

**maxon motor**

driven by precision



# HIGH PRECISION DRIVES AND SYSTEMS.

2019/2020



**Selection Guide**

**DC Motor**

**EC Motor**  
(BLDC Motor)

**Gearhead**

**Screw  
drive**

**Sensor**

**Motor &  
Motion control**

**Compact  
Drive**

**Accessories &  
Batteries**

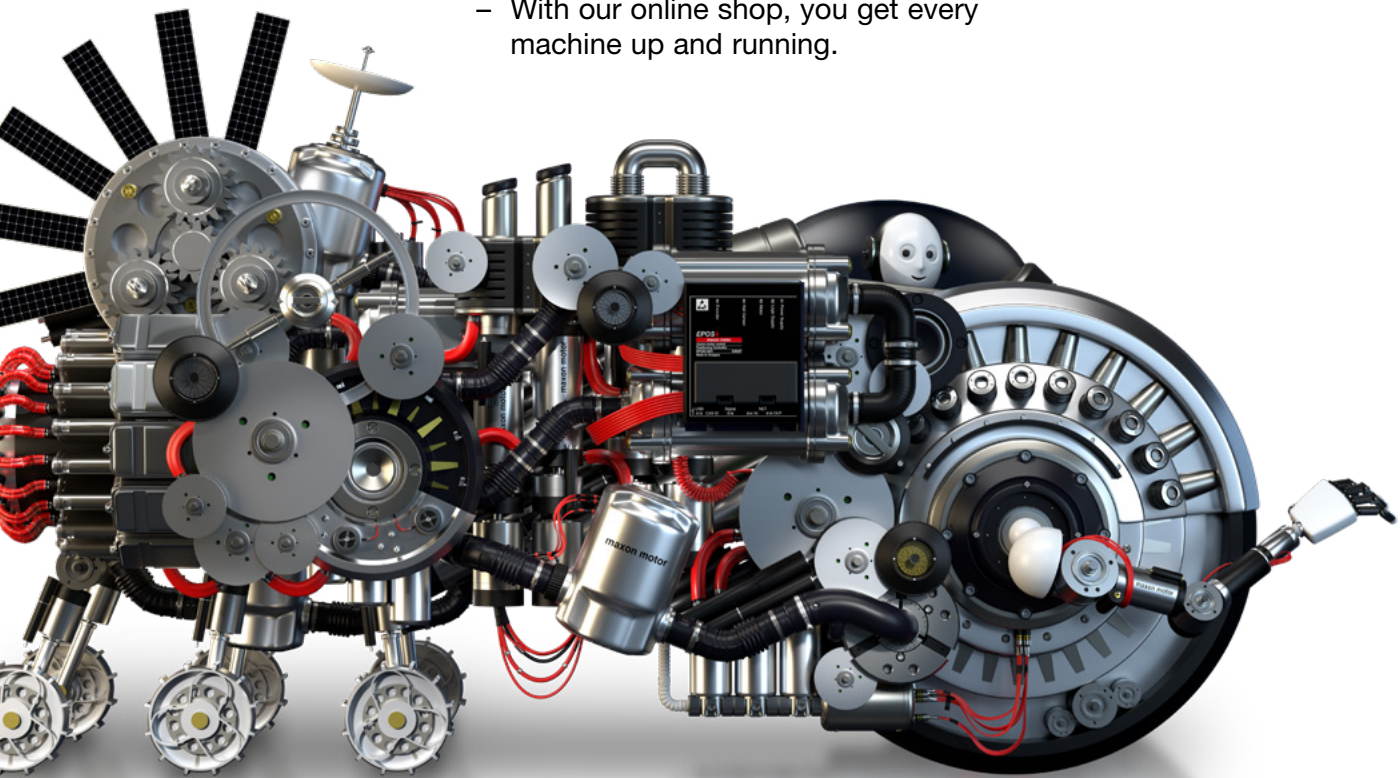
**Ceramic**

**Contact  
information**

**View the entire range of  
products online.**

**[shop.maxonmotor.com](http://shop.maxonmotor.com)**

- Greatest selection.
- Easy to configure.
- DC and BLDC motors, gears,  
motion control and drive systems.
- With our online shop, you get every  
machine up and running.



## maxon selection guide

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Get an overview of the extensive range of DC brushed and brushless motors, drives, encoders, control electronics, and the variety of possible combinations. Make a preliminary selection based on the power and size, commutation, or bearings. Quickly find what you're looking for, including sterilizable drives for use under special ambient conditions or drives with integrated electronics.

## Accessories overview

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Easily find the accessories you need for connecting maxon DC motors to maxon controllers.

### **4–27\_Welcome to maxon motor**

### **29–40\_maxon selection guide**

### **38\_Accessories overview**

### **42–62\_Technology – short and to the point**

### **63–65\_Standard Specification**

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### **67–160\_maxon DC motor**

Brushed DC motors with ironless winding.

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### **161–283\_maxon EC motor (BLDC)**

Brushless DC motors with ironless winding and flat motors with iron core winding.

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### **285–369\_maxon gear**

Precision planetary and spur gearheads.

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### **371–390\_maxon screw drive**

Compact screw drives with steel or ceramic screws.

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### **391–450\_maxon sensor**

Magnetic, optical, and inductive encoders, DC tachometers, and resolvers.

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### **451–481\_maxon motor & motion control**

4-Q PWM servo controllers, 1-Q-EC amplifiers, positioning controllers, and multi-axis motion controllers.

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### **483–486\_maxon compact drive**

Motor, sensors and controller as a compact drive for decentralized applications.

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### **487–501\_maxon accessories & batteries**

Brakes, end caps, connection cable and batteries.

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### **503–513\_maxon ceramic**

Custom ceramic components and standard components such as ceramic axles, shafts, or screws.

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### **515–518\_Contact**

Headquarters, Divisions, Manufacturing Companies, Sales Companies and Sales Agents

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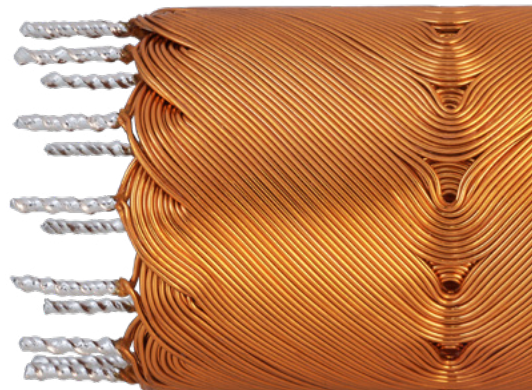
# Founded in Switzerland. Available worldwide.

## **maxon – a strong global brand.**

maxon motor, with headquarters in Sachseln/Central Switzerland, has production sites in Switzerland, Germany, Hungary, South Korea, France and Netherlands as well as sales companies in more than 30 countries. Our machines and product lines are developed in-house to guarantee cost-effective manufacturing of our products and enabling us to create custom solutions to fit your specific application needs.

## **Driven by precision.**

maxon motor develops and builds precision drive systems. Our brushless and brushed DC motors with ironless windings are among the best in the world. Flat motors with iron cores complete our modular product portfolio. maxon motor's modular system includes planetary and spur gearheads, screw drives, as well as encoders and control electronics.



## System solutions from a single source.

To our valued customers:

Electric motors only truly come into their own when they are installed in a linked system. This is why maxon also develops and produces gearheads, sensors, and controllers. We want to offer cross-platform system solutions from a single source that are perfectly tailored to our customers' requirements. We are expanding our product portfolio once again in 2019 with interesting drive solutions from British firm Parvalux, which became part of the maxon group this year.

In this catalog you will find many new products for a perfectly coordinated drive system. This includes our zub master controllers, which are ideal for controlling complex multi-axis systems, new EPOS4 controllers with EtherCAT communication, and, of course, maxon's solutions for intelligent battery management systems.

At the same time, we are continually developing our electric motors. Our ECX series has been expanded to include the small ECX Speed 6. The ironless winding in this precision drive permits speeds of up to 100,000 rpm. Like all brushless ECX motors, this drive is easily configured online. If you are looking for something powerful, look no further than the new version of the EC 90 flat motor, which provides an impressive 600 W output. The choice is as varied as the solutions that we develop with our customers every day.

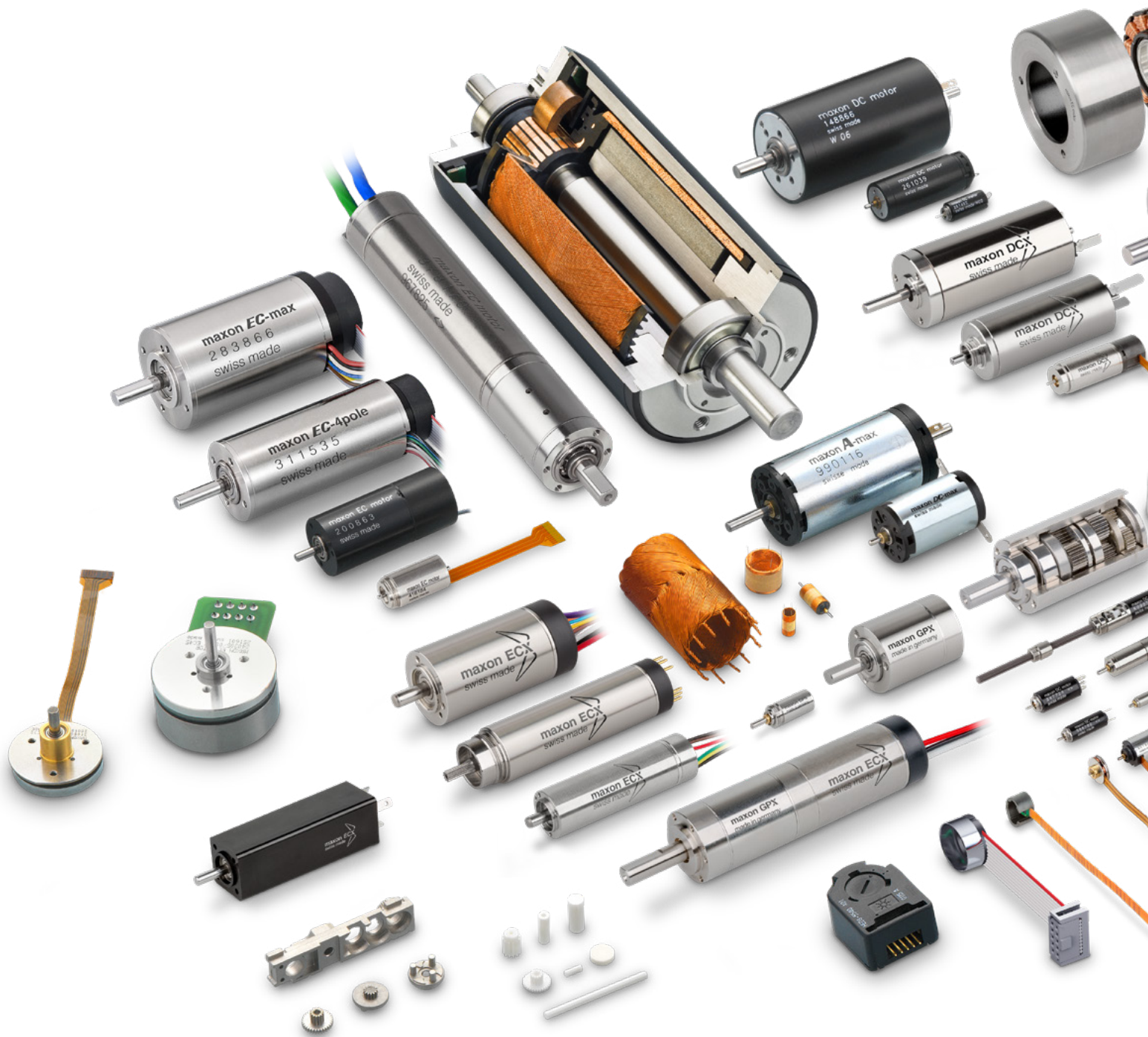
We thank you for your continued business and hope you enjoy browsing our new catalog.

Eugen Elmiger  
CEO maxon group



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# Close to 100 %

**We have a portfolio of drives for any application,  
and DC motors with an efficiency of more than 90 %.**



Maximum power packed into tiny spaces. maxon motor drives feature the following:

- High acceleration
- Long service life
- Low power consumption
- Unsurpassed reliability
- Able to bear high overloads for short periods
- Excellent control properties

## One stop shop.

### DC and BLDC motors

Brushed and brushless DC motors.  
Diameter 4 to 90 mm.

### Gearheads and screw drives

Planetary, spur and special gearheads. Compact screw drives with steel and ceramic screws.

### Sensors

Magnetic, optical, and inductive encoders, DC tachometers and resolvers.

### Controllers

4-Q PWM servo controllers, 1-Q EC amplifiers, positioning controllers, and multi-axis motion controllers.

### Ceramic components

Custom ceramic components and standard components such as ceramic axes, shafts, or screws.

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## Communication



Telescopes  
Professional cameras  
Television and aerial view cameras  
Theater and concert lighting  
Digital recording systems

## Robotics



Humanoid robots  
Inspection robots  
Research robots  
Household robots  
Mars rovers

## Security technology



Surveillance cameras  
Access and lock systems  
Mobile inspection systems  
Respirator suits  
Scanning systems

## Automotive



Gasoline and fuel injection pumps  
Adjustable shock absorbers  
Electric vehicles  
Driver-assist systems  
Power steering

## Aerospace



Autopilots  
Brake flap adjustment  
Seat and display adjustment  
Air-conditioning systems  
Solar sail adjustment

## Consumer Applications



High-end modeling  
Bicycle shift systems  
Motorized golf caddies  
Tattoo machines  
Record players



# If maxon is inside, the best is inside.

**maxon drives set the world in motion.**

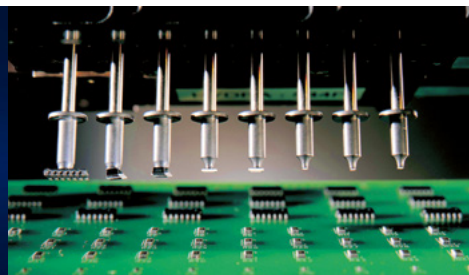
Precision drives from maxon motor are in operation in a wide number of industries. The most famous example comes from astronautics: NASA's Mars rovers prove that maxon drives can perform their work with absolute reliability, even under the harshest conditions. It then should come as no surprise that the high-precision drive systems from maxon motor are in widespread use on Earth.

## Medical science



Insulin pumps  
Prostheses  
Apnea devices  
Surgical robots  
Power tools

## Industrial Automation



Lithography systems  
Packing machines  
Industrial robots  
Welding equipment  
Printing equipment

## Instrumentation & Inspection



Microscopes  
Laser leveling systems  
Precision scales  
Calibration systems  
Weather and climate analyzers

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# maxon X drives

**Configure your drive online – according to with your individual needs. Mechanical and electrical data, dimensional drawings and CAD files can be downloaded immediately after the configuration has been completed. Within 11 working days, your drive will be ready for shipment.**

## Brushed DC motors

### maxon DCX

#### Powerful

Up to 120 W continuous output power, robust and very quiet.

#### Highly dynamic

Ironless winding and the latest in magnetic material.

#### Efficient

Efficiency of more than 90%.

### maxon DC-max

#### Cost-effective

Unrivalled price-performance ratio.

#### Dynamic

Ironless winding and the latest in magnetic material.

#### Efficient

Efficiency of almost 90%.

## Brushless DC motors

### maxon ECX

#### High speed

Up to 120000 rpm, smooth-running, almost no heat development.

#### Efficient

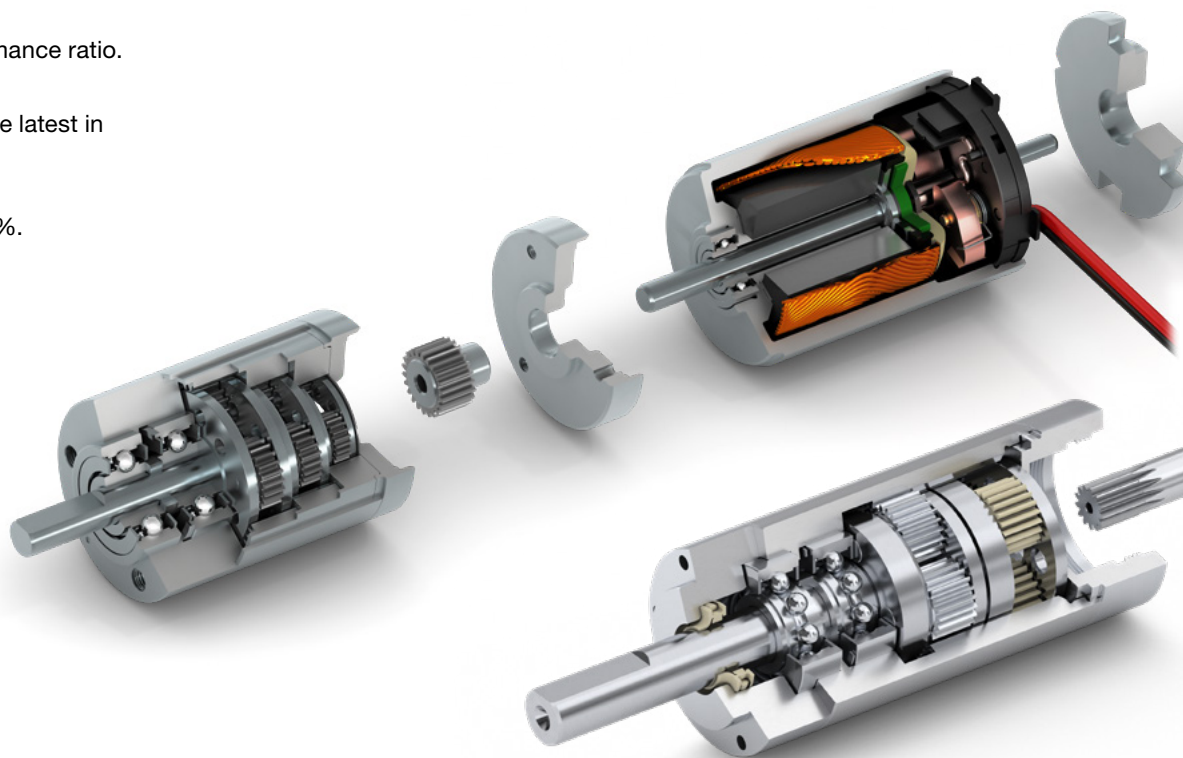
Efficiency of more than 90%.

#### Large selection

Various power stage options and diameters, electrical and mechanical interfaces.

#### Sterilizable

Sterilizable for up to 2000 cycles.



## Planetary gearhead

# maxon GPX

### Modular

High number of variants for different applications.

### High power density

Transmission of high torques and speeds.

### High efficiency

Up to 96%.

### Sterilizable

Sterilizable for up to 2000 cycles.

## Encoder

# maxon ENX

### Robust and compact

Interference-free functionality in a robust housing that takes up minimal space.

### Variety of options

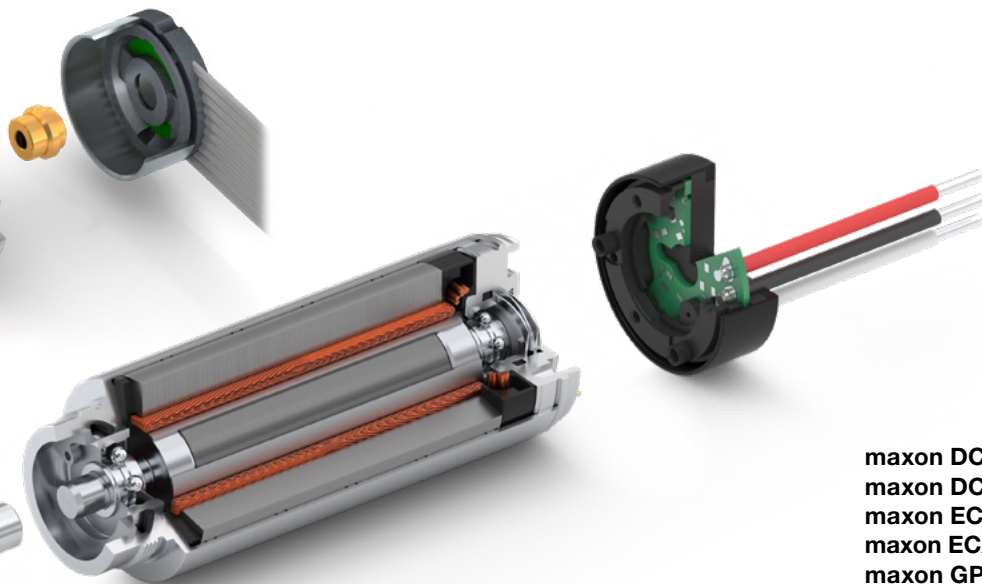
Various 3-channel incremental and absolute encoders.

### Flexible

Selectable counts per turn, signal protocol and electrical connection.

### Sterilizable

Sterilizable for up to 1000 cycles.



maxon DCX motor	70–91
maxon DC-max motor	94–99
maxon ECX SPEED motor	164–199
maxon ECX SQUARE motor	202
maxon GPX gear	288–320
maxon ENX encoder	394–410

[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

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maxon X drives

# Produced within 11 days.

Lean, automated processes ensure that all drive versions are ready for shipment within 11 days.

Assemble your individual brushed or brushless DC drive: You can configure the gear stages, the motor bearings, the shafts, the encoder and much more. Design your custom drive online today and your finished drive will ship from Switzerland in 11 working days.

[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)



# 11 READY IN DAYS

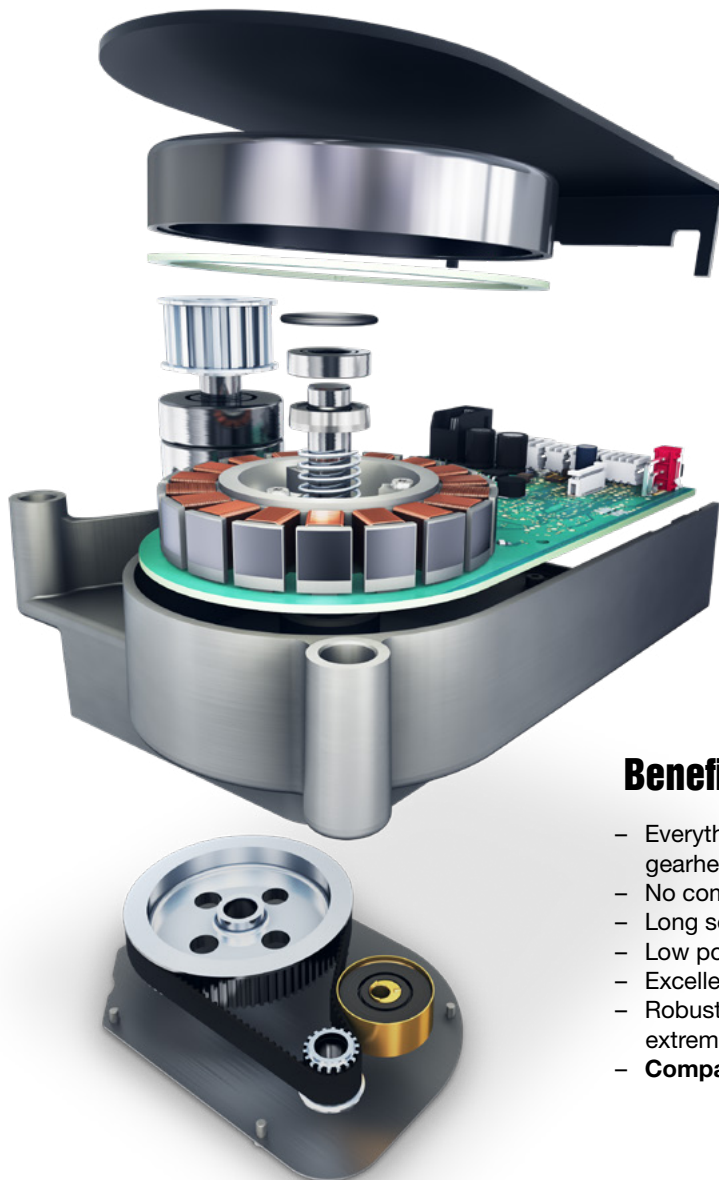


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# Ready for the next step.

**We develop customized mechatronic drive systems.  
Premium quality from a single source.**

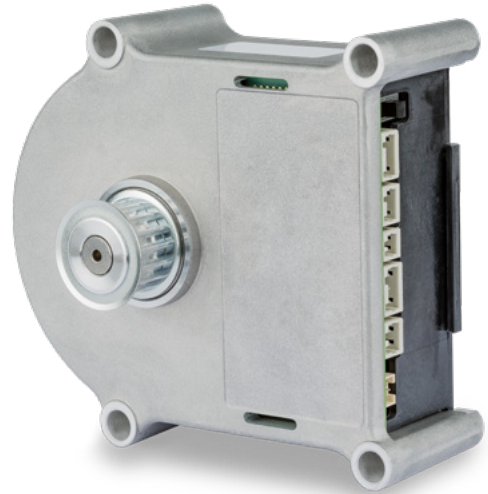


## **Benefits**

- Everything from a single source: DC/BLDC motor, gearhead, sensor, electronics, software, housing
- No compromise on quality
- Long service life
- Low power consumption
- Excellent control properties
- Robust design: resistant to vibrations, shocks, and extreme temperatures
- **Compact design:** top volume-to-performance ratio

### The invisible door opener

Together with a Swiss elevator manufacturer, maxon developed a system solution for driving elevator doors. Encased in a housing, the door drive can be mounted directly to the lift cab. And this is where its real work starts. There are many different types of elevators, with differently sized cabs, different materials and, depending on the country, different safety standards. After a homing procedure, the controller co-developed by maxon detects the size and weight of the doors, autonomously calculates the optimal parameters, and corrects them if necessary. In just a few steps, the door drive is configured and ready for use. The system solution combines a brushless EC90 flat with customized housing, an integrated EPOS positioning controller and MILE encoder.



### Complex mechatronic drive systems only work if all components are of the highest quality and perfectly synchronized.

maxon not only develops and produces DC and BLDC motors, gearheads, sensors, and controllers, but is also able to combine the high-quality drive components in a mechatronic system. The benefits: a compact design, components configured specifically for the customer, and the guarantee of obtaining maximum performance from the drive system.

### Better quality of life

Exoskeletons are used in medicine and industry. The mechatronic support structures help in cases of paralysis, for example, or with post-accident rehabilitation. The system solution from maxon consists of a powerful, brushless flat motor with an encoder, a three-stage planetary gearhead and an EPOS-4 controller. The components are stored in a light yet robust aluminum housing, with not a millimeter of space wasted. The Exoskeleton Drive from maxon is mainly suitable for knee and hip joints.



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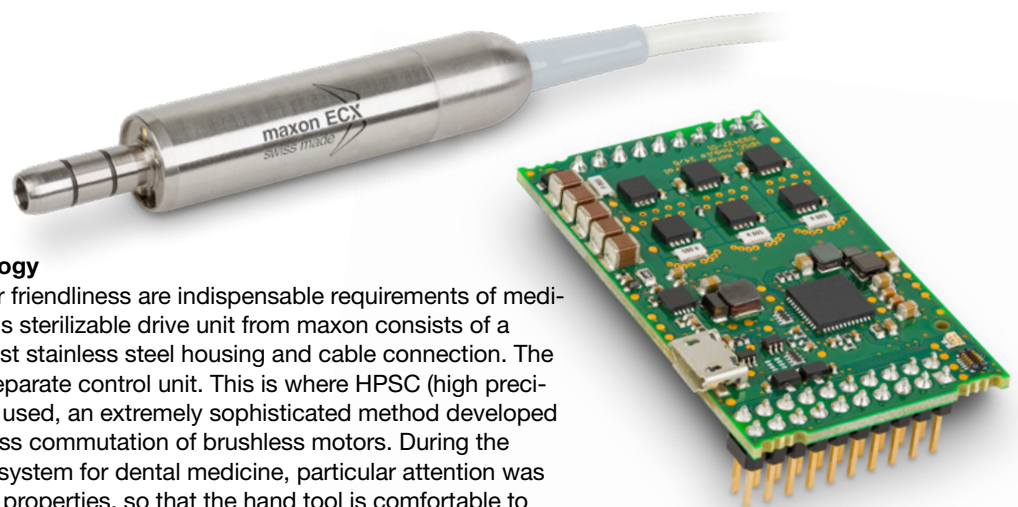


#### **For clean air**

The drive system consists of a customized brushless flat motor plus electronics. This system solution accurately regulates the urea supply for treatment of diesel exhaust gas, which triggers a chemical reaction that breaks down toxic nitrogen compounds. This pollutant separation ensures compliance with the latest exhaust gas standards. The system is primarily used in trucks and is an important contribution from maxon to improve the global climate.

### **What does maxon motor understand by «mechatronic drive systems»?**

maxon has extensive knowledge of the perfect interaction of various drive components – and thus of mechatronic drive systems. After all, we've been developing and producing drive components that are among the best in the world for decades now. These include precision motors, gearheads, sensors, and controllers. As system experts, we are your first choice when you need to find sophisticated solutions to complex drive problems and implement these in your application.



#### **Precise medical technology**

Precision, speed, and user friendliness are indispensable requirements of medical hand-held devices. This sterilizable drive unit from maxon consists of a brushless motor with robust stainless steel housing and cable connection. The motor is controlled by a separate control unit. This is where HPSC (high precision sensorless control) is used, an extremely sophisticated method developed by maxon for the sensorless commutation of brushless motors. During the development of this drive system for dental medicine, particular attention was also paid to its ergonomic properties, so that the hand tool is comfortable to hold. It is available in a range of sizes and power levels.



We build your system.



### Cloud Service & App

Collect ride data, adjust personal settings, navigate, or request support – these are only a few of our app's capabilities.



### Twist Shift & Display

Intuitive HMIs are very important to us. In addition to a modern display, our portfolio also includes various twist shifters with LED indicators.

### Sensors

Our carefully fine-tuned speed and torque sensors continuously capture operating data to ensure a perfectly natural riding experience.



### Controller

The central controller is the heart of the e-bike system. It uses the CANopen protocol and can be adjusted individually.



### Motor

50 Nm from only 3.5 kg. Maximum efficiency due to an ironless rotor. The hub motor can be configured for various speeds: 25, 45 km/h, or 20 mph.



### Battery

As a systems partner, we supply our own lithium-ion batteries, including battery management system (BMS). The battery is fully or partially integrated as per customer request, from prototype to series production.



### From BIKEDRIVE to holistic e-mobility technology

With BIKEDRIVE, maxon has not only made a name for itself on the e-bike scene, but also established itself as a systems specialist. Numerous OEMs are now using maxon e-mobility technology in their electromobility applications. When it comes to our system solutions, we offer professional care from system integration right through to global service and support.

# Modify!

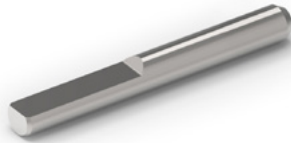
## The online configurator

With our configurator, you can easily modify your drive online as you need it. It allows you to adapt a shaft, flange, bearing, or electrical connection perfectly to your application. With our automated processes, you will be holding your customized drives in your hands within a few days: [xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

If you need further adjustments to your drives, such as hollow shafts, special lubricants, or special windings, please contact us for assistance.

### Shaft

- Length
- Diameter
- Surface
- Cross bore



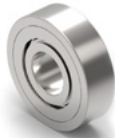
### Winding

- Nominal voltage
- Temperature range



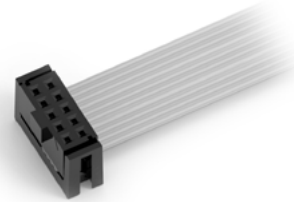
### Bearings

- Ball bearing
- Sleeve bearing
- Lubrication



### Electrical connection

- Terminals or cables
- Cable length
- Connection alignment
- Connector



### Flange

- Centering collar
- Bolt circle
- Thread



### Output component

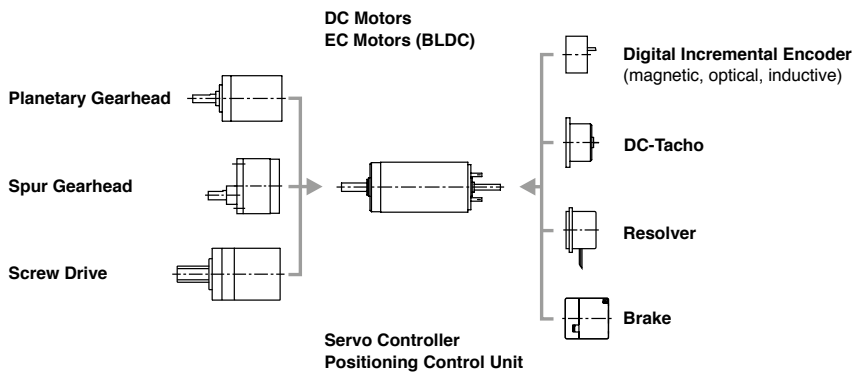
- Pinion
- Pulley



# Combine!

## The maxon modular system

The motors, gearheads, sensors, brakes, and controllers of maxon motor are perfectly matched to each other and can be combined in a number of ways. Our modular system makes it easy to find suitable components for your motor – in the catalog and in the online shop. [shop.maxonmotor.com](http://shop.maxonmotor.com)



## Great choice, easy ordering.

The diversity of motors and product combinations offered by maxon is unmatched worldwide. The maxon modular system and the numerous options for windings offer even more possibilities for variation. To make the delivery times as short as possible for our customers, we organized our products into program groups.



### Stock program

The market-oriented selection from our extensive product portfolio offers you short delivery times.



### Standard program

In the comprehensive standard program, products are included which can be produced and delivered in a short time. The plenitude of versions in this program offer tried and tested standard products for optimized application.



### Special program

A wide range of motors and combinations is available on request.

## Notes on the catalog.

### Disclaimer

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# **We are engineers. Dedicated to the develop- ment of drive technology.**

## **Quality with no compromise.**

Development engineers and designers at maxon motor use only state-of-the-art calculation and configuration software. This enables us to develop customer-specific solutions quickly. Advanced qualification and risk assessment methods guarantee that all of our products are highly reliable and robust. Simultaneously, systematic process and product optimization programs enable us to provide our customers with more options for drive configuration - in shorter delivery times. An example are maxon DCX drives, which can be configured online.

Consistent standards on quality, safety, and procedures ensure that only premium products leave our factories. The business and production processes fulfill international standards such as ISO 9001 and ISO 14001. maxon medical has ISO 13485 certification and products for the aerospace industry have ISO 9100 certification.



# We are experts in precision drives.

## Flexible in-house production.

All important components found in our maxon motor drive systems are produced on machines and manufacturing lines developed in-house. Our customers are guaranteed efficient and fast manufacturing of their products, whether in small or in large quantities, as well as maximum flexibility to meet special needs and requirements.

Our core areas of expertise include:

- Winding technology
- Standard and special gearhead engineering
- Encoder technology
- Electronics and systems technology
- Injection molding processes for plastics as well as ceramic and metal powder (CIM/MIM)
- Installation and automation technology
- Development / project management
- Quality management

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## SN EN ISO 9001:2015

SN EN ISO 9001 specifies the requirements to a quality management system (process approach) that an organization have to meet in order to provide products and services that meet the customer expectations as well as comply with the applicable regulatory requirements. Simultaneously, the management system has to be subject to continuous improvement.

## EN 9100:2018 (corresponds to AS 9100)

This is an internationally accepted quality standard of the aerospace industry. It obliges companies and employees to reduce potential risks in the aerospace industry to a minimum by structuring the design and manufacturing processes accordingly. At maxon motor, this standard is applied for customer-specific products on request – except for A-max motors and controllers.

The EN 9100 standard builds on the SN EN ISO 9001 standard.  
EN 9100 certification includes SN EN ISO 9001 certification.

EN 9100

ISO 9001

## SN EN ISO 13485:2016

Is an internationally accepted quality norm for medical products that requires management and staff to ensure that the design and manufacture of medical products minimize potential risks for patients. The traceability of processes and raw materials must also be guaranteed. At maxon motor, this standard is applied for customer-specific products on request ( $\leq \varnothing 10$  mm drives).

## SN EN ISO 14001:2015

Is an internationally accepted quality norm for environmental management systems (EMS). It covers environmental-relevant processes and procedures in a company, requiring a company's management and employees to adopt environmentally-compatible behavior and constantly seek to improve its procedures and documentation.

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## EU Directives

maxon products are designed for installation in complete devices and are considered incomplete machines according to EU Directive 2006/42/EC (Machinery Directive). They are designed to be installed in machines or other incomplete machines and are therefore not CE marked. It is the responsibility of the end device manufacturer to identify the relevant directives and issue a declaration of conformity.

maxon motor confirms compliance with the following directives of the European Union. Exceptions are described on the respective product pages.

**1907/2006/EU REACH**

**2012/19/EU WEEE**

**2018/851/EU Waste Framework Directive**

**2011/65/EU RoHS**



# Quality management.

## Only performance counts.

Drives manufactured by maxon motor can be absolutely relied on even under the most difficult conditions – they have for example been in use on Mars for years. But maxon DC motors do not only do their job in space, they also function in tough conditions on and deep below the surface of the Earth flawlessly and efficiently.

The quality management system of maxon motor is an integral part of the overall management system. The operational and organizational structures, the powers and responsibilities, as well as the process and procedure assessments are documented for all employees. The quality management system is enacted, maintained and periodically verified. Since 18.9.1991, Bureau Veritas is responsible for the verification.

## Overview of the maxon certifications.

	maxon motor Sachseln	maxon medical Sachseln	maxon motor Sexau	maxon motor Hungary	maxon motor Korea
ISO 13485					
EN 9100					
ISO 9001					
ISO 14001					

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# www.maxonmotor.com

## Visit us online and discover the digital maxon world.

On our website, you can find general news and information on our products and services, as well as an integrated online catalog (e-shop), the selection program and the maxon online configurator.



### online configurator

Configure and combine motors (DCX, DC-max, ECX), gearheads (GPX) and encoders (ENX) according to your individual requirements. Fast, easy and online. We guide you step-by-step through the various functionalities in the configurator.



### maxon selection program

Find the right drive by entering just a few parameters, such as supply voltage and torque. After you have entered the requirements of your drive, the maxon selection program shows the possible solution combinations from the maxon product program.



### maxon online shop

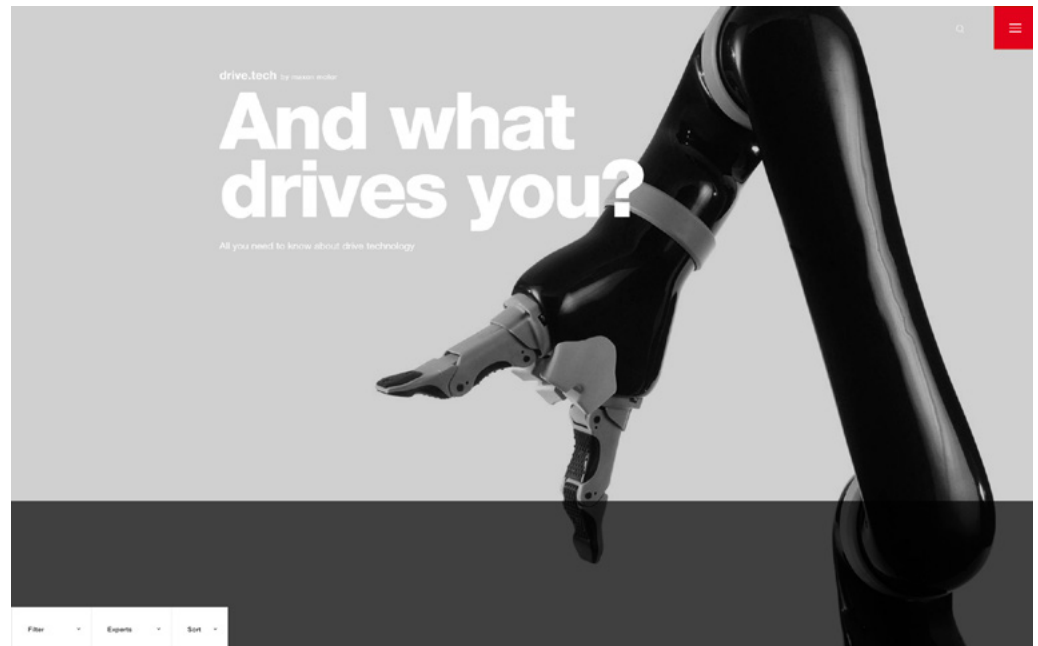
In the maxon online catalog, we provide a complete overview of all maxon products. Here you can order motors, gearheads, sensors and electronics online. Additionally, you can download data on all maxon products in the online catalog.



## drive.tech: Drives and technology online.

On our online platform drive.tech, you will find stories, technical reports, and videos about drive technology. Read blogs from our maxon experts, share content on social media, and stay up to date with our eNewsletter.

[www.drive.tech](http://www.drive.tech)



maxon motor 06.02.2018  
poor little guy :  
[twitter.com/teppasrobotics...](https://twitter.com/teppasrobotics)

maxon motor 05.02.2018  
Thanks for 1000 subs on our YouTube channel! #1kreator  
[goo.gl/YuYDZ](https://www.youtube.com/channel/UCk1kreator)

## driven magazine: Read and experience.

In driven, the maxon motor magazine, we present exciting applications, expert interviews, and tips and tricks from the field of drive technology. High-quality, entertaining and informativ. driven is published twice per year and comes both in a print version and as an app for downloading. Happy reading!

[magazine.maxonmotor.com](http://magazine.maxonmotor.com)

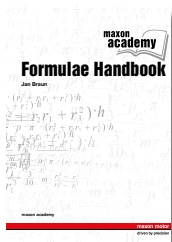


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$$M_{in,\alpha} = \left( J_{in} + J_1 + \frac{J_2}{\eta} \cdot \frac{d_1^2}{d_2^2} + \frac{J_X}{\eta} \cdot \frac{d_1^2}{d_X^2} + \frac{m_L + m_B}{\eta} \cdot \frac{d_1^2}{4} \right) \cdot \frac{\pi}{30} \cdot \frac{\Delta n_{in}}{\Delta t_a}$$



### maxon Formula Compendium.

Formulae, terms and explanations for all types of calculations concerning drive systems. Detailed collection with illustrations and descriptions. Flow chart for targeted drive selection. (Author: Dipl. Ing. Jan Braun, edition)



### The selection of high-precision microdrives.

Step by step from the specific formulation of the drive problem to its solution. Numerous tips and explanations, focusing only on theory where required for greater understanding. Various examples of applications deal with the practical aspects of drive technology. (Author: Dr. Urs Kafader, 149 pages, ISBN 978-3-9523654-5-8)

# academy.maxonmotor.com

**Increase your knowledge of drive technology and motion control.**

Learn more about the interaction of drive components, namely motor, gears, sensors and controllers. maxon academy brings together maxon products to provide ongoing education on drive technology. In addition to the maxon academy books and brochures, you will find here E-learning modules, the currently planned seminars on drive technology and motion control as well as teaching material. These range from presentation and sample motors that can be taken apart for student exercises to models for hands-on training with suggestions for practical work.



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## New products

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164	ECX SPEED 6 M Ø6 mm, brushless, 1.5 Watt		<b>NEW</b>
165	ECX SPEED 6 M Ø6 mm, brushless, 2 Watt	High Power	<b>NEW</b>
250	EC-i 52, Ø52 mm, brushless, 200 Watt	High Torque	<b>NEW</b>
267	EC 60 flat Ø60 mm brushless, 100 Watt		<b>NEW</b>
268	EC 60 flat Ø60 mm, brushless, 150 Watt, open rotor		<b>NEW</b>
269	EC 60 flat Ø60 mm, brushless, 200 Watt, ventilated		<b>NEW</b>
271	EC 90 flat Ø90 mm, brushless, 220 Watt, open rotor		<b>NEW</b>
272	EC 90 flat Ø90 mm, brushless, 360 Watt, ventilated		<b>NEW</b>
274	EC 90 flat Ø90 mm, brushless, 400 Watt , open rotor		<b>NEW</b>
275	EC 90 flat Ø90 mm, brushless, 600 Watt, ventilated		<b>NEW</b>
309	GPX 22 UP Ø22 mm, planetary gearhead, ultra performance		<b>NEW</b>
317	GPX 32 UP Ø32 mm, planetary gearhead, ultra performance		<b>NEW</b>
399	ENX 10 EASY XT Ø10 mm, encoder, incremental 1-1024 cpt, 3 channel		<b>NEW</b>
402	ENX 16 EASY XT Ø16 mm, encoder, incremental 1-1024 cpt, 3 channel		<b>NEW</b>
404	ENX 16 EASY Abs. XT Ø16 mm, encoder, absolute 4096 steps		<b>NEW</b>
420	Encoder 16 EASY XT Ø16 mm, incremental, 128-1024 cpt, 3 channel		<b>NEW</b>
424	Encoder 16 EASY Abs. XT Ø16 mm, absolute 4096 steps		<b>NEW</b>
463	EPOS4 Compact 24/1.5 EtherCAT, positioning controller up to 36/108 Watt		<b>NEW</b>
464	EPOS4 Compact 50/5 EtherCAT, positioning controller up to 250/750 Watt		<b>NEW</b>
475	MiniMACS, programmable motion controller, 3 axes		<b>NEW</b>
476	MACS5, programmable motion controller, 6 axes		<b>NEW</b>
477	OEM motion controller, MACS5-AMP3-Lite/HP, programmable motion controller		<b>NEW</b>
478	MasterMACS, programmable motion controller, 32 axes		<b>NEW</b>
501	Battery management BMS 13-02 and BMS 14-01		<b>NEW</b>



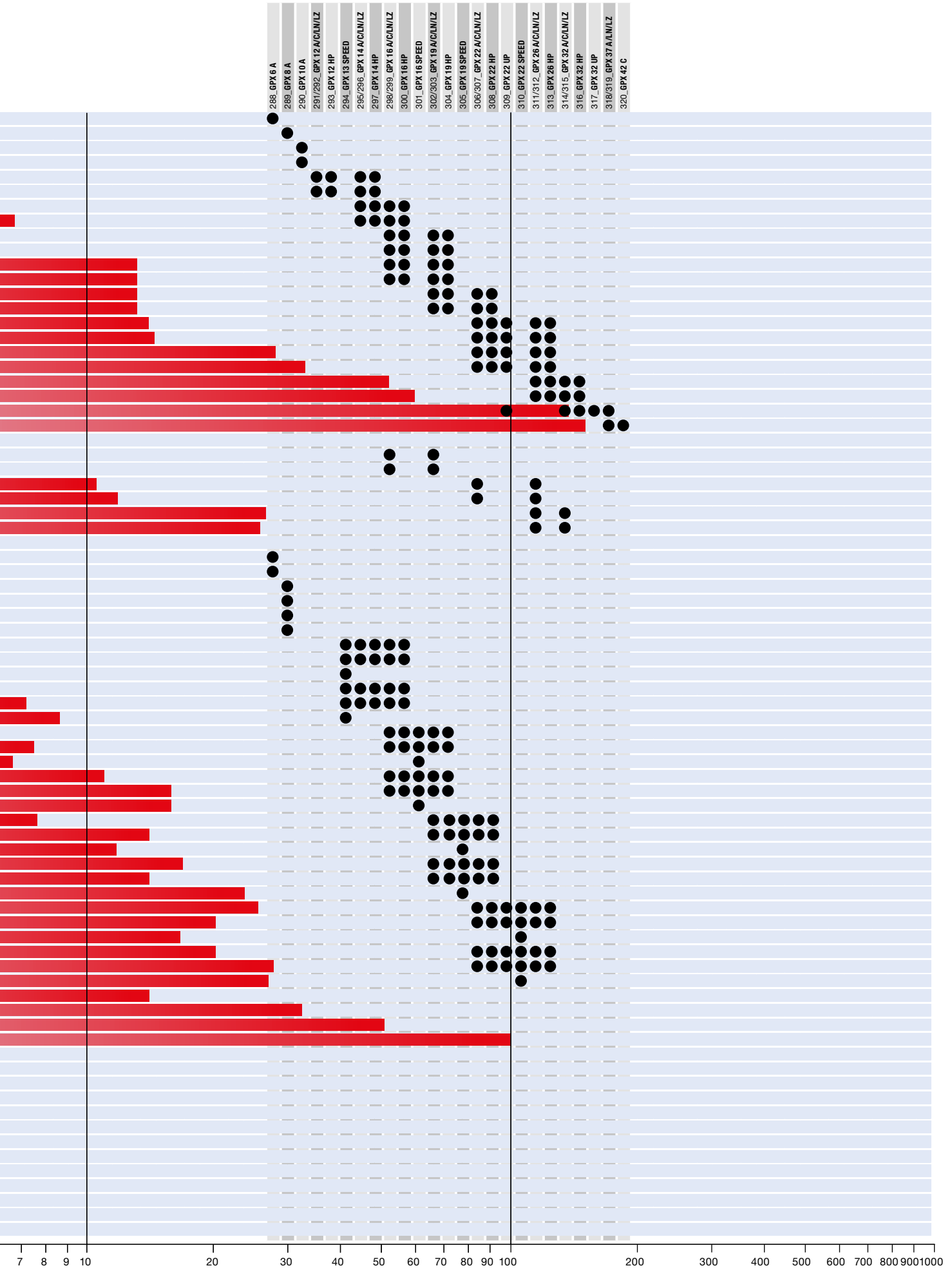
# maxon selection guide

Classification of the maxon ranges according to performance classes. Performance, also in conjunction with size, is frequently a central requirement when considering drive systems. A preliminary size-related selection can be made from the different product ranges with the maxon selection guide. Our data sheets provide detailed specifications related to individual motors. Should you need any additional information, simply call us!

<b>maxon X drives</b>	30–31
<b>maxon DC motor</b>	32–33
<b>maxon EC motor</b>	34–37
<b>Summary accessories</b>	38
<b>maxon sensor</b>	39
<b>maxon gear</b>	40



### Gears



Description of numbers with detailed information about the connection on page 38

# Selection Guide

DC motors (brushed).  
maxon DC motor



### Type/Sensor

### Electronics

RE

A-max

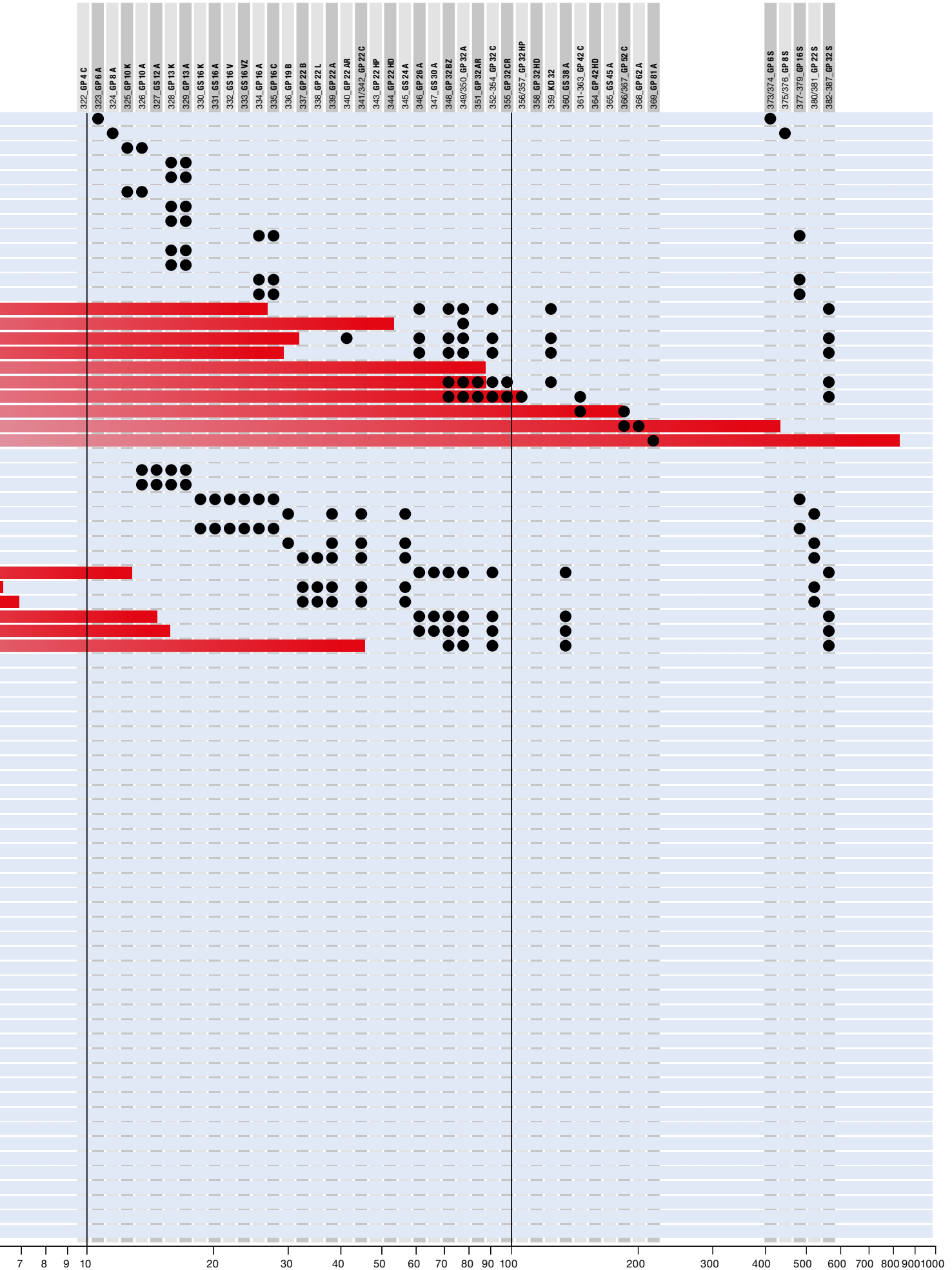
Nominal torque mNm

● Standard ○ Option/on request



Gears

Screw Drives

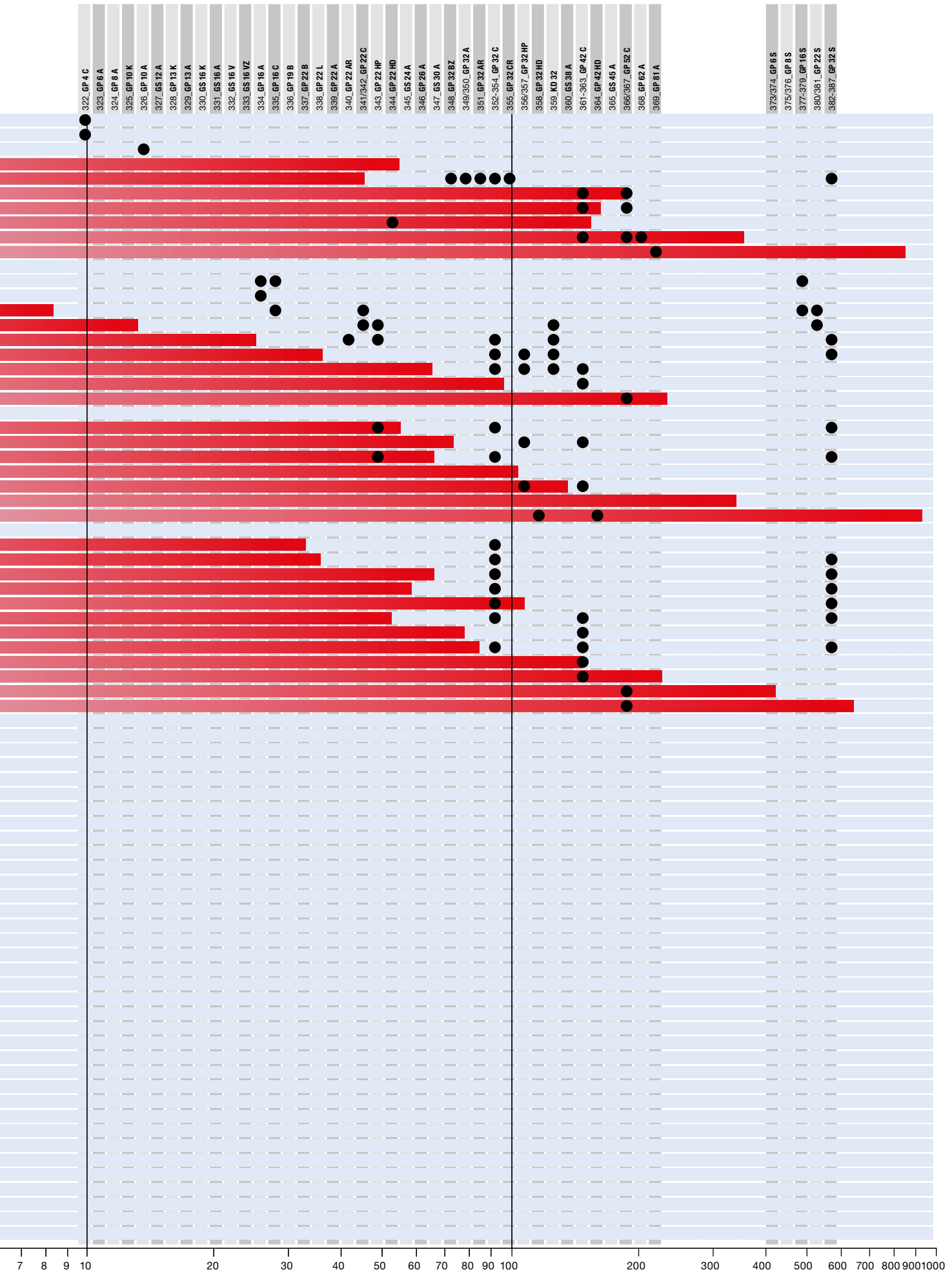


Description of numbers with detailed information about the connection on page 38



Gears

Screw Drives



Description of numbers with detailed information about the connection on page 38



Gears

Screw Drives



Description of numbers with detailed information about the connection on page 38

# Accessories overview

The following table contains information on connecting maxon motors with maxon controllers. All listed adapters, plugs, evaluation boards, etc. must be ordered separately. The numbers refer to the Selection Guide pages 30–40.

1	Can be connected directly. No accessories required.	50	ESCON Module 50/8 Motherboard 546048 and extension cable 651900 required.
2	Can be connected directly. Plug must be removed.	51	Evaluation board board 370652 and extension cable 651900 required.
3	ESCON Module Motherboard Sensorless 450237 and adapter 220310 required.	52	Extension cable 275851 required.
4	ESCON Module Motherboard Sensorless 450237 required. Can be connected directly with suitable configuration.	53	Adapter 327086 required. Attach solder bridge (Jumper) to printed circuit board.
5	Evaluation board 370652 required.	54	Extension cable 403962 required, for motors with terminals.
6	Evaluation board 370652 required. Can be connected directly with suitable configuration.	55	ESCON Module Motherboard 438779 required. Can be connected directly with suitable configuration.
7	ESCON Module Motherboard Sensorless 450237 required. Plug must be removed.	56	ESCON Module 24/2 Motherboard 486400 required. Can be connected directly with suitable configuration.
8	Evaluation board 370652 and extension cable 339380 required.	57	ESCON Module 24/2 Motherboard 486400 and adapter 223774 required. Connector needs to be removed.
9	Adapter 220300 required.	58	ESCON Module Motherboard 438779 and extension cable 651900 required.
10	Extension cable 339380 required.	59	Can be connected directly with suitable configuration.
11	Adapter 418721 required.	60	Adapter 223774 required.
12	Adapter 418723 required.	61	Adapter 223774 and extension cable 3409.506 (6 poles plug must be removed) required.
13	ESCON Module Motherboard Sensorless 450237 and extension cable 339380 required.	62	ESCON Module Motherboard 438779 and adapter 459875 required.
14	ESCON Module 50/8 Motherboard 586048 required. Connectors at the motor need to be removed.	63	Intended for use with customer-specific Motherboard. Combination with EPOS4 CB 50/5 CAN (534133) yields EPOS4 Compact 50/5 CAN (541718).
15	Adapter 220300, extension cable 275878 and extension cable 275851 required.	64	Can be connected directly. Attach solder bridges (jumpers) to printed circuit board.
16	Extension cable 354045 required.	65	Adapter 223774 required. Plug must be removed.
17	Plug set 384915 required. Plug must be removed.	66	Extension cable 403964 required.
18	Plug set 384915 required.	67	Adapter 425931 and extension cable 354046 required. Connector needs to be removed.
19	Evaluation board 370652 required. Connectors at the motor need to be removed.	68	Cable 275851 and cable 275878 required.
20	ESCON Module 50/8 Motherboard 586048 required.	69	Extension cable 354046 required.
21	ESCON Module 50/8 Motherboard 586048 and extension cable 339380 required.	70	Adapter 405120 required.
22	Adapter 262359 and cable 354046 required. Connector needs to be removed.	71	Extension cable 302948 required.
23	ESCON Module Motherboard Sensorless 450237 and adapter 498157 required.	72	ESCON Module Motherboard 438779 and extension cable 354046 required.
24	ESCON Module 24/2 Motherboard 486400 required.	73	ESCON Module Motherboard 438779 and adapter 223774 required. Plug must be removed.
25	Evaluation board 370652 and adapter 425931 required.	74	Adapter 498157 and cable 403962 required.
26	Adapter 418719 required.	75	ESCON Module Motherboard 438779, adapter 223774, and extension cable 3409.506 (6-pin plug must be removed) are required.
27	Adapter 425931 and cable 354046 (remove connector on one end) required. Install solder bridge (jumper) on circuit board.	76	ESCON Module 24/2 Motherboard 486400 and adapter 498157 required.
28	ESCON Module Motherboard 438779 and adapter 220300 required.	77	DEC Module Evaluation board 370652 and adapter 498157 required.
29	Adapter 459875 required.	78	Adapter 488167 and cable 300586 required.
30	ESCON Module Motherboard 438779 required. Plug must be removed.	79	Adapter 488167 and cable 451290 required.
31	ESCON Module Motherboard 438779 and extension cable 339380 required.	80	Adapter 498157 required.
32	Extension cable 442086 required.	81	Adapter 498157 and cable 302948 required.
33	Plug set 451746 required. Plug must be removed.	82	ESCON Module Motherboard 438779 required.
34	Plug set 451746 required.	83	Plug set 520859 required. Plug must be removed.
35	Adapter 262359, cable 354046 and extension cable 3409.506 (6-pin connector needs to be removed) required.	84	Plug set 520859 required.
36	ESCON Module Motherboard 586048, adapter 223774, and extension cable 3409.506 (6-pin connector needs to be removed) required.	85	Adapter 488167 and cable 520852 required.
37	ESCON Module Motherboard 586048 and adapter 223774 required. Connector needs to be removed.	86	Intended for use with customer-specific Motherboard. Combination with EPOS4 CB Power CAN (520884) yields EPOS4 Compact 50/8 CAN (520885).
38	ESCON Module 24/2 Motherboard 486400 and adapter 425931 required.	87	Intended for use with customer-specific Motherboard. Combination with EPOS4 CB Power CAN (520884) yields EPOS4 Compact 50/15 CAN (520886).
39	ESCON Module 24/2 Motherboard 486400 and adapter 220300 required.	88	Intended for use with customer-specific Motherboard. Combination with EPOS4 CB 24/1.5 CAN (536997) yields EPOS4 Compact 24/1.5 CAN (546714).
40	ESCON Module 24/2 Motherboard 486400 and adapter 405120 required.	89	Adapter 488167 and cable 378173 required.
41	ESCON Module 24/2 Motherboard 486400 required; connector needs to be removed.	90	Adapter 425931, cable 403962 and cable 354046 (Plug must be removed from one side) required.
42	ESCON Module 50/8 Motherboard 586048 and extension cable 354046 required.	91	Adapter 549609 required.
43	ESCON Module 24/2 Motherboard 486400 and extension cable 339380 required.	92	ESCON Module Motherboard 438779 and Adapter 549609 required.
44	ESCON Module 24/2 Motherboard 486400 and adapter 459875 required.	93	ESCON Module 50/8 Motherboard 586048 required. Can be connected directly with suitable configuration.
45	Can be connected directly. Attach solder bridge (Jumper) to printed circuit board.		
46	Can be connected directly. Connect via encoder connection.		
47	Adapter 327086 required.		
48	Extension cable 303490 required.		
49	Extension cable 651900 required.		

- For motors without Hall sensors
- For motors with Hall sensors
- For motors with/without sensors
- For motors with Hall sensors, with or without encoders
- At least 2 channel encoder with line driver or Hall sensors required
- At least 2 channel encoder with line driver required



# Selection Guide

Planetary and spur gearheads.

## maxon gear maxon screw drive

GP / GS

GPX

Screw

Type Bearing

C (Ceramic Version)  
 LI (Noise Reduced)  
 LZ (Backlash Reduced)  
 HP (High Power)  
 Sterilizable  
 HD (Heavy Duty)  
 UP (Ultra Performance)  
 Ball bearing  
 Sleeve bearing  
 Slide bearing

Model	Shaft Diameter	Output Torque	Speed	Ratio	Output Torque	Type	Bearing
GP 4 C	Ø4 mm	0.002–0.015 Nm	17:1–280:1	322	0.002	●	●
GP 6 A	Ø6 mm	0.002–0.03 Nm	3.9:1–854:1	323	0.002	●	●
GP 8 A	Ø8 mm	0.01–0.1 Nm	4:1–4096:1	324	0.01	●	●
GP 10 K	Ø10 mm	0.005–0.1 Nm	4:1–1024:1	325	0.005	●	●
GP 10 A	Ø10 mm	0.01–0.15 Nm	4:1–1024:1	326	0.01	●	●
GS 12 A	Ø12 mm	0.01–0.03 Nm	6.4:1–4402:1	327	0.01	●	●
GP 13 K	Ø13 mm	0.05–0.15 Nm	4.1:1–1119:1	328	0.05	●	●
GP 13 A	Ø13 mm	0.2–0.35 Nm	4.1:1–3373:1	329	0.2	●	●
GS 16 K	Ø16 mm	0.01–0.03 Nm	6.4:1–5752:1	330	0.01	●	●
GS 16 A	Ø16 mm	0.015–0.04 Nm	6.4:1–5752:1	331	0.015	●	●
GS 16 V	Ø16 mm	0.06–0.1 Nm	6.4:1–5752:1	332	0.06	●	●
GS 16 VZ	Ø16 mm	0.06–0.1 Nm	22:1–1670:1	333	0.06	●	●
GP 16 A	Ø16 mm	0.1–0.3 Nm	4.4:1–4592:1	334	0.1	●	●
GP 16 C	Ø16 mm	0.2–0.6 Nm	4.4:1–4592:1	335	0.2	●	●
GP 19 B	Ø19 mm	0.1–0.3 Nm	4.4:1–4592:1	336	0.1	●	●
GP 22 B	Ø22 mm	0.1–0.3 Nm	4.4:1–4592:1	337	0.1	●	●
GP 22 L	Ø22 mm	0.2–0.6 Nm	3.8:1–4592:1	338	0.2	●	●
GP 22 A	Ø22 mm	0.5–1.0 Nm	3.8:1–4592:1	339	0.5	●	●
GP 22 AR	Ø22 mm	0.5 Nm	3.8:1–5.4:1	340	0.5	●	○
GP 22 C	Ø22 mm	0.5–2.0 Nm	3.8:1–4592:1	341-342	0.5	●	●
GP 22 HP	Ø22 mm	2.0–3.4 Nm	3.8:1–850:1	343	2.0	●	●
GP 22 HD	Ø22 mm	2.0–4.0 Nm	3.8:1–4592:1	344	2.0	●	●
GS 24 A	Ø24 mm	0.1 Nm	7.2:1–325:1	345	0.1	●	●
GP 26 A	Ø26 mm	0.75–4.5 Nm	5.2:1–236:1	346	0.75	●	●
GS 30 A	Ø30 mm	0.07–0.2 Nm	15:1–500:1	347	0.07	●	●
GP 32 BZ	Ø32 mm	0.75–4.5 Nm	3.7:1–236:1	348	0.75	●	●
GP 32 A	Ø32 mm	0.75–4.5 Nm	3.7:1–6285:1	349-350	0.75	●	●
GP 32 AR	Ø32 mm	0.75 Nm	3.7:1–5.8:1	351	0.75	●	○
GP 32 C	Ø32 mm	1.0–6.0 Nm	3.7:1–6285:1	352-354	1.0	●	●
GP 32 CR	Ø32 mm	1.0 Nm	3.7:1–5.8:1	355	1.0	●	○
GP 32 HP	Ø32 mm	4.0–8.0 Nm	14:1–913:1	356-357	4.0	●	●
GP 32 HD	Ø32 mm	3.0–8.0 Nm	3.7:1–6285:1	358	3.0	●	●
KD 32	Ø32 mm	1.0–4.5 Nm	11:1–1091:1	359	1.0	●	●
GS 38 A	Ø38 mm	0.1–0.6 Nm	6:1–900:1	360	0.1	●	●
GP 42 C	Ø42 mm	3.0–15.0 Nm	3.5:1–936:1	361-363	3.0	●	●
GP 42 HD	Ø42 mm	10.0–50.0 Nm	3.5:1–676:1	364	10.0	●	●
GS 45 A	Ø45 mm	0.5–2.0 Nm	5:1–1952:1	365	0.5	●	●
GP 52 C	Ø52 mm	4.0–30.0 Nm	3.5:1–936:1	366-367	4.0	●	●
GP 62 A	Ø62 mm	8.0–50.0 Nm	5.2:1–236:1	368	8.0	●	●
GP 81 A	Ø81 mm	20.0–120.0 Nm	3.7:1–308:1	369	20.0	●	●

GPX 6	Ø6 mm	0.002–0.03 Nm	3.9:1–854:1	288	0.002	●	●
GPX 8	Ø8 mm	0.008–0.10 Nm	4:1–1296:1	289	0.008	●	●
GPX 10	Ø10 mm	0.01–0.15 Nm	4:1–1024:1	290	0.01	●	●
GPX 12	Ø12 mm	0.06–0.23 Nm	3.9:1–1526:1	291-292	0.06	●	●
GPX 12 HP	Ø12 mm	0.25–0.35 Nm	16:1–1526:1	293	0.25	●	●
GPX 13 SP	Ø13 mm	0.025–0.2 Nm	5:1–125:1	294	0.025	●	●
GPX 14	Ø14 mm	0.13–0.4 Nm	3.9:1–1526:1	295-296	0.13	●	●
GPX 14 HP	Ø14 mm	0.3–0.5 Nm	16:1–1526:1	297	0.3	●	●
GPX 16	Ø16 mm	0.16–0.6 Nm	3.9:1–1526:1	298-299	0.16	●	●
GPX 16 HP	Ø16 mm	0.55–0.9 Nm	16:1–1526:1	300	0.55	●	●
GPX 16 SP	Ø16 mm	0.045–0.2 Nm	3.9:1–44:1	301	0.045	●	●
GPX 19	Ø19 mm	0.28–1.05 Nm	3.9:1–1526:1	302-303	0.28	●	●
GPX 19 HP	Ø19 mm	0.9–2.0 Nm	16:1–1526:1	304	0.9	●	●
GPX 19 SP	Ø19 mm	0.08–0.36 Nm	3.9:1–44:1	305	0.08	●	●
GPX 22	Ø22 mm	0.4–2.0 Nm	3.9:1–1526:1	306-307	0.4	●	●
GPX 22 HP	Ø22 mm	2.4–3.7 Nm	16:1–1526:1	308	2.4	●	●
GPX 22 UP	Ø22 mm	1.0–5.2 Nm	3.9:1–1526:1	309	1.0	●	●
GPX 22 SP	Ø22 mm	0.11–0.55 Nm	3.9:1–44:1	310	0.11	●	●
GPX 26	Ø26 mm	0.6–6.0 Nm	3.9:1–231:1	311-312	0.6	●	●
GPX 26 HP	Ø26 mm	3.0–6.3 Nm	16:1–1526:1	313	3.0	●	●
GPX 32	Ø32 mm	1.0–6.6 Nm	3.9:1–231:1	314-315	1.0	●	●
GPX 32 HP	Ø32 mm	4.0–9.0 Nm	16:1–1526:1	316	4.0	●	●
GPX 32 UP	Ø32 mm	2.2–12.6 Nm	3.9:1–1526:1	317	2.2	●	●
GPX 37	Ø37 mm	1.85–9.3 Nm	3.9:1–231:1	318-319	1.85	●	●
GPX 42	Ø42 mm	3.0–15.0 Nm	3.5:1–936:1	320	3.0	●	●

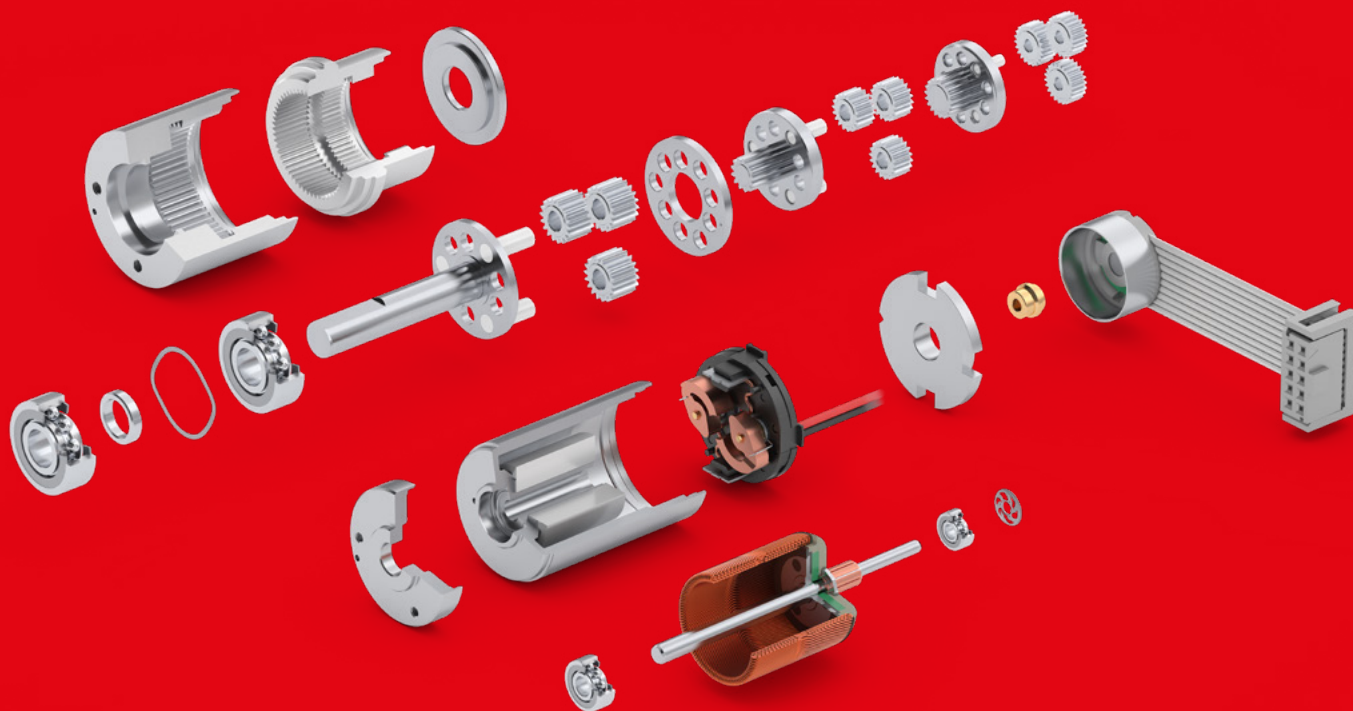
GP 6 S	Ø6 mm	2–11 N	3.9:1–1024:1	373-374	2	●	●
GP 8 S	Ø8 mm	3–27 N	4:1–1526:1	375-376	3	●	●
GP 16 S	Ø16 mm	35–370 N	1:1–850:1	377-379	35	●	●
GP 22 S	Ø22 mm	42–500 N	1:1–850:1	380-381	42	●	●
GP 32 S	Ø32 mm	183–2700 N	1:1–1093:1	382-387	183	●	●

Nm 0.001  
Output torque

● Standard

○ Option/on request





DC Motor  
EC Motor (BLDC Motor)  
Gearhead  
Screw drive  
Sensor

Motor & Motion control  
Compact Drive  
Accessories & Batteries  
Ceramic

Contact information

# Technology short and to the point.

Here you can find short descriptions of the structure and technology of maxon products. Under “key information”, you will find details about characteristics and diagrams, motor properties, motor selection, and many other important details.

<b>Selection Guide</b>	29–40
<b>maxon DC motor</b>	42–43
<b>maxon EC motor</b>	44–47
<b>maxon gear</b>	48–49
<b>maxon sensor</b>	50–51
<b>maxon motor control</b>	52–53
<b>Key information</b>	54–61
<b>Conversion tables</b>	62
<b>Standard Specification</b>	63–65

# maxon DC motor

## Technology – short and to the point

The outstanding technical features of **maxon DC motors:**

- No magnetic cogging
- High acceleration thanks to a low mass inertia
- Low electromagnetic interference
- Low inductance
- High efficiency
- Linearity between voltage and speed
- Linearity between load and speed
- Linearity between load and current
- Small torque ripple thanks to multi-segment commutator
- Able to bear high overloads for short periods
- Compact design – small dimensions
- Multiple combination possibilities with gears as well as DC tachometers and encoders

Characteristics of the **maxon DCX** range:

- High power density
- High-quality DC motor with NdFeB magnet
- High speeds and torques
- Robust design (metal flange)
- Easily configured online
- Fast delivery

Characteristics of the **maxon DC-max** range:

- High-performance at low cost
- Combines rational manufacturing and design of the A-max motors with the higher power density of the NdFeB magnets
- Automated manufacturing process
- Easily configured online
- Fast delivery

Characteristics of the **maxon RE** range:

- High power density
- High-quality DC motor with NdFeB magnet
- High speeds and torques
- Robust design (metal flange)

Characteristics of the **maxon A-max** range:

- Good price-performance ratio
- DC motor with AlNiCo magnet
- Automated manufacturing process

### Turning speed

The optimal operating speeds are between 4000 rpm and 9000 rpm depending on the motor size. Speeds of more than 20000 rpm have been attained with some special versions.

A physical property of a DC motor is that, at a constant voltage, the speed is reduced with increasing loads. A good adaptation to the desired conditions is possible thanks to a variety of winding variants.

At lower speeds, a gear combination is often more favorable than a slowly turning motor.

### Program

- **DCX**
- **DC-max**
- **RE**
- **A-max**

### The maxon winding

The “heart” of the maxon motor is the world-wide patented ironless winding, System maxon. This motor principle has very specific advantages. There is no magnetic detent and minimal electromagnetic interference. The efficiency of up to 90% exceeds that of other motor systems.

There are numerous winding variants for each motor type (see motor data sheets). They are differentiated by the wire diameter and number of turns. This results in various motor terminal resistances. The wire sizes used are between 32 µm and 0.45 mm, resulting in the different terminal resistances of the motors.

This influences the motor parameters that describe the transformation of electrical and mechanical energy (torque and speed constants). It allows you to select the motor that is best suited to your application.

Effects of wire gauge and number of windings are:

#### Low terminal resistance

- Low resistance winding
- Thick wire, few turns
- High starting currents
- High specific speed (rpm per volt)

#### High terminal resistance

- High resistance winding
- Thin wire, many turns
- Low starting currents
- Low specific speed (rpm per volt)

The maximum permissible winding temperature in high-temperature applications is 125°C (155°C in special cases), otherwise 85°C.

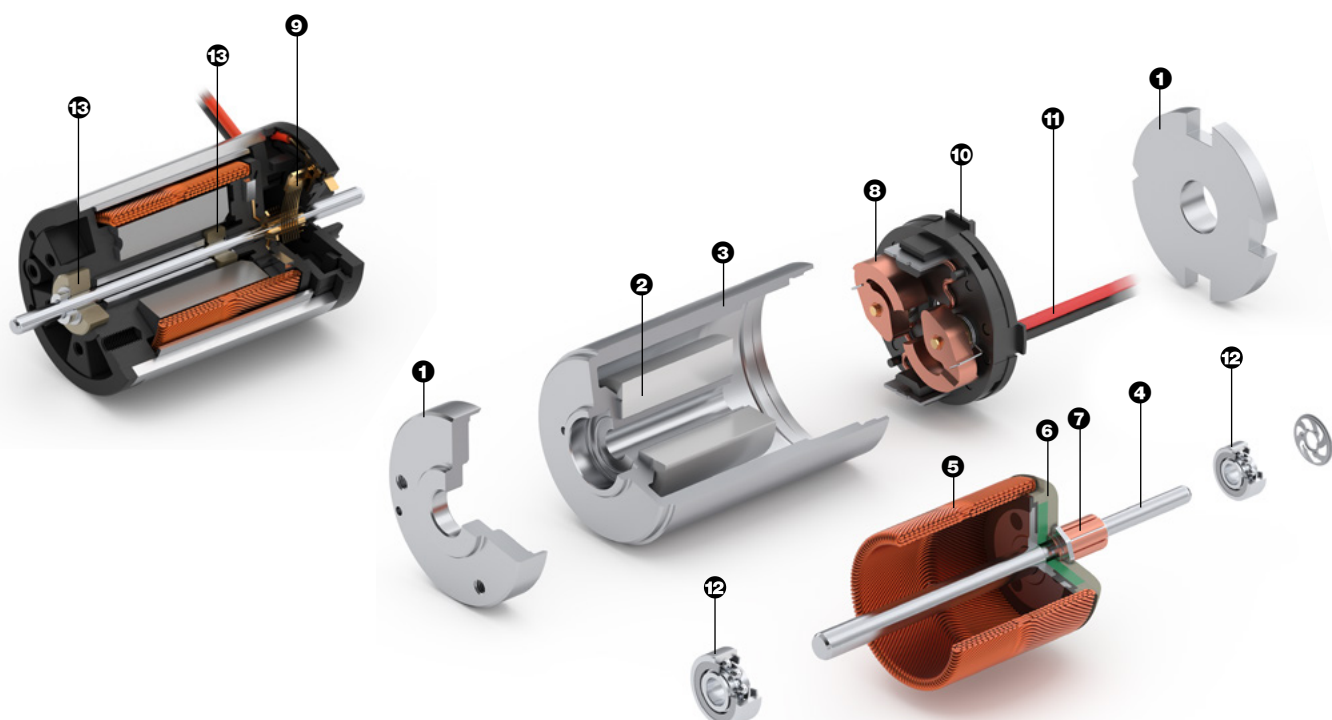
- 1 Flange
- 2 Permanent magnet
- 3 Housing (magnetic return)
- 4 Shaft
- 5 Winding
- 6 Commutator plate
- 7 Commutator
- 8 Graphite brushes
- 9 Precious metal brushes
- 10 Cover
- 11 Electrical connection
- 12 Ball bearing
- 13 Sintered sleeve bearing

### Service life

A general statement about service life cannot be made due to many influencing factors. Service life can vary between more than 20000 hours under favorable conditions, and less than 100 hours under extreme conditions (in rare cases). Roughly 1000 to 3000 hours are attained with average requirements.

#### The following have an influence:

1. **The electric load:** higher current loads result in greater electric wear. Therefore, it may be advisable to select a somewhat stronger motor for certain applications. We would be happy to advise you.
2. **Speed:** the higher the speed, the greater the mechanical wear.
3. **Type of operation:** extreme start/stop, left/right operation leads to a reduction in service life.
4. **Environmental influences:** temperature, humidity, vibration, type of installation, etc.
5. In the case of precious metal brushes, **the CLL concept** increases service life at higher loads and the benefits of precious metal brushes are retained.
6. Combinations of **graphite brushes** and ball bearings lead to a long service life, even under extreme conditions.



## Mechanical commutation

### Graphite brushes

In combination with copper commutators for the most rigorous applications. More than 10 million cycles were attained in different applications.

### Graphite brushes are typically used:

- In larger motors
- With high current loads
- In start/stop operation
- In reverse operation
- While controlling at pulsed power stage (PWM)

The special properties of **graphite brushes** can cause so-called spikes. They are visible in the commutation pattern. Despite the high-frequency interference caused by the spikes, these motors have become popular in applications with electronic controls. Please note, that the contact resistance of the graphite brushes changes dependent on load.

### Precious metal brushes and commutator

Our precious metal combinations ensure a highly constant and low contact resistance, even after a prolonged standstill time. The motors work with very low starting voltages and electromagnetic interferences.

### Precious metal brushes are typically used:

- In small motors
- In continuous operation
- With small current loads
- With battery operation
- In DC tachometers

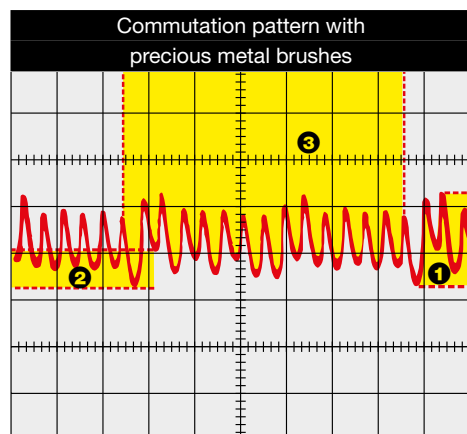
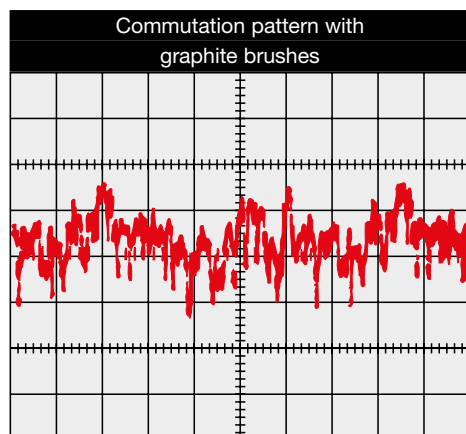
The commutation pattern is uniform and free of spikes, as opposed to that of other motors. The combination of precious metal brushes and maxon rotor system results in minimum of high-frequency interference, which otherwise leads to major problems in electrical circuits. The motors need practically no interference suppression.

### CLL concept

With precious metal commutation, the wear on commutators and brushes is caused mainly by sparks. The CLL concept suppresses spark generation to a large extent, thus greatly extending service life.

When driven with a pulsed power stage (PWM) higher no load currents occur and an unwanted motor heating can result.

For further explanations, please see page 68 or "The selection of high-precision microdrives" by Dr. Urs Kafader.



### Commutation pattern

The commutation pattern shows the current pattern of a maxon DC motor over one motor revolution.

Please place a low-ohm series resistor in series with the motor (approx. 50 times smaller than the motor resistance). Observe the voltage drop over the resistor on the oscilloscope.

### Legend

- ① Ripple, actual peak-to-peak ripple
- ② Modulation, attributable mainly to asymmetry in the magnetic field and in the winding.
- ③ Signal pattern within a revolution (number of peaks = twice the number of commutator segments)

# maxon EC motor ironless winding

## Technology – short and to the point

Characteristics of the **maxon EC motors** with ironless winding:

- Brushless DC motor (BLDC)
- Long service life
- Highly efficient
- Linear motor characteristics, excellent control properties
- Ironless winding system maxon with three phases in the stator
- Lowest electrical time constant and low inductance
- No detent
- Good heat dissipation, high overload capacity
- Rotating NdFeB permanent magnet with 1 or 2 pole pairs

Characteristics of the **maxon ECX SPEED** range:

- Power optimized, with high speeds up to 120 000 rpm
- Robust design
- Various types: e.g. short/long, sterilizable
- Lowest residual imbalance
- Easily configured online
- Fast delivery

Characteristics of the **maxon EC** range:

- Power optimized, with high speeds up to 100 000 rpm
- Robust design
- Various types: e.g. short/long, sterilizable
- Lowest residual imbalance

Characteristics of the **maxon EC-max** range:

- attractive price-performance ratio
- robust steel casing
- speeds of up to 20 000 rpm
- rotor with 1 pole pair

Characteristics of the **maxon EC-4pole** range:

- Highest power density thanks to rotor with 2 pole pairs
- Knitted winding system maxon with optimised interconnection of the partial windings
- Speeds of up to 25 000 rpm
- High-quality magnetic return material to reduce eddy current losses
- Mechanical time constants below 3 ms

### Legend

The commutation angle is based on the length of a full commutation sequence (360°e). The length of a commutation interval is therefore 60°e.

The commutation rotor position is identical to the motor shaft position for motors with 1 pole pair. The values of the shaft position are halved for motors with 2 pole pairs.

### Program

- **ECX SPEED**
- **EC**
- **EC-max**
- **EC-4pole**
- **with Hall sensors**
- **sensorless**
- **with integrated electronics**
- **sterilizable**
- **Heavy Duty**

### Electronical commutation

#### Block commutation

Rotor position is reported by three in-built Hall sensors. The Hall sensors arranged offset by 120° provide six different signal combinations per revolution. The three partial windings are now supplied in six different conducting phases in accordance with the sensor information. The current and voltage curves are block-shaped. The switching position of each electronic commutation is offset by 30° from the respective torque maximum.

#### Properties of block commutation

- Relatively simple and favorably priced electronics
- Torque ripple of 14%
- Controlled motor start-up
- High starting torques and accelerations possible
- Servo drives, Start/stop operation
- Positioning tasks
- The data of the maxon EC motors are determined with block commutation.

- 1 Flange
- 2 Housing
- 3 Laminated steel stack
- 4 Winding
- 5 Permanent magnet
- 6 Shaft
- 7 Print with Hall sensors
- 8 Control magnet
- 9 Ball bearing

#### Sensorless block commutation

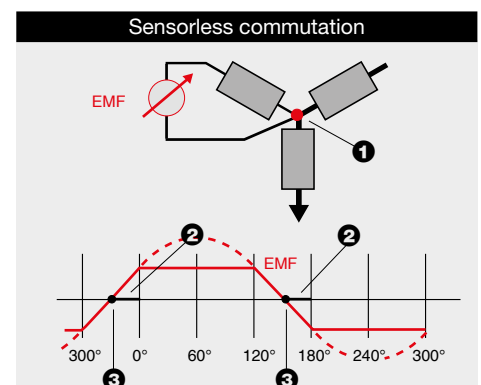
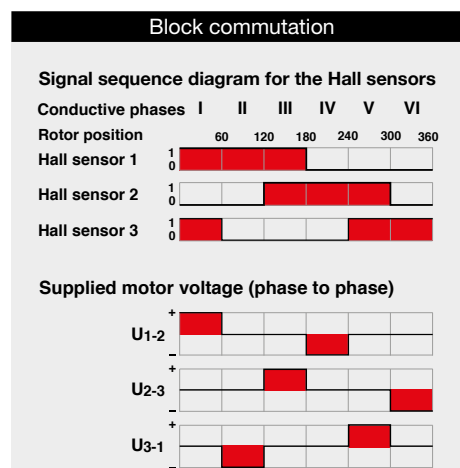
The rotor position is determined using the progression of the induced voltage. The electronics evaluate the zero crossing of the induced voltage (EMF) and commute the motor current after a speed dependent pause (30°e after EMF zero crossing).

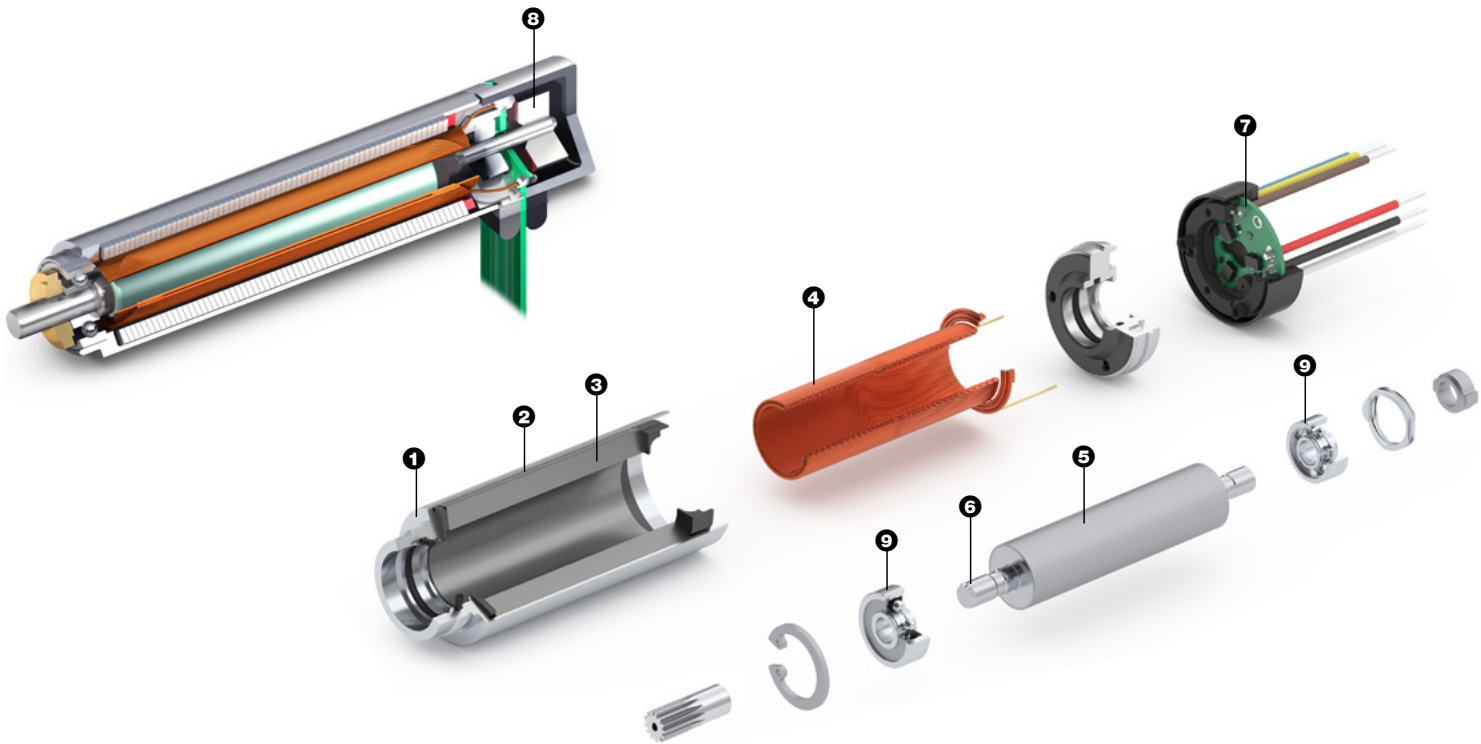
The amplitude of the induced voltage is dependent on the speed. When stalled or at low speed, the voltage signal is too small and the zero crossing cannot be detected precisely. This is why special algorithms are required for starting (similar to stepper motor control).

To allow EC motors to be commuted without sensors in a Δ arrangement, a virtual star point is usually created in the electronics.

#### Properties of sensorless commutation

- Torque ripple of 14% (block commutation)
- No defined start-up
- Not suitable for low speeds and for dynamic applications
- Continuous operation at higher speeds (Fans, mills, drills)





### Hall sensor circuit

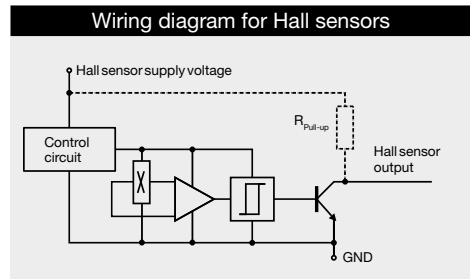
#### Sinusoidal commutation

The high resolution signals from the encoder or resolver are used for generating sine-wave motor currents in the electronics. The currents through the three motor windings are related to the rotor position and are shifted at each phase by 120° (sinusoidal commutation). This results in the very smooth, precise running of the motor and, in a very precise, high quality control.

#### Properties of sinusoidal commutation

- More expensive electronics
- No torque ripple
- Very smooth running, even at very low speeds
- Approx. 5% more continuous torque compared to block commutation
- Highly dynamic servo drives
- Positioning tasks

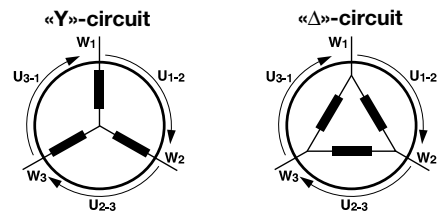
The open collector output of Hall sensors does not normally have its own pull-up resistance, as this is integral in maxon controllers. Any exceptions are specifically mentioned in the relevant motor data sheets.



The power consumption of a Hall sensor is typically 4 mA (for output of Hall sensor = "HI").

### Winding arrangement

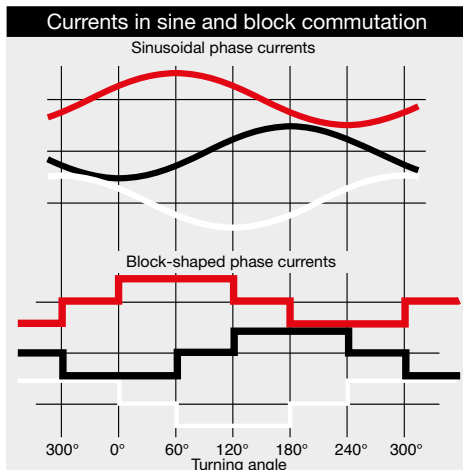
The maxon rhombic winding is divided into three partial windings, each shifted by 120°. The partial windings can be connected in two different manners - "Y" or "Δ". This changes the speed and torque inversely proportional by the factor  $\sqrt{3}$ . However, the winding arrangement does not play a decisive role in the selection of the motor. It is important that the motor-specific parameters (speed and torque constants) are in line with requirements.



### Bearings and service life

The long service life of the brushless design can only be properly exploited by using preloaded ball bearings.

- Bearings designed for tens of thousands of hours
- Service life is affected by maximum speed, residual unbalance and bearing load



- Legend**
- ① Star point
  - ② Time delay 30°e
  - ③ Zero crossing of EMF

For further explanations, please see page 162 or "The selection of high-precision microdrives" by Dr. Urs Kafader.

# maxon EC motor iron-cored winding

## Technology – short and to the point

### Characteristics of the maxon EC motors with iron winding:

- Brushless DC motor (BLDC)
- Long service life
- Comparatively high inertia
- Motor characteristics may vary from the strongly linear behaviour
- Hall sensor signals utilizable for simple speed and position control
- Winding with iron core and several teeth per phase in the stator
- Low detent torque
- Good heat dissipation, high overload capacity
- Multipole NdFeB permanent magnet
- Smaller commutation steps

### Characteristics of the maxon EC-i program:

- Highly dynamic due to internal, multipole rotor
- Mechanical time constants below 3 ms
- High torque density
- Speeds of up to 15 000 rpm

### Characteristics of the maxon EC-flat program:

- Attractive price-performance ratio
- High torques due to external, multipole rotor
- Excellent heat dissipation at higher speeds thanks to open design
- Flat design for when space is limited

In **EC frameless motor kits**, rotor and stator are delivered separately, without bearings and motor shaft. The motor is operational only when the two components are assembled.

- High torque grace to multi-pole motor design
- Installation instructions with detailed specification for optimum integration.
- Sensor for supervising the temperature (NTC hot conductor)
- Space-saving integration into the application

### Program

- EC-i
- EC-flat
- EC frameless
- with Hall sensors
- sensorless
- with integrated electronics

- 1 Flange
- 2 Housing
- 3 Laminated steel stack
- 4 Winding
- 5 Permanent magnet
- 6 Shaft
- 7 Print with Hall sensors
- 8 Ball bearing
- 9 Spring (bearing preload)

### Electronical commutation

#### Block commutation

Rotor position is reported by three built-in Hall sensors which deliver six different signal combinations per commutation sequence. The three phases are powered in six different conducting phases in line with this sensor information. The current and voltage curves are block-shaped. The switching position of every electronic commutation lies symmetrically around the respective torque maximum.

#### Properties of block commutation

- Relatively simple and favorably priced electronics
- Controlled motor start-up
- High starting torques and accelerations possible
- Servo drives, start/stop operation
- Positioning tasks
- The data of the maxon EC motors are determined with block commutation.

#### Sensorless block commutation

The rotor position is determined using the progression of the induced voltage. The electronics evaluate the zero crossing of the induced voltage (EMF) and commute the motor current after a speed dependent pause (30°e after EMF zero crossing).

The amplitude of the induced voltage is dependent on the speed. When stalled or at low speed, the voltage signal is too small and the zero crossing cannot be detected precisely. This is why special algorithms are required for starting (similar to stepper motor control). To allow EC motors to be commuted without sensors in a Δ arrangement, a virtual star point is usually created in the electronics.

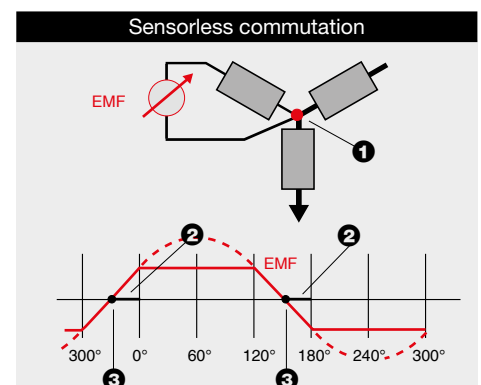
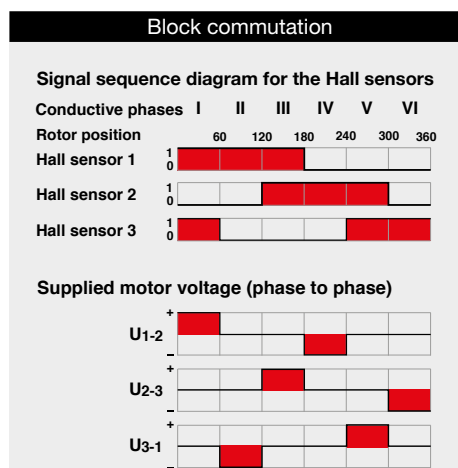
#### Properties of sensorless commutation

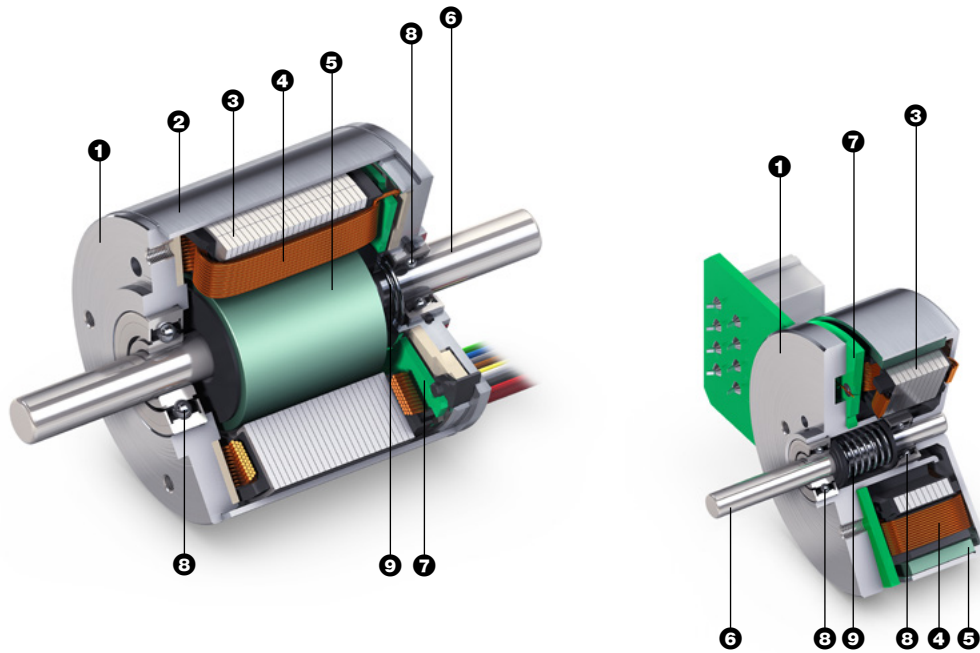
- No defined start-up
- Not suitable for low speeds and for dynamic applications
- Continuous operation at higher speeds (Fans, pumps)

### Legend

The commutation angle is based on the length of a full commutation sequence (360°e). The length of a commutation interval is therefore 60°e.

The values of the shaft position can be calculated from the commutation angle divided by the number of pole pairs.



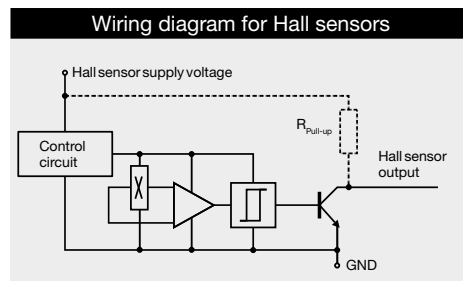


### Hall sensor circuit

#### Sinusoidal commutation

Sinusoidal commutation for EC motors with slotted winding is basically possible, provided that an encoder can be mounted. The main benefit of sinusoidal commutation – the smooth operation – only comes into play to a limited degree due to the detent.

The open collector output of Hall sensors does not normally have its own pull-up resistance, as this is integral in maxon controllers. Any exceptions are specifically mentioned in the relevant motor data sheets.



The power consumption of a Hall sensor is typically 4 mA (for output of Hall sensor = "HI").

### Bearings and service life

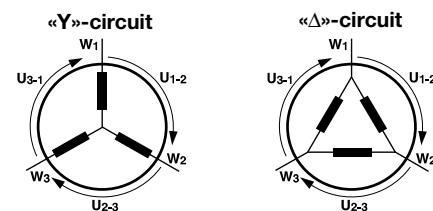
The long service life of the brushless design can only be properly exploited by using preloaded ball bearings.

- Bearings designed for tens of thousands of hours
- Service life is affected by maximum speed, residual imbalance and bearing load

### Winding arrangement

The winding is divided into 3 partial windings which have several stator teeth each. The partial windings can be connected in two different manners - "Y" or "Δ". This changes the speed and torque inversely proportional by the factor  $\sqrt{3}$ .

However, the winding arrangement does not play a decisive role in the selection of the motor. It is important that the motor-specific parameters (speed and torque constants) are in line with requirements.



### Integrated electronics

For motors with integrated electronics, the electronic commutation (mostly block commutation with Hall sensors) is built in. A speed controller and other functionalities can also be implemented.

#### Features

- Simple operation with DC voltage
- Fewer connections than with the EC motor
- No additional electronics required
- Output power reductions possible due to less space for power electronics

#### Legend

- ❶ Star point
- ❷ Time delay 30°
- ❸ Zero crossing of EMF

For further explanations, please see page 162 or "The selection of high-precision microdrives" by Dr. Urs Kafader.

# maxon gear

## Technology – short and to the point

### Gears

If mechanical power is required at a high torque and correspondingly reduced speed, a maxon precision gear is recommended. According to the gear ratio the output speed is reduced while the output torque is enhanced. For a more precise determination of the latter, efficiency must be taken into consideration.

#### Conversion

The conversion of speed and torque of the gear output ( $n_L$ ,  $M_L$ ) to the motor shaft ( $n_{mot}$ ,  $M_{mot}$ ) follows the following equations:

$$n_{mot} = i \cdot n_L$$

$$M_{mot} = \frac{M_L}{i \cdot \eta}$$

where:

- i: reduction
- $\eta$ : Gearhead efficiency

### Service life

The gears usually achieve 1000 to 3000 operating hours in continuous operation at the maximum permissible load and recommended input speed. Service life is significantly extended if these limits are not pushed.

If the speed drops below this threshold, the gearhead may be loaded with higher torques without compromising the life span. On the other hand, higher speeds and thus higher reduction ratios can be chosen if the torque limits are not fully exploited.

Factors affecting life span include:

- Exceeding maximum torque can lead to excessive wear.
- Local temperature peaks in the area of tooth contact can destroy the lubricant.
- Massively exceeding the gear input speed reduces the service life.
- Radial and axial loads on the bearing.

### Temperature/lubrication

maxon gears are lubricated for life. The lubricants used are especially effective in the recommended temperature range. At higher or lower operating temperatures we offer recommendations for special lubricants.

### Program

- GPX/GP (Planetary gearhead)
- GS (Spur gearhead)
- KD (Koaxdrive)
- GPS (Screw drives)

### Selection of gears

For the selection of the gearhead, the maximum transmittable power – the product of speed and torque – is decisive. It should be noted that the transmittable power depends on the number of gear stages.

The load torque should be below the nominal torque (max. continuous torque) of the gearhead  $M_{N,G}$ .

$$M_{N,G} \geq M_L$$

For short-term loading, the short-term torque of the gearhead must also be considered.

Where possible, the input speed of the gear  $n_{max,G}$  should not be exceeded. This limits the maximum possible reduction  $i_{max}$  at a given operating speed. The following applies to the selection of the reduction  $i$

$$i \leq i_{max} = \frac{n_{max,G}}{n_L}$$

If the gear is selected, the data converted to the motor axis ( $n_{mot}$ ,  $M_{mot}$ ) are used to select the motor. The maxon modular system defines the proper motor-gear combinations.

- 1 Output shaft
- 2 Mounting flange
- 3 Bearing of the output shaft
- 4 Axial security
- 5 Intermediate plate
- 6 Cogwheel
- 7 Planetary gearwheel
- 8 Sun gearwheel
- 9 Planet carrier
- 10 Internal gear

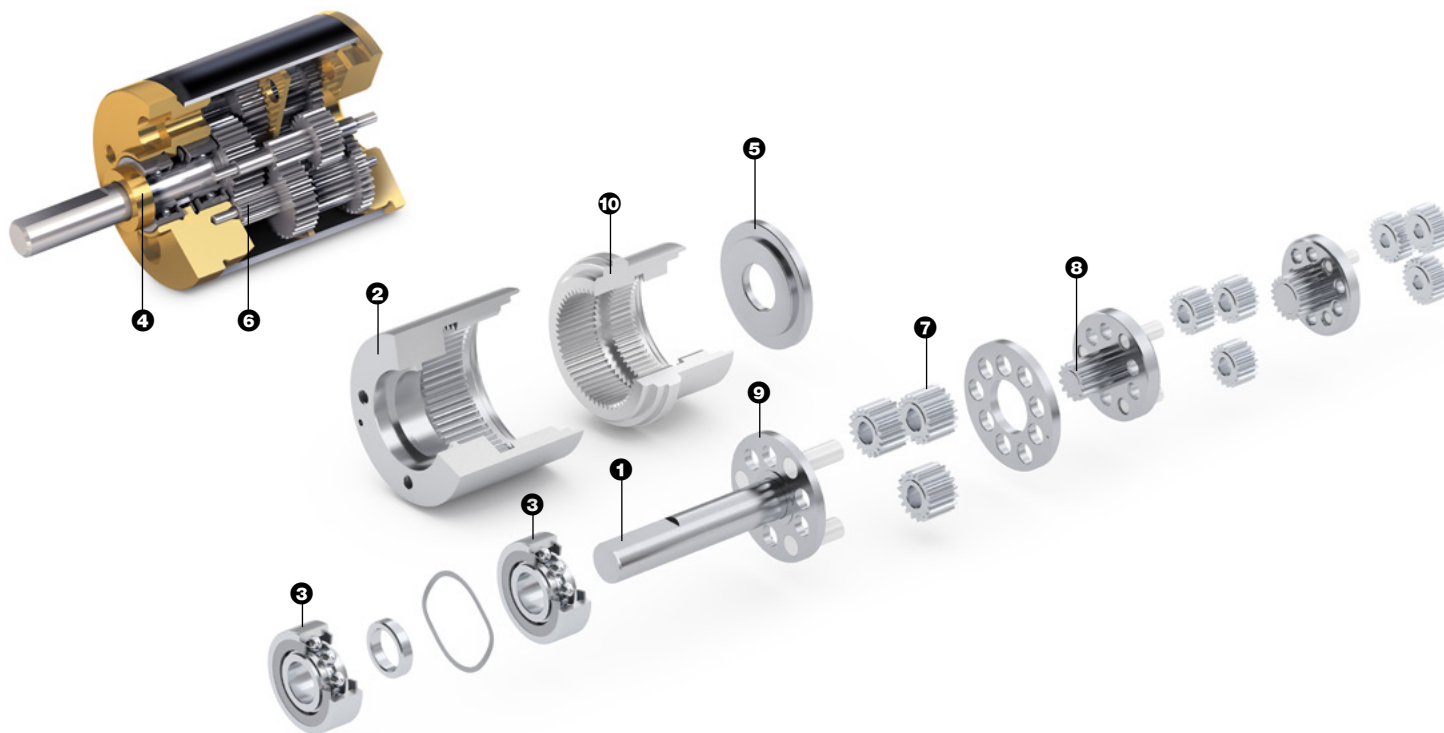
### Spur gearhead

The gear consists of one or more stages. One stage represents the pairing of two cogwheels. The first cogwheel (pinion) is mounted directly on the motor shaft. The bearing of the output shaft is usually made of sintered material.

- Favorably priced
- For low torques
- Output torque up to 2 Nm
- Reduction ratios of 6:1 to 5752:1
- External – Ø12–45 mm
- Low noise level
- High efficiency







## Planetary gearhead

Planetary gears are particularly suitable for the transfer of high torques. Large gearheads are normally fitted with ball bearings at gearhead output.

- For transferring high torques up to 180 Nm
- Reduction ratios of 4:1 to 6285:1
- External diameter 6–81 mm
- High performance in a small space
- High reduction ratio in a small space
- Concentric gear input and output

### Plastic versions

Favorably priced and yet compact drives can be realized with plastic gears. The mechanical load is slightly smaller than that of metal designs, however, it is significantly higher than that of spur gears.

### Ceramic versions

By using ceramic components in gearheads, the wear characteristics of critical components can be significantly improved. The result when compared to purely metal gearheads is:

- Longer service life
- Higher continuous torques
- Higher intermittent torques
- Higher input speeds

### High power gearhead

Especially high output torques in the output stage of planetary gearheads can be achieved through the following measures

- Use of ceramic components
- 4 instead of 3 planet gears in the output stage
- Additional motor-side support of the output stage
- Reinforcement of the output bearings

### Heavy duty gearhead

The HD (heavy duty) gearheads are characterized by their robust construction. The use of stainless steel and optimized welding joints enable use under the most extreme conditions.

### Reduced backlash gearhead

The reduction in backlash is achieved through a preloading of the planet gears in the output stage. Despite the wear that occurs during operation, the gearhead backlash remains constantly low, unlike for gearheads in which the backlash reduction is achieved by low-tolerance manufacturing and material pairing.

### Sterilizable gearhead

Sterilizable gearheads are characterized by the use of stainless steel and special lubricants. The bearing of the output shaft and the connection to the motor are designed so that fluid leaking into the gearhead is inhibited.

## Koaxdrive

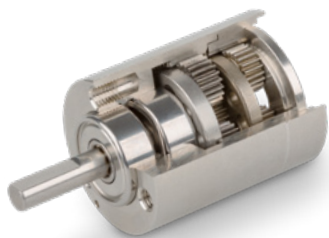
### Noise reduction

Noise is primarily generated in the input stage of the gearhead. The following measures can help to reduce noise:

- Smaller input speeds and thus smaller relative velocity of the tooth flanks
- Input stage with plastic gears
- Use of a Koaxdrive gearhead

The quiet “Koaxdrive” combines worm and planetary gearing. In the first stage, a separately mounted worm drives the three offset planetary wheels which then mesh in the specially toothed internal geared wheel. All further stages are designed as a normal planetary gear:

- low noise
- high reduction ratio in the first stage
- other properties as planetary gears



# maxon sensor

## Technology – short and to the point

### Encoder

maxon offers a range of different encoders. Their main characteristics are:

#### Digital incremental encoders

- Relative position signal, suitable for positioning tasks
- Direction of rotation detection
- Speed information from number of pulses per unit of time
- Standard solution for many applications

#### Digital absolute encoders

- Absolute single-turn position signal, suitable for absolute positioning within one motor revolution
- Option to generate commutation signals
- Solution for special applications without homing procedure

#### DC tachometer

- Analog speed signal
- Direction of rotation detection
- Not suited for positioning tasks

#### Resolver

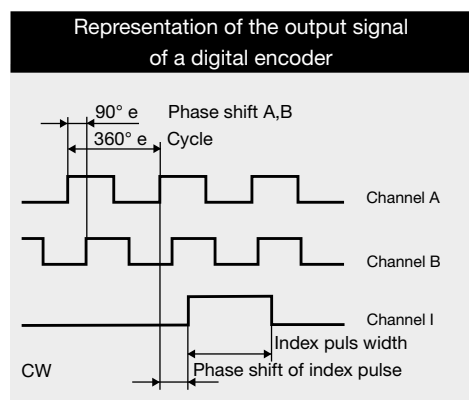
- Analog signal transmission
- More complex evaluation electronics required in controller
- For special industrial solutions

### Encoder signals

#### Digital incremental encoders

Position changes (relative position) are transmitted to the controller as square pulses. The controller evaluates these pulses for precise positioning or speed measurement. The signal transmission is implemented via two phase-shifted channels (A and B) that are compared to determine the direction of rotation. Usually the phasing of channels A and B applies for operation in a clockwise direction (CW), relative to the motor shaft seen from the outside.

The maxon controllers evaluate the signal edges. This results in a four times higher positioning resolution relative to the counts per turn of the encoder. The technical term for this is quad counts or states. The absolute position can be determined by homing to a fixed position. The signal edges of index channel I can be used for a precise reference position.



### Program

- **MILE (inductive encoders)**
- **EASY, MAG, MR, MEnc (magnetic encoders)**
- **OPT, Enc, HEDL, RIO, HEDS, AEDL (optical encoders)**
- **DC-Tacho, Res (analog sensors)**

The line driver is a driver built into the encoder to improve the signal quality through steeper edges. It also generates the complementary signals  $\bar{A}$ ,  $\bar{B}$ ,  $\bar{I}$  that can be used to eliminate interference resulting for instance from long signal lines.

#### Absolute encoders

Absolute encoders return the absolute position as a bit sequence for transmission with a suitable protocol (SSI, BiSS-C) at the clock rate of the controller. The resolution given as a bit length; e.g. 12-bit equals 4096 positions. Single-turn absolute encoders output the position only within one motor revolution. Multi-turn absolute encoders determine the position unambiguously over several revolutions. They frequently have the capability to detect motor revolutions even without a power supply. At start-up, the motor position is determined over multiple revolutions.

- 1 End cap
- 2 Electrical connections motor and encoder
- 3 PCB
- 4 MR sensor
- 5 Graduated disk
- 6 Magnetic multi-pole wheel
- 7 Encoder housing
- 8 Solid measure
- 9 Flange
- 10 Sensor with housing
- 11 Encoder fork coupler

### Key points for encoder selection

These are the main characteristics of maxon incremental encoders:

- Counts per turn (increments)
- Accuracy
- Use of an index channel
- Use of a line driver
- Maximum supported speed
- Suitability for special ambient conditions (dust, oil, magnetic fields, ionizing radiation)

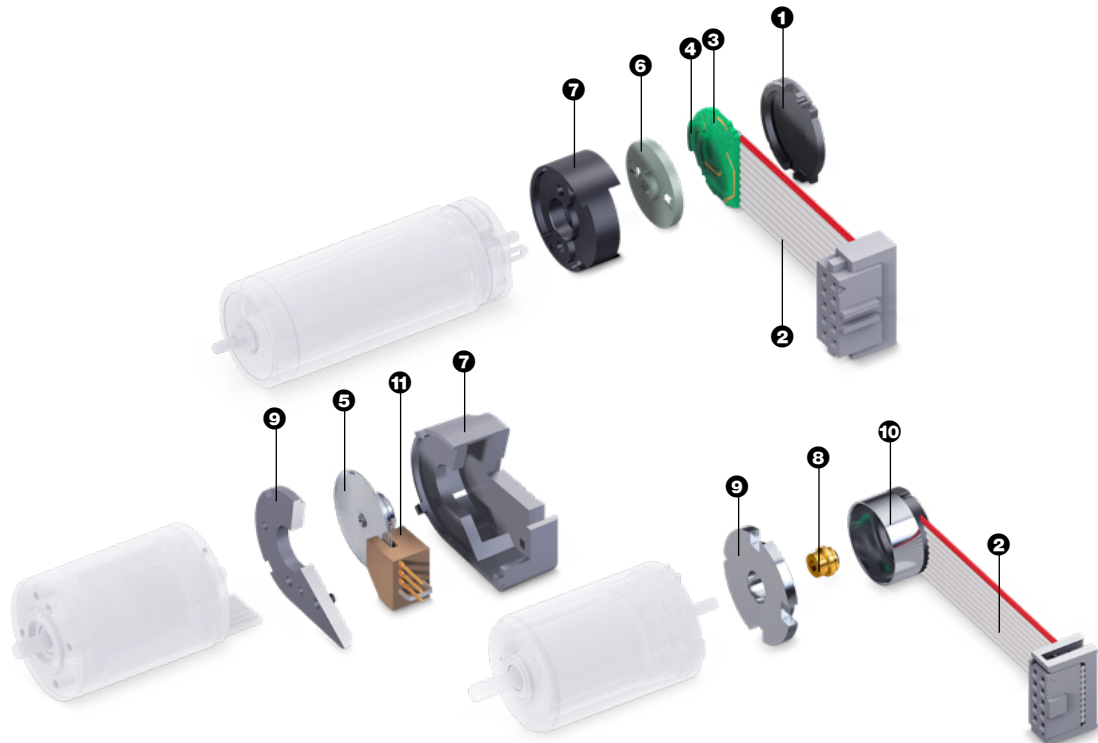
#### Encoders and maxon controllers

- The input frequency of the control electronics may limit the maximum possible counts per turn of the encoder.
- The higher the counts per turn and the accuracy, the easier it is to achieve a smooth, jolt-free operation even at low speeds.
- maxon controllers can be adjusted for operation at low or high speeds, as well as for encoders with low or high counts per turn.

#### For positioning systems, the following applies:

- The higher the counts per turn, the more accurate the positioning. For 500 counts (2000 quad counts), a mechanical angle resolution of 0.18° is achieved. This is usually much higher than the precision of the mechanical drive components (e.g. due to gear backlash or the elasticity of drive belts).
- In positioning controllers, only encoders with an integrated line driver should be used (e.g. RS422). This prevents signal loss and accumulated positioning errors due to electromagnetic interference.
- Positioning applications often required the encoder's index channel for precise determination of a reference point.

Recommendations on encoder selection							
(✓) Conditionally applicable	QUAD	MEnc	MR	EASY	MILE	optical*	RIO
1 very high speed	✓	✓	✓	✓	(✓)	✓	✓
2 very low speed			(✓)	(✓)	✓	✓	✓
3 precise position			(✓)	(✓)	(✓)	✓	✓
4 line driver possible			✓	✓	✓	✓	✓
5 index channel possible			✓	✓	✓	✓	✓
6 compact design	✓	(✓)	✓	✓	✓		✓
7 dust, dirt, oil	✓	✓	✓	✓	✓		(✓)
8 external magnetic fields	(✓)	(✓)		(✓)	✓	✓	✓
9 ionising radiation		✓					



## Magnetic encoders

In magnetic encoders, a small permanent magnet is installed on the spinning motor shaft. Sensors in the stator capture the changes in the magnetic flux. The signals are evaluated in the encoder and transmitted to the controller as pulses or as an absolute signal. Magnetic encoders are typically very small and resilient to dirt.

### EASY and MAG encoders

- Integrated circuit based on Hall sensors and interpolator
- EASY incremental: Factory programmable resolution from 1 to 1024 counts per turn, with index channel and line driver
- EASY absolute: Single-turn with 4096 states (12-bit) and Biss-C or SSI interface
- MAG incremental: Various resolutions available (up to 256 counts per turn); recommended for battery operation

### MR encoder (incremental)

- Magneto-resistive Sensor with/without interpolator
- Various resolutions available (up to 1024 counts per turn)
- With/Without index channel and/or line driver

### MEnc and QUAD encoder (incremental)

- Digital Hall sensors without interpolation
- Line driver not available
- MEnc: 12 or 16 counts per turn
- QUAD: 1 count per turn (4 states)

## Optical encoders

In optical encoders, an LED emits light through a finely structured code wheel (HEDL, AEDL, HEDS, Enc22) or directed at a structured reflector (RIO) attached to the motor shaft. The receiver converts the light/dark signals into electrical currents, which are amplified and turned into electrical pulses by the respective electronics. Optical encoders typically have a high resolution and high accuracy.

### RIO encoder

- Reflective interpolated optical encoder
- Very high resolution (typically 4096 to 16,384 counts per turn), programmable at the factory
- With index channel and RS422 line driver
- Very small size

### Encoder attachment AEDL, HEDL, HEDS

- Transmissive optical encoders
- Up to 5000 counts per turn (AEDL)
- With line driver RS422 (AEDL, HEDL)
- Relatively large size

## Inductive encoder

With inductive MILE encoders, a high-frequency alternating field is transmitted via transformer while being modulated angle-dependently using a structured copper disk.

### Characteristics

- Highly resistant to magnetic and electrical fields as well as soiling.
- High speeds possible
- High accuracy
- Line driver (can be acc. to RS422)

## DC tachometer

In principle, any maxon DC motor can be used as a DC tachometer. For motor-tachometer combinations, we offer a DC tachometer that has the tachometer rotor mounted directly on the motor shaft.

### Characteristics

- Output DC voltage proportional to the speed due to precious metal brushes
- AlNiCo magnet for high signal stability even with temperature fluctuations
- Without additional tachometer bearing; no added friction torque
- No couplings, high mechanical resonant frequency

## Resolver

The resolver is attached to the continuous shaft of the motor and aligned perfectly with the rotor's magnetic field.

The resolver has a rotating primary winding (rotor) and two secondary windings offset by 90° (stator). An AC voltage connected to the primary winding is transmitted to the two secondary windings. The amplitudes of the secondary voltages are  $\sin \varphi$  and  $\cos \varphi$ , with  $\varphi$  as the angle of rotation.

### Characteristics

- Robust, for industrial use
- Long service life
- No mechanical wear
- Interference-free signal transmission over long distances
- No sensitive electronics
- Special signal evaluation required
- Only one encoder for position and speed information
- EC motors with resolvers are delivered without Hall sensors

# maxon motor control

## Technology – short and to the point

### Controllers

The **maxon motor control** program contains servo amplifiers for controlling the fast reacting maxon DC and EC motors.

Special characteristics:

- built-in additional inductance for operation with low-inductance motors.
- high PWM frequencies (~50 kHz)
- high efficiency

The **zub machine controllers** are programmable master controllers for sophisticated multi-axis systems

- EtherCAT and/or CANopen master (and/or slave)
- Highly dynamic drive synchronization
- Curve interpolation (camming)

### Set value specification

Servo controllers (speed and current controllers) are usually designed for analog specification of set values. Alternatively, PWM signals or fixed set values are also possible.

maxon positioning controllers (EPOS, MAXPOS) require a higher-level master, which takes care of process control and sends individual commands to the positioning controller and to other slave modules in the system via the bus system (RS232, USB, CANopen, EtherCAT). Typically, the master reads the parameters of the slave modules (e.g., the current position or the status of an input), and uses them to generate new commands (e.g., a new target position or setting of an output). The master runs an application specific program.

Possible master systems

- zub motion control
- PLC
- Microcontroller
- PC

### Program

- **DEC module: 1-Q speed controller (closed loop) for brushless (maxon EC) motors**
- **ESCON: 4-Q speed and current controller for DC and EC motors**
- **EPOS: Position controller for DC and EC motors**
- **MAXPOS: Highly dynamic controller for DC brushed and brushless (maxon EC) motors**
- **MACS5, MiniMACS, MasterMACS: Programmable multi-axis masters**

### Motor type

- maxon DC motor
- maxon EC motor with or without sensor

### Control variables

- Speed
- Position
- Current

### Feedback

- Encoder
- DC Tacho
- IxR compensation
- Hall sensors

### Set value specification

- Analog voltage
- Digitally via field bus

### Controlled variables

#### Speed control

The function of the speed servo amplifier is to keep the prescribed motor speed constant and independent of load changes. To achieve this, the set value (desired speed) is continuously compared with the actual value (actual speed) in the control electronics of the servo amplifier. The controller difference determined in this way is used by the controller to regulate the power stage of the servo amplifier in such a manner that the motor reduces the controller difference. This represents a closed speed regulating circuit.

#### Position control

The positioning control ensures a match between the currently measured position with a target position, by providing the motor with the corresponding correction values, as with a speed controller. The position data are usually obtained from a digital encoder.

#### Current control

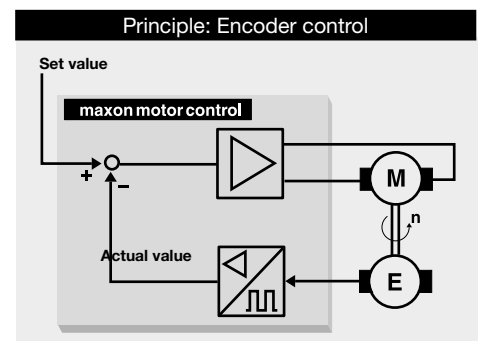
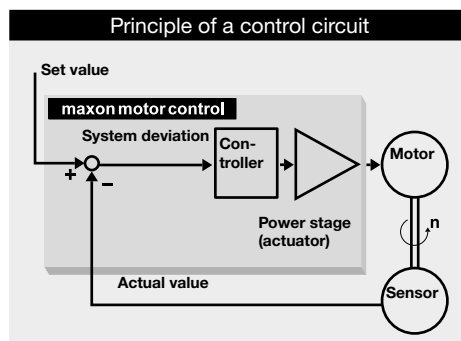
The current control provides the motor with a current proportional to the set value. Accordingly, the motor torque changes proportionally to the set value. The current controller improves the dynamics of a higher-level position or speed control loop.

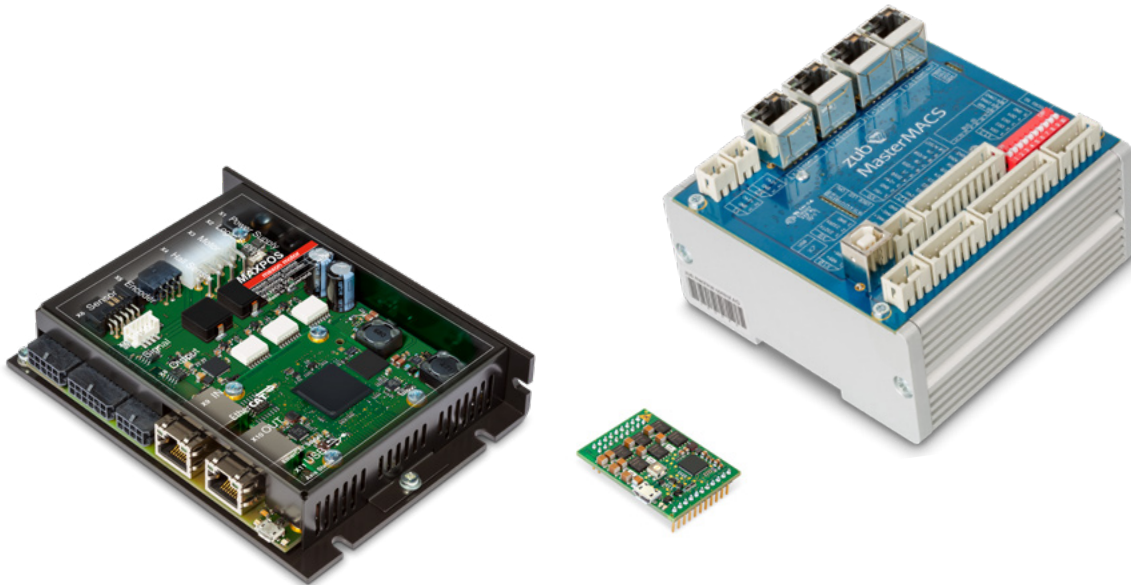
### Feedback sensors

#### Digital encoder control

The motor is equipped with a digital encoder that provides a certain number of pulses per revolution. Incremental or absolute encoders can be used (cf. p. 50: Encoder signals).

- Digital encoders are often found in positioning controls, in order to derive and measure the travel or angle.
- Digital encoders are not subject to mechanical wear.
- If an EC motor's Hall sensor signals are used for control, then the result is similar to using an incremental encoder with a low resolution.





### DC tacho control

The motor must be equipped with a DC tachometer that provides a speed proportional signal. In the maxon modular system, the tachometer rotor is mounted directly on the through motor shaft, resulting in a high resonant frequency.

- Limited service life of the DC tacho generator
- For speed control only
- Analog feedback signal

### IxR compensation

The motor is provided with a voltage that is proportional to the applied speed set value. The speed would drop with increasing motor load. The compensation circuitry increases the output voltage with increasing motor current. The compensation must be adjusted to the terminal resistance of the motor which depends on temperature and load.

The attainable speed precision of such a system is subject to limits in the percent range.

- Favorably priced and space-saving
- No tacho-generator or encoder required
- Less precise control when there is a load change
- Only analog speed control possible
- Ideal for low-cost applications without high demands on speed accuracy

## Control concepts

Traditional PI or PID controllers often additionally use a feed forward that is proportional to speed and acceleration in order to compensate for friction and inertia.

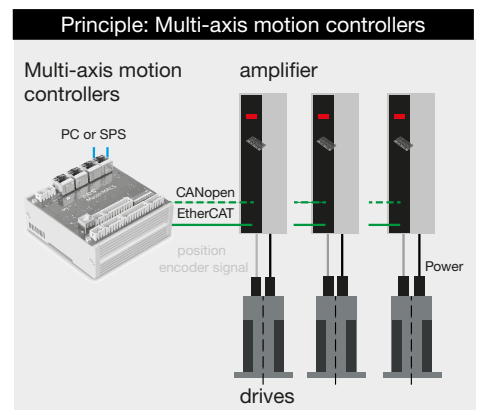
- More sophisticated control concepts may also be used on a case-by-case basis. These include
- Observer-supported control
  - Sensorless control through evaluation of motor parameters (EMF, impedance)
  - Dual loop control for load-side control with compensation of backlash and elasticity
  - Gain scheduling

One key aspect for users is automatic controller tuning, which is available as standard for all maxon motor control products and ensures optimum system adjustment.

## Multi-axis motion controllers

Multi-axis motion controllers are freely programmable controllers that make it possible to easily synchronize coordinated movements of several axes. Powerful commands are provided, for example for completing the following tasks (among others)

- PLC functionality as a sequential program (cyclical processing) or as state machines that work in parallel
- Coordinated time or path-synchronous multi-axis positioning
- Synchronous execution of CAM profiles (cam disks) on several axes
- Control of freely definable path trajectories with different kinematics (X-Y tables, 3D plotters, Scara robots, Delta robots, ...)
- Master-slave synchronization of several axes with marker comparison.



# maxon DC motor and maxon EC motor

## Key information

### The motor as an energy converter

The electrical motor converts electrical power  $P_{el}$  (current  $I_{mot}$  and voltage  $U_{mot}$ ) into mechanical power  $P_{mech}$  (speed  $n$  and torque  $M$ ). The losses that arise are divided into frictional losses, attributable to  $P_{mech}$  and in Joule power losses  $P_J$  of the winding (resistance  $R$ ). Iron losses do not occur in the coreless maxon DC motors. In maxon EC motors, they are treated formally like an additional friction torque. The power balance can therefore be formulated as:

$$P_{el} = P_{mech} + P_J$$

The detailed result is as follows

$$U_{mot} \cdot I_{mot} = \frac{\pi}{30\,000} n \cdot M + R \cdot I_{mot}^2$$

#### Electromechanical motor constants

The geometric arrangement of the magnetic circuit and winding defines in detail how the motor converts the electrical input power (current, voltage) into mechanical output power (speed, torque). Two important characteristic values of this energy conversion are the speed constant  $k_n$  and the torque constant  $k_M$ . The speed constant combines the speed  $n$  with the voltage induced in the winding  $U_{ind}$  (= EMF).  $U_{ind}$  is proportional to the speed; the following applies:

$$n = k_n \cdot U_{ind}$$

Similarly, the torque constant links the mechanical torque  $M$  with the electrical current  $I_{mot}$ .

$$M = k_M \cdot I_{mot}$$

The main point of this proportionality is that torque and current are equivalent for the maxon motor. The current axis in the motor diagrams is therefore shown as parallel to the torque axis as well.

### Motor diagrams

A diagram can be drawn for every maxon DC and EC motor, from which key motor data can be taken. Although tolerances and temperature influences are not taken into consideration, the values are sufficient for a first estimation in most applications. In the diagram, speed  $n$ , current  $I_{mot}$ , power output  $P_2$  and efficiency  $\eta$  are applied as a function of torque  $M$  at constant voltage  $U_{mot}$ .

#### Speed-torque line

This curve describes the mechanical behavior of the motor at a constant voltage  $U_{mot}$ :

- Speed decreases linearly with increasing torque.
- The faster the motor turns, the less torque it can provide.

The curve can be described with the help of the two end points, no load speed  $n_0$  and stall torque  $M_H$  (cf. lines 2 and 7 in the motor data). DC motors can be operated at any voltage. No load speed and stall torque change proportionally to the applied voltage. This is equivalent to a parallel shift of the speed-torque line in the diagram. Between the no load speed and voltage, the following proportionality applies in good approximation

$$n_0 \approx k_n \cdot U_{mot}$$

where  $k_n$  is the speed constant (line 13 of the motor data).

Independent of the voltage, the speed-torque line is described most practically by the slope or gradient of the curve (line 14 of the motor data).

$$\frac{\Delta n}{\Delta M} = \frac{n_0}{M_H}$$

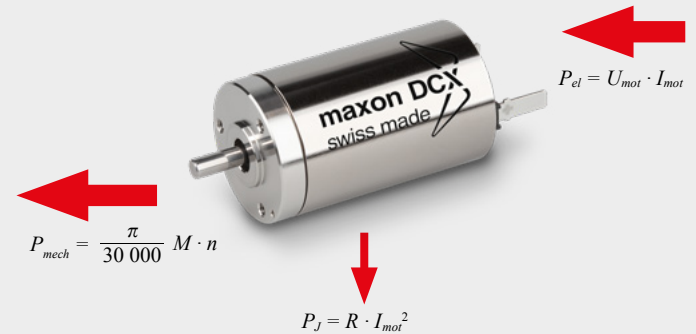
See also: Technology – short and to the point, explanation of the motor

#### Units

In all formulas, the variables are to be used in the units according to the catalog (cf. physical variables and their units on page 60).

The following applies in particular:

- All torques in mNm
- All currents in A (even no load currents)
- Speeds (rpm) instead of angular velocity (rad/s)

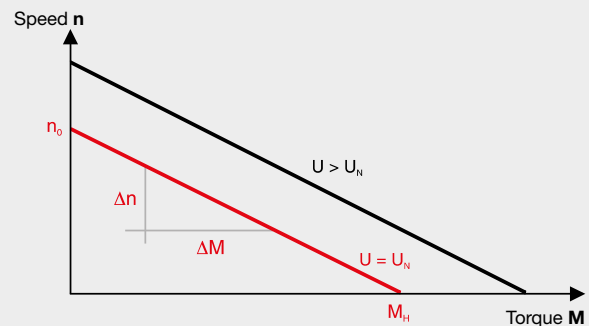


#### Motor constants

Speed constant  $k_n$  and torque constant  $k_M$  are not independent of one another. The following applies:

$$k_n \cdot k_M = \frac{30\,000}{\pi}$$

The speed constant is also called specific speed. Specific voltage, generator or voltage constants are mainly the reciprocal value of the speed constant and describe the voltage induced in the motor per speed. The torque constant is also called specific torque. The reciprocal value is called specific current or current constant.



#### Derivation of the speed-torque line

The following occurs if one replaces current  $I_{mot}$  with torque  $M$  using the torque constant in the detailed power balance:

$$U_{mot} \cdot \frac{M}{k_M} = \frac{\pi}{30\,000} n \cdot M + R \cdot \left(\frac{M}{k_M}\right)^2$$

Transformed and taking account of the close relationship of  $k_M$  and  $k_n$ , an equation is produced of a straight line between speed  $n$  and torque  $M$ .

$$n = k_n \cdot U_{mot} - \frac{30\,000}{\pi} \cdot \frac{R}{k_M^2} \cdot M$$

or with the gradient and the no load speed  $n_0$

$$n = n_0 - \frac{\Delta n}{\Delta M} \cdot M$$

The speed-torque gradient is one of the most informative pieces of data and allows direct comparison between different motors. The smaller the speed-torque gradient, the less sensitive the speed reacts to torque (load) changes and the stronger the motor. With the maxon motor, the speed-torque gradient within the winding series of a motor type (i.e. on one catalog page) remains practically constant.

**Current gradient**

The equivalence of current to torque is shown by an axis parallel to the torque: more current flowing through the motor produces more torque. The current scale is determined by the two points no load current  $I_0$  and starting current  $I_A$  (lines 3 and 8 of motor data). The no load current is equivalent to the friction torque  $M_R$ , that describes the internal friction in the bearings and commutation system.

$$M_R = k_M \cdot I_0$$

In the maxon EC motor, there are strong, speed dependent iron losses in the stator iron stack instead of friction losses in the commutation system.

The motors develop the highest torque when starting. It is many times greater than the normal operating torque, so the current uptake is the greatest as well.

The following applies for the stall torque  $M_H$  and starting current  $I_A$

$$M_H = k_M \cdot I_A$$

**Efficiency curve**

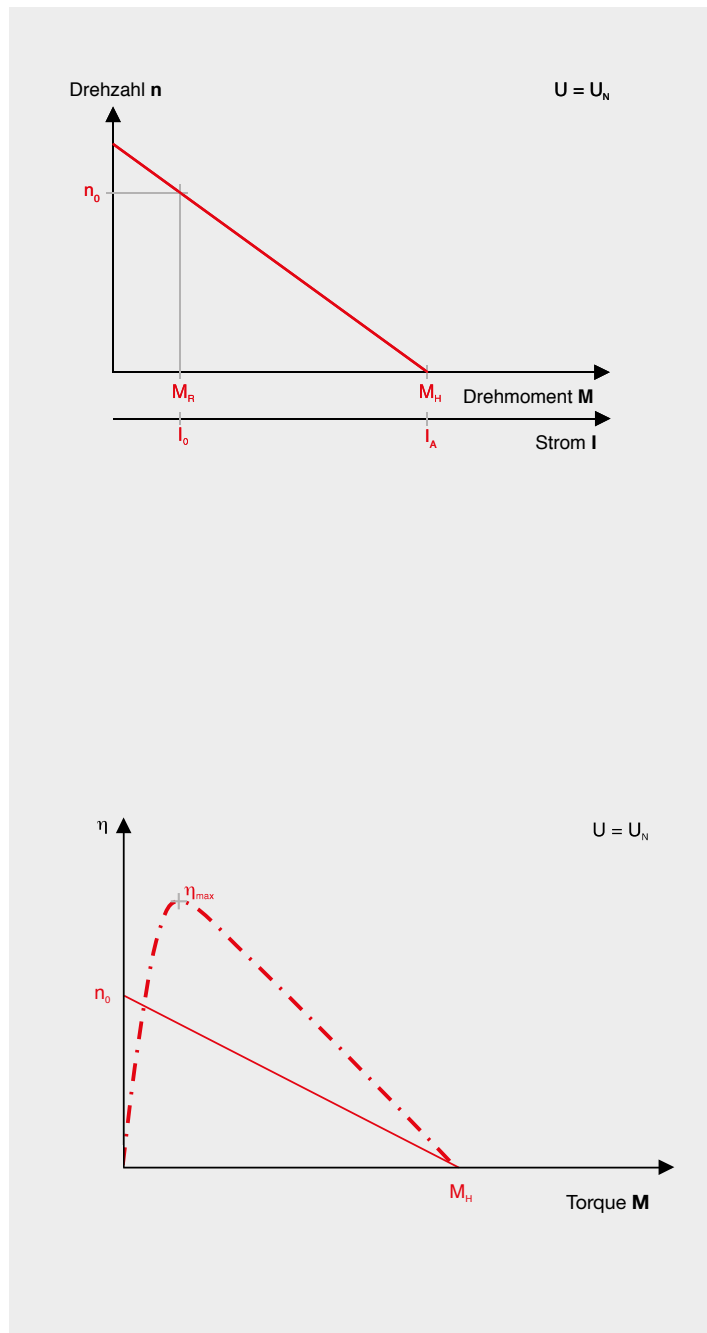
The efficiency  $\eta$  describes the relationship of mechanical power delivered to electrical power consumed.

$$\eta = \frac{\pi}{30\,000} \cdot \frac{n \cdot (M - M_R)}{U_{mot} \cdot I_{mot}}$$

One can see that at constant applied voltage  $U$  and due to the proportionality of torque and current, the efficiency increases with increasing speed (decreasing torque). At low torques, friction losses become increasingly significant and efficiency rapidly approaches zero. Maximum efficiency (line 9 of motor data) is calculated using the starting current and no load current and is dependent on voltage.

$$\eta_{max} = \left(1 - \sqrt{\frac{I_0}{I_A}}\right)^2$$

Maximum efficiency and maximum output power do not occur at the same torque.

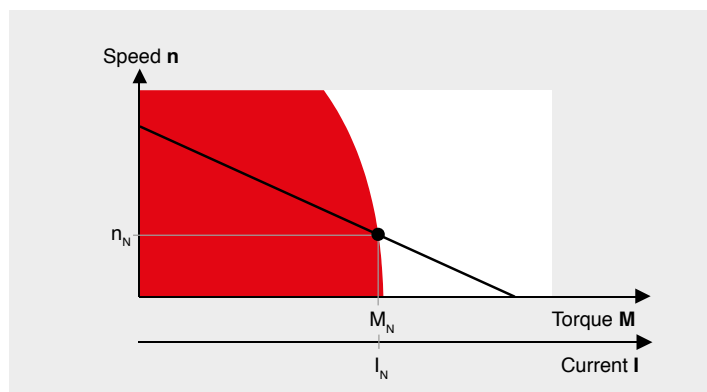


**Rated operating point**

The rated operating point is an ideal operating point for the motor and derives from operation at nominal voltage  $U_N$  (line 1 of motor data) and nominal current  $I_N$  (line 6). The nominal torque  $M_N$  produced (line 5) in this operating point follows from the equivalence of torque and current.

$$M_N \approx k_M \cdot (I_N - I_0)$$

Nominal speed  $n_N$  (line 4) is reached in line with the speed gradient. The choice of nominal voltage follows from considerations of where the maximum no load speed should be. The nominal current derives from the motor's thermally maximum permissible continuous current.



## Motor diagrams, operating ranges

The catalog contains a diagram of every maxon DC and EC motor type that shows the operating ranges of the different winding types using a typical motor.

### Permanent operating range

The two criteria “maximum continuous torque” and “maximum permissible speed” limit the continuous operating range. Operating points within this range are not critical thermally and do not generally cause increased wear of the commutation system.

### Short-term operating range

The motor may only be loaded with the maximum continuous current for thermal reasons. However, temporary higher currents (torques) are allowed. As long as the winding temperature is below the critical value, the winding will not be damaged. Phases with increased currents are time limited. A measure of how long the temporary overload can last is provided by the thermal time constant of the winding (line 19 of the motor data). The magnitude of the times with overload ranges from several seconds for the smallest motors (6 mm to 13 mm diameter) up to roughly one minute for the largest (60 mm to 90 mm diameter). The calculation of the exact overload duration depends highly on the motor current and the winding temperature at the beginning.

### Maximum continuous current, maximum continuous torque

The Joule power losses heat up the winding. The heat produced must be able to dissipate and the maximum rotor temperature (line 22 of the motor data) should not be exceeded. This results in a maximum continuous current, at which the maximum winding temperature is attained under standard conditions (25°C ambient temperature, no heat dissipation via the flange, free air circulation). Higher motor currents cause excessive winding temperatures.

The nominal current is selected so that it corresponds to this maximum permissible constant current. It depends heavily on the winding. These thin wire windings have lower nominal current levels than thick ones. With very low resistive windings, the brush system’s capacity can further limit the permissible constant current. With graphite brush motors, friction losses increase sharply at higher speeds. With EC motors, eddy current losses increase in the return as speed increases and produce additional heat. The maximum permissible continuous current decreases at faster speeds accordingly.

The nominal torque allocated to the nominal current is almost constant within a motor type’s winding range and represents a characteristic size of the motor type.

### The maximum permissible speed

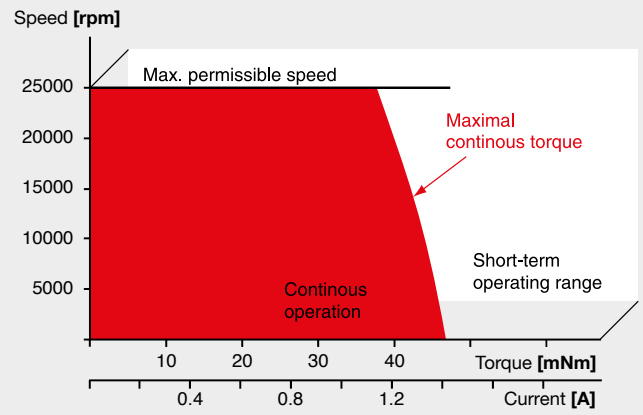
for DC motors is primarily limited by the commutation system. The commutator and brushes wear more rapidly at very high speeds. The reasons are:

- Increased mechanical wear because of the large traveled path of the commutator
- Increased electro-erosion because of brush vibration and spark formation.

A further reason for limiting the speed is the rotor’s residual mechanical imbalance which shortens the service life of the bearings. Higher speeds than the limit speed  $n_{max}$  (line 23) are possible, however, they are “paid for” by a reduced service life expectancy. The maximum permissible speed for the EC motor is calculated based on service life considerations of the ball bearings (at least 20 000 hours) at the maximum residual imbalance and bearing load.

### Maximum winding temperature

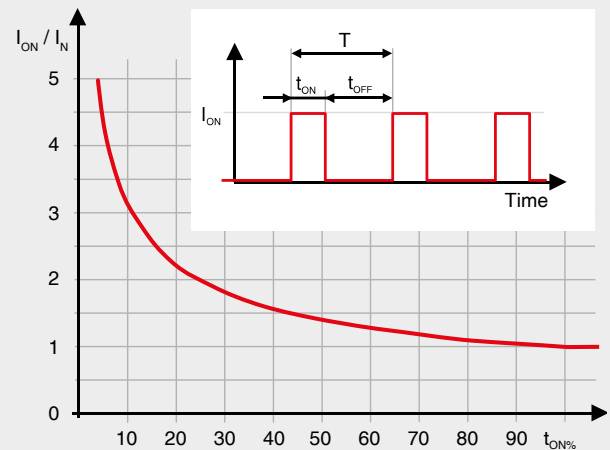
Due to the winding resistance, the motor current causes the winding to heat up. To prevent the motor from overheating, this heat needs to be dissipated to the environment via the stator. The maximum winding temperature must not be exceeded even for a short time. For graphite brush motors and EC motors with their usually higher current load, it is 125 °C (in some cases up to 155 °C). Precious metal commutated motors only allow for low current loads, so that the rotor temperature must not exceed 85 °C. Precautions taken during installation, such as good air circulation or cooling plates, may significantly lower the temperature.



Operating range diagram

### Intermittent operation

Switch-on duration and current



ON	Motor in operation
OFF	Motor stationary
$I_{ON}$	Max. peak current
$I_N$	Max. permissible continuous current (line 6)
$t_{ON}$	ON time [s], should not exceed $\tau_w$ (line 19)
$T$	Cycle time $t_{ON} + t_{OFF}$ [s]
$t_{ON\%}$	Duty cycle as percentage of cycle time.

The motor may be overloaded by the relationship  $I_{ON} / I_N$  at X % of the total cycle time.

$$I_{on} = I_N \sqrt{\frac{T}{t_{ON}}}$$



## maxon flat and EC-i motors

Multi-pole maxon flat motors and EC-i motors require a greater number of commutation steps per revolution (6 x number of pole pairs). Due to their wound stator teeth, they have a higher terminal inductance than motors with an ironless winding. At high speeds, the current cannot fully develop due to the short commutation intervals. The torque is therefore less. In addition, some current is returned to the controller power stage. As a result, the behavior deviates from the ideal linear characteristic depending on voltage and speed: The apparent speed/torque gradient is steeper at higher speeds and flatter at very low speeds.

Mostly, flat motors are operated in the continuous operation range where the achievable speed-torque gradient at nominal voltage can be approximated by a straight line between no load speed and nominal operating point. The achievable speed-torque gradient is approximate.

$$\frac{\Delta n}{\Delta M} \approx \frac{n_0 - n_N}{M_N}$$

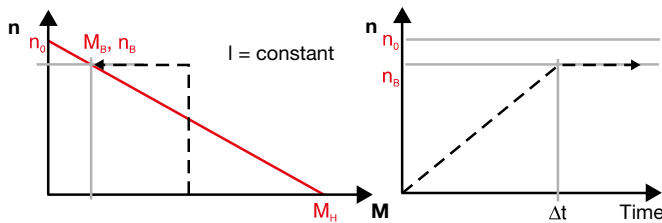
## Acceleration

In accordance with the electrical boundary conditions (power supply, control, battery), a distinction is primarily made between two different starting processes:

- Start at constant voltage (without current limitation)
- Start at constant current (with current limitation)

### Start under constant current

A current limit always means that the motor can only deliver a limited torque. In the speed-torque diagram, the speed increases on a vertical line with a constant torque. Acceleration is also constant, thus simplifying the calculation. Start at constant current is usually found in applications with servo amplifiers, where acceleration torques are limited by the amplifier's peak current.



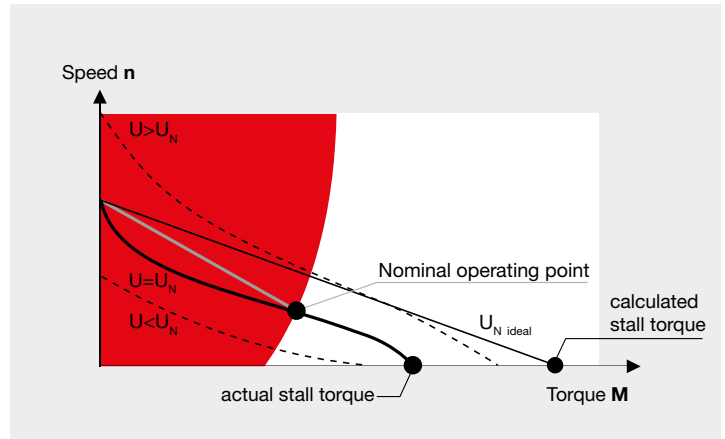
- Angular acceleration  $\alpha$  (in rad/s<sup>2</sup>) at constant current  $I$  or constant torque  $M$  with an additional load of inertia  $J_L$ :

$$\alpha = 10^4 \cdot \frac{k_M \cdot I_{mot}}{J_R + J_L} = 10^4 \cdot \frac{M}{J_R + J_L}$$

- Run-up time  $\Delta t$  (in ms) at a speed change  $\Delta n$  with an additional load inertia  $J_L$ :

$$\Delta t = \frac{\pi}{300} \cdot \Delta n \cdot \frac{J_R + J_L}{k_M \cdot I_{mot}}$$

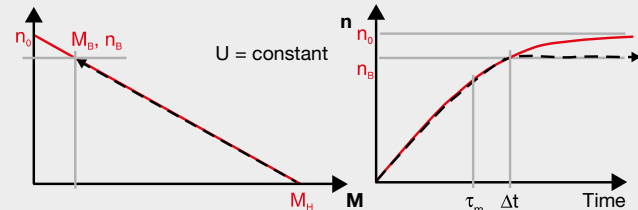
(all variables in units according to the catalog)



The stall torque specified on the product page is equal to the linearly calculated load torque (without magnetic saturation effect) which causes the shaft to stall at nominal voltage. With EC-flat and EC-i motors, this torque often cannot be achieved due to saturation effects.

### Start with constant terminal voltage

Here, the speed increases from the stall torque along the speed-torque line. The greatest torque and thus the greatest acceleration is effective at the start. The faster the motor turns, the lower the acceleration. The speed increases more slowly. This exponentially flattening increase is described by the mechanical time constant  $\tau_m$  (line 15 of the motor data). After this time, the rotor at the free shaft end has attained 63% of the no load speed. After roughly three mechanical time constants, the rotor has almost reached the no load speed.



- Mechanical time constant  $\tau_m$  (in ms) of the unloaded motor:

$$\tau_m = 100 \cdot \frac{J_R \cdot R}{k_M^2}$$

- Mechanical time constants  $\tau_m'$  (in ms) with an additional load inertia  $J_L$ :

$$\tau_m' = 100 \cdot \frac{J_R \cdot R}{k_M^2} \left( 1 + \frac{J_L}{J_R} \right)$$

- Maximum angular acceleration  $\alpha_{max}$  (in rad/s<sup>2</sup>) of the unloaded motor:

$$\alpha_{max} = 10^4 \cdot \frac{M_H}{J_R}$$

- Maximum angular acceleration  $\alpha_{max}$  (in rad/s<sup>2</sup>) with an additional load inertia  $J_L$ :

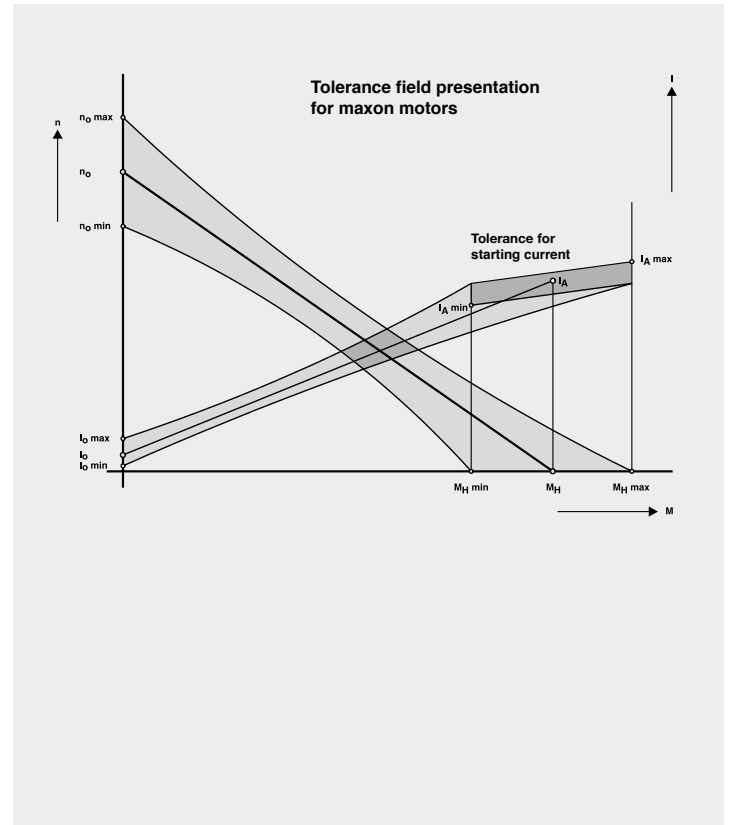
$$\alpha_{max} = 10^4 \cdot \frac{M_H}{J_R + J_L}$$

- Run-up time (in ms) at constant voltage up to the operating point ( $M_L, n_L$ ):

$$\Delta t = \tau_m' \cdot \ln \left( \frac{\left( 1 - \frac{M_L + M_R}{M_H} \right) \cdot n_0}{\left( 1 - \frac{M_L + M_R}{M_H} \right) \cdot n_0 - n_L} \right)$$

## Tolerances

Tolerances must be considered in critical ranges. The possible deviations of the mechanical dimensions can be found in the overview drawings. The motor data are average values: the adjacent diagram shows the effect of tolerances on the curve characteristics. They are mainly caused by differences in the magnetic field strength and in wire resistance, and not so much by mechanical influences. The changes are heavily exaggerated in the diagram and are simplified to improve understanding. It is clear, however, that in the motor's actual operating range, the tolerance range is more limited than at start or at no load. Our computer sheets contain all detailed specifications.



## Thermal behavior

The Joule power losses  $P_J$  in the winding determine heating of the motor. This heat energy must be dissipated via the surfaces of the winding and motor. The increase  $\Delta T_W$  of the winding temperature  $T_W$  with regard to the ambient temperature arises from heat losses  $P_J$  and thermal resistances  $R_{th1}$  and  $R_{th2}$ .

$$T_W - T_U = \Delta T_W = (R_{th1} + R_{th2}) \cdot P_J$$

Here, thermal resistance  $R_{th1}$  relates to the heat transfer between the winding and the stator (magnetic return and magnet), whereas  $R_{th2}$  describes the heat transfer from the housing to the environment. Mounting the motor on a heat dissipating chassis noticeably lowers thermal resistance  $R_{th2}$ . The values specified in the data sheets for thermal resistances and the maximum continuous current were determined in a series of tests, in which the motor was end-mounted onto a vertical plastic plate. The modified thermal resistance  $R_{th2}$  that occurs in a particular application must be determined using original installation and ambient conditions. Thermal resistance  $R_{th2}$  on motors with metal flanges decreases by up to 80% if the motor is coupled to a good heat-conducting (e.g. metallic) retainer.

The heating runs at different rates for the winding and stator due to the different masses. After switching on the current, the winding heats up first (with time constants from several seconds to half a minute). The stator reacts much slower, with time constants ranging from 1 to 30 minutes depending on motor size. A thermal balance is gradually established. The temperature difference of the winding compared to the ambient temperature can be determined with the value of the current  $I$  (or in intermittent operation with the effective value of the current  $I = I_{RMS}$ ).

$$\Delta T_W = \frac{(R_{th1} + R_{th2}) \cdot R \cdot I_{mot}^2}{1 - \alpha_{Cu} \cdot (R_{th1} + R_{th2}) \cdot R \cdot I_{mot}^2}$$

Here, electrical resistance  $R$  must be applied at the actual ambient temperature.

### Influence of temperature

An increased motor temperature affects winding resistance and magnetic characteristic values.

Winding resistance increases linearly according to the thermal resistance coefficient for copper ( $\alpha_{Cu} = 0.0039$ ):

$$R_T = R_{25} \cdot (1 + \alpha_{Cu} (T - 25^\circ C))$$

Example: a winding temperature of 75°C causes the winding resistance to increase by nearly 20%.

The magnet becomes weaker at higher temperatures. The reduction is 1 to 10% at 75°C depending on the magnet material.

The most important consequence of increased motor temperature is that the speed curve becomes steeper which reduces the stall torque. The changed stall torque can be calculated in first approximation from the voltage and increased winding resistance:

$$M_H = k_M \cdot I_A = k_M \cdot \frac{U_{mot}}{R_T}$$

## Motor selection

The drive requirements must be defined before proceeding to motor selection.

- How fast and at which torques does the load move?
- How long do the individual load phases last?
- What accelerations take place?
- How great are the mass inertias?

Often the drive is indirect, this means that there is a mechanical transformation of the motor output power using belts, gears, screws and the like. The drive parameters, therefore, are to be calculated to the motor shaft. Additional steps for gear selection are listed below.

Furthermore, the power supply requirements need to be checked.

- Which maximum voltage is available at the motor terminals?
- Which limitations apply with regard to current?

The current and voltage of motors supplied with batteries or solar cells are very limited. In the case of control of the unit via a servo amplifier, the amplifier's maximum current is often an important limit.

### Selection of motor types

The possible motor types are selected using the required torque. On the one hand, the peak torque,  $M_{max}$  is to be taken into consideration and on the other, the effective torque  $M_{RMS}$ . Continuous operation is characterized by a single operating or load point ( $M_L, n_L$ ). The motor types in question must have a nominal torque (= max. continuous torque)  $M_N$  that is greater than load torque  $M_L$ .

$$M_N > M_L$$

In operating cycles, such as start/stop operation, the motor's nominal torque must be greater than the effective load torque (RMS). This prevents the motor from overheating.

$$M_N > M_{RMS}$$

The stall torque of the selected motor should usually exceed the emerging load peak torque.

$$M_H > M_{max}$$

### Selection of the winding: electric requirement

In selecting the winding, it must be ensured that the voltage applied directly to the motor is sufficient for attaining the required speed in all operating points.

### Uncontrolled operation

In applications with only one operating point, this is often achieved with a fixed voltage  $U$ . A winding is sought with a speed-torque line that passes through the operating point at the specified voltage. The calculation uses the fact that all motors of a type feature practically the same speed-torque gradient. A target no load speed  $n_{0,theor}$  is calculated from operating point ( $n_L, M_L$ ).

$$n_{0,theor} = n_L + \frac{\Delta n}{\Delta M} M_L$$

This target no load speed must be achieved with the existing voltage  $U$ , which defines the target speed constant.

$$k_{n,theor} = \frac{n_{0,theor}}{U_{mot}}$$

Those windings whose  $k_n$  is as close to  $k_{n,theor}$  as possible, will approximate the operating point the best at the specified voltage. A somewhat larger speed constant results in a somewhat higher speed, a smaller speed constant results in a lower one. The variation of the voltage adjusts the speed to the required value, a principle that servo amplifiers also use.

The motor current  $I_{mot}$  is calculated using the torque constant  $k_M$  of the selected winding and the load torque  $M_L$ .

$$I_{mot} = \frac{M_L}{k_M}$$

### Advices for evaluating the requirements:

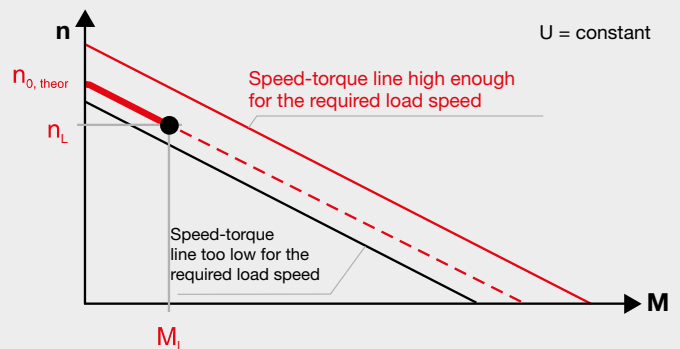
Often the load points (especially the torque) are not known or are difficult to determine. In such cases you can operate your device with a measuring motor roughly estimated according to size and power. Vary the voltage until the desired operating points and motion sequences have been achieved. Measure the voltage and current flow. Using these specifications and the part number of the measuring motor, our engineers can often specify the suitable motor for your application.

Additional optimization criteria are, for example:

- Mass to be accelerated (type, mass inertia)
- Type of operation (continuous, intermittent, reversing)
- Ambient conditions (temperature, humidity, medium)
- Power supply, battery

When selecting the motor type, other constraints also play a major role:

- What maximum length should the drive unit have, including gear and encoder diameter?
- What service life is expected from the motor and which commutation system should be used?
- Precious metal commutation for continuous operation at low currents (rule of thumb for longest service life: up to approx. 50% of  $I_N$ ).
- Graphite commutation for high continuous currents (rule of thumb: 50% to approx. 75% of  $I_N$ ) and frequent current peaks (start/stop operation, reversing operation).
- Electronic commutation for highest speeds and longest service life.
- How great are the forces on the shaft, do ball bearings have to be used or are less expensive sintered bearings sufficient?

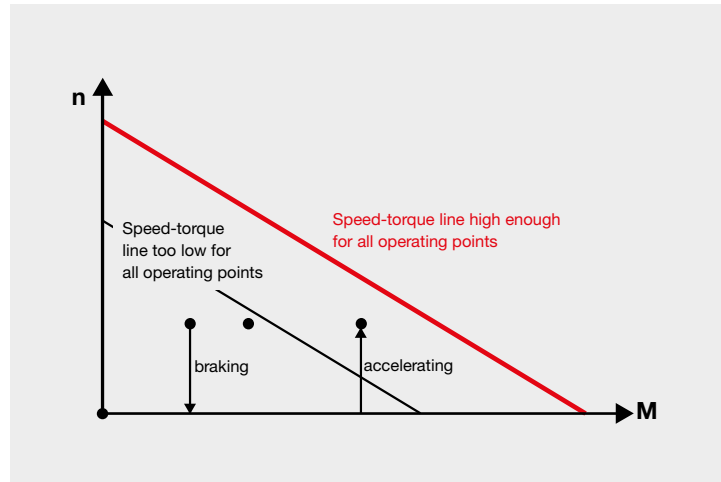


**Regulated servo drives**

In operating cycles, all operating points must lie beneath the curve at a maximum voltage  $U_{max}$ . Mathematically, this means that the following must apply for all operating points ( $n_L, M_L$ ):

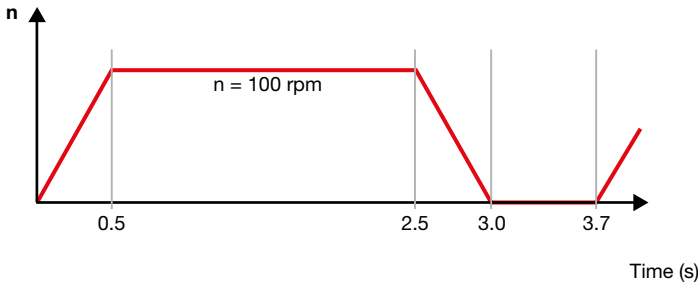
$$k_n \cdot U_{max} = n_0 + n_L + \frac{\Delta n}{\Delta M} M_L$$

When using servo amplifiers, a voltage drop occurs at the power stage, so that the effective voltage applied to the motor is lower. This must be taken into consideration when determining the maximum supply voltage  $U_{max}$ . It is recommended that a regulating reserve of some 20% be included, so that regulation is even ensured with an unfavorable tolerance situation of motor, load, amplifier and supply voltage. Finally, the average current load and peak current are calculated ensuring that the servo amplifier used can deliver these currents. In some cases, a higher resistance winding must be selected, so that the currents are lower. However, the required voltage is then increased.



**Example for motor/gear selection**

The following speed curve is to be repeated cyclically.



The accelerated load inertia  $J_L$  is 300 000 gcm<sup>2</sup> = 0.03 kgm<sup>2</sup>. The friction torque is 400 mNm. The motor is driven with the 4-Q servo amplifier ESCON 36/2 DC for DC motors. The power supply has a maximum output of 3 A and 24 V.

**Calculation of load data**

The torque required for acceleration and braking are calculated as follows (motor and gearhead inertia omitted):

$$M_a = J_L \cdot \frac{\pi}{30} \cdot \frac{\Delta n}{\Delta t} = 0.03 \cdot \frac{\pi}{30} \cdot \frac{100}{0.5} = 0.628 \text{ Nm} = 628 \text{ mNm}$$

Together with the friction torque, the following torques result for the different phases of motion.

- Acceleration phase (duration 0.5 s) 1028 mNm
- Constant speed (duration 2 s) 400 mNm
- Braking (friction brakes with 400 mNm) (duration 0.5 s) -228 mNm
- Standstill (duration 0.7 s) 0 mNm

Peak torque occurs during acceleration.

The RMS determined torque of the entire operating cycle is

$$M_{RMS} = \sqrt{\frac{t_1 \cdot M_1^2 + t_2 \cdot M_2^2 + t_3 \cdot M_3^2 + t_4 \cdot M_4^2}{t_{tot}}}$$

$$= \sqrt{\frac{0.5 \cdot 1028^2 + 2 \cdot 400^2 + 0.5 \cdot (-228)^2 + 0.7 \cdot 0}{3.7}} \approx 486 \text{ mNm}$$

The maximum speed (100 rpm) occurs at the end of the acceleration phase at maximum torque (1028 mNm). Thus, the peak mechanical power is:

$$P_{max} = M_{max} \cdot \frac{\pi}{30} \cdot n_{max} = 1.028 \cdot \frac{\pi}{30} \cdot 100 \approx 11 \text{ W}$$

**Physical variables**

		and their units	
		SI	Catalog
$i$	Gear reduction*		
$I_{mot}$	Motor current	A	A, mA
$I_A$	Stall current*	A	A, mA
$I_0$	No load current*	A	mA
$I_{RMS}$	RMS determined current	A	A, mA
$I_N$	Nominal current*	A	A, mA
$J_R$	Moment of inertia of the rotor*	kgm <sup>2</sup>	gcm <sup>2</sup>
$J_L$	Moment of inertia of the load	kgm <sup>2</sup>	gcm <sup>2</sup>
$K_M$	Torque constant*	Nm/A	mNm/A
$k_n$	Speed constant*		rpm/V
$M$	(Motor) torque	Nm	mNm
$M_L$	Load torque	Nm	mNm
$M_{H1}$	Stall torque*	Nm	mNm
$M_{mot}$	Motor torque	Nm	mNm
$M_R$	Moment of friction	Nm	mNm
$M_{RMS}$	RMS determined torque	Nm	mNm
$M_N$	Nominal torque	Nm	mNm
$M_{N,G}$	Max. torque of gear*	Nm	Nm
$n$	Speed		rpm
$n_L$	Operating speed of the load		rpm
$n_{max}$	Limit speed of motor*		rpm
$n_{max,G}$	Limit speed of gear*		rpm
$n_{mot}$	Motor speed		rpm
$n_0$	No load speed*		rpm
$P_{el}$	Electrical power	W	W
$P_J$	Joule power loss	W	W
$P_{mech}$	Mechanical power	W	W
$R$	Terminal resistance	Ω	Ω
$R_{25}$	Resistance at 25°C*	Ω	Ω
$R_T$	Resistance at temperature T	Ω	Ω
$R_{th1}$	Heat resistance winding housing*		K/W
$R_{th2}$	Heat resistance housing/air*		K/W
$t$	Time	s	s
$T$	Temperature	K	°C
$T_{max}$	Max. winding temperature*	K	°C
$T_U$	Ambient temperature	K	°C
$T_W$	Winding temperature	K	°C
$U_{mot}$	Motor voltage	V	V
$U_{ind}$	Induced voltage (EMF)	V	V
$U_{max}$	Max. supplied voltage	V	V
$U_N$	Nominal voltage*	V	V
$\alpha_{Cu}$	Resistance coefficient of Cu		= 0.0039
$\alpha_{max}$	Max. angle acceleration		rad/s <sup>2</sup>
$\Delta n / \Delta M$	Curve gradient*		rpm/mNm
$\Delta T_W$	Temperature difference winding/ambient	K	K
$\Delta t$	Run up time	s	ms
$\eta$	(Motor) efficiency		%
$\eta_G$	(Gear) efficiency*		%
$\eta_{max}$	Max. efficiency*		%
$\tau_m$	Mechanical time constant*	s	ms
$\tau_S$	Therm. time constant of the motor*	s	s
$\tau_W$	Therm. time constant of the winding*	s	s

(\*Specified in the motor or gear data)

### Gear selection

We are looking for a gearhead with a maximum continuous torque of at least 0.486 Nm and a short-term torque of at least 1.028 Nm. This requirement can be fulfilled by the ceramic version of the configurable GPX 22 gearhead with 2 or 3 stages. With 2 stages, the maximum gearhead input speed of 10000 rpm permits a maximum ratio of

$$i_{max} = \frac{n_{max,G}}{n_L} = \frac{10000}{100} = 100:1$$

Three-stage gearheads permit higher input speeds, and the maximum ratio is 120:1. Because of the shorter design, we decide to use the 2-stage gearhead. To keep the motor torque as small as possible, we select the highest possible ratio of 44:1. The 2-stage gearhead has an efficiency of 81%.

### Motor type selection

Speed and torque are calculated to the motor shaft

$$n_{mot} = i \cdot n_L = 44 \cdot 100 = 4400 \text{ rpm}$$

$$M_{mot,RMS} = \frac{M_{RMS}}{i \cdot \eta} = \frac{486}{44 \cdot 0.81} \approx 13.6 \text{ mNm}$$

$$M_{mot,max} = \frac{M_{max}}{i \cdot \eta} = \frac{1028}{44 \cdot 0.81} \approx 28.8 \text{ mNm}$$

The possible motors, which match the selected gears in accordance with the maxon modular system, are summarized in the table opposite. The table shows only motors with graphite commutation because they are better suited for stop-and-go operation.

We select the DCX 22 S, which has sufficient continuous torque. The motor should have a torque reserve so that it will be able to function in slightly less favorable conditions. The additional torque requirement during acceleration is no problem for the motor. The short-term peak torque is only slightly less than twice as high as the permissible continuous torque of the motor.

### Selection of the winding

The DCX 22 S motor has a mean characteristic gradient of about 110 rpm/mNm. The desired idle speed is calculated as follows:

$$n_{0,theor} = n_{mot} + \frac{\Delta n}{\Delta M} \cdot M_{max} = 4400 + 110 \cdot 28.8 = 7570 \text{ rpm}$$

The extreme operating point should of course be used in the calculation (max. speed and max. torque), since the speed-torque line of the winding must run above all operating points in the speed / torque diagram. This target no load speed must be achieved with the maximum voltage  $U = 24 \text{ V}$  supplied by the control (ESCON 36/2), which defines the minimum target speed constant  $k_{n,theor}$  of the motor.

$$k_{n,theor} = \frac{n_{0,theor}}{U_{mot}} = \frac{7570}{24} = 315 \frac{\text{rpm}}{\text{V}}$$

If one considers the speed constant of the windings, then the first choice would be the motor with a nominal speed of 36 V. At a speed constant of 342 rpm V<sup>-1</sup> however, it has only a small speed control reserve. If the tolerances are insufficient, then the winding with the next higher speed constant (24 V nominal voltage) offers better safety.

The higher speed constant of the winding compared to the calculated value means that the motor runs faster at 24 V than required, which can be compensated with the speed controller. The motor can be equipped with an encoder to record the speed. The speed constant of the selected 24 V winding is 18.4 mNm/A. The maximum torque therefore corresponds to a peak current of

$$I_{max} = \frac{M_{max}}{k_M} + I_0 = \frac{28.8}{18.4} + 0.036 = 1.6 \text{ A}$$

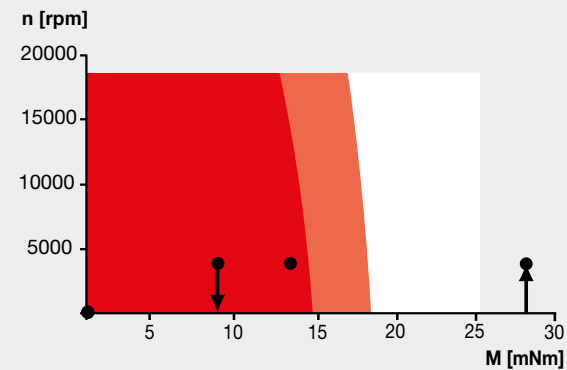
This current is smaller than the maximum current (4 A) of the controller and the power supply unit (3 A).

Thus, a gear motor has been found that fulfils the requirements (torque and speed) and can be operated by the controller provided.

### Alternative solutions

GPX 19 ceramic gearhead  
3 stages (138:1 reduction)  
with motor type DCX 16 S (graphite brushes)

GPX 22 gearhead, standard configuration  
3 stages (111:1 reduction)  
with motor type DCX 19 S (graphite brushes)



Motor	$M_N$	Suitability
DCX 22 S	≈ 15 mNm	good
DCX 22 L	≈ 30 mNm	too strong, builds long
DC-max 22 S	≈ 11 mNm	too weak

# maxon Conversion Tables

## General Information

Quantity	Basic-unit	Sign
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Electrical current	Ampere	A
Thermodynamic Temperature	Kelvin	K

### Conversion Example

A known unit  
B unit sought

known: oz-in multiply by 7.06 sought: mNm

### Factors used for ...

#### ... conversions:

1 oz = 2.834952313 · 10<sup>-2</sup> kg  
1 in = 2.54 · 10<sup>-2</sup> m

#### ... gravitational acceleration:

g = 9.80665 m s<sup>-2</sup>  
= 386.08858 in s<sup>-2</sup>

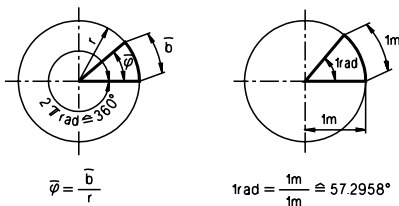
#### ... derived units:

1 yd = 3 ft = 36 in  
1 lb = 16 oz = 7000 gr (grains)  
1 kp = 1 kg · 9.80665 ms<sup>-2</sup>  
1 N = 1 kgms<sup>-2</sup>  
1 W = 1 Nms<sup>-1</sup> = 1 kgm<sup>2</sup>s<sup>-3</sup>  
1 J = 1 Nm = 1 Ws

### Decimal multiples and fractions of units

Prefix	Abbreviation	Multiply	Prefix	Abbreviation	Multiply
Deka ..	da	10 <sup>1</sup>	Dezi ..	d	10 <sup>-1</sup>
Hekto ..	h	10 <sup>2</sup>	Zenti ..	c	10 <sup>-2</sup>
Kilo ..	k	10 <sup>3</sup>	Milli ..	m	10 <sup>-3</sup>
Mega ..	M	10 <sup>6</sup>	Mikro ..	μ	10 <sup>-6</sup>
Giga ..	G	10 <sup>9</sup>	Nano ..	n	10 <sup>-9</sup>
Tera ..	T	10 <sup>12</sup>	Piko ..	p	10 <sup>-12</sup>

### Arc definition



## Power

P [W]

B \ A	oz-in-s <sup>-1</sup>	oz-in-min <sup>-1</sup>	in-lbf-s <sup>-1</sup>	ft-lbf-s <sup>-1</sup>	W = N · ms <sup>-1</sup>	mW	kpm s <sup>-1</sup>	mNm min <sup>-1</sup>
W = N · ms <sup>-1</sup>	7.06 · 10 <sup>-3</sup>	1.17 · 10 <sup>-4</sup>	0.113	1.356	1	1 · 10 <sup>-3</sup>	9.807	2 <sub>60</sub> ⁄
mW	7.06	0.117	112.9	1.356 · 10 <sup>3</sup>	1 · 10 <sup>3</sup>	1	9.807 · 10 <sup>3</sup>	2 <sub>60</sub> ⁄
oz-in-s <sup>-1</sup>	1	1/60	16	192	141.6	0.142	1.39 · 10 <sup>3</sup>	2.36 · 10 <sup>-3</sup>
ft-lbf-s <sup>-1</sup>	1/192	1/11520	1/12	1	0.737	0.737 · 10 <sup>-3</sup>	7.233	1.23 · 10 <sup>-5</sup>
kpm s <sup>-1</sup>	7.20 · 10 <sup>-4</sup>	1.2 · 10 <sup>-5</sup>	1.15 · 10 <sup>-2</sup>	0.138	0.102	0.102 · 10 <sup>-3</sup>	1	1.70 · 10 <sup>-6</sup>

## Torque

M [Nm]

B \ A	oz-in	ft-lbf	Nm = Ws	Ncm	mNm	kpm	pcm
Nm	7.06 · 10 <sup>-3</sup>	1.356	1	1 · 10 <sup>-2</sup>	1 · 10 <sup>-3</sup>	9.807	9.807 · 10 <sup>-5</sup>
mNm	7.06	1.356 · 10 <sup>3</sup>	1 · 10 <sup>3</sup>	10	1	9.807 · 10 <sup>3</sup>	9.807 · 10 <sup>-2</sup>
kpm	7.20 · 10 <sup>-4</sup>	0.138	0.102	0.102 · 10 <sup>-2</sup>	0.102 · 10 <sup>-3</sup>	1	1 · 10 <sup>-5</sup>
oz-in	1	192	141.6	1.416	0.142	1.39 · 10 <sup>3</sup>	1.39 · 10 <sup>-2</sup>
ft-lbf	1/192	1	0.737	0.737 · 10 <sup>-2</sup>	0.737 · 10 <sup>-3</sup>	7.233	7.233 · 10 <sup>-5</sup>

## Moment of Inertia

J [kg m<sup>2</sup>]

B \ A	oz-in <sup>2</sup>	oz-in-s <sup>2</sup>	lb-in <sup>2</sup>	lb-in-s <sup>2</sup>	Nms <sup>2</sup> =kgm <sup>2</sup>	mNm s <sup>2</sup>	gcm <sup>2</sup>	kpm s <sup>2</sup>
g cm <sup>2</sup>	182.9	7.06 · 10 <sup>4</sup>	2.93 · 10 <sup>3</sup>	1.13 · 10 <sup>6</sup>	1 · 10 <sup>7</sup>	1 · 10 <sup>4</sup>	1	9.807 · 10 <sup>7</sup>
kgm <sup>2</sup> =Nms <sup>2</sup>	1.83 · 10 <sup>-5</sup>	7.06 · 10 <sup>-3</sup>	2.93 · 10 <sup>-4</sup>	0.113	1	1 · 10 <sup>-3</sup>	1 · 10 <sup>-7</sup>	9.807
oz-in <sup>2</sup>	1	386.08	16	6.18 · 10 <sup>3</sup>	5.46 · 10 <sup>4</sup>	54.6	5.46 · 10 <sup>-3</sup>	5.35 · 10 <sup>5</sup>
lb-in <sup>2</sup>	1/16	24.130	1	386.08	3.41 · 10 <sup>3</sup>	3.41	3.41 · 10 <sup>-4</sup>	3.35 · 10 <sup>4</sup>

## Mass

m [kg]

## Force

F [N]

B \ A	oz	lb	gr (grain)	kg	g	B \ A	oz	lbf	N	kp	p
kg	28.35 · 10 <sup>-3</sup>	0.454	64.79 · 10 <sup>-6</sup>	1	1 · 10 <sup>-3</sup>	N	0.278	4.448	1	9.807	9.807 · 10 <sup>-3</sup>
g	28.35	0.454 · 10 <sup>3</sup>	64.79 · 10 <sup>-3</sup>	1 · 10 <sup>3</sup>	1	kp	0.028	0.454	0.102	1	1 · 10 <sup>-3</sup>
oz	1	16	2.28 · 10 <sup>-3</sup>	35.27	35.27 · 10 <sup>3</sup>	oz	1	16	3.600	35.27	35.27 · 10 <sup>-3</sup>
lb	1/16	1	1/7000	2.205	2.205 · 10 <sup>3</sup>	lbf	1/16	1	0.225	2.205	2.205 · 10 <sup>-3</sup>
gr (grain)	437.5	7000	1	15.43 · 10 <sup>3</sup>	15.43 · 10 <sup>6</sup>	pdl	2.011	32.17	7.233	70.93	70.93 · 10 <sup>-3</sup>

## Length

l [m]

B \ A	in	ft	yd	Mil	m	cm	mm	μ
m	25.4 · 10 <sup>-3</sup>	0.305	0.914	25.4 · 10 <sup>-6</sup>	1	0.01	1 · 10 <sup>-3</sup>	1 · 10 <sup>-6</sup>
cm	2.54	30.5	91.4	25.4 · 10 <sup>-4</sup>	1 · 10 <sup>2</sup>	1	0.1	1 · 10 <sup>-4</sup>
mm	25.4	305	914	25.4 · 10 <sup>-3</sup>	1 · 10 <sup>3</sup>	10	1	1 · 10 <sup>-3</sup>
in	1	12	36	1 · 10 <sup>-3</sup>	39.37	0.394	3.94 · 10 <sup>-2</sup>	3.94 · 10 <sup>-5</sup>
ft	1/12	1	3	1/12 · 10 <sup>-3</sup>	3.281	3.281 · 10 <sup>-2</sup>	3.281 · 10 <sup>-3</sup>	3.281 · 10 <sup>-6</sup>

## Angular Velocity

ω [s<sup>-1</sup>]

## Angular Acceleration

α [s<sup>-2</sup>]

B \ A	s <sup>-1</sup> = Hz	rpm	rad s <sup>-1</sup>	B \ A	min <sup>-2</sup>	s <sup>-2</sup>	rad s <sup>-2</sup>	min <sup>-1</sup> s <sup>-1</sup>
rad s <sup>-1</sup>	2π	π/30	1	s <sup>-2</sup>	1/3600	1	1/2π	1/60
rpm	1/60	1	30/π	rad s <sup>-2</sup>	π/1800	2π	1	π/30

## Linear Velocity

v [m s<sup>-1</sup>]

B \ A	in-s <sup>-1</sup>	in-min <sup>-1</sup>	ft-s <sup>-1</sup>	ft-min <sup>-1</sup>	m s <sup>-1</sup>	cm s <sup>-1</sup>	mm s <sup>-1</sup>	m min <sup>-1</sup>
m s <sup>-1</sup>	2.54 · 10 <sup>-2</sup>	4.23 · 10 <sup>-4</sup>	0.305	5.08 · 10 <sup>-3</sup>	1	1 · 10 <sup>-2</sup>	1 · 10 <sup>-3</sup>	1/60
in-s <sup>-1</sup>	1	60	12	720	39.37	39.37 · 10 <sup>-2</sup>	39.37 · 10 <sup>-3</sup>	0.656
ft-s <sup>-1</sup>	1/12	5	1	60	3.281	3.281 · 10 <sup>-2</sup>	3.281 · 10 <sup>-3</sup>	5.46 · 10 <sup>-2</sup>

## Temperature

T [K]

B \ A	° Fahrenheit	° Celsius = Centigrade	Kelvin
Kelvin	(°F - 305.15) / 1.8	+ 273.15	1
° Celsius	(°F - 32) / 1.8	1	-273.15
° Fahrenheit	1	1.8°C + 32	1.8 K + 305.15

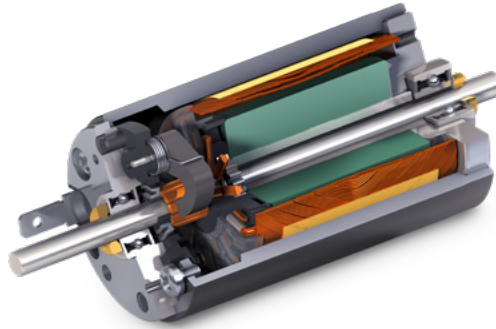
Units used in this brochure

# maxon standard specification

Our standard specifications gives you the means to assess the key aspects of maxon products. In our experience, the standard specifications cover normal cases. It is part of our Terms and Conditions of Delivery.

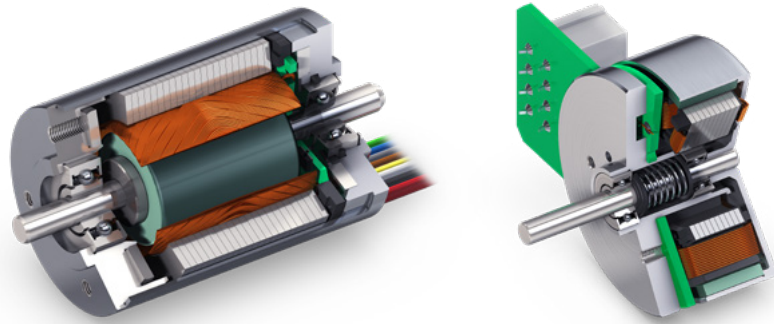
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## Standard specification no. 100 maxon DC motor



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## Standard specification no. 101 maxon EC motor



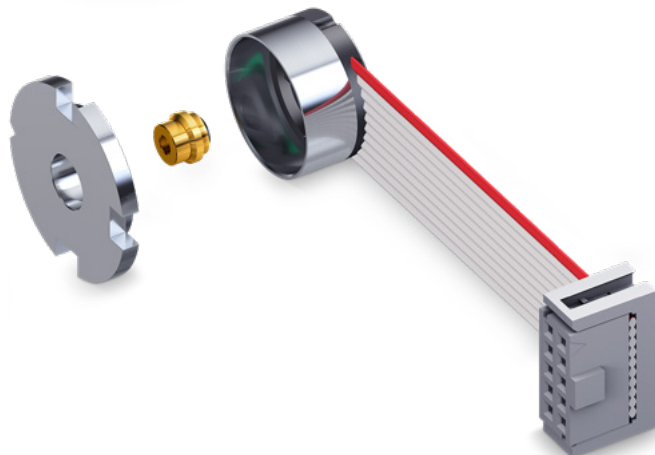
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## Standard specification no. 102 maxon gear maxon screw drive



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## Standard specification no. 103 maxon sensor



## Standard specification no. 100

### maxon DC motor

#### 1 Basics

The standard specification describes tests and inspections that are performed on the finished motor and during the manufacturing process. To safeguard our high quality standard, we inspect materials, individual parts, assemblies, and the finished motor for conformity with specified dimensions and properties. The results are recorded statistically and can be viewed by the customer on request. Sampling plans in acc. with ISO 2859 and DIN/ISO 3951 are used (attribute inspection, follow-up inspection and variable inspection), as well as self-monitoring procedures of the manufacturing departments. This standard specification applies in all cases where no other specification has been agreed upon between the customer and maxon.

#### 2 Data

2.1 **Electrical data** apply at temperatures between 22 and 25 °C. Data check within one minute of runtime.

**Measuring voltage** ±0.5% for voltages ≥ 3 V and  
±0.015 V for voltages ≤ 3 V

**No-load speed** ±10 %

**No-load current** ≤ maximum

**Direction of rotation** cw = clockwise

**Motor orientation** horizontal or vertical

**Additional information:** The measuring voltage may deviate from the nominal voltage listed in the catalog. The no-load current specified in the catalog is a typical value, not the maximum. If the red wire or the terminal marked + is connected to the positive terminal, then the shaft (seen from the face) turns clockwise. For counterclockwise (ccw) operation, the specified tolerances may be exceeded slightly.

**Terminal resistance:** Winding resistance is checked in samples during production. The terminal resistance is determined during the product qualification. Observe that the terminal resistance depends on the rotor position. Because contact resistance of graphite brushes varies with the current density, resistance measurement with an ohmmeter does not deliver meaningful results for small currents. In the case of precious metal brushes, the resistance measurements show a value that's too low when the brush bridges two commutator plates, shorting part of a coil.

The **inductance** is determined during the product qualification. The measuring frequency is 1 kHz. The terminal inductance of the motor is frequency-dependent.

**Commutation:** The check for neutral setting and electrical errors, e.g. winding discontinuities or winding shorts, is performed using an oscilloscope. The commutation graphs of precious metal and graphite brushes are not directly comparable. Precious metal brushes have a clearer commutation graph that remains interference-free up to the limit speed, approximately. For graphite brushes, this can only be expected at speeds up to 1/3 of the limit speed. For graphite brush motors, the brush contact resistance changes over time. The same applies to the torque constant due to the overlap between commutator plates. As a result, the no-load current and the speed change slightly. A similar effect can be observed when the motor has been run without load over a long time.

2.2 **Mechanical data** as shown in the dimensional drawing: Assembly-dependent dimensions are sampled in acc. with the sampling schedule. This does not apply to form and position tolerances. The process uses standard measurement tools (electrical length measurement, micrometers, dial gauges, calipers, plug and thread gauges, etc.). The calibration of the measuring instruments follows the standards listed below:

- EN ISO 10012:2003 Measurement management systems – Requirements for measurement processes and measuring equipment
- EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- VDI/VDE/DGQ 2618 Test equipment monitoring

2.3 **Imbalance:** Rotors are balanced according to our standard during the manufacturing process.

2.4 **Noise:** A subjective test is made for outliers within a batch. The motion inside a motor causes noise and vibration depending on speed. The noise and vibrations may vary in their frequency and intensity. The noise level of an individual sample does not permit any conclusions about the noise or vibration level of a future delivery.

2.5 **Service life:** Service life tests are conducted according to unified, internal criteria as part of the product qualification. The service life of a motor primarily depends on the operating modes and ambient conditions. The great diversity of applications does not permit us to make a general statement of service life.

#### 2.6 Environmental testing

**Corrosion protection:** Our products are tested based on DIN EN 60068-2-30 during product qualification.

**Coating of the components:** The finishing and coating processes are selected for best corrosion protection. Such layers are checked during product qualification, in accordance with the applicable standard.

3. Parameters that deviate from or supplement the data sheet can be determined and then become part of the systematically performed inspection, as customer specification. Inspection certificates are supplied, if agreed upon in advance.

## Standard specification no. 101

### maxon EC motor

#### 1 Basics

The standard specification describes tests and inspections that are performed on the finished motor and during the manufacturing process. To safeguard our high quality standard, we inspect materials, individual parts, assemblies, and the finished motor for conformity with specified dimensions and properties. The results are recorded statistically and can be viewed by the customer on request. Sampling plans in acc. with ISO 2859 and DIN/ISO 3951 are used (attribute inspection, follow-up inspection and variable inspection), as well as self-monitoring procedures of the manufacturing departments. This standard specification applies in all cases where no other specification has been agreed upon between the customer and maxon.

#### 2 Data

2.1 **Electrical data** apply at temperatures from 22 to 25 °C, using a 1-quadrant controller with block commutation. Data check within one minute of runtime.

**Measuring voltage** ±0.5% for voltages > 3 V and  
±0.015 V for voltages ≤ 3 V

**No-load speed** ±10 %

**No-load current** ≤ maximum

**Direction of rotation** cw = clockwise

**Motor orientation** horizontal or vertical

**Additional information:** The measuring voltage may deviate from the nominal voltage listed in the catalog. The no-load current specified in the catalog is a typical value, not the maximum. When connected as per the catalog (or marking), the shaft rotates clockwise (seen from the face side). The **terminal resistance** is checked by sampling.

The **inductance** is determined during product qualification. The measuring frequency is 1 kHz. The terminal inductance is frequency-dependent. These measurements are sufficient to ensure compliance with electro-mechanical specifications.

2.2 **Mechanical data** as shown in the dimensional drawing: Assembly-dependent dimensions are sampled in acc. with the sampling schedule. This does not apply to form and position tolerances. The process uses standard measurement tools (electrical length measurement, micrometers, dial gauges, calipers, plug and thread gauges, etc.). The calibration of the measuring instruments follows the standards listed below:

- EN ISO 10012:2003 Measurement management systems – Requirements for measurement processes and measuring equipment
- EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- VDI/VDE/DGQ 2618 Test equipment monitoring

2.3 **Imbalance:** Rotors for EC motors with air-gap windings are balanced in accordance with our standard during the manufacturing process. For EC motors with wound stator teeth, the rotors are mounted in gauges but, as a standard, are not balanced. For the finished motor, only a subjective assessment is possible, which is done by sampling.

2.4 **Following** DIN EN 60204-1 and EN 600034-1, the dielectric strength is always determined using a high-voltage tester. It is connected between motor connection (electrical) and motor housing or shaft. Parts with integrated electronics are excepted.

Test conditions for EC motors ≤ Ø13 mm

- Test voltage 250 VDC for 2 s (motor at standstill)
- Ramp time (up and down): 1 s
- Good / bad output
- Leakage current < 0.25 mA

Test conditions for EC motors > Ø13 mm

- Test voltage 500 VDC for 2 s (motor at standstill)
- Ramp time (up and down): 1 s
- Good / bad output
- Leakage current: < 0.5 mA

2.5 **Noise:** A subjective test is made for outliers within a batch. The motion inside a motor causes noise and vibration depending on speed. The noise and vibrations may vary in their frequency and intensity. The noise level of an individual sample does not permit any conclusions about the noise or vibration level of a future delivery.

2.6 **Service life:** Service life tests are conducted according to unified, internal criteria as part of the product qualification. The service life of an EC motor mainly depends on the bearing life. This is determined by the operating mode, the bearing load, and ambient conditions. The great diversity of applications does not permit us to make a general statement of service life.

#### 2.7 Environmental testing

**Corrosion protection:** Our products are tested based on DIN EN 60068-2-30 during product qualification.

**Coating of the components:** The finishing and coating processes are selected for best corrosion protection. Such layers are checked during product qualification, in accordance with the applicable standard.

3. Parameters that deviate from or supplement the data sheet can be determined and then become part of the systematically performed inspection, as customer specification. Inspection certificates are supplied, if agreed upon in advance.



## Standard specification no. 102

### maxon gear/maxon screw drive

#### 1. Basics

The standard specification describes tests and inspections that are performed on the finished gearhead and during the manufacturing process. To safeguard our high quality standard, we inspect materials, individual parts, assemblies, and the finished gearhead for conformity with specified dimensions and properties. The results are recorded statistically and can be viewed by the customer on request. Sampling plans in acc. with ISO 2859 and DIN/ISO 3951 are used (attribute inspection, follow-up inspection and variable inspection), as well as self-monitoring procedures of the manufacturing departments. This specification applies in all cases where no other specification has been agreed upon between the customer and maxon.

#### 2. Data

**2.1 Mechanical data** as shown in the dimensional drawing: Assembly-dependent dimensions are sampled in acc. with the sampling schedule. This does not apply to form and position tolerances. The process uses standard measurement tools (electrical length measurement, micrometers, dial gauges, calipers, plug and thread gauges, etc.). The calibration of the measuring instruments follows the standards listed below:

- EN ISO 10012:2003 Measurement management systems – Requirements for measurement processes and measuring equipment
- EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- VDI/VDE/DGQ 2618 Test equipment monitoring

#### 2.2 Noise

A subjective test is made for outliers within a batch. The motion inside a gearhead causes noise and vibration depending on speed. The noise and vibrations may vary in their frequency and intensity. The noise levels of an individual sample do not permit any conclusions about the noise or vibration level of a future delivery.

#### 2.3 Service life

Service life tests are conducted according to unified, internal criteria as part of the product qualification. The service life of a gearhead primarily depends on the operating modes and ambient conditions. The great diversity of applications does not permit us to make a general statement of service life. The minimum expected service life for the relevant maxon gearheads is in reference to standard conditions.

- 25°C
- Normal room conditions
- Horizontal orientation of unit
- No axial or radial load on the output shaft

#### 2.4 Environmental testing

**Corrosion protection:** Our products are tested based on DIN EN 60068-2-30 during product qualification.

**Coating of the components:** The finishing and coating processes are selected for best corrosion protection. Such layers are checked during product qualification, in accordance with the applicable standard.

**3. Parameters that deviate from or supplement the data sheet can be determined and then become part of the systematically performed inspection, as customer specification. Inspection certificates are supplied, if agreed upon in advance.**

## Standard specification no. 103

### maxon sensor

#### 1. Basics

The standard specification describes tests and inspections that are performed on the finished combination of sensor and motor (in some cases also with gearhead), as well as during the manufacturing process. To safeguard our high quality standard, we inspect materials, individual parts, assemblies and the finished combination for conformity with the specified dimensions and properties. For sensor testing, it is necessary to keep in mind that the measuring signal inevitably contains the speed fluctuations of the motor and in some cases those of the gearhead.

The results are recorded statistically. Sampling plans in acc. with ISO 2859 and DIN / ISO 3951 are used (attribute inspection, follow-up inspection and variable inspection), as well as self-monitoring procedures of the manufacturing departments. This standard specification applies in all cases where no other specification has been agreed upon between the customer and maxon.

#### 2. Data

**2.1 Electrical data** apply at temperatures between 22 and 25 °C. Data check within one minute of runtime or a minimum of three measuring revolutions.

**The conditions during the sensor measurement are:**

<b>Operating voltage</b>	Set value ±50 mV
<b>Direction of rotation</b>	cw = clockwise
<b>Motor orientation</b>	Horizontal
<b>Operation</b>	No load
<b>Measuring speed</b>	Set value ±40%

Every **incremental encoder** is tested while installed:

<b>Current draw</b>	Minimum/maximum value
<b>Signal level</b>	For encoders without a line driver (“single-ended output”): “Low” level: maximum value; “High” level: minimum value For encoders with a line driver (“differential output”): Controlling an RS422-compatible line receiver.

#### Signal integrity

Signals present  
Counts per turn (3-channel encoder)  
Single unique index pulse (if applicable)

#### Angle information

For the angle information, one or several of the following characteristics are tested, depending on the technology: Phasing A to B, duty cycles of the incremental signals, cycle length, INL, DNL, minimum/maximum state length, jitter

**Additional information:** maxon testing devices have built-in glitch filters. Glitches on individual encoder signals are not recognized and are permissible.

Every **absolute encoder** is tested while installed:

<b>Current draw</b>	Minimum/maximum value
<b>Signal integrity</b>	CLK signals, data present Protocol in acc. with the specification (SSI, BiSS, coding) Counting direction of angle values: as listed in catalog

**2.2 Mechanical data** as shown in the dimensional drawing: Assembly-dependent dimensions are sampled in acc. with the sampling schedule. This does not apply to form and position tolerances. The process uses standard measurement tools (electrical length measurement, micrometers, dial gauges, calipers, plug and thread gauges, etc.). The calibration of the measuring instruments follows the standards listed below:

- EN ISO 10012:2003 Measurement management systems – Requirements for measurement processes and measuring equipment
- EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- VDI/VDE/DGQ 2618 Test equipment monitoring

#### 2.3 Imbalance

The solid measure of the sensor (target, pole wheel) is mounted on the shaft and can cause additional imbalance.

#### 2.4 Service life

The service life of sensors is usually not limited by wear but by the ambient conditions. These are highly diverse, so that no general statement regarding the service life can be made.

#### 2.5 Environmental testing

Humidity: Sensors consist of electronic and, in some cases, optical components. Condensation has to be prevented or removed prior to startup, even when this is not explicitly stated. In the case of optical encoders, condensation and humidity can cause stains and thus lead to signal errors.

**3. Parameters that deviate from or supplement the data sheet can be determined and then become part of the systematically performed inspection, as customer specification. Inspection certificates are supplied, if agreed upon in advance.**




# Brushed DC motors with ironless windings.

<b>Standard Specification No. 100</b>	64
<b>Explanation</b>	68
<b>DCX Program</b> (can be configured online)	70–91
<b>DCX 6 M</b> Ø6 mm, Precious metal brushes, 0.3 Watt	70
<b>DCX 8 M</b> Ø8 mm, Precious metal brushes, 0.5 Watt	71
<b>DCX 10 S</b> Ø10 mm, Precious metal brushes, 1 Watt	72
<b>DCX 10 L</b> Ø10 mm, Precious metal brushes, 1.5 Watt	73
<b>DCX 12 S</b> Ø12 mm, Precious metal brushes, 1.6 Watt	74
<b>DCX 12 L</b> Ø12 mm, Precious metal brushes, 2.5 Watt	75
<b>DCX 14 L</b> Ø14 mm, Precious metal brushes, 3 Watt	76
<b>DCX 14 L</b> Ø14 mm, Graphite brushes, 6 Watt	77
<b>DCX 16 S</b> Ø16 mm, Precious metal brushes, 3 Watt	78
<b>DCX 16 S</b> Ø16 mm, Graphite brushes, 5 Watt	79
<b>DCX 16 L</b> Ø16 mm, Precious metal brushes, 5 Watt	80
<b>DCX 16 L</b> Ø16 mm, Graphite brushes, 10 Watt	81
<b>DCX 19 S</b> Ø19 mm, Precious metal brushes, 5 Watt	82
<b>DCX 19 S</b> Ø19 mm, Graphite brushes, 11 Watt	83
<b>DCX 22 S</b> Ø22 mm, Precious metal brushes, 6 Watt	84
<b>DCX 22 S</b> Ø22 mm, Graphite brushes, 14 Watt	85
<b>DCX 22 L</b> Ø22 mm, Precious metal brushes, 11 Watt	86
<b>DCX 22 L</b> Ø22 mm, Graphite brushes, 20 Watt	87
<b>DCX 26 L</b> Ø26 mm, Precious metal brushes, 18 Watt	88
<b>DCX 26 L</b> Ø26 mm, Graphite brushes, 40 Watt	89
<b>DCX 32 L</b> Ø32 mm, Graphite brushes, 70 Watt	90
<b>DCX 35 L</b> Ø35 mm, Graphite brushes, 80 Watt	91
<b>DC-max Program</b> (can be configured online)	94–99
<b>DC-max 16 S</b> Ø16 mm, Precious metal brushes, 2 Watt	94
<b>DC-max 16 S</b> Ø16 mm, Graphite brushes, 3 Watt	95
<b>DC-max 22 S</b> Ø22 mm, Precious metal brushes, 5 Watt	96
<b>DC-max 22 S</b> Ø22 mm, Graphite brushes, 8 Watt	97
<b>DC-max 26 S</b> Ø26 mm, Precious metal brushes, 9 W	98
<b>DC-max 26 S</b> Ø26 mm, Graphite brushes, 22 Watt	99

<b>RE Program</b>	102–138
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<b>RE 8</b> Ø8 mm, Precious metal brushes, 0.5 Watt	103
<b>RE 10</b> Ø10 mm, Precious metal brushes, 0.75 Watt	104–105
<b>RE 10</b> Ø10 mm, Precious metal brushes, 1.5 Watt	106–107
<b>RE 13</b> Ø13 mm, Precious metal brushes, 1.2/0.75 Watt	108–111
<b>RE 13</b> Ø13 mm, Precious metal brushes, 2.5/2 Watt	112–115
<b>RE 13</b> Ø13 mm, Graphite brushes, 1.5 Watt	116–119
<b>RE 13</b> Ø13 mm, Graphite brushes, 3.0 Watt	120–123
<b>RE 16</b> Ø16 mm, Precious metal brushes CLL, 2 Watt	124
<b>RE 16</b> Ø16 mm, Precious metal brushes CLL, 3.2 Watt	125–126
<b>RE 16</b> Ø16 mm, Graphite brushes, 4.5 Watt	127–128
<b>RE 25</b> Ø25 mm, Precious metal brushes CLL, 10 Watt	129
<b>RE 25</b> Ø25 mm, Graphite brushes, 20 Watt	130–131
<b>RE 30</b> Ø30 mm, Precious metal brushes, 15 Watt	132
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<b>RE 50</b> Ø50 mm, Graphite brushes, 200 Watt	137
<b>RE 65</b> Ø65 mm, Graphite brushes, 250 Watt	138
<b>A-max Program</b>	141–160
<b>A-max 12</b> Ø12 mm, Precious metal brushes CLL, 0.75/0.5 W	141–142
<b>A-max 16</b> Ø16 mm, Precious metal brushes CLL, 2/1.2 Watt	143–144
<b>A-max 16</b> Ø16 mm, Graphite brushes, 2 Watt	145–146
<b>A-max 19</b> Ø19 mm, Precious metal brushes CLL, 2.5/1.5 W	147–148
<b>A-max 19</b> Ø19 mm, Graphite brushes, 2.5 Watt	149–150
<b>A-max 22</b> Ø22 mm, Precious metal brushes CLL, 5/3.5 W	151–152
<b>A-max 22</b> Ø22 mm, Graphite brushes, 6 Watt	153–154
<b>A-max 26</b> Ø26 mm, Precious metal brushes CLL, 7/4.5 W	155–156
<b>A-max 26</b> Ø26 mm, Graphite brushes, 11 Watt	157–158
<b>A-max 32</b> Ø32 mm, Graphite brushes, 20 Watt	159–160

# Explanation of maxon DC motor terminology

## Dimensional drawings

Presentation of the views according to the projection method E (ISO).  All dimensions in [mm].

## Mounting in plastic

Screwed connections on motors with plastic flanges require special attention.

## M<sub>A</sub> Max. tightening torque [Ncm]

A torque screw driver may be adjusted to this value.

## L Active depth of screw connection [mm]

The depth of the screw connection must be less than the usable length of the thread!

## Motor Data

The values stated are based on a motor temperature of 25°C (so-called cold data).

### 1 Nominal voltage U<sub>N</sub> [Volt]

is the DC voltage on the motor connections on which all nominal data are based (lines 2–9). Lower and higher voltages are permissible, provided set limits are not exceeded.

### 2 No load speed n<sub>0</sub> [rpm] ±10%

This is the speed at which the motor turns at nominal voltage and without load. It is approximately proportional to the applied voltage.

### 3 No load current I<sub>0</sub> [mA] ±50%

This is the typical current that the unloaded motor draws when operating at nominal voltage. It depends on brush friction and friction in the bearings, and also increases with rising speed. No load friction depends heavily on temperature, particularly with precious metal commutation. In extended operation, no load friction decreases and increases at lower temperatures.

### 4 Nominal speed n<sub>N</sub> [rpm]

is the speed set for operation at nominal voltage and nominal torque at a motor temperature of 25°C.

### 5 Nominal torque M<sub>N</sub> [mNm]

is the torque generated for operation at nominal voltage and nominal current at a motor temperature of 25°C. It is at the limit of the motor's continuous operation range. Higher torques heat up the winding too much.

### 6 Nominal current I<sub>N</sub> [A]

is the current that, at 25°C ambient temperature, heats the winding up to the maximum permissible temperature (= max. permissible continuous current). I<sub>N</sub> decreases as speed increases due to additional friction losses.

### 7 Stall torque M<sub>H</sub> [mNm]

is the calculated load torque that causes the shaft to stop at nominal voltage. Rising motor temperatures reduce stall torque.

### 8 Stall current I<sub>A</sub> [A]

is the quotient from nominal voltage and the motor's terminal resistance. Stall current is equivalent to stall torque. With larger motors, I<sub>A</sub> can often not be reached due to the amplifier's current limits.

### 9 Max. efficiency η<sub>max</sub> [%]

is the optimal relationship between input and output power at nominal voltage. It also doesn't always denote the optimal operating point.

### 10 Terminal resistance R [Ω]

is the resistance at the terminals at 25°C and determines the stall current at a given voltage. For graphite brushes, it should be noted that resistance is load-dependent and the value only applies to large currents.

### 11 Terminal inductance L [mH]

is the winding inductance when stationary and measured at 1 kHz, sinusoidal.

### 12 Torque constant k<sub>M</sub> [mNm/A]

This may also be referred to as "specific torque" and represents the quotient from generated torque and applicable current.

### 13 Speed constant k<sub>n</sub> [rpm/V]

shows the ideal no load speed per 1 volt of applied voltage. Friction losses not taken into account.

### 14 Speed / torque gradient

$$\Delta n / \Delta M \text{ [rpm/mNm]}$$

The speed / torque gradient is an indicator of the motor's performance. The smaller the value, the more powerful the motor and consequently the less motor speed varies with load variations. It is based on the quotient of ideal no load speed and ideal stall torque.

### 15 Mechanical time constant

$$\tau_m \text{ [ms]}$$

is the time required for the rotor to accelerate from standstill to 63% of its no load speed.

### 16 Rotor inertia J<sub>R</sub> [gcm<sup>2</sup>]

is the mass moment of inertia of the rotor, based on the axis of rotation.

### 17 Thermal resistance housing-ambient R<sub>th2</sub> [K/W]

and

### 18 Thermal resistance winding-housing R<sub>th1</sub> [K/W]

Characteristic values of thermal contact resistance without additional heat sinking. Lines 17 and 18 combined define the maximum heating at a given power loss (load). Thermal resistance R<sub>th2</sub> on motors with metal flanges can decrease by up to 80% if the motor is coupled directly to a good heat-conducting (e.g. metallic) mounting rather than a plastic panel.

### 19 Thermal time constant winding τ<sub>w</sub> [s]

and

### 20 Thermal time constant motor τ<sub>s</sub> [s]

These are the typical reaction times for a temperature change of winding and motor. It can be seen that the motor reacts much more sluggishly in thermal terms than the winding. The values are calculated from the product of thermal capacity and given heat resistances.

### 21 Ambient temperature [°C]

Operating temperature range. This derives from the heat reliability of the materials used and viscosity of bearing lubrication.

### 22 Max. winding temperature [°C]

Maximum permissible winding temperature.

### 23 Max. speed

$$n_{\max} \text{ [rpm]}$$

is the maximum recommended speed based on thermal and mechanical perspectives. A reduced service life can be expected at higher speeds.

### 24 Axial play [mm]

On motors that are not preloaded, these are the tolerance limits for the bearing play. A preload cancels out the axial play up to the specified axial force. When load is applied in the direction of the preload force (away from the flange), the axial play is always zero. The length tolerance of the shaft includes the maximum axial play.

### 25 Radial play [mm]

Radial play is the bearing's radial movement. A spring is utilized to preload the motor's bearings, eliminating radial play up to a given axial load.

### 26/27 Max. axial load [N]

**Dynamically:** axial load permissible in operation. If different values apply for traction and thrust, the smaller value is given.

**Statically:** maximum axial force applying to the shaft at standstill where no residual damage occurs.

**Shaft supported:** maximum axial force applying to the shaft at standstill if the force is not input at the other shaft end. This is not possible for motors with only one shaft end.

### 28 Max. radial load [N]

The value is given for a typical clearance from the flange; this value falls the greater the clearance.

### 29 Number of pole pairs

Number of north poles of the permanent magnet. The phase streams and commutation signals pass through per revolution p cycles. Servo-controllers require the correct details of the number of pole pairs.

### 30 Number of commutator segments

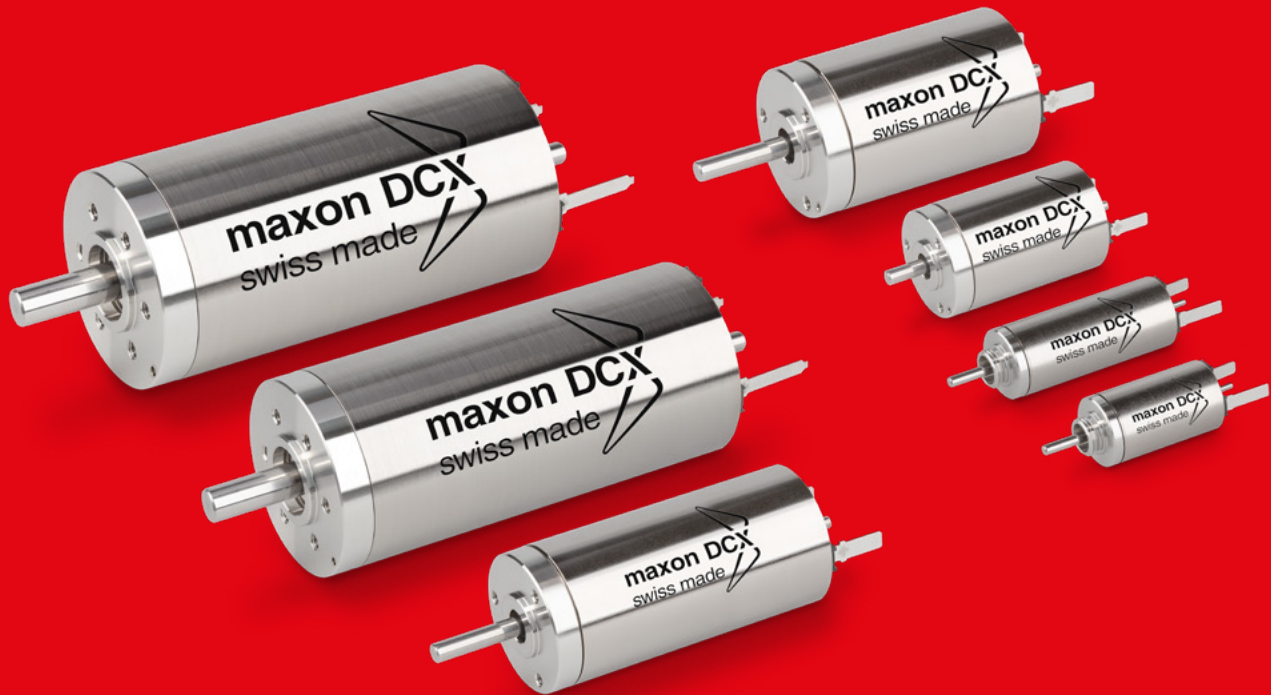
### 31 Weight of motor [g]

### 32 Typical noise level [dBA]

is that statistical average of the noise level measured according to maxon standard (10 cm distance radially to the drive, no load operation at a speed of 6,000 rpm. The drive lies freely on a plastic foam mat in the noise chamber).

The acoustic noise level depends on a number of factors, such as component tolerances, and it is greatly influenced by the overall system in which the drive is installed. When the drive is installed in an unfavorable constellation, the noise level may be significantly higher than the noise level of the drive alone.

The acoustic noise level is measured and determined during product qualification. In manufacturing, a structure-borne noise test is performed with defined limits. Impermissible deviations can thus be identified.



# maxon DCX

maxon DCX motors make an impression with their unsurpassed power density (torque/motor volume ratio) and their absolute quiet running. The robust construction together with the ironless rotor make the DCX motors a highly dynamic drive in almost any situation. maxon DCX motors can be configured online and are ready for delivery within 11 working days. [dcx.maxonmotor.com](http://dcx.maxonmotor.com)

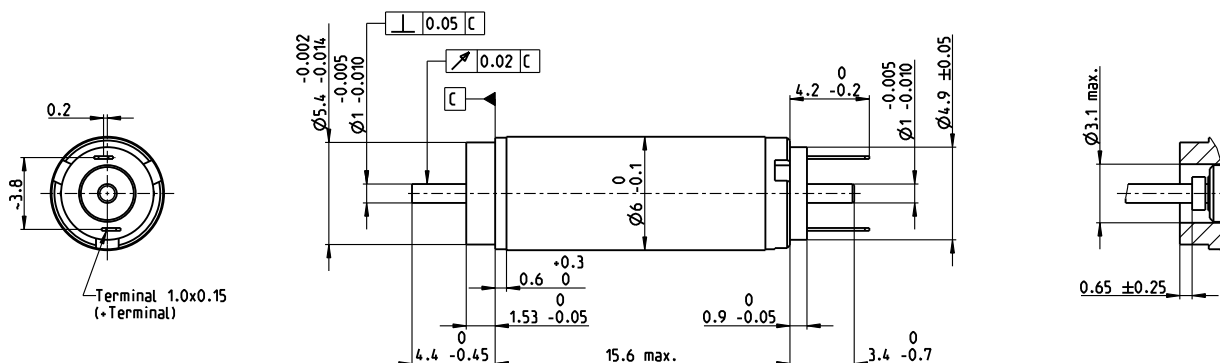
<b>Standard Specification No. 100</b>	64
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<b>RE Program</b>	102–138
<b>A-max Program</b>	141–160

# DCX 6 M Precious Metal Brushes

DC motor Ø6 mm



**Key Data: 0.3/0.56 W, 0.3 mNm, 17300 rpm**



**M 5:2**

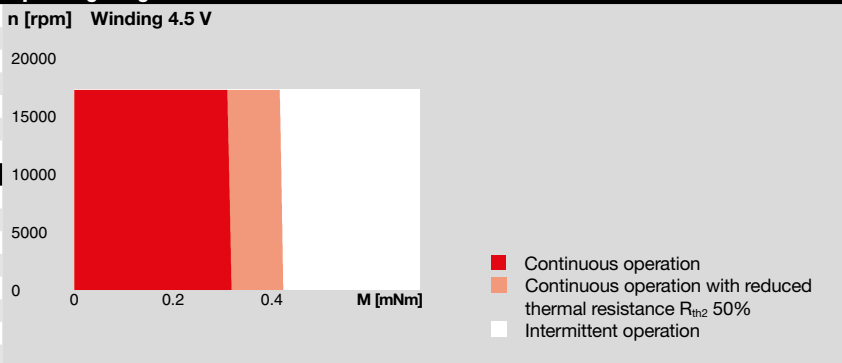
**Motor Data**

1_	Nominal voltage	V	1.5	3	4.5	6
2_	No load speed	rpm	17300	17500	17400	17400
3_	No load current	mA	34.1	17.1	11.4	8.54
4_	Nominal speed	rpm	4950	5940	5730	5690
5_	Nominal torque (max. continuous torque)	mNm	0.309	0.332	0.326	0.325
6_	Nominal current (max. continuous current)	A	0.425	0.228	0.149	0.111
7_	Stall torque	mNm	0.453	0.524	0.507	0.503
8_	Stall current	A	0.581	0.336	0.217	0.161
9_	Max. efficiency	%	58	61	60	60
10_	Terminal resistance	Ω	2.58	9.0	20.8	37.2
11_	Terminal inductance	mH	0.008	0.0316	0.0711	0.126
12_	Torque constant	mNm/A	0.779	1.560	2.34	3.12
13_	Speed constant	rpm/V	12300	6130	4090	3060
14_	Speed/torque gradient	rpm/mNm	40600	35100	36300	36600
15_	Mechanical time constant	ms	7.06	6.74	6.81	6.81
16_	Rotor inertia	gcm <sup>2</sup>	0.017	0.0183	0.0179	0.018

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	105
18_	Thermal resistance winding-housing	K/W	20
19_	Thermal time constant winding	s	1.71
20_	Thermal time constant motor	s	79
21_	Ambient temperature ball bearings	°C	-30...+85
21_	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	17300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.6 [5]

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	17300
24_	Axial play	mm	0.02...0.1
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	100
28_	Max. radial load [mm from flange]	N	0.4 [5]

**maxon Modular System**

23_	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
24_	288_GPX 6 A	1-5	394_ENX 6 MAG 408_ENX 6 OPT	454_ESCON Module 24/2 454_ESCON 36/2 DC 462_EPOS4 Module/Comp. 24/1.5

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		5
31_	Weight of motor	g	2.4
32_	Typical noise level	dBA	-

**Configuration**

Bearing: Sleeve bearings/ball bearings preloaded  
 Commutation: Precious metal brushes  
 Flange front/back: Standard flange  
 Shaft front/back: Length  
 Electric connection: Terminals or cables (encoder always with Flex)

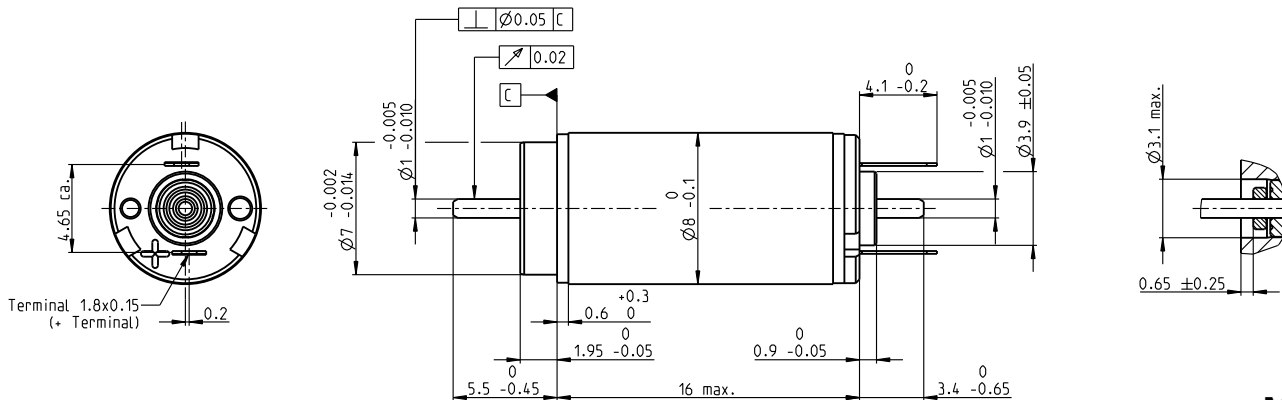
# DCX 8 M Precious Metal Brushes

## DC motor Ø8 mm

Key Data: 0.5/1.0 W, 0.65 mNm, 17300 rpm



maxon DCX



M 5:2

### Motor Data

		2.4	4.2	6	7.2	9	12
1_ Nominal voltage	V	2.4	4.2	6	7.2	9	12
2_ No load speed	rpm	11500	11700	11000	11900	11900	12900
3_ No load current	mA	11.9	6.93	4.51	4.12	3.3	2.74
4_ Nominal speed	rpm	4780	4950	4190	4820	5190	5800
5_ Nominal torque (max. continuous torque)	mNm	0.653	0.649	0.641	0.62	0.652	0.614
6_ Nominal current (max. continuous current)	A	0.345	0.199	0.13	0.113	0.0949	0.0728
7_ Stall torque	mNm	1.13	1.14	1.05	1.06	1.17	1.13
8_ Stall current	A	0.581	0.34	0.207	0.187	0.166	0.13
9_ Max. efficiency	%	74	74	73	73	74	74
10_ Terminal resistance	Ω	4.13	12	29	38.5	54.3	92.2
11_ Terminal inductance	mH	0.014	0.0411	0.0941	0.117	0.183	0.276
12_ Torque constant	mNm/A	1.95	3.360	5.08	5.67	7.07	8.71
13_ Speed constant	rpm/V	4900	2850	1880	1680	1350	1100
14_ Speed/torque gradient	rpm/mNm	10400	10500	10700	11400	10400	11600
15_ Mechanical time constant	ms	4.17	4.15	4.18	4.24	4.15	4.28
16_ Rotor inertia	gcm <sup>2</sup>	0.038	0.0379	0.0372	0.035	0.038	0.035

### Thermal data

			Operating Range	
			n [rpm]	Winding 6 V
17_ Thermal resistance housing-ambient	K/W	101		
18_ Thermal resistance winding-housing	K/W	16.9		
19_ Thermal time constant winding	s	2.31		
20_ Thermal time constant motor	s	162		
21_ Ambient temperature ball bearings	°C	-30...+85		
21_ Ambient temperature sleeve bearings	°C	-30...+85		
22_ Max. winding temperature	°C	100		

### Mechanical data ball bearings

23_ Max. speed	rpm	17300
24_ Axial play	mm	0...0.1
Preload	N	0.5
25_ Radial play	mm	0.012
26_ Max. axial load (dynamic)	N	0.1
27_ Max. force for press fits (static)	N	8.8
(static, shaft supported)	N	100
28_ Max. radial load [mm from flange]	N	0.6 [5]

### maxon Modular System

Details on catalog page 30

23_ Max. speed	rpm	17300	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
24_ Axial play	mm	0.02...0.1	289_GPX 8 A	1-5	395_ENX 8 MAG	454_ESCON Module 24/2
Preload	N	0			409_ENX 8 OPT	454_ESCON 36/2 DC
25_ Radial play	mm	0.012				462_EPOS4 Module/Comp. 24/1.5
26_ Max. axial load (dynamic)	N	0.1				
27_ Max. force for press fits (static)	N	10				
(static, shaft supported)	N	100				
28_ Max. radial load [mm from flange]	N	0.4 [5]				

### Other specifications

29_ Number of pole pairs		1
30_ Number of commutator segments		5
31_ Weight of motor	g	4.4
32_ Typical noise level	dBA	-

### Configuration

Bearing: Sleeve bearings/ball bearings preloaded  
 Commutation: Precious metal brushes with or without CLL  
 Flange front/back: Standard flange  
 Shaft front/back: Length  
 Electric connection: Terminals or cables (encoder always with Flex)

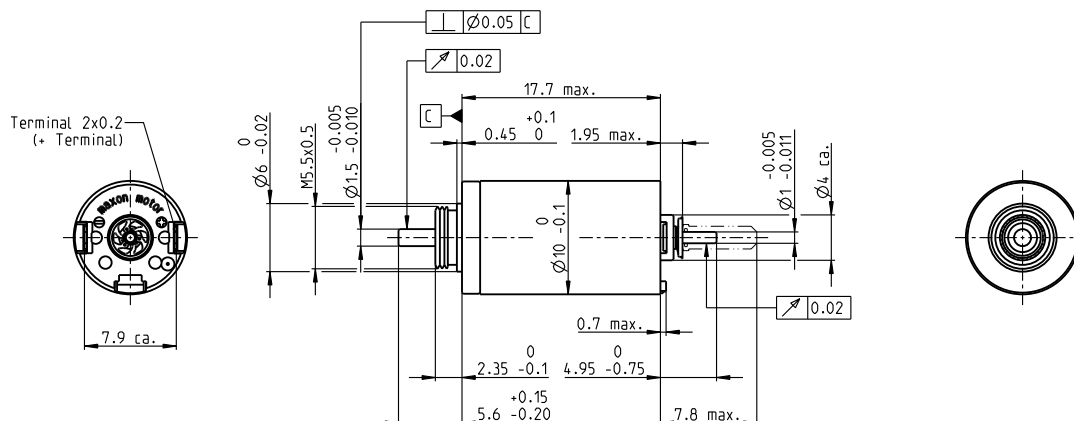
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# DCX 10 S Precious Metal Brushes

## DC motor Ø10 mm



**Key Data: 1/1.4 W, 0.9 mNm, 14300 rpm**



**M 3:2**

Motor Data								
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	12600	13000	12600	11400	12600	12500
3_	No load current	mA	84.1	43.8	28	18.2	14	10.5
4_	Nominal speed	rpm	4530	4690	4270	3310	3930	3890
5_	Nominal torque (max. continuous torque)	mNm	0.918	0.948	0.944	0.993	0.909	0.905
6_	Nominal current (max. continuous current)	A	0.924	0.49	0.316	0.223	0.152	0.114
7_	Stall torque	mNm	1.49	1.54	1.48	1.46	1.38	1.37
8_	Stall current	A	1.39	0.742	0.463	0.307	0.215	0.16
9_	Max. efficiency	%	58	58	58	58	56	56
10_	Terminal resistance	Ω	1.08	4.04	9.72	19.5	41.8	74.9
11_	Terminal inductance	mH	0.014	0.051	0.122	0.268	0.488	0.868
12_	Torque constant	mNm/A	1.07	2.07	3.2	4.74	6.4	8.53
13_	Speed constant	rpm/V	8950	4600	2980	2010	1490	1120
14_	Speed/torque gradient	rpm/mNm	9030	8970	9060	8290	9750	9830
15_	Mechanical time constant	ms	7.24	7.19	7.21	7.03	7.27	7.26
16_	Rotor inertia	gcm <sup>2</sup>	0.077	0.077	0.076	0.081	0.071	0.071

Thermal data			Operating Range	
17_	Thermal resistance housing-ambient	K/W	37.6	
18_	Thermal resistance winding-housing	K/W	22.0	
19_	Thermal time constant winding	s	4.69	
20_	Thermal time constant motor	s	156	
21_	Ambient temperature ball bearings	°C	-40...+85	
21_	Ambient temperature sleeve bearings	°C	-30...+85	
22_	Max. winding temperature	°C	100	
<b>Mechanical data ball bearings</b>				
23_	Max. speed	rpm	14300	
24_	Axial play	mm	0...0.1	
<b>Mechanical data sleeve bearings</b>				
25_	Radial play	mm	0.015	
26_	Max. axial load (dynamic)	N	0.5	
27_	Max. force for press fits (static)	N	8.8	
27_	(static, shaft supported)	N	120	
28_	Max. radial load [mm from flange]	N	1.5 [5]	

Mechanical data sleeve bearings			maxon Modular System		Details on catalog page 30		
23_	Max. speed	rpm	14300	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
24_	Axial play	mm	0...0.15				
24_	Preload	N	0	290_GPX 10 A	1-5	398_ENX 10 EASY	454_ESCON Module 24/2
25_	Radial play	mm	0.015			398_ENX 10 QUAD	454_ESCON 36/2 DC
26_	Max. axial load (dynamic)	N	0.1			399_ENX 10 EASY XT	462_EPOS4 Module/Comp. 24/1.5
27_	Max. force for press fits (static)	N	30				
27_	(static, shaft supported)	N	120				
28_	Max. radial load [mm from flange]	N	0.8 [5]				

Other specifications			Configuration		
29_	Number of pole pairs		Bearing: Sleeve bearings/ball bearings preloaded		
30_	Number of commutator segments		Commutation: Precious metal brushes with or without CLL		
31_	Weight of motor	g	Flange front/back: Standard flange/Flange with thread holes/no flange		
32_	Typical noise level	dBA	Shaft front/back: Length		
			Electric connection: Terminals or cable/cable length/connector type		



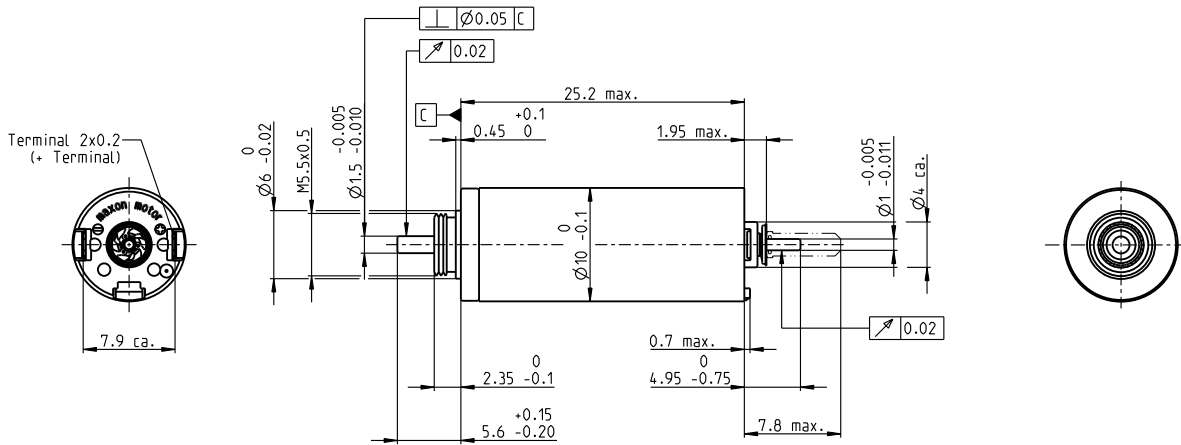
# DCX 10 L Precious Metal Brushes

## DC motor Ø10 mm



maxon DCX

**Key Data: 1.5/3 W, 2.2 mNm, 14300 rpm**



**M 3:2**

### Motor Data

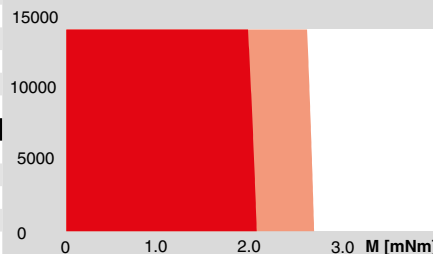
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	11600	12200	12000	12200	12000	11300
3_	No load current	mA	72.1	38.7	25.2	19.3	12.6	8.71
4_	Nominal speed	rpm	9230	6930	7110	6640	6780	5980
5_	Nominal torque (max. continuous torque)	mNm	1.04	2.05	2.2	1.94	2.06	2.03
6_	Nominal current (max. continuous current)	A	0.924	0.922	0.648	0.436	0.304	0.211
7_	Stall torque	mNm	5.13	4.81	5.45	4.32	4.8	4.36
8_	Stall current	A	4.23	2.09	1.55	0.937	0.682	0.439
9_	Max. efficiency	%	75	75	77	74	75	74
10_	Terminal resistance	Ω	0.355	1.44	2.9	6.4	13.2	27.3
11_	Terminal inductance	mH	0.005	0.020	0.045	0.078	0.181	0.362
12_	Torque constant	mNm/A	1.21	2.31	3.52	4.61	7.04	10.0
13_	Speed constant	rpm/V	7870	4140	2710	2070	1360	960
14_	Speed/torque gradient	rpm/mNm	2300	2590	2240	2880	2550	2640
15_	Mechanical time constant	ms	3.68	3.57	3.54	3.58	3.56	3.59
16_	Rotor inertia	gcm <sup>2</sup>	0.153	0.132	0.151	0.119	0.134	0.130

### Thermal data

17_	Thermal resistance housing-ambient	K/W	36.5
18_	Thermal resistance winding-housing	K/W	10.6
19_	Thermal time constant winding	s	3.94
20_	Thermal time constant motor	s	151
21_	Ambient temperature ball bearings	°C	-40...+85
21_	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100

### Operating Range

n [rpm] Winding 4.5 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	14300
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static) (static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]

### Mechanical data sleeve bearings

23_	Max. speed	rpm	14300
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static) (static, shaft supported)	N	30
28_	Max. radial load [mm from flange]	N	120

### Other specifications

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	11
32_	Typical noise level	dBA	37

### maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
290_GPX 10 A	1-5	398_ENX 10 EASY	454_ESCON Module 24/2
		398_ENX 10 QUAD	454_ESCON 36/2 DC
		399_ENX 10 EASY XT	462_EPOS4 Module/Comp. 24/1.5

Details on catalog page 30

### Configuration

Bearing: Sleeve bearings/ball bearings preloaded  
 Commutation: Precious metal brushes with or without CLL  
 Flange front/back: Standard flange/Flange with thread holes/no flange  
 Shaft front/back: Length  
 Electric connection: Terminals or cable/cable length/connector type

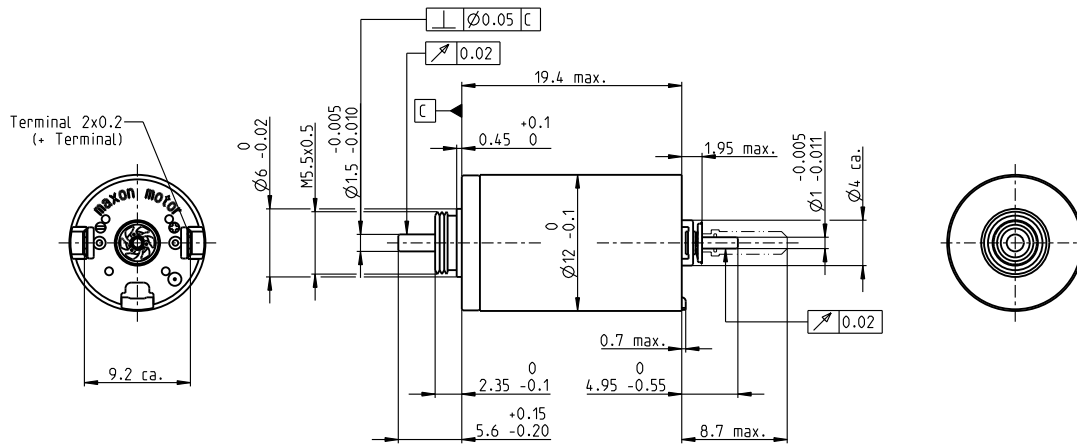
[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

# DCX 12 S Precious Metal Brushes

## DC motor Ø12 mm



**Key Data: 1.6/2 W, 2.0 mNm, 13000 rpm**



**M 3:2**

**Motor Data**

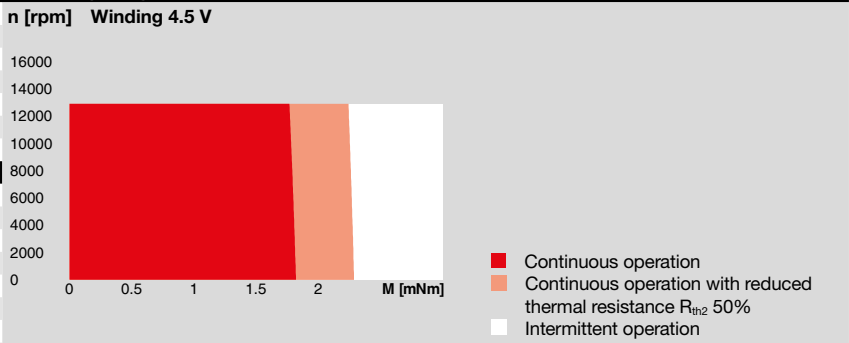
1_	Nominal voltage	V	3	4.5	6	9	12
2_	No load speed	rpm	9090	9000	9100	9010	9020
3_	No load current	mA	31.8	20.9	15.9	10.5	7.88
4_	Nominal speed	rpm	3760	3620	3870	3700	3620
5_	Nominal torque (max. continuous torque)	mNm	1.92	1.9	1.95	1.92	1.88
6_	Nominal current (max. continuous current)	A	0.655	0.427	0.332	0.216	0.159
7_	Stall torque	mNm	3.35	3.25	3.46	3.33	3.21
8_	Stall current	A	1.09	0.701	0.566	0.36	0.261
9_	Max. efficiency	%	69	69	70	69	69
10_	Terminal resistance	Ω	2.74	6.42	10.6	25	46
11_	Terminal inductance	mH	0.0724	0.166	0.29	0.664	1.17
12_	Torque constant	mNm/A	3.06	4.63	6.12	9.26	12.3
13_	Speed constant	rpm/V	3120	2060	1560	1030	775
14_	Speed/torque gradient	rpm/mNm	2800	2860	2700	2780	2890
15_	Mechanical time constant	ms	8.37	8.32	8.31	8.33	8.33
16_	Rotor inertia	gcm <sup>2</sup>	0.286	0.278	0.293	0.286	0.275

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	35
18_	Thermal resistance winding-housing	K/W	14.4
19_	Thermal time constant winding	s	7.18
20_	Thermal time constant motor	s	146
21_	Ambient temperature ball bearings	°C	-40...+85
21_	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100

**Mechanical data ball bearings**

23_	Max. speed	rpm	13000
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]



**Mechanical data sleeve bearings**

23_	Max. speed	rpm	13000
24_	Axial play	mm	0...0.15
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	11
32_	Typical noise level	dBA	40

**Configuration**

Bearing: Sleeve bearings/ball bearings preloaded  
 Commutation: Precious metal brushes with or without CLL  
 Flange front/back: Standard flange/Flange with thread holes/no flange  
 Shaft front/back: Length  
 Electric connection: Terminals or cable/cable length/connector type

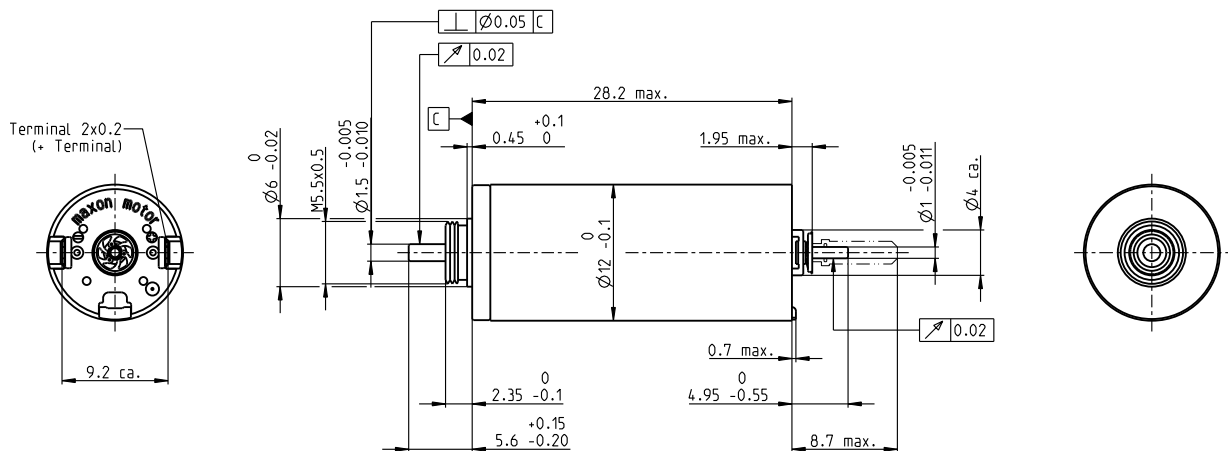
# DCX 12 L Precious Metal Brushes

## DC motor Ø12 mm



maxon DCX

**Key Data: 2.5/4.8 W, 4.2 mNm, 12000 rpm**



**M 3:2**

**Motor Data**

1_	Nominal voltage	V	3	4.5	6	9	12	18
2_	No load speed	rpm	8810	8820	8810	8820	8810	8810
3_	No load current	mA	31.3	20.9	15.7	10.4	7.83	5.22
4_	Nominal speed	rpm	6230	5640	5540	5750	5560	5540
5_	Nominal torque (max. continuous torque)	mNm	2.88	4.02	3.88	4.13	3.89	3.87
6_	Nominal current (max. continuous current)	A	0.924	0.851	0.616	0.437	0.309	0.205
7_	Stall torque	mNm	9.9	11.2	10.5	11.9	10.6	10.5
8_	Stall current	A	3.08	2.32	1.63	1.23	0.824	0.543
9_	Max. efficiency	%	81	82	82	83	82	82
10_	Terminal resistance	Ω	0.975	1.94	3.68	7.29	14.6	33.1
11_	Terminal inductance	mH	0.031	0.071	0.125	0.282	0.502	1.13
12_	Torque constant	mNm/A	3.22	4.83	6.44	9.66	12.9	19.3
13_	Speed constant	rpm/V	2970	1980	1480	989	741	494
14_	Speed/torque gradient	rpm/mNm	898	793	846	746	839	848
15_	Mechanical time constant	ms	4.55	4.43	4.4	4.37	4.38	4.39
16_	Rotor inertia	gcm <sup>2</sup>	0.484	0.533	0.496	0.559	0.498	0.495

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	31	<b>Operating Range</b>	
18_	Thermal resistance winding-housing	K/W	10.3	<b>n [rpm]</b>	<b>Winding 4.5 V</b>
19_	Thermal time constant winding	s	10.1	14000	
20_	Thermal time constant motor	s	194	12000	
21_	Ambient temperature ball bearings	°C	-40...+85	10000	
21_	Ambient temperature sleeve bearings	°C	-30...+85	8000	
22_	Max. winding temperature	°C	100	6000	<ul style="list-style-type: none"> <li>Continuous operation</li> <li>Continuous operation with reduced thermal resistance R<sub>th2</sub> 50%</li> <li>Intermittent operation</li> </ul>

**Mechanical data ball bearings**

23_	Max. speed	rpm	12000
24_	Axial play	mm	0...0.1
	Preload	N	0.5
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.5
27_	Max. force for press fits (static)	N	8.8
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	1.5 [5]

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	12000	<b>maxon Modular System</b>		Details on catalog page 30	
24_	Axial play	mm	0...0.15	<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
	Preload	N	0	291_GPX 12 A/C	1-4	398_ENX 10 EASY	454_ESCON Module 24/2
25_	Radial play	mm	0.015	292_GPX 12 LN/LZ	1-4	398_ENX 10 QUAD	454_ESCON 36/2 DC
26_	Max. axial load (dynamic)	N	0.1	293_GPX 12 HP	2-4	399_ENX 10 EASY XT	462_EPOS4 Module/Comp. 24/1.5
27_	Max. force for press fits (static)	N	30	295_GPX 14 A/C	3-4		
	(static, shaft supported)	N	120	296_GPX 14 LN/LZ	3-4		
28_	Max. radial load [mm from flange]	N	0.8 [5]	297_GPX 14 HP	4		

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	16
32_	Typical noise level	dBA	44

**Configuration**

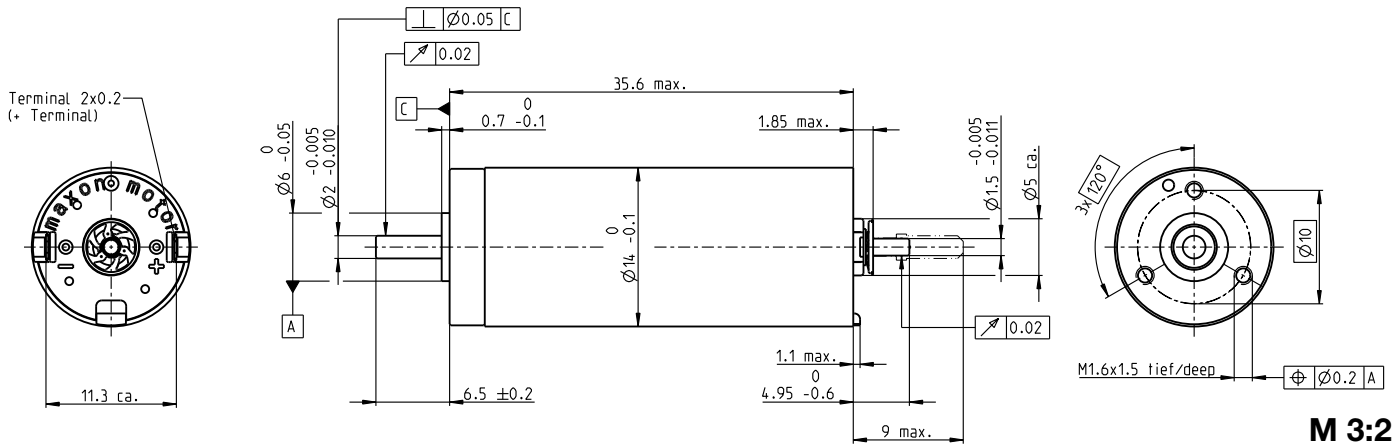
Bearing: Sleeve bearings/ball bearings preloaded  
 Commutation: Precious metal brushes with or without CLL  
 Flange front/back: Standard flange/Flange with thread holes/no flange  
 Shaft front/back: Length  
 Electric connection: Terminals or cable/cable length/connector type

# DCX 14 L Precious Metal Brushes

DC motor Ø14 mm



**Key Data: 3/5 W, 6.3 mNm, 8680 rpm**



**M 3:2**

**Motor Data**

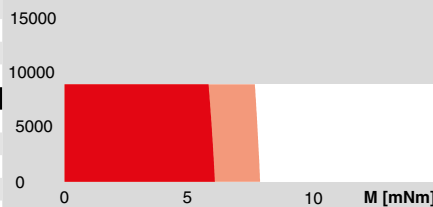
1_	Nominal voltage	V	3	4.5	6	9	12	18	24
2_	No load speed	rpm	7720	7740	7740	7740	7740	7730	7740
3_	No load current	mA	73.6	49.1	36.8	24.5	18.4	12.2	9.2
4_	Nominal speed	rpm	5770	5160	5140	5200	5200	5040	5150
5_	Nominal torque (max. continuous torque)	mNm	4.12	6.29	6.23	6.37	6.38	6.01	6.24
6_	Nominal current (max. continuous current)	A	1.2	1.2	0.889	0.605	0.454	0.286	0.223
7_	Stall torque	mNm	16.5	19.1	18.8	19.6	19.7	17.5	18.9
8_	Stall current	A	4.52	3.49	2.57	1.79	1.35	0.799	0.647
9_	Max. efficiency	%	76	77.7	77.6	78	78.1	77	77.7
10_	Terminal resistance	Ω	0.664	1.29	2.33	5.02	8.9	22.5	37.1
11_	Terminal inductance	mH	0.0252	0.0567	0.101	0.227	0.403	0.908	1.61
12_	Torque constant	mNm/A	3.65	5.47	7.3	10.9	14.6	21.9	29.2
13_	Speed constant	rpm/V	2620	1740	1310	872	654	436	327
14_	Speed/torque gradient	rpm/mNm	476	411	418	400	399	449	415
15_	Mechanical time constant	ms	4.14	4.06	4.05	4.04	4.05	4.1	4.09
16_	Rotor inertia	gcm <sup>2</sup>	0.831	0.942	0.926	0.966	0.97	0.872	0.939

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	22.2
18_	Thermal resistance winding-housing	K/W	8.63
19_	Thermal time constant winding	s	10.3
20_	Thermal time constant motor	s	226
21_	Ambient temperature ball bearings	°C	-40...+85
21_	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100

**Operating Range**

n [rpm] Winding 9 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

**Mechanical data ball bearings**

23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]
295_GPX 14 A/C	1-2 [3-4]
296_GPX 14 LN/LZ	1-2 [3-4]
297_GPX 14 HP	2-3 [4]
298_GPX 16 A/C	3-4
299_GPX 16 LN/LZ	3-4
300_GPX 16 HP	4

<b>maxon sensor</b>
398_ENX 10 EASY
398_ENX 10 QUAD
399_ENX 10 EASY XT

Details on catalog page 30

<b>maxon motor control</b>
454_ESCON Module 24/2
454_ESCON 36/2 DC
462_EPOS4 Module/Comp. 24/1.5
473_MAXPOS 50/5

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	44

**Configuration**

Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

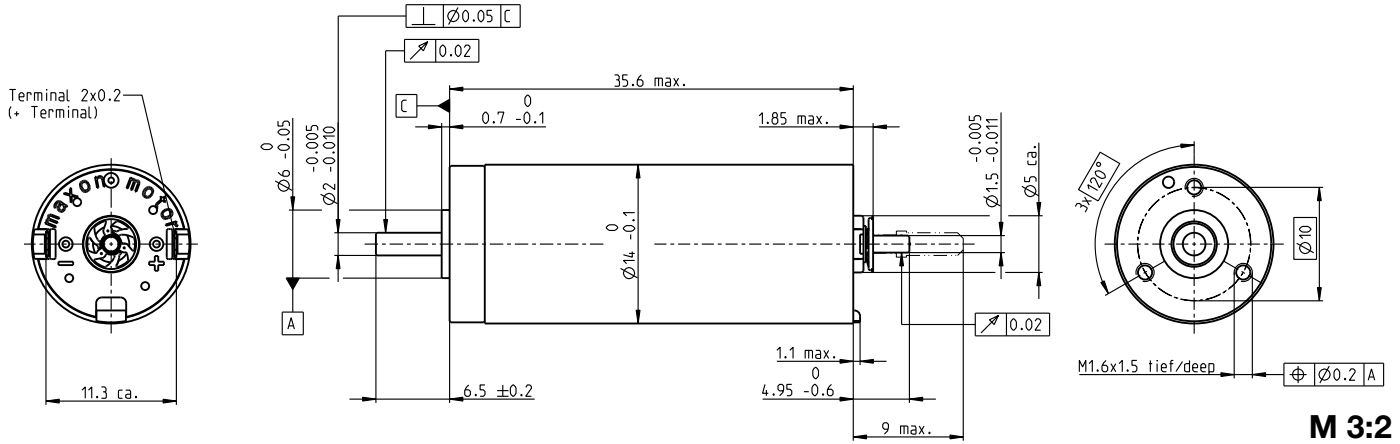
# DCX 14 L Graphite Brushes

## DC motor Ø14 mm

Key Data: 6/10 W, 6.9 mNm, 17000 rpm



maxon DCX



M 3:2

### Motor Data

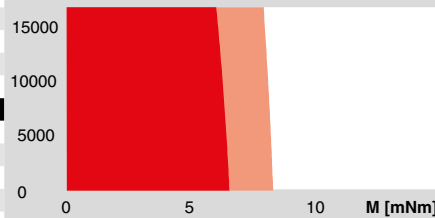
	V	4.5	6	9	12	18	24
1_ Nominal voltage	V	4.5	6	9	12	18	24
2_ No load speed	rpm	11600	10400	11700	10300	11600	10300
3_ No load current	mA	73.9	46.4	37	23.2	18.5	11.6
4_ Nominal speed	rpm	8460	7430	8750	7370	8760	7300
5_ Nominal torque (max. continuous torque)	mNm	6.36	6.96	6.88	6.91	6.94	6.66
6_ Nominal current (max. continuous current)	A	1.81	1.31	0.974	0.651	0.492	0.314
7_ Stall torque	mNm	23.5	24.8	27.8	24.7	28.5	22.9
8_ Stall current	A	6.45	4.53	3.8	2.26	1.95	1.05
9_ Max. efficiency	%	79.5	80.8	81.4	80.1	81.3	80.1
10_ Terminal resistance	Ω	0.698	1.33	2.37	5.31	9.21	22.9
11_ Terminal inductance	mH	0.0252	0.0567	0.101	0.227	0.403	0.908
12_ Torque constant	mNm/A	3.65	5.47	7.3	10.9	14.6	21.9
13_ Speed constant	rpm/V	2620	1740	1310	872	654	436
14_ Speed/torque gradient	rpm/mNm	500	422	424	423	413	456
15_ Mechanical time constant	ms	4.35	4.17	4.11	4.28	4.19	4.17
16_ Rotor inertia	gcm <sup>2</sup>	0.831	0.942	0.926	0.966	0.97	0.872

### Thermal data

17_ Thermal resistance housing-ambient	K/W	22.2
18_ Thermal resistance winding-housing	K/W	8.63
19_ Thermal time constant winding	s	10.3
20_ Thermal time constant motor	s	226
21_ Ambient temperature ball bearings	°C	-40...+100
21_ Ambient temperature sleeve bearings	°C	-30...+100
22_ Max. winding temperature	°C	125

### Operating Range

n [rpm] Winding 12 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

### Mechanical data ball bearings

23_ Max. speed	rpm	17000
24_ Axial play	mm	0...0.1
Preload	N	0.8
25_ Radial play	mm	0.015
26_ Max. axial load (dynamic)	N	0.8
27_ Max. force for press fits (static)	N	18
(static, shaft supported)	N	300
28_ Max. radial load [mm from flange]	N	10 [5]

### Mechanical data sleeve bearings

23_ Max. speed	rpm	15000
24_ Axial play	mm	0...0.2
Preload	N	0
25_ Radial play	mm	0.015
26_ Max. axial load (dynamic)	N	0.1
27_ Max. force for press fits (static)	N	60
(static, shaft supported)	N	300
28_ Max. radial load [mm from flange]	N	2 [5]

### maxon Modular System

maxon gear	Stages [opt.]
295_GPX 14 A/C	1-2 [3-4]
296_GPX 14 LN/LZ	1-2 [3-4]
297_GPX 14 HP	2-3 [4]
298_GPX 16 A/C	3-4
299_GPX 16 LN/LZ	3-4
300_GPX 16 HP	4

maxon sensor
398_ENX 10 EASY
398_ENX 10 QUAD
399_ENX 10 EASY XT

Details on catalog page 30

maxon motor control
454_ESCON Module 24/2
454_ESCON 36/2 DC
462_EPOS4 Module/Comp. 24/1.5
473_MAXPOS 50/5

### Other specifications

29_ Number of pole pairs		1
30_ Number of commutator segments		7
31_ Weight of motor	g	26
32_ Typical noise level	dB(A)	40

### Configuration

Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

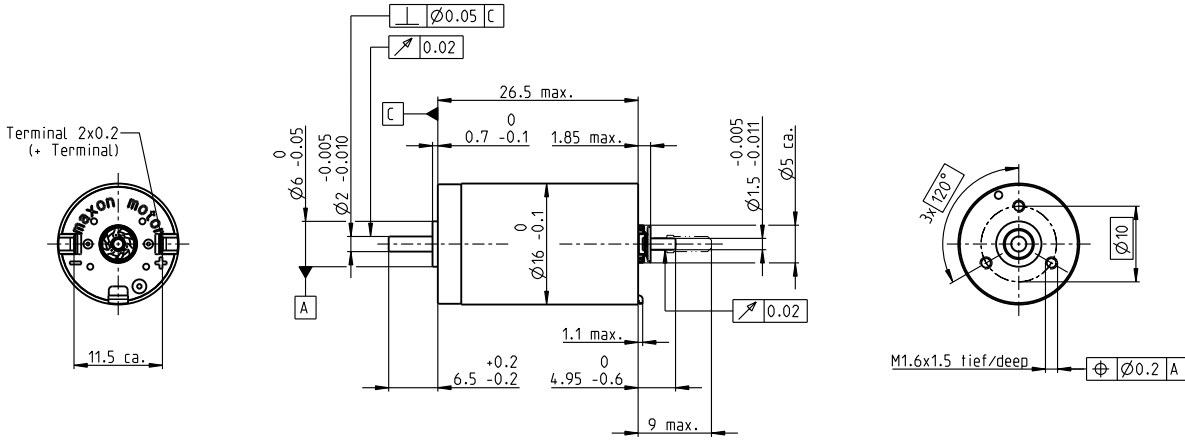
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# DCX 16 S Precious Metal Brushes

## DC motor Ø16 mm



Key Data: 3/5 W, 5.3 mNm, 8680 rpm



M 1:1

### Motor Data

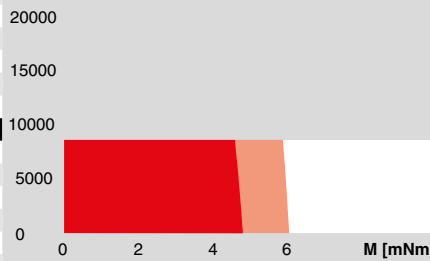
1_	Nominal voltage	V	3	4.5	6	9	12	18	24
2_	No load speed	rpm	6320	6320	6610	6320	6260	6340	6250
3_	No load current	mA	44.6	29.7	23.4	14.9	11	7.43	5.51
4_	Nominal speed	rpm	3350	3300	3760	3270	3320	3530	3200
5_	Nominal torque (max. continuous torque)	mNm	5.15	5.05	5.36	5	5.19	5.45	4.99
6_	Nominal current (max. continuous current)	A	1.20	0.784	0.65	0.389	0.299	0.211	0.144
7_	Stall torque	mNm	11.1	10.7	12.6	10.6	11.2	12.5	10.4
8_	Stall current	A	2.49	1.61	1.48	0.791	0.624	0.467	0.289
9_	Max. efficiency	%	75	75	77	75	75	77	74
10_	Terminal resistance	Ω	1.20	2.80	4.06	11.4	19.2	38.6	83.1
11_	Terminal inductance	mH	0.036	0.080	0.131	0.320	0.581	1.28	2.32
12_	Torque constant	mNm/A	4.45	6.67	8.53	13.3	18.0	26.7	36.0
13_	Speed constant	rpm/V	2150	1430	1120	715	531	358	265
14_	Speed/torque gradient	rpm/mNm	580	600	533	610	568	517	613
15_	Mechanical time constant	ms	6.09	6.09	6.05	6.13	6.11	6.08	6.17
16_	Rotor inertia	gcm <sup>2</sup>	1.00	0.97	1.08	0.959	1.03	1.12	0.960

### Thermal data

17_	Thermal resistance housing-ambient	K/W	23.5
18_	Thermal resistance winding-housing	K/W	9.9
19_	Thermal time constant winding	s	9.63
20_	Thermal time constant motor	s	227
21_	Ambient temperature ball bearings	°C	-40...+85
21_	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100

### Operating Range

n [rpm] Winding 12 V



### Mechanical data ball bearings

23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

### Mechanical data sleeve bearings

23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of commutator segments	7	
31_	Weight of motor	g	26
32_	Typical noise level	dBA	40

### maxon Modular System

	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
298_GPX 16 A/C	1-2 [3-4]	398_ENX 10 EASY	454_ESCON Module 24/2	
299_GPX 16 LN/LZ	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON 36/2 DC	
300_GPX 16 HP	2-3 [4]	399_ENX 10 EASY XT	462_EPOS4 Module/Comp. 24/1.5	
302_GPX 19 A/C	3-4	401_ENX 16 EASY	463_EPOS4 50/5	
303_GPX 19 LN/LZ	3-4	402_ENX 16 EASY XT	464_EPOS4 Module/Comp. 50/5	
304_GPX 19 HP	4	403_ENX 16 EASY Abs.	473_MAXPOS 50/5	
		404_ENX 16 EASY Abs. XT		
		410_ENX 16 RIO		

### Configuration

Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

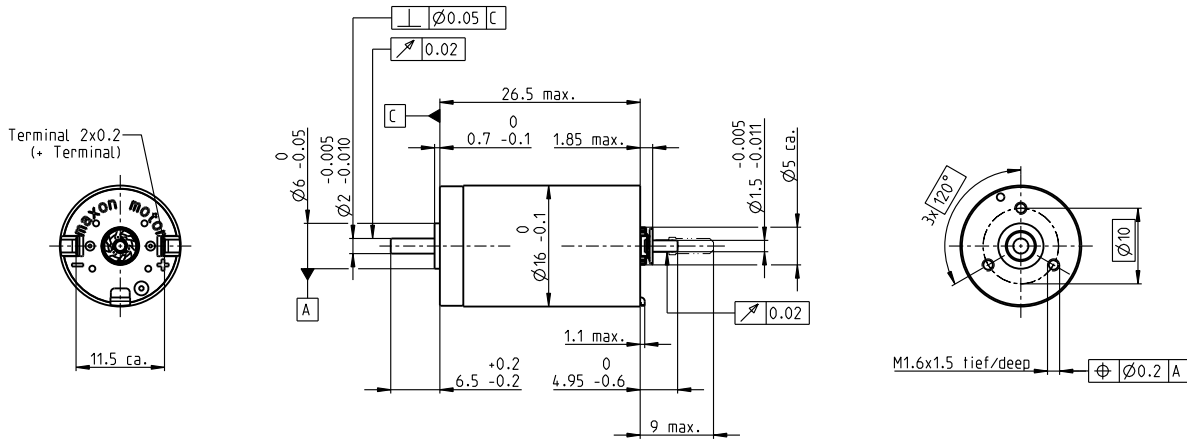
# DCX 16 S Graphite Brushes

## DC motor Ø16 mm

Key Data: 5/10 W, 5.4 mNm, 17000 rpm



maxon DCX



M 1:1

### Motor Data

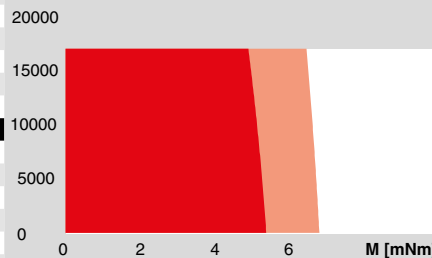
1_	Nominal voltage	V	6	9	12	18	24	48
2_	No load speed	rpm	12700	12700	13200	12700	12700	12600
3_	No load current	mA	63.9	42.6	35.4	22.4	16.8	8.28
4_	Nominal speed	rpm	9400	9400	9850	9260	9430	9250
5_	Nominal torque (max. continuous torque)	mNm	5.45	5.4	5.36	5.21	5.43	5.32
6_	Nominal current (max. continuous current)	A	1.28	0.847	0.662	0.411	0.321	0.156
7_	Stall torque	mNm	21.3	21	22.6	20.1	21.7	20.6
8_	Stall current	A	4.79	3.15	2.65	1.51	1.22	0.572
9_	Max. efficiency	%	78	78	76	76	78	77
10_	Terminal resistance	Ω	1.25	2.85	4.53	12	19.7	83.9
11_	Terminal inductance	mH	0.036	0.080	0.131	0.320	0.569	2.32
12_	Torque constant	mNm/A	4.45	6.67	8.53	13.3	17.8	36.0
13_	Speed constant	rpm/V	2150	1430	1120	715	536	265
14_	Speed/torque gradient	rpm/mNm	605	612	594	641	592	620
15_	Mechanical time constant	ms	6.35	6.21	6.74	6.43	6.32	6.23
16_	Rotor inertia	gcm <sup>2</sup>	1.00	0.970	1.08	0.959	1.02	0.960

### Thermal data

17_	Thermal resistance housing-ambient	K/W	23.5
18_	Thermal resistance winding-housing	K/W	9.9
19_	Thermal time constant winding	s	9.63
20_	Thermal time constant motor	s	227
21_	Ambient temperature ball bearings	°C	-40...+100
21_	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125

### Operating Range

n [rpm] Winding 12 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

### Mechanical data sleeve bearings

23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]
298_GPX 16 A/C	1-2 [3-4]
299_GPX 16 LN/LZ	1-2 [3-4]
300_GPX 16 HP	2-3 [4]
302_GPX 19 A/C	3-4
303_GPX 19 LN/LZ	3-4
304_GPX 19 HP	4

### maxon sensor

398_ENX 10 EASY
398_ENX 10 QUAD
399_ENX 10 EASY XT
401_ENX 16 EASY
402_ENX 16 EASY XT
403_ENX 16 EASY Abs.
404_ENX 16 EASY Abs. XT
410_ENX 16 RIO

Details on catalog page 30

### maxon motor control

454_ESCON Module 24/2
454_ESCON 36/2 DC
455_ESCON Module 50/5
457_ESCON 50/5
462_EPOS4 Module/Comp. 24/1.5
463_EPOS4 50/5
463_EPOS4 Module/Comp. 50/5
463_EPOS4 50/5
473_MAXPOS 50/5

### Other specifications

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	26
32_	Typical noise level	dBA	38

### Configuration

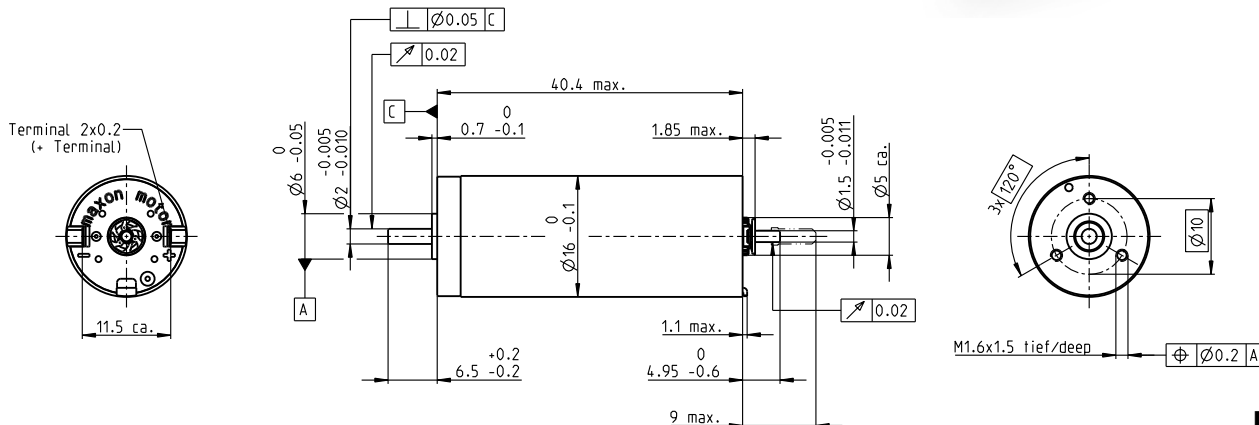
Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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# DCX 16 L Precious Metal Brushes

DC motor Ø16 mm

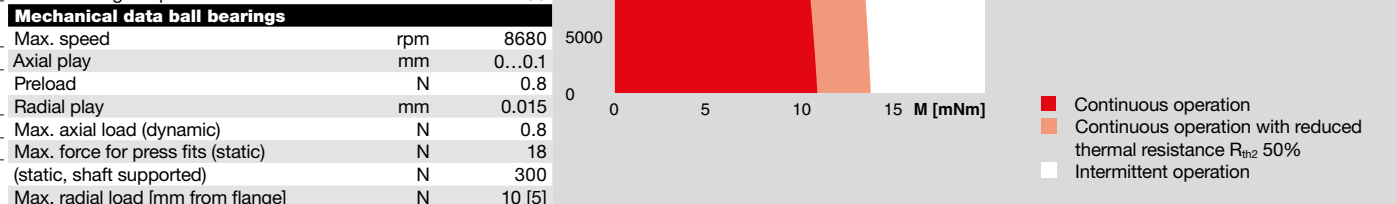
Key Data: 5/10 W, 11.5 mNm, 8680 rpm



M 1:1

Motor Data								
1_	Nominal voltage	V	3	6	9	12	18	24
2_	No load speed	rpm	6400	6620	6410	6400	6400	6560
3_	No load current	mA	62.5	32.6	20.8	15.6	10.4	8.05
4_	Nominal speed	rpm	5450	4920	4620	4490	4510	4630
5_	Nominal torque (max. continuous torque)	mNm	5.06	10.0	11.6	10.8	10.9	10.7
6_	Nominal current (max. continuous current)	A	1.20	1.20	0.89	0.625	0.42	0.316
7_	Stall torque	mNm	34.4	39.3	41.8	36.6	37.3	36.6
8_	Stall current	A	7.73	4.57	3.14	2.06	1.40	1.06
9_	Max. efficiency	%	83	84	84	83	84	83
10_	Terminal resistance	Ω	0.388	1.31	2.87	5.82	12.9	22.7
11_	Terminal inductance	mH	0.026	0.096	0.231	0.411	0.925	1.56
12_	Torque constant	mNm/A	4.44	8.59	13.3	17.8	26.7	34.7
13_	Speed constant	rpm/V	2150	1110	716	537	358	276
14_	Speed/torque gradient	rpm/mNm	188	170	154	176	173	181
15_	Mechanical time constant	ms	4.29	4.20	4.18	4.19	4.22	4.23
16_	Rotor inertia	gcm <sup>2</sup>	2.18	2.36	2.59	2.28	2.33	2.23

Thermal data			Operating Range	
17_	Thermal resistance housing-ambient	K/W	17.9	n [rpm] Winding 9 V
18_	Thermal resistance winding-housing	K/W	7.21	
19_	Thermal time constant winding	s	21.5	
20_	Thermal time constant motor	s	294	
21_	Ambient temperature ball bearings	°C	-40...+85	
21_	Ambient temperature sleeve bearings	°C	-30...+85	
22_	Max. winding temperature	°C	100	



Mechanical data ball bearings			maxon Modular System		Details on catalog page 30		
23_	Max. speed	rpm	8680	<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
24_	Axial play	mm	0...0.2	298_GPX 16 A/C	1-2 [3-4]	398_ENX 10 EASY	454_ESCON Module 24/2
24_	Preload	N	0	299_GPX 16 LN/LZ	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON 36/2 DC
25_	Radial play	mm	0.015	300_GPX 16 HP	2-3 [4]	399_ENX 10 EASY XT	462_EPOS4 Module/Comp. 24/1.5
26_	Max. axial load (dynamic)	N	0.1	302_GPX 19 A/C	3-4	401_ENX 16 EASY	470_EPOS2 P 24/5
27_	Max. force for press fits (static)	N	60	303_GPX 19 LN/LZ	3-4	402_ENX 16 EASY XT	473_MAXPOS 50/5
27_	(static, shaft supported)	N	300	304_GPX 19 HP	4	403_ENX 16 EASY Abs.	
28_	Max. radial load [mm from flange]	N	2 [5]			404_ENX 16 EASY Abs. XT	
						410_ENX 16 RIO	

Other specifications			Configuration	
29_	Number of pole pairs		Bearing: Ball bearings preloaded/sleeve bearings	
30_	Number of commutator segments		Commutation: Precious metal brushes with CLL/graphite brushes	
31_	Weight of motor	g	Flange front/back: Standard flange/configurable flange/no flange	
32_	Typical noise level	dBA	Shaft front/back: Length/diameter/flat face	
			Electric connection: Terminals or cable/alignment of connection/cable length/connector type	



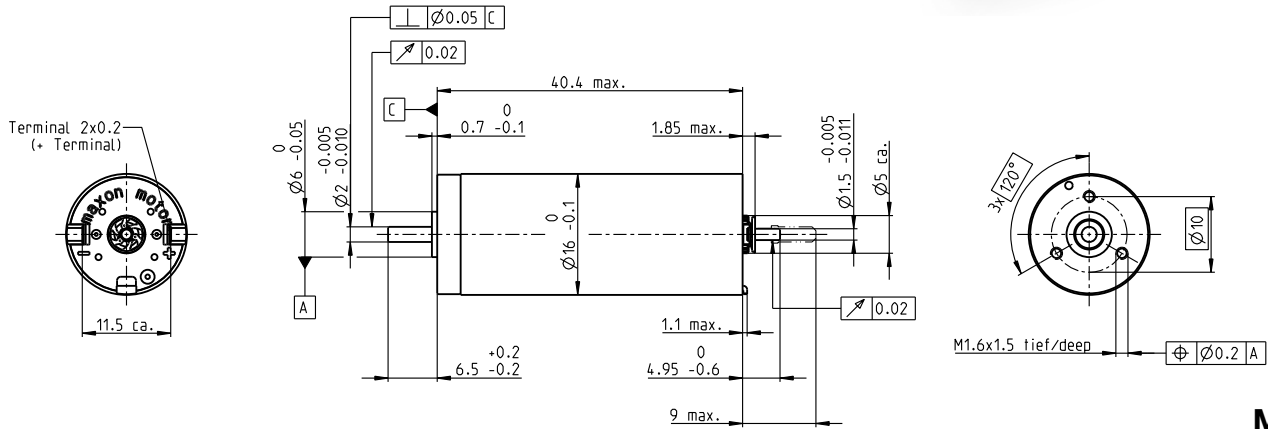
# DCX 16 L Graphite Brushes

## DC motor Ø16 mm

Key Data: 10/19 W, 11.7 mNm, 17000 rpm



maxon DCX



M 1:1

### Motor Data

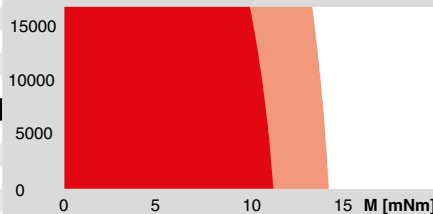
1_	Nominal voltage	V	6	9	12	18	24	36
2_	No load speed	rpm	12800	13100	13200	12800	12800	12800
3_	No load current	mA	73.5	50.7	38.6	24.5	18.4	12.3
4_	Nominal speed	rpm	11000	11000	10700	10600	10600	10700
5_	Nominal torque (max. continuous torque)	mNm	8.58	11.8	10.4	11.6	11.3	11.6
6_	Nominal current (max. continuous current)	A	2.00	1.85	1.24	0.896	0.651	0.447
7_	Stall torque	mNm	61.8	74.2	63.3	74.5	68.5	72
8_	Stall current	A	13.9	11.4	7.37	5.59	3.85	2.70
9_	Max. efficiency	%	85	87	83	86	86	87
10_	Terminal resistance	Ω	0.431	0.791	1.63	3.22	6.23	13.3
11_	Terminal inductance	mH	0.026	0.055	0.096	0.231	0.411	0.925
12_	Torque constant	mNm/A	4.44	6.52	8.59	13.3	17.8	26.7
13_	Speed constant	rpm/V	2150	1470	1110	716	537	358
14_	Speed/torque gradient	rpm/mNm	209	178	211	173	188	179
15_	Mechanical time constant	ms	4.77	4.47	5.21	4.70	4.48	4.37
16_	Rotor inertia	gcm <sup>2</sup>	2.18	2.40	2.36	2.59	2.28	2.33

### Thermal data

17_	Thermal resistance housing-ambient	K/W	17.9
18_	Thermal resistance winding-housing	K/W	7.21
19_	Thermal time constant winding	s	21.5
20_	Thermal time constant motor	s	294
21_	Ambient temperature ball bearings	°C	-40...+100
21_	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125

### Operating Range

n [rpm] Winding 12 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	17000
24_	Axial play	mm	0...0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

### Mechanical data sleeve bearings

23_	Max. speed	rpm	15000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]
298_GPX 16 A/C	1-2 [3-4]
299_GPX 16 LN/LZ	1-2 [3-4]
300_GPX 16 HP	2-3 [4]
302_GPX 19 A/C	3-4
303_GPX 19 LN/LZ	3-4
304_GPX 19 HP	4

### maxon sensor

398_ENX 10 EASY
398_ENX 10 QUAD
399_ENX 10 EASY XT
401_ENX 16 EASY
402_ENX 16 EASY XT
403_ENX 16 EASY Abs.
404_ENX 16 EASY Abs. XT
410_ENX 16 RIO

Details on catalog page 30

### maxon motor control

454_ESCON Module 24/2
454_ESCON 36/2 DC
462_EPOS4 Module/Comp. 24/1.5
463_EPOS4 50/5
463_EPOS4 Module/Comp. 50/5
470_EPOS2 P 24/5
473_MAXPOS 50/5

### Other specifications

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	42
32_	Typical noise level	dBA	40

### Configuration

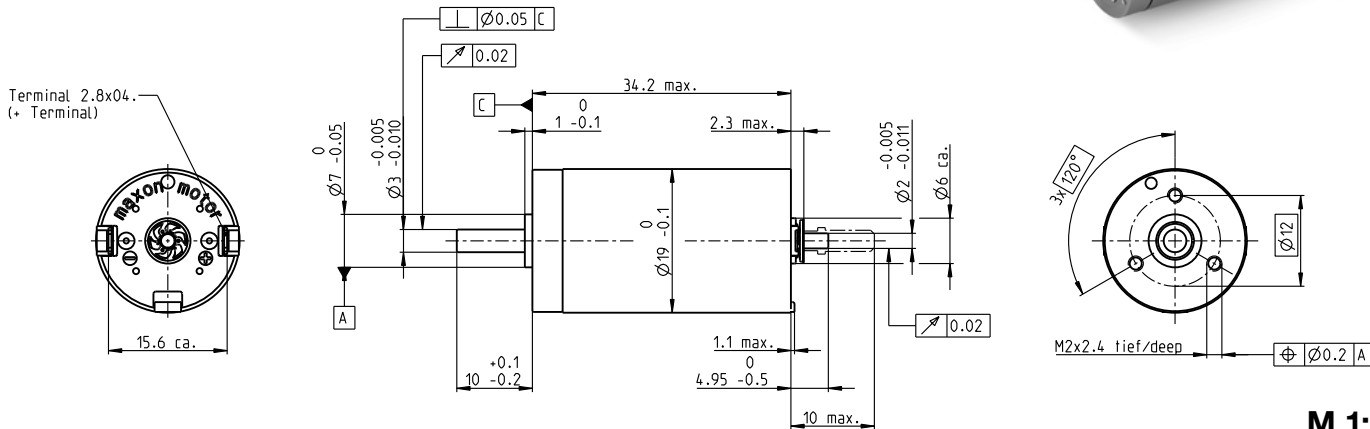
Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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# DCX 19 S Precious Metal Brushes

DC motor Ø19 mm

Key Data: 5/8 W, 11.0 mNm, 7500 rpm



M 1:1

**Motor Data**

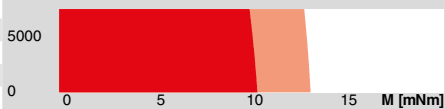
1_	Nominal voltage	V	4.5	6	9	12	18	24
2_	No load speed	rpm	6440	6350	6260	6360	6360	6350
3_	No load current	mA	72	53	34.6	26.5	17.7	13.2
4_	Nominal speed	rpm	5080	4540	4350	4490	4490	4480
5_	Nominal torque (max. continuous torque)	mNm	7.46	10.3	10.8	11.0	11.0	10.9
6_	Nominal current (max. continuous current)	A	1.20	1.20	0.829	0.643	0.428	0.319
7_	Stall torque	mNm	35.7	36.3	35.8	38.0	37.8	37.5
8_	Stall current	A	5.42	4.07	2.64	2.13	1.41	1.05
9_	Max. efficiency	%	78	79	79	79	79	79
10_	Terminal resistance	Ω	0.831	1.47	3.40	5.63	12.7	22.8
11_	Terminal inductance	mH	0.045	0.082	0.191	0.329	0.740	1.320
12_	Torque constant	mNm/A	6.58	8.90	13.5	17.8	26.7	35.6
13_	Speed constant	rpm/V	1450	1070	705	536	358	268
14_	Speed/torque gradient	rpm/mNm	183	177	177	170	170	172
15_	Mechanical time constant	ms	5.12	4.99	4.92	4.89	4.89	4.90
16_	Rotor inertia	gcm <sup>2</sup>	2.67	2.68	2.65	2.75	2.74	2.72

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	17.6
18_	Thermal resistance winding-housing	K/W	6.5
19_	Thermal time constant winding	s	11.6
20_	Thermal time constant motor	s	312
21_	Ambient temperature ball bearings	°C	-40...+85
21_	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100

**Mechanical data ball bearings**

23_	Max. speed	rpm	7500
24_	Axial play	mm	0...0.1
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
27_	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	7500
24_	Axial play	mm	0...0.2
24_	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
27_	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	50
32_	Typical noise level	dBA	48

**Configuration**

Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

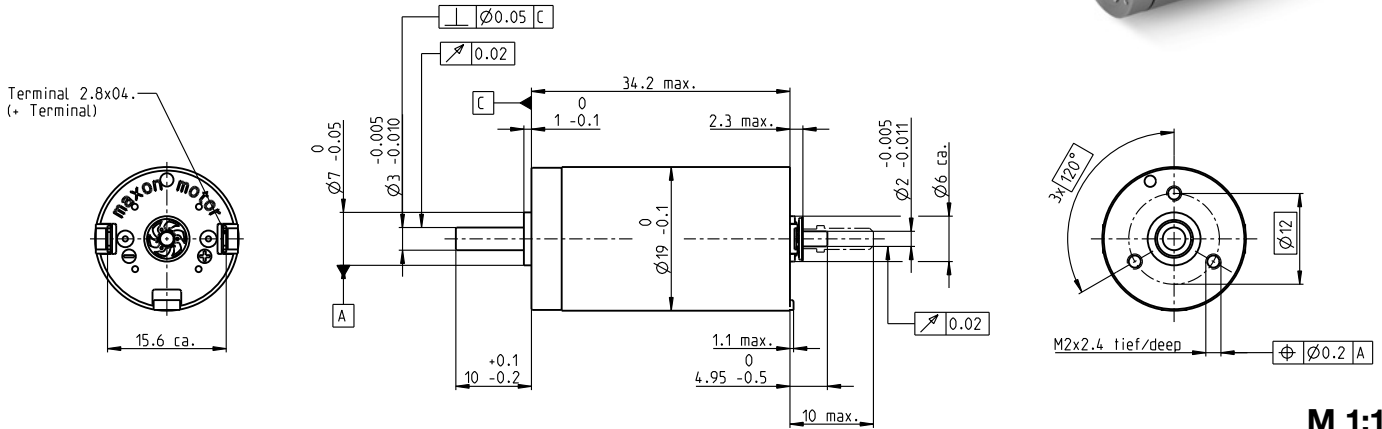
# DCX 19 S Graphite Brushes

## DC motor Ø19 mm

Key Data: 11/17 W, 11.3 mNm, 16000 rpm



maxon DCX



M 1:1

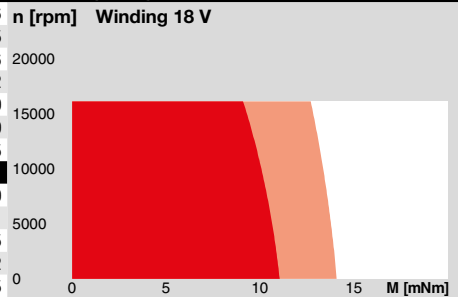
### Motor Data

1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	12900	12800	12600	12700	12700	12700
3_	No load current	mA	102	75	48.9	37.4	25	18.7
4_	Nominal speed	rpm	10900	10800	10600	10600	10700	10700
5_	Nominal torque (max. continuous torque)	mNm	11.3	11.4	11.4	11.1	11.3	11.3
6_	Nominal current (max. continuous current)	A	1.81	1.35	0.884	0.657	0.445	0.335
7_	Stall torque	mNm	73.8	73.9	72.2	73.2	73.9	73.8
8_	Stall current	A	11.2	8.30	5.33	4.11	2.77	2.07
9_	Max. efficiency	%	82	82	82	81	82	82
10_	Terminal resistance	Ω	0.802	1.45	3.38	5.84	13.0	23.2
11_	Terminal inductance	mH	0.045	0.082	0.191	0.329	0.740	1.320
12_	Torque constant	mNm/A	6.58	8.90	13.5	17.8	26.7	35.6
13_	Speed constant	rpm/V	1450	1070	705	536	358	268
14_	Speed/torque gradient	rpm/mNm	177	174	176	176	174	174
15_	Mechanical time constant	ms	4.94	4.90	4.88	5.07	5.00	4.97
16_	Rotor inertia	gcm <sup>2</sup>	2.67	2.68	2.65	2.75	2.74	2.72

### Thermal data

17_	Thermal resistance housing-ambient	K/W	17.6
18_	Thermal resistance winding-housing	K/W	6.5
19_	Thermal time constant winding	s	11.6
20_	Thermal time constant motor	s	312
21_	Ambient temperature ball bearings	°C	-40...+100
21_	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125

### Operating Range



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	16000
24_	Axial play	mm	0...0.1
24_	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
27_	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]

### Mechanical data sleeve bearings

23_	Max. speed	rpm	13500
24_	Axial play	mm	0...0.2
24_	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
27_	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
302_GPX 19 A/C	1-2 [3-4]	398_ENX 10 EASY	454_ESCON Module 24/2
303_GPX 19 LN/LZ	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON 36/2 DC
304_GPX 19 HP	2-3 [4]	399_ENX 10 EASY XT	455_ESCON Module 50/5
306_GPX 22 A/C	3-4	401_ENX 16 EASY	457_ESCON 50/5
307_GPX 22 LN/LZ	3-4	402_ENX 16 EASY XT	462_EPOS4 Module/Comp. 24/1.5
308_GPX 22 HP	4	403_ENX 16 EASY Abs.	463_EPOS4 50/5
		404_ENX 16 EASY Abs. XT	463_EPOS4 Module/Comp. 50/5
		410_ENX 16 RIO	470_EPOS2 P 24/5
			473_MAXPOS 50/5

### Other specifications

29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	50
32_	Typical noise level	dBA	40

### Configuration

Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type



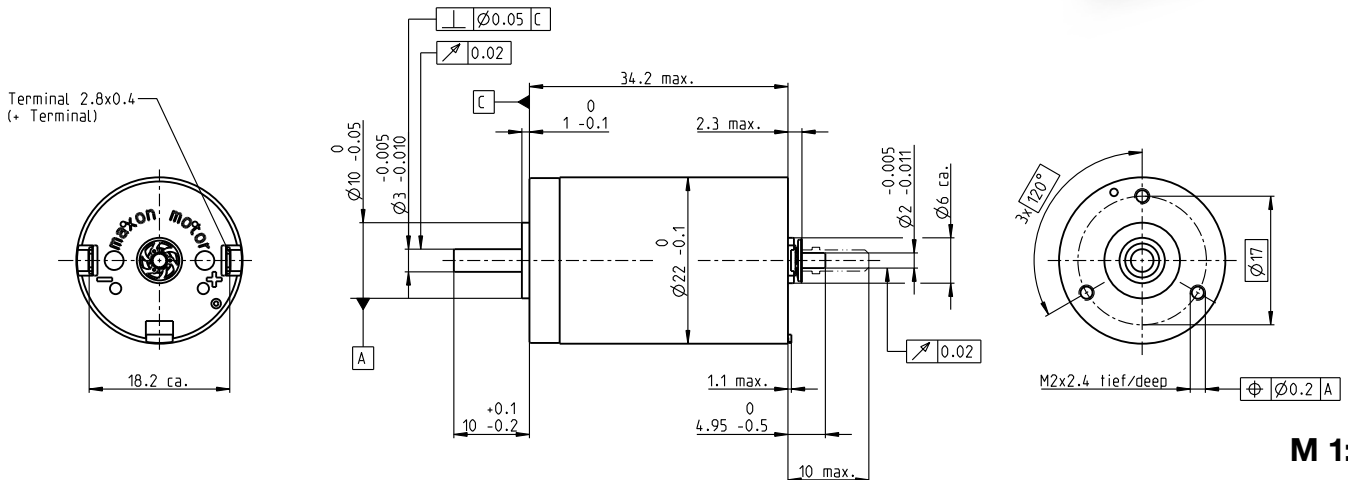
# DCX 22 S Graphite Brushes

## DC motor Ø22 mm



maxon DCX

**Key Data: 14/24 W, 15.3 mNm, 18000 rpm**



**M 1:1**

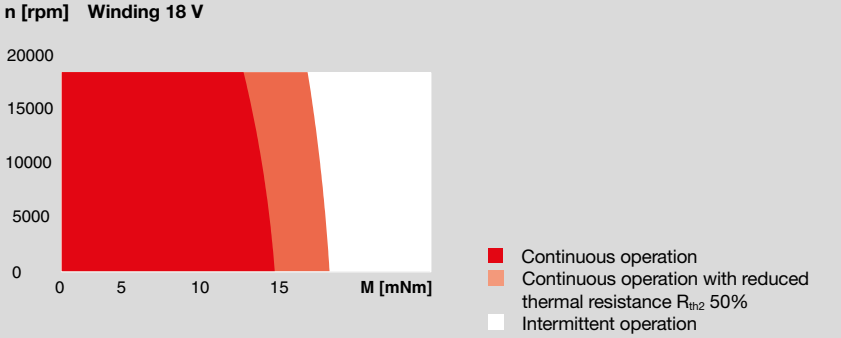
**Motor Data**

1_	Nominal voltage	V	6	12	18	24	36	48
2_	No load speed	rpm	11400	12400	12400	12400	12200	12700
3_	No load current	mA	126	71.7	47.8	35.9	23.4	18.5
4_	Nominal speed	rpm	9700	10700	10800	10800	10500	10900
5_	Nominal torque (max. continuous torque)	mNm	14.4	14.6	14.9	15.3	14.8	14.0
6_	Nominal current (max. continuous current)	A	3.00	1.65	1.12	0.869	0.552	0.406
7_	Stall torque	mNm	101	108	112	120	113	104
8_	Stall current	A	20.2	11.8	8.15	6.51	4.03	2.90
9_	Max. efficiency	%	85	85	85	86	85	84
10_	Terminal resistance	Ω	0.297	1.02	2.21	3.69	8.94	16.6
11_	Terminal inductance	mH	0.017	0.058	0.130	0.231	0.535	0.881
12_	Torque constant	mNm/A	5.01	9.18	13.8	18.4	28.0	35.9
13_	Speed constant	rpm/V	1910	1040	693	520	342	266
14_	Speed/torque gradient	rpm/mNm	113	116	111	104	109	123
15_	Mechanical time constant	ms	6.23	6.12	6.08	6.07	6.22	6.01
16_	Rotor inertia	gcm <sup>2</sup>	5.27	5.05	5.22	5.55	5.44	4.67

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	16
18_	Thermal resistance winding-housing	K/W	7
19_	Thermal time constant winding	s	20
20_	Thermal time constant motor	s	528
21_	Ambient temperature ball bearings	°C	-40...+100
21_	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	18000
24_	Axial play	mm	0...0.1
24_	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
27_	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	18000
24_	Axial play	mm	0...0.2
24_	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
27_	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	66
32_	Typical noise level	dBA	41

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
306_GPX 22 A/C	1-2 [3-4]	398_ENX 10 EASY	454_ESCON Module 24/2
307_GPX 22 LN/LZ	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON 36/2 DC
308_GPX 22 HP	2-3 [4]	399_ENX 10 EASY XT	455_ESCON Module 50/5
309_GPX 22 UP	1-4	401_ENX 16 EASY	457_ESCON 50/5
311_GPX 26 A/C	3	402_ENX 16 EASY XT	462_EPOS4 Module/Comp. 24/1.5
312_GPX 26 LN/LZ	3	403_ENX 16 EASY Abs.	463_EPOS4 50/5
313_GPX 26 HP	4	404_ENX 16 EASY Abs. XT	463_EPOS4 Module/Comp. 50/5
		410_ENX 16 RIO	470_EPOS2 P 24/5
		439_ENC AEDL 5810	473_MAXPOS 50/5
		440_ENC 30 HEDS 5540	
		446_ENC 30 HEDL 5540	

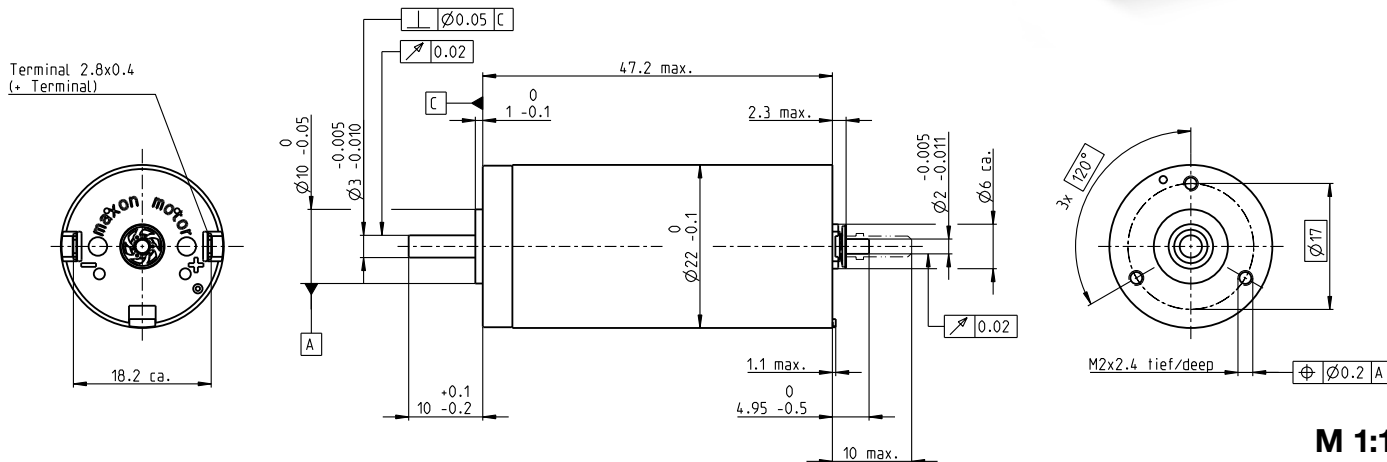
**Configuration**

Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

# DCX 22 L Precious Metal Brushes

## DC motor Ø22 mm

**Key Data: 11/20 W, 29.8 mNm, 7160 rpm**



**M 1:1**

**Motor Data**

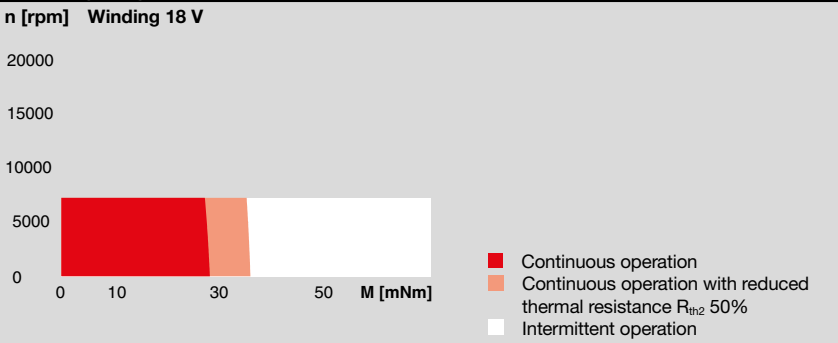
1_	Nominal voltage	V	6	9	12	18	24	36	48
2_	No load speed	rpm	5870	5870	4980	5740	5060	6020	5220
3_	No load current	mA	51.0	34	20.0	16.4	10.2	8.82	5.36
4_	Nominal speed	rpm	5380	5210	4000	4780	4070	5040	4180
5_	Nominal torque (max. continuous torque)	mNm	14.1	21.4	29.5	29.8	29.2	29.2	27.8
6_	Nominal current (max. continuous current)	A	1.50	1.50	1.30	1.01	0.655	0.520	0.322
7_	Stall torque	mNm	170	191	150	178	150	180	140
8_	Stall current	A	17.5	13.1	6.54	5.97	3.31	3.16	1.60
9_	Max. efficiency	%	89	90	89	90	89	90	89
10_	Terminal resistance	Ω	0.343	0.687	1.84	3.01	7.25	11.4	29.9
11_	Terminal inductance	mH	0.035	0.078	0.192	0.326	0.746	1.19	2.80
12_	Torque constant	mNm/A	9.73	14.6	22.9	29.9	45.2	57.0	87.6
13_	Speed constant	rpm/V	981	654	416	320	211	168	109
14_	Speed/torque gradient	rpm/mNm	34.6	30.8	33.3	32.2	33.9	33.5	37.3
15_	Mechanical time constant	ms	3.28	3.17	3.14	3.13	3.14	3.14	3.17
16_	Rotor inertia	gcm <sup>2</sup>	9.06	9.82	9.00	9.26	8.85	8.94	8.12

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	4.57
19_	Thermal time constant winding	s	22
20_	Thermal time constant motor	s	646
21_	Ambient temperature ball bearings	°C	-40...+85
21_	Ambient temperature sleeve bearings	°C	-30...+85
22_	Max. winding temperature	°C	100

**Mechanical data ball bearings**

23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.1
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
27_	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]



**Mechanical data sleeve bearings**

23_	Max. speed	rpm	7160
24_	Axial play	mm	0...0.2
24_	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
27_	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	95
32_	Typical noise level	dBA	52

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
306_GPX 22 A/C	1-2 [3-4]	398_ENX 10 EASY	454_ESCON Module 24/2
307_GPX 22 LN/LZ	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON 36/2 DC
308_GPX 22 HP	2-3 [4]	399_ENX 10 EASY XT	455_ESCON Module 50/5
309_GPX 22 UP	1-4	401_ENX 16 EASY	457_ESCON 50/5
311_GPX 26 A/C	3	402_ENX 16 EASY XT	462_EPOS4 Module/Comp. 24/1.5
312_GPX 26 LN/LZ	3	403_ENX 16 EASY Abs.	463_EPOS4 50/5
313_GPX 26 HP	4	404_ENX 16 EASY Abs. XT	463_EPOS4 Module/Comp. 50/5
		410_ENX 16 RIO	470_EPOS2 P 24/5
		439_ENC AEDL 5810	473_MAXPOS 50/5
		440_ENC 30 HEDS 5540	
		446_ENC 30 HEDL 5540	

**Configuration**

Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

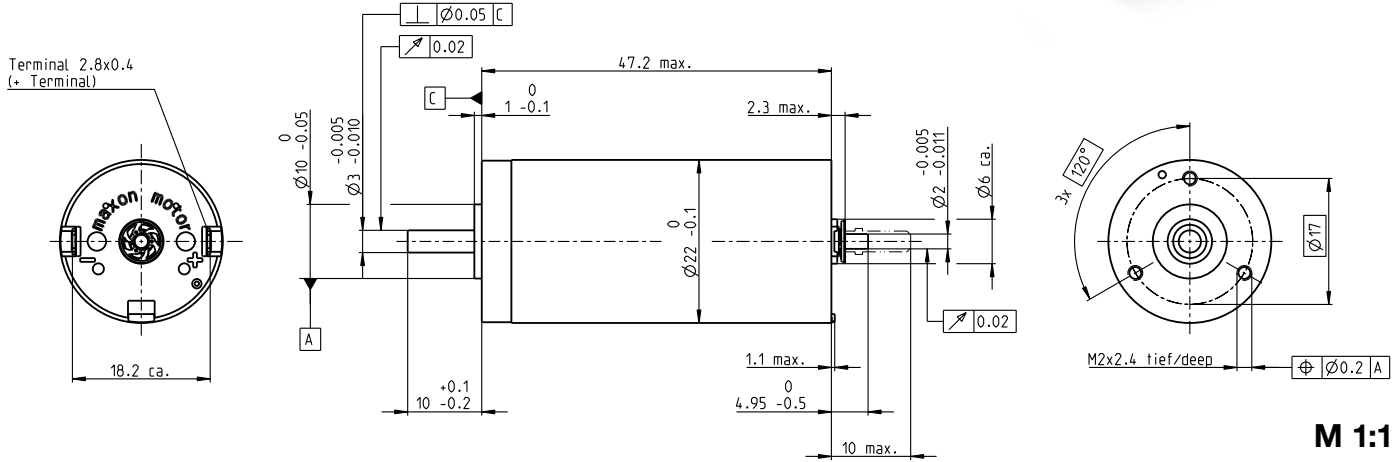
# DCX 22 L Graphite Brushes

## DC motor Ø22 mm

Key Data: 20/49 W, 32.2 mNm, 18000 rpm



maxon DCX



M 1:1

### Motor Data

1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	12300	11700	11800	9970	11400	10100
3_	No load current	mA	118	81.8	54.6	31.8	26.3	16.2
4_	Nominal speed	rpm	11400	10700	10800	8920	10400	9020
5_	Nominal torque (max. continuous torque)	mNm	27.0	30.5	32.2	31.5	30.0	30.3
6_	Nominal current (max. continuous current)	A	4.00	3.21	2.26	1.40	1.03	0.687
7_	Stall torque	mNm	371	348	386	301	346	294
8_	Stall current	A	53.4	35.8	26.5	13.1	11.6	6.50
9_	Max. efficiency	%	90	91	91	90	90	90
10_	Terminal resistance	Ω	0.168	0.335	0.680	1.83	3.11	7.39
11_	Terminal inductance	mH	0.018	0.035	0.078	0.192	0.326	0.746
12_	Torque constant	mNm/A	6.95	9.73	14.6	22.9	29.9	45.2
13_	Speed constant	rpm/V	1370	981	654	416	320	211
14_	Speed/torque gradient	rpm/mNm	33.3	33.8	30.5	33.2	33.3	34.6
15_	Mechanical time constant	ms	3.27	3.21	3.13	3.13	3.23	3.20
16_	Rotor inertia	gcm <sup>2</sup>	9.37	9.06	9.82	9.00	9.26	8.85

### Thermal data

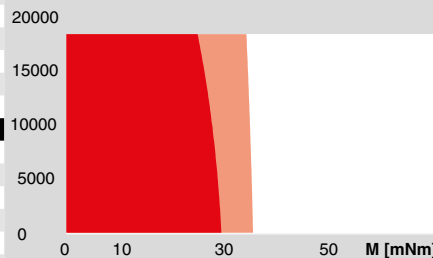
17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	4.57
19_	Thermal time constant winding	s	22
20_	Thermal time constant motor	s	646
21_	Ambient temperature ball bearings	°C	-40...+100
21_	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	125

### Mechanical data ball bearings

23_	Max. speed	rpm	18000
24_	Axial play	mm	0...0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]

### Operating Range

n [rpm] Winding 18 V



■ Continuous operation  
 ■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
 □ Intermittent operation

### Mechanical data sleeve bearings

23_	Max. speed	rpm	18000
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of commutator segments	9	
31_	Weight of motor	g	95
32_	Typical noise level	dBA	44

### maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
306_GPX 22 A/C	1-2 [3-4]	398_ENX 10 EASY	454_ESCON Module 24/2
307_GPX 22 LN/LZ	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON 36/2 DC
308_GPX 22 HP	2-3 [4]	399_ENX 10 EASY XT	455_ESCON Module 50/5
309_GPX 22 UP	1-4	401_ENX 16 EASY	457_ESCON 50/5
311_GPX 26 A/C	3	402_ENX 16 EASY XT	462_EPOS4 Module/Comp. 24/1.5
312_GPX 26 LN/LZ	3	403_ENX 16 EASY Abs.	463_EPOS4 50/5
313_GPX 26 HP	4	404_ENX 16 EASY Abs. XT	463_EPOS4 Module/Comp. 50/5
		410_ENX 16 RIO	470_EPOS2 P 24/5
		439_ENC AEDL 5810	473_MAXPOS 50/5
		440_ENC 30 HEDS 5540	
		446_ENC 30 HEDL 5540	

### Configuration

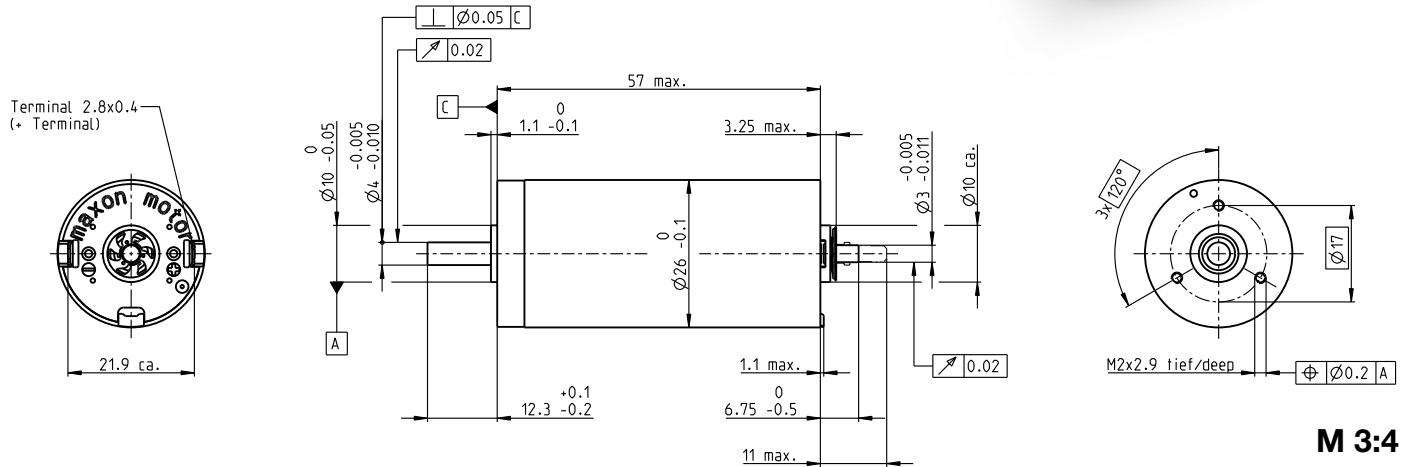
Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

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# DCX 26 L Precious Metal Brushes

DC motor Ø26 mm

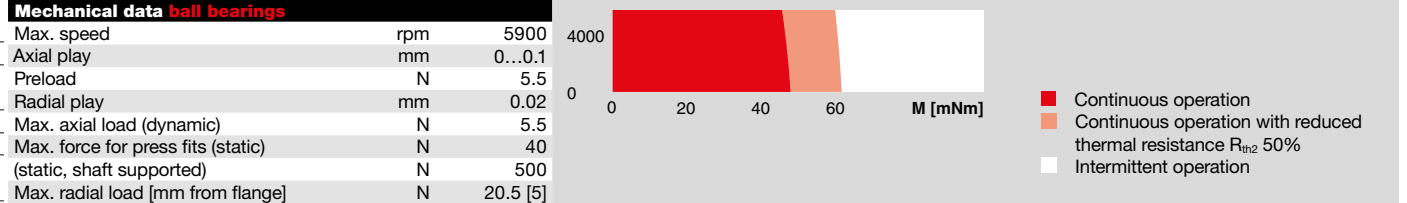
Key Data: 18/29 W, 52.3 mNm, 5900 rpm



M 3:4

Motor Data								
1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	5530	5330	5530	5330	5430	5320
3_	No load current	mA	80.5	56.8	40.2	28.4	19.5	14.2
4_	Nominal speed	rpm	5060	4690	4770	4600	4680	4570
5_	Nominal torque (max. continuous torque)	mNm	32.9	46.1	49.8	52.3	50.8	50.3
6_	Nominal current (max. continuous current)	A	2.2	2.2	1.64	1.25	0.822	0.599
7_	Stall torque	mNm	384	384	362	384	370	355
8_	Stall current	A	24.8	17.9	11.7	8.95	5.86	4.14
9_	Max. efficiency	%	89	89	89	89	89	89
10_	Terminal resistance	Ω	0.363	0.671	1.54	2.68	6.15	11.6
11_	Terminal inductance	mH	0.067	0.129	0.268	0.514	1.11	2.06
12_	Torque constant	mNm/A	15.5	21.4	31	42.9	63.2	85.8
13_	Speed constant	rpm/V	616	445	308	223	151	111
14_	Speed/torque gradient	rpm/mNm	14.4	13.9	15.3	13.9	14.7	15
15_	Mechanical time constant	ms	3.23	3.13	3.11	3.09	3.1	3.11
16_	Rotor inertia	gcm <sup>2</sup>	21.3	21.4	19.4	21.2	20.1	19.7

Thermal data			Operating Range	
17_	Thermal resistance housing-ambient	K/W	10.2	n [rpm] Winding 18 V
18_	Thermal resistance winding-housing	K/W	3.01	
19_	Thermal time constant winding	s	24	
20_	Thermal time constant motor	s	620	
21_	Ambient temperature ball bearings	°C	-40...+85	
21_	Ambient temperature sleeve bearings	°C	-30...+85	
22_	Max. winding temperature	°C	100	



Mechanical data ball bearings			maxon Modular System			Details on catalog page 30		
23_	Max. speed	rpm	5900	<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>	
24_	Axial play	mm	0...0.2	311_GPX 26 A/C	1-2 [3]	398_ENX 10 EASY	454_ESCON 36/2 DC	
	Preload	N	0	312_GPX 26 LN/LZ	1-2 [3]	398_ENX 10 QUAD	455_ESCON Module 50/5	
25_	Radial play	mm	0.02	313_GPX 26 HP	2-3 [4]	399_ENX 10 EASY XT	457_ESCON 50/5	
26_	Max. axial load (dynamic)	N	0.1	314_GPX 32 A/C	3	401_ENX 16 EASY	462_EPOS4 Module/Comp. 24/1.5	
27_	Max. force for press fits (static)	N	80	315_GPX 32 LN/LZ	3	402_ENX 16 EASY XT	463_EPOS4 50/5	
	(static, shaft supported)	N	500	316_GPX 32 HP	4	403_ENX 16 EASY Abs.	463_EPOS4 Module/Comp. 50/5	
28_	Max. radial load [mm from flange]	N	5.5 [5]			404_ENX 16 EASY Abs. XT	470_EPOS2 P 24/5	
						410_ENX 16 RIO	473_MAXPOS 50/5	

Other specifications		
29_	Number of pole pairs	1
30_	Number of commutator segments	11
31_	Weight of motor	g 170
32_	Typical noise level	dBA 48

**Configuration**  
 Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type



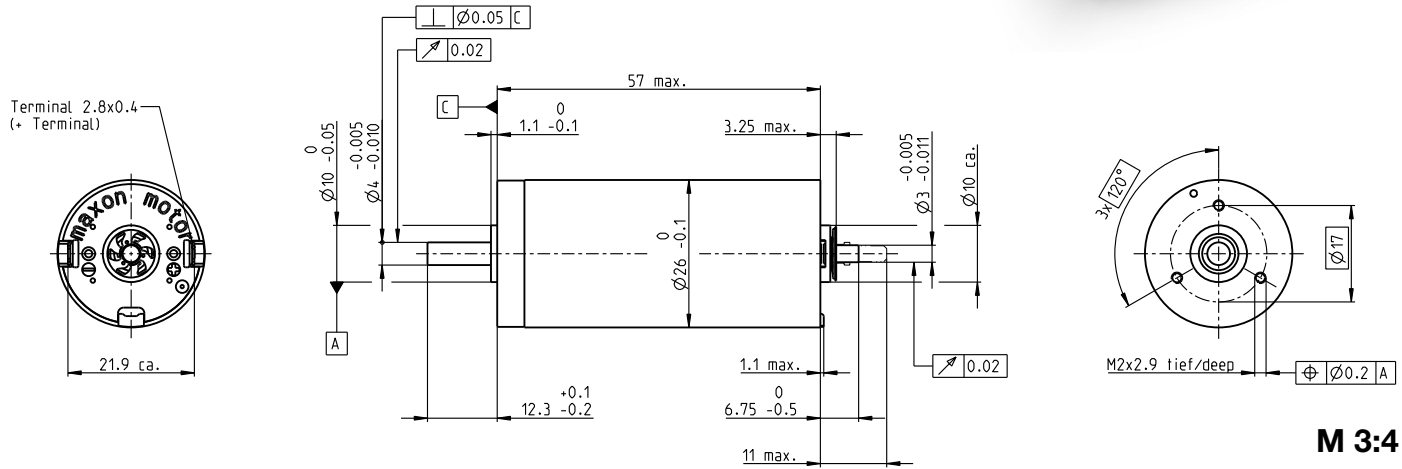
# DCX 26 L Graphite Brushes

## DC motor Ø26 mm

Key Data: 40/74 W, 59.8 mNm, 14400 rpm



maxon DCX



M 3:4

### Motor Data

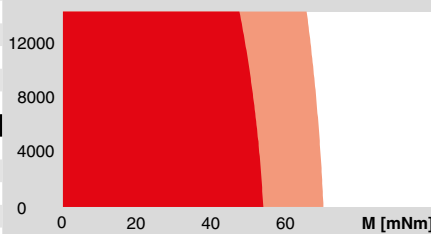
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	10600	11100	10700	11100	10700	10900
3_	No load current	mA	131	93	65.7	46.5	32.9	27.3
4_	Nominal speed	rpm	9460	10000	9690	10000	9730	10000
5_	Nominal torque (max. continuous torque)	mNm	46.9	54.3	57.8	54	59.1	59.8
6_	Nominal current (max. continuous current)	A	4.5	3.59	2.76	1.79	1.41	1.17
7_	Stall torque	mNm	532	653	695	639	697	750
8_	Stall current	A	49.7	42.2	32.4	20.6	16.2	14.3
9_	Max. efficiency	%	88	90	91	90	91	91
10_	Terminal resistance	Ω	0.242	0.427	0.74	1.75	2.95	4.19
11_	Terminal inductance	mH	0.032	0.067	0.129	0.268	0.514	0.768
12_	Torque constant	mNm/A	10.7	15.5	21.4	31	42.9	52.4
13_	Speed constant	rpm/V	890	616	445	308	223	182
14_	Speed/torque gradient	rpm/mNm	20.1	17	15.4	17.4	15.3	14.6
15_	Mechanical time constant	ms	4.5	3.79	3.45	3.53	3.4	3.16
16_	Rotor inertia	gcm <sup>2</sup>	21.4	21.3	21.4	19.4	21.2	20.7

### Thermal data

17_	Thermal resistance housing-ambient	K/W	10.2
18_	Thermal resistance winding-housing	K/W	3.01
19_	Thermal time constant winding	s	24
20_	Thermal time constant motor	s	620
21_	Ambient temperature ball bearings	°C	-40...+100
21_	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature	°C	155

### Operating Range

n [rpm] Winding 18 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	14400
24_	Axial play	mm	0...0.1
	Preload	N	5.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	5.5
27_	Max. force for press fits (static)	N	40
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	20.5 [5]

### Mechanical data sleeve bearings

23_	Max. speed	rpm	8600
24_	Axial play	mm	0...0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	5.5 [5]

### maxon Modular System

maxon gear		Stages [opt.]
311_GPX 26 A/C	1-2 [3]	
312_GPX 26 LN/LZ	1-2 [3]	
313_GPX 26 HP	2-3 [4]	
314_GPX 32 A/C	3	
315_GPX 32 LN/LZ	3	
316_GPX 32 HP	4	

### maxon sensor

398_ENX 10 EASY
398_ENX 10 QUAD
399_ENX 10 EASY XT
401_ENX 16 EASY
402_ENX 16 EASY XT
403_ENX 16 EASY Abs.
404_ENX 16 EASY Abs. XT
410_ENX 16 RIO
439_ENC AEDL 5810
440_ENC 30 HEDS 5540
446_ENC 30 HEDL 5540

Details on catalog page 30

### maxon motor control

454_ESCON 36/2 DC
455_ESCON Module 50/5
457_ESCON 50/5
463_EPOS4 50/5
463_EPOS4 Module/Comp. 50/5
470_EPOS2 P 24/5
473_MAXPOS 50/5

### Other specifications

29_	Number of pole pairs		1
30_	Number of commutator segments		11
31_	Weight of motor	g	170
32_	Typical noise level	dBA	44

Motor specifications may vary for version with sintered bearing (max. winding temperature 125°C).

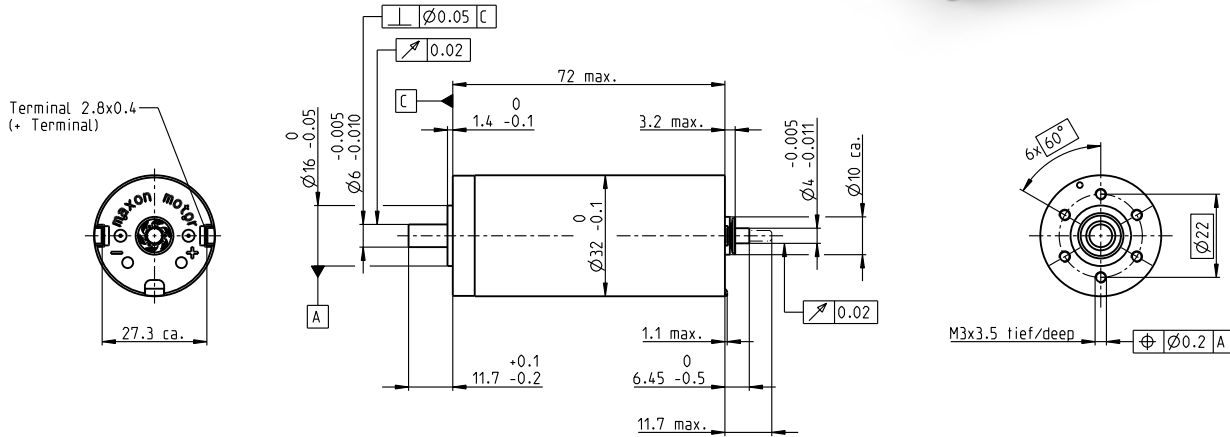
### Configuration

Bearing: Ball bearings preloaded/sleeve bearings  
 Commutation: Precious metal brushes with CLL/graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

# DCX 32 L Graphite Brushes

## DC motor Ø32 mm

Key Data: 70/110 W, 128 mNm, 11 300 rpm



M 1:2

### Motor Data

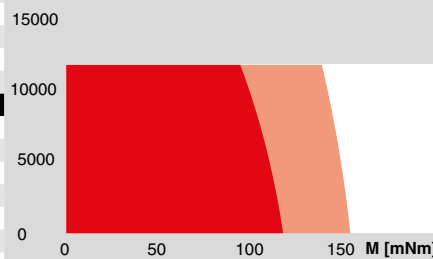
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	7120	8630	8270	7940	7780	5840
3_	No load current	mA	274	234	164	103	75.2	41.6
4_	Nominal speed	rpm	6560	8070	7710	7410	7260	5290
5_	Nominal torque (max. continuous torque)	mNm	89.4	101	108	119	123	128
6_	Nominal current (max. continuous current)	A	6.00	5.42	4.12	2.87	2.17	1.35
7_	Stall torque	mNm	1730	2120	1980	2020	2000	1420
8_	Stall current	A	111	109	72.5	47.1	34.2	14.5
9_	Max. efficiency	%	85	88	88	90	90	89
10_	Terminal resistance	Ω	0.108	0.165	0.331	0.764	1.40	4.12
11_	Terminal inductance	mH	0.034	0.053	0.103	0.254	0.473	1.31
12_	Torque constant	mNm/A	15.6	19.5	27.3	42.9	58.5	97.5
13_	Speed constant	rpm/V	612	490	350	223	163	97.9
14_	Speed/torque gradient	rpm/mNm	4.24	4.15	4.24	3.96	3.92	4.14
15_	Mechanical time constant	ms	3.44	3.30	3.24	3.19	3.11	3.11
16_	Rotor inertia	gcm <sup>2</sup>	77.6	75.9	72.8	76.8	75.9	71.7

### Thermal data

17_	Thermal resistance housing-ambient	K/W	7.28
18_	Thermal resistance winding-housing	K/W	2.3
19_	Thermal time constant winding	s	42.2
20_	Thermal time constant motor	s	837
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155

### Operating Range

n [rpm] Winding 36 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	11 300
24_	Axial play	mm	0...0.1
	Preload	N	7
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	7
27_	Max. force for press fits (static) (static, shaft supported)	N	22.6 / 2510
28_	Max. radial load [mm from flange]	N	65.3 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of commutator segments	11	
31_	Weight of motor	g	325
32_	Typical noise level	dBA	47

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]
314_GPX 32 A/C	1-2 [3]
315_GPX 32 LN/LZ	1-2 [3]
316_GPX 32 HP	2-3 [4]
317_GPX 32 UP	1-4
318_GPX 37 A	3
319_GPX 37 LN/LZ	3

<b>maxon sensor</b>
398_ENX 10 EASY/QUAD
399_ENX 10 EASY XT
401_ENX 16 EASY
402_ENX 16 EASY XT
403_ENX 16 EASY Abs.
404_ENX 16 EASY Abs. XT
410_ENX 16 RIO
439_ENC AEDL 5810
440_ENC 30 HEDS 5540
446_ENC 30 HEDL 5540

<b>maxon motor control</b>
455_ESCON Module 50/5
456_ESCON Module 50/8 HE
457_ESCON 50/5
457_ESCON 70/10
463_EPOS4 50/5
463_EPOS4 Module/Comp. 50/5
465_EPOS4 Module/Comp. 50/8
467_EPOS4 70/15
470_EPOS2 P 24/5
473_MAXPOS 50/5

Details on catalog page 30

### Configuration

Bearing: Ball bearings preloaded  
 Commutation: Graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type

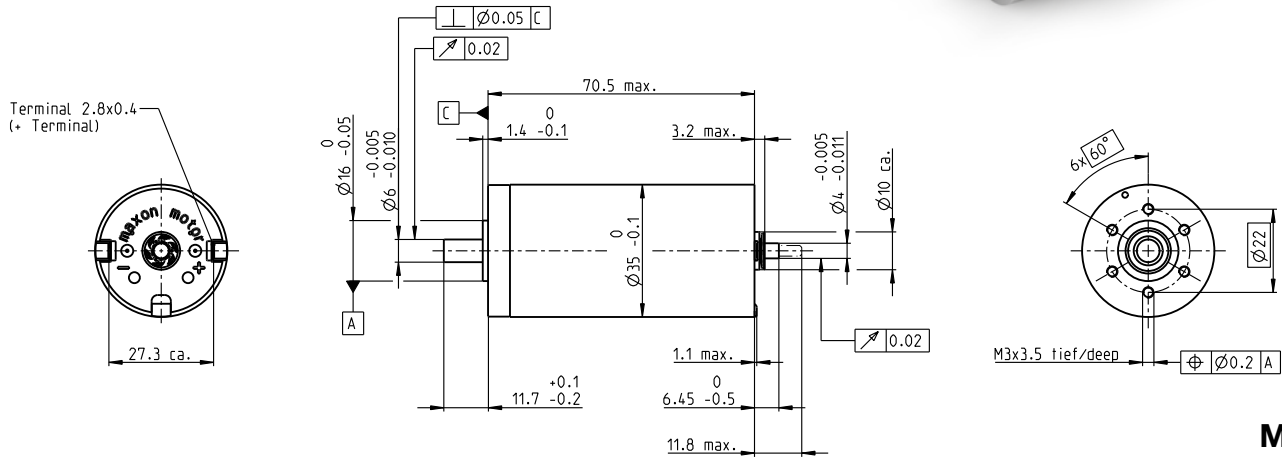
# DCX 35 L Graphite Brushes

## DC motor Ø35 mm

Key Data: 80/120 W, 138 mNm, 12300 rpm



maxon DCX



M 1:2

### Motor Data

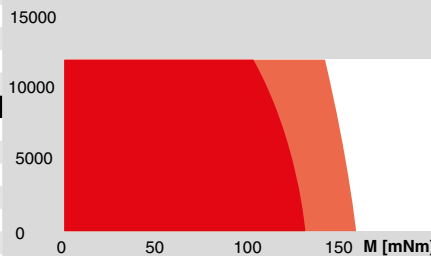
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	8130	7200	7720	7940	6670	7690
3_	No load current	mA	320	177	146	101	58.6	57.5
4_	Nominal speed	rpm	7610	6640	7160	7410	6140	7160
5_	Nominal torque (max. continuous torque)	mNm	77.7	120	121	128	138	132
6_	Nominal current (max. continuous current)	A	6.00	5.32	4.26	3.07	2.08	1.84
7_	Stall torque	mNm	2080	1980	2030	2160	1860	2050
8_	Stall current	A	152	84.8	69.3	50.3	27.3	27.7
9_	Max. efficiency	%	85	88	89	90	90	90
10_	Terminal resistance	Ω	0.079	0.212	0.346	0.716	1.76	2.16
11_	Terminal inductance	mH	0.026	0.077	0.121	0.260	0.658	0.776
12_	Torque constant	mNm/A	13.7	23.4	29.3	42.9	68.3	74.1
13_	Speed constant	rpm/V	699	408	326	223	140	129
14_	Speed/torque gradient	rpm/mNm	4.04	3.70	3.86	3.72	3.61	3.76
15_	Mechanical time constant	ms	4.21	3.97	3.91	3.84	3.76	3.75
16_	Rotor inertia	gcm <sup>2</sup>	99.5	102	96.6	98.7	99.5	95.2

### Thermal data

17_	Thermal resistance housing-ambient	K/W	6.98
18_	Thermal resistance winding-housing	K/W	2.1
19_	Thermal time constant winding	s	43.9
20_	Thermal time constant motor	s	1030
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155

### Operating Range

n [rpm] Winding 36 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	12300
24_	Axial play	mm	0...0.1
	Preload	N	7
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	7
27_	Max. force for press fits (static) (static, shaft supported)	N	22.6 2510
28_	Max. radial load [mm from flange]	N	65.3 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of commutator segments	11	
31_	Weight of motor	g	385
32_	Typical noise level	dBA	48

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]
318_GPX 37 A	1-2
319_GPX 37 LN/LZ	1-2
320_GPX 42 C	1-4

<b>maxon sensor</b>
398_ENX 10 EASY/QUAD
399_ENX 10 EASY XT
401_ENX 16 EASY
402_ENX 16 EASY XT
403_ENX 16 EASY Abs.
404_ENX 16 EASY Abs. XT
410_ENX 16 RIO
439_ENC AEDL 5810
440_ENC 30 HEDS 5540
446_ENC 30 HEDL 5540

<b>maxon motor control</b>
455_ESCON Module 50/5
456_ESCON Module 50/8 HE
457_ESCON 50/5
457_ESCON 70/10
463_EPOS4 50/5
463_EPOS4 Module/Comp. 50/5
465_EPOS4 Module/Comp. 50/8
467_EPOS4 70/15
470_EPOS2 P 24/5
473_MAXPOS 50/5

Details on catalog page 30

### Configuration

Bearing: Ball bearings preloaded  
 Commutation: Graphite brushes  
 Flange front/back: Standard flange/configurable flange/no flange  
 Shaft front/back: Length/diameter/flat face  
 Electric connection: Terminals or cable/alignment of connection/cable length/connector type





# maxon DC-max

Strong RE magnets, state-of-the-art winding technology, cost-optimized design, economical manufacturing: The maxon DC-max motors feature maximum performance at minimum volume and an unrivaled price-performance ratio. maxon DC-max motors can be configured online and are ready for delivery within 11 working days. [dcmx.maxonmotor.com](http://dcmx.maxonmotor.com)

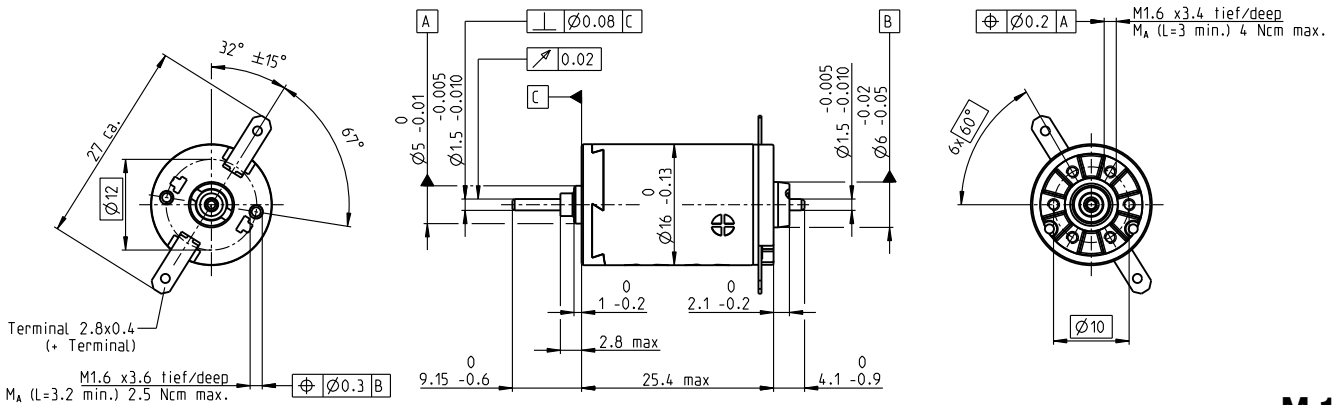
<b>Standard Specification No. 100</b>	64
<b>Explanation of the DC motors</b>	68
<b>DCX Program</b>	70-91
<b>DC-max Program</b>	94-99
<b>RE Program</b>	102-138
<b>A-max Program</b>	141-160

# DC-max 16 S Precious Metal Brushes

## DC motor Ø16 mm



**Key Data: 2/4.3 W, 4.1 mNm, 11 000 rpm**



**M 1:1**

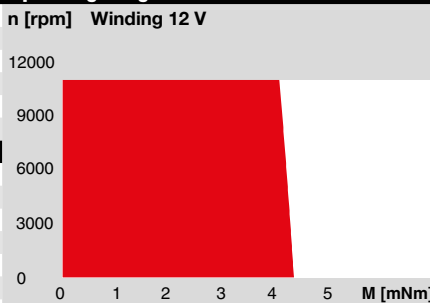
**Motor Data**

1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	7890	7560	7470
3_	No load current	mA	14.7	6.90	3.40
4_	Nominal speed	rpm	4830	4390	4210
5_	Nominal torque (max. continuous torque)	mNm	4.06	3.92	3.80
6_	Nominal current (max. continuous current)	A	0.577	0.267	0.128
7_	Stall torque	mNm	10.5	9.44	8.75
8_	Stall current	A	1.46	0.629	0.289
9_	Max. efficiency	%	81	80	80
10_	Terminal resistance	Ω	4.10	19.1	83.2
11_	Terminal inductance	mH	0.140	0.610	2.49
12_	Torque constant	mNm/A	7.19	15.0	30.3
13_	Speed constant	rpm/V	1330	637	315
14_	Speed/torque gradient	rpm/mNm	758	809	864
15_	Mechanical time constant	ms	8.87	8.92	9.00
16_	Rotor inertia	gcm <sup>2</sup>	1.12	1.05	0.994

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	29.8
18_	Thermal resistance winding-housing	K/W	5.5
19_	Thermal time constant winding	s	5.35
20_	Thermal time constant motor	s	288
21_	Ambient temperature	°C	-30...+65
22_	Max. winding temperature	°C	85

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	11 000
24_	Axial play	mm	0.15...0.05
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	2.2
27_	Max. force for press fits (static) (static, shaft supported)	N	30
28_	Max. radial load [mm from flange]	N	200
			7.8 [5]

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	11 000
24_	Axial play	mm	0.15...0.05
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static) (static, shaft supported)	N	35
28_	Max. radial load [mm from flange]	N	200
			1.4 [5]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
298_GPX 16 A/C	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON Module 24/2
299_GPX 16 LN/LZ	1-2 [3-4]	398_ENX 10 EASY	454_ESCON 36/2 DC
302_GPX 19 A/C	3-4		462_EPOS4 Module/Comp. 24/1.5
303_GPX 19 LN/LZ	3-4		473_MAXPOS 50/5

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	23.3

**Configuration**

Bearing: Sleeve bearings/ball bearings  
 Commutation: Precious metal brushes with CLL/Graphite Brushes  
 Shaft front/back: Length  
 Electric connection: Terminals/cable

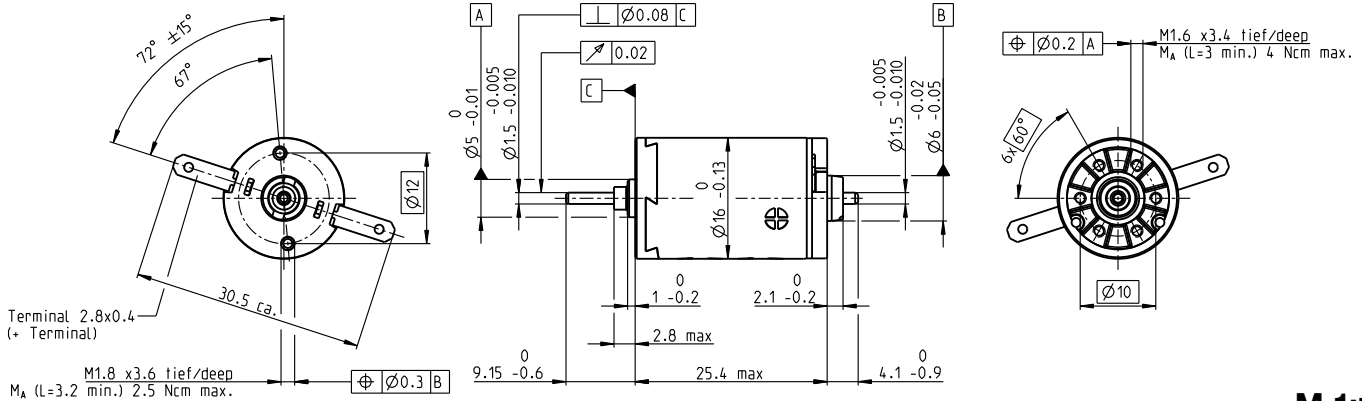
# DC-max 16 S Graphite Brushes

## DC motor Ø16 mm



maxon DC-max

**Key Data: 3/4.7 W, 4.8 mNm, 11 000 rpm**



**M 1:1**

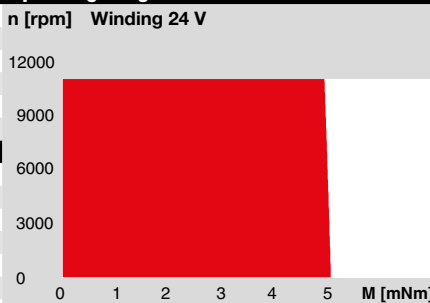
**Motor Data**

1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	9870	9860	9920
3_	No load current	mA	67.3	33.6	16.8
4_	Nominal speed	rpm	6770	6200	6580
5_	Nominal torque (max. continuous torque)	mNm	3.71	4.31	4.76
6_	Nominal current (max. continuous current)	A	0.720	0.413	0.227
7_	Stall torque	mNm	12.1	11.9	14.4
8_	Stall current	A	2.15	1.05	0.64
9_	Max. efficiency	%	68	68	71
10_	Terminal resistance	Ω	2.79	11.4	37.5
11_	Terminal inductance	mH	0.086	0.343	1.37
12_	Torque constant	mNm/A	5.62	11.2	22.5
13_	Speed constant	rpm/V	1700	849	424
14_	Speed/torque gradient	rpm/mNm	843	858	707
15_	Mechanical time constant	ms	8.85	8.92	8.57
16_	Rotor inertia	gcm <sup>2</sup>	1.00	0.993	1.16

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	29.8
18_	Thermal resistance winding-housing	K/W	5.5
19_	Thermal time constant winding	s	5.35
20_	Thermal time constant motor	s	288
21_	Ambient temperature	°C	-30...+85
22_	Max. winding temperature	°C	125

**Operating Range**



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

**Mechanical data ball bearings**

23_	Max. speed	rpm	11 000
24_	Axial play	mm	0.15...0.05
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	2.2
27_	Max. force for press fits (static) (static, shaft supported)	N	30
28_	Max. radial load [mm from flange]	N	200
		N	7.8 [5]

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	11 000
24_	Axial play	mm	0.15...0.05
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static) (static, shaft supported)	N	35
28_	Max. radial load [mm from flange]	N	200
		N	1.4 [5]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
298_GPX 16 A/C	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON Module 24/2
299_GPX 16 LN/LZ	1-2 [3-4]	398_ENX 10 EASY	454_ESCON 36/2 DC
302_GPX 19 A/C	3-4		462_EPOS4 Module/Comp. 24/1.5
303_GPX 19 LN/LZ	3-4		473_MAXPOS 50/5

Details on catalog page 30

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	23.1

**Configuration**

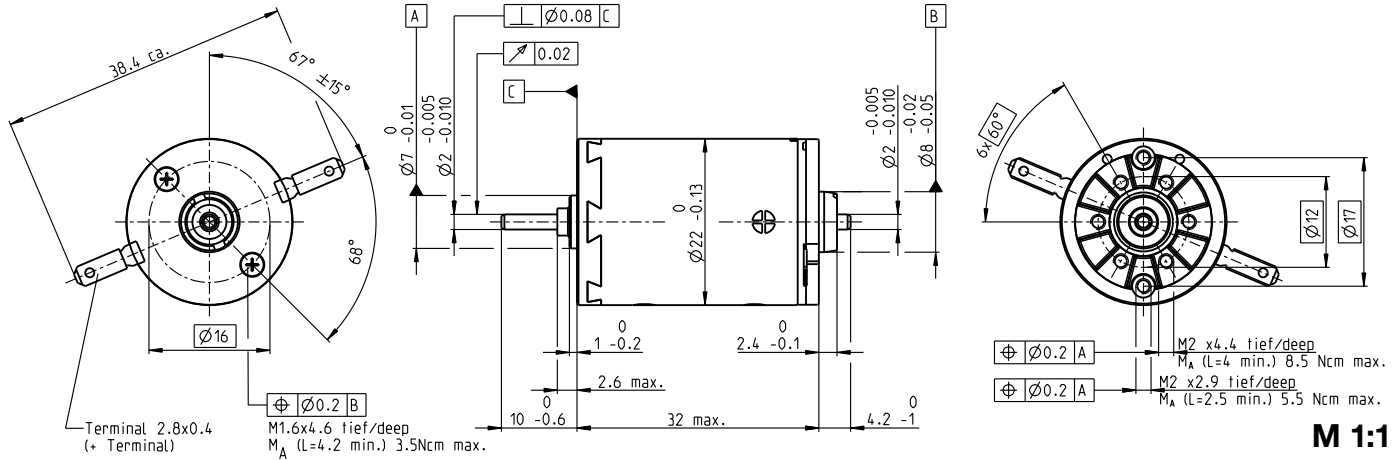
Bearing: Sleeve bearings/ball bearings  
 Commutation: Precious metal brushes with CLL/Graphite Brushes  
 Shaft front/back: Length  
 Electric connection: Terminals/cable

# DC-max 22 S Precious Metal Brushes

## DC motor Ø22 mm



**Key Data: 5/9.6 W, 10.4 mNm, 9000 rpm**



**M 1:1**

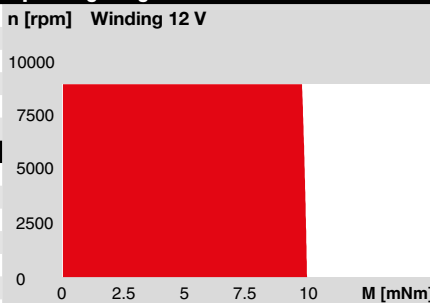
**Motor Data**

1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	5480	5890	5090
3_	No load current	mA	20.8	11.7	4.62
4_	Nominal speed	rpm	4280	4240	3440
5_	Nominal torque (max. continuous torque)	mNm	8.54	10.3	10.4
6_	Nominal current (max. continuous current)	A	0.840	0.543	0.236
7_	Stall torque	mNm	39.0	36.9	33.3
8_	Stall current	A	3.75	1.91	0.721
9_	Max. efficiency	%	85.7	85.2	84.9
10_	Terminal resistance	Ω	1.60	6.28	33.3
11_	Terminal inductance	mH	0.119	0.413	2.21
12_	Torque constant	mNm/A	10.4	19.3	44.8
13_	Speed constant	rpm/V	919	494	213
14_	Speed/torque gradient	rpm/mNm	141	160	159
15_	Mechanical time constant	ms	8.44	8.36	8.39
16_	Rotor inertia	gcm <sup>2</sup>	5.70	4.98	5.05

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	20
18_	Thermal resistance winding-housing	K/W	6
19_	Thermal time constant winding	s	16.8
20_	Thermal time constant motor	s	538
21_	Ambient temperature	°C	-30...65
22_	Max. winding temperature	°C	85

**Operating Range**



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

**Mechanical data ball bearings**

23_	Max. speed	rpm	9000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	3.3
27_	Max. force for press fits (static) (static, shaft supported)	N	45
28_	Max. radial load [mm from flange]	N	420

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	9000
24_	Axial play	mm	0.15...0.05
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	1
27_	Max. force for press fits (static) (static, shaft supported)	N	80
28_	Max. radial load [mm from flange]	N	420

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
306_GPX 22 A/C	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON Module 24/2
307_GPX 22 LN/LZ	1-2 [3-4]	398_ENX 10 EASY	454_ESCON 36/2 DC
311_GPX 26 A/C	3		462_EPOS4 Module/Comp. 24/1.5
312_GPX 26 LN/LZ	3		473_MAXPOS 50/5

Details on catalog page 30

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	53.8

**Configuration**

Bearing: Sleeve bearings/ball bearings  
 Commutation: Precious metal brushes with CLL/Graphite Brushes  
 Shaft front/back: Length  
 Electric connection: Terminals/cable



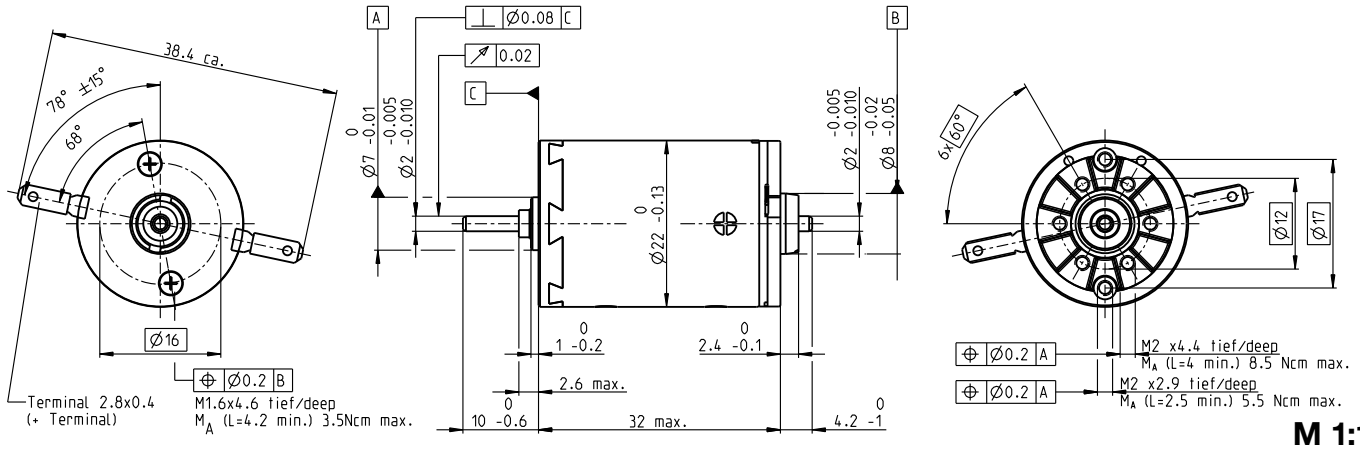
# DC-max 22 S Graphite Brushes

## DC motor Ø22 mm



maxon DC-max

**Key Data: 8/10 W, 12.5 mNm, 9000 rpm**



**M 1:1**

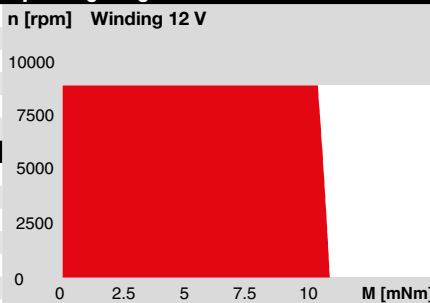
### Motor Data

1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	7030	7140	7330
3_	No load current	mA	58.8	29.5	15.1
4_	Nominal speed	rpm	4950	5240	5350
5_	Nominal torque (max. continuous torque)	mNm	11.5	12.6	11.8
6_	Nominal current (max. continuous current)	A	1.52	0.825	0.398
7_	Stall torque	mNm	42.4	49.4	44.6
8_	Stall current	A	5.39	3.14	1.45
9_	Max. efficiency	%	76	80	80
10_	Terminal resistance	Ω	1.11	3.83	16.6
11_	Terminal inductance	mH	0.069	0.274	1.05
12_	Torque constant	mNm/A	7.88	15.8	30.8
13_	Speed constant	rpm/V	1210	606	310
14_	Speed/torque gradient	rpm/mNm	171	147	167
15_	Mechanical time constant	ms	9.09	8.57	8.20
16_	Rotor inertia	gcm <sup>2</sup>	5.07	5.57	4.69

### Thermal data

17_	Thermal resistance housing-ambient	K/W	20
18_	Thermal resistance winding-housing	K/W	6
19_	Thermal time constant winding	s	16.8
20_	Thermal time constant motor	s	538
21_	Ambient temperature	°C	-30...85
22_	Max. winding temperature	°C	125

### Operating Range



- Continuous operation
- Continuous operation with reduced thermal resistance  $R_{th2}$  50%
- Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	9000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	3.3
27_	Max. force for press fits (static) (static, shaft supported)	N	45
28_	Max. radial load [mm from flange]	N	420
		N	12.3 [5]

### Mechanical data sleeve bearings

23_	Max. speed	rpm	9000
24_	Axial play	mm	0.05...0.15
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	1
27_	Max. force for press fits (static) (static, shaft supported)	N	80
28_	Max. radial load [mm from flange]	N	420
		N	2.8 [5]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
306_GPX 22 A/C	1-2 [3-4]	398_ENX 10 QUAD	454_ESCON Module 24/2
307_GPX 22 LN/LZ	1-2 [3-4]	398_ENX 10 EASY	454_ESCON 36/2 DC
311_GPX 26 A/C	3		462_EPOS4 Module/Comp. 24/1.5
312_GPX 26 LN/LZ	3		473_MAXPOS 50/5

Details on catalog page 30

### Other specifications

29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	53.8

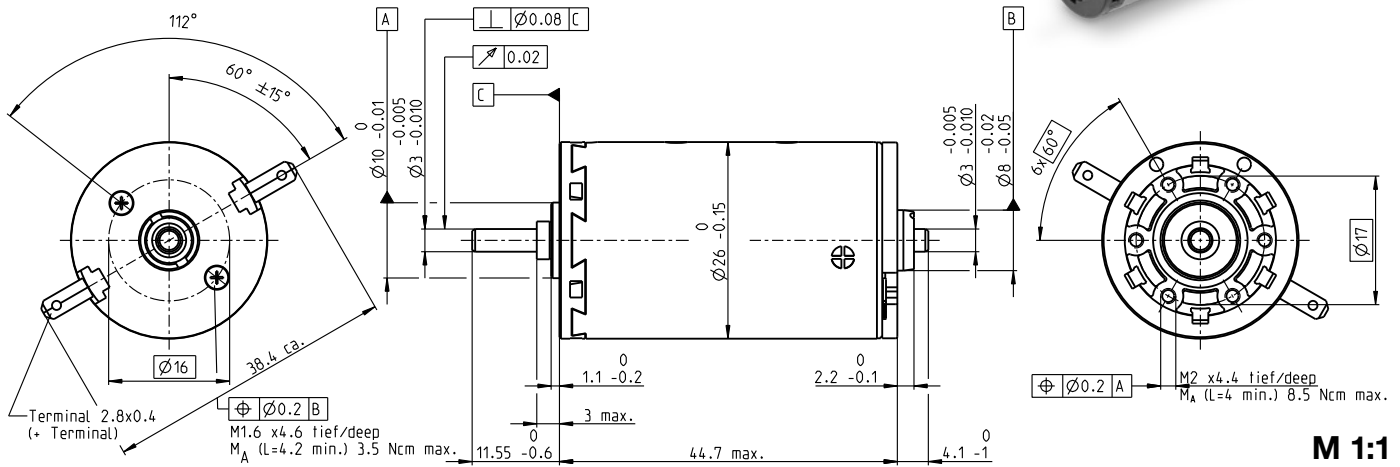
### Configuration

Bearing: Sleeve bearings/ball bearings  
 Commutation: Precious metal brushes with CLL/Graphite Brushes  
 Shaft front/back: Length  
 Electric connection: Terminals/cable

# DC-max 26 S Precious Metal Brushes

## DC motor Ø26 mm

**Key Data: 9/12 W, 28.8 mNm, 6700 rpm**



**M 1:1**

**Motor Data**

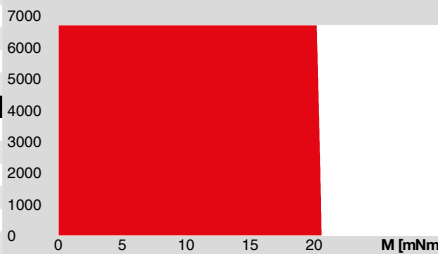
1_	Nominal voltage	V	12	24
2_	No load speed	rpm	4460	4370
3_	No load current	mA	27.1	13.2
4_	Nominal speed	rpm	3790	3450
5_	Nominal torque (max. continuous torque)	mNm	20.8	28.8
6_	Nominal current (max. continuous current)	A	0.84	0.564
7_	Stall torque	mNm	140	138
8_	Stall current	A	5.49	2.64
9_	Max. efficiency	%	87	87
10_	Terminal resistance	Ω	2.19	9.08
11_	Terminal inductance	mH	0.278	1.16
12_	Torque constant	mNm/A	25.6	52.2
13_	Speed constant	rpm/V	373	183
14_	Speed/torque gradient	rpm/mNm	31.9	31.8
15_	Mechanical time constant	ms	4.99	5.06
16_	Rotor inertia	gcm <sup>2</sup>	14.9	15.2

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	13.2
18_	Thermal resistance winding-housing	K/W	3.2
19_	Thermal time constant winding	s	17.8
20_	Thermal time constant motor	s	350
21_	Ambient temperature	°C	-30...65
22_	Max. winding temperature	°C	85

**Operating Range**

**n [rpm] Winding 12 V**



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Intermittent operation

**Mechanical data ball bearings**

23_	Max. speed	rpm	6700
24_	Axial play	mm	0.1...0.2
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	5
27_	Max. force for press fits (static) (static, shaft supported)	N	75
28_	Max. radial load [mm from flange]	N	1200
			20 [5]

**Mechanical data sleeve bearings**

23_	Max. speed	rpm	6700
24_	Axial play	mm	0.1...0.2
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	1.7
27_	Max. force for press fits (static) (static, shaft supported)	N	80
28_	Max. radial load [mm from flange]	N	1200
			5.5 [5]

**Other specifications**

29_	Number of pole pairs		1
30_	Number of commutator segments		13
31_	Weight of motor	g	120

**maxon Modular System**

<table border="1"> <tr><td><b>maxon gear</b></td><td>Stages [opt.]</td></tr> <tr><td>311_GPX 26 A/C</td><td>1-2 [3]</td></tr> <tr><td>312_GPX 26 LN/LZ</td><td>1-2 [3]</td></tr> <tr><td>314_GPX 32 A/C</td><td>3</td></tr> <tr><td>315_GPX 32 LN/LZ</td><td>3</td></tr> </table>	<b>maxon gear</b>	Stages [opt.]	311_GPX 26 A/C	1-2 [3]	312_GPX 26 LN/LZ	1-2 [3]	314_GPX 32 A/C	3	315_GPX 32 LN/LZ	3	<table border="1"> <tr><td><b>maxon sensor</b></td><td></td></tr> <tr><td>398_ENX 10 QUAD</td><td></td></tr> <tr><td>401_ENX 16 EASY</td><td></td></tr> <tr><td>403_ENX 16 EASY Abs.</td><td></td></tr> </table>	<b>maxon sensor</b>		398_ENX 10 QUAD		401_ENX 16 EASY		403_ENX 16 EASY Abs.		<table border="1"> <tr><td><b>maxon motor control</b></td><td></td></tr> <tr><td>454_ESCON Module 24/2</td><td></td></tr> <tr><td>454_ESCON 36/2 DC</td><td></td></tr> <tr><td>455_ESCON Module 50/5</td><td></td></tr> <tr><td>457_ESCON 50/5</td><td></td></tr> <tr><td>462_EPOS4 Module/Comp. 24/1.5</td><td></td></tr> <tr><td>463_EPOS4 50/5</td><td></td></tr> <tr><td>463_EPOS4 Module/Comp. 50/5</td><td></td></tr> <tr><td>470_EPOS2 P 24/5</td><td></td></tr> <tr><td>473_MAXPOS 50/5</td><td></td></tr> </table>	<b>maxon motor control</b>		454_ESCON Module 24/2		454_ESCON 36/2 DC		455_ESCON Module 50/5		457_ESCON 50/5		462_EPOS4 Module/Comp. 24/1.5		463_EPOS4 50/5		463_EPOS4 Module/Comp. 50/5		470_EPOS2 P 24/5		473_MAXPOS 50/5	
<b>maxon gear</b>	Stages [opt.]																																							
311_GPX 26 A/C	1-2 [3]																																							
312_GPX 26 LN/LZ	1-2 [3]																																							
314_GPX 32 A/C	3																																							
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473_MAXPOS 50/5																																								

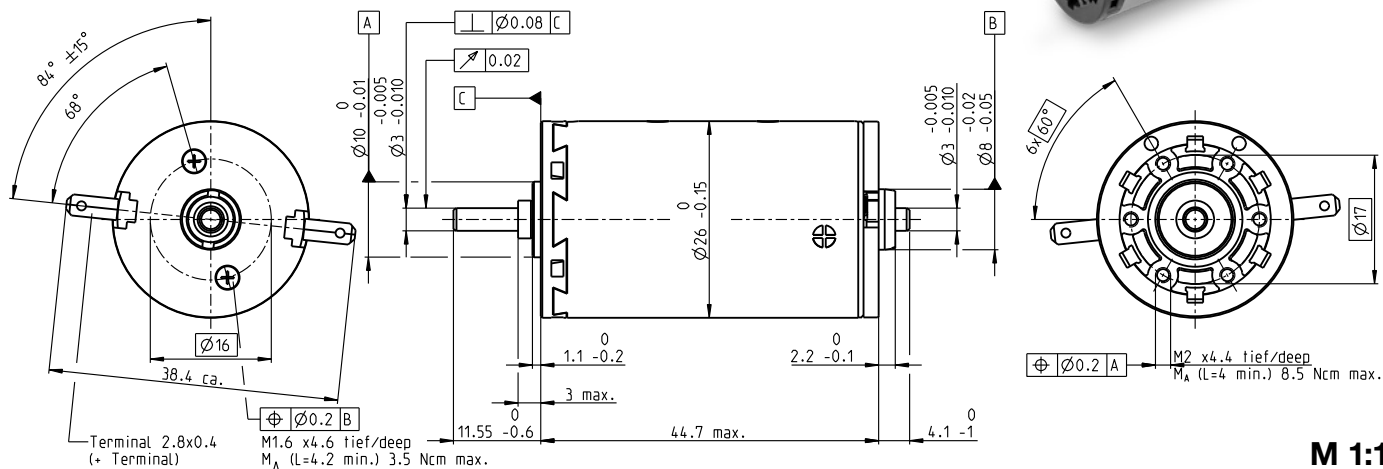
**Configuration**

Bearing: Sleeve bearings/ball bearings  
 Commutation: Precious metal brushes with CLL/Graphite Brushes  
 Shaft front/back: Length  
 Electric connection: Terminals/cable

# DC-max 26 S Graphite Brushes

## DC motor Ø26 mm

Key Data: 22/29 W, 32.7 mNm, 11 000 rpm



M 1:1

### Motor Data

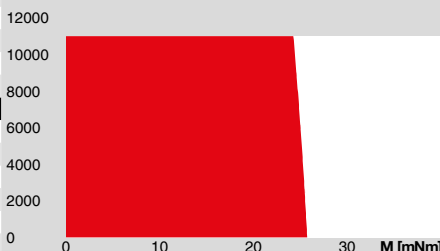
1_	Nominal voltage	V	24	48
2_	No load speed	rpm	8920	8730
3_	No load current	mA	53	25.7
4_	Nominal speed	rpm	8100	7840
5_	Nominal torque (max. continuous torque)	mNm	26.3	28.3
6_	Nominal current (max. continuous current)	A	1.08	0.567
7_	Stall torque	mNm	287	277
8_	Stall current	A	11.2	5.31
9_	Max. efficiency	%	87	87
10_	Terminal resistance	Ω	2.14	9.04
11_	Terminal inductance	mH	0.278	1.16
12_	Torque constant	mNm/A	25.6	52.2
13_	Speed constant	rpm/V	373	183
14_	Speed/torque gradient	rpm/mNm	31.2	31.6
15_	Mechanical time constant	ms	4.89	5.04
16_	Rotor inertia	gcm <sup>2</sup>	14.9	15.2

### Thermal data

17_	Thermal resistance housing-ambient	K/W	13.2
18_	Thermal resistance winding-housing	K/W	3.2
19_	Thermal time constant winding	s	17.8
20_	Thermal time constant motor	s	350
21_	Ambient temperature	°C	-30...85
22_	Max. winding temperature	°C	100

### Operating Range

n [rpm] Winding 24 V



- Continuous operation
- Continuous operation with reduced thermal resistance R<sub>th2</sub> 50%
- Intermittent operation

### Mechanical data ball bearings

23_	Max. speed	rpm	11000
24_	Axial play	mm	0.1...0.2
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	5
27_	Max. force for press fits (static) (static, shaft supported)	N	75
28_	Max. radial load [mm from flange]	N	1200
			20 [5]

### Mechanical data sleeve bearings

23_	Max. speed	rpm	11000
24_	Axial play	mm	0.1...0.2
	Preload	N	0
25_	Radial play	mm	0.012
26_	Max. axial load (dynamic)	N	1.7
27_	Max. force for press fits (static) (static, shaft supported)	N	80
28_	Max. radial load [mm from flange]	N	1200
			5.5 [5]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]
311_GPX 26 A/C	1-2 [3]
312_GPX 26 LN/LZ	1-2 [3]
314_GPX 32 A/C	3
315_GPX 32 LN/LZ	3

<b>maxon sensor</b>
398_ENX 10 QUAD
401_ENX 16 EASY
403_ENX 16 EASY Abs.

Details on catalog page 30

<b>maxon motor control</b>
454_ESCON Module 24/2
454_ESCON 36/2 DC
455_ESCON Module 50/5
457_ESCON 50/5
462_EPOS4 Module/Comp. 24/1.5
463_EPOS4 50/5
463_EPOS4 Module/Comp. 50/5
470_EPOS2 P 24/5
473_MAXPOS 50/5

### Other specifications

29_	Number of pole pairs	1
30_	Number of commutator segments	13
31_	Weight of motor	g 120

### Configuration

Bearing: Sleeve bearings/ball bearings  
 Commutation: Precious metal brushes with CLL/Graphite Brushes  
 Shaft front/back: Length  
 Electric connection: Terminals/cable

For your personal notes.

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DC Motor

EC Motor  
(BLDC Motor)

Gearhead

Screw  
drive

Sensor

Motor &  
Motion control

Compact  
Drive

Accessories &  
Batteries

Ceramic

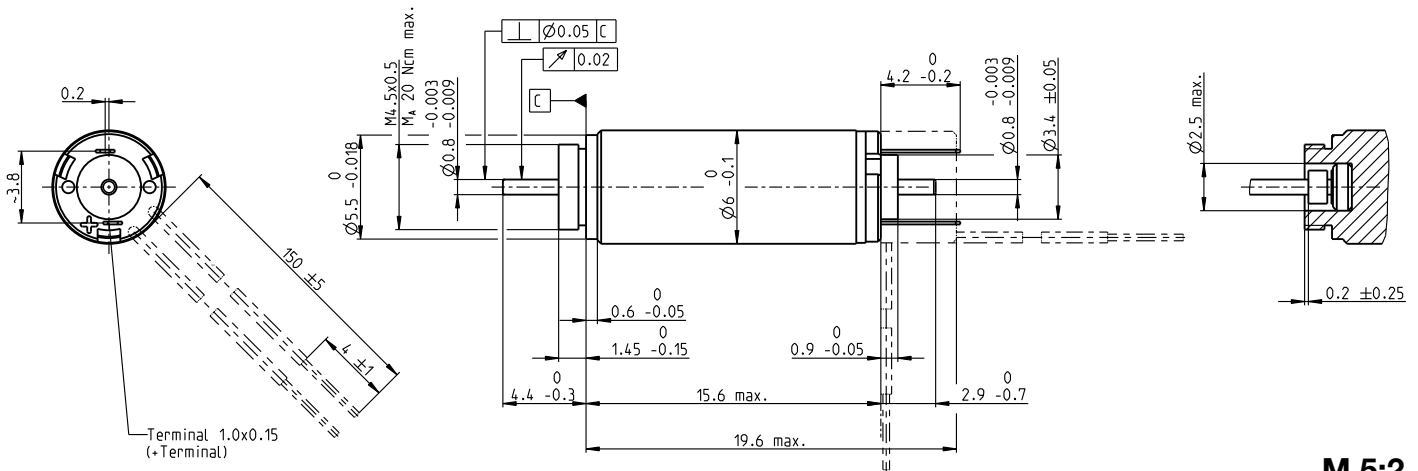
Contact  
information

# maxon RE motor

maxon RE motors are high-quality motors fitted with powerful permanent magnets. At the core of the motor, is the unique ironless maxon winding. For you, this means cutting-edge technology in compact, powerful and low inertia drives.

<b>Standard Specification No. 100</b>	64
<b>Explanation of the DC motors</b>	68
<b>DCX Program</b>	70-91
<b>DC-max Program</b>	94-99
<b>RE Program</b>	102-138
<b>A-max Program</b>	141-160

# RE 6 Ø6 mm, Precious Metal Brushes, 0.3 Watt



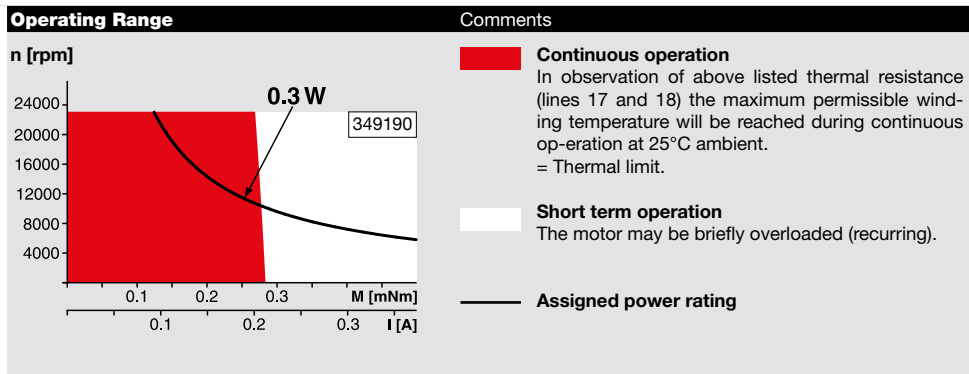
**M 5:2**

- Stock program
- Standard program
- Special program (on request)

		Part Numbers			
<b>B with cables</b>		386780	386781	386782	386783
<b>A with terminals</b>		349189	349190	349191	349192

Motor Data					
<b>Values at nominal voltage</b>					
1 Nominal voltage	V	1.5	3	4.5	6
2 No load speed	rpm	18500	18600	18600	18600
3 No load current	mA	42.6	21.3	14.2	10.7
4 Nominal speed	rpm	4680	5670	5400	5340
5 Nominal torque (max. continuous torque)	mNm	0.302	0.324	0.318	0.316
6 Nominal current (max. continuous current)	A	0.453	0.242	0.158	0.118
7 Stall torque	mNm	0.419	0.485	0.469	0.465
8 Stall current	A	0.581	0.336	0.217	0.161
9 Max. efficiency	%	54	56	56	56
<b>Characteristics</b>					
10 Terminal resistance	Ω	2.58	8.92	20.8	37.2
11 Terminal inductance	mH	0.023	0.091	0.204	0.363
12 Torque constant	mNm/A	0.72	1.44	2.16	2.88
13 Speed constant	rpm/V	13300	6630	4420	3310
14 Speed / torque gradient	rpm/mNm	47500	41000	42400	42700
15 Mechanical time constant	ms	7.45	7.18	7.24	7.24
16 Rotor inertia	gcm <sup>2</sup>	0.015	0.0167	0.0163	0.0162

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	77 K/W
18 Thermal resistance winding-housing	16.2 K/W
19 Thermal time constant winding	1.39 s
20 Thermal time constant motor	16.3 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	23 000 rpm
24 Axial play	0.02 - 0.1 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	0.15 N
27 Max. force for press fits (static)	10 N
28 Max. radial load, 4 mm from flange	0.6 N
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	5
31 Weight of motor	2.3 g

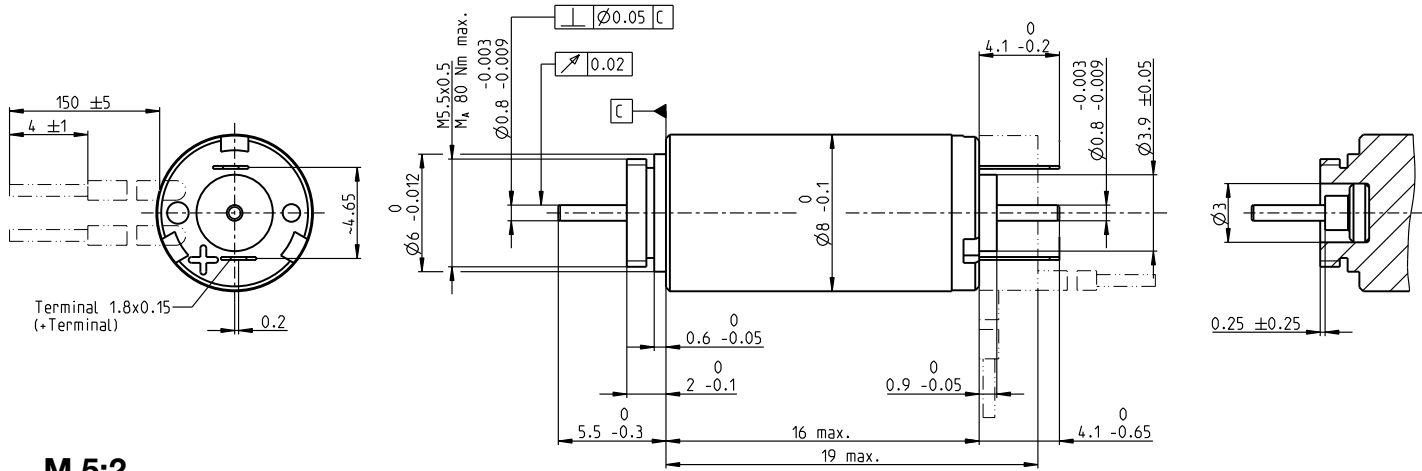


Values listed in the table are nominal. Explanation of the figures on page 68.

**maxon Modular System** Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø6 mm 0.002 - 0.03 Nm Page 323</p> <p><b>Screw Drive</b> Ø6 mm Page 373-374</p>		<p><b>Recommended Electronics:</b> <b>Notes</b> <span style="float: right;">Page 32</span></p> <p>ESCON Module 24/2 <span style="float: right;">454</span></p> <p>ESCON 36/2 DC <span style="float: right;">454</span></p>
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# RE 8 Ø8 mm, Precious Metal Brushes, 0.5 Watt



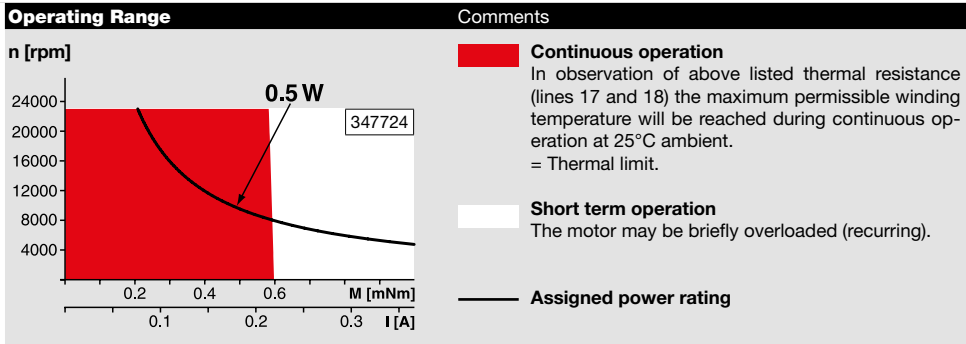
## M 5:2

- Stock program
- Standard program
- Special program (on request)

		Part Numbers					
B with cables		462207	463219	463220	463221	463222	463223
A with terminals		347723	347724	347725	347728	347726	347727

Motor Data									
Values at nominal voltage									
1	Nominal voltage	V	2.4	4.2	6	7.2	9	12	
2	No load speed	rpm	13900	14200	13300	14300	14400	15600	
3	No load current	mA	19.2	11.2	7.3	6.66	5.35	4.44	
4	Nominal speed	rpm	4320	4480	3500	4220	4760	5410	
5	Nominal torque (max. continuous torque)	mNm	0.63	0.624	0.616	0.596	0.626	0.589	
6	Nominal current (max. continuous current)	A	0.412	0.237	0.155	0.134	0.113	0.0865	
7	Stall torque	mNm	0.925	0.932	0.857	0.866	0.957	0.925	
8	Stall current	A	0.581	0.34	0.207	0.187	0.166	0.13	
9	Max. efficiency	%	67	67	66	66	68	67	
Characteristics									
10	Terminal resistance	Ω	4.13	12.3	29	38.5	54.3	92.2	
11	Terminal inductance	mH	0.03	0.09	0.206	0.257	0.4	0.606	
12	Torque constant	mNm/A	1.59	2.74	4.15	4.63	5.77	7.11	
13	Speed constant	rpm/V	6000	3490	2300	2060	1650	1340	
14	Speed / torque gradient	rpm/mNm	15600	15700	16100	17200	15500	17400	
15	Mechanical time constant	ms	6.31	6.3	6.34	6.44	6.29	6.49	
16	Rotor inertia	gcm <sup>2</sup>	0.0388	0.0383	0.0375	0.0358	0.0387	0.0355	

Specifications		
<b>Thermal data</b>		
17	Thermal resistance housing-ambient	48 K/W
18	Thermal resistance winding-housing	22 K/W
19	Thermal time constant winding	2.96 s
20	Thermal time constant motor	21.3 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>		
23	Max. speed	23000 rpm
24	Axial play	0.02 - 0.1 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	10 N
28	Max. radial load, 4 mm from flange	0.6 N



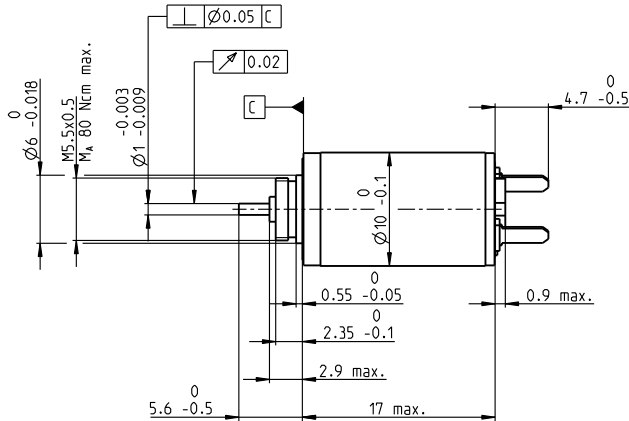
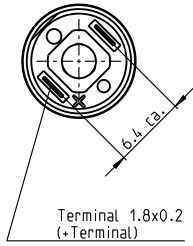
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	5
31	Weight of motor	4.0 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**maxon Modular System** Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø8 mm 0.01 - 0.1 Nm Page 324</p> <p><b>Screw Drive</b> Ø8 mm Page 375-376</p>		<p><b>Recommended Electronics:</b> <span style="float: right;">Page 32</span></p> <p><b>Notes</b></p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p>	<p><b>for type A:</b> <b>Encoder MR</b> 100 CPT, 2 channels Page 427</p> <p><b>for type A:</b> <b>Encoder 8 OPT</b> 50 CPT, 2 channels Page 434</p>
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# RE 10 Ø10 mm, Precious Metal Brushes, 0.75 Watt



**M 3:2**

- Stock program
- Standard program
- Special program (on request)

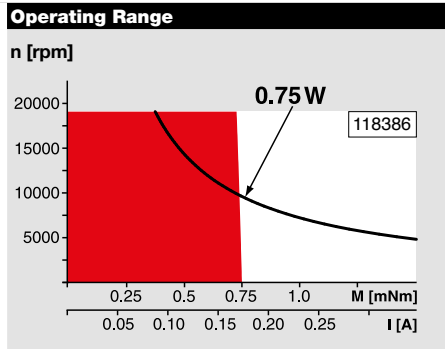
## Part Numbers

118382	118383	118384	118385	118386	118387	118388	118389	118390	118391
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Motor Data																				
Values at nominal voltage																				
1 Nominal voltage	V	2.4	3	3.6	4.5	6	6	7.2	7.2	9	12									
2 No load speed	rpm	13000	11100	9930	11300	13000	11400	11400	10600	10700	11600									
3 No load current	mA	16.1	13	10.4	9.34	8.07	7.04	6.04	5.46	4.44	3.59									
4 Nominal speed	rpm	1630	1990	1500	2950	4670	3150	3340	2300	2000	2790									
5 Nominal torque (max. continuous torque)	mNm	0.757	0.789	0.784	0.787	0.784	0.8	0.784	0.718	0.757	0.746									
6 Nominal current (max. continuous current)	A	0.367	0.306	0.243	0.222	0.19	0.17	0.143	0.119	0.101	0.081									
7 Stall torque	mNm	0.924	1	0.949	1.09	1.25	1.13	1.12	0.944	0.957	1.01									
8 Stall current	A	0.432	0.375	0.284	0.297	0.292	0.232	0.198	0.15	0.123	0.106									
9 Max. efficiency	%	66	67	66	68	69	68	68	66	66	67									
Characteristics																				
10 Terminal resistance	Ω	5.55	8	12.7	15.2	20.6	25.8	36.4	47.9	72.9	114									
11 Terminal inductance	mH	0.046	0.072	0.112	0.136	0.184	0.24	0.325	0.398	0.605	0.92									
12 Torque constant	mNm/A	2.14	2.67	3.34	3.67	4.27	4.88	5.68	6.28	7.75	9.55									
13 Speed constant	rpm/V	4470	3570	2860	2600	2230	1960	1680	1520	1230	1000									
14 Speed / torque gradient	rpm/mNm	11600	10700	10800	10700	10700	10400	10800	11600	11600	11900									
15 Mechanical time constant	ms	7.97	7.96	7.95	7.9	7.9	7.85	7.93	8.04	8.04	8.11									
16 Rotor inertia	gcm <sup>2</sup>	0.066	0.0711	0.0704	0.0706	0.0706	0.0726	0.0706	0.0666	0.0666	0.0654									

### Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	45.5 K/W
18 Thermal resistance winding-housing	19.5 K/W
19 Thermal time constant winding	3.16 s
20 Thermal time constant motor	108 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	19000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	0.15 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 4 mm from flange	0.4 N



### Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

### Other specifications

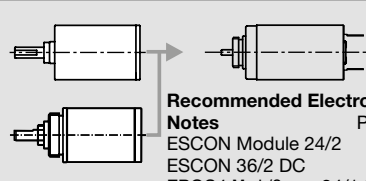
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	7 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

## maxon Modular System Details on catalog page 32

**Planetary Gearhead**  
Ø10 mm  
0.005 - 0.1 Nm  
Page 325

**Planetary Gearhead**  
Ø10 mm  
0.01 - 0.15 Nm  
Page 326

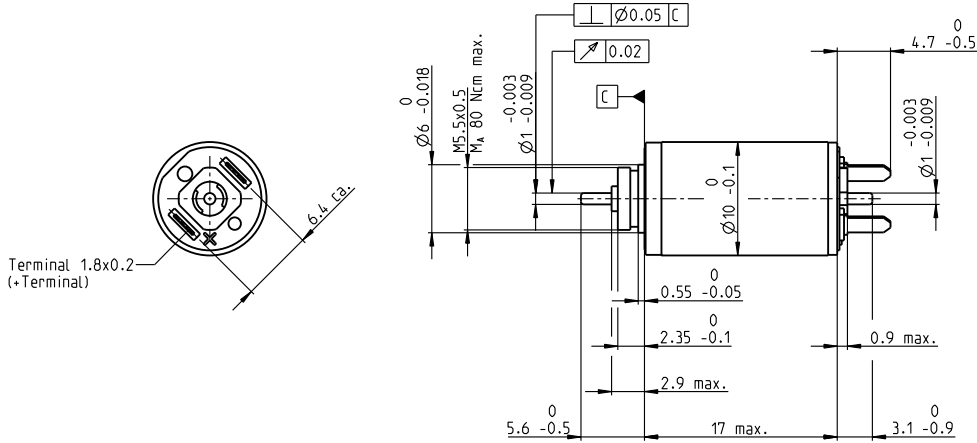


**Recommended Electronics:**  
Notes Page 32

ESCON Module 24/2	454
ESCON 36/2 DC	454
EPOS4 Mod./Comp. 24/1.5	462



# RE 10 Ø10 mm, Precious Metal Brushes, 0.75 Watt



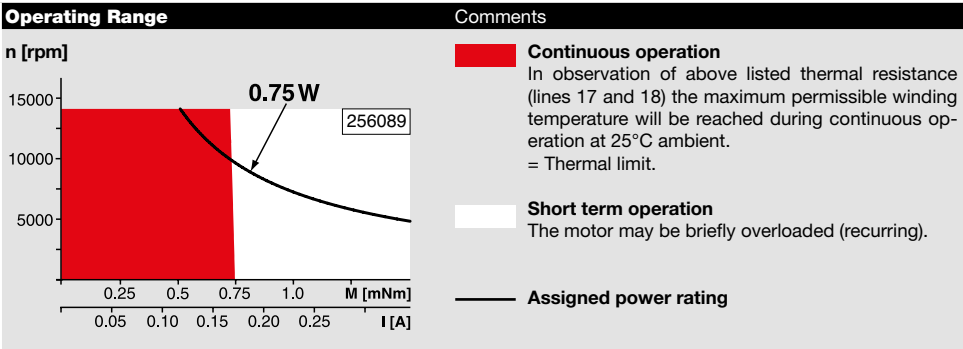
## M 3:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers									
256085	256086	256087	256088	256089	256090	256091	256092	256093	256094

Motor Data												
Values at nominal voltage												
1	Nominal voltage	V	2.4	3	3.6	4.5	6	6	7.2	7.2	9	12
2	No load speed	rpm	10200	10300	9840	11200	12900	11300	11600	10500	10600	11500
3	No load current	mA	23.4	18.8	14.9	13.9	11.8	10.5	8.86	8.01	6.51	5.37
4	Nominal speed	rpm	1630	1990	1500	2950	4680	3160	3350	1860	2000	2790
5	Nominal torque (max. continuous torque)	mNm	0.742	0.775	0.769	0.771	0.768	0.785	0.768	0.743	0.742	0.731
6	Nominal current (max. continuous current)	A	0.367	0.306	0.243	0.222	0.19	0.17	0.143	0.125	0.101	0.081
7	Stall torque	mNm	0.924	1	0.949	1.09	1.25	1.13	1.12	0.944	0.957	1.01
8	Stall current	A	0.432	0.375	0.284	0.297	0.292	0.232	0.198	0.15	0.123	0.106
9	Max. efficiency	%	59	61	60	62	64	62	62	60	60	60
Characteristics												
10	Terminal resistance	Ω	5.55	8	12.7	15.2	20.6	25.8	36.4	47.9	72.9	114
11	Terminal inductance	mH	0.046	0.072	0.112	0.136	0.184	0.24	0.325	0.398	0.605	0.92
12	Torque constant	mNm/A	2.14	2.67	3.34	3.67	4.27	4.87	5.68	6.28	7.75	9.55
13	Speed constant	rpm/V	4470	3570	2860	2600	2230	1960	1680	1520	1230	1000
14	Speed / torque gradient	rpm/mNm	11600	10700	10800	10700	10700	10400	10800	11600	11600	11900
15	Mechanical time constant	ms	7.97	7.92	7.95	7.9	7.9	7.85	7.93	8.04	8.04	8.11
16	Rotor inertia	gcm <sup>2</sup>	0.066	0.0711	0.0704	0.0706	0.0706	0.0726	0.0706	0.0666	0.0666	0.0654

Specifications		
Thermal data		
17	Thermal resistance housing-ambient	45.5 K/W
18	Thermal resistance winding-housing	19.5 K/W
19	Thermal time constant winding	3.16 s
20	Thermal time constant motor	108 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. speed	14000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 4 mm from flange	0.4 N



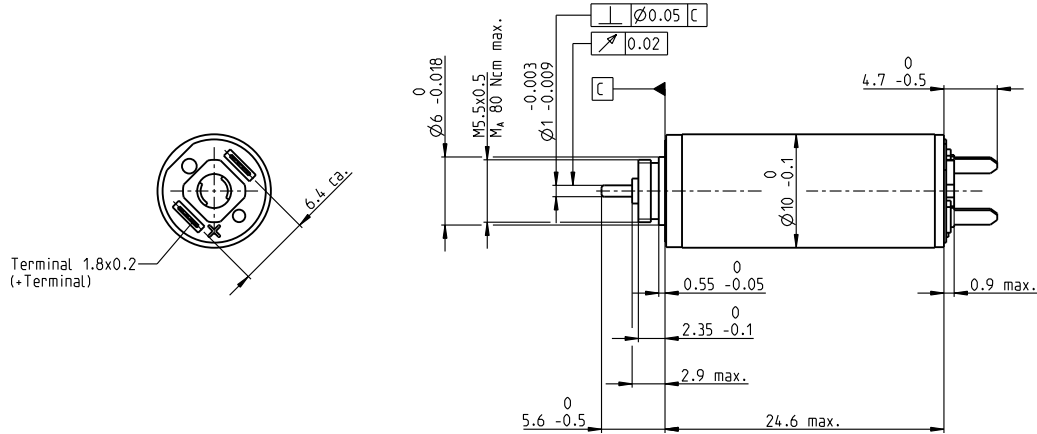
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	7 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**maxon Modular System** Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø10 mm 0.005 - 0.1 Nm Page 325</p> <p><b>Planetary Gearhead</b> Ø10 mm 0.01 - 0.15 Nm Page 326</p>	<p><b>Recommended Electronics:</b></p> <p><b>Notes</b></p> <table style="font-size: x-small;"> <tr> <td>ESCON Module 24/2</td> <td style="text-align: right;">454</td> </tr> <tr> <td>ESCON 36/2 DC</td> <td style="text-align: right;">454</td> </tr> <tr> <td>EPOS4 Mod./Comp. 24/1.5</td> <td style="text-align: right;">462</td> </tr> </table>	ESCON Module 24/2	454	ESCON 36/2 DC	454	EPOS4 Mod./Comp. 24/1.5	462	<p><b>Encoder MEnc</b> Ø10 mm 12 CPT, 2 channels Page 415</p> <p><b>Encoder MR</b> 16 CPT, 2 channels Page 426</p> <p><b>Encoder MR</b> 64 - 256 CPT, 2 channels Page 427</p>
ESCON Module 24/2	454							
ESCON 36/2 DC	454							
EPOS4 Mod./Comp. 24/1.5	462							

# RE 10 Ø10 mm, Precious Metal Brushes, 1.5 Watt



**M 3:2**

- Stock program
- Standard program
- Special program (on request)

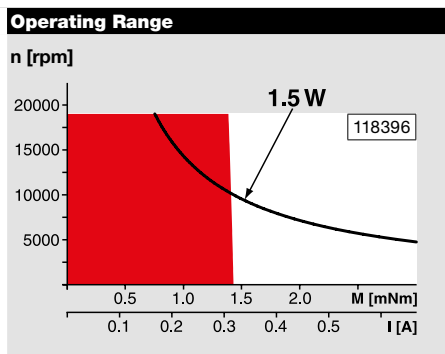
## Part Numbers

118392	118393	118394	118395	118396	118397	118398	118399	118400
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Motor Data												
Values at nominal voltage												
1 Nominal voltage	V	3	3	4.5	4.5	6	6	9	9	12		
2 No load speed	rpm	13000	10700	12800	10600	12400	9880	12200	11100	12500		
3 No load current	mA	23.9	18.5	15.5	12.1	11.1	8.33	7.27	6.42	5.67		
4 Nominal speed	rpm	6840	4430	6530	4210	6160	3880	6080	4990	6510		
5 Nominal torque (max. continuous torque)	mNm	1.5	1.49	1.48	1.47	1.5	1.57	1.53	1.54	1.54		
6 Nominal current (max. continuous current)	A	0.713	0.582	0.462	0.379	0.338	0.282	0.226	0.207	0.176		
7 Stall torque	mNm	3.12	2.52	3.04	2.47	3.01	2.61	3.08	2.83	3.24		
8 Stall current	A	1.44	0.963	0.919	0.619	0.66	0.458	0.444	0.371	0.36		
9 Max. efficiency	%	76	74	76	74	76	75	76	76	77		
Characteristics												
10 Terminal resistance	Ω	2.08	3.11	4.9	7.27	9.09	13.1	20.3	24.3	33.3		
11 Terminal inductance	mH	0.017	0.025	0.04	0.059	0.077	0.12	0.178	0.215	0.299		
12 Torque constant	mNm/A	2.16	2.62	3.3	3.99	4.56	5.7	6.95	7.63	9		
13 Speed constant	rpm/V	4410	3640	2890	2400	2100	1680	1370	1250	1060		
14 Speed / torque gradient	rpm/mNm	4240	4330	4280	4370	4180	3860	4010	3980	3930		
15 Mechanical time constant	ms	4.62	4.61	4.6	4.59	4.58	4.56	4.59	4.56	4.56		
16 Rotor inertia	gcm <sup>2</sup>	0.104	0.102	0.102	0.1	0.105	0.113	0.109	0.11	0.111		

### Specifications

Thermal data	
17 Thermal resistance housing-ambient	37.5 K/W
18 Thermal resistance winding-housing	9.0 K/W
19 Thermal time constant winding	2.22 s
20 Thermal time constant motor	135 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	19000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	0.15 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 4 mm from flange	0.4 N



### Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

### Other specifications

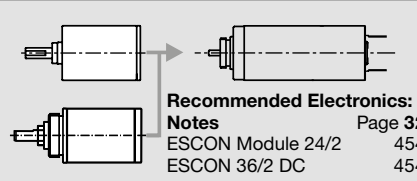
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	10 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### maxon Modular System Details on catalog page 32

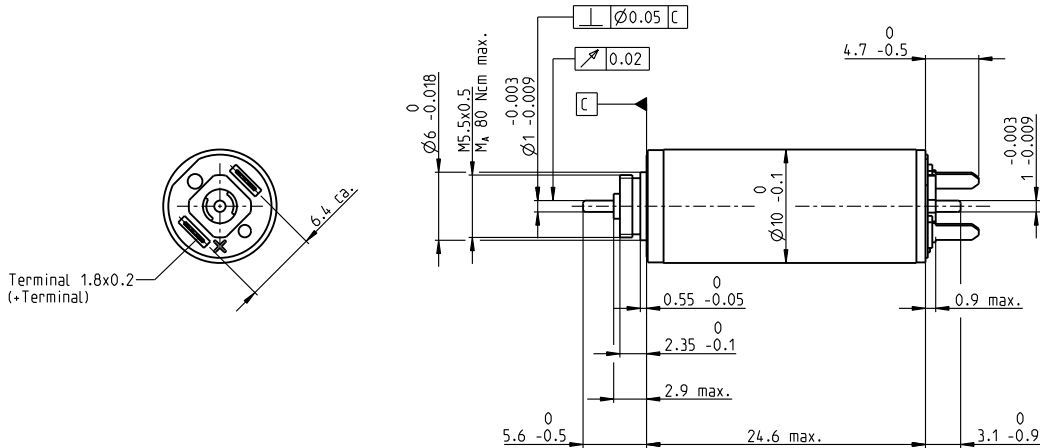
**Planetary Gearhead**  
Ø10 mm  
0.005 - 0.1 Nm  
Page 325

**Planetary Gearhead**  
Ø10 mm  
0.01 - 0.15 Nm  
Page 326



**Recommended Electronics:**  
Notes Page 32  
ESCON Module 24/2 454  
ESCON 36/2 DC 454

# RE 10 Ø10 mm, Precious Metal Brushes, 1.5 Watt



## M 3:2

- Stock program
- Standard program
- Special program (on request)

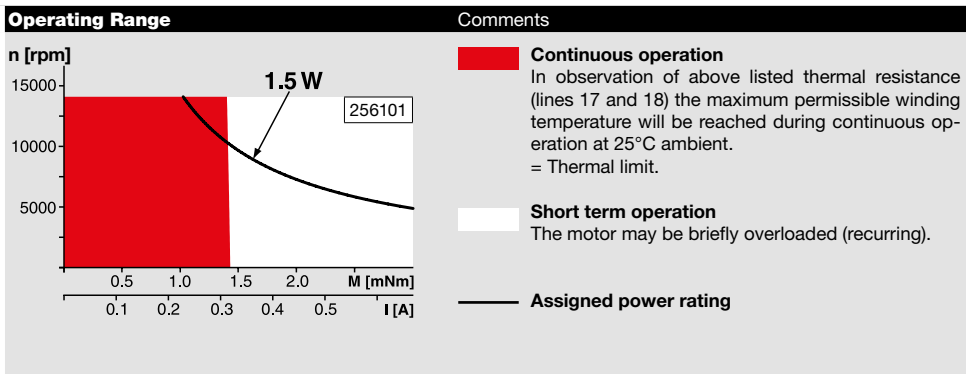
### Part Numbers

256096 | 256097 | 256099 | 256100 | 256101 | 256102 | 256103 | 256104 | 256105

Motor Data		256096	256097	256099	256100	256101	256102	256103	256104	256105
<b>Values at nominal voltage</b>										
1 Nominal voltage	V	2.4	2.4	4.5	4.5	6	7.2	9	10	12
2 No load speed	rpm	10400	8560	12800	10600	12400	11900	12200	12300	12500
3 No load current	mA	21.7	17	15.1	11.8	10.8	8.55	7.06	6.45	5.5
4 Nominal speed	rpm	4170	2230	6530	4210	6160	5900	6080	6250	6510
5 Nominal torque (max. continuous torque)	mNm	1.51	1.49	1.48	1.47	1.5	1.56	1.53	1.54	1.55
6 Nominal current (max. continuous current)	A	0.715	0.583	0.462	0.379	0.339	0.282	0.226	0.207	0.176
7 Stall torque	mNm	2.49	2.02	3.04	2.47	3.01	3.13	3.08	3.14	3.24
8 Stall current	A	1.15	0.771	0.919	0.619	0.66	0.549	0.444	0.412	0.36
9 Max. efficiency	%	75	73	76	75	76	77	77	77	77
<b>Characteristics</b>										
10 Terminal resistance	Ω	2.08	3.11	4.9	7.27	9.09	13.1	20.3	24.3	33.3
11 Terminal inductance	mH	0.017	0.025	0.04	0.059	0.077	0.12	0.178	0.215	0.299
12 Torque constant	mNm/A	2.16	2.62	3.3	3.99	4.56	5.7	6.95	7.63	9
13 Speed constant	rpm/V	4410	3640	2890	2400	2100	1680	1370	1250	1060
14 Speed / torque gradient	rpm/mNm	4240	4330	4280	4370	4180	3860	4010	3980	3930
15 Mechanical time constant	ms	4.62	4.61	4.6	4.59	4.58	4.56	4.59	4.56	4.56
16 Rotor inertia	gcm <sup>2</sup>	0.104	0.102	0.102	0.1	0.105	0.113	0.109	0.11	0.111

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	37.5 K/W
18 Thermal resistance winding-housing	9.0 K/W
19 Thermal time constant winding	2.22 s
20 Thermal time constant motor	135 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	14000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	0.15 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 4 mm from flange	0.4 N
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	10 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.



**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

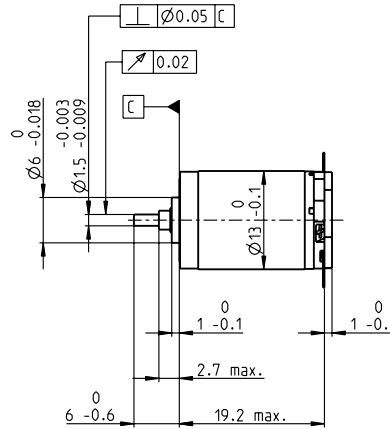
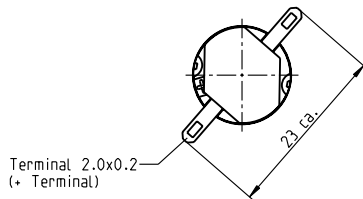
**Short term operation**  
The motor may be briefly overloaded (recurring).

— Assigned power rating

### maxon Modular System Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø10 mm 0.005 - 0.1 Nm Page 325</p> <p><b>Planetary Gearhead</b> Ø10 mm 0.01 - 0.15 Nm Page 326</p>		<p><b>Encoder MEnc</b> Ø10 mm 12 CPT, 2 channels Page 415</p> <p><b>Encoder MR</b> 16 CPT, 2 channels Page 426</p> <p><b>Encoder MR</b> 64 - 256 CPT, 2 channels Page 427</p>
<p><b>Recommended Electronics:</b> Page 32</p> <p>ESCON Module 24/2      454</p> <p>ESCON 36/2 DC          454</p> <p>EPOS4 Mod./Comp. 24/1.5      462</p>		

# RE 13 Ø13 mm, Precious Metal Brushes, 1.2 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

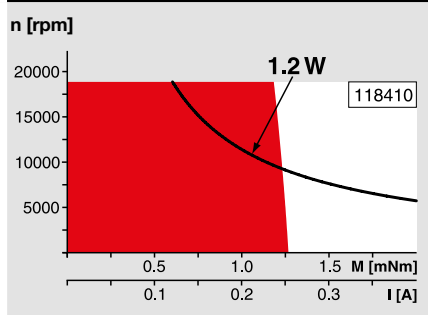
**Motor Data**

	118401	118402	118403	118404	118405	118406	118407	118408	118409	118410	118411	118412	118413	118414	118415	
<b>Values at nominal voltage</b>																
1 Nominal voltage	V	1	1.2	1.5	1.8	2.4	3	3.6	4.2	5	6	8	9	10	12	15
2 No load speed	rpm	11600	11300	11100	11000	11300	11600	12100	11500	11300	10900	11700	10600	11000	11200	10700
3 No load current	mA	104	84.1	65.7	53.8	42	34.5	30.6	24.5	20.1	16	13.2	10.3	9.75	8.31	6.21
4 Nominal speed	rpm	9930	8600	7670	6520	5860	6250	6960	6310	6010	5650	6400	5210	5590	5820	5300
5 Nominal torque (max. continuous torque)	mNm	0.499	0.63	0.825	1.02	1.24	1.27	1.31	1.3	1.28	1.28	1.27	1.26	1.24	1.25	1.27
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.666	0.557	0.499	0.405	0.329	0.266	0.211	0.169	0.156	0.133	0.103
7 Stall torque	mNm	2.86	2.4	2.52	2.45	2.54	2.76	3.08	2.9	2.76	2.69	2.84	2.52	2.57	2.65	2.57
8 Stall current	A	3.56	2.45	2.02	1.62	1.3	1.15	1.11	0.857	0.674	0.53	0.449	0.321	0.307	0.268	0.198
9 Max. efficiency	%	69	67	68	67	68	69	70	70	69	69	69	68	68	68	68
<b>Characteristics</b>																
10 Terminal resistance	Ω	0.281	0.491	0.742	1.11	1.85	2.61	3.23	4.9	7.42	11.3	17.8	28	32.6	44.9	78.8
11 Terminal inductance	mH	0.006	0.009	0.015	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.6
12 Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.32	7.84	8.37	9.89	13
13 Speed constant	rpm/V	11900	9740	7660	6310	4870	3970	3460	2820	2330	1880	1510	1220	1140	966	734
14 Speed / torque gradient	rpm/mNm	4170	4880	4560	4640	4600	4310	4040	4090	4220	4190	4250	4350	4440	4380	4280
15 Mechanical time constant	ms	15.6	14.9	14.3	14.1	13.9	13.7	13.5	13.5	13.5	13.5	13.6	13.7	13.6	13.6	13.2
16 Rotor inertia	gcm <sup>2</sup>	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

**Specifications**

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	46 K/W
18 Thermal resistance winding-housing	14 K/W
19 Thermal time constant winding	5.18 s
20 Thermal time constant motor	76.1 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	19000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 5 mm from flange	1.4 N

**Operating Range**



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

**maxon Modular System** Details on catalog page 32

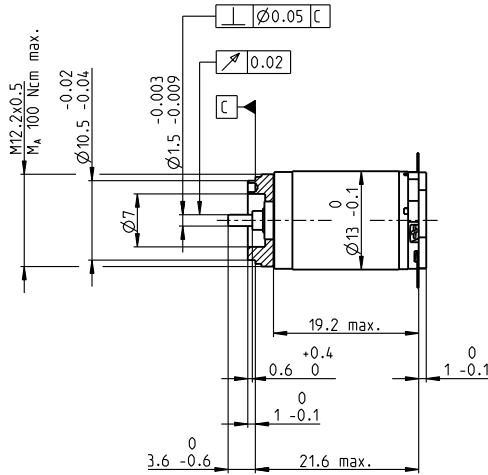
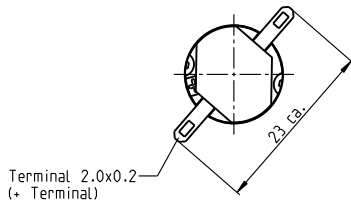
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	12 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Recommended Electronics:**  
**Notes** Page 32  
 ESCON Module 24/2 454  
 ESCON 36/2 DC 454

# RE 13 Ø13 mm, Precious Metal Brushes, 1.2 Watt

maxon RE motor



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118416	118417	118418	118419	118420	118421	118422	118423	118424	118425	118426	118427	118428	118429	118430
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																	
Values at nominal voltage																	
		1	1.2	1.5	1.8	2.4	3	3.6	4.2	5	6	8	9	10	12	15	
1	Nominal voltage	V	1	1.2	1.5	1.8	2.4	3	3.6	4.2	5	6	8	9	10	12	15
2	No load speed	rpm	11600	11300	11100	11000	11300	11600	12100	11500	11300	10900	11700	10600	11000	11200	10700
3	No load current	mA	104	84.1	65.7	53.8	42	34.5	30.6	24.5	20.1	16	13.2	10.3	9.75	8.31	6.2
4	Nominal speed	rpm	9930	8600	7670	6520	5860	6250	6960	6310	6010	5650	6400	5210	5590	5820	5190
5	Nominal torque (max. continuous torque)	mNm	0.499	0.63	0.825	1.02	1.24	1.27	1.31	1.3	1.28	1.28	1.27	1.26	1.24	1.25	1.24
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.666	0.557	0.499	0.405	0.329	0.266	0.211	0.169	0.156	0.133	0.101
7	Stall torque	mNm	2.86	2.4	2.52	2.45	2.54	2.76	3.08	2.9	2.76	2.69	2.84	2.52	2.57	2.65	2.48
8	Stall current	A	3.56	2.45	2.02	1.62	1.3	1.15	1.11	0.857	0.674	0.53	0.449	0.321	0.307	0.268	0.19
9	Max. efficiency	%	69	67	68	67	68	69	70	70	69	69	69	68	68	68	68
Characteristics																	
10	Terminal resistance	Ω	0.281	0.491	0.742	1.11	1.85	2.61	3.23	4.9	7.42	11.3	17.8	28	32.6	44.9	78.8
11	Terminal inductance	mH	0.006	0.009	0.015	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59
12	Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.32	7.84	8.37	9.89	13
13	Speed constant	rpm/V	11900	9740	7660	6310	4870	3970	3460	2820	2330	1880	1510	1220	1140	966	734
14	Speed / torque gradient	rpm/mNm	4170	4880	4560	4640	4600	4310	4040	4090	4220	4190	4250	4350	4440	4380	4450
15	Mechanical time constant	ms	15.6	14.9	14.3	14.1	13.9	13.7	13.5	13.5	13.5	13.5	13.6	13.7	13.6	13.6	13.7
16	Rotor inertia	gcm <sup>2</sup>	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

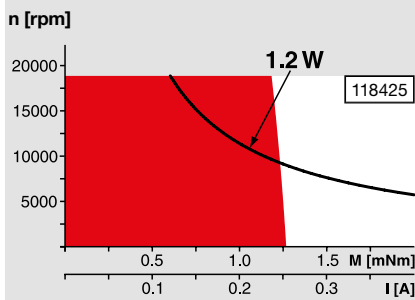
### Specifications

Thermal data		
17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.18 s
20	Thermal time constant motor	76.1 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. speed	19000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	15 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Operating Range

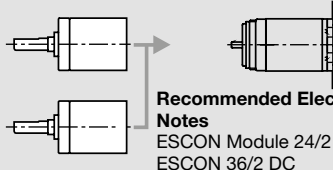


### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

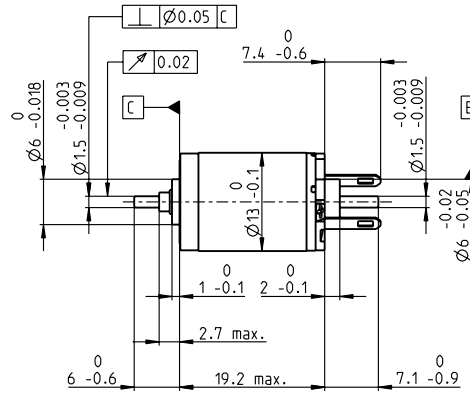
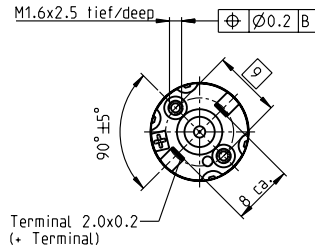
### maxon Modular System Details on catalog page 32

- Planetary Gearhead**  
Ø13 mm  
0.05 - 0.15 Nm  
Page 328
- Planetary Gearhead**  
Ø13 mm  
0.2 - 0.35 Nm  
Page 329



- Recommended Electronics:**  
Notes Page 32
- ESCON Module 24/2 454
- ESCON 36/2 DC 454

# RE 13 Ø13 mm, Precious Metal Brushes, 0.75 Watt



**M 1:1**

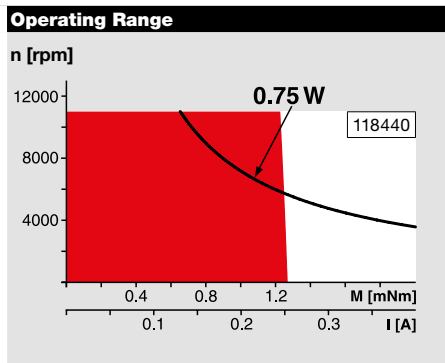
- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

118431	118432	118433	118434	118435	118436	118437	118438	118439	118440	118441	118442	118443	118444	118445
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																	
Values at nominal voltage																	
1	Nominal voltage	V	0.6	0.72	0.9	1.2	1.5	1.8	1.8	2.4	3	3.6	4.8	6	6	7.2	10
2	No load speed	rpm	6900	6710	6590	7250	6990	6850	5950	6490	6700	6480	6950	7000	6530	6650	7030
3	No load current	mA	88.2	71.7	56.1	47.3	36.2	29.4	24.7	20.6	17.1	13.7	11.2	9.06	8.33	7.09	5.46
4	Nominal speed	rpm	5170	3920	3070	2740	1430	1430	682	1350	1300	1090	1520	1510	990	1140	1480
5	Nominal torque (max. continuous torque)	mNm	0.511	0.643	0.837	1.03	1.26	1.3	1.34	1.28	1.3	1.3	1.29	1.28	1.26	1.27	1.26
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.671	0.562	0.504	0.396	0.331	0.268	0.213	0.17	0.158	0.134	0.101
7	Stall torque	mNm	1.71	1.44	1.51	1.63	1.59	1.66	1.54	1.66	1.66	1.61	1.7	1.68	1.54	1.59	1.65
8	Stall current	A	2.14	1.47	1.21	1.08	0.812	0.69	0.557	0.489	0.404	0.318	0.269	0.214	0.184	0.161	0.127
9	Max. efficiency	%	64	61	62	63	63	63	63	64	64	63	64	64	62	63	63
Characteristics																	
10	Terminal resistance	Ω	0.281	0.491	0.742	1.11	1.85	2.61	3.23	4.9	7.42	11.3	17.8	28	32.6	44.9	78.8
11	Terminal inductance	mH	0.006	0.009	0.015	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59
12	Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.32	7.84	8.37	9.89	13
13	Speed constant	rpm/V	11900	9740	7660	6310	4870	3970	3460	2820	2330	1880	1510	1220	1140	966	734
14	Speed / torque gradient	rpm/mNm	4170	4880	4560	4640	4600	4310	4040	4090	4220	4190	4250	4350	4440	4380	4450
15	Mechanical time constant	ms	15.6	14.9	14.3	14.1	13.9	13.7	13.5	13.5	13.5	13.5	13.6	13.7	13.6	13.6	13.7
16	Rotor inertia	gcm <sup>2</sup>	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

Specifications		
<b>Thermal data</b>		
17	Thermal resistance housing-ambient	46 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.18 s
20	Thermal time constant motor	76.1 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>		
23	Max. speed	11 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static) (static, shaft supported)	15 N
28	Max. radial load, 5 mm from flange	170 N
		1.4 N



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	12 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**maxon Modular System** Details on catalog page 32

**Encoder MEnc**  
Ø13 mm  
16 CPT, 2 channels  
Page 416

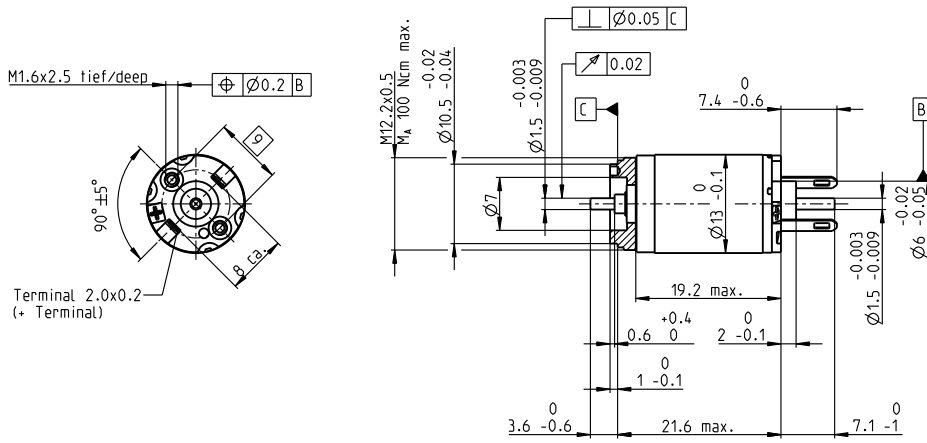
**Encoder MR**  
16 CPT,  
2 channels  
Page 426

**Encoder MR**  
64 - 256 CPT,  
2 channels  
Page 427/428

**Recommended Electronics:**

<b>Notes</b>	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

# RE 13 Ø13 mm, Precious Metal Brushes, 0.75 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

### Motor Data

		118446	118447	118448	118449	118450	118451	118452	118453	118454	118455	118456	118457	118458	118459	118460	
<b>Values at nominal voltage</b>																	
1	Nominal voltage	V	0.6	0.7	0.9	1.2	1.5	1.8	1.8	2.4	3	3.6	4.8	6	6	7.2	10
2	No load speed	rpm	6900	6520	6590	7250	6990	6850	5950	6490	6700	6480	6950	7000	6530	6650	7030
3	No load current	mA	88.2	71.2	56.1	47.3	36.2	29.4	24.7	20.6	17.1	13.7	11.2	9.06	8.33	7.09	5.46
4	Nominal speed	rpm	5170	3730	3070	2740	1430	1430	682	1350	1300	1090	1520	1510	990	1140	1480
5	Nominal torque (max. continuous torque)	mNm	0.511	0.643	0.837	1.03	1.26	1.3	1.34	1.28	1.3	1.29	1.28	1.26	1.26	1.27	1.26
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.671	0.562	0.504	0.396	0.331	0.268	0.213	0.17	0.158	0.134	0.101
7	Stall torque	mNm	1.71	1.4	1.51	1.63	1.59	1.66	1.54	1.66	1.66	1.61	1.7	1.68	1.54	1.59	1.65
8	Stall current	A	2.14	1.43	1.21	1.08	0.812	0.69	0.557	0.489	0.404	0.318	0.269	0.214	0.184	0.161	0.127
9	Max. efficiency	%	64	61	62	63	63	63	63	64	64	63	64	64	62	63	63
<b>Characteristics</b>																	
10	Terminal resistance	Ω	0.281	0.491	0.742	1.11	1.85	2.61	3.23	4.9	7.42	11.3	17.8	28	32.6	44.9	78.8
11	Terminal inductance	mH	0.006	0.009	0.015	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59
12	Torque constant	mNm/A	0.802	0.98	1.25	1.51	1.96	2.41	2.76	3.39	4.1	5.08	6.32	7.84	8.37	9.89	13
13	Speed constant	rpm/V	11900	9740	7660	6310	4870	3970	3460	2820	2330	1880	1510	1220	1140	966	734
14	Speed / torque gradient	rpm/mNm	4170	4880	4560	4640	4600	4310	4040	4090	4220	4190	4250	4350	4440	4380	4450
15	Mechanical time constant	ms	15.6	14.9	14.3	14.1	13.9	13.7	13.5	13.5	13.5	13.5	13.6	13.7	13.6	13.6	13.7
16	Rotor inertia	gcm <sup>2</sup>	0.358	0.291	0.299	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.294

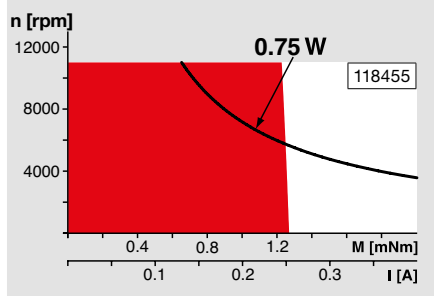
### Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	46 K/W
18 Thermal resistance winding-housing	14 K/W
19 Thermal time constant winding	5.18 s
20 Thermal time constant motor	76.1 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	11000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	15 N
28 Max. radial load, 5 mm from flange	1.4 N

<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	15 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Operating Range



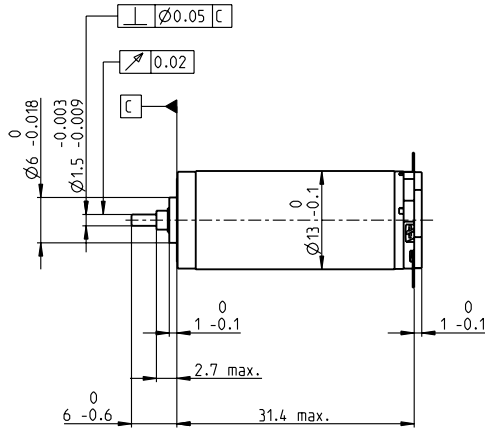
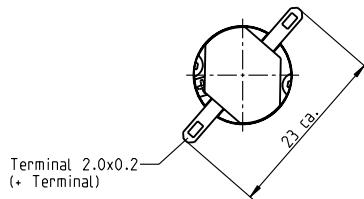
**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø13 mm 0.05 - 0.15 Nm Page 328</p> <p><b>Planetary Gearhead</b> Ø13 mm 0.2 - 0.35 Nm Page 329</p>	<p><b>Recommended Electronics:</b> Notes Page 32</p> <p>ESCON Module 24/2      454 ESCON 36/2 DC          454 MAXPOS 50/5            473</p>	<p><b>Encoder MEnc</b> Ø13 mm 16 CPT, 2 channels Page 416</p> <p><b>Encoder MR</b> 16 CPT, 2 channels Page 426</p> <p><b>Encoder MR</b> 64 - 256 CPT, 2 channels Page 427/428</p>
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# RE 13 Ø13 mm, Precious Metal Brushes, 2.5 Watt



M 1:1

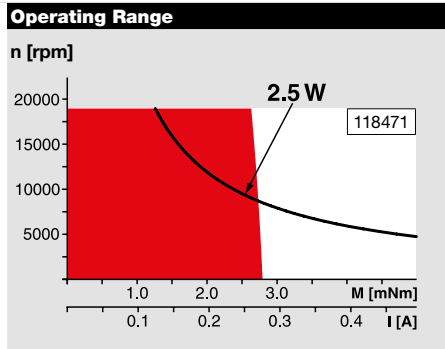
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118461	118462	118463	118464	118465	118466	118467	118468	118469	118470	118471	118472	118473	118474	118475
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	2.4	3	3	3.6	4.8	4.8	6	7.2	8	10	12	15	15	18	24
2 No load speed	rpm	10600	12200	10700	10800	11400	10100	11400	11400	10900	11400	11000	11100	10300	10600	11500
3 No load current	mA	51.5	50.8	42	35.5	28.8	24.4	23	19.2	16.1	13.8	11	8.87	7.98	6.9	5.82
4 Nominal speed	rpm	9160	10500	8490	8050	7890	6430	7660	7730	7320	7790	7390	7470	6620	6920	7800
5 Nominal torque (max. continuous torque)	mNm	1.44	1.56	1.8	2.16	2.76	2.87	2.81	2.86	2.98	2.9	2.89	2.9	2.88	2.9	2.84
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.664	0.586	0.497	0.443	0.363	0.291	0.235	0.217	0.187	0.149
7 Stall torque	mNm	9.95	10.2	8.34	8.25	8.81	7.78	8.51	8.84	9.1	9.15	8.77	8.9	8.13	8.44	8.87
8 Stall current	A	4.63	4.42	3.15	2.63	2.22	1.74	1.72	1.48	1.31	1.11	0.856	0.699	0.592	0.526	0.451
9 Max. efficiency	%	80	80	79	78	79	78	79	79	79	79	79	79	78	79	79
Characteristics																
10 Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11 Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.87	1.19	1.79
12 Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13 Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14 Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15 Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16 Rotor inertia	gcm <sup>2</sup>	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	33 K/W
18 Thermal resistance winding-housing	7.0 K/W
19 Thermal time constant winding	4.88 s
20 Thermal time constant motor	229 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	19000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 5 mm from flange	1.4 N
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	21 g



**Comments**

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

**maxon Modular System** Details on catalog page 32

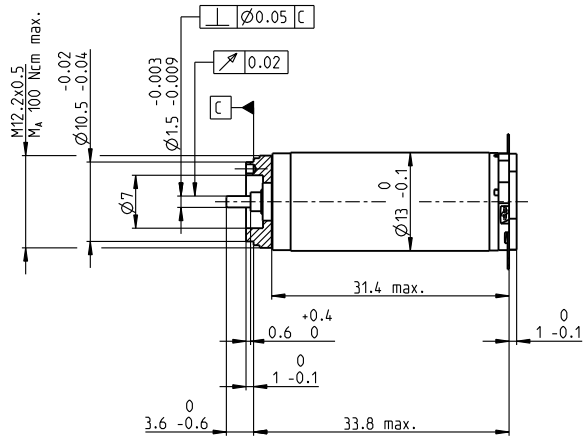
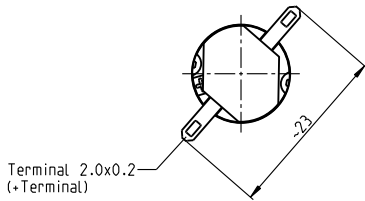
**Recommended Electronics:**

<b>Notes</b>	<b>Page 32</b>
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457

Values listed in the table are nominal.  
Explanation of the figures on page 68.



# RE 13 Ø13 mm, Precious Metal Brushes, 2.5 Watt



**M 1:1**

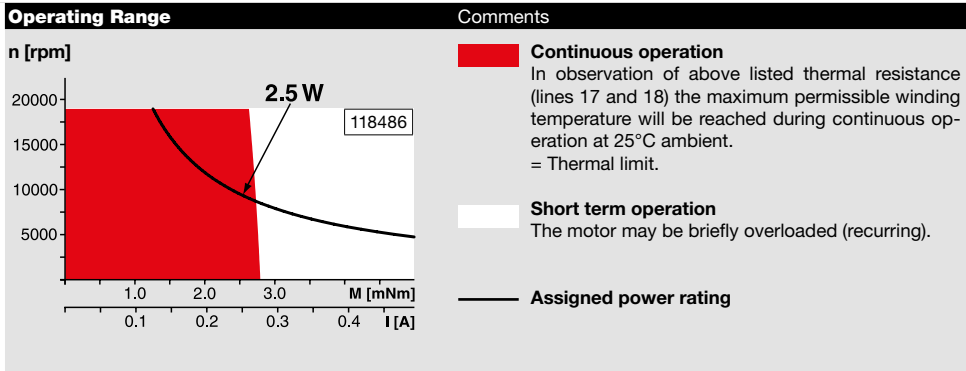
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118476	118477	118478	118479	118480	118481	118482	118483	118484	118485	118486	118487	118488	118489	118490
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	2.4	3	3	3.6	4.8	4.8	6	7.2	8	10	12	15	15	18	24
2 No load speed	rpm	10600	12200	10700	10800	11400	10100	11400	11400	10900	11400	11000	11100	10300	10600	11500
3 No load current	mA	51.5	50.8	42	35.5	28.8	24.4	23	19.2	16.1	13.8	11	8.87	7.98	6.9	5.82
4 Nominal speed	rpm	9160	10500	8490	8050	7890	6430	7660	7730	7320	7790	7390	7470	6620	6920	7800
5 Nominal torque (max. continuous torque)	mNm	1.44	1.56	1.8	2.16	2.76	2.87	2.81	2.86	2.98	2.9	2.89	2.9	2.88	2.9	2.84
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.664	0.586	0.497	0.443	0.363	0.291	0.235	0.217	0.187	0.149
7 Stall torque	mNm	9.95	10.2	8.34	8.25	8.81	7.78	8.51	8.84	9.1	9.15	8.77	8.9	8.13	8.44	8.87
8 Stall current	A	4.63	4.42	3.15	2.63	2.22	1.74	1.72	1.48	1.31	1.11	0.856	0.699	0.592	0.526	0.451
9 Max. efficiency	%	80	80	79	78	79	78	79	79	79	79	79	79	78	79	79
Characteristics																
10 Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11 Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12 Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13 Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14 Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15 Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16 Rotor inertia	gcm <sup>2</sup>	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	33 K/W
18 Thermal resistance winding-housing	7.0 K/W
19 Thermal time constant winding	4.88 s
20 Thermal time constant motor	229 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	19000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 5 mm from flange	1.4 N
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	24 g



### maxon Modular System

**Planetary Gearhead**  
Ø13 mm  
0.05 - 0.15 Nm  
Page 328

**Planetary Gearhead**  
Ø13 mm  
0.2 - 0.35 Nm  
Page 329

**Recommended Electronics:**  
Page 32

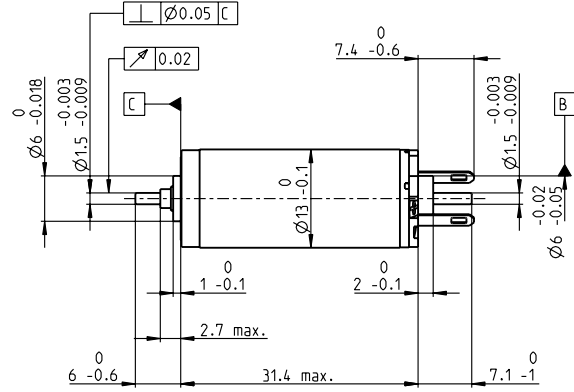
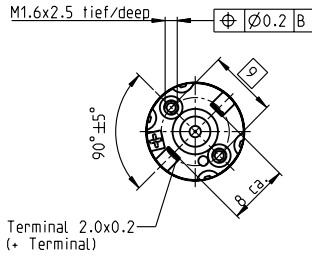
**Notes**

ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457

Details on catalog page 32

Values listed in the table are nominal.  
Explanation of the figures on page 68.

# RE 13 Ø13 mm, Precious Metal Brushes, 2 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

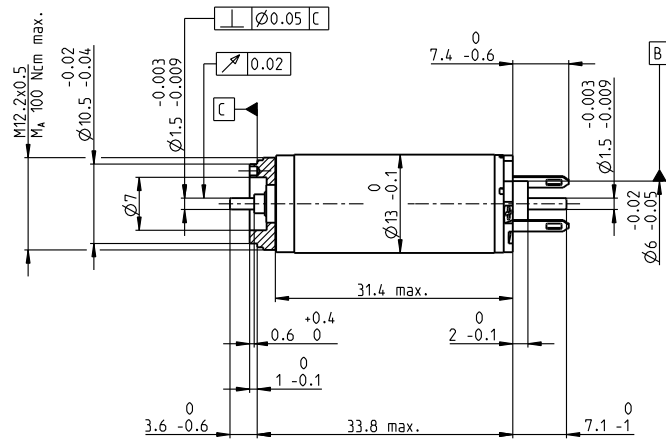
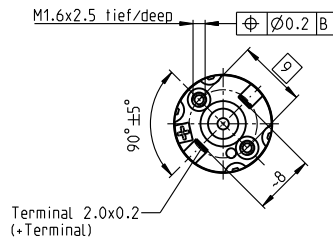
118491	118492	118493	118494	118495	118496	118497	118498	118499	118500	118501	118502	118503	118504	118505
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data		118491	118492	118493	118494	118495	118496	118497	118498	118499	118500	118501	118502	118503	118504	118505
<b>Values at nominal voltage</b>																
1 Nominal voltage	V	1.5	1.5	1.8	2.4	3	3	3.6	4.2	4.8	6	7.2	9	10	12	15
2 No load speed	rpm	6570	6090	6380	7170	7100	6300	6800	6620	6490	6810	6590	6630	6840	7020	7150
3 No load current	mA	43.8	39.8	35.3	30.8	24.3	20.8	19.2	15.8	13.5	11.5	9.19	7.41	6.94	5.99	4.91
4 Nominal speed	rpm	5170	4320	4160	4400	3560	2550	3000	2880	2880	3130	2880	2940	3120	3330	3400
5 Nominal torque (max. continuous torque)	mNm	1.46	1.58	1.82	2.18	2.78	2.91	2.85	2.91	3.02	2.95	2.93	2.94	2.92	2.93	2.88
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.669	0.592	0.502	0.446	0.367	0.294	0.237	0.218	0.188	0.151
7 Stall torque	mNm	6.22	5.12	5.01	5.5	5.51	4.86	5.1	5.16	5.46	5.49	5.26	5.34	5.42	5.63	5.54
8 Stall current	A	2.89	2.21	1.89	1.75	1.39	1.09	1.03	0.866	0.786	0.665	0.514	0.419	0.395	0.351	0.282
9 Max. efficiency	%	77	75	75	76	76	75	75	75	76	76	75	76	76	76	76
<b>Characteristics</b>																
10 Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11 Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.87	1.19	1.79
12 Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13 Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14 Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15 Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16 Rotor inertia	gcm <sup>2</sup>	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications	Operating Range	Comments
<p><b>Thermal data</b></p> <p>17 Thermal resistance housing-ambient 33 K/W</p> <p>18 Thermal resistance winding-housing 7.0 K/W</p> <p>19 Thermal time constant winding 4.88 s</p> <p>20 Thermal time constant motor 229 s</p> <p>21 Ambient temperature -20...+65°C</p> <p>22 Max. winding temperature +85°C</p> <p><b>Mechanical data (sleeve bearings)</b></p> <p>23 Max. speed 11 000 rpm</p> <p>24 Axial play 0.05 - 0.15 mm</p> <p>25 Radial play 0.014 mm</p> <p>26 Max. axial load (dynamic) 0.8 N</p> <p>27 Max. force for press fits (static) 15 N (static, shaft supported) 95 N</p> <p>28 Max. radial load, 5 mm from flange 1.4 N</p>	<p><b>Operating Range</b></p>	<p><b>Continuous operation</b></p> <p>In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.</p> <p><b>Short term operation</b></p> <p>The motor may be briefly overloaded (recurring).</p> <p><b>Assigned power rating</b></p>

Other specifications	maxon Modular System	Encoder MEnc
<p>29 Number of pole pairs 1</p> <p>30 Number of commutator segments 7</p> <p>31 Weight of motor 21 g</p> <p>Values listed in the table are nominal. Explanation of the figures on page 68.</p>	<p>Encoder MR</p> <p>16 CPT, 2 channels</p> <p>Encoder MR</p> <p>16 CPT, 2 channels</p>	<p>Encoder MR</p> <p>64 - 256 CPT, 2 channels</p> <p>Encoder MR</p> <p>64 - 256 CPT, 2 channels</p>
	<p><b>Recommended Electronics:</b></p> <p>Notes Page 32</p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p> <p>MAXPOS 50/5 473</p>	<p>Encoder MR</p> <p>16 CPT, 2 channels</p> <p>Encoder MR</p> <p>64 - 256 CPT, 2 channels</p>

# RE 13 Ø13 mm, Precious Metal Brushes, 2 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Motor Data	118506	118507	118508	118509	118510	118511	118512	118513	118514	118515	118516	118517	118518	118519	118520
------------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Values at nominal voltage		118506	118507	118508	118509	118510	118511	118512	118513	118514	118515	118516	118517	118518	118519	118520	
1	Nominal voltage	V	1.5	1.5	1.8	2.4	3	3	3.6	4.2	4.8	6	7.2	9	10	12	15
2	No load speed	rpm	6570	6090	6380	7170	7100	6300	6800	6620	6490	6810	6590	6630	6840	7020	7150
3	No load current	mA	43.8	39.8	35.3	30.8	24.3	20.8	19.2	15.8	13.5	11.5	9.19	7.41	6.94	5.99	4.91
4	Nominal speed	rpm	5170	4320	4160	4400	3560	2550	3000	2880	2880	3130	2880	2940	3120	3330	3400
5	Nominal torque (max. continuous torque)	mNm	1.46	1.58	1.82	2.18	2.78	2.91	2.85	2.91	3.02	2.95	2.93	2.94	2.92	2.93	2.88
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.669	0.592	0.502	0.446	0.367	0.294	0.237	0.218	0.188	0.151
7	Stall torque	mNm	6.22	5.12	5.01	5.5	5.51	4.86	5.1	5.16	5.46	5.49	5.26	5.34	5.42	5.63	5.54
8	Stall current	A	2.89	2.21	1.89	1.75	1.39	1.09	1.03	0.866	0.786	0.665	0.514	0.419	0.395	0.351	0.282
9	Max. efficiency	%	77	75	75	76	76	75	75	75	76	76	75	76	76	76	76
<b>Characteristics</b>																	
10	Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16	Rotor inertia	gcm <sup>2</sup>	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

### Specifications

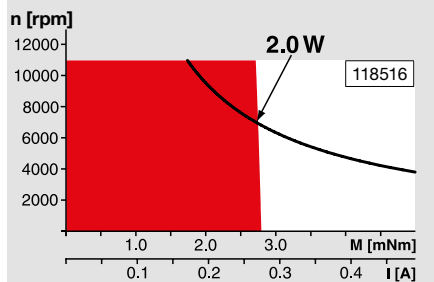
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	33 K/W
18 Thermal resistance winding-housing	7.0 K/W
19 Thermal time constant winding	4.88 s
20 Thermal time constant motor	229 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	11000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	15 N
28 Max. radial load, 5 mm from flange	1.4 N

### Other specifications

29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	24 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Operating Range



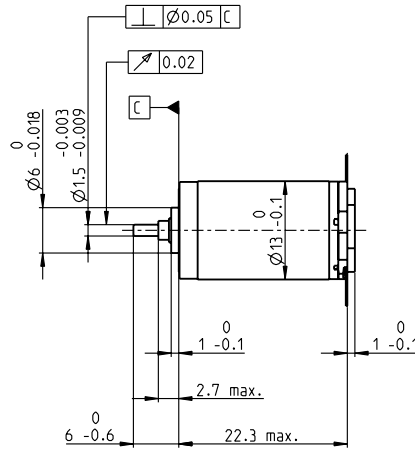
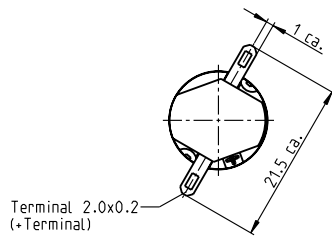
**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø13 mm 0.05 - 0.15 Nm Page 328</p> <p><b>Planetary Gearhead</b> Ø13 mm 0.2 - 0.35 Nm Page 329</p>	<p><b>Recommended Electronics:</b> Notes Page 32</p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p> <p>MAXPOS 50/5 473</p>	<p><b>Encoder MEnc</b> Ø13 mm 16 CPT, 2 channels Page 416</p> <p><b>Encoder MR</b> 16 CPT, 2 channels Page 426</p> <p><b>Encoder MR</b> 64 - 256 CPT, 2 channels Page 427/428</p>
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# RE 13 Ø13 mm, Graphite Brushes, 1.5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

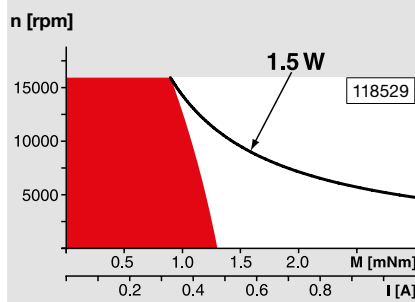
**Motor Data**

	118521	118522	118523	118524	118525	118526	118527	118528	118529	118530	118531	118532	118533	118534	118535	
<b>Values at nominal voltage</b>																
1 Nominal voltage	V	1.2	1.5	2.4	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2 No load speed	rpm	13300	13300	13700	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3 No load current	mA	482	394	259	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4 Nominal speed	rpm	12600	11800	10600	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5 Nominal torque (max. continuous torque)	mNm	0.194	0.329	0.719	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7 Stall torque	mNm	4.07	3.25	3.33	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8 Stall current	A	5.2	3.4	2.26	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9 Max. efficiency	%	49	44	45	44	45	46	45	45	44	44	45	43	44	46	44
<b>Characteristics</b>																
10 Terminal resistance	Ω	0.231	0.441	1.06	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11 Terminal inductance	mH	0.006	0.009	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12 Torque constant	mNm/A	0.782	0.956	1.48	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13 Speed constant	rpm/V	12200	9990	6470	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14 Speed / torque gradient	rpm/mNm	3600	4610	4660	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15 Mechanical time constant	ms	13.5	14	14.1	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16 Rotor inertia	gcm <sup>2</sup>	0.358	0.291	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.303	0.294

**Specifications**

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	46 K/W
18 Thermal resistance winding-housing	14 K/W
19 Thermal time constant winding	5.18 s
20 Thermal time constant motor	231 s
21 Ambient temperature	-20...+85°C
22 Max. winding temperature	+125°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 5 mm from flange	1.4 N
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	15 g

**Operating Range**



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

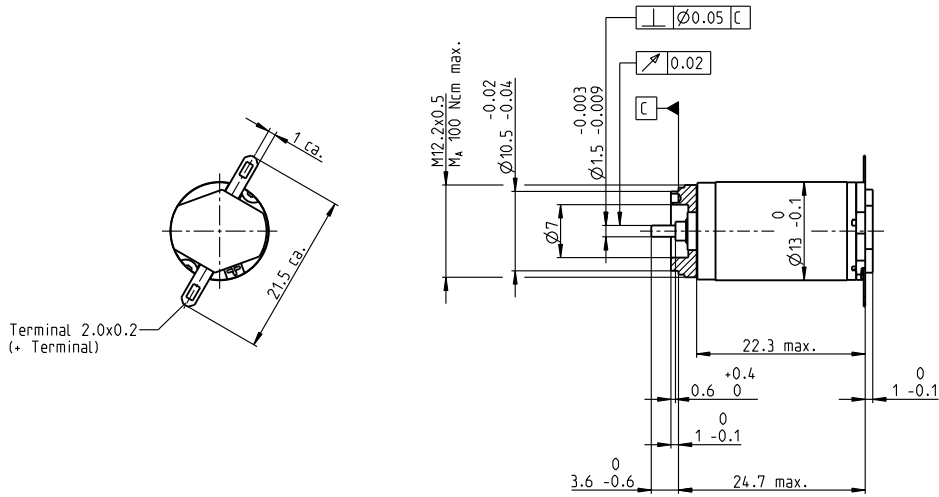
**maxon Modular System**

Details on catalog page 32

**Recommended Electronics:**  
**Notes** Page 32  
 ESCON Module 24/2 454  
 ESCON 36/2 DC 454

Values listed in the table are nominal.  
 Explanation of the figures on page 68.

# RE 13 Ø13 mm, Graphite Brushes, 1.5 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

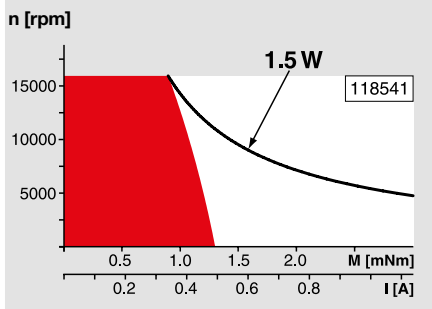
118536	118537	118538	118539	118540	118541	118542	118543	118544	118545	118546	118547	118548	118549	118550
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																	
Values at nominal voltage																	
1	Nominal voltage	V	1.2	1.5	2.4	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2	No load speed	rpm	13300	13300	13700	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3	No load current	mA	482	394	259	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4	Nominal speed	rpm	12600	11800	10600	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5	Nominal torque (max. continuous torque)	mNm	0.194	0.329	0.719	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7	Stall torque	mNm	4.07	3.25	3.33	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8	Stall current	A	5.2	3.4	2.26	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9	Max. efficiency	%	49	44	45	44	45	46	45	45	44	44	45	43	44	46	44
Characteristics																	
10	Terminal resistance	Ω	0.231	0.441	1.06	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11	Terminal inductance	mH	0.006	0.009	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm/A	0.782	0.956	1.48	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13	Speed constant	rpm/V	12200	9990	6470	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14	Speed / torque gradient	rpm/mNm	3600	4610	4660	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15	Mechanical time constant	ms	13.5	14	14.1	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16	Rotor inertia	gcm <sup>2</sup>	0.358	0.291	0.29	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.303	0.294

### Specifications

Thermal data	
17 Thermal resistance housing-ambient	46 K/W
18 Thermal resistance winding-housing	14 K/W
19 Thermal time constant winding	5.38 s
20 Thermal time constant motor	231 s
21 Ambient temperature	-20...+85°C
22 Max. winding temperature	+125°C
Mechanical data (sleeve bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 5 mm from flange	1.4 N

### Operating Range



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

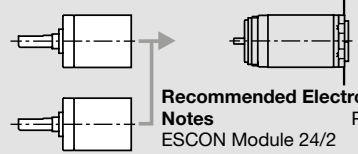
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	17 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### maxon Modular System

**Planetary Gearhead**  
Ø13 mm  
0.05 - 0.15 Nm  
Page 328

**Planetary Gearhead**  
Ø13 mm  
0.2 - 0.35 Nm  
Page 329

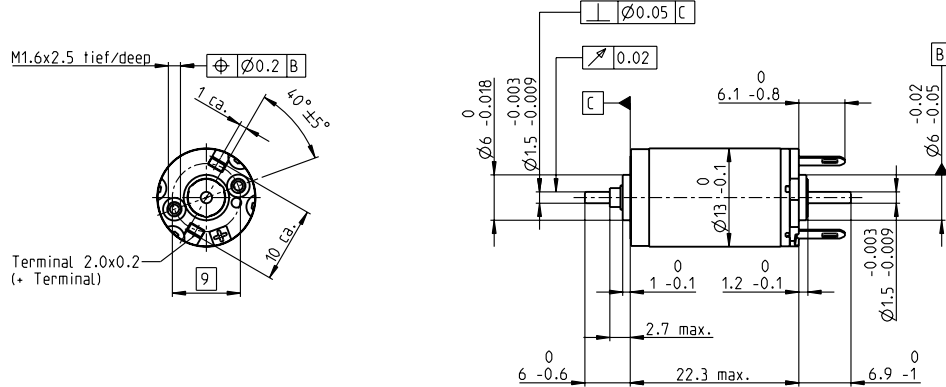


**Recommended Electronics:**  
**Notes** Page 32

ESCON Module 24/2	454
ESCON 36/2 DC	454

Details on catalog page 32

# RE 13 Ø13 mm, Graphite Brushes, 1.5 Watt



M 1:1

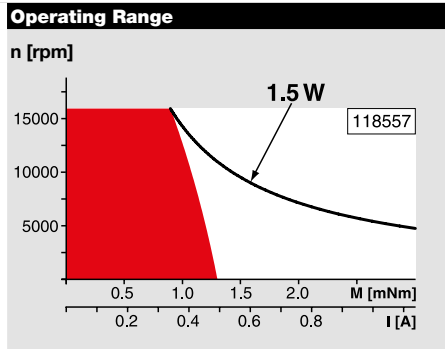
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118555	118556	118557	118558	118559	118560	118561	118562	118563	118564	118565	118566
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data															
<b>Values at nominal voltage</b>															
1 Nominal voltage	V	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20		
2 No load speed	rpm	13200	13000	13300	12300	12700	12300	13300	12300	13100	14000	13300			
3 No load current	mA	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7		
4 Nominal speed	rpm	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020		
5 Nominal torque (max. continuous torque)	mNm	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19		
6 Nominal current (max. continuous current)	A	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119		
7 Stall torque	mNm	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22		
8 Stall current	A	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254		
9 Max. efficiency	%	44	45	46	45	45	44	44	45	43	44	46	44		
<b>Characteristics</b>															
10 Terminal resistance	Ω	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8		
11 Terminal inductance	mH	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59		
12 Torque constant	mNm/A	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7		
13 Speed constant	rpm/V	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753		
14 Speed / torque gradient	rpm/mNm	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680		
15 Mechanical time constant	ms	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4		
16 Rotor inertia	gcm <sup>2</sup>	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.303	0.294		

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	46 K/W
18 Thermal resistance winding-housing	14 K/W
19 Thermal time constant winding	5.38 s
20 Thermal time constant motor	231 s
21 Ambient temperature	-20...+85°C
22 Max. winding temperature	+125°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	15 N
28 Max. radial load, 5 mm from flange	140 N
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	15 g



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Values listed in the table are nominal.  
Explanation of the figures on page 68.

## maxon Modular System

**Encoder MEnc**  
Ø13 mm  
16 CPT, 2 channels  
Page 416

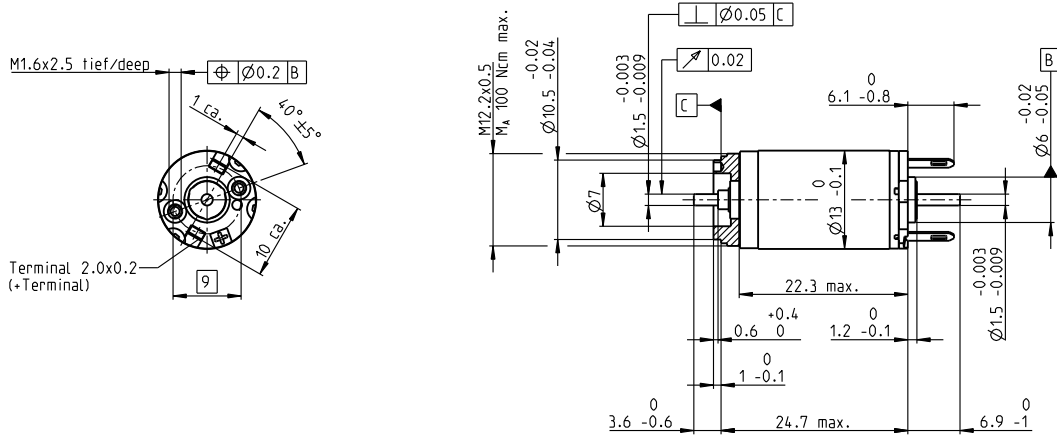
**Encoder MR**  
16 CPT,  
2 channels  
Page 426

**Encoder MR**  
64 - 256 CPT,  
2 channels  
Page 427/428

**Recommended Electronics:**

Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

# RE 13 Ø13 mm, Graphite Brushes, 1.5 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

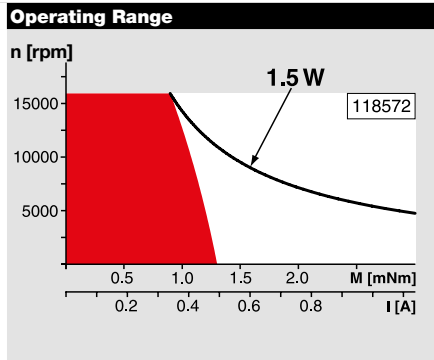
## Part Numbers

118570	118571	118572	118573	118574	118575	118576	118577	118578	118579	118580	118581
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data													
Values at nominal voltage													
1 Nominal voltage	V	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2 No load speed	rpm	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3 No load current	mA	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4 Nominal speed	rpm	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5 Nominal torque (max. continuous torque)	mNm	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6 Nominal current (max. continuous current)	A	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7 Stall torque	mNm	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8 Stall current	A	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9 Max. efficiency	%	44	45	46	45	45	44	44	45	43	44	46	44
Characteristics													
10 Terminal resistance	Ω	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11 Terminal inductance	mH	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12 Torque constant	mNm/A	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13 Speed constant	rpm/V	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14 Speed / torque gradient	rpm/mNm	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15 Mechanical time constant	ms	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16 Rotor inertia	gcm <sup>2</sup>	0.288	0.303	0.318	0.315	0.306	0.308	0.304	0.3	0.293	0.297	0.303	0.294

### Specifications

Thermal data	
17 Thermal resistance housing-ambient	46 K/W
18 Thermal resistance winding-housing	14 K/W
19 Thermal time constant winding	5.38 s
20 Thermal time constant motor	231 s
21 Ambient temperature	-20...+85°C
22 Max. winding temperature	+125°C
Mechanical data (sleeve bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	15 N
28 Max. radial load, 5 mm from flange	140 N



### Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

### Other specifications

29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	18 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### maxon Modular System

**Planetary Gearhead**  
Ø13 mm  
0.05 - 0.15 Nm  
Page 328

**Planetary Gearhead**  
Ø13 mm  
0.2 - 0.35 Nm  
Page 329

**Recommended Electronics:**  
Page 32

ESCON Module 24/2 454

ESCON 36/2 DC 454

EPOS4 Mod./Comp. 24/1.5 462

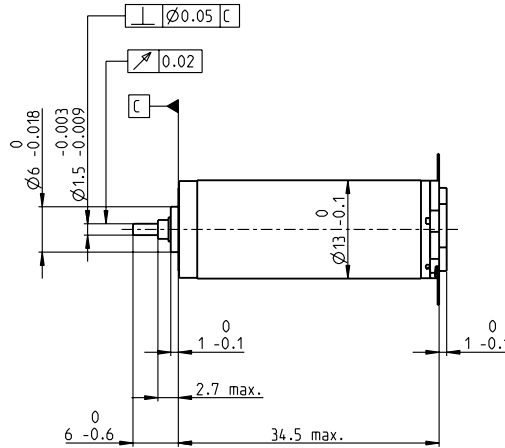
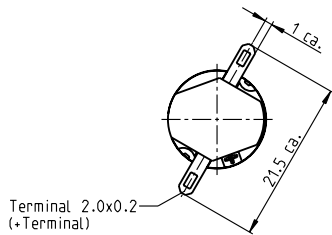
MAXPOS 50/5 473

**Encoder MEnc**  
Ø13 mm  
16 CPT, 2 channels  
Page 416

**Encoder MR**  
16 CPT,  
2 channels  
Page 426

**Encoder MR**  
64 - 256 CPT,  
2 channels  
Page 427/428

# RE 13 Ø13 mm, Graphite Brushes, 3 Watt



M 1:1

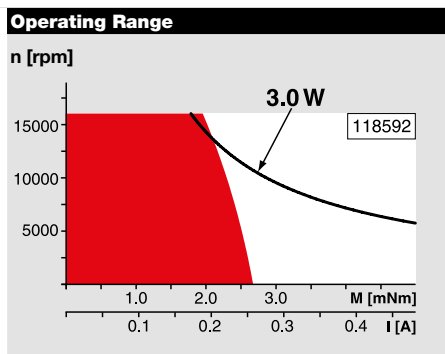
- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

118582	118583	118584	118585	118586	118587	118588	118589	118590	118591	118592	118593	118594	118595	118596
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																	
Values at nominal voltage																	
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3	No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4	Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5	Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7	Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8	Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9	Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
Characteristics																	
10	Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1540	1430	1310	1340	1330	1300	1320	1300	1330
15	Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16	Rotor inertia	gcm <sup>2</sup>	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications		
<b>Thermal data</b>		
17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	259 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>		
23	Max. speed	16000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N
<b>Other specifications</b>		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	24 g



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

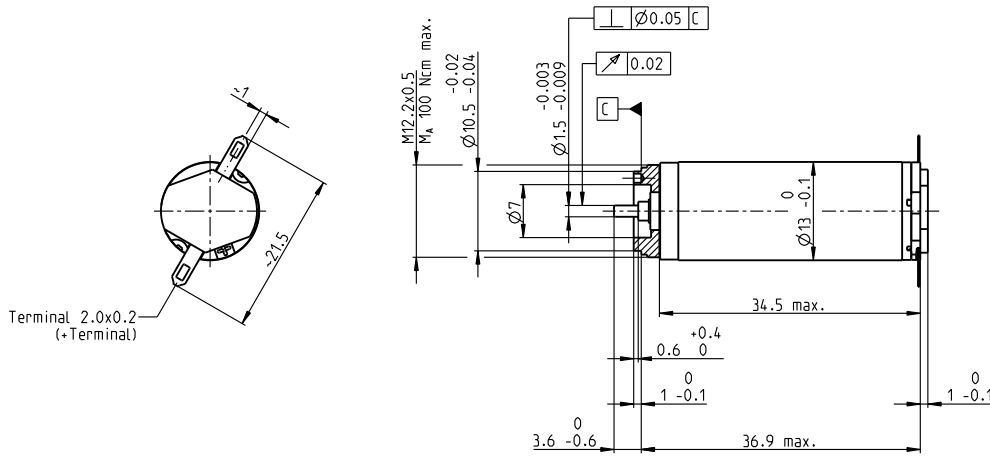
**maxon Modular System** Details on catalog page 32

**Recommended Electronics:**

<b>Notes</b>	<b>Page 32</b>
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457



# RE 13 Ø13 mm, Graphite Brushes, 3 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118597	118598	118599	118600	118601	118602	118603	118604	118605	118606	118607	118608	118609	118610	118611
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Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2 No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3 No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4 Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5 Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7 Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8 Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9 Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
Characteristics																
10 Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11 Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12 Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13 Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14 Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1540	1430	1310	1340	1330	1300	1320	1300	1330
15 Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16 Rotor inertia	gcm <sup>2</sup>	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

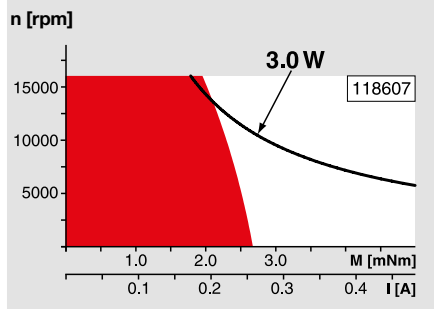
### Specifications

Thermal data	
17 Thermal resistance housing-ambient	33 K/W
18 Thermal resistance winding-housing	7.0 K/W
19 Thermal time constant winding	4.88 s
20 Thermal time constant motor	259 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 5 mm from flange	1.4 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	27 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Operating Range

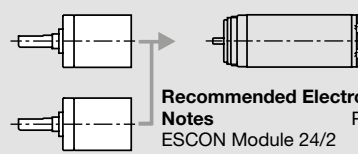


**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

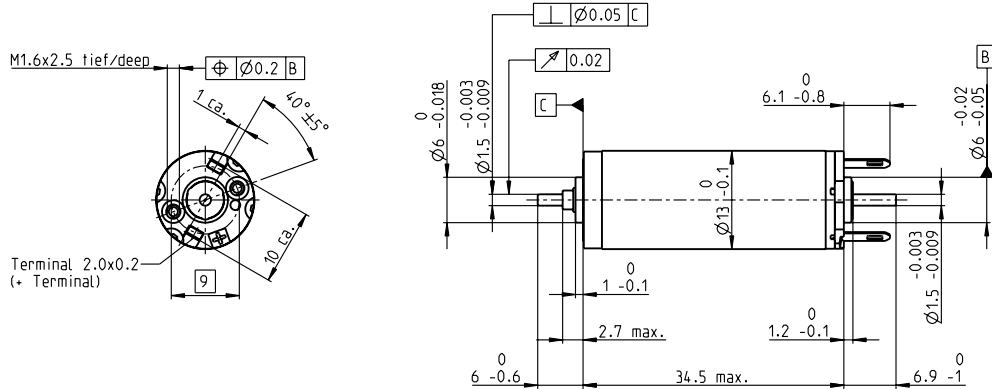
### maxon Modular System Details on catalog page 32

- Planetary Gearhead**  
Ø13 mm  
0.05 - 0.15 Nm  
Page 328
- Planetary Gearhead**  
Ø13 mm  
0.2 - 0.35 Nm  
Page 329



Recommended Electronics:	
Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457

# RE 13 Ø13 mm, Graphite Brushes, 3 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

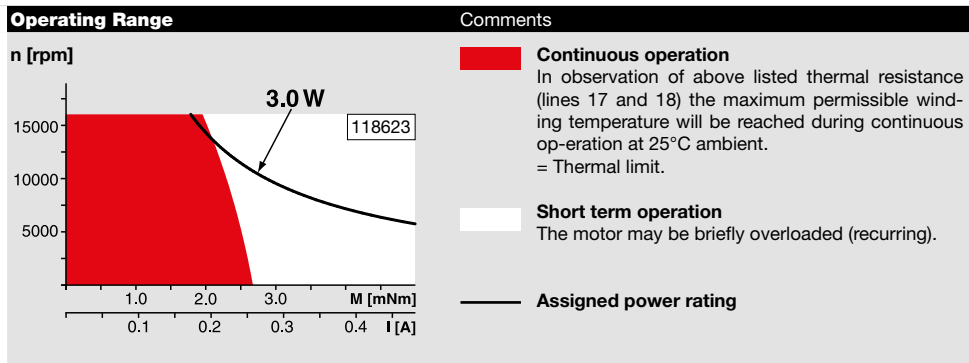
**Part Numbers**

118613	118614	118615	118616	118617	118618	118619	118620	118621	118622	118623	118624	118625	118626	118627
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2 No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3 No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4 Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5 Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7 Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8 Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9 Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
Characteristics																
10 Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11 Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12 Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13 Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14 Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1540	1430	1310	1340	1330	1300	1320	1300	1330
15 Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16 Rotor inertia	gcm <sup>2</sup>	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	33 K/W
18 Thermal resistance winding-housing	7.0 K/W
19 Thermal time constant winding	4.88 s
20 Thermal time constant motor	259 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	15 N
	95 N
28 Max. radial load, 5 mm from flange	1.4 N
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	24 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.



**maxon Modular System** Details on catalog page 32

**Encoder MEnc**  
Ø13 mm  
16 CPT, 2 channels  
Page 416

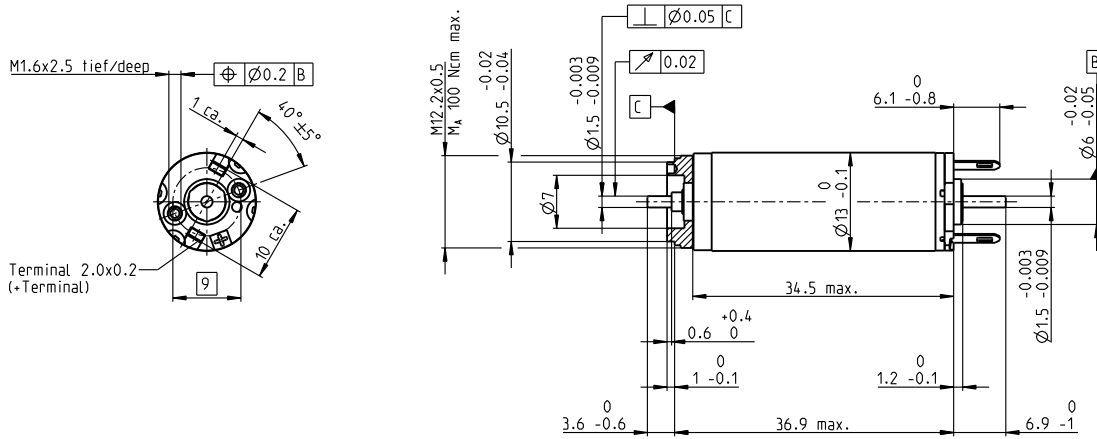
**Encoder MR**  
16 CPT,  
2 channels  
Page 426

**Encoder MR**  
64 - 256 CPT,  
2 channels  
Page 427/428

**Recommended Electronics:**

<b>Notes</b>	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

# RE 13 Ø13 mm, Graphite Brushes, 3 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

### Motor Data

		118628	118629	118630	118631	118632	118633	118634	118635	118636	118637	118638	118639	118640	118641	118642	
<b>Values at nominal voltage</b>																	
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3	No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4	Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5	Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7	Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8	Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9	Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
<b>Characteristics</b>																	
10	Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1430	1310	1340	1330	1300	1300	1320	1300	1330
15	Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16	Rotor inertia	gcm <sup>2</sup>	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

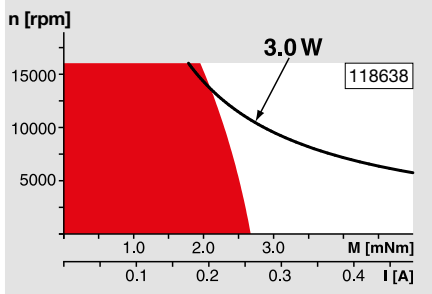
### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 33 K/W
  - 18 Thermal resistance winding-housing 7.0 K/W
  - 19 Thermal time constant winding 4.88 s
  - 20 Thermal time constant motor 259 s
  - 21 Ambient temperature -20...+65°C
  - 22 Max. winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. speed 16000 rpm
  - 24 Axial play 0.05 - 0.15 mm
  - 25 Radial play 0.014 mm
  - 26 Max. axial load (dynamic) 0.8 N
  - 27 Max. force for press fits (static) (static, shaft supported) 15 N
  - 28 Max. radial load, 5 mm from flange 1.4 N

- Other specifications**
- 29 Number of pole pairs 1
  - 30 Number of commutator segments 7
  - 31 Weight of motor 27 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Operating Range



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System Details on catalog page 32

**Planetary Gearhead**  
Ø13 mm  
0.05 - 0.15 Nm  
Page 328

**Planetary Gearhead**  
Ø13 mm  
0.2 - 0.35 Nm  
Page 329

**Recommended Electronics:** Page 32

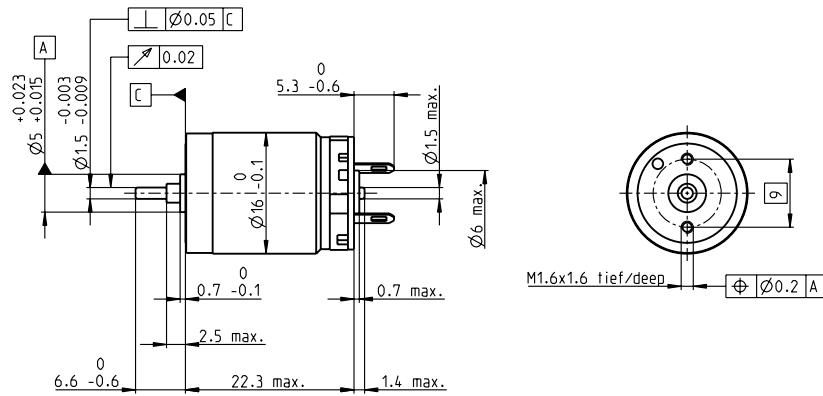
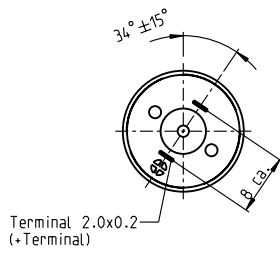
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

**Encoder MEnc**  
Ø13 mm  
16 CPT, 2 channels  
Page 416

**Encoder MR**  
16 CPT,  
2 channels  
Page 426

**Encoder MR**  
64 - 256 CPT,  
2 channels  
Page 427/428

# RE 16 Ø16 mm, Precious Metal Brushes CLL, 2 Watt



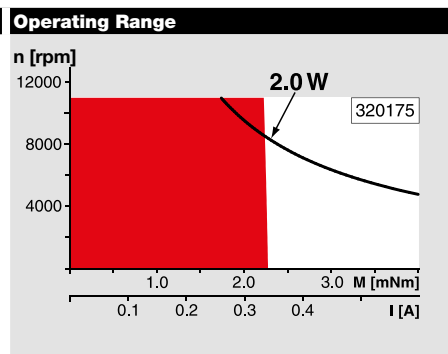
M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers							
320173	320174	320175	320176	320177	320178	320179	

Motor Data		320173	320174	320175	320176	320177	320178	320179
<b>Values at nominal voltage</b>								
1 Nominal voltage	V	1.8	3	6	9	12	18	24
2 No load speed	rpm	8230	8330	8480	8230	8090	7940	7760
3 No load current	mA	35.1	21.4	11	7.02	5.81	3.35	2.44
4 Nominal speed	rpm	6080	4730	4830	4580	4350	4140	3850
5 Nominal torque (max. continuous torque)	mNm	1.42	2.38	2.37	2.37	2.29	2.28	2.22
6 Nominal current (max. continuous current)	A	0.72	0.72	0.365	0.236	0.169	0.11	0.0783
7 Stall torque	mNm	5.46	5.55	5.55	5.4	5.01	4.81	4.45
8 Stall current	A	2.65	1.64	0.833	0.524	0.359	0.226	0.153
9 Max. efficiency	%	79	79	79	79	77	78	77
<b>Characteristics</b>								
10 Terminal resistance	Ω	0.679	1.83	7.2	17.2	33.4	79.8	157
11 Terminal inductance	mH	0.017	0.046	0.176	0.421	0.771	1.81	3.36
12 Torque constant	mNm/A	2.06	3.39	6.66	10.3	13.9	21.3	29.1
13 Speed constant	rpm/V	4640	2810	1430	927	685	448	328
14 Speed / torque gradient	rpm/mNm	1530	1520	1550	1550	1640	1680	1770
15 Mechanical time constant	ms	10.4	9.97	9.87	9.87	9.98	9.92	10.1
16 Rotor inertia	gcm <sup>2</sup>	0.65	0.626	0.609	0.61	0.58	0.565	0.546

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	40.6 K/W
18 Thermal resistance winding-housing	9.5 K/W
19 Thermal time constant winding	5.33 s
20 Thermal time constant motor	268 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	11 000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 5 mm from flange	1.5 N



**Comments**

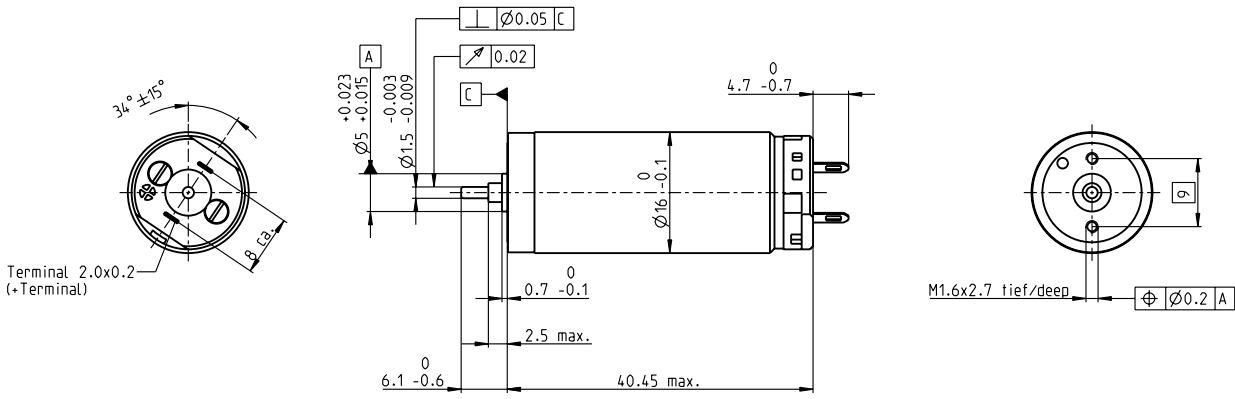
- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	21 g
CLL = Capacitor Long Life	
Values listed in the table are nominal. Explanation of the figures on page 68.	

**maxon Modular System** Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø16 mm 0.1 - 0.3 Nm Page 334</p> <p><b>Planetary Gearhead</b> Ø16 mm 0.2 - 0.6 Nm Page 335</p> <p><b>Screw Drive</b> Ø16 mm Page 377-379</p>		<p><b>Recommended Electronics:</b> Notes Page 32</p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p> <p>MAXPOS 50/5 473</p>	<p><b>Encoder MR</b> 32 CPT, 2 / 3 channels Page 429</p> <p><b>Encoder MR</b> 128 / 256 / 512 CPT, 2 / 3 channels Page 430</p>
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# RE 16 Ø16 mm, Precious Metal Brushes CLL, 3.2 Watt



M 1:1

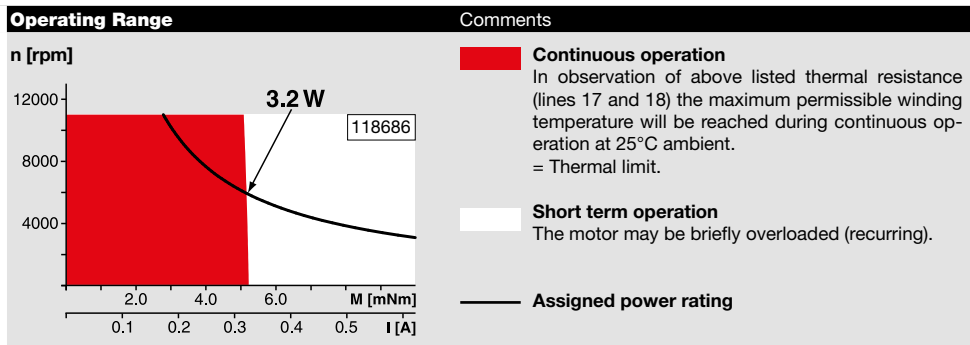
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118678	118679	118680	118681	118682	118683	118684	118685	118686	118687	118688	118689	118690	118691	118692
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	1.8	2.4	3	3.2	4.5	4.8	7.2	9	12	12	15	18	24	30	48
2 No load speed	rpm	4990	6360	6890	6270	6740	5700	6890	6740	7130	5990	6010	5900	7250	6460	5500
3 No load current	mA	23.5	25.4	23	18.6	14.8	10.8	9.57	7.4	6.05	4.63	3.72	3.02	3.11	2.08	1.02
4 Nominal speed	rpm	4320	5510	5820	4930	5050	3630	4810	4630	5030	3830	3840	3730	5070	4220	3180
5 Nominal torque (max. continuous torque)	mNm	2.39	2.5	2.89	3.41	4.48	5.61	5.54	5.48	5.48	5.38	5.36	5.33	5.29	5.18	5.01
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.711	0.566	0.438	0.348	0.287	0.229	0.187	0.171	0.119	0.0614
7 Stall torque	mNm	15.5	16.9	17.3	15.2	17.4	15.2	18.1	17.4	18.6	14.9	14.9	14.5	17.6	15	11.9
8 Stall current	A	4.53	4.71	4.19	3.13	2.74	1.9	1.82	1.37	1.16	0.784	0.628	0.5	0.561	0.341	0.144
9 Max. efficiency	%	86	86	86	85	86	86	86	86	86	86	85	85	86	85	84
Characteristics																
10 Terminal resistance	Ω	0.397	0.51	0.715	1.02	1.64	2.53	3.95	6.56	10.3	15.3	23.9	36	42.8	88	333
11 Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.284	0.452	0.639	0.993	1.48	1.75	3.44	12.1
12 Torque constant	mNm/A	3.43	3.58	4.13	4.84	6.34	7.99	9.92	12.7	16	19	23.7	28.9	31.4	44.1	82.7
13 Speed constant	rpm/V	2790	2660	2310	1970	1510	1190	962	753	597	502	403	330	304	217	115
14 Speed / torque gradient	rpm/mNm	323	379	400	415	391	378	383	389	386	404	406	410	414	432	465
15 Mechanical time constant	ms	5.84	5.71	5.56	5.46	5.36	5.31	5.29	5.29	5.27	5.29	5.3	5.31	5.31	5.36	5.42
16 Rotor inertia	gcm <sup>2</sup>	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	30 K/W
18 Thermal resistance winding-housing	8.5 K/W
19 Thermal time constant winding	10.6 s
20 Thermal time constant motor	436 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	11000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial load, 5 mm from flange	1.5 N

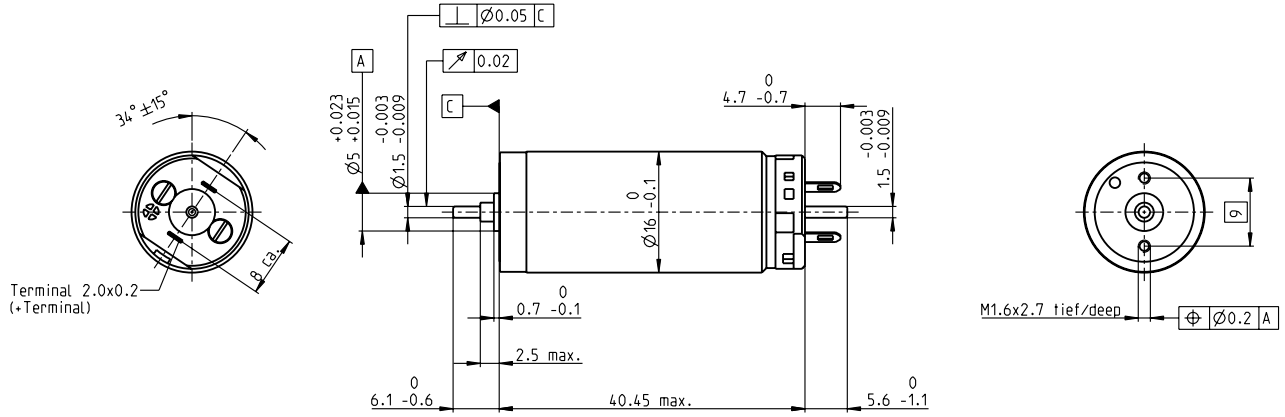


Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	38 g
CLL = Capacitor Long Life	
Values listed in the table are nominal. Explanation of the figures on page 68.	

## maxon Modular System Details on catalog page 32

<b>Planetary Gearhead</b> Ø16 mm 0.1 - 0.3 Nm Page 334		
<b>Planetary Gearhead</b> Ø16 mm 0.2 - 0.6 Nm Page 335		
<b>Screw Drive</b> Ø16 mm Page 377-379		
<b>Recommended Electronics:</b> Notes <span style="float: right;">Page 32</span>		
ESCON Module 24/2		454
ESCON 36/2 DC		454
ESCON Module 50/5		455
ESCON 50/5		457
EPOS4 50/5		463

# RE 16 Ø16 mm, Precious Metal Brushes CLL, 3.2 Watt



M 1:1

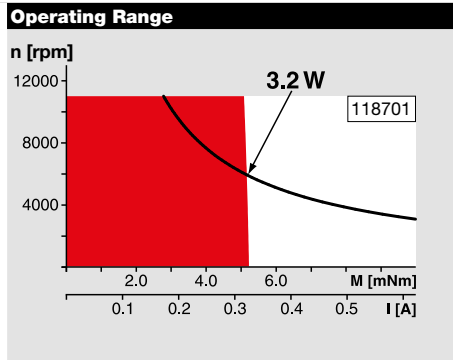
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118693	118694	118695	118696	118697	118698	118699	118700	118701	118702	118703	118704	118705	118706	118707
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Motor Data																	
Values at nominal voltage																	
1	Nominal voltage	V	1.8	2.4	3	3.2	4.5	4.8	7.2	9	12	12	15	18	24	30	48
2	No load speed	rpm	4990	6360	6890	6270	6740	5700	6890	6740	7130	5990	6010	5900	7250	6460	5500
3	No load current	mA	23.5	25.4	23	18.6	14.8	10.8	9.57	7.4	6.05	4.63	3.72	3.02	3.11	2.08	1.02
4	Nominal speed	rpm	4320	5510	5820	4930	5050	3630	4810	4630	5030	3830	3840	3730	5070	4220	3180
5	Nominal torque (max. continuous torque)	mNm	2.39	2.5	2.89	3.41	4.48	5.61	5.54	5.48	5.48	5.38	5.36	5.33	5.29	5.18	5.01
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.711	0.566	0.438	0.348	0.287	0.229	0.187	0.171	0.119	0.0614
7	Stall torque	mNm	15.5	16.9	17.3	15.2	17.4	15.2	18.1	17.4	18.6	14.9	14.9	14.5	17.6	15	11.9
8	Stall current	A	4.53	4.71	4.19	3.13	2.74	1.9	1.82	1.37	1.16	0.784	0.628	0.5	0.561	0.341	0.144
9	Max. efficiency	%	86	86	86	85	86	86	86	86	86	86	85	85	86	85	84
Characteristics																	
10	Terminal resistance	Ω	0.397	0.51	0.715	1.02	1.64	2.53	3.95	6.56	10.3	15.3	23.9	36	42.8	88	333
11	Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.284	0.452	0.639	0.993	1.48	1.75	3.44	12.1
12	Torque constant	mNm/A	3.43	3.58	4.13	4.84	6.34	7.99	9.92	12.7	16	19	23.7	28.9	31.4	44.1	82.7
13	Speed constant	rpm/V	2790	2660	2310	1970	1510	1190	962	753	597	502	403	330	304	217	115
14	Speed / torque gradient	rpm/mNm	323	379	400	415	391	378	383	389	386	404	406	410	414	432	465
15	Mechanical time constant	ms	5.84	5.71	5.56	5.46	5.36	5.31	5.29	5.29	5.27	5.29	5.3	5.31	5.31	5.36	5.42
16	Rotor inertia	gcm <sup>2</sup>	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

Specifications		
Thermal data		
17	Thermal resistance housing-ambient	30 K/W
18	Thermal resistance winding-housing	8.5 K/W
19	Thermal time constant winding	10.6 s
20	Thermal time constant motor	436 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. speed	11 000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static) (static, shaft supported)	15 N / 70 N
28	Max. radial load, 5 mm from flange	1.5 N



**Comments**

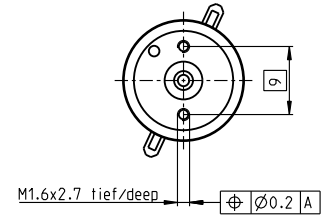
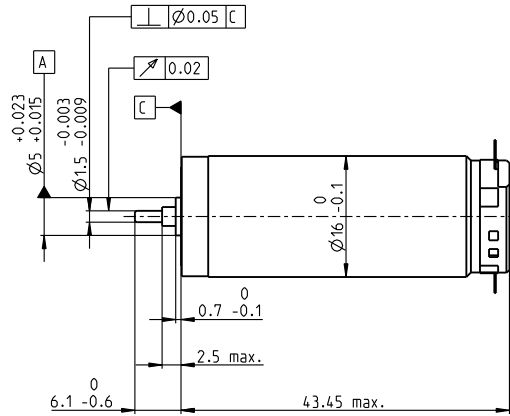
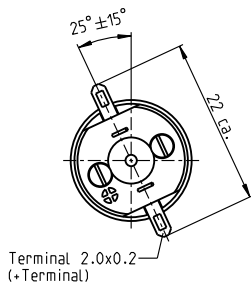
- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	38 g
CLL = Capacitor Long Life		
Values listed in the table are nominal. Explanation of the figures on page 68.		

## maxon Modular System Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø16 mm 0.1 - 0.3 Nm Page 334</p> <p><b>Planetary Gearhead</b> Ø16 mm 0.2 - 0.6 Nm Page 335</p> <p><b>Screw Drive</b> Ø16 mm Page 377-379</p>		<p><b>Encoder MEnc</b> Ø13 mm 16 CPT, 2 channels Page 416</p> <p><b>Encoder MR</b> 32 CPT, 2 / 3 channels Page 429</p> <p><b>Encoder MR</b> 128 / 256 / 512 CPT, 2 / 3 channels Page 430</p>																
<p><b>Recommended Electronics:</b> <span style="float: right;">Page 32</span></p> <p><b>Notes</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td>ESCON Module 24/2</td> <td style="text-align: right;">454</td> </tr> <tr> <td>ESCON 36/2 DC</td> <td style="text-align: right;">454</td> </tr> <tr> <td>ESCON Module 50/5</td> <td style="text-align: right;">455</td> </tr> <tr> <td>ESCON 50/5</td> <td style="text-align: right;">457</td> </tr> <tr> <td>EPOS4 Mod./Comp. 24/1.5</td> <td style="text-align: right;">462</td> </tr> <tr> <td>EPOS4 50/5</td> <td style="text-align: right;">463</td> </tr> <tr> <td>EPOS4 Mod./Comp. 50/5</td> <td style="text-align: right;">463</td> </tr> <tr> <td>MAXPOS 50/5</td> <td style="text-align: right;">473</td> </tr> </table>			ESCON Module 24/2	454	ESCON 36/2 DC	454	ESCON Module 50/5	455	ESCON 50/5	457	EPOS4 Mod./Comp. 24/1.5	462	EPOS4 50/5	463	EPOS4 Mod./Comp. 50/5	463	MAXPOS 50/5	473
ESCON Module 24/2	454																	
ESCON 36/2 DC	454																	
ESCON Module 50/5	455																	
ESCON 50/5	457																	
EPOS4 Mod./Comp. 24/1.5	462																	
EPOS4 50/5	463																	
EPOS4 Mod./Comp. 50/5	463																	
MAXPOS 50/5	473																	

# RE 16 Ø16 mm, Graphite Brushes, 4.5 Watt



## M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

118710	118711	118712	118713	118714	118715	118716	118717	118718	118719	118720	118721	118722	118723	118724
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data		118710	118711	118712	118713	118714	118715	118716	118717	118718	118719	118720	118721	118722	118723	118724
<b>Values at nominal voltage</b>																
1 Nominal voltage	V	4.8	4.8	6	7.2	9	12	15	18	24	30	36	45	48	48	48
2 No load speed	rpm	12700	12100	13200	13600	13100	13900	14000	13200	14000	14700	14100	14500	14200	10100	5320
3 No load current	mA	105	98.7	87.6	75.4	56.9	45.9	37.1	28.5	23	19.6	15.6	12.8	11.8	7.66	3.63
4 Nominal speed	rpm	11200	10500	11500	11700	11000	11900	12100	11300	12100	12900	12300	12700	12400	8120	3170
5 Nominal torque (max. continuous torque)	mNm	2.15	2.27	2.67	3.18	4.23	4.36	4.42	4.53	4.53	4.4	4.46	4.42	4.43	4.65	4.77
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.712	0.582	0.475	0.379	0.302	0.247	0.2	0.163	0.15	0.111	0.0603
7 Stall torque	mNm	26.3	22.8	25.8	27.4	29.9	34.3	35.3	33.4	36.3	36.8	35.6	36.2	35.4	24.2	12.1
8 Stall current	A	7.56	6.26	6.16	5.58	4.65	4.23	3.51	2.6	2.24	1.91	1.48	1.23	1.11	0.541	0.144
9 Max. efficiency	%	73	72	74	76	77	79	80	80	80	81	81	81	81	78	71
<b>Characteristics</b>																
10 Terminal resistance	Ω	0.635	0.767	0.975	1.29	1.94	2.83	4.28	6.93	10.7	15.7	24.4	36.5	43.3	88.7	334
11 Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.284	0.452	0.639	0.993	1.48	1.74	3.44	12.1
12 Torque constant	mNm/A	3.48	3.64	4.2	4.91	6.43	8.11	10.1	12.9	16.2	19.3	24.1	29.4	31.9	44.8	83.9
13 Speed constant	rpm/V	2750	2630	2280	1940	1480	1180	948	742	589	495	397	325	299	213	114
14 Speed / torque gradient	rpm/mNm	502	554	529	510	447	411	403	399	389	403	402	404	407	423	453
15 Mechanical time constant	ms	9.07	8.35	7.36	6.71	6.13	5.78	5.56	5.43	5.31	5.28	5.25	5.23	5.22	5.24	5.28
16 Rotor inertia	gcm <sup>2</sup>	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

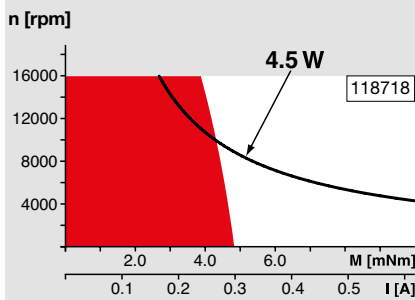
### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 30 K/W
  - 18 Thermal resistance winding-housing 8.5 K/W
  - 19 Thermal time constant winding 10.6 s
  - 20 Thermal time constant motor 504 s
  - 21 Ambient temperature -20...+65°C
  - 22 Max. winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. speed 16000 rpm
  - 24 Axial play 0.05 - 0.15 mm
  - 25 Radial play 0.014 mm
  - 26 Max. axial load (dynamic) 0.8 N
  - 27 Max. force for press fits (static) 15 N
  - 28 Max. radial load, 5 mm from flange 1.5 N

- Other specifications**
- 29 Number of pole pairs 1
  - 30 Number of commutator segments 7
  - 31 Weight of motor 40 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Operating Range



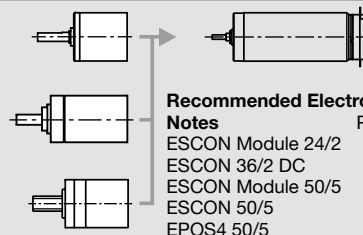
### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System

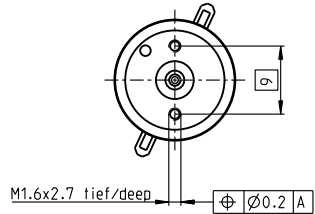
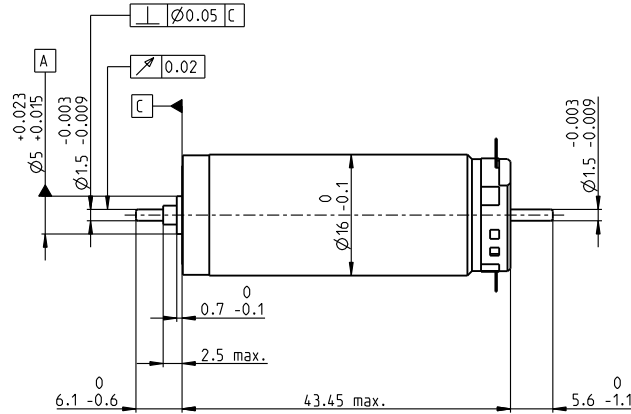
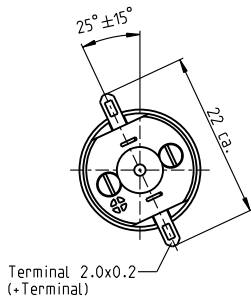
Details on catalog page 32

- Planetary Gearhead**  
Ø16 mm  
0.1 - 0.3 Nm  
Page 334
- Planetary Gearhead**  
Ø16 mm  
0.2 - 0.6 Nm  
Page 335
- Screw Drive**  
Ø16 mm  
Page 377-379



- Recommended Electronics:**
- |                   |         |
|-------------------|---------|
| <b>Notes</b>      | Page 32 |
| ESCON Module 24/2 | 454     |
| ESCON 36/2 DC     | 454     |
| ESCON Module 50/5 | 455     |
| ESCON 50/5        | 457     |
| EPOS4 50/5        | 463     |

# RE 16 Ø16 mm, Graphite Brushes, 4.5 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Motor Data		118725	118726	118727	118728	118729	118730	118731	118732	118733	118734	118735	118736	118737	118738	118739
<b>Values at nominal voltage</b>																
1 Nominal voltage	V	4.8	4.8	6	7.2	9	12	15	18	24	30	36	45	48	48	48
2 No load speed	rpm	12700	12100	13200	13600	13100	13900	14000	13200	14000	14700	14100	14500	14200	10100	5320
3 No load current	mA	105	98.7	87.6	75.4	56.9	45.9	37.1	28.5	23	19.6	15.6	12.8	11.8	7.66	3.63
4 Nominal speed	rpm	11200	10500	11500	11700	11000	11900	12200	11300	12200	12900	12300	12700	12400	8130	3170
5 Nominal torque (max. continuous torque)	mNm	2.15	2.27	2.67	3.18	4.09	4.36	4.34	4.48	4.5	4.37	4.44	4.41	4.43	4.65	4.77
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.69	0.582	0.467	0.375	0.299	0.245	0.199	0.162	0.15	0.111	0.0603
7 Stall torque	mNm	26.3	22.7	25.8	27.4	29.9	34.3	35.3	33.4	36.3	36.8	35.6	36.2	35.4	24.2	12.1
8 Stall current	A	7.56	6.26	6.16	5.58	4.65	4.23	3.51	2.6	2.24	1.91	1.48	1.23	1.11	0.541	0.144
9 Max. efficiency	%	69	69	72	73	76	79	79	79	80	80	80	81	81	78	71
<b>Characteristics</b>																
10 Terminal resistance	$\Omega$	0.635	0.767	0.975	1.29	1.94	2.83	4.28	6.93	10.7	15.7	24.4	36.5	43.3	88.7	334
11 Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.285	0.452	0.64	0.994	1.48	1.74	3.44	12.1
12 Torque constant	mNm/A	3.48	3.64	4.2	4.91	6.43	8.11	10.1	12.9	16.2	19.3	24.1	29.4	31.9	44.8	83.9
13 Speed constant	rpm/V	2750	2630	2280	1940	1480	1180	948	742	589	495	397	325	299	213	114
14 Speed / torque gradient	rpm/mNm	502	554	529	511	447	411	403	399	389	403	402	404	407	423	453
15 Mechanical time constant	ms	9.07	8.35	7.36	6.71	6.13	5.78	5.56	5.43	5.31	5.28	5.25	5.23	5.22	5.24	5.28
16 Rotor inertia	gcm <sup>2</sup>	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

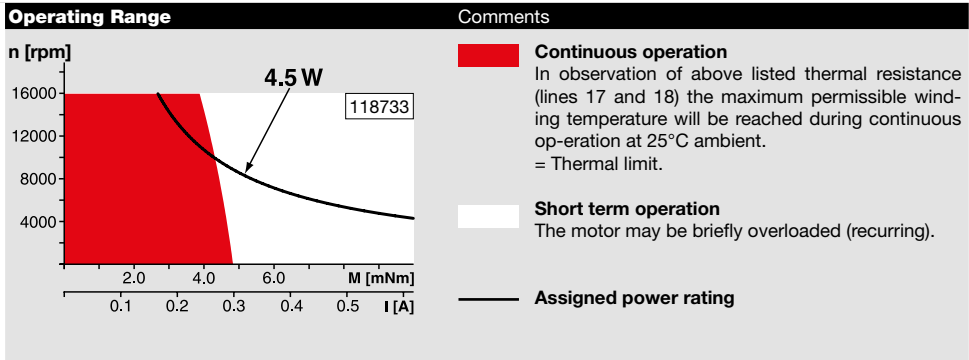
### Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	30 K/W
18 Thermal resistance winding-housing	8.5 K/W
19 Thermal time constant winding	10.6 s
20 Thermal time constant motor	459 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	15 N / 60 N
28 Max. radial load, 5 mm from flange	1.5 N

### Other specifications

29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	40 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

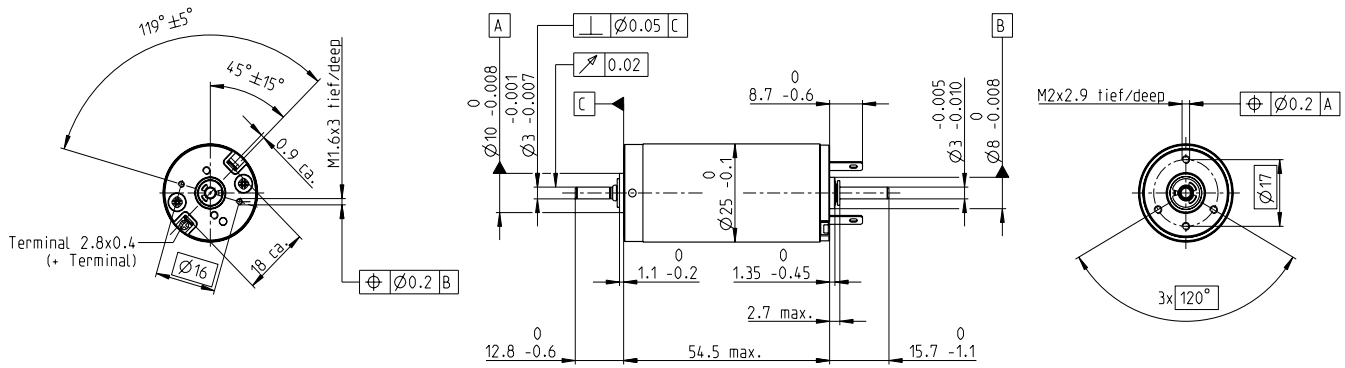


### maxon Modular System

<p><b>Planetary Gearhead</b> Ø16 mm 0.1 - 0.3 Nm Page 334</p> <p><b>Planetary Gearhead</b> Ø16 mm 0.2 - 0.6 Nm Page 335</p> <p><b>Screw Drive</b> Ø16 mm Page 377-379</p>		<p><b>Recommended Electronics:</b> Notes Page 32</p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>ESCON Module 50/5 455</p> <p>ESCON 50/5 457</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p> <p>EPOS4 50/5 463</p> <p>EPOS4 Mod./Comp. 50/5 463</p> <p>MAXPOS 50/5 473</p>	<p style="text-align: right;">Details on catalog page 32</p> <p><b>Encoder MEnc</b> Ø13 mm 16 CPT, 2 channels Page 416</p> <p><b>Encoder MR</b> 32 CPT, 2 / 3 channels Page 429</p> <p><b>Encoder MR</b> 128 / 256 / 512 CPT, 2 / 3 channels Page 430</p>
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# RE 25 Ø25 mm, Precious Metal Brushes CLL, 10 Watt



## M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

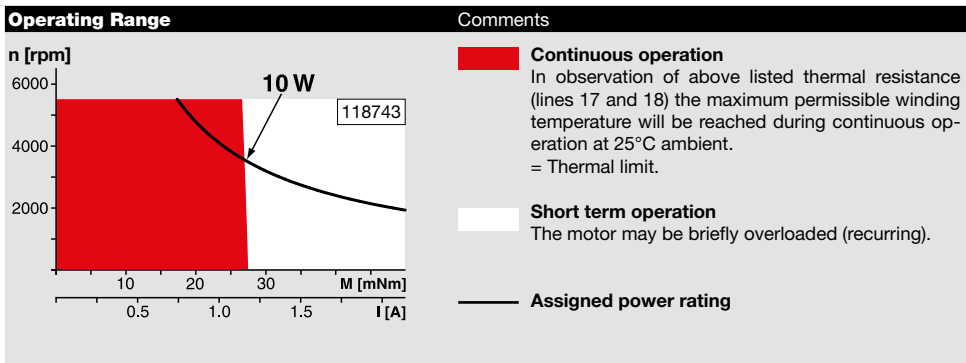
118740	118741	118742	118743	118744	118745	118746	118747	118748
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Motor Data										
Values at nominal voltage										
1 Nominal voltage	V	4.5	8	9	12	15	18	24	32	48
2 No load speed	rpm	5360	5320	5230	4850	4980	4790	5190	5510	5070
3 No load current	mA	79.7	44.4	38.7	26.3	21.8	9.88	14.4	11.7	6.96
4 Nominal speed	rpm	4980	4520	4220	3800	3920	3710	4130	4450	4000
5 Nominal torque (max. continuous torque)	mNm	11.4	20.9	23.9	28.6	28.2	28.7	28	27.9	27.9
6 Nominal current (max. continuous current)	A	1.5	1.5	1.5	1.24	1.01	0.811	0.652	0.516	0.317
7 Stall torque	mNm	131	132	119	129	131	126	136	144	132
8 Stall current	A	16.5	9.23	7.31	5.5	4.57	3.52	3.1	2.61	1.47
9 Max. efficiency	%	87	87	86	87	87	90	87	87	87
Characteristics										
10 Terminal resistance	Ω	0.273	0.867	1.23	2.18	3.28	5.11	7.73	12.3	32.6
11 Terminal inductance	mH	0.0275	0.0882	0.115	0.238	0.353	0.551	0.832	1.31	3.48
12 Torque constant	mNm/A	7.99	14.3	16.3	23.5	28.6	35.8	43.9	55.2	89.9
13 Speed constant	rpm/V	1200	668	584	406	334	267	217	173	106
14 Speed / torque gradient	rpm/mNm	40.9	40.5	44	37.7	38.3	38.2	38.3	38.5	38.6
15 Mechanical time constant	ms	4.99	4.4	4.37	4.25	4.23	4.22	4.22	4.22	4.23
16 Rotor inertia	gcm <sup>2</sup>	11.7	10.4	9.49	10.8	10.6	10.6	10.5	10.5	10.5

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	14 K/W
18 Thermal resistance winding-housing	3.1 K/W
19 Thermal time constant winding	12.5 s
20 Thermal time constant motor	612 s
21 Ambient temperature	-20...+85°C
22 Max. winding temperature	+100°C
<b>Mechanical data (ball bearings)</b>	
23 Max. speed	5500 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.2 N
27 Max. force for press fits (static) (static, shaft supported)	64 N
28 Max. radial load, 5 mm from flange	800 N

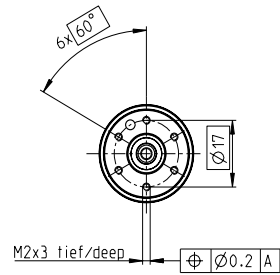
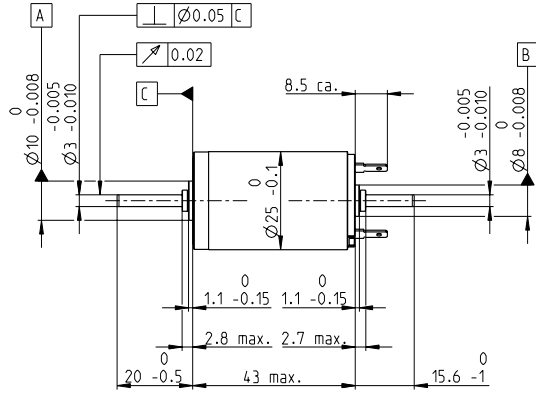
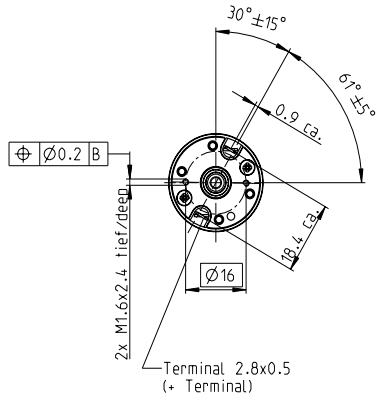
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	11
31 Weight of motor	130 g
CLL = Capacitor Long Life	
Values listed in the table are nominal. Explanation of the figures on page 68.	

**Option**  
Preloaded ball bearings



maxon Modular System		Details on catalog page 32	
<b>Planetary Gearhead</b> Ø26 mm 0.75 - 4.5 Nm Page 346		<b>Encoder MR</b> 128 - 1000 CPT, 3 channels Page 432	
<b>Planetary Gearhead</b> Ø32 mm 0.75 - 6.0 Nm Page 348/349/352		<b>Encoder Enc</b> 22 mm 100 CPT, 2 channels Page 437	
<b>Koaxdrive</b> Ø32 mm 1.0 - 4.5 Nm Page 359		<b>Encoder HED_ 5540</b> 500 CPT, 3 channels Page 440/442	
<b>Screw Drive</b> Ø32 mm Page 382-387		<b>DC-Tacho DCT</b> Ø22 mm 0.52 V Page 449	
<b>Recommended Electronics:</b>		<b>Notes</b>	
ESCON Module 24/2      454		Page 32	
ESCON 36/2 DC      454			
ESCON Module 50/5      455			
ESCON 50/5      457			
EPOS4 Mod./Comp. 24/1.5      462			
EPOS4 50/5      463			
EPOS4 Mod./Comp. 50/5      463			
MAXPOS 50/5      473			

# RE 25 Ø25 mm, Graphite Brushes, 20 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

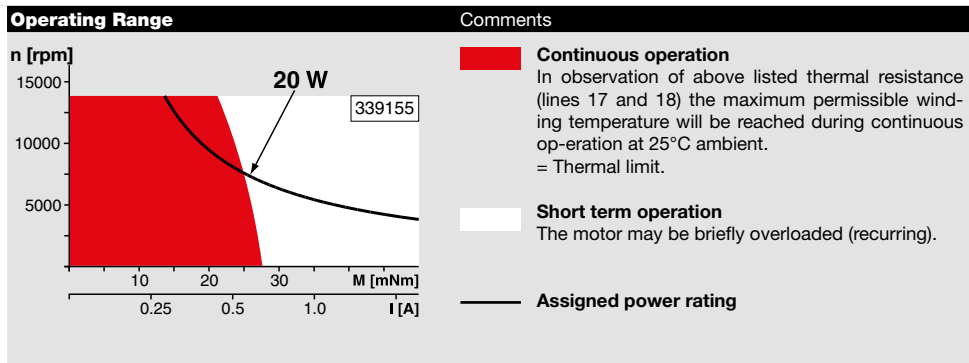
302534	339149	339150	339151	339152	339153	339154	339155	339156	339157	339158
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Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	7.2	9	12	18	24	30	36	48	48	48	48				
2 No load speed	rpm	10500	9710	9620	10400	10900	9210	10100	9540	8450	6720	4650				
3 No load current	mA	133	93.2	68.1	50.6	40.2	25	23.7	16.4	13.7	9.89	6				
4 Nominal speed	rpm	8970	8260	8310	9190	9690	8010	8860	8360	7270	5530	3430				
5 Nominal torque (max. continuous torque)	mNm	21.9	24.4	27.5	29.1	30.4	31.4	30.7	31.7	32.3	32.9	32.8				
6 Nominal current (max. continuous current)	A	3.68	2.97	2.45	1.85	1.5	1.04	0.931	0.68	0.614	0.495	0.341				
7 Stall torque	mNm	259	238	268	297	325	265	279	270	243	192	127				
8 Stall current	A	42.1	28.1	23.2	18.4	15.6	8.61	8.24	5.67	4.51	2.84	1.3				
9 Max. efficiency	%	79	81	84	86	88	88	88	89	88	88	86				
Characteristics																
10 Terminal resistance	Ω	0.171	0.32	0.517	0.98	1.53	3.49	4.37	8.47	10.6	16.9	36.8				
11 Terminal inductance	mH	0.016	0.031	0.057	0.112	0.186	0.407	0.493	0.979	1.25	1.97	4.11				
12 Torque constant	mNm/A	6.15	8.46	11.5	16.1	20.8	30.8	33.8	47.7	53.8	67.7	97.6				
13 Speed constant	rpm/V	1550	1130	828	591	460	311	282	200	177	141	97.8				
14 Speed / torque gradient	rpm/mNm	43.2	42.8	37.1	35.9	34	35.2	36.5	35.6	35.1	35.2	36.9				
15 Mechanical time constant	ms	6.52	6.06	5.62	5.36	5.24	5.17	5.16	5.13	5.12	5.12	5.14				
16 Rotor inertia	gcm <sup>2</sup>	14.4	13.5	14.5	14.3	14.7	14	13.5	13.8	13.9	13.9	13.3				

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	14.4 K/W
18 Thermal resistance winding-housing	5.1 K/W
19 Thermal time constant winding	27.7 s
20 Thermal time constant motor	543 s
21 Ambient temperature	-30...+100°C
22 Max. winding temperature	+155°C
Mechanical data (ball bearings)	
23 Max. speed	14000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	20 N
27 Max. force for press fits (static) (static, shaft supported)	60 N
28 Max. radial load, 5 mm from flange	1000 N
	35 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	11
31 Weight of motor	115 g

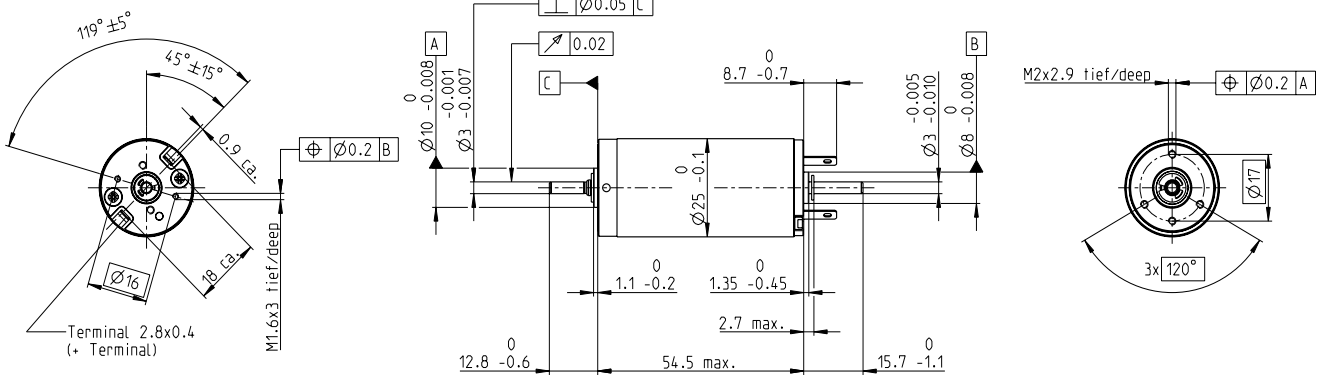
Values listed in the table are nominal.  
Explanation of the figures on page 68.



maxon Modular System		Details on catalog page 32	
<p><b>Planetary Gearhead</b> Ø22 mm 0.5 Nm Page 340</p> <p><b>Planetary Gearhead</b> Ø26 mm 0.75 - 4.5 Nm Page 346</p> <p><b>Planetary Gearhead</b> Ø32 mm 0.75 - 6.0 Nm Page 348/349/352</p> <p><b>Koaxdrive</b> Ø32 mm 1.0 - 4.5 Nm Page 359</p> <p><b>Screw Drive</b> Ø32 mm Page 382-387</p>		<p><b>Encoder MR</b> 128 - 1000 CPT, 3 channels Page 432</p> <p><b>Encoder HED_ 5540</b> 500 CPT, 3 channels Page 441/442</p> <p><b>DC-Tacho DCT</b> Ø22 mm 0.52 V Page 449</p> <p><b>Brake AB 28</b> 24 VDC 0.4 Nm Page 491</p>	<p><b>Recommended Electronics:</b> Notes Page 32</p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>ESCON Module 50/5 455</p> <p>ESCON 50/5 457</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p> <p>EPOS4 50/5 463</p> <p>EPOS4 Mod./Comp. 50/5 463</p> <p>EPOS2 P 24/5 470</p> <p>MAXPOS 50/5 473</p>

# RE 25 Ø25 mm, Graphite Brushes, 20 Watt

maxon RE motor



## M 1:2

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

according to dimensional drawing  
shaft length 15.7 shortened to 4 mm

118749	118750	118751	118752	118753	118754	118755	118756	118757
302002	302003	302004	302005	302006	302007	302001	302008	302009

### Motor Data

Values at nominal voltage											
1	Nominal voltage	V	9	15	18	24	30	42	48	48	48
2	No load speed	rpm	10000	9660	10200	9560	9860	11100	10300	8240	5050
3	No load current	mA	110	60.8	53.9	36.9	30.5	25.2	20.1	15.2	8.52
4	Nominal speed	rpm	8970	8430	8850	8330	8640	9920	9160	7040	3830
5	Nominal torque (max. continuous torque)	mNm	11.1	20.5	22.9	26.3	26.7	27.1	27.7	28.7	30
6	Nominal current (max. continuous current)	A	1.5	1.5	1.46	1.16	0.968	0.784	0.653	0.536	0.343
7	Stall torque	mNm	232	225	220	243	249	283	264	209	129
8	Stall current	A	29.1	15.8	13.5	10.4	8.72	7.94	6.03	3.81	1.44
9	Max. efficiency	%	76	82	83	85	86	87	87	86	84
Characteristics											
10	Terminal resistance	Ω	0.309	0.952	1.33	2.32	3.44	5.29	7.96	12.6	33.4
11	Terminal inductance	mH	0.028	0.088	0.115	0.238	0.353	0.551	0.832	1.31	3.48
12	Torque constant	mNm/A	7.96	14.3	16.3	23.4	28.5	35.6	43.8	55	89.6
13	Speed constant	rpm/V	1200	670	586	408	335	268	218	174	107
14	Speed / torque gradient	rpm/mNm	46.5	44.7	48	40.3	40.4	39.8	39.6	39.8	39.7
15	Mechanical time constant	ms	5.68	4.87	4.77	4.55	4.47	4.4	4.37	4.37	4.35
16	Rotor inertia	gcm <sup>2</sup>	11.7	10.4	9.49	10.8	10.6	10.6	10.5	10.5	10.5

### Specifications

Thermal data		
17	Thermal resistance housing-ambient	14 K/W
18	Thermal resistance winding-housing	3.1 K/W
19	Thermal time constant winding	12.5 s
20	Thermal time constant motor	612 s
21	Ambient temperature	-30...+100°C
22	Max. winding temperature	+125°C

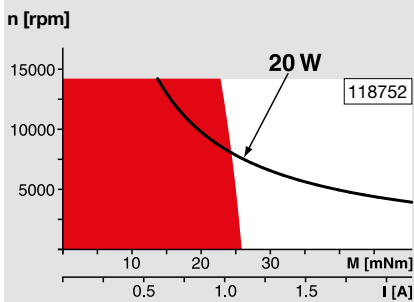
Mechanical data (ball bearings)		
23	Max. speed	14000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.2 N
27	Max. force for press fits (static) (static, shaft supported)	64 N
28	Max. radial load, 5 mm from flange	800 N
		16 N

Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	11
31	Weight of motor	130 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

- Option**  
Preloaded ball bearings

### Operating Range



### Comments

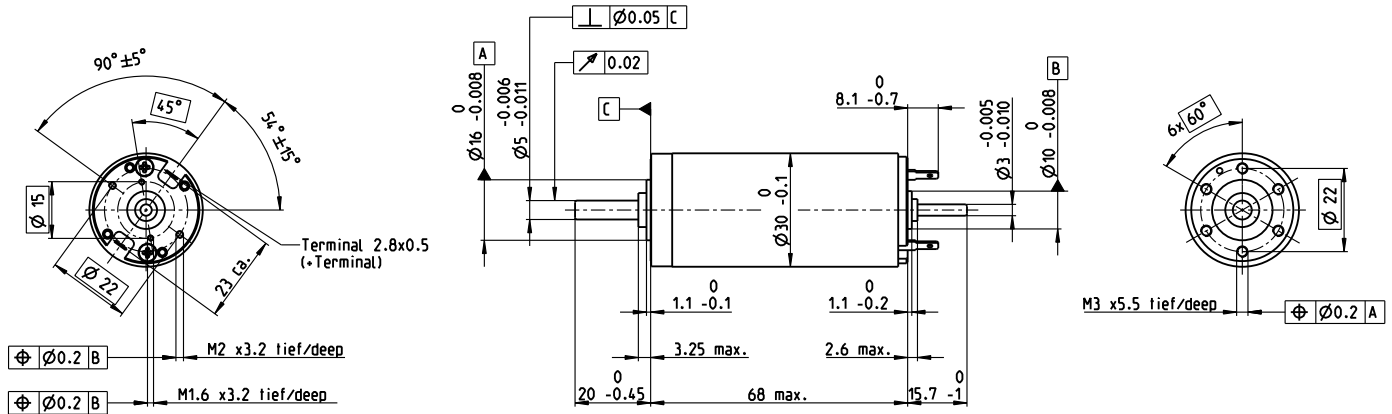
- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System

Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø26 mm 0.75 - 4.5 Nm Page 346</p> <p><b>Planetary Gearhead</b> Ø32 mm 0.75 - 6.0 Nm Page 348/349/352</p> <p><b>Koaxdrive</b> Ø32 mm 1.0 - 4.5 Nm Page 359</p> <p><b>Screw Drive</b> Ø32 mm Page 382-387</p>		<p><b>Recommended Electronics:</b> Page 32</p> <p><b>Notes</b></p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>ESCON Module 50/5 455</p> <p>ESCON 50/5 457</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p> <p>EPOS4 50/5 463</p> <p>EPOS4 Mod./Comp. 50/5 463</p> <p>EPOS2 P 24/5 470</p> <p>MAXPOS 50/5 473</p>	<p><b>Encoder MR</b> 128 - 1000 CPT, 3 channels Page 432</p> <p><b>Encoder Enc</b> 22 mm 100 CPT, 2 channels Page 437</p> <p><b>Encoder HED_ 5540</b> 500 CPT, 3 channels Page 440/442</p> <p><b>DC-Tacho DCT</b> Ø22 mm 0.52 V Page 449</p> <p><b>Brake AB 28</b> 24 VDC 0.4 Nm Page 491</p>
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# RE 30 Ø30 mm, Precious Metal Brushes, 15 Watt



M 1:2

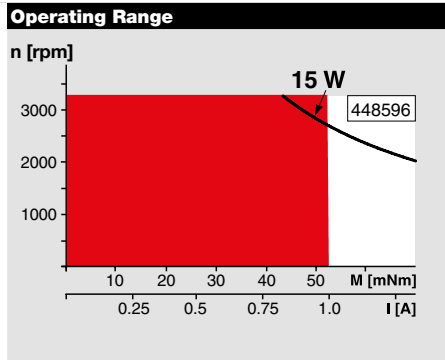
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Motor Data (provisional)	448593	448594	448595	448596	
<b>Values at nominal voltage</b>					
1 Nominal voltage	V	6	9	12	18
2 No load speed	rpm	2870	3310	2870	3190
3 No load current	mA	41.6	33.4	20.8	15.9
4 Nominal speed	rpm	2450	2870	2420	2770
5 Nominal torque (max. continuous torque)	mNm	53	53	53	53
6 Nominal current (max. continuous current)	A	2.7	2.08	1.35	1
7 Stall torque	mNm	364	402	342	401
8 Stall current	A	18.3	15.5	8.58	7.45
9 Max. efficiency	%	90	91	90	91
<b>Characteristics</b>					
10 Terminal resistance	Ω	0.378	0.63	1.45	2.47
11 Terminal inductance	mH	0.07	0.119	0.281	0.513
12 Torque constant	mNm/A	19.9	25.9	39.8	53.8
13 Speed constant	rpm/V	479	369	240	178
14 Speed / torque gradient	rpm/mNm	9.1	8.97	8.71	8.14
15 Mechanical time constant	ms	3.42	3.14	3.02	2.96
16 Rotor inertia	gcm <sup>2</sup>	35.9	33.5	33.1	34.7

### Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	6 K/W
18 Thermal resistance winding-housing	1.7 K/W
19 Thermal time constant winding	16.9 s
20 Thermal time constant motor	593 s
21 Ambient temperature	-20...+85°C
22 Max. winding temperature	+100°C
<b>Mechanical data (ball bearings)</b>	
23 Max. speed	3300 rpm
24 Axial play at axial load	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5.6 N
27 Max. force for press fits (static) (static, shaft supported)	110 N
28 Max. radial load, 5 mm from flange	1200 N
28 Max. radial load, 5 mm from flange	28 N



### Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

### Other specifications

29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	260 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

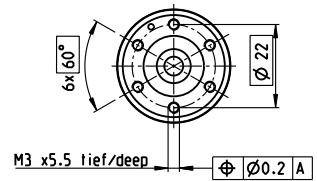
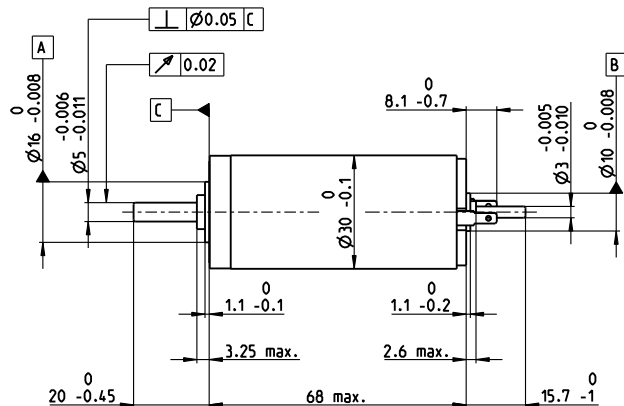
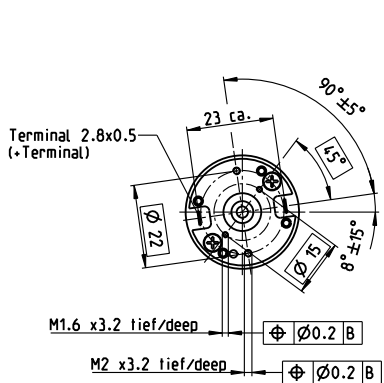
**Option**  
Preloaded ball bearings

### maxon Modular System

Details on catalog page 32

<b>Planetary Gearhead</b> Ø32 mm 0.75 - 4.5 Nm Page 350		<b>Encoder MR</b> 256 - 1024 CPT, 3 channels Page 433 <b>Encoder HED_ 5540</b> 500 CPT, 3 channels Page 440/442
<b>Recommended Electronics:</b>		
<b>Notes</b>		
ESCON Module 24/2	454	Page 32
ESCON 36/2 DC	454	
ESCON Module 50/5	455	
ESCON 50/5	457	
EPOS4 Mod./Comp. 24/1.5	462	
EPOS4 50/5	463	
EPOS4 Mod./Comp. 50/5	463	
EPOS2 P 24/5	470	
MAXPOS 50/5	473	

# RE 30 Ø30 mm, Graphite Brushes, 60 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

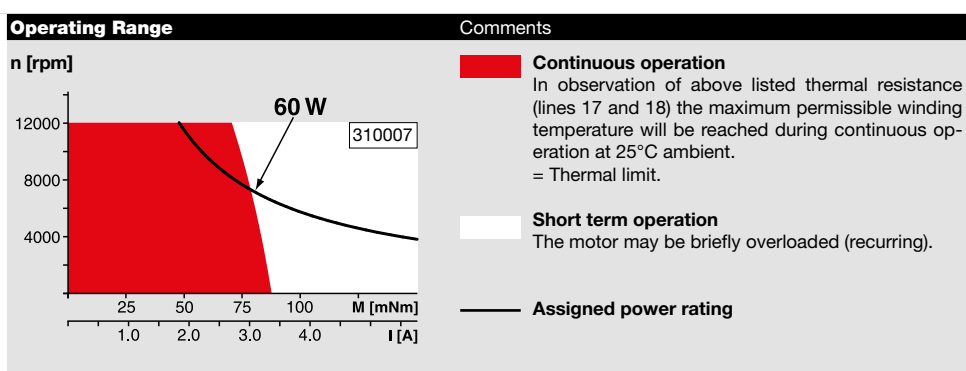
Part Numbers					
	310005	310006	310007	310008	310009
	268193	268213	268214	268215	268216

according to dimensional drawing  
shaft length 15.7 shortened to 8.7 mm

Motor Data	
<b>Values at nominal voltage</b>	
1 Nominal voltage	V
2 No load speed	rpm
3 No load current	mA
4 Nominal speed	rpm
5 Nominal torque (max. continuous torque)	mNm
6 Nominal current (max. continuous current)	A
7 Stall torque	mNm
8 Stall current	A
9 Max. efficiency	%
<b>Characteristics</b>	
10 Terminal resistance	Ω
11 Terminal inductance	mH
12 Torque constant	mNm/A
13 Speed constant	rpm/V
14 Speed / torque gradient	rpm/mNm
15 Mechanical time constant	ms
16 Rotor inertia	gcm <sup>2</sup>

	12	18	24	36	48
	8170	8590	8810	8590	8490
	301	213	165	106	78.6
	7630	7910	8050	7840	7760
	51.6	75.5	85.6	86.6	89.7
	4	4	3.47	2.28	1.74
	853	1000	1020	1000	1050
	61.1	50.3	39.3	25.2	19.6
	85	87	87	87	88
	0.196	0.358	0.611	1.43	2.45
	0.034	0.07	0.119	0.281	0.513
	13.9	19.9	25.9	39.8	53.8
	685	479	369	240	178
	9.64	8.61	8.7	8.61	8.09
	3.4	3.24	3.05	2.98	2.94
	33.7	35.9	33.5	33.1	34.7

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	6.0 K/W
18 Thermal resistance winding-housing	1.7 K/W
19 Thermal time constant winding	16.3 s
20 Thermal time constant motor	593 s
21 Ambient temperature	-30...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (ball bearings)</b>	
23 Max. speed	12000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5.6 N
27 Max. force for press fits (static) (static, shaft supported)	110 N
28 Max. radial load, 5 mm from flange	1200 N



Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	260 g

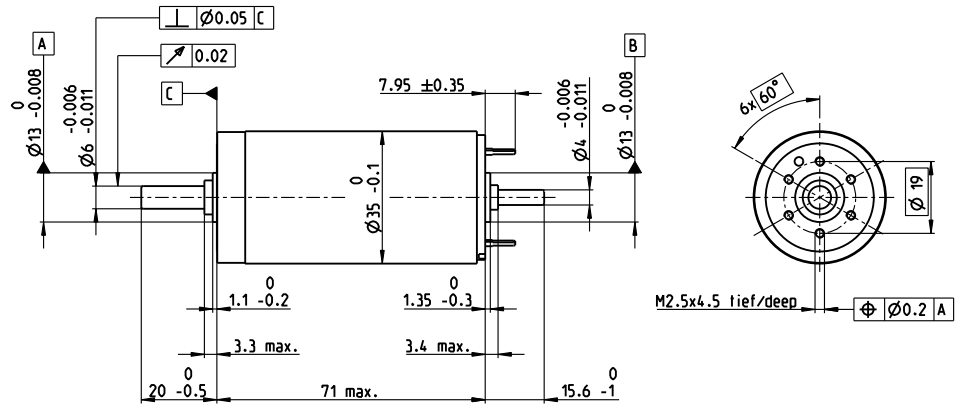
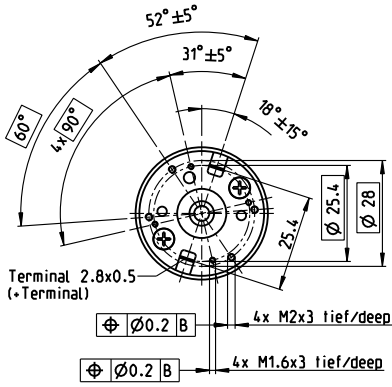
Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Preloaded ball bearings

**maxon Modular System** Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø32 mm 0.75 - 6.0 Nm Page 348-355</p> <p><b>Koaxdrive</b> Ø32 mm 1.0 - 4.5 Nm Page 359</p> <p><b>Screw Drive</b> Ø32 mm Page 382-387</p>		<p><b>Recommended Electronics:</b></p> <p><b>Notes</b></p> <p>Page 32</p> <p>ESCON 36/2 DC 454</p> <p>ESCON Module 50/5 455</p> <p>ESCON 50/5 457</p> <p>EPOS4 50/5 463</p> <p>EPOS4 Mod./Comp. 50/5 463</p> <p>EPOS2 P 24/5 470</p> <p>MAXPOS 50/5 473</p>	<p><b>Encoder MR</b> 256 - 1024 CPT, 3 channels Page 433</p> <p><b>Encoder HED_ 5540</b> 500 CPT, 3 channels Page 440/442</p>
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# RE 35 Ø35 mm, Graphite Brushes, 90 Watt



## M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers													
273752	323890	273753	273754	273755	273756	273757	273758	273759	273760	273761	273762	273763	
285785	323891	285786	285787	285788	285789	285790	285791	285792	285793	285794	285795	285796	

according to dimensional drawing shaft length 15.6 shortened to 4 mm

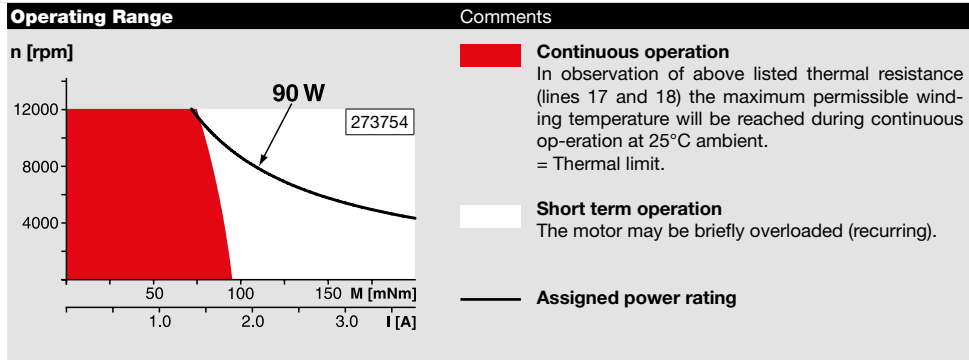
Motor Data																	
<b>Values at nominal voltage</b>																	
1 Nominal voltage	V	15	24	30	42	48	48	48	48	48	48	48	48	48	48	48	48
2 No load speed	rpm	7200	7750	7280	7580	7310	6680	5990	4770	3830	3150	2590	2110	1630			
3 No load current	mA	188	128	94.1	70.5	58.9	52.6	46	34.9	27	21.6	17.3	13.9	10.5			
4 Nominal speed	rpm	6500	6990	6470	6800	6510	5870	5170	3930	2990	2290	1720	1230	737			
5 Nominal torque (max. continuous torque)	mNm	74.2	105	101	105	103	104	104	106	108	107	107	106	106			
6 Nominal current (max. continuous current)	A	4	3.72	2.68	2.07	1.71	1.58	1.41	1.15	0.934	0.764	0.628	0.508	0.393			
7 Stall torque	mNm	931	1200	976	1090	983	892	778	621	499	399	323	256	196			
8 Stall current	A	47.9	41.2	25.1	20.7	15.8	13.1	10.3	6.52	4.21	2.77	1.85	1.2	0.71			
9 Max. efficiency	%	85	87	87	88	88	87	86	85	84	83	81	79	77			
<b>Characteristics</b>																	
10 Terminal resistance	Ω	0.313	0.582	1.2	2.03	3.04	3.66	4.68	7.36	11.4	17.3	26	40.1	67.6			
11 Terminal inductance	mH	0.085	0.191	0.34	0.62	0.87	1.04	1.29	2.04	3.16	4.65	6.89	10.3	17.1			
12 Torque constant	mNm/A	19.4	29.2	38.9	52.5	62.2	68	75.8	95.2	119	144	175	214	276			
13 Speed constant	rpm/V	491	328	246	182	154	140	126	100	80.5	66.4	54.6	44.7	34.6			
14 Speed / torque gradient	rpm/mNm	7.91	6.54	7.55	7.03	7.5	7.55	7.77	7.75	7.74	7.99	8.1	8.38	8.47			
15 Mechanical time constant	ms	5.62	5.41	5.37	5.32	5.32	5.32	5.33	5.33	5.33	5.34	5.35	5.36	5.38			
16 Rotor inertia	gcm <sup>2</sup>	67.9	79	67.9	72.3	67.7	67.2	65.4	65.7	65.7	63.8	63	61	60.6			

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	6.2 K/W
18 Thermal resistance winding-housing	2 K/W
19 Thermal time constant winding	30.1 s
20 Thermal time constant motor	707 s
21 Ambient temperature	-30...+100°C
22 Max. winding temperature	+155°C
<b>Mechanical data (ball bearings)</b>	
23 Max. speed	12000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5.6 N
27 Max. force for press fits (static) (static, shaft supported)	110 N
28 Max. radial load, 5 mm from flange	1200 N
	28 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	340 g

Values listed in the table are nominal. Explanation of the figures on page 68.

- Option**
- Hollow shaft as special design
  - Preloaded ball bearings



**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.

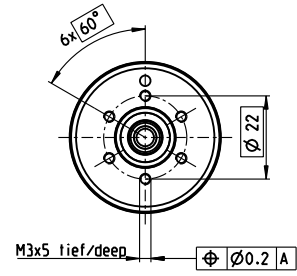
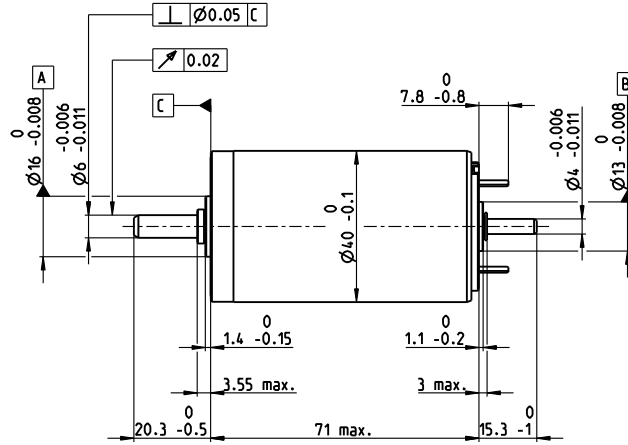
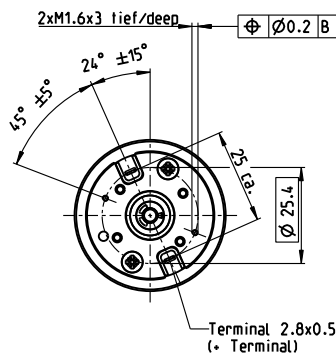
**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

**maxon Modular System** Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø32 mm 0.75 - 6.0 Nm Page 348-355</p> <p><b>Planetary Gearhead</b> Ø32 mm 4.0 - 8.0 Nm Page 356</p> <p><b>Planetary Gearhead</b> Ø42 mm 3 - 15 Nm Page 361</p> <p><b>Screw Drive</b> Ø32 mm Page 382-387</p>	<p><b>Recommended Electronics:</b>  <b>Notes</b>                  ESCON Mod. 50/5 Page 32 455                  ESCON 50/5 457                  EPOS4 50/5 463                  EPOS4 Mod./Comp. 50/5 463                  EPOS2 P 24/5 470                  MAXPOS 50/5 473</p>	<p><b>Encoder MR</b> 256 - 1024 CPT, 3 channels Page 433</p> <p><b>Encoder HED_ 5540</b> 500 CPT, 3 channels Page 440/442</p> <p><b>DC-Tacho DCT</b> Ø22 mm 0.52 V Page 449</p> <p><b>Brake AB 28</b> 24 VDC 0.4 Nm Page 491 <b>End cap</b> Page 496</p>
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# RE 40 $\varnothing$ 40 mm, Precious Metal Brushes, 25 Watt



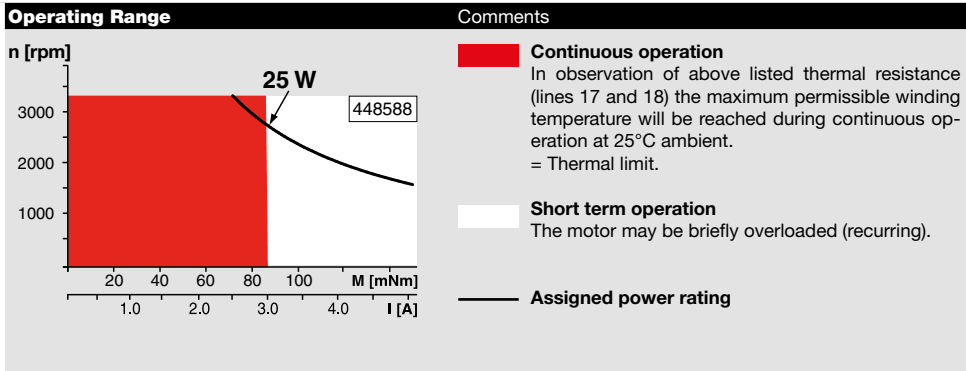
M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Motor Data (provisional)		448588	448589	448590	448591	448592
<b>Values at nominal voltage</b>						
1 Nominal voltage	V	9	18	24	42	48
2 No load speed	rpm	2850	2850	2780	2920	2690
3 No load current	mA	49.7	24.8	18.1	11	8.62
4 Nominal speed	rpm	2560	2580	2470	2640	2400
5 Nominal torque (max. continuous torque)	mNm	87.8	87.8	88.2	87.6	87.6
6 Nominal current (max. continuous current)	A	2.96	1.48	1.09	0.65	0.524
7 Stall torque	mNm	873	956	794	895	818
8 Stall current	A	29	15.9	9.66	6.53	4.81
9 Max. efficiency	%	92	92	92	92	92
<b>Characteristics</b>						
10 Terminal resistance	$\Omega$	0.311	1.14	2.49	6.43	9.97
11 Terminal inductance	mH	0.082	0.33	0.613	1.7	2.62
12 Torque constant	mNm/A	30.2	60.3	82.2	137	170
13 Speed constant	rpm/V	317	158	116	69.7	56.2
14 Speed / torque gradient	rpm/mNm	3.27	2.98	3.51	3.27	3.3
15 Mechanical time constant	ms	4.85	4.29	4.36	4.14	4.13
16 Rotor inertia	gcm <sup>2</sup>	142	137	119	121	120

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	4.65 K/W
18 Thermal resistance winding-housing	1.93 K/W
19 Thermal time constant winding	41.5 s
20 Thermal time constant motor	809 s
21 Ambient temperature	-20...+85°C
22 Max. winding temperature	+100°C
<b>Mechanical data (ball bearings)</b>	
23 Max. speed	3330 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5.6 N
27 Max. force for press fits (static) (static, shaft supported)	110 N
28 Max. radial load, 5 mm from flange	1200 N
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	480 g



Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Preloaded ball bearings

**maxon Modular System** Details on catalog page 32

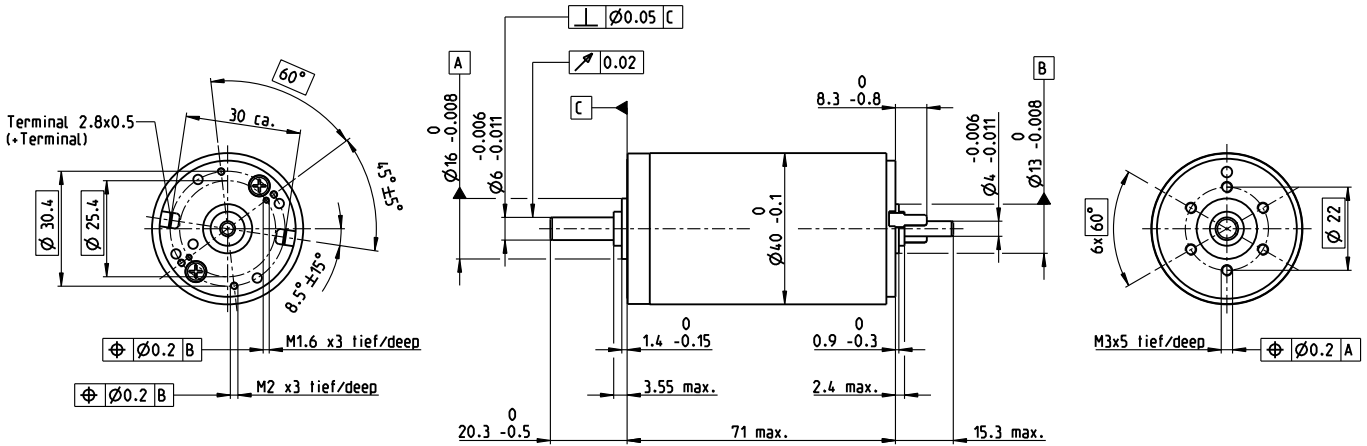
**Encoder MR**  
256 - 1024 CPT,  
3 channels  
Page 433

**Encoder HED\_ 5540**  
500 CPT,  
3 channels  
Page 440/443

**Recommended Electronics:**

Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

# RE 40 Ø40 mm, Graphite Brushes, 150 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

148866	148867	148877	218008	218009	218010	218011	218012	218013	218014
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data		148866	148867	148877	218008	218009	218010	218011	218012	218013	218014
<b>Values at nominal voltage</b>											
1 Nominal voltage	V	12	24	48	48	48	48	48	48	48	48
2 No load speed	rpm	6920	7580	7590	6420	5560	3330	2690	2130	1720	1420
3 No load current	mA	241	137	68.6	53.7	43.7	21.9	16.6	12.5	9.66	7.76
4 Nominal speed	rpm	6380	6940	7000	5810	4930	2710	2060	1510	1080	781
5 Nominal torque (max. continuous torque)	mNm	94.9	177	187	186	180	189	190	192	192	190
6 Nominal current (max. continuous current)	A	6	6	3.17	2.66	2.23	1.4	1.13	0.909	0.73	0.6
7 Stall torque	mNm	1720	2420	2560	2040	1620	1020	814	655	523	424
8 Stall current	A	105	80.2	42.4	28.6	19.7	7.43	4.79	3.06	1.97	1.32
9 Max. efficiency	%	88	91	92	91	91	89	89	88	86	85
<b>Characteristics</b>											
10 Terminal resistance	Ω	0.115	0.299	1.13	1.68	2.44	6.46	10	15.7	24.4	36.3
11 Terminal inductance	mH	0.024	0.082	0.33	0.46	0.613	1.7	2.62	4.14	6.41	9.32
12 Torque constant	mNm/A	16.4	30.2	60.3	71.3	82.2	137	170	214	266	321
13 Speed constant	rpm/V	581	317	158	134	116	69.7	56.2	44.7	35.9	29.8
14 Speed / torque gradient	rpm/mNm	4.05	3.14	2.97	3.16	3.45	3.29	3.31	3.27	3.29	3.37
15 Mechanical time constant	ms	5.89	4.67	4.28	4.2	4.19	4.16	4.15	4.15	4.15	4.16
16 Rotor inertia	gcm <sup>2</sup>	139	142	137	127	116	121	120	121	120	118

### Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	4.7 K/W
18 Thermal resistance winding-housing	1.9 K/W
19 Thermal time constant winding	41.5 s
20 Thermal time constant motor	809 s
21 Ambient temperature	-30...+100°C
22 Max. winding temperature	+155°C

<b>Mechanical data (ball bearings)</b>	
23 Max. speed	12000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5.6 N
27 Max. force for press fits (static) (static, shaft supported)	110 N
28 Max. radial load, 5 mm from flange	1200 N
	28 N

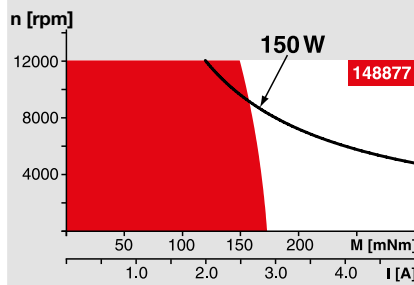
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	480 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Preloaded ball bearings

\* Industrial version with radial shaft seal ring (resulting in increased no load current).  
IP54 protection only if mounted on brush side, in compliance with maxon modular system.

### Operating Range



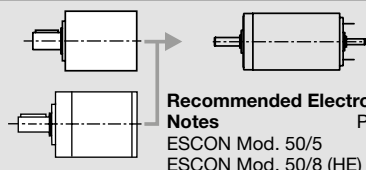
### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System

Details on catalog page 32

- Planetary Gearhead**  
Ø42 mm  
3 - 15 Nm  
Page 361
- Planetary Gearhead**  
Ø52 mm  
4 - 30 Nm  
Page 366



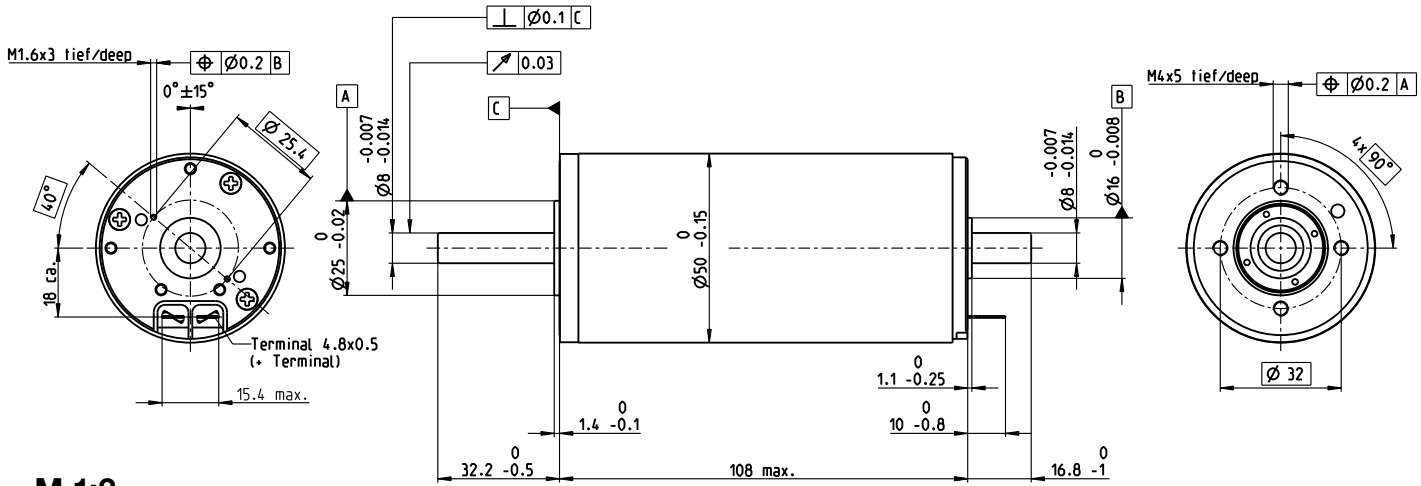
### Recommended Electronics:

- |                       |         |
|-----------------------|---------|
| <b>Notes</b>          | Page 32 |
| ESCON Mod. 50/5       | 455     |
| ESCON Mod. 50/8 (HE)  | 456     |
| ESCON 50/5            | 457     |
| ESCON 70/10           | 457     |
| EPOS4 50/5            | 463     |
| EPOS4 Mod./Comp. 50/5 | 463     |
| EPOS4 Module 50/8     | 465     |
| EPOS4 Comp. 50/8 CAN  | 465     |
| EPOS4 70/15           | 467     |
| EPOS2 P 24/5          | 470     |
| MAXPOS 50/5           | 473     |

- Encoder MR**  
256 - 1024 CPT,  
3 channels  
Page 433
- Encoder HED\_ 5540**  
500 CPT,  
3 channels  
Page 440/443
- Brake AB 28**  
24 VDC  
0.4 Nm  
Page 491
- Industrial Version IP54\***  
**Encoder HEDL 9140**  
Page 447
- Brake AB 28**  
Page 492
- End cap**  
Page 496



# RE 50 Ø50 mm, Graphite Brushes, 200 Watt



**M 1:2**

- Stock program
- Standard program
- Special program (on request)

Part Numbers			
578296	578297	578298	578299
618570	618571	618572	618573

Industrial Version IP54\*

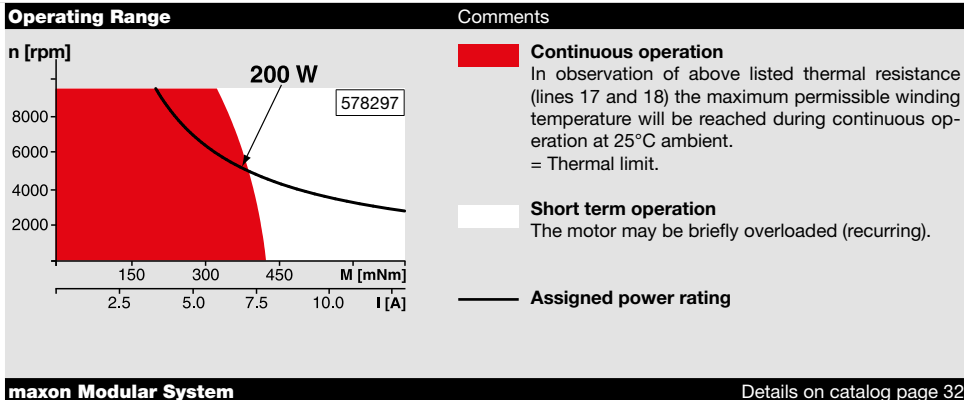
Motor Data					
<b>Values at nominal voltage</b>					
1 Nominal voltage	V	24	36	48	70
2 No load speed	rpm	5950	5680	4900	2760
3 No load current	mA	236	147	88.4	27.4
4 Nominal speed	rpm	5680	5420	4620	2470
5 Nominal torque (max. continuous torque)	mNm	405	418	420	452
6 Nominal current (max. continuous current)	A	10.8	7.07	4.58	1.89
7 Stall torque	mNm	8920	8920	7370	4340
8 Stall current	A	232	148	78.9	17.9
9 Max. efficiency	%	94	94	94	92
<b>Characteristics</b>					
10 Terminal resistance	Ω	0.103	0.244	0.608	3.9
11 Terminal inductance	mH	0.072	0.177	0.423	2.83
12 Torque constant	mNm/A	38.5	60.4	93.4	242
13 Speed constant	rpm/V	248	158	102	39.5
14 Speed / torque gradient	rpm/mNm	0.668	0.638	0.666	0.638
15 Mechanical time constant	ms	3.75	3.74	3.78	3.74
16 Rotor inertia	gcm <sup>2</sup>	536	560	542	560

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	3.8 K/W
18 Thermal resistance winding-housing	1.2 K/W
19 Thermal time constant winding	71.7 s
20 Thermal time constant motor	1370 s
21 Ambient temperature	-30...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	9500 rpm
24 Axial play at axial load < 11.5 N	0 mm
> 11.5 N	0.1 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	30 N
27 Max. force for press fits (static) (static, shaft supported)	150 N / 6000 N
28 Max. radial load, 15 mm from flange	110 N

<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	15
31 Weight of motor	1100 g

Values listed in the table are nominal. Explanation of the figures on page 68.

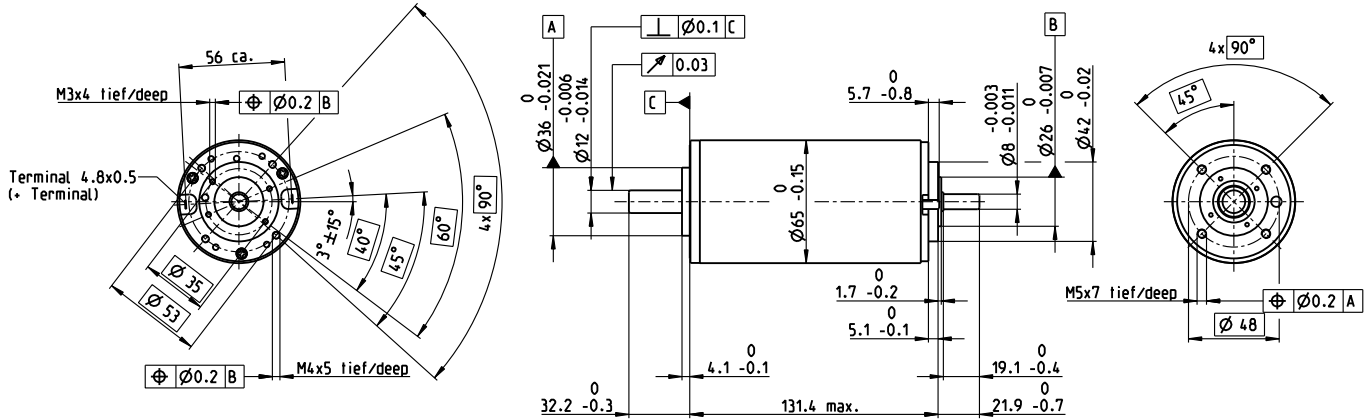
\* Industrial version with radial shaft seal ring (resulting in increased no load current). IP54 protection only if mounted on brush side, in compliance with maxon modular system.



maxon Modular System Details on catalog page 32

<b>Planetary Gearhead</b> Ø52 mm 4 - 30 Nm Page 366		<b>Encoder HEDS 5540</b> 500 CPT, 3 channels Page 441
<b>Planetary Gearhead</b> Ø62 mm 8 - 50 Nm Page 368	<b>Recommended Electronics:</b> <b>Notes</b> <span style="float: right;">Page 32</span> ESCON Mod. 50/5 455 ESCON Mod. 50/8 (HE) 456 ESCON 50/5 457 ESCON 70/10 457 EPOS4 50/5 463 EPOS4 Mod./Comp. 50/5 463 EPOS4 Module 50/8 465 EPOS4 Comp. 50/8 CAN 465 EPOS4 Module 50/15 466 EPOS4 Comp. 50/15 CAN 466 EPOS4 70/15 467 MAXPOS 50/5 473	<b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 443
		<b>Industrial Version IP54*</b> <b>Encoder HEDL 9140</b> Page 448 <b>Brake AB 44</b> Page 495 <b>End cap</b> Page 496

# RE 65 Ø65 mm, Graphite Brushes, 250 Watt



M 1:4

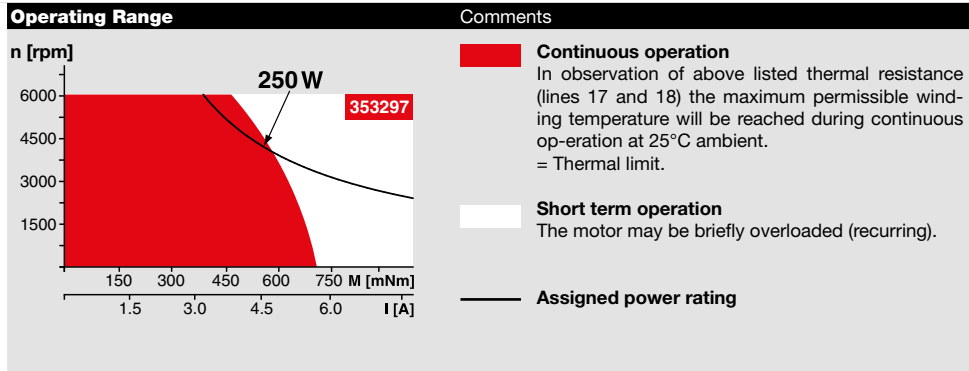
- Stock program
- Standard program
- Special program (on request)

Part Numbers							
353294	353295	353296	353297	353298	353299	353300	353301
388984	388985	388986	388987	388988	388989	388990	388991

Industrial Version IP54\*

Motor Data									
<b>Values at nominal voltage</b>									
1 Nominal voltage	V	18	24	36	48	60	70	70	70
2 No load speed	rpm	3520	4090	3970	3670	3680	3440	3190	2690
3 No load current	mA	755	697	437	289	231	179	160	125
4 Nominal speed	rpm	3250	3810	3700	3420	3450	3220	2960	2470
5 Nominal torque (max. continuous torque)	mNm	427	501	751	800	813	832	839	888
6 Nominal current (max. continuous current)	A	10	10	9.32	6.8	5.53	4.51	4.21	3.74
7 Stall torque	mNm	13600	15700	17400	16100	16200	15100	13700	12200
8 Stall current	A	295	292	207	131	106	78.6	66.1	49.7
9 Max. efficiency	%	81	83	87	88	89	89	89	89
<b>Characteristics</b>									
10 Terminal resistance	Ω	0.0609	0.0821	0.174	0.365	0.568	0.891	1.06	1.41
11 Terminal inductance	mH	0.023	0.031	0.076	0.161	0.251	0.393	0.458	0.644
12 Torque constant	mNm/A	46	53.7	84.4	123	153	192	207	245
13 Speed constant	rpm/V	208	178	113	77.8	62.3	49.8	46.1	38.9
14 Speed / torque gradient	rpm/mNm	0.275	0.272	0.234	0.231	0.231	0.231	0.236	0.223
15 Mechanical time constant	ms	3.98	3.68	3.38	3.25	3.19	3.16	3.16	3.13
16 Rotor inertia	gcm <sup>2</sup>	1380	1290	1380	1340	1320	1310	1280	1340

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	1.3 K/W
18 Thermal resistance winding-housing	1.85 K/W
19 Thermal time constant winding	123 s
20 Thermal time constant motor	1060 s
21 Ambient temperature	-30...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	5500 rpm
24 Axial play at axial load < 25 N	0 mm
24 Axial play at axial load > 25 N	0.1 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	70 N
27 Max. force for press fits (static) (static, shaft supported)	420 N
27 Max. force for press fits (static) (static, shaft supported)	12000 N
28 Max. radial load, 15 mm from flange	350 N
<b>Other specifications</b>	
29 Number of pole pairs	2
30 Number of commutator segments	26
31 Weight of motor	2100 g



**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

Values listed in the table are nominal.  
Explanation of the figures on page 68.

\* Industrial version with radial shaft seal ring (resulting in increased no load current).  
IP54 protection only if mounted on brush side, in compliance with maxon modular system.

**maxon Modular System** Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø81 mm 20 - 120 Nm Page 369</p>		<p><b>Encoder HEDS 5540</b> 500 CPT, 3 channels Page 441</p> <p><b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 443</p> <p><b>Industrial Version IP54*</b> <b>Encoder HEDL 9140</b> Page 448</p> <p><b>Brake AB 44</b> Page 495</p> <p><b>End cap</b> Page 496</p>
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**Recommended Electronics:**

Notes	Page 32
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
EPOS4 Module 50/8	465
EPOS4 Comp. 50/8 CAN	465
EPOS4 Module 50/15	466
EPOS4 Comp. 50/15 CAN	466
EPOS4 70/15	467
MAXPOS 50/5	473



# maxon A-max

- Good price-performance ratio
- Equipped with AlNiCo magnets
- High and consistent quality thanks to mastery and monitoring of the processes
- Automated manufacturing process
- Open for customer-oriented modifications

<b>Standard Specification No. 100</b>	64
<b>Explanation of the DC motors</b>	68
<b>DCX Program</b>	70-91
<b>DC-max Program</b>	94-99
<b>RE Program</b>	102-138
<b>A-max Program</b>	141-160

DC Motor

EC Motor  
(BLDC Motor)

Gearhead

Screw  
drive

Sensor

Motor &  
Motion control

Compact  
Drive

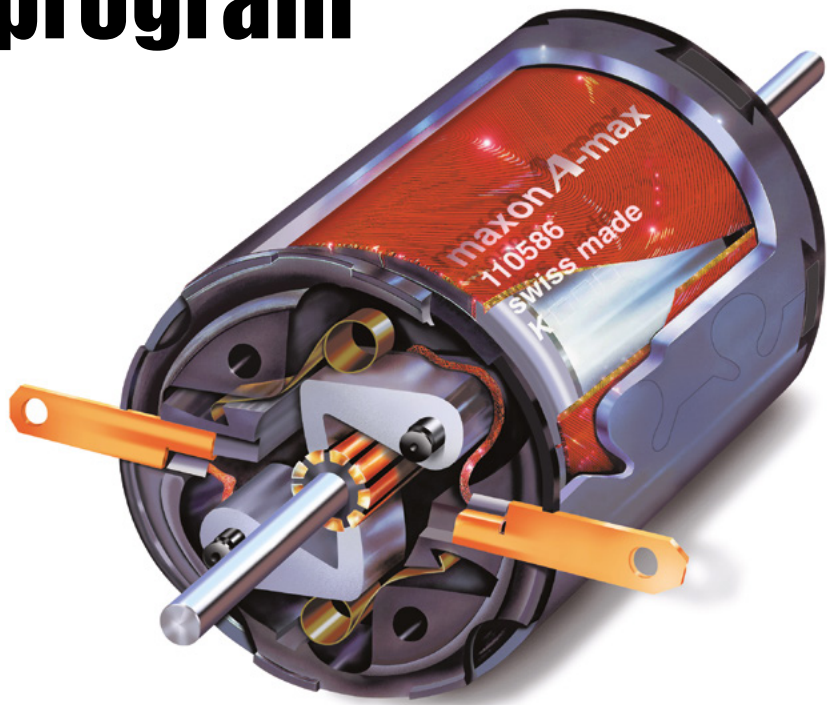
Accessories &  
Batteries

Ceramic

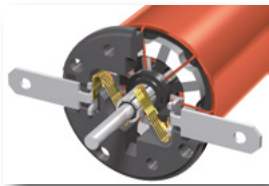
Contact  
information

# maxon A-max program

The economically priced DC motor program that gives you top performance and convincing quality.



Motor housing, precision-made from rolled steel, delivers high strength yet minimizes waste material to reduce costs.



Power leads or AMP-compatible terminals. Save strain relieve on power leads.



Elimination of a C-Clip groove results in higher torsional stability and greater cross-sectional strength.



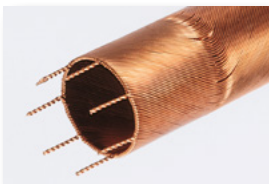
Reduced-diameter commutator, employing more segments, provides longer life.



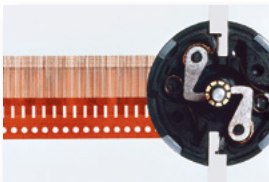
Hybrid process forms the stator by assembling motor housing, magnet and end cap in one step using injection molding of PPA plastic. Customers can select either sleeve or ball bearings.



Glass-fibre reinforced polyphthalamide plastic (PPA), impact-resistant, heat-resistant up to 125°C and noise absorbing.

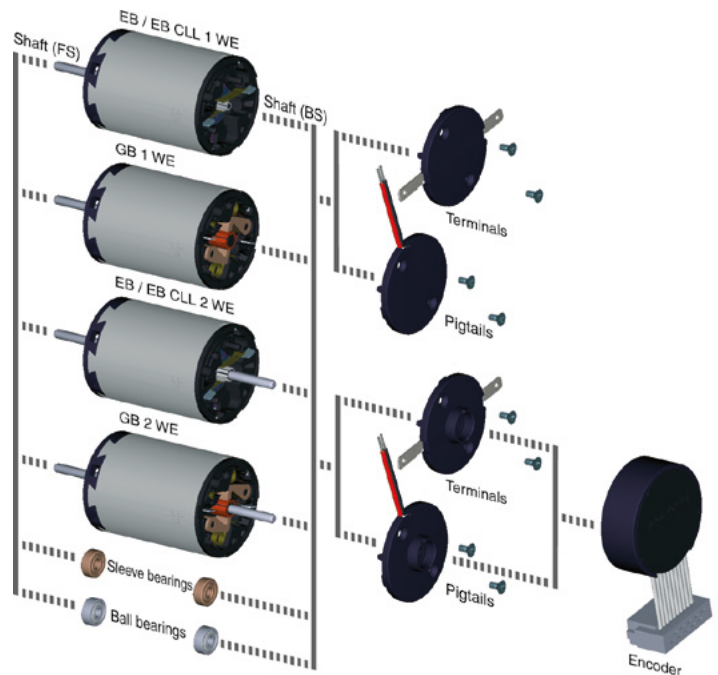


Proven winding technology provides a high-performance relationship between the coil and magnet system.



Graphite brushes for the most demanding tasks. 4-, 5- or 7-fingered precious metal brushes for fine rotary motions.

## Modular construction of the A-max program

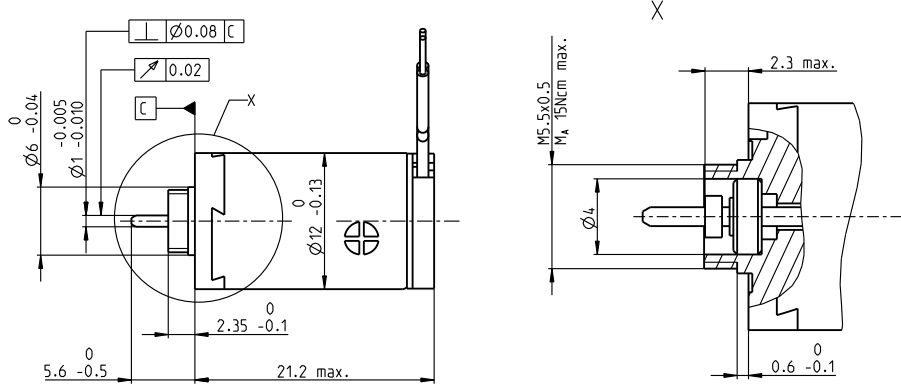
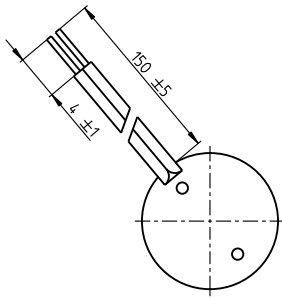


	WE = Shaft end	A-max 12 1 WE	A-max 12 2 WE	A-max 16 1 WE	A-max 16 2 WE	A-max 19 1 WE	A-max 19 2 WE	A-max 22 1 WE	A-max 22 2 WE	A-max 26 1 WE	A-max 26 2 WE	A-max 32 1 WE	A-max 32 2 WE
X = Standard X = Option													
Precious Metal Brushes (EB)			X	X	X	X	X	X	X	X	X	X	X
Precious Metal Brushes (EB) and CLL	X	X	X	X	X	X	X	X	X	X	X	X	X
Graphite Brushes (GB)			X	X	X	X	X	X	X	X	X	X	X
Sleeve Bearings	X	X	X	X	X	X	X	X	X	X	X	X	X
Ball Bearings	X	X	X	X	X	X	X	X	X	X	X	X	X
Terminals			X	X	X	X	X	X	X	X	X	X	X
Pigtails	X	X	X	X	X	X	X	X	X	X	X	X	X
Shaft flange side (FS)	min.	4.5	4.5	4.5	4.5	5.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0
	max.	10.0	10.0	15.0	15.0	27.4	27.4	25.0	25.0	27.0	27.0	27.0	27.0
Shaft brush side (BS)	min.		2.6		2.6		2.6		2.6		2.6		3.0
	max.		9.4		10.0		16.6		16.0		16.0		19.3

# A-max 12 Ø12 mm, Precious Metal Brushes CLL, 0.75 Watt

Kabel AWG 28/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



**M 3:2**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

200937 265374 265375 **265376** 265377 265378

## Motor Data

Values at nominal voltage			3	4.5	6	9	12	15
1	Nominal voltage	V	3	4.5	6	9	12	15
2	No load speed	rpm	13900	11900	12800	12100	12300	13800
3	No load current	mA	21.1	11.5	9.47	5.87	4.5	4.2
4	Nominal speed	rpm	5980	4380	5260	4470	4610	5030
5	Nominal torque (max. continuous torque)	mNm	0.897	0.961	0.948	0.941	0.931	0.804
6	Nominal current (max. continuous current)	A	0.465	0.282	0.225	0.141	0.107	0.0836
7	Stall torque	mNm	1.58	1.55	1.63	1.52	1.52	1.29
8	Stall current	A	0.789	0.438	0.374	0.22	0.168	0.129
9	Max. efficiency	%	70	71	71	70	70	68
Characteristics			3.8	10.3	16	40.9	71.6	116
10	Terminal resistance	Ω	3.8	10.3	16	40.9	71.6	116
11	Terminal inductance	mH	0.085	0.264	0.403	1.01	1.74	2.13
12	Torque constant	mNm/A	2.01	3.53	4.36	6.92	9.06	10
13	Speed constant	rpm/V	4760	2710	2190	1380	1050	952
14	Speed / torque gradient	rpm/mNm	9030	7880	8060	8170	8330	11000
15	Mechanical time constant	ms	20.6	20.3	20.4	20.4	20.5	21.1
16	Rotor inertia	gcm <sup>2</sup>	0.218	0.246	0.241	0.238	0.235	0.183

## Specifications

Thermal data			44.5 K/W
17	Thermal resistance housing-ambient		44.5 K/W
18	Thermal resistance winding-housing		15 K/W
19	Thermal time constant winding		5.03 s
20	Thermal time constant motor		245 s
21	Ambient temperature		-30...+65°C
22	Max. winding temperature		+85°C

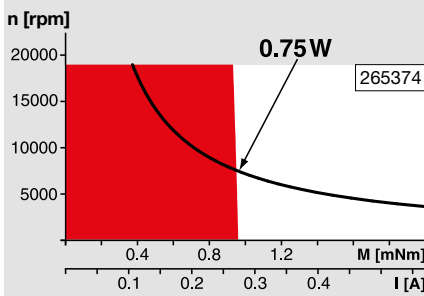
Mechanical data (sleeve bearings)			19000 rpm
23	Max. speed		19000 rpm
24	Axial play		0.05 - 0.15 mm
25	Radial play		0.012 mm
26	Max. axial load (dynamic)		0.15 N
27	Max. force for press fits (static)		15 N
28	Max. radial load, 4 mm from flange		0.4 N

Other specifications			1
29	Number of pole pairs		1
30	Number of commutator segments		7
31	Weight of motor		11 g

CLL = Capacitor Long Life  
Alignment of the electronic connections not specified.

Values listed in the table are nominal.  
Explanation of the figures on page 68.

## Operating Range



## Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

— Assigned power rating

## maxon Modular System

Details on catalog page 32

### Planetary Gearhead

Ø10 mm  
0.01 - 0.15 Nm  
Page 326

### Spur Gearhead

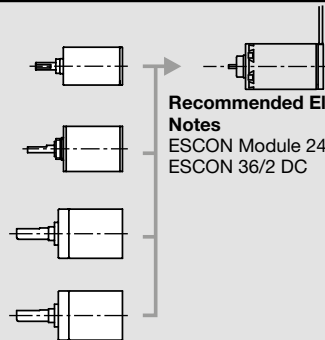
Ø12 mm  
0.01 - 0.03 Nm  
Page 327

### Planetary Gearhead

Ø13 mm  
0.05 - 0.15 Nm  
Page 328

### Planetary Gearhead

Ø13 mm  
0.2 - 0.35 Nm  
Page 329



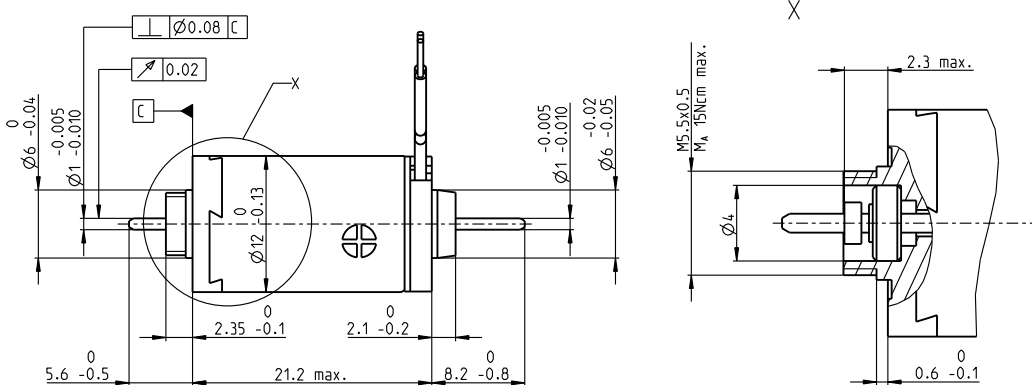
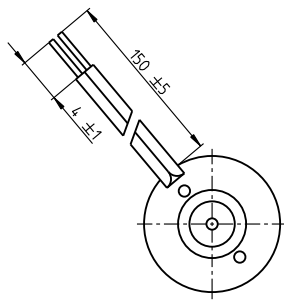
### Recommended Electronics:

**Notes** Page 32  
ESCON Module 24/2 454  
ESCON 36/2 DC 454

# A-max 12 Ø12 mm, Precious Metal Brushes CLL, 0.5 Watt

Kabel AWG 28/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



**M 3:2**

- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

200938 | 265389 | 265390 | 265391 | **265392** | 265393

Motor Data								
Values at nominal voltage								
	V	3	4.5	6	9	12	15	
1	Nominal voltage							
2	No load speed	rpm	13700	11700	12600	11900	12100	13500
3	No load current	mA	34.5	18.8	15.5	9.63	7.38	6.88
4	Nominal speed	rpm	6000	4390	5280	4480	4620	5050
5	Nominal torque (max. continuous torque)	mNm	0.872	0.937	0.923	0.918	0.908	0.78
6	Nominal current (max. continuous current)	A	0.464	0.282	0.225	0.141	0.106	0.0835
7	Stall torque	mNm	1.58	1.55	1.63	1.52	1.52	1.29
8	Stall current	A	0.789	0.438	0.374	0.22	0.168	0.129
9	Max. efficiency	%	63	63	64	63	63	60
Characteristics								
10	Terminal resistance	Ω	3.8	10.3	16	40.9	71.6	116
11	Terminal inductance	mH	0.085	0.264	0.403	1.01	1.74	2.13
12	Torque constant	mNm/A	2.01	3.53	4.36	6.92	9.06	10
13	Speed constant	rpm/V	4760	2710	2190	1380	1050	952
14	Speed / torque gradient	rpm/mNm	9030	7880	8060	8170	8330	11000
15	Mechanical time constant	ms	20.6	20.3	20.4	20.4	20.5	21.1
16	Rotor inertia	gcm <sup>2</sup>	0.218	0.246	0.241	0.238	0.235	0.183

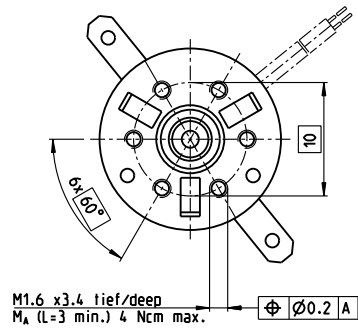
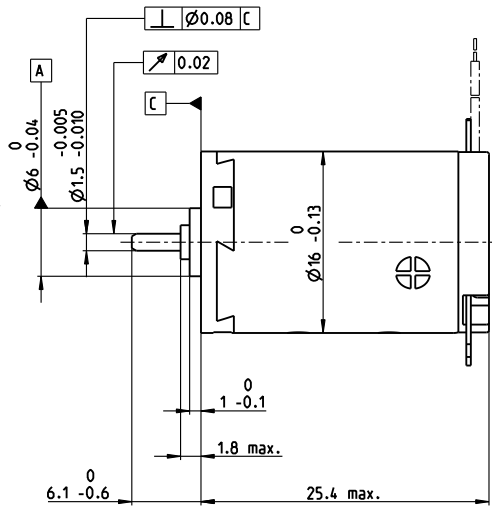
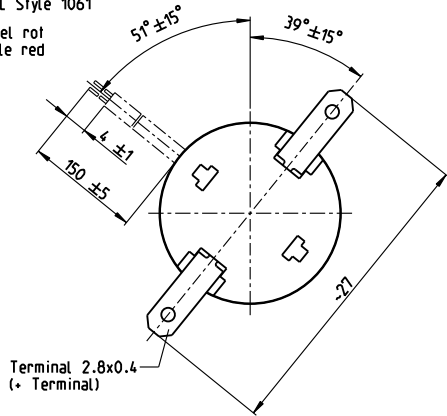
Specifications	Operating Range	Comments
<p><b>Thermal data</b></p> <p>17 Thermal resistance housing-ambient 44.5 K/W</p> <p>18 Thermal resistance winding-housing 15 K/W</p> <p>19 Thermal time constant winding 5.03 s</p> <p>20 Thermal time constant motor 267 s</p> <p>21 Ambient temperature -30...+65°C</p> <p>22 Max. winding temperature +85°C</p> <p><b>Mechanical data (sleeve bearings)</b></p> <p>23 Max. speed 14000 rpm</p> <p>24 Axial play 0.05 - 0.15 mm</p> <p>25 Radial play 0.012 mm</p> <p>26 Max. axial load (dynamic) 0.15 N</p> <p>27 Max. force for press fits (static) 15 N (static, shaft supported) 70 N</p> <p>28 Max. radial load, 4 mm from flange 0.4 N</p>		<p><b>Continuous operation</b> In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.</p> <p><b>Short term operation</b> The motor may be briefly overloaded (recurring).</p> <p><b>Assigned power rating</b></p>

Other specifications	maxon Modular System	Recommended Electronics:	Encoder MR
<p>29 Number of pole pairs 1</p> <p>30 Number of commutator segments 7</p> <p>31 Weight of motor 12 g</p> <p>CLL = Capacitor Long Life</p> <p>Alignment of the electronic connections not specified.</p> <p>Values listed in the table are nominal. Explanation of the figures on page 68.</p>	<p><b>Planetary Gearhead</b> Ø10 mm 0.01 - 0.15 Nm Page 326</p> <p><b>Spur Gearhead</b> Ø12 mm 0.01 - 0.03 Nm Page 327</p> <p><b>Planetary Gearhead</b> Ø13 mm 0.05 - 0.15 Nm Page 328</p> <p><b>Planetary Gearhead</b> Ø13 mm 0.2 - 0.35 Nm Page 329</p>	<p><b>Notes</b> Page 32</p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p> <p>MAXPOS 50/5 473</p>	<p>16 CPT, 2 channels Page 426</p> <p>Encoder MR 64 - 256 CPT, 2 channels Page 427</p>

# A-max 16 Ø16 mm, Precious Metal Brushes CLL, 2 Watt

maxon A-max

Kabel AWG 26/7  
cable UL Style 1061  
⊕ Kabel rot  
cable red



**M 3:2**

- Stock program
- Standard program
- Special program (on request)

		Part Numbers									
with terminals		110041	110042	110043	110044	110045	110046	110047	110048	110049	110050
with cables		139820	352815	134844	231379	220514	304672	352823	352816	260678	352817

Motor Data														
Values at nominal voltage														
		1.5	3	6	9	12	15	18	21	24	30			
1	Nominal voltage	V	1.5	3	6	9	12	15	18	21	24	30		
2	No load speed	rpm	10800	11000	10100	12300	12300	13200	14100	13700	13800	11400		
3	No load current	mA	61.4	38.1	13.9	12.7	9.54	8.57	7.99	6.53	5.83	3.37		
4	Nominal speed	rpm	9360	8810	4530	6700	6660	7590	8480	8040	8120	5480		
5	Nominal torque (max. continuous torque)	mNm	0.712	1.3	2.22	2.19	2.17	2.17	2.15	2.14	2.11	2.08		
6	Nominal current (max. continuous current)	A	0.6	0.6	0.408	0.327	0.243	0.209	0.185	0.153	0.134	0.0864		
7	Stall torque	mNm	4.79	4.51	4.03	4.82	4.77	5.16	5.44	5.22	5.12	4.04		
8	Stall current	A	3.66	1.97	0.723	0.702	0.52	0.482	0.453	0.362	0.315	0.164		
9	Max. efficiency	%	76	75	75	76	76	76	76	76	76	74		
Characteristics														
10	Terminal resistance	Ω	0.41	1.52	8.3	12.8	23.1	31.1	39.7	57.9	76.2	183		
11	Terminal inductance	mH	0.017	0.052	0.306	0.467	0.83	1.13	1.42	2.05	2.61	6.01		
12	Torque constant	mNm/A	1.31	2.29	5.57	6.88	9.17	10.7	12	14.4	16.3	24.7		
13	Speed constant	rpm/V	7290	4170	1720	1390	1040	893	795	663	587	387		
14	Speed / torque gradient	rpm/mNm	2280	2770	2560	2590	2620	2600	2630	2670	2750	2880		
15	Mechanical time constant	ms	25.3	23.8	23.2	23.3	23.3	23.4	23.5	23.4	23.5	23.9		
16	Rotor inertia	gcm <sup>2</sup>	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793		

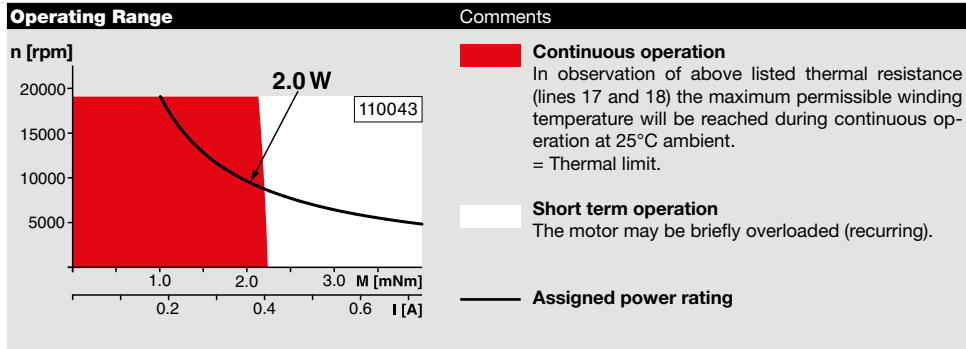
Specifications			
Thermal data			
17	Thermal resistance housing-ambient	29.8 K/W	
18	Thermal resistance winding-housing	5.5 K/W	
19	Thermal time constant winding	3.55 s	
20	Thermal time constant motor	165 s	
21	Ambient temperature	-30...+65°C	
22	Max. winding temperature	+85°C	
Mechanical data (sleeve bearings)			
23	Max. speed	19000 rpm	
24	Axial play	0.05 - 0.15 mm	
25	Radial play	0.012 mm	
26	Max. axial load (dynamic)	0.8 N	
27	Max. force for press fits (static)	35 N	
28	Max. radial load, 5 mm from flange	1.4 N	

Mechanical data (ball bearings)			
23	Max. speed	19000 rpm	
24	Axial play	0.05 - 0.15 mm	
25	Radial play	0.025 mm	
26	Max. axial load (dynamic)	2.2 N	
27	Max. force for press fits (static)	30 N	
28	Max. radial load, 5 mm from flange	7.8 N	

Other specifications			
29	Number of pole pairs	1	
30	Number of commutator segments	7	
31	Weight of motor	21 g	
		CLL = Capacitor Long Life	

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings  
Without CLL



Details on catalog page 32

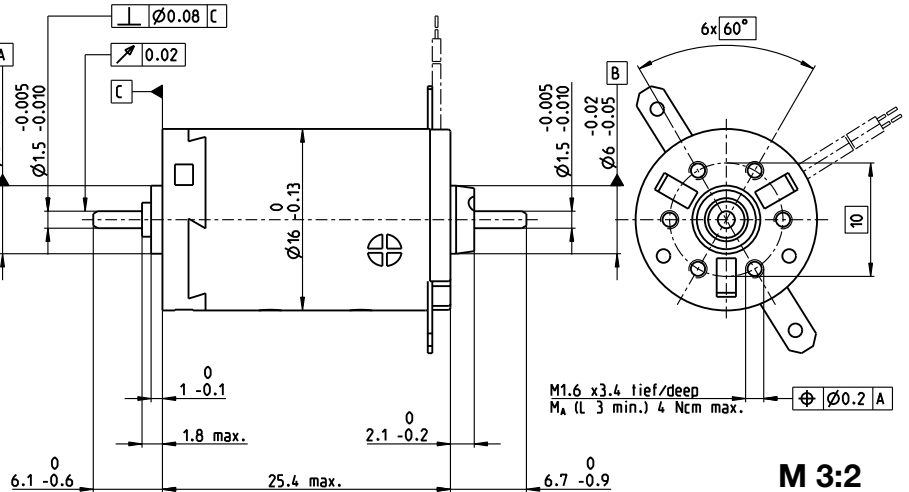
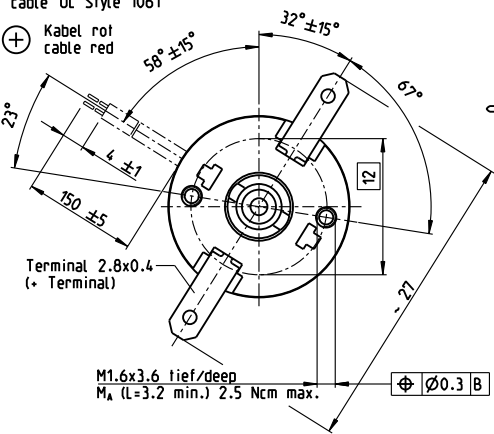
maxon Modular System	
<b>Spur Gearhead</b> Ø16 mm 0.01 - 0.1 Nm Page 330-333	
<b>Planetary Gearhead</b> Ø16 mm 0.1 - 0.6 Nm Page 334/335	
<b>Screw Drive</b> Ø16 mm Page 377-379	
<b>Recommended Electronics:</b> Notes Page 32 ESCON Module 24/2 454 ESCON 36/2 DC 454	

# A-max 16 Ø16 mm, Precious Metal Brushes CLL, 1.2 Watt

maxon A-max

Kabel AWG 26/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with terminals	110051	110052	110053	110054	110055	110056	110057	110058	110059	110060
with cables	139823	352825	352826	352827	352828	352829	352830	352831	352832	352833

## Motor Data

Values at nominal voltage		1.2	2.4	6	7.2	9	12	15	18	18	30
1 Nominal voltage	V	1.2	2.4	6	7.2	9	12	15	18	18	30
2 No load speed	rpm	8560	9730	10000	9740	9120	10400	11600	11600	10300	11300
3 No load current	mA	73.9	44.1	18.3	14.7	10.8	9.69	8.99	7.49	6.34	4.33
4 Nominal speed	rpm	7170	6310	4540	4200	3530	4900	6090	6050	4580	5500
5 Nominal torque (max. continuous torque)	mNm	0.694	1.29	2.18	2.17	2.16	2.16	2.13	2.12	2.09	2.04
6 Nominal current (max. continuous current)	A	0.6	0.6	0.407	0.327	0.244	0.21	0.185	0.153	0.134	0.0862
7 Stall torque	mNm	3.83	3.61	4.03	3.86	3.57	4.13	4.54	4.48	3.84	4.04
8 Stall current	A	2.93	1.58	0.723	0.561	0.39	0.386	0.378	0.311	0.236	0.164
9 Max. efficiency	%	71	70	71	71	70	71	72	72	71	71
<b>Characteristics</b>											
10 Terminal resistance	Ω	0.41	1.52	8.3	12.8	23.1	31.1	39.7	57.9	76.2	183
11 Terminal inductance	mH	0.017	0.0519	0.306	0.467	0.831	1.13	1.42	2.05	2.61	6.01
12 Torque constant	mNm/A	1.31	2.29	5.57	6.88	9.17	10.7	12	14.4	16.3	24.7
13 Speed constant	rpm/V	7290	4170	1720	1390	1040	893	795	663	587	387
14 Speed / torque gradient	rpm/mNm	2280	2770	2560	2590	2620	2600	2630	2670	2750	2880
15 Mechanical time constant	ms	25.3	23.7	23.2	23.3	23.3	23.3	23.4	23.3	23.4	23.8
16 Rotor inertia	gcm <sup>2</sup>	1.06	0.818	0.866	0.857	0.847	0.857	0.85	0.836	0.814	0.791

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	29.8 K/W
18 Thermal resistance winding-housing	5.5 K/W
19 Thermal time constant winding	3.55 s
20 Thermal time constant motor	165 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C

Mechanical data (sleeve bearings)	
23 Max. speed	11 000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	35 N
28 Max. radial load, 5 mm from flange	280 N

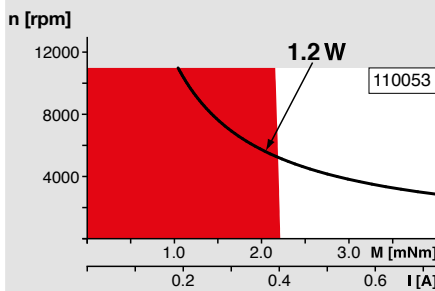
Mechanical data (ball bearings)	
23 Max. speed	11 000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	2.2 N
27 Max. force for press fits (static) (static, shaft supported)	30 N
28 Max. radial load, 5 mm from flange	280 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	22 g

CLL = Capacitor Long Life  
Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings  
Without CLL

## Operating Range



## Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

## maxon Modular System

### Spur Gearhead

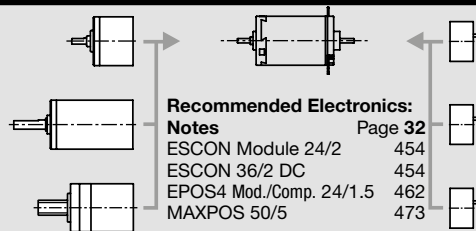
Ø16 mm  
0.01 - 0.1 Nm  
Page 330-333

### Planetary Gearhead

Ø16 mm  
0.1 - 0.6 Nm  
Page 334/335

### Screw Drive

Ø16 mm  
Page 377-379



### Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

Details on catalog page 32

**Encoder MEnc**  
Ø13 mm  
16 CPT, 2 channels  
Page 416

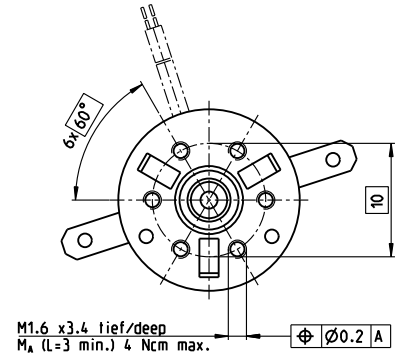
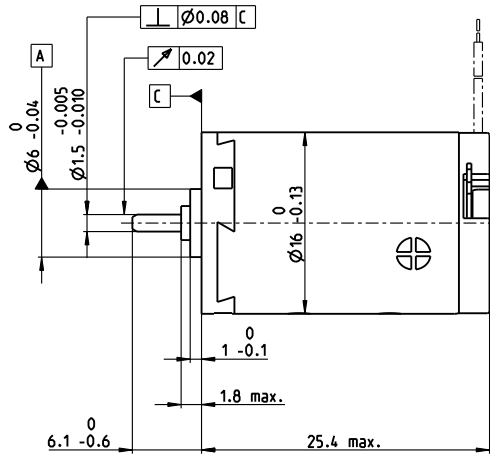
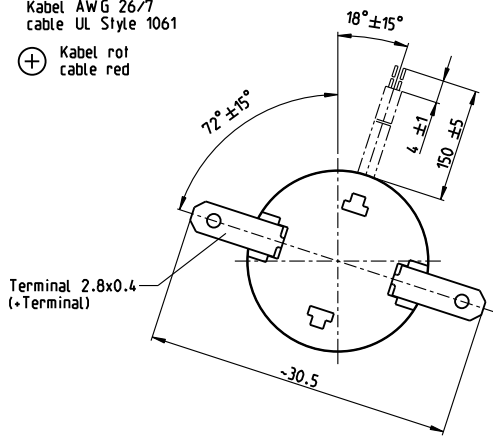
**Encoder MR**  
32 CPT,  
2 / 3 channels  
Page 429

**Encoder MR**  
128 / 256 / 512 CPT,  
2 / 3 channels  
Page 430



# A-max 16 Ø16 mm, Graphite Brushes, 2 Watt

Kabel AWG 26/7  
cable UL Style 1061  
⊕ Kabel rot  
cable red



**M 3:2**

- Stock program
- Standard program
- Special program (on request)

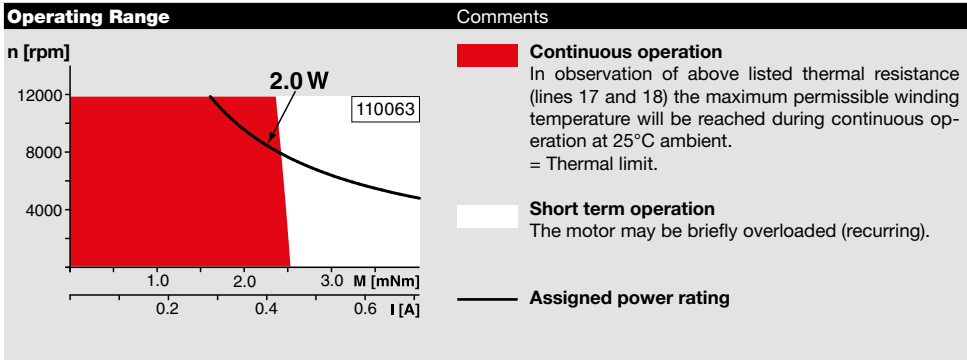
		Part Numbers									
with terminals		110061	110062	110063	110064	110065	110066	110067	110068	110069	110070
with cables		139821	352853	352854	352855	325083	352856	205903	352857	266076	352858

Motor Data												
Values at nominal voltage												
		V	1.5	3	6	9	12	14	15	18	21	30
1	Nominal voltage	V	1.5	3	6	9	12	14	15	18	21	30
2	No load speed	rpm	10200	11500	9360	11500	11500	11500	11000	10900	11300	10500
3	No load current	mA	282	164	65.6	54.6	41	35.1	31.1	25.9	23	15
4	Nominal speed	rpm	9010	8060	3280	5510	5460	5500	4860	4810	5100	4180
5	Nominal torque (max. continuous torque)	mNm	0.579	1.29	2.42	2.36	2.34	2.35	2.35	2.33	2.28	2.24
6	Nominal current (max. continuous current)	A	0.72	0.72	0.495	0.394	0.293	0.253	0.224	0.186	0.162	0.105
7	Stall torque	mNm	5.36	4.65	4.05	4.84	4.78	4.82	4.54	4.48	4.49	4.04
8	Stall current	A	4.1	2.03	0.727	0.704	0.521	0.451	0.378	0.311	0.276	0.164
9	Max. efficiency	%	54	51	49	52	52	52	51	51	50	48
Characteristics												
10	Terminal resistance	Ω	0.366	1.48	8.25	12.8	23	31.1	39.7	57.9	76.1	183
11	Terminal inductance	mH	0.017	0.052	0.306	0.467	0.83	1.13	1.42	2.05	2.61	6.01
12	Torque constant	mNm/A	1.31	2.29	5.57	6.88	9.17	10.7	12	14.4	16.3	24.7
13	Speed constant	rpm/V	7290	4170	1720	1390	1040	893	795	663	587	387
14	Speed / torque gradient	rpm/mNm	2040	2690	2540	2580	2620	2590	2630	2660	2750	2880
15	Mechanical time constant	ms	22.6	23.1	23.1	23.2	23.3	23.3	23.5	23.4	23.5	23.9
16	Rotor inertia	gcm <sup>2</sup>	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793

Specifications		
Thermal data		
17	Thermal resistance housing-ambient	29.8 K/W
18	Thermal resistance winding-housing	5.5 K/W
19	Thermal time constant winding	3.55 s
20	Thermal time constant motor	165 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. speed	11900 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	35 N
28	Max. radial load, 5 mm from flange	1.4 N
Mechanical data (ball bearings)		
23	Max. speed	11900 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.2 N
27	Max. force for press fits (static)	30 N
28	Max. radial load, 5 mm from flange	7.8 N
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	21 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings

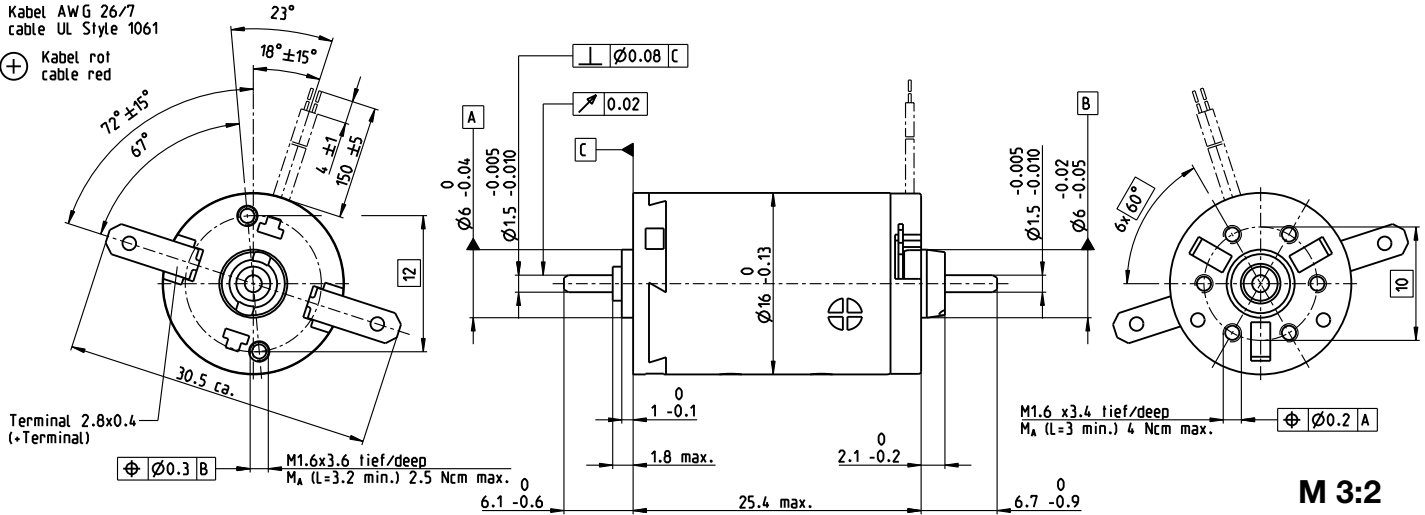


Details on catalog page 32

maxon Modular System	
<b>Spur Gearhead</b> Ø16 mm 0.01 - 0.1 Nm Page 330-333	
<b>Planetary Gearhead</b> Ø16 mm 0.1 - 0.6 Nm Page 334/335	
<b>Screw Drive</b> Ø16 mm Page 377-379	
<b>Recommended Electronics:</b> Notes Page 32 ESCON Module 24/2 454 ESCON 36/2 DC 454	

# A-max 16 Ø16 mm, Graphite Brushes, 2 Watt

Kabel AWG 26/7  
cable UL Style 1061  
⊕ Kabel rot  
cable red



- Stock program
- Standard program
- Special program (on request)

Part Numbers										
with terminals	110071	110072	110073	110074	110075	110076	110077	110078	110079	110080
with cables	139825	352870	352871	352872	352873	352874	352875	352876	352877	352878

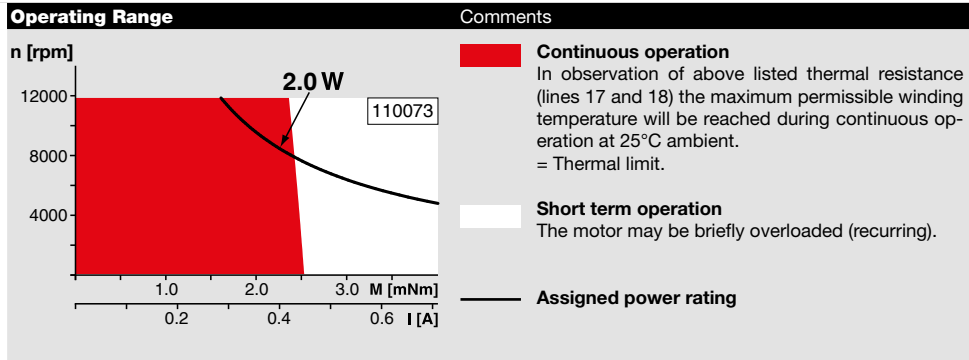
Motor Data															
<b>Values at nominal voltage</b>															
1 Nominal voltage	V	1.5	3	6	9	12	14	15	18	21	30				
2 No load speed	rpm	10200	11500	9360	11500	11500	11500	11000	10900	11300	10500				
3 No load current	mA	282	164	65.6	54.6	41	35.1	31.1	25.9	23	15				
4 Nominal speed	rpm	9010	8060	3280	5510	5460	5500	4860	4810	5100	4180				
5 Nominal torque (max. continuous torque)	mNm	0.579	1.29	2.42	2.36	2.34	2.35	2.35	2.33	2.28	2.24				
6 Nominal current (max. continuous current)	A	0.72	0.72	0.495	0.394	0.293	0.253	0.224	0.186	0.162	0.105				
7 Stall torque	mNm	5.36	4.65	4.05	4.84	4.78	4.82	4.54	4.48	4.49	4.04				
8 Stall current	A	4.1	2.03	0.727	0.704	0.521	0.451	0.378	0.311	0.276	0.164				
9 Max. efficiency	%	54	51	49	52	52	52	51	51	50	48				
<b>Characteristics</b>															
10 Terminal resistance	Ω	0.366	1.48	8.25	12.8	23	31.1	39.7	57.9	76.1	183				
11 Terminal inductance	mH	0.017	0.052	0.306	0.467	0.83	1.13	1.42	2.05	2.61	6.01				
12 Torque constant	mNm/A	1.31	2.29	5.57	6.88	9.17	10.7	12	14.4	16.3	24.7				
13 Speed constant	rpm/V	7290	4170	1720	1390	1040	893	795	663	587	387				
14 Speed / torque gradient	rpm/mNm	2040	2690	2540	2580	2620	2590	2630	2660	2750	2880				
15 Mechanical time constant	ms	22.6	23.1	23.1	23.2	23.3	23.3	23.5	23.4	23.5	23.9				
16 Rotor inertia	gcm <sup>2</sup>	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793				

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	29.8 K/W
18 Thermal resistance winding-housing	5.5 K/W
19 Thermal time constant winding	3.55 s
20 Thermal time constant motor	165 s
21 Ambient temperature	-30...+85°C
22 Max. winding temperature	+125°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	11 900 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static) (static, shaft supported)	35 N / 280 N
28 Max. radial load, 5 mm from flange	1.4 N

<b>Mechanical data (ball bearings)</b>	
23 Max. speed	11 900 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	2.2 N
27 Max. force for press fits (static) (static, shaft supported)	30 N / 280 N
28 Max. radial load, 5 mm from flange	7.8 N
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	22 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings



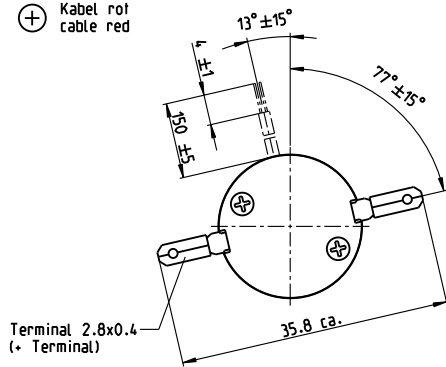
maxon Modular System		Details on catalog page 32	
<b>Spur Gearhead</b> Ø16 mm 0.01 - 0.1 Nm Page 330-333		<b>Encoder MEnc</b> Ø13 mm 16 CPT, 2 channels Page 416	
<b>Planetary Gearhead</b> Ø16 mm 0.1 - 0.6 Nm Page 334/335		<b>Encoder MR</b> 32 CPT, 2 / 3 channels Page 429	
<b>Screw Drive</b> Ø16 mm Page 377-379		<b>Encoder MR</b> 128 / 256 / 512 CPT, 2 / 3 channels Page 430	

**Recommended Electronics:**  
**Notes** Page 32  
 ESCON Module 24/2 454  
 ESCON 36/2 DC 454  
 EPOS4 Mod./Comp. 24/1.5 462  
 MAXPOS 50/5 473

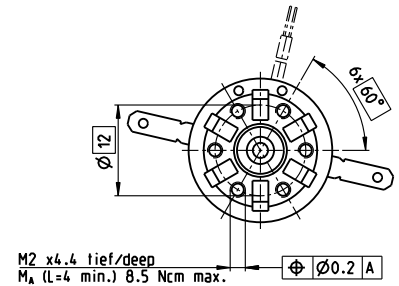
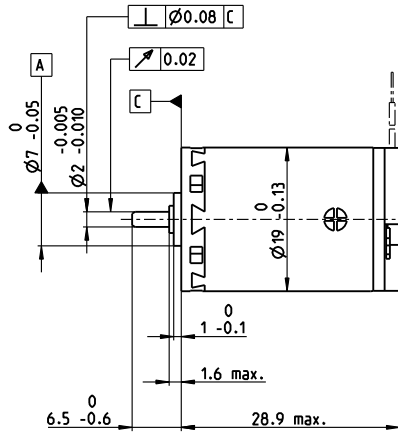
# A-max 19 Ø19 mm, Precious Metal Brushes CLL, 2.5 Watt

Kabel AWG 26/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



M 1:1



- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with terminals	110081	110082	110083	110084	110085	110086	110087	110088	110089
with cables	139828	202411	352922	202412	352923	233453	238388	267427	235373

## Motor Data

Values at nominal voltage		1.5	3.6	4.5	6	9	12	15	18	24
1 Nominal voltage	V	1.5	3.6	4.5	6	9	12	15	18	24
2 No load speed	rpm	8040	10800	9420	7790	9220	10300	10300	9300	8870
3 No load current	mA	78	52.9	33.6	18.6	16.2	14.6	11.7	8.25	5.73
4 Nominal speed	rpm	6840	8080	5710	4000	5470	6510	6500	5380	4900
5 Nominal torque (max. continuous torque)	mNm	1.35	2.48	3.61	3.59	3.59	3.49	3.48	3.42	3.39
6 Nominal current (max. continuous current)	A	0.84	0.84	0.83	0.51	0.403	0.33	0.264	0.195	0.138
7 Stall torque	mNm	7.79	9.43	9	7.36	8.83	9.47	9.45	8.16	7.63
8 Stall current	A	4.44	3.02	2.01	1.02	0.963	0.867	0.692	0.45	0.301
9 Max. efficiency	%	76	76	76	76	76	76	76	76	75
Characteristics										
10 Terminal resistance	Ω	0.338	1.19	2.24	5.88	9.34	13.8	21.7	40	79.7
11 Terminal inductance	mH	0.019	0.059	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12 Torque constant	mNm/A	1.76	3.12	4.49	7.22	9.17	10.9	13.7	18.1	25.4
13 Speed constant	rpm/V	5440	3060	2130	1320	1040	874	699	526	377
14 Speed / torque gradient	rpm/mNm	1050	1170	1060	1080	1060	1110	1110	1160	1180
15 Mechanical time constant	ms	27.9	25.4	24.3	24.2	24.1	24.2	24.3	25	24.6
16 Rotor inertia	gcm <sup>2</sup>	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	21.3 K/W
18 Thermal resistance winding-housing	10.5 K/W
19 Thermal time constant winding	11 s
20 Thermal time constant motor	201 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C

Mechanical data (sleeve bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static)	80 N
28 Max. radial load, 5 mm from flange	2.7 N

Mechanical data (ball bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static)	45 N
28 Max. radial load, 5 mm from flange	11.9 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	33 g

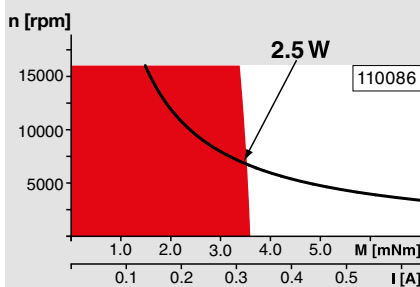
CLL = Capacitor Long Life

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Option

Ball bearings in place of sleeve bearings  
Without CLL

## Operating Range



## Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

— Assigned power rating

## maxon Modular System

Details on catalog page 32

### Planetary Gearhead

Ø19 mm  
0.1 - 0.3 Nm  
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### Planetary Gearhead

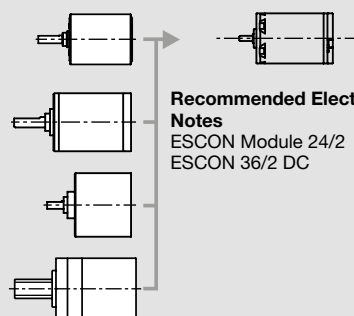
Ø22 mm  
0.5 - 2.0 Nm  
Page 339/341

### Spur Gearhead

Ø24 mm  
0.1 Nm  
Page 345

### Screw Drive

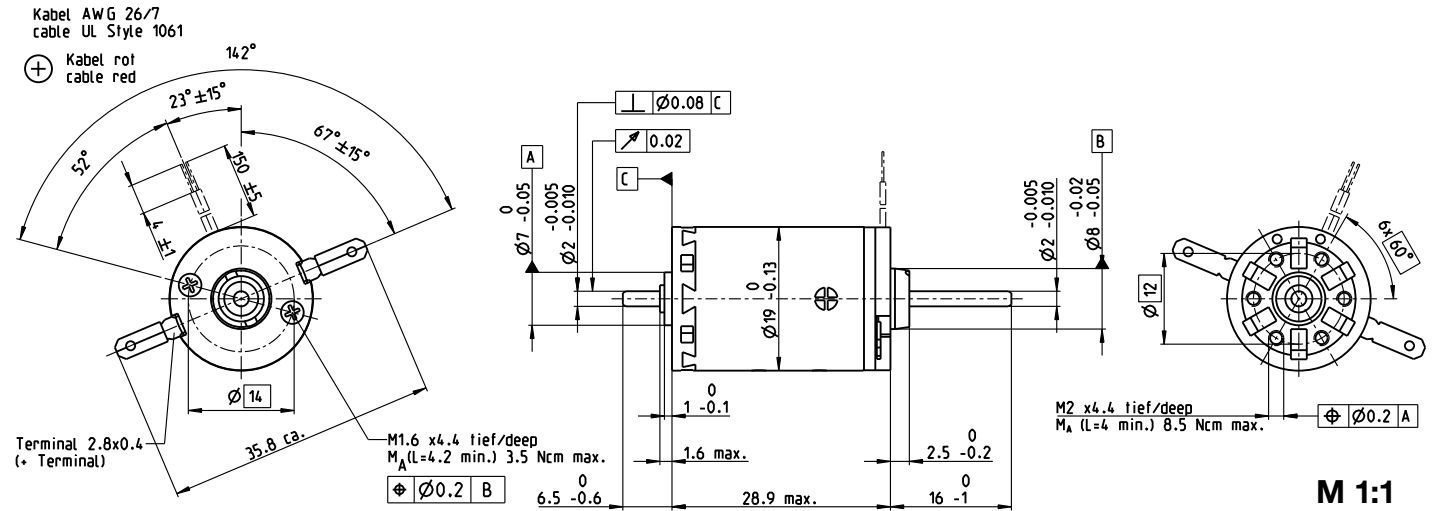
Ø22 mm  
Page 380/381



### Recommended Electronics:

**Notes** Page 32  
ESCON Module 24/2 454  
ESCON 36/2 DC 454

# A-max 19 Ø19 mm, Precious Metal Brushes CLL, 1.5 Watt



- Stock program
- Standard program
- Special program (on request)

Part Numbers									
with terminals	110090	110091	110092	110093	110094	110095	110096	110097	110098
with cables	139832	352925	352926	352927	352928	352929	352930	315468	352931

Motor Data										
Values at nominal voltage										
1 Nominal voltage	V	1.2	2.4	3	4.8	6	7.2	9	12	18
2 No load speed	rpm	6390	7160	6230	6190	6090	6130	6130	6140	6590
3 No load current	mA	88.3	52	34.2	21.2	16.6	14	11.2	8.41	6.19
4 Nominal speed	rpm	5210	4410	2500	2410	2330	2290	2280	2210	2630
5 Nominal torque (max. continuous torque)	mNm	1.33	2.49	3.62	3.57	3.59	3.51	3.51	3.43	3.38
6 Nominal current (max. continuous current)	A	0.84	0.84	0.833	0.511	0.405	0.332	0.265	0.195	0.138
7 Stall torque	mNm	6.23	6.28	6	5.89	5.89	5.68	5.67	5.44	5.73
8 Stall current	A	3.55	2.01	1.34	0.816	0.642	0.52	0.415	0.3	0.226
9 Max. efficiency	%	72	71	71	71	71	70	70	70	70
Characteristics										
10 Terminal resistance	Ω	0.338	1.19	2.24	5.88	9.34	13.8	21.7	40	79.7
11 Terminal inductance	mH	0.019	0.059	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12 Torque constant	mNm/A	1.76	3.12	4.49	7.22	9.17	10.9	13.7	18.1	25.4
13 Speed constant	rpm/V	5440	3060	2130	1320	1040	874	699	526	377
14 Speed / torque gradient	rpm/mNm	1050	1170	1060	1080	1060	1110	1110	1160	1180
15 Mechanical time constant	ms	27.9	25.4	24.3	24.2	24.1	24.3	24.3	25	24.7
16 Rotor inertia	gcm <sup>2</sup>	2.54	2.08	2.18	2.15	2.17	2.09	2.09	2.06	1.99

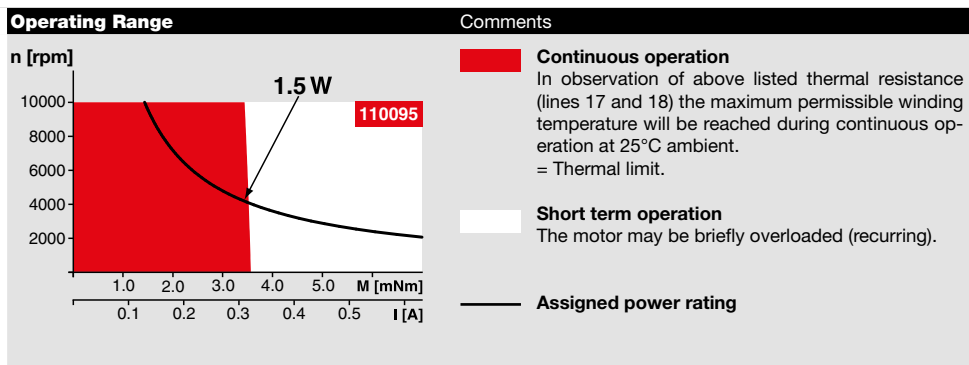
Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	21.3 K/W
18 Thermal resistance winding-housing	10.5 K/W
19 Thermal time constant winding	11 s
20 Thermal time constant motor	201 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C
<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	10000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static) (static, shaft supported)	80 N / 440 N
28 Max. radial load, 5 mm from flange	2.7 N

<b>Mechanical data (ball bearings)</b>	
23 Max. speed	10000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static) (static, shaft supported)	45 N / 440 N
28 Max. radial load, 5 mm from flange	11.9 N

<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor g	34 g

Values listed in the table are nominal. Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings  
Without CLL

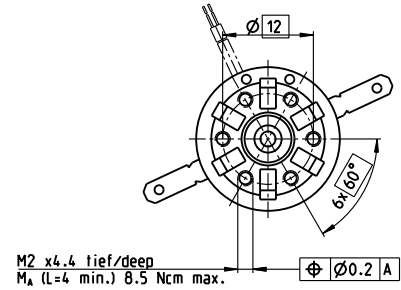
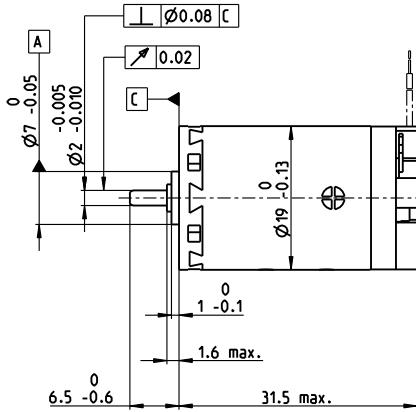
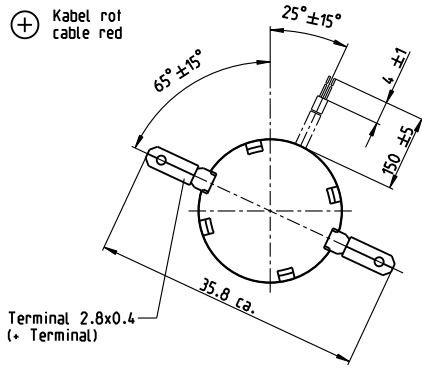


maxon Modular System		Details on catalog page 32
<b>Planetary Gearhead</b> Ø19 mm 0.1 - 0.3 Nm Page 336		<b>Encoder MEnc</b> Ø13 mm 16 CPT, 2 channels Page 416 <b>Encoder MR</b> 32 CPT, 2 / 3 channels Page 429 <b>Encoder MR</b> 128 / 256 / 512 CPT, 2 / 3 channels Page 430 <b>Encoder Enc</b> 22 mm 100 CPT, 2 channels Page 437
<b>Planetary Gearhead</b> Ø22 mm 0.5 - 2.0 Nm Page 339/341		
<b>Spur Gearhead</b> Ø24 mm 0.1 Nm Page 345		
<b>Screw Drive</b> Ø22 mm Page 380/381		

# A-max 19 Ø19 mm, Graphite Brushes, 2.5 Watt

Kabel AWG 26/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



M 1:1

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with terminals	249982	249983	249984	249985	249986	249987	249988	249989	249990
with cables	240133	352942	310977	352943	352944	352945	352946	352947	310980

## Motor Data

Values at nominal voltage		2.4	3.6	6	7.2	9	12	15	18	24
1 Nominal voltage	V	2.4	3.6	6	7.2	9	12	15	18	24
2 No load speed	rpm	12400	10400	12200	8980	8850	9930	9930	8910	8470
3 No load current	mA	292	158	114	66.1	51.9	44.6	35.7	26.3	18.6
4 Nominal speed	rpm	11700	8350	9310	4750	4630	5670	5670	4520	4020
5 Nominal torque (max. continuous torque)	mNm	0.759	1.78	2.75	3.98	4.02	3.89	3.89	3.83	3.8
6 Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.612	0.485	0.397	0.317	0.235	0.167
7 Stall torque	mNm	14.1	9.66	12.1	8.84	8.83	9.47	9.44	8.16	7.63
8 Stall current	A	8.04	3.09	2.71	1.23	0.963	0.867	0.691	0.45	0.301
9 Max. efficiency	%	64	59	63	59	59	60	60	58	57
Characteristics										
10 Terminal resistance	Ω	0.299	1.16	2.22	5.88	9.35	13.8	21.7	40	79.8
11 Terminal inductance	mH	0.019	0.059	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12 Torque constant	mNm/A	1.76	3.12	4.49	7.22	9.17	10.9	13.7	18.1	25.4
13 Speed constant	rpm/V	5440	3060	2130	1320	1040	874	699	526	377
14 Speed / torque gradient	rpm/mNm	925	1140	1050	1080	1060	1110	1110	1160	1180
15 Mechanical time constant	ms	24.9	25.1	24.4	24.5	24.4	24.6	24.7	25.4	25
16 Rotor inertia	gcm <sup>2</sup>	2.57	2.1	2.21	2.17	2.2	2.12	2.12	2.09	2.02

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	21.3 K/W
18 Thermal resistance winding-housing	10.5 K/W
19 Thermal time constant winding	11.0 s
20 Thermal time constant motor	201 s
21 Ambient temperature	-30...+85°C
22 Max. winding temperature	+125°C
Mechanical data (sleeve bearings)	
23 Max. speed	12000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static)	80 N
28 Max. radial load, 5 mm from flange	2.7 N

Mechanical data (ball bearings)	
23 Max. speed	12000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static)	45 N
28 Max. radial load, 5 mm from flange	11.9 N

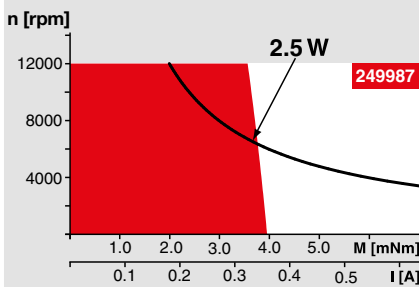
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	33 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Option

Ball bearings in place of sleeve bearings

## Operating Range



## Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

## maxon Modular System

Details on catalog page 32

### Planetary Gearhead

Ø19 mm  
0.1 - 0.3 Nm  
Page 336

### Planetary Gearhead

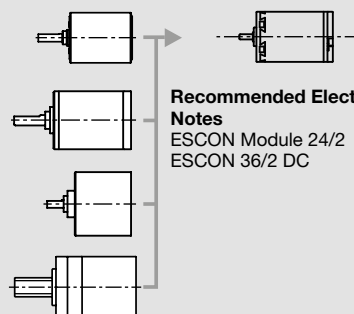
Ø22 mm  
0.5 - 2.0 Nm  
Page 339/341

### Spur Gearhead

Ø24 mm  
0.1 Nm  
Page 345

### Screw Drive

Ø22 mm  
Page 380/381



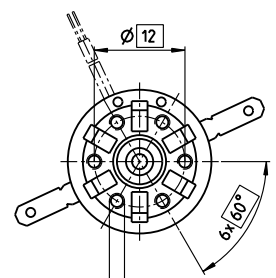
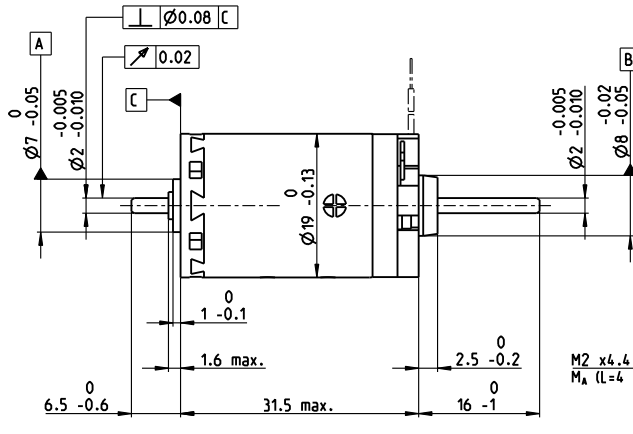
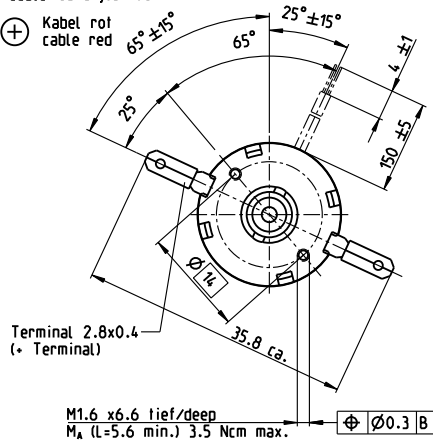
### Recommended Electronics:

**Notes** Page 32  
ESCON Module 24/2 454  
ESCON 36/2 DC 454

# A-max 19 Ø19 mm, Graphite Brushes, 2.5 Watt

Kabel AWG 26/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

with terminals	249991	249992	249993	249994	249995	249996	249997	249998	249999
with cables	240035	352971	353590	352972	352973	344596	352974	352975	352976

Motor Data											
Values at nominal voltage											
		2.4	3.6	6	7.2	9	12	15	18	24	
1	Nominal voltage	V	2.4	3.6	6	7.2	9	12	15	18	24
2	No load speed	rpm	12400	10400	12200	8980	8850	9930	9930	8910	8470
3	No load current	mA	292	158	114	66.1	51.9	44.6	35.7	26.3	18.6
4	Nominal speed	rpm	11700	8350	9310	4750	4630	5670	5670	4520	4020
5	Nominal torque (max. continuous torque)	mNm	0.759	1.78	2.75	3.98	4.02	3.89	3.89	3.83	3.8
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.612	0.485	0.397	0.317	0.235	0.167
7	Stall torque	mNm	14.1	9.66	12.1	8.84	8.83	9.47	9.44	8.16	7.63
8	Stall current	A	8.04	3.09	2.71	1.23	0.963	0.867	0.691	0.45	0.301
9	Max. efficiency	%	64	59	63	59	59	60	60	58	57
Characteristics											
10	Terminal resistance	Ω	0.299	1.16	2.22	5.88	9.35	13.8	21.7	40	79.8
11	Terminal inductance	mH	0.019	0.059	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12	Torque constant	mNm/A	1.76	3.12	4.49	7.22	9.17	10.9	13.7	18.1	25.4
13	Speed constant	rpm/V	5440	3060	2130	1320	1040	874	699	526	377
14	Speed / torque gradient	rpm/mNm	925	1140	1050	1080	1060	1110	1110	1160	1180
15	Mechanical time constant	ms	24.6	24.8	24	24.2	24.1	24.2	24.3	25	24.6
16	Rotor inertia	gcm <sup>2</sup>	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

### Specifications

Thermal data		
17	Thermal resistance housing-ambient	21.3 K/W
18	Thermal resistance winding-housing	10.5 K/W
19	Thermal time constant winding	11.0 s
20	Thermal time constant motor	201 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C

Mechanical data (sleeve bearings)		
23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static) (static, shaft supported)	80 N / 480 N
28	Max. radial load, 5 mm from flange	2.7 N

Mechanical data (ball bearings)		
23	Max. speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static) (static, shaft supported)	45 N / 240 N
28	Max. radial load, 5 mm from flange	11.9 N

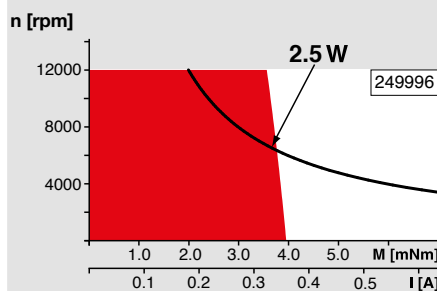
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	34 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

#### Option

Ball bearings in place of sleeve bearings

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System

Details on catalog page 32

#### Planetary Gearhead

Ø19 mm  
0.1 - 0.3 Nm  
Page 336

#### Planetary Gearhead

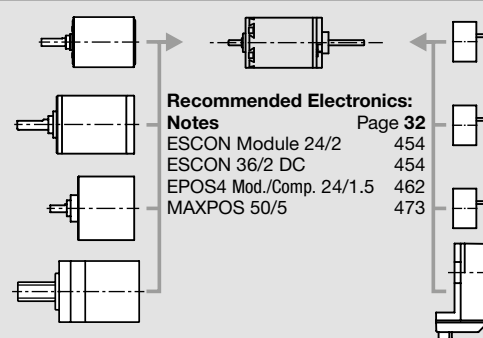
Ø22 mm  
0.5 - 2.0 Nm  
Page 339/341

#### Spur Gearhead

Ø24 mm  
0.1 Nm  
Page 345

#### Screw Drive

Ø22 mm  
Page 380/381



#### Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

#### Encoder MEnc

Ø13 mm  
16 CPT, 2 channels  
Page 416

#### Encoder MR

32 CPT,  
2 / 3 channels  
Page 429

#### Encoder MR

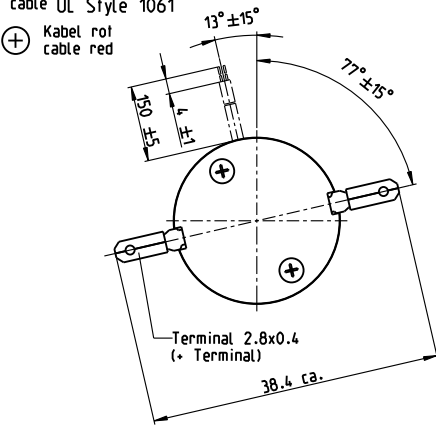
128 / 256 / 512 CPT,  
2 / 3 channels  
Page 430

#### Encoder Enc

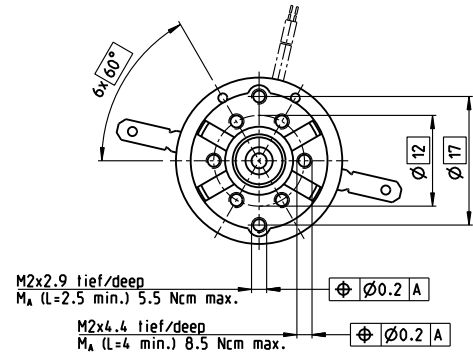
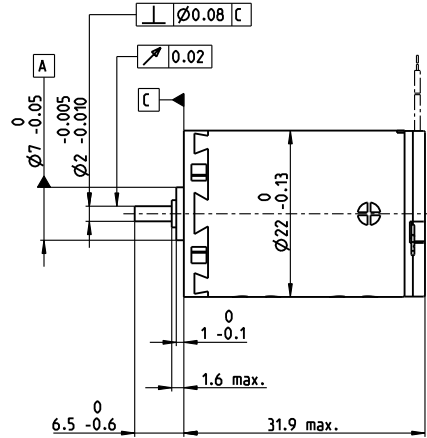
22 mm  
100 CPT, 2 channels  
Page 437

# A-max 22 Ø22 mm, Precious Metal Brushes CLL, 5 Watt

Kabel AWG 24/7  
cable UL Style 1061  
Kabel rot  
cable red



M 1:1



- Stock program
- Standard program
- Special program (on request)

Part Numbers												
with terminals	110117	110119	110120	110121	110122	110123	110124	110125	110126	110127	110128	110129
with cables	139838	218799	238798	202413	258367	137255	134267	134666	267423	137476	310003	342390

Motor Data													
Values at nominal voltage													
1 Nominal voltage	V	6	9	9	12	12	15	18	24	30	36	48	48
2 No load speed	rpm	9630	9970	8760	10400	9400	10300	9970	10700	10800	9800	9280	8370
3 No load current	mA	29.5	20.8	16.8	16.8	14.2	13.1	10.4	8.81	7.18	5.06	3.47	2.93
4 Nominal speed	rpm	7390	7300	6100	7770	6700	7530	7220	7970	8070	7000	6420	5520
5 Nominal torque (max. continuous torque)	mNm	4.81	6.22	6.3	6.24	6.18	6.1	6.05	6.02	5.98	5.94	5.83	5.9
6 Nominal current (max. continuous current)	A	0.84	0.745	0.661	0.586	0.523	0.451	0.362	0.291	0.234	0.175	0.122	0.111
7 Stall torque	mNm	20.1	22.9	20.5	24.3	21.4	22.9	22	23.5	23.5	20.8	19	17.4
8 Stall current	A	3.42	2.68	2.11	2.23	1.77	1.65	1.28	1.11	0.894	0.599	0.387	0.32
9 Max. efficiency	%	83	84	83	84	83	83	83	83	83	83	82	82
Characteristics													
10 Terminal resistance	Ω	1.76	3.36	4.27	5.39	6.78	9.07	14	21.6	33.5	60.1	124	150
11 Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.584	0.89	1.37	2.1	3.68	7.29	8.95
12 Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9	54.3
13 Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195	176
14 Speed / torque gradient	rpm/mNm	482	438	430	432	443	451	458	459	465	474	494	486
15 Mechanical time constant	ms	20.5	19.8	19.7	19.7	19.8	20.2	20.1	20.2	20.3	20.3	20.5	20.4
16 Rotor inertia	gcm <sup>2</sup>	4.07	4.32	4.37	4.36	4.26	4.27	4.2	4.2	4.16	4.09	3.97	4.01

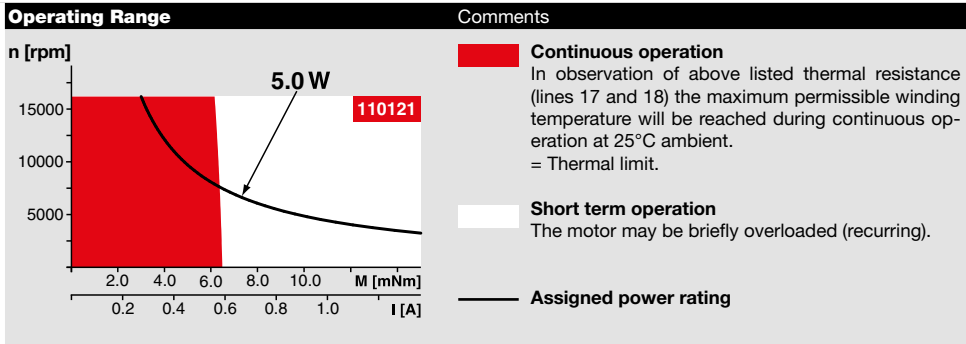
Specifications	
Thermal data	
17 Thermal resistance housing-ambient	20 K/W
18 Thermal resistance winding-housing	6.0 K/W
19 Thermal time constant winding	10.2 s
20 Thermal time constant motor	313 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static)	80 N
28 Max. radial load, 5 mm from flange	2.8 N

Mechanical data (ball bearings)	
23 Max. speed	16000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static)	45 N
28 Max. radial load, 5 mm from flange	12.3 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	54 g
CLL = Capacitor Long Life	

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings  
Without CLL



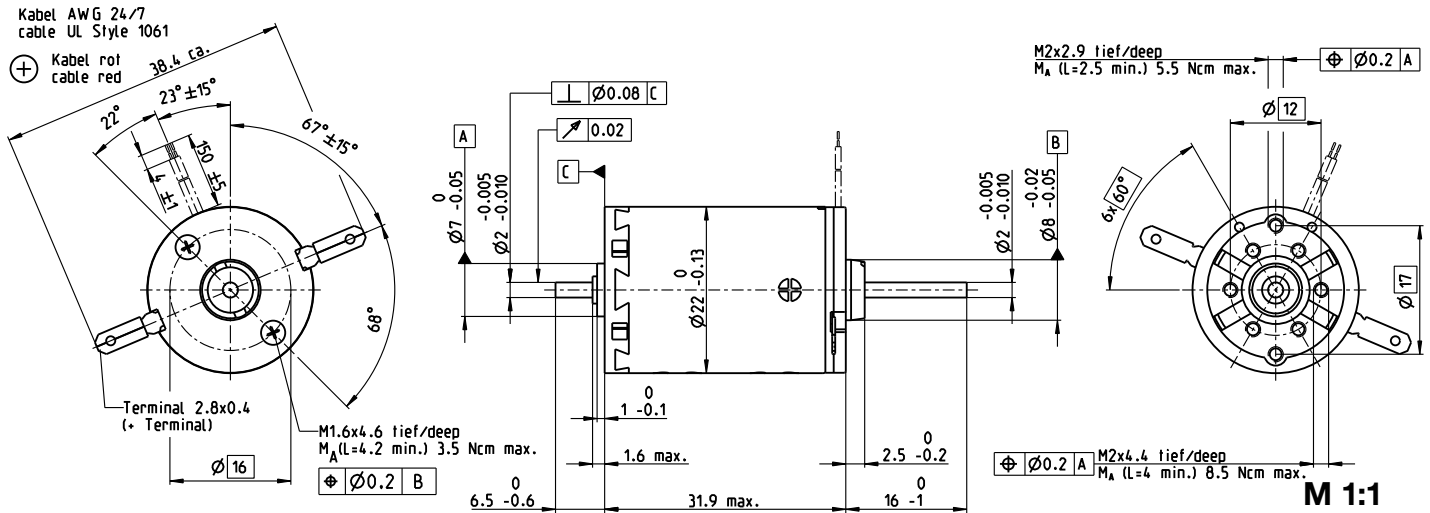
**maxon Modular System** Details on catalog page 32

<b>Planetary Gearhead</b> Ø22 mm 0.1 - 0.6 Nm Page 337/338	
<b>Planetary Gearhead</b> Ø22 mm 0.5 - 2.0 Nm Page 339/341	
<b>Spur Gearhead</b> Ø24 mm 0.1 Nm Page 345	
<b>Screw Drive</b> Ø22 mm Page 380/381	

**Recommended Electronics:** Page 32

<b>Notes</b>	
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457

# A-max 22 Ø22 mm, Precious Metal Brushes CLL, 3.5 Watt



- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	110130	110132	110133	110134	110135	110136	110137	110138	110139	110140	110141	110142
with terminals	110130	110132	110133	110134	110135	110136	110137	110138	110139	110140	110141	110142
with cables	139846	352986	352987	352988	352989	352990	352991	352992	352993	352994	352995	352996

Motor Data													
<b>Values at nominal voltage</b>													
1 Nominal voltage	V	4.5	6	7.2	7.2	7.2	9	12	15	18	24	36	42
2 No load speed	rpm	7210	6630	7000	6240	5620	6140	6630	6680	6480	6520	6950	7320
3 No load current	mA	26.7	17.8	16	13.6	11.8	10.6	8.88	7.17	5.73	4.33	3.16	2.92
4 Nominal speed	rpm	5010	3940	4330	3550	2890	3400	3890	3930	3710	3720	4100	4490
5 Nominal torque (max. continuous torque)	mNm	4.82	6.27	6.31	6.31	6.24	6.21	6.16	6.15	6.11	6.05	5.91	5.95
6 Nominal current (max. continuous current)	A	0.84	0.749	0.662	0.589	0.525	0.457	0.368	0.296	0.237	0.177	0.123	0.112
7 Stall torque	mNm	15.4	15.3	16.4	14.6	12.8	14	14.9	15	14.4	14.2	14.5	15.5
8 Stall current	A	2.61	1.79	1.69	1.34	1.06	1.01	0.872	0.706	0.547	0.407	0.296	0.286
9 Max. efficiency	%	81	81	82	81	80	81	81	81	81	81	81	81
<b>Characteristics</b>													
10 Terminal resistance	Ω	1.72	3.36	4.27	5.39	6.78	8.9	13.8	21.2	32.9	59	122	147
11 Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.585	0.89	1.37	2.1	3.69	7.29	8.95
12 Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9	54.3
13 Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195	176
14 Speed / torque gradient	rpm/mNm	474	438	430	432	443	443	449	450	456	465	485	477
15 Mechanical time constant	ms	20.2	19.8	19.7	19.7	19.8	19.8	19.8	19.8	19.9	19.9	20.2	20
16 Rotor inertia	gcm <sup>2</sup>	4.07	4.32	4.38	4.36	4.26	4.27	4.2	4.21	4.16	4.1	3.97	4.01

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	20 K/W
18 Thermal resistance winding-housing	6.0 K/W
19 Thermal time constant winding	10.2 s
20 Thermal time constant motor	313 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C

Mechanical data (sleeve bearings)	
23 Max. speed	10000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static) (static, shaft supported)	80 N / 440 N
28 Max. radial load, 5 mm from flange	2.8 N

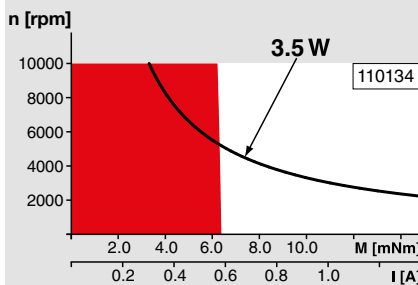
Mechanical data (ball bearings)	
23 Max. speed	10000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static) (static, shaft supported)	45 N / 440 N
28 Max. radial load, 5 mm from flange	12.3 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	54 g

Values listed in the table are nominal. Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings  
Without CLL

## Operating Range



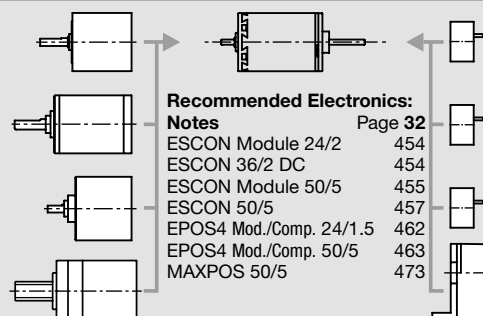
## Comments

- **Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- **Assigned power rating**

## maxon Modular System

Details on catalog page 32

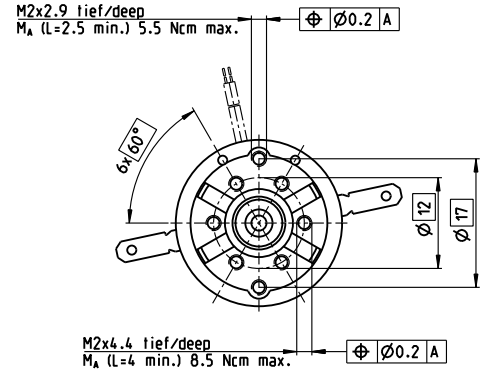
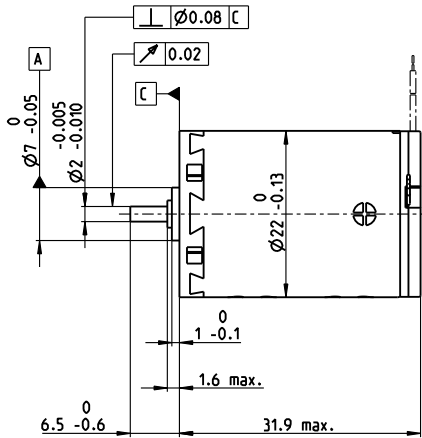
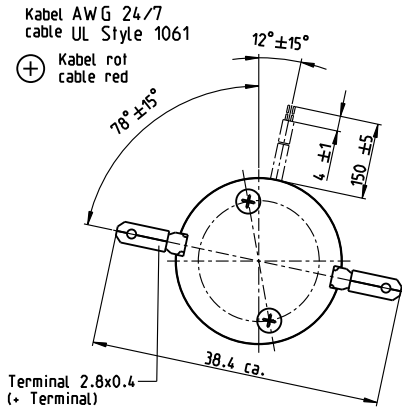
- Planetary Gearhead**  
Ø22 mm  
0.1 - 0.6 Nm  
Page 337/338
- Planetary Gearhead**  
Ø22 mm  
0.5 - 2.0 Nm  
Page 339/341
- Spur Gearhead**  
Ø24 mm  
0.1 Nm  
Page 345
- Screw Drive**  
Ø22 mm  
Page 380/381



- Encoder MEnc**  
Ø13 mm  
16 CPT, 2 channels  
Page 417
- Encoder MR**  
32 CPT,  
2 / 3 channels  
Page 429
- Encoder MR**  
128 / 256 / 512 CPT,  
2 / 3 channels  
Page 430
- Encoder Enc**  
22 mm  
100 CPT, 2 channels  
Page 437



# A-max 22 Ø22 mm, Graphite Brushes, 6 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

		Part Numbers											
with terminals		110143	110145	110146	<b>110147</b>	110148	110149	110150	<b>110151</b>	110152	110153	110154	110155
with cables		139840	353017	199807	320206	323856	108828	199424	202921	267433	325492	313302	353019

Motor Data													
Values at nominal voltage													
1 Nominal voltage	V	6	9	9	12	12	15	18	24	24	36	48	48
2 No load speed	rpm	9240	9690	8500	10200	9170	10000	9770	10500	8480	9630	9110	8210
3 No load current	mA	83.1	57.9	49.6	45.8	40.5	36	29	23.7	18.4	14.2	9.99	8.84
4 Nominal speed	rpm	6240	6530	5350	7060	6000	6890	6600	7380	5270	6420	5840	4940
5 Nominal torque (max. continuous torque)	mNm	5.91	6.88	7.04	6.96	6.95	6.93	6.92	6.9	6.97	6.86	6.75	6.86
6 Nominal current (max. continuous current)	A	1.08	0.859	0.77	0.681	0.613	0.534	0.432	0.347	0.283	0.21	0.147	0.135
7 Stall torque	mNm	19.4	22.1	19.8	23.7	20.9	22.9	22	23.7	18.9	21.1	19.2	17.6
8 Stall current	A	3.29	2.59	2.04	2.17	1.72	1.65	1.29	1.12	0.721	0.606	0.393	0.325
9 Max. efficiency	%	67	70	69	72	70	72	72	73	70	72	71	70
Characteristics													
10 Terminal resistance	Ω	1.82	3.48	4.42	5.53	6.96	9.09	14	21.5	33.3	59.4	122	148
11 Terminal inductance	mH	0.106	0.223	0.288	0.363	0.445	0.585	0.891	1.37	2.1	3.69	7.3	8.97
12 Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9	54.3
13 Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195	176
14 Speed / torque gradient	rpm/mNm	500	454	446	444	455	452	457	456	461	468	487	479
15 Mechanical time constant	ms	20.9	20.2	20.1	19.9	19.9	19.9	19.7	19.7	19.8	19.7	19.9	19.8
16 Rotor inertia	gcm <sup>2</sup>	4	4.25	4.3	4.29	4.19	4.2	4.13	4.13	4.09	4.02	3.9	3.94

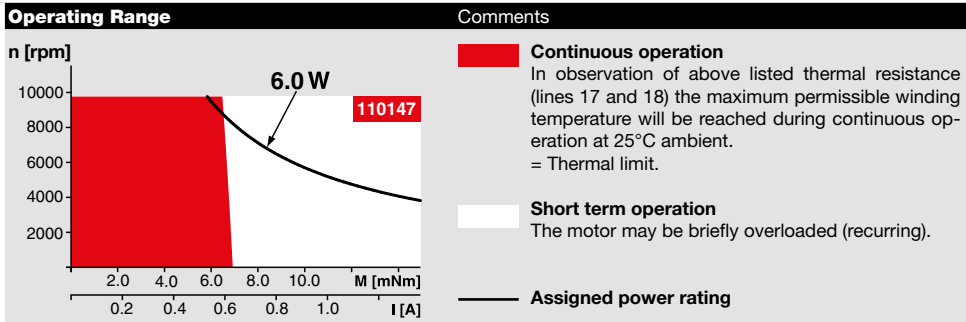
Specifications	
Thermal data	
17 Thermal resistance housing-ambient	20 K/W
18 Thermal resistance winding-housing	6.0 K/W
19 Thermal time constant winding	10.2 s
20 Thermal time constant motor	314 s
21 Ambient temperature	-30...+85°C
22 Max. winding temperature	+125°C
Mechanical data (sleeve bearings)	
23 Max. speed	9800 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1 N
27 Max. force for press fits (static)	80 N
28 Max. radial load, 5 mm from flange	2.8 N

Mechanical data (ball bearings)	
23 Max. speed	9800 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	3.3 N
27 Max. force for press fits (static)	45 N
28 Max. radial load, 5 mm from flange	12.3 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	54 g

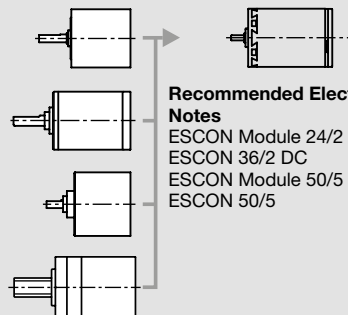
Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings



**maxon Modular System** Details on catalog page 32

- Planetary Gearhead**  
Ø22 mm  
0.1 - 0.6 Nm  
Page 337/338
- Planetary Gearhead**  
Ø22 mm  
0.5 - 2.0 Nm  
Page 339/341
- Spur Gearhead**  
Ø24 mm  
0.1 Nm  
Page 345
- Screw Drive**  
Ø22 mm  
Page 380/381

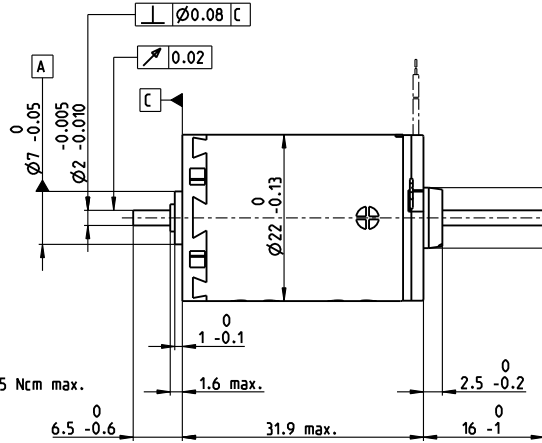
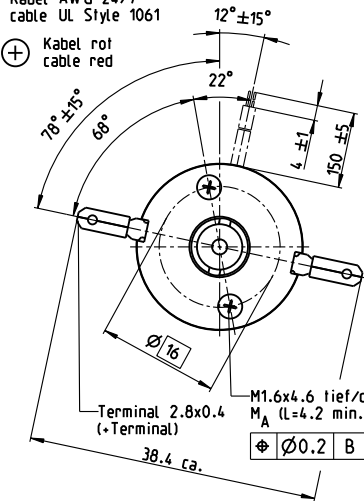


- Recommended Electronics:**
- | Notes             | Page 32 |
|-------------------|---------|
| ESCON Module 24/2 | 454     |
| ESCON 36/2 DC     | 454     |
| ESCON Module 50/5 | 455     |
| ESCON 50/5        | 457     |

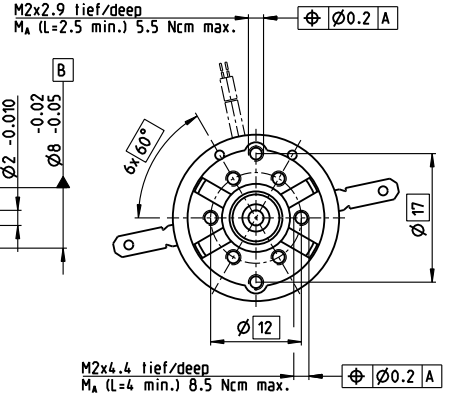
# A-max 22 Ø22 mm, Graphite Brushes, 6 Watt

Kabel AWG 24/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



M2x2.9 tief/deep  
MA (L=2.5 min.) 5.5 Ncm max.



M 1:1

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with terminals	110156	110158	110159	110160	110161	110162	110163	110164	110165	110166	110167	110168
with cables	139848	353023	353024	231171	353025	353026	231174	353027	353028	353029	316659	353603

## Motor Data

Values at nominal voltage		6	9	9	12	12	15	18	24	24	36	48	48
1	Nominal voltage	V	6	9	9	12	12	15	18	24	24	36	48
2	No load speed	rpm	9240	9690	8500	10200	9170	10000	9770	10500	8480	9630	9110
3	No load current	mA	83.1	57.9	49.6	45.8	40.5	36	29	23.7	18.4	14.2	9.99
4	Nominal speed	rpm	6240	6530	5350	7060	6000	6890	6600	7380	5270	6420	5840
5	Nominal torque (max. continuous torque)	mNm	5.91	6.88	7.04	6.96	6.95	6.93	6.92	6.9	6.97	6.86	6.75
6	Nominal current (max. continuous current)	A	1.08	0.859	0.77	0.681	0.613	0.534	0.432	0.347	0.283	0.21	0.147
7	Stall torque	mNm	19.4	22.1	19.8	23.7	20.9	22.9	22	23.7	18.9	21.1	19.2
8	Stall current	A	3.29	2.59	2.04	2.17	1.72	1.65	1.29	1.12	0.721	0.606	0.393
9	Max. efficiency	%	67	70	69	72	70	72	72	73	70	72	71
Characteristics													
10	Terminal resistance	Ω	1.82	3.48	4.42	5.53	6.96	9.09	14	21.5	33.3	59.4	122
11	Terminal inductance	mH	0.106	0.223	0.288	0.363	0.445	0.585	0.891	1.37	2.1	3.69	7.3
12	Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9
13	Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195
14	Speed / torque gradient	rpm/mNm	500	454	446	444	455	452	457	456	461	468	487
15	Mechanical time constant	ms	21.3	20.5	20.4	20.2	20.3	20.2	20.1	20.1	20.1	20.1	20.2
16	Rotor inertia	gcm <sup>2</sup>	4.07	4.32	4.37	4.36	4.26	4.27	4.2	4.2	4.16	4.09	3.97

## Specifications

Thermal data		
17	Thermal resistance housing-ambient	20 K/W
18	Thermal resistance winding-housing	6.0 K/W
19	Thermal time constant winding	10.2 s
20	Thermal time constant motor	313 s
21	Ambient temperature	-30...+85°C
22	Max. winding temperature	+125°C

Mechanical data (sleeve bearings)		
23	Max. speed	9800 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static) (static, shaft supported)	80 N / 440 N
28	Max. radial load, 5 mm from flange	2.8 N

Mechanical data (ball bearings)		
23	Max. speed	9800 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static) (static, shaft supported)	45 N / 240 N
28	Max. radial load, 5 mm from flange	12.3 N

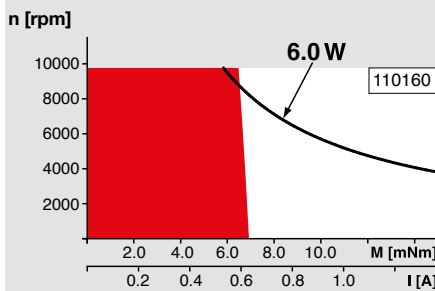
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	54 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Option

Ball bearings in place of sleeve bearings

## Operating Range



## Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

— Assigned power rating

## maxon Modular System

Details on catalog page 32

### Planetary Gearhead

Ø22 mm  
0.1 - 0.6 Nm  
Page 337/338

### Planetary Gearhead

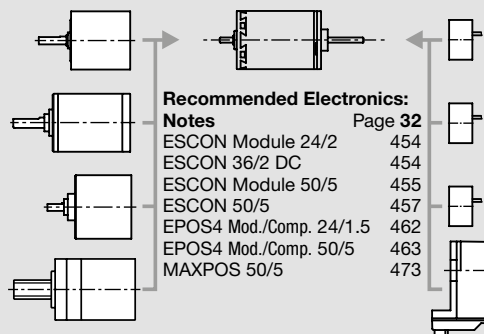
Ø22 mm  
0.5 - 2.0 Nm  
Page 339/341

### Spur Gearhead

Ø24 mm  
0.1 Nm  
Page 345

### Screw Drive

Ø22 mm  
Page 380/381



### Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 Mod./Comp. 50/5	463
MAXPOS 50/5	473

### Encoder MEnc

Ø13 mm  
16 CPT, 2 channels  
Page 417

### Encoder MR

32 CPT,  
2 / 3 channels  
Page 429

### Encoder MR

128 / 256 / 512 CPT,  
2 / 3 channels  
Page 430

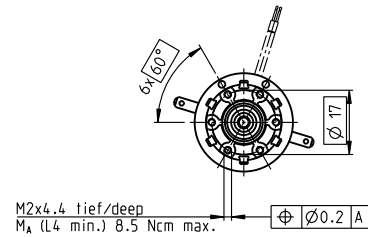
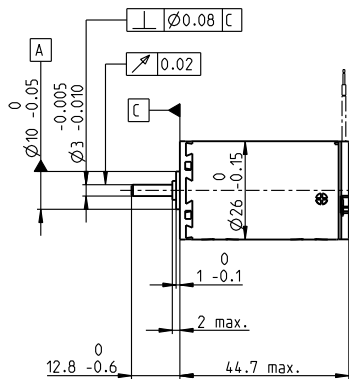
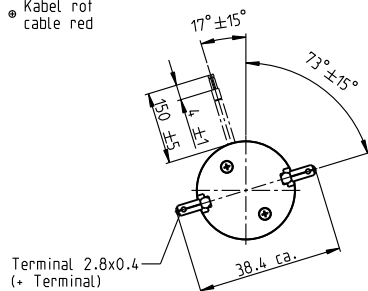
### Encoder Enc

22 mm  
100 CPT, 2 channels  
Page 437

# A-max 26 Ø26 mm, Precious Metal Brushes CLL, 7 Watt

Kabel AWG 24/7  
cable UL Style 1061

\* Kabel rot  
cable red



## M 1:2

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

with terminals	110181	110182	110183	110184	110185	110186	110187	110188	110189	110190	110191
with cables	353078	353079	353080	353081	329757	353082	332818	353083	353084	353085	353086

### Motor Data

Values at nominal voltage		4.5	6	9	12	15	18	24	30	36	42	48
1 Nominal voltage	V	4.5	6	9	12	15	18	24	30	36	42	48
2 No load speed	rpm	7320	8670	6160	6780	6720	6690	5670	6090	6780	6570	6050
3 No load current	mA	78.9	77.7	30.2	26.3	20.7	17.1	9.97	8.9	8.76	7.15	5.5
4 Nominal speed	rpm	6900	8130	5000	5340	5060	5010	3940	4370	5060	4820	4280
5 Nominal torque (max. continuous torque)	mNm	4.46	5.02	11.3	13.7	15.8	15.6	15.3	15.3	15.2	15	15
6 Nominal current (max. continuous current)	A	0.84	0.84	0.84	0.84	0.766	0.627	0.391	0.336	0.31	0.254	0.204
7 Stall torque	mNm	67.3	73.5	58.8	63.5	63.6	62.1	50.3	54.2	60.2	56.4	51.4
8 Stall current	A	11.5	11.2	4.25	3.78	3.01	2.43	1.25	1.16	1.2	0.93	0.683
9 Max. efficiency	%	84	84	84	84	84	84	83	84	84	84	83
<b>Characteristics</b>												
10 Terminal resistance	Ω	0.39	0.536	2.12	3.17	4.99	7.41	19.2	25.8	30.1	45.1	70.2
11 Terminal inductance	mH	0.04	0.051	0.227	0.333	0.529	0.77	1.9	2.58	2.99	4.34	6.68
12 Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2
13 Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127
14 Speed / torque gradient	rpm/mNm	109	119	105	108	106	108	114	113	114	117	119
15 Mechanical time constant	ms	16.5	16	15	14.9	14.8	14.8	14.9	14.9	14.9	15	15
16 Rotor inertia	gcm <sup>2</sup>	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

### Specifications

Thermal data	
17 Thermal resistance housing-ambient	13.2 K/W
18 Thermal resistance winding-housing	3.2 K/W
19 Thermal time constant winding	13.8 s
20 Thermal time constant motor	473 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C

Mechanical data (sleeve bearings)	
23 Max. speed	11000 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1.7 N
27 Max. force for press fits (static)	80 N
28 Max. radial load, 5 mm from flange	5.5 N

Mechanical data (ball bearings)	
23 Max. speed	11000 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5 N
27 Max. force for press fits (static)	75 N
28 Max. radial load, 5 mm from flange	20.5 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	117 g

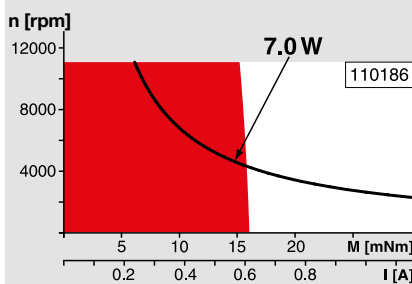
CLL = Capacitor Long Life

Values listed in the table are nominal.  
Explanation of the figures on page 68.

#### Option

Ball bearings in place of sleeve bearings  
Without CLL

### Operating Range



### Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

— Assigned power rating

### maxon Modular System

Details on catalog page 32

#### Planetary Gearhead

Ø26 mm  
0.75 - 4.5 Nm  
Page 346

#### Spur Gearhead

Ø30 mm  
0.07 - 0.2 Nm  
Page 347

#### Planetary Gearhead

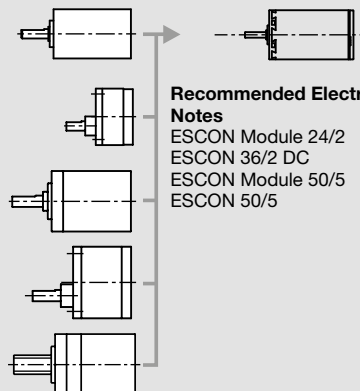
Ø32 mm  
0.75 - 6.0 Nm  
Page 348/349/352

#### Spur Gearhead

Ø38 mm  
0.1 - 0.6 Nm  
Page 360

#### Screw Drive

Ø32 mm  
Page 382-387



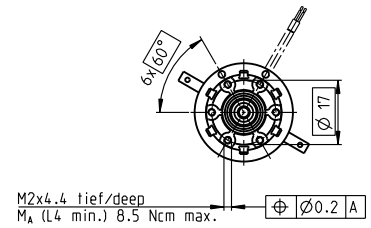
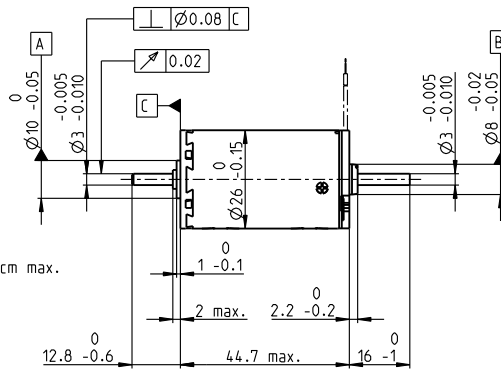
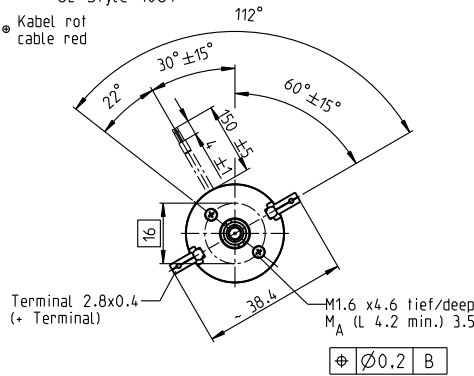
#### Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457

# A-max 26 Ø26 mm, Precious Metal Brushes CLL, 4.5 Watt

Kabel AWG 24/7  
cable UL Style 1061

● Kabel rot  
cable red



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with terminals	110204	110205	110206	110207	110208	110209	110210	110211	110212	110213	110214
with cables	353109	353110	353111	353112	353113	353114	353115	353116	353117	353118	353119

Motor Data													
Values at nominal voltage													
		2.4	3.6	6	7.2	9	12	15	18	24	30	36	
1 Nominal voltage	V	2.4	3.6	6	7.2	9	12	15	18	24	30	36	
2 No load speed	rpm	3890	5190	4090	4060	4020	4440	3530	3640	4510	4680	4520	
3 No load current	mA	67.7	69.9	29.2	24	19	16.5	9.41	8.2	8.45	7.16	5.67	
4 Nominal speed	rpm	3460	4640	2940	2650	2620	3030	2070	2180	3060	3210	3050	
5 Nominal torque (max. continuous torque)	mNm	4.53	5.08	11.3	13.3	13.4	13.2	12.9	12.9	12.8	12.6	12.5	
6 Nominal current (max. continuous current)	A	0.84	0.84	0.84	0.814	0.647	0.529	0.33	0.284	0.262	0.214	0.171	
7 Stall torque	mNm	35.9	44.1	39.2	38.1	38.2	41.4	31.4	32.5	40.1	40.3	38.5	
8 Stall current	A	6.15	6.71	2.83	2.27	1.8	1.62	0.783	0.697	0.797	0.665	0.513	
9 Max. efficiency	%	81	81	81	81	81	81	80	80	81	81	81	
Characteristics													
10 Terminal resistance	Ω	0.39	0.536	2.12	3.17	4.99	7.41	19.2	25.8	30.1	45.1	70.2	
11 Terminal inductance	mH	0.0402	0.0509	0.227	0.332	0.528	0.77	1.9	2.57	2.99	4.34	6.68	
12 Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2	
13 Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127	
14 Speed / torque gradient	rpm/mNm	109	119	105	108	106	108	114	113	114	117	119	
15 Mechanical time constant	ms	16.6	16.1	15	14.9	14.9	14.9	14.9	14.9	14.9	15	15	
16 Rotor inertia	gcm <sup>2</sup>	14.4	12.9	13.6	13.2	13.3	13.1	12.6	12.6	12.5	12.2	12.1	

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	13.2 K/W
18 Thermal resistance winding-housing	3.2 K/W
19 Thermal time constant winding	12.5 s
20 Thermal time constant motor	473 s
21 Ambient temperature	-30...+65°C
22 Max. winding temperature	+85°C

Mechanical data (sleeve bearings)	
23 Max. speed	6700 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1.7 N
27 Max. force for press fits (static) (static, shaft supported)	80 N
28 Max. radial load, 5 mm from flange	1200 N

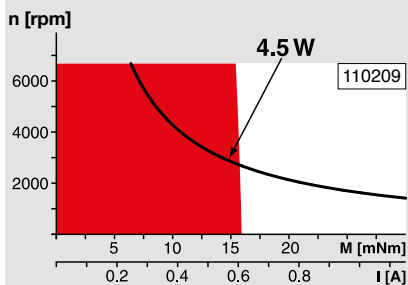
Mechanical data (ball bearings)	
23 Max. speed	6700 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5.0 N
27 Max. force for press fits (static) (static, shaft supported)	75 N
28 Max. radial load, 5 mm from flange	1200 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	119 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Ball bearings in place of sleeve bearings  
Without CLL

## Operating Range



## Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

## maxon Modular System

Details on catalog page 32

### Planetary Gearhead

Ø26 mm  
0.75 - 4.5 Nm  
Page 346

### Spur Gearhead

Ø30 mm  
0.07 - 0.2 Nm  
Page 347

### Planetary Gearhead

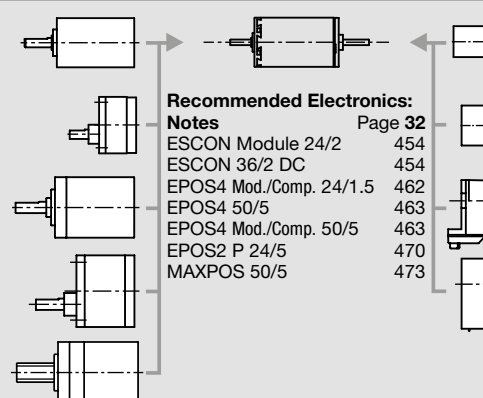
Ø32 mm  
0.75 - 6.0 Nm  
Page 348/349/352

### Spur Gearhead

Ø38 mm  
0.1 - 0.6 Nm  
Page 360

### Screw Drive

Ø32 mm  
Page 382-387



### Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

### Encoder MEnc

Ø13 mm  
16 CPT, 2 channels  
Page 417

### Encoder MR

128 - 1000 CPT,  
3 channels  
Page 432

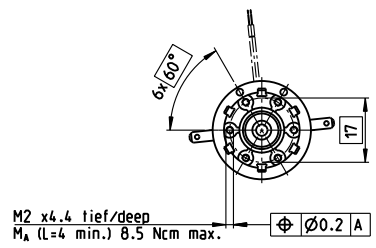
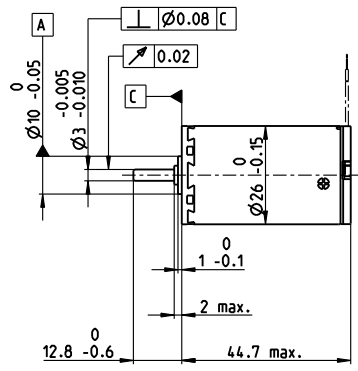
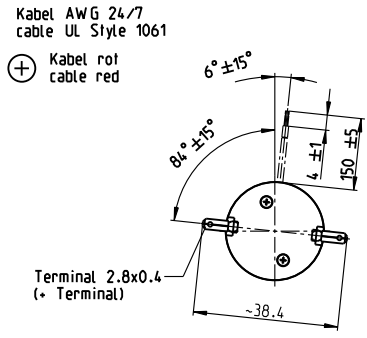
### Encoder Enc

22 mm  
100 CPT, 2 channels  
Page 437

### Encoder HED\_5540

500 CPT,  
3 channels  
Page 441/443

# A-max 26 Ø26 mm, Graphite Brushes, 11 Watt



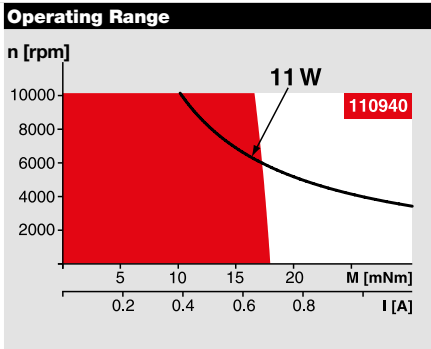
M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers											
with terminals	110935	110936	110937	110938	110939	110940	110941	110942	110943	110944	110945
with cables	139852	353166	353167	353168	353169	206344	353171	314214	202893	353174	353175

Motor Data												
Values at nominal voltage												
1 Nominal voltage	V	6	7.2	12	15	18	24	30	36	42	48	48
2 No load speed	rpm	9740	10400	8190	8450	8040	8890	7050	7280	7880	7470	6010
3 No load current	mA	143	130	57	47.5	37.1	31.7	18.9	16.4	15.5	12.7	9.66
4 Nominal speed	rpm	9210	9700	6720	6620	6080	6910	5000	5230	5840	5390	3900
5 Nominal torque (max. continuous torque)	mNm	5.48	6.26	14.2	17.4	18.7	18.4	18.2	18.2	18.1	17.8	17.9
6 Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	0.919	0.749	0.47	0.404	0.373	0.305	0.247
7 Stall torque	mNm	102	96.4	80.2	80.5	77.1	83.3	63	65.2	70.3	64.5	51.4
8 Stall current	A	17.4	14.7	5.79	4.8	3.64	3.26	1.57	1.4	1.4	1.06	0.684
9 Max. efficiency	%	83	82	81	81	81	82	80	80	80	80	78
Characteristics												
10 Terminal resistance	Ω	0.345	0.49	2.07	3.13	4.94	7.36	19.1	25.8	30.1	45.1	70.2
11 Terminal inductance	mH	0.04	0.051	0.227	0.333	0.529	0.77	1.9	2.58	2.99	4.34	6.68
12 Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2
13 Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127
14 Speed / torque gradient	rpm/mNm	96.6	109	103	106	105	108	113	113	113	117	119
15 Mechanical time constant	ms	14.6	14.7	14.6	14.7	14.7	14.7	14.9	14.9	14.9	15	15
16 Rotor inertia	gcm <sup>2</sup>	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	13.2 K/W
18 Thermal resistance winding-housing	3.2 K/W
19 Thermal time constant winding	12.5 s
20 Thermal time constant motor	473 s
21 Ambient temperature	-30...+85°C
22 Max. winding temperature	+125°C
<b>Mechanical data (ball bearings)</b>	
23 Max. speed	10400 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5 N
27 Max. force for press fits (static)	75 N
28 Max. radial load, 5 mm from flange	20 N



**Comments**

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

<b>Mechanical data (sleeve bearings)</b>	
23 Max. speed	10400 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1.7 N
27 Max. force for press fits (static)	80 N
28 Max. radial load, 5 mm from flange	5.5 N
<b>Other specifications</b>	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	117 g

**maxon Modular System** Details on catalog page 32

<p><b>Planetary Gearhead</b> Ø26 mm 0.75 - 4.5 Nm Page 346</p> <p><b>Spur Gearhead</b> Ø30 mm 0.07 - 0.2 Nm Page 347</p> <p><b>Planetary Gearhead</b> Ø32 mm 0.75 - 6.0 Nm Page 348/349/352</p> <p><b>Spur Gearhead</b> Ø38 mm 0.1 - 0.6 Nm Page 360</p> <p><b>Screw Drive</b> Ø32 mm Page 382-387</p>		<p><b>Recommended Electronics:</b></p> <p><b>Notes</b> <span style="float: right;">Page 32</span></p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/2 DC 454</p> <p>ESCON Module 50/5 455</p> <p>ESCON 50/5 457</p> <p>ESCON 70/10 457</p>
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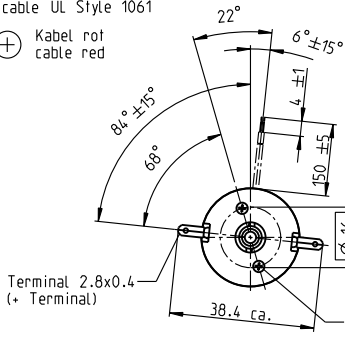
Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Sleeve bearings in place of ball bearings

# A-max 26 Ø26 mm, Graphite Brushes, 11 Watt

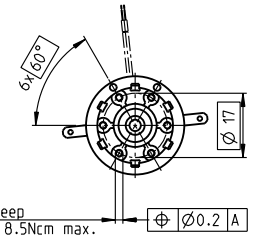
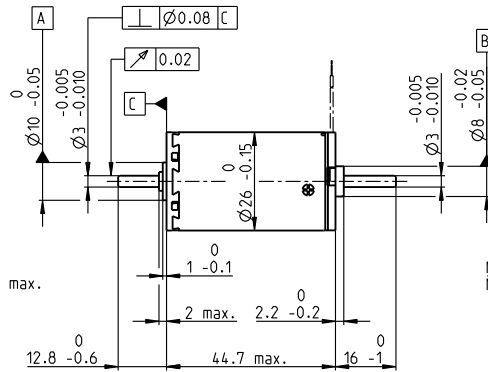
Kabel AWG 24/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



Terminal 2.8x0.4  
(+ Terminal)

M1.6 x4.6 tief/deep  
M<sub>A</sub> (L=4.2 min.) 3.5Ncm max.  
⊕ Ø0.2 B



M2x4.4 tief/deep  
M<sub>A</sub> (L=4 min.) 8.5Ncm max.  
⊕ Ø0.2 A

M 1:2

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	110958	110959	110960	110961	110962	110963	110964	110965	110966	110967	110968
with terminals	110958	110959	110960	110961	110962	110963	110964	110965	110966	110967	110968
with cables	353606	353607	353608	353609	353610	353611	353612	353613	353614	353615	353616

Motor Data		110958	110959	110960	110961	110962	110963	110964	110965	110966	110967	110968
<b>Values at nominal voltage</b>												
1 Nominal voltage	V	6	7.2	12	15	18	24	30	36	42	48	48
2 No load speed	rpm	9740	10400	8190	8450	8040	8890	7050	7280	7880	7470	6010
3 No load current	mA	143	130	57	47.5	37.1	31.7	18.9	16.4	15.5	12.7	9.66
4 Nominal speed	rpm	9210	9700	6720	6620	6080	6910	5000	5230	5840	5390	3900
5 Nominal torque (max. continuous torque)	mNm	5.48	6.26	14.2	17.4	18.7	18.4	18.2	18.2	18.1	17.8	17.9
6 Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	0.919	0.749	0.47	0.404	0.373	0.305	0.247
7 Stall torque	mNm	102	96.4	80.2	80.5	77.1	83.3	63	65.2	70.3	64.5	51.4
8 Stall current	A	17.4	14.7	5.79	4.8	3.64	3.26	1.57	1.4	1.4	1.06	0.684
9 Max. efficiency	%	83	82	81	81	81	82	80	80	80	80	78
<b>Characteristics</b>												
10 Terminal resistance	Ω	0.345	0.49	2.07	3.13	4.94	7.36	19.1	25.8	30.1	45.1	70.2
11 Terminal inductance	mH	0.04	0.051	0.227	0.333	0.529	0.77	1.9	2.58	2.99	4.34	6.68
12 Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2
13 Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127
14 Speed / torque gradient	rpm/mNm	96.6	109	103	106	105	108	113	113	113	117	119
15 Mechanical time constant	ms	14.6	14.7	14.6	14.7	14.7	14.7	14.9	14.9	14.9	15	15
16 Rotor inertia	gcm <sup>2</sup>	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

### Specifications

Thermal data	
17 Thermal resistance housing-ambient	13.2 K/W
18 Thermal resistance winding-housing	3.2 K/W
19 Thermal time constant winding	12.5 s
20 Thermal time constant motor	473 s
21 Ambient temperature	-30...+85°C
22 Max. winding temperature	+125°C

Mechanical data (ball bearings)	
23 Max. speed	10400 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5 N
27 Max. force for press fits (static) (static, shaft supported)	75 N
28 Max. radial load, 5 mm from flange	1200 N

Mechanical data (sleeve bearings)	
23 Max. speed	10400 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1.7 N
27 Max. force for press fits (static) (static, shaft supported)	80 N
28 Max. radial load, 5 mm from flange	1200 N

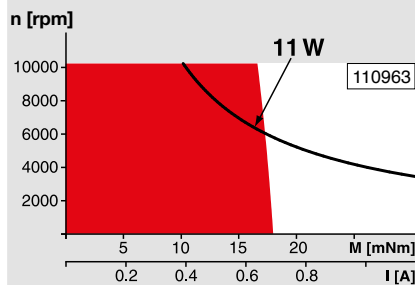
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	119 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

#### Option

Sleeve bearings in place of ball bearings

### Operating Range



### Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

— Assigned power rating

### maxon Modular System

Details on catalog page 32

#### Planetary Gearhead

Ø26 mm  
0.75 - 4.5 Nm  
Page 346

#### Spur Gearhead

Ø30 mm  
0.07 - 0.2 Nm  
Page 347

#### Planetary Gearhead

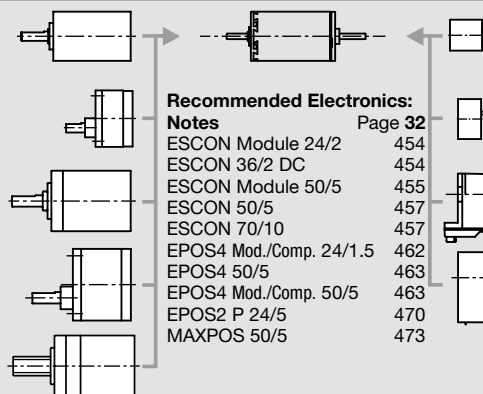
Ø32 mm  
0.75 - 6.0 Nm  
Page 348/349/352

#### Spur Gearhead

Ø38 mm  
0.1 - 0.6 Nm  
Page 360

#### Screw Drive

Ø32 mm  
Page 382-387



#### Recommended Electronics:

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ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457
ESCON 70/10	457
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

#### Encoder MEnc

Ø13 mm  
16 CPT, 2 channels  
Page 417

#### Encoder MR

128 - 1000 CPT,  
3 channels  
Page 432

#### Encoder Enc

22 mm  
100 CPT, 2 channels  
Page 437

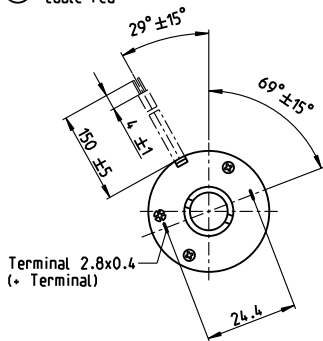
#### Encoder HED\_5540

500 CPT,  
3 channels  
Page 441/443

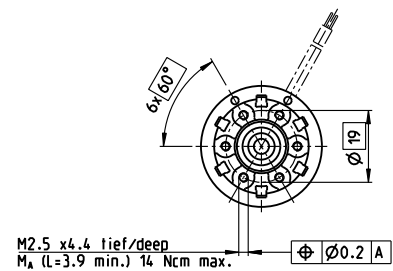
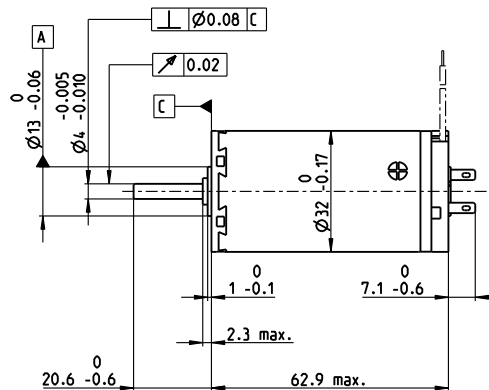
# A-max 32 Ø32 mm, Graphite Brushes, 20 Watt

Kabel AWG 22/7  
cable UL Style 1061

⊕ Kabel rot  
cable red



**M 1:2**



- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with terminals	236659	236660	236661	236662	236663	236664	236665
with cables	353230	353231	353232	262500	341970	353233	353234

## Motor Data

Values at nominal voltage		6	9	12	24	30	36	42	
1	Nominal voltage	V	6	9	12	24	30	36	42
2	No load speed	rpm	4880	5000	4670	6460	6160	5860	5650
3	No load current	mA	123	84.2	58.2	42.8	32.3	25.3	20.8
4	Nominal speed	rpm	3400	3480	3170	5060	4740	4430	4210
5	Nominal torque (max. continuous torque)	mNm	44.5	43.1	44	45.5	45.1	45.4	45
6	Nominal current (max. continuous current)	A	3.96	2.62	1.87	1.33	1.01	0.804	0.659
7	Stall torque	mNm	153	146	140	212	197	189	178
8	Stall current	A	13.2	8.57	5.77	6.02	4.27	3.24	2.54
9	Max. efficiency	%	80	80	80	84	83	83	83
Characteristics									
10	Terminal resistance	Ω	0.454	1.05	2.08	3.99	7.02	11.1	16.6
11	Terminal inductance	mH	0.06	0.13	0.264	0.556	0.954	1.52	2.22
12	Torque constant	mNm/A	11.6	17	24.3	35.2	46.1	58.2	70.4
13	Speed constant	rpm/V	825	562	394	271	207	164	136
14	Speed / torque gradient	rpm/mNm	32.4	34.8	33.8	30.8	31.6	31.3	31.9
15	Mechanical time constant	ms	15	14.9	14.7	14.6	14.6	14.6	14.7
16	Rotor inertia	gcm <sup>2</sup>	44.2	40.8	41.7	45.3	44.2	44.6	43.8

## Specifications

Thermal data		
17	Thermal resistance housing-ambient	7.5 K/W
18	Thermal resistance winding-housing	2.1 K/W
19	Thermal time constant winding	17.8 s
20	Thermal time constant motor	521 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+125°C

Mechanical data (ball bearings)		
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	7.6 N
27	Max. force for press fits (static)	110 N
28	Max. radial load, 5 mm from flange	32 N

Mechanical data (sleeve bearings)		
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	5 N
27	Max. force for press fits (static)	110 N
28	Max. radial load, 5 mm from flange	10.5 N

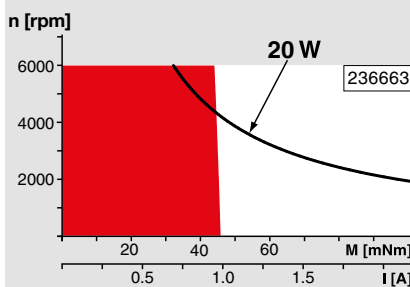
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	240 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

### Option

Sleeve bearings in place of ball bearings

## Operating Range



## Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

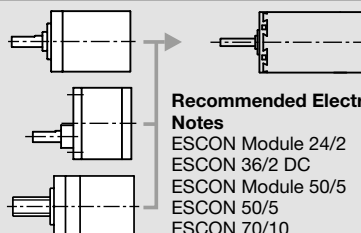
**Short term operation**  
The motor may be briefly overloaded (recurring).

— Assigned power rating

## maxon Modular System

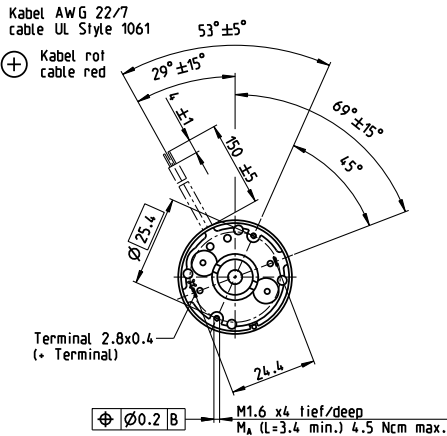
Details on catalog page 32

- Planetary Gearhead**  
Ø32 mm  
0.75 - 6.0 Nm  
Page 348-350/352-353
- Spur Gearhead**  
Ø38 mm  
0.1 - 0.6 Nm  
Page 360
- Screw Drive**  
Ø32 mm  
Page 382-387

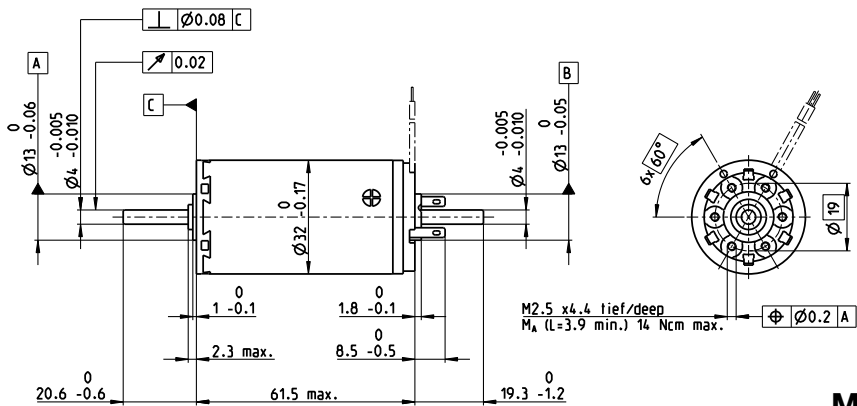


Recommended Electronics:	
Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457
ESCON 70/10	457

# A-max 32 Ø32 mm, Graphite Brushes, 20 Watt



Verlegung der Kabel im Buerstendeckel nicht dargestellt!  
Cable routing not shown inside brush cover!



M 1:2

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

with terminals	236666	236667	236668	236669	236670	236671	236672
with cables	353236	353237	301030	353239	353240	353241	353242

Motor Data										
Values at nominal voltage										
		6	9	12	24	30	36	42		
1	Nominal voltage	V	6	9	12	24	30	36	42	
2	No load speed	rpm	4880	5000	4670	6460	6160	5860	5650	
3	No load current	mA	123	84.2	58.2	42.8	32.3	25.3	20.8	
4	Nominal speed	rpm	3400	3480	3170	5060	4740	4430	4210	
5	Nominal torque (max. continuous torque)	mNm	44.5	43.1	44	45.5	45.1	45.4	45	
6	Nominal current (max. continuous current)	A	3.96	2.62	1.87	1.33	1.01	0.804	0.659	
7	Stall torque	mNm	153	146	140	212	197	189	178	
8	Stall current	A	13.2	8.57	5.77	6.02	4.27	3.24	2.54	
9	Max. efficiency	%	80	80	80	84	83	83	83	
Characteristics										
10	Terminal resistance	Ω	0.454	1.05	2.08	3.99	7.02	11.1	16.6	
11	Terminal inductance	mH	0.06	0.13	0.264	0.556	0.954	1.52	2.22	
12	Torque constant	mNm/A	11.6	17	24.3	35.2	46.1	58.2	70.4	
13	Speed constant	rpm/V	825	562	394	271	207	164	136	
14	Speed / torque gradient	rpm/mNm	32.4	34.8	33.8	30.8	31.6	31.3	31.9	
15	Mechanical time constant	ms	15	14.9	14.7	14.6	14.6	14.6	14.7	
16	Rotor inertia	gcm <sup>2</sup>	44.2	40.8	41.7	45.3	44.2	44.6	43.8	

### Specifications

Thermal data		
17	Thermal resistance housing-ambient	7.5 K/W
18	Thermal resistance winding-housing	2.1 K/W
19	Thermal time constant winding	17.8 s
20	Thermal time constant motor	521 s
21	Ambient temperature	-20...+85°C
22	Max. winding temperature	+125°C

Mechanical data (ball bearings)		
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	7.6 N
27	Max. force for press fits (static) (static, shaft supported)	110 N / 2000 N
28	Max. radial load, 5 mm from flange	32 N

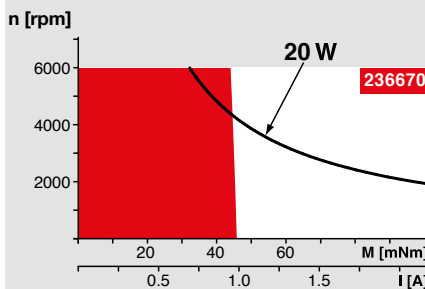
Mechanical data (sleeve bearings)		
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static) (static, shaft supported)	110 N / 2000 N
28	Max. radial load, 5 mm from flange	10.5 N

Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	240 g

Values listed in the table are nominal.  
Explanation of the figures on page 68.

**Option**  
Sleeve bearings in place of ball bearings

### Operating Range



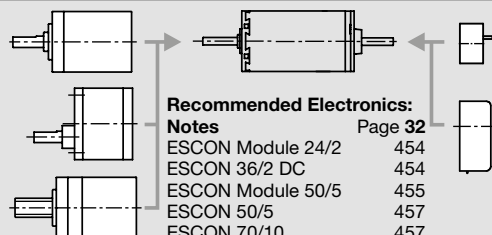
### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System

Details on catalog page 32

- Planetary Gearhead**  
Ø32 mm  
0.75 - 6.0 Nm  
Page 348-350/352-353
- Spur Gearhead**  
Ø38 mm  
0.1 - 0.6 Nm  
Page 360
- Screw Drive**  
Ø32 mm  
Page 382-387



### Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	454
ESCON 36/2 DC	454
ESCON Module 50/5	455
ESCON 50/5	457
ESCON 70/10	457
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

- Encoder MR**  
256 - 1024 CPT,  
3 channels  
Page 433
- Encoder HED\_ 5540**  
500 CPT,  
3 channels  
Page 441/443




# Brushless DC motors (BLDC) with ironless or iron core windings.

<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b> (can be configured online)	164–199
<b>ECX SPEED 6 M</b> Ø6 mm, 1.5 Watt <b>NEW</b>	164
<b>ECX SPEED 6 M</b> Ø6 mm, 2 Watt, High Power <b>NEW</b>	165
<b>ECX SPEED 8 M</b> Ø8 mm, 2 Watt	166
<b>ECX SPEED 8 M</b> Ø8 mm, 3 Watt, High Power	167
<b>ECX SPEED 13 M</b> Ø13 mm, 12 Watt	168
<b>ECX SPEED 13 M</b> Ø13 mm, 25 Watt, High Power	169
<b>ECX SPEED 13 M</b> Ø13 mm, 25 W, steril./steril. ceramic	170–171
<b>ECX SPEED 13 L</b> Ø13 mm, 25 Watt	172
<b>ECX SPEED 13 L</b> Ø13 mm, 50 Watt, High Power	173
<b>ECX SPEED 13 L</b> Ø13 mm, 50 W, steril./steril. ceramic	174–175
<b>ECX SPEED 16 M</b> Ø16 mm, 20 Watt	176
<b>ECX SPEED 16 M</b> Ø16 mm, 40 Watt, High Power	177
<b>ECX SPEED 16 M</b> Ø16 mm, 40 W, steril./steril. ceramic	178–179
<b>ECX SPEED 16 L</b> Ø16 mm, 40 Watt	180
<b>ECX SPEED 16 L</b> Ø16 mm, 80 Watt, High Power	181
<b>ECX SPEED 16 L</b> Ø16 mm, 80 W, steril./steril. ceramic	182–183
<b>ECX SPEED 19 M</b> Ø19 mm, 30 Watt	184
<b>ECX SPEED 19 M</b> Ø19 mm, 60 Watt, High Power	185
<b>ECX SPEED 19 M</b> Ø19 mm, 60 W, steril./steril. ceramic	186–187
<b>ECX SPEED 19 L</b> Ø19 mm, 60 Watt	188
<b>ECX SPEED 19 L</b> Ø19 mm, 120 Watt, High Power	189
<b>ECX SPEED 19 L</b> Ø19 mm, 120 W, steril./steril. ceramic	190–191
<b>ECX SPEED 22 M</b> Ø22 mm, 40 Watt	192
<b>ECX SPEED 22 M</b> Ø22 mm, 80 Watt, High Power	193
<b>ECX SPEED 22 M</b> Ø22 mm, 80 W, steril./steril. ceramic	194–195
<b>ECX SPEED 22 L</b> Ø22 mm, 80 Watt	196
<b>ECX SPEED 22 L</b> Ø22 mm, 120 Watt, High Power	197
<b>ECX SPEED 22 L</b> Ø22 mm, 120 W, steril./steril. ceramic	198–199
<b>ECX SQUARE Program</b> (can be configured online)	201
<b>ECX SQUARE 16 L</b> □16 mm, 20 Watt, sensorlos	202
<b>EC Program</b>	204–213
<b>EC 4</b> Ø4 mm, 0.5/1 Watt	204–205
<b>EC 10</b> Ø10 mm, 8 Watt	206
<b>EC 22</b> Ø22 mm, 80/240 Watt <b>HD</b>	207–208
<b>EC 32</b> Ø32 mm, 80 Watt	209
<b>EC 40</b> Ø40 mm, 170 Watt	210
<b>EC 45</b> Ø45 mm, 150/250 Watt	211–212
<b>EC 60</b> Ø60 mm, 400 Watt	213

<b>EC-max Program</b>	217–225
<b>EC-max 16</b> Ø16 mm, 5/8 Watt <b>IE</b>	217–219
<b>EC-max 22</b> Ø22 mm, 12/25 Watt	220–221
<b>EC-max 30</b> Ø30 mm, 40/60 Watt	222–223
<b>EC-max 40</b> Ø40 mm, 70/120 Watt	224–225
<b>EC-4pole Program</b>	229–235
<b>EC-4pole 22</b> Ø22 mm, 90/120 Watt, High Power	229–230
<b>EC-4pole 30</b> Ø30 mm, 100 Watt, High Power	231
<b>EC-4pole 30</b> Ø30 mm, 150 Watt, sterilizable	232
<b>EC-4pole 30</b> Ø30 mm, 200 Watt, High Power	233
<b>EC-4pole 32</b> Ø32 mm, 220/480 Watt <b>HD</b>	234–235
<b>EC-i Program</b>	239–250
<b>EC-i 30</b> Ø30 mm, 20 Watt <b>IE</b>	239
<b>EC-i 30</b> Ø30 mm, 30 Watt	240
<b>EC-i 30</b> Ø30 mm, 45 Watt, High Torque	241
<b>EC-i 30</b> Ø30 mm, 50 Watt	242
<b>EC-i 30</b> Ø30 mm, 75 Watt, High Torque	243
<b>EC-i 40</b> Ø40 mm, 50 Watt	244
<b>EC-i 40</b> Ø40 mm, 50 Watt, High Torque	245
<b>EC-i 40</b> Ø40 mm, 70 Watt	246
<b>EC-i 40</b> Ø40 mm, 70/100 Watt, High Torque	247–248
<b>EC-i 52</b> Ø52 mm, 180 Watt, High Torque	249
<b>EC-i 52</b> Ø52 mm, 200 Watt, High Torque <b>NEW</b>	250
<b>EC-flat Program</b>	252–275
<b>EC 9.2 flat</b> Ø10 mm, 0.5 Watt	252
<b>EC 14 flat</b> Ø13.6 mm, 1.5 Watt	253
<b>EC 20 flat</b> Ø20 mm, 3/5 Watt	254–255
<b>EC 20 flat</b> Ø20 mm, 2/5 Watt <b>IE</b>	256–257
<b>EC 32 flat</b> Ø32 mm, 6/15 Watt	258–259
<b>EC 32 flat</b> Ø32 mm, 15 Watt <b>IE</b>	260
<b>EC 45 flat</b> Ø42.8/42.9 mm, 12/30 Watt	261–262
<b>EC 45 flat</b> Ø42.8 mm, 50/70 Watt	263–264
<b>EC 45 flat</b> Ø45 mm, 30/50 Watt <b>IE</b>	265–266
<b>EC 60 flat</b> Ø60 mm, 100 Watt <b>NEW</b>	267
<b>EC 60 flat</b> Ø60 mm, 150 Watt, open rotor <b>NEW</b>	268
<b>EC 60 flat</b> Ø60 mm, 200 Watt, ventilated <b>NEW</b>	269
<b>EC 90 flat</b> Ø90 mm, 160 Watt	270
<b>EC 90 flat</b> Ø90 mm, 220 Watt, open rotor <b>NEW</b>	271
<b>EC 90 flat</b> Ø90 mm, 360 Watt, ventilated <b>NEW</b>	272
<b>EC 90 flat</b> Ø90 mm, 260 Watt	273
<b>EC 90 flat</b> Ø90 mm, 400 Watt, open rotor <b>NEW</b>	274
<b>EC 90 flat</b> Ø90 mm, 600 Watt, ventilated <b>NEW</b>	275
<b>EC-frameless Program</b>	278–283
<b>EC frameless 45 flat</b> Ø43.4 mm, 30/50/70 Watt	278–280
<b>EC frameless 60 flat</b> Ø60 mm, 100 Watt	281
<b>EC frameless 90 flat</b> Ø90 mm, 160/260 Watt	282–283

# Explanation of maxon EC motor terminology

## Dimensional drawings

Presentation of the views according to the projection method E (ISO).  All dimensions in [mm].

## Motor Data

The values in lines 2–15 are valid when using block commutation.

### 1 Nominal voltage $U_N$ [Volt]

is the applied voltage between two powered phases in block commutation. See page 44 for the timing diagram of the voltage in the three phases. All nominal data (lines 2–9) refer to this voltage. Lower and higher voltages are permissible, provided that limits are not exceeded.

### 2 No load speed $n_0$ [rpm] $\pm 10\%$

is the speed at which the unloaded motor runs with the nominal voltage applied. It is approximately proportional to the applied voltage.

### 3 No load current $I_0$ [mA] $\pm 50\%$

This is the typical current that the unloaded motor draws when operating at nominal voltage. It increases with rising speed owing to bearing friction and iron losses. No load friction depends heavily on temperature. It decreases in extended operation and increases at lower temperatures.

### 4 Nominal speed $n_N$ [rpm]

is the speed set for operation at nominal voltage and nominal torque at a motor temperature of 25°C.

### 5 Nominal torque $M_N$ [mNm]

is the torque generated for operation at nominal voltage and nominal current at a motor temperature of 25°C. It is at the limit of the motor's continuous operation range. Higher torques heat up the winding too much.

### 6 Nominal current $I_N$ [A]

is the current in the active phase in block commutation that generates the nominal torque at the given nominal speed (= max. permissible continuous load current). The maximum winding temperature is reached at 25°C ambient temperature in continuous operation with  $I_N$ .  $I_N$  decreases as speed increases due to additional losses in the lamination.

### 7 Stall torque $M_H$ [mNm]

is the linearly calculated load torque for motors that causes the shaft to stall at nominal voltage. With EC-flat and EC-i motors, this torque often cannot be achieved due to saturation effects.

### 8 Stall current $I_A$ [A]

is the quotient from nominal voltage and the motor's terminal resistance. Stall current is equivalent to stall torque. With larger motors,  $I_A$  cannot often be reached due to the amplifier's current limits.

### 9 Max. efficiency $\eta_{\max}$ [%]

is the calculated load torque that brings the shaft to standstill at nominal voltage. It also doesn't always denote the optimal operating point.

### 10 Terminal resistance phase to phase $R$ [ $\Omega$ ]

is determined by the resistance at 25 °C between two connections of the standard resolution.

### 11 Terminal inductance phase to phase $L$ [mH]

is the winding inductance between two connections. It is measured at 1 kHz, sinusoidal.

### 12 Torque constant $k_M$ [mNm/A]

This may also be referred to as «specific torque» and represents the quotient from generated torque and applicable current.

### 13 Speed constant $k_n$ [rpm/V]

indicates the theoretical no load speed per volt of applied voltage, disregarding friction losses.

### 14 Speed/torque gradient

$$\Delta n / \Delta M \text{ [rpm/mNm]}$$

The speed/torque gradient is an indicator of the motor's performance. The smaller the value, the more powerful the motor and consequently the less motor speed varies with load variations. It is based on the quotient of ideal no load speed and ideal stall torque (tolerance  $\pm 20\%$ ).

The real characteristic curve depends on the speed for EC motors with slotted winding (EC flat and EC-i); it is steeper at high speeds and flatter at low speeds. The real gradient at nominal voltage can be approximated by a straight line between no load speed and the nominal operating point (see page 57).

### 15 Mechanical time constant $\tau_m$ [ms]

is the time required for the rotor to accelerate from standstill to 63% of its no load speed.

### 16 Rotor moment of inertia $J_R$ [gcm<sup>2</sup>]

is the mass moment of inertia of the rotor, based on the axis of rotation.

### 17 Thermal resistance housing-ambient $R_{th2}$ [K/W]

and

### 18 Thermal resistance winding-housing $R_{th1}$ [K/W]

Characteristic values of thermal contact resistance without additional heat sinking. Lines 17 and 18 combined define the maximum heating at a given power loss (load). Thermal resistance  $R_{th2}$  on motors with metal flanges can decrease by up to 80% if the motor is coupled directly to a good heat-conducting (e.g. metallic) mounting rather than a plastic panel.

### 19 Thermal time constant winding $\tau_w$ [s]

and

### 20 Thermal time constant motor $\tau_s$ [s]

These are the typical reaction times for a temperature change of winding and motor. It can be seen that the motor reacts much more sluggishly in thermal terms than the winding. The values are calculated from the product of thermal capacity and given heat resistances.

### 21 Ambient temperature [ $^{\circ}$ C]

Operating temperature range. This derives from the heat reliability of the materials used and viscosity of bearing lubrication.

### 22 Max. winding temperature [ $^{\circ}$ C]

Maximum permissible winding temperature.

### 23 Max. speed $n_{\max}$ [rpm]

is the maximum recommended speed based on thermal and mechanical perspectives. A reduced service life can be expected at higher speeds.

### 24 Axial play [mm]

On motors that are not preloaded, these are the tolerance limits for the bearing play. A preload cancels out the axial play up to the specified axial force. When load is applied in the direction of the preload force (away from the flange), the axial play is always zero. The length tolerance of the shaft includes the maximum axial play.

### 25 Radial play [mm]

Radial play is the bearing's radial movement. A spring is utilized to preload the motor's bearings, eliminating radial play up to a given axial load.

### 26/27 Max. axial load [N]

**Dynamically:** axial loading permissible in operation. If different values apply for traction and thrust, the smaller value is given.

**Statically:** maximum axial force applying to the shaft at standstill where no residual damage occurs.

**Shaft supported:** maximum axial force applying to the shaft at standstill if the force is not input at the other shaft end. This is not possible for motors with only one shaft end.

### 28 Max. radial load [N]

The value is given for a typical clearance from the flange; this value falls the greater the clearance.

### 29 Number of pole pairs

Number of north poles of the permanent magnet. The phase streams and commutation signals pass through per revolution  $p$  cycles. Servo-controllers require the correct details of the number of pole pairs.

### 30 Number of phases

All maxon EC motors have three phases.

### 31 Weight of motor [g]

### 32 Typical noise level [dBA]

is that statistical average of the noise level measured according to maxon standard (10 cm distance radially to the drive, no load operation at a speed of 6,000 or 50,000 rpm. The drive lies freely on a plastic foam mat in the noise chamber).

The acoustic noise level depends on a number of factors, such as component tolerances, and it is greatly influenced by the overall system in which the drive is installed. When the drive is installed in an unfavorable constellation, the noise level may be significantly higher than the noise level of the drive alone.

The acoustic noise level is measured and determined during product qualification. In manufacturing, a structure-borne noise test is performed with defined limits. Impermissible deviations can thus be identified.

### 33 Max. torque $M_{\max}$ [mNm]

Maximum torque the motor can briefly deliver. It is limited by the overload protection of the electronics.

### 34 Max. current $I_{\max}$ [A]

Surge current with which the peak torque is generated at nominal voltage. With an active speed controller, surge current is not proportionate to the torque, but also depends on the supply voltage. As a result, this value only applies at nominal voltage.

### 35 Type of control

«Speed» means that the drive is fitted with an integral speed controller. «Controlled» means that the drive is fitted with true commutation electronics.

### 36 Supply voltage $+V_{CC}$ [V]

Range of supply voltages measured in respect of GND at which the drive functions.

### 37 Speed set value input $U_C$ [V]

Range of analog voltage for set speed value measured in respect of GND. For 2 wire solutions, the supply voltage acts as speed setting at the same time.

### 38 Scaling Set speed value input $k_c$ [rpm/V]

Set speed value  $n_c$  is based on the product  $n_c = k_c \cdot U_c$ .

### 39 Speed range

Achievable speeds in the controlled range.

### 40 Max. acceleration

The set speed value follows a sudden set point change with a ramp. This value indicates the increase in the ramp.



# maxon ECX SPEED

The brushless ECX motors (BLDC) are the perfect solution for applications that need 0–120 000 rpm. Quiet, highly efficient, durable and perfectly tailored to your needs. Available in standard, high-power and sterilizable versions. maxon ECX motors can be configured online and are ready for delivery within 11 working days. [ecx.maxonmotor.com](http://ecx.maxonmotor.com)

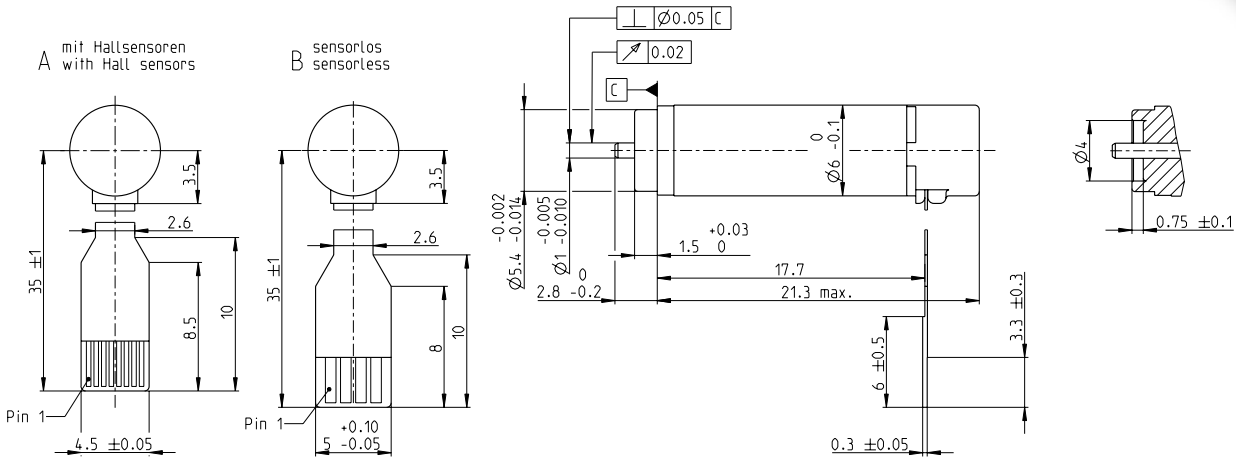
<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b>	164–199
<b>ECX SQUARE Program</b>	202
<b>EC Program</b>	204–213
<b>EC-max Program</b>	217–225
<b>EC-4pole Program</b>	229–235
<b>EC-i Program</b>	239–250
<b>EC flat Program</b>	252–273
<b>EC frameless Program</b>	278–283

# ECX SPEED 6 M brushless BLDC motor Ø6 mm

**NEW**



**Key Data: 1.5/3.0 W, 0.33 mNm, 100000 rpm**



**M 2:1**

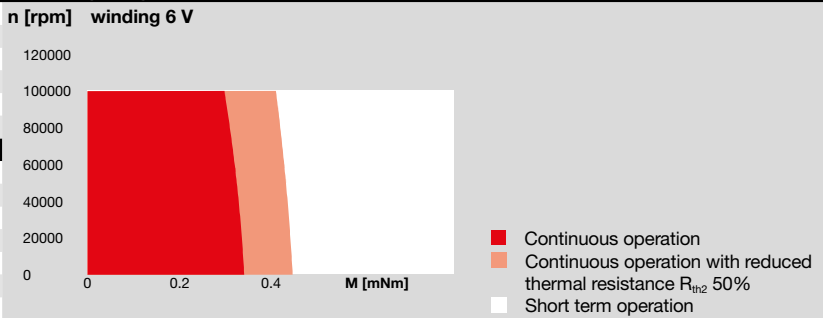
**Motor Data**

1_	Nominal voltage	V	6	12
2_	No load speed	rpm	44200	33300
3_	No load current	mA	46.5	16.2
4_	Nominal speed	rpm	25500	13900
5_	Nominal torque (max. continuous torque)	mNm	0.334	0.322
6_	Nominal current (max. continuous current)	A	0.314	0.116
7_	Stall torque	mNm	0.832	0.59
8_	Stall current	A	0.688	0.188
9_	Max. efficiency	%	55.6	50.4
10_	Terminal resistance	Ω	8.72	63.8
11_	Terminal inductance	mH	0.0652	0.436
12_	Torque constant	mNm/A	1.21	3.14
13_	Speed constant	rpm/V	7900	3040
14_	Speed/torque gradient	rpm/mNm	57000	61800
15_	Mechanical time constant	ms	4.2	4.55
16_	Rotor inertia	gcm <sup>2</sup>	0.00703	0.00703

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	67.1
18_	Thermal resistance winding-housing	K/W	16.8
19_	Thermal time constant winding	s	1.69
20_	Thermal time constant motor	s	71.8
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	125

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	100 000
24_	Axial play	mm	0.. 0.07
	Preload	N	0.15
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	110
28_	Max. radial load [mm from flange]	N	2 [2]

**Other specifications**

29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	3
32_	Typical noise level [rpm]	dBA	44 [50 000]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
288_GPX 6 A	1-5	for motor type A and B: 394_ENX 6 MAG for motor type B: 408_ENX 6 OPT	454_ESCON Module 24/2 455_ESCON 36/3 EC 455_ESCON Module 50/4 EC-S 459_DEC Module 24/2 462_EPOS4 Mod./Comp. 24/1.5

Details on catalog page 30

**Connection motor with hall sensor (A)**

FPC Flexprint 8-pole, pitch 0.5 mm  
 Pin 1 Motor winding 1  
 Pin 2 Motor winding 2  
 Pin 3 Motor winding 3  
 Pin 4 V<sub>Hall</sub> 3.8 ..5.5 VDC  
 Pin 5 GND  
 Pin 6 hall sensor 1  
 Pin 7 hall sensor 2  
 Pin 8 hall sensor 3  
 Output current per channel: max. 0.5 mA

**Connection motor sensorless (B)**

FPC flexprint 4-pole, pitch 1.0 mm:  
 Pin 1 Motor winding 1  
 Pin 2 Motor winding 2  
 Pin 3 Motor winding 3  
 Pin 4 N.C.

**Configuration**

Shaft front: length

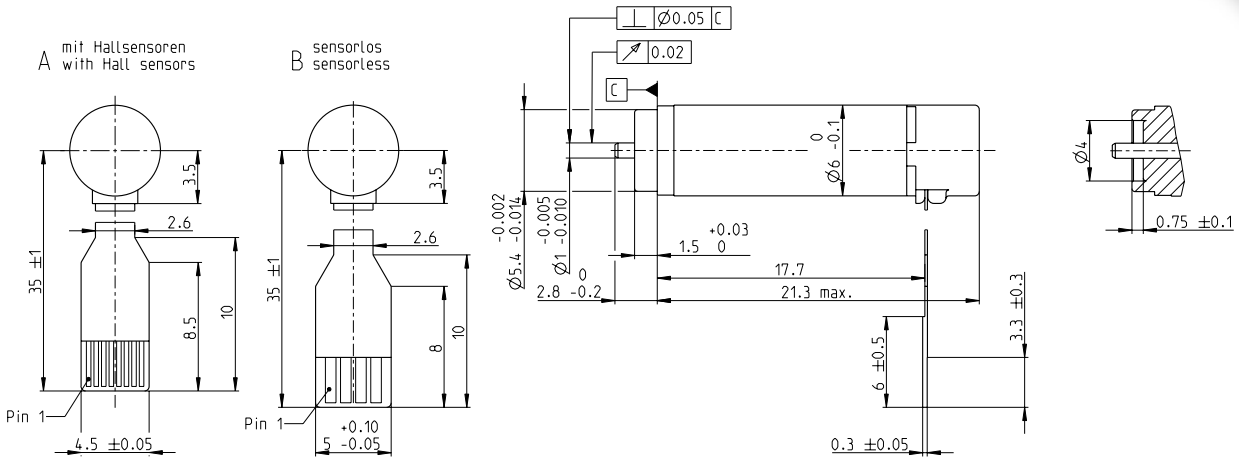
# ECX SPEED 6 M brushless BLDC motor $\varnothing 6$ mm

High Power

Key Data: 2.0/4.0 W, 0.42 mNm, 100000 rpm

**NEW**

maxon ECX



M 2:1

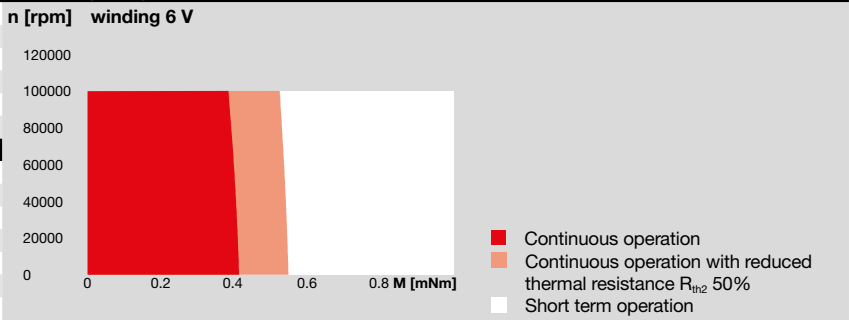
**Motor Data**

	V	3	6	12
1_ Nominal voltage	V	3	6	12
2_ No load speed	rpm	74400	62700	63400
3_ No load current	mA	149	58.8	29.8
4_ Nominal speed	rpm	52300	44900	46800
5_ Nominal torque (max. continuous torque)	mNm	0.413	0.412	0.425
6_ Nominal current (max. continuous current)	A	1.24	0.517	0.268
7_ Stall torque	mNm	1.45	1.52	1.7
8_ Stall current	A	3.92	1.72	0.97
9_ Max. efficiency	%	65.5	66.9	68.5
10_ Terminal resistance	$\Omega$	0.766	3.49	12.4
11_ Terminal inductance	mH	0.00529	0.0301	0.118
12_ Torque constant	mNm/A	0.37	0.882	1.75
13_ Speed constant	rpm/V	25800	10800	5460
14_ Speed/torque gradient	rpm/mNm	53400	42800	38500
15_ Mechanical time constant	ms	3.93	3.15	2.84
16_ Rotor inertia	gcm <sup>2</sup>	0.00703	0.00703	0.00703

**Thermal data**

17_ Thermal resistance housing-ambient	K/W	65.8
18_ Thermal resistance winding-housing	K/W	13.2
19_ Thermal time constant winding	s	1.34
20_ Thermal time constant motor	s	70.4
21_ Ambient temperature	$^{\circ}$ C	-20...+100
22_ Max. winding temperature	$^{\circ}$ C	125

**Operating Range**



**Mechanical data ball bearings**

23_ Max. speed	rpm	100 000
24_ Axial play	mm	0.. 0.07
Preload	N	0.15
Direction of force		pull
25_ Radial play		preloaded
26_ Max. axial load (dynamic)	N	0.1
27_ Max. force for press fits (static)	N	10
(static, shaft supported)	N	110
28_ Max. radial load [mm from flange]	N	2 [2]

**Other specifications**

29_ Number of pole pairs		1
30_ Number of phases		3
31_ Weight of motor	g	3
32_ Typical noise level [rpm]	dBA	44 [50 000]

**maxon Modular System**

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
288_GPX 6 A	1-5	for motor type A and B: 394_ENX 6 MAG for motor type B: 408_ENX 6 OPT	454_ESCON Module 24/2 455_ESCON 36/3 EC 455_ESCON Module 50/4 EC-S 459_DEC Module 24/2 462_EPOS4 Mod./Comp. 24/1.5

**Connection motor with hall sensor (A)**

FPC Flexprint 8-pole, pitch 0.5 mm  
 Pin 1 Motor winding 1  
 Pin 2 Motor winding 2  
 Pin 3 Motor winding 3  
 Pin 4 V<sub>Hall</sub> 3.8 ..5.5 VDC  
 Pin 5 GND  
 Pin 6 hall sensor 1  
 Pin 7 hall sensor 2  
 Pin 8 hall sensor 3  
 Output current per channel: max. 0.5 mA

**Connection motor sensorless (B)**

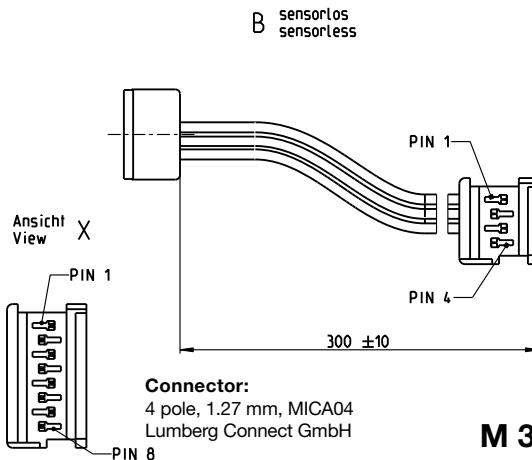
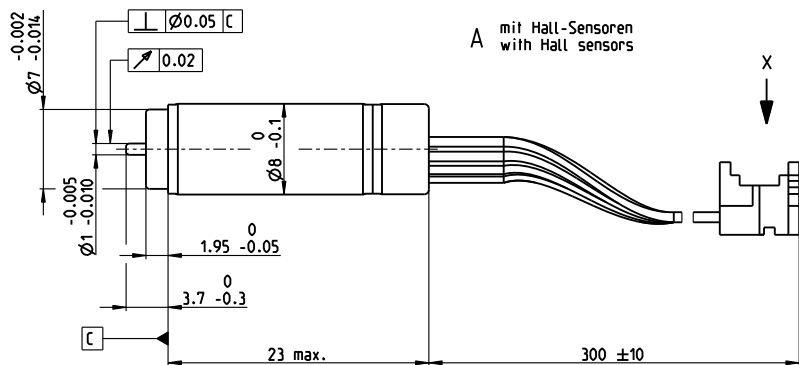
FPC flexprint 4-pole, pitch 1.0 mm:  
 Pin 1 Motor winding 1  
 Pin 2 Motor winding 2  
 Pin 3 Motor winding 3  
 Pin 4 N.C.

**Configuration**

Shaft front: length

# ECX SPEED 8 M brushless BLDC motor Ø8 mm

**Key Data: 2/4.7 W, 0.98 mNm, 50000 rpm**



**Connector:**  
8 pole, 1.27 mm, MICA08  
Lumberg Connect GmbH

**Connector:**  
4 pole, 1.27 mm, MICA04  
Lumberg Connect GmbH

**M 3:2**

**Motor Data**

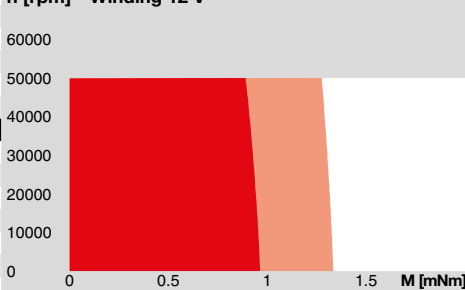
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	35400	43300	42200
3_	No load current	mA	105	69.0	33.2
4_	Nominal speed	rpm	24200	33100	32300
5_	Nominal torque (max. continuous torque)	mNm	0.917	0.874	0.877
6_	Nominal current (max. continuous current)	A	0.687	0.406	0.198
7_	Stall torque	mNm	3.04	3.88	3.92
8_	Stall current	A	1.98	1.54	0.755
9_	Max. efficiency	%	61	63	64
10_	Terminal resistance	Ω	3.02	7.8	31.8
11_	Terminal inductance	mH	0.039	0.106	0.447
12_	Torque constant	mNm/A	1.53	2.51	5.19
13_	Speed constant	rpm/V	6230	3780	1840
14_	Speed/torque gradient	rpm/mNm	12300	11700	11300
15_	Mechanical time constant	ms	3.21	3.06	2.95
16_	Rotor inertia	gcm <sup>2</sup>	0.0249	0.0249	0.0249

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	51.2
18_	Thermal resistance winding-housing	K/W	3.5
19_	Thermal time constant winding	s	0.811
20_	Thermal time constant motor	s	154
21_	Ambient temperature	°C	-20...+85
22_	Max. winding temperature	°C	+125

**Operating Range**

n [rpm] Winding 12 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Short term operation

**Mechanical data ball bearings**

23_	Max. speed	rpm	50000
24_	Axial play	mm	0...0.07
	Preload	N	0.3
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	0.2
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	110
28_	Max. radial load [mm from flange]	N	2 [2]

**Other specifications**

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 6
32_	Typical noise level [rpm]	dBA 49 [50000]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
289_GPX 8 A	1-5	for motor type A + B:	454_ESCON Module 24/2
		395_ENX 8 MAG	455_ESCON 36/3 EC
		396_ENX 8 EASY INT	455_ESCON Module 50/4 EC-S
		397_ENX 8 EASY INT Abs.	459_DEC Module 24/2
		for motor type B:	462_EPOS4 Mod./Comp. 24/1.5
		409_ENX 8 OPT	

Details on catalog page 30

**Connection A** (flat band cable AWG 28, pitch 1.27 mm)

- Pin 1 Motor winding 1
  - Pin 2 Motor winding 2
  - Pin 3 Motor winding 3
  - Pin 4  $V_{Hall}$  1.6...5.5 VDC
  - Pin 5 GND
  - Pin 6 Hall sensor 1
  - Pin 7 Hall sensor 2
  - Pin 8 Hall sensor 3
- Output signal: CMOS compatible  
Output current per channel: max 0.5 mA

**Connection B** (flat band cable AWG 28, pitch 1.27 mm)

- Pin 1 Motor winding 1
- Pin 2 Motor winding 2
- Pin 3 Motor winding 3
- Pin 4 N.C.

**Configuration**

Shaft front: length  
Electric connection: flex or cable, cable length  
Cable insulation: PVC/PO/FEP

<sup>1</sup> For type A:  
PVC-cable (-20...85°C)  
PO- and FEP cable (-30...85°C)  
For type B:  
PVC-cable (-20...100°C)  
PO- and FEP cable (-40...100°C)

Cable and plug configuration:  
Adapter Micromotor (Part number 498157)  
required for all maxon controllers.

# ECX SPEED 8 M brushless

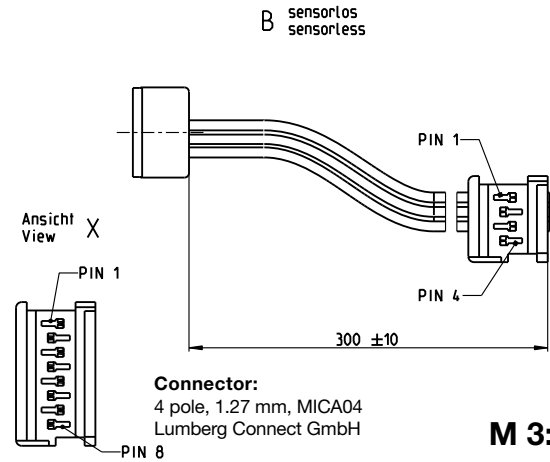
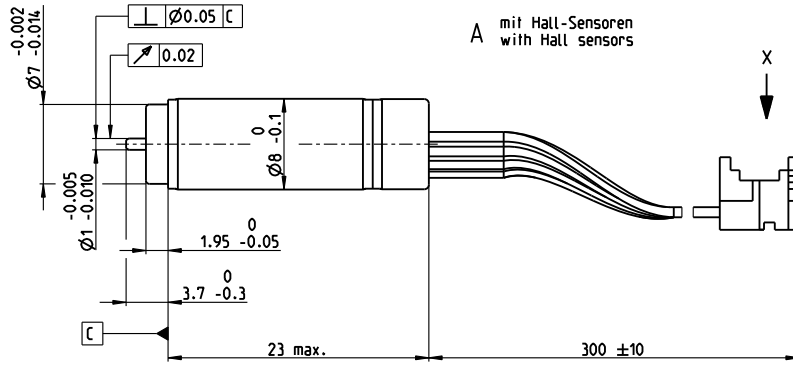
## BLDC motor Ø8 mm

High Power

Key Data: 3/6 W, 1.26 mNm, 50000 rpm



maxon ECX



**Connector:**  
8 pole, 1.27 mm, MICA08  
Lumberg Connect GmbH

**Connector:**  
4 pole, 1.27 mm, MICA04  
Lumberg Connect GmbH

**M 3:2**

### Motor Data

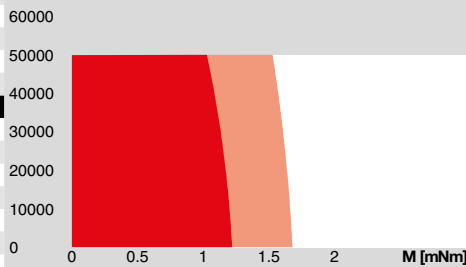
		V	6	9	12
1_	Nominal voltage	V	6	9	12
2_	No load speed	rpm	35500	29100	30500
3_	No load current	mA	128	63.4	50.9
4_	Nominal speed	rpm	26700	21200	22800
5_	Nominal torque (max. continuous torque)	mNm	1.23	1.26	1.26
6_	Nominal current (max. continuous current)	A	0.902	0.497	0.391
7_	Stall torque	mNm	5.18	4.83	5.18
8_	Stall current	A	3.34	1.7	1.43
9_	Max. efficiency	%	66	66	67
10_	Terminal resistance	Ω	1.8	5.3	8.38
11_	Terminal inductance	mH	0.026	0.089	0.144
12_	Torque constant	mNm/A	1.55	2.84	3.62
13_	Speed constant	rpm/V	6160	3360	2640
14_	Speed/torque gradient	rpm/mNm	7130	6260	6110
15_	Mechanical time constant	ms	1.86	1.64	1.6
16_	Rotor inertia	gcm <sup>2</sup>	0.0249	0.0249	0.0249

### Thermal data

17_	Thermal resistance housing-ambient	K/W	51.2
18_	Thermal resistance winding-housing	K/W	4.11
19_	Thermal time constant winding	s	0.874
20_	Thermal time constant motor	s	154
21_	Ambient temperature	°C	-20...+85
22_	Max. winding temperature	°C	+125

### Operating Range

n [rpm] Winding 9 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Short term operation

### Mechanical data ball bearings

23_	Max. speed	rpm	50000
24_	Axial play	mm	0...0.07
	Preload	N	0.3
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	0.2
27_	Max. force for press fits (static)	N	10
	(static, shaft supported)	N	110
28_	Max. radial load [mm from flange]	N	2 [2]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	6
32_	Typical noise level [rpm]	dBA	49 [50000]

### maxon Modular System

maxon gear Stages [opt.] maxon sensor maxon motor control

289_GPX 8 A	1-5	for motor type A + B: 395_ENX 8 MAG 396_ENX 8 EASY INT 397_ENX 8 EASY INT Abs. for motor type B: 409_ENX 8 OPT	454_ESCON Module 24/2 455_ESCON 36/3 EC 455_ESCON Module 50/4 EC-S 459_DEC Module 24/2 462_EPOS4 Mod./Comp. 24/1.5
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Details on catalog page 30

### Connection A (flat band cable AWG 28, pitch 1.27 mm)

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	V <sub>Hall</sub> 1.6...5.5 VDC
Pin 5	GND
Pin 6	Hall sensor 1
Pin 7	Hall sensor 2
Pin 8	Hall sensor 3
Output signal: CMOS compatible	
Output current per channel: max 0.5 mA	

### Connection B (flat band cable AWG 28, pitch 1.27 mm)

Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

### Configuration

Shaft front: length  
Electric connection: flex or cable, cable length  
Cable insulation: PVC/PO/FEP

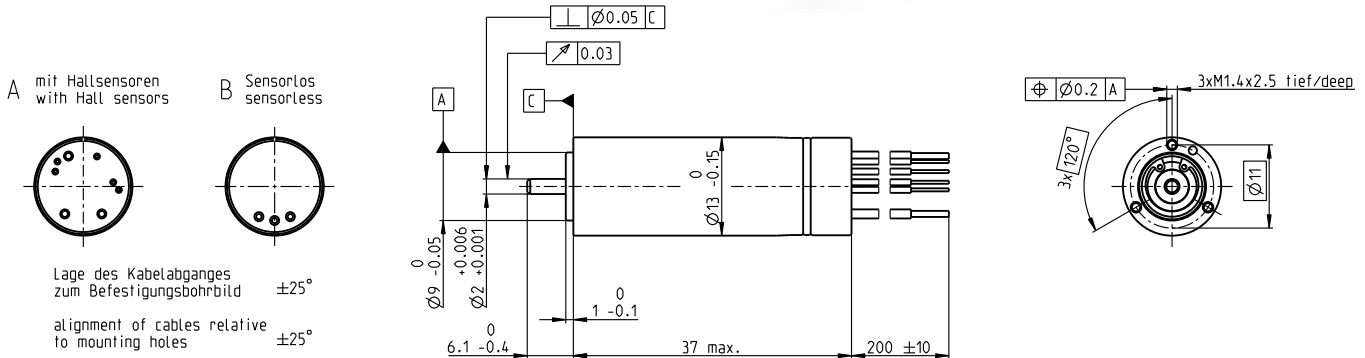
<sup>1</sup> For type A:  
PVC-cable (-20...85°C)  
PO- and FEP cable (-30...85°C)  
For type B:  
PVC-cable (-20...100°C)  
PO- and FEP cable (-40...100°C)

Cable and plug configuration:  
Adapter Micromotor (Part number 498157)  
required for all maxon controllers.

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# ECX SPEED 13 M brushless BLDC motor Ø13 mm

**Key Data: 12/12.8 W, 2.7 mNm, 50000 rpm**



**M 1:1**

**Motor Data**

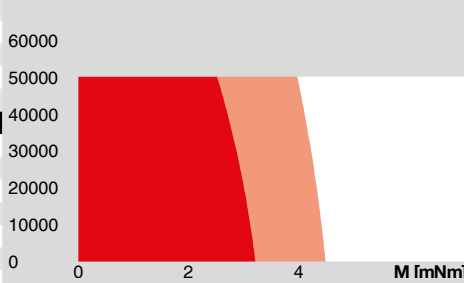
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	44700	44500	43300	43700
3_	No load current	mA	206	154	98.1	74.7
4_	Nominal speed	rpm	40000	40000	38600	38900
5_	Nominal torque (max. continuous torque)	mNm	2.73	2.74	2.63	2.58
6_	Nominal current (max. continuous current)	A	0.916	0.687	0.431	0.321
7_	Stall torque	mNm	28	28.4	25.5	25.2
8_	Stall current	A	7.49	5.68	3.32	2.48
9_	Max. efficiency	%	71	71	70	69
10_	Terminal resistance	Ω	2.4	4.22	10.9	19.3
11_	Terminal inductance	mH	0.0652	0.117	0.276	0.483
12_	Torque constant	mNm/A	3.74	5	7.69	10.2
13_	Speed constant	rpm/V	2560	1910	1240	939
14_	Speed/torque gradient	rpm/mNm	1640	1610	1750	1790
15_	Mechanical time constant	ms	4.2	4.12	4.48	4.56
16_	Rotor inertia	gcm <sup>2</sup>	0.244	0.244	0.244	0.244

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	29.5
18_	Thermal resistance winding-housing	K/W	2.21
19_	Thermal time constant winding	s	1.31
20_	Thermal time constant motor	s	355
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

**Operating Range**

n [rpm] winding 36 V



**Mechanical data ball bearings**

23_	Max. speed	rpm	50000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

**Other specifications**

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 24.1
32_	Typical noise level [rpm]	dBA 46 [50000]

**Connection A and B, motor (Cable AWG A: 26, B: 22)**

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

**Connection A, sensors (Cable AWG 28)**

orange	V <sub>CC</sub> 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V<sub>cc</sub>) and blue (GND) connections are not used.

**maxon Modular System**

Details on catalog page 30

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
294_GPX 13 SPEED	1-3	for motor type A:	454_ESCON Module 24/2
295_GPX 14 A/C	1-2 [3-4]	400_ENX 13 EASY INT	455_ESCON 36/3 EC
296_GPX 14 LN/LZ	1-2 [3-4]	for motor type B:	455_ESCON Module 50/4 EC-S
297_GPX 14 HP	2-3 [4]	400_ENX 13 EASY INT Abs.	455_ESCON Module 50/5
298_GPX 16 A/C	3-4		457_ESCON 50/5
299_GPX 16 LN/LZ	3-4		459_DEC Module 24/2
300_GPX 16 HP	4		459_DEC Module 50/5
			462_EPOS4 Mod./Comp. 24/1.5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

**Configuration**

Flange front: thread holes/center thread  
Flange back: metal ring/external thread  
Shaft front: length/diameter  
Electric connection: cable length/pin connection/connector  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.



# ECX SPEED 13 M brushless

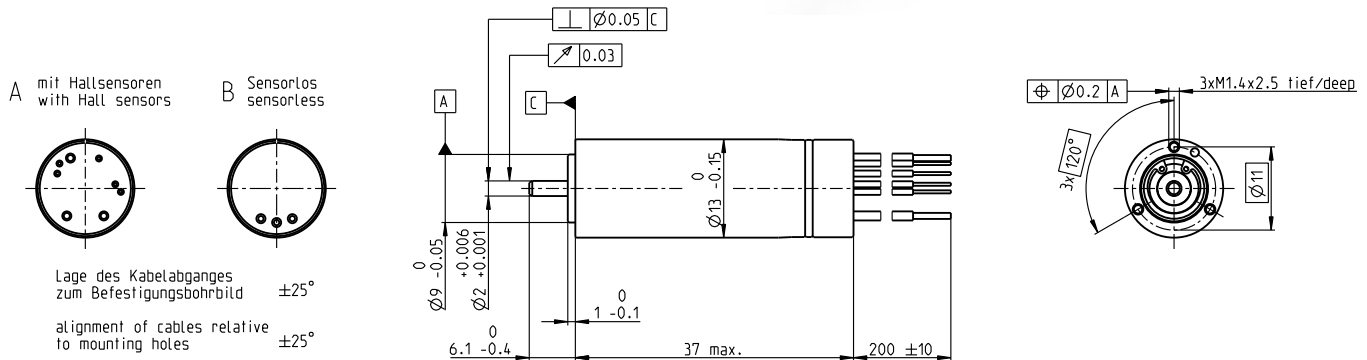
BLDC motor Ø13 mm

High Power

Key Data: 25/29.7 W, 4.3 mNm, 70000 rpm



maxon ECX



M 1:1

### Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	66700	66700	66700	64000
3_	No load current	mA	273	205	137	95.6
4_	Nominal speed	rpm	62700	63000	63000	60400
5_	Nominal torque (max. continuous torque)	mNm	4.33	4.3	4.04	4.22
6_	Nominal current (max. continuous current)	A	1.95	1.45	0.917	0.682
7_	Stall torque	mNm	79.8	83.9	79	80.3
8_	Stall current	A	31.3	24.7	15.5	11.3
9_	Max. efficiency	%	82.6	83	82.6	82.9
10_	Terminal resistance	Ω	0.576	0.973	2.33	4.24
11_	Terminal inductance	mH	0.0178	0.0316	0.0711	0.137
12_	Torque constant	mNm/A	2.55	3.4	5.11	7.09
13_	Speed constant	rpm/V	3740	2810	1870	1350
14_	Speed/torque gradient	rpm/mNm	843	802	853	805
15_	Mechanical time constant	ms	2.15	2.05	2.18	2.06
16_	Rotor inertia	gcm <sup>2</sup>	0.244	0.244	0.244	0.244

### Thermal data

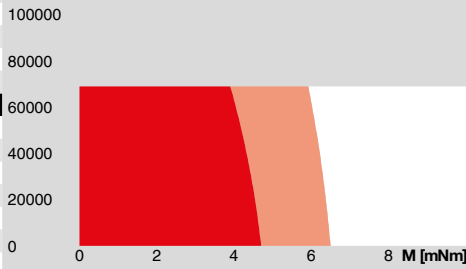
17_	Thermal resistance housing-ambient	K/W	29.5
18_	Thermal resistance winding-housing	K/W	2.53
19_	Thermal time constant winding	s	1.71
20_	Thermal time constant motor	s	558
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

### Mechanical data ball bearings

23_	Max. speed	rpm	70000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

### Operating Range

n [rpm] winding 36 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Short term operation

### Other specifications

29_	Number of pole pairs	1	294_GPX 13 SPEED	Stages [opt.]	1-3	maxon sensor	for motor type A:	maxon motor control	454_ESCON Module 24/2
30_	Number of phases	3	295_GPX 14 A/C		1-2 [3-4]	400_ENX 13 EASY INT			455_ESCON 36/3 EC
31_	Weight of motor	g	37.8	296_GPX 14 LN/LZ		1-2 [3-4]	for motor type B:		455_ESCON Module 50/4 EC-S
32_	Typical noise level [rpm]	dBA	46 [50000]	297_GPX 14 HP		2-3 [4]	400_ENX 13 EASY INT Abs.		455_ESCON Module 50/5

### Connection A and B, motor (Cable AWG A: 26, B: 22)

red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

### Connection A, sensors (Cable AWG 28)

orange  $V_{CC}$  5 ±0.5 V  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange ( $V_{CC}$ ) and blue (GND) connections are not used.

### maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
294_GPX 13 SPEED	1-3	for motor type A:	454_ESCON Module 24/2
295_GPX 14 A/C	1-2 [3-4]	400_ENX 13 EASY INT	455_ESCON 36/3 EC
296_GPX 14 LN/LZ	1-2 [3-4]	for motor type B:	455_ESCON Module 50/4 EC-S
297_GPX 14 HP	2-3 [4]	400_ENX 13 EASY INT Abs.	455_ESCON Module 50/5
298_GPX 16 A/C	3-4		457_ESCON 50/5
299_GPX 16 LN/LZ	3-4		459_DEC Module 24/2
300_GPX 16 HP	4		459_DEC Module 50/5
			462_EPOS4 Mod./Comp. 24/1.5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

### Configuration

Flange front: thread holes/center thread  
 Flange back: metal ring/external thread  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

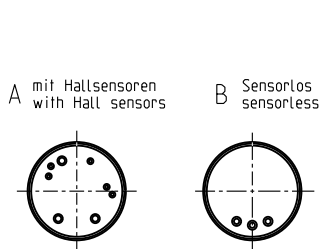
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# ECX SPEED 13 M brushless

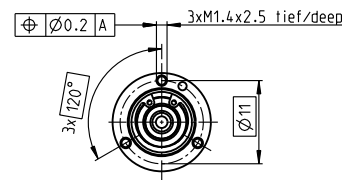
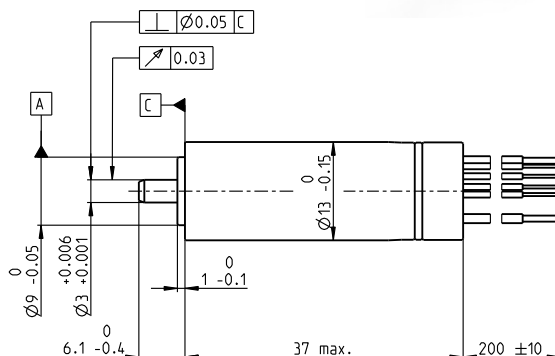
## BLDC motor Ø13 mm

Sterilizable

Key Data: 25/25 W, 3.3 mNm, 90000 rpm



Lage des Kabelabganges zum Befestigungsbohrbild ±25°  
alignment of cables relative to mounting holes ±25°



M 1:1

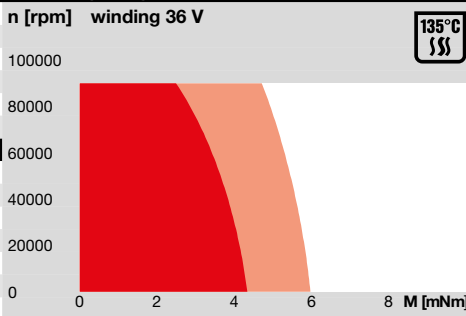
**Motor Data**

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	77600	77600	77600	74500
3_	No load current	mA	208	156	104	72.9
4_	Nominal speed	rpm	74300	74500	74500	71300
5_	Nominal torque (max. continuous torque)	mNm	2.67	2.64	2.48	2.73
6_	Nominal current (max. continuous current)	A	1.41	1.05	0.663	0.517
7_	Stall torque	mNm	68.8	72.3	68.1	69.2
8_	Stall current	A	31.3	24.7	15.5	11.3
9_	Max. efficiency	%	85	85	85	85
10_	Terminal resistance	Ω	0.576	0.973	2.33	4.24
11_	Terminal inductance	mH	0.0135	0.024	0.054	0.104
12_	Torque constant	mNm/A	2.2	2.93	4.4	6.11
13_	Speed constant	rpm/V	4340	3260	2170	1560
14_	Speed/torque gradient	rpm/mNm	1140	1080	1150	1080
15_	Mechanical time constant	ms	1.55	1.47	1.56	1.48
16_	Rotor inertia	gcm <sup>2</sup>	0.13	0.13	0.13	0.13

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	29.5
18_	Thermal resistance winding-housing	K/W	2.5
19_	Thermal time constant winding	s	1.69
20_	Thermal time constant motor	s	475
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

**Operating Range**



**Sterilization information**

Sensorless: typical 2000 sterilization cycles  
Hall sensors: typical 1000 sterilization cycles  
Sterilization with steam  
Temperature +134°C ±4°C  
Compression pressure up to 2.3 bar  
Rel. humidity 100%  
Cycle length 18 min.

**Mechanical data ball bearings**

23_	Max. speed	rpm	90000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

**Other specifications**

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	32
32_	Typical noise level [rpm]	dBA	46 [50000]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
294_GPX 13 SPEED	1-3	for motor type A: 400_ENX 13 EASY INT	454_ESCON Module 24/2 455_ESCON 36/3 EC
		for motor type B: 400_ENX 13 EASY INT Abs.	455_ESCON Module 50/4 EC-S 457_ESCON 50/5 459_DEC Module 24/2 459_DEC Module 50/5 462_EPOS4 Mod./Comp. 24/1.5 463_EPOS4 50/5 463_EPOS4 Mod./Comp. 50/5 470_EPOS2 P 24/5 473_MAXPOS 50/5

**Connection A and B, motor** (Cable AWG A: 26, B: 22)

red Motor winding 1  
black Motor winding 2  
white Motor winding 3

**Connection A, sensors** (Cable AWG 28)

orange V<sub>CC</sub> 5 ±0.5 V  
blue GND  
yellow Hall sensor 1  
brown Hall sensor 2  
grey Hall sensor 3

**Configuration**

Flange front: thread holes/center thread  
Flange back: metal ring/external thread  
Shaft front: length/diameter  
Electric connection: cable length/pin connection  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V<sub>cc</sub>) and blue (GND) connections are not used.

# ECX SPEED 13 M brushless

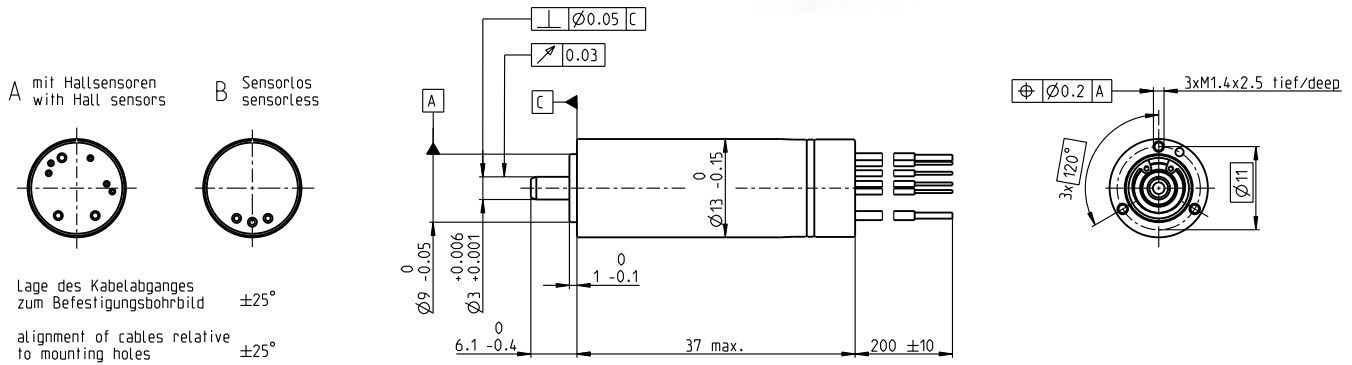
## BLDC motor Ø13 mm

Sterilizable, Ceramic Bearings

Key Data: 25/27 W, 3.6 mNm, 120 000 rpm



maxon ECX



M 1:1

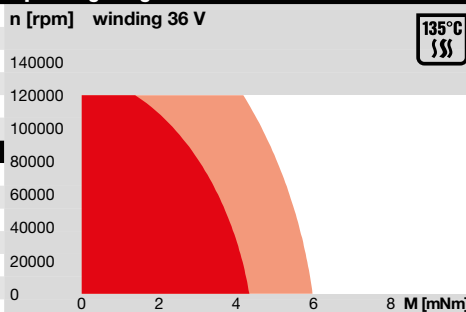
### Motor Data

		18	24	36	48	
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	77600	77600	77600	74500
3_	No load current	mA	186	140	93.3	65.7
4_	Nominal speed	rpm	73900	74100	74200	71000
5_	Nominal torque (max. continuous torque)	mNm	3.02	2.99	2.8	3.03
6_	Nominal current (max. continuous current)	A	1.55	1.15	0.724	0.557
7_	Stall torque	mNm	68.8	72.3	68.1	69.2
8_	Stall current	A	31.3	24.7	15.5	11.3
9_	Max. efficiency	%	85	86	85	86
10_	Terminal resistance	Ω	0.576	0.973	2.33	4.24
11_	Terminal inductance	mH	0.0135	0.024	0.054	0.104
12_	Torque constant	mNm/A	2.2	2.93	4.4	6.11
13_	Speed constant	rpm/V	4340	3260	2170	1560
14_	Speed/torque gradient	rpm/mNm	1140	1080	1150	1080
15_	Mechanical time constant	ms	1.55	1.47	1.56	1.48
16_	Rotor inertia	gcm <sup>2</sup>	0.13	0.13	0.13	0.13

### Thermal data

17_	Thermal resistance housing-ambient	K/W	29.5
18_	Thermal resistance winding-housing	K/W	2.5
19_	Thermal time constant winding	s	1.69
20_	Thermal time constant motor	s	475
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Operating Range



### Sterilization information

135°C  
SSS

Sensorless: typical 2000 sterilization cycles  
Hall sensors: typical 1000 sterilization cycles  
Sterilization with steam  
Temperature +134°C ±4°C  
Compression pressure up to 2.3 bar  
Rel. humidity 100%  
Cycle length 18 min.

### Mechanical data ball bearings

23_	Max. speed	rpm	120 000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

### Other specifications

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 32
32_	Typical noise level [rpm]	dBA 46 [50 000]

### Connection A and B, motor (Cable AWG A: 26, B: 22)

red Motor winding 1  
black Motor winding 2  
white Motor winding 3

### Connection A, sensors (Cable AWG 28)

orange V<sub>CC</sub> 5 ±0.5 V  
blue GND  
yellow Hall sensor 1  
brown Hall sensor 2  
grey Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V<sub>CC</sub>) and blue (GND) connections are not used.

### maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
294_GPX 13 SPEED	1-3	for motor type A: 400_ENX 13 EASY INT	454_ESCON Module 24/2 455_ESCON 36/3 EC
		for motor type B: 400_ENX 13 EASY INT Abs.	455_ESCON Module 50/4 EC-S 457_ESCON 50/5 459_DEC Module 24/2 459_DEC Module 50/5 462_EPOS4 Mod./Comp. 24/1.5 463_EPOS4 50/5 463_EPOS4 Mod./Comp. 50/5 470_EPOS2 P 24/5 473_MAXPOS 50/5

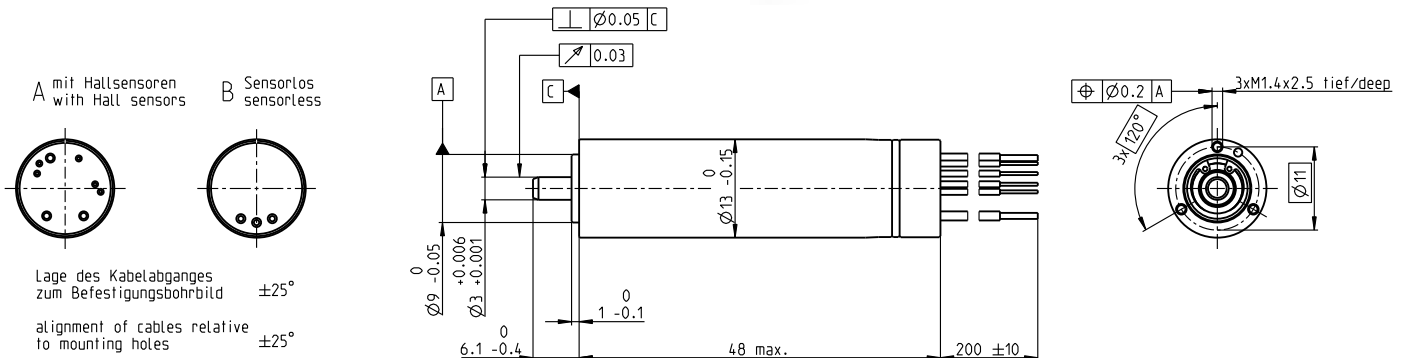
### Configuration

Flange front: thread holes/center thread  
Flange back: metal ring/external thread  
Shaft front: length/diameter  
Electric connection: cable length/pin connection  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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# ECX SPEED 13 L brushless BLDC motor Ø13 mm

Key Data: 25/27 W, 5.2 mNm, 50000 rpm



M 1:1

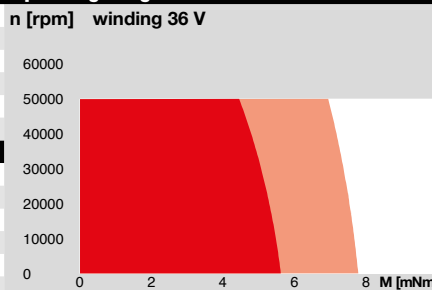
**Motor Data**

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	42300	43100	42300	42700
3_	No load current	mA	165	128	82.5	62.8
4_	Nominal speed	rpm	38000	39100	38400	38700
5_	Nominal torque (max. continuous torque)	mNm	4.84	5.1	5.23	5.13
6_	Nominal current (max. continuous current)	A	1.35	1.08	0.724	0.539
7_	Stall torque	mNm	50.9	58.5	59.9	58.9
8_	Stall current	A	12.7	11.1	7.47	5.55
9_	Max. efficiency	%	79.1	80.3	80.6	80.4
10_	Terminal resistance	Ω	1.42	2.16	4.82	8.64
11_	Terminal inductance	mH	0.0444	0.0761	0.178	0.31
12_	Torque constant	mNm/A	4.01	5.25	8.02	10.6
13_	Speed constant	rpm/V	2380	1820	1190	901
14_	Speed/torque gradient	rpm/mNm	842	746	715	734
15_	Mechanical time constant	ms	3.3	2.92	2.8	2.88
16_	Rotor inertia	gcm <sup>2</sup>	0.374	0.374	0.374	0.374

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	23.7
18_	Thermal resistance winding-housing	K/W	2
19_	Thermal time constant winding	s	2.12
20_	Thermal time constant motor	s	398
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	50000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play	preloaded	
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

**Other specifications**

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 33.6
32_	Typical noise level [rpm]	dBA 47 [50000]

**Connection A and B, motor** (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

**Connection A, sensors** (Cable AWG 28)

orange	V <sub>CC</sub> 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V<sub>cc</sub>) and blue (GND) connections are not used.

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
294_GPX 13 SPEED	1-3	for motor type A:	454_ESCON Module 24/2
295_GPX 14 A/C	1-2 [3-4]	400_ENX 13 EASY INT	455_ESCON 36/3 EC
296_GPX 14 LN/LZ	1-2 [3-4]	for motor type B:	455_ESCON Module 50/4 EC-S
297_GPX 14 HP	2-3 [4]	400_ENX 13 EASY INT Abs.	455_ESCON Module 50/5
298_GPX 16 A/C	3-4		457_ESCON 50/5
299_GPX 16 LN/LZ	3-4		459_DEC Module 50/5
300_GPX 16 HP	4		462_EPOS4 Mod./Comp. 24/1.5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

**Configuration**

Flange front: thread holes/center thread  
Flange back: metal ring/external thread  
Shaft front: length/diameter  
Electric connection: cable length/pin connection/connector  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

# ECX SPEED 13 L brushless

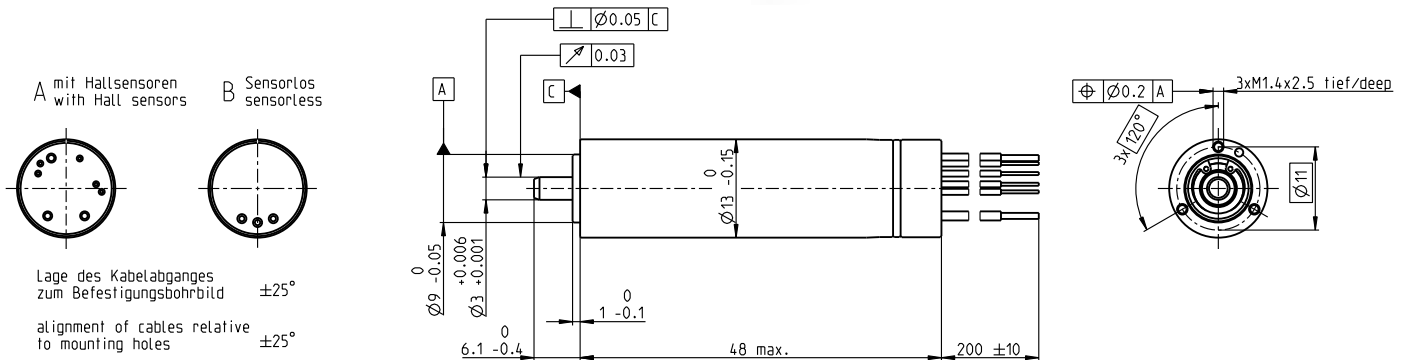
BLDC motor Ø13 mm

High Power

Key Data: 50/54 W, 7.1 mNm, 70000 rpm



maxon ECX



M 1:1

## Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	67900	66400	67900	62300
3_	No load current	mA	223	161	112	72.1
4_	Nominal speed	rpm	64400	63100	64600	59000
5_	Nominal torque (max. continuous torque)	mNm	6.89	7.15	6.88	7.12
6_	Nominal current (max. continuous current)	A	2.93	2.22	1.46	1.03
7_	Stall torque	mNm	149	161	161	151
8_	Stall current	A	59.1	46.8	31.9	20.5
9_	Max. efficiency	%	88.3	88.8	88.7	88.7
10_	Terminal resistance	Ω	0.304	0.512	1.13	2.34
11_	Terminal inductance	mH	0.012	0.0223	0.0479	0.101
12_	Torque constant	mNm/A	2.52	3.44	5.04	7.33
13_	Speed constant	rpm/V	3790	2780	1890	1300
14_	Speed/torque gradient	rpm/mNm	457	414	424	415
15_	Mechanical time constant	ms	1.67	1.51	1.55	1.52
16_	Rotor inertia	gcm <sup>2</sup>	0.349	0.349	0.349	0.349

## Thermal data

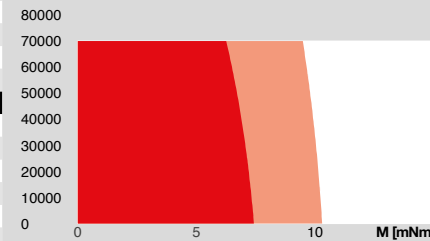
17_	Thermal resistance housing-ambient	K/W	24.4
18_	Thermal resistance winding-housing	K/W	1.6
19_	Thermal time constant winding	s	1.68
20_	Thermal time constant motor	s	411
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

## Mechanical data ball bearings

23_	Max. speed	rpm	70000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play	preloaded	
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

## Operating Range

n [rpm] winding 36 V



- Continuous operation
- Continuous operation with reduced thermal resistance R<sub>th2</sub> 50%
- Short term operation

## maxon Modular System

Details on catalog page 30

## Other specifications

29_	Number of pole pairs	1	294_GPX 13 SPEED	Stages [opt.]	1-3	maxon sensor	for motor type A:	maxon motor control
30_	Number of phases	3	295_GPX 14 A/C		1-2 [3-4]	400_ENX 13 EASY INT		455_ESCON 36/3 EC
31_	Weight of motor	g	33.7	296_GPX 14 LN/LZ	1-2 [3-4]	for motor type B:		455_ESCON Module 50/4 EC-S
32_	Typical noise level [rpm]	dBA	47 [50000]	297_GPX 14 HP	2-3 [4]	400_ENX 13 EASY INT Abs.		455_ESCON Module 50/5

## Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

## Connection A, sensors (Cable AWG 28)

orange	V <sub>CC</sub> 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V<sub>cc</sub>) and blue (GND) connections are not used.

## Configuration

Flange front: thread holes/center thread  
Flange back: metal ring/external thread  
Shaft front: length/diameter  
Electric connection: cable length/pin connection/connector  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

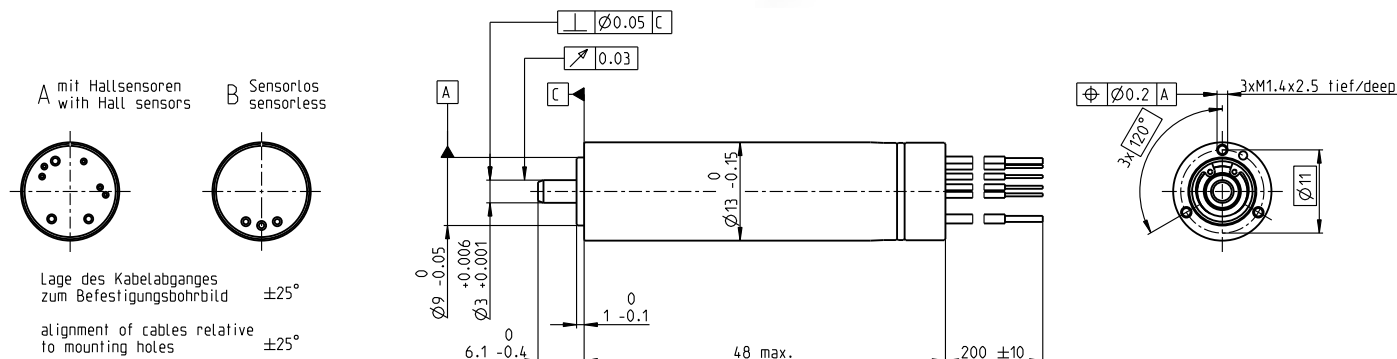
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# ECX SPEED 13 L brushless

## BLDC motor Ø13 mm

Sterilizable

Key Data: 50/62 W, 7.8 mNm, 90000 rpm



M 1:1

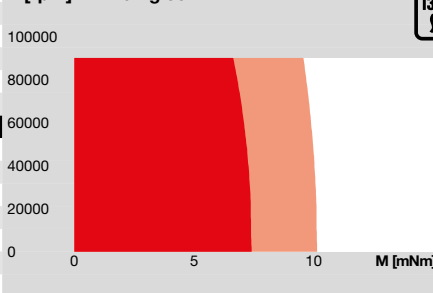
### Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	72200	70600	72200	66200
3_	No load current	mA	234	170	117	76.5
4_	Nominal speed	rpm	67500	66400	68200	62300
5_	Nominal torque (max. continuous torque)	mNm	7.55	7.8	7.53	7.69
6_	Nominal current (max. continuous current)	A	3.39	2.57	1.69	1.18
7_	Stall torque	mNm	124	140	146	139
8_	Stall current	A	52.3	43.4	30.8	20.2
9_	Max. efficiency	%	87.3	88.1	88.2	88.3
10_	Terminal resistance	Ω	0.344	0.552	1.17	2.38
11_	Terminal inductance	mH	0.00741	0.0138	0.0296	0.0627
12_	Torque constant	mNm/A	2.37	3.23	4.74	6.89
13_	Speed constant	rpm/V	4030	2950	2010	1390
14_	Speed/torque gradient	rpm/mNm	586	505	496	478
15_	Mechanical time constant	ms	1.93	1.67	1.64	1.58
16_	Rotor inertia	gcm <sup>2</sup>	0.315	0.315	0.315	0.315

### Thermal data

17_	Thermal resistance housing-ambient	K/W	22
18_	Thermal resistance winding-housing	K/W	2.04
19_	Thermal time constant winding	s	2.13
20_	Thermal time constant motor	s	448
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Operating Range



### Sterilization information

Sensorless: typical 2000 sterilization cycles  
 Hall sensors: typical 1000 sterilization cycles  
 Sterilization with steam  
 Temperature +134°C ±4°C  
 Compression pressure up to 2.3 bar  
 Rel. humidity 100%  
 Cycle length 18 min.

### Mechanical data ball bearings

23_	Max. speed	rpm	90000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play	preloaded	
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	41
32_	Typical noise level [rpm]	dBA	47 [50000]

### Connection A and B, motor (Cable AWG A: 26, B: 22)

red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

### Connection A, sensors (Cable AWG 28)

orange V<sub>CC</sub> 5 ±0.5 V  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V<sub>cc</sub>) and blue (GND) connections are not used.

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
294_GPX 13 SPEED	1-3	for motor type A: 400_ENX 13 EASY INT	455_ESCON 36/3 EC 455_ESCON Module 50/4 EC-S 455_ESCON Module 50/5
		for motor type B: 400_ENX 13 EASY INT Abs.	457_ESCON 50/5 459_DEC Module 50/5 463_EPOS4 50/5 463_EPOS4 Mod./Comp. 50/5 470_EPOS2 P 24/5 473_MAXPOS 50/5

### Configuration

Flange front: thread holes/center thread  
 Flange back: metal ring/external thread  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

# ECX SPEED 13 L brushless

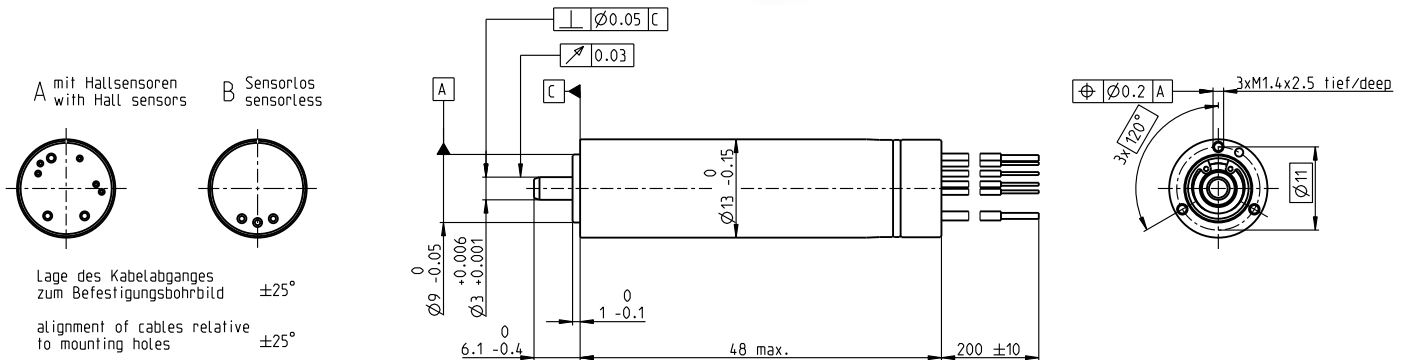
## BLDC motor Ø13 mm

Sterilizable, Ceramic Bearings

Key Data: 50/79 W, 7.9 mNm, 120000 rpm



maxon ECX



M 1:1

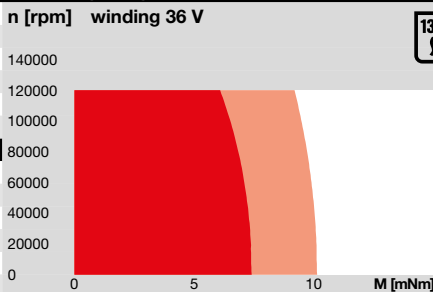
### Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	72200	70700	72300	66200
3_	No load current	mA	203	147	101	66
4_	Nominal speed	rpm	67500	66400	68200	62300
5_	Nominal torque (max. continuous torque)	mNm	7.65	7.91	7.64	7.78
6_	Nominal current (max. continuous current)	A	3.41	2.58	1.7	1.19
7_	Stall torque	mNm	124	140	146	139
8_	Stall current	A	52.3	43.4	30.8	20.2
9_	Max. efficiency	%	88.1	88.9	89	89.1
10_	Terminal resistance	Ω	0.344	0.552	1.17	2.38
11_	Terminal inductance	mH	0.00741	0.0138	0.0296	0.0627
12_	Torque constant	mNm/A	2.37	3.23	4.74	6.89
13_	Speed constant	rpm/V	4030	2950	2010	1390
14_	Speed/torque gradient	rpm/mNm	586	505	496	478
15_	Mechanical time constant	ms	1.93	1.67	1.64	1.58
16_	Rotor inertia	gcm <sup>2</sup>	0.315	0.315	0.315	0.315

### Thermal data

17_	Thermal resistance housing-ambient	K/W	22
18_	Thermal resistance winding-housing	K/W	2.0
19_	Thermal time constant winding	s	2.13
20_	Thermal time constant motor	s	448
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Operating Range



### Sterilization information

Sensorless: typical 2000 sterilization cycles  
 Hall sensors: typical 1000 sterilization cycles  
 Sterilization with steam  
 Temperature +134°C ±4°C  
 Compression pressure up to 2.3 bar  
 Rel. humidity 100%  
 Cycle length 18 min.

### Mechanical data ball bearings

23_	Max. speed	rpm	120000
24_	Axial play	mm	0...0.28
	Preload	N	1.5
	Direction of force		pull
25_	Radial play	preloaded	
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	50
	(static, shaft supported)	N	1500
28_	Max. radial load [mm from flange]	N	6 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	41
32_	Typical noise level [rpm]	dBA	47 [50000]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
294_GPX 13 SPEED	1-3	for motor type A:	455_ESCON 36/3 EC
		400_ENX 13 EASY INT	455_ESCON Module 50/4 EC-S
		for motor type B:	455_ESCON Module 50/5
		400_ENX 13 EASY INT Abs.	457_ESCON 50/5
			459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

### Connection A and B, motor (Cable AWG A: 26, B: 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

### Connection A, sensors (Cable AWG 28)

orange	V <sub>CC</sub> 5 ±0.5 V
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Output signals: CMOS compatible push-pull stage. No pull-up resistor required. Hall signals are generated by an EASY INT sensor. In combination with the ENX EASY INT, the orange (V<sub>cc</sub>) and blue (GND) connections are not used.

### Configuration

Flange front: thread holes/center thread  
 Flange back: metal ring/external thread  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

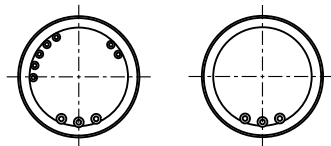
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# ECX SPEED 16 M brushless BLDC motor $\varnothing$ 16 mm



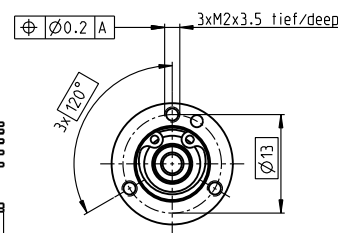
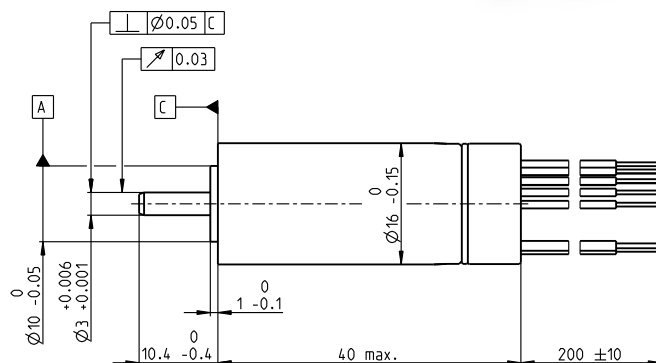
**Key Data: 20/26 W, 5.1 mNm, 55000 rpm**

A mit Hallensoren with Hall sensors      B Sensorlos sensorless



Lage des Kabelabganges zum Befestigungsbohrbild  $\pm 25^\circ$

alignment of cables relative to mounting holes  $\pm 25^\circ$



**M 1:1**

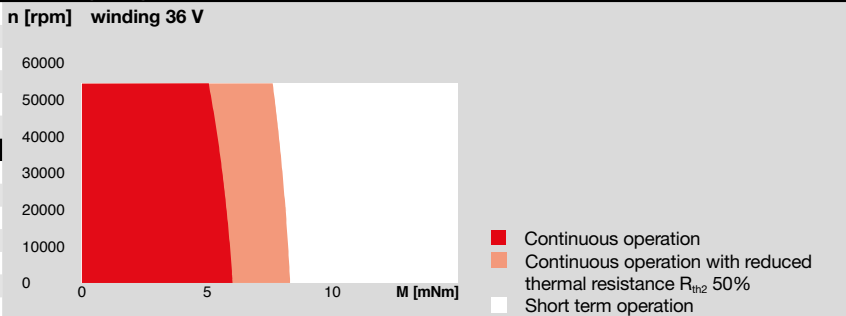
**Motor Data**

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	49600	49600	49700	49600
3_	No load current	mA	236	177	118	88.7
4_	Nominal speed	rpm	45100	45300	45500	45200
5_	Nominal torque (max. continuous torque)	mNm	4.69	4.93	5.1	4.75
6_	Nominal current (max. continuous current)	A	1.59	1.24	0.852	0.601
7_	Stall torque	mNm	57.3	63.2	67.8	59.9
8_	Stall current	A	16.8	13.9	9.94	6.59
9_	Max. efficiency	%	78.1	79.1	79.8	78.6
10_	Terminal resistance	$\Omega$	1.07	1.73	3.62	7.29
11_	Terminal inductance	mH	0.0502	0.0893	0.201	0.357
12_	Torque constant	mNm/A	3.41	4.55	6.83	9.1
13_	Speed constant	rpm/V	2800	2100	1400	1050
14_	Speed/torque gradient	rpm/mNm	880	797	743	840
15_	Mechanical time constant	ms	7.42	6.73	6.27	7.09
16_	Rotor inertia	gcm <sup>2</sup>	0.806	0.806	0.806	0.806

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	20.3
18_	Thermal resistance winding-housing	K/W	1.52
19_	Thermal time constant winding	s	1.83
20_	Thermal time constant motor	s	508
21_	Ambient temperature	$^\circ$ C	-20...+100
22_	Max. winding temperature	$^\circ$ C	125

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	55000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

**Other specifications**

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50000]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
298_GPX 16 A/C	1-2 [3-4]	for motor type A:	454_ESCON Module 24/2
299_GPX 16 LN/LZ	1-2 [3-4]	405_ENX 16 EASY INT	455_ESCON 36/3 EC
300_GPX 16 HP	2-3 [4]	for motor type B:	455_ESCON Module 50/4 EC-S
301_GPX 16 SPEED	1-2	403_ENX 16 EASY INT Abs.	455_ESCON Module 50/5
302_GPX 19 A/C	3-4		457_ESCON 50/5
303_GPX 19 LN/LZ	3-4		459_DEC Module 24/2
304_GPX 19 HP	4		459_DEC Module 50/5
			462_EPOS4 Mod./Comp. 24/1.5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

**Connection A and B, motor (Cable AWG 22)**

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

**Connection A, sensors (Cable AWG 26)**

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC (Cable AWG 26)**

purple	NTC
purple	NTC

Resistance 25 $^\circ$ C: 10 kOhm  $\pm$ 1%, beta (25-85 $^\circ$ C): 3490 K

**Configuration**

Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.



# ECX SPEED 16 M brushless BLDC motor Ø16 mm

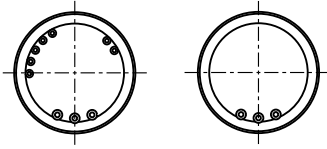
High Power

Key Data: 40/50 W, 7.5 mNm, 70000 rpm

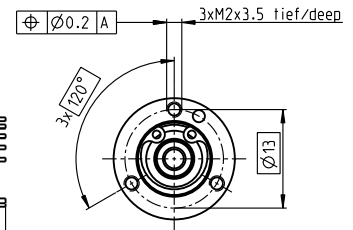
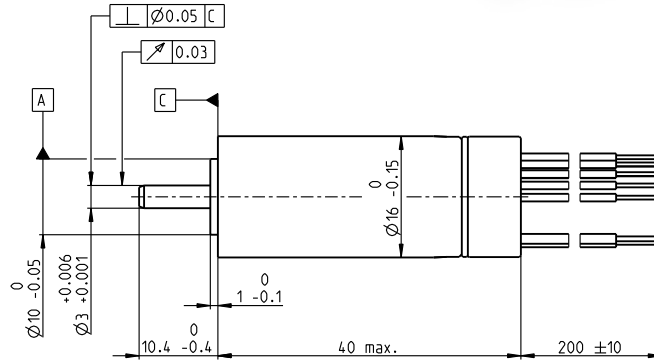


maxon ECX

A mit Hallsensoren with Hall sensors  
B Sensorlos sensorless



Lage des Kabelabganges zum Befestigungsbohrbild ±25°  
alignment of cables relative to mounting holes ±25°



M 1:1

### Motor Data

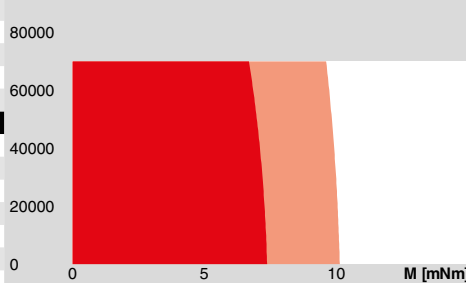
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	55100	58300	56400	56400
3_	No load current	mA	276	227	143	107
4_	Nominal speed	rpm	50800	54000	52200	52200
5_	Nominal torque (max. continuous torque)	mNm	7.53	7.21	7.4	7.44
6_	Nominal current (max. continuous current)	A	2.67	2.05	1.35	1.01
7_	Stall torque	mNm	109	111	113	115
8_	Stall current	A	35.1	28.5	18.8	14.3
9_	Max. efficiency	%	83.5	83.4	83.7	83.8
10_	Terminal resistance	Ω	0.512	0.841	1.92	3.35
11_	Terminal inductance	mH	0.0295	0.0469	0.113	0.201
12_	Torque constant	mNm/A	3.09	3.9	6.04	8.06
13_	Speed constant	rpm/V	3090	2450	1580	1180
14_	Speed/torque gradient	rpm/mNm	513	529	501	493
15_	Mechanical time constant	ms	4.36	4.5	4.26	4.19
16_	Rotor inertia	gcm <sup>2</sup>	0.812	0.812	0.812	0.812

### Thermal data

17_	Thermal resistance housing-ambient	K/W	20.3
18_	Thermal resistance winding-housing	K/W	1.8
19_	Thermal time constant winding	s	2.16
20_	Thermal time constant motor	s	508
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

### Operating Range

n [rpm] winding 36 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance R<sub>th2</sub> 50%  
■ Short term operation

### Mechanical data ball bearings

23_	Max. speed	rpm	70000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50000]

### maxon Modular System

maxon gear	Stages [opt.]
298_GPX 16 A/C	1-2 [3-4]
299_GPX 16 LN/LZ	1-2 [3-4]
300_GPX 16 HP	2-3 [4]
301_GPX 16 SPEED	1-2
302_GPX 19 A/C	3-4
303_GPX 19 LN/LZ	3-4
304_GPX 19 HP	4

maxon sensor
for motor type A:
405_ENX 16 EASY INT
for motor type B:
403_ENX 16 EASY INT Abs.

maxon motor control
454_ESCON Module 24/2
455_ESCON 36/3 EC
455_ESCON Module 50/4 EC-S
455_ESCON Module 50/5
457_ESCON 50/5
459_DEC Module 24/2
459_DEC Module 50/5
463_EPOS4 50/5
463_EPOS4 Mod./Comp. 50/5
470_EPOS2 P 24/5
473_MAXPOS 50/5

Details on catalog page 30

### Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC
Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K	

### Configuration

Flange front: thread holes/center thread  
Flange back: plastic ring/external thread/with opening  
Shaft front: length/diameter  
Electric connection: cable length/pin connection/connector  
Temperature Sensor: NTC-Thermistor  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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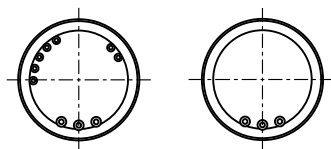
# ECX SPEED 16 M brushless BLDC motor Ø16 mm

Sterilizable

Key Data: 40/50 W, 6.8 mNm, 70000 rpm

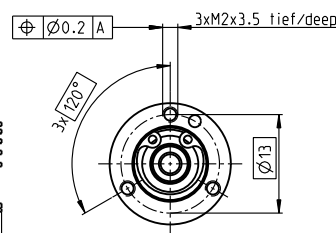
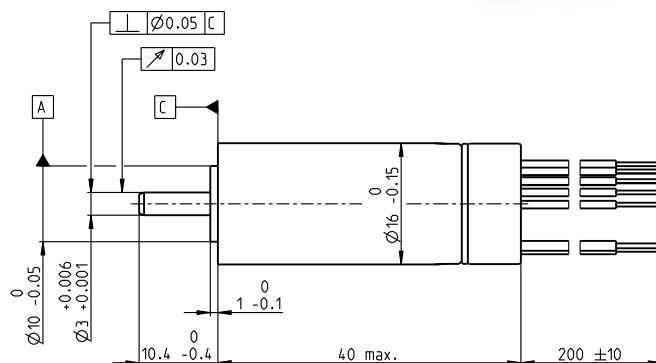


A mit Hallsensoren with Hall sensors      B Sensorlos sensorless



Lage des Kabelabganges zum Befestigungsbohrbild ±25°

alignment of cables relative to mounting holes ±25°



M 1:1

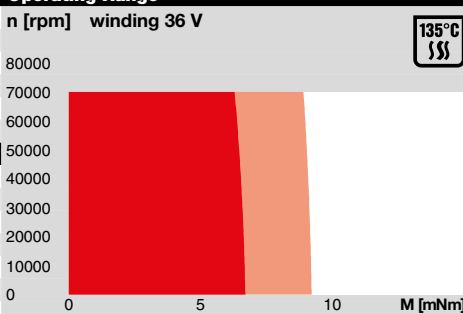
### Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	61500	65000	57700	58900
3_	No load current	mA	275	227	124	96.2
4_	Nominal speed	rpm	56400	60000	52700	53900
5_	Nominal torque (max. continuous torque)	mNm	6.84	6.56	6.56	6.6
6_	Nominal current (max. continuous current)	A	2.69	2.07	1.21	0.935
7_	Stall torque	mNm	97.3	99.6	87.2	91
8_	Stall current	A	35.1	28.5	14.8	11.8
9_	Max. efficiency	%	83.5	83.4	83	83.2
10_	Terminal resistance	Ω	0.512	0.841	2.43	4.06
11_	Terminal inductance	mH	0.0341	0.0542	0.155	0.264
12_	Torque constant	mNm/A	2.77	3.49	5.9	7.7
13_	Speed constant	rpm/V	3450	2740	1620	1240
14_	Speed/torque gradient	rpm/mNm	638	659	668	654
15_	Mechanical time constant	ms	3.94	4.06	4.12	4.03
16_	Rotor inertia	gcm <sup>2</sup>	0.589	0.589	0.589	0.589

### Thermal data

17_	Thermal resistance housing-ambient	K/W	20.3
18_	Thermal resistance winding-housing	K/W	1.8
19_	Thermal time constant winding	s	2.16
20_	Thermal time constant motor	s	508
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Operating Range



### Sterilization information

Sensorless: typical 2000 sterilization cycles  
Hall sensors: typical 1000 sterilization cycles  
Sterilization with steam  
Temperature +134°C ±4°C  
Compression pressure up to 2.3 bar  
Rel. humidity 100%  
Cycle length 18 min.

### Mechanical data ball bearings

23_	Max. speed	rpm	70000
24_	Axial play	mm	0..0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

### Other specifications

29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50000]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
301_GPX 16 SPEED	1-2	for motor type A:	454_ESCON Module 24/2
		405_ENX 16 EASY INT	455_ESCON 36/3 EC
		for motor type B:	455_ESCON Module 50/4 EC-S
		403_ENX 16 EASY INT Abs.	455_ESCON Module 50/5
			457_ESCON 50/5
			459_DEC Module 24/2
			459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

### Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

### Configuration

Flange front: thread holes/center thread  
Flange back: plastic ring/external thread/with opening  
Shaft front: length/diameter  
Electric connection: cable length/pin connection  
Temperature Sensor: NTC-Thermistor  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

# ECX SPEED 16 M brushless BLDC motor Ø16 mm

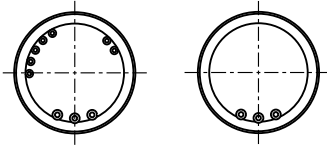
Sterilizable, Ceramic Bearings

Key Data: 40/68 W, 6.6 mNm, 120000 rpm



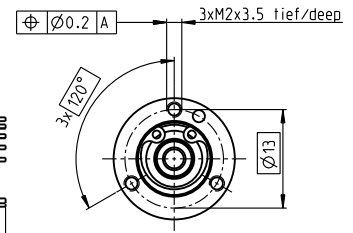
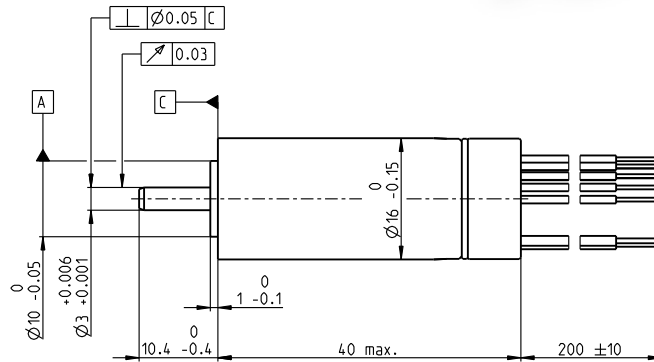
maxon ECX

A mit Hallensoren with Hall sensors  
B Sensorlos sensorless



Lage des Kabelabganges zum Befestigungsbohrbild ±25°

alignment of cables relative to mounting holes ±25°



M 1:1

### Motor Data

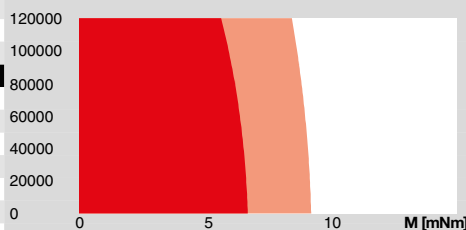
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	61400	64900	57600	58800
3_	No load current	mA	328	271	147	114
4_	Nominal speed	rpm	56500	60000	52700	54000
5_	Nominal torque (max. continuous torque)	mNm	6.63	6.34	6.38	6.41
6_	Nominal current (max. continuous current)	A	2.67	2.04	1.2	0.927
7_	Stall torque	mNm	97.3	99.6	87.2	91
8_	Stall current	A	35.1	28.5	14.8	11.8
9_	Max. efficiency	%	82.1	82	81.6	81.8
10_	Terminal resistance	Ω	0.512	0.841	2.43	4.06
11_	Terminal inductance	mH	0.0341	0.0542	0.155	0.264
12_	Torque constant	mNm/A	2.77	3.49	5.9	7.7
13_	Speed constant	rpm/V	3450	2740	1620	1240
14_	Speed/torque gradient	rpm/mNm	638	659	668	654
15_	Mechanical time constant	ms	3.94	4.06	4.12	4.03
16_	Rotor inertia	gcm <sup>2</sup>	0.589	0.589	0.589	0.589

### Thermal data

17_	Thermal resistance housing-ambient	K/W	20.3
18_	Thermal resistance winding-housing	K/W	1.8
19_	Thermal time constant winding	s	2.16
20_	Thermal time constant motor	s	508
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Operating Range

n [rpm] winding 36 V



### Sterilization information

Sensorless: typical 2000 sterilization cycles  
Hall sensors: typical 1000 sterilization cycles  
Sterilization with steam  
Temperature +134°C ±4°C  
Compression pressure up to 2.3 bar  
Rel. humidity 100%  
Cycle length 18 min.

### Mechanical data ball bearings

23_	Max. speed	rpm	120 000
24_	Axial play	mm	0..0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50000]

### Connection A and B, motor (Cable AWG 22)

red Motor winding 1  
black Motor winding 2  
white Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange V<sub>Hall</sub> 3...24 VDC  
blue GND  
yellow Hall sensor 1  
brown Hall sensor 2  
grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple NTC  
purple NTC  
Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
301_GPX 16 SPEED	1–2	for motor type A:	454_ESCON Module 24/2
		405_ENX 16 EASY INT	455_ESCON 36/3 EC
		for motor type B:	455_ESCON Module 50/4 EC-S
		403_ENX 16 EASY INT Abs.	455_ESCON Module 50/5
			457_ESCON 50/5
			459_DEC Module 24/2
			459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

### Configuration

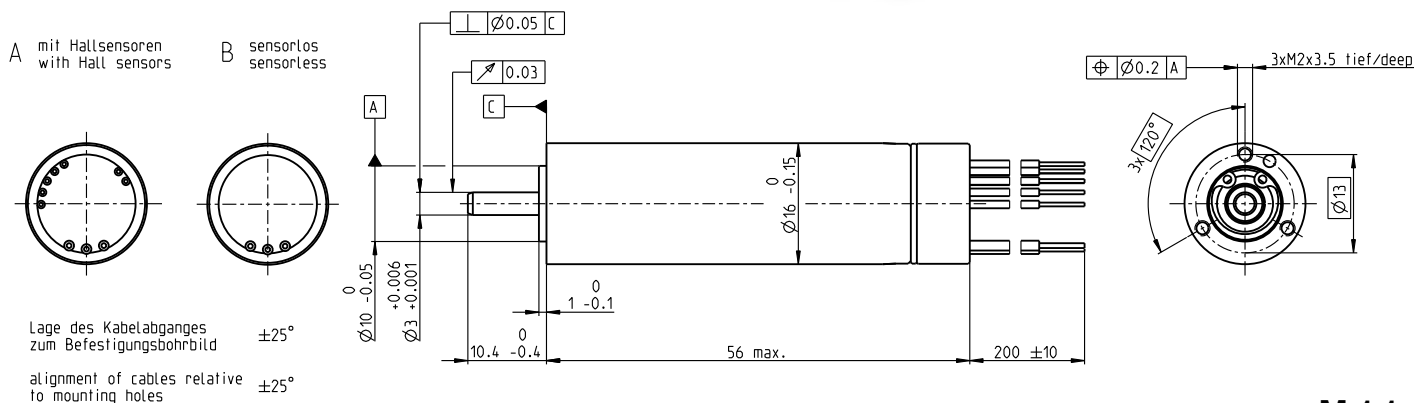
Flange front: thread holes/center thread  
Flange back: plastic ring/external thread/with opening  
Shaft front: length/diameter  
Electric connection: cable length/pin connection  
Temperature Sensor: NTC-Thermistor  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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# ECX SPEED 16 L brushless BLDC motor Ø16 mm



**Key Data: 40/52 W, 10.6 mNm, 50000 rpm**



**M 1:1**

**Motor Data**

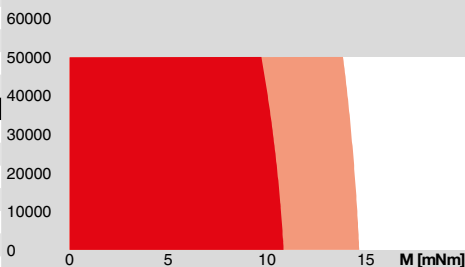
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	47500	47500	48400	48800
3_	No load current	mA	342	256	176	134
4_	Nominal speed	rpm	43900	44100	45100	45600
5_	Nominal torque (max. continuous torque)	mNm	9.73	9.84	10.3	10.6
6_	Nominal current (max. continuous current)	A	3.02	2.29	1.61	1.25
7_	Stall torque	mNm	142	150	170	182
8_	Stall current	A	39.8	31.4	24.1	19.6
9_	Max. efficiency	%	82.7	83.1	84	84.5
10_	Terminal resistance	Ω	0.453	0.765	1.49	2.45
11_	Terminal inductance	mH	0.0221	0.0392	0.0853	0.149
12_	Torque constant	mNm/A	3.58	4.78	7.04	9.31
13_	Speed constant	rpm/V	2670	2000	1360	1030
14_	Speed/torque gradient	rpm/mNm	337	320	287	270
15_	Mechanical time constant	ms	3.52	3.34	3	2.82
16_	Rotor inertia	gcm <sup>2</sup>	0.997	0.997	0.997	0.997

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	16.2
18_	Thermal resistance winding-housing	K/W	2.34
19_	Thermal time constant winding	s	4.91
20_	Thermal time constant motor	s	588
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

**Operating Range**

**n [rpm] winding 36 V**



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Short term operation

**Mechanical data ball bearings**

23_	Max. speed	rpm	50000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

**Other specifications**

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 72.6
32_	Typical noise level [rpm]	dBA 52 [50000]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]
298_GPX 16 A/C	1-2 [3-4]
299_GPX 16 LN/LZ	1-2 [3-4]
300_GPX 16 HP	2-3 [4]
301_GPX 16 SPEED	1-2
302_GPX 19 A/C	3-4
303_GPX 19 LN/LZ	3-4
304_GPX 19 HP	4

<b>maxon sensor</b>	
for motor type A:	
401_ENX 16 EASY INT	
for motor type B:	
403_ENX 16 EASY INT Abs.	

Details on catalog page 30

<b>maxon motor control</b>
455_ESCON 36/3 EC
455_ESCON Module 50/4 EC-S
455_ESCON Module 50/5
457_ESCON 50/5
459_DEC Module 50/5
463_EPOS4 50/5
463_EPOS4 Mod./Comp. 50/5
470_EPOS2 P 24/5
473_MAXPOS 50/5

**Connection A and B, motor (Cable AWG 22)**

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

**Connection A, sensors (Cable AWG 26)**

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC (Cable AWG 26)**

purple	NTC
purple	NTC
Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K	

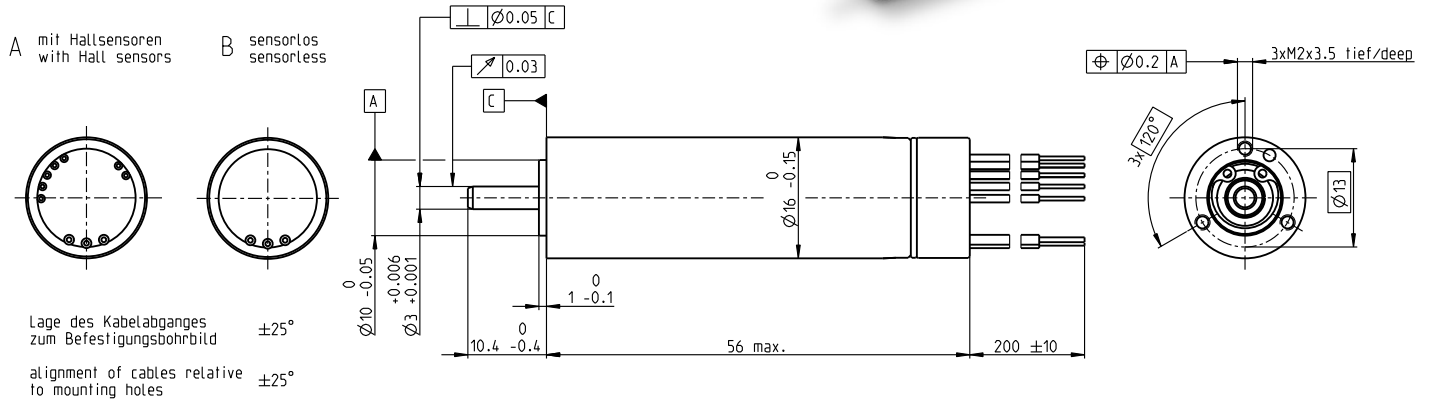
**Configuration**

Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

# ECX SPEED 16 L brushless BLDC motor Ø16 mm

High Power

Key Data: 80/107 W, 16 mNm, 70000 rpm



M 1:1

maxon ECX

## Motor Data

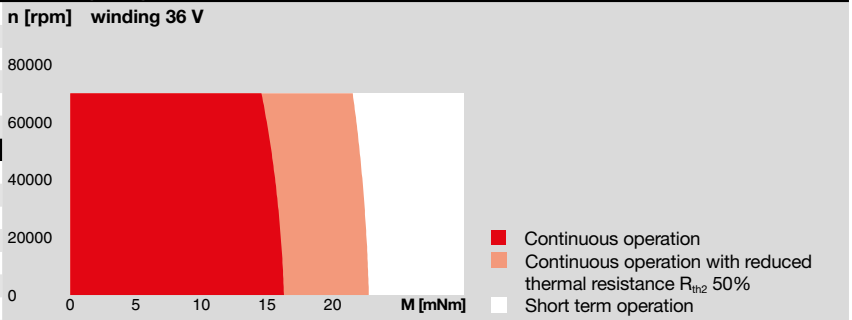
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	64600	64600	64600	64600
3_	No load current	mA	459	344	230	172
4_	Nominal speed	rpm	61200	61600	61800	61800
5_	Nominal torque (max. continuous torque)	mNm	15.4	16	15.4	14.7
6_	Nominal current (max. continuous current)	A	6.2	4.82	3.1	2.24
7_	Stall torque	mNm	346	407	414	396
8_	Stall current	A	131	115	78.1	56
9_	Max. efficiency	%	88.7	89.5	89.6	89.4
10_	Terminal resistance	Ω	0.138	0.208	0.461	0.858
11_	Terminal inductance	mH	0.00794	0.0141	0.0318	0.0565
12_	Torque constant	mNm/A	2.65	3.53	5.3	7.07
13_	Speed constant	rpm/V	3600	2700	1800	1350
14_	Speed/torque gradient	rpm/mNm	187	159	157	164
15_	Mechanical time constant	ms	2.35	2	1.97	2.06
16_	Rotor inertia	gcm <sup>2</sup>	1.2	1.2	1.2	1.2

## Thermal data

17_	Thermal resistance housing-ambient	K/W	16.2
18_	Thermal resistance winding-housing	K/W	0.58
19_	Thermal time constant winding	s	1.37
20_	Thermal time constant motor	s	588
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

## Mechanical data ball bearings

23_	Max. speed	rpm	70000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]



## Other specifications

29_	Number of pole pairs	1	298_GPX 16 A/C	1-2 [3-4]	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
30_	Number of phases	3	299_GPX 16 LN/LZ	1-2 [3-4]	for motor type A:		for motor type A:	455_ESCON 36/3 EC
31_	Weight of motor	g	300_GPX 16 HP	2-3 [4]	401_ENX 16 EASY INT		401_ENX 16 EASY INT	455_ESCON Module 50/4 EC-S
32_	Typical noise level [rpm]	dBA	301_GPX 16 SPEED	1-2	for motor type B:		403_ENX 16 EASY INT Abs.	455_ESCON Module 50/5
			302_GPX 19 A/C	3-4				456_ESCON Module 50/8 HE
			303_GPX 19 LN/LZ	3-4				457_ESCON 70/10
			304_GPX 19 HP	4				459_DEC Module 50/5
								463_EPOS4 50/5
								463_EPOS4 Mod./Comp. 50/5
								465_EPOS4 Mod./Comp. 50/8
								467_EPOS4 70/15
								470_EPOS2 P 24/5
								473_MAXPOS 50/5

## Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

## Connection A, sensors (Cable AWG 26)

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

## Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

## maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
298_GPX 16 A/C	1-2 [3-4]	for motor type A:	455_ESCON 36/3 EC
299_GPX 16 LN/LZ	1-2 [3-4]	401_ENX 16 EASY INT	455_ESCON Module 50/4 EC-S
300_GPX 16 HP	2-3 [4]	for motor type B:	455_ESCON Module 50/5
301_GPX 16 SPEED	1-2	403_ENX 16 EASY INT Abs.	455_ESCON 50/5
302_GPX 19 A/C	3-4		456_ESCON Module 50/8 HE
303_GPX 19 LN/LZ	3-4		457_ESCON 70/10
304_GPX 19 HP	4		459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			465_EPOS4 Mod./Comp. 50/8
			467_EPOS4 70/15
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

## Configuration

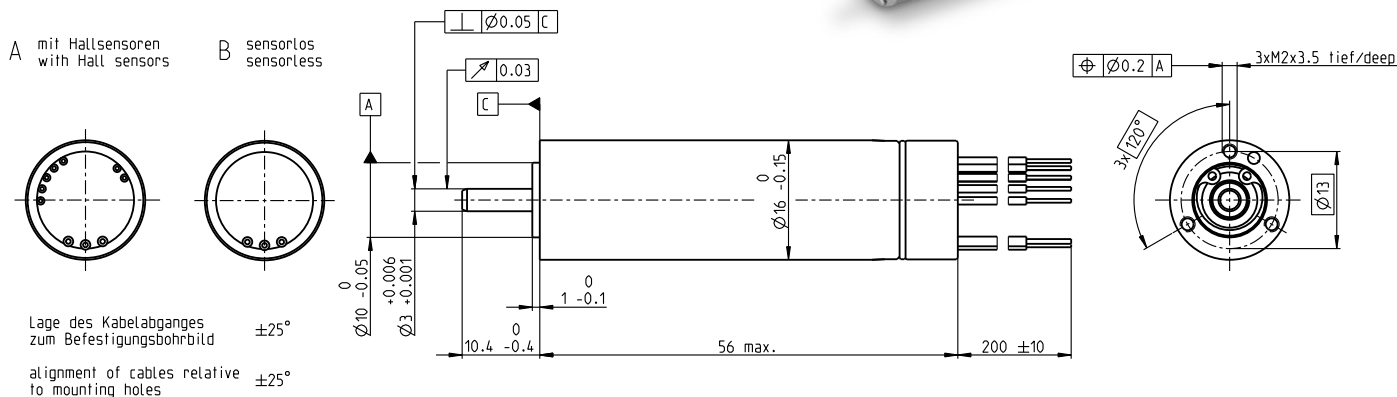
Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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# ECX SPEED 16 L brushless BLDC motor Ø16 mm

Sterilizable

Key Data: 80/108 W, 16.3 mNm, 70000 rpm



M 1:1

**Motor Data**

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	65700	65800	65800	65800
3_	No load current	mA	333	250	167	125
4_	Nominal speed	rpm	62100	62400	62600	62600
5_	Nominal torque (max. continuous torque)	mNm	15.7	16.3	15.7	15
6_	Nominal current (max. continuous current)	A	6.28	4.87	3.13	2.26
7_	Stall torque	mNm	341	401	407	389
8_	Stall current	A	131	115	78.1	56
9_	Max. efficiency	%	90.3	91	91.1	90.9
10_	Terminal resistance	Ω	0.138	0.208	0.461	0.858
11_	Terminal inductance	mH	0.01	0.0178	0.04	0.0712
12_	Torque constant	mNm/A	2.61	3.48	5.21	6.95
13_	Speed constant	rpm/V	3660	2750	1830	1370
14_	Speed/torque gradient	rpm/mNm	194	165	162	170
15_	Mechanical time constant	ms	1.93	1.64	1.62	1.69
16_	Rotor inertia	gcm <sup>2</sup>	0.952	0.952	0.952	0.952

**Thermal data**      **Operating Range**      **Sterilization information**

17_	Thermal resistance housing-ambient	K/W	16.2	<b>n [rpm] winding 36 V</b>				<b>Sterilization information</b> Sensorless: typical 2000 sterilization cycles Hall sensors: typical 1000 sterilization cycles Sterilization with steam Temperature +134°C ±4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 min.
18_	Thermal resistance winding-housing	K/W	0.58	80000	20			
19_	Thermal time constant winding	s	1.28	70000	15			
20_	Thermal time constant motor	s	588	60000	10			
21_	Ambient temperature	°C	-40...+135	50000	5			
22_	Max. winding temperature	°C	155	40000	0			

**Mechanical data ball bearings**

23_	Max. speed	rpm	70000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

**Other specifications**      **maxon Modular System**      **maxon sensor**      **maxon motor control**

29_	Number of pole pairs	1	<b>maxon gear</b> Stages [opt.]	for motor type A:	455_ESCON 36/3 EC
30_	Number of phases	3	301_GPX 16 SPEED 1-2	401_ENX 16 EASY INT	455_ESCON Module 50/4 EC-S
31_	Weight of motor	g 72.6		for motor type B:	455_ESCON Module 50/5
32_	Typical noise level [rpm]	dBA 52 [50000]		403_ENX 16 EASY INT Abs.	456_ESCON Module 50/8 HE

**Connection A and B, motor** (Cable AWG 22)      **Configuration**

red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

**Connection A, sensors** (Cable AWG 26)  
 orange V<sub>Hall</sub> 3...24 VDC  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC** (Cable AWG 26)  
 purple NTC  
 purple NTC  
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**  
 Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

**maxon motor control**

455_ESCON 36/3 EC
455_ESCON Module 50/4 EC-S
455_ESCON Module 50/5
456_ESCON Module 50/8 HE
457_ESCON 50/5
457_ESCON 70/10
459_DEC Module 50/5
463_EPOS4 50/5
463_EPOS4 Mod./Comp. 50/5
465_EPOS4 Mod./Comp. 50/8
467_EPOS4 70/15
470_EPOS2 P 24/5
473_MAXPOS 50/5

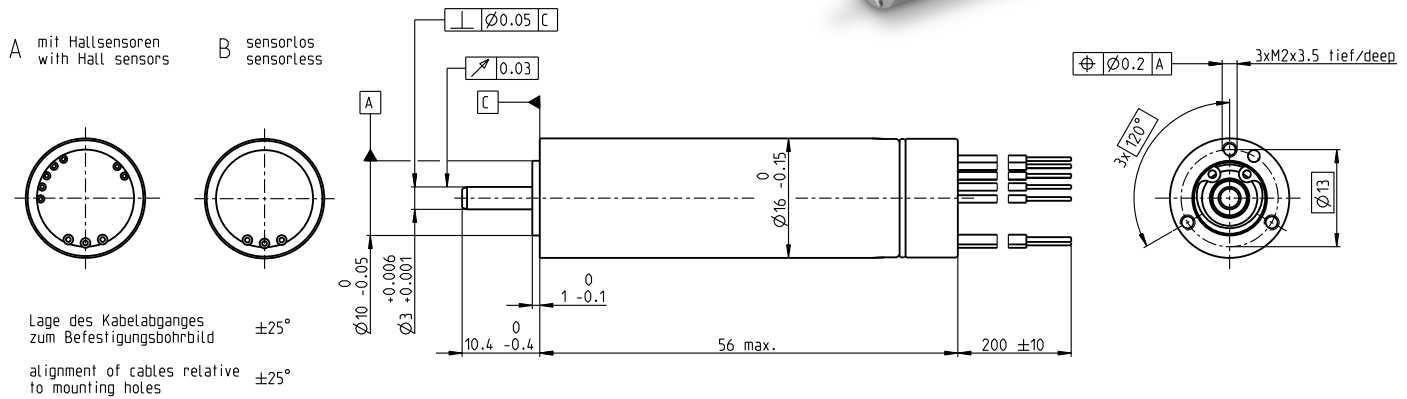
# ECX SPEED 16 L brushless BLDC motor Ø16 mm

Sterilizable, Ceramic Bearings

Key Data: 80/132 W, 15.7 mNm, 120000 rpm



maxon ECX



M 1:1

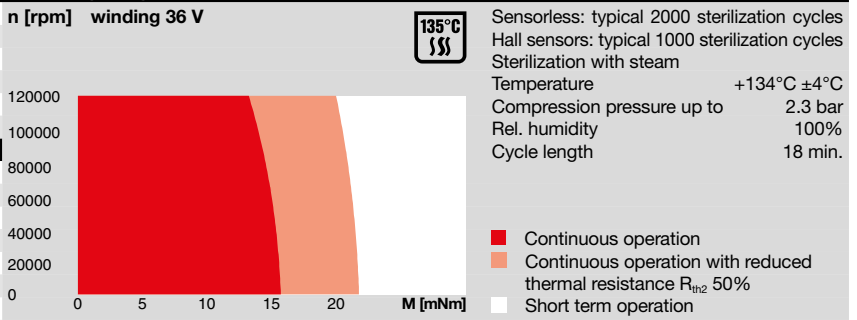
### Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	65700	65700	65700	65700
3_	No load current	mA	383	287	192	144
4_	Nominal speed	rpm	62200	62500	62700	62700
5_	Nominal torque (max. continuous torque)	mNm	15.2	15.7	15.1	14.5
6_	Nominal current (max. continuous current)	A	6.12	4.75	3.05	2.2
7_	Stall torque	mNm	341	401	407	389
8_	Stall current	A	131	115	78.1	56
9_	Max. efficiency	%	89.7	90.4	90.5	90.3
10_	Terminal resistance	Ω	0.138	0.208	0.461	0.858
11_	Terminal inductance	mH	0.01	0.0178	0.04	0.0712
12_	Torque constant	mNm/A	2.61	3.48	5.21	6.95
13_	Speed constant	rpm/V	3660	2750	1830	1370
14_	Speed/torque gradient	rpm/mNm	194	165	162	170
15_	Mechanical time constant	ms	1.93	1.64	1.62	1.69
16_	Rotor inertia	gcm <sup>2</sup>	0.952	0.952	0.952	0.952

### Thermal data

17_	Thermal resistance housing-ambient	K/W	16.2
18_	Thermal resistance winding-housing	K/W	0.58
19_	Thermal time constant winding	s	1.14
20_	Thermal time constant motor	s	588
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Operating Range



### Sterilization information

Sensorless: typical 2000 sterilization cycles  
Hall sensors: typical 1000 sterilization cycles  
Sterilization with steam  
Temperature +134°C ±4°C  
Compression pressure up to 2.3 bar  
Rel. humidity 100%  
Cycle length 18 min.

### Mechanical data ball bearings

23_	Max. speed	rpm	120 000
24_	Axial play	mm	0...0.29
	Preload	N	1.5
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	1.5
27_	Max. force for press fits (static)	N	60
	(static, shaft supported)	N	2500
28_	Max. radial load [mm from flange]	N	10 [5]

### Other specifications

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 72.6
32_	Typical noise level [rpm]	dBA 52 [50000]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
301_GPX 16 SPEED	1-2	for motor type A:	455_ESCON 36/3 EC
		401_ENX 16 EASY INT	455_ESCON Module 50/4 EC-S
		for motor type B:	455_ESCON Module 50/5
		403_ENX 16 EASY INT Abs.	456_ESCON Module 50/8 HE
			457_ESCON 50/5
			457_ESCON 70/10
			459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			465_EPOS4 Mod./Comp. 50/8
			467_EPOS4 70/15
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

### Connection A and B, motor (Cable AWG 22)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

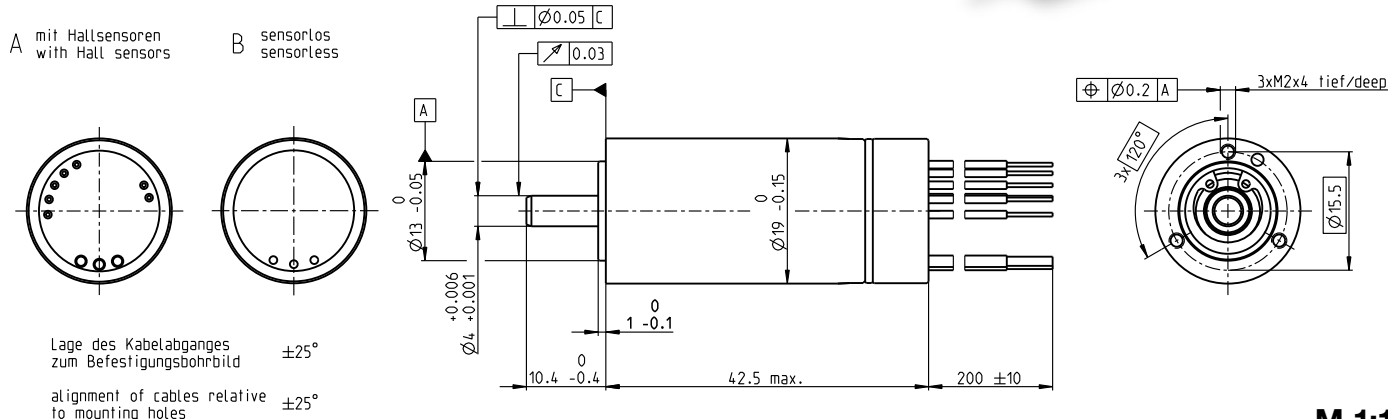
### Configuration

Flange front: thread holes/center thread  
Flange back: plastic ring/external thread/with opening  
Shaft front: length/diameter  
Electric connection: cable length/pin connection  
Temperature Sensor: NTC-Thermistor  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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# ECX SPEED 19 M brushless BLDC motor Ø19 mm

**Key Data: 30/37 W, 7.6 mNm, 50000 rpm**



**M 1:1**

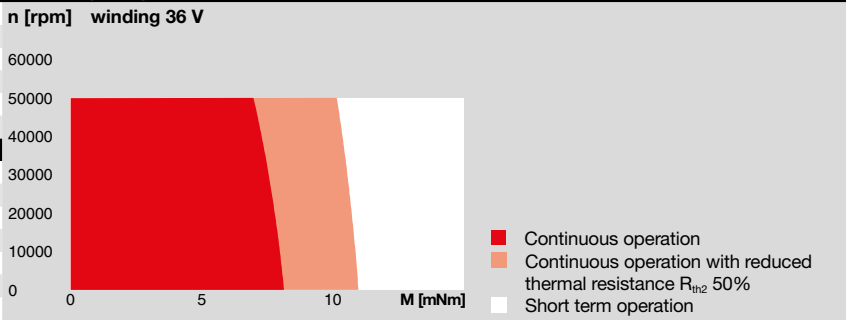
**Motor Data**

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	45200	47700	45200	47100
3_	No load current	mA	250	205	125	100
4_	Nominal speed	rpm	41000	43600	41100	42900
5_	Nominal torque (max. continuous torque)	mNm	7.61	7.47	7.57	7.08
6_	Nominal current (max. continuous current)	A	2.23	1.74	1.11	0.82
7_	Stall torque	mNm	94.8	101	96.7	91.8
8_	Stall current	A	25.2	21.3	12.8	9.54
9_	Max. efficiency	%	82	82	82	81
10_	Terminal resistance	Ω	0.715	1.13	2.8	5.03
11_	Terminal inductance	mH	0.0548	0.0873	0.219	0.358
12_	Torque constant	mNm/A	3.76	4.75	7.53	9.62
13_	Speed constant	rpm/V	2540	2010	1270	992
14_	Speed/torque gradient	rpm/mNm	482	476	473	519
15_	Mechanical time constant	ms	5.81	5.74	5.69	6.25
16_	Rotor inertia	gcm <sup>2</sup>	1.15	1.15	1.15	1.15

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	16.8
18_	Thermal resistance winding-housing	K/W	2.77
19_	Thermal time constant winding	s	5.55
20_	Thermal time constant motor	s	696
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	50000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

**Other specifications**

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 78
32_	Typical noise level [rpm]	dBA 48 [50000]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
302_GPX 19 A/C	1-2 [3-4]	for motor type A:	454_ESCON Module 24/2
303_GPX 19 LN/LZ	1-2 [3-4]	406_ENX 19 EASY INT	455_ESCON 36/3 EC
304_GPX 19 HP	2-3 [4]	for motor type B:	455_ESCON Module 50/4 EC-S
305_GPX 19 SPEED	1-2	406_ENX 19 EASY INT Abs.	455_ESCON Module 50/5
306_GPX 22 A/C	3-4		457_ESCON 50/5
307_GPX 22 LN/LZ	3-4		459_DEC Module 24/2
308_GPX 22 HP	4		459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Module/Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

**Connection A and B, motor (Cable AWG 20)**

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

**Connection A, sensors (Cable AWG 26)**

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC (Cable AWG 26)**

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**

Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.



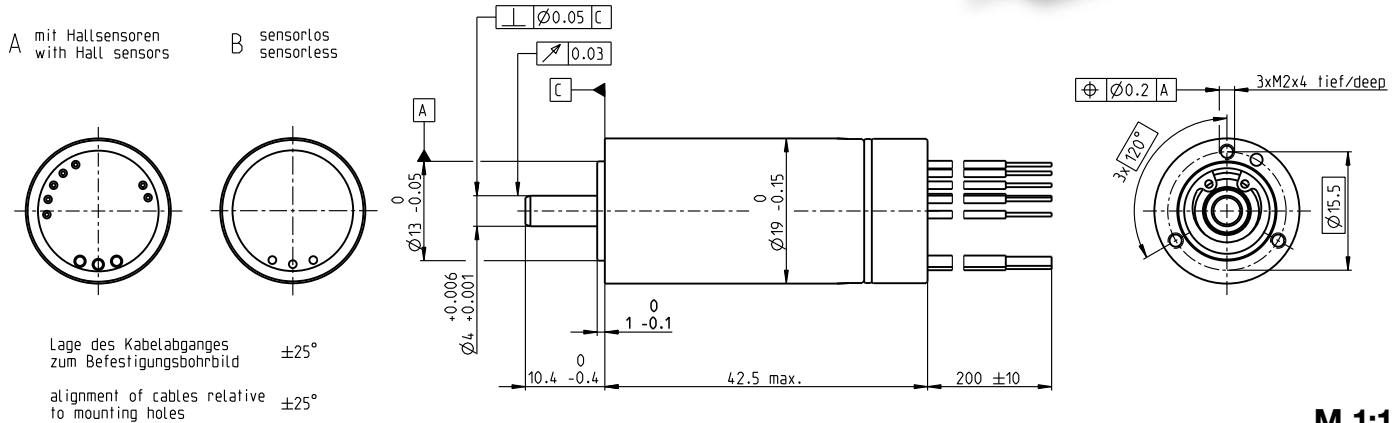
# ECX SPEED 19 M brushless BLDC motor Ø19 mm

High Power

Key Data: 60/71 W, 11.2 mNm, 65000 rpm



maxon ECX



M 1:1

### Motor Data

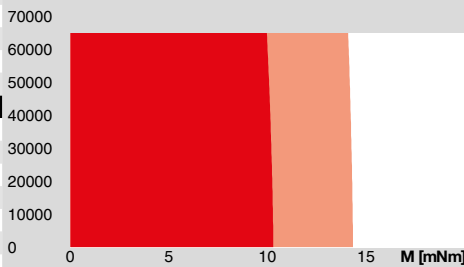
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	61300	59600	59700	58600
3_	No load current	mA	408	293	195	142
4_	Nominal speed	rpm	56800	55200	55400	54400
5_	Nominal torque (max. continuous torque)	mNm	11.2	10.2	10.5	10.8
6_	Nominal current (max. continuous current)	A	4.36	2.91	2	1.5
7_	Stall torque	mNm	189	162	177	183
8_	Stall current	A	67.7	42.4	31	23.5
9_	Max. efficiency	%	85.4	84.4	85.1	85.4
10_	Terminal resistance	Ω	0.266	0.566	1.16	2.04
11_	Terminal inductance	mH	0.0213	0.0398	0.0896	0.166
12_	Torque constant	mNm/A	2.78	3.81	5.72	7.77
13_	Speed constant	rpm/V	3430	2510	1670	1230
14_	Speed/torque gradient	rpm/mNm	327	372	340	323
15_	Mechanical time constant	ms	4.49	5.1	4.66	4.43
16_	Rotor inertia	gcm <sup>2</sup>	1.31	1.31	1.31	1.31

### Thermal data

17_	Thermal resistance housing-ambient	K/W	16.8
18_	Thermal resistance winding-housing	K/W	0.75
19_	Thermal time constant winding	s	1.27
20_	Thermal time constant motor	s	696
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

### Operating Range

n [rpm] winding 36 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Short term operation

### Mechanical data ball bearings

23_	Max. speed	rpm	65 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	78
32_	Typical noise level [rpm]	dBA	48 [50000]

### maxon Modular System

maxon gear	Stages [opt.]
302_GPX 19 A/C	1-2 [3-4]
303_GPX 19 LN/LZ	1-2 [3-4]
304_GPX 19 HP	2-3 [4]
305_GPX 19 SPEED	1-2
306_GPX 22 A/C	3-4
307_GPX 22 LN/LZ	3-4
308_GPX 22 HP	4

maxon sensor
for motor type A:
406_ENX 19 EASY INT
for motor type B:
406_ENX 19 EASY INT Abs.

maxon motor control
455_ESCON 36/3 EC
455_ESCON Module 50/4 EC-S
455_ESCON Module 50/5
457_ESCON 50/5
459_DEC Module 50/5
463_EPOS4 50/5
463_EPOS4 Mod./Comp. 50/5
470_EPOS2 P 24/5
473_MAXPOS 50/5

### Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

### Configuration

Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

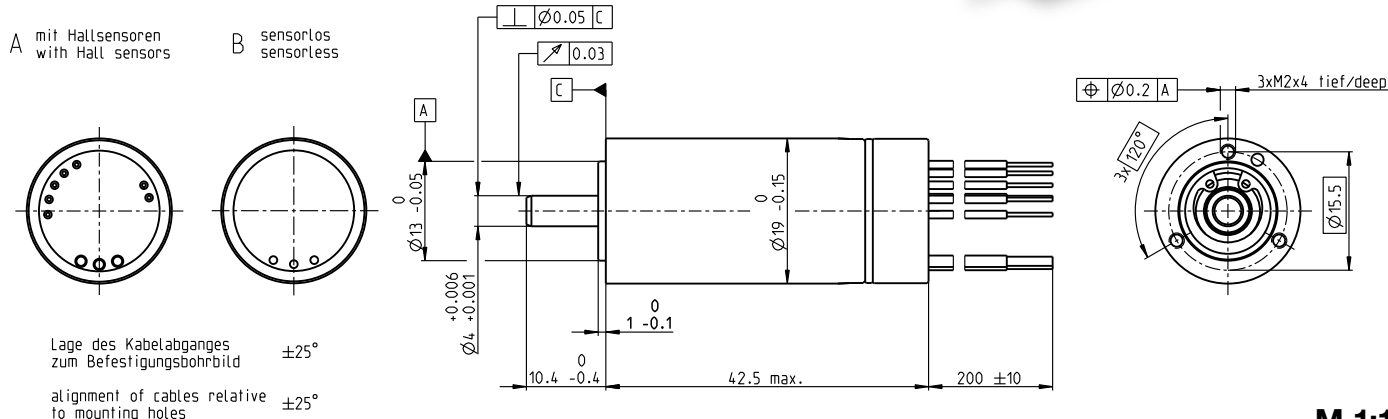
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# ECX SPEED 19 M brushless

## BLDC motor Ø19 mm

Sterilizable

Key Data: 60/65 W, 11.1 mNm, 70000 rpm



M 1:1

**Motor Data**

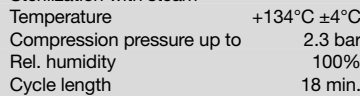
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	64800	64600	64600	63400
3_	No load current	mA	207	155	103	75.3
4_	Nominal speed	rpm	59800	59500	59700	58600
5_	Nominal torque (max. continuous torque)	mNm	11.1	9.77	10.1	10.3
6_	Nominal current (max. continuous current)	A	4.32	2.87	1.98	1.48
7_	Stall torque	mNm	179	150	164	169
8_	Stall current	A	67.7	42.4	31	23.5
9_	Max. efficiency	%	89.4	88.4	88.9	89.1
10_	Terminal resistance	Ω	0.266	0.566	1.16	2.04
11_	Terminal inductance	mH	0.0234	0.0438	0.0986	0.182
12_	Torque constant	mNm/A	2.64	3.53	5.3	7.2
13_	Speed constant	rpm/V	3610	2700	1800	1330
14_	Speed/torque gradient	rpm/mNm	363	433	396	376
15_	Mechanical time constant	ms	4.38	5.22	4.77	4.53
16_	Rotor inertia	gcm <sup>2</sup>	1.15	1.15	1.15	1.15

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	16.8
18_	Thermal resistance winding-housing	K/W	1.6
19_	Thermal time constant winding	s	2.36
20_	Thermal time constant motor	s	696
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

**Operating Range**

n [rpm] winding 36 V



**Sterilization information**  
 Sensorless: typical 2000 sterilization cycles  
 Hall sensors: typical 1000 sterilization cycles  
 Sterilization with steam  
 Temperature +134°C ±4°C  
 Compression pressure up to 2.3 bar  
 Rel. humidity 100%  
 Cycle length 18 min.

**Mechanical data ball bearings**

23_	Max. speed	rpm	70 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

**Other specifications**

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 78
32_	Typical noise level [rpm]	dBA 48 [50 000]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
305_GPX 19 SPEED	1-2	for motor type A:	455_ESCON 36/3 EC
		406_ENX 19 EASY INT	455_ESCON Module 50/4 EC-S
		for motor type B:	455_ESCON Module 50/5
		406_ENX 19 EASY INT Abs.	457_ESCON 50/5
			459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

**Connection A and B, motor (Cable AWG 20)**

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

**Connection A, sensors (Cable AWG 26)**

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC (Cable AWG 26)**

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**

Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

# ECX SPEED 19 M brushless

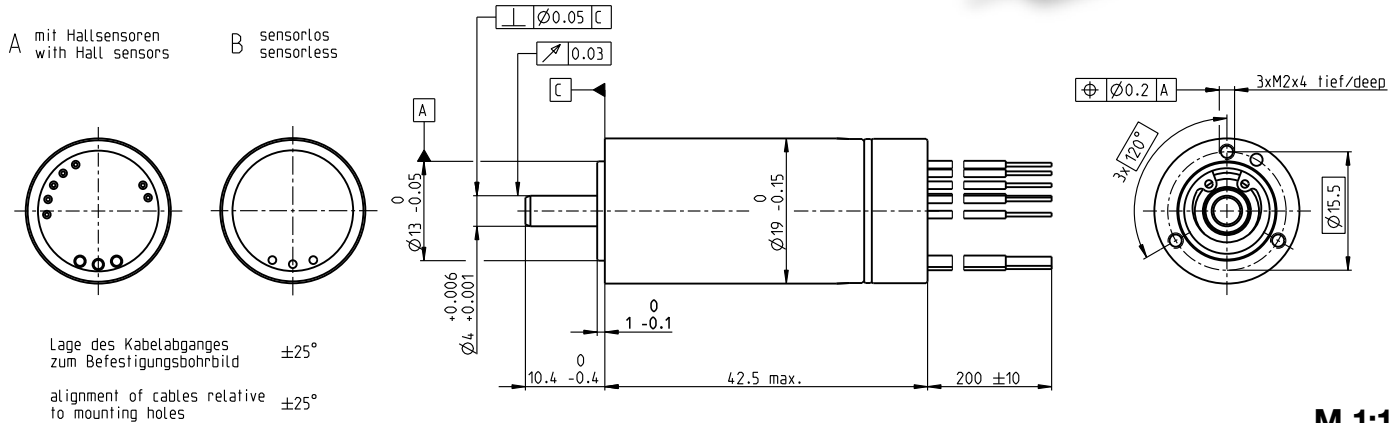
## BLDC motor Ø19 mm

Sterilizable, Ceramic Bearings

Key Data: 60/92 W, 10.9 mNm, 100000 rpm



maxon ECX



M 1:1

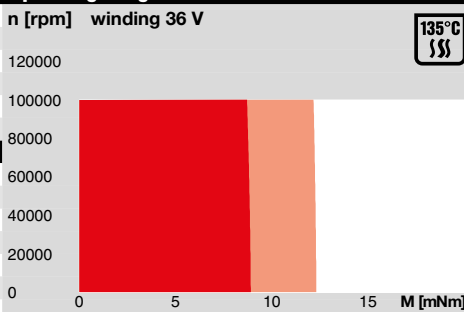
### Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	64700	64600	64600	63400
3_	No load current	mA	247	185	123	90.1
4_	Nominal speed	rpm	59800	59500	59700	58600
5_	Nominal torque (max. continuous torque)	mNm	10.9	9.65	9.98	10.2
6_	Nominal current (max. continuous current)	A	4.31	2.87	1.97	1.48
7_	Stall torque	mNm	179	150	164	169
8_	Stall current	A	67.7	42.4	31	23.5
9_	Max. efficiency	%	88.4	87.4	87.9	88.1
10_	Terminal resistance	Ω	0.266	0.566	1.16	2.04
11_	Terminal inductance	mH	0.0234	0.0438	0.0986	0.182
12_	Torque constant	mNm/A	2.64	3.53	5.3	7.2
13_	Speed constant	rpm/V	3610	2700	1800	1330
14_	Speed/torque gradient	rpm/mNm	363	433	396	376
15_	Mechanical time constant	ms	4.38	5.22	4.77	4.53
16_	Rotor inertia	gcm <sup>2</sup>	1.15	1.15	1.15	1.15

### Thermal data

17_	Thermal resistance housing-ambient	K/W	16.8
18_	Thermal resistance winding-housing	K/W	1.6
19_	Thermal time constant winding	s	2.36
20_	Thermal time constant motor	s	696
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Operating Range



### Sterilization information

Sensorless: typical 2000 sterilization cycles  
 Hall sensors: typical 1000 sterilization cycles  
 Sterilization with steam  
 Temperature +134°C ±4°C  
 Compression pressure up to 2.3 bar  
 Rel. humidity 100%  
 Cycle length 18 min.

### Mechanical data ball bearings

23_	Max. speed	rpm	100 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

### Other specifications

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 78
32_	Typical noise level [rpm]	dBA 48 [50000]

### Connection A and B, motor (Cable AWG 20)

red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange V<sub>Hall</sub> 3...24 VDC  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple NTC  
 purple NTC  
 Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
305_GPX 19 SPEED	1–2	for motor type A:	455_ESCON 36/3 EC
		406_ENX 19 EASY INT	455_ESCON Module 50/4 EC-S
		for motor type B:	455_ESCON Module 50/5
		406_ENX 19 EASY INT Abs.	457_ESCON 50/5
			459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

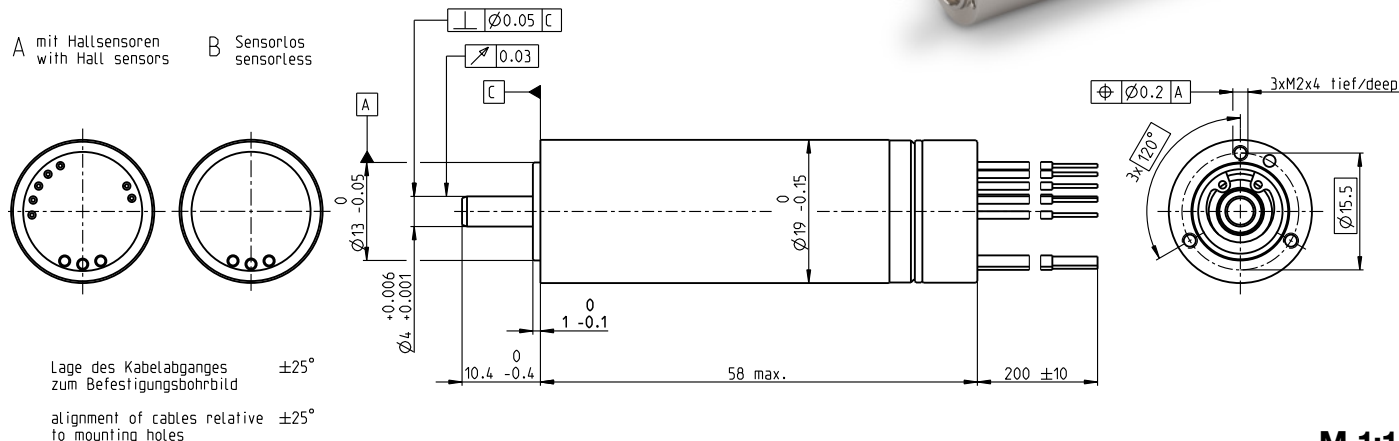
### Configuration

Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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# ECX SPEED 19 L brushless BLDC motor Ø19 mm

**Key Data: 60/73 W, 15.3 mNm, 50000 rpm**



**M 1:1**

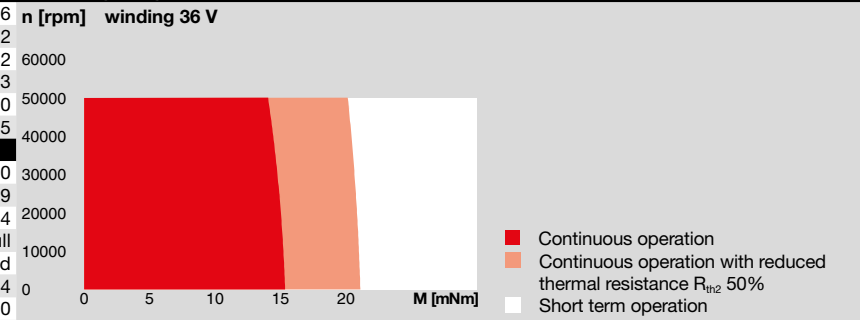
**Motor Data**

1_	Nominal voltage	V	18	24	36
2_	No load speed	rpm	47500	48400	49200
3_	No load current	mA	348	269	184
4_	Nominal speed	rpm	43800	44900	45900
5_	Nominal torque (max. continuous torque)	mNm	14.4	15.2	15.3
6_	Nominal current (max. continuous current)	A	4.29	3.45	2.36
7_	Stall torque	mNm	214	251	270
8_	Stall current	A	59.6	53.3	39
9_	Max. efficiency	%	86	87	87
10_	Terminal resistance	Ω	0.302	0.45	0.924
11_	Terminal inductance	mH	0.0217	0.0373	0.0811
12_	Torque constant	mNm/A	3.59	4.71	6.94
13_	Speed constant	rpm/V	2660	2030	1380
14_	Speed/torque gradient	rpm/mNm	223	194	183
15_	Mechanical time constant	ms	3.91	3.39	3.2
16_	Rotor inertia	gcm <sup>2</sup>	1.67	1.67	1.67

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	1.2
19_	Thermal time constant winding	s	3.62
20_	Thermal time constant motor	s	563
21_	Ambient temperature	°C	-20...-100
22_	Max. winding temperature	°C	155

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	50000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

**Other specifications**

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 108
32_	Typical noise level [rpm]	dBA 51 [50000]

**maxon Modular System**

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
302_GPX 19 A/C	1-2 [3-4]	for motor type A:	455_ESCON 36/3 EC
303_GPX 19 LN/LZ	1-2 [3-4]	406_ENX 19 EASY INT	455_ESCON Module 50/4 EC-S
304_GPX 19 HP	2-3 [4]	for motor type B:	455_ESCON Module 50/5
305_GPX 19 SPEED	1-2	406_ENX 19 EASY INT Abs.	457_ESCON 50/5
306_GPX 22 A/C	3-4		459_DEC Module 50/5
307_GPX 22 LN/LZ	3-4		463_EPOS4 50/5
308_GPX 22 HP	4		463_EPOS4 Module/Comp. 50/5
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

**Connection A and B, motor (Cable AWG 20)**

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

**Connection A, sensors (Cable AWG 26)**

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC (Cable AWG 26)**

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**

Flange front: thread holes/center thread  
Flange back: plastic ring/external thread/with opening  
Shaft front: length/diameter  
Electric connection: cable length/pin connection/connector  
Temperature Sensor: NTC-Thermistor  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

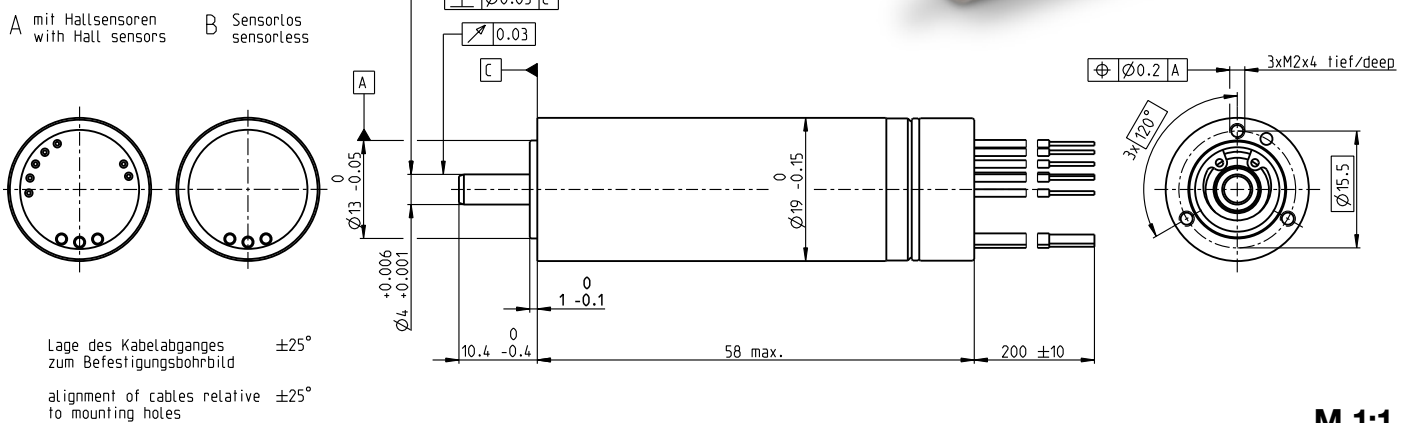
# ECX SPEED 19 L brushless BLDC motor Ø19 mm

High Power

Key Data: 120/133 W, 23.2 mNm, 65000 rpm



maxon ECX



M 1:1

### Motor Data

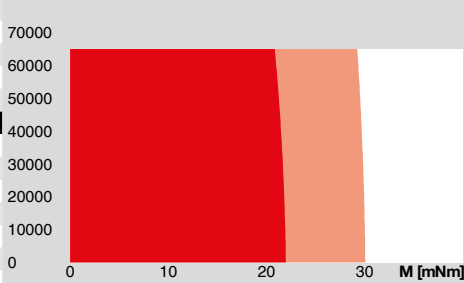
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	60900	60900	57700	63500
3_	No load current	mA	351	263	160	142
4_	Nominal speed	rpm	57700	57900	54900	60800
5_	Nominal torque (max. continuous torque)	mNm	22.9	22.6	23.2	22.2
6_	Nominal current (max. continuous current)	A	8.38	6.21	4.01	3.19
7_	Stall torque	mNm	558	598	630	667
8_	Stall current	A	198	159	106	92.6
9_	Max. efficiency	%	91.9	92.1	92.5	92.4
10_	Terminal resistance	Ω	0.0908	0.151	0.34	0.518
11_	Terminal inductance	mH	0.00838	0.0149	0.0373	0.0547
12_	Torque constant	mNm/A	2.82	3.76	5.95	7.2
13_	Speed constant	rpm/V	3390	2540	1600	1330
14_	Speed/torque gradient	rpm/mNm	109	102	91.7	95.4
15_	Mechanical time constant	ms	1.88	1.75	1.58	1.64
16_	Rotor inertia	gcm <sup>2</sup>	1.64	1.64	1.64	1.64

### Thermal data

17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	1.32
19_	Thermal time constant winding	s	4.01
20_	Thermal time constant motor	s	563
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

### Operating Range

n [rpm] winding 36 V



■ Continuous operation  
■ Continuous operation with reduced thermal resistance  $R_{th2}$  50%  
■ Short term operation

### Mechanical data ball bearings

23_	Max. speed	rpm	65000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

### Other specifications

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	108
32_	Typical noise level [rpm]	dBA	51 [50000]

### maxon Modular System

maxon gear	Stages [opt.]
302_GPX 19 A/C	1-2 [3-4]
303_GPX 19 LN/LZ	1-2 [3-4]
304_GPX 19 HP	2-3 [4]
305_GPX 19 SPEED	1-2
306_GPX 22 A/C	3-4
307_GPX 22 LN/LZ	3-4
308_GPX 22 HP	4

maxon sensor
for motor type A:
406_ENX 19 EASY INT
for motor type B:
406_ENX 19 EASY INT Abs.

maxon motor control
455_ESCON Module 50/4 EC-S
455_ESCON Module 50/5
456_ESCON Module 50/8 HE
457_ESCON 50/5
457_ESCON 70/10
459_DEC Module 50/5
463_EPOS4 50/5
463_EPOS4 Mod./Comp. 50/5
465_EPOS4 Mod./Comp. 50/8
467_EPOS4 70/15
470_EPOS2 P 24/5
473_MAXPOS 50/5

### Connection A and B, motor (Cable AWG 20)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC
Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K	

### Configuration

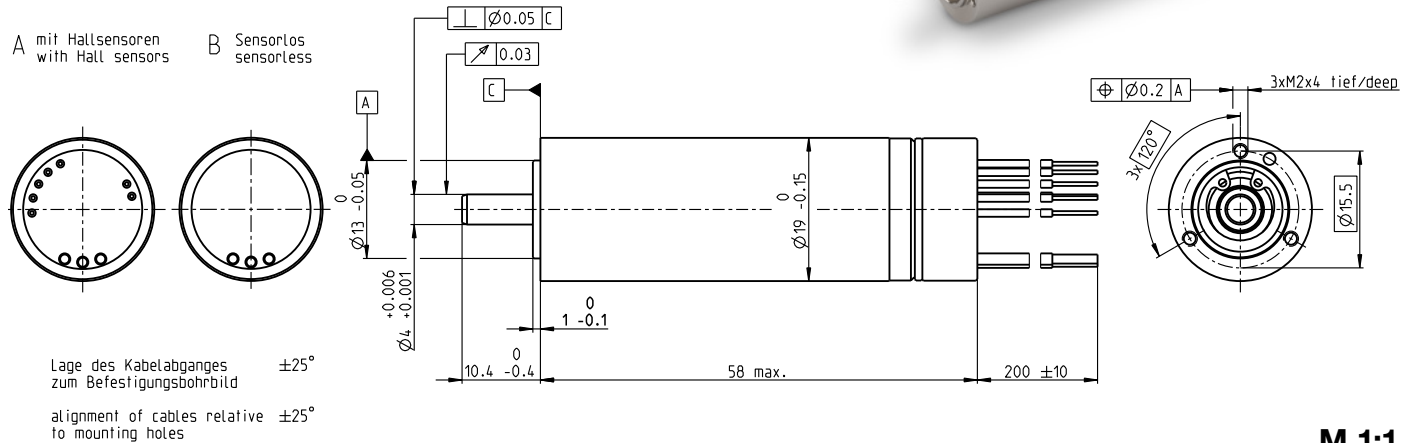
Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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# ECX SPEED 19 L brushless BLDC motor Ø19 mm


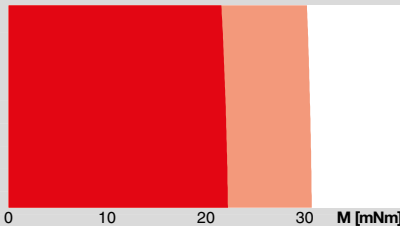
Sterilizable

Key Data: 120/147 W, 23.9 mNm, 70000 rpm



M 1:1

Motor Data						
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	60800	60800	57600	63400
3_	No load current	mA	426	319	194	172
4_	Nominal speed	rpm	57200	57500	54600	60500
5_	Nominal torque (max. continuous torque)	mNm	23.6	23.3	23.9	23
6_	Nominal current (max. continuous current)	A	8.68	6.43	4.14	3.31
7_	Stall torque	mNm	503	561	613	655
8_	Stall current	A	178	149	103	90.8
9_	Max. efficiency	%	90.6	91.1	91.6	91.6
10_	Terminal resistance	Ω	0.101	0.161	0.35	0.528
11_	Terminal inductance	mH	0.0096	0.0171	0.0428	0.0627
12_	Torque constant	mNm/A	2.82	3.76	5.95	7.21
13_	Speed constant	rpm/V	3390	2540	1600	1320
14_	Speed/torque gradient	rpm/mNm	121	109	94.2	97.1
15_	Mechanical time constant	ms	2.27	2.04	1.77	1.82
16_	Rotor inertia	gcm <sup>2</sup>	1.79	1.79	1.79	1.79

Thermal data		Operating Range		Sterilization information		
17_	Thermal resistance housing-ambient	K/W	13.6	n [rpm]	winding 36 V	 Sensorless: typical 2000 sterilization cycles Hall sensors: typical 1000 sterilization cycles Sterilization with steam Temperature +134°C ±4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 min.
18_	Thermal resistance winding-housing	K/W	0.9			
19_	Thermal time constant winding	s	2.79		Continuous operation Continuous operation with reduced thermal resistance R <sub>th2</sub> 50% Short term operation	
20_	Thermal time constant motor	s	563			
21_	Ambient temperature	°C	-40...+135			
22_	Max. winding temperature	°C	155			
Mechanical data ball bearings			<b>maxon Modular System</b> <span style="float: right;">Details on catalog page 30</span>			
23_	Max. speed	rpm	70000	<b>maxon gear</b> Stages [opt.] 305_GPX 19 SPEED 1-2		
24_	Axial play	mm	0...0.29	<b>maxon sensor</b> for motor type A: 406_ENX 19 EASY INT for motor type B: 406_ENX 19 EASY INT Abs.		
25_	Radial play	preloaded		<b>maxon motor control</b> 455_ESCON Module 50/4 EC-S 455_ESCON Module 50/5 456_ESCON Module 50/8 HE 457_ESCON 50/5 457_ESCON 70/10 459_DEC Module 50/5 463_EPOS4 50/5 463_EPOS4 Mod./Comp. 50/5 465_EPOS4 Mod./Comp. 50/8 467_EPOS4 70/15 470_EPOS2 P 24/5 473_MAXPOS 50/5		
26_	Max. axial load (dynamic)	N	4			
27_	Max. force for press fits (static)	N	70			
28_	Max. radial load [mm from flange]	N	12 [5]			
Other specifications						
29_	Number of pole pairs		1			
30_	Number of phases		3			
31_	Weight of motor	g	108			
32_	Typical noise level [rpm]	dBA	51 [50000]			

**Connection A and B, motor** (Cable AWG 20)  
 red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

**Connection A, sensors** (Cable AWG 26)  
 orange V<sub>Hall</sub> 3...24 VDC  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC** (Cable AWG 26)  
 purple NTC  
 purple NTC  
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**  
 Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

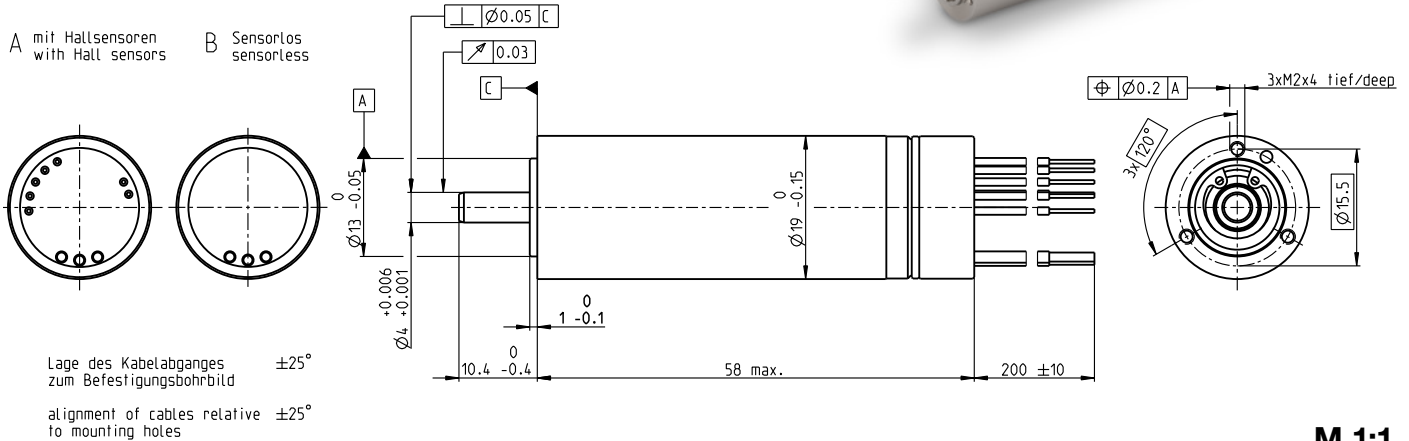
# ECX SPEED 19 L brushless BLDC motor Ø19 mm

Sterilizable, Ceramic Bearings

Key Data: 120/206 W, 24.1 mNm, 100 000 rpm



maxon ECX



### Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	60800	60800	57600	63400
3_	No load current	mA	376	282	172	152
4_	Nominal speed	rpm	57200	57500	54600	60400
5_	Nominal torque (max. continuous torque)	mNm	23.9	23.6	24.1	23.2
6_	Nominal current (max. continuous current)	A	8.71	6.45	4.16	3.32
7_	Stall torque	mNm	503	561	613	655
8_	Stall current	A	178	149	103	90.8
9_	Max. efficiency	%	91.2	91.6	92.1	92.1
10_	Terminal resistance	Ω	0.101	0.161	0.35	0.528
11_	Terminal inductance	mH	0.0096	0.0171	0.0428	0.0627
12_	Torque constant	mNm/A	2.82	3.76	5.95	7.21
13_	Speed constant	rpm/V	3390	2540	1600	1320
14_	Speed/torque gradient	rpm/mNm	121	109	94.2	97.1
15_	Mechanical time constant	ms	2.27	2.04	1.77	1.82
16_	Rotor inertia	gcm <sup>2</sup>	1.79	1.79	1.79	1.79

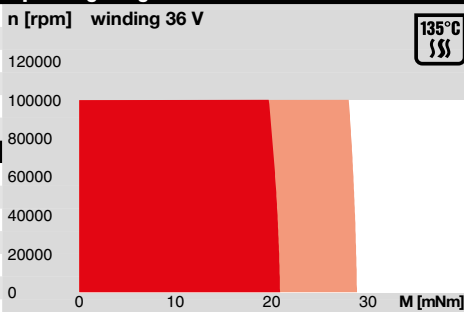
### Thermal data

17_	Thermal resistance housing-ambient	K/W	13.6
18_	Thermal resistance winding-housing	K/W	0.9
19_	Thermal time constant winding	s	2.79
20_	Thermal time constant motor	s	563
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Mechanical data ball bearings

23_	Max. speed	rpm	100 000
24_	Axial play	mm	0...0.29
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	70
	(static, shaft supported)	N	5000
28_	Max. radial load [mm from flange]	N	12 [5]

### Operating Range



### Sterilization information

Sensorless: typical 2000 sterilization cycles  
Hall sensors: typical 1000 sterilization cycles  
Sterilization with steam  
Temperature +134°C ±4°C  
Compression pressure up to 2.3 bar  
Rel. humidity 100%  
Cycle length 18 min.

### Other specifications

29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 108
32_	Typical noise level [rpm]	dBA 51 [50000]

### Connection A and B, motor (Cable AWG 20)

red Motor winding 1  
black Motor winding 2  
white Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange V<sub>Hall</sub> 3...24 VDC  
blue GND  
yellow Hall sensor 1  
brown Hall sensor 2  
grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple NTC  
purple NTC  
Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
305_GPX 19 SPEED	1–2	for motor type A: 406_ENX 19 EASY INT	455_ESCON Module 50/4 EC-S
		for motor type B: 406_ENX 19 EASY INT Abs.	455_ESCON Module 50/5
			456_ESCON Module 50/8 HE
			457_ESCON 50/5
			457_ESCON 70/10
			459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			465_EPOS4 Mod./Comp. 50/8
			467_EPOS4 70/15
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

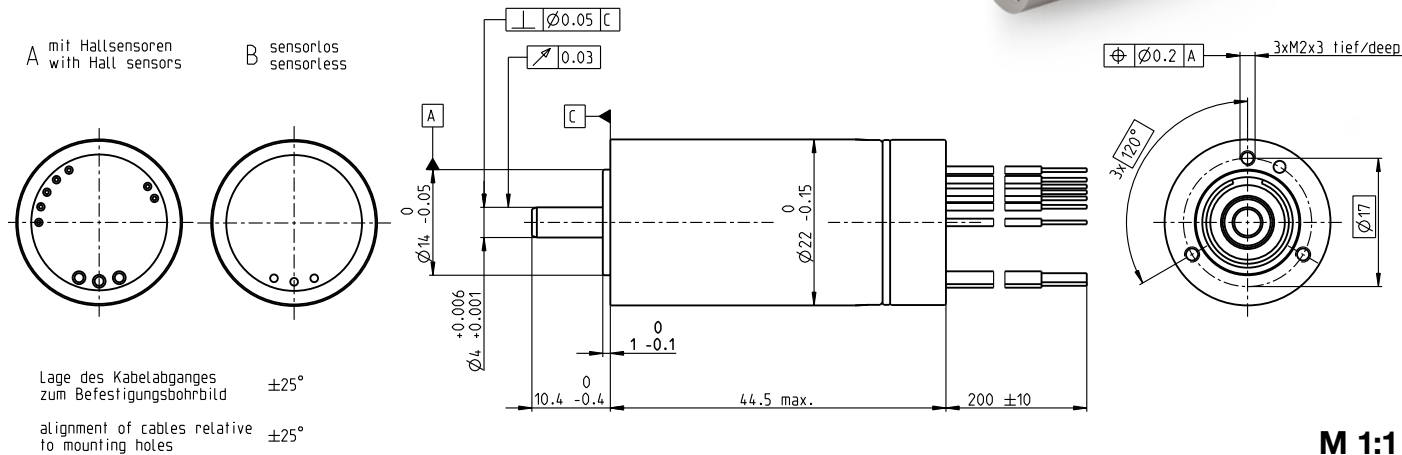
### Configuration

Flange front: thread holes/center thread  
Flange back: plastic ring/external thread/with opening  
Shaft front: length/diameter  
Electric connection: cable length/pin connection  
Temperature Sensor: NTC-Thermistor  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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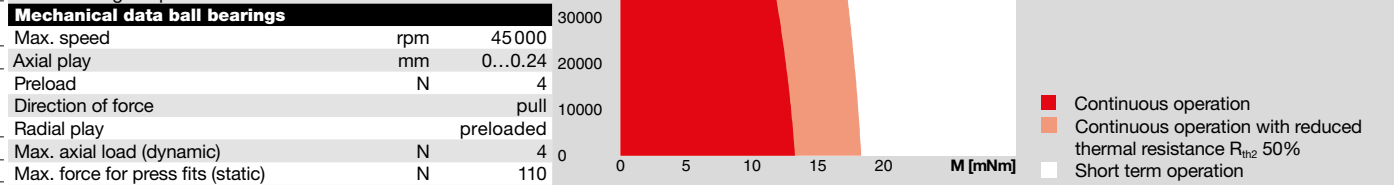
# ECX SPEED 22 M brushless BLDC motor Ø22 mm

**Key Data: 40/51 W, 12.1 mNm, 45000 rpm**



Motor Data						
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	40400	40000	40500	40400
3_	No load current	mA	378	279	189	141
4_	Nominal speed	rpm	37300	37100	37700	37500
5_	Nominal torque (max. continuous torque)	mNm	10.7	11.5	12.1	11.9
6_	Nominal current (max. continuous current)	A	2.89	2.28	1.61	1.18
7_	Stall torque	mNm	154	175	196	189
8_	Stall current	A	36.5	30.8	23.3	16.8
9_	Max. efficiency	%	81.1	82.2	83.1	82.8
10_	Terminal resistance	Ω	0.493	0.779	1.54	2.86
11_	Terminal inductance	mH	0.0272	0.0495	0.109	0.194
12_	Torque constant	mNm/A	4.2	5.67	8.4	11.2
13_	Speed constant	rpm/V	2270	1680	1140	850
14_	Speed/torque gradient	rpm/mNm	266	231	209	216
15_	Mechanical time constant	ms	5.94	5.16	4.65	4.82
16_	Rotor inertia	gcm <sup>2</sup>	2.13	2.13	2.13	2.13

Thermal data			Operating Range	
17_	Thermal resistance housing-ambient	K/W	15	n [rpm] winding 36 V
18_	Thermal resistance winding-housing	K/W	1.34	
19_	Thermal time constant winding	s	2.71	
20_	Thermal time constant motor	s	417	
21_	Ambient temperature	°C	-20...+100	
22_	Max. winding temperature	°C	155	



Mechanical data ball bearings			maxon Modular System		maxon sensor		maxon motor control	
23_	Max. speed	rpm	45 000	306_GPX 22 A/C	1-2 [3-4]	for motor type A:	455_ESCON 36/3 EC	
24_	Axial play	mm	0...0.24	307_GPX 22 LN/LZ	1-2 [3-4]	407_ENX 22 EASY INT	455_ESCON Module 50/4 EC-S	
	Preload	N	4	308_GPX 22 HP	2-3 [4]	for motor type B:	455_ESCON Module 50/5	
	Direction of force		pull	310_GPX 22 SPEED	1-2	407_ENX 22 EASY INT Abs.	457_ESCON 50/5	
25_	Radial play		preloaded	311_GPX 26 A/C	3		459_DEC Module 50/5	
26_	Max. axial load (dynamic)	N	4	312_GPX 26 LN/LZ	3		463_EPOS4 50/5	
27_	Max. force for press fits (static)	N	110	313_GPX 26 HP	4		463_EPOS4 Mod./Comp. 50/5	
	(static, shaft supported)	N	6000				470_EPOS2 P 24/5	
28_	Max. radial load [mm from flange]	N	16 [5]				473_MAXPOS 50/5	

Other specifications			maxon gear		maxon sensor		maxon motor control	
29_	Number of pole pairs	1	306_GPX 22 A/C	1-2 [3-4]	for motor type A:	455_ESCON 36/3 EC		
30_	Number of phases	3	307_GPX 22 LN/LZ	1-2 [3-4]	407_ENX 22 EASY INT	455_ESCON Module 50/4 EC-S		
31_	Weight of motor	g	98	308_GPX 22 HP	2-3 [4]	for motor type B:	455_ESCON Module 50/5	
32_	Typical noise level [rpm]	dBA	53 [45 000]	310_GPX 22 SPEED	1-2	407_ENX 22 EASY INT Abs.	457_ESCON 50/5	

Connection A and B, motor (Cable AWG 18)		Connection A, sensors (Cable AWG 26)	
red	Motor winding 1	orange	V <sub>Hall</sub> 3...24 VDC
black	Motor winding 2	blue	GND
white	Motor winding 3	yellow	Hall sensor 1
		brown	Hall sensor 2
		grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC (Cable AWG 26)**  
 purple NTC  
 purple NTC  
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**  
 Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.



# ECX SPEED 22 M brushless

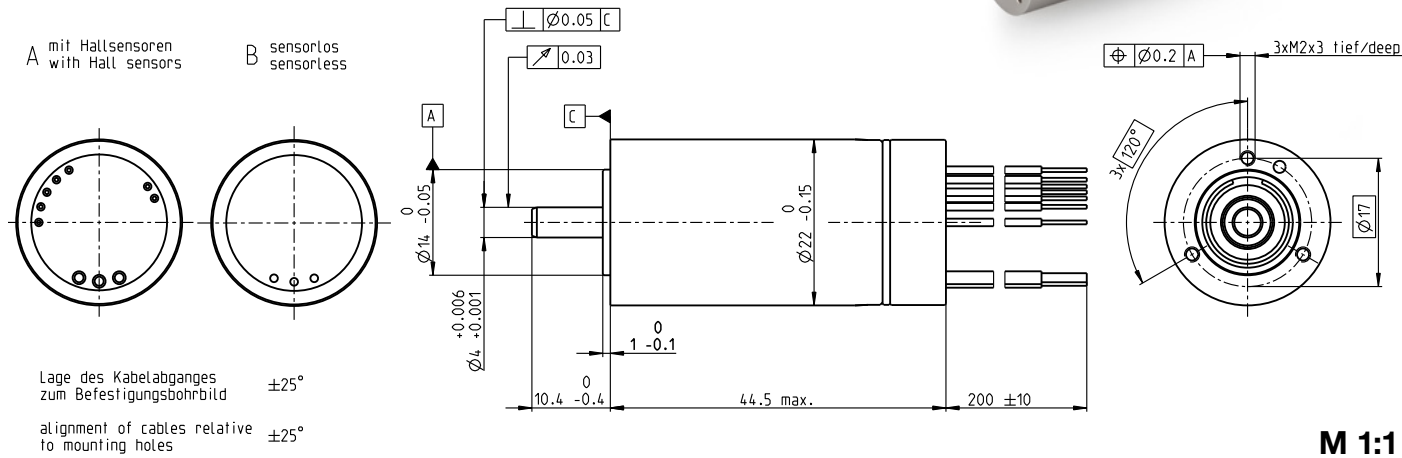
## BLDC motor Ø22 mm

High Power

Key Data: 80/115 W, 20.3 mNm, 60000 rpm



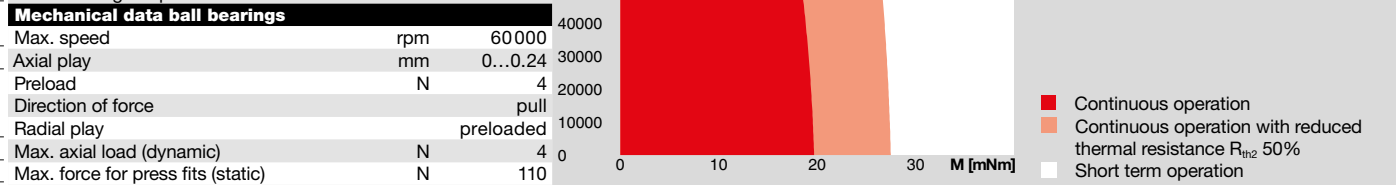
maxon ECX



M 1:1

Motor Data						
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	50900	58100	55500	52500
3_	No load current	mA	324	302	186	128
4_	Nominal speed	rpm	48200	55600	53000	49900
5_	Nominal torque (max. continuous torque)	mNm	20.3	20.1	20	18.3
6_	Nominal current (max. continuous current)	A	6.28	5.36	3.4	2.21
7_	Stall torque	mNm	454	549	537	425
8_	Stall current	A	135	140	87	48.8
9_	Max. efficiency	%	90.6	91	91.1	90.2
10_	Terminal resistance	Ω	0.133	0.172	0.414	0.983
11_	Terminal inductance	mH	0.00978	0.0133	0.0329	0.0653
12_	Torque constant	mNm/A	3.37	3.93	6.18	8.7
13_	Speed constant	rpm/V	2830	2430	1550	1100
14_	Speed/torque gradient	rpm/mNm	112	106	104	124
15_	Mechanical time constant	ms	2.53	2.39	2.33	2.79
16_	Rotor inertia	gcm <sup>2</sup>	2.15	2.15	2.15	2.15

Thermal data			Operating Range	
17_	Thermal resistance housing-ambient	K/W	15	n [rpm] winding 36 V
18_	Thermal resistance winding-housing	K/W	0.6	
19_	Thermal time constant winding	s	1.22	
20_	Thermal time constant motor	s	417	
21_	Ambient temperature	°C	-20...+100	
22_	Max. winding temperature	°C	155	



Mechanical data ball bearings			maxon Modular System		Details on catalog page 30	
23_	Max. speed	rpm	60000	maxon gear	Stages [opt.]	maxon sensor
24_	Axial play	mm	0...0.24			
	Preload	N	4	306_GPX 22 A/C	1-2 [3-4]	for motor type A:
	Direction of force			307_GPX 22 LN/LZ	1-2 [3-4]	407_ENX 22 EASY INT
25_	Radial play	preloaded		308_GPX 22 HP	2-3 [4]	for motor type B:
26_	Max. axial load (dynamic)	N	4	309_GPX 22 UP	1-4	407_ENX 22 EASY INT Abs.
27_	Max. force for press fits (static)	N	110	310_GPX 22 SPEED	1-2	455_ESCON Module 50/4 EC-S
	(static, shaft supported)	N	6000	311_GPX 26 A/C	3	455_ESCON Module 50/5
28_	Max. radial load [mm from flange]	N	16 [5]	312_GPX 26 LN/LZ	3	456_ESCON Module 50/8 HE
				313_GPX 26 HP	4	457_ESCON 50/5
						457_ESCON 70/10
						459_DEC Module 50/5
						463_EPOS4 50/5
						463_EPOS4 Mod./Comp. 50/5
						465_EPOS4 Mod./Comp. 50/8
						467_EPOS4 70/15
						470_EPOS2 P 24/5
						473_MAXPOS 50/5

Other specifications		maxon gear		maxon sensor		maxon motor control	
29_	Number of pole pairs	1	306_GPX 22 A/C	1-2 [3-4]	for motor type A:	455_ESCON Module 50/4 EC-S	
30_	Number of phases	3	307_GPX 22 LN/LZ	1-2 [3-4]	407_ENX 22 EASY INT	455_ESCON Module 50/5	
31_	Weight of motor	g	98	308_GPX 22 HP	2-3 [4]	456_ESCON Module 50/8 HE	
32_	Typical noise level [rpm]	dBA	53 [50000]	309_GPX 22 UP	1-4	457_ESCON 50/5	

Connection A and B, motor (Cable AWG 18)	
red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)	
orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

Connection NTC (Cable AWG 26)	
purple	NTC
purple	NTC
Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K	

Configuration	
Flange front: thread holes/center thread	
Flange back: plastic ring/external thread/with opening	
Shaft front: length/diameter	
Electric connection: cable length/pin connection/connector	
Temperature Sensor: NTC-Thermistor	
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.	

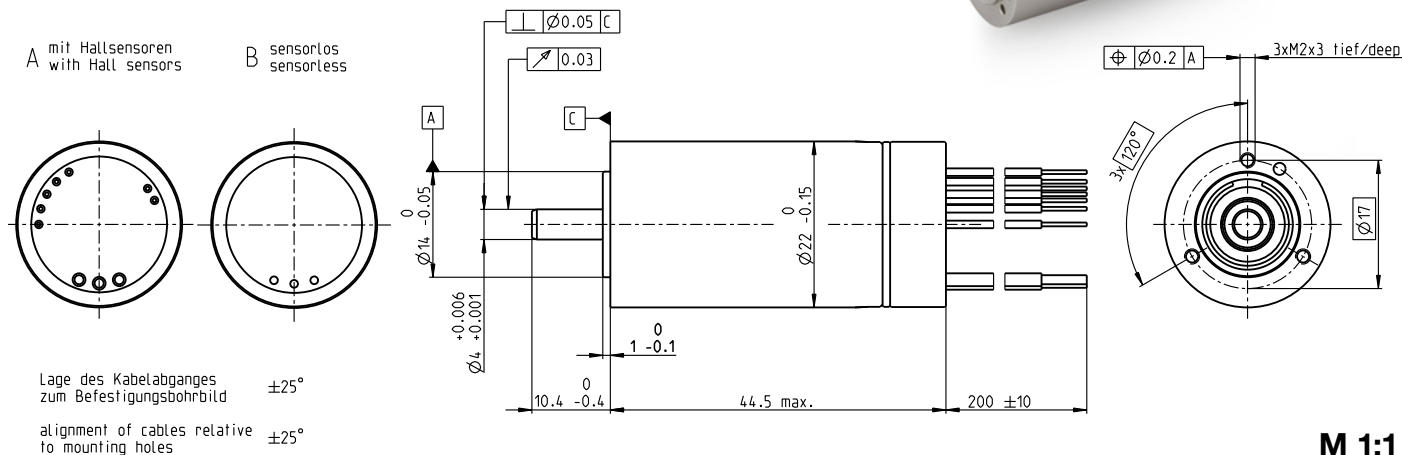
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# ECX SPEED 22 M brushless

## BLDC motor Ø22 mm

Sterilizable

Key Data: 80/97 W, 17.6 mNm, 60000 rpm



Motor Data						
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	52800	54800	56900	54800
3_	No load current	mA	280	222	157	111
4_	Nominal speed	rpm	49800	51800	53900	51800
5_	Nominal torque (max. continuous torque)	mNm	17.6	17.6	16.9	17.1
6_	Nominal current (max. continuous current)	A	5.65	4.4	2.93	2.15
7_	Stall torque	mNm	340	365	362	361
8_	Stall current	A	105	87.5	60.1	43.3
9_	Max. efficiency	%	90	90.3	90.2	90.2
10_	Terminal resistance	Ω	0.172	0.274	0.599	1.11
11_	Terminal inductance	mH	0.00934	0.0154	0.0322	0.0617
12_	Torque constant	mNm/A	3.24	4.17	6.02	8.34
13_	Speed constant	rpm/V	2940	2290	1590	1150
14_	Speed/torque gradient	rpm/mNm	156	151	158	152
15_	Mechanical time constant	ms	3.12	3.01	3.15	3.05
16_	Rotor inertia	gcm <sup>2</sup>	1.91	1.91	1.91	1.91

Thermal data		Operating Range		Sterilization information			
17_	Thermal resistance housing-ambient	K/W	15	n [rpm]	winding 36 V		Sensorless: typical 2000 sterilization cycles
18_	Thermal resistance winding-housing	K/W	0.6				70000
19_	Thermal time constant winding	s	1.25	60000	50000	Sterilization with steam	
20_	Thermal time constant motor	s	417	40000	20000	Temperature	+134°C ±4°C
21_	Ambient temperature	°C	-40...+135	10000	0	Compression pressure up to	2.3 bar
22_	Max. winding temperature	°C	155			Rel. humidity	100%
<b>Mechanical data ball bearings</b>					Cycle length		18 min.
23_	Max. speed	rpm	60000			<ul style="list-style-type: none"> <li>Continuous operation</li> <li>Continuous operation with reduced thermal resistance R<sub>th2</sub> 50%</li> <li>Short term operation</li> </ul>	
24_	Axial play	mm	0...0.24				
Preload		N	4				
Direction of force			pull				
25_	Radial play		preloaded				
26_	Max. axial load (dynamic)	N	4				
27_	Max. force for press fits (static)	N	110				
(static, shaft supported)		N	6000				
28_	Max. radial load [mm from flange]	N	16 [5]				

Other specifications		maxon Modular System		maxon motor control	
29_	Number of pole pairs	1	maxon gear	Stages [opt.]	455_ESCON Module 50/4 EC-S
30_	Number of phases	3	310_GPX 22 SPEED	1-2	455_ESCON Module 50/5
31_	Weight of motor	g	maxon sensor		456_ESCON Module 50/8 HE
32_	Typical noise level [rpm]	dBA	for motor type A:		457_ESCON 50/5
			407_ENX 22 EASY INT		457_ESCON 70/10
			for motor type B:		459_DEC Module 50/5
			407_ENX 22 EASY INT Abs.		463_EPOS4 50/5
					463_EPOS4 Mod./Comp. 50/5
					465_EPOS4 Mod./Comp. 50/8
					467_EPOS4 70/15
					470_EPOS2 P 24/5
					473_MAXPOS 50/5

**Connection A and B, motor** (Cable AWG 18)  
 red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

**Connection A, sensors** (Cable AWG 26)  
 orange V<sub>Hall</sub> 3...24 VDC  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC** (Cable AWG 26)  
 purple NTC  
 purple NTC  
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

### Configuration

Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

# ECX SPEED 22 M brushless

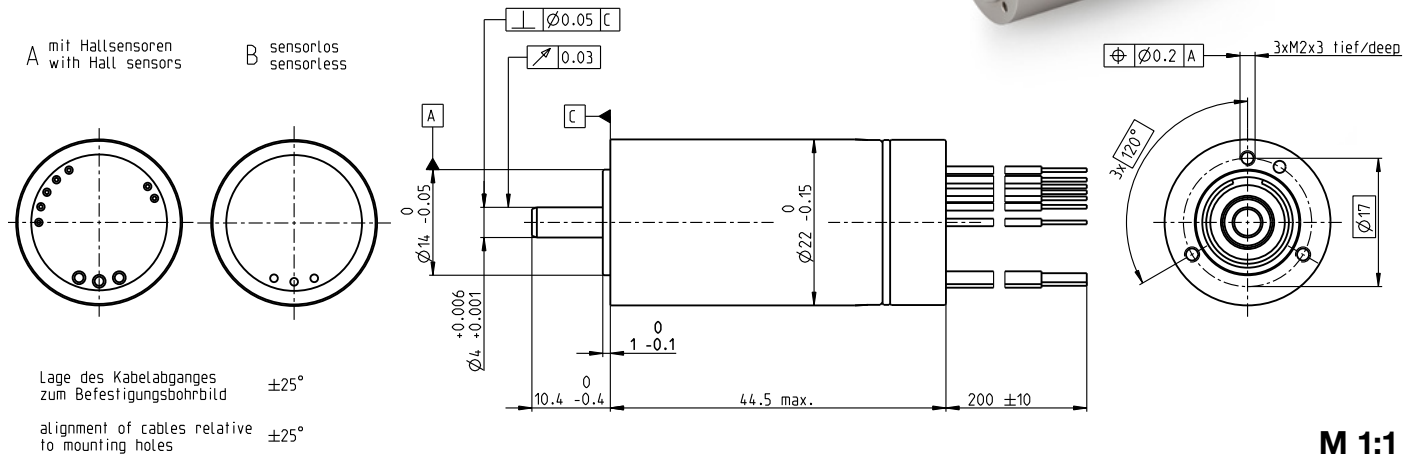
## BLDC motor Ø22 mm

Sterilizable, Ceramic Bearings

Key Data: 80/127 W, 16.9 mNm, 85000 rpm



maxon ECX



M 1:1

Motor Data						
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	52800	54700	56800	54700
3_	No load current	mA	391	311	221	156
4_	Nominal speed	rpm	49800	51900	54000	51900
5_	Nominal torque (max. continuous torque)	mNm	16.9	16.9	16.1	16.5
6_	Nominal current (max. continuous current)	A	5.56	4.32	2.87	2.11
7_	Stall torque	mNm	340	365	362	361
8_	Stall current	A	105	87.5	60.1	43.3
9_	Max. efficiency	%	88.4	88.6	88.4	88.6
10_	Terminal resistance	Ω	0.172	0.274	0.599	1.11
11_	Terminal inductance	mH	0.00934	0.0154	0.0322	0.0617
12_	Torque constant	mNm/A	3.24	4.17	6.02	8.34
13_	Speed constant	rpm/V	2940	2290	1590	1150
14_	Speed/torque gradient	rpm/mNm	156	151	158	152
15_	Mechanical time constant	ms	3.12	3.01	3.15	3.05
16_	Rotor inertia	gcm <sup>2</sup>	1.91	1.91	1.91	1.91

Thermal data		Operating Range		Sterilization information			
17_	Thermal resistance housing-ambient	K/W	15	n [rpm]	winding 36 V		Sensorless: typical 2000 sterilization cycles Hall sensors: typical 1000 sterilization cycles Sterilization with steam
18_	Thermal resistance winding-housing	K/W	0.6				
19_	Thermal time constant winding	s	1.25	100000		Temperature +134°C ±4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 min.	
20_	Thermal time constant motor	s	417	80000			
21_	Ambient temperature	°C	-40...+135	60000	■ Continuous operation ■ Continuous operation with reduced thermal resistance R <sub>th2</sub> 50% ■ Short term operation		
22_	Max. winding temperature	°C	155	40000			

Mechanical data ball bearings		maxon Modular System				
23_	Max. speed	rpm	85000	<b>maxon gear</b> Stages [opt.] 310_GPX 22 SPEED 1-2	<b>maxon sensor</b> for motor type A: 407_ENX 22 EASY INT for motor type B: 407_ENX 22 EASY INT Abs.	<b>maxon motor control</b> 455_ESCON Module 50/4 EC-S 455_ESCON Module 50/5 456_ESCON Module 50/8 HE 457_ESCON 50/5 457_ESCON 70/10 459_DEC Module 50/5 463_EPOS4 50/5 463_EPOS4 Mod./Comp. 50/5 465_EPOS4 Mod./Comp. 50/8 467_EPOS4 70/15 470_EPOS2 P 24/5 473_MAXPOS 50/5
24_	Axial play	mm	0...0.24			
	Preload	N	4	Details on catalog page 30		
	Direction of force		pull			
25_	Radial play		preloaded			
26_	Max. axial load (dynamic)	N	4			
27_	Max. force for press fits (static)	N	110			
	(static, shaft supported)	N	6000			
28_	Max. radial load [mm from flange]	N	16 [5]			

Other specifications		
29_	Number of pole pairs	1
30_	Number of phases	3
31_	Weight of motor	g 106
32_	Typical noise level [rpm]	dBA 54 [50000]

**Connection A and B, motor** (Cable AWG 18)  
 red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

**Connection A, sensors** (Cable AWG 26)  
 orange V<sub>Hall</sub> 3...24 VDC  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

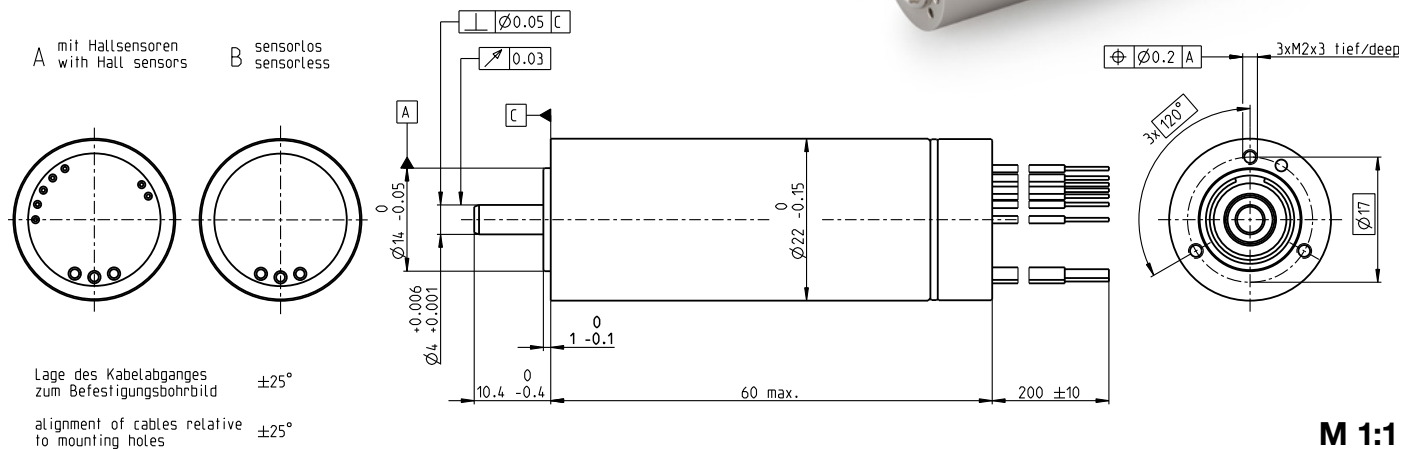
**Connection NTC** (Cable AWG 26)  
 purple NTC  
 purple NTC  
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**  
 Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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# ECX SPEED 22 L brushless BLDC motor Ø22 mm

**Key Data: 80/81 W, 20.2 mNm, 45000 rpm**



**M 1:1**

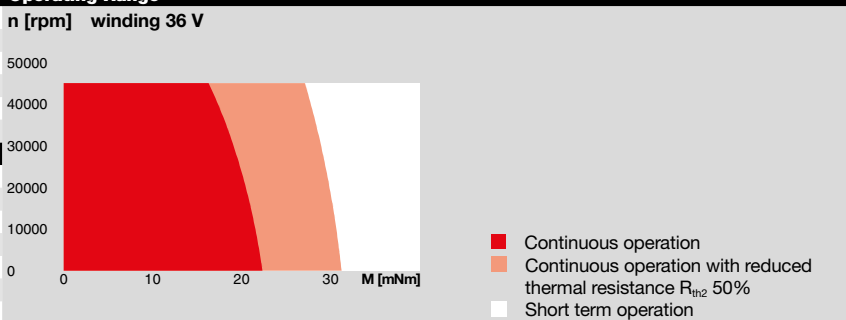
**Motor Data**

1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	38000	36800	37400
3_	No load current	mA	337	214	164
4_	Nominal speed	rpm	36000	34800	35600
5_	Nominal torque (max. continuous torque)	mNm	18.2	19.3	20.2
6_	Nominal current (max. continuous current)	A	3.35	2.27	1.8
7_	Stall torque	mNm	383	407	461
8_	Stall current	A	64	43.8	37.8
9_	Max. efficiency	%	86.2	86.7	87.4
10_	Terminal resistance	Ω	0.375	0.823	1.27
11_	Terminal inductance	mH	0.0234	0.0563	0.0968
12_	Torque constant	mNm/A	5.99	9.29	12.2
13_	Speed constant	rpm/V	1590	1030	784
14_	Speed/torque gradient	rpm/mNm	99.9	91	81.7
15_	Mechanical time constant	ms	4.07	3.71	3.33
16_	Rotor inertia	gcm <sup>2</sup>	3.89	3.89	3.89

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	12.7
18_	Thermal resistance winding-housing	K/W	0.62
19_	Thermal time constant winding	s	1.95
20_	Thermal time constant motor	s	644
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	45000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play	preloaded	
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]

**maxon Modular System**

Other specifications	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
29_ Number of pole pairs	306_GPX 22 A/C	1-2 [3-4]	for motor type A:	455_ESCON 36/3 EC
30_ Number of phases	307_GPX 22 LN/LZ	1-2 [3-4]	407_ENX 22 EASY INT	455_ESCON Module 50/4 EC-S
31_ Weight of motor	308_GPX 22 HP	2-3 [4]	for motor type B:	455_ESCON Module 50/5
32_ Typical noise level [rpm]	309_GPX 22 UP	1-4	407_ENX 22 EASY INT Abs.	457_ESCON 50/5
	310_GPX 22 SPEED	1-2		459_DEC Module 50/5
	311_GPX 26 A/C	3		463_EPOS4 50/5
	312_GPX 26 LN/LZ	3		463_EPOS4 Mod./Comp. 50/5
	313_GPX 26 HP	4		470_EPOS2 P 24/5
				473_MAXPOS 50/5

**Connection A and B, motor (Cable AWG 18)**

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

**Connection A, sensors (Cable AWG 26)**

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC (Cable AWG 26)**

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**

Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

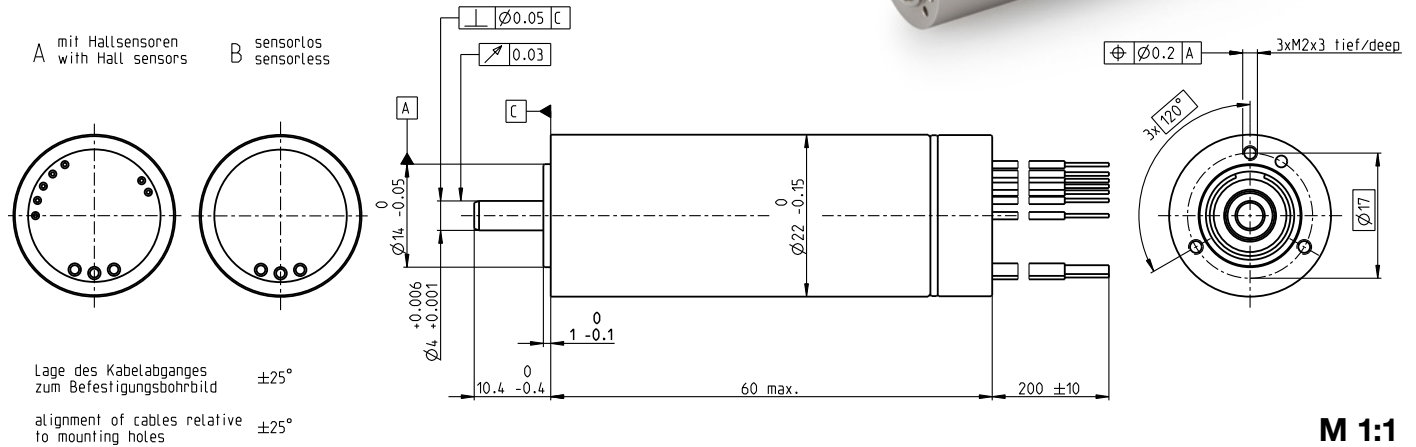
# ECX SPEED 22 L brushless BLDC motor Ø22 mm

High Power

Key Data: 120/153 W, 29.3 mNm, 60000 rpm

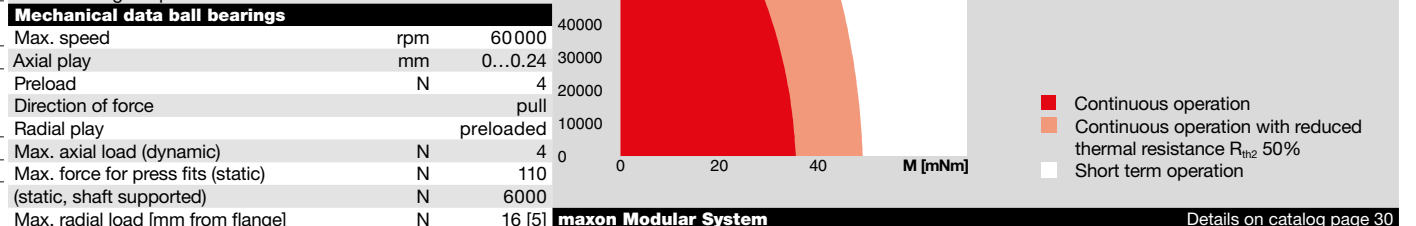


maxon ECX



Motor Data					
1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	49400	51400	52400
3_	No load current	mA	432	307	238
4_	Nominal speed	rpm	47800	49900	50900
5_	Nominal torque (max. continuous torque)	mNm	29.1	29.3	27.4
6_	Nominal current (max. continuous current)	A	6.67	4.67	3.36
7_	Stall torque	mNm	1080	1290	1230
8_	Stall current	A	233	193	141
9_	Max. efficiency	%	91.7	92.3	92
10_	Terminal resistance	Ω	0.103	0.187	0.341
11_	Terminal inductance	mH	0.009	0.0188	0.0321
12_	Torque constant	mNm/A	4.63	6.68	8.74
13_	Speed constant	rpm/V	2060	1430	1090
14_	Speed/torque gradient	rpm/mNm	45.9	40	42.6
15_	Mechanical time constant	ms	1.9	1.65	1.76
16_	Rotor inertia	gcm <sup>2</sup>	3.94	3.94	3.94

Thermal data		Operating Range	
17_	Thermal resistance housing-ambient	K/W	12.2
18_	Thermal resistance winding-housing	K/W	0.841
19_	Thermal time constant winding	s	2.77
20_	Thermal time constant motor	s	619
21_	Ambient temperature	°C	-20...+100
22_	Max. winding temperature	°C	155



Mechanical data ball bearings		maxon Modular System		maxon sensor		maxon motor control	
23_	Max. speed	rpm	60000	maxon gear	Stages [opt.]	for motor type A:	455_ESCON Module 50/4 EC-S
24_	Axial play	mm	0...0.24	306_GPX 22 A/C	1-2 [3-4]	407_ENX 22 EASY INT	455_ESCON Module 50/5
	Preload	N	4	307_GPX 22 LN/LZ	1-2 [3-4]	for motor type B:	456_ESCON Module 50/8 HE
	Direction of force			308_GPX 22 HP	2-3 [4]	407_ENX 22 EASY INT Abs.	457_ESCON 50/5
25_	Radial play		preloaded	309_GPX 22 UP	1-4		457_ESCON 70/10
26_	Max. axial load (dynamic)	N	4	310_GPX 22 SPEED	1-2		459_DEC Module 50/5
27_	Max. force for press fits (static)	N	110	311_GPX 26 A/C	3		463_EPOS4 50/5
	(static, shaft supported)	N	6000	312_GPX 26 LN/LZ	3		463_EPOS4 Mod./Comp. 50/5
28_	Max. radial load [mm from flange]	N	16 [5]	313_GPX 26 HP	4		465_EPOS4 Mod./Comp. 50/8
							467_EPOS4 70/15
							470_EPOS2 P 24/5
							473_MAXPOS 50/5

Other specifications		maxon gear		maxon sensor		maxon motor control	
29_	Number of pole pairs	1	306_GPX 22 A/C	1-2 [3-4]	for motor type A:	455_ESCON Module 50/4 EC-S	
30_	Number of phases	3	307_GPX 22 LN/LZ	1-2 [3-4]	407_ENX 22 EASY INT	455_ESCON Module 50/5	
31_	Weight of motor	g	140	308_GPX 22 HP	for motor type B:	456_ESCON Module 50/8 HE	
32_	Typical noise level [rpm]	dBA	54 [50000]	309_GPX 22 UP	407_ENX 22 EASY INT Abs.	457_ESCON 50/5	

**Connection A and B, motor** (Cable AWG 18)  
 red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

**Connection A, sensors** (Cable AWG 26)  
 orange V<sub>Hall</sub> 3...24 VDC  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC** (Cable AWG 26)  
 purple NTC  
 purple NTC  
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

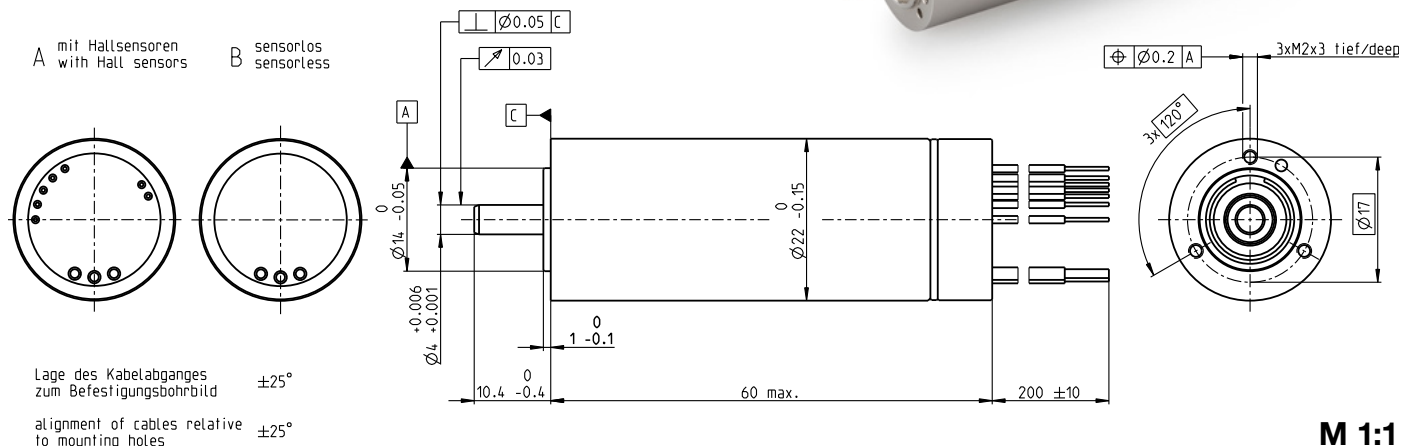
**Configuration**  
 Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection/connector  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

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# ECX SPEED 22 L brushless BLDC motor Ø22 mm

Sterilizable

Key Data: 120/162 W, 28.3 mNm, 60000 rpm



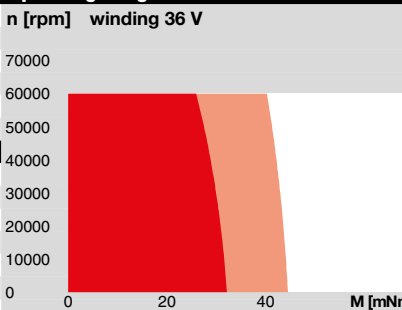
### Motor Data

1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	54100	56200	57300
3_	No load current	mA	425	303	235
4_	Nominal speed	rpm	52100	54400	55500
5_	Nominal torque (max. continuous torque)	mNm	27.7	28.3	26.6
6_	Nominal current (max. continuous current)	A	6.92	4.89	3.54
7_	Stall torque	mNm	965	1160	1120
8_	Stall current	A	228	190	140
9_	Max. efficiency	%	91.7	92.3	92.1
10_	Terminal resistance	Ω	0.105	0.189	0.343
11_	Terminal inductance	mH	0.0114	0.0237	0.0406
12_	Torque constant	mNm/A	4.23	6.11	7.99
13_	Speed constant	rpm/V	2260	1560	1200
14_	Speed/torque gradient	rpm/mNm	56.1	48.4	51.3
15_	Mechanical time constant	ms	1.39	1.2	1.27
16_	Rotor inertia	gcm <sup>2</sup>	2.36	2.36	2.36

### Thermal data

17_	Thermal resistance housing-ambient	K/W	12.5
18_	Thermal resistance winding-housing	K/W	0.84
19_	Thermal time constant winding	s	2.96
20_	Thermal time constant motor	s	634
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

### Operating Range



### Sterilization information

Sensorless: typical 2000 sterilization cycles  
Hall sensors: typical 1000 sterilization cycles  
Sterilization with steam  
Temperature +134°C ±4°C  
Compression pressure up to 2.3 bar  
Rel. humidity 100%  
Cycle length 18 min.

### Mechanical data ball bearings

23_	Max. speed	rpm	60000
24_	Axial play	mm	0...0.24
	Preload	N	4
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	4
27_	Max. force for press fits (static)	N	110
	(static, shaft supported)	N	6000
28_	Max. radial load [mm from flange]	N	16 [5]

### Other specifications

29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	148
32_	Typical noise level [rpm]	dBA	55 [50000]

### maxon Modular System

<b>maxon gear</b>	Stages [opt.]	<b>maxon sensor</b>	<b>maxon motor control</b>
310_GPX 22 SPEED	1-2	for motor type A:	455_ESCON Module 50/4 EC-S
		407_ENX 22 EASY INT	455_ESCON Module 50/5
		for motor type B:	456_ESCON Module 50/8 HE
		407_ENX 22 EASY INT Abs.	457_ESCON 50/5
			457_ESCON 70/10
			459_DEC Module 50/5
			463_EPOS4 50/5
			463_EPOS4 Mod./Comp. 50/5
			465_EPOS4 Mod./Comp. 50/8
			467_EPOS4 70/15
			470_EPOS2 P 24/5
			473_MAXPOS 50/5

### Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

### Connection A, sensors (Cable AWG 26)

orange	V <sub>Hall</sub> 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

### Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

### Configuration

Flange front: thread holes/center thread  
Flange back: plastic ring/external thread/with opening  
Shaft front: length/diameter  
Electric connection: cable length/pin connection  
Temperature Sensor: NTC-Thermistor  
Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

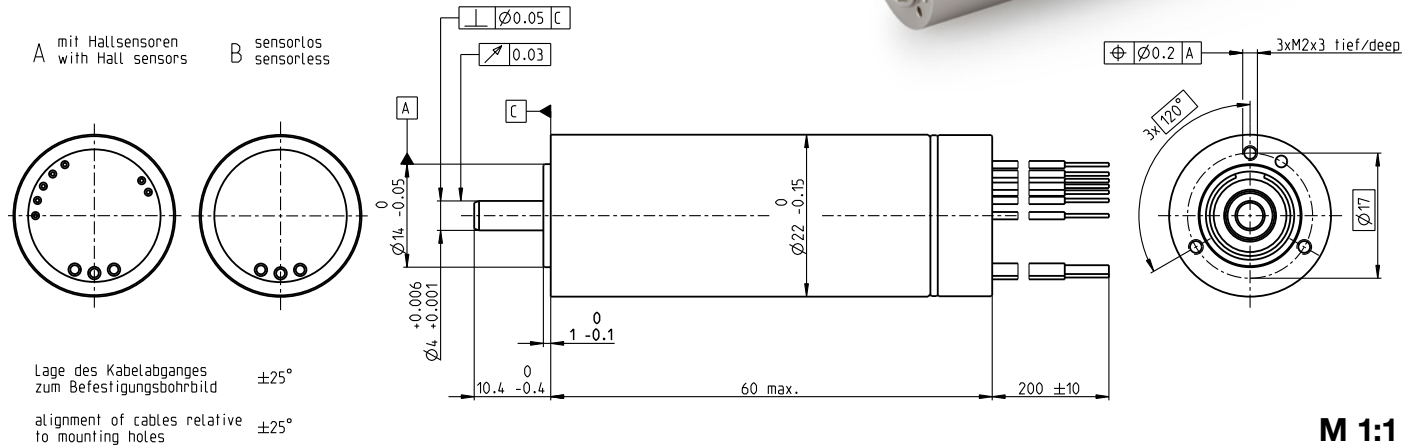
# ECX SPEED 22 L brushless BLDC motor Ø22 mm

Sterilizable, Ceramic Bearings

Key Data: 120/169 W, 27.1 mNm, 85000 rpm



maxon ECX



Motor Data					
1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	54100	56200	57300
3_	No load current	mA	477	339	263
4_	Nominal speed	rpm	52200	54400	55500
5_	Nominal torque (max. continuous torque)	mNm	26.7	27.1	25.5
6_	Nominal current (max. continuous current)	A	6.72	4.74	3.42
7_	Stall torque	mNm	965	1160	1120
8_	Stall current	A	228	190	140
9_	Max. efficiency	%	91.2	91.8	91.6
10_	Terminal resistance	Ω	0.105	0.189	0.343
11_	Terminal inductance	mH	0.0114	0.0237	0.0406
12_	Torque constant	mNm/A	4.23	6.11	7.99
13_	Speed constant	rpm/V	2260	1560	1200
14_	Speed/torque gradient	rpm/mNm	56.1	48.4	51.3
15_	Mechanical time constant	ms	1.39	1.2	1.27
16_	Rotor inertia	gcm <sup>2</sup>	2.36	2.36	2.36

Thermal data		Operating Range		Sterilization information				
17_	Thermal resistance housing-ambient	K/W	12.5	n [rpm]	winding 36 V		Sensorless: typical 2000 sterilization cycles	
18_	Thermal resistance winding-housing	K/W	0.84				100000	Hall sensors: typical 1000 sterilization cycles
19_	Thermal time constant winding	s	2.96		Sterilization with steam			
20_	Thermal time constant motor	s	634		Temperature +134°C ±4°C			
21_	Ambient temperature	°C	-40...+135	Compression pressure up to 2.3 bar		Rel. humidity 100%		
22_	Max. winding temperature	°C	155	Cycle length 18 min.				
Mechanical data ball bearings								
23_	Max. speed	rpm	85000					
24_	Axial play	mm	0...0.24					
Preload			N	4				
Direction of force				pull	Continuous operation			
25_	Radial play		preloaded	Continuous operation with reduced thermal resistance R <sub>th2</sub> 50%				
26_	Max. axial load (dynamic)	N	4	Short term operation				
27_	Max. force for press fits (static)	N	110					
(static, shaft supported)			N	6000				
28_	Max. radial load [mm from flange]	N	16 [5]					

Other specifications		maxon Modular System		maxon sensor		maxon motor control	
29_	Number of pole pairs	1	maxon gear	Stages [opt.]	for motor type A:	455_ESCON Module 50/4 EC-S	
30_	Number of phases	3	310_GPX 22 SPEED	1-2	407_ENX 22 EASY INT	455_ESCON Module 50/5	
31_	Weight of motor	g			for motor type B:	456_ESCON Module 50/8 HE	
32_	Typical noise level [rpm]	dBA	55 [50000]		407_ENX 22 EASY INT Abs.	457_ESCON 50/5	
						457_ESCON 70/10	
						459_DEC Module 50/5	
						463_EPOS4 50/5	
						463_EPOS4 Mod./Comp. 50/5	
						465_EPOS4 Mod./Comp. 50/8	
						467_EPOS4 70/15	
						470_EPOS2 P 24/5	
						473_MAXPOS 50/5	

**Connection A and B, motor** (Cable AWG 18)  
 red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

**Connection A, sensors** (Cable AWG 26)  
 orange V<sub>Hall</sub> 3...24 VDC  
 blue GND  
 yellow Hall sensor 1  
 brown Hall sensor 2  
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 45. In combination with the ENX EASY INT, the orange (Vcc) and blue (GND) connections are not used. Hall signals are then generated by an ENX EASY-INT sensor (no pull-up resistor required; output signals: CMOS compatible push-pull stage).

**Connection NTC** (Cable AWG 26)  
 purple NTC  
 purple NTC  
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

**Configuration**  
 Flange front: thread holes/center thread  
 Flange back: plastic ring/external thread/with opening  
 Shaft front: length/diameter  
 Electric connection: cable length/pin connection  
 Temperature Sensor: NTC-Thermistor  
 Appropriate connectors and connecting cables are available for the configuration of the pin connection together with the external thread: see catalog, Accessories section.

xdrives.maxonmotor.com

For your personal notes.

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# maxon ECX SQUARE

The brushless ECX SQUARE features an economical design and is perfect for large quantities. The plastic casing and the winding within it are molded in one step, resulting in robust, compact, and long-lasting motors. ECX motors can be configured online and are available for shipping in 11 working days. [ecx.maxonmotor.com](http://ecx.maxonmotor.com)

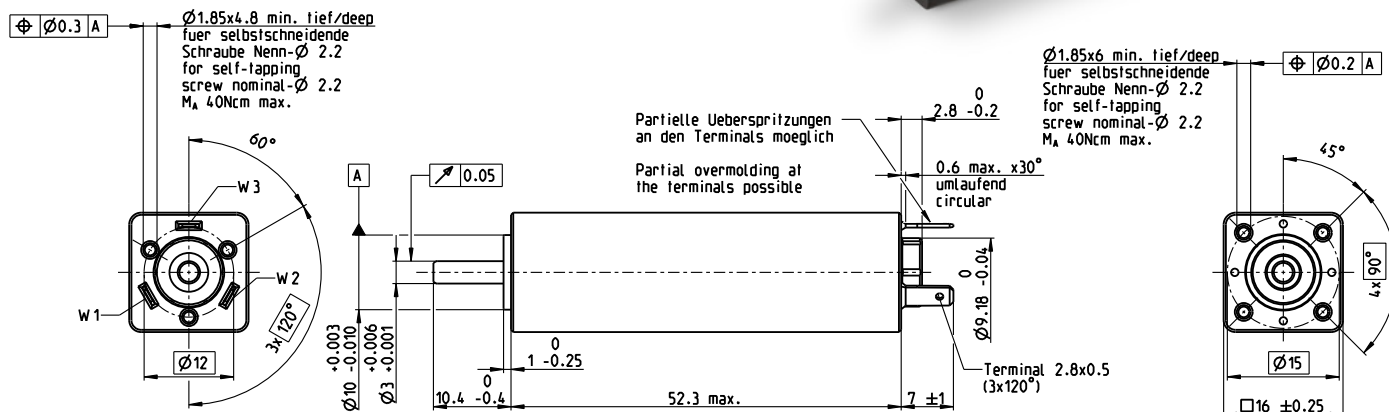
<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b>	166–199
<b>ECX SQUARE Program</b>	202
<b>EC Program</b>	204–213
<b>EC-max Program</b>	217–225
<b>EC-4pole Program</b>	229–235
<b>EC-i Program</b>	239–249
<b>EC flat Program</b>	252–273
<b>EC frameless Program</b>	278–283

# ECX SQUARE 16 L brushless

BLDC motor □16 mm

Sensorless

Key Data: 20/36 W, 12.9 mNm, 30000 rpm



M 1:1

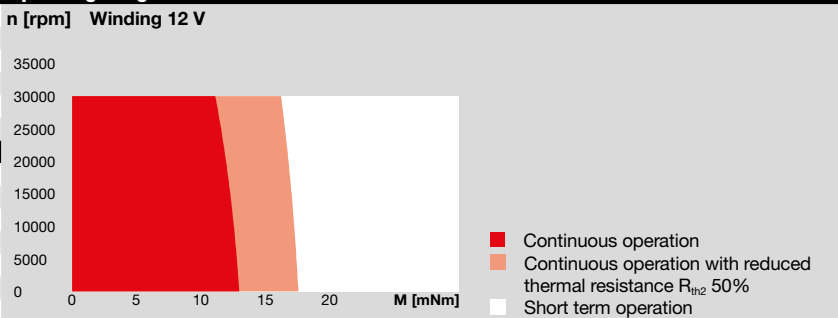
**Motor Data**

1_	Nominal voltage	V	6	9	12	18
2_	No load speed	rpm	17000	19500	18100	20300
3_	No load current	mA	309	253	151	117
4_	Nominal speed	rpm	13800	16200	14900	17000
5_	Nominal torque (max. continuous torque)	mNm	13.1	12	13.2	12.6
6_	Nominal current (max. continuous current)	A	4.2	2.97	2.23	1.6
7_	Stall torque	mNm	73.9	73.8	78.7	82.2
8_	Stall current	A	22.3	17	12.6	9.83
9_	Max. efficiency	%	78.3	77.6	79.7	79.8
10_	Terminal resistance	Ω	0.27	0.528	0.954	1.83
11_	Terminal inductance	mH	0.0178	0.0307	0.0622	0.115
12_	Torque constant	mNm/A	3.32	4.33	6.26	8.36
13_	Speed constant	rpm/V	2880	2210	1530	1140
14_	Speed/torque gradient	rpm/mNm	234	269	233	250
15_	Mechanical time constant	ms	2.47	2.84	2.46	2.65
16_	Rotor inertia	gcm <sup>2</sup>	1.01	1.01	1.01	1.01

**Thermal data**

17_	Thermal resistance housing-ambient	K/W	12
18_	Thermal resistance winding-housing	K/W	1.68
19_	Thermal time constant winding	s	3.52
20_	Thermal time constant motor	s	390
21_	Ambient temperature <sup>1</sup>	°C	-20...-100
22_	Max. winding temperature	°C	125

**Operating Range**



**Mechanical data ball bearings**

23_	Max. speed	rpm	30000
24_	Axial play	mm	0...0.14
	Preload	N	1
	Direction of force		pull
25_	Radial play		preloaded
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	40
	(static, shaft supported)	N	1000
28_	Max. radial load [mm from flange]	N	6 [5]

**Other specifications**

29_	Number of pole pairs		1
30_	Number of phases		3
31_	Weight of motor	g	65
32_	Typical noise level [rpm]	dBA	46 [16000]

**maxon Modular System**

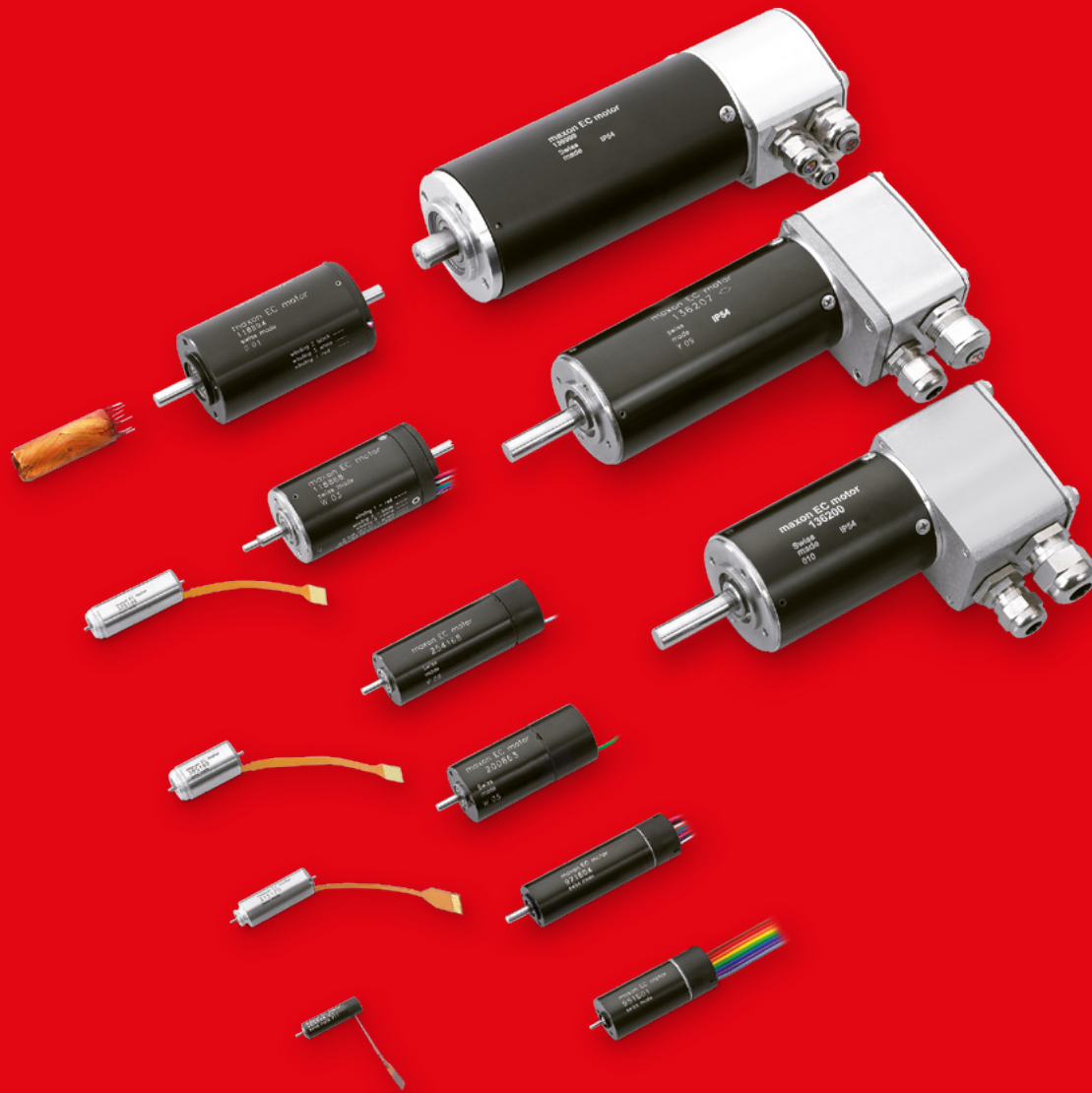
<b>maxon gear</b>	<b>maxon sensor</b>	<b>maxon motor control</b> 455_ESCON Module 50/4 EC-S
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**Connection**

W1: Motor winding 1  
W2: Motor winding 2  
W3: Motor winding 3

**Configuration**

**Notes**

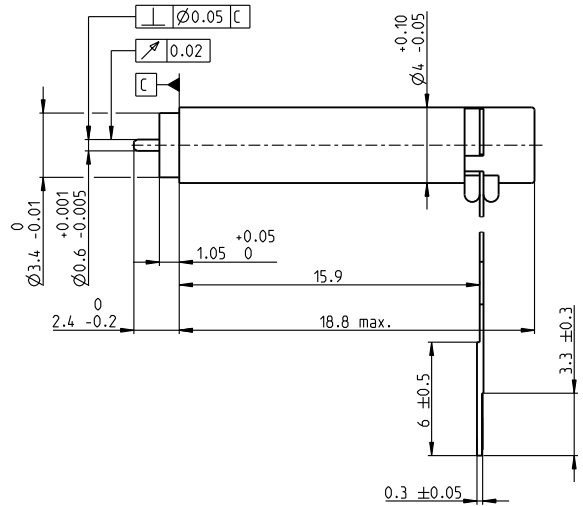
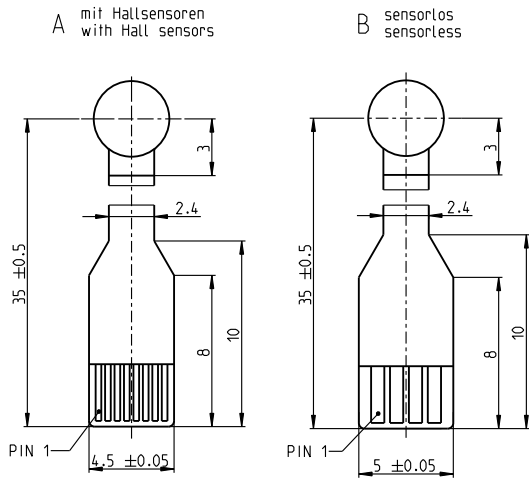


# maxon EC motor

The electronically commutated EC motors are characterized especially by their favorable torque characteristics, high power, extremely broad speed range and, of course, by their unsurpassed service life.

<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b>	166-199
<b>ECX SQUARE Program</b>	202
<b>EC Program</b>	204-213
<b>EC-max Program</b>	217-225
<b>EC-4pole Program</b>	229-235
<b>EC-i Program</b>	239-250
<b>EC flat Program</b>	252-273
<b>EC frameless Program</b>	278-283

# EC 4 Ø4 mm, brushless, 0.5 Watt



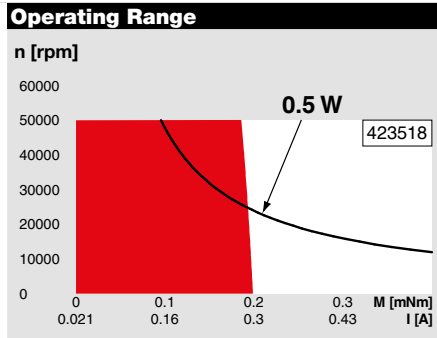
M 5:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
A with Hall sensors	431555 431558
B sensorless	423518 423525

Motor Data (provisional)				
Values at nominal voltage				
1 Nominal voltage	V	3	6	
2 No load speed	rpm	35200	35400	
3 No load current	mA	28.8	14.4	
4 Nominal speed	rpm	11700	13400	
5 Nominal torque	mNm	0.225	0.239	
6 Nominal current	A	0.317	0.167	
7 Stall torque	mNm	0.355	0.403	
8 Stall current	A	0.465	0.264	
9 Max. efficiency	%	57	59	
Characteristics				
10 Terminal resistance phase to phase	Ω	6.45	22.8	
11 Terminal inductance phase to phase	mH	0.0749	0.285	
12 Torque constant	mNm/A	0.763	1.53	
13 Speed constant	rpm/V	12500	6240	
14 Speed/torque gradient	rpm/mNm	106000	92900	
15 Mechanical time constant	ms	1.23	1.08	
16 Rotor inertia	gcm <sup>2</sup>	0.00111	0.00111	

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	96.7 K/W
18 Thermal resistance winding-housing	15.2 K/W
19 Thermal time constant winding	0.74 s
20 Thermal time constant motor	58.5 s
21 Ambient temperature	-20...+80°C
22 Max. winding temperature	+125°C
Mechanical data	
23 Max. speed	50000 rpm
24 Axial play at axial load	max. 0.06 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	0.1 N
27 Max. force for press fits (static)	10 N
28 Max. radial load, 2 mm from flange	0.2 N
Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	1.2 g



**Comments**

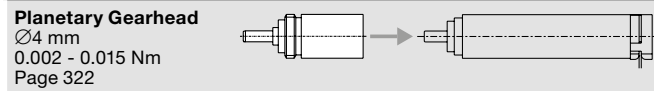
- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Values listed in the table are nominal.

Connection	with hall sensors	sensorless
Pin 1	Motor winding 1	Motor winding 1
Pin 2	Motor winding 2	Motor winding 2
Pin 3	Motor winding 3	Motor winding 3
Pin 4	V <sub>Hall</sub> 3.8...24 VDC	N.C.
Pin 5	GND	
Pin 6	Hall sensor 1	
Pin 7	Hall sensor 2	
Pin 8	Hall sensor 3	
Connector	Part number	Part number
Molex	52745-0897	52207-0460
FCI	SFV8R-2STBE1HLF	SFW4R-2STGE1LF

Pin for design with Hall sensors:  
FPC, 8 pole, pitch 0.5 mm, top contact style  
Wiring diagram for Hall sensors see page 45

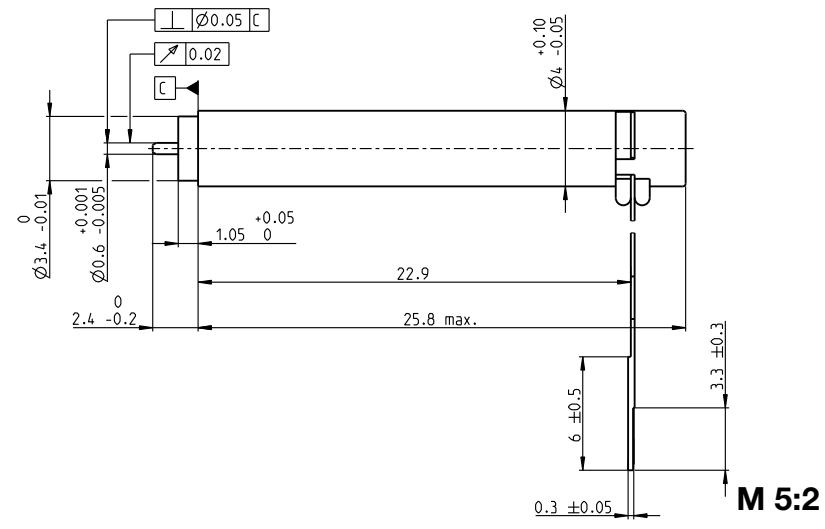
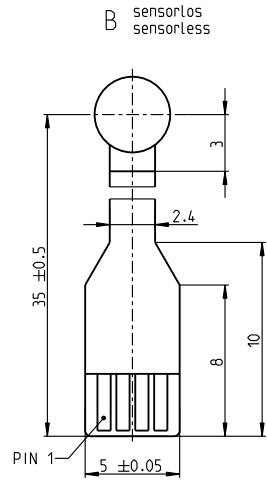
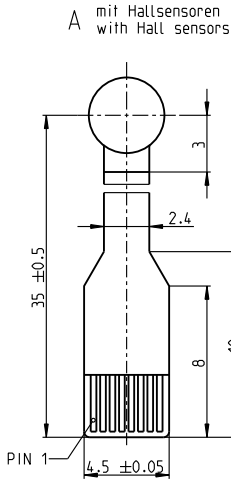
**maxon Modular System** Details on catalog page 34



**Recommended Electronics:**

Notes	Page 34
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455

# EC 4 Ø4 mm, brushless, 1.0 Watt

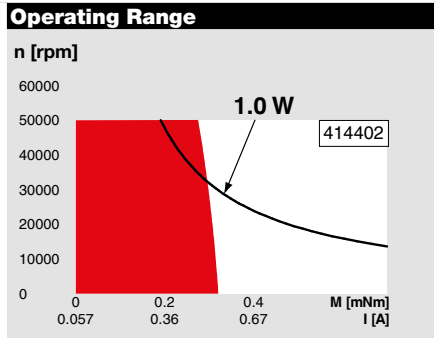


- Stock program
- Standard program
- Special program (on request)

Part Numbers	
A with Hall sensors	431182 431284
B sensorless	414402 423511

Motor Data (provisional)			
Values at nominal voltage			
1 Nominal voltage	V	3	6
2 No load speed	rpm	40700	30500
3 No load current	mA	55.6	18.9
4 Nominal speed	rpm	23000	13400
5 Nominal torque (max. continuous torque)	mNm	0.338	0.341
6 Nominal current (max. continuous current)	A	0.545	0.206
7 Stall torque	mNm	0.817	0.641
8 Stall current	A	1.22	0.36
9 Max. efficiency	%	63	60
Characteristics			
10 Terminal resistance phase to phase	Ω	2.46	16.7
11 Terminal inductance phase to phase	mH	0.0458	0.323
12 Torque constant	mNm/A	0.67	1.78
13 Speed constant	rpm/V	14300	5360
14 Speed/torque gradient	rpm/mNm	52300	50200
15 Mechanical time constant	ms	0.903	0.867
16 Rotor inertia	gcm <sup>2</sup>	0.00165	0.00165

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	84 K/W
18 Thermal resistance winding-housing	16.7 K/W
19 Thermal time constant winding	1.31 s
20 Thermal time constant motor	76.4 s
21 Ambient temperature	-20...+80°C
22 Max. winding temperature	+125°C
Mechanical data	
23 Max. speed	50000 rpm
24 Axial play at axial load	max. 0.06 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	0.1 N
27 Max. force for press fits (static)	10 N
28 Max. radial load, 2 mm from flange	0.2 N



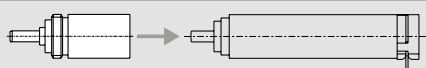
**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	1.8 g

**maxon Modular System** Details on catalog page 34

**Planetary Gearhead**  
 Ø4 mm  
 0.002 - 0.015 Nm  
 Page 322



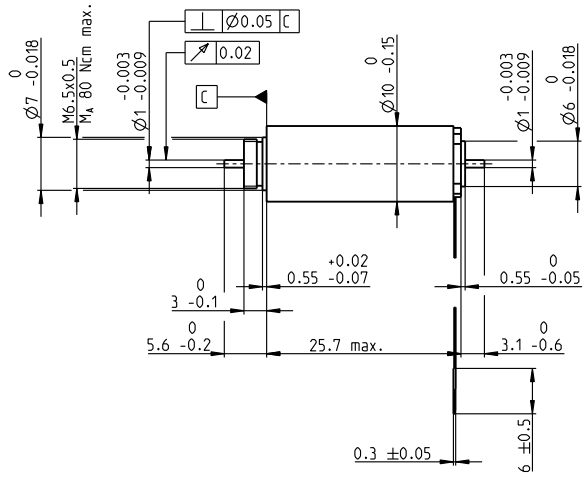
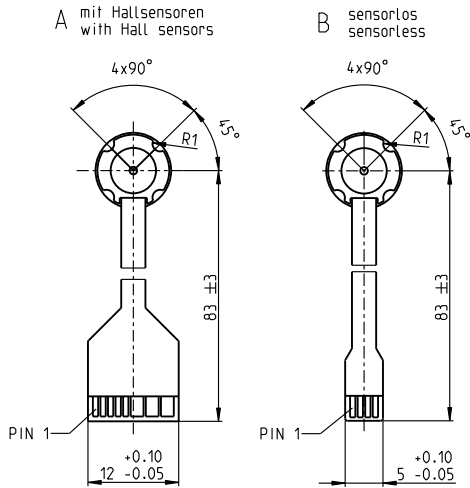
Connection with hall sensors sensorless		
Pin 1	Motor winding 1	Motor winding 1
Pin 2	Motor winding 2	Motor winding 2
Pin 3	Motor winding 3	Motor winding 3
Pin 4	V <sub>Hall</sub> 3.8...24 VDC	N.C.
Pin 5	GND	
Pin 6	Hall sensor 1	
Pin 7	Hall sensor 2	
Pin 8	Hall sensor 3	
Connector Part number Part number		
Molex	52745-0897	52207-0460
FCI	SFV8R-2STBE1HLF	SFW4R-2STGE1LF

Pin for design with Hall sensors:  
 FPC, 8 pole, pitch 0.5 mm, top contact style  
 Wiring diagram for Hall sensors see page 45

**Recommended Electronics:**

Notes	Page 34
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455

# EC 10 Ø10 mm, brushless, 8 Watt



**M 1:1**

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
A with Hall sensors	315170	315171	315172	315173
B sensorless	315174	315175	315176	315177

**Motor Data**

Values at nominal voltage					
1 Nominal voltage	V	6	9	12	18
2 No load speed	rpm	49200	52500	53200	57100
3 No load current	mA	160	118	90.4	67.3
4 Nominal speed	rpm	41700	45600	46600	50900
5 Nominal torque (max. continuous torque)	mNm	1.74	1.63	1.62	1.61
6 Nominal current (max. continuous current)	A	1.66	1.11	0.843	0.6
7 Stall torque	mNm	12	13	13.7	15.6
8 Stall current	A	10.4	8.05	6.46	5.27
9 Max. efficiency	%	77	78	78	79
Characteristics					
10 Terminal resistance phase to phase	Ω	0.575	1.12	1.86	3.42
11 Terminal inductance phase to phase	mH	0.00998	0.0198	0.0342	0.0671
12 Torque constant	mNm/A	1.15	1.61	2.12	2.97
13 Speed constant	rpm/V	8340	5920	4500	3220
14 Speed/torque gradient	rpm/mNm	4180	4110	3940	3700
15 Mechanical time constant	ms	3.03	2.97	2.85	2.68
16 Rotor inertia	gcm <sup>2</sup>	0.0691	0.0691	0.0691	0.0691

**Specifications**

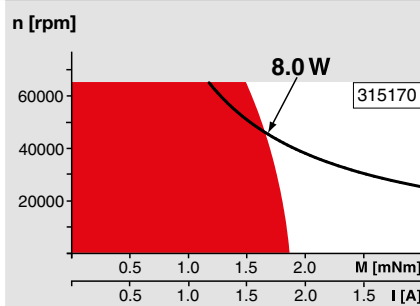
Thermal data		
17 Thermal resistance housing-ambient	39.8 K/W	
18 Thermal resistance winding-housing	5.1 K/W	
19 Thermal time constant winding	1.51 s	
20 Thermal time constant motor	221 s	
21 Ambient temperature	-40...+100°C	
22 Max. winding temperature	+125°C	
Mechanical data (preloaded ball bearings)		
23 Max. speed	65 000 rpm	
24 Axial play at axial load < 0.2 N	0 mm	
> 0.2 N	max. 0.14 mm	
25 Radial play	preloaded	
26 Max. axial load (dynamic)	0.16 N	
27 Max. force for press fits (static) (static, shaft supported)	12 N	
28 Max. radial load, 5 mm from flange	2 N	

Other specifications		
29 Number of pole pairs	1	
30 Number of phases	3	
31 Weight of motor	13 g	

Values listed in the table are nominal.

Connection		
Pin 1	V <sub>Hall</sub> 4.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	N.C.
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	
Adapter		
see p. 481	Part number 220300	Part number 220310
Connector		
TE	Part number 1-84953-1	Part number 84953-4
Molex	Part number 52207-1133	Part number 52207-0433
Pin for design with Hall sensors: FPC, 11-pol, Pitch 1.0 mm, top contact style		
Wiring diagram for Hall sensors see page 45		

**Operating Range**



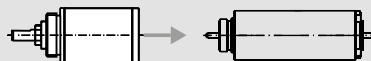
**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

**maxon Modular System**

Details on catalog page 34

**Planetary Gearhead**  
Ø10 mm  
0.01 - 0.15 Nm  
Page 326

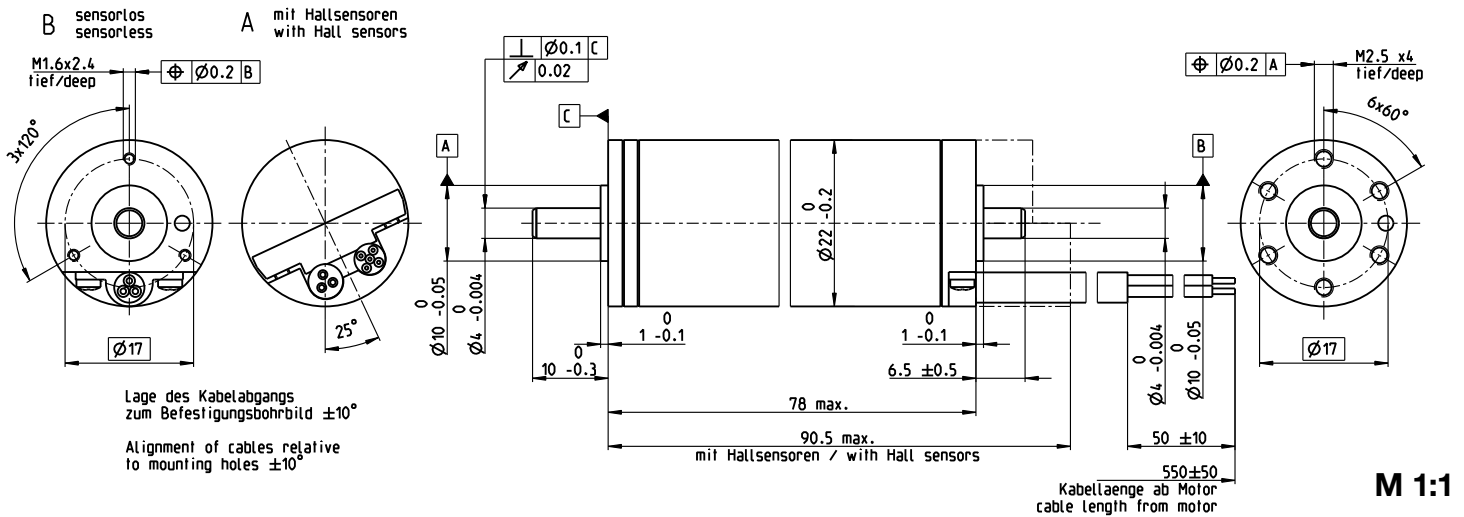


Recommended Electronics:	
<b>Notes</b>	Page 34
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
DEC Module 24/2	459

# EC 22 Ø22 mm, brushless, 80 Watt

Heavy Duty – for applications in air

maxon EC motor



- Stock program
- Standard program
- Special program (on request)

Part Numbers	
A with Hall sensors	426448
B sensorless	426449

Motor Data (provisional)	25	100	150	200	
<b>Values at nominal voltage and ambient temperature °C</b>					
1 Nominal voltage	V	48	48	48	48
2 No load speed	rpm	13300	13600	13800	14100
3 No load current	mA	63.9	53.4	54.9	56.5
4 Nominal speed <sup>1)</sup>	rpm	11400	11700	12200	13200
5 Nominal torque (max. continuous torque) <sup>1)</sup>	mNm	57.9	44	32.4	14.9
6 Nominal current (max. continuous current)	A	1.72	1.35	1.03	0.515
7 Stall torque	mNm	460	346	295	256
8 Stall current	A	13.4	10.3	8.98	7.93
9 Max. efficiency	%	87	86	85	84
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	3.59	4.64	5.35	6.05
11 Terminal inductance phase to phase	mH	0.626	0.626	0.626	0.626
12 Torque constant	mNm/A	34.4	33.5	32.9	32.3
13 Speed constant	rpm/V	278	285	290	296
14 Speed / torque gradient	rpm/mNm	29	39.5	47.2	55.4
15 Mechanical time constant	ms	2.31	3.16	3.77	4.43
16 Rotor inertia	gcm <sup>2</sup>	7.63	7.63	7.63	7.63

<sup>1)</sup> Values for operation in thermal equilibrium.

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	9.12 K/W
18 Thermal resistance winding-housing	0.92 K/W
19 Thermal time constant winding	5.84 s
20 Thermal time constant motor	462 s
21 Ambient temperature	-55...+200°C
22 Max. winding temperature	+240°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	20000 rpm
24 Axial play at axial load < 5 N	0 mm
> 5 N	max. 0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	8 N
27 Max. force for press fits (static) (static, shaft supported)	98 N
	250 N
28 Max. radial load, 5 mm from flange	16 N

Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	210 g

### Connection A, motor cable PTFE (AWG 19)

- red Motor winding 1
- black Motor winding 2
- white Motor winding 3

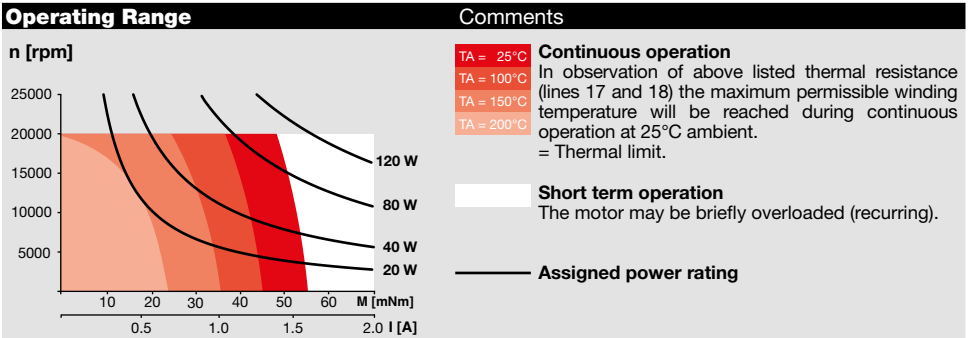
### Connection A, sensors cable PTFE (AWG 24)

- green V<sub>Hall</sub> 4.5...24 V
- blue GND
- red Hall sensor 1
- black Hall sensor 2
- white Hall sensor 3

### Connection B, motor cable PTFE (AWG 19)

- red Motor winding 1
- black Motor winding 2
- white Motor winding 3

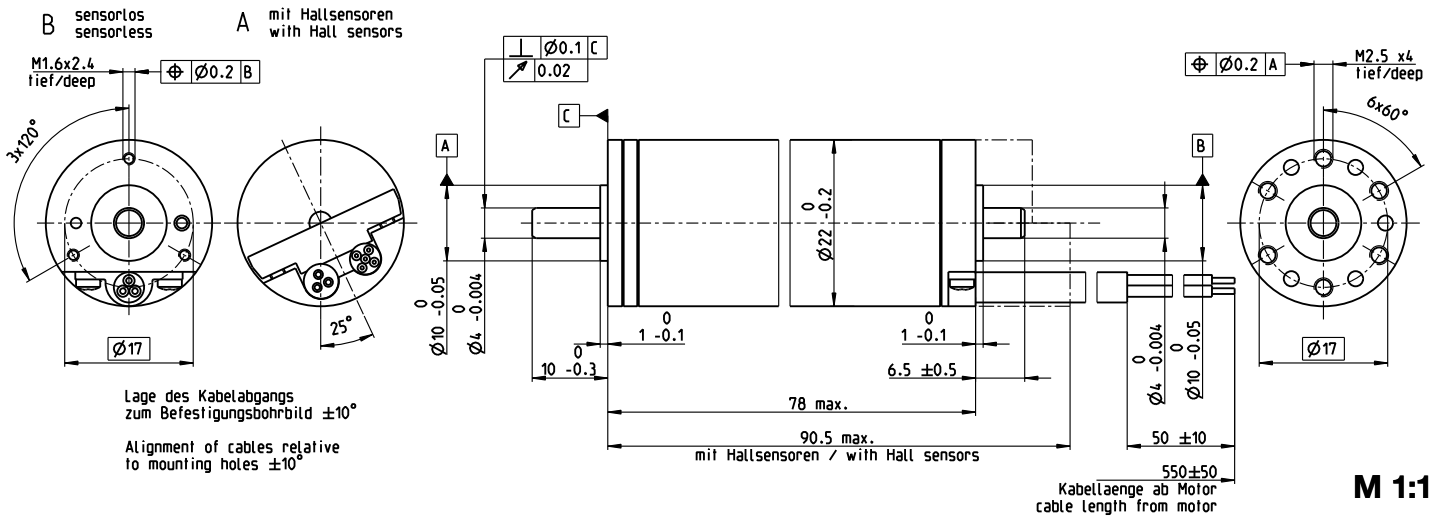
Wiring diagram for Hall sensors see p. 45



Application	Notice
<b>General</b> - extreme temperature applications - vibration tested (according to MIL-STD810F/Jan2000 Fig. 514.5C-10) - ultra-high vacuum applications (modifications necessary). low outgassing, can be baked out at 240°C <b>Aerospace</b> - gas turbine starter/generators for aircraft engines - regulation of combustion engines <b>Oil &amp; Gas Industry</b> - oil, gas and geothermal wells <b>Robotics</b> - robotic exploration vehicles <b>Industry</b> - pumps and valves for liquid metal cooling systems/turbine fuel and steam control - valve adjustment for gas and steam power plants	This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

# EC 22 Ø22 mm, brushless, 240 Watt

Heavy Duty – for applications in oil



█ Stock program  
 Standard program  
 Special program (on request)

Part Numbers	
A with Hall Sensors	426450
B sensorless	426451

Motor Data (provisional)	25	100	150	200
<b>Values at nominal voltage and ambient temperature °C</b>				
1 Nominal voltage	V	48	48	48
2 No load speed	rpm	12900	13400	13800
3 No load current	mA	384	177	183
4 Nominal speed <sup>1)</sup>	rpm	8410	8510	9130
5 Nominal torque (max. continuous torque) <sup>1)</sup>	mNm	149	120	92.2
6 Nominal current (max. continuous current)	A	4.48	3.61	2.88
7 Stall torque	mNm	460	346	295
8 Stall current	A	13.4	10.3	8.98
9 Max. efficiency	%	71	77	73
<b>Characteristics</b>				
10 Terminal resistance phase to phase	Ω	3.59	4.64	5.35
11 Terminal inductance phase to phase	mH	0.626	0.626	0.626
12 Torque constant	mNm/A	34.4	33.5	32.9
13 Speed constant	rpm/V	278	285	290
14 Speed / torque gradient	rpm/mNm	29	39.5	47.2
15 Mechanical time constant	ms	2.31	3.16	3.77
16 Rotor inertia	gcm <sup>2</sup>	7.63	7.63	7.63

<sup>1)</sup> Values in thermal steady state.

Specifications	Operating Range	Comments
<p><b>Thermal data</b></p> <p>17 Thermal resistance housing-ambient 0.793 K/W</p> <p>18 Thermal resistance winding-housing 0.754 K/W</p> <p>19 Thermal time constant winding 4.78 s</p> <p>20 Thermal time constant motor 40.2 s</p> <p>21 Ambient temperature -55...+200°C</p> <p>22 Max. winding temperature +240°C</p> <p><b>Mechanical data (preloaded ball bearings)</b></p> <p>23 Max. speed 20000 rpm</p> <p>24 Axial play at axial load &lt; 5 N 0 mm</p> <p style="padding-left: 40px;">&gt; 5 N max. 0.14 mm</p> <p>25 Radial play preloaded</p> <p>26 Max. axial load (dynamic) 8 N</p> <p>27 Max. force for press fits (static) (static, shaft supported) 98 N</p> <p>28 Max. radial load, 5 mm from flange 250 N</p> <p>16 N</p> <p><b>Other specifications</b></p> <p>29 Number of pole pairs 1</p> <p>30 Number of phases 3</p> <p>31 Weight of motor 210 g</p> <p><b>Connection A, motor cable PTFE (AWG 19)</b></p> <p>red Motor winding 1</p> <p>black Motor winding 2</p> <p>white Motor winding 3</p> <p><b>Connection A, sensors cable PTFE (AWG 24)</b></p> <p>green V<sub>Hall</sub> 4.5...24 V</p> <p>blue GND</p> <p>red Hall sensor 1</p> <p>black Hall sensor 2</p> <p>white Hall sensor 3</p> <p><b>Connection B, motor cable PTFE (AWG 19)</b></p> <p>red Motor winding 1</p> <p>black Motor winding 2</p> <p>white Motor winding 3</p> <p>Wiring diagram for Hall sensors see p. 45</p>	<p style="text-align: center;"><b>n [rpm]</b></p> <p style="text-align: center;"><b>M [mNm]</b></p> <p style="text-align: center;"><b>I [A]</b></p>	<p><b>TA = 25°C</b> <b>Continuous operation</b> In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.</p> <p><b>TA = 100°C</b></p> <p><b>TA = 150°C</b></p> <p><b>TA = 200°C</b></p> <p><b>Short term operation</b> The motor may be briefly overloaded (recurring).</p> <p><b>Assigned power rating</b></p>

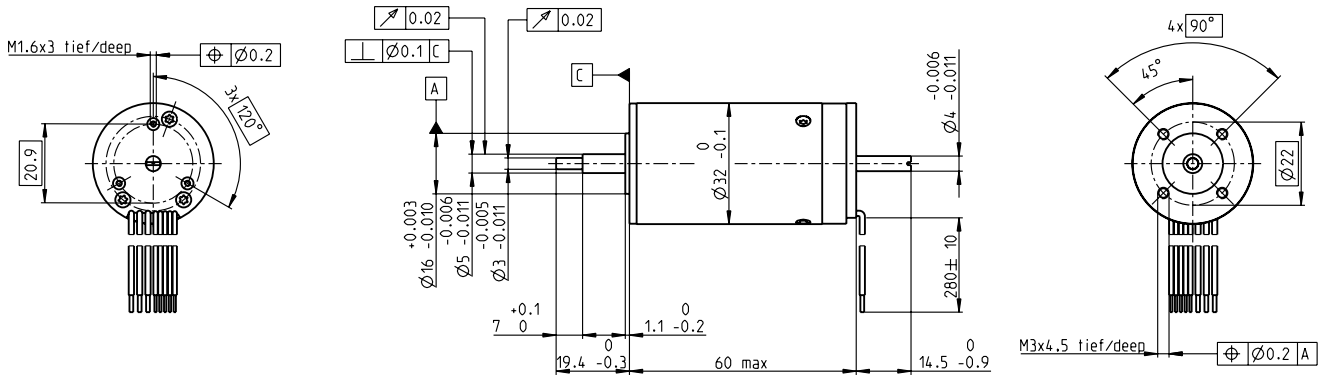
Application	Notice
<p><b>General</b></p> <ul style="list-style-type: none"> <li>– extreme temperature applications</li> <li>– vibration tested according to MIL-STD810F/Jan2000 Fig. 514.5C-10</li> <li>– operation in oil and high pressure (only minimal lubrication, therefore use under rated ambient conditions is not suggested)</li> </ul> <p><b>Oil &amp; Gas Industry</b></p> <ul style="list-style-type: none"> <li>– oil, gas and geothermal wells</li> </ul>	<p>This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.</p> <p><b>Reference medium: Shell Tellus oil T15</b> Operation in oil of different viscosity will affect the motor data.</p>

Details on catalog page 34

maxon modular system
<p><b>Planetary Gearhead</b></p> <p>Ø22 mm</p> <p>2.0 - 4.0 Nm</p> <p>Page 344</p>



# EC 32 Ø32 mm, brushless, 80 Watt



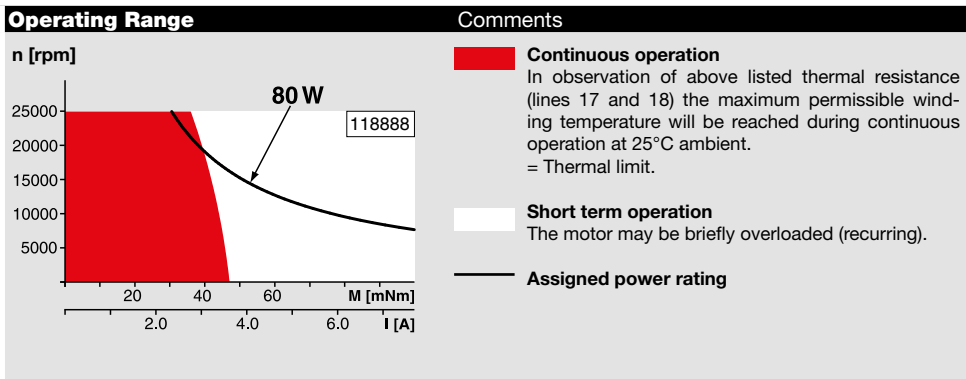
## M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers							
				118889			

Motor Data							
<b>Values at nominal voltage</b>							
1 Nominal voltage	V	12	18	18	24	36	48
2 No load speed	rpm	15100	14300	13100	11000	14700	11300
3 No load current	mA	662	404	349	199	211	104
4 Nominal speed	rpm	13400	12700	11500	9450	13200	9740
5 Nominal torque (max. continuous torque)	mNm	44.6	45.2	45.9	47.2	43.8	45.9
6 Nominal current (max. continuous current)	A	6.51	4.15	3.82	2.46	2.07	1.23
7 Stall torque	mNm	428	443	407	355	454	353
8 Stall current	A	57.2	37.4	31.4	17.3	19.7	8.84
9 Max. efficiency	%	80	81	81	80	81	80
<b>Characteristics</b>							
10 Terminal resistance phase to phase	Ω	0.21	0.481	0.573	1.39	1.83	5.43
11 Terminal inductance phase to phase	mH	0.03	0.0752	0.09	0.226	0.285	0.856
12 Torque constant	mNm/A	7.48	11.8	13	20.5	23.1	40
13 Speed constant	rpm/V	1280	806	737	465	414	239
14 Speed/torque gradient	rpm/mNm	35.8	32.7	32.6	31.5	32.8	32.5
15 Mechanical time constant	ms	7.49	6.86	6.82	6.59	6.87	6.8
16 Rotor inertia	gcm <sup>2</sup>	20	20	20	20	20	20

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	5.4 K/W
18 Thermal resistance winding-housing	2.5 K/W
19 Thermal time constant winding	14.8 s
20 Thermal time constant motor	1180 s
21 Ambient temperature	-20...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed <sup>1)</sup>	25000 rpm
24 Axial play at axial load < 8 N	0 mm
	> 8 N
25 Radial play	max. 0.14 mm
26 Max. axial load (dynamic)	preloaded
27 Max. force for press fits (static)	5.6 N
	98 N
	(static, shaft supported)
	1200 N
28 Max. radial load, 5 mm from flange	28 N



Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	270 g

Values listed in the table are nominal.

**Connection motor** (Cable AWG 22)  
 red Motor winding 1  
 black Motor winding 2  
 white Motor winding 3

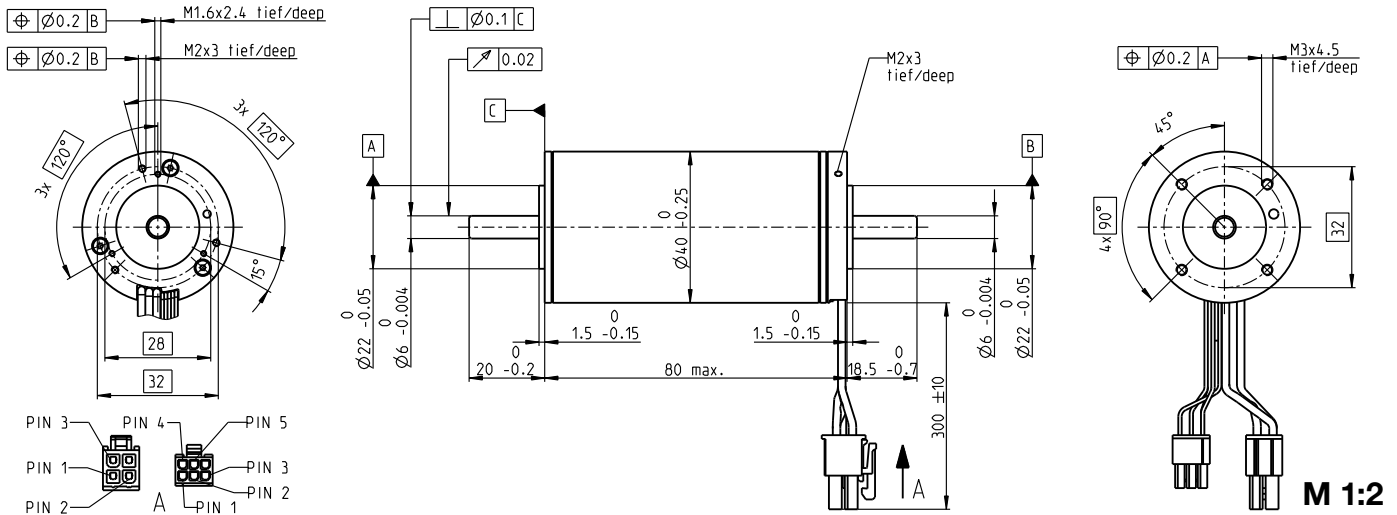
**Connection sensors** (Cable AWG 26)<sup>1)</sup>  
 green V<sub>Hall</sub> 4.5...24 VDC  
 blue GND  
 red/grey Hall sensor 1  
 black/grey Hall sensor 2  
 white/grey Hall sensor 3

Wiring diagram for Hall sensors see p. 45

<sup>1)</sup> Not lead through in combination with resolver.

maxon Modular System		Details on catalog page 34
<p><b>Planetary Gearhead</b> Ø32 mm 0.75 - 4.5 Nm Page 348</p> <p><b>Planetary Gearhead</b> Ø32 mm 0.75 - 6.0 Nm Page 350-355</p> <p><b>Screw Drive</b> Ø32 mm Page 382-387</p>		<p><b>Encoder HED_5540</b> 500 CPT, 3 channels Page 441/443</p> <p><b>Resolver Res 26</b> Ø26 mm 10 V Page 450</p> <p><b>Recommended Electronics:</b>  <b>Notes</b> Page 34</p> <p>ESCON 36/3 EC 455            ESCON Module 50/5 455            ESCON Mod. 50/4 EC-S 455            ESCON Mod. 50/8 (HE) 456            ESCON 50/5 457            ESCON 70/10 457            DEC Module 50/5 459            EPOS4 50/5 463            EPOS4 Mod./Comp. 50/5 463            EPOS4 Module 50/8 465            EPOS4 Comp. 50/8 CAN 465            EEPOS4 70/15 467            EPOS2 P 24/5 470            MAXPOS 50/5 473</p>

# EC 40 Ø40 mm, brushless, 170 Watt



- Stock program
- Standard program
- Special program (on request)

Part Numbers				
369146	393023	393024	393025	

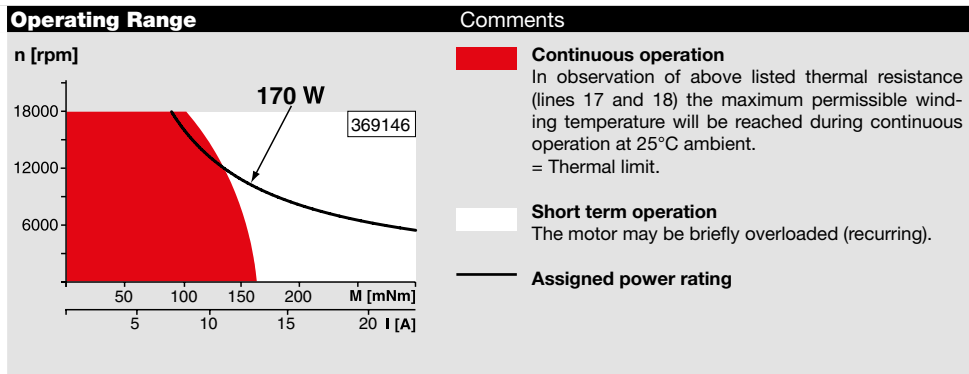
Motor Data (provisional)					
<b>Values at nominal voltage</b>					
1 Nominal voltage	V	15	24	42	48
2 No load speed	rpm	9840	9840	10100	9840
3 No load current	mA	617	386	230	193
4 Nominal speed	rpm	9090	9120	9380	9150
5 Nominal torque (max. continuous torque)	mNm	171	165	161	165
6 Nominal current (max. continuous current)	A	12.2	7.39	4.24	3.69
7 Stall torque	mNm	2620	2660	2740	2760
8 Stall current	A	181	115	69.1	59.6
9 Max. efficiency	%	89	89	89	89
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	0.0829	0.209	0.608	0.806
11 Terminal inductance phase to phase	mH	0.0329	0.0843	0.246	0.337
12 Torque constant	mNm/A	14.5	23.2	39.6	46.4
13 Speed constant	rpm/V	659	412	241	206
14 Speed/torque gradient	rpm/mNm	3.77	3.71	3.7	3.57
15 Mechanical time constant	ms	2.12	2.09	2.08	2.01
16 Rotor inertia	gcm <sup>2</sup>	53.8	53.8	53.8	53.8

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	5.21 K/W
18 Thermal resistance winding-housing	1.05 K/W
19 Thermal time constant winding	18.7 s
20 Thermal time constant motor	1910 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	18000 rpm
24 Axial play at axial load < 9 N	0 mm
> 9 N	max. 0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	23 N
27 Max. force for press fits (static)	106 N
(static, shaft supported)	5500 N
28 Max. radial load, 5 mm from flange	75 N

Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	580 g

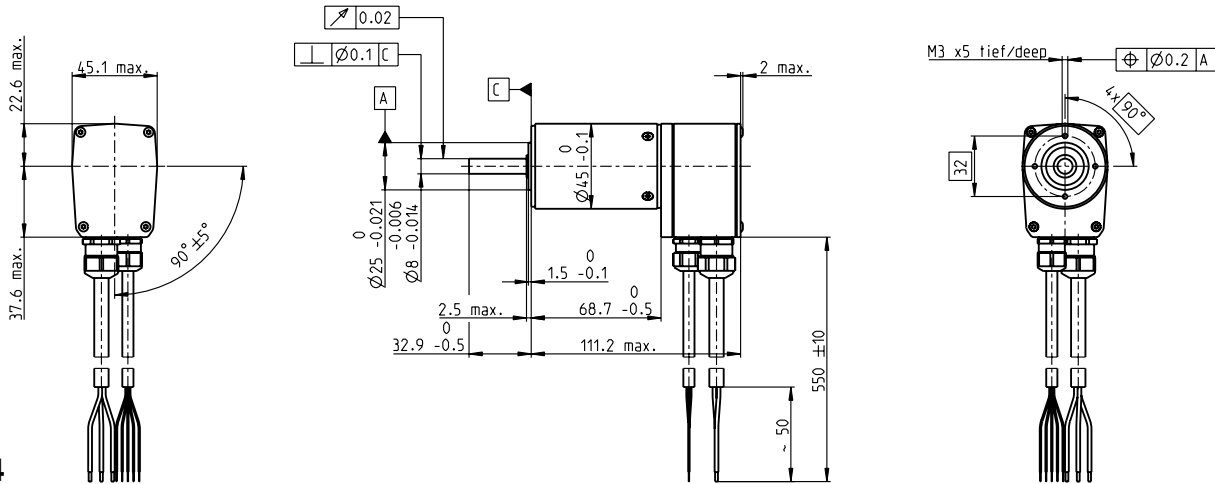
Values listed in the table are nominal.

- Connection motor** (Cable AWG 16)
- red Motor winding 1 Pin 1
  - black Motor winding 2 Pin 2
  - white Motor winding 3 Pin 3
  - N.C. Pin 4
- Connector** Part number  
Molex 39-01-2040
- Connection sensors** (Cable AWG 26)
- yellow Hall sensor 1 Pin 1
  - brown Hall sensor 2 Pin 2
  - grey Hall sensor 3 Pin 3
  - blue GND Pin 4
  - green V<sub>Hall</sub> 3...24 VDC Pin 5
  - N.C. Pin 6
- Connector** Part number  
Molex 430-25-0600  
Wiring diagram for Hall sensors see p. 45



maxon Modular System		Details on catalog page 34																										
<p><b>Planetary Gearhead</b> Ø42 mm 3 - 15 Nm Page 361</p> <p><b>Planetary Gearhead</b> Ø52 mm 4 - 30 Nm Page 366</p>	<p><b>Recommended Electronics:</b> Page 34</p> <table border="0" style="width: 100%;"> <tr><td>ESCON Module 50/5</td><td>455</td></tr> <tr><td>ESCON Mod. 50/4 EC-S</td><td>455</td></tr> <tr><td>ESCON Mod. 50/8 (HE)</td><td>456</td></tr> <tr><td>ESCON 50/5</td><td>457</td></tr> <tr><td>ESCON 70/10</td><td>457</td></tr> <tr><td>DEC Module 50/5</td><td>459</td></tr> <tr><td>EPOS4 50/5</td><td>463</td></tr> <tr><td>EPOS4 Mod./Comp. 50/5</td><td>463</td></tr> <tr><td>EPOS4 Mod./Comp. 50/8</td><td>465</td></tr> <tr><td>EPOS4 Mod./Comp. 50/15</td><td>466</td></tr> <tr><td>EPOS4 70/15</td><td>467</td></tr> <tr><td>EPOS2 P 24/5</td><td>470</td></tr> <tr><td>MAXPOS 50/5</td><td>473</td></tr> </table>	ESCON Module 50/5	455	ESCON Mod. 50/4 EC-S	455	ESCON Mod. 50/8 (HE)	456	ESCON 50/5	457	ESCON 70/10	457	DEC Module 50/5	459	EPOS4 50/5	463	EPOS4 Mod./Comp. 50/5	463	EPOS4 Mod./Comp. 50/8	465	EPOS4 Mod./Comp. 50/15	466	EPOS4 70/15	467	EPOS2 P 24/5	470	MAXPOS 50/5	473	<p><b>Encoder HED_5540</b> 500 CPT, 3 channels Page 441/443</p> <p><b>Resolver Res 26</b> Ø26 mm 10 V Page 450</p> <p><b>Brake AB 32</b> 24 VDC 0.4 Nm Page 493</p>
ESCON Module 50/5	455																											
ESCON Mod. 50/4 EC-S	455																											
ESCON Mod. 50/8 (HE)	456																											
ESCON 50/5	457																											
ESCON 70/10	457																											
DEC Module 50/5	459																											
EPOS4 50/5	463																											
EPOS4 Mod./Comp. 50/5	463																											
EPOS4 Mod./Comp. 50/8	465																											
EPOS4 Mod./Comp. 50/15	466																											
EPOS4 70/15	467																											
EPOS2 P 24/5	470																											
MAXPOS 50/5	473																											

# EC 45 Ø45 mm, brushless, 150 Watt



M 1:4

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

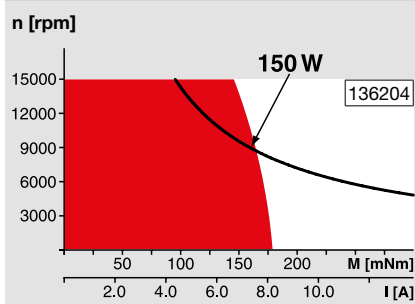
### Motor Data

	136202	136196	136203	136197	136204	136198	136205	136200	136206	136201	
<b>Values at nominal voltage</b>											
1 Nominal voltage	V	12	12	18	18	24	24	36	36	48	48
2 No load speed	rpm	9780	5650	10300	5930	10500	6090	9360	5400	10200	5860
3 No load current	mA	1530	577	1120	419	879	328	471	177	411	154
4 Nominal speed	rpm	8410	4370	9000	4680	9290	4840	8150	4190	8960	4640
5 Nominal torque (max. continuous torque)	mNm	174	186	171	184	169	183	179	191	174	187
6 Nominal current (max. continuous current)	A	16.2	9.65	11.2	6.72	8.55	5.13	5.29	3.14	4.21	2.52
7 Stall torque	mNm	1380	872	1540	931	1600	952	1560	911	1650	962
8 Stall current	A	119	43.6	93.3	32.6	74.8	25.6	43.1	14.5	37.2	12.5
9 Max. efficiency	%	79	79	80	79	80	79	81	80	81	80
<b>Characteristics</b>											
10 Terminal resistance phase to phase	Ω	0.101	0.275	0.193	0.552	0.321	0.936	0.836	2.48	1.29	3.85
11 Terminal inductance phase to phase	mH	0.0266	0.0797	0.0542	0.163	0.0917	0.275	0.263	0.788	0.395	1.19
12 Torque constant	mNm/A	11.5	20	16.5	28.6	21.4	37.1	36.3	62.8	44.5	77.1
13 Speed constant	rpm/V	827	478	579	334	445	257	263	152	214	124
14 Speed/torque gradient	rpm/mNm	7.22	6.58	6.78	6.46	6.67	6.49	6.07	6	6.22	6.18
15 Mechanical time constant	ms	8.99	8.19	8.44	8.05	8.32	8.08	7.56	7.48	7.75	7.7
16 Rotor inertia	gcm <sup>2</sup>	119	119	119	119	119	119	119	119	119	119

### Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	1.9 K/W
18 Thermal resistance winding-housing	0.9 K/W
19 Thermal time constant winding	15.4 s
20 Thermal time constant motor	1600 s
21 Ambient temperature	-20...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	15000 rpm
24 Axial play at axial load < 20 N	0 mm
24 Axial play at axial load > 20 N	max. 0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	16 N
27 Max. force for press fits (static) (static, shaft supported)	182 N
27 Max. force for press fits (static) (static, shaft supported)	5000 N
28 Max. radial load, 5 mm from flange	140 N

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### Other specifications

29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	850 g
Protection to	IP54*

Values listed in the table are nominal.

#### Connection motor (Cable AWG 16)

Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

#### Connection sensors (Cable AWG 24)<sup>1)</sup>

white	Hall sensor 3
brown	Hall sensor 2
green	Hall sensor 1
yellow	GND
grey	V <sub>Hall</sub> 4.5 ... 24 VDC

Wiring diagram for Hall sensors see p. 45

<sup>1)</sup> Not lead through in combination with resolver.

\*Protection level only when installed with flange-side seal.

### maxon Modular System

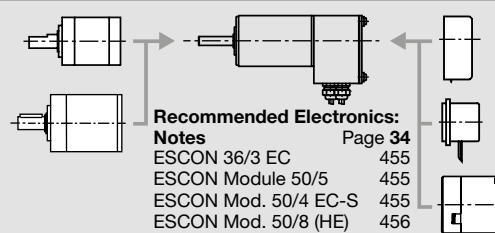
Details on catalog page 34

#### Planetary Gearhead

Ø42 mm  
3 - 15 Nm  
Page 361

#### Planetary Gearhead

Ø52 mm  
4 - 30 Nm  
Page 367



#### Recommended Electronics:

<b>Notes</b>	Page 34
ESCON 36/3 EC	455
ESCON Module 50/5	455
ESCON Mod. 50/4 EC-S	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EEPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 Mod./Comp. 50/15	466
EPOS4 70/15	467
EPOS2 P 24/5	470
MAXPOS 50/5	473

#### Encoder HEDL 9140

500 CPT,  
3 channels  
Page 447

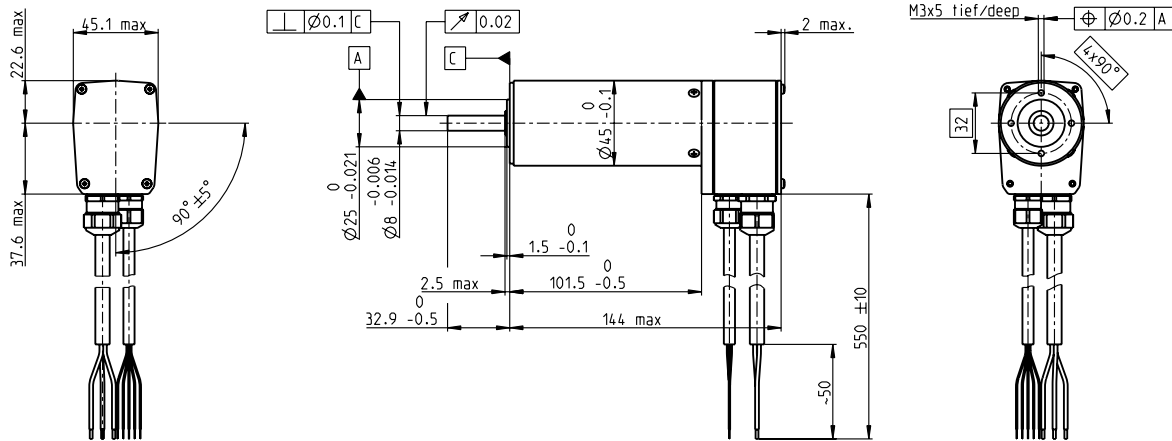
#### Resolver Res 26

Ø26 mm  
10 V  
Page 450

#### Brake AB 28

24 VDC  
0.4 Nm  
Page 492

# EC 45 Ø45 mm, brushless, 250 Watt



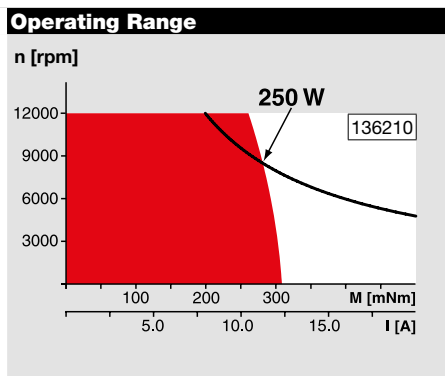
M 1:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers						

Motor Data							
Values at nominal voltage							
1 Nominal voltage	V	24	24	36	36	48	48
2 No load speed	rpm	8670	5000	10400	6010	10700	6160
3 No load current	mA	897	341	834	312	656	244
4 Nominal speed	rpm	7970	4300	9730	5320	10000	5490
5 Nominal torque (max. continuous torque)	mNm	311	331	312	341	316	347
6 Nominal current (max. continuous current)	A	12.5	7.51	10.2	6.21	7.94	4.86
7 Stall torque	mNm	4400	2540	5750	3320	6110	3530
8 Stall current	A	167	55.8	175	58.3	143	47.7
9 Max. efficiency	%	86	85	87	86	87	87
Characteristics							
10 Terminal resistance phase to phase	Ω	0.143	0.43	0.206	0.617	0.336	1.01
11 Terminal inductance phase to phase	mH	0.0565	0.17	0.0883	0.265	0.149	0.448
12 Torque constant	mNm/A	26.3	45.5	32.8	56.9	42.7	73.9
13 Speed constant	rpm/V	364	210	291	168	224	129
14 Speed/torque gradient	rpm/mNm	1.98	1.98	1.82	1.82	1.76	1.76
15 Mechanical time constant	ms	4.34	4.34	3.99	3.99	3.85	3.85
16 Rotor inertia	gcm <sup>2</sup>	209	209	209	209	209	209

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	1.7 K/W
18 Thermal resistance winding-housing	1.1 K/W
19 Thermal time constant winding	31 s
20 Thermal time constant motor	1570 s
21 Ambient temperature	-20...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	12000 rpm
24 Axial play at axial load < 20 N	0 mm
24 Axial play at axial load > 20 N	max. 0.15 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	16 N
27 Max. force for press fits (static) (static, shaft supported)	182 N
27 Max. force for press fits (static) (static, shaft supported)	5000 N
28 Max. radial load, 5 mm from flange	180 N



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	1150 g
Protection to	IP54*

Values listed in the table are nominal.

**Connection motor** (Cable AWG 16)

Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

**Connection sensors** (Cable AWG 24)<sup>1)</sup>

white	Hall sensor 3
brown	Hall sensor 2
green	Hall sensor 1
yellow	GND
grey	V <sub>Hall</sub> 4.5...24 VDC

Wiring diagram for Hall sensors see p. 45

<sup>1)</sup> Not lead through in combination with resolver.

Details on catalog page 34

<p><b>maxon Modular System</b></p> <p><b>Planetary Gearhead</b> Ø42 mm 3 - 15 Nm Page 361</p> <p><b>Planetary Gearhead</b> Ø52 mm 4 - 30 Nm Page 367</p> <p><b>Planetary Gearhead</b> Ø62 mm 8 - 50 Nm Page 368</p>		<p><b>Encoder HEDL 9140</b> 500 CPT, 3 channels Page 447</p> <p><b>Resolver Res 26</b> Ø26 mm 10 V Page 450</p> <p><b>Brake AB 28</b> 24 VDC 0.4 Nm Page 492</p>
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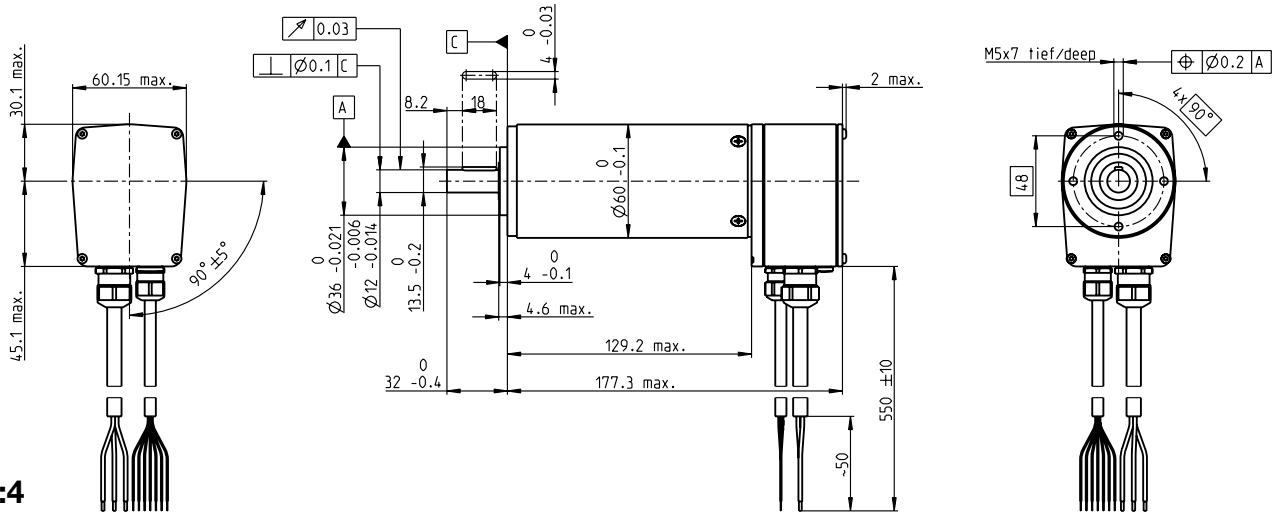
**Recommended Electronics:** Page 34

ESCON Module 50/5	455
ESCON Mod. 50/4 EC-S	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 Mod./Comp. 50/15	466
EPOS4 70/15	467
MAXPOS 50/5	473

\*Protection level only when installed with flange-side seal.

# EC 60 Ø60 mm, brushless, 400 Watt

maxon EC motor



M 1:4

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

167132 167131

## Motor Data

Values at nominal voltage			
1 Nominal voltage	V	48	48
2 No load speed	rpm	5370	3100
3 No load current	mA	670	268
4 Nominal speed	rpm	4960	2680
5 Nominal torque (max. continuous torque)	mNm	768	843
6 Nominal current (max. continuous current)	A	9.56	5.9
7 Stall torque	mNm	11800	6820
8 Stall current	A	139	46.4
9 Max. efficiency	%	87	86
Characteristics			
10 Terminal resistance phase to phase	Ω	0.345	1.03
11 Terminal inductance phase to phase	mH	0.273	0.82
12 Torque constant	mNm/A	84.9	147
13 Speed constant	rpm/V	113	65
14 Speed/torque gradient	rpm/mNm	0.457	0.457
15 Mechanical time constant	ms	3.98	3.98
16 Rotor inertia	gcm <sup>2</sup>	831	831

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	1.3 K/W
18 Thermal resistance winding-housing	0.5 K/W
19 Thermal time constant winding	33.9 s
20 Thermal time constant motor	1200 s
21 Ambient temperature	-20...+100°C
22 Max. winding temperature	+125°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	7000 rpm
24 Axial play at axial load < 30 N	0 mm
> 30 N	max. 0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	24 N
27 Max. force for press fits (static) (static, shaft supported)	392 N
28 Max. radial load, 5 mm from flange	6000 N
	240 N

## Other specifications

29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	2450 g
Protection to	IP54*

Values listed in the table are nominal.

## Connection motor (Cable AWG 16)

Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

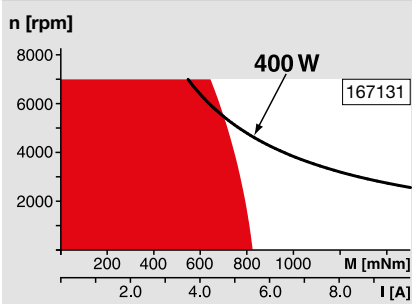
## Connection sensors (Cable AWG 24)<sup>1)</sup>

white	Hall sensor 3
brown	Hall sensor 2
green	Hall sensor 1
yellow	GND
grey	V <sub>Hall</sub> 4.5 ... 24 VDC
blue	Temperature sensor (PTC)
pink	Temperature sensor (PTC)

<sup>1)</sup> Not lead through in combination with resolver.

Temperature monitoring, PTC resistance Micropille  
110°C, R 25°C < 0.7 kΩ, R 115°C ≥ 2.66 kΩ,  
R 125°C ≥ 8.0 kΩ  
Wiring diagram for Hall sensors see p. 45

## Operating Range



## Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

## maxon Modular System

Details on catalog page 34

### Planetary Gearhead

Ø81 mm  
20 - 120 Nm  
Page 369



### Recommended Electronics:

Notes	Page 34
ESCON Mod. 50/4 EC-S	455
ESCON Mod. 50/8 (HE)	456
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 Module 50/8	465
EPOS4 Comp. 50/8 CAN	465
EPOS4 Module 50/15	466
EPOS4 Comp. 50/15 CAN	466
EPOS4 70/15	467
MAXPOS 50/5	473

### Encoder HEDL 9140

500 CPT,  
3 channels  
Page 447

### Resolver Res

Ø26 mm  
10 V  
Page 450

### Brake AB 41

24 VDC  
2.0 Nm  
Page 494

\*Protection level only when installed with flange-side seal.



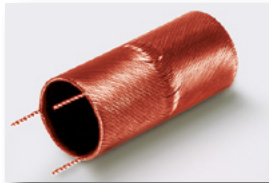


# maxon EC-max

The maxon EC-max program picks up the ideology of the successful A-max motors. The electronically commutated DC motors are based on the same parts platform idea, creating a wide market-oriented range in the modular system with gearheads, sensors and brakes.

<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b>	166-199
<b>ECX SQUARE Program</b>	202
<b>EC Program</b>	204-213
<b>EC-max Program</b>	217-225
<b>EC-4pole Program</b>	229-235
<b>EC-i Program</b>	239-250
<b>EC flat Program</b>	252-273
<b>EC frameless Program</b>	278-283

# maxon EC-max program



The «heart» is the ironless winding, System maxon. This means physically dependent – advantages like no detent, high efficiency and excellent regulating dynamics.



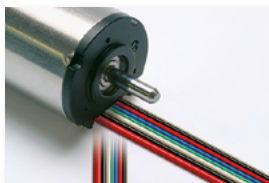
The motor housing, a simple tube made of stainless steel – non magnetic, rigid, rust-proof.



Metallic housing and flange allow good heat dissipation and mechanical stability.



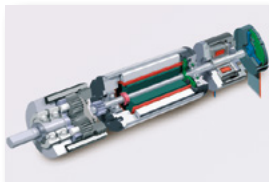
Shaft with no groove guarantees torsional stability and smooth running.



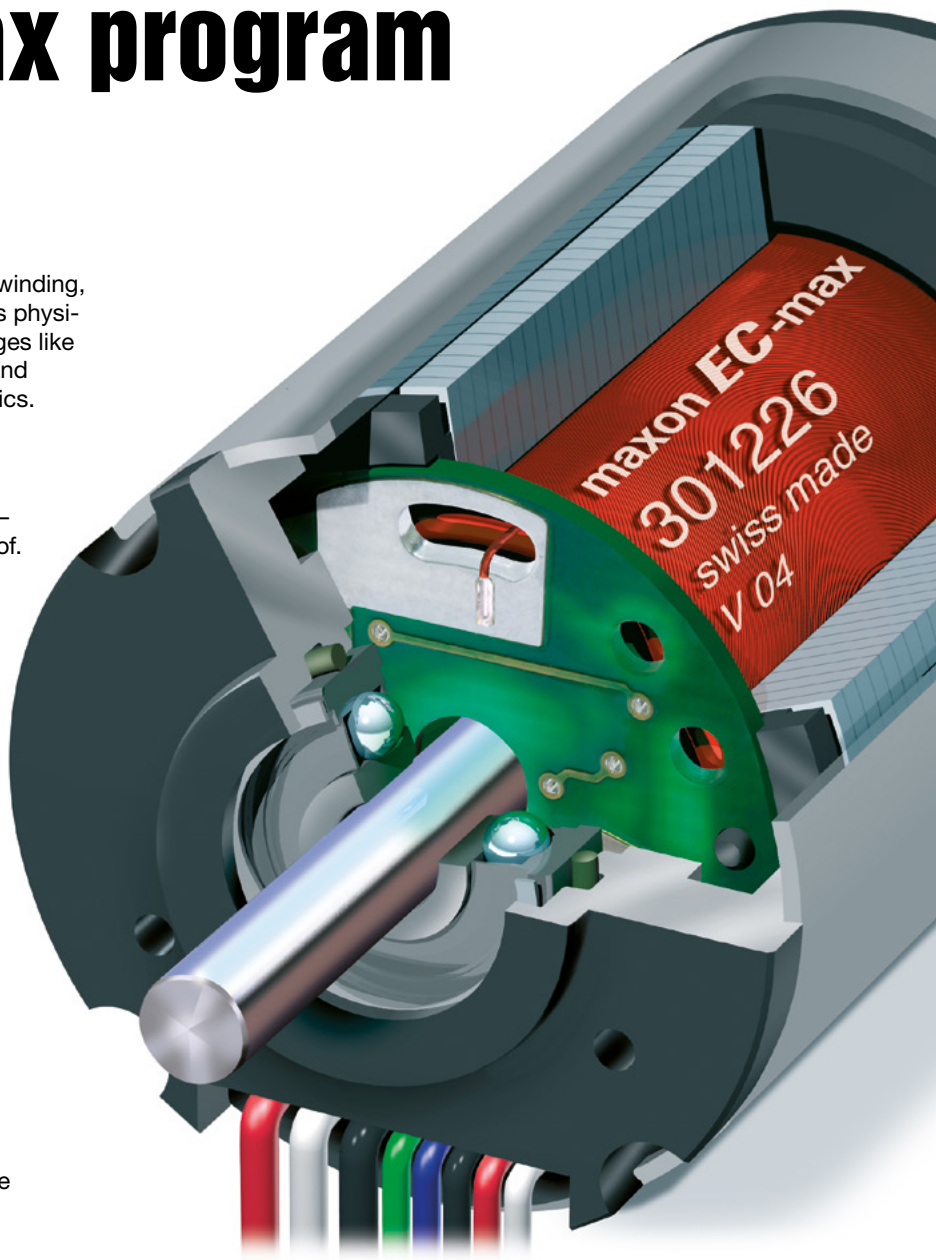
Non-tension cables can be directed both radially and axially from the motor. Wide range of plug options.



High quality, thanks to a process monitored production on the most modern assembly lines which are, in part, developed by maxon.



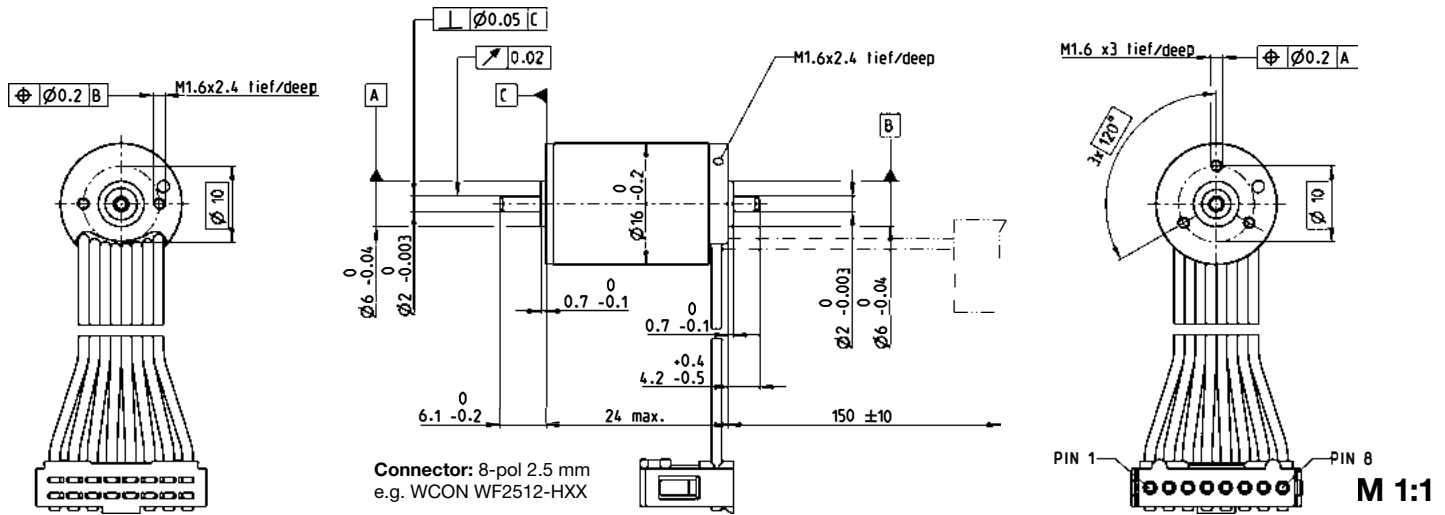
Modular construction with gears, sensors and brakes.



**The modular EC-motor program with an impressive price-performance ratio**



# EC-max 16 Ø16 mm, brushless, 5 Watt



- Stock program
- Standard program
- Special program (on request)

## Part Numbers

283825	283826	283827	283828
--------	--------	--------	--------

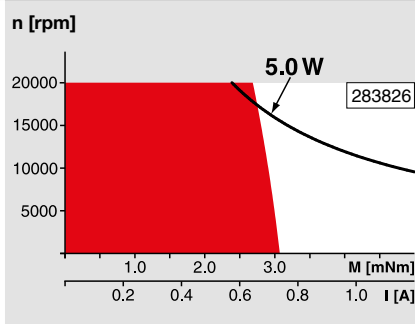
### Motor Data

Values at nominal voltage		4.5	6	9	12
1 Nominal voltage	V	4.5	6	9	12
2 No load speed	rpm	12800	13500	12600	13500
3 No load current	mA	148	120	72.4	60.2
4 Nominal speed	rpm	5170	5690	4920	5840
5 Nominal torque (max. continuous torque)	mNm	3.33	3.2	3.29	3.23
6 Nominal current (max. continuous current)	A	1.18	0.903	0.574	0.456
7 Stall torque	mNm	5.82	5.79	5.64	5.95
8 Stall current	A	1.89	1.49	0.901	0.762
9 Max. efficiency	%	53	53	53	53
Characteristics					
10 Terminal resistance phase to phase	Ω	2.38	4.04	9.99	15.7
11 Terminal inductance phase to phase	mH	0.0396	0.0634	0.163	0.254
12 Torque constant	mNm/A	3.08	3.9	6.26	7.8
13 Speed constant	rpm/V	3100	2450	1530	1220
14 Speed/torque gradient	rpm/mNm	2390	2540	2440	2470
15 Mechanical time constant	ms	10.7	11.4	10.9	11.1
16 Rotor inertia	gcm <sup>2</sup>	0.428	0.428	0.428	0.428

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 23.5 K/W
  - 18 Thermal resistance winding-housing: 2.57 K/W
  - 19 Thermal time constant winding: 0.943 s
  - 20 Thermal time constant motor: 390 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 20000 rpm
  - 24 Axial play at axial load < 1.5 N: 0 mm
  - > 1.5 N: 0.14 mm
  - 25 Radial play: preloaded
  - 26 Max. axial load (dynamic): 1 N
  - 27 Max. force for press fits (static) (static, shaft supported): 18 N
  - 28 Max. radial load, 5 mm from flange: 600 N
  - 6 N

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### Other specifications

- 29 Number of pole pairs: 1
- 30 Number of phases: 3
- 31 Weight of motor: 36 g

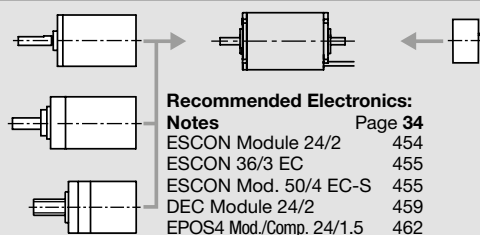
Values listed in the table are nominal.

- Connection (Cable AWG 24)**
- |        |                              |       |
|--------|------------------------------|-------|
| brown  | Motor winding 1              | Pin 1 |
| red    | Motor winding 2              | Pin 2 |
| orange | Motor winding 3              | Pin 3 |
| yellow | V <sub>Hall</sub> 3...24 VDC | Pin 4 |
| green  | GND                          | Pin 5 |
| blue   | Hall sensor 1                | Pin 6 |
| violet | Hall sensor 2                | Pin 7 |
| grey   | Hall sensor 3                | Pin 8 |
- Wiring diagram for Hall sensors see p. 45

### maxon Modular System

Details on catalog page 34

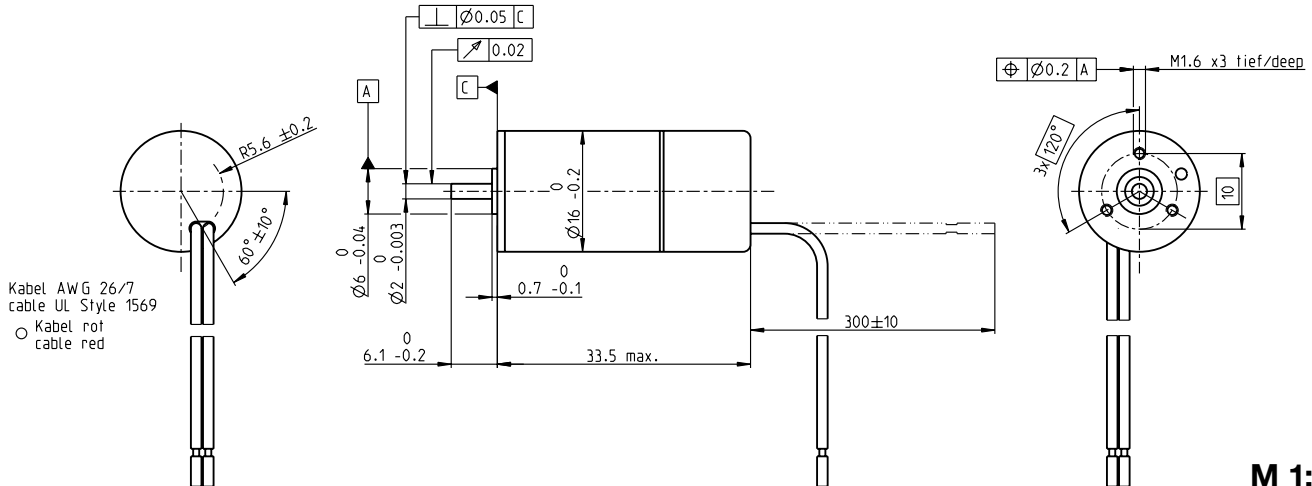
- Planetary Gearhead**  
Ø16 mm  
0.1 - 0.3 Nm  
Page 334
- Planetary Gearhead**  
Ø16 mm  
0.2 - 0.6 Nm  
Page 335
- Screw Drive**  
Ø16 mm  
Page 377-379



**Encoder MR**  
128/256/512 CPT,  
2/3 channels  
Page 431

- Recommended Electronics:**
- |                         |         |
|-------------------------|---------|
| <b>Notes</b>            | Page 34 |
| ESCON Module 24/2       | 454     |
| ESCON 36/3 EC           | 455     |
| ESCON Mod. 50/4 EC-S    | 455     |
| DEC Module 24/2         | 459     |
| EPOS4 Mod./Comp. 24/1.5 | 462     |
| MAXPOS 50/5             | 473     |

# EC-max 16 2-wire $\varnothing 16$ mm, brushless, 5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
	320816	320817	320818	320819

Motor Data		320816	320817	320818	320819	
<b>Values at nominal voltage</b>						
1	Nominal voltage	V	5	6	9	12
2	No load speed	rpm	14200	13400	12600	13800
3	No load current	mA	189	149	97.4	72.7
4	Nominal speed	rpm	8280	7510	6970	8080
5	Nominal torque (max. continuous torque)	mNm	2.19	2.19	2.28	2.26
6	Nominal current (max. continuous current)	A	0.903	0.714	0.465	0.37
7	Stall torque	mNm	4.6	5.25	5.39	5.76
8	Stall current	A	1.7	1.44	0.929	0.801
9	Max. efficiency	%	47.3	46.4	46.2	49
<b>Characteristics</b>						
35	Type of control		controlled	controlled	controlled	controlled
36	Supply voltage +V <sub>CC</sub>	V	5...15	5...15	5...15	5...15
12	Torque constant	mNm/A	3.06	3.87	6.21	7.73
13	Speed constant	rpm/V	3130	2470	1540	1230
14	Speed/torque gradient	rpm/mNm	2440	2580	2480	2510
15	Mechanical time constant	ms	10.9	11.6	11.1	11.3
16	Rotor inertia	gcm <sup>2</sup>	0.428	0.428	0.428	0.428
39	Speed range	rpm	14200-20000	11300-20000	6720-20000	5360-17400

Specifications		
<b>Thermal data</b>		
17	Thermal resistance housing-ambient	23.5 K/W
18	Thermal resistance winding-housing	2.57 K/W
19	Thermal time constant winding	0.943 s
20	Thermal time constant motor	390 s
21	Ambient temperature	-40...+85°C
22	Max. temperature of electronics (max. loading capacity of the motor is defined by the electronics)	+100°C
<b>Mechanical data (preloaded ball bearings)</b>		
23	Max. speed	20000 rpm
24	Axial play at axial load < 1.5 N	0 mm
	> 1.5 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	18 N
28	Max. radial load, 5 mm from flange	6 N

**Other specifications**

31 Weight of motor 32 g  
 Direction of rotation Clockwise (CW)

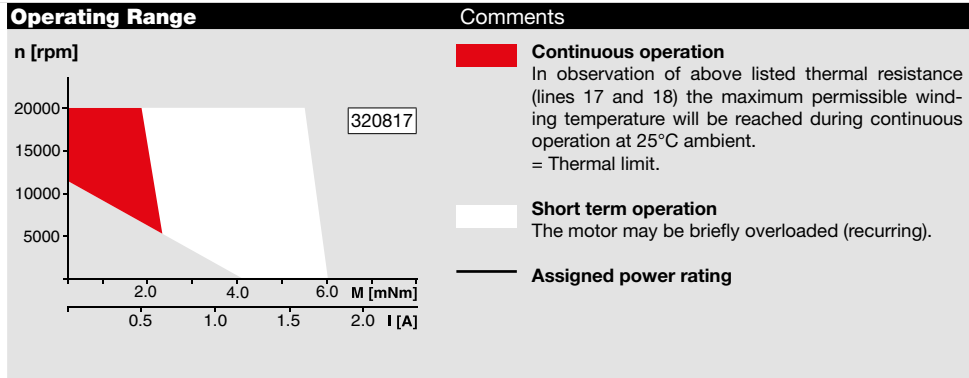
Values listed in the table are nominal.

**Connection** (Cable AWG 26/7 UL Style 1569)  
 red +V<sub>CC</sub>  
 black GND

**Protective functions**  
 Inverse-polarity protection up to max. 18 VDC  
 Blockage protection at speed < 76 rpm  
 Temperature monitoring > 104°C  
 Current limitation 1.6 A ± 15%  
 Low voltage monitoring < 4 VDC

**Attention:** Operating voltage V<sub>CC</sub> > 18 VDC will destroy the electronics

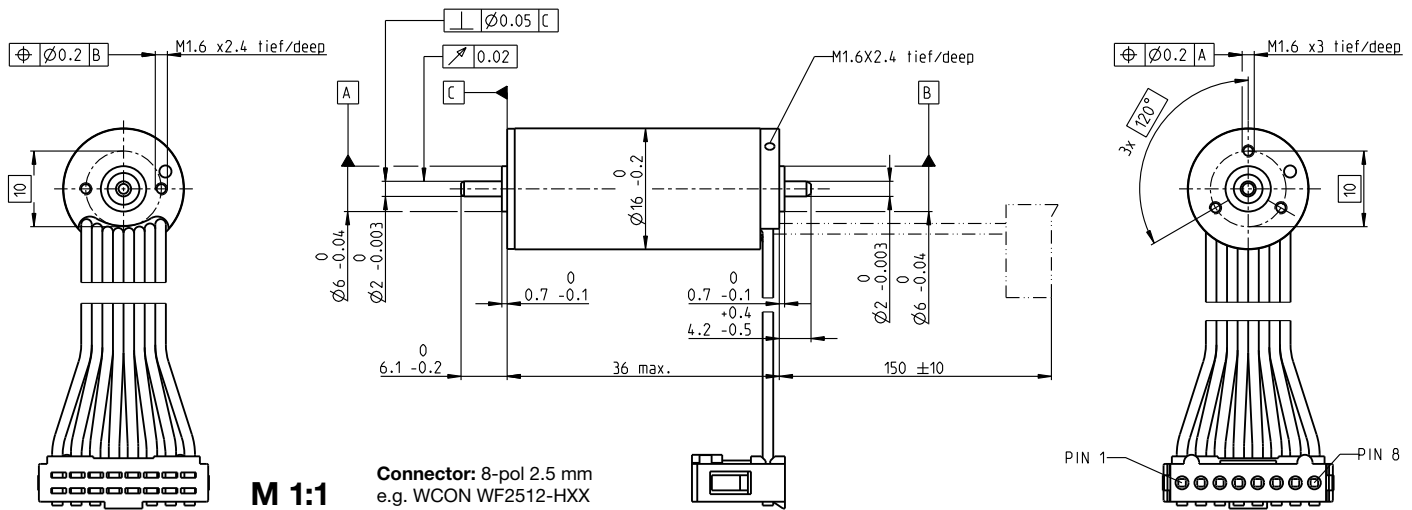
**Option:** Direction of rotation counter-clockwise (CCW)



**maxon Modular System** Details on catalog page 34

**Planetary Gearhead**  
 $\varnothing 16$  mm  
 0.1 - 0.3 Nm  
 Page 334

# EC-max 16 Ø16 mm, brushless, 8 Watt



**M 1:1**

Connector: 8-pol 2.5 mm  
e.g. WCON WF2512-HXX

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

283831	283832	283833	283834	283835
--------	--------	--------	--------	--------

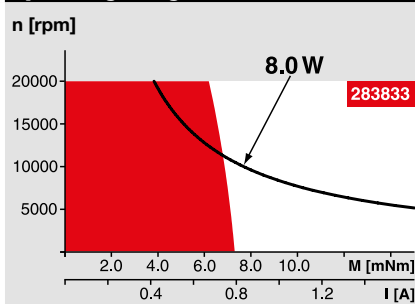
### Motor Data

Values at nominal voltage		6	9	12	18	24
1 Nominal voltage	V	6	9	12	18	24
2 No load speed	rpm	12000	11900	11900	11900	11900
3 No load current	mA	130	85.1	64.2	42.6	31.9
4 Nominal speed	rpm	7120	7090	7300	7170	7350
5 Nominal torque (max. continuous torque)	mNm	7.66	7.8	8.02	7.87	8.19
6 Nominal current (max. continuous current)	A	1.76	1.17	0.909	0.593	0.461
7 Stall torque	mNm	19.2	19.8	21.1	20.3	22
8 Stall current	A	4.17	2.82	2.27	1.45	1.17
9 Max. efficiency	%	69	69	70	70	71
Characteristics						
10 Terminal resistance phase to phase	Ω	1.44	3.19	5.3	12.4	20.5
11 Terminal inductance phase to phase	mH	0.034	0.079	0.14	0.317	0.566
12 Torque constant	mNm/A	4.61	7.02	9.32	14	18.7
13 Speed constant	rpm/V	2070	1360	1020	681	510
14 Speed/torque gradient	rpm/mNm	646	619	582	602	556
15 Mechanical time constant	ms	5.75	5.51	5.18	5.36	4.95
16 Rotor inertia	gcm <sup>2</sup>	0.85	0.85	0.85	0.85	0.85

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 17.7 K/W
  - 18 Thermal resistance winding-housing: 1.41 K/W
  - 19 Thermal time constant winding: 0.9 s
  - 20 Thermal time constant motor: 427 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 20000 rpm
  - 24 Axial play at axial load < 1.5 N: 0 mm
  - > 1.5 N: 0.14 mm
  - 25 Radial play: preloaded
  - 26 Max. axial load (dynamic): 1 N
  - 27 Max. force for press fits (static) (static, shaft supported): 18 N
  - 28 Max. radial load, 5 mm from flange: 400 N
  - 6 N

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### Other specifications

- 29 Number of pole pairs: 1
- 30 Number of phases: 3
- 31 Weight of motor: 52 g

Values listed in the table are nominal.

- Connection (Cable AWG 24)**
- |        |                              |       |
|--------|------------------------------|-------|
| brown  | Motor winding 1              | Pin 1 |
| red    | Motor winding 2              | Pin 2 |
| orange | Motor winding 3              | Pin 3 |
| yellow | V <sub>Hall</sub> 3...24 VDC | Pin 4 |
| green  | GND                          | Pin 5 |
| blue   | Hall sensor 1                | Pin 6 |
| violet | Hall sensor 2                | Pin 7 |
| grey   | Hall sensor 3                | Pin 8 |
- Wiring diagram for Hall sensors see p. 45

### maxon Modular System

Details on catalog page 34

#### Planetary Gearhead

Ø16 mm  
0.2 - 0.6 Nm  
Page 335

#### Planetary Gearhead

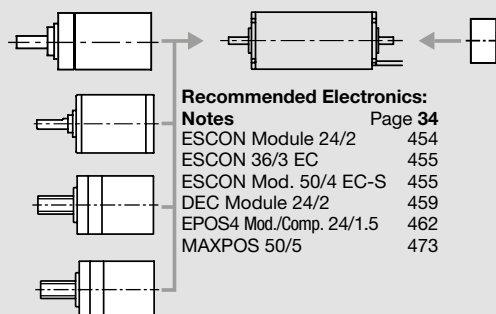
Ø22 mm  
0.5 - 2.0 Nm  
Page 342

#### Screw Drive

Ø16 mm  
Page 377-379

#### Screw Drive

Ø22 mm  
Page 380/381

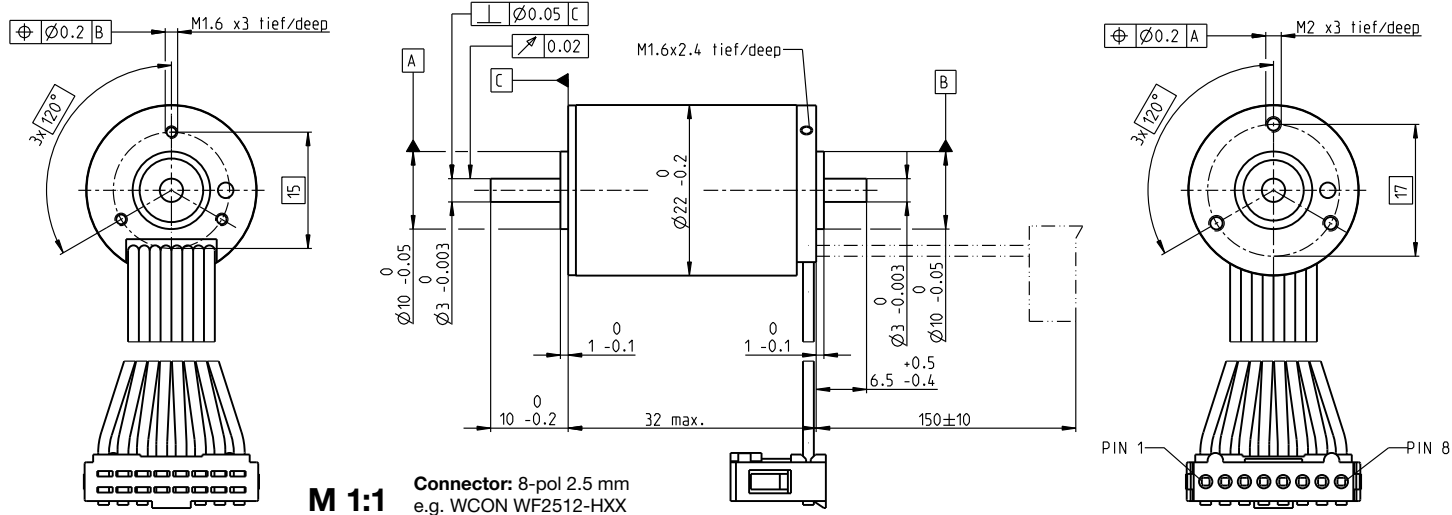


#### Recommended Electronics:

- Notes** Page 34
- ESCON Module 24/2: 454
  - ESCON 36/3 EC: 455
  - ESCON Mod. 50/4 EC-S: 455
  - DEC Module 24/2: 459
  - EPOS4 Mod./Comp. 24/1.5: 462
  - MAXPOS 50/5: 473

**Encoder MR**  
128/256/512 CPT,  
2/3 channels  
Page 431

# EC-max 22 Ø22 mm, brushless, 12 Watt



**M 1:1** Connector: 8-pol 2.5 mm  
e.g. WCON WF2512-HXX

- Stock program
- Standard program
- Special program (on request)

Part Numbers					
283837	283838	283839	283840	283841	

## Motor Data

Values at nominal voltage						
1 Nominal voltage	V	6	12	18	24	36
2 No load speed	rpm	11900	12100	12100	12100	12100
3 No load current	mA	301	155	103	77.3	51.6
4 Nominal speed	rpm	7920	8040	8250	8250	8210
5 Nominal torque (max. continuous torque)	mNm	11	10.2	10.9	10.8	10.6
6 Nominal current (max. continuous current)	A	2.61	1.25	0.88	0.657	0.432
7 Stall torque	mNm	33.9	31.3	35.4	35.1	34.1
8 Stall current	A	7.36	3.47	2.6	1.94	1.25
9 Max. efficiency	%	65	63	65	65	65
Characteristics						
10 Terminal resistance phase to phase	Ω	0.816	3.46	6.93	12.4	28.7
11 Terminal inductance phase to phase	mH	0.0315	0.121	0.275	0.488	1.09
12 Torque constant	mNm/A	4.61	9.02	13.6	18.1	27.2
13 Speed constant	rpm/V	2070	1060	701	526	352
14 Speed/torque gradient	rpm/mNm	366	406	356	360	372
15 Mechanical time constant	ms	8.63	9.56	8.39	8.47	8.75
16 Rotor inertia	gcm <sup>2</sup>	2.25	2.25	2.25	2.25	2.25

## Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 13.5 K/W
  - 18 Thermal resistance winding-housing: 1.72 K/W
  - 19 Thermal time constant winding: 1.85 s
  - 20 Thermal time constant motor: 567 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 18000 rpm
  - 24 Axial play at axial load < 4 N: 0 mm
  - > 4 N: 0.14 mm
  - 25 Radial play preloaded: 3.5 N
  - 26 Max. axial load (dynamic): 53 N
  - 27 Max. force for press fits (static) (static, shaft supported): 1400 N
  - 28 Max. radial load, 5 mm from flange: 16 N

## Other specifications

- 29 Number of pole pairs: 1
- 30 Number of phases: 3
- 31 Weight of motor: 83 g

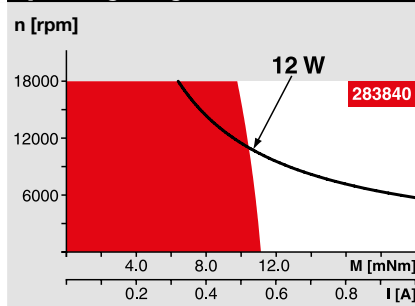
Values listed in the table are nominal.

**Connection** (Cable AWG 24)

brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V <sub>Hall</sub> 3...24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 45

## Operating Range



## Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

## maxon Modular System

Details on catalog page 34

### Planetary Gearhead

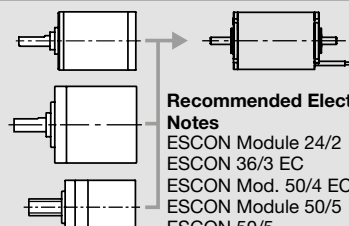
Ø22 mm  
0.5 - 3.4 Nm  
Page 342/343

### Koaxdrive

Ø32 mm  
1.0 - 4.5 Nm  
Page 359

### Screw Drive

Ø22 mm  
Page 380/381



### Recommended Electronics:

<b>Notes</b>	Page 34
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
ESCON Module 50/5	455
ESCON 50/5	457
DEC Module 24/2	459
DEC Module 50/5	459
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

### Encoder MR

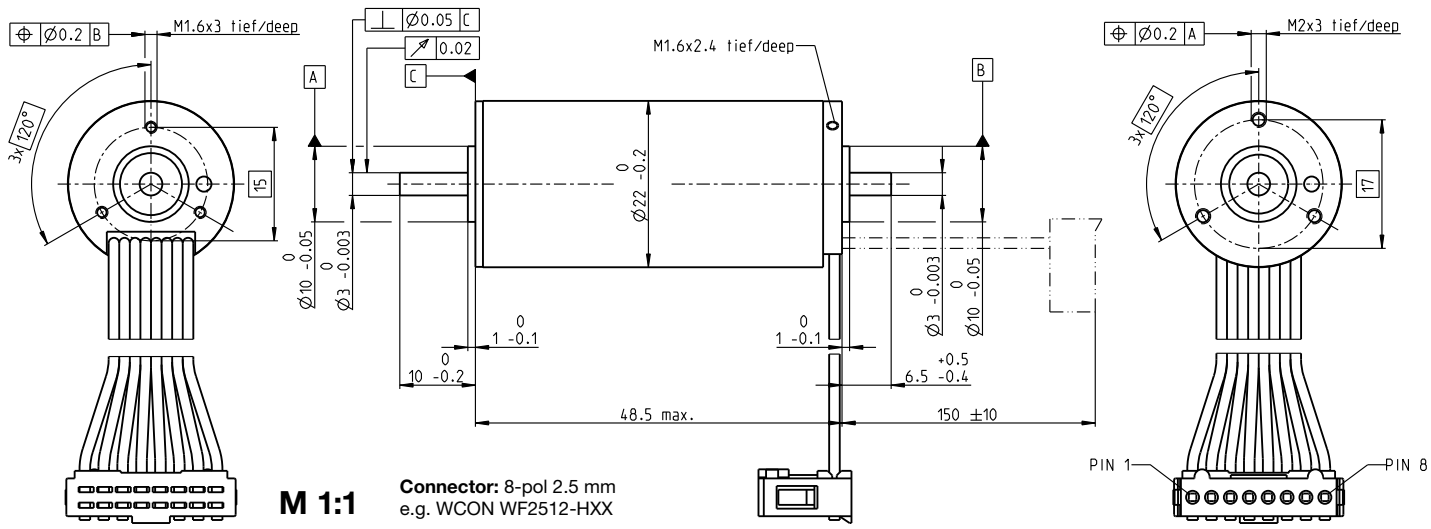
128/256/512 CPT,  
2/3 channels  
Page 431

### Brake AB 20

24 VDC  
0.1 Nm  
Page 488

# EC-max 22 Ø22 mm, brushless, 25 Watt

maxon EC-max



**M 1:1** Connector: 8-pol 2.5 mm e.g. WCON WF2512-HXX

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

283856	283857	283858	283859	283860
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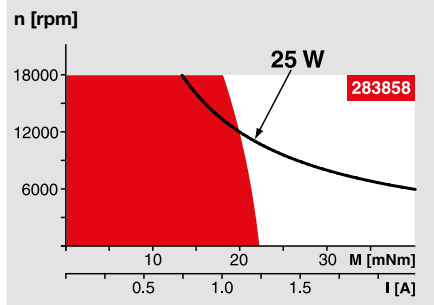
### Motor Data

Values at nominal voltage		12	18	24	36	48
1 Nominal voltage	V	12	18	24	36	48
2 No load speed	rpm	12400	12900	12900	12200	12900
3 No load current	mA	226	161	121	73.5	60.4
4 Nominal speed	rpm	9800	10300	10400	9630	10500
5 Nominal torque (max. continuous torque)	mNm	23	21.8	22.7	22.5	23.2
6 Nominal current (max. continuous current)	A	2.71	1.8	1.4	0.872	0.716
7 Stall torque	mNm	114	112	121	111	127
8 Stall current	A	12.6	8.55	6.97	4	3.66
9 Max. efficiency	%	76	75	76	75	77
<b>Characteristics</b>						
10 Terminal resistance phase to phase	Ω	0.955	2.1	3.44	9.01	13.1
11 Terminal inductance phase to phase	mH	0.05	0.103	0.182	0.462	0.729
12 Torque constant	mNm/A	9.1	13	17.4	27.7	34.8
13 Speed constant	rpm/V	1050	732	549	345	274
14 Speed/torque gradient	rpm/mNm	110	118	109	112	103
15 Mechanical time constant	ms	5.14	5.5	5.06	5.23	4.82
16 Rotor inertia	gcm <sup>2</sup>	4.45	4.45	4.45	4.45	4.45

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 10.2 K/W
  - 18 Thermal resistance winding-housing: 1.02 K/W
  - 19 Thermal time constant winding: 1.99 s
  - 20 Thermal time constant motor: 628 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 18000 rpm
  - 24 Axial play at axial load < 4 N: 0 mm
  - > 4 N: 0.14 mm
  - 25 Radial play preloaded: 3.5 N
  - 26 Max. axial load (dynamic): 60 N
  - 27 Max. force for press fits (static, shaft supported): 1000 N
  - 28 Max. radial load, 5 mm from flange: 16 N

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### Other specifications

- 29 Number of pole pairs: 1
- 30 Number of phases: 3
- 31 Weight of motor: 110 g

Values listed in the table are nominal.

**Connection** (Cable AWG 24)

brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V <sub>hall</sub> 3...24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

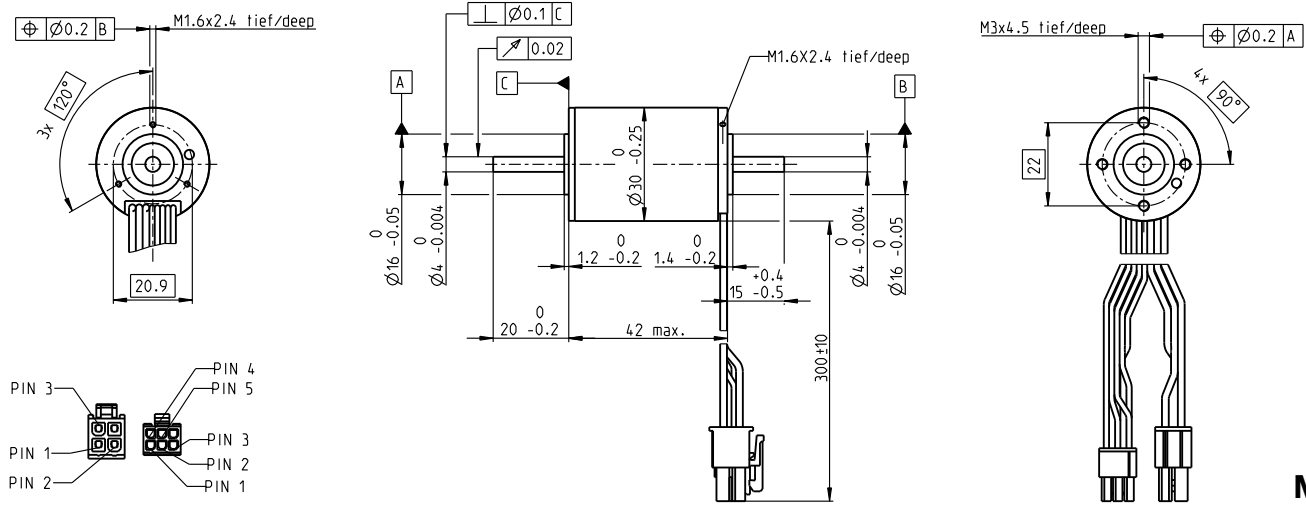
Wiring diagram for Hall sensors see p. 45

### maxon Modular System

Details on catalog page 34

<p><b>Planetary Gearhead</b> Ø22 mm 0.5 - 3.4 Nm Page 340/343</p> <p><b>Planetary Gearhead</b> Ø32 mm 1.0 - 6.0 Nm Page 353</p> <p><b>Koaxdrive</b> Ø32 mm 1.0 - 4.5 Nm Page 359</p> <p><b>Screw Drive</b> Ø32 mm Page 382-387</p>		<p><b>Encoder MR</b> 128/256/512 CPT, 2/3 channels Page 431</p> <p><b>Brake AB 20</b> 24 VDC 0.1 Nm Page 488</p> <p><b>Recommended Electronics:</b> Page 34</p> <p><b>Notes</b></p> <table border="0"> <tr><td>ESCON Module 24/2</td><td>454</td></tr> <tr><td>ESCON 36/3 EC</td><td>455</td></tr> <tr><td>ESCON Mod. 50/4 EC-S</td><td>455</td></tr> <tr><td>ESCON Module 50/5</td><td>455</td></tr> <tr><td>ESCON 50/5</td><td>457</td></tr> <tr><td>DEC Module 24/2</td><td>459</td></tr> <tr><td>DEC Module 50/5</td><td>459</td></tr> <tr><td>EPOS4 Mod./Comp. 24/1.5</td><td>462</td></tr> <tr><td>EPOS4 50/5</td><td>463</td></tr> <tr><td>EPOS4 Mod./Comp. 50/5</td><td>463</td></tr> <tr><td>EPOS2 P 24/5</td><td>470</td></tr> <tr><td>MAXPOS 50/5</td><td>473</td></tr> </table>	ESCON Module 24/2	454	ESCON 36/3 EC	455	ESCON Mod. 50/4 EC-S	455	ESCON Module 50/5	455	ESCON 50/5	457	DEC Module 24/2	459	DEC Module 50/5	459	EPOS4 Mod./Comp. 24/1.5	462	EPOS4 50/5	463	EPOS4 Mod./Comp. 50/5	463	EPOS2 P 24/5	470	MAXPOS 50/5	473
ESCON Module 24/2	454																									
ESCON 36/3 EC	455																									
ESCON Mod. 50/4 EC-S	455																									
ESCON Module 50/5	455																									
ESCON 50/5	457																									
DEC Module 24/2	459																									
DEC Module 50/5	459																									
EPOS4 Mod./Comp. 24/1.5	462																									
EPOS4 50/5	463																									
EPOS4 Mod./Comp. 50/5	463																									
EPOS2 P 24/5	470																									
MAXPOS 50/5	473																									

# EC-max 30 Ø30 mm, brushless, 40 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

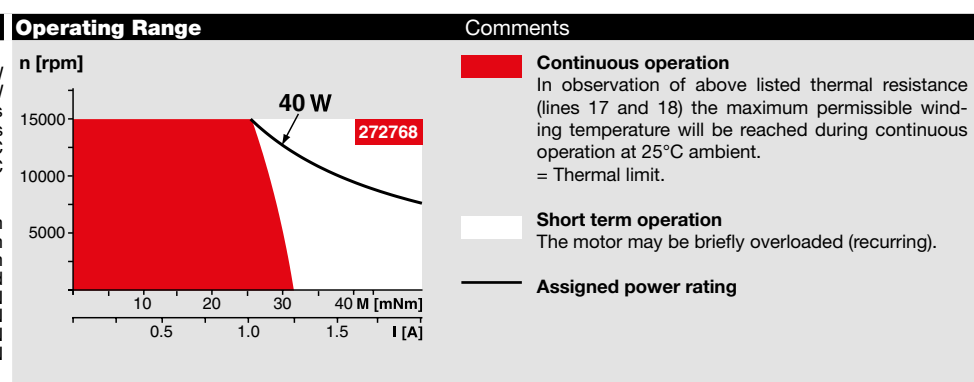
272766	272768	272769	272770
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Motor Data					
Values at nominal voltage					
1 Nominal voltage	V	12	24	36	48
2 No load speed	rpm	8680	9250	9150	9250
3 No load current	mA	223	123	80.5	61.4
4 Nominal speed	rpm	6630	7220	7090	7210
5 Nominal torque (max. continuous torque)	mNm	34.9	33.8	33.3	33.4
6 Nominal current (max. continuous current)	A	2.88	1.49	0.97	0.738
7 Stall torque	mNm	153	160	154	157
8 Stall current	A	11.8	6.57	4.18	3.24
9 Max. efficiency	%	75	75	75	75
Characteristics					
10 Terminal resistance phase to phase	Ω	1.01	3.65	8.61	14.8
11 Terminal inductance phase to phase	mH	0.088	0.31	0.713	1.24
12 Torque constant	mNm/A	12.9	24.3	36.8	48.6
13 Speed constant	rpm/V	738	393	259	197
14 Speed/torque gradient	rpm/mNm	57.8	59.1	60.6	59.9
15 Mechanical time constant	ms	6.66	6.81	6.98	6.9
16 Rotor inertia	gcm <sup>2</sup>	11	11	11	11

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	8.6 K/W
18 Thermal resistance winding-housing	1 K/W
19 Thermal time constant winding	3.25 s
20 Thermal time constant motor	777 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	15000 rpm
24 Axial play at axial load < 6.0 N	0 mm
> 6.0 N	0.14 mm
25 Radial play preloaded	5 N
26 Max. axial load (dynamic)	98 N
27 Max. force for press fits (static) (static, shaft supported)	2000 N
28 Max. radial load, 5 mm from flange	25 N
Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	195 g

Values listed in the table are nominal.

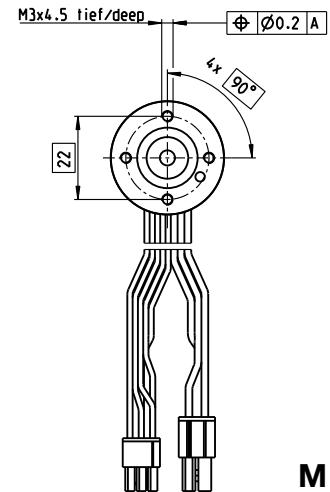
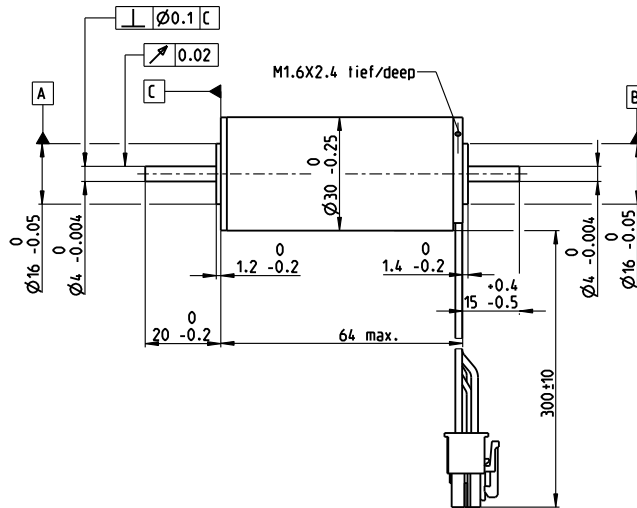
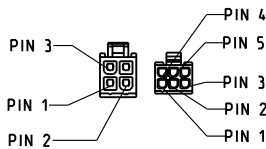
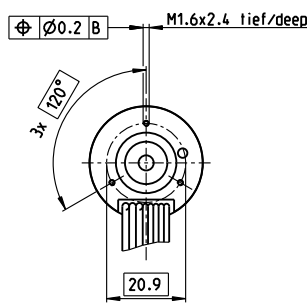
- Connection motor** (Cable AWG 20)
- red Motor winding 1 Pin 1
  - black Motor winding 2 Pin 2
  - white Motor winding 3 Pin 3
  - N.C. N.C. Pin 4
- Connector Part number**
- Molex 39-01-2040
- Connection sensors** (Cable AWG 26)
- yellow Hall sensor 1 Pin 1
  - brown Hall sensor 2 Pin 2
  - grey Hall sensor 3 Pin 3
  - blue GND Pin 4
  - green V<sub>Hall</sub> 3...24 VDC Pin 5
  - N.C. N.C. Pin 6
- Connector Part number**
- Molex 430-25-0600
- Wiring diagram for Hall sensors see p. 45



maxon Modular System		Details on catalog page 34	
<p><b>Planetary Gearhead</b></p> <p>Ø32 mm 1.0 - 8.0 Nm Page 353/356</p> <p><b>Koaxdrive</b></p> <p>Ø32 mm 1.0 - 4.5 Nm Page 359</p> <p><b>Screw Drive</b></p> <p>Ø32 mm Page 382-387</p>		<p><b>Recommended Electronics:</b></p> <p><b>Notes</b> Page 34</p> <ul style="list-style-type: none"> <li>ESCON Module 24/2 454</li> <li>ESCON 36/3 EC 455</li> <li>ESCON Mod. 50/4 EC-S 455</li> <li>ESCON Module 50/5 455</li> <li>ESCON 50/5 457</li> <li>DEC Module 24/2 459</li> <li>DEC Module 50/5 459</li> <li>EPOS4 Mod./Comp. 24/1.5 462</li> <li>EPOS4 50/5 463</li> <li>EPOS4 Mod./Comp. 50/5 463</li> <li>EPOS2 P 24/5 470</li> <li>MAXPOS 50/5 473</li> </ul>	<p><b>Encoder MR</b></p> <p>500/1000 CPT, 3 channels Page 432</p> <p><b>Encoder HEDL 5540</b></p> <p>500 CPT, 3 channels Page 444</p> <p><b>Brake AB 20</b></p> <p>24 VDC 0.1 Nm Page 488</p>

# EC-max 30 Ø30 mm, brushless, 60 Watt

maxon EC-max



M 1:2

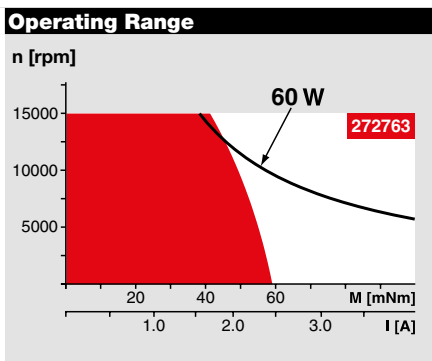
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

272762	272763	272764	272765
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Motor Data						
Values at nominal voltage						
1 Nominal voltage	V	12	24	36	48	
2 No load speed	rpm	7980	9340	9490	9350	
3 No load current	mA	302	191	130	95.4	
4 Nominal speed	rpm	6590	8040	8270	8130	
5 Nominal torque (max. continuous torque)	mNm	63.6	60.7	63.7	64.1	
6 Nominal current (max. continuous current)	A	4.72	2.66	1.88	1.4	
7 Stall torque	mNm	381	458	522	519	
8 Stall current	A	26.8	18.8	14.5	10.7	
9 Max. efficiency	%	80	81	82	82	
Characteristics						
10 Terminal resistance phase to phase	Ω	0.447	1.27	2.48	4.49	
11 Terminal inductance phase to phase	mH	0.049	0.143	0.312	0.573	
12 Torque constant	mNm/A	14.2	24.3	35.9	48.6	
13 Speed constant	rpm/V	672	393	266	197	
14 Speed/torque gradient	rpm/mNm	21.2	20.6	18.4	18.2	
15 Mechanical time constant	ms	4.86	4.73	4.21	4.17	
16 Rotor inertia	gcm <sup>2</sup>	21.9	21.9	21.9	21.9	

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	7.4 K/W
18 Thermal resistance winding-housing	0.5 K/W
19 Thermal time constant winding	2.76 s
20 Thermal time constant motor	1000 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	15000 rpm
24 Axial play at axial load < 6.0 N	0 mm
> 6.0 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	5 N
27 Max. force for press fits (static) (static, shaft supported)	98 N
28 Max. radial load, 5 mm from flange	1300 N
	25 N



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	305 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector		
Molex	Part number	
	39-01-2040	

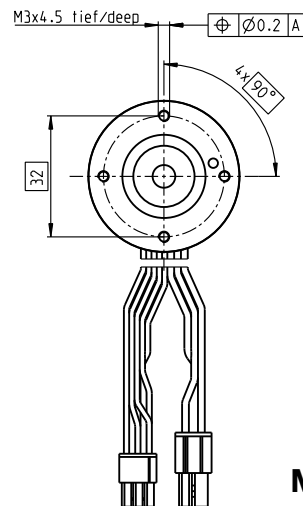
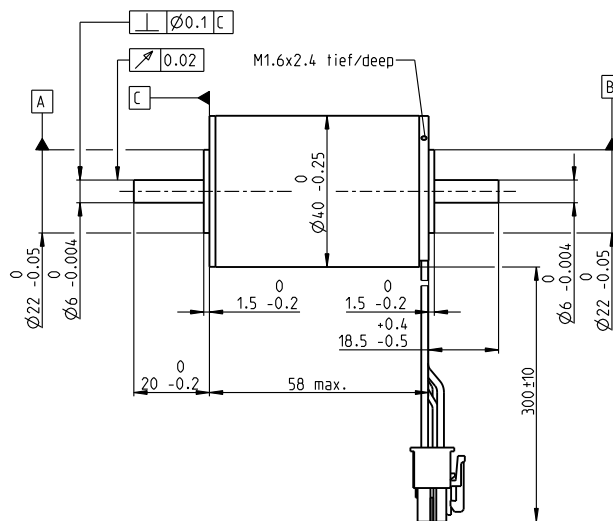
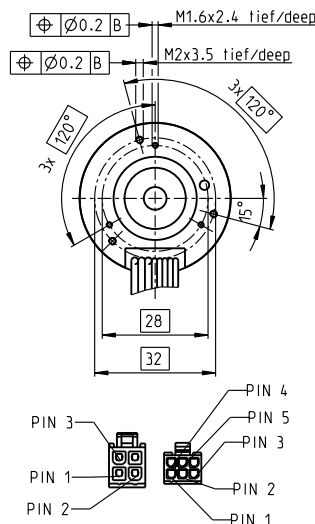
Connection sensors (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 3...24 VDC	Pin 5
	N.C.	Pin 6

Connector	
Molex	Part number
	430-25-0600

Wiring diagram for Hall sensors see p. 45

maxon Modular System		Details on catalog page 34	
<b>Planetary Gearhead</b> Ø32 mm 1.0 - 8.0 Nm Page 353/356	<b>Koaxdrive</b> Ø32 mm 1.0 - 4.5 Nm Page 359	<b>Planetary Gearhead</b> Ø42 mm 3 - 15 Nm Page 362	<b>Encoder MR</b> 128 - 1000 CPT, 3 channels Page 432  <b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 444  <b>Brake AB 20</b> 24 VDC 0.1 Nm Page 488
<b>Recommended Electronics:</b>		<b>Notes</b>	
ESCON 36/3 EC 455 ESCON Mod. 50/4 EC-S 455 ESCON Module 50/5 455 ESCON 50/5 457 DEC Module 50/5 459 EPOS4 50/5 463 EPOS4 Mod./Comp. 50/5 463 EPOS2 P 24/5 470 MAXPOS 50/5 473		Page 34	

# EC-max 40 Ø40 mm, brushless, 70 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

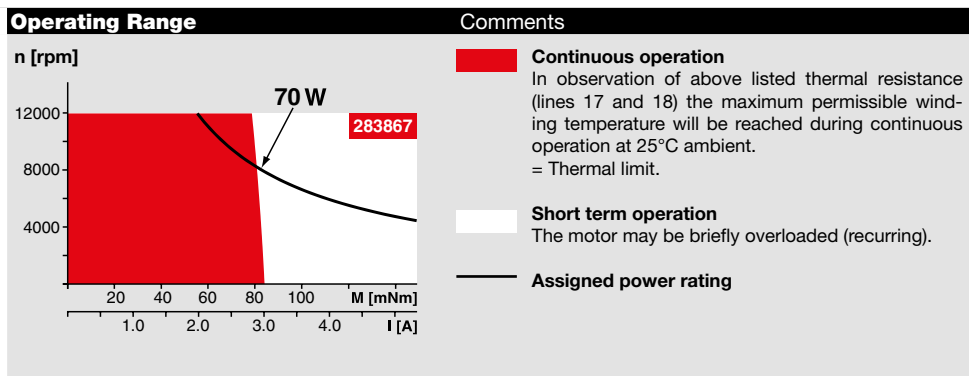
283866	283867	283868	283869
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Motor Data					
Values at nominal voltage					
1 Nominal voltage	V	12	24	36	48
2 No load speed	rpm	8030	8040	8470	9030
3 No load current	mA	584	292	209	173
4 Nominal speed	rpm	6410	6520	7030	7610
5 Nominal torque (max. continuous torque)	mNm	89.7	89.6	95	94.2
6 Nominal current (max. continuous current)	A	6.88	3.44	2.55	2.02
7 Stall torque	mNm	466	497	595	636
8 Stall current	A	33.3	17.8	14.9	12.7
9 Max. efficiency	%	76	77	78	79
Characteristics					
10 Terminal resistance phase to phase	Ω	0.36	1.35	2.42	3.78
11 Terminal inductance phase to phase	mH	0.0464	0.186	0.379	0.592
12 Torque constant	mNm/A	14	28	40	50
13 Speed constant	rpm/V	682	341	239	191
14 Speed/torque gradient	rpm/mNm	17.6	16.5	14.4	14.4
15 Mechanical time constant	ms	9.41	8.82	7.74	7.73
16 Rotor inertia	gcm <sup>2</sup>	51.2	51.2	51.2	51.2

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	4.63 K/W
18 Thermal resistance winding-housing	0.542 K/W
19 Thermal time constant winding	3.78 s
20 Thermal time constant motor	1060 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	12000 rpm
24 Axial play at axial load < 10 N	0 mm
> 10 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	8 N
27 Max. force for press fits (static) (static, shaft supported)	211 N
28 Max. radial load, 5 mm from flange	5000 N
80 N	
Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	460 g

Values listed in the table are nominal.

- Connection motor** (Cable AWG 20)
- red Motor winding 1 Pin 1
  - black Motor winding 2 Pin 2
  - white Motor winding 3 Pin 3
  - N.C. N.C. Pin 4
- Connector** Part number  
Molex 39-01-2040
- Connection sensor** (Cable AWG 26)
- yellow Hall sensor 1 Pin 1
  - brown Hall sensor 2 Pin 2
  - grey Hall sensor 3 Pin 3
  - blue GND Pin 4
  - green V<sub>Hall</sub> 3...24 VDC Pin 5
  - N.C. N.C. Pin 6
- Connector** Part number  
Molex 430-25-0600
- Wiring diagram for Hall sensors see p. 45



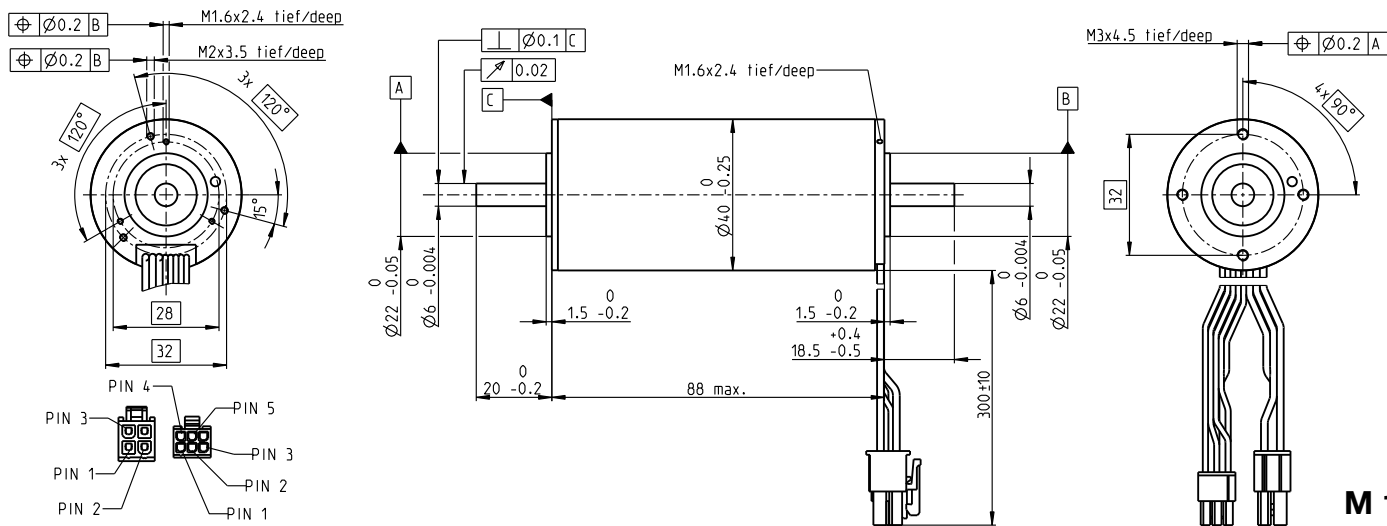
## maxon Modular System Details on catalog page 34

<p><b>Planetary Gearhead</b></p> <p>Ø42 mm 3 - 15 Nm Page 362</p>	<p><b>Recommended Electronics:</b></p> <p><b>Notes</b> Page 34</p> <ul style="list-style-type: none"> <li>ESCON 36/3 EC 455</li> <li>ESCON Module 50/5 455</li> <li>ESCON Mod. 50/4 EC-S 455</li> <li>ESCON Mod. 50/8 (HE) 456</li> <li>ESCON 50/5 457</li> <li>ESCON 70/10 457</li> <li>DEC Module 50/5 459</li> <li>EPOS4 50/5 463</li> <li>EPOS4 Mod./Comp. 50/5 463</li> <li>EPOS4 Mod./Comp. 50/8 465</li> <li>EPOS4 70/15 467</li> <li>EPOS2 P 24/5 470</li> <li>MAXPOS 50/5 473</li> </ul>	<p><b>Encoder MR</b></p> <p>256 - 1024 CPT, 3 channels Page 433</p> <p><b>Encoder HEDL 5540</b></p> <p>500 CPT, 3 channels Page 444</p> <p><b>Brake AB 28</b></p> <p>24 VDC 0.4 Nm Page 490</p>
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# EC-max 40 Ø40 mm, brushless, 120 Watt

maxon EC-max



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

283870	283871	283872	283873
--------	--------	--------	--------

Motor Data					
Values at nominal voltage					
1 Nominal voltage	V	48	48	48	48
2 No load speed	rpm	10100	7240	4720	3610
3 No load current	mA	310	188	104	72.8
4 Nominal speed	rpm	9250	6280	3770	2670
5 Nominal torque (max. continuous torque)	mNm	170	185	203	211
6 Nominal current (max. continuous current)	A	4.06	3.1	2.19	1.74
7 Stall torque	mNm	2090	1490	1050	838
8 Stall current	A	46.7	23.7	10.9	6.68
9 Max. efficiency	%	85	83	82	80
Characteristics					
10 Terminal resistance phase to phase	Ω	1.03	2.02	4.4	7.19
11 Terminal inductance phase to phase	mH	0.204	0.4	0.937	1.6
12 Torque constant	mNm/A	44.8	62.8	96.1	126
13 Speed constant	rpm/V	213	152	99.4	76.1
14 Speed/torque gradient	rpm/mNm	4.89	4.9	4.55	4.35
15 Mechanical time constant	ms	5.17	5.19	4.81	4.61
16 Rotor inertia	gcm <sup>2</sup>	101	101	101	101

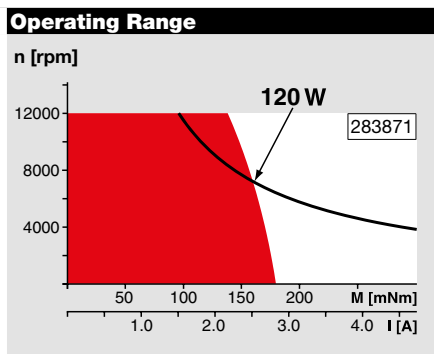
### Specifications

**Thermal data**

17 Thermal resistance housing-ambient	3.45 K/W
18 Thermal resistance winding-housing	0.29 K/W
19 Thermal time constant winding	3.96 s
20 Thermal time constant motor	1240 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C

**Mechanical data (preloaded ball bearings)**

23 Max. speed	12000 rpm
24 Axial play at axial load < 10 N	0 mm
> 10 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	8 N
27 Max. force for press fits (static) (static, shaft supported)	211 N
28 Max. radial load, 5 mm from flange	4000 N
	80 N



### Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

**Other specifications**

29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	720 g

Values listed in the table are nominal.

**Connection motor (Cable AWG 20)**

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

**Connector** Part number  
Molex 39-01-2040

**Connection sensors (Cable AWG 26)**

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 3...24 VDC	Pin 5
	N.C.	Pin 6

**Connector** Part number  
Molex 430-25-0600  
Wiring diagram for Hall sensors see p. 45

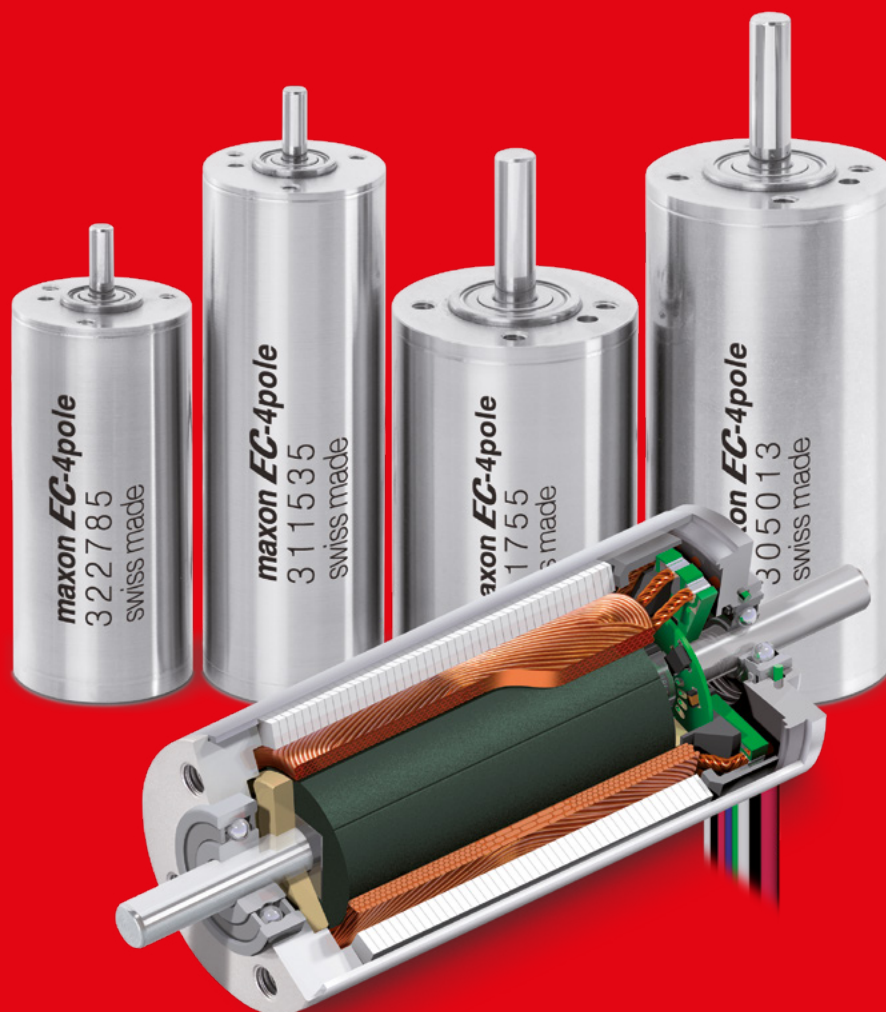
### maxon Modular System

Details on catalog page 34

<p><b>Planetary Gearhead</b> Ø52 mm 4 - 30 Nm Page 367</p>	<p><b>Recommended Electronics:</b> Page 34</p> <table border="0"> <tr><td>Notes</td><td></td></tr> <tr><td>ESCON Module 50/5</td><td>455</td></tr> <tr><td>ESCON Mod. 50/4 EC-S</td><td>455</td></tr> <tr><td>ESCON 50/5</td><td>457</td></tr> <tr><td>ESCON 70/10</td><td>457</td></tr> <tr><td>DEC Module 50/5</td><td>459</td></tr> <tr><td>EPOS4 50/5</td><td>463</td></tr> <tr><td>EPOS4 Mod./Comp. 50/5</td><td>463</td></tr> <tr><td>EPOS4 Module 50/8</td><td>465</td></tr> <tr><td>EPOS4 Comp. 50/8 CAN</td><td>465</td></tr> <tr><td>EPOS2 P 24/5</td><td>470</td></tr> <tr><td>MAXPOS 50/5</td><td>473</td></tr> </table>	Notes		ESCON Module 50/5	455	ESCON Mod. 50/4 EC-S	455	ESCON 50/5	457	ESCON 70/10	457	DEC Module 50/5	459	EPOS4 50/5	463	EPOS4 Mod./Comp. 50/5	463	EPOS4 Module 50/8	465	EPOS4 Comp. 50/8 CAN	465	EPOS2 P 24/5	470	MAXPOS 50/5	473	<p><b>Encoder MR</b> 256 - 1024 CPT, 3 channels Page 433</p> <p><b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 444</p> <p><b>Brake AB 28</b> 24 VDC 0.4 Nm Page 490</p>
Notes																										
ESCON Module 50/5	455																									
ESCON Mod. 50/4 EC-S	455																									
ESCON 50/5	457																									
ESCON 70/10	457																									
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EPOS4 Comp. 50/8 CAN	465																									
EPOS2 P 24/5	470																									
MAXPOS 50/5	473																									

For your personal notes.

Lined area for personal notes.



# maxon EC-4pole

This 4-pole power motor is one of the best in its class and demonstrates excellent performance thanks to maxon's winding technology: top performance per volume and weight unit, quality and security thanks to largely automated production, cogging-free motion and of course an unprecedented service life.

<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b>	166-199
<b>ECX SQUARE Program</b>	202
<b>EC Program</b>	204-213
<b>EC-max Program</b>	217-225
<b>EC-4pole Program</b>	229-235
<b>EC-i Program</b>	239-250
<b>EC flat Program</b>	252-273
<b>EC frameless Program</b>	278-283

# maxon EC-4pole program



The «heart» is the ironless winding, System maxon. This means physically dependent – advantages like no detent, high efficiency and excellent regulating dynamics.



The motor housing, a simple tube made of stainless steel – non magnetic, rigid, rustproof.



High performance capability thanks to the 4-pole magnet.



Metallic housing and flange allow good heat dissipation and mechanical stability.



Shaft with no groove guarantees torsional stability and smooth running.



Non-tension cables can be directed both radially and axially from the motor. Wide range of plug options.



High quality, thanks to a process monitored production on the most modern assembly lines which are, in part, developed by maxon.

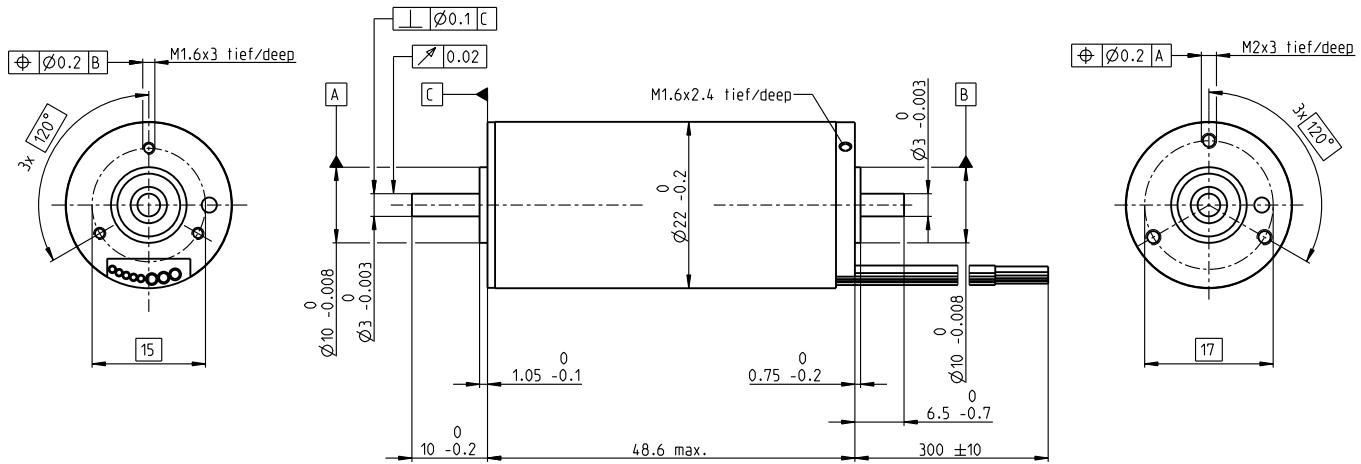


**The EC-motor program  
delivers top performance  
per volume  
and weight unit.**

# EC-4pole 22 Ø22 mm, brushless, 90 Watt

High Power

maxon EC-4pole



M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

323217	323218	323219	323220	327739
--------	--------	--------	--------	--------

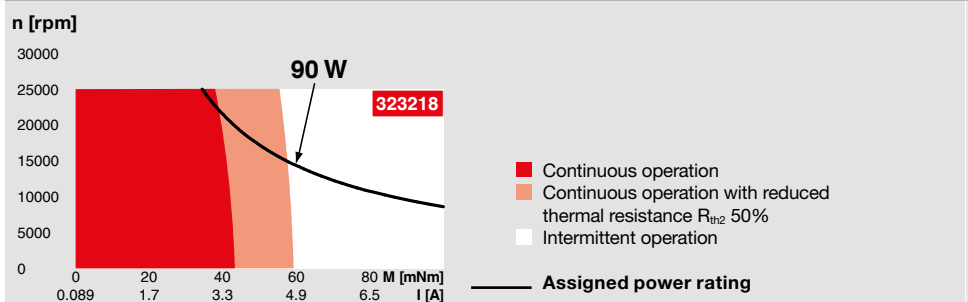
### Motor Data

Values at nominal voltage			18	24	36	48	48
1	Nominal voltage	V	18	24	36	48	48
2	No load speed	rpm	16300	16300	16300	16300	6900
3	No load current	mA	218	164	109	81.8	20.7
4	Nominal speed	rpm	14900	15000	14900	14900	5550
5	Nominal torque (max. continuous torque)	mNm	43.7	45.1	43.7	42.6	43.9
6	Nominal current (max. continuous current)	A	4.32	3.34	2.16	1.58	0.679
7	Stall torque	mNm	588	639	612	586	234
8	Stall current	A	55.8	45.5	29.1	20.9	3.55
9	Max. efficiency	%	88	89	88	88	85
Characteristics							
10	Terminal resistance phase to phase	Ω	0.323	0.527	1.24	2.3	13.5
11	Terminal inductance phase to phase	mH	0.0283	0.0503	0.113	0.201	1.11
12	Torque constant	mNm/A	10.5	14	21.1	28.1	66
13	Speed constant	rpm/V	907	680	453	340	145
14	Speed/torque gradient	rpm/mNm	27.8	25.5	26.7	27.9	29.7
15	Mechanical time constant	ms	1.61	1.48	1.55	1.62	1.72
16	Rotor inertia	gcm <sup>2</sup>	5.54	5.54	5.54	5.54	5.54

### Specifications

Thermal data			
17	Thermal resistance housing-ambient	12.2 K/W	
18	Thermal resistance winding-housing	1.19 K/W	
19	Thermal time constant winding	5.12 s	
20	Thermal time constant motor	482 s	
21	Ambient temperature	-20...+100°C	
22	Max. winding temperature	+155°C	
Mechanical data (preloaded ball bearings)			
23	Max. speed	25000 rpm	
24	Axial play at axial load < 3.0 N	0 mm	
	> 3.0 N	0.14 mm	
25	Radial play	preloaded	
26	Max. axial load (dynamic)	4 N	
27	Max. force for press fits (static) (static, shaft supported)	53 N	
		1000 N	
28	Max. radial load, 5 mm from flange	16 N	

### Operating Range



### Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	125 g

Values listed in the table are nominal.

#### Connection motor (Cable AWG 20)

red	Motor winding 1
white	Motor winding 3
black	Motor winding 2

#### Connection sensors (Cable AWG 26)

red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3
green	$V_{Hall}$ 3...24 VDC
blue	GND

Wiring diagram for Hall sensors see p. 45

### maxon Modular System

Details on catalog page 34

#### Planetary Gearhead

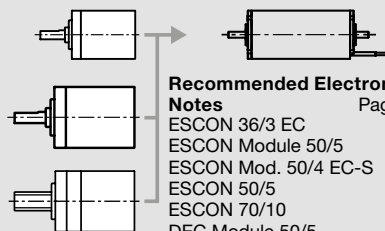
Ø22 mm  
2.0 - 3.4 Nm  
Page 343

#### Planetary Gearhead

Ø32 mm  
1.0 - 6.0 Nm  
Page 353

#### Screw Drive

Ø32 mm  
Page 382-387



#### Recommended Electronics:

Notes	Page 27
ESCON 36/3 EC	455
ESCON Module 50/5	455
ESCON Mod. 50/4 EC-S	455
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

#### Encoder 16 EASY

128 - 1024 CPT, 3 channels  
Page 418

#### Encoder 16 EASY XT

128 - 1024 CPT, 3 channels  
Page 420

#### Encoder 16 EASY Absolute

4096 steps, Single Turn  
Page 422

#### Encoder 16 EASY Absolute XT

4096 steps, Single Turn  
Page 424

#### Encoder 16 RIO

1024 - 32768 CPT, 3 channels  
Page 435

#### Encoder AEDL 5810

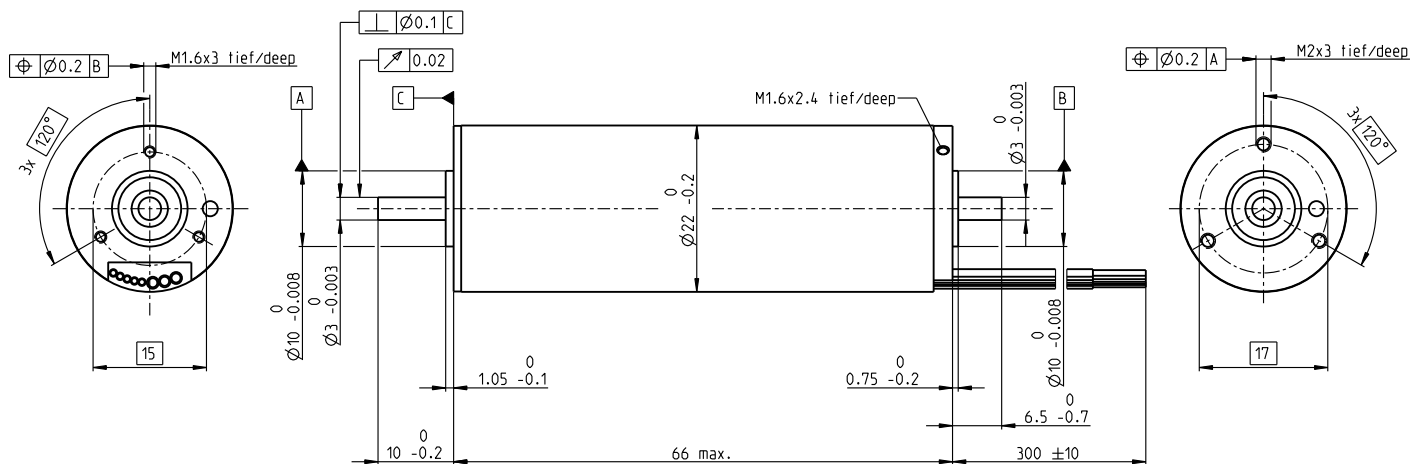
1024 - 5000 CPT, 3 channels  
Page 438

#### Encoder HEDL 5540

500 CPT, 3 channels  
Page 446

# EC-4pole 22 Ø22 mm, brushless, 120 Watt

High Power



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers			
311535	311536	311537	311538

## Motor Data

Values at nominal voltage					
	V	18	24	36	48
1 Nominal voltage	V	18	24	36	48
2 No load speed	rpm	16800	16900	17800	16900
3 No load current	mA	298	223	166	112
4 Nominal speed	rpm	15700	15800	16800	15800
5 Nominal torque (max. continuous torque)	mNm	54	54.6	54	54.5
6 Nominal current (max. continuous current)	A	5.55	4.21	2.95	2.1
7 Stall torque	mNm	874	954	1090	1020
8 Stall current	A	86	70.4	56.8	37.7
9 Max. efficiency	%	89	89	90	90
Characteristics					
10 Terminal resistance phase to phase	Ω	0.209	0.341	0.634	1.27
11 Terminal inductance phase to phase	mH	0.017	0.031	0.062	0.123
12 Torque constant	mNm/A	10.2	13.5	19.2	27.1
13 Speed constant	rpm/V	940	705	497	352
14 Speed/torque gradient	rpm/mNm	19.4	17.7	16.4	16.6
15 Mechanical time constant	ms	1.81	1.65	1.53	1.54
16 Rotor inertia	gcm <sup>2</sup>	8.91	8.91	8.91	8.91

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	10.7 K/W
18 Thermal resistance winding-housing	0.7 K/W
19 Thermal time constant winding	4.66 s
20 Thermal time constant motor	936 s
21 Ambient temperature	-20...+100°C
22 Max. winding temperature	+155°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	25000 rpm
24 Axial play at axial load < 3.0 N	0 mm
24 Axial play at axial load > 3.0 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	4 N
27 Max. force for press fits (static) (static, shaft supported)	53 N
28 Max. radial load, 5 mm from flange	600 N
	16 N

## Other specifications

29 Number of pole pairs	2
30 Number of phases	3
31 Weight of motor	175 g

Values listed in the table are nominal.

### Connection motor (Cable AWG 20)

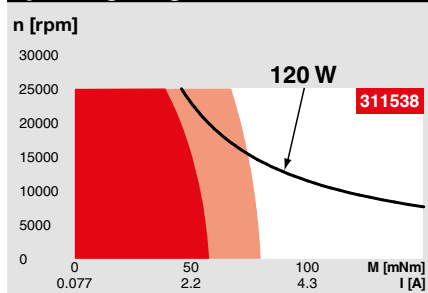
red	Motor winding 1
white	Motor winding 3
black	Motor winding 2

### Connection sensors (Cable AWG 26)

red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3
green	V <sub>Hall</sub> 3...24 VDC
blue	GND

Wiring diagram for Hall sensors see p. 45

## Operating Range



## Comments

- Continuous operation
  - Continuous operation with reduced thermal resistance  $R_{th2}$  50%
  - Intermittent operation
- Assigned power rating

## maxon Modular System

Details on catalog page 34

### Planetary Gearhead

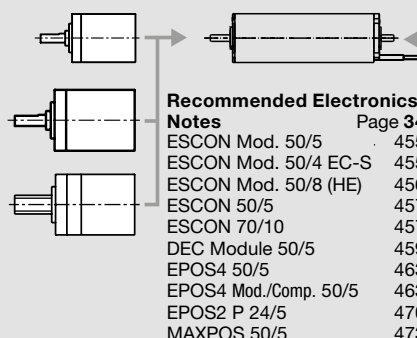
Ø22 mm
2.0 - 3.4 Nm
Page 343

### Planetary Gearhead

Ø32 mm
1.0 - 6.0 Nm
Page 353

### Screw Drive

Ø32 mm
Page 382-387



### Recommended Electronics: Notes

ESCON Mod. 50/5	455
ESCON Mod. 50/4 EC-S	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

### Encoder 16 EASY

128 - 1024 CPT, 3 channels  
Page 418

### Encoder 16 EASY XT

128 - 1024 CPT, 3 channels  
Page 420

### Encoder 16 EASY Absolute

4096 steps, Single Turn  
Page 422

### Encoder 16 EASY Absolute XT

4096 steps, Single Turn  
Page 424

### Encoder 16 RIO

1024 - 32768 CPT, 3 channels  
Page 435

### Encoder AEDL 5810

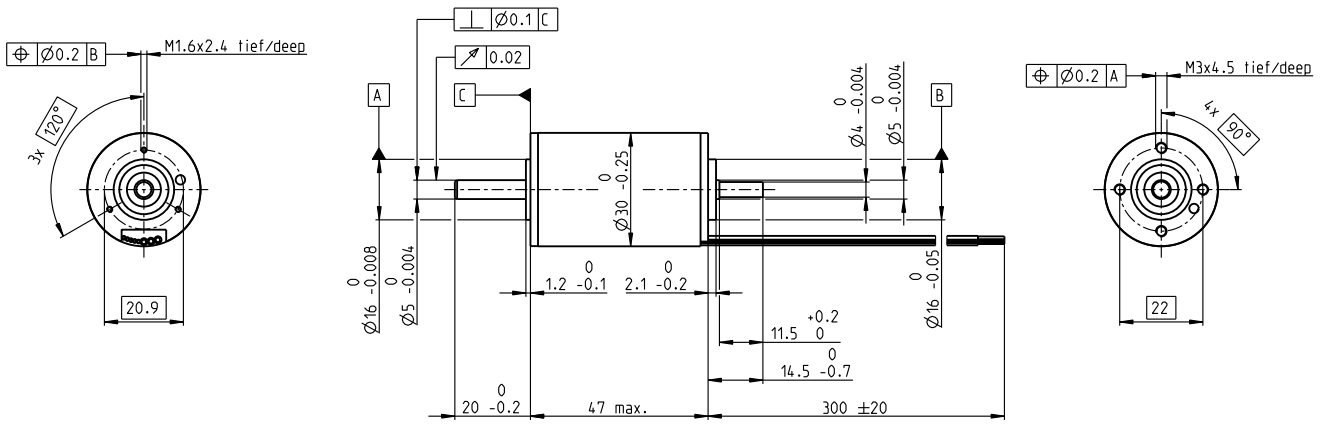
1024 - 5000 CPT, 3 channels  
Page 438

### Encoder HEDL 5540

500 CPT, 3 channels  
Page 446

# EC-4pole 30 Ø30 mm, brushless, 100 Watt

High Power



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

309755 309756 309757 309758

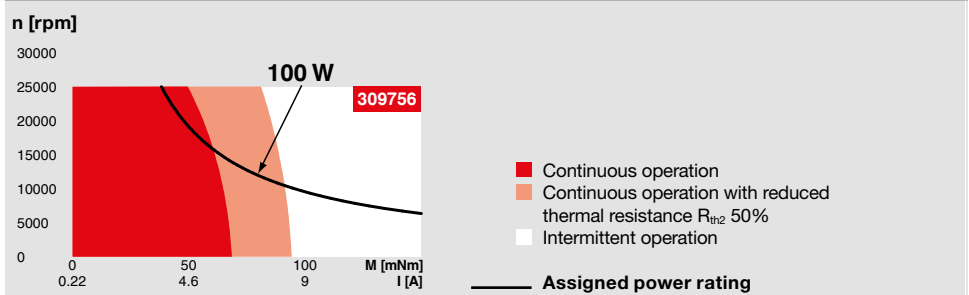
## Motor Data

Values at nominal voltage		18	24	36	48	
1	Nominal voltage	V	18	24	36	48
2	No load speed	rpm	17500	17500	17500	17500
3	No load current	mA	505	379	253	189
4	Nominal speed	rpm	16300	16300	16400	16400
5	Nominal torque (max. continuous torque)	mNm	72	68.8	74.3	73.4
6	Nominal current (max. continuous current)	A	7.74	5.56	3.98	2.95
7	Stall torque	mNm	1310	1270	1510	1500
8	Stall current	A	133	96.9	77.2	57.4
9	Max. efficiency	%	88.3	88.2	89.1	89.1
<b>Characteristics</b>						
10	Terminal resistance phase to phase	Ω	0.135	0.248	0.466	0.836
11	Terminal inductance phase to phase	mH	0.0166	0.0295	0.0664	0.118
12	Torque constant	mNm/A	9.8	13.1	19.6	26.1
13	Speed constant	rpm/V	974	731	487	365
14	Speed/torque gradient	rpm/mNm	13.4	13.9	11.6	11.7
15	Mechanical time constant	ms	2.57	2.65	2.22	2.24
16	Rotor inertia	gcm <sup>2</sup>	18.3	18.3	18.3	18.3

## Specifications

<b>Thermal data</b>		
17	Thermal resistance housing-ambient	8.96 K/W
18	Thermal resistance winding-housing	0.74 K/W
19	Thermal time constant winding	4.12 s
20	Thermal time constant motor	968 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+155°C
<b>Mechanical data (preloaded ball bearings)</b>		
23	Max. speed	25000 rpm
24	Axial play at axial load < 4.0 N	0 mm
	> 4.0 N	0.14 mm
25	Radial play preloaded	5.5 N
26	Max. axial load (dynamic)	73 N
27	Max. force for press fits (static) (static, shaft supported)	2000 N
28	Max. radial load, 5 mm from flange	25 N

## Operating Range



## Other specifications

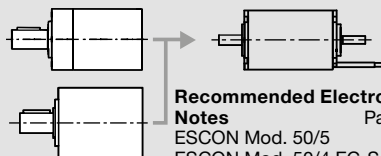
29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	210 g

Values listed in the table are nominal.

- Connection motor** (Cable AWG 18)
- black Motor winding 2
  - white Motor winding 3
  - red Motor winding 1
- Connection sensors** (Cable AWG 26)
- black/grey Hall sensor 2
  - blue GND
  - green V<sub>Hall</sub> 3...24 VDC
  - red/grey Hall sensor 1
  - white/grey Hall sensor 3
- Wiring diagram for Hall sensors see p. 45

## maxon Modular System

- 2 Planetary Gearhead
- 3 Ø32 mm
- 4 - 8 Nm
- Page 356
- Planetary Gearhead
- Ø42 mm
- 3 - 15 Nm
- Page 362



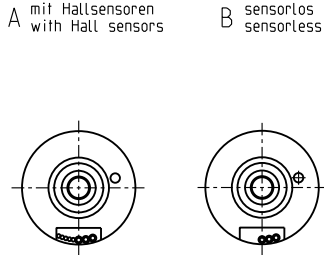
- Recommended Electronics:**
- |                       |         |
|-----------------------|---------|
| Notes                 | Page 34 |
| ESCON Mod. 50/5       | 455     |
| ESCON Mod. 50/4 EC-S  | 455     |
| ESCON Mod. 50/8 (HE)  | 456     |
| ESCON 50/5            | 457     |
| ESCON 70/10           | 457     |
| DEC Module 50/5       | 459     |
| EPOS4 50/5            | 463     |
| EPOS4 Mod./Comp. 50/5 | 463     |
| EPOS4 Module 50/8     | 465     |
| EPOS4 Comp. 50/8 CAN  | 465     |
| EPOS4 70/15           | 467     |
| MAXPOS 50/5           | 473     |

## Details on catalog page 34

- Encoder 16 EASY/XT**
- 128 - 1024 CPT, 3 channels
- Page 418/420
- Encoder 16 EASY Absolute/XT**
- 4096 steps, Single Turn
- Page 422/424
- Encoder 16 RIO**
- 1024 - 32768 CPT, 3 channels
- Page 435
- Encoder AEDL 5810**
- 1024 - 5000 CPT, 3 channels
- Page 438
- Encoder HEDL 5540**
- 500 CPT, 3 channels
- Page 446
- Brake AB 20**
- 24 VDC, 0.1 Nm
- Page 488

# EC-4pole 30 Ø30 mm, brushless, 150 Watt

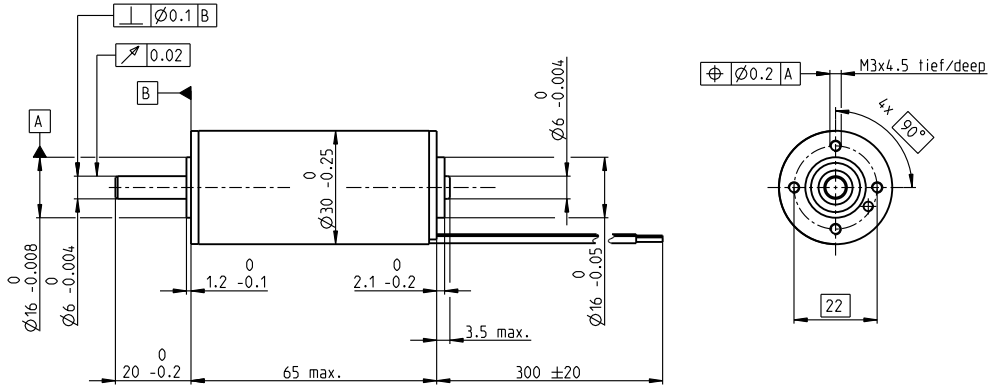
Sterilizable



Lage des Kabelabgangs zum Befestigungsbohrbild ±10°

Alignment of cables relative to mounting holes ±10°

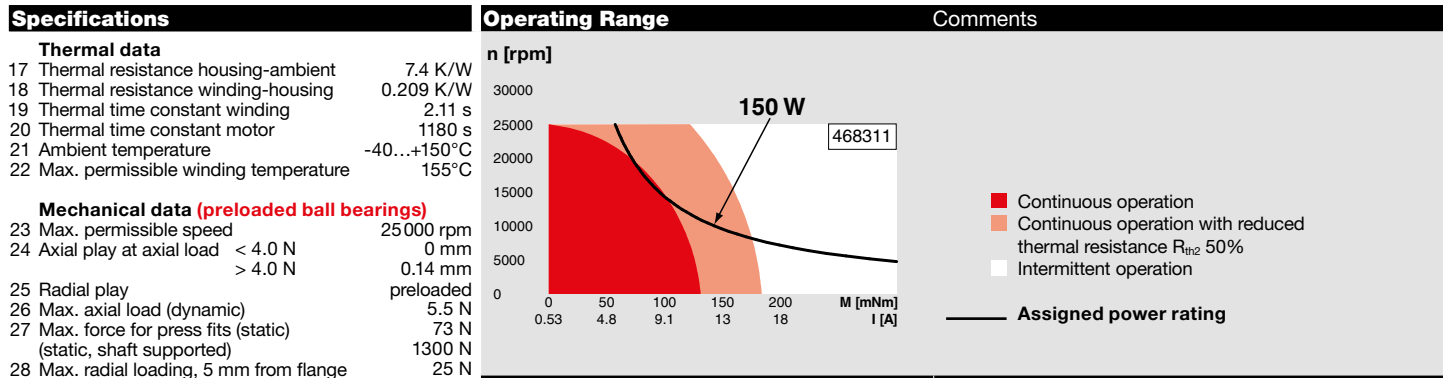
M 1:2



- Stock program
- Standard program
- Special program (on request)

Part Numbers	
A with Hall sensors	468311    468313
B sensorless	468312    468314

Motor Data (provisional)		
<b>Values at nominal voltage</b>		
1 Nominal voltage	V	24    32
2 No load speed	rpm	17100    13100
3 No load current	mA	944    429
4 Nominal speed	rpm	16600    12400
5 Nominal torque (max. continuous torque)	mNm	84.6    106
6 Nominal current (max. continuous current)	A	7.23    4.9
7 Stall torque	mNm	3140    2320
8 Stall current	A	236    99.7
9 Max. efficiency	%	88    88
<b>Characteristics</b>		
10 Terminal resistance phase to phase	Ω	0.102    0.321
11 Terminal inductance phase to phase	mH	0.016    0.049
12 Torque constant	mNm/A	13.3    23.3
13 Speed constant	rpm/V	718    410
14 Speed/torque gradient	rpm/mNm	5.49    5.66
15 Mechanical time constant	ms	2.02    2.09
16 Rotor inertia	gcm <sup>2</sup>	35.2    35.2



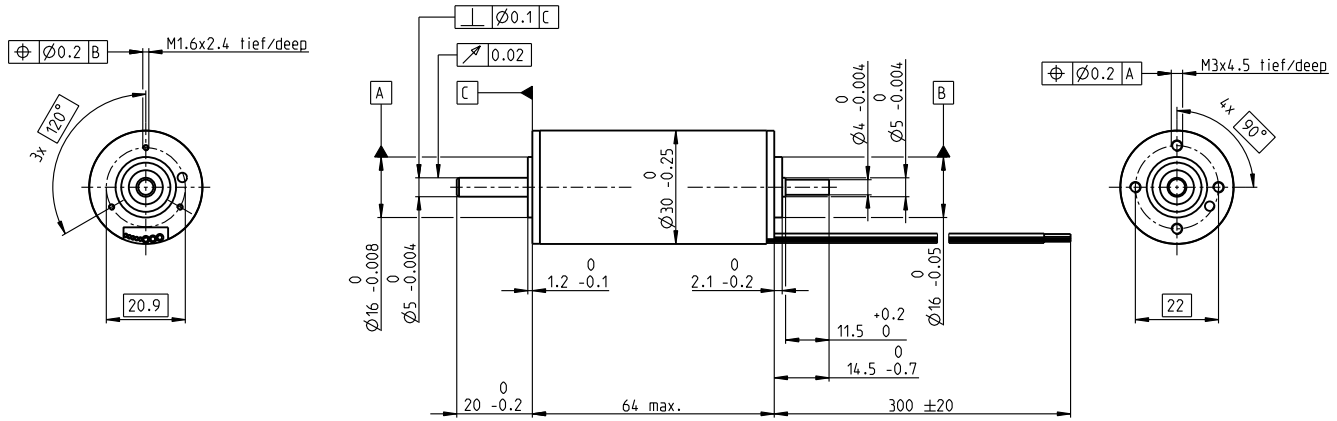
Application	Sterilization information
<p><b>Sterilizable Devices</b></p> Orthopedic Drills Orthopedic Saws Surgical Reamers	Sensorless: typically 2000 autoclave cycles Hall sensor: typically 1000 autoclave cycles  Sterilization with steam Temperature +134°C ± 4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 minutes

maxon Modular System	Details on catalog page 34														
Values listed in the table are nominal.  <b>Connection motor</b> (Cable AWG 18) red Motor winding 1 black Motor winding 2 white Motor winding 3 <b>Connection sensors</b> (Cable AWG 26) green VHall 3...24 VDC blue GND red/grey Hall sensor 1 black/grey Hall sensor 2 white/grey Hall sensor 3 Wiring diagram for Hall sensors see p. 45  <b>Option</b> Hollow shaft with bore diameter up to 4.1 mm	<b>Recommended Electronics:</b> <table border="0"> <tr> <td><b>Notes</b></td> <td style="text-align: right;">Page <b>34</b></td> </tr> <tr> <td>ESCON Mod. 50/5</td> <td style="text-align: right;">455</td> </tr> <tr> <td>ESCON Mod. 50/4 EC-S</td> <td style="text-align: right;">455</td> </tr> <tr> <td>ESCON Mod. 50/8 (HE)</td> <td style="text-align: right;">456</td> </tr> <tr> <td>ESCON 50/5</td> <td style="text-align: right;">457</td> </tr> <tr> <td>ESCON 70/10</td> <td style="text-align: right;">457</td> </tr> <tr> <td>DEC Module 50/5</td> <td style="text-align: right;">459</td> </tr> </table>	<b>Notes</b>	Page <b>34</b>	ESCON Mod. 50/5	455	ESCON Mod. 50/4 EC-S	455	ESCON Mod. 50/8 (HE)	456	ESCON 50/5	457	ESCON 70/10	457	DEC Module 50/5	459
<b>Notes</b>	Page <b>34</b>														
ESCON Mod. 50/5	455														
ESCON Mod. 50/4 EC-S	455														
ESCON Mod. 50/8 (HE)	456														
ESCON 50/5	457														
ESCON 70/10	457														
DEC Module 50/5	459														



# EC-4pole 30 Ø30 mm, brushless, 200 Watt

High Power



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

305013      305014      305015

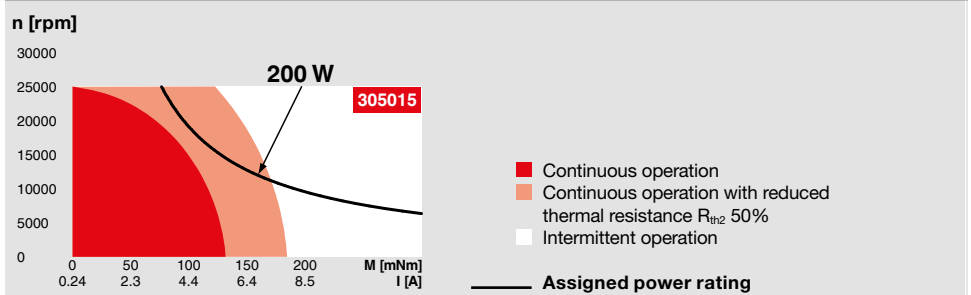
## Motor Data

		305013	305014	305015
<b>Values at nominal voltage</b>				
1 Nominal voltage	V	24	36	48
2 No load speed	rpm	16700	16700	16500
3 No load current	mA	723	482	356
4 Nominal speed	rpm	16100	16100	16000
5 Nominal torque (max. continuous torque)	mNm	95.6	95.2	92.9
6 Nominal current (max. continuous current)	A	7.61	5.06	3.68
7 Stall torque	mNm	3240	3520	3430
8 Stall current	A	236	171	124
9 Max. efficiency	%	90	90	90
<b>Characteristics</b>				
10 Terminal resistance phase to phase	Ω	0.102	0.21	0.386
11 Terminal inductance phase to phase	mH	0.016	0.037	0.065
12 Torque constant	mNm/A	13.7	20.6	27.6
13 Speed constant	rpm/V	697	465	346
14 Speed/torque gradient	rpm/mNm	5.17	4.75	4.83
15 Mechanical time constant	ms	1.80	1.66	1.69
16 Rotor inertia	gcm <sup>2</sup>	33.3	33.3	33.3

## Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 7.4 K/W
  - 18 Thermal resistance winding-housing 0.21 K/W
  - 19 Thermal time constant winding 2.11 s
  - 20 Thermal time constant motor 1180 s
  - 21 Ambient temperature -20...+100°C
  - 22 Max. winding temperature +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed 25000 rpm
  - 24 Axial play at axial load < 4.0 N 0 mm
  - > 4.0 N 0.14 mm
  - 25 Radial play preloaded 0 mm
  - 26 Max. axial load (dynamic) 5.5 N
  - 27 Max. force for press fits (static) (static, shaft supported) 73 N
  - 28 Max. radial load, 5 mm from flange 1300 N

## Operating Range



Assigned power rating

## Other specifications

- 29 Number of pole pairs 2
- 30 Number of phases 3
- 31 Weight of motor 300 g

Values listed in the table are nominal.

### Connection motor (Cable AWG 18)

- black Motor winding 2
- white Motor winding 3
- red Motor winding 1

### Connection sensors (Cable AWG 26)

- black/grey Hall sensor 2
  - blue GND
  - green V<sub>Hall</sub> 3...24 VDC
  - red/grey Hall sensor 1
  - white/grey Hall sensor 3
- Wiring diagram for Hall sensors see p. 45

## maxon Modular System

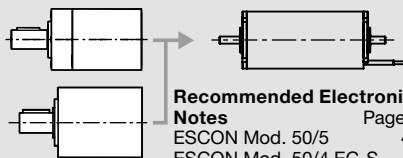
Details on catalog page 34

### Planetary Gearhead

- Ø32 mm
- 4 - 8 Nm
- Page 356

### Planetary Gearhead

- Ø42 mm
- 3 - 15 Nm
- Page 362



### Recommended Electronics:

- Notes Page 34
- ESCON Mod. 50/5 455
  - ESCON Mod. 50/4 EC-S 455
  - ESCON Mod. 50/8 (HE) 456
  - ESCON 50/5 457
  - ESCON 70/10 457
  - DEC Module 50/5 459
  - EPOS4 50/5 463
  - EPOS4 Mod./Comp. 50/5 463
  - EPOS4 Module 50/8 465
  - EPOS4 Comp. 50/8 CAN 465
  - EPOS4 70/15 467
  - MAXPOS 50/5 473

### Encoder 16 EASY/XT

- 128 - 1024 CPT, 3 channels
- Page 418/420

### Encoder 16 EASY Absolute/XT

- 4096 steps, Single Turn
- Page 422/424

### Encoder 16 RIO

- 1024 - 32768 CPT, 3 channels
- Page 435

### Encoder AEDL 5810

- 1024 - 5000 CPT, 3 channels
- Page 438

### Encoder HEDL 5540

- 500 CPT, 3 channels
- Page 446

### Brake AB 20

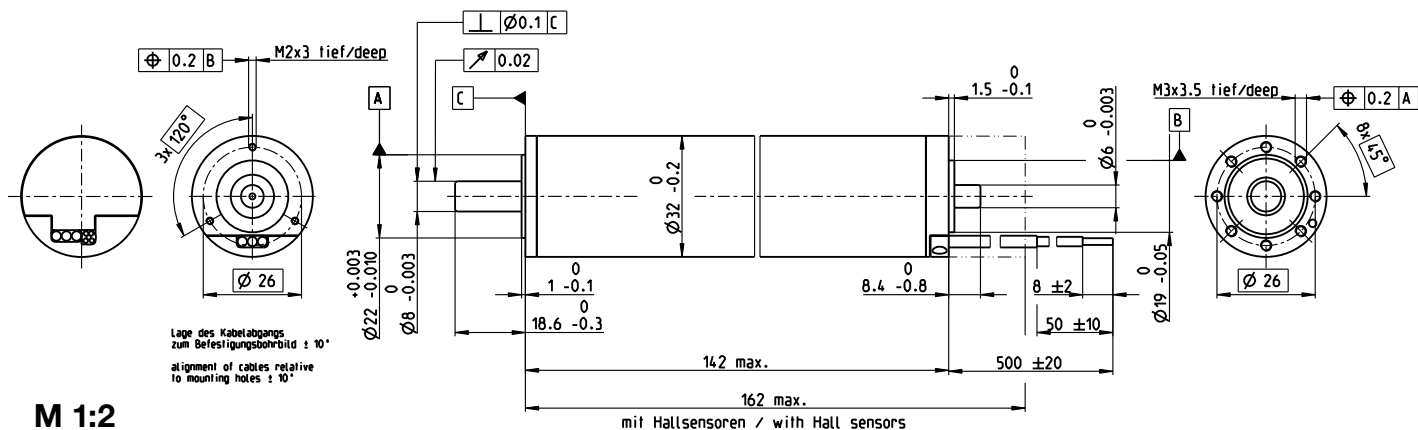
- 24 VDC, 0.1 Nm
- Page 488

# EC-4pole 32 Ø32 mm, brushless, 220 Watt

Heavy Duty – for applications in air

A mit Hallensoren  
with Hall sensors

B sensorlos  
sensorless



- Stock program
- Standard program
- Special program (on request)

## Part Numbers

A with Hall sensors  
B sensorless

A with Hall sensors	397798
B sensorless	393879

## Motor Data (provisional)

Values at nominal voltage and ambient temperature °C

	25	100	150	200	
1 Nominal voltage	V	48	48	48	48
2 No load speed	rpm	6470	6650	6770	6890
3 No load current	mA	149	113	109	107
4 Nominal speed <sup>1)</sup>	rpm	5710	5870	6080	6470
5 Nominal torque (max. continuous torque) <sup>1)</sup>	mNm	334	261	196	104
6 Nominal current (max. continuous current)	A	4.87	3.85	2.98	1.67
7 Stall torque	mNm	3350	2520	2150	1860
8 Stall current	A	47.5	36.7	31.9	28.1
9 Max. efficiency	%	89	89	89	88
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	1.01	1.31	1.51	1.71
11 Terminal inductance phase to phase	mH	0.298	0.298	0.298	0.298
12 Torque constant	mNm/A	70.5	68.7	67.4	66.2
13 Speed constant	rpm/V	135	139	142	144
14 Speed / torque gradient	rpm/mNm	1.94	2.65	3.16	3.71
15 Mechanical time constant	ms	2.6	3.55	4.24	4.98
16 Rotor inertia	gcm <sup>2</sup>	128	128	128	128

<sup>1)</sup> Values for operation in thermal equilibrium.

## Specifications

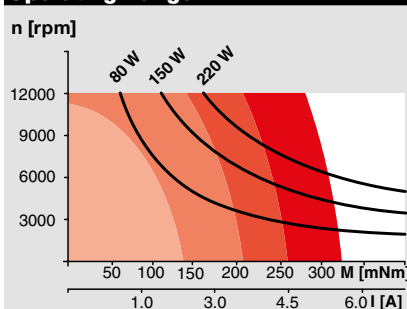
Thermal data	
17 Thermal resistance housing-ambient	4 K/W
18 Thermal resistance winding-housing	0.53 K/W
19 Thermal time constant winding	17 s
20 Thermal time constant motor	1720 s
21 Ambient temperature	-55...+200°C
22 Max. winding temperature	+240°C

Mechanical data (preloaded ball bearings)	
23 Max. speed	12000 rpm
24 Axial play at axial load < 20 N	0 mm
> 20 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	16 N
27 Max. force for press fits (static) (static, shaft supported)	80 N
28 Max. radial load, 5 mm from flange	75 N

Other specifications	
29 Number of pole pairs	2
30 Number of phases	3
31 Weight of motor	860 g

- Connection A, motor cable PTFE (AWG 14)**
- red Motor winding 1
  - black Motor winding 2
  - white Motor winding 3
- Connection A, sensors cable PTFE (AWG 24)**
- green V<sub>Hall</sub> 4.5...24 V
  - blue GND
  - red Hall sensor 1
  - black Hall sensor 2
  - white Hall sensor 3
- Connection B, motor cable PTFE (AWG 14)**
- red Motor winding 1
  - black Motor winding 2
  - white Motor winding 3
- Wiring diagram for Hall sensors see p. 45

## Operating Range



## Comments

- TA = 25°C** Continuous operation  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- TA = 100°C**
- TA = 150°C**
- TA = 200°C**
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

## Application

- General**
- extreme temperature applications
  - vibration tested (according to MIL-STD810F/Jan2000 Fig. 514.5C-10)
  - ultra-high vacuum applications (modifications necessary). low outgassing, can be baked out at 240°C
- Aerospace**
- gas turbine starter/generators for aircraft engines
  - regulation of combustion engines
- Oil & Gas Industry**
- oil, gas and geothermal wells
- Robotics**
- robotic exploration vehicles
- Industry**
- pumps and valves for liquid metal cooling systems/turbine fuel and steam control
  - valve adjustment for gas and steam power plants

## Notice

This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

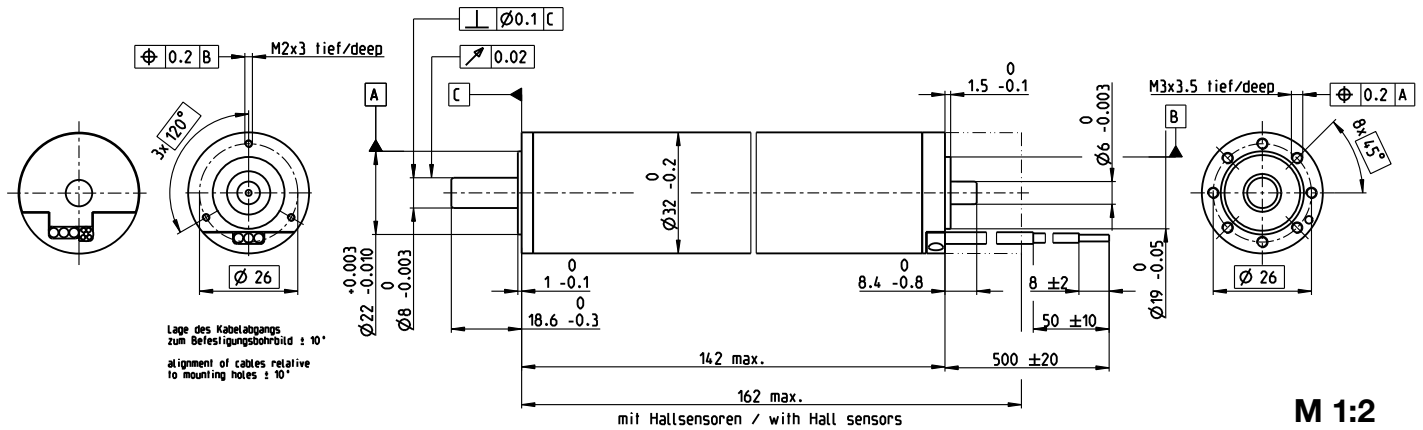
# EC-4pole 32 Ø32 mm, brushless, 480 Watt

Heavy Duty – for applications in oil

maxon EC-4pole

A mit Hallensoren  
with Hall sensors

B sensorlos  
sensorless



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

A with Hall sensors	397799
B sensorless	397800

## Motor Data (provisional)

Values at nominal voltage and ambient temperature °C

	25	100	150	200	
1 Nominal voltage	V	48	48	48	48
2 No load speed	rpm	6420	6630	6750	6860
3 No load current	mA	482	222	212	216
4 Nominal speed <sup>1)</sup>	rpm	4670	4420	4700	5340
5 Nominal torque (max. continuous torque) <sup>1)</sup>	mNm	804	762	596	379
6 Nominal current (max. continuous current)	A	11.4	10.9	8.75	5.78
7 Stall torque	mNm	3350	2520	2150	1860
8 Stall current	A	47.5	36.7	31.9	28.1
9 Max. efficiency	%	82	85	85	84
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	1.01	1.31	1.51	1.71
11 Terminal inductance phase to phase	mH	0.298	0.298	0.298	0.298
12 Torque constant	mNm/A	70.5	68.7	67.4	66.2
13 Speed constant	rpm/V	135	139	142	144
14 Speed / torque gradient	rpm/mNm	1.94	2.65	3.16	3.71
15 Mechanical time constant	ms	2.85	3.88	4.64	5.45
16 Rotor inertia	gcm <sup>2</sup>	140	140	140	140

<sup>1)</sup> Values for operation in thermal equilibrium.

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	0.3 K/W
18 Thermal resistance winding-housing	0.53 K/W
19 Thermal time constant winding	17 s
20 Thermal time constant motor	129 s
21 Ambient temperature	-55...+200°C
22 Max. winding temperature	+240°C

Mechanical data (preloaded ball bearings)	
23 Max. speed	12000 rpm
24 Axial play at axial load < 20 N	0 mm
24 Axial play at axial load > 20 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	16 N
27 Max. force for press fits (static) (static, shaft supported)	80 N
27 Max. force for press fits (static) (static, shaft supported)	3000 N
28 Max. radial load, 5 mm from flange	75 N

## Other specifications

29 Number of pole pairs	2
30 Number of phases	3
31 Weight of motor	860 g

## Connection A, motor cable PTFE (AWG 14)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

## Connection A, sensors cable PTFE (AWG 24)

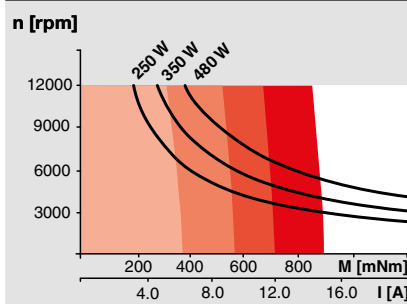
green	V <sub>Hall</sub> 4.5...24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

## Connection B, motor cable PTFE (AWG 14)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Wiring diagram for Hall sensors see p. 45

## Operating Range



## Comments

**TA = 25°C** Continuous operation  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

— Assigned power rating

## Application

- General**
- extreme temperature applications
  - vibration tested (according to MIL-STD810F/Jan2000 Fig. 514.5C-10)
  - operation in oil and high pressure (only minimal lubrication, therefore use under rated ambient conditions is not suggested)

**Oil & Gas Industry**  
– oil, gas and geothermal wells

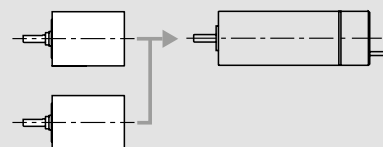
## Notice

This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

**Reference medium: Shell Tellus oil T15**  
Operation in oil of different viscosity will affect the motor data.

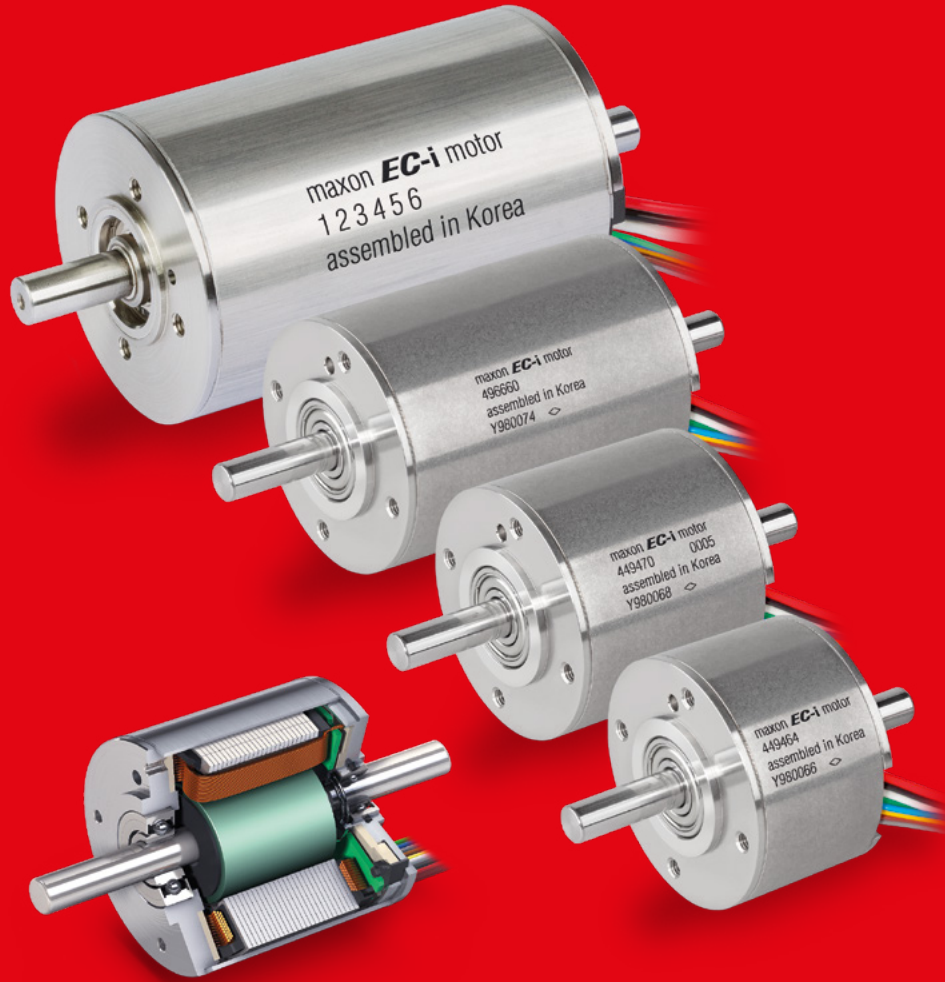
## maxon Modular System

**Planetary Gearhead**  
Ø32 mm  
3.0 - 8.0 Nm  
Page 358  
**Planetary Gearhead**  
Ø42 mm  
10 - 50 Nm  
Page 364



Details on catalog page 34





# maxon EC-i

Due to an optimized magnetic circuit, the brushless DC motors with iron windings have a very high torque and very low cogging torque. The robust design with a steel flange and housing offers a wide variety of applications. The “assembled in Korea” label stands for consistently high maxon quality at a competitive price.

<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b>	166-199
<b>ECX SQUARE Program</b>	202
<b>EC Program</b>	204-213
<b>EC-max Program</b>	217-225
<b>EC-4pole Program</b>	229-235
<b>EC-i Program</b>	239-250
<b>EC flat Program</b>	252-273
<b>EC frameless Program</b>	278-283

DC Motor

EC Motor  
(BLDC Motor)

Gearhead

Screw  
drive

Sensor

Motor &  
Motion control

Compact  
Drive

Accessories &  
Batteries

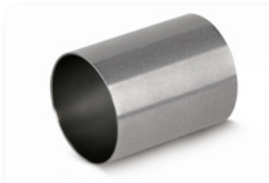
Ceramic

Contact  
information

# maxon EC-i program



The stator with an iron winding is designed for high power at a low cogging torque.



The steel housing and flange ensure good heat dissipation and mechanical stability.



Shaft with no groove guarantees torsional stability and smooth running.



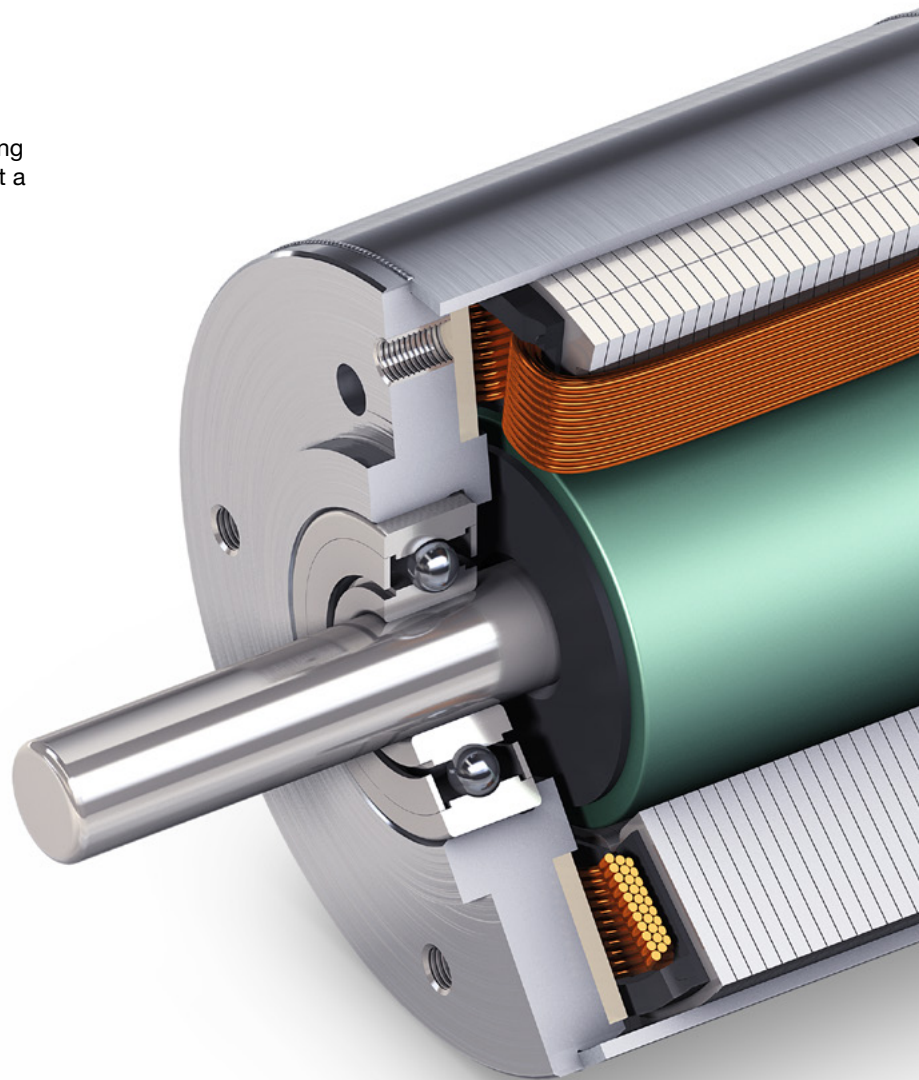
The modular rotor delivers good dynamics and large torques.



"assembled in Korea": High quality due to process-monitored manufacturing on state-of-the-art assembly lines.



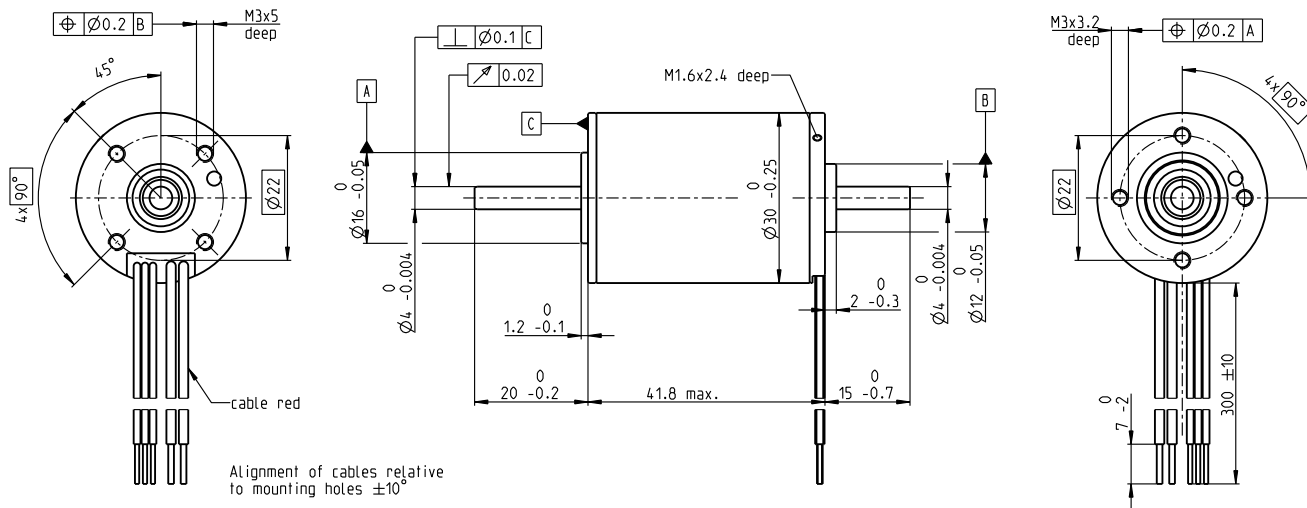
Modular construction with gears, sensors and brakes.



**Dynamic, high torque,  
and unbeatable value.**

# EC-i 30 Ø30 mm brushless, 20 Watt, with integrated electronics

## 4-Q-Speed Controller



M 3:4

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

5 wire version	
Enable	Direction
618864	619301

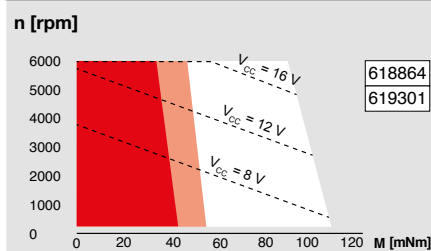
### Motor Data (provisional)

Values at nominal voltage				
1 Nominal voltage	V	24	24	
2 No load speed	rpm	6000	6000	
3 No load current	mA	107	107	
4 Nominal speed	rpm	6000	6000	
5 Nominal torque (max. continuous torque)	mNm	32.6	32.6	
6 Nominal current (max. continuous current)	A	1.19	1.19	
33 Max. torque	mNm	105	105	
34 Max. current	A	6.5	6.5	
9 Max. efficiency	%	75.4	75.4	
Characteristics				
35 Type of control				
36 Supply voltage +V <sub>CC</sub>	V	8...28	8...28	
37 Speed set value input	V	0.42...10.1	0.42...10.1	
38 Scale speed set value input	rpm/V	600	600	
39 Speed range	rpm	250...6060	250...6060	
40 Max. acceleration	rpm/s	6000	6000	

### Specifications

Thermal data		
17 Thermal resistance housing-ambient	13.0 K/W	
18 Thermal resistance winding-housing	5.9 K/W	
19 Thermal time constant winding	34.1 s	
20 Thermal time constant motor	1030 s	
21 Ambient temperature	-40...+85°C	
22 Max. winding temperature	+155°C	
41 Max. temperature of electronics	100°C	
Mechanical data (preloaded ball bearings)		
16 Rotor inertia	6.69 gcm <sup>2</sup>	
24 Axial play at axial load < 9.0 N	0 mm	
	> 9.0 N	0.14 mm
25 Radial play	preloaded	
26 Max. axial load (dynamic)	9 N	
27 Max. force for press fits (static) (static, shaft supported)	48.8 N	
28 Max. radial load, 10 mm from flange	30 N	

### Operating Range



### Comments

- Continuous operation
- Continuous operation with reduced thermal resistance R<sub>th2</sub> 50%
- Intermittent operation

### Other specifications

31 Weight of motor	160 g
32 Direction of rotation	Clockwise (CW)

Values listed in the table are nominal.

### Protective functions

Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

### Connection 5 wire version (Cable AWG 20/24)

red	+V <sub>CC</sub> 8...28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

### maxon Modular System

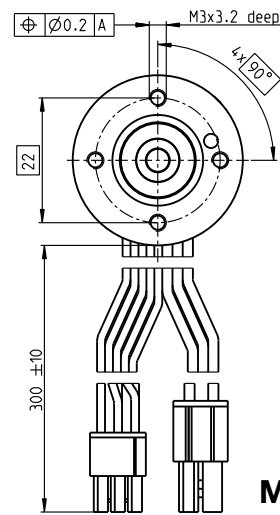
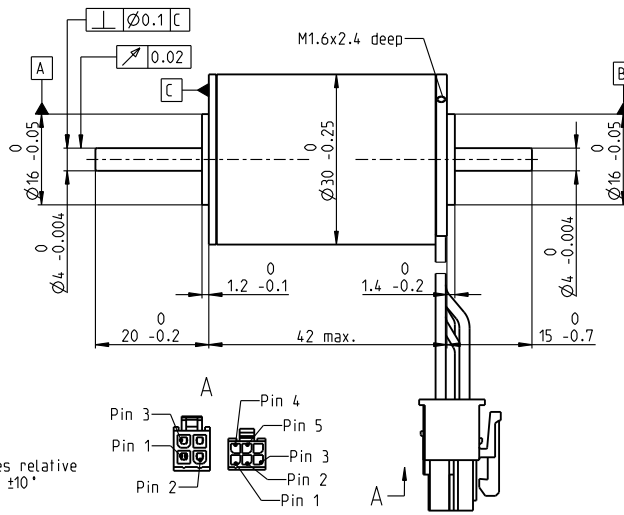
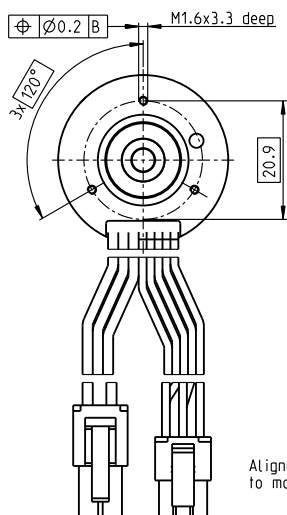
Details on catalog page 34

### Planetary Gearhead

Ø32 mm  
1.0 - 6.0 Nm  
Page 353



# EC-i 30 Ø30 mm, brushless, 30 Watt



Alignment of cables relative to mounting holes  $\pm 10^\circ$

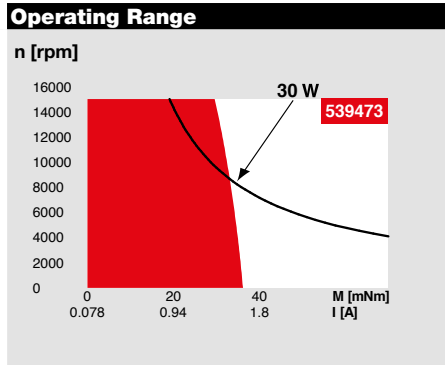
M 3:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
with Hall sensors	539472	539473	539474	539475

Motor Data (provisional)	539472	539473	539474	539475	
<b>Values at nominal voltage</b>					
1 Nominal voltage	V	12	24	36	48
2 No load speed	rpm	9190	9190	9190	9010
3 No load current	mA	206	103	68.6	50.1
4 Nominal speed	rpm	7710	7770	7760	7600
5 Nominal torque (max. continuous torque)	mNm	37.3	37.3	35.9	37.4
6 Nominal current (max. continuous current)	A	3.05	1.52	0.982	0.748
7 Stall torque <sup>1</sup>	mNm	341	360	338	358
8 Stall current	A	27.7	14.6	9.15	7.11
9 Max. efficiency	%	83.7	84.1	83.6	84.1
<b>Characteristics</b>					
10 Terminal resistance phase to phase	$\Omega$	0.434	1.64	3.93	6.76
11 Terminal inductance phase to phase	mH	0.279	1.12	2.51	4.66
12 Torque constant	mNm/A	12.3	24.6	37	50.3
13 Speed constant	rpm/V	775	387	258	190
14 Speed/torque gradient	rpm/mNm	27.3	25.8	27.5	25.5
15 Mechanical time constant	ms	2.08	1.98	2.1	1.95
16 Rotor inertia	gcm <sup>2</sup>	7.3	7.3	7.3	7.3

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	11.1 K/W
18 Thermal resistance winding-housing	3.75 K/W
19 Thermal time constant winding	29.1 s
20 Thermal time constant motor	849 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	15000 rpm
24 Axial play at axial load < 9.0 N	0 mm
> 9.0 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	5 N
27 Max. force for press fits (static) (static, shaft supported)	98 N
28 Max. radial load, 5 mm from flange	2000 N



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Other specifications	
29 Number of pole pairs	2
30 Number of phases	3
31 Weight of motor	153 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector Article number	
Molex	39-01-2040

Connection sensors (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number	
Molex	430-25-0600

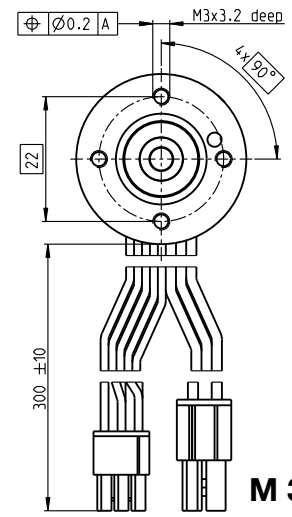
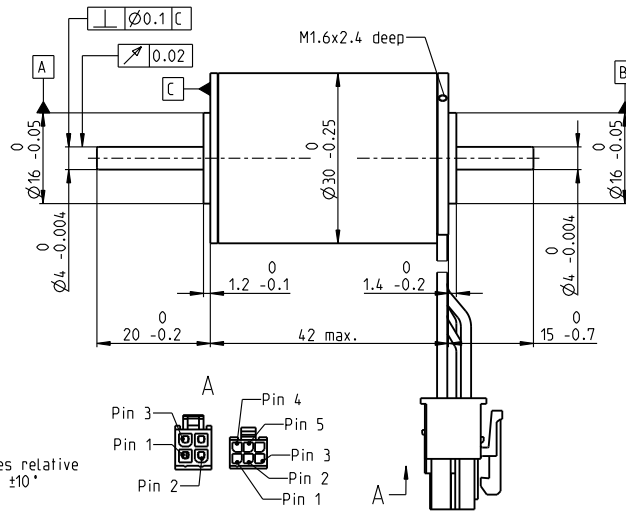
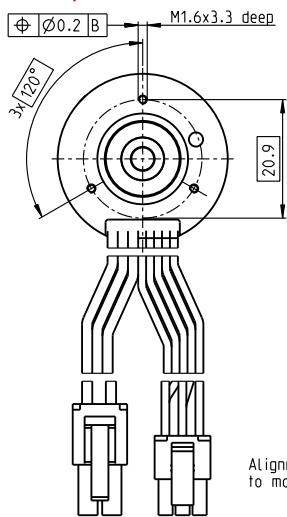
Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

maxon Modular System		Details on catalog page 34	
<b>Planetary Gearhead</b> Ø32 mm 1.0 - 6.0 Nm Page 353		<b>Encoder 16 EASY</b> 128 - 1024 CPT, 3 channels Page 418	<b>Encoder 16 EASY Absolute</b> 4096 steps Page 422
<b>Screw Drive</b> Ø32 mm Page 382-387		<b>Encoder 16 RIO</b> 1024 - 32768 CPT, 3 channels Page 435	<b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 438
<b>Recommended Electronics:</b>	<b>Notes</b>	<b>Encoder AEDL 5810</b> 1024 - 5000 CPT, 3 channels Page 445	
ESCON Module 24/2	454		
ESCON 36/3 EC	455		
ESCON Mod. 50/4 EC-S	455		
ESCON Mod. 50/5	455		
ESCON 50/5	457		
DEC Module 24/2	459		
DEC Module 50/5	459		
EPOS4 50/5	463		
EPOS4 Mod./Comp. 50/5	463		
EPOS2 P 24/5	470		
MAXPOS 50/5	473		



# EC-i 30 Ø30 mm, brushless, 45 Watt

High Torque



Alignment of cables relative to mounting holes ±10°

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with Hall sensors

539480	539481	539482	539483	539484
--------	--------	--------	--------	--------

## Motor Data (provisional)

Values at nominal voltage		12	18	24	36	48
1 Nominal voltage	V	12	18	24	36	48
2 No load speed	rpm	8250	8250	8520	8250	8520
3 No load current	mA	273	182	143	91.1	71.5
4 Nominal speed	rpm	6710	6760	7030	6790	7050
5 Nominal torque (max. continuous torque)	mNm	65.4	67.7	63.8	67.6	63.8
6 Nominal current (max. continuous current)	A	4.51	3.09	2.28	1.54	1.14
7 Stall torque <sup>1</sup>	mNm	731	840	811	885	835
8 Stall current	A	53.2	40.8	30.5	21.5	15.7
9 Max. efficiency	%	86.3	87.2	86.9	87.5	87.1
Characteristics						
10 Terminal resistance phase to phase	Ω	0.225	0.441	0.787	1.68	3.06
11 Terminal inductance phase to phase	mH	0.199	0.449	0.749	1.8	3
12 Torque constant	mNm/A	13.7	20.6	26.6	41.2	53.2
13 Speed constant	rpm/V	696	464	359	232	180
14 Speed/torque gradient	rpm/mNm	11.4	9.94	10.6	9.43	10.3
15 Mechanical time constant	ms	0.969	0.843	0.902	0.8	0.876
16 Rotor inertia	gcm <sup>2</sup>	8.1	8.1	8.1	8.1	8.1

## Specifications

Thermal data		
17 Thermal resistance housing-ambient	11.1 K/W	
18 Thermal resistance winding-housing	3.75 K/W	
19 Thermal time constant winding	27.8 s	
20 Thermal time constant motor	866 s	
21 Ambient temperature	-40...+100°C	
22 Max. winding temperature	+155°C	
Mechanical data (preloaded ball bearings)		
23 Max. speed	10000 rpm	
24 Axial play at axial load < 9.0 N	0 mm	
	> 9.0 N	0.14 mm preloaded
25 Radial play	5 N	
26 Max. axial load (dynamic)	98 N	
27 Max. force for press fits (static) (static, shaft supported)	2000 N	
28 Max. radial load, 5 mm from flange	25 N	

## Other specifications

29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	156 g

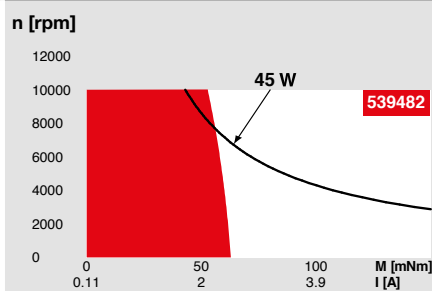
Values listed in the table are nominal.

Connection motor (Cable AWG 20)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector Article number		
Molex	39-01-2040	
Connection sensors (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number  
Molex 430-25-0600  
Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

## Operating Range



## Comments

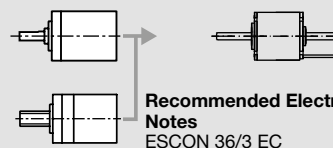
- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

## maxon Modular System

Details on catalog page 34

**Planetary Gearhead**  
Ø32 mm  
1.0 - 6.0 Nm  
Page 353

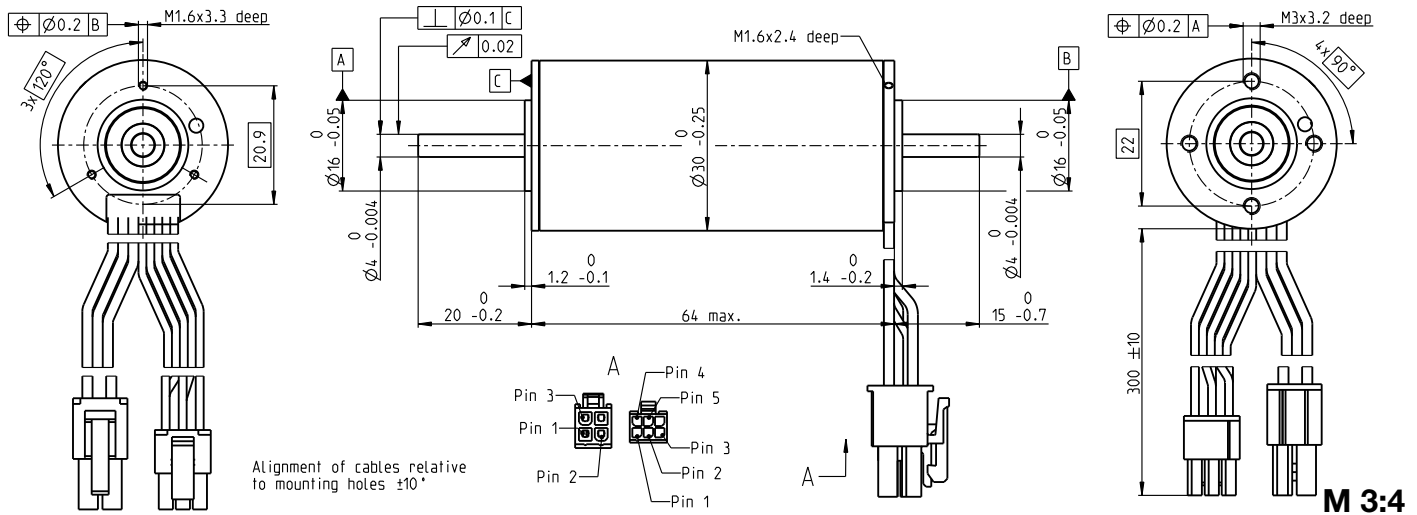
**Screw Drive**  
Ø32 mm  
Page 382-387



Recommended Electronics:		Page 34
Notes		
ESCON 36/3 EC	455	
ESCON Mod. 50/4 EC-S	455	
ESCON Mod. 50/5	455	
ESCON 50/5	457	
DEC Module 50/5	459	
EPOS2 P 24/5	470	
EPOS4 50/5	463	
EPOS4 Mod./Comp. 50/5	463	
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<b>Encoder 16 EASY</b>	128 - 1024 CPT, 3 channels
	Page 418
<b>Encoder 16 EASY Absolute</b>	4096 steps
	Page 422
<b>Encoder 16 RIO</b>	1024 - 32768 CPT, 3 channels
	Page 435
<b>Encoder HEDL 5540</b>	500 CPT, 3 channels
	Page 438
<b>Encoder AEDL 5810</b>	1024 - 5000 CPT, 3 channels
	Page 445

# EC-i 30 Ø30 mm, brushless, 50 Watt

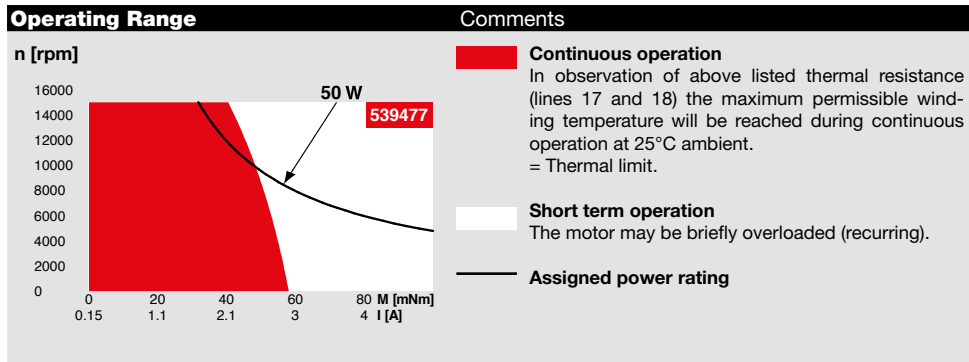


- Stock program
- Standard program
- Special program (on request)

Part Numbers				
with Hall sensors	539476	539477	539478	539479

Motor Data (provisional)					
<b>Values at nominal voltage</b>					
1 Nominal voltage	V	12	24	36	48
2 No load speed	rpm	9950	9960	10300	10200
3 No load current	mA	337	169	117	86.8
4 Nominal speed	rpm	8750	8840	9160	9110
5 Nominal torque (max. continuous torque)	mNm	55.6	55.5	53.1	58.4
6 Nominal current (max. continuous current)	A	4.98	2.48	1.64	1.33
7 Stall torque <sup>1</sup>	mNm	682	768	762	909
8 Stall current	A	59.8	33.7	23	20.4
9 Max. efficiency	%	85.7	86.5	86.3	87.5
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	0.201	0.713	1.57	2.35
11 Terminal inductance phase to phase	mH	0.119	0.475	1.01	1.82
12 Torque constant	mNm/A	11.4	22.8	33.2	44.6
13 Speed constant	rpm/V	837	418	288	214
14 Speed/torque gradient	rpm/mNm	14.7	13.1	13.6	11.3
15 Mechanical time constant	ms	2.13	1.89	1.96	1.63
16 Rotor inertia	gcm <sup>2</sup>	13.8	13.8	13.8	13.8

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	9.01 K/W
18 Thermal resistance winding-housing	2.46 K/W
19 Thermal time constant winding	31.2 s
20 Thermal time constant motor	1080 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	15000 rpm
24 Axial play at axial load < 9.0 N	0 mm
> 9.0 N	0.14 mm preloaded
25 Radial play	5 N
26 Max. axial load (dynamic)	98 N
27 Max. force for press fits (static) (static, shaft supported)	1300 N
28 Max. radial load, 5 mm from flange	25 N

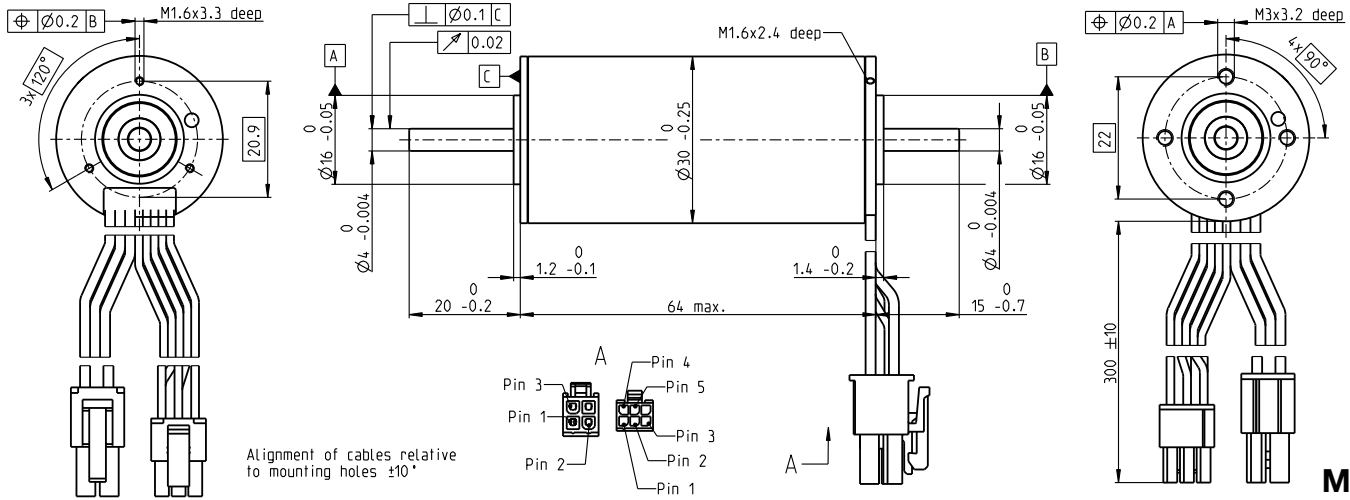


- | Other specifications    |       |
|-------------------------|-------|
| 29 Number of pole pairs | 2     |
| 30 Number of phases     | 3     |
| 31 Weight of motor      | 240 g |
- Values listed in the table are nominal.
- | Connection motor (Cable AWG 20) |                 |       |
|---------------------------------|-----------------|-------|
| red                             | Motor winding 1 | Pin 1 |
| black                           | Motor winding 2 | Pin 2 |
| white                           | Motor winding 3 | Pin 3 |
|                                 | N.C.            | Pin 4 |
- | Connector Article number |            |  |
|--------------------------|------------|--|
| Molex                    | 39-01-2040 |  |
- | Connection sensors (Cable AWG 26) |                                |       |
|-----------------------------------|--------------------------------|-------|
| yellow                            | Hall sensor 1                  | Pin 1 |
| brown                             | Hall sensor 2                  | Pin 2 |
| grey                              | Hall sensor 3                  | Pin 3 |
| blue                              | GND                            | Pin 4 |
| green                             | V <sub>Hall</sub> 4.5...24 VDC | Pin 5 |
|                                   | N.C.                           | Pin 6 |
- | Connector Article number |             |
|--------------------------|-------------|
| Molex                    | 430-25-0600 |
- Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

maxon Modular System		Details on catalog page 34																				
<p><b>Planetary Gearhead</b>                      Ø32 mm                      1.0 - 6.0 Nm                      Page 353</p> <p><b>Screw Drive</b>                      Ø32 mm                      Page 382-387</p>		<p><b>Encoder 16 EASY</b>                      128 - 1024 CPT, 3 channels                      Page 418</p> <p><b>Encoder 16 EASY Absolute</b>                      4096 steps                      Page 422</p> <p><b>Encoder 16 RIO</b>                      1024 - 32768 CPT, 3 channels                      Page 435</p> <p><b>Encoder HEDL 5540</b>                      500 CPT, 3 channels                      Page 438</p> <p><b>Encoder AEDL 5810</b>                      1024 - 5000 CPT, 3 channels                      Page 445</p>																				
<p><b>Recommended Electronics:</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Notes</th> <th>Page 34</th> </tr> </thead> <tbody> <tr> <td>ESCON 36/3 EC</td> <td style="text-align: center;">455</td> </tr> <tr> <td>ESCON Mod. 50/4 EC-S</td> <td style="text-align: center;">455</td> </tr> <tr> <td>ESCON Mod. 50/5</td> <td style="text-align: center;">455</td> </tr> <tr> <td>ESCON 50/5</td> <td style="text-align: center;">457</td> </tr> <tr> <td>DEC Module 50/5</td> <td style="text-align: center;">459</td> </tr> <tr> <td>EPOS4 50/5</td> <td style="text-align: center;">463</td> </tr> <tr> <td>EPOS4 Mod./Comp. 50/5</td> <td style="text-align: center;">463</td> </tr> <tr> <td>EPOS2 P 24/5</td> <td style="text-align: center;">470</td> </tr> <tr> <td>MAXPOS 50/5</td> <td style="text-align: center;">473</td> </tr> </tbody> </table>		Notes	Page 34	ESCON 36/3 EC	455	ESCON Mod. 50/4 EC-S	455	ESCON Mod. 50/5	455	ESCON 50/5	457	DEC Module 50/5	459	EPOS4 50/5	463	EPOS4 Mod./Comp. 50/5	463	EPOS2 P 24/5	470	MAXPOS 50/5	473	
Notes	Page 34																					
ESCON 36/3 EC	455																					
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DEC Module 50/5	459																					
EPOS4 50/5	463																					
EPOS4 Mod./Comp. 50/5	463																					
EPOS2 P 24/5	470																					
MAXPOS 50/5	473																					

# EC-i 30 Ø30 mm, brushless, 75 Watt

High Torque



maxon EC-i

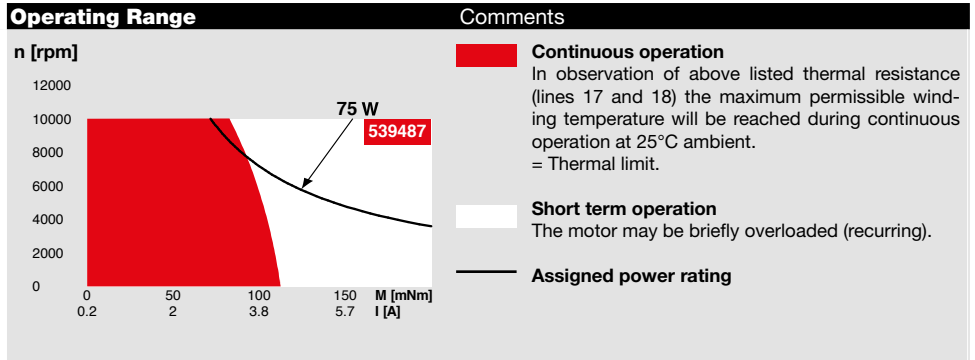
M 3:4

- Stock program
- Standard program
- Special program (on request)

		Part Numbers				
with Hall sensors		539485	539486	539487	539488	539489

Motor Data (provisional)		with Hall sensors				
Values at nominal voltage						
1 Nominal voltage	V	12	18	24	36	48
2 No load speed	rpm	7940	7950	7950	7950	8210
3 No load current	mA	447	298	223	149	117
4 Nominal speed	rpm	6760	6840	6870	6890	7150
5 Nominal torque (max. continuous torque)	mNm	108	110	107	110	104
6 Nominal current (max. continuous current)	A	7.32	4.97	3.64	2.48	1.83
7 Stall torque <sup>1</sup>	mNm	1460	1770	1800	1970	1910
8 Stall current	A	102	82.5	63.1	46	34.6
9 Max. efficiency	%	87.3	88.5	88.6	89	88.8
Characteristics						
10 Terminal resistance phase to phase	Ω	0.118	0.218	0.38	0.782	1.39
11 Terminal inductance phase to phase	mH	0.0975	0.219	0.39	0.877	1.46
12 Torque constant	mNm/A	14.3	21.4	28.6	42.9	55.4
13 Speed constant	rpm/V	668	446	334	223	173
14 Speed/torque gradient	rpm/mNm	5.5	4.54	4.45	4.07	4.33
15 Mechanical time constant	ms	0.893	0.736	0.722	0.66	0.702
16 Rotor inertia	gcm <sup>2</sup>	15.5	15.5	15.5	15.5	15.5

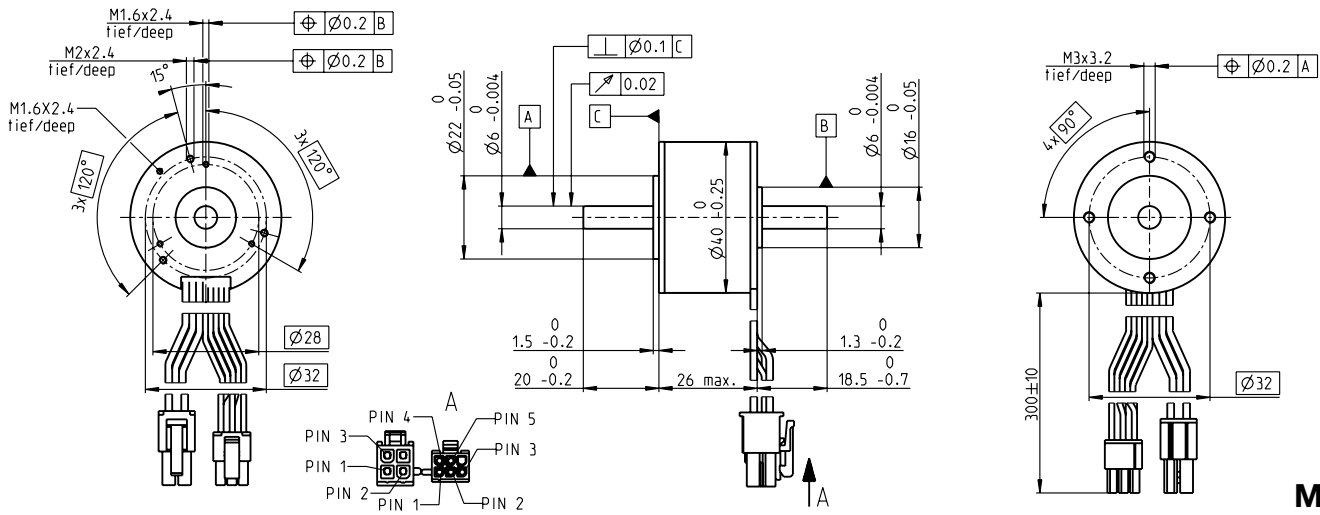
Specifications	
Thermal data	
17 Thermal resistance housing-ambient	9.01 K/W
18 Thermal resistance winding-housing	2.46 K/W
19 Thermal time constant winding	32.7 s
20 Thermal time constant motor	1090 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	10000 rpm
24 Axial play at axial load < 9.0 N	0 mm
> 9.0 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	5 N
27 Max. force for press fits (static) (static, shaft supported)	98 N
1300 N	
28 Max. radial load, 5 mm from flange	25 N



- | Other specifications    |       |
|-------------------------|-------|
| 29 Number of pole pairs | 4     |
| 30 Number of phases     | 3     |
| 31 Weight of motor      | 242 g |
- Values listed in the table are nominal.
- | Connection motor (Cable AWG 20) |                 |       |
|---------------------------------|-----------------|-------|
| red                             | Motor winding 1 | Pin 1 |
| black                           | Motor winding 2 | Pin 2 |
| white                           | Motor winding 3 | Pin 3 |
|                                 | N.C.            | Pin 4 |
- | Connector Article number |            |
|--------------------------|------------|
| Molex                    | 39-01-2040 |
- | Connection sensors (Cable AWG 26) |                                |       |
|-----------------------------------|--------------------------------|-------|
| yellow                            | Hall sensor 1                  | Pin 1 |
| brown                             | Hall sensor 2                  | Pin 2 |
| grey                              | Hall sensor 3                  | Pin 3 |
| blue                              | GND                            | Pin 4 |
| green                             | V <sub>Hall</sub> 4.5...24 VDC | Pin 5 |
|                                   | N.C.                           | Pin 6 |
- | Connector Article number |             |
|--------------------------|-------------|
| Molex                    | 430-25-0600 |
- Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

maxon Modular System		Details on catalog page 34
<b>Planetary Gearhead</b> Ø32 mm 1.0 - 6.0 Nm Page 353 <b>Screw Drive</b> Ø32 mm Page 382-387		<b>Encoder 16 EASY</b> 128 - 1024 CPT, 3 channels Page 418 <b>Encoder 16 EASY Absolute</b> 4096 steps Page 422 <b>Encoder 16 RIO</b> 1024 - 32768 CPT, 3 channels Page 435 <b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 438 <b>Encoder AEDL 5810</b> 1024 - 5000 CPT, 3 channels Page 445
<b>Recommended Electronics:</b> <b>Notes</b> Page 34		ESCON 36/3 EC 455 ESCON Mod. 50/4 EC-S 455 ESCON Mod. 50/5 455 ESCON Mod. 50/8 (HE) 456 ESCON 50/5 457 DEC Module 50/5 459 EPOS4 50/5 463 EPOS4 Mod./Comp. 50/5 463 EPOS4 Mod./Comp. 50/8 465 EPOS4 70/15 467 EPOS2 P 24/5 470 MAXPOS 50/5 473

# EC-i 40 Ø40 mm, brushless, 50 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
with Hall sensors	449463 <span style="background-color: red; color: white;">449464</span>

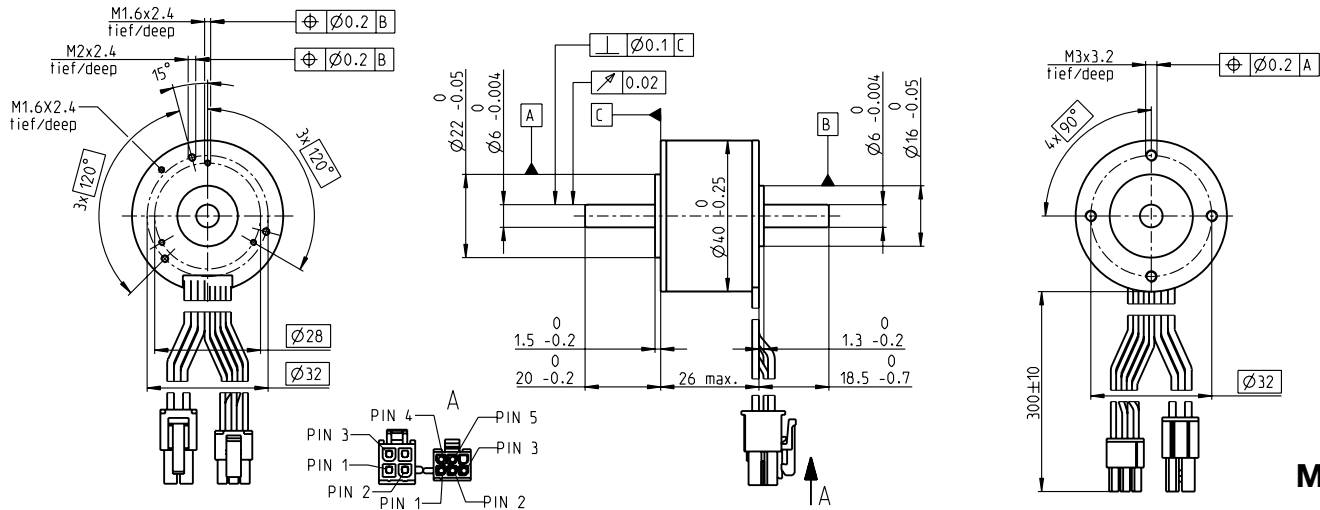
Motor Data			
Values at nominal voltage			
1 Nominal voltage	V	12	24
2 No load speed	rpm	12400	13200
3 No load current	mA	522	285
4 Nominal speed	rpm	9660	10300
5 Nominal torque (max. continuous torque)	mNm	43.3	52.8
6 Nominal current (max. continuous current)	A	4.53	2.8
7 Stall torque <sup>1</sup>	mNm	473	810
8 Stall current	A	52.9	47.9
9 Max. efficiency	%	81	85
Characteristics			
10 Terminal resistance phase to phase	Ω	0.227	0.501
11 Terminal inductance phase to phase	mH	0.109	0.39
12 Torque constant	mNm/A	8.95	16.9
13 Speed constant	rpm/V	1070	565
14 Speed/torque gradient	rpm/mNm	27.1	16.7
15 Mechanical time constant	ms	2.98	1.84
16 Rotor inertia	gcm <sup>2</sup>	10.5	10.5

Specifications	Operating Range	Comments
<b>Thermal data</b> 17 Thermal resistance housing-ambient 9.66 K/W 18 Thermal resistance winding-winding 2.57 K/W 19 Thermal time constant winding 17.5 s 20 Thermal time constant motor 821 s 21 Ambient temperature -40...+100°C 22 Max. winding temperature +155°C  <b>Mechanical data (preloaded ball bearings)</b> 23 Max. speed 15000 rpm 24 Axial play at axial load < 9.0 N 0 mm > 9.0 N 0.15 mm 25 Radial play preloaded 5 N 26 Max. axial load (dynamic) 87 N 27 Max. force for press fits (static) (static, shaft supported) 6500 N 28 Max. radial load, 5 mm from flange 15 N  <b>Other specifications</b> 29 Number of pole pairs 7 30 Number of phases 3 31 Weight of motor 170 g		<p><span style="display: inline-block; width: 10px; height: 10px; background-color: red; border: 1px solid black;"></span> <b>Continuous operation</b>                      In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.                      = Thermal limit.</p> <p><span style="display: inline-block; width: 10px; height: 10px; background-color: white; border: 1px solid black;"></span> <b>Short term operation</b>                      The motor may be briefly overloaded (recurring).</p> <p><span style="display: inline-block; width: 10px; height: 10px; border-bottom: 1px solid black;"></span> <b>Assigned power rating</b></p>

maxon Modular System		Details on catalog page 34	
<b>Planetary Gearhead</b> Ø32 mm 1.0 - 6.0 Nm Page 353 <b>Planetary Gearhead</b> Ø42 mm 3 - 15 Nm Page 362 <b>Screw Drive</b> Ø32 mm Page 382-387		<b>Recommended Electronics:</b> Notes Page 34 ESCON 36/3 EC 455 ESCON Mod. 50/4 EC-S 455 ESCON Module 50/5 455 ESCON 50/5 457 DEC Module 50/5 459 EPOS4 50/5 463 EPOS4 Mod./Comp. 50/5 463 EPOS2 P 24/5 470 MAXPOS 50/5 473	<b>Encoder 16 EASY</b> 128 - 1024 CPT, 3 channels Page 418 <b>Encoder 16 EASY Absolute</b> 4096 steps Page 422 <b>Encoder 16 RIO</b> 1024 - 32768 CPT, 3 channels Page 436 <b>Encoder AEDL 5810</b> 1024 - 5000 CPT, 3 channels Page 438 <b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 446

# EC-i 40 Ø40 mm, brushless, 50 Watt

High Torque



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with Hall sensors	496650	496651	496652	496653
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## Motor Data

Values at nominal voltage		9	18	36	48
1 Nominal voltage	V	9	18	36	48
2 No load speed	rpm	7770	7790	7350	7560
3 No load current	mA	577	289	131	103
4 Nominal speed	rpm	6390	6520	6080	6310
5 Nominal torque (max. continuous torque)	mNm	65.2	64.6	78.2	73.3
6 Nominal current (max. continuous current)	A	5.91	2.93	1.61	1.18
7 Stall torque <sup>1</sup>	mNm	716	858	1150	1090
8 Stall current	A	66	39.5	25	18.2
9 Max. efficiency	%	82	84	86	85
Characteristics		0.136	0.455	1.44	2.63
10 Terminal resistance phase to phase	Ω	0.136	0.455	1.44	2.63
11 Terminal inductance phase to phase	mH	0.064	0.255	1.15	1.93
12 Torque constant	mNm/A	10.8	21.7	46.1	59.6
13 Speed constant	rpm/V	881	440	207	160
14 Speed/torque gradient	rpm/mNm	11.1	9.24	6.48	7.07
15 Mechanical time constant	ms	1.48	1.24	0.869	0.948
16 Rotor inertia	gcm <sup>2</sup>	12.8	12.8	12.8	12.8

## Specifications

Thermal data		9.91 K/W
17 Thermal resistance housing-ambient		9.91 K/W
18 Thermal resistance winding-housing		3.77 K/W
19 Thermal time constant winding		25.6 s
20 Thermal time constant motor		892 s
21 Ambient temperature		-40...+100°C
22 Max. winding temperature		+155°C
Mechanical data (preloaded ball bearings)		10000 rpm
23 Max. speed		10000 rpm
24 Axial play at axial load < 9.0 N		0 mm
	> 9.0 N	0.15 mm
25 Radial play		preloaded
26 Max. axial load (dynamic)		7 N
27 Max. force for press fits (static) (static, shaft supported)		87 N
28 Max. radial load, 5 mm from flange		6500 N
		21 N

## Other specifications

29 Number of pole pairs	7
30 Number of phases	3
31 Weight of motor	180 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

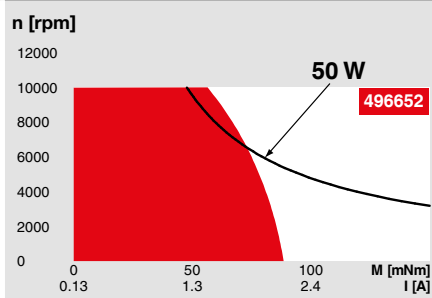
Connector	Article number
Molex	39-01-2040

Connection sensor (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	Article number
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

## Operating Range



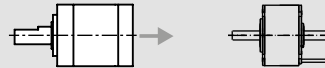
## Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

## maxon Modular System

Details on catalog page 34

**Planetary Gearhead**  
 Ø42 mm  
 3 - 15 Nm  
 Page 362



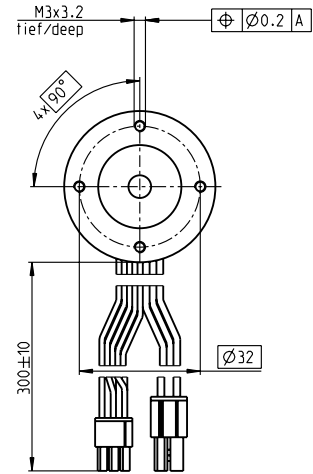
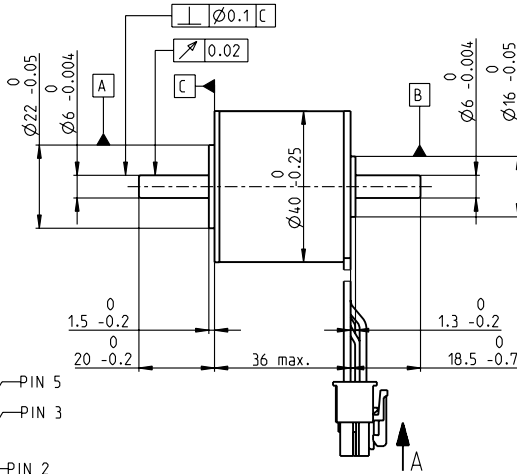
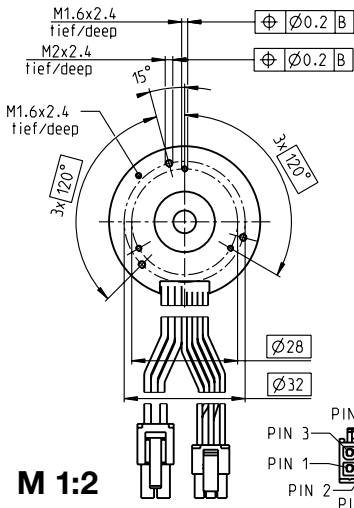
## Recommended Electronics:

Notes	Page 34
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
ESCON Module 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 70/15	467
EPOS2 P 24/5	470
MAXPOS 50/5	473

## Encoder 16 EASY

128 - 1024 CPT, 3 channels	Page 418
<b>Encoder 16 EASY Absolute</b>	4096 steps
	Page 422
<b>Encoder 16 RIO</b>	1024 - 32768 CPT, 3 channels
	Page 436
<b>Encoder AEDL 5810</b>	1024 - 5000 CPT, 3 channels
	Page 438
<b>Encoder HEDL 5540</b>	500 CPT, 3 channels
	Page 446

# EC-i 40 Ø40 mm, brushless, 70 Watt

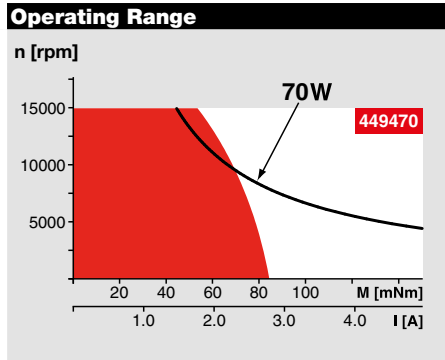


- Stock program
- Standard program
- Special program (on request)

Part Numbers	
with Hall sensors	449469 <span style="color: red;">449470</span>

Motor Data			
<b>Values at nominal voltage</b>			
1 Nominal voltage	V	18	36
2 No load speed	rpm	10100	10700
3 No load current	mA	354	192
4 Nominal speed	rpm	8230	8740
5 Nominal torque (max. continuous torque)	mNm	68.7	83.4
6 Nominal current (max. continuous current)	A	3.93	2.43
7 Stall torque <sup>1</sup>	mNm	876	1460
8 Stall current	A	52.5	46.3
9 Max. efficiency	%	84	87
<b>Characteristics</b>			
10 Terminal resistance phase to phase	Ω	0.343	0.778
11 Terminal inductance phase to phase	mH	0.18	0.644
12 Torque constant	mNm/A	16.7	31.5
13 Speed constant	rpm/V	572	303
14 Speed/torque gradient	rpm/mNm	11.7	7.47
15 Mechanical time constant	ms	2.98	1.89
16 Rotor inertia	gcm <sup>2</sup>	24.2	24.2

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	7.8 K/W
18 Thermal resistance winding-housing	2.6 K/W
19 Thermal time constant winding	28.1 s
20 Thermal time constant motor	936 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	15000 rpm
24 Axial play at axial load < 9.0 N	0 mm
> 9.0 N	0.15 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	5 N
27 Max. force for press fits (static) (static, shaft supported)	87 N
28 Max. radial load, 5 mm from flange	5000 N



**Comments**

- **Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- **Assigned power rating**

Other specifications	
29 Number of pole pairs	7
30 Number of phases	3
31 Weight of motor	240 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector Article number		
Molex	39-01-2040	

Connection sensor (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

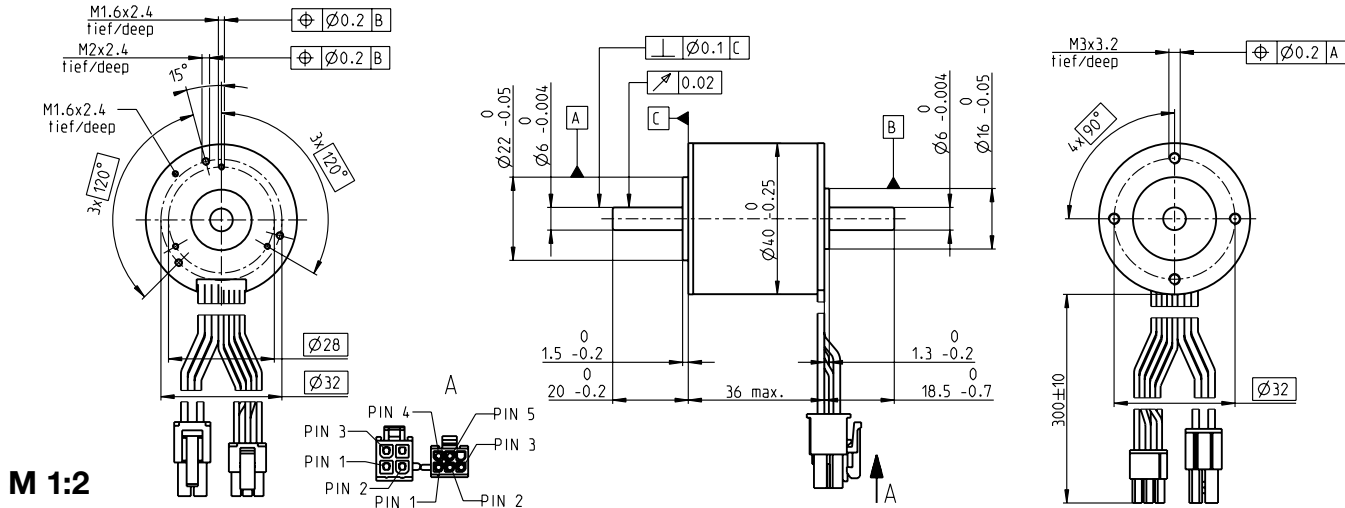
Connector Article number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

maxon Modular System		Details on catalog page 34
<b>Planetary Gearhead</b> Ø32 mm 1.0 - 6.0 Nm Page 353		<b>Encoder 16 EASY</b> 128 - 1024 CPT, 3 channels Page 418 <b>Encoder 16 EASY Absolute</b> 4096 steps Page 422 <b>Encoder 16 RIO</b> 1024 - 32768 CPT, 3 channels Page 436 <b>Encoder AEDL 5810</b> 1024 - 5000 CPT, 3 channels Page 438 <b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 446
<b>Planetary Gearhead</b> Ø42 mm 3 - 15 Nm Page 362		<b>Recommended Electronics:</b> <b>Notes</b> Page 34
<b>Screw Drive</b> Ø32 mm Page 382-387		ESCON 36/3 EC 455 ESCON Mod. 50/4 EC-S 455 ESCON Module 50/5 455 ESCON 50/5 457 DEC Module 50/5 459 EPOS4 50/5 463 EPOS4 Mod./Comp. 50/5 463 EPOS2 P 24/5 470 MAXPOS 50/5 473

# EC-i 40 Ø40 mm, brushless, 70 Watt

High Torque



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with Hall sensors	496654	496655	496656
-------------------	--------	--------	--------

## Motor Data

Values at nominal voltage		18	36	48
1 Nominal voltage	V	18	36	48
2 No load speed	rpm	7840	7390	4930
3 No load current	mA	448	205	86.4
4 Nominal speed	rpm	6890	6450	4100
5 Nominal torque (max. continuous torque)	mNm	105	129	151
6 Nominal current (max. continuous current)	A	4.87	2.73	1.55
7 Stall torque <sup>1</sup>	mNm	1960	2800	1940
8 Stall current	A	90.4	60.9	21.1
9 Max. efficiency	%	86	89	87
Characteristics				
10 Terminal resistance phase to phase	Ω	0.199	0.591	2.28
11 Terminal inductance phase to phase	mH	0.113	0.512	2.05
12 Torque constant	mNm/A	21.7	46.1	92.1
13 Speed constant	rpm/V	441	207	104
14 Speed/torque gradient	rpm/mNm	4.05	2.66	2.56
15 Mechanical time constant	ms	0.975	0.641	0.617
16 Rotor inertia	gcm <sup>2</sup>	23	23	23

## Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	8.17 K/W
18 Thermal resistance winding-housing	2.27 K/W
19 Thermal time constant winding	24.5 s
20 Thermal time constant motor	1020 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	10000 rpm
24 Axial play at axial load < 9.0 N	0 mm
> 9.0 N	0.15 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	7 N
27 Max. force for press fits (static) (static, shaft supported)	87 N
28 Max. radial load, 5 mm from flange	5000 N
	26 N

## Other specifications

29 Number of pole pairs	7
30 Number of phases	3
31 Weight of motor	250 g

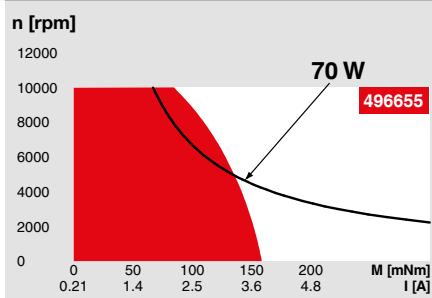
Values listed in the table are nominal.

Connection motor (Cable AWG 20)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector Article number		
Molex	39-01-2040	
Connection sensor (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number  
Molex 430-25-0600  
Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

## Operating Range



## Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

## maxon Modular System

Details on catalog page 34

**Planetary Gearhead**  
Ø42 mm  
3 - 15 Nm  
Page 362

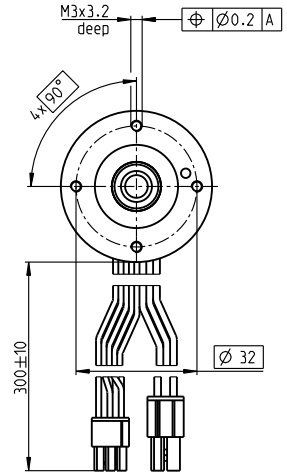
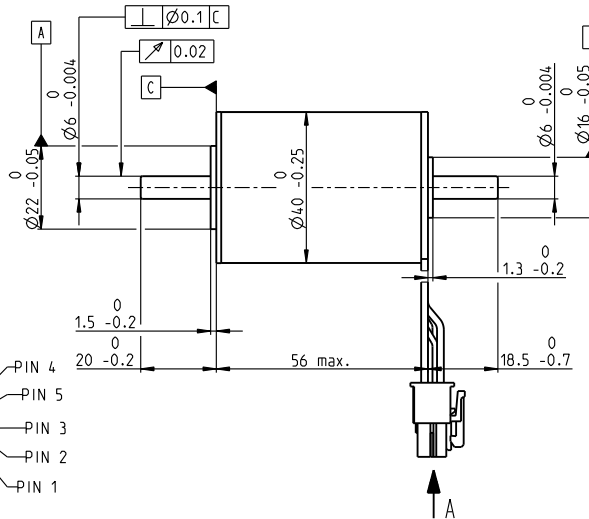
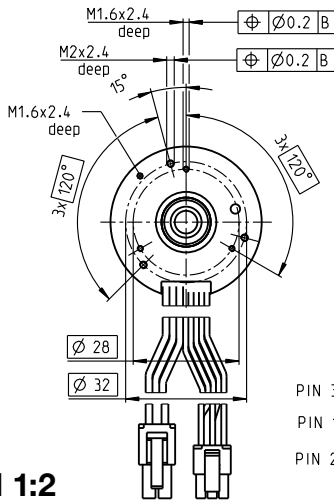


Recommended Electronics:	
Notes	Page 34
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
ESCON Module 50/5	455
ESCON 50/5	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

<b>Encoder 16 EASY</b> 128 - 1024 CPT, 3 channels Page 418
<b>Encoder 16 EASY Absolute</b> 4096 steps Page 422
<b>Encoder 16 RIO</b> 1024 - 32768 CPT, 3 channels Page 436
<b>Encoder AEDL 5810</b> 1024 - 5000 CPT, 3 channels Page 438
<b>Encoder HEDL 5540</b> 500 CPT, 3 channels Page 446

# EC-i 40 Ø40 mm, brushless, 100 Watt

High Torque



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

with Hall sensors

496660	496661	488607
--------	--------	--------

## Motor Data

Values at nominal voltage			496660	496661	488607
1 Nominal voltage	V	18	36	48	
2 No load speed	rpm	4540	4550	5000	
3 No load current	mA	352	176	150	
4 Nominal speed	rpm	3920	3950	4390	
5 Nominal torque (max. continuous torque)	mNm	207	207	222	
6 Nominal current (max. continuous current)	A	5.46	2.72	2.39	
7 Stall torque <sup>1</sup>	mNm	2860	3160	4330	
8 Stall current	A	76.3	42.2	47.5	
9 Max. efficiency	%	87	87	89	
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	0.236	0.853	1.01	
11 Terminal inductance phase to phase	mH	0.169	0.675	0.995	
12 Torque constant	mNm/A	37.5	74.9	91	
13 Speed constant	rpm/V	255	127	105	
14 Speed/torque gradient	rpm/mNm	1.6	1.45	1.16	
15 Mechanical time constant	ms	0.739	0.669	0.537	
16 Rotor inertia	gcm <sup>2</sup>	44	44	44	

## Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	7.17 K/W
18 Thermal resistance winding-housing	1.35 K/W
19 Thermal time constant winding	20.7 s
20 Thermal time constant motor	1400 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	8000 rpm
24 Axial play at axial load < 9.0 N	0 mm
> 9.0 N	0.15 mm preloaded
25 Radial play	7 N
26 Max. axial load (dynamic)	87 N
27 Max. force for press fits (static) (static, shaft supported)	3000 N
28 Max. radial load, 5 mm from flange	29.9 N

## Other specifications

29 Number of pole pairs	7
30 Number of phases	3
31 Weight of motor	390 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

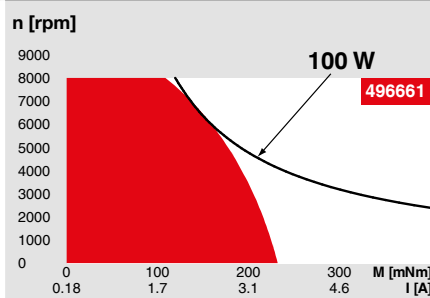
Connector	Article number
Molex	39-01-2040

Connection sensor (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	Article number
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

## Operating Range



## Comments

**Continuous operation**  
 In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
 = Thermal limit.

**Short term operation**  
 The motor may be briefly overloaded (recurring).

**Assigned power rating**

## maxon Modular System

Details on catalog page 34

**Planetary Gearhead**  
 Ø42 mm  
 3 - 15 Nm  
 Page 362



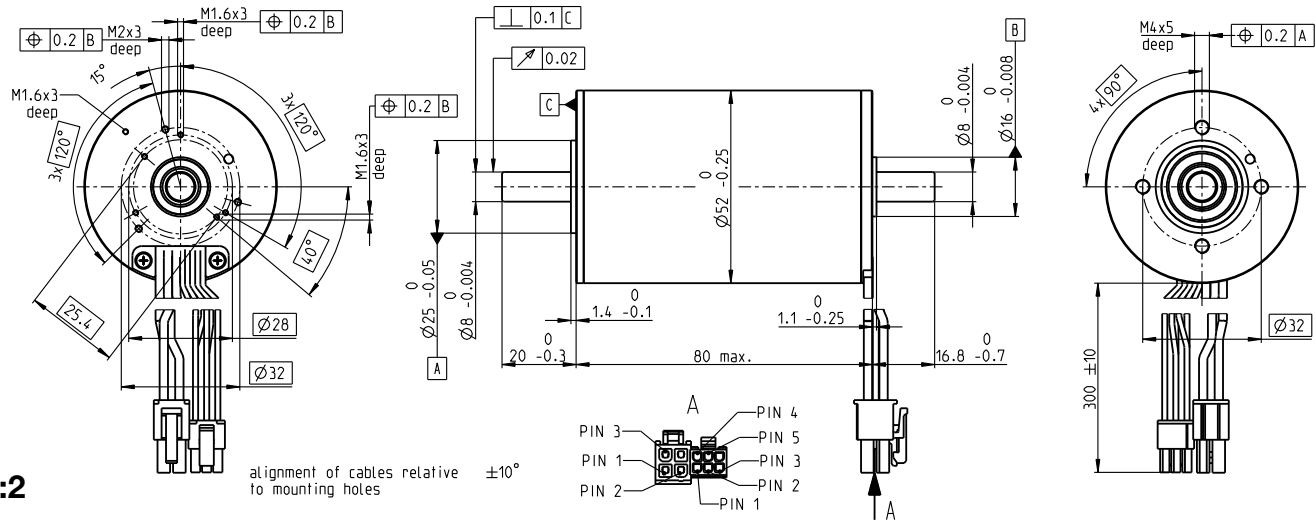
Recommended Electronics:	
Notes	Page 34
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
ESCON Module 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 70/15	467
EPOS2 P 24/5	470
MAXPOS 50/5	473

<b>Encoder 16 EASY</b>
128 - 1024 CPT, 3 channels
Page 418
<b>Encoder 16 EASY Absolute</b>
4096 steps
Page 422
<b>Encoder 16 RIO</b>
1024 - 32768 CPT, 3 channels
Page 436
<b>Encoder AEDL 5810</b>
1024 - 5000 CPT, 3 channels
Page 438
<b>Encoder HEDL 5540</b>
500 CPT, 3 channels
Page 446



# EC-i 52 Ø52 mm, brushless, 180 Watt

High Torque



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	with Hall sensors	574740	574741	579164	579165
--	-------------------	--------	--------	--------	--------

## Motor Data (provisional)

Values at nominal voltage		18	24	36	48
1 Nominal voltage	V	18	24	36	48
2 No load speed	rpm	4820	4680	4820	4900
3 No load current	mA	1010	726	507	390
4 Nominal speed	rpm	4360	4200	4360	4450
5 Nominal torque (max. continuous torque)	mNm	388	428	438	412
6 Nominal current (max. continuous current)	A	11.1	8.81	6.18	4.47
7 Stall torque <sup>1</sup>	mNm	11500	13000	15900	15700
8 Stall current	A	325	268	225	169
9 Max. efficiency	%	89.3	90	90.8	90.7
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	0.0555	0.0894	0.16	0.284
11 Terminal inductance phase to phase	mH	0.0643	0.122	0.257	0.443
12 Torque constant	mNm/A	35.3	48.6	70.6	92.7
13 Speed constant	rpm/V	270	197	135	103
14 Speed/torque gradient	rpm/mNm	0.425	0.362	0.306	0.316
15 Mechanical time constant	ms	0.756	0.645	0.544	0.562
16 Rotor inertia	gcm <sup>2</sup>	170	170	170	170

## Specifications

Thermal data	
17 Thermal resistance housing-ambient	4.32 K/W
18 Thermal resistance winding-housing	0.63 K/W
19 Thermal time constant winding	10.2 s
20 Thermal time constant motor	1780 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)	
23 Max. speed	6000 rpm
24 Axial play at axial load < 15 N	0 mm
> 15 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	12 N
27 Max. force for press fits (static) (static, shaft supported)	150 N
6000 N	
28 Max. radial load, 5 mm from flange	110 N

## Other specifications

29 Number of pole pairs	8
30 Number of phases	3
31 Weight of motor	823 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

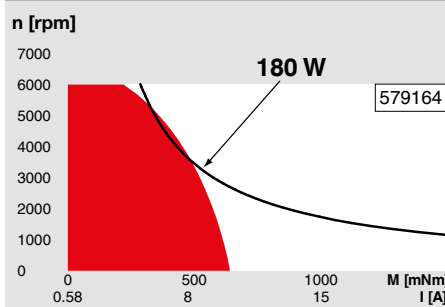
Connector Article number	
Molex	39-01-2040

Connection sensor (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

## Operating Range



## Comments

**Continuous operation**  
 In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
 = Thermal limit.

**Short term operation**  
 The motor may be briefly overloaded (recurring).

**Assigned power rating**

## maxon Modular System

Details on catalog page 34

**Planetary Gearhead**  
 Ø52 mm  
 4 - 30 Nm  
 Page 367



## Recommended Electronics:

Notes	Page 34
ESCON Mod. 50/8 (HE)	456
ESCON 70/10	457
EPOS4 Module/Comp. 50/8	465
EPOS4 Module/Comp. 50/15	466
EPOS4 70/15	467
MAXPOS 50/5	473

## Encoder 16 EASY

128 - 1024 CPT, 3 channels  
 Page 418

## Encoder 16 EASY XT

3 channels  
 Page 422

## Encoder 16 EASY Absolute

4096 steps  
 Page 422

## Encoder 16 EASY Absolute XT

4096 steps  
 Page 422

## Encoder 16 RIO

1024 - 32768 CPT, 3 channels  
 Page 436

## Encoder AEDL 5810

1024 - 5000 CPT, 3 channels  
 Page 438

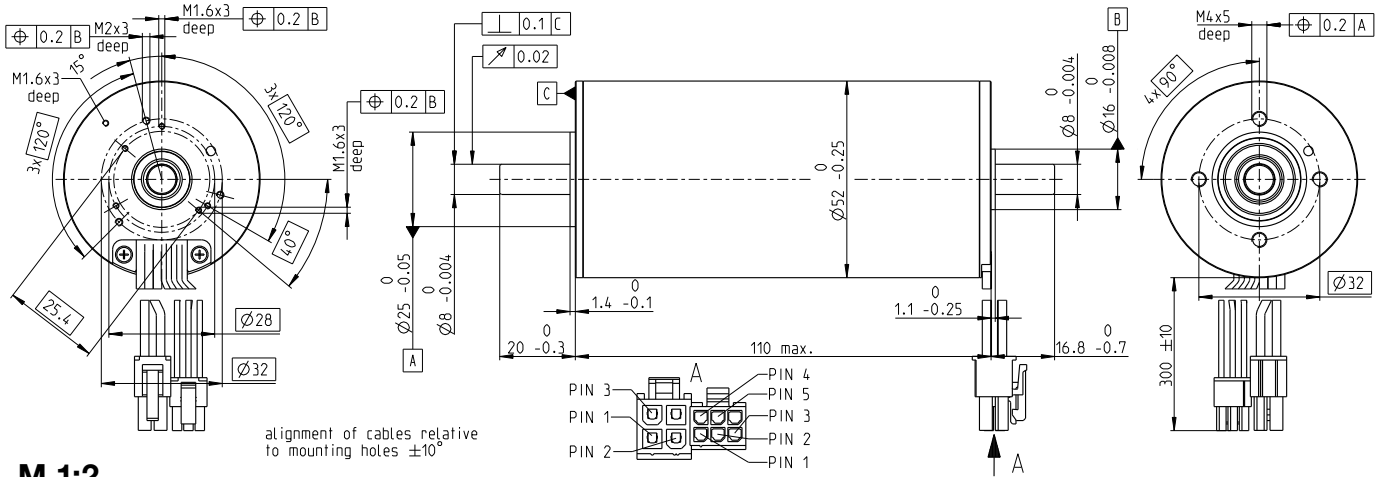
## Encoder HEDL 5540

500 CPT, 3 channels  
 Page 446

# EC-i 52 Ø52 mm, brushless, 200 Watt

**NEW**

High Torque



alignment of cables relative to mounting holes ±10°

**M 1:2**

- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

with Hall sensors

606793	596099	634043
--------	--------	--------

**Motor Data (provisional)**

Values at nominal voltage		606793	596099	634043
1 Nominal voltage	V	24	36	48
2 No load speed	rpm	3340	3660	3970
3 No load current	mA	657	499	419
4 Nominal speed	rpm	2970	3300	3610
5 Nominal torque (max. continuous torque)	mNm	640	649	622
6 Nominal current (max. continuous current)	A	9.36	6.93	5.44
7 Stall torque <sup>1</sup>	mNm	13800	18800	22900
8 Starting current	A	202	202	200
9 Max. efficiency	%	89	90.4	91.1
<b>Characteristics</b>				
10 Terminal resistance phase to phase	Ω	0.119	0.178	0.24
11 Terminal inductance phase to phase	mH	0.149	0.28	0.424
12 Torque constant	mNm/A	68	93.1	115
13 Speed constant	rpm/V	140	103	83.3
14 Speed/torque gradient	rpm/mNm	0.245	0.196	0.174
15 Mechanical time constant	ms	0.677	0.543	0.482
16 Rotor inertia	gcm <sup>2</sup>	264	264	264

**Specifications**

Thermal data	
17 Thermal resistance housing-ambient	4.02 K/W
18 Thermal resistance winding-housing	0.53 K/W
19 Thermal time constant winding	12.8 s
20 Thermal time constant motor	2310 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)	
23 Max. permissible speed	5000 rpm
24 Axial play at axial load < 15 N	0 mm
24 Axial play at axial load > 15 N	0.14 mm
25 Radial play preloaded	12 N
26 Max. axial load (dynamic)	150 N
27 Max. force for press fits (static) (static, shaft supported)	6000 N
28 Max. radial load, 5 mm from flange	110 N

**Other specifications**

29 Number of pole pairs	8
30 Number of phases	3
31 Weight of motor	1150 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
N.C.		Pin 4

Connector Article number	
Molex	39-01-2040

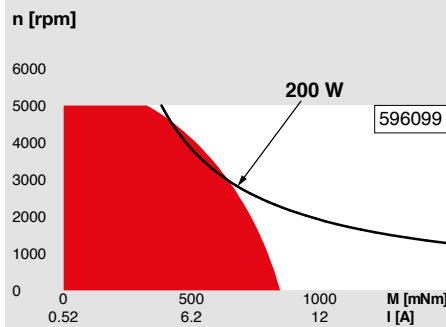
Connection sensor (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
N.C.		Pin 6

Connector Article number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47

<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

**Operating Range**



**Comments**

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

**maxon Modular System**

Details on catalog page 34

**Planetary Gearhead**  
Ø52 mm  
4 - 30 Nm  
Page 367



Recommended Electronics:	
Notes	Page 34
ESCON Mod. 50/8 (HE)	456
ESCON 70/10	457
EPOS4 Module/Comp. 50/8	465
EPOS4 Module/Comp. 50/15	466
EPOS4 70/15	467
MAXPOS 50/5	473

<b>Encoder 16 EASY</b>	128 - 1024 CPT, 3 channels	Page 418
<b>Encoder 16 EASY XT</b>	3 channels	Page 422
<b>Encoder 16 EASY Absolute</b>	4096 steps	Page 422
<b>Encoder 16 EASY Absolute XT</b>	4096 steps	Page 422
<b>Encoder 16 RIO</b>	1024 - 32768 CPT, 3 channels	Page 436
<b>Encoder AEDL 5810</b>	1024 - 5000 CPT, 3 channels	Page 438
<b>Encoder HEDL 5540</b>	500 CPT, 3 channels	Page 446

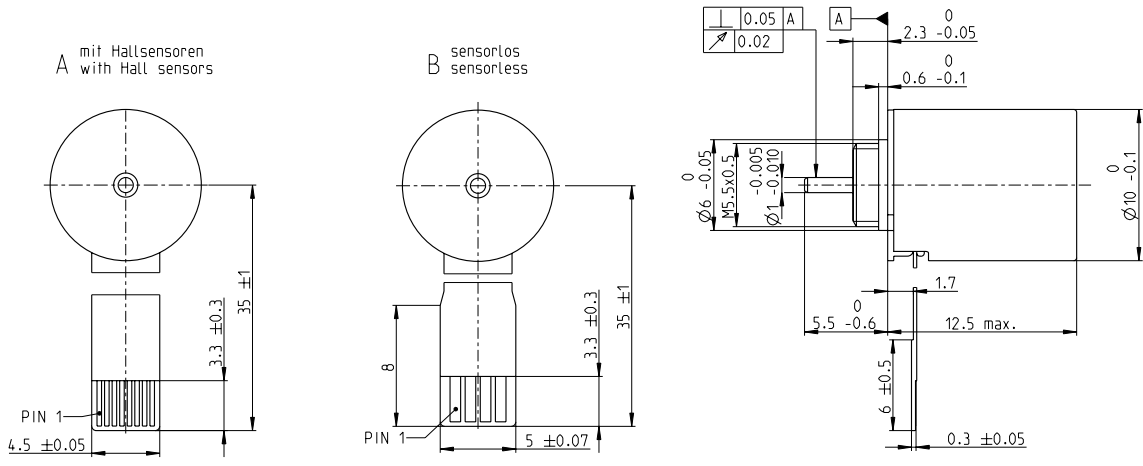


# maxon flat motor

Thanks to their flat design, the brushless DC motors with iron-core winding are exactly the right drive for many applications. The well-conceived, simple engineering allows mainly automated production which results in a favorable price.

<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b>	166-199
<b>ECX SQUARE Program</b>	202
<b>EC Program</b>	204-213
<b>EC-max Program</b>	217-225
<b>EC-4pole Program</b>	229-235
<b>EC-i Program</b>	239-250
<b>EC flat Program</b>	252-273
<b>EC frameless Program</b>	278-283

# EC 9.2 flat $\varnothing 10$ mm, brushless, 0.5 Watt

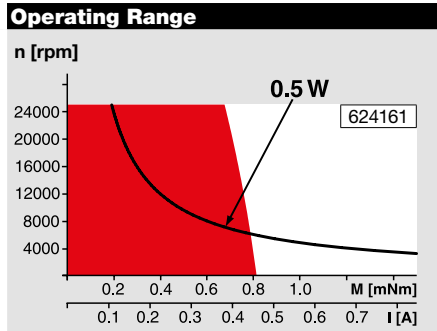


- Stock program
- Standard program
- Special program (on request)

Part Numbers				
A with Hall sensors	624161	624162	624163	
B sensorless	371119	371120	371122	

Motor Data (provisional)				
Values at nominal voltage				
1 Nominal voltage	V	3	4.5	6
2 No load speed	rpm	14500	15100	15600
3 No load current	mA	53.9	38.3	30.9
4 Nominal speed	rpm	4830	5260	5240
5 Nominal torque	mNm	0.764	0.809	0.684
6 Nominal current	A	0.447	0.327	0.222
7 Stall torque <sup>1</sup>	mNm	1.22	1.32	1.1
8 Stall current	A	0.675	0.507	0.332
9 Max. efficiency	%	53	54	50
Characteristics				
10 Terminal resistance phase to phase	$\Omega$	4.44	8.88	18.1
11 Terminal inductance phase to phase	mH	0.12	0.25	0.4
12 Torque constant	mNm/A	1.81	2.61	3.3
13 Speed constant	rpm/V	5270	3660	2890
14 Speed/torque gradient	rpm/mNm	12900	12500	15800
15 Mechanical time constant	ms	32.1	30.9	39.3
16 Rotor inertia	gcm <sup>2</sup>	0.237	0.237	0.237

Specifications			
Thermal data			
17 Thermal resistance housing-ambient	49.2 K/W		
18 Thermal resistance winding-housing	13.2 K/W		
19 Thermal time constant winding	1.47 s		
20 Thermal time constant motor	73.8 s		
21 Ambient temperature	-20...+85°C		
22 Max. winding temperature	+100°C		
Mechanical data (preloaded ball bearings)			
23 Max. speed	25000 rpm		
24 Axial play at axial load < 0.35 N	0 mm		
	> 0.35 N	0.1 mm	
25 Radial play	preloaded		
26 Max. axial load (dynamic)	0.15 N		
27 Max. force for press fits (static) (static, shaft supported)	15 N		
		70 N	
28 Max. radial load, 4 mm from flange	0.4 N		



**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

**Assigned power rating**

Other specifications			
29 Number of pole pairs	4		
30 Number of phases	3		
31 Weight of motor	3 g		

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless	
Pin 1	Motor winding 1	Motor winding 1	
Pin 2	Motor winding 2	Motor winding 2	
Pin 3	Motor winding 3	Motor winding 3	
Pin 4	V <sub>Hall</sub> 3.8...24 VDC	Y	
Pin 5	GND		
Pin 6	Hall sensor 1		
Pin 7	Hall sensor 2		
Pin 8	Hall sensor 3		

Output signals: CMOS compatible push-pull stage.

Compatible connector:		
Type	Part number	Part number
Molex	52745-0897	52207-0460
FCI	SFV8R-2STBE1HLF	SFW4R-2STGE1LF

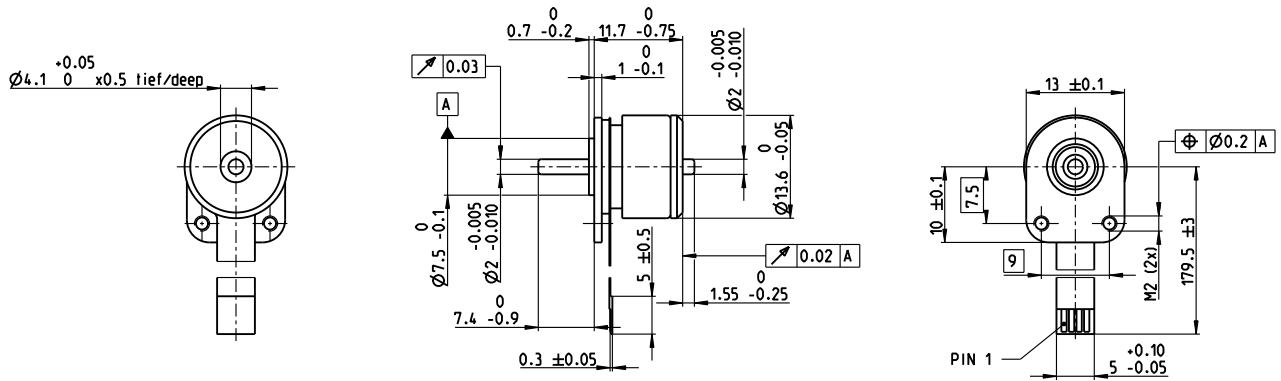
Pin for design with Hall sensors:  
FPC, 8-pol, Pitch 0.5 mm, top contact style

**Option:** Sleeve bearings in place of ball bearings  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

**maxon Modular System** Details on catalog page 36

<p><b>Planetary Gearhead</b> <math>\varnothing 10</math> mm 0.005 - 0.1 Nm Page 325</p> <p><b>Planetary Gearhead</b> <math>\varnothing 10</math> mm 0.01 - 0.15 Nm Page 326</p>		<p><b>Recommended Electronics:</b> <b>Notes</b> <span style="float: right;">Page 36</span></p> <p>ESCON Module 24/2 454</p> <p>ESCON 36/3 EC 455</p> <p>ESCON Mod. 50/4 EC-S 455</p> <p>DEC Module 24/2 459</p> <p>EPOS4 Mod./Comp. 24/1.5 462</p>
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# EC 14 flat $\varnothing 13.6$ mm, brushless, 1.5 Watt



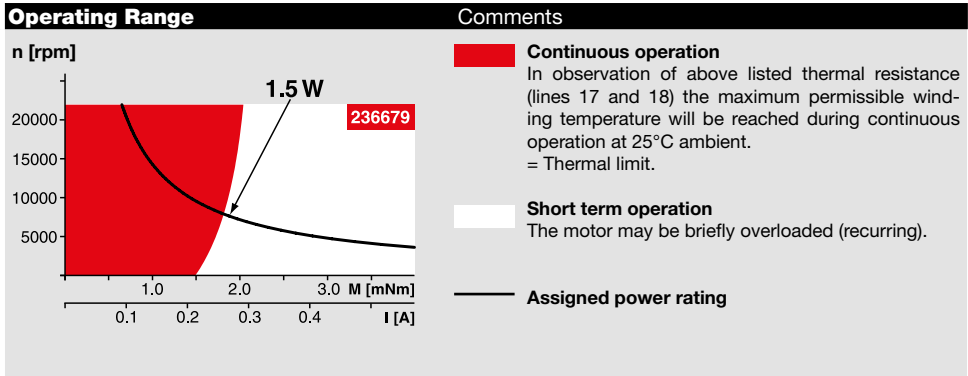
M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
sensorless	339251	339252	236679	339253

Motor Data						
Values at nominal voltage						
1 Nominal voltage	V	6	12	18	24	
2 No load speed	rpm	20000	20100	19900	20000	
3 No load current	mA	156	78.1	51.7	38.9	
4 Nominal speed	rpm	9600	9680	9390	9590	
5 Nominal torque (max. continuous torque)	mNm	1.8	1.83	1.74	1.81	
6 Nominal current (max. continuous current)	A	0.794	0.402	0.256	0.199	
7 Stall torque <sup>1</sup>	mNm	3.79	3.87	3.6	3.8	
8 Stall current	A	1.5	0.764	0.474	0.374	
9 Max. efficiency	%	49	49	48	49	
Characteristics						
10 Terminal resistance phase to phase	$\Omega$	4.01	15.7	38	64.1	
11 Terminal inductance phase to phase	mH	0.107	0.428	0.962	1.71	
12 Torque constant	mNm/A	2.53	5.06	7.6	10.1	
13 Speed constant	rpm/V	3770	1890	1260	942	
14 Speed/torque gradient	rpm/mNm	5980	5860	6270	5960	
15 Mechanical time constant	ms	68.9	67.5	72.3	68.6	
16 Rotor inertia	gcm <sup>2</sup>	1.1	1.1	1.1	1.1	

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	11.6 K/W
18 Thermal resistance winding-housing	11.3 K/W
19 Thermal time constant winding	1.37 s
20 Thermal time constant motor	49.2 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	22000 rpm
24 Axial play at axial load < 1.5 N	0 mm
> 1.5 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	1.3 N
27 Max. force for press fits (static) (static, shaft supported)	18 N
28 Max. radial load, 5 mm from flange	200 N
	3.4 N
Other specifications	
29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	8 g



Values listed in the table are nominal.

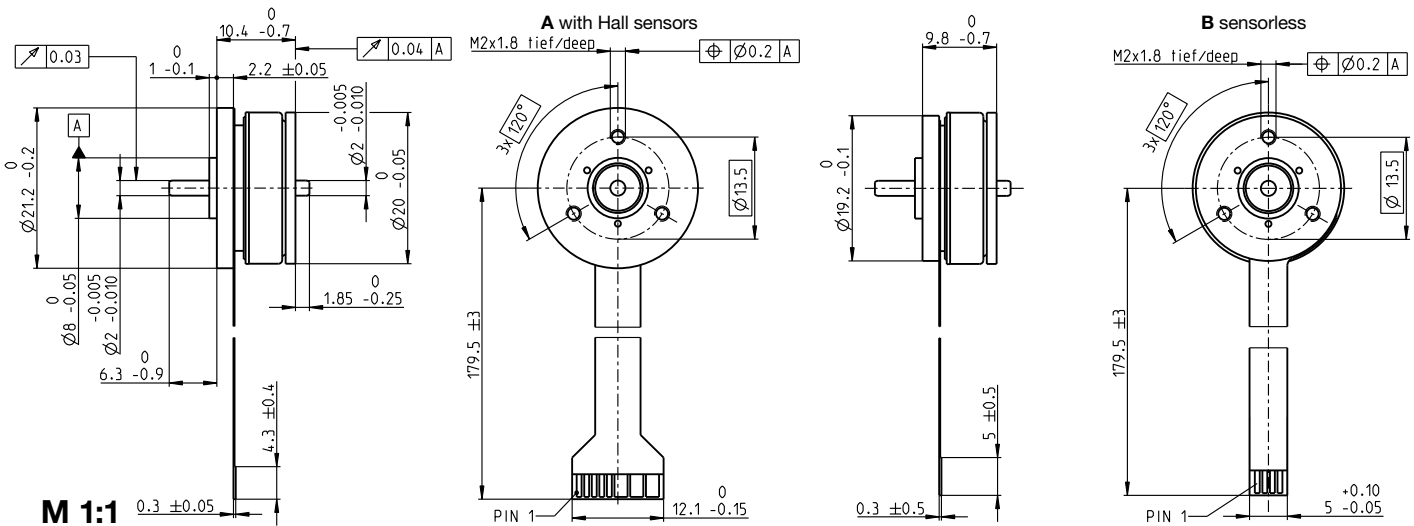
- Connection**
- Pin 1 Motor winding 1
  - Pin 2 Motor winding 2
  - Pin 3 Motor winding 3
  - Pin 4 neutral point
- Adapter** Part number  
see p. 481 220310
- Connector** Part number  
TE 84953-4  
Molex 52207-0433

<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

**maxon Modular System** Details on catalog page 36

**Recommended Electronics:**  
Notes Page 36  
ESCON Mod. 50/4 EC-S 455

# EC 20 flat Ø20 mm, brushless, 3 Watt



- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	351098	351099	351100	351101
A with Hall sensors	351098	351099	351100	351101
B sensorless	339255	241916	339257	339258

## Motor Data

Values at nominal voltage			6	9	12	24
1 Nominal voltage	V		6	9	12	24
2 No load speed	rpm		9070	9760	9540	9450
3 No load current	mA		53.6	35.1	25.8	12.6
4 Nominal speed	rpm		3030	4140	3490	3830
5 Nominal torque (max. continuous torque)	mNm		3.22	4.08	3.28	3.78
6 Nominal current (max. continuous current)	A		0.56	0.478	0.294	0.163
7 Stall torque <sup>1</sup>	mNm		5.29	8.04	5.67	7.12
8 Stall current	A		0.9	0.957	0.503	0.309
9 Max. efficiency	%		59	66	61	65
Characteristics						
10 Terminal resistance phase to phase	Ω		6.67	9.4	23.9	77.7
11 Terminal inductance phase to phase	mH		0.639	1.3	2.35	9.8
12 Torque constant	mNm/A		5.88	8.4	11.3	23
13 Speed constant	rpm/V		1620	1140	847	414
14 Speed/torque gradient	rpm/mNm		1840	1270	1790	1400
15 Mechanical time constant	ms		74.1	51.2	72.1	56.2
16 Rotor inertia	gcm <sup>2</sup>		3.84	3.84	3.84	3.84

## Specifications

Thermal data			
17 Thermal resistance housing-ambient		19.2 K/W	
18 Thermal resistance winding-housing		8.41 K/W	
19 Thermal time constant winding		3.69 s	
20 Thermal time constant motor		31.8 s	
21 Ambient temperature		-40...+100°C	
22 Max. winding temperature		+125°C	
Mechanical data (preloaded ball bearings)			
23 Max. speed		15000 rpm	
24 Axial play at axial load < 2.0 N		0 mm	
	> 2.0 N	0.14 mm	
25 Radial play		preloaded	
26 Max. axial load (dynamic)		1.8 N	
27 Max. force for press fits (static) (static, shaft supported)		200 N	
28 Max. radial load, 5 mm from flange		1.9 N	

## Other specifications

29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	15 g

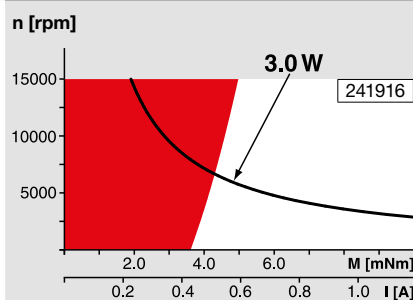
Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V <sub>Hall</sub> 4.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	
<b>Adapter</b>	<b>Part number</b>	<b>Part number</b>
see p. 481	220300	220310
<b>Connector</b>	<b>Part number</b>	<b>Part number</b>
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:  
 FPC, 11-pol, Pitch 1.0 mm, top contact style  
 Wiring diagram for Hall sensors see p. 47

<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

## Operating Range



## Comments

**Continuous operation**  
 In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
 = Thermal limit.

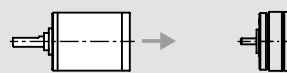
**Short term operation**  
 The motor may be briefly overloaded (recurring).

**Assigned power rating**

## maxon Modular System

Details on catalog page 36

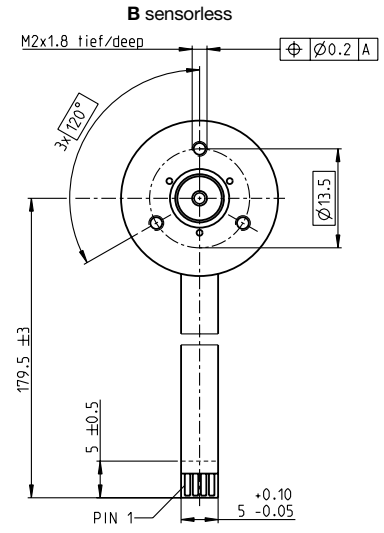
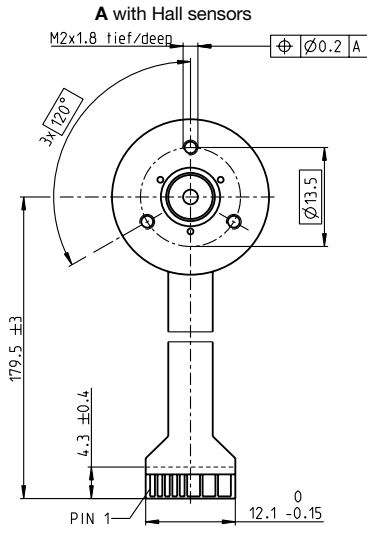
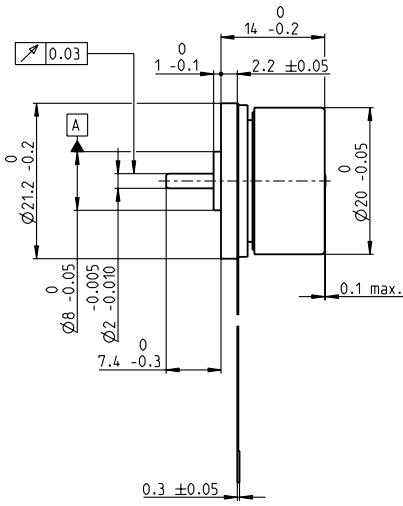
**Planetary Gearhead**  
 Ø22 mm  
 0.5 - 2.0 Nm  
 Page 339/342



**Recommended Electronics:**

Notes	Page 36
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
DEC Module 24/2	459
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

# EC 20 flat Ø20 mm, brushless, 5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
A with Hall sensors	351005	351006	351007	351008
B sensorless	351054	351055	351056	351057

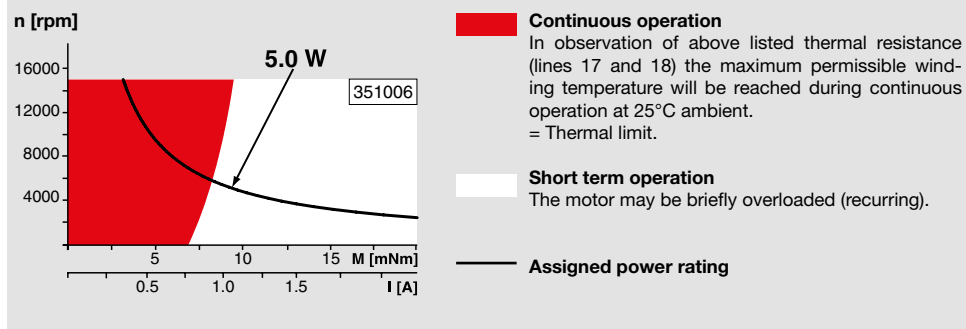
**Motor Data** (provisional)

Values at nominal voltage		6	9	12	24
1 Nominal voltage	V				
2 No load speed	rpm	9350	9430	9380	9300
3 No load current	mA	102	68.3	51.1	25.1
4 Nominal speed	rpm	4780	5310	5170	5220
5 Nominal torque (max. continuous torque)	mNm	7.59	8.58	7.59	7.74
6 Nominal current (max. continuous current)	A	1.31	0.974	0.655	0.329
7 Stall torque <sup>1</sup>	mNm	17.2	22.4	18.9	19.9
8 Stall current	A	2.93	2.54	1.61	0.838
9 Max. efficiency	%	67	71	68	69
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	2.05	3.54	7.45	28.6
11 Terminal inductance phase to phase	mH	0.189	0.424	0.754	3.09
12 Torque constant	mNm/A	5.88	8.82	11.8	23.8
13 Speed constant	rpm/V	1620	1080	812	402
14 Speed/torque gradient	rpm/mNm	567	435	515	484
15 Mechanical time constant	ms	30.3	23.2	27.5	25.8
16 Rotor inertia	gcm <sup>2</sup>	5.1	5.1	5.1	5.1

**Specifications**

- Thermal data**
- 17 Thermal resistance housing-ambient 16.5 K/W
  - 18 Thermal resistance winding-housing 2.66 K/W
  - 19 Thermal time constant winding 1.77 s
  - 20 Thermal time constant motor 27.5 s
  - 21 Ambient temperature -40...+100°C
  - 22 Max. winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed 15000 rpm
  - 24 Axial play at axial load < 2.0 N 0 mm
  - > 2.0 N 0.14 mm
  - 25 Radial play preloaded
  - 26 Max. axial load (dynamic) 1.8 N
  - 27 Max. force for press fits (static) (static, shaft supported) 26 N
  - 28 Max. radial load, 5 mm from flange 200 N
  - 5.3 N

**Operating Range** Comments



**Other specifications**

- 29 Number of pole pairs 4
  - 30 Number of phases 3
  - 31 Weight of motor 22 g
- Values listed in the table are nominal.

Connection with Hall sensors		sensorless	
Pin 1	V <sub>Hall</sub> 4.5...24 VDC	Motor winding 1	
Pin 2	Hall sensor 3	Motor winding 2	
Pin 3	Hall sensor 1	Motor winding 3	
Pin 4	Hall sensor 2	↘ neutral point	
Pin 5	GND		
Pin 6	Motor winding 3		
Pin 7	Motor winding 2		
Pin 8	Motor winding 1		

Adapter	Part number	Part number
see p. 481	220300	220310

Connector	Part number	Part number
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:  
FPC, 11-pol, Pitch 1.0 mm, top contact style  
Wiring diagram for Hall sensors see p. 47  
<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

**maxon Modular System** Details on catalog page 36

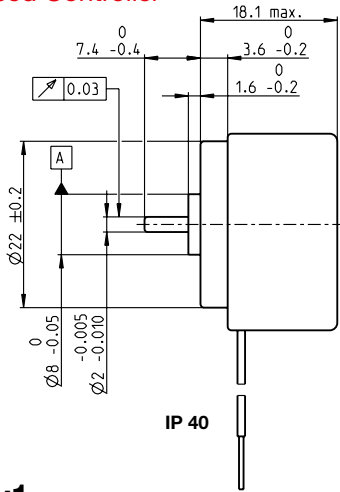
**Planetary Gearhead**  
Ø22 mm  
0.5 - 2.0 Nm  
Page 339/342

**Recommended Electronics:**  
Notes Page 36

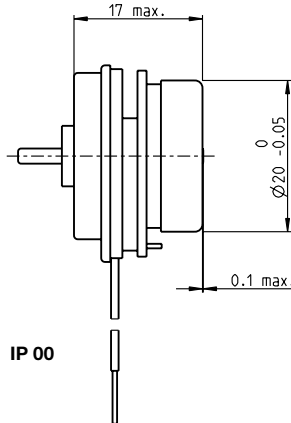
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
DEC Module 24/2	459
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

# EC 20 flat brushless, 2 Watt, with integrated electronics

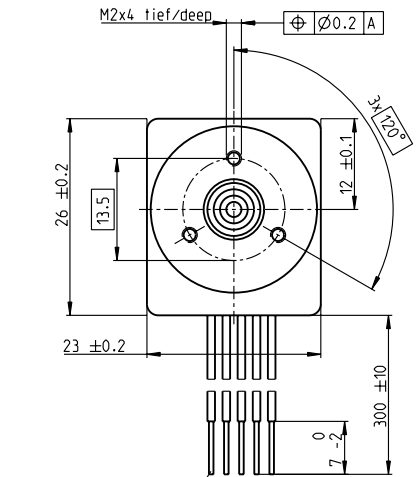
## 1-Q-Speed Controller



IP 40



IP 00



M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

IP 40 (with cover)  
IP 00 (without cover)

2 wire version		5 wire version	
		Enable	Direction
350795	350796	350794	370413
350776	350778	349694	370412

### Motor Data

Values at nominal voltage					
1 Nominal voltage	V	24	24	24	24
2 No load speed	rpm	3000	6000	6000	6000
3 No load current	mA	10.6	14.7	14.7	14.7
4 Nominal speed	rpm	3000	6000	6000	6000
5 Nominal torque (max. continuous torque)	mNm	3.6	3.55	3.55	3.55
6 Nominal current (max. continuous current)	A	0.155	0.208	0.208	0.208
33 Max. torque	mNm	6.13	6.13	6.13	6.13
34 Max. current	A	0.73	0.73	0.73	0.73
9 Max. efficiency	%	39	52	52	52
Characteristics					
35 Type of control		Speed	Speed	Speed	Speed
36 Supply voltage +V <sub>CC</sub>	V	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V <sub>CC</sub>	= V <sub>CC</sub>	0.33...10.8	0.33...10.8
38 Scale speed set value input	rpm/V	125	250	600	600
39 Speed range	rpm	1250...3500	2500...7000	200...6480	200...6480
40 Max. acceleration	rpm/s	3000	6000	6000	6000

### Specifications

Thermal data	
17 Thermal resistance housing-ambient	17.2 K/W
18 Thermal resistance winding-housing	7.98 K/W
19 Thermal time constant winding	2.37 s
20 Thermal time constant motor	132 s
21 Ambient temperature	-40...+85°C
22 Max. winding temperature	+125°C
41 Max. temperature of electronics	+105°C

Mechanical data (preloaded ball bearings)	
16 Rotor inertia	3.84 gcm <sup>2</sup>
24 Axial play at axial load < 2.0 N	0 mm
	> 2.0 N
	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	1.8 N
27 Max. force for press fits (static) (static, shaft supported)	26 N
28 Max. radial load, 5 mm from flange	200 N
	11 N

Other specifications	
31 Weight of motor	30 g
32 Direction of rotation	Clockwise (CW)

Values listed in the table are nominal.

### Protective functions

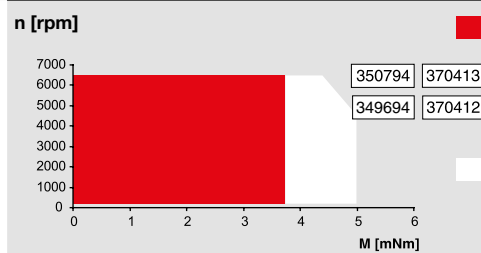
Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

**Connection 2 wire version** (Cable AWG 28)  
red +V<sub>CC</sub> 10...28 VDC  
black GND

**Connection 5 wire version** (Cable AWG 28)  
red +V<sub>CC</sub> 10...28 VDC  
black GND  
white Speed set value input  
green Monitor n (6 pulses per revolution)  
grey Disable (Type Enable) or sense of direction (Type Direction)

### Operating Range

### Comments

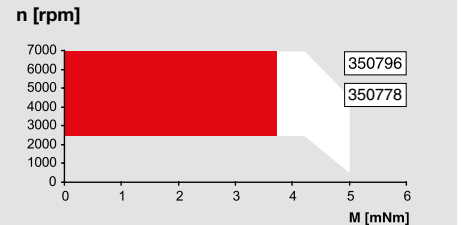
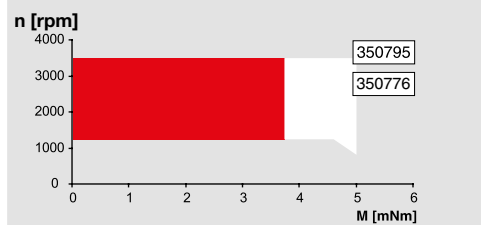


#### Continuous operation

The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

#### Overload range

The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

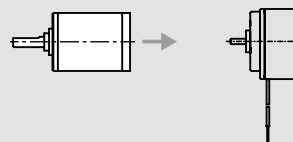


### maxon Modular System

Details on catalog page 36

#### Planetary Gearhead

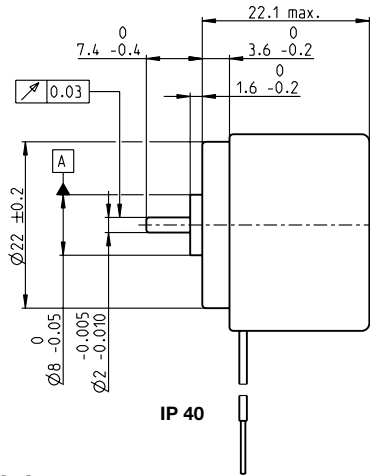
Ø22 mm  
0.5 - 2.0 Nm  
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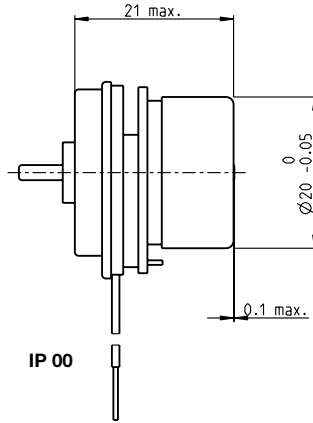


# EC 20 flat brushless, 5 Watt, with integrated electronics

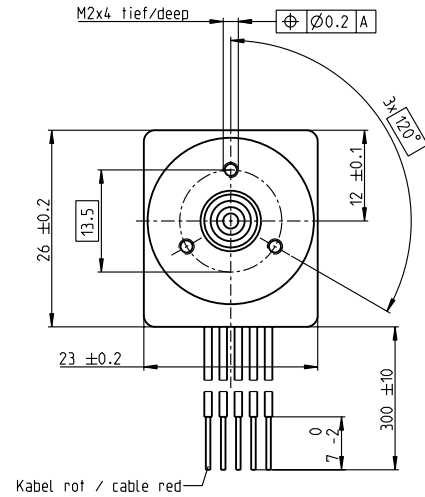
## 1-Q-Speed Controller



IP 40



IP 00



Kabel rot / cable red

M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

		5 wire version		
		2 wire version	Enable	Direction
IP 40 (with cover)	350834	350835	350806	370416
IP 00 (without cover)	350804	350805	349731	370415

### Motor Data

Values at nominal voltage					
1 Nominal voltage	V	24	24	24	24
2 No load speed	rpm	3000	6000	6000	6000
3 No load current	mA	18.6	32.9	32.9	32.9
4 Nominal speed	rpm	3000	6000	6000	6000
5 Nominal torque (max. continuous torque)	mNm	7.45	7.31	7.31	7.31
6 Nominal current (max. continuous current)	A	0.263	0.377	0.377	0.377
33 Max. torque	mNm	13.2	13.2	13.2	13.2
34 Max. current	A	0.73	0.73	0.73	0.73
9 Max. efficiency	%	44	54	54	54
Characteristics					
35 Type of control		Speed	Speed	Speed	Speed
36 Supply voltage +V <sub>CC</sub>	V	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V <sub>CC</sub>	= V <sub>CC</sub>	0.33...10.8	0.33...10.8
38 Scale speed set value input	rpm/V	125	250	600	600
39 Speed range	rpm	1250...3500	2500...7000	200...6480	200...6480
40 Max. acceleration	rpm/s	3000	6000	6000	6000

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 10.6 K/W
  - 18 Thermal resistance winding-housing 5.32 K/W
  - 19 Thermal time constant winding 3.66 s
  - 20 Thermal time constant motor 13.9 s
  - 21 Ambient temperature -40...+85°C
  - 22 Max. winding temperature +125°C
  - 41 Max. temperature of electronics +105°C
- Mechanical data (preloaded ball bearings)**
- 16 Rotor inertia 5.1 gcm<sup>2</sup>
  - 24 Axial play at axial load < 2.0 N 0 mm
  - > 2.0 N 0.14 mm
  - 25 Radial play preloaded 1.8 N
  - 26 Max. axial load (dynamic) 26 N
  - 27 Max. force for press fits (static) (static, shaft supported) 200 N
  - 28 Max. radial load, 5 mm from flange 12 N
- Other specifications**
- 31 Weight of motor 37 g
  - 32 Direction of rotation Clockwise (CW)

Values listed in the table are nominal.

### Protective functions

Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

### Connection 2 wire version (Cable AWG 28)

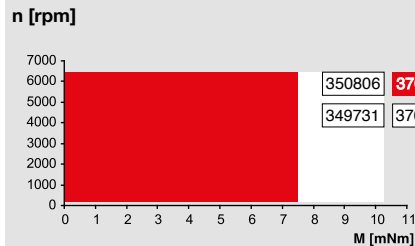
- red +V<sub>CC</sub> 10...28 VDC
- black GND

### Connection 5 wire version (Cable AWG 28)

- red +V<sub>CC</sub> 10...28 VDC
- black GND
- white Speed set value input
- green Monitor n (6 pulses per revolution)
- grey Disable (Type Enable) or sense of direction (Type Direction)

### Operating Range

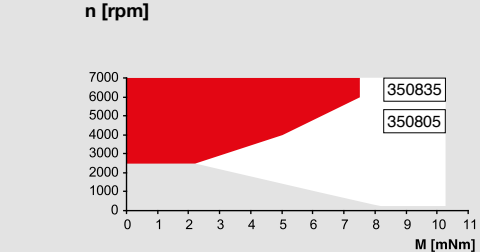
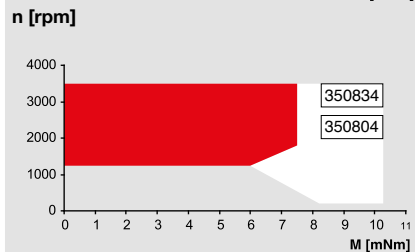
### Comments



**Continuous operation**  
The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

### Overload range

The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

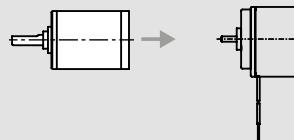


### maxon Modular System

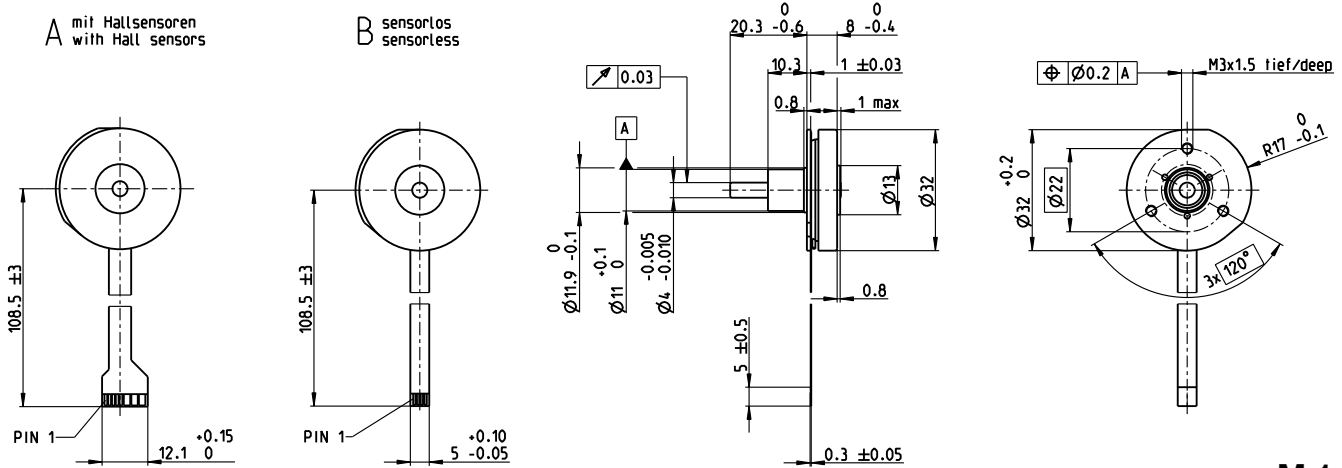
Details on catalog page 36

### Planetary Gearhead

- Ø22 mm
- 0.5 - 2.0 Nm
- Page 339/342



# EC 32 flat Ø32 mm, brushless, 6 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	339259	200187	339260	339261
A with Hall sensors	339259	200187	339260	339261
B sensorless	339263	200138	339264	339265

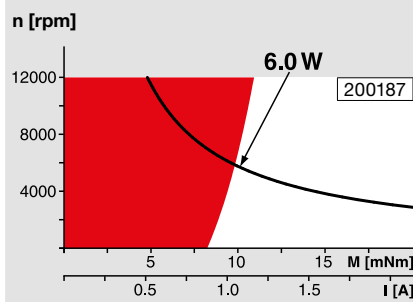
## Motor Data

Values at nominal voltage		6	9	12	24
1 Nominal voltage	V	6	9	12	24
2 No load speed	rpm	9210	8380	7970	9310
3 No load current	mA	186	107	75.6	46.2
4 Nominal speed	rpm	3860	3640	3210	4480
5 Nominal torque (max. continuous torque)	mNm	7.61	8.89	7.98	9.42
6 Nominal current (max. continuous current)	A	1.37	0.929	0.614	0.401
7 Stall torque <sup>1</sup>	mNm	15.5	19	15.7	22.8
8 Stall current	A	2.73	2	1.19	0.995
9 Max. efficiency	%	55	60	57	62
Characteristics		6	9	12	24
10 Terminal resistance phase to phase	Ω	2.2	4.5	10.1	24.1
11 Terminal inductance phase to phase	mH	0.378	1.06	2.04	6.19
12 Torque constant	mNm/A	5.67	9.5	13.2	23
13 Speed constant	rpm/V	1680	1010	724	416
14 Speed/torque gradient	rpm/mNm	651	476	551	437
15 Mechanical time constant	ms	94.8	69.3	80.3	63.6
16 Rotor inertia	gcm <sup>2</sup>	13.9	13.9	13.9	13.9

## Specifications

Thermal data		
17 Thermal resistance housing-ambient	8.25 K/W	
18 Thermal resistance winding-housing	6.21 K/W	
19 Thermal time constant winding	3.48 s	
20 Thermal time constant motor	22.1 s	
21 Ambient temperature	-40...+100°C	
22 Max. winding temperature	+125°C	
Mechanical data (preloaded ball bearings)		
23 Max. speed	12000 rpm	
24 Axial play at axial load < 5.0 N	0 mm	
	> 5.0 N	typ. 0.6 mm
		preloaded
25 Radial play	4.8 N	
26 Max. axial load (dynamic)	45 N	
27 Max. force for press fits (static) (static, shaft supported)	1000 N	
28 Max. radial load, 15 mm from flange	10.5 N	
Other specifications		
29 Number of pole pairs	4	
30 Number of phases	3	
31 Weight of motor	32 g	
Values listed in the table are nominal.		

## Operating Range



## Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Connection	with Hall sensors	sensorless
Pin 1	V <sub>Hall</sub> 3.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	
Adapter	Part number	Part number
see p. 481	220300	220310
Connector	Part number	Part number
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

Pin for design with Hall sensors:  
FPC, 11-pol, Pitch 1.0 mm, top contact style  
Wiring diagram for Hall sensors see p. 47

<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

## maxon Modular System

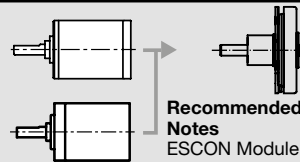
Details on catalog page 36

### Planetary Gearhead

Ø22 mm  
0.5 - 1.0 Nm  
Page 339

### Planetary Gearhead

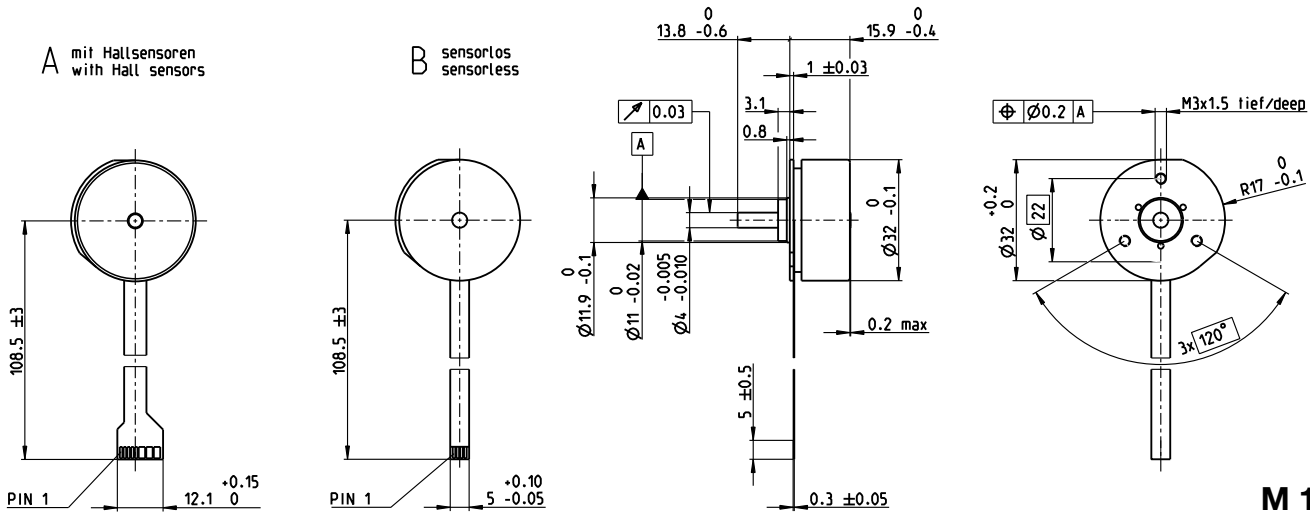
Ø22 mm  
0.5 - 2.0 Nm  
Page 342



### Recommended Electronics:

Notes	Page 36
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
DEC Module 24/2	459
EPOS4 Mod./Comp. 24/1.5	462
MAXPOS 50/5	473

# EC 32 flat Ø32 mm, brushless, 15 Watt

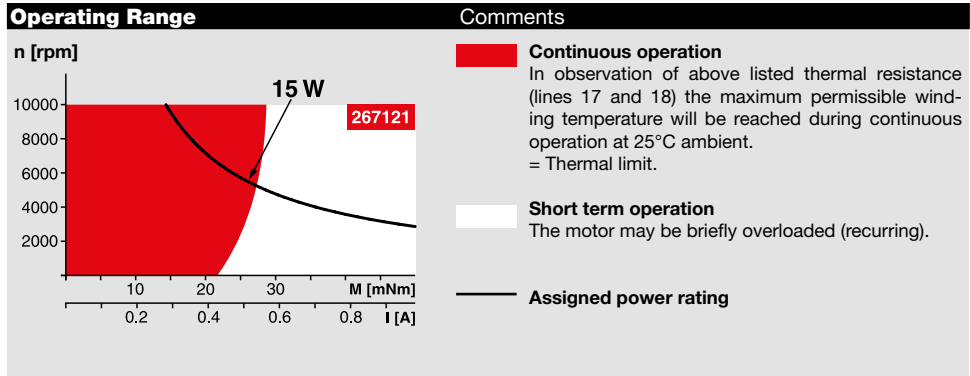


- Stock program
- Standard program
- Special program (on request)

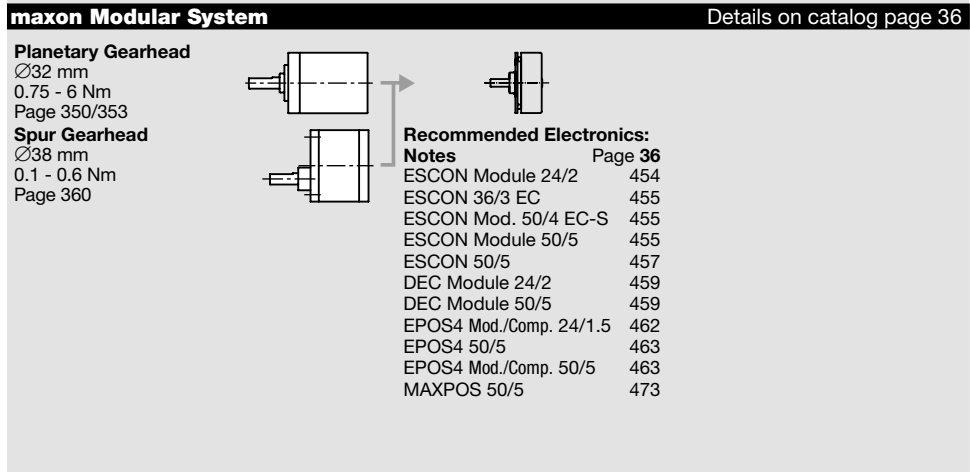
Part Numbers				
A with Hall sensors	339267	339268	267121	339269
B sensorless	339271	339272	226006	339273

Motor Data						
Values at nominal voltage						
1 Nominal voltage	V	9	12	24	48	
2 No load speed	rpm	3720	4610	4530	4780	
3 No load current	mA	74.7	75.7	36.9	19.9	
4 Nominal speed	rpm	2060	2790	2760	2940	
5 Nominal torque (max. continuous torque)	mNm	24.5	25	25.5	24.7	
6 Nominal current (max. continuous current)	A	1.06	1	0.5	0.257	
7 Stall torque <sup>1</sup>	mNm	68.3	82.3	85.3	83.9	
8 Stall current	A	3.06	3.42	1.74	0.904	
9 Max. efficiency	%	71	73	73	73	
Characteristics						
10 Terminal resistance phase to phase	Ω	2.95	3.51	13.8	53.1	
11 Terminal inductance phase to phase	mH	1.61	1.86	7.72	27.7	
12 Torque constant	mNm/A	22.4	24.1	49	92.8	
13 Speed constant	rpm/V	427	397	195	103	
14 Speed/torque gradient	rpm/mNm	56.3	57.8	54.8	58.8	
15 Mechanical time constant	ms	20.6	21.2	20.1	21.6	
16 Rotor inertia	gcm <sup>2</sup>	35	35	35	35	

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	10.8 K/W
18 Thermal resistance winding-housing	4.99 K/W
19 Thermal time constant winding	8.78 s
20 Thermal time constant motor	120 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	10000 rpm
24 Axial play at axial load < 5.0 N	0 mm
	> 5.0 N
	typ. 0.6 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	4.8 N
27 Max. force for press fits (static) (static, shaft supported)	45 N
28 Max. radial load, 5 mm from flange	1000 N
	14 N
<b>Other specifications</b>	
29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	57 g

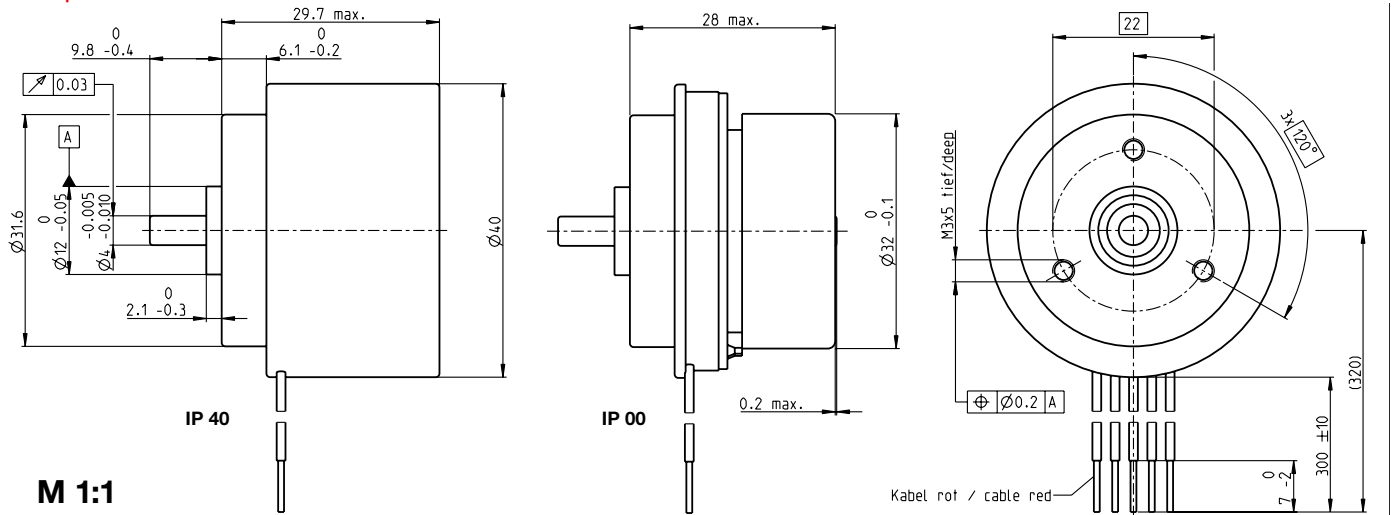


maxon Modular System		
Details on catalog page 36		
<b>Planetary Gearhead</b>		
Ø32 mm		
0.75 - 6 Nm		
Page 350/353		
<b>Spur Gearhead</b>		
Ø38 mm		
0.1 - 0.6 Nm		
Page 360		
<b>Recommended Electronics:</b>		
<b>Notes</b>		Page 36
ESCON Module 24/2		454
ESCON 36/3 EC		455
ESCON Mod. 50/4 EC-S		455
ESCON Module 50/5		455
ESCON 50/5		457
DEC Module 24/2		459
DEC Module 50/5		459
EPOS4 Mod./Comp. 24/1.5		462
EPOS4 50/5		463
EPOS4 Mod./Comp. 50/5		463
MAXPOS 50/5		473
<b>Connection</b>	<b>with Hall sensors</b>	<b>sensorless</b>
Pin 1	V <sub>Hall</sub> 3.5...24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	↖ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	
<b>Adapter</b>	<b>Part number</b>	<b>Part number</b>
see p. 481	220300	220310
<b>Connector</b>	<b>Part number</b>	<b>Part number</b>
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Pin for design with Hall sensors: FPC, 11-pol, Pitch 1.0 mm, top contact style Wiring diagram for Hall sensors see p. 47		
<sup>1</sup> Calculation does not include saturation effect (p. 57/162)		



# EC 32 flat brushless, 15 Watt, with integrated electronics

## 1-Q-Speed Controller



M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	2 wire version		5 wire version	
			Enable	Direction
IP 40 (with cover)	353400	353401	353399	370418
IP 00 (without cover)	353324	353325	349801	370417

### Motor Data

Values at nominal voltage					
1 Nominal voltage	V	24	24	24	24
2 No load speed	rpm	3000	6000	6000	6000
3 No load current	mA	44.8	84.6	84.6	84.6
4 Nominal speed	rpm	3000	6000	6000	6000
5 Nominal torque (max. continuous torque)	mNm	18.8	18.6	18.6	18.6
6 Nominal current (max. continuous current)	A	0.44	0.741	0.741	0.741
33 Max. torque	mNm	35.8	35.8	35.8	35.8
34 Max. current	A	1.6	1.6	1.6	1.6
9 Max. efficiency	%	58	66	66	66
Characteristics					
35 Type of control		Speed	Speed	Speed	Speed
36 Supply voltage +V <sub>CC</sub>	V	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V <sub>CC</sub>	= V <sub>CC</sub>	0.33...10.8	0.33...10.8
38 Scale speed set value input	rpm/V	125	250	600	600
39 Speed range	rpm	1250...3500	2500...7000	200...6480	200...6480
40 Max. acceleration	rpm/s	3000	6000	6000	6000

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 7.24 K/W
  - 18 Thermal resistance winding-housing 4.99 K/W
  - 19 Thermal time constant winding 8.69 s
  - 20 Thermal time constant motor 80.5 s
  - 21 Ambient temperature -40...+85°C
  - 22 Max. winding temperature +125°C
  - 41 Max. temperature of electronics +105°C
- Mechanical data (preloaded ball bearings)**
- 16 Rotor inertia 35 gcm<sup>2</sup>
  - 24 Axial play at axial load < 7.0 N 0 mm
  - > 7.0 N 0.14 mm
  - 25 Radial play preloaded
  - 26 Max. axial load (dynamic) 6.8 N
  - 27 Max. force for press fits (static) (static, shaft supported) 95 N
  - 28 Max. radial load, 5 mm from flange 1000 N
  - 37 N
- Other specifications**
- 31 Weight of motor 91 g
  - 32 Direction of rotation Clockwise (CW)

Values listed in the table are nominal.

### Protective functions

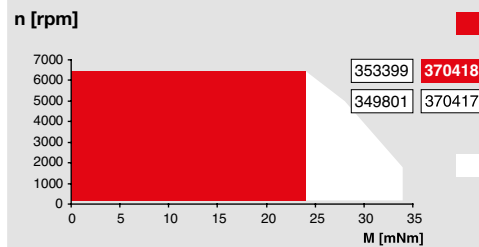
Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

**Connection 2 wire version** (Cable AWG 24)  
 red +V<sub>CC</sub> 10...28 VDC  
 black GND

**Connection 5 wire version** (Cable AWG 24)  
 red +V<sub>CC</sub> 10...28 VDC  
 black GND  
 white Speed set value input  
 green Monitor n (6 pulses per revolution)  
 grey Disable (Type Enable) or sense of direction (Type Direction)

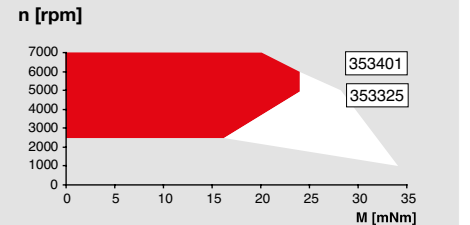
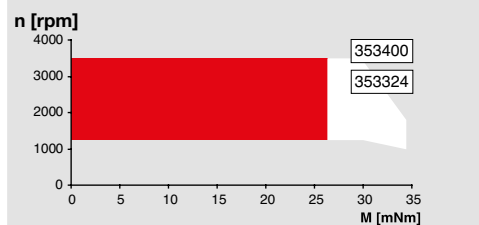
### Operating Range

### Comments



**Continuous operation**  
 The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

**Overload range**  
 The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.



### maxon Modular System

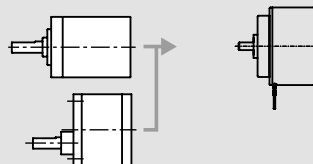
Details on catalog page 36

#### Planetary Gearhead

Ø32 mm  
 0.75 - 6 Nm  
 Page 350/353

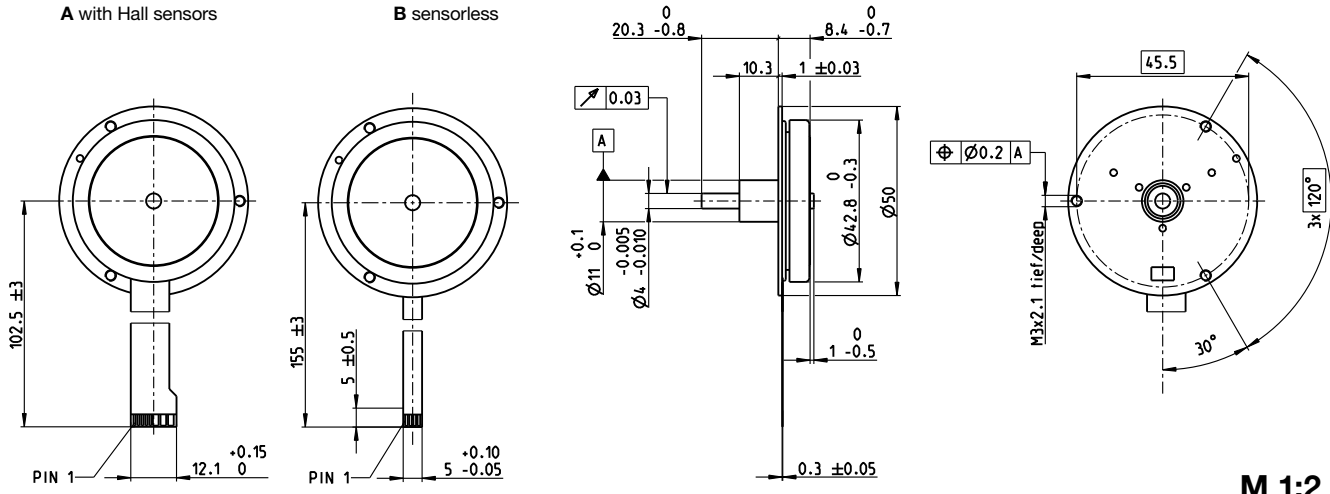
#### Spur Gearhead

Ø38 mm  
 0.1 - 0.6 Nm  
 Page 360



# EC 45 flat $\varnothing 42.8$ mm, brushless, 12 Watt

maxon flat motor



- Stock program
- Standard program
- Special program (on request)

		Part Numbers					
A with Hall sensors		200188		339275		339276	
B sensorless			200141		339277		339278

### Motor Data

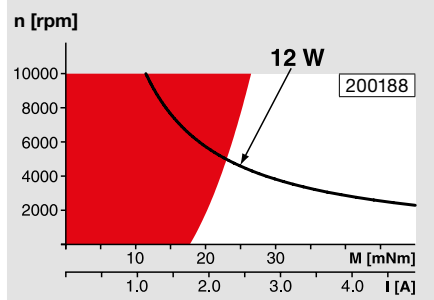
Values at nominal voltage							
1 Nominal voltage	V	9	9	12	12	24	24
2 No load speed	rpm	8000	7980	8160	8150	7310	7300
3 No load current	mA	147	147	115	115	47.6	47.6
4 Nominal speed	rpm	4780	4540	4840	4720	4390	4360
5 Nominal torque (max. continuous torque)	mNm	23.8	23.6	20.1	20	27	27.1
6 Nominal current (max. continuous current)	A	2.04	2.04	1.37	1.37	0.766	0.768
7 Stall torque <sup>1</sup>	mNm	92.6	80.6	70.8	66.5	114	112
8 Stall current	A	8.9	7.75	5.24	4.92	3.74	3.67
9 Max. efficiency	%	77	75	73	73	79	79
Characteristics							
10 Terminal resistance phase to phase	$\Omega$	1.01	1.16	2.29	2.44	6.42	6.54
11 Terminal inductance phase to phase	mH	0.32	0.32	0.541	0.541	2.75	2.75
12 Torque constant	mNm/A	10.4	10.4	13.5	13.5	30.5	30.5
13 Speed constant	rpm/V	918	918	706	706	313	313
14 Speed/torque gradient	rpm/mNm	89.3	103	120	128	65.9	67.1
15 Mechanical time constant	ms	48.9	56.1	65.5	69.8	36.1	36.8
16 Rotor inertia	gcm <sup>2</sup>	52.3	52.3	52.3	52.3	52.3	52.3

### Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	6.59 K/W
18 Thermal resistance winding-housing	5.56 K/W
19 Thermal time constant winding	8.36 s
20 Thermal time constant motor	188 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	10000 rpm
24 Axial play at axial load < 5.0 N	0 mm
	typ. 0.6 mm
	preloaded
25 Radial play	4.8 N
26 Max. axial load (dynamic)	45 N
27 Max. force for press fits (static) (static, shaft supported)	1000 N
28 Max. radial load, 15 mm from flange	12.5 N
<b>Other specifications</b>	
29 Number of pole pairs	8
30 Number of phases	3
31 Weight of motor	57 g

Values listed in the table are nominal.

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Connection with Hall sensors sensorless		
Pin 1	V <sub>Hall</sub> 4.5...18 VDC	Motor winding 1
Pin 2	Hall sensor 3*	Motor winding 2
Pin 3	Hall sensor 1*	Motor winding 3
Pin 4	Hall sensor 2*	neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

\*Internal pull-up (7...13 k $\Omega$ ) on V<sub>Hall</sub>  
Wiring diagram for Hall sensors see p. 47

Adapter	Part number	Part number
see p. 481	220300	220310

Connector	Part number	Part number
TE	1-84953-1	84953-4
Molex	52207-1133	52207-0433

### maxon Modular System

Details on catalog page 36

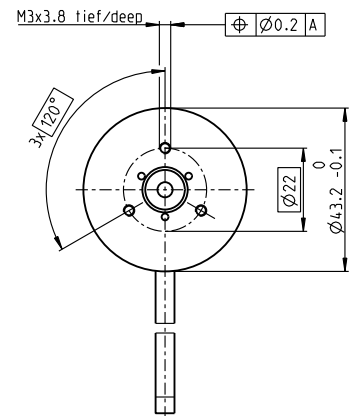
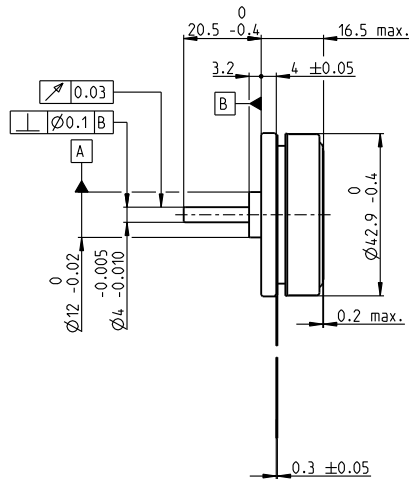
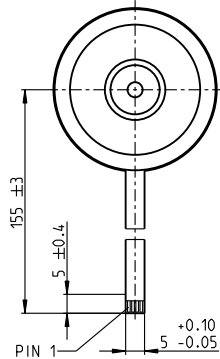
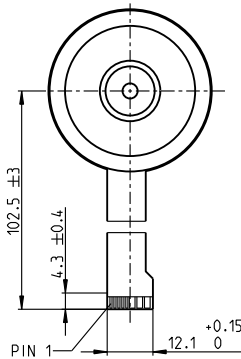
### Recommended Electronics:

Notes	Page 36
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
DEC Module 24/2	459
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
MAXPOS 50/5	473

# EC 45 flat $\varnothing 42.9$ mm, brushless, 30 Watt

**A with Hall sensors**  
 Option with cable and connector:  
 (Dimension drawings opt.)  
 Motor length +1.3 mm,  
 Ambient temperature -20...+100°C  
 Cable length 500 mm  $\pm$  10 mm

**B sensorless**



**M 1:2**

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
<b>A with Hall sensors</b>	<b>200142</b> <b>339281</b> <b>339282</b>
Option with Cable and Connector	<b>387266</b> <b>400527</b> <b>400580</b>
<b>B sensorless</b>	<b>200189</b> <b>339283</b> <b>339284</b>

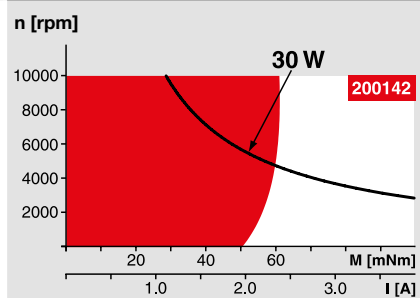
**Motor Data**

Values at nominal voltage		12	12	24	24	36	36
1 Nominal voltage	V	12	12	24	24	36	36
2 No load speed	rpm	4370	4350	4360	4380	4750	4760
3 No load current	mA	163	163	81.4	73	61.6	55.3
4 Nominal speed	rpm	2940	2800	2940	2900	3290	3270
5 Nominal torque (max. continuous torque)	mNm	55	54.7	54.8	55.2	66	66.6
6 Nominal current (max. continuous current)	A	2.02	2.02	1.01	1.01	0.847	0.849
7 Stall torque <sup>1</sup>	mNm	255	219	253	243	380	369
8 Stall current	A	10	8.58	4.97	4.77	5.38	5.22
9 Max. efficiency	%	76	75	76	77	80	81
Characteristics							
10 Terminal resistance phase to phase	$\Omega$	1.2	1.4	4.83	5.03	6.69	6.89
11 Terminal inductance phase to phase	mH	0.56	0.56	2.24	2.24	4.29	4.29
12 Torque constant	mNm/A	25.5	25.5	51	51	70.6	70.6
13 Speed constant	rpm/V	374	374	187	187	135	135
14 Speed/torque gradient	rpm/mNm	17.6	20.5	17.7	18.5	12.8	13.2
15 Mechanical time constant	ms	17.1	19.9	17.2	17.9	12.4	12.8
16 Rotor inertia	gcm <sup>2</sup>	92.5	92.5	92.5	92.5	92.5	92.5

**Specifications**

- Thermal data**
- 17 Thermal resistance housing-ambient: 6.69 K/W
  - 18 Thermal resistance winding-housing: 3.92 K/W
  - 19 Thermal time constant winding: 11.4 s
  - 20 Thermal time constant motor: 295 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 10000 rpm
  - 24 Axial play at axial load < 5.0 N: 0 mm
  - > 5.0 N: typ. 0.14 mm
  - 25 Radial play: preloaded
  - 26 Max. axial load (dynamic): 4.8 N
  - 27 Max. force for press fits (static) (static, shaft supported): 53 N
  - 28 Max. radial load, 5 mm from flange: 18 N
- Other specifications**
- 29 Number of pole pairs: 8
  - 30 Number of phases: 3
  - 31 Weight of motor: 75 g

**Operating Range**



**Comments**

- **Continuous operation**  
 In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
 = Thermal limit.
- Short term operation**  
 The motor may be briefly overloaded (recurring).
- **Assigned power rating**

Values listed in the table are nominal.

**Connection with Hall sensors**

Pin 1	V <sub>Hall</sub> 4.5...18 VDC	Motor winding 1
Pin 2	Hall sensor 3*	Motor winding 2
Pin 3	Hall sensor 1*	Motor winding 3
Pin 4	Hall sensor 2*	neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

\*Internal pull-up (7...13 k $\Omega$ ) on V<sub>Hall</sub>  
 Wiring diagram for Hall sensors see p. 47

**Adapter**

Part number	Part number
see p. 481	220300
	220310

**Connector**

Part number	Part number
TE	1-84953-1
	84953-4
Molex	52207-1133
	52207-0433

Pin for design with Hall sensors:  
 FPC, 11-pol, Pitch 1.0 mm, top contact style

<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

**maxon Modular System**

Details on catalog page 36

**Planetary Gearhead**

$\varnothing 42$  mm  
 3 - 15 Nm  
 Page 363

**Spur Gearhead**

$\varnothing 45$  mm  
 0.5 - 2.0 Nm  
 Page 365



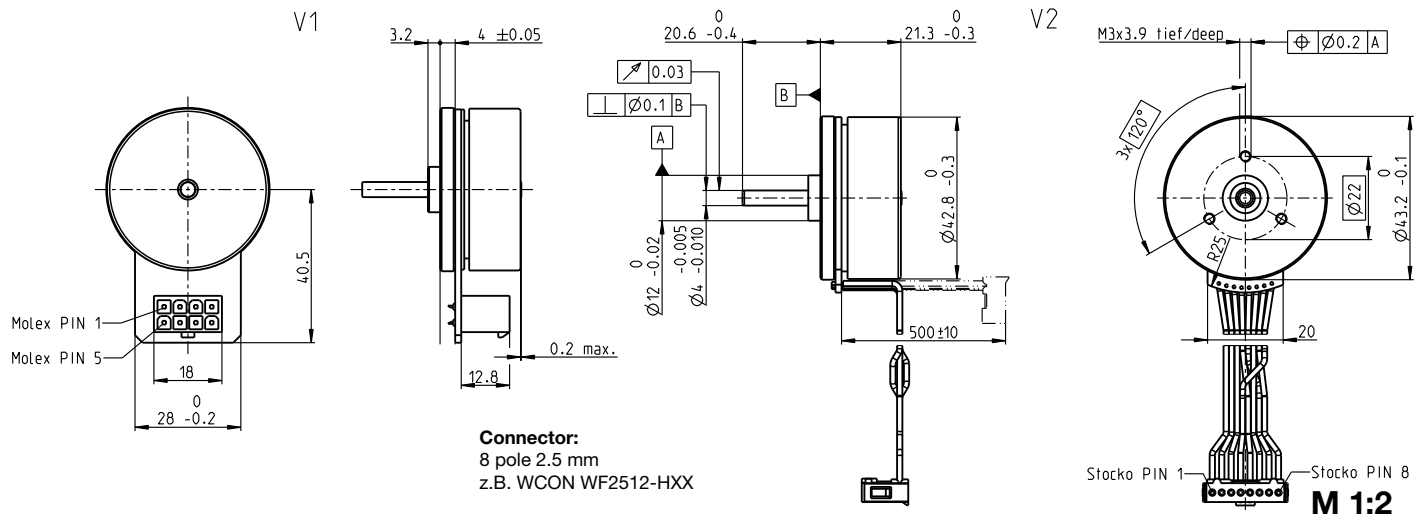
**Recommended Electronics:**

Notes	Page 36
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
ESCON Module 50/5	455
ESCON 50/5	457
DEC Module 24/2	459
DEC Module 50/5	459
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

for motor type A:  
**Encoder MILE**  
 256 - 2048 CPT,  
 2 channels  
 Page 412

# EC 45 flat $\varnothing 42.8$ mm, brushless, 50 Watt

maxon flat motor



- Stock program
- Standard program
- Special program (on request)

Part Numbers				
V1 with Hall sensors	339285	251601	339286	339287
V2 with Hall sensors and cables	400106	387250	400107	400108

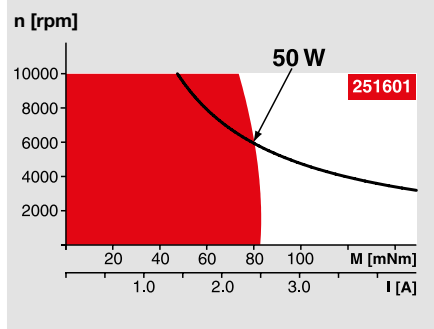
### Motor Data

Values at nominal voltage					
1 Nominal voltage	V	18	24	24	36
2 No load speed	rpm	6720	6710	4730	3360
3 No load current	mA	247	185	106	42.3
4 Nominal speed	rpm	5190	5240	3480	2360
5 Nominal torque (max. continuous torque)	mNm	97.1	83.4	69.6	90.5
6 Nominal current (max. continuous current)	A	3.52	2.33	1.41	0.828
7 Stall torque <sup>1</sup>	mNm	975	780	402	484
8 Stall current	A	38.8	23.3	8.47	4.81
9 Max. efficiency	%	85	83	79	82
Characteristics					
10 Terminal resistance phase to phase	$\Omega$	0.464	1.03	2.83	7.48
11 Terminal inductance phase to phase	mH	0.322	0.572	1.15	5.15
12 Torque constant	mNm/A	25.1	33.5	47.5	101
13 Speed constant	rpm/V	380	285	201	95
14 Speed/torque gradient	rpm/mNm	7.02	8.77	12	7.07
15 Mechanical time constant	ms	9.92	12.4	17	10
16 Rotor inertia	gcm <sup>2</sup>	135	135	135	135

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 4.53 K/W
  - 18 Thermal resistance winding-housing: 4.75 K/W
  - 19 Thermal time constant winding: 17.7 s
  - 20 Thermal time constant motor: 227 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 10000 rpm
  - 24 Axial play at axial load < 4.0 N: 0 mm
  - > 4.0 N: 0.14 mm
  - 25 Radial play preloaded: 3.8 N
  - 26 Max. axial load (dynamic): 53 N
  - 27 Max. force for press fits (static) (static, shaft supported): 1000 N
  - 28 Max. radial load, 5 mm from flange: 20 N

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

- Other specifications**
- 29 Number of pole pairs: 8
  - 30 Number of phases: 3
  - 31 Weight of motor: 110 g

- Values listed in the table are nominal.
- Connection V1**
- Pin 1 Hall sensor 1\*
  - Pin 2 Hall sensor 2\*
  - Pin 3 V<sub>hall</sub> 4.5...18 VDC
  - Pin 4 Motor winding 3
  - Pin 5 Hall sensor 3\*
  - Pin 6 GND
  - Pin 7 Motor winding 1
  - Pin 8 Motor winding 2
- V2 (AWG 24)**
- Motor winding 1
  - Motor winding 2
  - Motor winding 3
  - V<sub>hall</sub> 4.5...18 VDC
  - GND
  - Hall sensor 1\*
  - Hall sensor 2\*
  - Hall sensor 3\*
- \*Internal pull-up (7...13 k $\Omega$ ) on V<sub>hall</sub>  
Wiring diagram for Hall sensors see p. 27
- Cable for V1**
- Connection cable Universal, L = 500 mm: **339380**
  - Connection cable to EPOS, L = 500 mm: **354045**

### maxon Modular System

- Planetary Gearhead**  
 $\varnothing 42$  mm  
3 - 15 Nm  
Page 363
- Spur Gearhead**  
 $\varnothing 45$  mm  
0.5 - 2.0 Nm  
Page 365

- Recommended Electronics:**
- Notes** Page 36
- ESCON Module 24/2: 454
  - ESCON 36/3 EC: 455
  - ESCON Mod. 50/4 EC-S: 455
  - ESCON Module 50/5: 455
  - ESCON 50/5: 457
  - DEC Module 24/2: 459
  - DEC Module 50/5: 459
  - EPOS4 Mod./Comp. 24/1.5: 462
  - EPOS4 50/5: 463
  - EPOS4 Mod./Comp. 50/5: 463
  - EPOS2 P 24/5: 470
  - MAXPOS 50/5: 473

Details on catalog page 36

- Encoder MILE**  
256 - 2048 CPT,  
2 channels  
Page 412

- V2**
- 21 Ambient temperature: -20...+100°C
- <sup>1</sup>Calculation does not include saturation effect (p. 57/162)

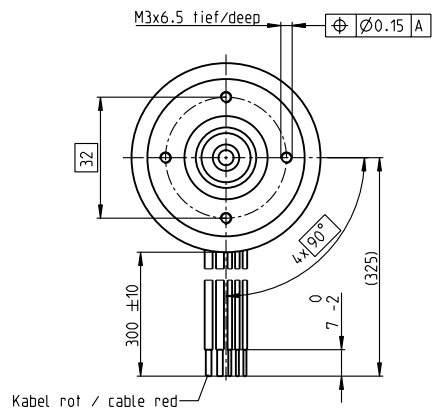
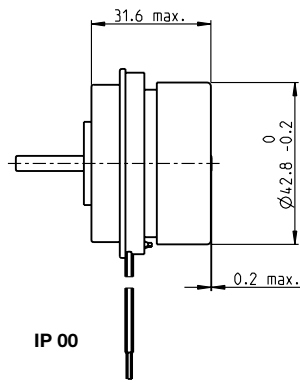
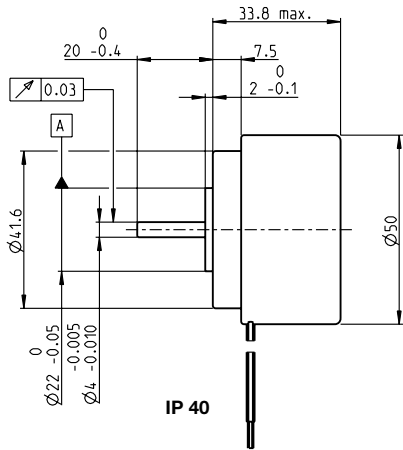




# EC 45 flat brushless, 30 Watt, with integrated electronics

1-Q-Speed Controller

maxon flat motor



M 1:2

- Stock program
- Standard program
- Special program (on request)

		2 wire version				5 wire version			
						Enable		Direction	
IP 40 (with cover)	353518		353519			350909		370425	
IP 00 (without cover)		353516		353517			352886		370424

**Motor Data** (provisional)

Values at nominal voltage		24		24		24		24	
1 Nominal voltage	V	24	24	24	24	24	24	24	24
2 No load speed	rpm	3000	3000	6000	6000	6000	6000	6000	6000
3 No load current	mA	79.5	79.5	210	210	210	210	210	210
4 Nominal speed	rpm	3000	3000	6000	6000	6000	6000	6000	6000
5 Nominal torque (max. continuous torque)	mNm	72.8	94.7	59.4	89.6	59.4	89.6	59.4	89.6
6 Nominal current (max. continuous current)	A	1.33	1.78	2.06	3.1	2.06	3.1	2.06	3.1
33 Max. torque	mNm	106	106	104	104	104	104	104	104
34 Max. current	A	2.02	2.02	3.62	3.62	3.62	3.62	3.62	3.62
9 Max. efficiency	%	73	73	76	76	76	76	76	76
Characteristics		Speed	Speed	Speed	Speed	Speed	Speed	Speed	Speed
35 Type of control		Speed	Speed	Speed	Speed	Speed	Speed	Speed	Speed
36 Supply voltage +V <sub>CC</sub>	V	10...28	10...28	10...28	10...28	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V <sub>CC</sub>	= V <sub>CC</sub>	= V <sub>CC</sub>	= V <sub>CC</sub>	0.33...10.8	0.33...10.8	0.33...10.8	0.33...10.8
38 Scale speed set value input	rpm/V	125	125	250	250	600	600	600	600
39 Speed range	rpm	1250...3500	1250...3500	2500...7000	2500...7000	200...6480	200...6480	200...6480	200...6480
40 Max. acceleration	rpm/s	3000	3000	6000	6000	6000	6000	6000	6000

**Specifications**

- Thermal data**
- 17 Thermal resistance housing-ambient 5.6 (3.12) K/W
  - 18 Thermal resistance winding-housing 7.7 (4.5) K/W
  - 19 Thermal time constant winding 37.6 (22) s
  - 20 Thermal time constant motor 633 (353) s
  - 21 Ambient temperature -40...+85°C
  - 22 Max. winding temperature +125°C
  - 41 Max. temperature of electronics +105°C
- Mechanical data (preloaded ball bearings)**
- 16 Rotor inertia 135 gcm<sup>2</sup>
  - 24 Axial play at axial load < 7.0 N 0 mm
  - > 7.0 N 0.14 mm
  - 25 Radial play preloaded 6.8 N
  - 26 Max. axial load (dynamic) 95 N
  - 27 Max. force for press fits (static) (static, shaft supported) 1000 N
  - 28 Max. radial load, 5 mm from flange 55 N
- Other specifications**
- 31 Weight of motor 226 g
  - 32 Direction of rotation Clockwise (CW)

Values listed in the table are nominal.

**Protective functions**

Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

**Connection 2 wire version** (Cable AWG 18)

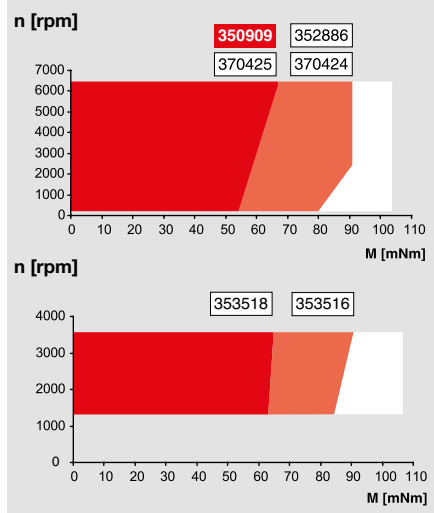
- red +V<sub>CC</sub> 10...28 VDC
- black GND

**Connection 5 wire version** (Cable AWG 18/24)

- red +V<sub>CC</sub> 10...28 VDC
- black GND
- white Speed set value input
- green Monitor n (6 pulses per revolution)
- grey Disable (Type Enable) or sense of direction (Type Direction)

**Operating Range**

**Comments**



**Continuous operation**  
The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.

**Overload range**  
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

**maxon Modular System**

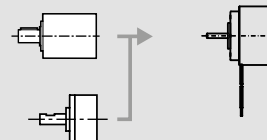
Details on catalog page 36

**Planetary Gearhead**

Ø42 mm  
3 - 15 Nm  
Page 363

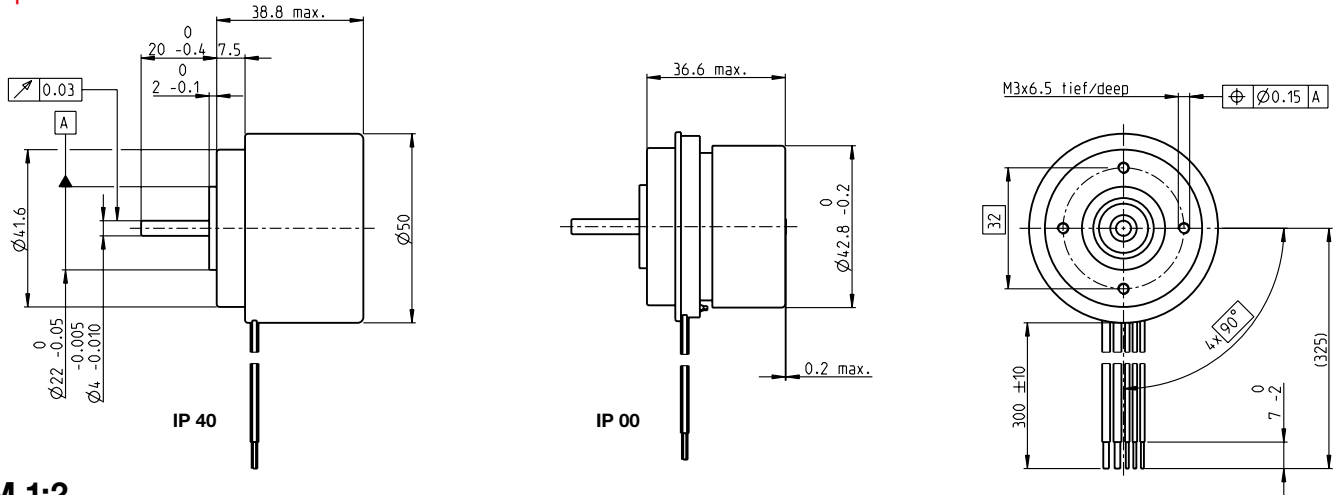
**Spur Gearhead**

Ø45 mm  
0.5 - 2.0 Nm  
Page 365



# EC 45 flat brushless, 50 Watt, with integrated electronics

## 1-Q-Speed Controller



M 1:2

- Stock program
- Standard program
- Special program (on request)

		Part Numbers				
		2 wire version		5 wire version		
				Enable	Direction	
IP 40 (with cover)		353526		350910		370427
IP 00 (without cover)			353524		352887	370426

Motor Data (provisional)							
Values at nominal voltage							
1 Nominal voltage	V	24	24	24	24	24	24
2 No load speed	rpm	3000	3000	4500	4500	4500	4500
3 No load current	mA	114	114	192	192	192	192
4 Nominal speed	rpm	3000	3000	4500	4500	4500	4500
5 Nominal torque (max. continuous torque)	mNm	89.9	130	82.8	131	82.8	131
6 Nominal current (max. continuous current)	A	1.61	2.41	2.15	3.45	2.15	3.45
33 Max. torque	mNm	150	150	149	149	149	149
34 Max. current	A	2.83	2.83	3.86	3.86	3.86	3.86
9 Max. efficiency	%	74	74	76	76	76	76
Characteristics							
35 Type of control		Speed	Speed	Speed	Speed	Speed	Speed
36 Supply voltage +V <sub>CC</sub>	V	10...28	10...28	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V <sub>CC</sub>	= V <sub>CC</sub>	0.33...10.8	0.33...10.8	0.33...10.8	0.33...10.8
38 Scale speed set value input	rpm/V	125	125	600	600	600	600
39 Speed range	rpm	1250...3500	1250...3500	200...6480	200...6480	200...6480	200...6480
40 Max. acceleration	rpm/s	3000	3000	6000	6000	6000	6000

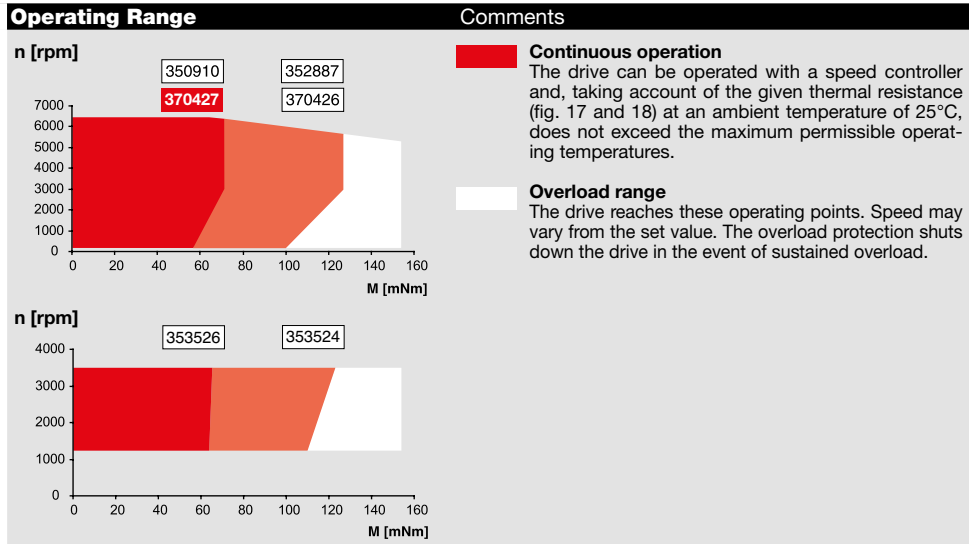
Specifications		
Thermal data		
17 Thermal resistance housing-ambient	5.1 (2.5) K/W	
18 Thermal resistance winding-housing	6.7 (3.3) K/W	
19 Thermal time constant winding	45.1 (22.1) s	
20 Thermal time constant motor	256 (124) s	
21 Ambient temperature	-40...+85°C	
22 Max. winding temperature	+125°C	
41 Max. temperature of electronics	+105°C	
Mechanical data (preloaded ball bearings)		
16 Rotor inertia	181 gcm <sup>2</sup>	
24 Axial play at axial load < 7.0 N	0 mm	
	> 7.0 N	0.14 mm
25 Radial play	preloaded	
26 Max. axial load (dynamic)	6.8 N	
27 Max. force for press fits (static) (static, shaft supported)	95 N	
28 Max. radial load, 5 mm from flange	1000 N	
	63 N	
Other specifications		
31 Weight of motor	260 g	
32 Direction of rotation	Clockwise (CW)	

Values listed in the table are nominal.

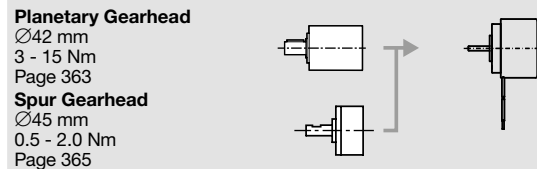
**Protective functions**  
 Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

**Connection 2 wire version** (Cable AWG 18)  
 red +V<sub>CC</sub> 10...28 VDC  
 black GND

**Connection 5 wire version** (Cable AWG 18/24)  
 red +V<sub>CC</sub> 10...28 VDC  
 black GND  
 white Speed set value input  
 green Monitor n (6 pulses per revolution)  
 grey Disable (Type Enable) or sense of direction (Type Direction)



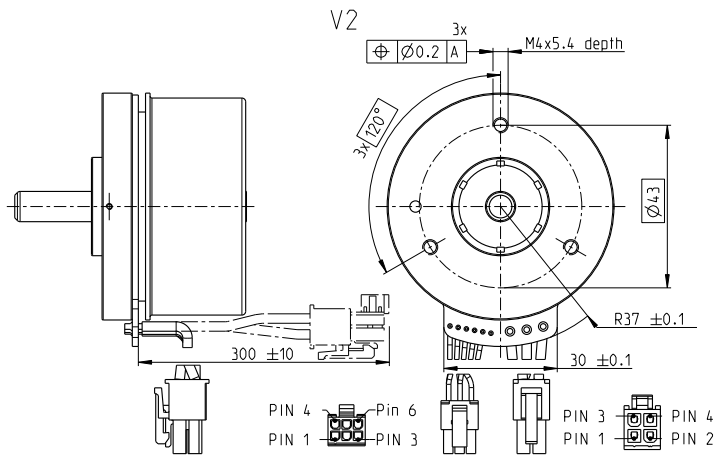
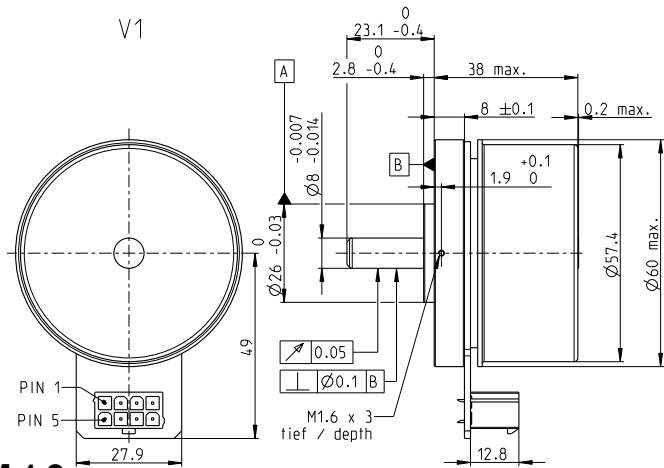
### maxon Modular System Details on catalog page 36



# EC 60 flat Ø60 mm, brushless, 100 Watt

**NEW**

maxon flat motor



**M 1:2**

- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

V1 with Hall sensors	625854	625855	625856
V2 with Hall sensors and cables	647691	645604	647692

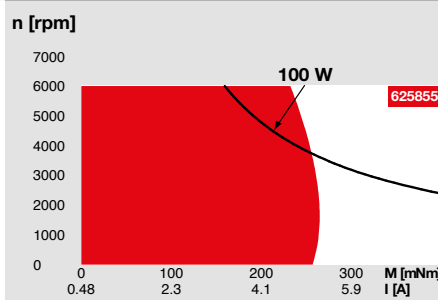
**Motor Data**

Values at nominal voltage		V	12	24	48
1 Nominal voltage	V		12	24	48
2 No load speed	rpm		3760	4300	4020
3 No load current	mA		797	493	221
4 Nominal speed	rpm		3210	3730	3460
5 Nominal torque (max. continuous torque)	mNm		261	269	298
6 Nominal current (max. continuous current)	A		8.72	5.14	2.61
7 Stall torque <sup>1</sup>	mNm		3340	4300	4870
8 Stall current	A		111	81.9	43.2
9 Max. efficiency	%		84.1	85.3	86.4
Characteristics		Ω	0.108	0.293	1.11
10 Terminal resistance phase to phase	Ω		0.108	0.293	1.11
11 Terminal inductance phase to phase	mH		0.0911	0.279	1.28
12 Torque constant	mNm/A		30	52.5	113
13 Speed constant	rpm/V		318	182	84.8
14 Speed/torque gradient	rpm/mNm		1.14	1.01	0.837
15 Mechanical time constant	ms		9.99	8.86	7.32
16 Rotor inertia	gcm <sup>2</sup>		835	835	835

**Specifications**

- Thermal data**
- 17 Thermal resistance housing-ambient 2.5 K/W
  - 18 Thermal resistance winding-housing 3.8 K/W
  - 19 Thermal time constant winding 41.4 s
  - 20 Thermal time constant motor 90 s
  - 21 Ambient temperature -40...+100°C
  - 22 Max. winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed 6000 rpm
  - 24 Axial play at axial load < 12.0 N 0 mm
  - > 12.0 N 0.14 mm
  - 25 Radial play preloaded
  - 26 Max. axial load (dynamic) 12 N
  - 27 Max. force for press fits (static) (static, shaft supported) 170 N
  - 28 Max. radial load, 5 mm from flange 8000 N
  - 112 N
- Other specifications**
- 29 Number of pole pairs 7
  - 30 Number of phases 3
  - 31 Weight of motor 355 g
- Values listed in the table are nominal.

**Operating Range**



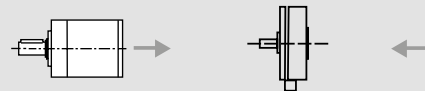
**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

**maxon Modular System**

Details on catalog page 36

**Planetary Gearhead**  
Ø52 mm  
4 - 30 Nm  
Page 367



**Encoder MILE**  
512 - 4096 CPT,  
2 channels  
Page 413

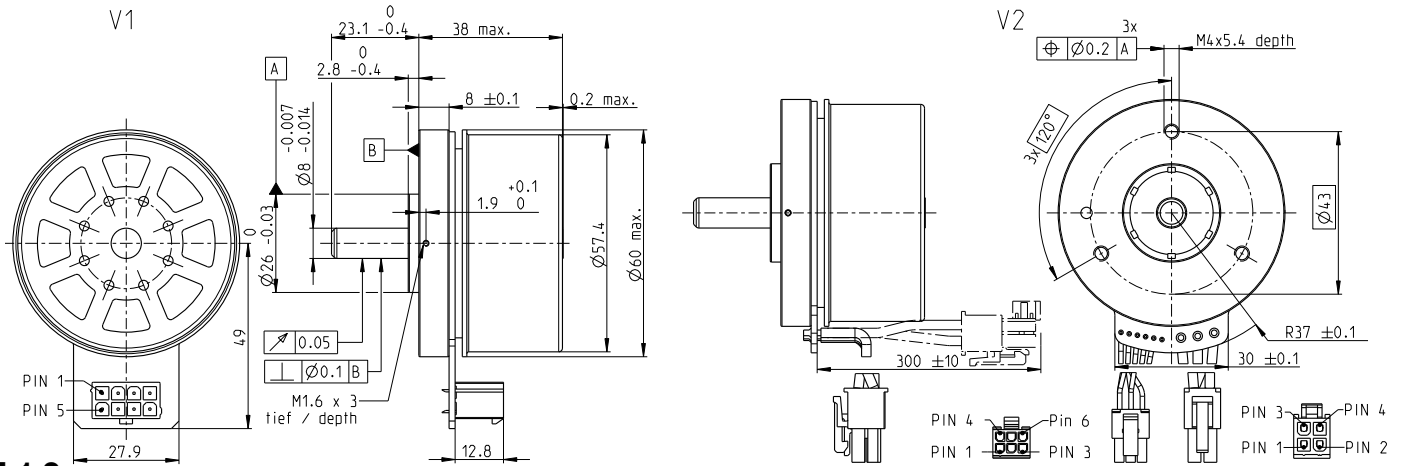
- Recommended Electronics:**
- |                        |          |
|------------------------|----------|
| Notes                  | Page 365 |
| ESCON Module 50/5      | 455      |
| ESCON Mod. 50/8 (HE)   | 456      |
| ESCON 50/5             | 457      |
| ESCON 70/10            | 457      |
| DEC Module 50/5        | 459      |
| EPOS4 50/5             | 463      |
| EPOS4 Mod./Comp. 50/5  | 463      |
| EPOS4 Mod./Comp. 50/8  | 465      |
| EPOS4 Mod./Comp. 50/15 | 466      |
| EPOS4 70/15            | 467      |
| EPOS2 P 24/5           | 470      |
| MAXPOS 50/5            | 473      |

- Connection V1**
- Pin 1 Hall sensor1
  - Pin 2 Hall sensor 2
  - Pin 3 V<sub>Hall</sub> 4.5...24 VDC
  - Pin 4 Motor winding 3
  - Pin 5 Hall sensor 3
  - Pin 6 GND
  - Pin 7 Motor winding 1
  - Pin 8 Motor winding 2
- V2 (sensors, AWG 24)**
- Hall sensor1
  - Hall sensor 2
  - Hall sensor 3
  - GND
  - N.C.
- V2 (Motor, AWG 16)**
- Motor winding 1
  - Motor winding 2
  - Motor winding 3
  - N.C.
- Wiring diagram for Hall sensors see p. 47
- Connector Part number**
- |                  |            |
|------------------|------------|
| Molex 46015-0806 | 43025-0600 |
| Molex            | 39-01-2040 |
- Connection cable for V1**
- Connection cable Universal, L = 500 mm **339380**
  - Connection cable zu EPOS4, L = 500 mm **354045**
- <sup>1</sup>Calculation does not include saturation effect (p. 57/162)

# EC 60 flat Ø60 mm, brushless, 150 Watt

**NEW**

Open Rotor



**M 1:2**

- Stock program
- Standard program
- Special program (on request)

**Part Numbers**

V1 with Hall sensors	625857	625858	625859
V2 with Hall sensors and cables	647693	647694	647695

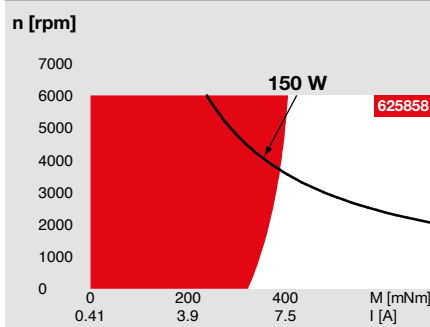
**Motor Data**

Values at nominal voltage		12	24	48
1 Nominal voltage	V	12	24	48
2 No load speed	rpm	3760	4300	4020
3 No load current	mA	815	497	224
4 Nominal speed	rpm	2990	3480	3230
5 Nominal torque (max. continuous torque)	mNm	378	401	437
6 Nominal current (max. continuous current)	A	12	7.25	3.63
7 Stall torque <sup>1</sup>	mNm	3340	4300	4870
8 Stall current	A	111	81.9	43.2
9 Max. efficiency	%	83.8	85.2	86.3
Characteristics				
10 Terminal resistance phase to phase	Ω	0.108	0.293	1.11
11 Terminal inductance phase to phase	mH	0.0911	0.279	1.28
12 Torque constant	mNm/A	30	52.5	113
13 Speed constant	rpm/V	318	182	84.8
14 Speed/torque gradient	rpm/mNm	1.14	1.01	0.837
15 Mechanical time constant	ms	9.68	8.6	9.1
16 Rotor inertia	gcm <sup>2</sup>	810	810	810

**Specifications**

- Thermal data**
- 17 Thermal resistance housing-ambient 1.94 K/W
- 18 Thermal resistance winding-housing 1.48 K/W
- 19 Thermal time constant winding 16.1 s
- 20 Thermal time constant motor 69.9 s
- 21 Ambient temperature -40...+100°C
- 22 Max. winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed 6000 rpm
- 24 Axial play at axial load < 12.0 N 0 mm
- > 12.0 N 0.14 mm
- 25 Radial play preloaded 12 N
- 26 Max. axial load (dynamic) 170 N
- 27 Max. force for press fits (static) (static, shaft supported) 8000 N
- 28 Max. radial load, 5 mm from flange 112 N
- Other specifications**
- 29 Number of pole pairs 7
- 30 Number of phases 3
- 31 Weight of motor 350 g

**Operating Range**



**Comments**

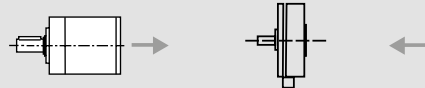
- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

- Values listed in the table are nominal.
- Connection V1**      **V2 (sensors, AWG 24)**
- Pin 1 Hall sensor1      Hall sensor1
- Pin 2 Hall sensor 2      Hall sensor 2
- Pin 3 V<sub>Hall</sub> 4.5...24 VDC      Hall sensor 3
- Pin 4 Motor winding 3      GND
- Pin 5 Hall sensor 3      V<sub>Hall</sub> 4.5...24 VDC
- Pin 6 GND      N.C.
- Pin 7 Motor winding 1
- Pin 8 Motor winding 2
- V2 (Motor, AWG 16)**
- Pin 1 Motor winding 1
- Pin 2 Motor winding 2
- Pin 3 Motor winding 3
- Pin 4 N.C.
- Wiring diagram for Hall sensors see p. 47
- Connector Part number**
- Molex 46015-0806      43025-0600
- Molex      39-01-2040
- Connection cable for V1**
- Connection cable Universal, L = 500 mm **339380**
- Connection cable to EPOS4, L = 500 mm **354045**
- <sup>1</sup>Calculation does not include saturation effect (p. 57/162)

**maxon Modular System**

Details on catalog page 36

**Planetary Gearhead**  
Ø52 mm  
4 - 30 Nm  
Page 367



**Encoder MILE**  
512 - 4096 CPT,  
2 channels  
Page 413

**Recommended Electronics:**

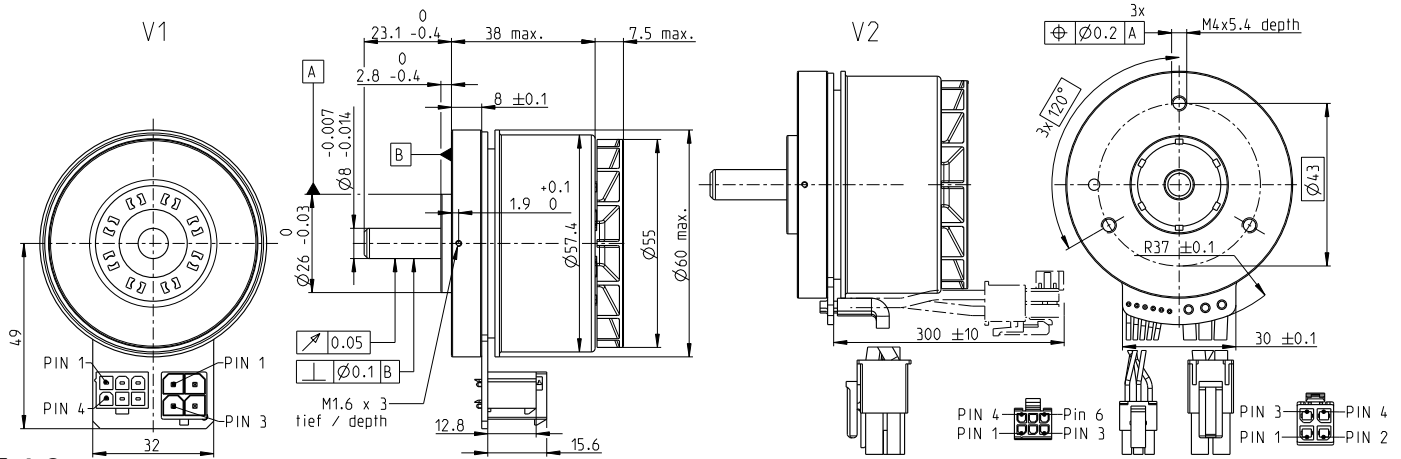
Notes	Page 366
ESCON Module 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 Mod./Comp. 50/15	466
EPOS4 70/15	467
EPOS2 P 24/5	470
MAXPOS 50/5	473

# EC 60 flat Ø60 mm, brushless, 200 Watt

Ventilated

**NEW**

maxon flat motor



## M 1:2

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

V1 with Hall sensors	625860	614949	625861
V2 with Hall sensors and cables	647696	642221	647697

### Motor Data

Values at nominal voltage		12	24	48
1 Nominal voltage	V	12	24	48
2 No load speed	rpm	3760	4300	4020
3 No load current	mA	815	497	224
4 Nominal speed	rpm	2790	3240	3020
5 Nominal torque (max. continuous torque)	mNm	492	536	577
6 Nominal current (max. continuous current)	A	15.1	9.28	4.6
7 Stall torque <sup>1</sup>	mNm	3340	4300	4870
8 Stall current	A	111	81.9	43.2
9 Max. efficiency	%	83.8	85.2	86.3
Characteristics				
10 Terminal resistance phase to phase	Ω	0.108	0.293	1.11
11 Terminal inductance phase to phase	mH	0.0911	0.279	1.28
12 Torque constant	mNm/A	30	52.5	113
13 Speed constant	rpm/V	318	182	84.8
14 Speed/torque gradient	rpm/mNm	1.14	1.01	0.837
15 Mechanical time constant	ms	9.95	8.83	9.29
16 Rotor inertia	gcm <sup>2</sup>	832	832	832

### Specifications

<b>Thermal data</b>	
17 Thermal resistance housing-ambient	1.22 K/W
18 Thermal resistance winding-housing	0.843 K/W
19 Thermal time constant winding	9.19 s
20 Thermal time constant motor	44 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data (preloaded ball bearings)</b>	
23 Max. speed	6000 rpm
24 Axial play at axial load < 12.0 N	0 mm
> 12.0 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	12 N
27 Max. force for press fits (static) (static, shaft supported)	170 N
28 Max. radial load, 5 mm from flange	8000 N
	112 N

### Other specifications

29 Number of pole pairs	7
30 Number of phases	3
31 Weight of motor	360 g

Values listed in the table are nominal.

### Connection V1

Pin	V1	V2 (sensors, AWG 24)
Pin 1	Hall sensor 1	Hall sensor 1
Pin 2	Hall sensor 2	Hall sensor 2
Pin 3	V <sub>Hall</sub> 4.5...24 VDC	Hall sensor 3
Pin 4	Hall sensor 3	GND
Pin 5	GND	V <sub>Hall</sub> 4.5...24 VDC
Pin 6	N.C.	N.C.

### Connection V2

Pin	V2 (Motor, AWG 14)
Pin 1	Motor winding 1
Pin 2	Motor winding 3
Pin 3	Motor winding 2
Pin 4	Motor winding 2
Pin 4	N.C.

Wiring diagram for Hall sensors see p. 47

### Connector Part number

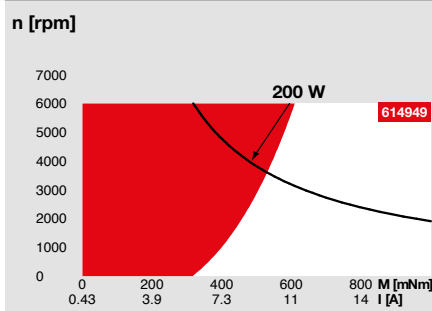
Molex	46015-0606	43025-0600
Molex	76829-0104	171692-0104

### Connection cable for V1

Connection cable Universal, L = 500 mm **651900**

<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

### Operating Range



### Comments

**Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.

**Short term operation**  
The motor may be briefly overloaded (recurring).

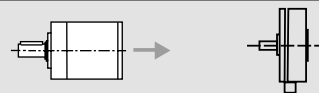
**Assigned power rating**

### maxon Modular System

Details on catalog page 36

### Planetary Gearhead

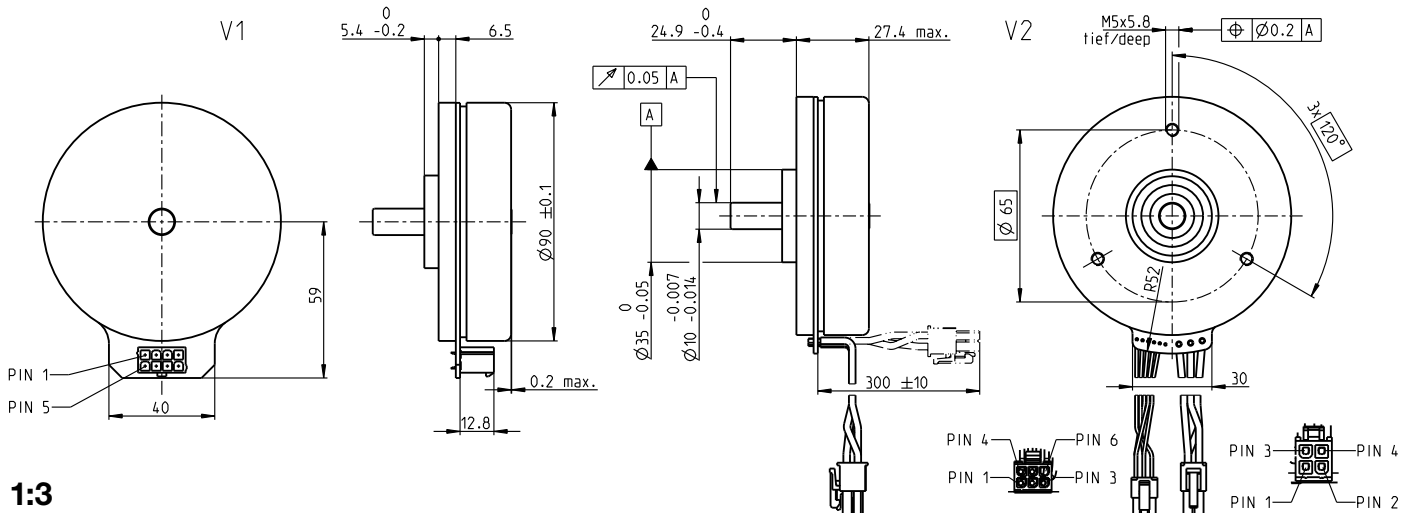
Ø52 mm  
4 - 30 Nm  
Page 367



### Recommended Electronics:

Notes	Page 36
ESCON Module 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459

# EC 90 flat Ø90 mm, brushless, 160 Watt



## M 1:3

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

Motor	586655	515458	505592	580047
V1 with Hall sensors				
V2 with Hall sensors and cables	607321	607322	607323	607324

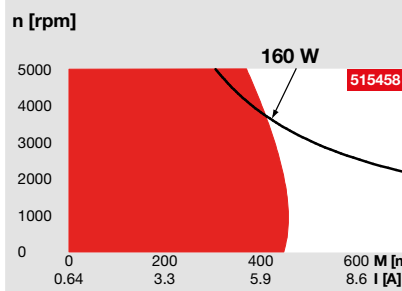
### Motor Data

Values at nominal voltage		12	24	36	60
1 Nominal voltage	V	12	24	36	60
2 No load speed	rpm	3170	3170	3070	2600
3 No load current	mA	1320	658	420	197
4 Nominal speed	rpm	2710	2720	2640	2200
5 Nominal torque (max. continuous torque)	mNm	458	457	453	460
6 Nominal current (max. continuous current)	A	12.8	6.39	4.09	2.1
7 Stall torque <sup>1</sup>	mNm	7400	7910	7580	6410
8 Stall current	A	208	111	68.9	29.6
9 Max. efficiency	%	85	85	85	85
Characteristics					
10 Terminal resistance phase to phase	Ω	0.0577	0.216	0.523	2.03
11 Terminal inductance phase to phase	mH	0.058	0.232	0.554	2.15
12 Torque constant	mNm/A	35.6	71.2	110	217
13 Speed constant	rpm/V	268	134	86.8	44.1
14 Speed/torque gradient	rpm/mNm	0.435	0.407	0.412	0.412
15 Mechanical time constant	ms	14.4	13.5	13.7	13.7
16 Rotor inertia	gcm <sup>2</sup>	3170	3170	3170	3170

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 1.75 K/W
  - 18 Thermal resistance winding-housing: 3.71 K/W
  - 19 Thermal time constant winding: 69.8 s
  - 20 Thermal time constant motor: 260 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 5000 rpm
  - 24 Axial play at axial load: 0.14 mm
  - 25 Radial play: preloaded
  - 26 Max. axial load (dynamic): 34 N
  - 27 Max. force for press fits (static) (static, shaft supported): 440 N
  - 28 Max. radial load, 10 mm from flange: 8000 N (static), 100 N (dynamic)
- Other specifications**
- 29 Number of pole pairs: 11
  - 30 Number of phases: 3
  - 31 Weight of motor: 630 g
- Values listed in the table are nominal.

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Connection V1		V2 (sensors, AWG 24)	
Pin 1	Hall sensor 1	Pin 1	Hall sensor 1
Pin 2	Hall sensor 2	Pin 2	Hall sensor 2
Pin 3	V <sub>Hall</sub> 4.5...24 VDC	Pin 3	Hall sensor 3
Pin 4	Motor winding 3	Pin 4	GND
Pin 5	Hall sensor 3	Pin 5	V <sub>Hall</sub> 4.5...24 VDC
Pin 6	GND	Pin 6	N.C.
Pin 7	Motor winding 1		
Pin 8	Motor winding 2		

V2 (motor, AWG 16)	
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

Wiring diagram for Hall sensors see p. 47

Connector	Part number
Molex 46015-0806	43025-0600
Molex	39-01-2040

- Connection cable for V1**
- Connection cable Universal, L = 500 mm: **339380**
  - Connection cable to EPOS4, L = 500 mm: **354045**
- <sup>1</sup>Calculation does not include saturation effect (p. 57/162)

### maxon Modular System

Details on catalog page 36



**Encoder MILE**  
512 - 6400 CPT,  
2 channels  
Page 414

### Recommended Electronics:

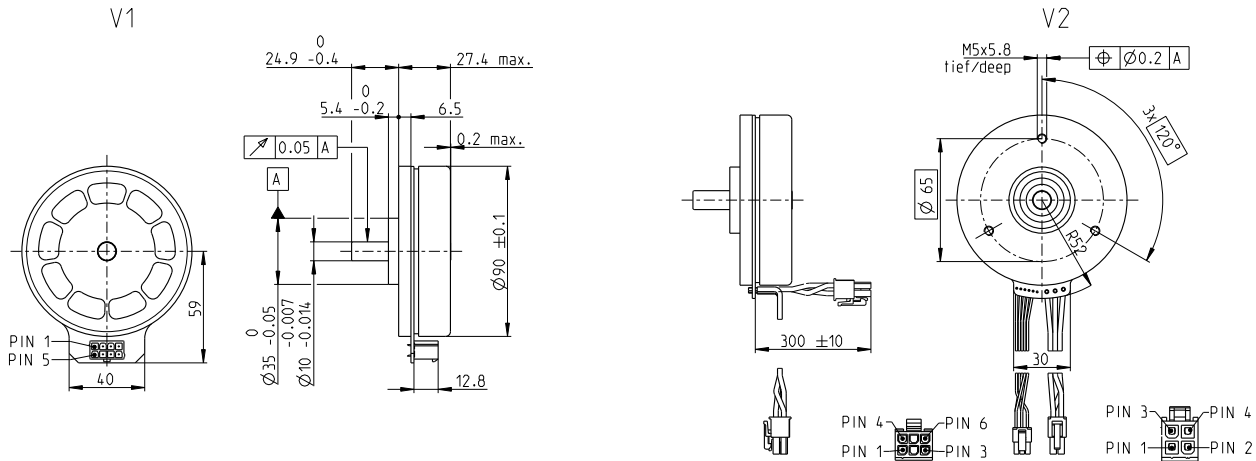
Notes	Page 36
ESCON Mod. 50/4 EC-S	455
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 Mod./Comp. 50/15	466
EPOS4 70/15	467
MAXPOS 50/5	473

# EC 90 flat Ø90 mm, brushless, 220 Watt

Open Rotor

**NEW**

maxon flat motor



## M 1:4

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

V1 with Hall sensors	607942	607943	607944
V2 with Hall sensors and cables	607946	607947	607948

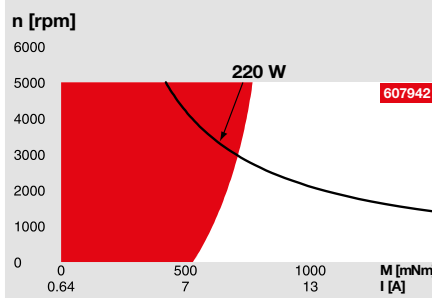
### Motor Data

Values at nominal voltage		24	36	60
1 Nominal voltage	V	24	36	60
2 No load speed	rpm	3170	3070	2600
3 No load current	mA	658	420	197
4 Nominal speed	rpm	2490	2420	2020
5 Nominal torque (max. continuous torque)	mNm	729	715	692
6 Nominal current (max. continuous current)	A	9.44	6.01	2.96
7 Stall torque <sup>1</sup>	mNm	7910	7580	6410
8 Stall current	A	111	68.9	29.6
9 Max. efficiency	%	85.4	85.2	84.6
Characteristics				
10 Terminal resistance phase to phase	Ω	0.216	0.523	2.03
11 Terminal inductance phase to phase	mH	0.232	0.554	2.15
12 Torque constant	mNm/A	71.2	110	217
13 Speed constant	rpm/V	134	86.8	44.1
14 Speed/torque gradient	rpm/mNm	0.407	0.412	0.412
15 Mechanical time constant	ms	13.5	13.7	13.7
16 Rotor inertia	gcm <sup>2</sup>	2875	2875	2875

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 1.87 K/W
  - 18 Thermal resistance winding-housing: 1.43 K/W
  - 19 Thermal time constant winding: 27.7 s
  - 20 Thermal time constant motor: 278 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 5000 rpm
  - 24 Axial play at axial load: 0.14 mm
  - 25 Radial play: preloaded
  - 26 Max. axial load (dynamic): 34 N
  - 27 Max. force for press fits (static) (static, shaft supported): 440 N
  - 28 Max. radial load, 10 mm from flange: 100 N
- Other specifications**
- 29 Number of pole pairs: 11
  - 30 Number of phases: 3
  - 31 Weight of motor: 624 g
- Values listed in the table are nominal.

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System

Details on catalog page 36



**Encoder MILE**  
512 - 6400 CPT,  
2 channels  
Page 414

**Recommended Electronics:**

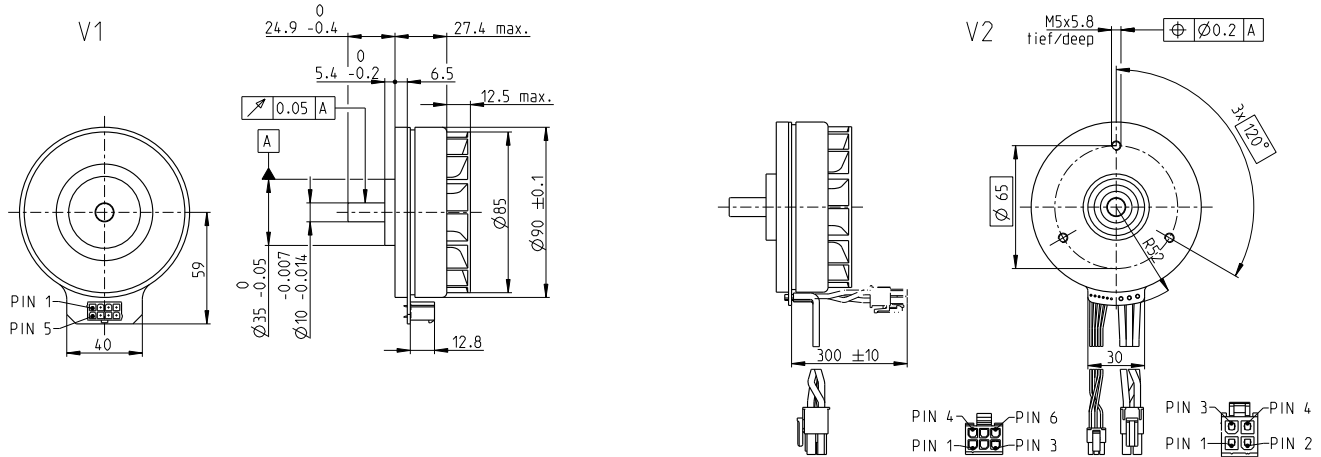
Notes	Page 36
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 Mod./Comp. 50/15	466
EPOS4 70/15	467
MAXPOS 50/5	473

- Connection V1**
- |       |                                |                                    |
|-------|--------------------------------|------------------------------------|
| Pin 1 | Hall sensor 1                  | V2 (sensors, AWG 24) Hall sensor 1 |
| Pin 2 | Hall sensor 2                  | Hall sensor 2                      |
| Pin 3 | V <sub>Hall</sub> 4.5...24 VDC | Hall sensor 3                      |
| Pin 4 | Motor winding 3                | GND                                |
| Pin 5 | Hall sensor 3                  | V <sub>Hall</sub> 4.5...24 VDC     |
| Pin 6 | GND                            | N.C.                               |
| Pin 7 | Motor winding 1                |                                    |
| Pin 8 | Motor winding 2                |                                    |
- Connection V2**
- |       |                 |                                    |
|-------|-----------------|------------------------------------|
| Pin 1 | Motor winding 1 | V2 (motor, AWG 16) Motor winding 1 |
| Pin 2 | Motor winding 2 | Motor winding 2                    |
| Pin 3 | Motor winding 3 | Motor winding 3                    |
| Pin 4 | N.C.            | N.C.                               |
- Wiring diagram for Hall sensors see p. 47
- Connector**
- |                  |                        |
|------------------|------------------------|
| Molex 46015-0806 | Part number 43025-0600 |
| Molex            | 39-01-2040             |
- Connection cable for V1**
- Connection cable Universal, L = 500 mm **339380**
  - Connection cable to EPOS4, L = 500 mm **354045**
- <sup>1</sup>Calculation does not include saturation effect (p. 57/162)

# EC 90 flat Ø90 mm, brushless, 360 Watt

**NEW**

Ventilated



## M 1:4

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

V1 with Hall sensors	607950	607951	607952
V2 with Hall sensors and cables	607953	607954	607955
			607956

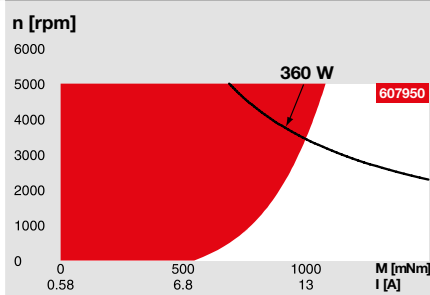
### Motor Data

Values at nominal voltage		12	24	36	60
1 Nominal voltage	V	12	24	36	60
2 No load speed	rpm	3210	3210	3120	2640
3 No load current	mA	1390	696	444	210
4 Nominal speed	rpm	2310	2340	2270	1890
5 Nominal torque (max. continuous torque)	mNm	951	953	933	894
6 Nominal current (max. continuous current)	A	23.9	12	7.61	3.73
7 Stall torque <sup>1</sup>	mNm	7290	7800	7470	6320
8 Stall current	A	208	111	68.9	29.6
9 Max. efficiency	%	84.5	85	84.8	84
Characteristics					
10 Terminal resistance phase to phase	Ω	0.0577	0.216	0.523	2.03
11 Terminal inductance phase to phase	mH	0.058	0.232	0.554	2.15
12 Torque constant	mNm/A	35.1	70.1	108	214
13 Speed constant	rpm/V	272	136	88.1	44.7
14 Speed/torque gradient	rpm/mNm	0.448	0.419	0.425	0.424
15 Mechanical time constant	ms	14.9	13.9	14.1	14.1
16 Rotor inertia	gcm <sup>2</sup>	3210	3210	3210	3210

### Specifications

Thermal data	
17 Thermal resistance housing-ambient	1.12 K/W
18 Thermal resistance winding-housing	1.04 K/W
19 Thermal time constant winding	20 s
20 Thermal time constant motor	166 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	5000 rpm
24 Axial play at axial load	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	34 N
27 Max. force for press fits (static) (static, shaft supported)	440 N
28 Max. radial load, 10 mm from flange	100 N
Other specifications	
29 Number of pole pairs	11
30 Number of phases	3
31 Weight of motor	638 g

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Connection V1		V2 (sensors, AWG 24)	
Pin 1	Hall sensor 1	Pin 1	Hall sensor 1
Pin 2	Hall sensor 2	Pin 2	Hall sensor 2
Pin 3	V <sub>Hall</sub> 4.5...24 VDC	Pin 3	Hall sensor 3
Pin 4	Motor winding 3	Pin 4	GND
Pin 5	Hall sensor 3	Pin 5	V <sub>Hall</sub> 4.5...24 VDC
Pin 6	GND	Pin 6	N.C.
Pin 7	Motor winding 1		
Pin 8	Motor winding 2		
Connection V2		V2 (motor, AWG 16)	
Pin 1	Motor winding 1	Pin 1	Motor winding 1
Pin 2	Motor winding 2	Pin 2	Motor winding 2
Pin 3	Motor winding 3	Pin 3	Motor winding 3
Pin 4	N.C.	Pin 4	N.C.

Wiring diagram for Hall sensors see p. 47

Connector	Part number
Molex 46015-0806	43025-0600
Molex	171692-0104

**Connection cable for V1**  
Connection cable Universal, L = 500 mm **339380**

<sup>1</sup>Calculation does not include saturation effect (p. 57/162)

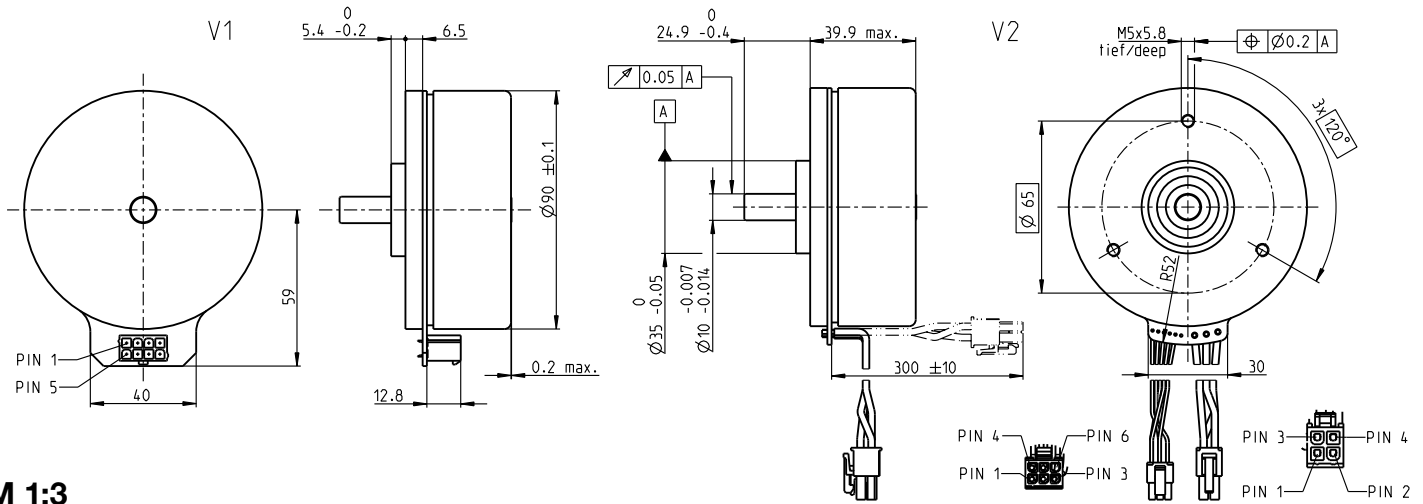
### maxon Modular System

Details on catalog page 36

Recommended Electronics:	
Notes	Page 36
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459



# EC 90 flat Ø90 mm, brushless, 260 Watt



## M 1:3

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

V1 with Hall sensors	500269	500266	500267	500268
V2 with Hall sensors and cables	607325	607326	607327	607328

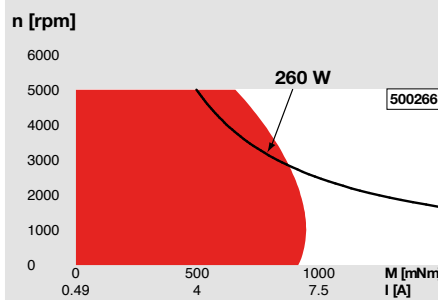
### Motor Data

Values at nominal voltage		18	30	48	60
1 Nominal voltage	V	18	30	48	60
2 No load speed	rpm	2110	2080	1960	1980
3 No load current	mA	830	490	278	227
4 Nominal speed	rpm	1790	1780	1670	1690
5 Nominal torque (max. continuous torque)	mNm	1010	988	964	963
6 Nominal current (max. continuous current)	A	12.1	7.06	4.06	3.28
7 Stall torque <sup>1</sup>	mNm	14800	14600	13100	13300
8 Stall current	A	183	107	56.9	46.7
9 Max. efficiency	%	87	87	86	87
Characteristics					
10 Terminal resistance phase to phase	Ω	0.0983	0.28	0.844	1.28
11 Terminal inductance phase to phase	mH	0.133	0.369	1.07	1.63
12 Torque constant	mNm/A	80.7	136	231	286
13 Speed constant	rpm/V	118	70.2	41.3	33.4
14 Speed/torque gradient	rpm/mNm	0.144	0.144	0.151	0.15
15 Mechanical time constant	ms	7.63	7.66	7.99	7.97
16 Rotor inertia	gcm <sup>2</sup>	5060	5060	5060	5060

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 1.74 K/W
  - 18 Thermal resistance winding-housing: 1.82 K/W
  - 19 Thermal time constant winding: 57 s
  - 20 Thermal time constant motor: 258 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 5000 rpm
  - 24 Axial play at axial load: 0.14 mm
  - 25 Radial play: preloaded
  - 26 Max. axial load (dynamic): 34 N
  - 27 Max. force for press fits (static) (static, shaft supported): 440 N / 8000 N
  - 28 Max. radial load, 10 mm from flange: 130 N
- Other specifications**
- 29 Number of pole pairs: 11
  - 30 Number of phases: 3
  - 31 Weight of motor: 980 g
- Values listed in the table are nominal.

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System

Details on catalog page 36



**Encoder MILE**  
512 - 6400 CPT,  
2 channels  
Page 414

### Recommended Electronics:

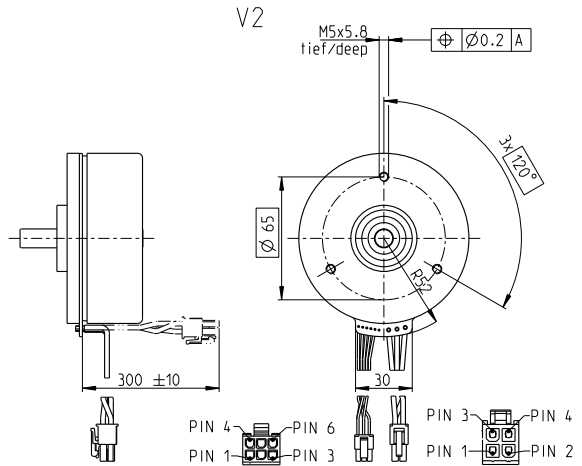
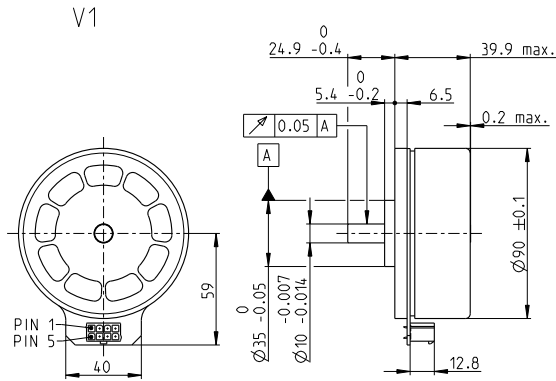
Notes	Page 36
ESCON Mod. 50/4 EC-S	455
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 Mod./Comp. 50/15	466
EPOS4 70/15	467
MAXPOS 50/5	473

- Connection V1**
- Pin 1 Hall sensor 1
  - Pin 2 Hall sensor 2
  - Pin 3 V<sub>Hall</sub> 4.5...24 VDC
  - Pin 4 Motor winding 3
  - Pin 5 Hall sensor 3
  - Pin 6 GND
  - Pin 7 Motor winding 1
  - Pin 8 Motor winding 2
- Connection V2 (sensors, AWG 24)**
- V<sub>Hall</sub> 4.5...24 VDC
  - GND
  - N.C.
- Connection V2 (motor, AWG 16)**
- Pin 1 Motor winding 1
  - Pin 2 Motor winding 2
  - Pin 3 Motor winding 3
  - Pin 4 N.C.
- Wiring diagram for Hall sensors see p. 47
- Connector**
- Molex 46015-0806
  - Molex 39-01-2040
- Part number**
- 43025-0600
  - 39-01-2040
- Connection cable for V1**
- Connection cable Universal, L = 500 mm: 339380
  - Connection cable to EPOS4, L = 500 mm: 354045
- <sup>1</sup>Calculation does not include saturation effect (p. 57/162)

# EC 90 flat Ø90 mm, brushless, 400 Watt

**NEW**

Open Rotor



## M 1:4

- Stock program
- Standard program
- Special program (on request)

		Part Numbers			
V1 with Hall sensors		607929	607930	607931	607932
V2 with Hall sensors and cables		607933	607934	607935	607936

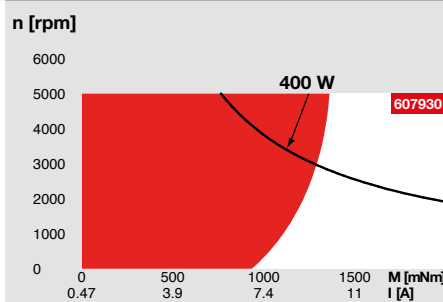
### Motor Data

Values at nominal voltage		18	30	48	60
1 Nominal voltage	V	18	30	48	60
2 No load speed	rpm	2080	2080	1960	1980
3 No load current	mA	792	475	272	221
4 Nominal speed	rpm	1700	1700	1600	1620
5 Nominal torque (max. continuous torque)	mNm	1300	1260	1210	1220
6 Nominal current (max. continuous current)	A	14.9	8.73	4.96	4.03
7 Stall torque <sup>1</sup>	mNm	14900	14600	13100	13300
8 Stall current	A	183	107	56.9	46.7
9 Max. efficiency	%	87.4	87.3	86.8	86.9
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	0.0983	0.28	0.844	1.28
11 Terminal inductance phase to phase	mH	0.133	0.369	1.07	1.63
12 Torque constant	mNm/A	81.6	136	231	286
13 Speed constant	rpm/V	117	70.2	41.3	33.4
14 Speed/torque gradient	rpm/mNm	0.141	0.144	0.151	0.15
15 Mechanical time constant	ms	7.47	7.66	7.99	7.97
16 Rotor inertia	gcm <sup>2</sup>	4765	4765	4765	4765

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 1.56 K/W
  - 18 Thermal resistance winding-housing 1.09 K/W
  - 19 Thermal time constant winding 34.2 s
  - 20 Thermal time constant motor 232 s
  - 21 Ambient temperature -40...+100°C
  - 22 Max. winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed 5000 rpm
  - 24 Axial play at axial load 0.14 mm
  - 25 Radial play preloaded
  - 26 Max. axial load (dynamic) 34 N
  - 27 Max. force for press fits (static) (static, shaft supported) 440 N
  - 28 Max. radial load, 10 mm from flange 130 N
- Other specifications**
- 29 Number of pole pairs 11
  - 30 Number of phases 3
  - 31 Weight of motor 964 g
- Values listed in the table are nominal.

### Operating Range



**Comments**

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

- Connection V1**
- |       |                                |                             |                                |
|-------|--------------------------------|-----------------------------|--------------------------------|
| Pin 1 | Hall sensor 1                  | <b>V2 (sensors, AWG 24)</b> | Hall sensor 1                  |
| Pin 2 | Hall sensor 2                  |                             | Hall sensor 2                  |
| Pin 3 | V <sub>hall</sub> 4.5...24 VDC |                             | Hall sensor 3                  |
| Pin 4 | Motor winding 3                |                             | GND                            |
| Pin 5 | Hall sensor 3                  |                             | V <sub>hall</sub> 4.5...24 VDC |
| Pin 6 | GND                            |                             | N.C.                           |
| Pin 7 | Motor winding 1                |                             |                                |
| Pin 8 | Motor winding 2                |                             |                                |
- Wiring diagram for Hall sensors** see p. 47
- Connector**
- |                  |                    |
|------------------|--------------------|
| Molex 46015-0806 | <b>Part number</b> |
| Molex            | 43025-0600         |
|                  | 39-01-2040         |
- Connection cable for V1**
- Connection cable Universal, L = 500 mm **339380**
  - Connection cable to EPOS4, L = 500 mm **354045**
- <sup>1</sup>Calculation does not include saturation effect (p. 57/162)

### maxon Modular System

Details on catalog page 36



**Encoder MILE**  
512 - 6400 CPT,  
2 channels  
Page 414

**Recommended Electronics:**

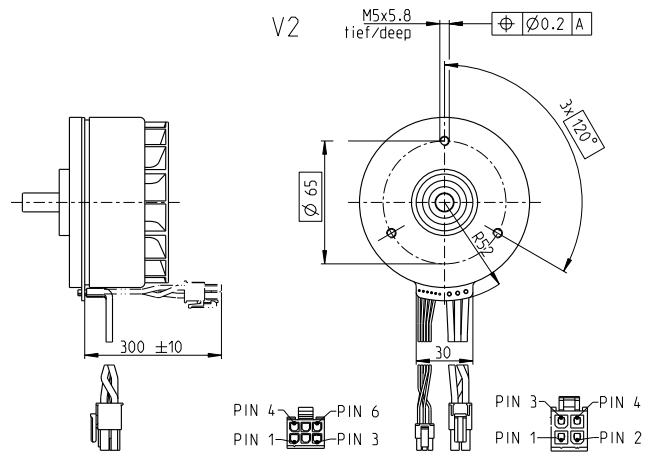
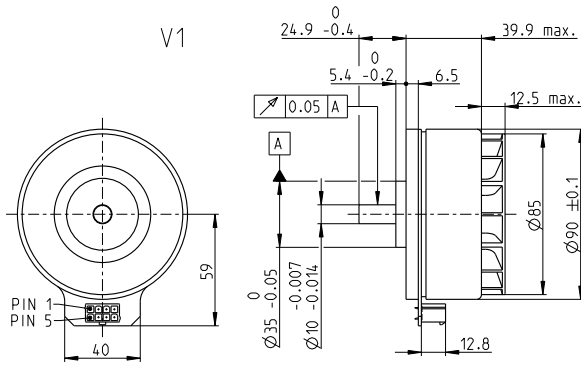
Notes	Page 36
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 Mod./Comp. 50/15	466
EPOS4 70/15	467
MAXPOS 50/5	473

# EC 90 flat Ø90 mm, brushless, 600 Watt

Ventilated

**NEW**

maxon flat motor



## M 1:4

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

V1 with Hall sensors	597974	597975	597976
V2 with Hall sensors and cables	607937	607938	607940

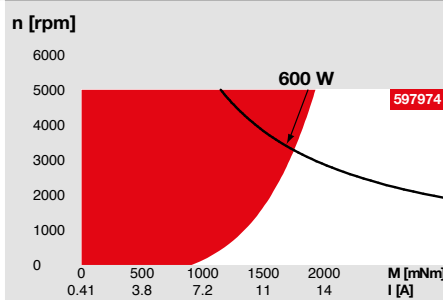
### Motor Data

Values at nominal voltage		18	30	48	60
1 Nominal voltage	V	18	30	48	60
2 No load speed	rpm	2080	2080	1960	1980
3 No load current	mA	821	493	283	230
4 Nominal speed	rpm	1620	1620	1520	1540
5 Nominal torque (max. continuous torque)	mNm	1610	1560	1490	1500
6 Nominal current (max. continuous current)	A	18	10.5	5.95	4.83
7 Stall torque <sup>1</sup>	mNm	14900	14600	13100	13300
8 Stall current	A	183	107	56.9	46.7
9 Max. efficiency	%	87.2	87	86.5	86.6
Characteristics					
10 Terminal resistance phase to phase	Ω	0.0983	0.28	0.844	1.28
11 Terminal inductance phase to phase	mH	0.133	0.369	1.07	1.63
12 Torque constant	mNm/A	81.6	136	231	286
13 Speed constant	rpm/V	117	70.2	41.3	33.4
14 Speed/torque gradient	rpm/mNm	0.141	0.144	0.151	0.15
15 Mechanical time constant	ms	7.47	7.66	7.99	7.97
16 Rotor inertia	gcm <sup>2</sup>	5100	5100	5100	5060

### Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 1.04 K/W
  - 18 Thermal resistance winding-housing: 0.89 K/W
  - 19 Thermal time constant winding: 27.9 s
  - 20 Thermal time constant motor: 255 s
  - 21 Ambient temperature: -40...+100°C
  - 22 Max. winding temperature: +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed: 5000 rpm
  - 24 Axial play at axial load: 0.14 mm
  - 25 Radial play: preloaded
  - 26 Max. axial load (dynamic): 34 N
  - 27 Max. force for press fits (static) (static, shaft supported): 440 N
  - 28 Max. radial load, 10 mm from flange: 130 N
- Other specifications**
- 29 Number of pole pairs: 11
  - 30 Number of phases: 3
  - 31 Weight of motor: 988 g
- Values listed in the table are nominal.

### Operating Range



### Comments

- Continuous operation**  
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.  
= Thermal limit.
- Short term operation**  
The motor may be briefly overloaded (recurring).
- Assigned power rating**

### maxon Modular System

Details on catalog page 36



**Recommended Electronics:**

Notes	Page 36
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459

Connection V1		V2 (sensors, AWG 24)	
Pin 1	Hall sensor 1	Pin 1	Hall sensor 1
Pin 2	Hall sensor 2	Pin 2	Hall sensor 2
Pin 3	V <sub>Hall</sub> 4.5...24 VDC	Pin 3	Hall sensor 3
Pin 4	Motor winding 3	Pin 4	GND
Pin 5	Hall sensor 3	Pin 5	V <sub>Hall</sub> 4.5...24 VDC
Pin 6	GND	Pin 6	N.C.
Pin 7	Motor winding 1		
Pin 8	Motor winding 2		

V2 (motor, AWG 16)	
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	N.C.

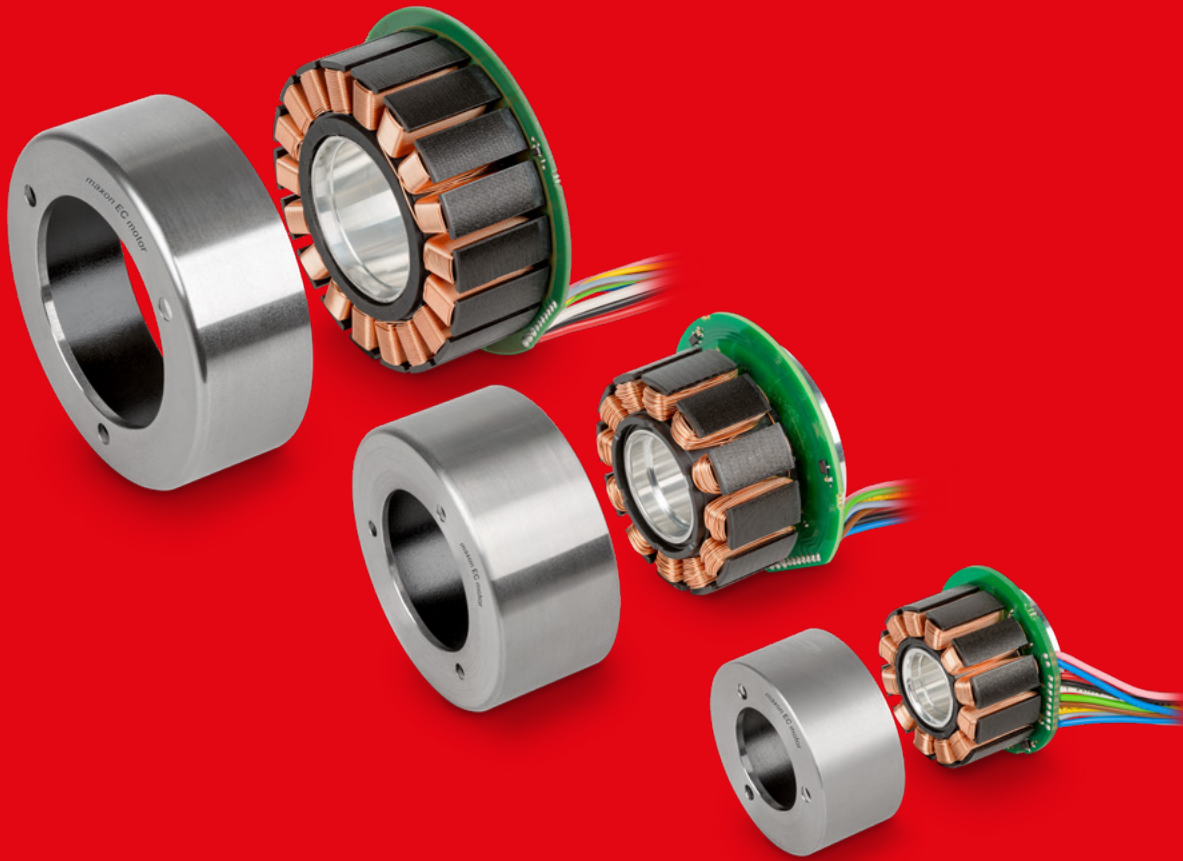
Wiring diagram for Hall sensors see p. 47

Connector	Part number
Molex 46015-0806	43025-0600
Molex	171692-0104

**Connection cable for V1**  
Connection cable Universal, L = 500 mm **339380**

<sup>1</sup>Calculation does not include saturation effect (p. 57/162)



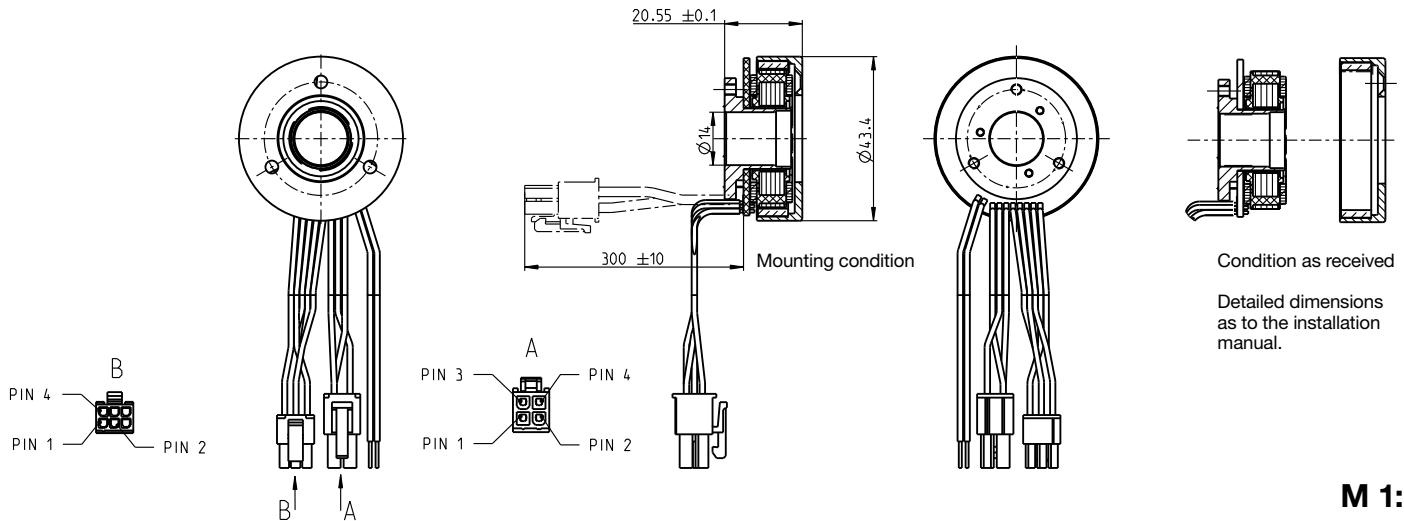


# maxon frameless motor

Rotor and stator are delivered separately and connected only during the assembly of the components. Frameless motors offer maximum torque density and minimum size, high overload capability, low cogging torque, and enough space for cable glands. Available in outer diameters from 43 to 90 millimeters.

<b>Standard Specification No. 101</b>	64
<b>Explanation</b>	162
<b>ECX SPEED Program</b>	166-199
<b>ECX SQUARE Program</b>	202
<b>EC Program</b>	204-213
<b>EC-max Program</b>	217-225
<b>EC-4pole Program</b>	229-235
<b>EC-i Program</b>	239-250
<b>EC flat Program</b>	252-273
<b>EC frameless Program</b>	278-283

# EC frameless 45 flat Ø43.4 mm, brushless, 30 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	with Hall sensors			
	548273	574536	574537	574538

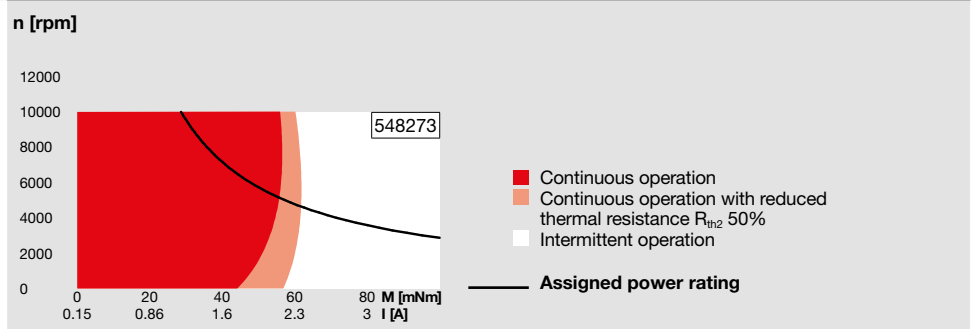
Motor Data		with Hall sensors			
<b>Values at nominal voltage</b>					
1 Nominal voltage	V	12	18	24	36
2 No load speed	rpm	4360	4890	4360	4750
3 No load current	mA	163	129	81.4	61.6
4 Nominal speed	rpm	2910	3510	2930	3290
5 Nominal torque (max. continuous torque)	mNm	54.9	57.8	54.7	66
6 Nominal current (max. continuous current)	A	2.02	1.63	1.01	0.847
7 Stall torque	mNm	247	295	251	378
8 Stall current	A	9.69	8.61	4.93	5.35
9 Max. efficiency	%	76.3	77.5	76.5	80.1
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	1.24	2.09	4.87	6.73
11 Terminal inductance phase to phase	mH	0.56	0.697	2.24	4.29
12 Torque constant	mNm/A	25.5	34.3	51	70.6
13 Speed constant	rpm/V	374	278	187	135
14 Speed/torque gradient	rpm/mNm	18.2	17	17.9	12.9
15 Mechanical time constant	ms	28.6	30.8	28.1	20.2
16 Rotor inertia	gcm <sup>2</sup>	150	150	150	150

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	6.73 K/W
18 Thermal resistance winding-housing	3.92 K/W
19 Thermal time constant winding	11.4 s
20 Thermal time constant motor	296 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data</b>	
23 Max. speed	10000 rpm
<b>Other specifications</b>	
29 Number of pole pairs	8
30 Number of phases	3
31 Weight of motor	89 g
Weight of rotor	35 g
Weight of stator	54 g

Values listed in the table are nominal.

- Connection motor** (Cable AWG 24)
- red Motor winding 1 Pin 1
  - black Motor winding 2 Pin 2
  - white Motor winding 3 Pin 3
  - N.C. Pin 4
- Connector Part number**
- Molex 39-01-2040
- Connection sensors** (Cable AWG 24)
- yellow Hall sensor 1\* Pin 1
  - brown Hall sensor 2\* Pin 2
  - grey Hall sensor 3\* Pin 3
  - blue GND Pin 4
  - green V<sub>Hall</sub> 4.5...24 VDC Pin 5
  - N.C. Pin 6
- Connector Part number**
- Molex 430-25-0600
- Wiring diagram for Hall sensors see p. 47
- \*Internal pull-up (7...13 kΩ) on pin 5
- Connection NTC** (Cable AWG 24)
- pink NTC
  - blue NTC
- Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

## Operating Range



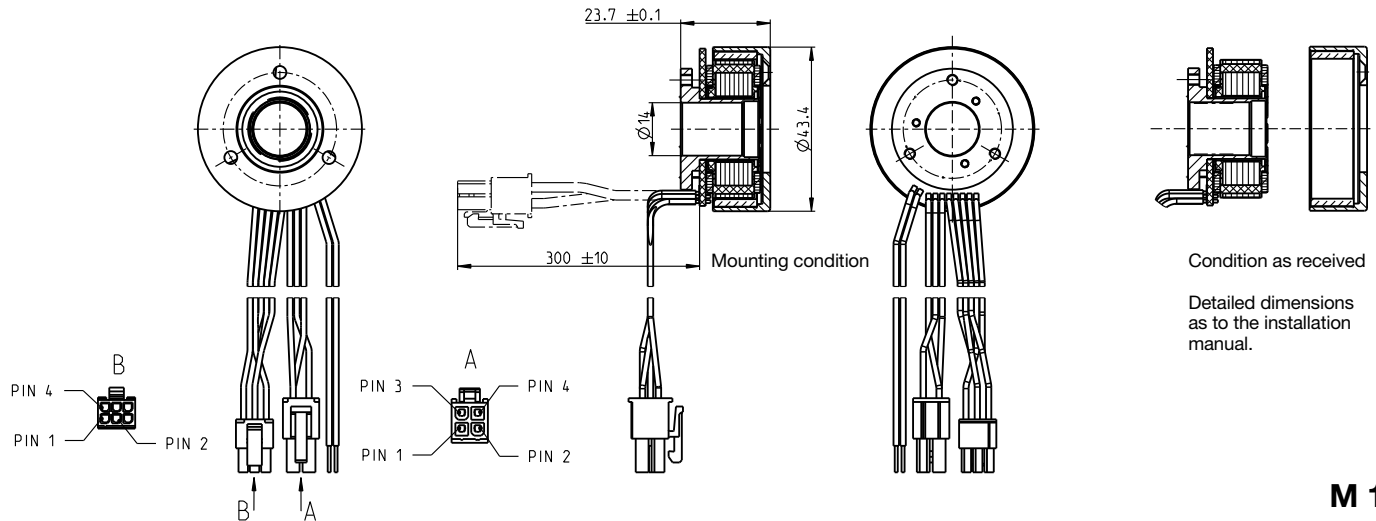
## maxon Modular System

Details on catalog page 36

**Recommended Electronics:**

Notes	Page 36
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
ESCON Module 50/5	455
ESCON 50/5	457
DEC Module 24/2	459
DEC Module 50/5	459
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

# EC frameless 45 flat $\varnothing 43.4$ mm, brushless, 50 Watt



- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	with Hall sensors	543631	574402	574403	574404
--	-------------------	--------	--------	--------	--------

## Motor Data

Values at nominal voltage					
1 Nominal voltage	V	18	24	24	36
2 No load speed	rpm	6720	6710	4730	3360
3 No load current	mA	247	185	106	42.3
4 Nominal speed	rpm	5190	5240	3480	2360
5 Nominal torque (max. continuous torque)	mNm	97.1	83.4	69.6	90.5
6 Nominal current (max. continuous current)	A	3.52	2.33	1.41	0.828
7 Stall torque	mNm	975	780	402	484
8 Stall current	A	38.8	23.3	8.47	4.81
9 Max. efficiency	%	85	83.3	79.3	82.4
Characteristics					
10 Terminal resistance phase to phase	$\Omega$	0.464	1.03	2.83	7.48
11 Terminal inductance phase to phase	mH	0.322	0.572	1.15	5.15
12 Torque constant	mNm/A	25.1	33.5	47.5	101
13 Speed constant	rpm/V	380	285	201	95
14 Speed/torque gradient	rpm/mNm	7.02	8.77	12	7.07
15 Mechanical time constant	ms	13.6	17	23.3	13.7
16 Rotor inertia	gcm <sup>2</sup>	185	185	185	185

## Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 4.53 K/W
- 18 Thermal resistance winding-housing 4.75 K/W
- 19 Thermal time constant winding 17.7 s
- 20 Thermal time constant motor 227 s
- 21 Ambient temperature -40...+100°C
- 22 Max. winding temperature +125°C
- Mechanical data**
- 23 Max. speed 10000 rpm
- Other specifications**
- 29 Number of pole pairs 8
- 30 Number of phases 3
- 31 Weight of motor 110 g
- Weight of rotor 41 g
- Weight of stator 69 g

Values listed in the table are nominal.

- Connection motor** (Cable AWG 24)
- red Motor winding 1 Pin 1
  - black Motor winding 2 Pin 2
  - white Motor winding 3 Pin 3
  - N.C. Pin 4

- Connector Part number**
- Molex 39-01-2040

- Connection sensors** (Cable AWG 24)
- yellow Hall sensor 1\* Pin 1
  - brown Hall sensor 2\* Pin 2
  - grey Hall sensor 3\* Pin 3
  - blue GND Pin 4
  - green V<sub>Hall</sub> 4.5...24 VDC Pin 5
  - N.C. Pin 6

- Connector Part number**
- Molex 430-25-0600

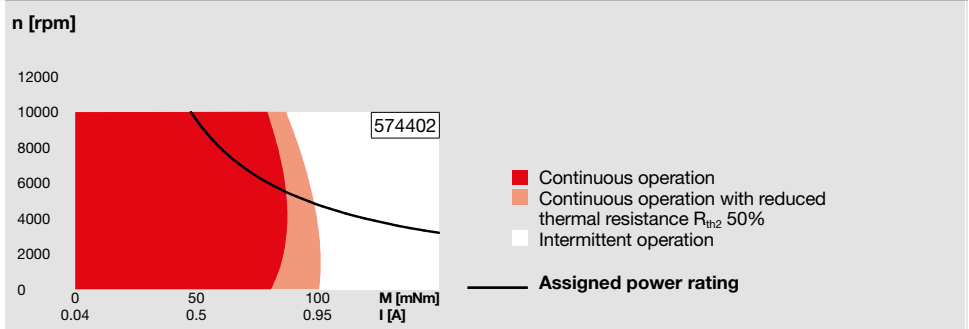
Wiring diagram for Hall sensors see p. 27

\*Internal pull-up (7...13 k $\Omega$ ) on pin 5

- Connection NTC** (Cable AWG 24)
- pink NTC
  - blue NTC
- Resistance 25°C: 5 k $\Omega$   $\pm$ 1%, beta (25–85°C): 3490 K

## Operating Range

## Comments



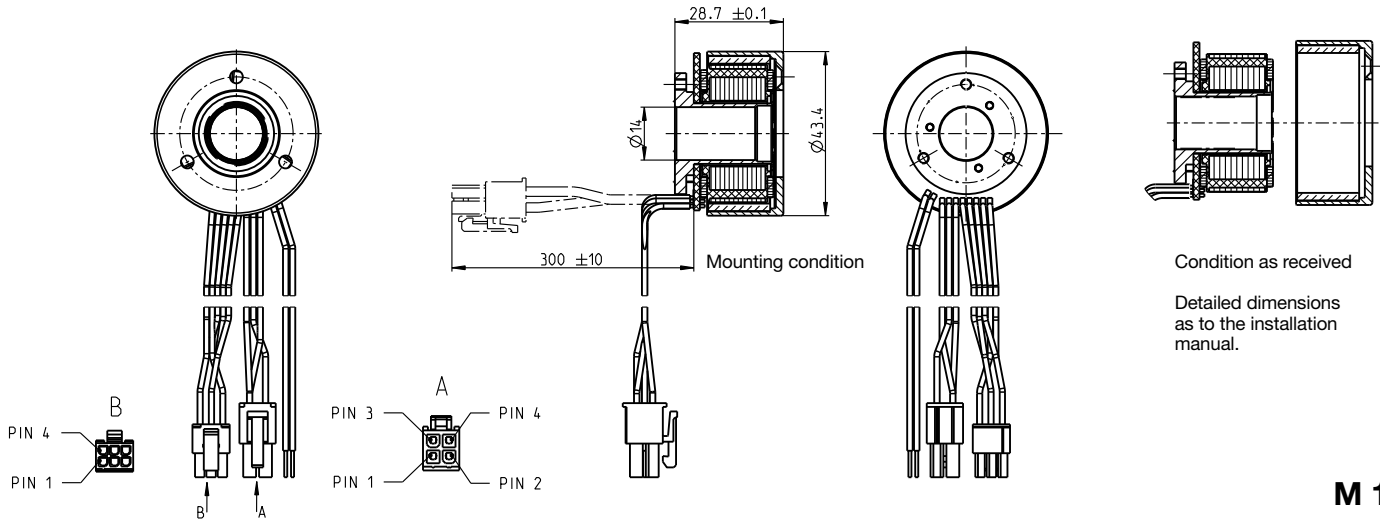
## maxon Modular System

Details on catalog page 36

## Recommended Electronics:

Notes	Page 36
ESCON Module 24/2	454
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
ESCON Module 50/5	455
ESCON 50/5	457
DEC Module 24/2	459
DEC Module 50/5	459
EPOS4 Mod./Comp. 24/1.5	462
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473

# EC frameless 45 flat $\varnothing 43.4$ mm, brushless, 70 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	with Hall sensors	548270	574035	574036	574037
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Motor Data		with Hall sensors	548270	574035	574036	574037
<b>Values at nominal voltage</b>						
1 Nominal voltage	V		24	30	36	48
2 No load speed	rpm		6110	6230	6330	3440
3 No load current	mA		234	194	166	48.1
4 Nominal speed	rpm		4860	4990	5080	2540
5 Nominal torque (max. continuous torque)	mNm		128	112	108	134
6 Nominal current (max. continuous current)	A		3.21	2.36	1.93	0.936
7 Stall torque	mNm		1460	1170	1100	915
8 Stall current	A		39.5	25.8	20.7	6.97
9 Max. efficiency	%		85.4	83.7	83.2	84.3
<b>Characteristics</b>						
10 Terminal resistance phase to phase	$\Omega$		0.608	1.16	1.74	6.89
11 Terminal inductance phase to phase	mH		0.463	0.691	0.966	5.85
12 Torque constant	mNm/A		36.9	45.1	53.3	131
13 Speed constant	rpm/V		259	212	179	72.7
14 Speed/torque gradient	rpm/mNm		4.26	5.44	5.85	3.82
15 Mechanical time constant	ms		10.7	13.7	14.7	9.6
16 Rotor inertia	gcm <sup>2</sup>		240	240	240	240

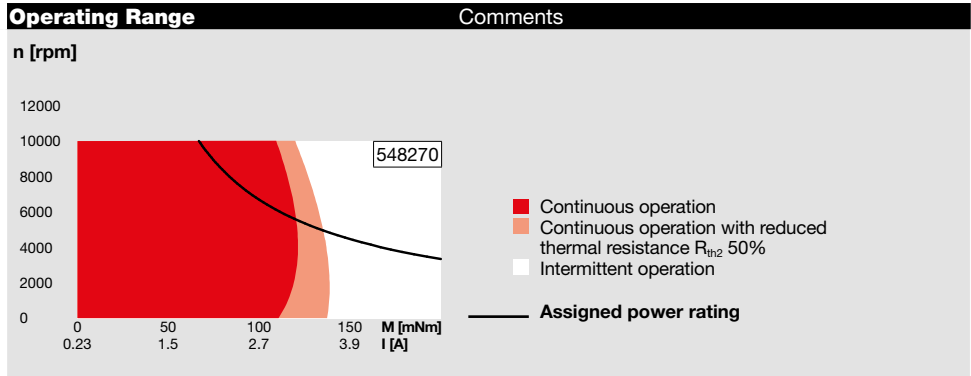
Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	3.56 K/W
18 Thermal resistance winding-housing	4.1 K/W
19 Thermal time constant winding	29.6 s
20 Thermal time constant motor	178 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data</b>	
23 Max. speed	10000 rpm
<b>Other specifications</b>	
29 Number of pole pairs	8
30 Number of phases	3
31 Weight of motor	143 g
Weight of rotor	51 g
Weight of stator	92 g

Values listed in the table are nominal.

<b>Connection motor</b> (Cable AWG 24)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

<b>Connector</b>	<b>Part number</b>	
Molex	39-01-2040	
<b>Connection sensors</b> (Cable AWG 24)		
yellow	Hall sensor 1*	Pin 1
brown	Hall sensor 2*	Pin 2
grey	Hall sensor 3*	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

<b>Connector</b>	<b>Part number</b>
Molex	430-25-0600
Wiring diagram for Hall sensors see p. 47	
*Internal pull-up (7...13 k $\Omega$ ) on pin 5	
<b>Connection NTC</b> (Cable AWG 24)	
pink	NTC
blue	NTC
Resistance 25°C: 5 k $\Omega$ $\pm$ 1%, beta (25–85°C): 3490 K	

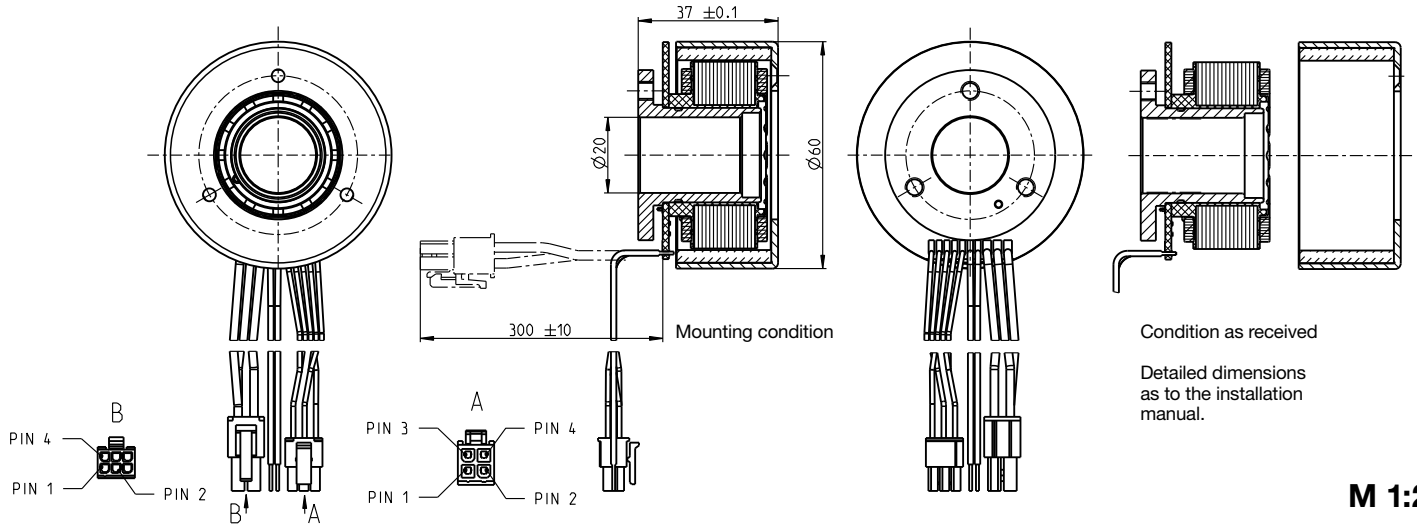


## maxon Modular System Details on catalog page 36

<b>Recommended Electronics:</b>	
<b>Notes</b>	<b>Page 36</b>
ESCON 36/3 EC	455
ESCON Mod. 50/4 EC-S	455
ESCON Module 50/5	455
ESCON 50/5	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS2 P 24/5	470
MAXPOS 50/5	473



# EC frameless 60 flat Ø60 mm, brushless, 100 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
with Hall sensors	550153	542002	550154	

Motor Data				
<b>Values at nominal voltage</b>				
1 Nominal voltage	V	12	24	48
2 No load speed	rpm	3710	4250	3970
3 No load current	mA	671	419	187
4 Nominal speed	rpm	3170	3740	3490
5 Nominal torque (max. continuous torque)	mNm	279	289	319
6 Nominal current (max. continuous current)	A	9.25	5.47	2.78
7 Stall torque	mNm	2850	4180	5010
8 Stall current	A	93.5	78.2	43.8
9 Max. efficiency	%	84	86	88
<b>Characteristics</b>				
10 Terminal resistance phase to phase	Ω	0.128	0.307	1.1
11 Terminal inductance phase to phase	mH	0.062	0.188	0.864
12 Torque constant	mNm/A	30.5	53.4	114
13 Speed constant	rpm/V	313	179	83.4
14 Speed/torque gradient	rpm/mNm	1.32	1.03	0.798
15 Mechanical time constant	ms	17.2	13.4	10.4
16 Rotor inertia	gcm <sup>2</sup>	1246	1246	1246

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	2.5 K/W
18 Thermal resistance winding-housing	3.8 K/W
19 Thermal time constant winding	40 s
20 Thermal time constant motor	89.9 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data</b>	
23 Max. speed	6000 rpm
<b>Other specifications</b>	
29 Number of pole pairs	7
30 Number of phases	3
31 Weight of motor	333 g
Weight of rotor	160 g
Weight of stator	173 g

Values listed in the table are nominal.

<b>Connection motor</b> (Cable AWG 18)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

<b>Connector</b>	<b>Part number</b>
Molex	39-01-2040

<b>Connection sensors</b> (Cable AWG 24)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

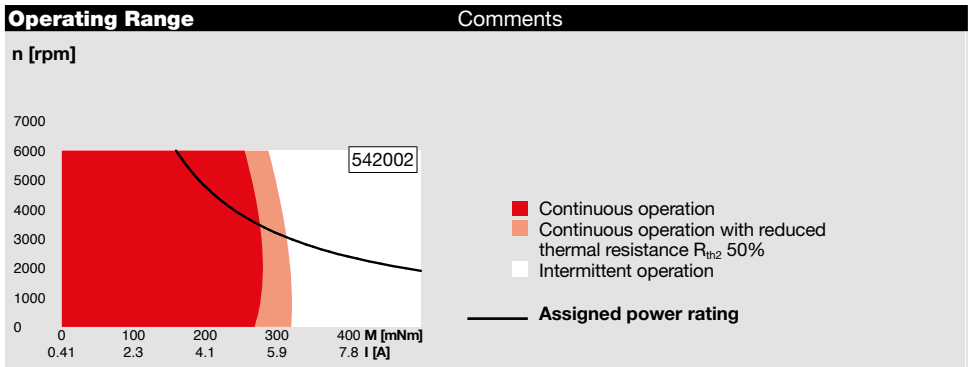
<b>Connector</b>	<b>Part number</b>
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47

**Connection NTC** (Cable AWG 24)

pink	NTC
blue	NTC

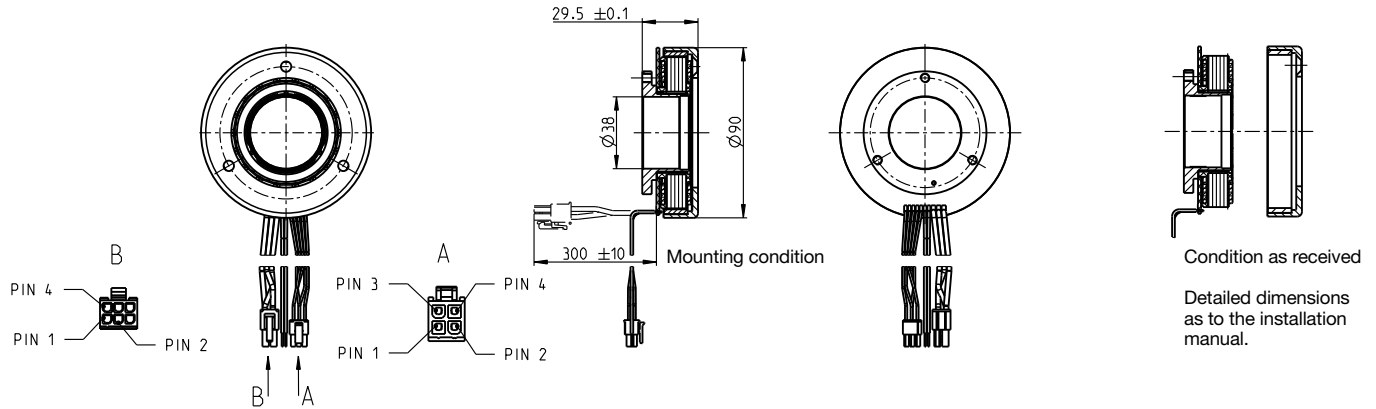
Resistance 25°C: 5 kΩ ± 1%, beta (25–85°C): 3490 K



**maxon Modular System** Details on catalog page 36

<b>Recommended Electronics:</b>	
<b>Notes</b>	Page 36
ESCON Mod. 50/4 EC-S	455
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 70/15	467
EPOS2 P 24/5	470
MAXPOS 50/5	473

# EC frameless 90 flat Ø90 mm, brushless, 160 Watt



M 1:4

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	588847	543673	581301	581302
with Hall sensors				

Motor Data	with Hall sensors				
<b>Values at nominal voltage</b>					
1 Nominal voltage	V	12	24	36	60
2 No load speed	rpm	3160	3170	3070	2600
3 No load current	mA	1320	658	420	197
4 Nominal speed	rpm	2670	2710	2630	2200
5 Nominal torque (max. continuous torque)	mNm	458	458	453	460
6 Nominal current (max. continuous current)	A	12.8	6.39	4.09	2.1
7 Stall torque	mNm	6260	7540	7430	6380
8 Stall current	A	176	106	67.5	29.4
9 Max. efficiency	%	83	85	85	84
<b>Characteristics</b>					
10 Terminal resistance phase to phase	Ω	0.0682	0.226	0.533	2.04
11 Terminal inductance phase to phase	mH	0.058	0.232	0.554	2.15
12 Torque constant	mNm/A	35.6	71.2	110	217
13 Speed constant	rpm/V	268	134	86.8	44.1
14 Speed/torque gradient	rpm/mNm	0.514	0.427	0.421	0.414
15 Mechanical time constant	ms	17.1	14.2	14	13.8
16 Rotor inertia	gcm <sup>2</sup>	3170	3170	3170	3170

Specifications	Operating Range	Comments
<b>Thermal data</b>		
17 Thermal resistance housing-ambient	1.77 K/W	
18 Thermal resistance winding-housing	3.71 K/W	
19 Thermal time constant winding	69.6 s	
20 Thermal time constant motor	263 s	
21 Ambient temperature	-40...+100°C	
22 Max. winding temperature	+125°C	
<b>Mechanical data</b>		
23 Max. speed	5000 rpm	
<b>Other specifications</b>		
29 Number of pole pairs	11	
30 Number of phases	3	
31 Weight of motor	490 g	
Weight of rotor	195 g	
Weight of stator	295 g	

Values listed in the table are nominal.

**Connection motor** (Cable AWG 16)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

**Connector Part number**

Molex	39-01-2040
-------	------------

**Connection sensors** (Cable AWG 24)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC	Pin 5
	N.C.	Pin 6

**Connector Part number**

Molex	430-25-0600
-------	-------------

Wiring diagram for Hall sensors see p. 47

**Connection NTC** (Cable AWG 24)

pink	NTC
blue	NTC

Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

## maxon Modular System

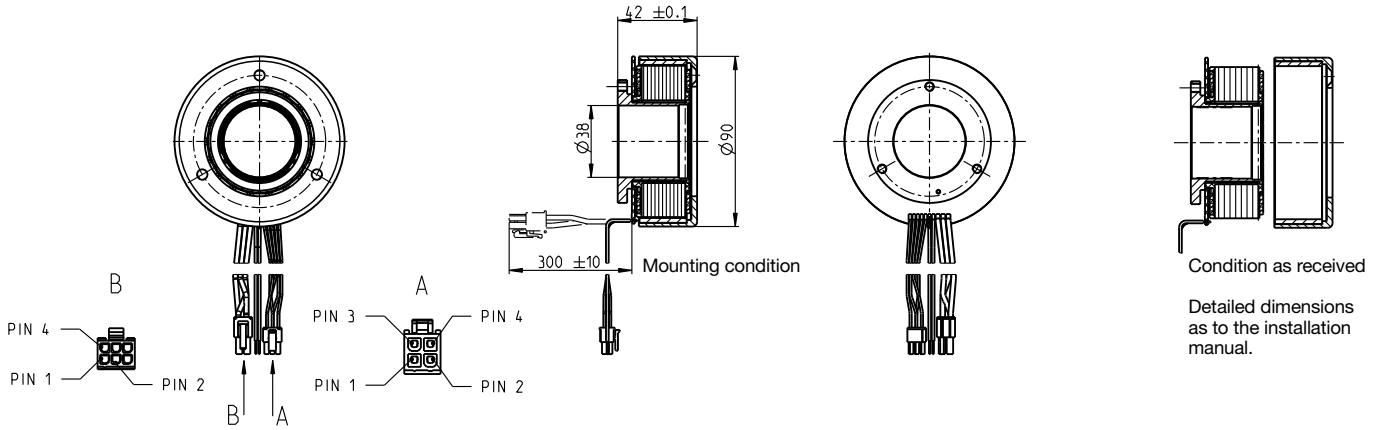
Details on catalog page 36

**Recommended Electronics:**

<b>Notes</b>	Page 36
ESCON Mod. 50/4 EC-S	455
ESCON Mod. 50/5	455
ESCON Mod. 50/8 (HE)	456
ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 70/15	467
EPOS2 P 24/5	470
MAXPOS 50/5	473

# EC frameless 90 flat Ø90 mm, brushless, 260 Watt

maxon frameless motor



M 1:4

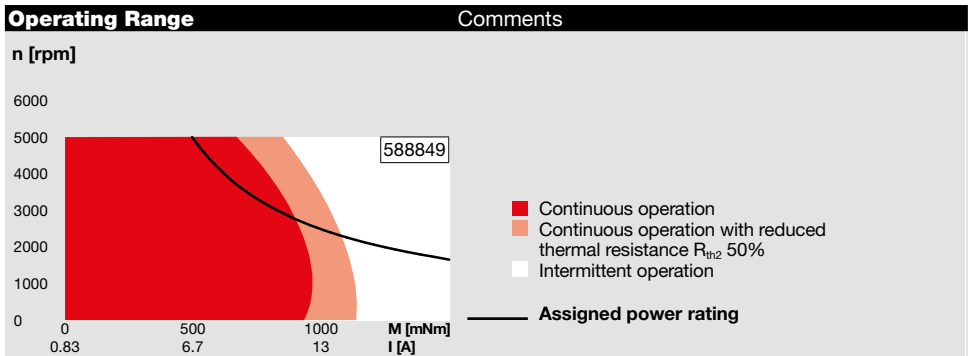
- Stock program
- Standard program
- Special program (on request)

Part Numbers				

with Hall sensors	588849	542099	581294	581295

Motor Data					
Values at nominal voltage					
1 Nominal voltage	V	18	30	48	60
2 No load speed	rpm	2100	2080	1960	1980
3 No load current	mA	830	490	278	227
4 Nominal speed	rpm	1770	1770	1660	1690
5 Nominal torque (max. continuous torque)	mNm	1010	988	964	963
6 Nominal current (max. continuous current)	A	12.1	7.06	4.06	3.28
7 Stall torque	mNm	13400	14100	13000	13200
8 Stall current	A	166	103	56.2	46.3
9 Max. efficiency	%	86	87	86	86
Characteristics					
10 Terminal resistance phase to phase	Ω	0.109	0.29	0.854	1.29
11 Terminal inductance phase to phase	mH	0.133	0.369	1.07	1.63
12 Torque constant	mNm/A	80.7	136	231	286
13 Speed constant	rpm/V	118	70.2	41.3	33.4
14 Speed/torque gradient	rpm/mNm	0.159	0.15	0.153	0.152
15 Mechanical time constant	ms	8.85	8.32	8.47	8.41
16 Rotor inertia	gcm <sup>2</sup>	5300	5300	5300	5300

Specifications	
<b>Thermal data</b>	
17 Thermal resistance housing-ambient	1.74 K/W
18 Thermal resistance winding-housing	1.82 K/W
19 Thermal time constant winding	60.5 s
20 Thermal time constant motor	258 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
<b>Mechanical data</b>	
23 Max. speed	5000 rpm
<b>Other specifications</b>	
29 Number of pole pairs	11
30 Number of phases	3
31 Weight of motor	814 g
Weight of rotor	292 g
Weight of stator	522 g



Values listed in the table are nominal.

<b>Connection motor</b> (Cable AWG 16)		
red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

<b>Connector</b>	<b>Part number</b>
Molex	39-01-2040
<b>Connection sensors</b> (Cable AWG 24)	
yellow	Hall sensor 1 Pin 1
brown	Hall sensor 2 Pin 2
grey	Hall sensor 3 Pin 3
blue	GND Pin 4
green	V <sub>Hall</sub> 4.5...24 VDC Pin 5
	N.C. Pin 6

<b>Connector</b>	<b>Part number</b>
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 47

<b>Connection NTC</b> (Cable AWG 24)	
pink	NTC
blue	NTC
Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K	

## maxon Modular System Details on catalog page 36

<b>Recommended Electronics:</b>	
<b>Notes</b>	Page 36
ESCON Mod. 50/4 EC-S	455
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ESCON 50/5	457
ESCON 70/10	457
DEC Module 50/5	459
EPOS4 50/5	463
EPOS4 Mod./Comp. 50/5	463
EPOS4 Mod./Comp. 50/8	465
EPOS4 Mod./Comp. 50/15	466
EPOS4 70/15	467
EPOS2 P 24/5	470
MAXPOS 50/5	473



# Precision planetary and spur gearheads.

<b>Standard Specification No. 102</b>	65
<b>Explanation</b>	286
<b>GPX-Program</b> (can be configured online)	288–320
<b>GPX 6 A</b> Ø6 mm, planetary gearhead	288
<b>GPX 8 A</b> Ø8 mm, planetary gearhead	289
<b>GPX 10 A</b> Ø10 mm, planetary gearhead	290
<b>GPX 12 A/C/LN/LZ</b> Ø12 mm, planetary gearhead	291–292
<b>GPX 12 HP</b> Ø12 mm, planetary gearhead	293
<b>GPX 13 SPEED</b> Ø13 mm, planetary gearhead, steril.	294
<b>GPX 14 A/C/LN/LZ</b> Ø14 mm, planetary gearhead	295–296
<b>GPX 14 HP</b> Ø14 mm, planetary gearhead	297
<b>GPX 16 A/C/LN/LZ</b> Ø16 mm, planetary gearhead	298–299
<b>GPX 16 HP</b> Ø16 mm, planetary gearhead	300
<b>GPX 16 SPEED</b> Ø16 mm, planetary gearhead, steril.	301
<b>GPX 19 A/C/LN/LZ</b> Ø19 mm, planetary gearhead	302–303
<b>GPX 19 HP</b> Ø19 mm, planetary gearhead	304
<b>GPX 19 SPEED</b> Ø19 mm, planetary gearhead, steril.	305
<b>GPX 22 A/C/LN/LZ</b> Ø22 mm, planetary gearhead	306–307
<b>GPX 22 HP</b> Ø22 mm, planetary gearhead	308
<b>GPX 22 UP</b> Ø22 mm, planetary gearhead	<b>NEW</b> 309
<b>GPX 22 SPEED</b> Ø22 mm, planetary gearhead, steril.	310
<b>GPX 26 A/C/LN/LZ</b> Ø26 mm, planetary gearhead	311–312
<b>GPX 26 HP</b> Ø26 mm, planetary gearhead	313
<b>GPX 32 A/C/LN/LZ</b> Ø32 mm, planetary gearhead	314–315
<b>GPX 32 HP</b> Ø32 mm, planetary gearhead	316
<b>GPX 32 UP</b> Ø32 mm, planetary gearhead	<b>NEW</b> 317
<b>GPX 37 A/LN/LZ</b> Ø37 mm, planetary gearhead	318–319
<b>GPX 42 C</b> Ø42 mm, planetary gearhead	320

<b>maxon gear</b>	322–369
<b>GP 4 C</b> Ø4 mm, 0.002–0.015 Nm	322
<b>GP 6 A</b> Ø6 mm, 0.002–0.03 Nm	323
<b>GP 8 A</b> Ø8 mm, 0.01–0.1 Nm	324
<b>GP 10 K</b> Ø10 mm, 0.005–0.1 Nm	325
<b>GP 10 A</b> Ø10 mm, 0.01–0.15 Nm	326
<b>GS 12 A</b> Ø12 mm, 0.01–0.03 Nm	327
<b>GP 13 K</b> Ø13 mm, 0.05–0.15 Nm	328
<b>GP 13 A</b> Ø13 mm, 0.2–0.35 Nm	329
<b>GS 16 K</b> Ø16 mm, 0.01–0.03 Nm	330
<b>GS 16 A</b> Ø16 mm, 0.015–0.04 Nm	331
<b>GS 16 V</b> Ø16 mm, 0.06–0.1 Nm	332
<b>GS 16 VZ</b> Ø16 mm, 0.06–0.1 Nm	333
<b>GP 16 A</b> Ø16 mm, 0.1–0.3 Nm	334
<b>GP 16 C</b> Ø16 mm, 0.2–0.6 Nm	335
<b>GP 19 B</b> Ø19 mm, 0.1–0.3 Nm	336
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<b>GP 22 L</b> Ø22 mm, 0.2–0.6 Nm	338
<b>GP 22 A</b> Ø22 mm, 0.5–1.0 Nm	339
<b>GP 22 AR</b> Ø22 mm, 0.5 Nm	340
<b>GP 22 C</b> Ø22 mm, 0.5–2.0 Nm	341–342
<b>GP 22 HP</b> Ø22 mm, 2.0–3.4 Nm	343
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<b>GS 24 A</b> Ø24 mm, 0.1 Nm	345
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<b>GS 30 A</b> Ø30 mm, 0.07–0.2 Nm	347
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<b>Koaxdrive KD 32</b> Ø32 mm, 1.0–4.5 Nm	359
<b>GS 38 A</b> Ø38 mm, 0.1–0.6 Nm	360
<b>GP 42 C</b> Ø42 mm, 3–15 Nm	361–363
<b>GP 42 HD</b> Ø42 mm, 10–50 Nm	364
<b>GS 45 A</b> Ø45 mm, 0.5–2.0 Nm	365
<b>GP 52 C</b> Ø52 mm, 4–30 Nm	366–367
<b>GP 62 A</b> Ø62 mm, 8–50 Nm	368
<b>GP 81 A</b> Ø81 mm, 20–120 Nm	369

DC Motor

EC Motor  
(BLDC Motor)

Gearhead

Screw  
drive

Sensor

Motor &  
Motion control

Compact  
Drive


Accessories &  
Batteries

Ceramic

Contact  
information

# Explanation of maxon gear and screw drive terminology

## Dimensional drawings

Presentation of the views according to the projection method E (ISO).  All dimensions in [mm].

## Mounting in plastic

Screwed connections on motors with plastic flanges require special attention.

## M<sub>A</sub> Max. tightening torque [Ncm]

A torque screwdriver may be adjusted to this value.

## L Active thread depth [mm]

The relation of the thread depth to the thread diameter must be at least 2:1. The screw-in depth must be less than the usable length of the thread!

## Gearhead data

Values are based on an ambient temperature of around 25°C (known as cold data).

## Key Data (GPX)

Maximum values identified as key data represent the maximum for all stages/reductions.

## Technical data

### Max. continuous/intermittent\* input speed

It is based on service life considerations. If this value is greatly exceeded, the service life can be shortened, the gear heats up more and more noise is generated.

### Temperature range

The temperature range may be extended for some gears to -40°C and +100°C, but in extremely low temperatures, much greater power consumption must be expected. Special lubrication can be supplied on request, even for other temperature ranges.

### Radial play

The radial play test value depends heavily on the mounting, measuring point and adjoining force. For this reason, the clearance of the measuring point to the flange is always given. Measurement is always carried out under a test force that is smaller than the maximum radial load.

### Max. permissible radial load

Is stated in a specific distance from the gear flange. If it is not specified in stages, radial load is based on a reference speed of 1,000 rpm on the gear drive shaft.

### Axial play

The value for the axial play of a gear is determined between the two axial end positions of the

output shaft. This measurement is determined by the type of bearings and may be zero for preloaded ball bearings and low axial forces. Minimum play is required for any kind of friction bearings otherwise they will jam.

### Max. axial load (dynamic)

Corresponds to the permissible axial load of the drive shaft without damaging the gear. Below the given load, axial play can be kept.

### Max. permissible pressing force

Corresponds to the force with which, for example, a coupling element may be mounted to the gear drive shaft.

### 1 Reduction ratio

The reduction indicates the ratio by which the speed of the gear output shaft is smaller than the motor speed.

### 2 Absolute reduction ratio

Provides the reduction as an exact ratio of two natural numbers.

### 3 Max. motor shaft diameter [mm]

The max. motor shaft diameter is based on the motor pinion's internal diameter.

### 4 Number of stages

States the number of gear stages engaged in series.

### 5 Max. continuous torque [Nm]

The continuous torque provides the maximum load permanently applied to the output shaft. If it is exceeded, the service life is significantly shortened.

### 6 Intermittent\* torque [Nm]

The intermittent torque is the value that may be applied to the gears for a short period without causing damage.

### 7 Efficiency [%]

The specified efficiency is a maximum value that is valid for maximum continuous torque. The efficiency is greatly reduced with very small loads (see diagram). The efficiency is stage-dependent, but is unaffected by the motor speed.

### 8 Weight [g]

### 9 Median gear backlash unloaded [°]

Gear backlash is the turning angle of the gear output shaft which, when the input shaft is blocked, the gear output shaft covers when it is turned from one end position to the opposite position. The end positions depend on the torque

applied to the output shaft. It should be noted that if the gear output shaft is blocked, based on the reversed reduction ratio, the motor shaft will turn through a much greater angle from stop to stop.

### 10 Mass inertia [gcm<sup>2</sup>]

The gear moment of inertia is given at the motor shaft. It is required in order to calculate the additional torque needed for acceleration of the gear components in the case of highly dynamic drives. Variations may arise depending on how lubrication is distributed.

### 11 Gear length L1 [mm]

L1 describes the gear length down to the motor's axial mount area (reference C in motors).

### 12 Direction of rotation

The Direction of rotation of our planetary gears is always the same as that of the motor shaft. With spur gears, it depends on the number of stages. With even numbers (i.e. 2, 4, 6, 8), the Direction of rotation is the same, but the opposite if the numbers are odd.

### 13 Max. transmittable power (continuous) [W]

This value gives the maximum constant output available on the output shaft. If it is exceeded, the service life is considerably shortened.

### 14 Max. transmittable power (intermittent\*) [W]

This value gives the maximum intermittent output available on the output shaft. This range may be used intermittently and repeatedly.

### 15 Max. overload torque

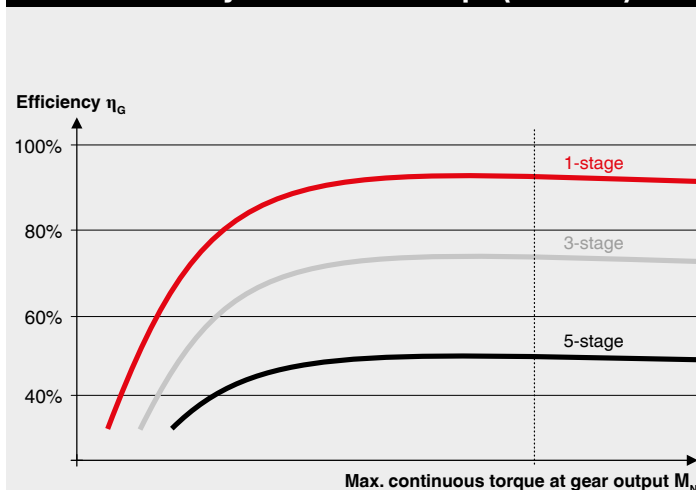
The maximal permitted torque that can be applied for a short period of time (a few seconds) without destroying the gear. It can be considered as break free torque, for example, to overcome static friction of a mechanically jammed drive.

### \*intermittent

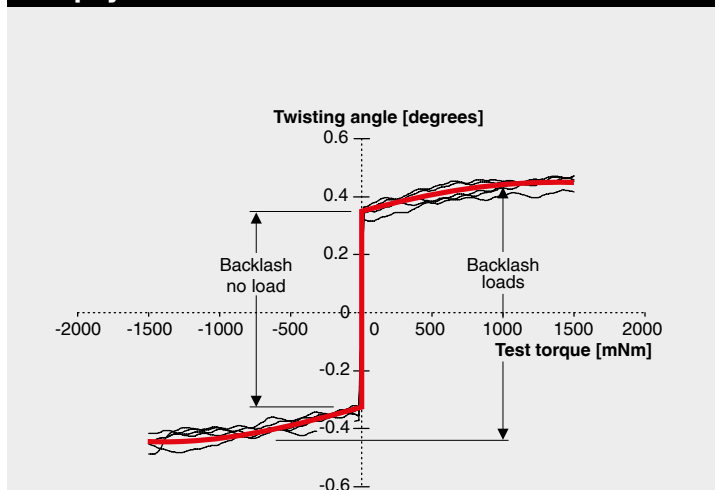
Short-term operation is defined as follows:

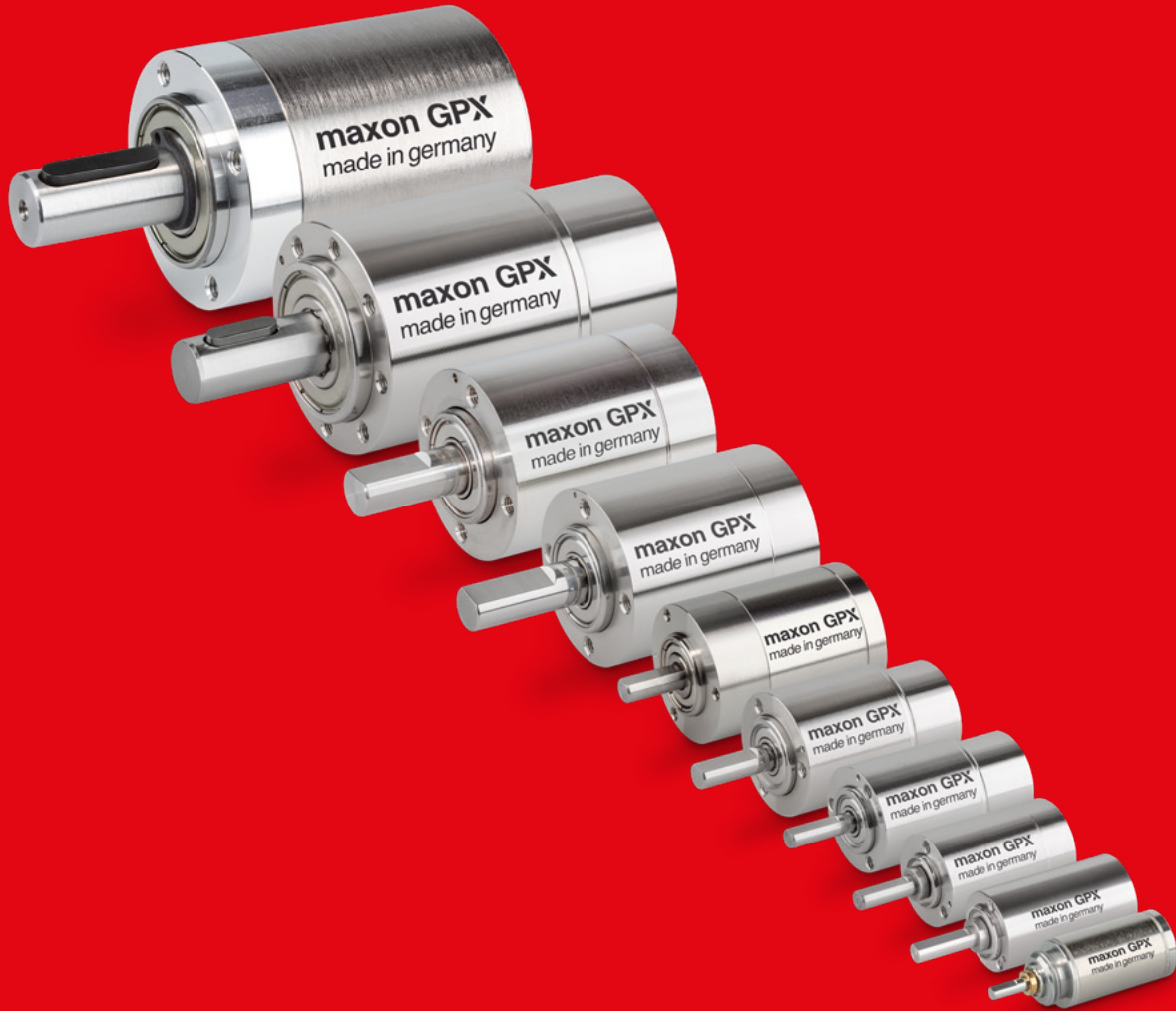
- during 1 second
  - during max. 10 % of the operating cycle
- If these values are exceeded, a reduced service life must be expected.

## Gearhead efficiency as a function of torque (schematic)



## Gear play measurement





# maxon GPX

maxon GPX gearheads make an impression with the highest power transmission in a very short compact design. The modular construction and the scaled stages form the basis for a custom made drive solution. High torque, high speed, low noise, low backlash; maxon GPX gearheads fulfill practically all requirements. maxon GPX gearheads can be configured online and are ready for delivery within 11 working days. [gpx.maxonmotor.com](http://gpx.maxonmotor.com)

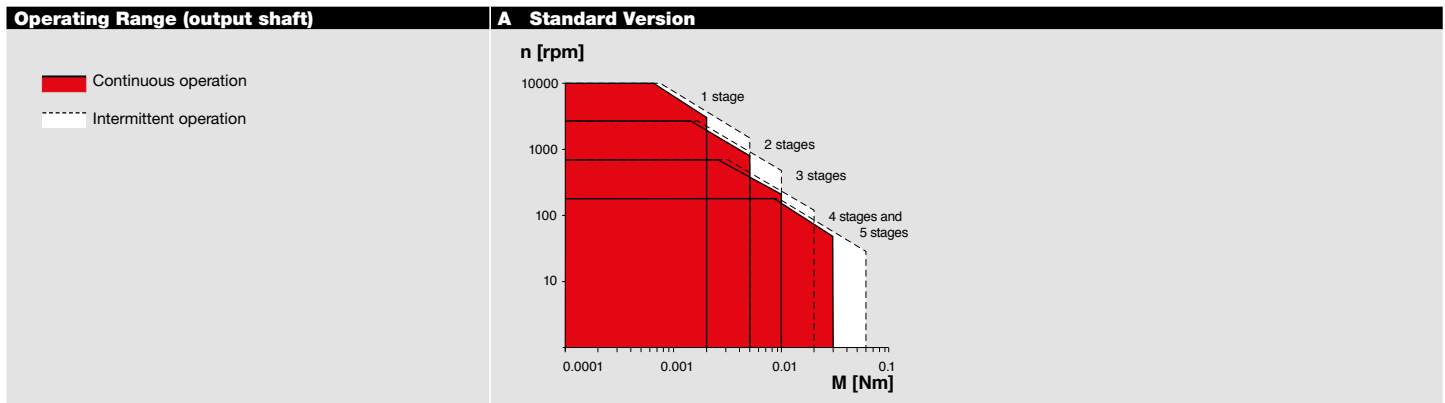
<b>Standard Specification No. 102</b>	65
<b>Explanation</b>	286
<b>GPX Program</b>	288–320
<b>maxon gear</b>	322–369

# GPX 6

## Planetary Gearhead Ø6 mm



Key Data		A Standard Version
Max. transmittable power	W	0.6
Max. continuous torque	Nm	0.03
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

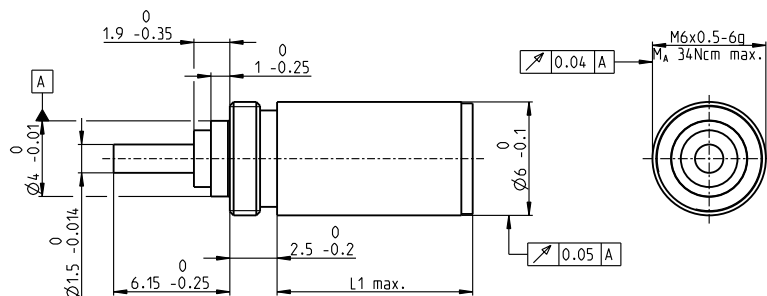


Specifications	A Standard Version					
Number of stages	1	2	3	4	5	
Max. transmittable power (continuous)	W	0.63	0.39	0.20	0.15	0.04
Max. transmittable power (intermittent)	W	0.79	0.49	0.25	0.18	0.05
Max. continuous torque	Nm	0.002	0.005	0.01	0.03	0.03
Max. intermittent torque	Nm	0.005	0.01	0.02	0.06	0.06
Max. continuous input speed	rpm	40000	40000	40000	40000	40000
Max. intermittent input speed	rpm	40000	40000	40000	40000	40000
Max. efficiency	%	88	77	68	60	52
Average backlash no load	°	1.8	2.0	2.2	2.5	2.8
Max. axial load (dynamic)	N	5	5	5	5	5
Max. radial load, 5 mm from flange	N	5	6	7	8	8
Gearhead length L1 <sup>1</sup>	mm	5.3	7.8	10.4	13.0	15.6
Weight	g	1.7	2.1	2.5	2.9	3.3

Configuration	A Standard Version					
Number of stages	1	2	3	4	5	
Reduction	X:1	3.9	15	57	221	854
Version	Standard					
Flange	Standard flange/with central thread					
Shaft	Length/flat face					

maxon Modular System	Page	Dimensions	M 5:2
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<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]	
DCX 6 M	1-5	70
<b>maxon EC motor</b>		
ECX SPEED 6 M	1-5	164



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.



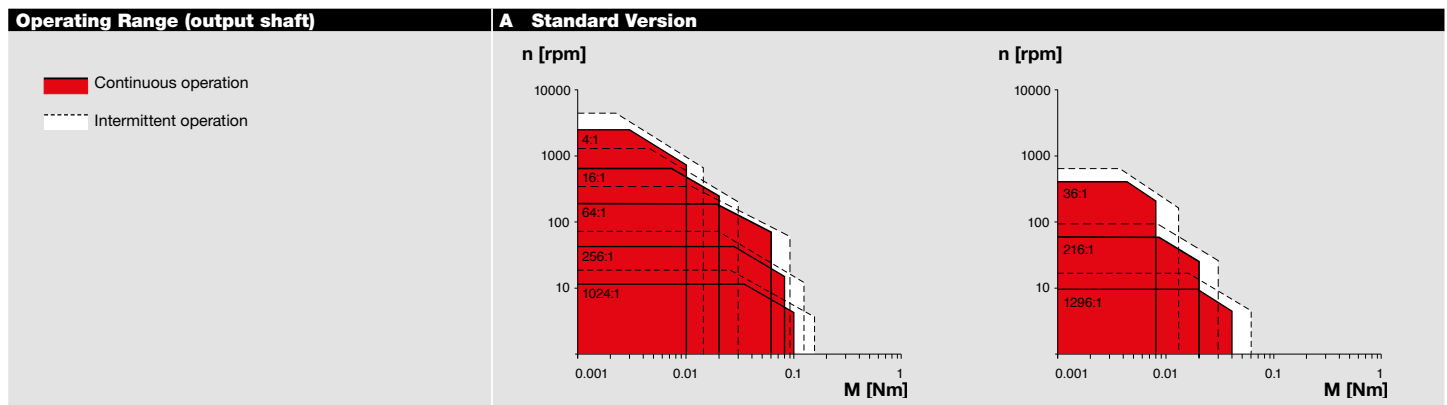
# GPX 8

## Planetary Gearhead $\varnothing 8$ mm



maxon GPX

Key Data		A Standard Version	
Max. transmittable power	W	0.84	
Max. continuous torque	Nm	0.1	
Max. continuous input speed	rpm	12000	
Ambient temperature	$^{\circ}\text{C}$	-15 ... +80	
Bearing at output		Ball bearing	

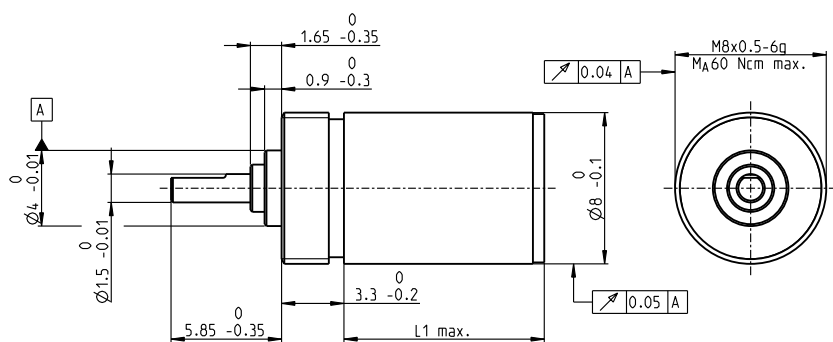


Specifications	A Standard Version								
Number of stages		1	2	2	3	3	4	4	5
Max. transmittable power (continuous)	W	0.840	0.520	0.140	0.390	0.060	0.130	0.040	0.040
Max. transmittable power (intermittent)	W	1.05	0.650	0.180	0.490	0.080	0.160	0.060	0.050
Max. continuous torque	Nm	0.010	0.020	0.008	0.060	0.020	0.080	0.040	0.100
Max. intermittent torque	Nm	0.015	0.030	0.012	0.090	0.030	0.120	0.060	0.150
Max. continuous input speed	rpm	12000	12000	12000	12000	12000	12000	12000	12000
Max. intermittent input speed	rpm	20000	20000	20000	20000	20000	20000	20000	20000
Max. efficiency	%	90	81	76	73	66	65	57	59
Average backlash no load	$^{\circ}$	1.8	2.0	2.4	2.2	2.6	2.5	2.8	2.8
Max. axial load (dynamic)	N	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max. radial load, 5 mm from flange	N	5	6	6	7	7	8	8	8
Gearhead length L1 <sup>1</sup>	mm	5.5	8.1	8.3	10.7	11.1	13.3	13.9	15.9
Weight	g	2.6	3.2	3.2	3.8	3.8	4.4	4.4	5.0

Configuration	A Standard Version									
Number of stages		1	2	2	3	3	4	4	5	
Reduction	X:1	4	16	36	64	216	256	1296	1024	
Version		Standard								
Flange		Standard flange/with central thread								
Shaft		Length/flat face								

maxon Modular System		Page	Dimensions	M 2:1
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<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]		
DCX 8 M	1-5	71	
<b>maxon EC motor</b>			
ECX SPEED 8 M	1-5	166-167	



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

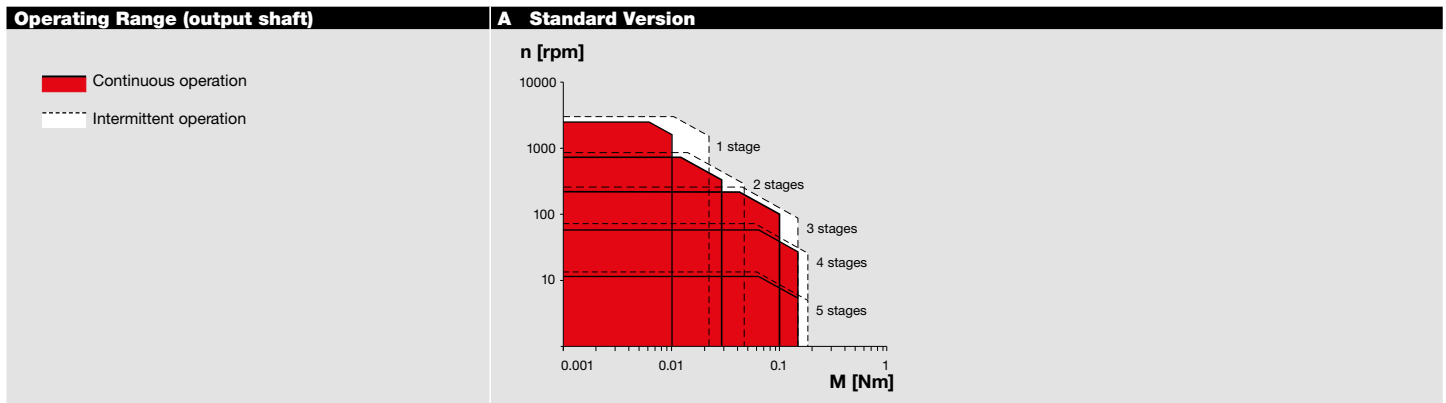
[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

# GPX 10

## Planetary Gearhead Ø10 mm



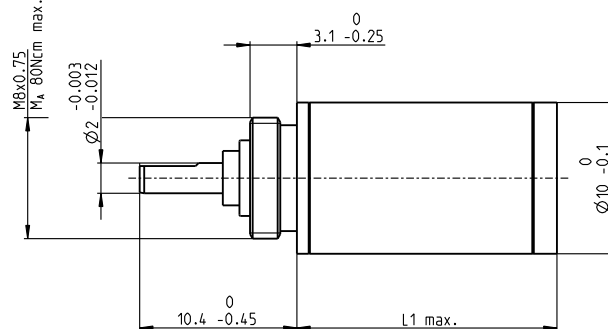
Key Data		A Standard Version	
Max. transmittable power	W	1.6	
Max. continuous torque	Nm	0.15	
Max. continuous input speed	rpm	12000	
Ambient temperature	°C	-40 ... +80	
Bearing at output		Ball bearing	



Specifications		A Standard Version				
Number of stages		1	2	3	4	5
Max. transmittable power (continuous)	W	1.6	1.2	1.0	0.40	0.10
Max. transmittable power (intermittent)	W	2.0	1.5	1.3	0.50	0.13
Max. continuous torque	Nm	0.01	0.03	0.10	0.15	0.15
Max. intermittent torque	Nm	0.02	0.05	0.15	0.20	0.20
Max. continuous input speed	rpm	12000	12000	12000	12000	12000
Max. intermittent input speed	rpm	15000	15000	15000	15000	15000
Max. efficiency	%	90	81	73	65	59
Average backlash no load	°	1.5	1.8	2.0	2.2	2.5
Max. axial load (dynamic)	N	5	5	5	5	5
Max. radial load, 5 mm from flange	N	5	10	15	20	25
Gearhead length L <sup>1</sup>	mm	9.9	13.4	16.6	19.8	23.0
Weight	g	6.7	7.2	7.7	8.2	8.7

Configuration		A Standard Version				
Number of stages		1	2	3	4	5
Reduction	X:1	4	16	64	256	1024
Version		Standard				
Flange		Standard flange				
Shaft		Length/flat face				

maxon Modular System		Page	Dimensions
maxon DC motor	N <sub>e</sub> of stages [opt.]		
DCX 10 S	1-5	72	
DCX 10 L	1-5	73	



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

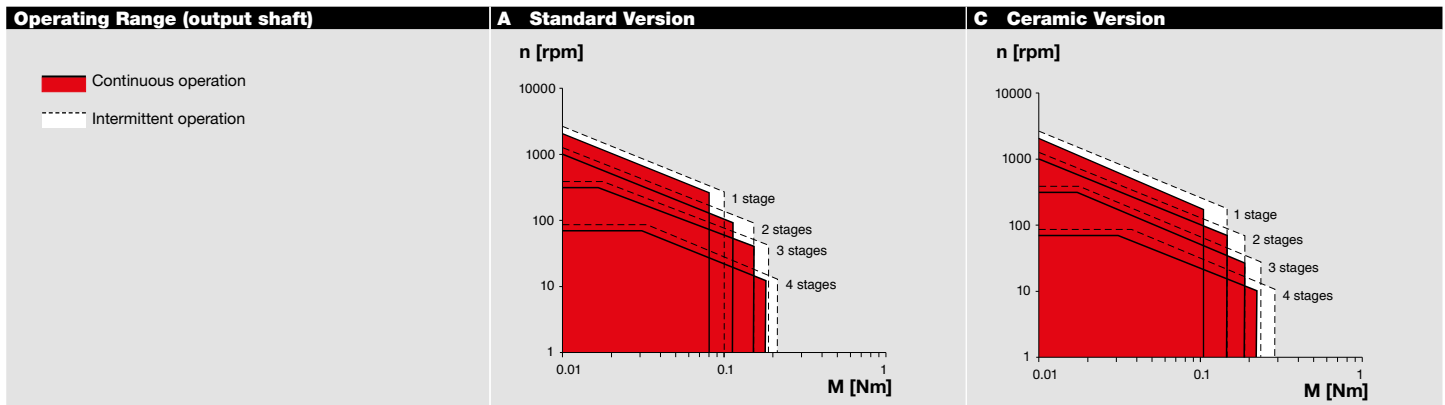
# GPX 12

## Planetary Gearhead $\varnothing 12$ mm



maxon GPX

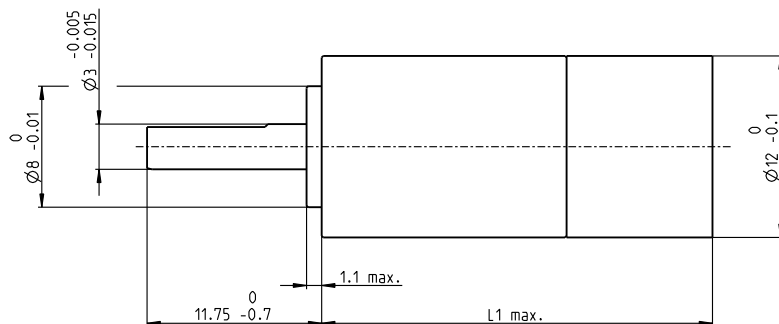
Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 2	2.4
Max. continuous torque	Nm 0.17	0.23
Max. continuous input speed	rpm 16000	16000
Ambient temperature	$^{\circ}\text{C}$ -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing



Specifications	A Standard Version				C Ceramic Version			
	1	2	3	4	1	2	3	4
Number of stages	1	2	3	4	1	2	3	4
Max. transmittable continuous power	W 2.0	1.0	0.50	0.25	2.4	1.2	0.60	0.30
Max. transmittable intermittent power	W 2.5	1.25	0.65	0.30	3.0	1.50	0.80	0.40
Max. continuous torque	Nm 0.08	0.11	0.14	0.17	0.11	0.15	0.19	0.23
Max. intermittent torque	Nm 0.10	0.14	0.18	0.21	0.15	0.19	0.24	0.29
Max. continuous input speed	rpm 16000	16000	16000	16000	16000	16000	16000	16000
Max. intermittent input speed	rpm 20000	20000	20000	20000	20000	20000	20000	20000
Max. efficiency	% 90	80	75	65	90	80	75	65
Average backlash no load	$^{\circ}$ 1.2	1.5	1.8	2.1	1.2	1.5	1.8	2.1
Max. axial load (dynamic)	N 20	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N 30	35	50	50	30	35	50	50
Gearhead length L1 <sup>1</sup>	mm 15.5	20.4	25.2	30.1	15.5	20.4	25.2	30.1
Weight	g 11	14	17	19	11	14	17	19

Configuration	A Standard Version				C Ceramic Version			
	1	2	3	4	1	2	3	4
Number of stages	1	2	3	4	1	2	3	4
Reduction	X:1 3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version	Standard/ceramic version/noise reduced/reduced backlash/high power							
Flange	Standard flange/configurable flange							
Shaft	Length/flat face							

maxon Modular System		Page	Dimensions	M 2:1
maxon DC motor	N <sub>e</sub> of stages [opt.]			
DCX 12 S	1-4	74		
DCX 12 L	1-4	75		



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

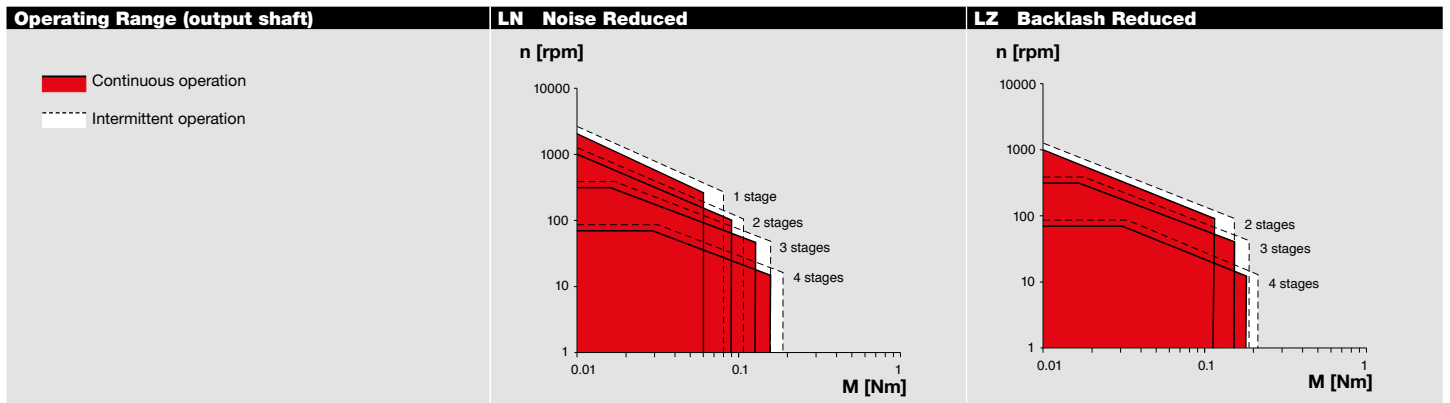
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# GPX 12

## Planetary Gearhead $\varnothing 12$ mm



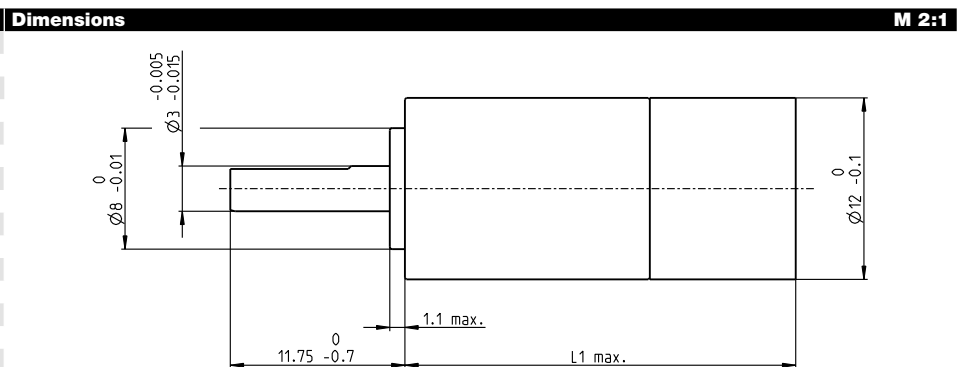
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	1.6	1
Max. continuous torque	Nm	0.14	0.2
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	



Specifications	LN Noise Reduced				LZ Backlash Reduced			
	1	2	3	4	2	3	4	
Number of stages								
Max. transmittable continuous power	W	1.6	0.8	0.40	0.20	1.0	0.50	0.25
Max. transmittable intermittent power	W	2.0	1.00	0.50	0.25	1.25	0.65	0.30
Max. continuous torque	Nm	0.06	0.09	0.11	0.14	0.11	0.14	0.17
Max. intermittent torque	Nm	0.08	0.11	0.14	0.18	0.14	0.18	0.21
Max. continuous input speed	rpm	16000	16000	16000	16000	16000	16000	16000
Max. intermittent input speed	rpm	20000	20000	20000	20000	20000	20000	20000
Max. efficiency	%	90	80	75	65	80	75	65
Average backlash no load	°	1.2	1.5	1.8	2.1	1.35	1.6	1.8
Max. axial load (dynamic)	N	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	30	35	50	50	35	50	50
Gearhead length L1 <sup>1</sup>	mm	15.5	20.4	25.2	30.1	20.4	25.2	30.1
Weight	g	11	14	17	19	14	17	19

Configuration	LN Noise Reduced				LZ Backlash Reduced			
	1	2	3	4	2	3	4	
Number of stages								
Reduction	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version	Standard/ceramic version/noise reduced/backlash reduced/high power							
Flange	Standard flange/configurable flange							
Shaft	Length/flat face							

maxon Modular System		Page
maxon DC motor	N <sub>e</sub> of stages [opt.]	
DCX 12 S	1-4	74
DCX 12 L	1-4	75



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

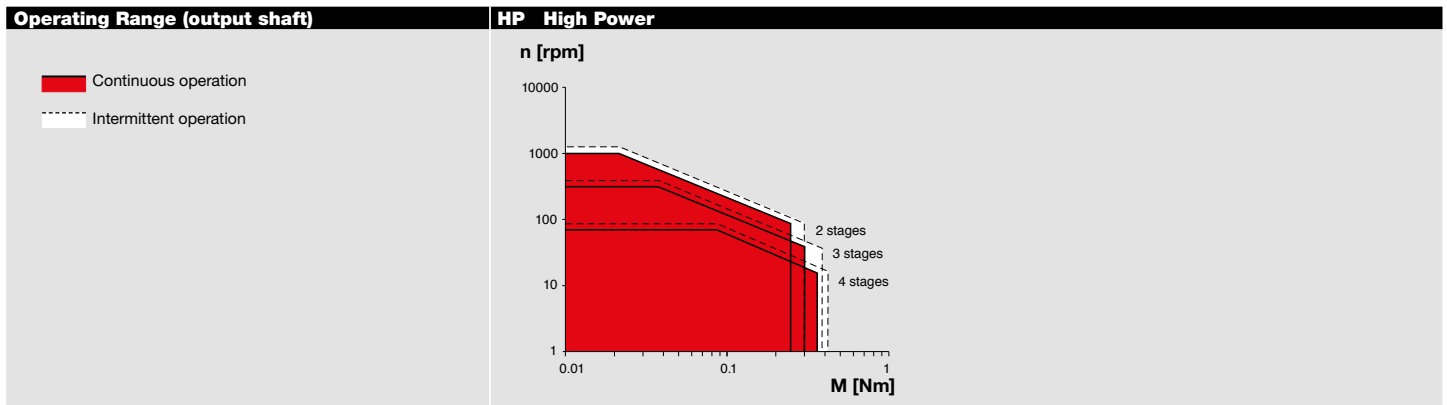
# GPX 12

## Planetary Gearhead Ø12 mm



maxon GPX

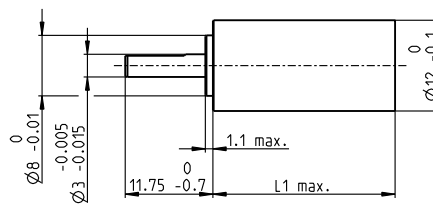
Key Data		HP High Power
Max. transmittable power	W	2.2
Max. continuous torque	Nm	0.35
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



Specifications		HP High Power		
		2	3	4
Number of stages		2	3	4
Max. transmittable power (continuous)	W	2.2	1.10	0.60
Max. transmittable power (intermittent)	W	2.80	1.40	0.80
Max. continuous torque	Nm	0.25	0.30	0.35
Max. intermittent torque	Nm	0.30	0.38	0.41
Max. continuous input speed	rpm	16000	16000	16000
Max. intermittent input speed	rpm	20000	20000	20000
Max. efficiency	%	75	65	55
Average backlash no load	°	1.5	1.8	2.1
Max. axial load (dynamic)	N	20	20	20
Max. radial load, 5 mm from flange	N	45	60	60
Gearhead length L <sup>1</sup>	mm	23.4	28.1	33.1
Weight	g	16	19	21

Configuration		HP High Power		
		2	3	4
Number of stages		2	3	4
Reduction	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face		

maxon Modular System		Page	Dimensions	M 1:1
maxon DC motor	N <sub>e</sub> of stages [opt.]			
DCX 12 S	2-4	74		
DCX 12 L	2-4	75		



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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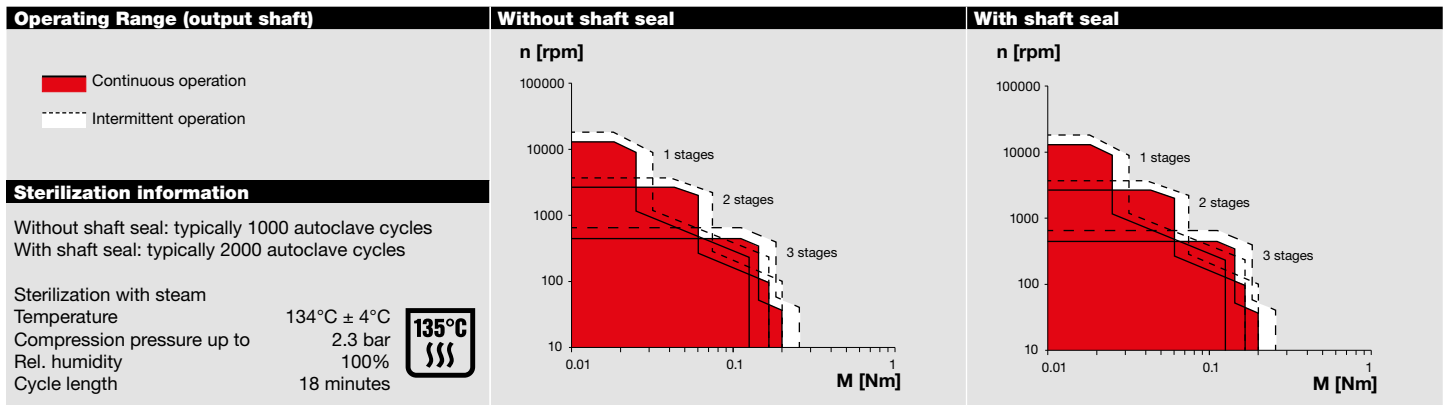
# GPX 13 SPEED

## Planetary Gearhead Ø13 mm

Sterilizable



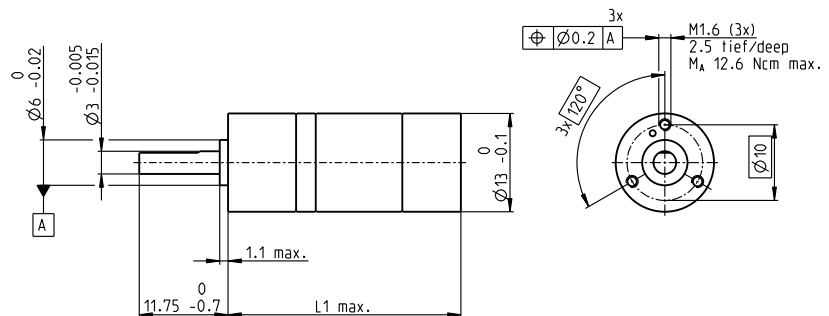
Key Data	Without shaft seal*	With shaft seal*
Max. transmittable power	W 22 (3.2)	22 (3.2)
Max. continuous torque	Nm 0.15	0.15
Max. continuous input speed	rpm 60000	60000
Ambient temperature	°C -10 ... +135	-10 ... +135
Bearing at output	Ball bearing	Ball bearing



Specifications	Without shaft seal*			With shaft seal*		
	1	2	3	1	2	3
Number of stages						
Max. transmittable continuous power	W 22 (3.2)	11 (1.6)	6 (0.8)	22 (3.2)	11 (1.6)	6 (0.8)
Max. transmittable intermittent power	W 27 (4)	13 (2)	7 (1)	27 (4)	13 (2)	7 (1)
Max. continuous torque	Nm 0.025 (0.13)	0.06 (0.16)	0.15 (0.2)	0.025 (0.13)	0.06 (0.16)	0.15 (0.2)
Max. intermittent torque	Nm 0.030 (0.16)	0.075 (0.2)	0.19 (0.25)	0.030 (0.16)	0.075 (0.2)	0.19 (0.25)
Max. continuous input speed	rpm 60000	60000	60000	60000	60000	60000
Max. intermittent input speed	rpm 75000	75000	75000	75000	75000	75000
Max. efficiency	% 85	80	70	85	80	70
Average backlash no load	° 1.2	1.4	1.6	1.2	1.4	1.6
Max. axial load (dynamic)	N 20	20	20	20	20	20
Max. radial load, 5 mm from flange	N 10	15	25	10	15	25
Gearhead length L1 <sup>1</sup>	mm 30.8	36.6	42.4	30.8	36.6	42.4
Weight	g 21	26	30	21	26	30

Configuration	Without shaft seal			With shaft seal		
	1	2	3	1	2	3
Number of stages	1	2	3	1	2	3
Reduction	X:1 5	25	125	5	25	125
Version	Without shaft seal/With shaft seal					
Flange	Standard flange/configurable flange					
Shaft	Length/flat face					

maxon Modular System	Page	Dimensions
maxon EC motor	№ of stages [opt.]	
ECX SPEED 13 M	1-3	168-171
ECX SPEED 13 L	1-3	172-175



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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\*Values in parentheses apply in case of reduced speed (according to diagram).

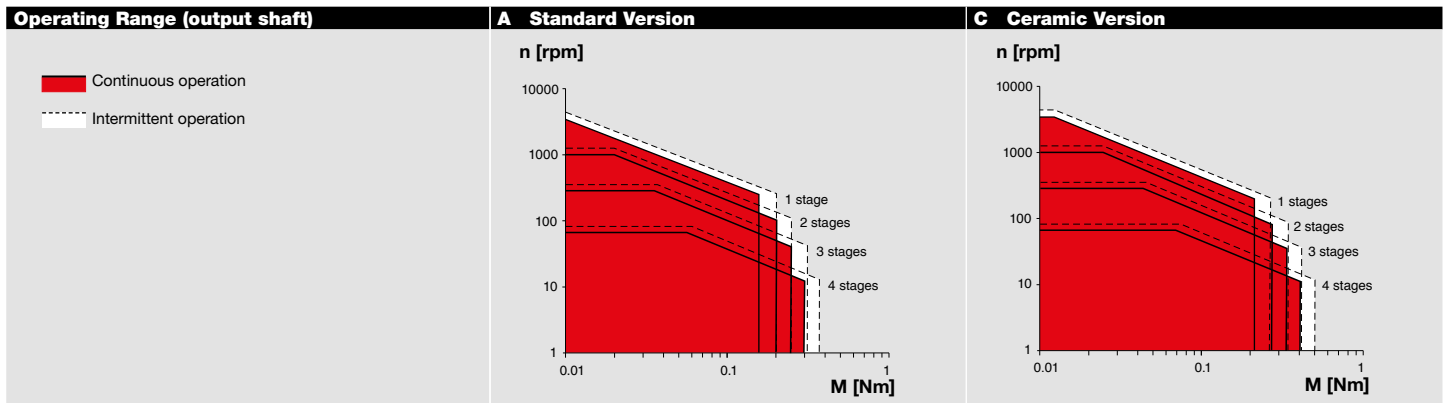
# GPX 14

## Planetary Gearhead $\varnothing 14$ mm



maxon GPX

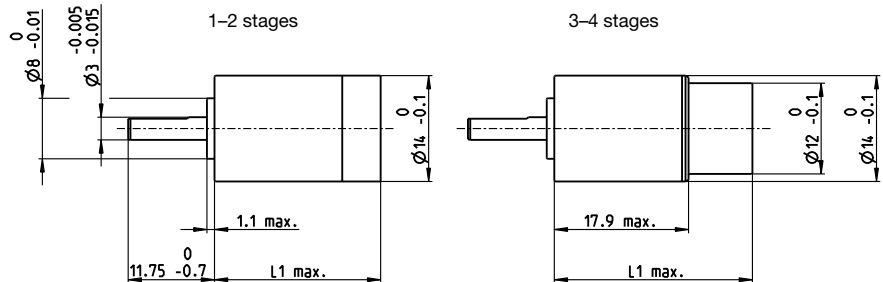
Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 4	4.8
Max. continuous torque	Nm 0.3	0.4
Max. continuous input speed	rpm 16000	16000
Ambient temperature	$^{\circ}\text{C}$ -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing



Specifications	A Standard Version				C Ceramic Version			
	1	2	3	4	1	2	3	4
Number of stages	1	2	3	4	1	2	3	4
Max. transmittable continuous power	W 4.0	2.0	1.0	0.4	4.8	2.4	1.2	0.5
Max. transmittable intermittent power	W 5.0	2.5	1.25	0.5	6.0	3.0	1.50	0.6
Max. continuous torque	Nm 0.16	0.20	0.25	0.30	0.21	0.27	0.33	0.40
Max. intermittent torque	Nm 0.20	0.25	0.31	0.38	0.26	0.34	0.41	0.50
Max. continuous input speed	rpm 14000	16000	16000	16000	14000	16000	16000	16000
Max. intermittent input speed	rpm 17500	20000	20000	20000	17500	20000	20000	20000
Max. efficiency	% 90	80	75	65	90	80	75	65
Average backlash no load	$^{\circ}$ 1.1	1.3	1.45	1.7	1.1	1.3	1.45	1.7
Max. axial load (dynamic)	N 20	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N 30	45	60	60	30	45	60	60
Gearhead length L1 <sup>1</sup>	mm 15.7	20.8	25.5	30.3	15.7	20.8	25.5	30.3
Weight	g 14	19	21	23	14	19	21	23

Configuration	A Standard Version				C Ceramic Version			
	1	2	3	4	1	2	3	4
Number of stages	1	2	3	4	1	2	3	4
Reduction	X:1 3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version	Standard/ceramic version/noise reduced/backlash reduced/high power							
Flange	Standard flange/configurable flange							
Shaft	Length/flat face							

maxon Modular System		Page	Dimensions	M 1:1
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]			
DCX 12 S	3-4	74		
DCX 12 L	3-4	75		
DCX 14 L	1-2 [3-4]	76-77		
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]			
ECX SPEED 13 M	1-2 [3-4]	168-171		
ECX SPEED 13 L	1-2 [3-4]	172-175		



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

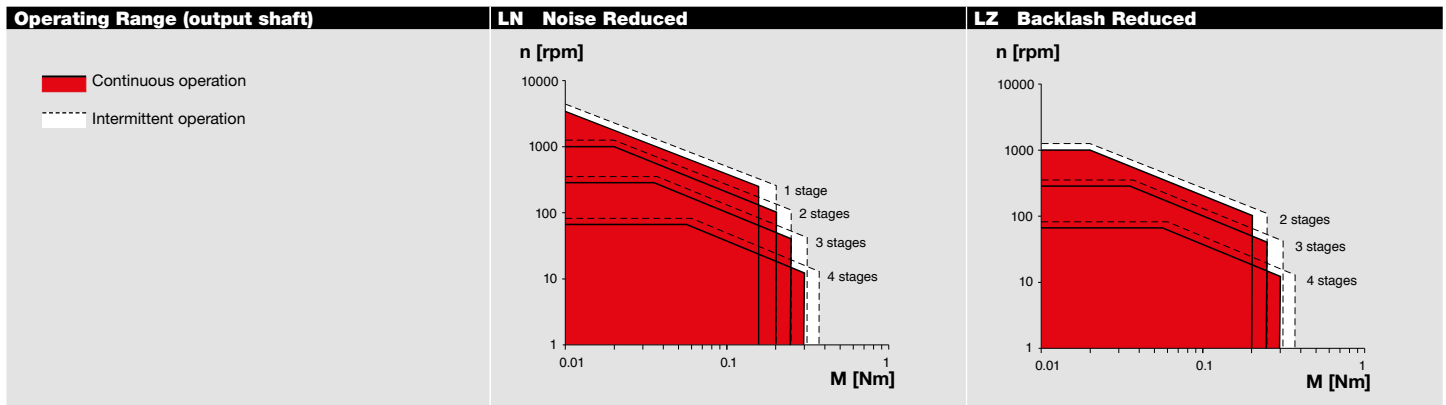
[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

# GPX 14

## Planetary Gearhead $\varnothing 14$ mm



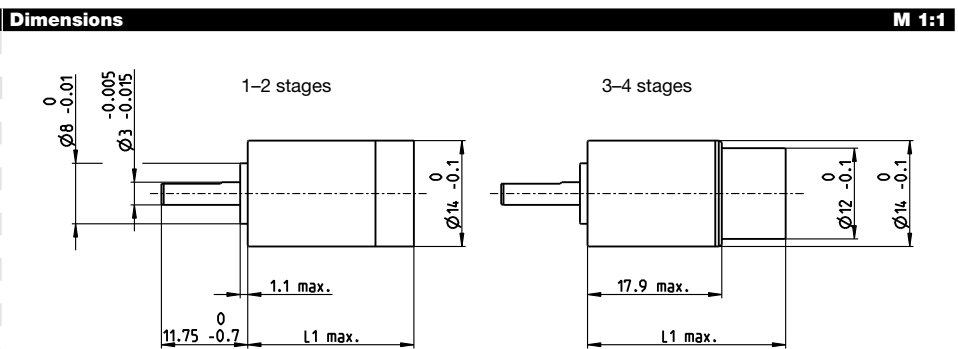
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	3.2	3
Max. continuous torque	Nm	0.24	0.3
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	



Specifications		LN Noise Reduced				LZ Backlash Reduced			
		1	2	3	4	2	3	4	
Number of stages									
Max. transmittable continuous power	W	3.2	1.6	0.8	0.3	2.0	1.0	0.4	
Max. transmittable intermittent power	W	4.0	2.0	1.0	0.4	2.5	1.25	0.5	
Max. continuous torque	Nm	0.13	0.16	0.20	0.24	0.20	0.25	0.30	
Max. intermittent torque	Nm	0.16	0.20	0.25	0.30	0.25	0.31	0.38	
Max. continuous input speed	rpm	14000	16000	16000	16000	16000	16000	16000	
Max. intermittent input speed	rpm	17500	20000	20000	20000	20000	20000	20000	
Max. efficiency	%	90	80	75	65	80	75	65	
Average backlash no load	°	1.1	1.3	1.45	1.7	0.95	1.05	1.2	
Max. axial load (dynamic)	N	20	20	20	20	20	20	20	
Max. radial load, 5 mm from flange	N	30	45	60	60	45	60	60	
Gearhead length L1 <sup>1</sup>	mm	15.7	20.8	25.5	30.3	20.8	25.5	30.3	
Weight	g	14	19	21	23	19	21	23	

Configuration		LN Noise Reduced				LZ Backlash Reduced			
		1	2	3	4	2	3	4	
Number of stages									
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	
Version		Standard/ceramic version/noise reduced/backlash reduced/high power							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face							

maxon Modular System		Page
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]	
DCX 12 S	3-4	74
DCX 12 L	3-4	75
DCX 14 L	1-2 [3-4]	76-77
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]	
ECX SPEED 13 M	1-2 [3-4]	168-171
ECX SPEED 13 L	1-2 [3-4]	172-175



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.



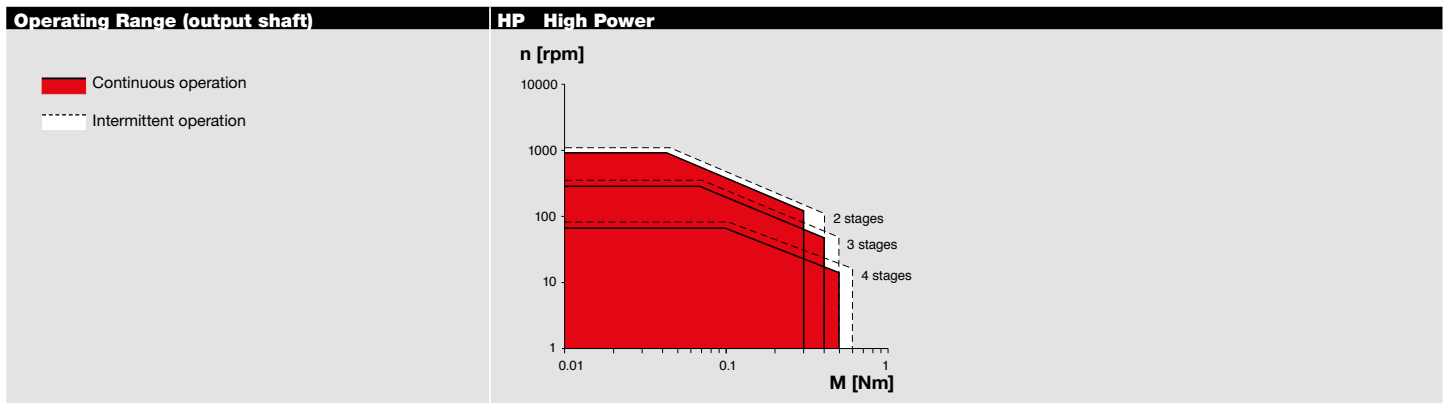
# GPX 14

## Planetary Gearhead Ø14 mm



maxon GPX

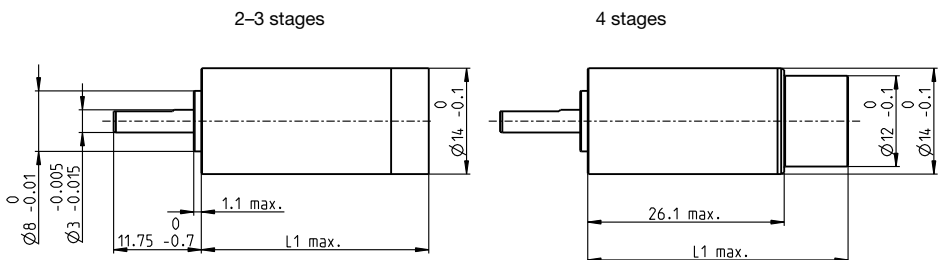
Key Data		HP High Power
Max. transmittable power	W	4.0
Max. continuous torque	Nm	0.50
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



Specifications		HP High Power		
		2	3	4
Number of stages		2	3	4
Max. transmittable power (continuous)	W	4.0	2.0	0.7
Max. transmittable power (intermittent)	W	5.0	2.5	1.0
Max. continuous torque	Nm	0.30	0.40	0.50
Max. intermittent torque	Nm	0.40	0.50	0.60
Max. continuous input speed	rpm	14000	16000	16000
Max. intermittent input speed	rpm	17500	20000	20000
Max. efficiency	%	75	65	55
Average backlash no load	°	1.3	1.45	1.7
Max. axial load (dynamic)	N	20	20	20
Max. radial load, 5 mm from flange	N	45	70	70
Gearhead length L1 <sup>1</sup>	mm	23.9	29.0	33.7
Weight	g	21	25	27

Configuration		HP High Power		
		2	3	4
Number of stages		2	3	4
Reduction	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face		

maxon Modular System		Page	Dimensions	M 1:1
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]			
DCX 12 S	4	74		
DCX 12 L	4	75		
DCX 14 L	2-3 [4]	76-77		
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]			
ECX SPEED 13 M	2-3 [4]	168-171		
ECX SPEED 13 L	2-3 [4]	172-175		



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

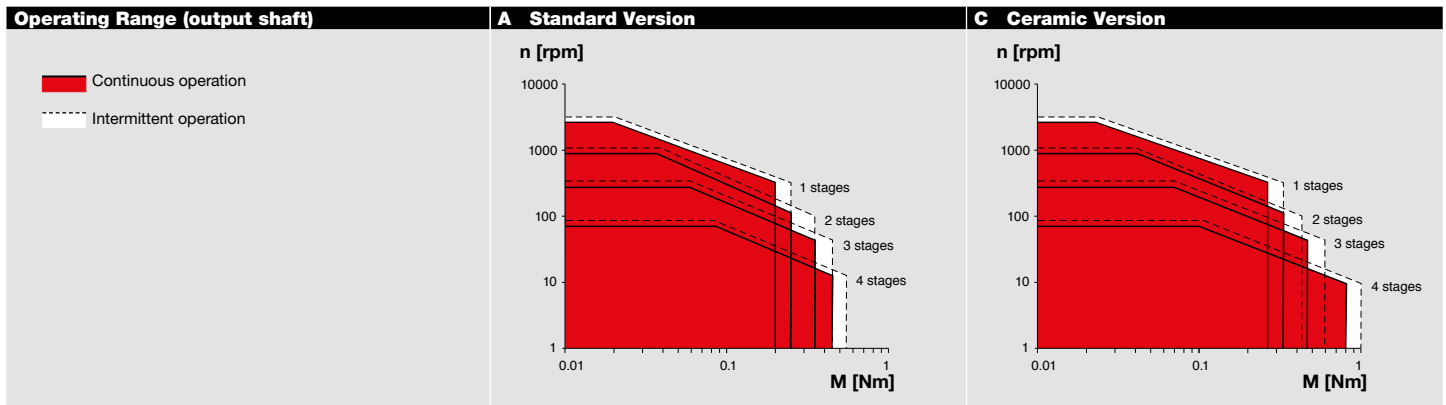
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# GPX 16

## Planetary Gearhead Ø16 mm



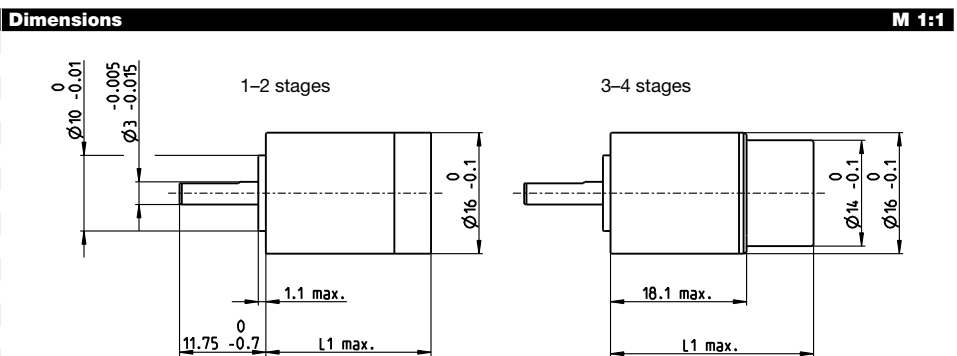
Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	6.5	7.8
Max. continuous torque	Nm	0.45	0.6
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing



Specifications	A Standard Version				C Ceramic Version				
	1	2	3	4	1	2	3	4	
Number of stages									
Max. transmittable continuous power	W	6.5	3.2	1.6	0.60	7.8	3.8	1.9	0.7
Max. transmittable intermittent power	W	8.0	4.0	2.0	0.75	10.0	5.0	2.5	1.0
Max. continuous torque	Nm	0.20	0.25	0.35	0.45	0.27	0.33	0.47	0.60
Max. intermittent torque	Nm	0.25	0.35	0.45	0.55	0.33	0.42	0.58	0.75
Max. continuous input speed	rpm	12000	14000	16000	16000	12000	14000	16000	16000
Max. intermittent input speed	rpm	15000	17500	20000	20000	15000	17500	20000	20000
Max. efficiency	%	90	80	75	65	90	80	75	65
Average backlash no load	°	1.0	1.2	1.3	1.4	1.0	1.2	1.3	1.4
Max. axial load (dynamic)	N	20	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	30	45	70	70	30	45	70	70
Gearhead length L1 <sup>1</sup>	mm	15.8	20.7	25.7	30.6	15.8	20.7	25.7	30.6
Weight	g	20	25	27	31	20	25	27	31

Configuration	A Standard Version				C Ceramic Version				
	1	2	3	4	1	2	3	4	
Number of stages									
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version	Standard/ceramic version/noise reduced/reduced backlash/high power								
Flange	Standard flange/configurable flange								
Shaft	Length/flat face								

maxon Modular System		Page
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]	
DCX 14 L	3-4	76-77
DCX 16 S	1-2 [3-4]	78-79
DCX 16 L	1-2 [3-4]	80-81
DC-max 16 S*	1-2 [3-4]	94-95
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]	
ECX SPEED 13 M	3-4	168-171
ECX SPEED 13 L	3-4	172-175
ECX SPEED 16 M	1-2 [3-4]	176-179
ECX SPEED 16 L	1-2 [3-4]	180-183



\*Limited selection of reduction ratios (see online).

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

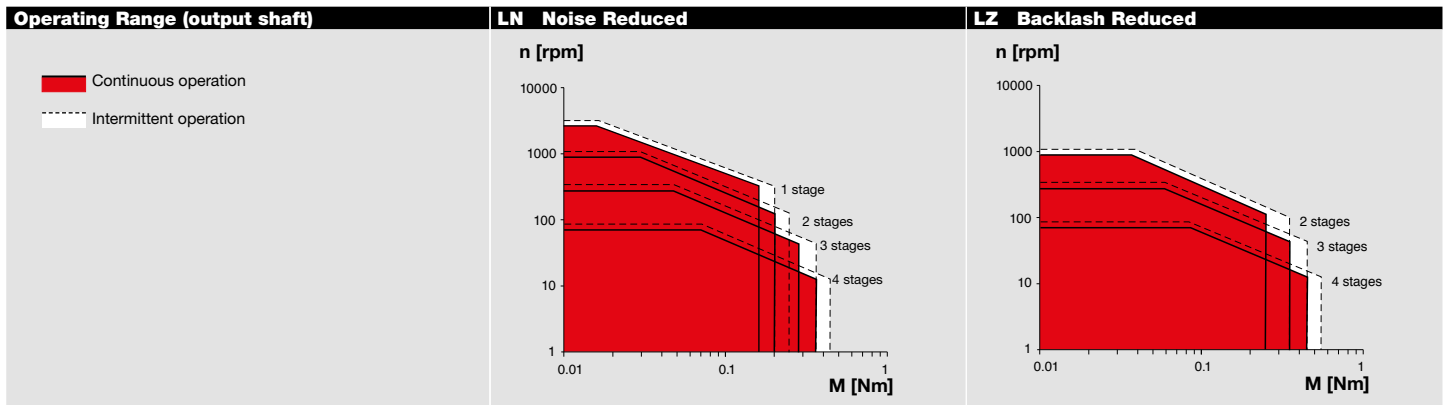
# GPX 16

## Planetary Gearhead Ø16 mm



maxon GPX

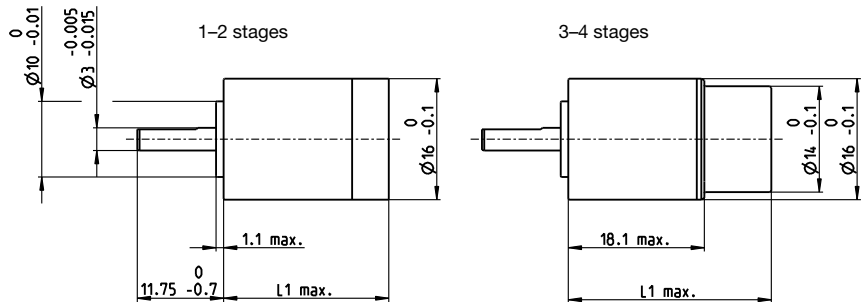
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	5.2	3.2
Max. continuous torque	Nm	0.36	0.5
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	



Specifications	LN Noise Reduced				LZ Backlash Reduced			
	1	2	3	4	2	3	4	
Number of stages								
Max. transmittable continuous power	W	5.2	2.6	1.3	0.5	3.2	1.6	0.6
Max. transmittable intermittent power	W	6.5	3.3	1.6	0.6	4.0	2.0	0.8
Max. continuous torque	Nm	0.16	0.20	0.28	0.36	0.25	0.35	0.45
Max. intermittent torque	Nm	0.20	0.25	0.35	0.45	0.35	0.45	0.55
Max. continuous input speed	rpm	12000	14000	16000	16000	14000	16000	16000
Max. intermittent input speed	rpm	15000	17500	20000	20000	17500	20000	20000
Max. efficiency	%	90	80	75	65	80	75	65
Average backlash no load	°	1.0	1.2	1.3	1.4	0.8	0.9	1.0
Max. axial load (dynamic)	N	20	20	20	20	20	20	20
Max. radial load, 5 mm from flange	N	30	45	70	70	45	70	70
Gearhead length L1 <sup>1</sup>	mm	15.8	20.7	25.7	30.6	20.7	25.7	30.6
Weight	g	20	25	27	30.6	25	27	30.6

Configuration	LN Noise Reduced				LZ Backlash Reduced			
	1	2	3	4	2	3	4	
Number of stages								
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version	Standard/ceramic version/noise reduced/backlash reduced/high power							
Flange	Standard flange/configurable flange							
Shaft	Length/flat face							

maxon Modular System		Page	Dimensions	M 1:1
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]			
DCX 14 L	3-4	76-77		
DCX 16 S	1-2 [3-4]	78-79		
DCX 16 L	1-2 [3-4]	80-81		
DC-max 16 S*	1-2 [3-4]	94-95		
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]			
ECX SPEED 13 M	3-4	168-171		
ECX SPEED 13 L	3-4	172-175		
ECX SPEED 16 M	1-2 [3-4]	176-179		
ECX SPEED 16 L	1-2 [3-4]	180-183		



\*Limited selection of reduction ratios (see online).

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

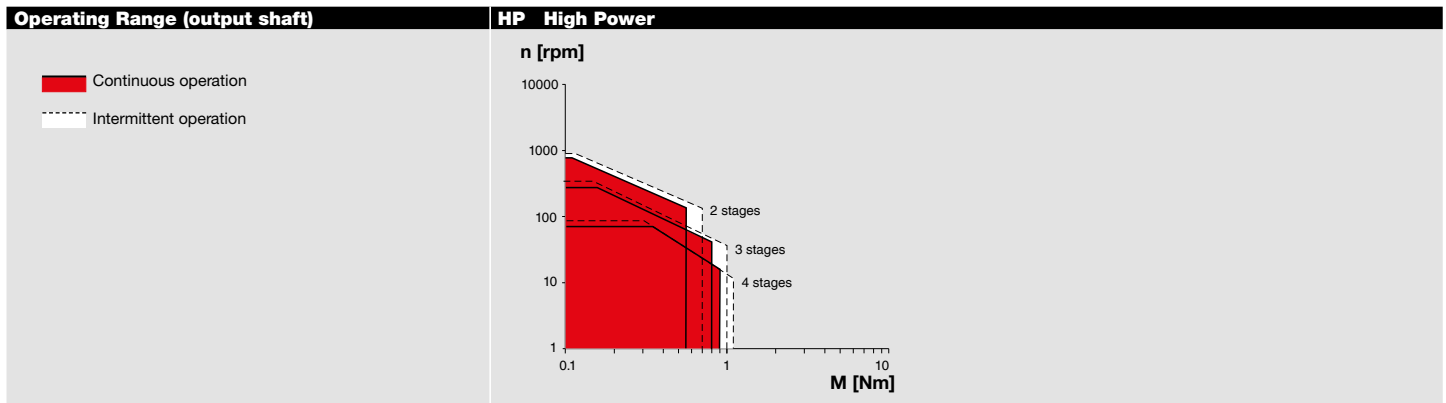
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# GPX 16

## Planetary Gearhead Ø16 mm



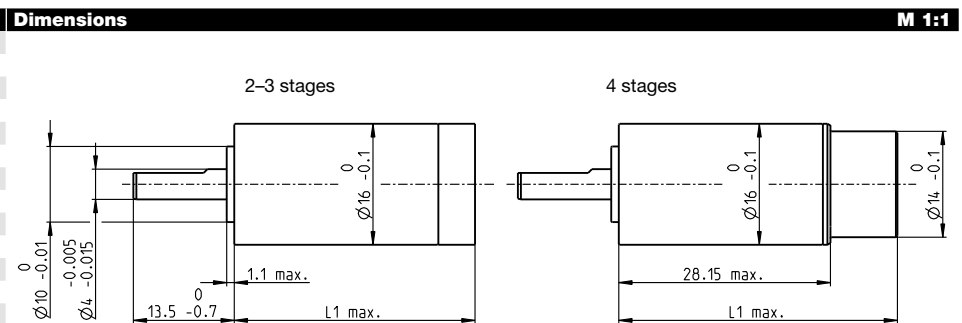
Key Data		HP High Power	
Max. transmittable power	W	8	
Max. continuous torque	Nm	0.9	
Max. continuous input speed	rpm	16000	
Ambient temperature	°C	-40 ... +100	
Bearing at output		Ball bearing	



Specifications		HP High Power			
		2	3	4	
Number of stages		2	3	4	
Max. transmittable power (continuous)	W	8.0	4.0	1.5	
Max. transmittable power (intermittent)	W	10.0	4.4	1.5	
Max. continuous torque	Nm	0.55	0.80	0.90	
Max. intermittent torque	Nm	0.70	1.00	1.10	
Max. continuous input speed	rpm	12000	14000	16000	
Max. intermittent input speed	rpm	15000	17500	20000	
Max. efficiency	%	75	65	55	
Average backlash no load	°	1.2	1.3	1.4	
Max. axial load (dynamic)	N	30	30	30	
Max. radial load, 5 mm from flange	N	80	90	90	
Gearhead length L1 <sup>1</sup>	mm	25.9	30.9	35.7	
Weight	g	31	35	39	

Configuration		HP High Power			
		2	3	4	
Number of stages		2	3	4	
Reduction	X:1	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	
Version		Standard/ceramic version/noise reduced/backlash reduced/high power			
Flange		Standard flange			
Shaft		Length/flat face/cross hole			

maxon Modular System		Page
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]	
DCX 14 L	4	76-77
DCX 16 S	2-3 [4]	78-79
DCX 16 L	2-3 [4]	80-81
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]	
ECX SPEED 13 M	4	168-171
ECX SPEED 13 L	4	172-175
ECX SPEED 16 M	2-3 [4]	176-179
ECX SPEED 16 L	2-3 [4]	180-183



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

# GPX 16 SPEED

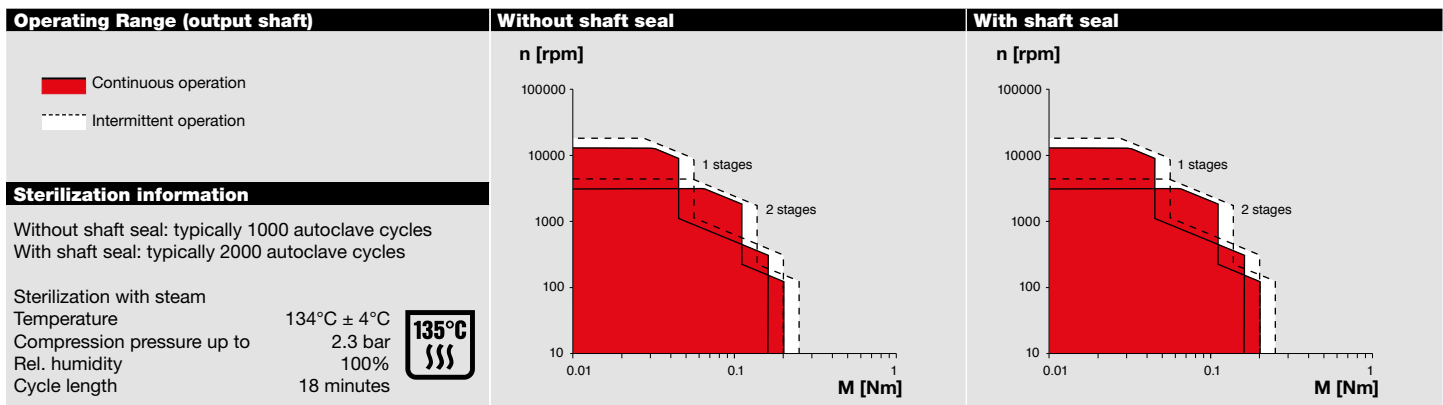
## Planetary Gearhead Ø16 mm

Sterilizable



maxon GPX

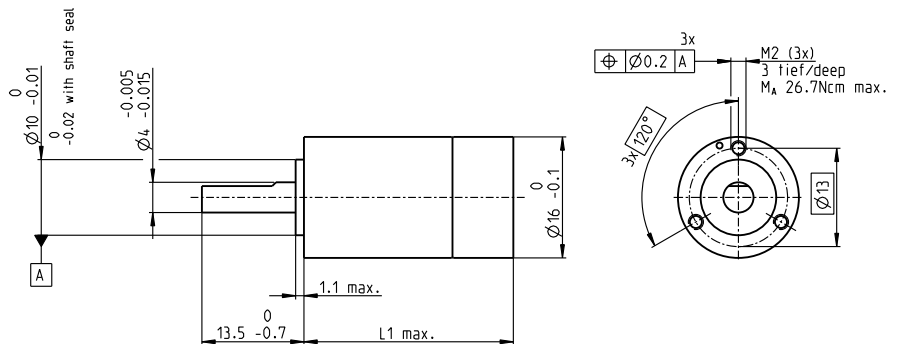
Key Data		Without shaft seal*	With shaft seal*
Max. transmittable power	W	42 (5.2)	42 (5.2)
Max. continuous torque	Nm	0.11 (0.2)	0.11 (0.2)
Max. continuous input speed	rpm	50000	50000
Ambient temperature	°C	-10 ... +135	-10 ... +135
Bearing at output		Ball bearing	Ball bearing



Specifications	Without shaft seal*		With shaft seal*	
	1	2	1	2
Number of stages				
Max. transmittable continuous power	W 42 (5.2)	21 (2.6)	42 (5.2)	21 (2.6)
Max. transmittable intermittent power	W 52 (6.5)	25 (3.3)	52 (6.5)	25 (3.3)
Max. continuous torque	Nm 0.045 (0.16)	0.11 (0.20)	0.045 (0.16)	0.11 (0.20)
Max. intermittent torque	Nm 0.055 (0.20)	0.140 (0.25)	0.055 (0.20)	0.140 (0.25)
Max. continuous input speed	rpm 50000	50000	50000	50000
Max. intermittent input speed	rpm 70000	70000	70000	70000
Max. efficiency	% 85	80	85	80
Average backlash no load	° 1.4	1.6	1.4	1.6
Max. axial load (dynamic)	N 30.0	30.0	30.0	30.0
Max. radial load, 5 mm from flange	N 25.0	35.0	15.0	20.0
Gearhead length L1 <sup>1</sup>	mm 27.7	35.1	35.3	42.7
Weight	g 27	35	37	45

Configuration	Without shaft seal		With shaft seal	
	1	2	1	2
Number of stages				
Reduction	X:1 3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44
Version	Without shaft seal/With shaft seal			
Flange	Standard flange			
Shaft	Length/flat face/cross hole			

maxon Modular System	Page	Dimensions
maxon EC motor	N <sub>e</sub> of stages [opt.]	
ECX SPEED 16 M	1-2	176-179
ECX SPEED 16 L	1-2	180-183



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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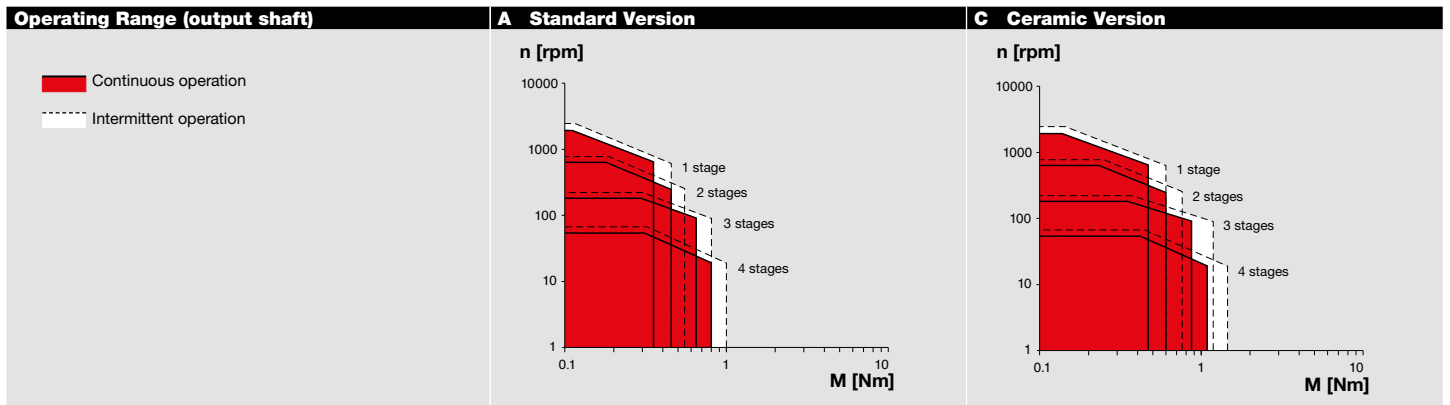
\*Values in parentheses apply in case of reduced speed (according to diagram).

# GPX 19

## Planetary Gearhead Ø19 mm



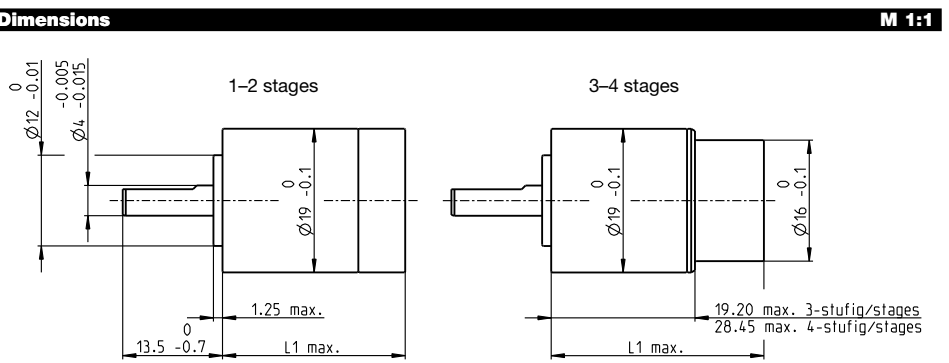
Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 13	15.5
Max. continuous torque	Nm 0.8	1.1
Max. continuous input speed	rpm 14000	14000
Ambient temperature	°C -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing



Specifications	A Standard Version	C Ceramic Version
Number of stages	1 2 3 4	1 2 3 4
Max. transmittable continuous power	W 13.0 6.5 3.2 0.9	15.5 7.8 3.9 1.0
Max. transmittable intermittent power	W 16.2 8.1 4.1 1.1	19.4 9.7 4.9 1.3
Max. continuous torque	Nm 0.35 0.45 0.65 0.80	0.47 0.60 0.86 1.05
Max. intermittent torque	Nm 0.45 0.55 0.80 1.00	0.60 0.75 1.10 1.30
Max. continuous input speed	rpm 10000 12000 14000 14000	10000 12000 14000 14000
Max. intermittent input speed	rpm 12500 15000 17500 17500	12500 15000 17500 17500
Max. efficiency	% 90 80 75 65	90 80 75 65
Average backlash no load	° 0.9 1.15 1.25 1.35	0.9 1.15 1.25 1.35
Max. axial load (dynamic)	N 40 40 40 40	40 40 40 40
Max. radial load, 5 mm from flange	N 50 80 90 90	50 80 90 90
Gearhead length L1 <sup>1</sup>	mm 16.7 22.9 27.0 36.2	16.7 22.9 27.0 36.2
Weight	g 30 40 43 55	30 40 43 55

Configuration	A Standard Version	C Ceramic Version	
Number of stages	1 2 3 4	1 2 3 4	
Reduction	X:1 3.9, 5.3, 6.6 16, 21, 26, 28, 35 62, 83, 103, 111, 138, 150, 172, 186, 231 243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6 16, 21, 26, 28, 35 62, 83, 103, 111, 138, 150, 172, 186, 231 243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	
Version	Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange	Standard flange/configurable flange		
Shaft	Length/flat face/cross hole		

maxon Modular System	Page
<b>maxon DC motor</b> № of stages [opt.]	
DCX 16 S	3-4 78-79
DCX 16 L	3-4 80-81
DCX 19 S	1-2 [3-4] 82-83
DC-max 16 S	3-4 94-95
<b>maxon EC motor</b> № of stages [opt.]	
ECX SPEED 16 M	3-4 176-179
ECX SPEED 16 L	3-4 180-183
ECX SPEED 19 M	1-2 [3-4] 184-187
ECX SPEED 19 L	1-2 [3-4] 188-191



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

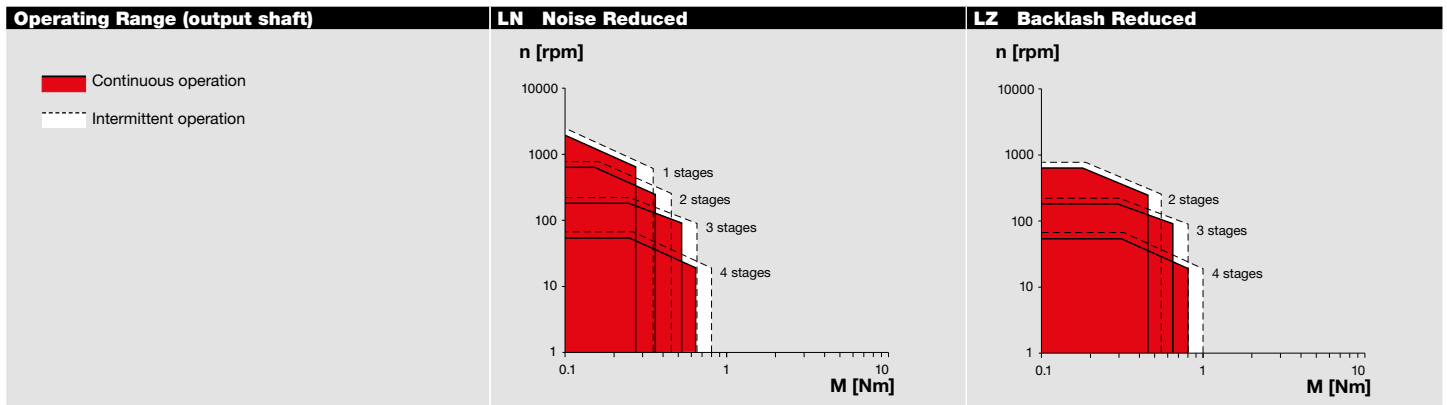
# GPX 19

## Planetary Gearhead $\varnothing 19$ mm



maxon GPX

Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	10.4	6.5
Max. continuous torque	Nm	0.64	0.8
Max. continuous input speed	rpm	14000	14000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	



Specifications		LN Noise Reduced				LZ Backlash Reduced			
		1	2	3	4	2	3	4	
Number of stages		1	2	3	4	2	3	4	
Max. transmittable continuous power	W	10.4	5.2	2.6	0.7	6.5	3.2	0.9	
Max. transmittable intermittent power	W	13.0	6.5	3.2	0.9	8.1	4.1	1.1	
Max. continuous torque	Nm	0.28	0.36	0.52	0.64	0.45	0.65	0.80	
Max. intermittent torque	Nm	0.35	0.45	0.65	0.80	0.55	0.80	1.00	
Max. continuous input speed	rpm	10000	12000	14000	14000	12000	14000	14000	
Max. intermittent input speed	rpm	12500	15000	17500	17500	15000	17500	17500	
Max. efficiency	%	90	80	75	65	80	75	65	
Average backlash no load	°	0.9	1.15	1.25	1.35	0.8	1.0	1.15	
Max. axial load (dynamic)	N	40	40	40	40	40	40	40	
Max. radial load, 5 mm from flange	N	50	80	90	90	80	90	90	
Gearhead length L1 <sup>1</sup>	mm	16.7	22.9	27.0	36.2	22.9	27.0	36.2	
Weight	g	30	40	43	55	40	43	55	

Configuration		LN Noise Reduced				LZ Backlash Reduced			
		1	2	3	4	2	3	4	
Number of stages		1	2	3	4	2	3	4	
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	
Version		Standard/ceramic version/noise reduced/backlash reduced/high power							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face/cross hole							

maxon Modular System		Page	Dimensions	M 1:1
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]			
DCX 16 S	3-4	78-79		
DCX 16 L	3-4	80-81		
DCX 19 S	1-2 [3-4]	82-83		
DC-max 16 S	3-4	94-95		
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]			
ECX SPEED 16 M	3-4	176-179		
ECX SPEED 16 L	3-4	180-183		
ECX SPEED 19 M	1-2 [3-4]	184-187		
ECX SPEED 19 L	1-2 [3-4]	188-191		

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

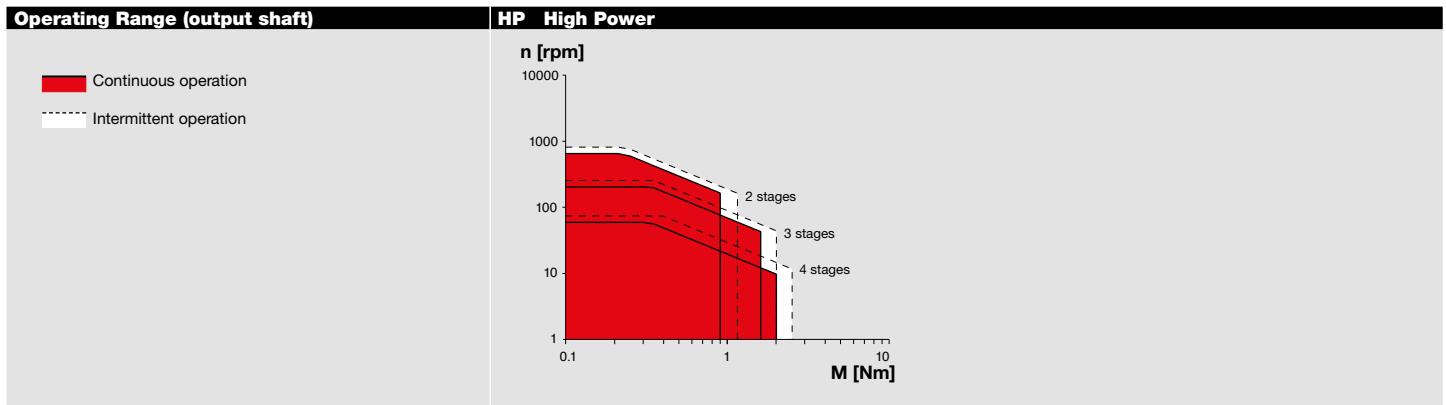
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# GPX 19

## Planetary Gearhead Ø19 mm



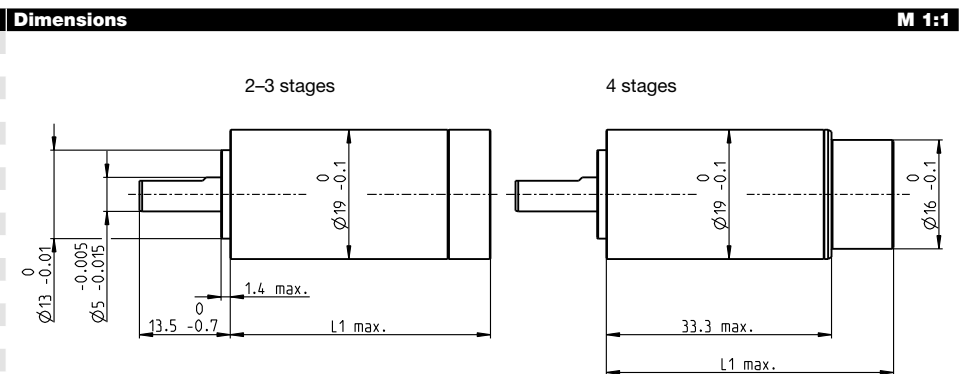
Key Data		HP High Power
Max. transmittable power	W	15
Max. continuous torque	Nm	2
Max. continuous input speed	rpm	14 000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



Specifications		HP High Power		
		2	3	4
Number of stages		2	3	4
Max. transmittable power (continuous)	W	15.0	7.0	2.0
Max. transmittable power (intermittent)	W	19.0	9.0	3.0
Max. continuous torque	Nm	0.90	1.60	2.00
Max. intermittent torque	Nm	1.15	2.00	2.50
Max. continuous input speed	rpm	10000	12000	14000
Max. intermittent input speed	rpm	12500	15000	17500
Max. efficiency	%	75	65	55
Average backlash no load	°	1.15	1.25	1.35
Max. axial load (dynamic)	N	40	40	40
Max. radial load, 5 mm from flange	N	100	120	120
Gearhead length L1 <sup>1</sup>	mm	30.8	37.0	41.0
Weight	g	51	61	63

Configuration		HP High Power		
		2	3	4
Number of stages		2	3	4
Reduction	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face/cross hole		

maxon Modular System		Page
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]	
DCX 16 S	4	78–79
DCX 16 L	4	80–81
DCX 19 S	2–3 [4]	82–83
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]	
ECX SPEED 16 M	4	176–179
ECX SPEED 16 L	4	180–183
ECX SPEED 19 M	2–3 [4]	184–187
ECX SPEED 19 L	2–3 [4]	188–191



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.



# GPX 19 SPEED

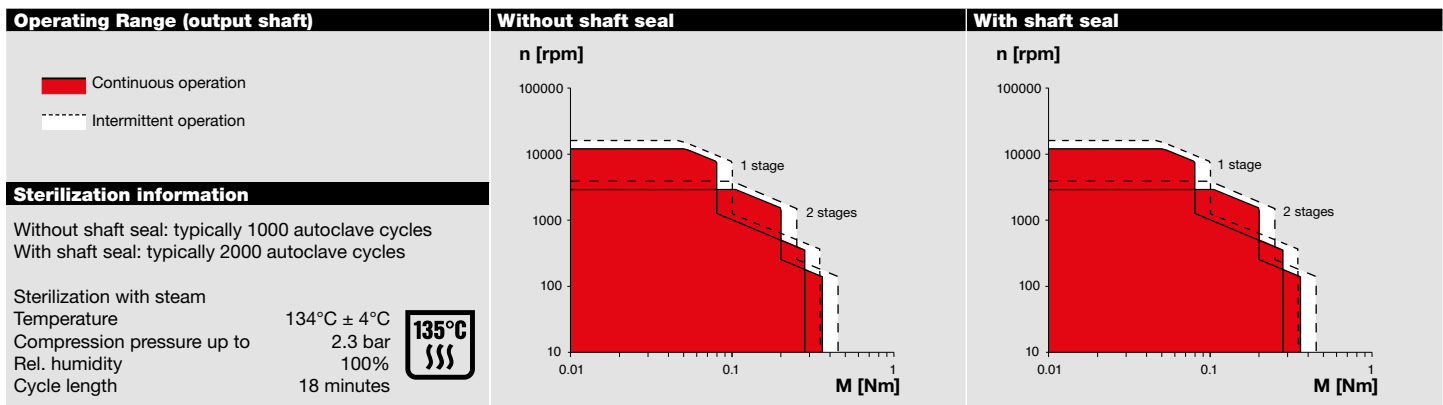
## Planetary Gearhead Ø19 mm

Sterilizable



maxon GPX

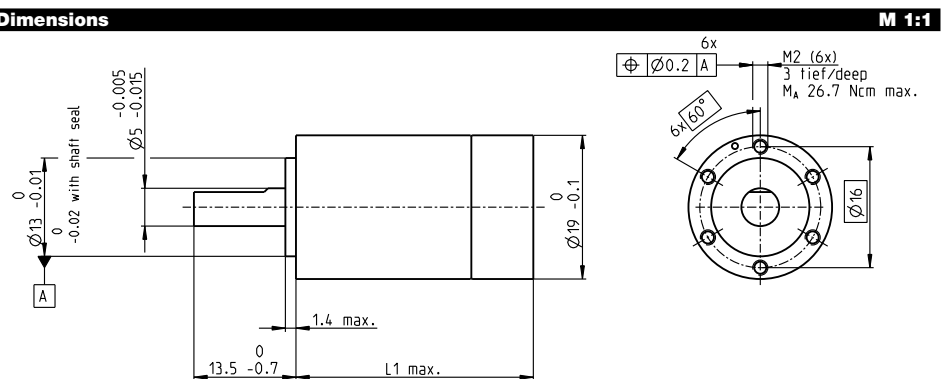
Key Data		Without shaft seal*	With shaft seal*
Max. transmittable power	W	62 (10.4)	62 (10.4)
Max. continuous torque	Nm	0.2 (0.36)	0.2 (0.36)
Max. continuous input speed	rpm	45000	45000
Ambient temperature	°C	-10 ... +135	-10 ... +135
Bearing at output		Ball bearing	Ball bearing



Specifications		Without shaft seal*		With shaft seal*	
		1	2	1	2
Number of stages					
Max. transmittable continuous power	W	62 (10.4)	31 (5.2)	62 (10.4)	31 (5.2)
Max. transmittable intermittent power	W	77 (13)	38 (6.5)	77 (13)	38 (6.5)
Max. continuous torque	Nm	0.08 (0.28)	0.2 (0.36)	0.08 (0.28)	0.2 (0.36)
Max. intermittent torque	Nm	0.1 (0.35)	0.25 (0.45)	0.1 (0.35)	0.25 (0.45)
Max. continuous input speed	rpm	45000	45000	45000	45000
Max. intermittent input speed	rpm	60000	60000	60000	60000
Max. efficiency	%	85	80	85	80
Average backlash no load	°	1.4	1.6	1.4	1.6
Max. axial load (dynamic)	N	40.0	40.0	40.0	40.0
Max. radial load, 5 mm from flange	N	50.0	85.0	35.0	55.0
Gearhead length L1 <sup>1</sup>	mm	31.4	40.3	39.20	48.10
Weight	g	41	54	56	69

Configuration		Without shaft seal		With shaft seal	
		1	2	1	2
Number of stages					
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44
Version		Without shaft seal/With shaft seal			
Flange		Standard flange			
Shaft		Length/flat face/cross hole			

maxon Modular System	Page	Dimensions
maxon EC motor	N <sub>e</sub> of stages [opt.]	
ECX SPEED 19 M	1-2	184-187
ECX SPEED 19 L	1-2	188-191



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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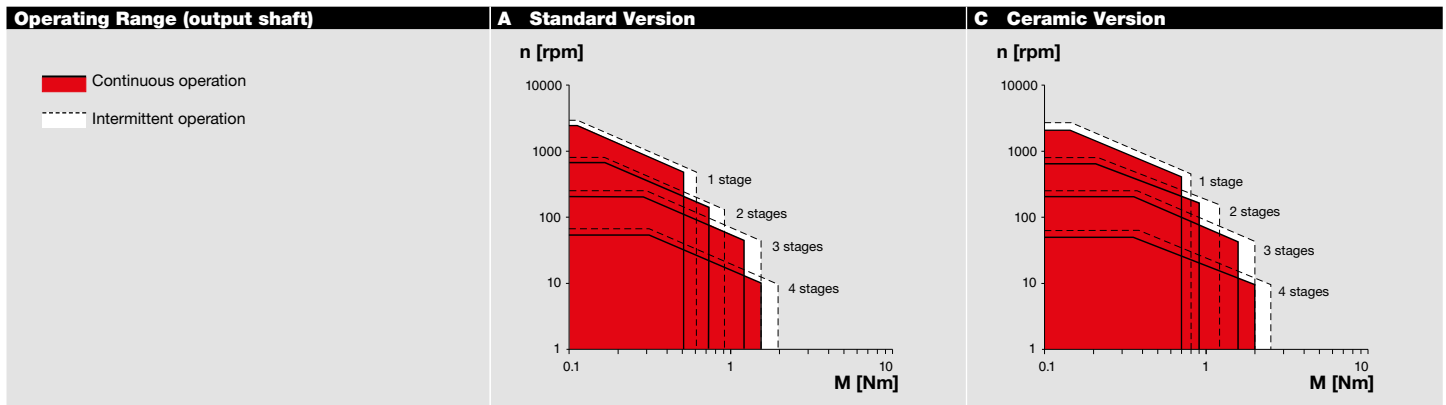
\*Values in parentheses apply in case of reduced speed (according to diagram).

# GPX 22

## Planetary Gearhead Ø22 mm



Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 24	30
Max. continuous torque	Nm 1.5	2
Max. continuous input speed	rpm 12000	12000
Ambient temperature	°C -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing

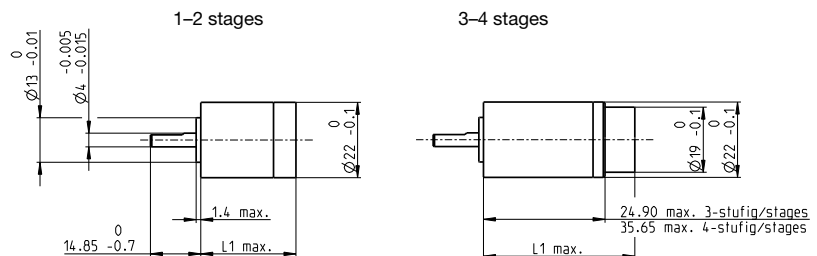


Specifications	A Standard Version	C Ceramic Version
Number of stages	1 2 3 4	1 2 3 4
Max. transmittable power (continuous)	W 24.0 12.0 6.0 1.6	30.0 15.0 7.0 2.0
Max. transmittable power (intermittent)	W 30.0 15.0 7.5 2.0	38.0 19.0 9.0 2.5
Max. continuous torque	Nm 0.50 0.70 1.20 1.50	0.70 0.90 1.60 2.00
Max. intermittent torque	Nm 0.60 0.90 1.50 1.90	0.80 1.20 2.00 2.50
Max. continuous input speed	rpm 8000 10000 12000 12000	8000 10000 12000 12000
Max. intermittent input speed	rpm 10000 12500 15000 15000	10000 12500 15000 15000
Max. efficiency	% 90 81 74 66	90 81 74 66
Average backlash no load	° 0.85 1.05 1.2 1.35	0.85 1.05 1.2 1.35
Max. axial load (dynamic)	N 40 40 40 40	40 40 40 40
Max. radial load, 10 mm from flange	N 65 100 120 120	65 100 120 120
Gearhead length L1 <sup>1</sup>	mm 19.9 26.4 32.2 43.0	19.9 26.4 32.2 43.0
Weight	g 45 58 67 89	45 58 67 89

Configuration	A Standard Version	C Ceramic Version	
Number of stages	1 2 3 4	1 2 3 4	
Reduction	X:1 3.9, 5.3, 6.6 16, 21, 26, 28, 35, 44 62, 83, 103, 111, 138, 150, 172, 186, 231 243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6 16, 21, 26, 28, 35, 44 62, 83, 103, 111, 138, 150, 172, 186, 231 243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	
Version	Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance		
Flange	Standard flange/configurable flange		
Shaft	Length/flat face/cross hole		

maxon Modular System	Page
<b>maxon DC motor</b> № of stages [opt.]	
DCX 19 S	3-4 82-83
DCX 22 S	1-2 [3-4] 84-85
DCX 22 L	1-2 [3-4] 86-87
DC-max 22 S*	1-2 [3-4] 96-97

maxon EC motor	№ of stages [opt.]	Page
ECX SPEED 19 M	3-4	184-187
ECX SPEED 19 L	3-4	188-191
ECX SPEED 22 M	1-2 [3-4]	192-195
ECX SPEED 22 L	1-2 [3-4]	196-199



\*Limited selection of reduction ratios (see online).

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

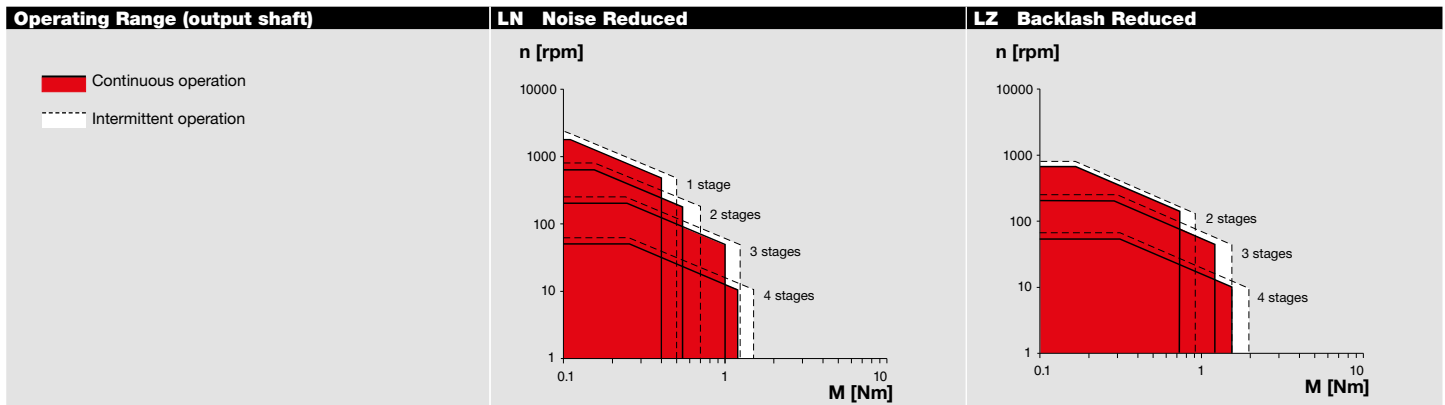
# GPX 22

## Planetary Gearhead Ø22 mm



maxon GPX

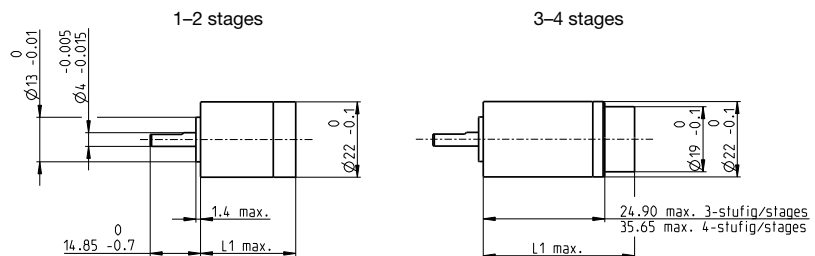
Key Data		LN Noise Reduced		LZ Backlash Reduced	
Max. transmittable power	W	20		12	
Max. continuous torque	Nm	1.2		1.5	
Max. continuous input speed	rpm	12000		12000	
Ambient temperature	°C	-40 ... +85		-40 ... +100	
Bearing at output		Ball bearing		Ball bearing	
Typical noise level	dBA	-5 dBA compared to standard configuration			



Specifications	LN Noise Reduced				LZ Backlash Reduced			
	1	2	3	4	2	3	4	
Number of stages								
Max. transmittable power (continuous)	W	20.0	10.0	5.0	1.3	12.0	6.0	1.6
Max. transmittable power (intermittent)	W	25.0	13.0	6.3	1.6	15.0	7.5	2.0
Max. continuous torque	Nm	0.40	0.55	1.00	1.20	0.70	1.20	1.50
Max. intermittent torque	Nm	0.50	0.70	1.25	1.50	0.90	1.50	1.90
Max. continuous input speed	rpm	8000	10000	12000	12000	10000	12000	12000
Max. intermittent input speed	rpm	10000	12500	15000	15000	12500	15000	15000
Max. efficiency	%	90	81	74	66	81	74	66
Average backlash no load	°	0.85	1.05	1.20	1.35	0.85	1.05	1.2
Max. axial load (dynamic)	N	40	40	40	40	40	40	40
Max. radial load, 10 mm from flange	N	65	100	120	120	100	120	120
Gearhead length L1 <sup>1</sup>	mm	19.9	26.4	32.2	43.0	26.4	32.2	43.0
Weight	g	45	58	67	89	58	67	89

Configuration	LN Noise Reduced				LZ Backlash Reduced			
	1	2	3	4	2	3	4	
Number of stages								
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version	Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance							
Flange	Standard flange/configurable flange							
Shaft	Length/flat face/cross hole							

maxon Modular System		Page	Dimensions	M 1:2
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]			
DCX 19 S	3-4	82-83		
DCX 22 S	1-2 [3-4]	84-85		
DCX 22 L	1-2 [3-4]	86-87		
DC-max 22 S*	1-2 [3-4]	96-97		
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]			
ECX SPEED 19 M	3-4	184-187		
ECX SPEED 19 L	3-4	188-191		
ECX SPEED 22 M	1-2 [3-4]	192-195		
ECX SPEED 22 L	1-2 [3-4]	196-199		



\*Limited selection of reduction ratios (see online).

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

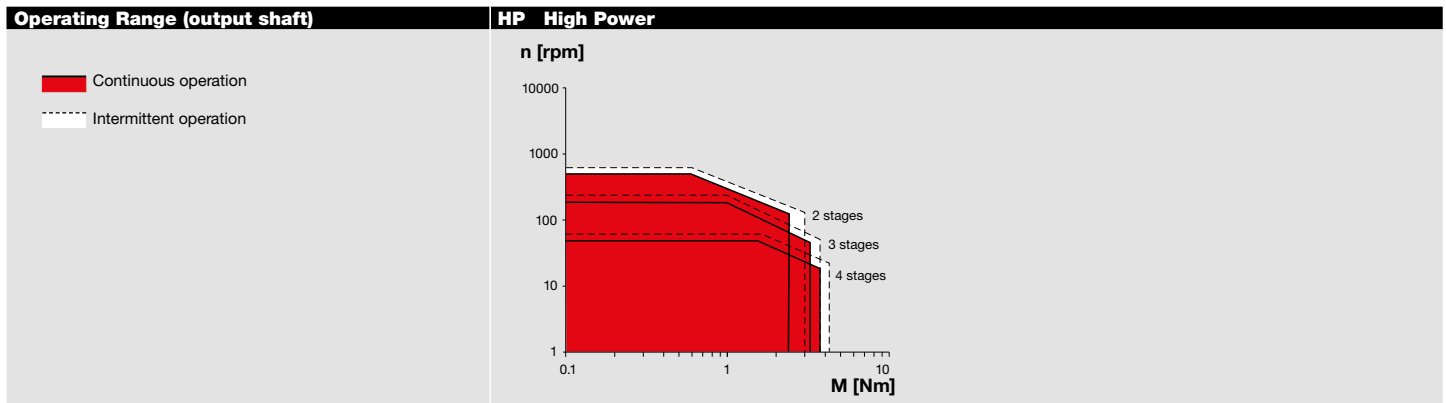
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# GPX 22

## Planetary Gearhead Ø22 mm



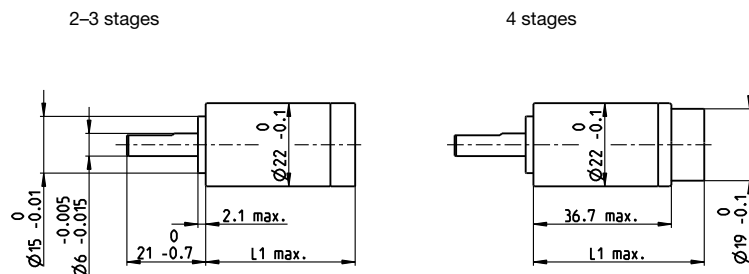
Key Data		HP High Power
Max. transmittable power	W	30
Max. continuous torque	Nm	3.7
Max. continuous input speed	rpm	12000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



Specifications	HP High Power			
		2	3	4
Number of stages		2	3	4
Max. transmittable power (continuous)	W	30.0	15.0	8.0
Max. transmittable power (intermittent)	W	40.0	20.0	10.0
Max. continuous torque	Nm	2.40	3.30	3.70
Max. intermittent torque	Nm	3.00	3.80	4.20
Max. continuous input speed	rpm	8000	10000	12000
Max. intermittent input speed	rpm	10000	12500	15000
Max. efficiency	%	75	65	55
Average backlash no load	°	1.05	1.2	1.35
Max. axial load (dynamic)	N	80	80	80
Max. radial load, 10 mm from flange	N	145	150	150
Gearhead length L1 <sup>1</sup>	mm	31.7	38.2	44.0
Weight	g	73	86	95

Configuration	HP High Power			
		2	3	4
Number of stages		2	3	4
Reduction	X:1	16, 21, 26, 28, 35, 44	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance		
Flange		Standard flange		
Shaft		Length/flat face/cross hole		

maxon Modular System	Page	Dimensions
<b>maxon DC motor</b> № of stages [opt.]		
DCX 19 S	4	82-83
DCX 22 S	2-3 [4]	84-85
DCX 22 L	2-3 [4]	86-87
<b>maxon EC motor</b> № of stages [opt.]		
ECX SPEED 19 M	4	184-187
ECX SPEED 19 L	4	188-191
ECX SPEED 22 M	2-3 [4]	192-195
ECX SPEED 22 L	2-3 [4]	196-199



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

# GPX 22

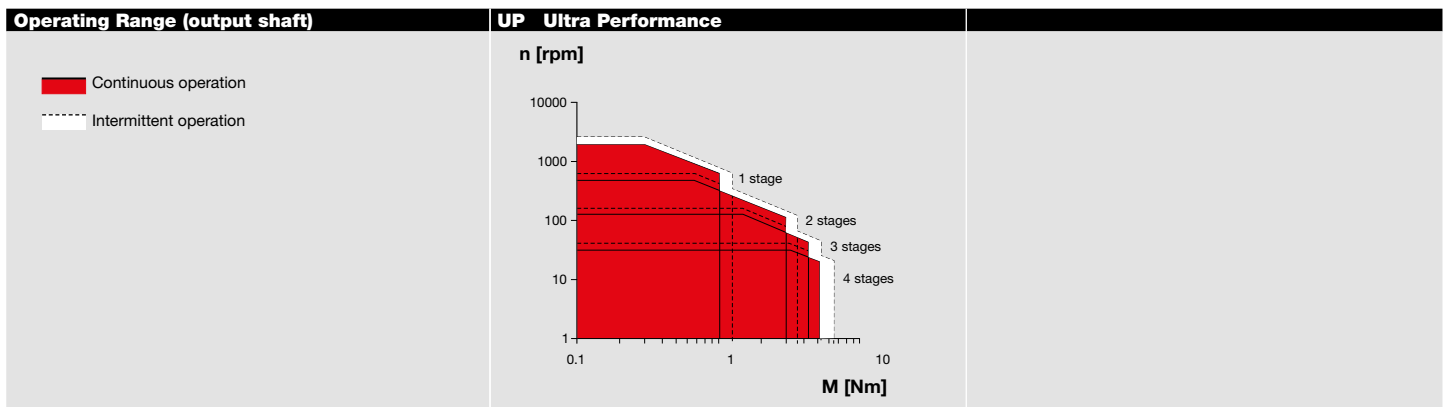
## Planetary Gearhead Ø22 mm

**NEW**



maxon GPX

Key Data	UP Ultra Performance
Max. transmittable power	W 66
Max. continuous torque	Nm 5.2
Max. continuous input speed	rpm 8000
Ambient temperature	°C -40 ... +100
Bearing at output	Ball bearing



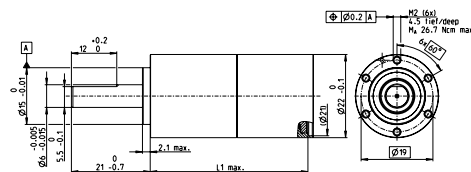
Specifications	UP Ultra Performance	1	2	3	4
Number of stages		1	2	3	4
Max. transmittable continuous power	W	66.0	36.0	20.0	11.0
Max. transmittable intermittent power	W	82.5	45.0	25.0	14.0
Max. continuous torque	Nm	1.00	2.90	4.30	5.20
Max. intermittent torque	Nm	1.25	3.60	5.30	6.50
Max. continuous input speed	rpm	8000	8000	8000	8000
Max. intermittent input speed	rpm	10000	10000	10000	10000
Max. efficiency	%	96	93	90	87
Average backlash no load	°	0.4	0.5	0.6	0.7
Max. axial load (dynamic)	N	80	80	80	80
Max. radial load, 10 mm from flange	N	100	145	150	150
Gearhead length L <sup>1</sup>	mm	22.0	32.0	42.0	52.0
Weight	g	49	69	87	106

Configuration	UP Ultra Performance	1	2	3	4
Number of stages		1	2	3	4
Reduction	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance			
Flange		Standard flange			
Shaft		Length/flat face/cross hole			

maxon Modular System	Page	Dimensions	M 1:2
maxon DC motor	N <sub>e</sub> of stages [opt.]		
DCX 22 S	1-4	84-85	
DCX 22 L	1-4	86-87	

maxon EC motor		
ECX SPEED 22 M	1-4	192-195
ECX SPEED 22 L	1-4	196-199

1-2 stages



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

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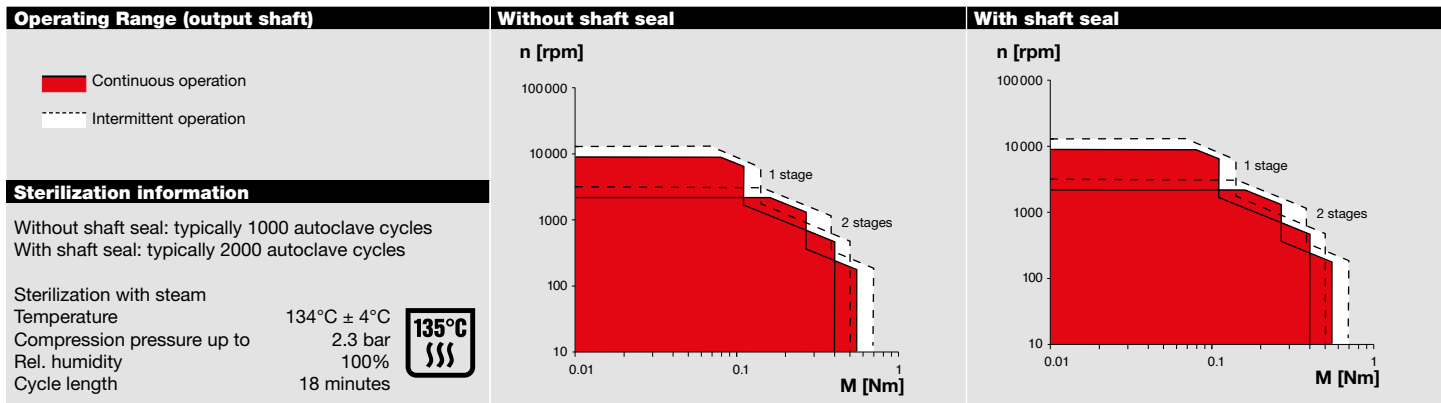
# GPX 22 SPEED

## Planetary Gearhead Ø22 mm

Sterilizable



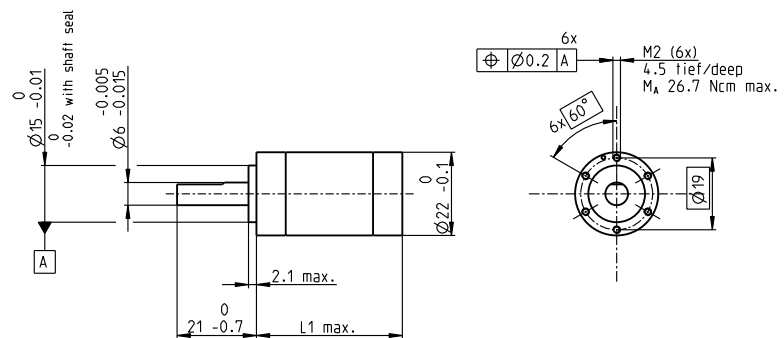
Key Data	Without shaft seal	With shaft seal
Max. transmittable power	W 74 (20)	74 (20)
Max. continuous torque	Nm 0.27 (0.55)	0.27 (0.55)
Max. continuous input speed	rpm 35000	35000
Ambient temperature	°C -10 ... +135	-10 ... +135
Bearing at output	Ball bearing	Ball bearing



Specifications	Without shaft seal*		With shaft seal*	
Number of stages	1	2	1	2
Max. transmittable continuous power	W 74 (20)	37 (10)	74 (20)	37 (10)
Max. transmittable intermittent power	W 92 (25)	46 (13)	92 (25)	46 (13)
Max. continuous torque	Nm 0.11 (0.4)	0.27 (0.55)	0.11 (0.4)	0.27 (0.55)
Max. intermittent torque	Nm 0.14 (0.5)	0.38 (0.7)	0.14 (0.5)	0.38 (0.7)
Max. continuous input speed	rpm 35000	35000	35000	35000
Max. intermittent input speed	rpm 50000	50000	50000	50000
Max. efficiency	% 85	80	85	80
Average backlash no load	° 1.4	1.6	1.4	1.6
Max. axial load (dynamic)	N 80.0	80.0	80.0	80.0
Max. radial load, 10 mm from flange	N 45.0	75.0	30.0	50.0
Gearhead length L1 <sup>1</sup>	mm 30.8	40.9	38.6	48.6
Weight	g 65	86	85	106

Configuration	Without shaft seal		With shaft seal	
Number of stages	1	2	1	2
Reduction	X:1 3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44	3.9, 5.3, 6.6	16, 21, 26, 28, 35, 44
Version	Without shaft seal/With shaft seal			
Flange	Standard flange			
Shaft	Length/flat face/cross hole			

maxon Modular System	Page	Dimensions
maxon EC motor	№ of stages [opt.]	
ECX SPEED 22 M	1-2	192-195
ECX SPEED 22 L	1-2	196-199



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

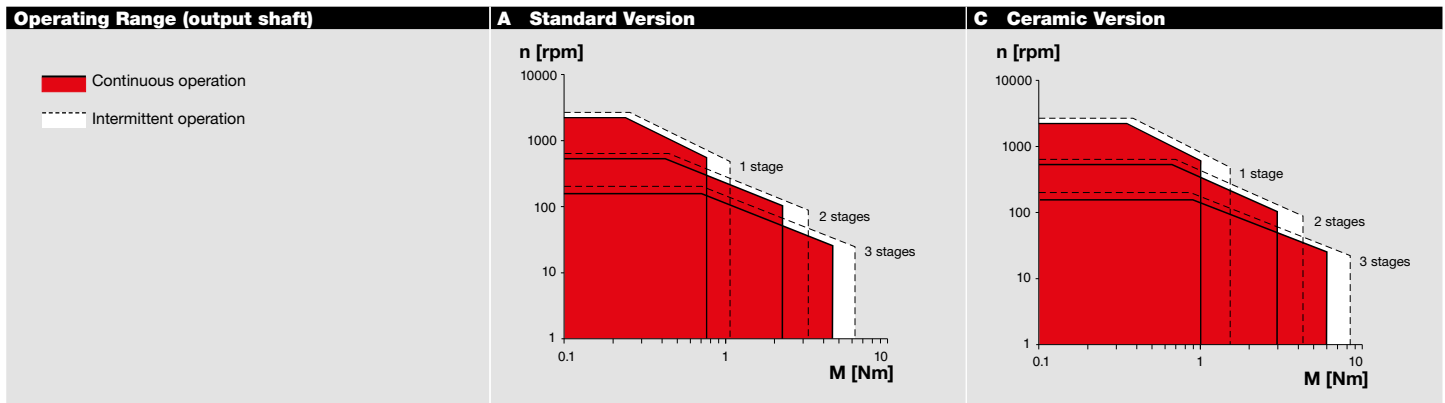
# GPX 26

## Planetary Gearhead Ø26 mm



maxon GPX

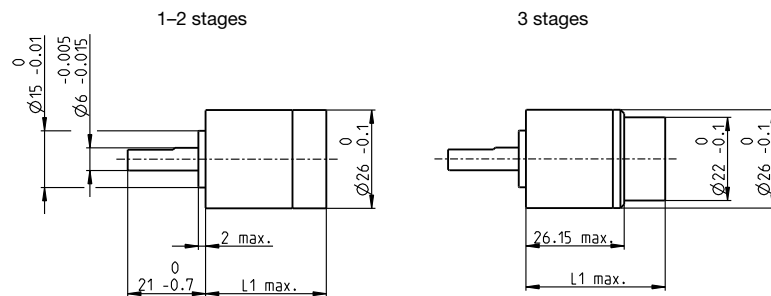
Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 48	55
Max. continuous torque	Nm 2.25	3.0
Max. continuous input speed	rpm 8000	8000
Ambient temperature	°C -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing



Specifications	A Standard Version			C Ceramic Version		
Number of stages	1	2	3	1	2	3
Max. transmittable continuous power	W 48	24	12.0	55	30	15.0
Max. transmittable intermittent power	W 60	30	15.0	70	35	18.0
Max. continuous torque	Nm 0.75	2.25	4.50	1.00	2.60	5.00
Max. intermittent torque	Nm 1.10	3.20	6.20	1.50	3.40	6.30
Max. continuous input speed	rpm 7000	8000	10000	7000	8000	10000
Max. intermittent input speed	rpm 8750	10000	12500	8750	10000	12500
Max. efficiency	% 90	78	75	90	78	75
Average backlash no load	° 0.75	0.95	1.1	0.75	0.95	1.1
Max. axial load (dynamic)	N 80	80	80	80	80	80
Max. radial load, 10 mm from flange	N 95	145	150	95	145	150
Gearhead length L1 <sup>1</sup>	mm 21.3	30.2	35.5	21.3	30.2	35.5
Weight	g 75	95	105	75	95	105

Configuration	A Standard Version			C Ceramic Version		
Number of stages	1	2	3	1	2	3
Reduction	X:1 3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231
Version	Standard/ceramic version/noise reduced/reduced backlash					
Flange	Standard flange/configurable flange					
Shaft	Length/flat face/cross hole					

maxon Modular System		Page	Dimensions	M 1:2
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]			
DCX 22 S	3	84-85		
DCX 22 L	3	86-87		
DCX 26 L	1-2 [3]	88-89		
DC-max 22 S*	3	96-97		
DC-max 26 S*	1-2 [3]	98-99		
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]			
ECX SPEED 22 M	3	192-195		
ECX SPEED 22 L	3	196-199		



\*Limited selection of reduction ratios (see online).

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

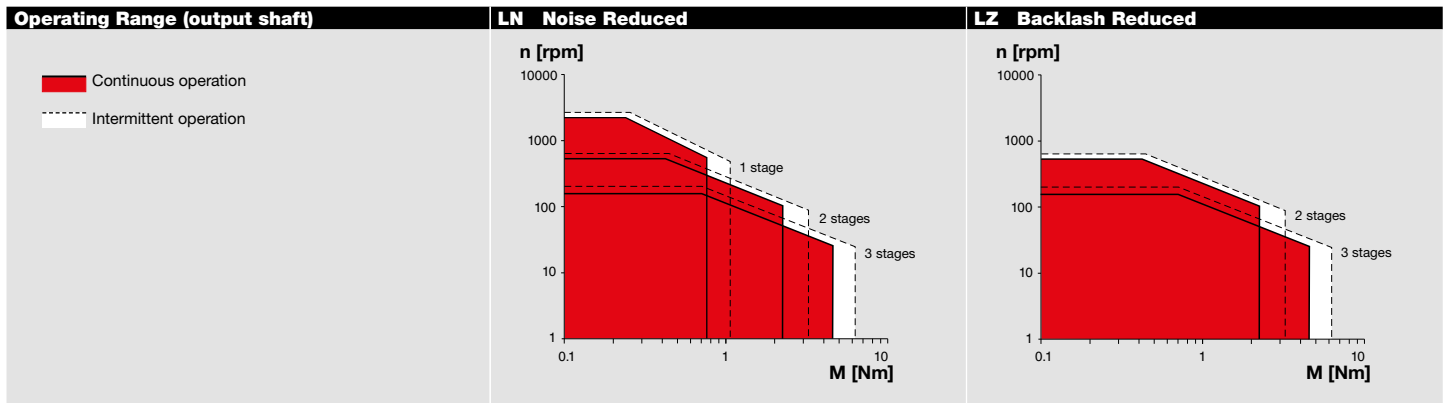
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# GPX 26

## Planetary Gearhead Ø26 mm



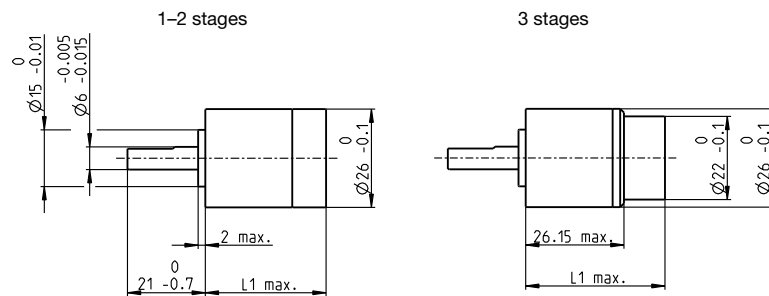
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	38	24
Max. continuous torque	Nm	1.8	2.3
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	



Specifications	LN Noise Reduced			LZ Backlash Reduced	
Number of stages	1	2	3	2	3
Max. transmittable continuous power	W	38	19	24	12.0
Max. transmittable intermittent power	W	48	24	30	15.0
Max. continuous torque	Nm	0.60	1.80	2.25	4.50
Max. intermittent torque	Nm	0.75	2.25	3.20	6.20
Max. continuous input speed	rpm	7000	8000	8000	10000
Max. intermittent input speed	rpm	8750	10000	10000	12500
Max. efficiency	%	90	78	78	75
Average backlash no load	°	0.75	0.95	0.85	0.9
Max. axial load (dynamic)	N	80	80	80	80
Max. radial load, 10 mm from flange	N	95	145	145	150
Gearhead length L1 <sup>1</sup>	mm	21.3	30.2	30.2	35.5
Weight	g	75	95	95	105

Configuration	LN Noise Reduced			LZ Backlash Reduced	
Number of stages	1	2	3	2	3
Reduction	X:1	3.9, 5.3	16, 21, 26, 28, 35	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231
Version	Standard/ceramic version/noise reduced/backlash reduced/high power				
Flange	Standard flange/configurable flange				
Shaft	Length/flat face/cross hole				

maxon Modular System		Page	Dimensions	M 1:2
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]			
DCX 22 S	3	84-85		
DCX 22 L	3	86-87		
DCX 26 L	1-2 [3]	88-89		
DC-max 22 S*	3	96-97		
DC-max 26 S*	1-2 [3]	98-99		
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]			
ECX SPEED 22 M	3	192-195		
ECX SPEED 22 L	3	196-199		



\*Limited selection of reduction ratios (see online).

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.



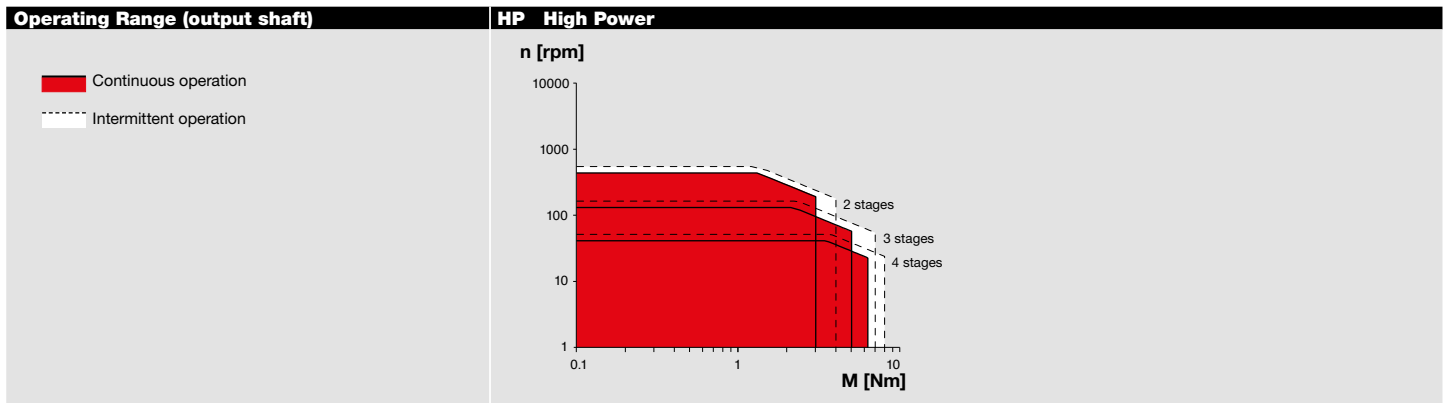
# GPX 26

## Planetary Gearhead Ø26 mm



maxon GPX

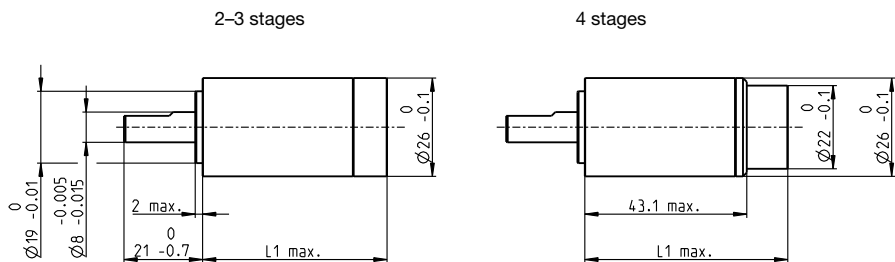
Key Data		HP High Power
Max. transmittable power	W	60
Max. continuous torque	Nm	6.3
Max. continuous input speed	rpm	10000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



Specifications	HP High Power	2	3	4
Number of stages		2	3	4
Max. transmittable power (continuous)	W	60	30	15
Max. transmittable power (intermittent)	W	75	40	20
Max. continuous torque	Nm	3.0	5.0	6.3
Max. intermittent torque	Nm	4.0	7.0	8.0
Max. continuous input speed	rpm	7000	8000	10000
Max. intermittent input speed	rpm	8750	10000	12500
Max. efficiency	%	75	65	55
Average backlash no load	°	0.95	1.1	1.3
Max. axial load (dynamic)	N	110	110	110
Max. radial load, 10 mm from flange	N	180	180	180
Gearhead length L1 <sup>1</sup>	mm	38.2	47.1	52.4
Weight	g	122	144	153

Configuration	HP High Power	2	3	4
Number of stages		2	3	4
Reduction	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power		
Flange		Standard flange		
Shaft		Length/flat face/cross hole		

maxon Modular System		Page	Dimensions	M 1:2
<b>maxon DC motor</b>	N <sub>e</sub> of stages [opt.]			
DCX 22 S	4	84–85		
DCX 22 L	4	86–87		
DCX 26 L	2–3 [4]	88–89		
<b>maxon EC motor</b>	N <sub>e</sub> of stages [opt.]			
ECX SPEED 22 M	4	192–195		
ECX SPEED 22 L	4	196–199		



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

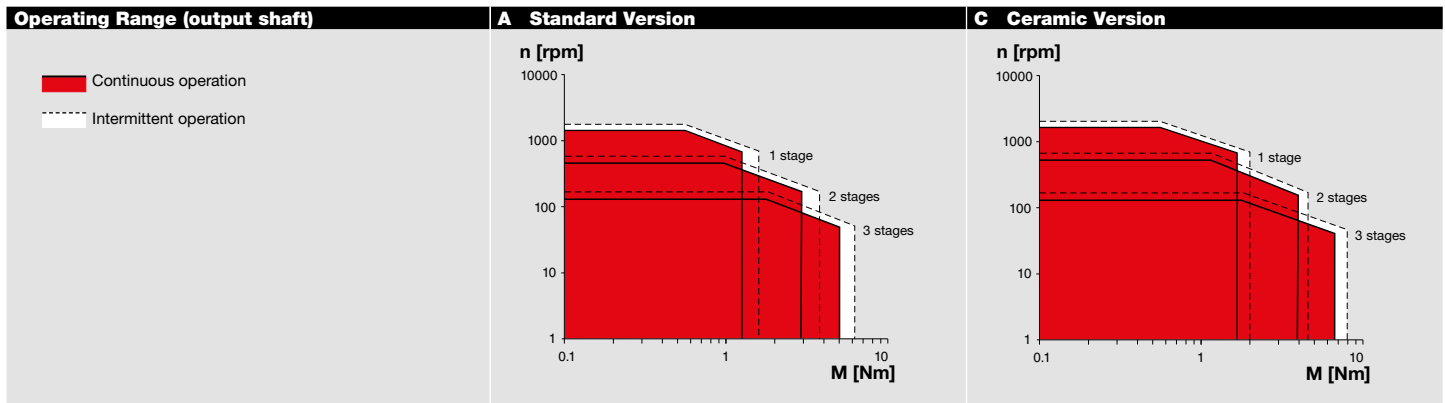
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# GPX 32

## Planetary Gearhead Ø32 mm



Key Data		A Standard Version	C Ceramic Version
Max. transmittable power	W	100	120
Max. continuous torque	Nm	5	6.6
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

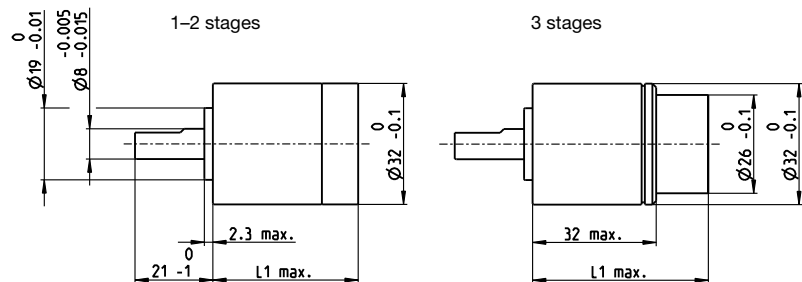


Specifications	A Standard Version			C Ceramic Version			
Number of stages	1	2	3	1	2	3	
Max. transmittable continuous power	W	100	50	25	120	60	30
Max. transmittable intermittent power	W	125	62	31	150	75	37
Max. continuous torque	Nm	1.25	2.90	5.00	1.60	3.80	6.60
Max. intermittent torque	Nm	1.60	3.60	6.25	2.00	4.50	8.00
Max. continuous input speed	rpm	6000	7000	8000	6000	7000	8000
Max. intermittent input speed	rpm	7500	8750	10000	7500	8750	10000
Max. efficiency	%	90	78	75	90	78	75
Average backlash no load	°	0.55	0.7	0.9	0.55	0.7	0.9
Max. axial load (dynamic)	N	110	110	110	110	110	110
Max. radial load, 10 mm from flange	N	160	180	180	160	180	180
Gearhead length L1 <sup>1</sup>	mm	26.7	36.3	43.9	26.7	36.3	43.9
Weight	g	140	185	230	140	185	230

Configuration	A Standard Version			C Ceramic Version			
Number of stages	1	2	3	1	2	3	
Reduction	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231
Version	Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance						
Flange	Standard flange/configurable flange						
Shaft	Length/flat face/cross hole						

maxon Modular System	Page
maxon DC motor	N <sub>e</sub> of stages [opt.]
DCX 26 L	3 88-89
DCX 32 L	1-2 [3] 90
DC-max 26 S*	3 98-99

### Dimensions M 1:2



\*Limited selection of reduction ratios (see online).

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

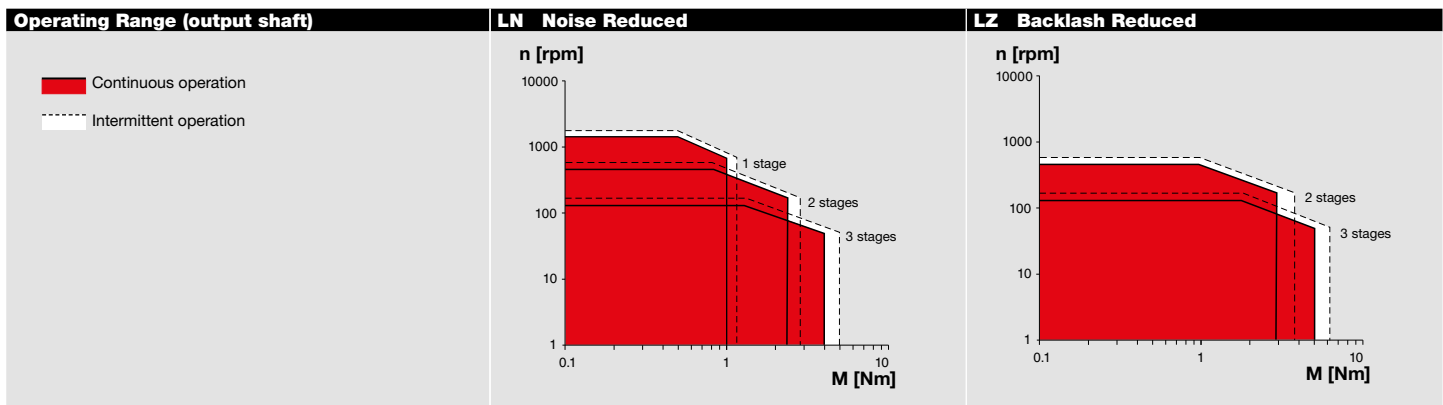
# GPX 32

## Planetary Gearhead Ø32 mm



maxon GPX

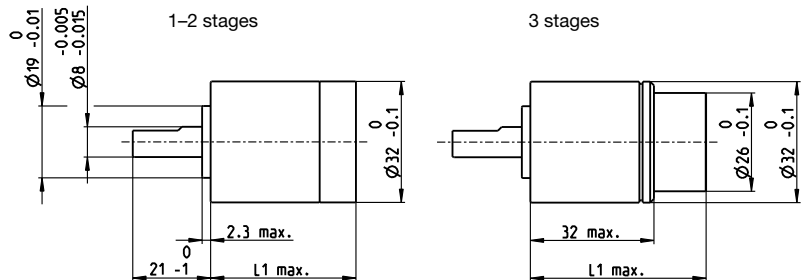
Key Data		LN Noise Reduced		LZ Backlash Reduced	
Max. transmittable power	W	80		50	
Max. continuous torque	Nm	4		5	
Max. continuous input speed	rpm	8000		8000	
Ambient temperature	°C	-40 ... +100		-40 ... +100	
Bearing at output		Ball bearing		Ball bearing	
Typical noise level	dBA	-5 dBA compared to standard configuration			



Specifications	LN Noise Reduced			LZ Backlash Reduced	
Number of stages	1	2	3	2	3
Max. transmittable continuous power	W	80	40	20	25
Max. transmittable intermittent power	W	100	50	25	31
Max. continuous torque	Nm	1.00	2.30	4.00	2.90
Max. intermittent torque	Nm	1.30	2.90	5.00	3.60
Max. continuous input speed	rpm	6000	7000	8000	7000
Max. intermittent input speed	rpm	7500	8750	10000	8750
Max. efficiency	%	90	78	75	78
Average backlash no load	°	0.55	0.7	0.9	0.55
Max. axial load (dynamic)	N	110	110	110	110
Max. radial load, 10 mm from flange	N	160	180	180	180
Gearhead length L1 <sup>1</sup>	mm	26.7	36.3	43.9	36.3
Weight	g	140	185	230	185

Configuration	LN Noise Reduced			LZ Backlash Reduced		
Number of stages	1	2	3	2	3	
Reduction	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231
Version	Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance					
Flange	Standard flange/configurable flange					
Shaft	Length/flat face/cross hole					

maxon Modular System		Page	Dimensions	M 1:2
maxon DC motor	N <sub>e</sub> of stages [opt.]			
DCX 26 L	3	88-89		
DCX 32 L	1-2 [3]	90		
DC-max 26 S*	3	98-99		



\*Limited selection of reduction ratios (see online).

<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

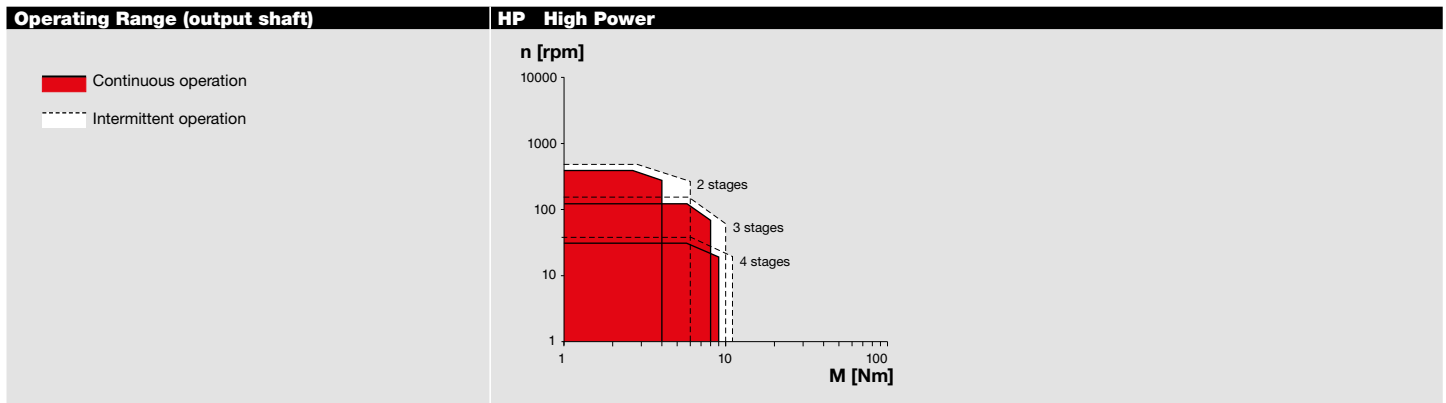
[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

# GPX 32

## Planetary Gearhead Ø32 mm



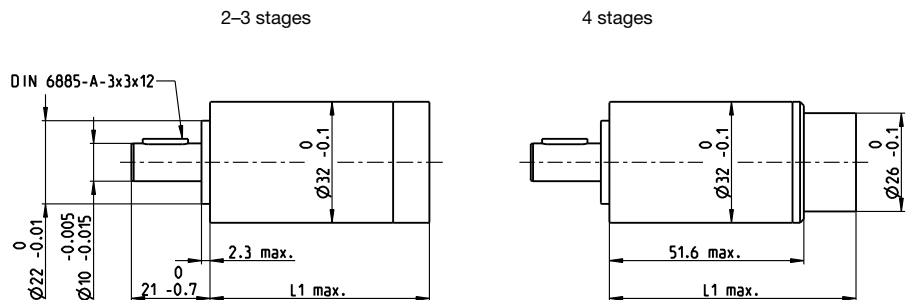
Key Data		HP High Power
Max. transmittable power	W	110
Max. continuous torque	Nm	9
Max. continuous input speed	rpm	8000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



Specifications		HP High Power			
		2	3	4	
Number of stages		2	3	4	
Max. transmittable power (continuous)	W	110	55	18	
Max. transmittable power (intermittent)	W	140	70	25	
Max. continuous torque	Nm	4.00	8.00	9.00	
Max. intermittent torque	Nm	6.00	10.00	12.00	
Max. continuous input speed	rpm	6000	7000	8000	
Max. intermittent input speed	rpm	7500	8750	10000	
Max. efficiency	%	76	65	55	
Average backlash no load	°	0.7	0.9	1.1	
Max. axial load (dynamic)	N	110	110	110	
Max. radial load, 10 mm from flange	N	200	250	250	
Gearhead length L <sup>1</sup>	mm	46.3	55.9	63.5	
Weight	g	200	220	250	

Configuration		HP High Power			
		2	3	4	
Number of stages		2	3	4	
Reduction	X:1	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance			
Flange		Standard flange			
Shaft		Length/flat face/feather key			

maxon Modular System		Page	Dimensions	M 1:2
maxon DC motor	N <sub>e</sub> of stages [opt.]			
DCX 26 L	4	88-89		
DCX 32 L	2-3 [4]	90		



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

# GPX 32

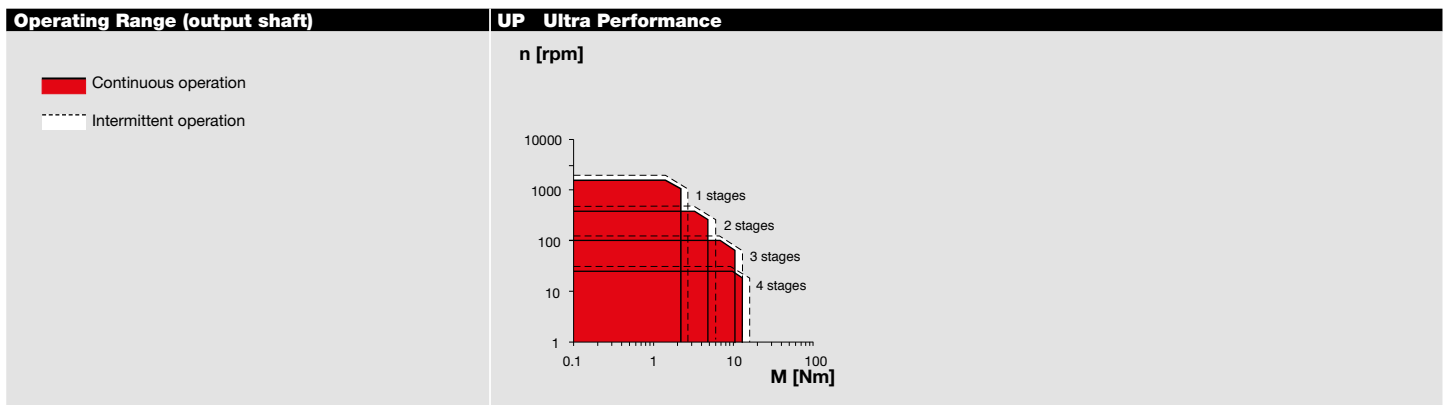
## Planetary Gearhead Ø32 mm

**NEW**



maxon GPX

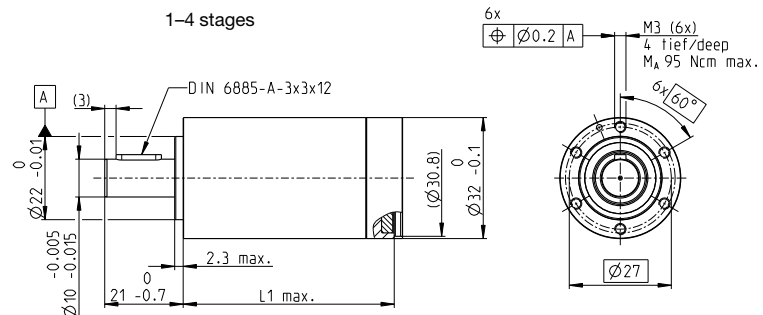
Key Data	UP Ultra Performance
Max. transmittable power	W 242
Max. continuous torque	Nm 12.6
Max. continuous input speed	rpm 6000
Ambient temperature	°C -40 ... +100
Bearing at output	Ball bearing



Specifications	UP Ultra Performance	1	2	3	4
Number of stages		1	2	3	4
Max. transmittable continuous power	W	242	130	70	25
Max. transmittable intermittent power	W	300	160	85	30
Max. continuous torque	Nm	2.20	4.80	10.40	12.60
Max. intermittent torque	Nm	2.70	6.00	13.00	16.00
Max. continuous input speed	rpm	6000	6000	6000	6000
Max. intermittent input speed	rpm	7500	7500	7500	7500
Max. efficiency	%	96	93	90	87
Average backlash no load	°	0.3	0.4	0.5	0.6
Max. axial load (dynamic)	N	110	110	110	110
Max. radial load, 10 mm from flange	N	150	200	250	250
Gearhead length L <sup>1</sup>	mm	32.0	47.0	62.0	77.0
Weight	g	167	231	287	350

Configuration	UP Ultra Performance	1	2	3	4
Number of stages		1	2	3	4
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/backlash reduced/high power/ultra performance			
Flange		Standard flange			
Shaft		Length/flat face/feather key			

maxon Modular System	Page	Dimensions	M 1:2
maxon DC motor	N <sub>e</sub> of stages [opt.]		
DCX 32 L	1-4	90	



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

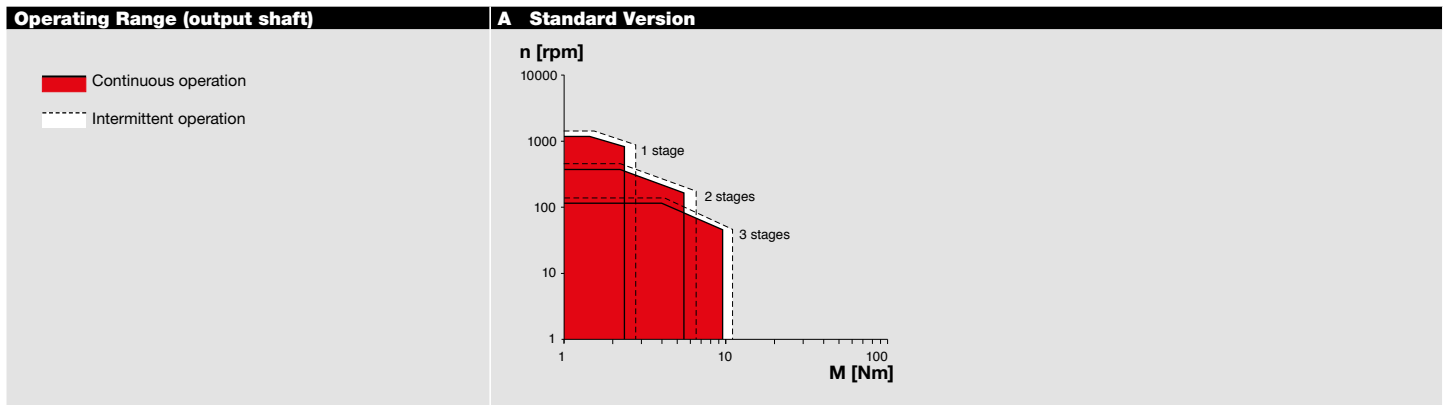
[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

# GPX 37

## Planetary Gearhead Ø37 mm



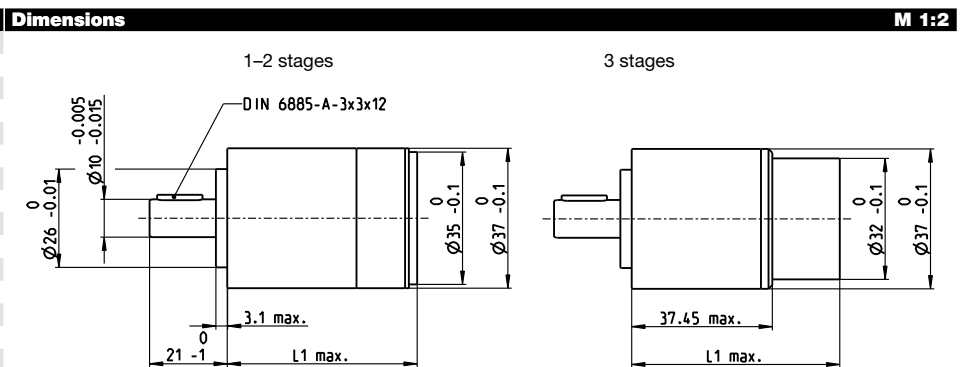
Key Data		A Standard Version	
Max. transmittable power	W	185	
Max. continuous torque	Nm	9.3	
Max. continuous input speed	rpm	7000	
Ambient temperature	°C	-40 ... +100	
Bearing at output		Ball bearing	



Specifications		A Standard Version		
		1	2	3
Number of stages		1	2	3
Max. transmittable continuous power	W	185	90	45
Max. transmittable intermittent power	W	230	115	60
Max. continuous torque	Nm	2.30	5.40	9.30
Max. intermittent torque	Nm	2.90	6.80	11.60
Max. continuous input speed	rpm	5000	6000	7000
Max. intermittent input speed	rpm	6250	7500	8750
Max. efficiency	%	90	80	75
Average backlash no load	°	0.5	0.6	0.7
Max. axial load (dynamic)	N	240	240	240
Max. radial load, 10 mm from flange	N	200	250	250
Gearhead length L1 <sup>1</sup>	mm	35.4	48.3	52.9
Weight	g	230	310	410

Configuration		A Standard Version		
		1	2	3
Number of stages		1	2	3
Reduction	X:1	3.9	16, 26	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard/noise reduced/reduced backlash		
Flange		Standard flange/configurable flange		
Shaft		Length/flat face/feather key		

maxon Modular System		Page
maxon DC motor	N <sub>e</sub> of stages [opt.]	
DCX 32 L	3	90
DCX 35 L	1-2	91



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

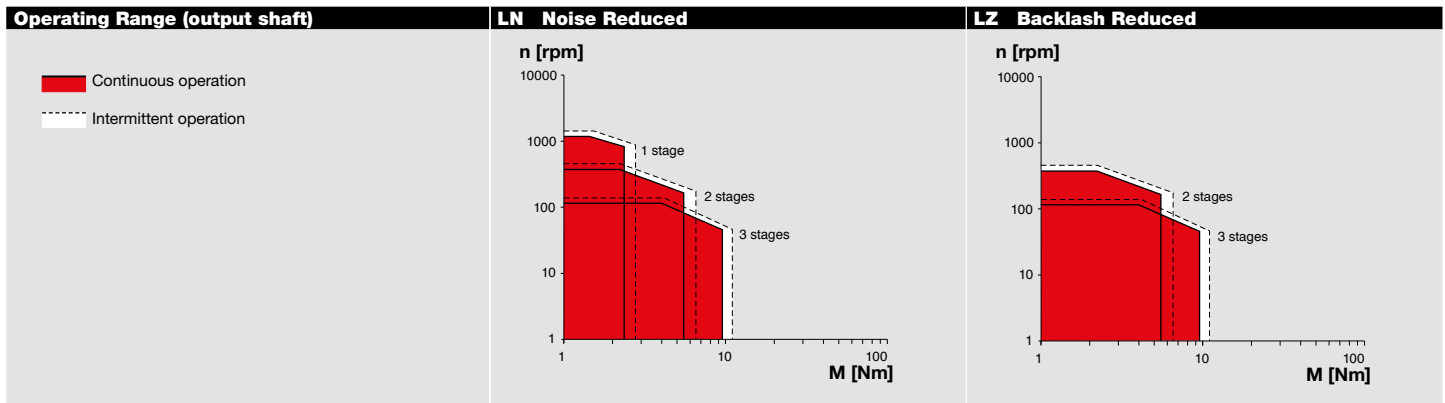
# GPX 37

## Planetary Gearhead Ø37 mm



maxon GPX

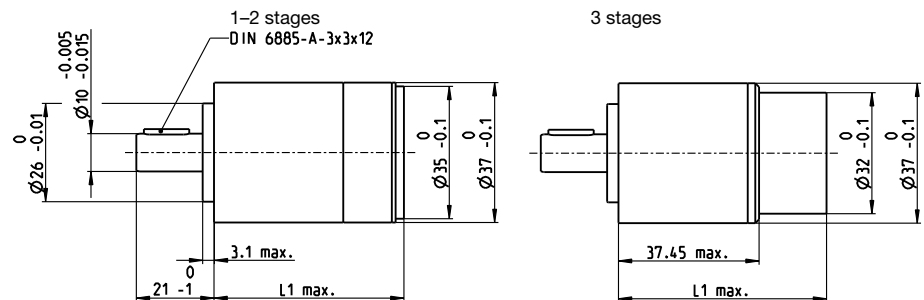
Key Data		LN Noise Reduced		LZ Backlash Reduced	
Max. transmittable power	W	150		90	
Max. continuous torque	Nm	7.4		9.3	
Max. continuous input speed	rpm	7000		7000	
Ambient temperature	°C	-40 ... +85		-40 ... +100	
Bearing at output		Ball bearing		Ball bearing	
Typical noise level	dBA	-5 dBA compared to standard configuration			



Specifications	LN Noise Reduced			LZ Backlash Reduced	
Number of stages	1	2	3	2	3
Max. transmittable continuous power	W	150	75	37	
Max. transmittable intermittent power	W	185	90	45	
Max. continuous torque	Nm	1.85	4.30	7.40	
Max. intermittent torque	Nm	2.30	5.40	9.20	
Max. continuous input speed	rpm	5000	6000	7000	
Max. intermittent input speed	rpm	6250	7500	8750	
Max. efficiency	%	90	80	75	
Average backlash no load	°	0.5	0.6	0.7	
Max. axial load (dynamic)	N	240	240	240	
Max. radial load, 10 mm from flange	N	200	250	250	
Gearhead length L <sup>1</sup>	mm	35.4	48.3	52.9	
Weight	g	230	310	410	

Configuration	LN Noise Reduced			LZ Backlash Reduced		
Number of stages	1	2	3	2	3	
Reduction	X:1	3.9	16, 26	62, 83, 103, 111, 138, 150, 172, 186, 231	16, 26	62, 83, 103, 111, 138, 150, 172, 186, 231
Version	Standard/noise reduced/backlash reduced					
Flange	Standard flange/configurable flange					
Shaft	Length/flat face/feather key					

maxon Modular System		Page	Dimensions	M 1:2
maxon DC motor	N <sub>e</sub> of stages [opt.]			
DCX 32 L	3	90		
DCX 35 L	1-2	91		



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.

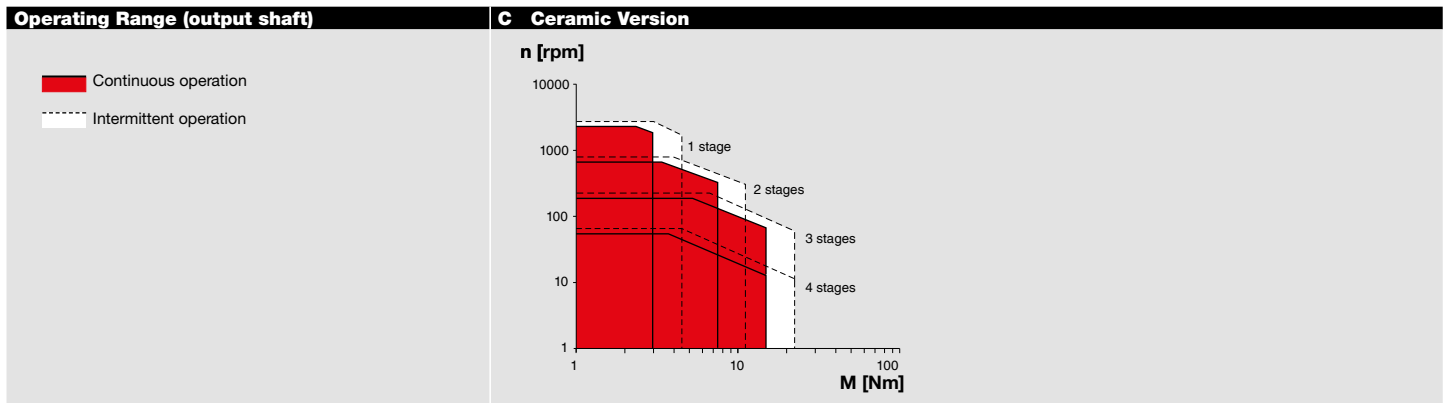
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# GPX 42

## Planetary Gearhead $\varnothing 42$ mm



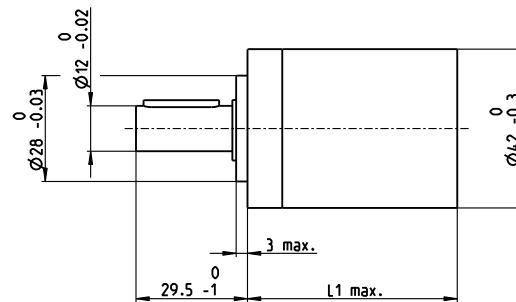
Key Data		C Ceramic Version
Max. transmittable power	W	580
Max. continuous torque	Nm	15.0
Max. continuous input speed	rpm	8000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



Specifications		C Ceramic Version			
		1	2	3	4
Number of stages		1	2	3	4
Max. transmittable power (continuous)	W	580	240	100	20
Max. transmittable power (intermittent)	W	725	300	125	25
Max. continuous torque	Nm	3.0	7.5	15.0	15.0
Max. intermittent torque	Nm	4.5	11.3	22.5	22.5
Max. continuous input speed	rpm	8000	8000	8000	8000
Max. intermittent input speed	rpm	10000	10000	10000	10000
Max. efficiency	%	90	81	72	64
Average backlash no load	°	0.6	0.8	1.0	1.0
Max. axial load (dynamic)	N	150	150	150	150
Max. radial load, 12 mm from flange	N	120	240	360	360
Gearhead length L <sup>1</sup>	mm	37.4	51.9	66.4	80.9
Weight	g	260	360	460	560

Configuration		C Ceramic Version			
		1	2	3	4
Number of stages		1	2	3	4
Reduction	X:1	3.5, 4.3	12, 15, 19, 21, 26	43, 53, 66, 74, 81, 113, 126, 156	150, 186, 230, 257, 285, 319, 353, 394, 441, 488, 546, 676, 756, 936
Version		Ceramic Version			
Flange		Standard flange/configurable flange			
Shaft		Length/feather key			

maxon Modular System		Page	Dimensions	M 1:2
maxon DC motor	N <sub>e</sub> of stages [opt.]			
DCX 35 L	1-4	91		



<sup>1</sup>This length may vary depending on the configuration and choice of motor. The effective length is calculated at the end of the configuration process.





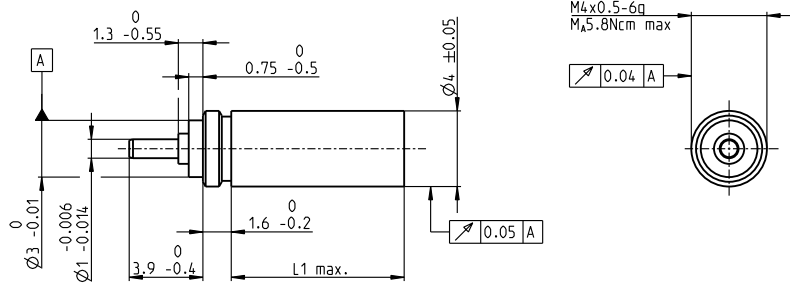
# maxon gear

Precision spur- and planetary gearheads matched to maxon motors. Gears are advantageously adapted directly to the desired motors in the delivery plant. The motor pinion is the input gearwheel for the first stage and is rigidly affixed to the motor shaft.

<b>Standard Specification No. 102</b>	65
<b>Explanation</b>	286
<b>GPX Program</b>	288–320
<b>maxon gear</b>	322–369

# Planetary Gearhead GP 4 C $\varnothing 4$ mm, 0.002–0.015 Nm

Ceramic Version



### Technical Data

Planetary Gearhead	special toothing
Output shaft	stainless steel
Bearing at output	ball bearings
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	0.2 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	5 N
Direction of rotation, drive to output	=
Max. continuous input speed	20000 rpm
Recommended temperature range	-15...+80°C
Number of stages	2 3 4
Max. radial load, 5 mm from flange	3 N 4 N 4 N

M 5:2

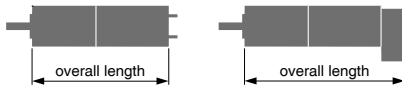
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

484357	484358	484359
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### Gearhead Data (provisional)

		484357	484358	484359
1 Reduction		17:1	68:1	280:1
2 Absolute reduction		$\frac{2025}{121}$	$\frac{91125}{1331}$	$\frac{4100625}{14641}$
3 Max. motor shaft diameter	mm	0.6	0.6	0.6
4 Number of stages		2	3	4
5 Max. continuous torque	Nm	0.002	0.006	0.015
6 Max. intermittent torque at gear output	Nm	0.003	0.008	0.020
7 Max. efficiency	%	76	70	65
8 Weight	g	0.4	0.5	0.6
9 Average backlash no load	°	5	5	5
10 Mass inertia	gcm <sup>2</sup>	0.0002	0.0002	0.0002
11 Gearhead length L1	mm	6.1	7.7	9.4

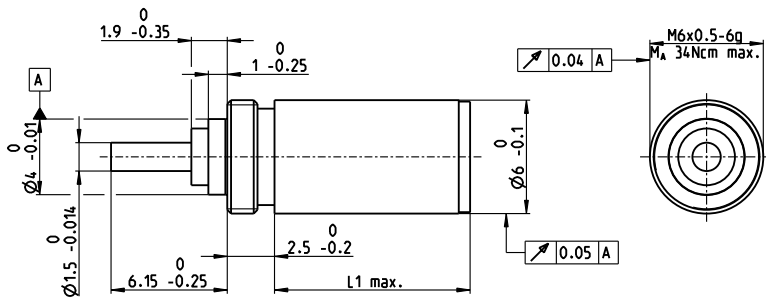


### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts
EC 4, 0.5 W, A	204			24.9 26.6 28.3
EC 4, 0.5 W, B	204			24.9 26.6 28.3
EC 4, 1.0 W, A	205			31.9 33.6 35.3
EC 4, 1.0 W, B	205			31.9 33.6 35.3

# Planetary Gearhead GP 6 A $\varnothing 6$ mm, 0.002–0.03 Nm

maxon gear



### Technical Data

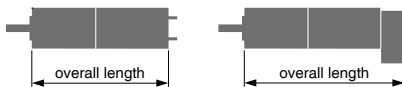
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Option	sleeve bearing
Radial play, 5 mm from flange	max. 0.12 mm
Axial play	max. 0.10 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input speed	40000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 5 mm from flange	5 N 6 N 7 N 8 N 8 N

M 5:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers					
472919	472920	472921	472229	472922	

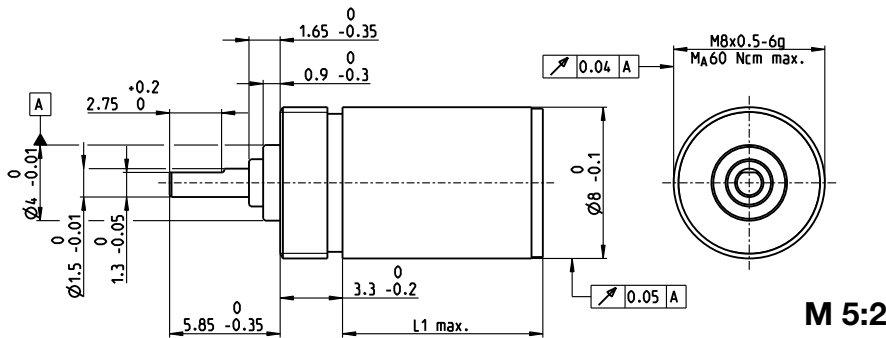
Gearhead Data		472919	472920	472921	472229	472922
1 Reduction		3.9:1	15:1	57:1	221:1	854:1
2 Absolute reduction		$\frac{27}{7}$	$\frac{729}{49}$	$\frac{19683}{343}$	$\frac{531441}{2401}$	$\frac{14348907}{16807}$
3 Max. motor shaft diameter	mm	1	1	1	1	1
4 Number of stages		1	2	3	4	5
5 Max. continuous torque	Nm	0.002	0.005	0.010	0.030	0.030
6 Max. intermittent torque at gear output	Nm	0.005	0.010	0.020	0.060	0.060
7 Max. efficiency	%	88	77	68	60	52
8 Weight	g	1.7	2.1	2.5	2.9	3.3
9 Average backlash no load	°	1.8	2.0	2.2	2.5	2.8
10 Mass inertia	gcm <sup>2</sup>	0.001	0.001	0.001	0.001	0.001
11 Gearhead length L1	mm	5.3	7.8	10.4	13.0	15.6



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 6, 0.3 W, A	102			21.0	23.5	26.1	28.7	31.3
RE 6, 0.3 W, B	102			25.0	27.5	30.1	32.7	35.3

# Planetary Gearhead GP 8 A $\varnothing 8$ mm, 0.01–0.1 Nm



### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.08 mm
Axial play	max. 0.08 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input speed	12 000 rpm
Recommended temperature range	-15...+80°C
Number of stages	1 2 3 4 5
Max. radial load, 5 mm from flange	5 N 6 N 7 N 8 N 8 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

468999	468998	474124	468997	474127	468996	474129	468995
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### Gearhead Data

		468999	468998	474124	468997	474127	468996	474129	468995
1 Reduction		4:1	16:1	36:1	64:1	216:1	256:1	1296:1	1024:1
2 Absolute reduction		4	16	36	64	216	256	1296	1024
3 Max. motor shaft diameter	mm	1	1	0.65	1	0.65	1	0.65	1
4 Number of stages		1	2	2	3	3	4	4	5
5 Max. continuous torque	Nm	0.01	0.020	0.008	0.060	0.020	0.080	0.040	0.100
6 Max. intermittent torque at gear output	Nm	0.015	0.030	0.012	0.090	0.030	0.120	0.060	0.150
7 Max. efficiency	%	90	81	76	73	66	65	57	59
8 Weight	g	2.6	3.2	3.2	3.8	3.8	4.4	4.4	5.0
9 Average backlash no load	°	1.80	2.0	2.4	2.2	2.6	2.50	2.8	2.80
10 Mass inertia	gcm <sup>2</sup>	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
11 Gearhead length L1	mm	5.5	8.1	8.3	10.7	11.1	13.3	13.9	15.9

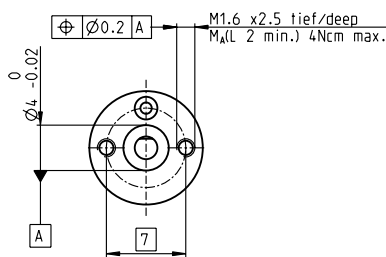
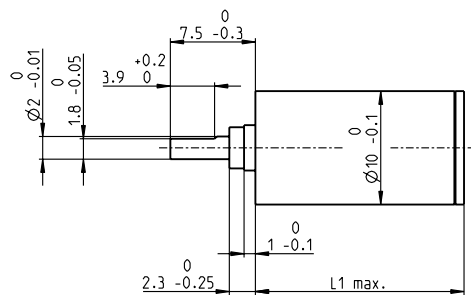


### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 8, 0.5 W, A	103			22.2	24.8	25.0	27.4	27.8	30.0	30.6	32.6
RE 8, 0.5 W, B	103			25.2	27.8	28.0	30.4	30.8	33.0	33.6	35.6
RE 8, 0.5 W, A	103	MR	427	28.8	31.4	31.6	34.0	34.4	36.6	37.2	39.2
RE 8, 0.5 W, A	103	8 OPT	434	30.4	33.0	33.2	35.6	36.0	38.2	38.8	40.8

# Planetary Gearhead GP 10 K $\varnothing 10$ mm, 0.005–0.1 Nm

Plastic Version



## Technical Data

Planetary Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Max. radial load, 5 mm from flange	1 N

M 3:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

110308	110309	110310	110311	110312
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## Gearhead Data

	110308	110309	110310	110311	110312
1 Reduction	4:1	16:1	64:1	256:1	1024:1
2 Absolute reduction	4	16	64	256	1024
3 Max. motor shaft diameter	mm 1.2	1.2	1.2	1.2	1.2
4 Number of stages	1	2	3	4	5
5 Max. continuous torque	Nm 0.005	0.015	0.054	0.100	0.100
6 Max. intermittent torque at gear output	Nm 0.005	0.015	0.054	0.100	0.100
7 Max. efficiency	% 90	80	70	60	55
8 Weight	g 2.1	2.5	2.8	3.2	3.6
9 Average backlash no load	° 1.8	2.0	2.2	2.5	2.8
10 Mass inertia	gcm <sup>2</sup> 0.004	0.003	0.003	0.003	0.003
11 Gearhead length L1	mm 10.2	14.3	18.4	22.5	26.6

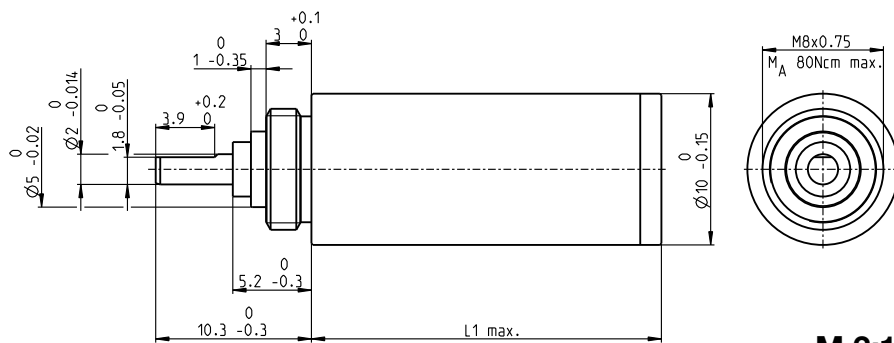


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 10, 0.75 W	104/105			27.3	31.4	35.5	39.6	43.7
RE 10, 0.75 W	105	MR	426/427	33.1	37.2	41.3	45.4	49.5
RE 10, 0.75 W	105	MEnc 10	415	35.4	39.5	43.6	47.7	51.8
RE 10, 1.5 W	106/107			34.9	39.0	43.1	47.2	51.3
RE 10, 1.5 W	107	MR	426/427	40.7	44.8	48.9	53.0	57.1
RE 10, 1.5 W	107	MEnc 10	415	43.0	47.1	51.2	55.3	59.4
EC 9.2 flat, 0.5 W	252			22.8	26.9	31.0	35.1	39.2

maxon gear

# Planetary Gearhead GP 10 A $\varnothing 10$ mm, 0.01–0.15 Nm



### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 5 mm from flange	max. 0.08 mm
Axial play at axial load	< 2 N 0 mm > 2 N max. 0.04 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input speed	12000 rpm
Recommended temperature range	-40...+80°C
Number of stages	1 2 3 4 5
Max. radial load, 5 mm from flange	5 N 10 N 15 N 20 N 25 N

M 2:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

218415	218416	218417	218418	218419	332422	332423	332424	332425	332426
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### Gearhead Data

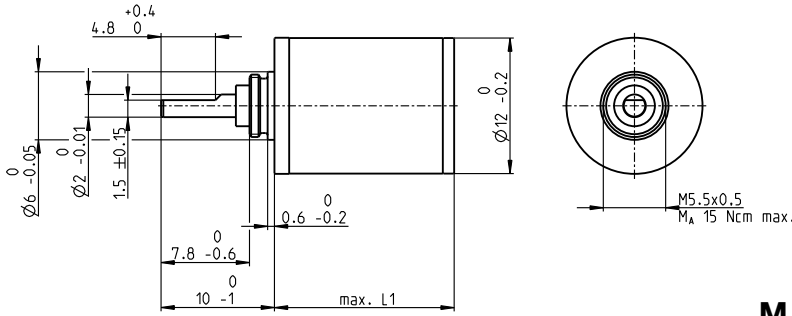
	4:1	16:1	64:1	256:1	1024:1	4:1	16:1	64:1	256:1	1024:1
1 Reduction	4:1	16:1	64:1	256:1	1024:1	4:1	16:1	64:1	256:1	1024:1
2 Absolute reduction	4	16	64	256	1024	4	16	64	256	1024
3 Max. motor shaft diameter	mm 1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
4 Number of stages	1	2	3	4	5	1	2	3	4	5
5 Max. continuous torque	Nm 0.010	0.030	0.100	0.150	0.150	0.010	0.030	0.100	0.150	0.150
6 Max. intermittent torque at gear output	Nm 0.020	0.050	0.150	0.200	0.200	0.020	0.050	0.150	0.200	0.200
7 Max. efficiency	% 90	81	73	65	59	90	81	73	65	59
8 Weight	g 6.7	7.2	7.7	8.2	8.7	6.7	7.2	7.7	8.2	8.7
9 Average backlash no load	° 1.5	1.8	2.0	2.2	2.5	1.5	1.8	2.0	2.2	2.5
10 Mass inertia	gcm <sup>2</sup> 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
11 Gearhead length L1	mm 10.4	14.1	17.2	20.4	23.5	10.4	14.1	17.2	20.4	23.5



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
RE 10, 0.75 W	104/105			27.5	31.2	34.3	37.5	40.6		
RE 10, 0.75 W	105	MR	426/427	33.3	37.0	40.1	43.3	46.4		
RE 10, 0.75 W	105	MEnc 10	415	35.6	39.3	42.4	45.6	48.7		
RE 10, 1.5 W	106/107			35.1	38.8	41.9	45.1	48.2		
RE 10, 1.5 W	107	MR	426/427	40.9	44.6	47.7	50.9	54.0		
RE 10, 1.5 W	107	MEnc 10	415	43.2	46.9	50.0	53.2	56.3		
A-max 12	141/142			31.7	35.4	38.5	41.7	44.8		
A-max 12, 0.5 W	142	MR	426/427	35.8	39.5	42.6	45.8	48.9		
EC 10, 8 W	206								36.2	39.9
EC 9.2 flat, 0.5 W	252			23.0	26.7	29.8	33.0	36.1		43.0
										46.2
										49.3

# Spur Gearhead GS 12 A $\varnothing 12$ mm, 0.01–0.03 Nm



## Technical Data

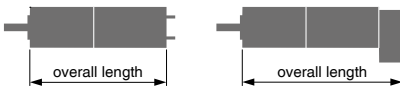
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.05 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	30 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+100°C
Extended range as option	-40...+100°C
Max. radial load, 6.5 mm from flange	2 N

M 3:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Gearhead Data	310301	313872	313990	313991	310311	313993	310316
1 Reduction	6.4:1	13:1	58:1	141:1	371:1	485:1	3101:1
2 Absolute reduction	$\frac{403}{63}$	$\frac{21866}{1694}$	$\frac{724594}{12474}$	$\frac{20138716}{142884}$	$\frac{26782109}{72171}$	$\frac{624300196}{1285956}$	$\frac{11537547853}{3720087}$
3 Max. motor shaft diameter	mm 1.2	1.0	1.0	1.2	1.0	1.2	1.2
<b>Part Numbers</b>	<b>310302</b>	<b>310304</b>	<b>310307</b>	<b>313992</b>		<b>310313</b>	<b>310317</b>
1 Reduction	9.1:1	22:1	76:1	200:1		900:1	4402:1
2 Absolute reduction	$\frac{899}{99}$	$\frac{12483}{567}$	$\frac{387283}{5103}$	$\frac{22462414}{112266}$		$\frac{372178963}{413343}$	$\frac{25737606749}{5845851}$
3 Max. motor shaft diameter	mm 1.0	1.2	1.2	1.0		1.2	1.0
<b>Part Numbers</b>		<b>310305</b>	<b>310308</b>	<b>310310</b>		<b>310314</b>	
1 Reduction		31:1	108:1	261:1		1278:1	
2 Absolute reduction		$\frac{27869}{891}$	$\frac{863939}{8019}$	$\frac{12005773}{45927}$		$\frac{830245379}{649539}$	
3 Max. motor shaft diameter	mm	1.0	1.0	1.2		1.0	
4 Number of stages		2	3	4	5	5	6
5 Max. continuous torque	Nm	0.010	0.015	0.020	0.025	0.025	0.030
6 Max. intermittent torque at gear output	Nm	0.030	0.035	0.040	0.045	0.045	0.050
12 Direction of rotation, drive to output		=	≠	=	≠	=	≠
7 Max. efficiency	%	81	73	66	59	59	53
8 Weight	g	6.5	7.4	8.3	9.2	9.2	10.1
9 Average backlash no load	°	1	1	1.2	1.2	1.2	1.2
10 Mass inertia	gcm <sup>2</sup>	0.002	0.002	0.002	0.002	0.002	0.002
11 Gearhead length L1	mm	10	12	14	16	16	18

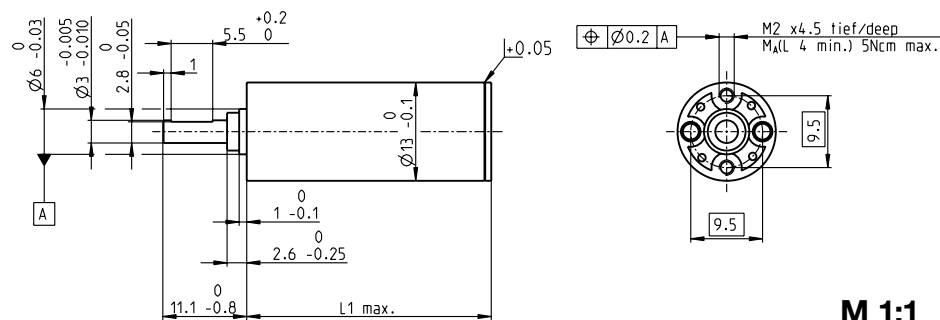


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
A-max 12	141/142			31.3	33.3	35.3	37.3	37.3	39.3	41.3
A-max 12, 0.5 W	142	MR	426/427	35.4	37.4	39.4	41.4	41.4	43.4	45.4

# Planetary Gearhead GP 13 K $\varnothing 13$ mm, 0.05–0.15 Nm

Plastic Version



Technical Data	
Planetary Gearhead	straight teeth
Housing, planetary wheels	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.12 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	2 N 3 N 4 N 5 N 5 N

M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

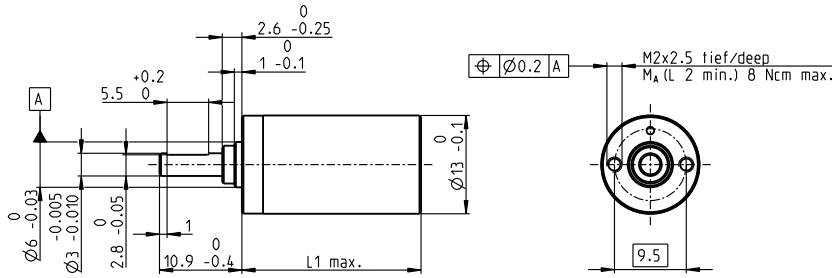
Gearhead Data	Part Numbers				
	137149	137150	137151	137152	137153
1 Reduction	4.1:1	17:1	67:1	275:1	1119:1
2 Absolute reduction	$\frac{57}{14}$	$\frac{3249}{196}$	$\frac{185193}{2744}$	$\frac{10556001}{38416}$	$\frac{601692057}{537824}$
3 Max. motor shaft diameter	mm 1.5	1.	1.5	1.5	1.5
4 Number of stages	1	2	3	4	5
5 Max. continuous torque	Nm 0.050	0.075	0.100	0.125	0.150
6 Max. intermittent torque at gear output	Nm 0.050	0.075	0.100	0.125	0.150
7 Max. efficiency	% 85	70	60	50	45
8 Weight	g 5.9	6.5	7.0	7.5	8.0
9 Average backlash no load	° 1.8	2.0	2.2	2.5	2.8
10 Mass inertia	gcm <sup>2</sup> 0.025	0.009	0.008	0.008	0.008
11 Gearhead length L1	mm 15.5	21.4	25.1	28.8	32.5



maxon Modular System								
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 13	109/111			34.8	40.7	44.4	48.1	51.8
RE 13, 0.75 W	111	MR	426-428	41.9	47.8	51.5	55.2	58.9
RE 13, 0.75 W	111	MEnc 13	416	42.6	48.5	52.2	55.9	59.6
RE 13	113/115			47.0	52.9	56.6	60.3	64.0
RE 13, 2 W	115	MR	426-428	54.1	60.0	63.7	67.4	71.1
RE 13, 2 W	115	MEnc 13	416	54.8	60.7	64.4	68.1	71.8
RE 13, 1.5 W	117/119			37.9	43.8	47.5	51.2	54.9
RE 13, 1.5 W	119	MR	426-428	44.0	49.9	53.6	57.3	61.0
RE 13, 1.5 W	119	MEnc 13	416	45.9	51.8	55.5	59.2	62.9
RE 13, 3 W	121/123			50.1	56.0	59.7	63.4	67.1
RE 13, 3 W	123	MR	426-428	56.2	62.1	65.8	69.5	73.2
RE 13, 3 W	123	MEnc 13	416	58.1	64.0	67.7	71.4	75.1
A-max 12	141/142			36.8	42.7	46.4	50.1	53.8
A-max 12, 0.5 W	142	MR	426-428	40.7	46.6	50.3	54.0	57.7



# Planetary Gearhead GP 13 A $\varnothing 13$ mm, 0.2–0.35 Nm



M 1:1

## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.055 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	8 N 12 N 16 N 20 N 20 N

maxon gear

- Stock program
- Standard program
- Special program (on request)

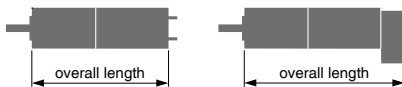
## Part Numbers

110313	110314	110315	110316	110317
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## Gearhead Data

	110313	110314	110315	110316	110317
1 Reduction	4.1:1	17:1	67:1	275:1	1119:1
2 Absolute reduction	57/14	3249/196	185193/2744	10556001/38416	601692057/537824
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5
<b>Part Numbers</b>	<b>352365</b>	<b>352366</b>	<b>352367</b>	<b>352368</b>	<b>352369</b>
1 Reduction	5.1:1	26:1	131:1	664:1	3373:1
2 Absolute reduction	66/13	4356/169	287496/2197	18974736/28561	1252332576/371293
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5
4 Number of stages	1	2	3	4	5
5 Max. continuous torque	Nm 0.20	0.20	0.30	0.30	0.35
6 Max. intermittent torque at gear output	Nm 0.30	0.30	0.45	0.45	0.53
7 Max. efficiency	% 91	83	75	69	62
8 Weight	g 11	14	17	20	23
9 Average backlash no load	° 1.0	1.2	1.5	1.8	2.0
10 Mass inertia	gcm <sup>2</sup> 0.025	0.015	0.015	0.015	0.015
11 Gearhead length L1*	mm 16.0	19.9	23.7	27.6	31.4

\* for A-max 12 is L1 + 0.3 mm



## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 13	109/111			35.4	39.3	43.1	47.0	50.8
RE 13, 0.75 W	111	MR	426-428	42.5	46.4	50.2	54.1	57.9
RE 13, 0.75 W	111	MEnc 13	416	43.2	47.1	50.9	54.8	58.6
RE 13	113/115			47.6	51.5	55.3	59.2	63.0
RE 13, 2 W	115	MR	426-428	54.7	58.6	62.4	66.3	70.1
RE 13, 2 W	115	MEnc 13	416	55.4	59.3	63.1	67.0	70.8
RE 13, 1.5 W	117/119			38.5	42.4	46.2	50.1	53.9
RE 13, 1.5 W	119	MR	426-428	44.6	48.5	52.3	56.2	60.0
RE 13, 1.5 W	119	MEnc 13	416	46.5	50.4	54.2	58.1	61.9
RE 13, 3 W	121/123			50.7	54.6	58.4	62.3	66.1
RE 13, 3 W	123	MR	426-428	56.8	60.7	64.5	68.4	72.2
RE 13, 3 W	123	MEnc 13	416	58.7	62.6	66.4	70.3	74.1
A-max 12	141/142			37.6	41.5	45.3	49.2	53.0
A-max 12, 0.5 W	142	MR	426-428	41.7	45.6	49.4	53.3	57.1

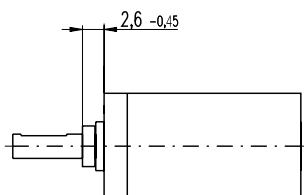
## Option Ball Bearing

## Part Numbers

4.1:1	144300	131:1	352393
5.1:1	352391	275:1	144303
17:1	144301	664:1	352394
26:1	352392	1119:1	144304
67:1	144302	3373:1	352395

## Technical Data

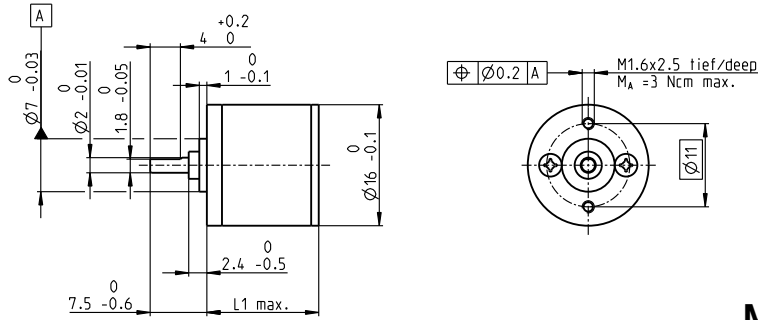
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6 mm from flange	max. 0.04 mm
Axial play at axial load	< 5 N 0 mm
	> 5 N max. 0.04 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	25 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	10 N 15 N 20 N 25 N 25 N
Gearhead values according to sleeve bearing version	



Gearhead length: L1 + 0.2 mm

# Spur Gearhead GS 16 K $\varnothing 16$ mm, 0.01–0.03 Nm

Plastic Version



M 1:1

### Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.15 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	15 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Max. radial load, 6.5 mm from flange	1 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

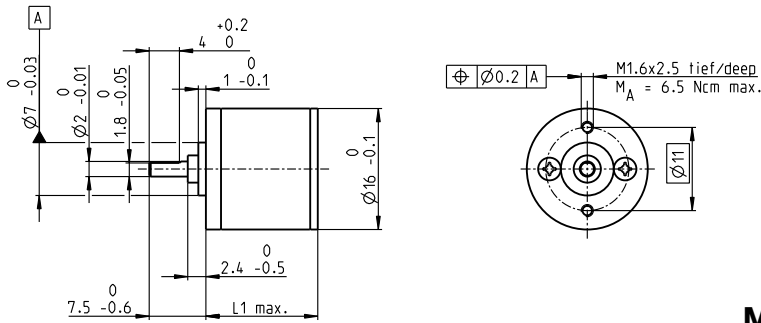
	201463	201465	201467	201469	201471	201473
<b>Gearhead Data</b>						
1 Reduction	6.4:1	22:1	76:1	261:1	900:1	3101:1
2 Absolute reduction	$\frac{403}{63}$	$\frac{12493}{567}$	$\frac{387283}{5103}$	$\frac{12005773}{45927}$	$\frac{372178963}{413343}$	$\frac{11537547853}{3720087}$
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5	1.5
<b>Part Numbers</b>						
1 Reduction	9.1:1	31:1	108:1	371:1	1278:1	4402:1
2 Absolute reduction	$\frac{899}{99}$	$\frac{27869}{891}$	$\frac{863939}{8019}$	$\frac{26782109}{72171}$	$\frac{830245379}{649539}$	$\frac{25737606749}{5845851}$
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5	1.5
<b>Part Numbers</b>						
1 Reduction	12:1	41:1	141:1	485:1	1670:1	5752:1
2 Absolute reduction	$\frac{961}{81}$	$\frac{29791}{729}$	$\frac{923521}{6561}$	$\frac{28629151}{59049}$	$\frac{887503681}{531441}$	$\frac{27512614111}{4782969}$
3 Max. motor shaft diameter	mm 1	1	1	1	1	1
4 Number of stages	2	3	4	5	6	7
5 Max. continuous torque	Nm 0.010	0.020	0.030	0.030	0.030	0.030
6 Max. intermittent torque at gear output	Nm 0.10	0.10	0.10	0.10	0.10	0.10
12 Direction of rotation, drive to output	=	≠	=	≠	=	≠
7 Max. efficiency	% 81	73	66	59	53	48
8 Weight	g 9.0	9.8	10.2	10.7	11.3	11.7
9 Average backlash no load	° 1.0	1.0	1.2	1.2	1.5	1.5
10 Mass inertia	gcm <sup>2</sup> 0.0032	0.0031	0.0031	0.0031	0.0031	0.0031
11 Gearhead length L1	mm 11.8	12.8	14.8	16.8	18.8	20.8



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	143-146			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	144/146 MR		429/430	42.3	43.3	45.3	47.3	49.3	51.3
A-max 16	144/146 MEnc 13		416	45.4	46.4	48.4	50.4	52.4	54.4

# Spur Gearhead GS 16 A $\varnothing 16$ mm, 0.015–0.04 Nm



## Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.15 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	30 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+100°C
Extended range as option	-40...+100°C
Max. radial load, 6.5 mm from flange	2 N

M 1:1

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	144409	143761	143763	143765	143767	143769
<b>Gearhead Data</b>						
1 Reduction	6.4:1	22:1	76:1	261:1	900:1	3101:1
2 Absolute reduction	403/63	12493/567	387283/5103	12005773/45927	372178963/413343	11537547853/3720087
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5	1.5
<b>Part Numbers</b>	<b>207834</b>	<b>207835</b>	<b>207836</b>	<b>207837</b>	<b>207838</b>	<b>207839</b>
1 Reduction	9.1:1	31:1	108:1	371:1	1278:1	4402:1
2 Absolute reduction	899/99	27869/891	863939/8019	26782109/72171	830245379/649539	25737606749/5845851
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5	1.5
<b>Part Numbers</b>	<b>144410</b>	<b>143762</b>	<b>143764</b>	<b>143766</b>	<b>143768</b>	<b>143770</b>
1 Reduction	12:1	41:1	141:1	485:1	1670:1	5752:1
2 Absolute reduction	961/81	29791/729	923521/6561	28629151/59049	887503681/531441	27512614111/4782969
3 Max. motor shaft diameter	mm 1	1	1	1	1	1
4 Number of stages	2	3	4	5	6	7
5 Max. continuous torque	Nm 0.015	0.025	0.035	0.040	0.040	0.040
6 Max. intermittent torque at gear output	Nm 0.10	0.10	0.10	0.10	0.10	0.10
12 Direction of rotation, drive to output	=	≠	=	≠	=	≠
7 Max. efficiency	% 81	73	66	59	53	48
8 Weight	g 9.0	9.8	10.2	10.7	11.3	11.7
9 Average backlash no load	° 1.0	1.0	1.2	1.2	1.5	1.5
10 Mass inertia	gcm <sup>2</sup> 0.0032	0.0031	0.0031	0.0031	0.0031	0.0031
11 Gearhead length L1	mm 11.8	12.8	14.8	16.8	18.8	20.8

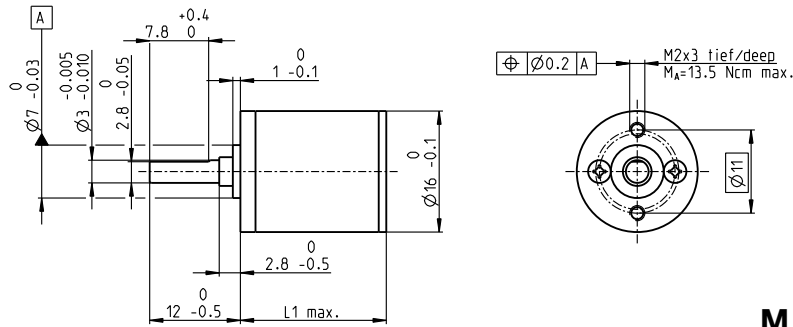


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	143-146			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	144/146 MR		429/430	42.3	43.3	45.3	47.3	49.3	51.3
A-max 16	144/146 MEnc 13		416	45.4	46.4	48.4	50.4	52.4	54.4

# Spur Gearhead GS 16 V $\varnothing 16$ mm, 0.06–0.1 Nm

Reinforced



M 1:1

### Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6.5 mm from flange	max. 0.02 mm
Axial play at axial load	< 5 N 0 mm > 5 N max. 0.05 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	5 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+100°C
Extended range as option	-40...+100°C
Number of stages	2 3 4 5 6 7
Max. radial load, 6.5 mm from flange	10 N 15 N 20 N 22 N 22 N 22 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

Gearhead Data		235066	235070	235073	235076	235079	235082
1 Reduction		6.4:1	22:1	76:1	261:1	900:1	3101:1
2 Absolute reduction		$\frac{403}{63}$	$\frac{12493}{567}$	$\frac{387283}{5103}$	$\frac{12005773}{45927}$	$\frac{372178963}{413343}$	$\frac{11537547853}{3720087}$
3 Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5	1.5
<b>Part Numbers</b>		235068	235071	235074	235077	235080	235083
1 Reduction		9.1:1	31:1	108:1	371:1	1278:1	4402:1
2 Absolute reduction		$\frac{899}{99}$	$\frac{27869}{891}$	$\frac{863939}{8019}$	$\frac{26782109}{72171}$	$\frac{830245379}{649539}$	$\frac{25737606749}{5845851}$
3 Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5	1.5
<b>Part Numbers</b>		235069	235072	235075	235078	235081	235084
1 Reduction		12:1	41:1	141:1	485:1	1670:1	5752:1
2 Absolute reduction		$\frac{961}{81}$	$\frac{29791}{729}$	$\frac{923521}{6561}$	$\frac{28629151}{59049}$	$\frac{887503681}{531441}$	$\frac{27512614111}{4782969}$
3 Max. motor shaft diameter	mm	1	1	1	1	1	1
4 Number of stages		2	3	4	5	6	7
5 Max. continuous torque	Nm	0.06	0.06	0.10	0.10	0.10	0.10
6 Max. intermittent torque at gear output	Nm	0.15	0.15	0.30	0.30	0.30	0.30
12 Direction of rotation, drive to output		=	≠	=	≠	=	≠
7 Max. efficiency	%	81	73	66	59	53	48
8 Weight	g	13.8	14.5	15.8	17.0	17.9	18.5
9 Average backlash no load	°	1.0	1.0	1.2	1.2	1.5	1.5
10 Mass inertia	gcm <sup>2</sup>	0.0057	0.0052	0.0035	0.0032	0.0032	0.0032
11 Gearhead length L1	mm	14.3	17.3	19.3	21.3	23.3	25.3

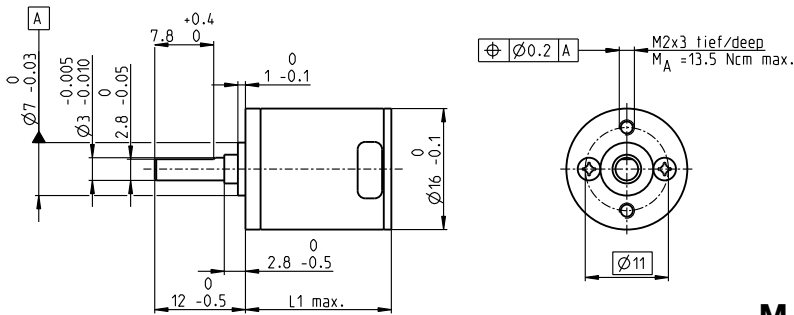


### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	143-146			39.8	42.8	44.8	46.8	48.8	50.8
A-max 16	144/146 MR		429/430	44.8	47.8	49.8	51.8	53.8	55.8
A-max 16	144/146 MEnc 13		416	47.9	50.9	52.9	54.9	56.9	58.9

# Spur Gearhead GS 16 VZ $\varnothing 16$ mm, 0.1 Nm

Low Backlash



M 1:1

## Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6.5 mm from flange	max. 0.02 mm
Axial play at axial load	< 5 N 0 mm
	> 5 N max. 0.05 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	5 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+100°C
Extended range as option	-40...+100°C
Number of stages	4 5 6
Max. radial load, 6.5 mm from flange	20 N 22 N 22 N

maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

327789	327796	327800
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## Gearhead Data

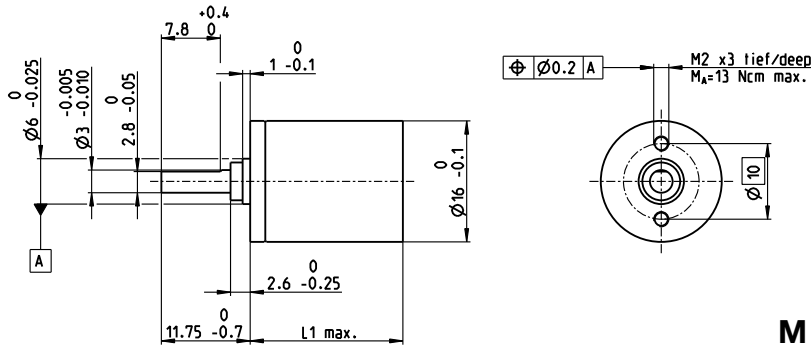
	327789	327796	327800
1 Reduction	76:1	261:1	900:1
2 Absolute reduction	387283/5103	12005773/45927	372178963/413343
3 Max. motor shaft diameter	mm 1.5	1.5	1.5
<b>Part Numbers</b>			
1 Reduction	108:1	371:1	1278:1
2 Absolute reduction	863939/8019	26782109/72171	830245379/649539
3 Max. motor shaft diameter	mm 1.5	1.5	1.5
<b>Part Numbers</b>			
1 Reduction	141:1	485:1	1670:1
2 Absolute reduction	92352/6561	28629151/59049	887503681/531441
3 Max. motor shaft diameter	mm 1	1	1
4 Number of stages	4	5	6
5 Max. continuous torque	Nm 0.10	0.10	0.10
6 Max. intermittent torque at gear output	Nm 0.30	0.30	0.30
12 Direction of rotation, drive to output	=	≠	=
7 Max. efficiency	% 62	54	48
8 Weight	g 17.2	18.7	20.2
9 Average backlash no load	° 0.3	0.45	0.5
10 Mass inertia	gcm <sup>2</sup> 0.017	0.014	0.013
11 Gearhead length L1	mm 19.3	21.3	23.3



## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
A-max 16	143-146			44.8	46.8	48.8
A-max 16	144/146 MR		429/430	49.8	51.8	53.8
A-max 16	144/146 MEnc 13		416	52.9	54.9	56.9

# Planetary Gearhead GP 16 A Ø16 mm, 0.1–0.3 Nm



M 1:1

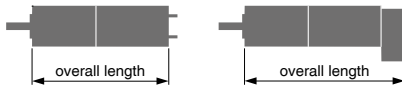
### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.06 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-30...+100°C
Extended range as option	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	8 N 12 N 16 N 20 N 20 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

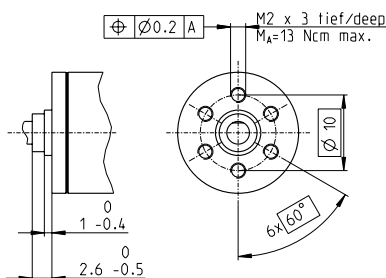
	110321	110322	110323	118186	110324	134782	110325	134785
<b>Gearhead Data</b>								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	2	2	2
<b>Part Numbers</b>	118184	134777	134778		134780	118187	134783	134786
1 Reduction	5.4:1	24:1	104:1		455:1	850:1	1996:1	3728:1
2 Absolute reduction	27/5	1539/65	87723/845		500021/10985	531441/625	285012027/142805	30292137/8125
3 Max. motor shaft diameter	mm 1.5	2	2		2	1.5	2	2
<b>Part Numbers</b>		118185	134779		134781		134784	118188
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		729/25	41553/325		2368521/4225		135005697/64925	14348907/3125
3 Max. motor shaft diameter	mm	1.5	2		2		2	1.5
4 Number of stages		1	2	3	3	4	4	5
5 Max. continuous torque	Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30
6 Max. intermittent torque at gear output	Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450
7 Max. efficiency	%	90	81	73	73	65	65	59
8 Weight	g	20	23	27	27	31	31	35
9 Average backlash no load	°	1.4	1.6	2.0	2.0	2.4	2.4	3.0
10 Mass inertia	gcm <sup>2</sup>	0.07	0.05	0.05	0.04	0.05	0.05	0.05
11 Gearhead length L1	mm	15.5	19.1	22.7	22.7	26.3	26.3	29.9



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 16, 2 W	124			37.9	41.5	45.1	45.1	48.7	48.7	52.3	52.3
RE 16, 2 W	124	MR	429/430	43.6	47.2	50.8	50.8	54.4	54.4	58.0	58.0
RE 16, 3.2 W	125/126			56.0	59.6	63.2	63.2	66.8	66.8	70.4	70.4
RE 16, 3.2 W	126	MR	429/430	61.0	64.6	68.2	68.2	71.8	71.8	75.4	75.4
RE 16, 3.2 W	126	MEnc 13	416	62.1	65.7	69.3	69.3	72.9	72.9	76.5	76.5
RE 16, 4.5 W	127/128			59.0	62.6	66.2	66.2	69.8	69.8	73.4	73.4
RE 16, 4.5 W	128	MR	429/430	64.0	67.6	71.2	71.2	74.8	74.8	78.4	78.4
RE 16, 4.5 W	128	MEnc 13	416	65.2	68.8	72.4	72.4	76.0	76.0	79.6	79.6
A-max 16	143-146			41.0	44.6	48.2	48.2	51.8	51.8	55.4	55.4
A-max 16	144/146	MR	429/430	46.0	49.6	53.2	53.2	56.8	56.8	60.4	60.4
A-max 16	144/146	MEnc 13	416	49.1	52.7	56.3	56.3	59.9	59.9	63.5	63.5
EC-max 16, 5 W	217			39.6	43.2	46.8	46.8	50.4	50.4	54.0	54.0
EC-max 16, 5 W	217	MR	431	46.9	50.5	54.1	54.1	57.7	57.7	61.3	61.3
EC-max 16, 2-wire	218			49.1	52.7	56.3	56.3	59.9	59.9	63.5	63.5

### Option Ball Bearing



### Part Numbers

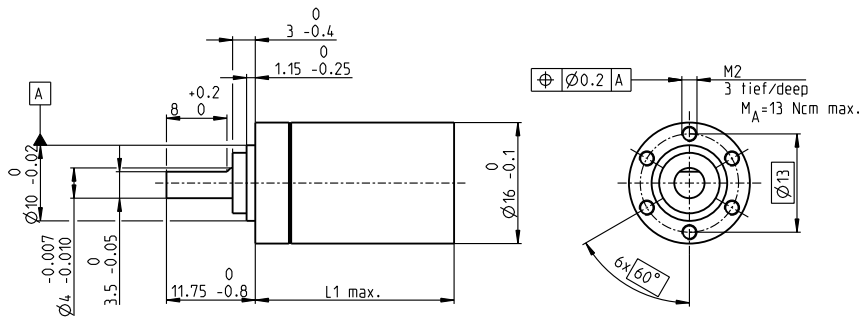
4.4 : 1	138333	455 : 1	138343
5.4 : 1	138334	561 : 1	138344
19 : 1	138335	690 : 1	138345
24 : 1	138336	850 : 1	138346
29 : 1	138337	1621 : 1	138347
84 : 1	138338	1996 : 1	138348
104 : 1	138339	2458 : 1	138349
128 : 1	138340	3027 : 1	138350
157 : 1	138341	3728 : 1	138351
370 : 1	138342	4592 : 1	138352

### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6 mm from flange	max. 0.08 mm
Axial play at axial load	< 4 N 0 mm
	> 4 N max. 0.05 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	25 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	10 N 15 N 20 N 20 N 20 N
Gearhead values according to sleeve bearing version	

# Planetary Gearhead GP 16 C $\varnothing 16$ mm, 0.2–0.6 Nm

Ceramic Version



## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6 mm from flange	max. 0.08 mm
Axial play at axial load	< 4 N 0 mm > 4 N max. 0.05 mm
Max. axial load (dynamic)	12 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	12000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	20 N 40 N 60 N 80 N 80 N

M 1:1

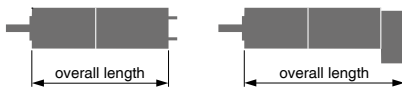
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

416328	407883	416391	401954	328699	416028	416188	414453
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## Gearhead Data

	416328	407883	416391	401954	328699	416028	416188	414453
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	1.5	2	2
<b>Part Numbers</b>	<b>416500</b>	<b>416499</b>	<b>416385</b>		<b>416115</b>	<b>415807</b>	<b>415893</b>	<b>415476</b>
1 Reduction	5.4:1	24:1	104:1		455:1	850:1	1996:1	3728:1
2 Absolute reduction	27/5	1539/65	87723/845		500021/10985	531441/625	285012027/142805	30292137/6125
3 Max. motor shaft diameter	mm 1.5	1.5	2		2	1.5	2	1.5
<b>Part Numbers</b>		<b>416428</b>	<b>402672</b>		<b>416097</b>		<b>415786</b>	<b>409316</b>
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		729/25	41553/325		2368521/4225		135005687/54925	14348907/3125
3 Max. motor shaft diameter	mm	1.5	1.5		2		2	1.5
4 Number of stages		1	2	3	3	4	4	5
5 Max. continuous torque	Nm	0.2	0.3	0.4	0.4	0.5	0.5	0.6
6 Max. intermittent torque at gear output	Nm	0.3	0.45	0.6	0.6	0.75	0.75	0.9
7 Max. efficiency	%	90	81	73	73	65	65	59
8 Weight	g	22	25	29	29	33	33	37
9 Average backlash no load	°	1.4	1.6	2	2	2.4	2.4	3
10 Mass inertia	gcm <sup>2</sup>	0.07	0.05	0.05	0.04	0.05	0.04	0.05
11 Gearhead length L1	mm	18.1	23.2	26.8	26.8	30.4	30.4	33.9

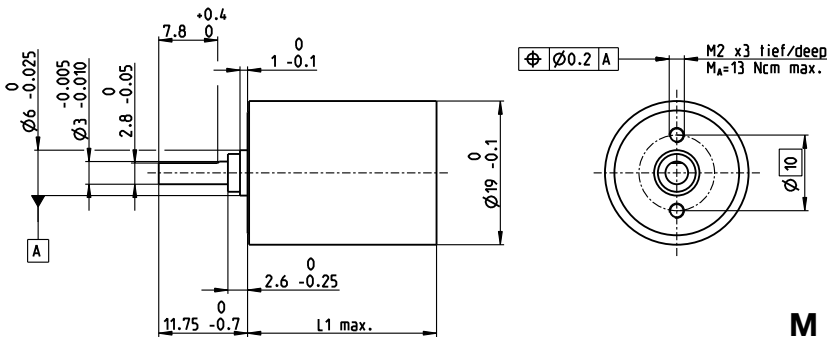


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 16, 2 W	124			40.5	45.6	49.2	49.2	52.8	52.8	56.3	56.3
RE 16, 2 W	124	MR	429/430	46.2	51.3	54.9	54.9	58.5	58.5	62.0	62.0
RE 16, 3.2 W	125/126			58.6	63.7	67.3	67.3	70.9	70.9	74.4	74.4
RE 16, 3.2 W	126	MR	429/430	63.6	68.7	72.3	72.3	75.9	75.9	79.4	79.4
RE 16, 3.2 W	126	MEnc 13	416	64.7	69.8	73.4	73.4	77.0	77.0	80.5	80.5
RE 16, 4.5 W	127/128			61.6	66.7	70.3	70.3	73.9	73.9	77.4	77.4
RE 16, 4.5 W	128	MR	429/430	66.6	71.7	75.3	75.3	78.9	78.9	82.4	82.4
RE 16, 4.5 W	128	MEnc 13	416	67.8	72.9	76.5	76.5	80.1	80.1	83.6	83.6
A-max 16	143-146			43.6	48.7	52.3	52.3	55.9	55.9	59.4	59.4
A-max 16	144/146	MR	429/430	48.6	53.7	57.3	57.3	60.9	60.9	64.4	64.4
A-max 16	144/146	MEnc 13	416	51.7	56.8	60.4	60.4	64.0	64.0	67.5	67.5
EC-max 16, 5 W	217			42.2	47.3	50.9	50.9	54.5	54.5	58.0	58.0
EC-max 16, 5 W	217	MR	431	49.5	54.6	58.2	58.2	61.8	61.8	65.3	65.3
EC-max 16, 8 W	219			54.2	59.3	62.9	62.9	66.5	66.5	70.0	70.0
EC-max 16, 8 W	219	MR	431	61.5	66.6	70.2	70.2	73.8	73.8	77.3	77.3

maxon gear

# Planetary Gearhead GP 19 B Ø19 mm, 0.1–0.3 Nm



### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.08 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-30...+100°C
Extended range as option	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	8 N 12 N 16 N 20 N 20 N

M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

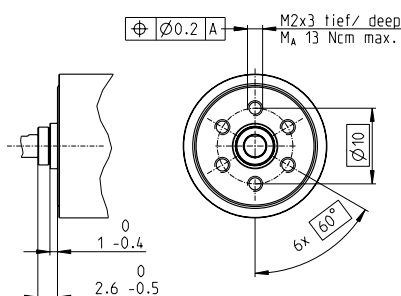
	149039	149041	149044	149047	149048	149051	149053	149056
<b>Gearhead Data</b>								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	2	2	2
<b>Part Numbers</b>	149040	149042	149045		149049	149052	149054	149057
1 Reduction	5.4:1	24:1	104:1		455:1	850:1	1996:1	3728:1
2 Absolute reduction	27/5	1539/65	87723/845		500021/10985	531441/625	285012027/142805	30292137/8125
3 Max. motor shaft diameter	mm 1.5	2	2		2	1.5	2	2
<b>Part Numbers</b>		149043	149046		149050		149055	149058
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		729/25	41553/325		2368521/4225		135005697/64925	14348907/3125
3 Max. motor shaft diameter	mm	1.5	2		2		2	1.5
4 Number of stages		1	2	3	3	4	4	5
5 Max. continuous torque	Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30
6 Max. intermittent torque at gear output	Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450
7 Max. efficiency	%	90	81	73	73	65	65	59
8 Weight	g	26	31	36	36	41	41	46
9 Average backlash no load	°	1.4	1.6	2.0	2.0	2.4	2.4	3.0
10 Mass inertia	gcm <sup>2</sup>	0.07	0.05	0.05	0.05	0.05	0.05	0.05
11 Gearhead length L1	mm	15.9	19.5	23.1	23.1	26.7	26.7	30.3



### maxon Modular System

+ Motor	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 19	147/148		44.9	48.5	52.1	52.1	55.7	55.7	59.3	59.3
A-max 19, 1.5 W	148 MR	429/430	50.0	53.6	57.2	57.2	60.8	60.8	64.4	64.4
A-max 19, 1.5 W	148 Enc 22	437	59.3	62.9	66.5	66.5	70.1	70.1	73.7	73.7
A-max 19, 1.5 W	148 MEnc 13	416	52.4	56.0	59.6	59.6	63.2	63.2	66.8	66.8
A-max 19, 2.5 W	149/150		47.5	51.1	54.7	54.7	58.3	58.3	61.9	61.9
A-max 19, 2.5 W	150 MR	429/430	51.8	55.4	59.0	59.0	62.6	62.6	66.2	66.2
A-max 19, 2.5 W	150 Enc 22	437	61.9	65.5	69.1	69.1	72.7	72.7	76.3	76.3
A-max 19, 2.5 W	150 MEnc 13	416	55.0	58.6	62.2	62.2	65.8	65.8	69.4	69.4

### Option Ball Bearing



### Part Numbers

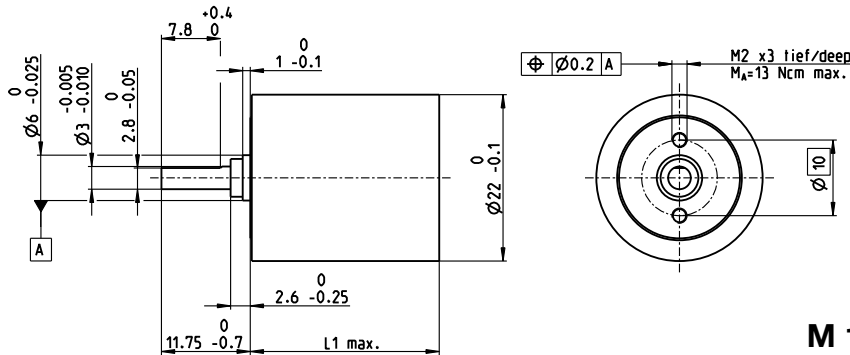
4.4 : 1	227632	455 : 1	227642
5.4 : 1	227633	561 : 1	227643
19 : 1	227634	690 : 1	227644
24 : 1	227635	850 : 1	227645
29 : 1	227636	1621 : 1	227646
84 : 1	227637	1996 : 1	227647
104 : 1	227638	2458 : 1	227648
128 : 1	227639	3027 : 1	227649
157 : 1	227640	3728 : 1	227650
370 : 1	227641	4592 : 1	227651

### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6 mm from flange	max. 0.08 mm
Axial play at axial load	< 4 N 0 mm
	> 4 N max. 0.05 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	25 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	10 N 15 N 20 N 20 N 20 N
Gearhead values according to sleeve bearing version	



# Planetary Gearhead GP 22 B Ø22 mm, 0.1–0.3 Nm



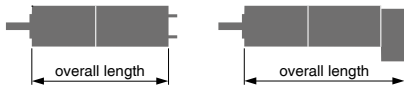
Technical Data	
Planetary Gearhead	straight teeth
Housing	steel
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.06 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-30...+100°C
Extended range as option	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	8 N 12 N 16 N 20 N 20 N

M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

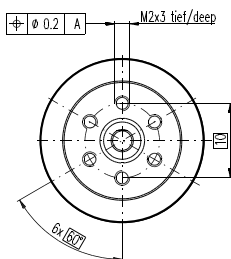
	110355	110356	110357	118653	110358	134772	110359	134775
<b>Gearhead Data</b>								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	2	2	2
<b>Part Numbers</b>	118651	134767	134768		134770	118654	134773	134776
1 Reduction	5.4:1	24:1	104:1		455:1	850:1	1996:1	3728:1
2 Absolute reduction	27/5	1539/65	87723/845		5000211/10985	531441/625	285012027/142805	30292137/6125
3 Max. motor shaft diameter	mm 1.5	2	2		2	1.5	2	2
<b>Part Numbers</b>		118652	134769		134771		134774	118655
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		729/25	41553/325		2368521/4225		135005687/54925	14348907/3125
3 Max. motor shaft diameter	mm	1.5	2		2		2	1.5
4 Number of stages		1	2	3	3	4	4	5
5 Max. continuous torque	Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30
6 Max. intermittent torque at gear output	Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450
7 Max. efficiency	%	90	81	73	73	65	65	59
8 Weight	g	39	48	57	57	65	65	73
9 Average backlash no load	°	1.4	1.6	2.0	2.0	2.4	2.4	3.0
10 Mass inertia	gcm <sup>2</sup>	0.07	0.05	0.05	0.05	0.05	0.05	0.05
11 Gearhead length L1	mm	15.9	19.5	23.1	23.1	26.7	26.7	30.3



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 22	151-154			47.9	51.5	55.1	55.1	58.7	58.7	62.3	62.3
A-max 22	152/154 MR		429/430	52.9	56.5	60.1	60.1	63.7	63.7	67.3	67.3
A-max 22	152/154 Enc 22		437	62.3	65.9	69.5	69.5	73.1	73.1	76.7	76.7
A-max 22	152/154 MEnc 13		416	55.0	58.6	62.2	62.2	65.8	65.8	69.4	69.4

### Option Ball Bearing



### Part Numbers

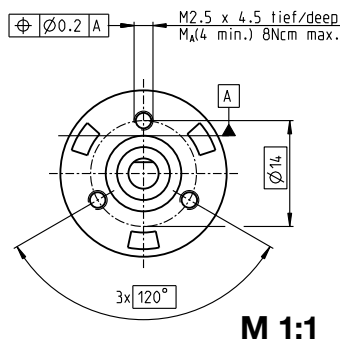
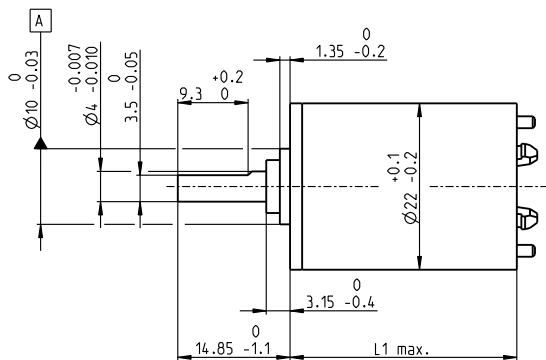
4.4:1	144137	455:1	144147
5.4:1	144138	561:1	144148
19:1	144139	690:1	144149
24:1	144140	850:1	144150
29:1	144141	1621:1	144151
84:1	144142	1996:1	144152
104:1	144143	2458:1	144153
128:1	144144	3027:1	144154
157:1	144145	3728:1	144155
370:1	144146	4592:1	144156

### Technical Data

Planetary Gearhead	straight teeth
Housing	steel
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6 mm from flange	max. 0.08 mm
Axial play at axial load	< 4 N 0 mm
	> 4 N max. 0.05 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	25 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 6 mm from flange	10 N 15 N 20 N 20 N 20 N
Gearhead values according to sleeve bearing version	

# Planetary Gearhead GP 22 L Ø22 mm, 0.2–0.6 Nm

Plastic Version



M 1:1

### Technical Data

Planetary Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 10 mm from flange	max. 0.1 mm
Axial play	max. 0.15 mm
Max. axial load (dynamic)	20 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-15...+80°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	15 N 20 N 25 N 30 N 30 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

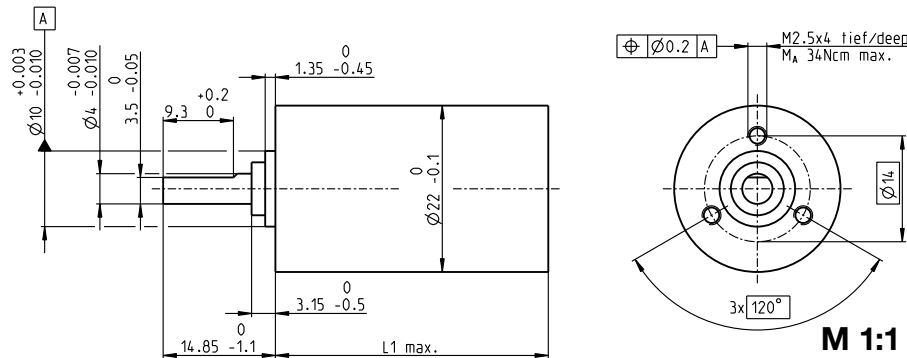
	232763	232766	232772	232778	232782	232788	232794	232796	232803	232809	232815
<b>Gearhead Data</b>											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	59049/100	759375/1024	158340015/114244	285012027/142805	1594323/500
3 Max. motor shaft diameter	mm 4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
<b>Part Numbers</b>	232764	232767	232773	232779	232783	232789	232795	232798	232804	232810	232816
1 Reduction	4.4:1	16:1	62:1	109:1	231:1	389:1	690:1	867:1	1460:1	2102:1	3728:1
2 Absolute reduction	57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	3947535/2704	7105563/3380	30292137/8125
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
<b>Part Numbers</b>	232765	232768	232774	232780	232784	232790	232797	232799	232805	232811	232817
1 Reduction	5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2 Absolute reduction	27/5	3249/169	48735/676	41559/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter	mm 2.5	3.2	3.2	4	3.2	4	2.5	3.2	4	4	2.5
<b>Part Numbers</b>		232769	232775	232781	232785	232791		232800	232806	232812	
1 Reduction		20:1	76:1	157:1	285:1	455:1		1068:1	1621:1	2458:1	
2 Absolute reduction		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	601692057/371293	135005687/54825	
3 Max. motor shaft diameter		mm 4	4	2.5	4	3.2		4	3.2	3.2	
<b>Part Numbers</b>		232770	232776		232786	232792		232801	232807	232813	
1 Reduction		24:1	84:1		316:1	479:1		1185:1	1707:1	2589:1	
2 Absolute reduction		1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	15000633/8788	3365793/1300	
3 Max. motor shaft diameter		mm 3.2	3.2		3.2	3.2		3.2	3.2	3.2	
<b>Part Numbers</b>		232771	232777		232787	232793		232802	232808	232814	
1 Reduction		29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2 Absolute reduction		729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter		mm 2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque	Nm 0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6
6 Max. intermittent torque at gear output	Nm 0.3	0.4	0.5	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8
7 Max. efficiency	% 84	70	59	59	49	49	49	42	42	42	42
8 Weight	g 28	35	43	43	51	51	51	59	59	59	59
9 Average backlash no load	° 1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia	gcm <sup>2</sup> 0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1	mm 22.7	29.5	36.3	36.3	43.1	43.1	43.1	49.9	49.9	49.9	49.9



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
A-max 22	151-154			54.7	61.5	68.3	68.3	75.1	75.1	81.9	81.9	81.9
A-max 22	152/154 MR		429/430	59.7	66.5	73.3	73.3	80.1	80.1	86.9	86.9	86.9
A-max 22	152/154 Enc 22		437	69.1	75.9	82.7	82.7	89.5	89.5	96.3	96.3	96.3
A-max 22	152/154 MEnc 13		416	61.8	68.6	75.4	75.4	82.2	82.2	89.0	89.0	89.0

# Planetary Gearhead GP 22 A Ø22 mm, 0.5–1.0 Nm



## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Option	sleeve bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	30 N 50 N 55 N 55 N 55 N

maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	134156	134158	134163	134168	134172	110340	134183	134186	134190	134195	134203
<b>Gearhead Data</b>											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	59049/100	759375/1024	158340015/114244	285012027/142805	1594323/500
3 Max. motor shaft diameter	mm 4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
<b>Part Numbers</b>	110337	134159	134164	134169	134173	134178	134184	134187	134193	134198	134204
1 Reduction	4.4:1	16:1	62:1	109:1	231:1	389:1	690:1	867:1	1460:1	2102:1	3728:1
2 Absolute reduction	57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	3947535/2704	7105563/3380	30292137/8125
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
<b>Part Numbers</b>	134157	110338	134165	134170	134174	134180	134185	134188	134196	134200	134205
1 Reduction	5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2 Absolute reduction	27/5	3249/169	48735/676	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter	mm 2.5	3.2	3.2	3.2	4	2.5	3.2	4	4	4	2.5
<b>Part Numbers</b>		134160	134166	134171	134176	134179		134191	110341	134199	
1 Reduction		20:1	76:1	157:1	285:1	455:1		1068:1	1621:1	2458:1	
2 Absolute reduction		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	601692057/371293	13500693/54925	
3 Max. motor shaft diameter	mm	4	4	2.5	4	3.2		4	3.2	3.2	
<b>Part Numbers</b>		134161	110339		134175	134181		134189	134194	134201	
1 Reduction		24:1	84:1		316:1	479:1		1185:1	1707:1	2589:1	
2 Absolute reduction		1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	150000633/8788	3365793/300	
3 Max. motor shaft diameter	mm	3.2	3.2		3.2	3.2		3.2	3.2	3.2	
<b>Part Numbers</b>		134162	134167		134177	134182		134192	134197	134202	
1 Reduction		29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2 Absolute reduction		729/25	4617/52		68255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter	mm	2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages		1	2	3	4	4		5	5	5	5
5 Max. continuous torque	Nm	0.5	0.5	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0
6 Max. intermittent torque at gear output	Nm	0.8	0.8	1.2	1.2	1.6	1.6	1.6	1.6	1.6	1.6
7 Max. efficiency	%	84	70	59	59	49	49	42	42	42	42
8 Weight	g	42	55	68	68	81	81	81	94	94	94
9 Average backlash no load	°	1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia	gcm <sup>2</sup>	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1*	mm	22.6	29.4	36.2	36.2	43.0	43.0	43.0	49.8	49.8	49.8

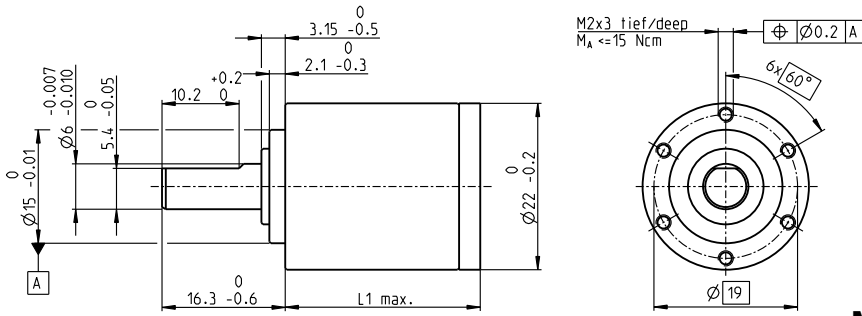
\*for EC 32fl. L1 is + 7.1 mm

## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
A-max 19	147/148			51.6	58.4	65.2	65.2	72.0	72.0	78.8	78.8	78.8	78.8
A-max 19, 1.5 W	148	MR	429/430	56.7	63.5	70.3	70.3	77.1	77.1	83.9	83.9	83.9	83.9
A-max 19, 1.5 W	148	Enc 22	437	66.0	72.8	79.6	79.6	86.4	86.4	93.2	93.2	93.2	93.2
A-max 19, 1.5 W	148	MEnc 13	416	59.1	65.9	72.7	72.7	79.5	79.5	86.3	86.3	86.3	86.3
A-max 19, 2.5 W	149/150			54.2	61.0	67.8	67.8	74.6	74.6	81.4	81.4	81.4	81.4
A-max 19, 2.5 W	150	MR	429/430	58.5	65.3	72.1	72.1	78.9	78.9	85.7	85.7	85.7	85.7
A-max 19, 2.5 W	150	Enc 22	437	68.6	75.4	82.2	82.2	89.0	89.0	95.8	95.8	95.8	95.8
A-max 19, 2.5 W	150	MEnc 13	416	61.7	68.5	75.3	75.3	82.1	82.1	88.9	88.9	88.9	88.9
A-max 22	151-154			54.6	61.4	68.2	68.2	75.0	75.0	81.8	81.8	81.8	81.8
A-max 22	152/154	MR	429/430	59.6	66.4	73.2	73.2	80.0	80.0	86.8	86.8	86.8	86.8
A-max 22	152/154	Enc 22	437	69.0	75.8	82.6	82.6	89.4	89.4	96.2	96.2	96.2	96.2
A-max 22	152/154	MEnc 13	416	61.7	68.5	75.3	75.3	82.1	82.1	88.9	88.9	88.9	88.9
EC 20 flat, 3 W, A	254			33.1	39.9	46.7	46.7	53.5	53.5	60.3	60.3	60.3	60.3
EC 20 flat, 3 W, B	254			32.5	39.3	46.1	46.1	52.9	52.9	59.7	59.7	59.7	59.7
EC 20 flat, 5 W	255			36.7	43.5	50.3	50.3	57.1	57.1	63.9	63.9	63.9	63.9
EC 20 flat, IE, IP 00	256			39.7	46.5	53.3	53.3	60.1	60.1	66.9	66.9	66.9	66.9
EC 20 flat, IE, IP 40	256			40.8	47.6	54.4	54.4	61.2	61.2	68.0	68.0	68.0	68.0
EC 20 flat, IE, IP 00	257			43.7	50.5	57.3	57.3	64.1	64.1	70.9	70.9	70.9	70.9
EC 20 flat, IE, IP 40	257			44.8	51.6	58.4	58.4	65.2	65.2	72.0	72.0	72.0	72.0
EC 32 flat, 6 W	258			39.8	46.6	53.4	53.4	60.2	60.2	67.0	67.0	67.0	67.0

# Planetary Gearhead GP 22 AR $\varnothing 22$ mm, 0.50 Nm

for high radial loads



## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-30...+100°C
Max. radial load, 10 mm from flange	70 N

M 1:1

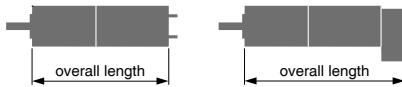
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

462695	438992	462696
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## Gearhead Data

		3.8:1	4.4:1	5.4:1
1 Reduction		3.8:1	4.4:1	5.4:1
2 Absolute reduction		$\frac{15}{4}$	$\frac{57}{13}$	$\frac{27}{5}$
3 Max. motor shaft diameter	mm	4	3.2	2.5
4 Number of stages		1	1	1
5 Max. continuous torque	Nm	0.5	0.5	0.5
6 Max. intermittent torque at gear output	Nm	0.8	0.8	0.8
7 Max. efficiency	%	90	90	90
8 Weight	g	44	44	44
9 Average backlash no load	°	1.0	1.0	1.0
10 Mass inertia	gcm <sup>2</sup>	0.5	0.38	0.25
11 Gearhead length L1	mm	25.8	25.8	25.8

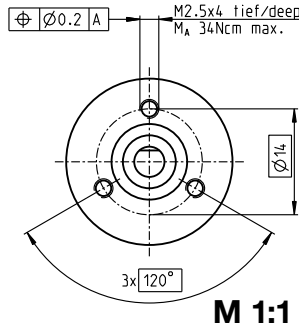
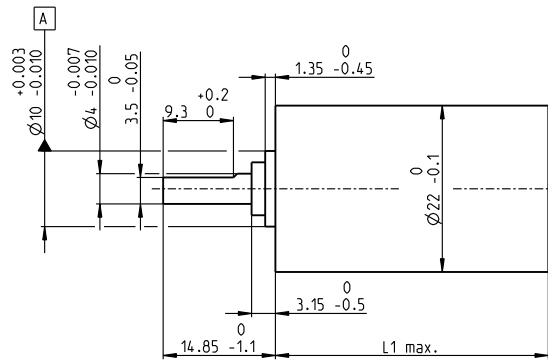


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 25, 20 W	130			68.9	68.9	68.9
RE 25, 20 W	130	MR	432	79.9	79.9	79.9
RE 25, 20 W	130	HED_ 5540	441/442	89.7	89.7	89.7
RE 25, 20 W	130	DCT 22	449	91.2	91.2	91.2
RE 25, 20 W	130	AB 28	491	103	103	103
RE 25, 20 W	130	HED_ 5540/AB 28	441/491	120.2	120.2	120.2
EC-max 22, 25 W	221			74.4	74.4	74.4
EC-max 22, 25 W	221	MR	431	84	84	84
EC-max 22, 25 W	221	AB 20	488	110	110	110

# Planetary Gearhead GP 22 C Ø22 mm, 0.5–2.0 Nm

Ceramic Version



## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	30 N 50 N 55 N 55 N 55 N

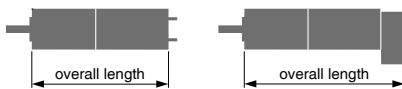
maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	143971	143974	143980	143986	143990	143996	144002	144004	144011	144017	144023
<b>Gearhead Data</b>											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	59049/100	759375/1024	158340015/114244	285012027/142805	1594323/500
3 Max. motor shaft diameter	mm 4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
<b>Part Numbers</b>	143972	143975	143981	143987	143991	143997	144003	144006	144012	144018	144024
1 Reduction	4.4:1	16:1	62:1	109:1	231:1	389:1	690:1	867:1	1460:1	2102:1	3728:1
2 Absolute reduction	57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	3947535/2704	7105563/3380	30292137/8125
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
<b>Part Numbers</b>	143973	143976	143982	143988	143992	143998	144005	144007	144013	144019	144025
1 Reduction	5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2 Absolute reduction	27/5	3249/169	48735/676	41559/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter	mm 2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	4	4	2.5
<b>Part Numbers</b>		143977	143983	143989	143993	143999		144008	144014	144020	
1 Reduction		20:1	76:1	157:1	285:1	455:1		1068:1	1621:1	2458:1	
2 Absolute reduction		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	601692057/371293	135005697/54825	
3 Max. motor shaft diameter	mm	4	4	2.5	4	3.2		4	3.2	3.2	
<b>Part Numbers</b>		143978	143984		143994	144000		144009	144015	144021	
1 Reduction		24:1	84:1		316:1	479:1		1185:1	1707:1	2589:1	
2 Absolute reduction		1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	15000633/8788	3365793/300	
3 Max. motor shaft diameter	mm	3.2	3.2		3.2	3.2		3.2	3.2	3.2	
<b>Part Numbers</b>		143979	143985		143995	144001		144010	144016	144022	
1 Reduction		29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2 Absolute reduction		729/25	4617/52		68255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter	mm	2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages		1	2	3	4	4		5	5	5	5
5 Max. continuous torque	Nm	0.5	0.6	1.2	1.2	1.8	1.8	1.8	2.0	2.0	2.0
6 Max. intermittent torque at gear output	Nm	0.8	0.9	1.9	1.9	2.7	2.7	2.7	3.0	3.0	3.0
7 Max. efficiency	%	84	70	59	59	49	49	49	42	42	42
8 Weight	g	42	55	68	68	81	81	81	94	94	94
9 Average backlash no load	°	1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia	gcm <sup>2</sup>	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1*	mm	25.4	32.2	39.0	39.0	45.8	45.8	45.8	52.6	52.6	52.6

\*L1 is -2.8 mm for calculating the overall length

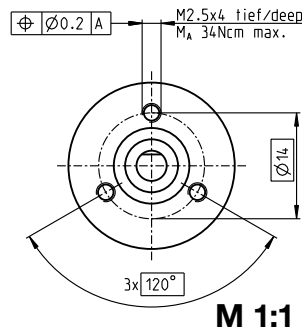
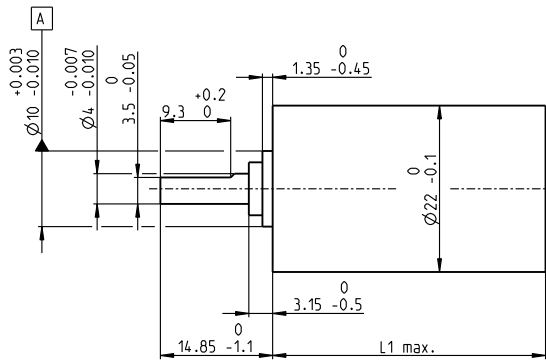


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 19	147/148			51.6	58.4	65.2	65.2	72.0	78.8	78.8	78.8
A-max 19, 1.5 W	148	MR	429/430	56.7	63.5	70.3	70.3	77.1	77.1	77.1	83.9
A-max 19, 1.5 W	148	Enc 22	437	66.0	72.8	79.6	79.6	86.4	86.4	86.4	93.2
A-max 19, 1.5 W	148	MEnc 13	416	59.1	65.9	72.7	72.7	79.5	79.5	79.5	86.3
A-max 19, 2.5 W	149/150			54.2	61.0	67.8	67.8	74.6	74.6	74.6	81.4
A-max 19, 2.5 W	150	MR	429/430	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7
A-max 19, 2.5 W	150	Enc 22	437	68.6	75.4	82.2	82.2	89.0	89.0	89.0	95.8
A-max 19, 2.5 W	150	MEnc 13	416	61.7	68.5	75.3	75.3	82.1	82.1	82.1	88.9
A-max 22	151-154			54.6	61.4	68.2	68.2	75.0	75.0	75.0	81.8
A-max 22	152/154	MR	429/430	59.6	66.4	73.2	73.2	80.0	80.0	80.0	86.8
A-max 22	152/154	Enc 22	437	69.0	75.8	82.6	82.6	89.4	89.4	89.4	96.2
A-max 22	152/154	MEnc 13	416	61.7	68.5	75.3	75.3	82.1	82.1	82.1	88.9

# Planetary Gearhead GP 22 C Ø22 mm, 0.5–2.0 Nm

Ceramic Version



M 1:1

### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	30 N 50 N 55 N 55 N 55 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	143971	143974	143980	143986	143990	143996	144002	144004	144011	144017	144023
<b>Gearhead Data</b>											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	59049/100	759375/1024	158340015/114244	285012027/142805	1594323/500
3 Max. motor shaft diameter	mm 4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
<b>Part Numbers</b>	143972	143975	143981	143987	143991	143997	144003	144006	144012	144018	144024
1 Reduction	4.4:1	16:1	62:1	109:1	231:1	389:1	690:1	867:1	1460:1	2102:1	3728:1
2 Absolute reduction	57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	3947535/2704	7105563/3380	30292137/8125
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
<b>Part Numbers</b>	143973	143976	143982	143988	143992	143998	144005	144007	144013	144019	144025
1 Reduction	5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2 Absolute reduction	27/5	3249/169	48735/676	41553/325	731023/2704	6561/16	531444/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter	mm 2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	4	4	2.5
<b>Part Numbers</b>	143977	143983	143989	143993	143999		144008	144014	144020		
1 Reduction		20:1	76:1	157:1	285:1	455:1		1068:1	1621:1	2458:1	
2 Absolute reduction		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	601692057/371293	135005697/54825	
3 Max. motor shaft diameter	mm 4	4	2.5	4	3.2		4	3.2	3.2		
<b>Part Numbers</b>	143978	143984		143994	144000		144009	144015	144021		
1 Reduction		24:1	84:1		316:1	479:1		1185:1	1707:1	2589:1	
2 Absolute reduction		1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	15000633/6788	3365793/1300	
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	
<b>Part Numbers</b>	143979	143985		143995	144001		144010	144016	144022		
1 Reduction		29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2 Absolute reduction		729/25	4617/52		6925/208	2368821/4225		1038825/832	379377/208	63950067/21125	
3 Max. motor shaft diameter	mm 2.5	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque	Nm 0.5	0.6	1.2	1.2	1.8	1.8	1.8	2.0	2.0	2.0	2.0
6 Max. intermittent torque at gear output	Nm 0.8	0.9	1.9	1.9	2.7	2.7	2.7	3.0	3.0	3.0	3.0
7 Max. efficiency	% 84	70	59	59	49	49	49	42	42	42	42
8 Weight	g 42	55	68	68	81	81	81	94	94	94	94
9 Average backlash no load	° 1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia	gcm <sup>2</sup> 0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1*	mm 25.4	32.2	39.0	39.0	45.8	45.8	45.8	52.6	52.6	52.6	52.6

\*for EC-max 16 L1 is=2.8 mm

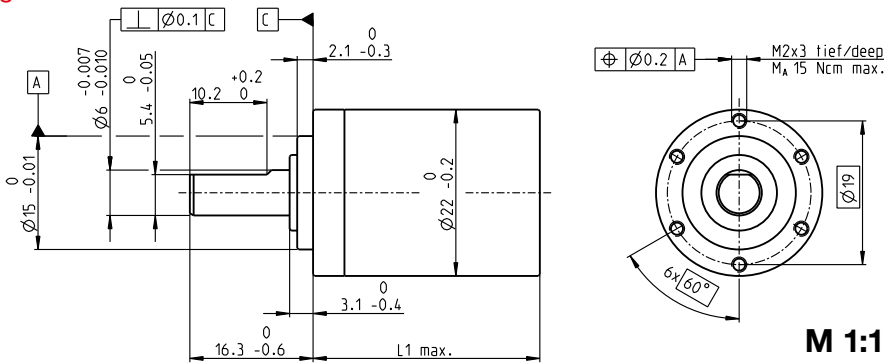


### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
EC-max 16, 8 W	219			58.7	65.5	72.3	72.3	79.1	79.1	85.9	85.9	85.9
EC-max 16, 8 W	219	MR	431	66.0	72.8	79.6	79.6	86.4	86.4	93.2	93.2	93.2
EC-max 22, 12 W	220			57.5	64.3	71.1	71.1	77.9	77.9	84.7	84.7	84.7
EC-max 22, 12 W	220	MR	431	67.2	74.0	80.8	80.8	87.6	87.6	94.4	94.4	94.4
EC-max 22, 12 W	220	AB 20	488	93.1	99.9	106.7	106.7	113.5	113.5	120.3	120.3	120.3
EC 20 flat, 3 W, A	254			33.1	39.9	46.7	46.7	53.5	53.5	60.3	60.3	60.3
EC 20 flat, 3 W, B	254			32.5	39.3	46.1	46.1	52.9	52.9	59.7	59.7	59.7
EC 20 flat, 5 W	255			36.7	43.5	50.3	50.3	57.1	57.1	63.9	63.9	63.9
EC 20 flat, IE, IP 00	256			39.7	46.5	53.3	53.3	60.1	60.1	66.9	66.9	66.9
EC 20 flat, IE, IP 40	256			40.8	47.6	54.4	54.4	61.2	61.2	68.0	68.0	68.0
EC 20 flat, IE, IP 00	257			43.7	50.5	57.3	57.3	64.1	64.1	70.9	70.9	70.9
EC 20 flat, IE, IP 40	257			44.8	51.6	58.4	58.4	65.2	65.2	72.0	72.0	72.0
EC 32 flat, 6 W	258			39.8	46.6	53.4	53.4	60.2	60.2	67.0	67.0	67.0

# Planetary Gearhead GP 22 HP $\varnothing 22$ mm, 2.0–3.4 Nm

High Power



M 1:1

## Technical Data

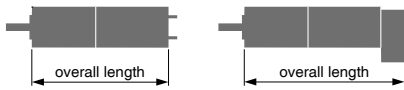
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	12000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4
Max. radial load, 10 mm from flange	55 N 85 N 100 N 110 N

maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	370683	370687	370690	370776	370780	370783	370792	370797	370802	370807
<b>Gearhead Data (provisional)</b>										
1 Reduction	3.8:1	14:1	20:1	53:1	76:1	104:1	198:1	316:1	410:1	590:1
2 Absolute reduction	15/4	225/16	81/4	3375/64	1215/16	87723/845	50625/256	2777895/8788	6561/16	59049/100
3 Max. motor shaft diameter	mm 4	4	4	4	4	3.2	4	3.2	4	4
<b>Part Numbers</b>	370685	370688	370691	370778	370781	370784	370794	370799	370803	370808
1 Reduction	4.4:1	16:1	24:1	62:1	84:1	109:1	231:1	333:1	455:1	690:1
2 Absolute reduction	57/13	855/52	1539/65	12825/208	185193/2197	2187/20	192375/632	69255/208	5000211/10985	1121931/1625
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	3.2	3.2	4	3.2	3.2	3.2	3.2
<b>Part Numbers</b>	370686	370689	370692	370779	370782	370785	370795	370800	370805	370809
1 Reduction	5.4:1	19:1	29:1	72:1	89:1	128:1	270:1	370:1	479:1	850:1
2 Absolute reduction	27/5	3249/169	729/25	48735/676	4617/52	41553/325	731025/2704	10556001/28561	124659/260	531441/625
3 Max. motor shaft diameter	mm 2.5	3.2	2.5	3.2	3.2	3.2	3.2	3.2	3.2	2.5
<b>Part Numbers</b>						370786	370796	370801	370806	
1 Reduction						157:1	285:1	389:1	561:1	
2 Absolute reduction						19683/125	18225/64	263169/676	2368521/4225	
3 Max. motor shaft diameter						mm 2.5	4	3.2	3.2	
4 Number of stages	1	2	2	3	3	3	4	4	4	4
5 Max. continuous torque	Nm 2	2.4	2.4	3	3	3	3.4	3.4	3.4	3.4
6 Max. intermittent torque at gear output	Nm 2.5	3	3	3.5	3.5	3.5	3.8	3.8	3.8	3.8
7 Max. efficiency	% 84	70	70	59	59	59	49	49	49	49
8 Weight	g 51	64	64	78	78	78	91	91	91	91
9 Average backlash no load	° 1.0	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0
10 Mass inertia	gcm <sup>2</sup> 0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1	mm 25.3	32.3	32.3	39.0	39.0	39.0	45.7	45.7	45.7	45.7

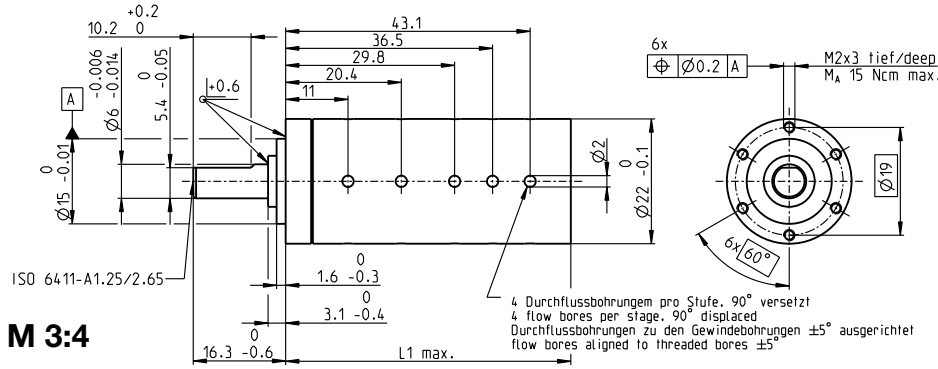


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
EC-max 22, 12 W	220			57.4	64.4	64.4	71.1	71.1	77.8	77.8	77.8	77.8
EC-max 22, 12 W	220	MR	431	67.1	74.1	74.1	80.8	80.8	80.8	87.5	87.5	87.5
EC-max 22, 12 W	220	AB 20	488	93.0	100.0	100.0	106.7	106.7	106.7	113.4	113.4	113.4
EC-max 22, 25 W	221			73.9	80.9	80.9	87.6	87.6	87.6	94.3	94.3	94.3
EC-max 22, 25 W	221	MR	431	83.6	90.6	90.6	97.3	97.3	97.3	104.0	104.0	104.0
EC-max 22, 25 W	221	AB 20	488	109.5	116.5	116.5	123.2	123.2	123.2	129.9	129.9	129.9
EC-4pole 22, 90 W	229			74.0	81.0	81.0	87.7	87.7	87.7	94.4	94.4	94.4
EC-4pole 22, 90 W	229	16 EASY/XT/Abs.	418-422	86.2	93.2	93.2	99.9	99.9	99.9	106.6	106.6	106.6
EC-4pole 22, 90 W	229	16 EASY Abs. XT	424	86.7	93.7	93.7	100.4	100.4	100.4	107.1	107.1	107.1
EC-4pole 22, 90 W	229	16 RIO	435	84.7	91.7	91.7	98.4	98.4	98.7	105.1	105.1	105.1
EC-4pole 22, 90 W	229	AEDL/HEDL	438/444	95.5	102.5	102.5	109.2	109.2	109.2	115.9	115.9	115.9
EC-4pole 22, 120 W	230			91.4	98.4	98.4	105.1	105.1	105.1	111.8	111.8	111.8
EC-4pole 22, 120 W	230	16 EASY/XT/Abs.	418-422	103.6	110.6	110.6	117.3	117.3	117.3	124.0	124.0	124.0
EC-4pole 22, 120 W	230	16 EASY Abs. XT	424	104.1	111.1	111.1	117.8	117.8	117.8	124.5	124.5	124.5
EC-4pole 22, 120 W	230	16 RIO	435	102.1	109.1	109.1	115.8	115.8	115.8	122.5	122.5	122.5
EC-4pole 22, 120 W	230	AEDL/HEDL	438/444	112.9	119.9	119.9	126.6	126.6	126.6	133.3	133.3	133.3

# Planetary Gearhead GP 22 HD Ø22 mm, 2.0–4.0 Nm

Heavy Duty – for application in oil



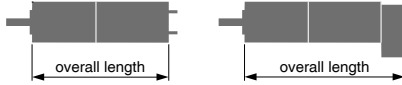
M 3:4

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

Gearhead Data (provisional)	410657	410637	410558	416698	409667	416709	416738	416211	416747	416753	416760
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	561:1	742:1	1386:1	1798:1	3027:1
2 Absolute reduction	<sup>15</sup> / <sub>4</sub>	<sup>225</sup> / <sub>16</sub>	<sup>3375</sup> / <sub>64</sub>	<sup>87723</sup> / <sub>845</sub>	<sup>50625</sup> / <sub>256</sub>	<sup>10556001</sup> / <sub>28561</sub>	<sup>2368521</sup> / <sub>4225</sub>	<sup>759375</sup> / <sub>1024</sub>	<sup>158340015</sup> / <sub>114244</sub>	<sup>373977</sup> / <sub>208</sub>	<sup>63950067</sup> / <sub>21125</sub>
3 Max. motor shaft diameter	mm 4	4	4	3.2	4	3.2	3.2	4	3.2	3.2	3.2
<b>Part Numbers</b>	416684	416686	416693	416699	416703	416710	416739	416742	416748	416754	416762
1 Reduction	4.4:1	16:1	62:1	109:1	231:1	389:1	590:1	867:1	1460:1	1996:1	3189:1
2 Absolute reduction	<sup>57</sup> / <sub>13</sub>	<sup>855</sup> / <sub>52</sub>	<sup>12825</sup> / <sub>208</sub>	<sup>2187</sup> / <sub>20</sub>	<sup>192375</sup> / <sub>832</sub>	<sup>263169</sup> / <sub>676</sub>	<sup>59049</sup> / <sub>100</sub>	<sup>2885625</sup> / <sub>3328</sub>	<sup>3947535</sup> / <sub>2704</sub>	<sup>285012027</sup> / <sub>142805</sub>	<sup>1594323</sup> / <sub>500</sub>
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	4	3.2	3.2	4	3.2	3.2	3.2	4
<b>Part Numbers</b>	416687	416694	416701	416704	416711	416740	416743	416749	416756	416763	
1 Reduction	19:1	72:1	128:1	270:1	410:1	690:1	1014:1	1538:1	2102:1	3728:1	
2 Absolute reduction	<sup>3249</sup> / <sub>169</sub>	<sup>48735</sup> / <sub>676</sub>	<sup>41559</sup> / <sub>325</sub>	<sup>731025</sup> / <sub>2704</sub>	<sup>6561</sup> / <sub>16</sub>	<sup>1121931</sup> / <sub>1625</sub>	<sup>10965375</sup> / <sub>10816</sub>	<sup>98415</sup> / <sub>64</sub>	<sup>7105563</sup> / <sub>3380</sub>	<sup>30292137</sup> / <sub>8125</sub>	
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	4	3.2	4	3.2	4	3.2	3.2	
<b>Part Numbers</b>	416688	416695		416706	416736		416744	416751	416757		
1 Reduction	20:1	76:1		285:1	455:1		1068:1	1621:1	2214:1		
2 Absolute reduction	<sup>81</sup> / <sub>4</sub>	<sup>1215</sup> / <sub>16</sub>		<sup>18225</sup> / <sub>64</sub>	<sup>5000211</sup> / <sub>10985</sub>		<sup>273375</sup> / <sub>256</sub>	<sup>601692057</sup> / <sub>371293</sub>	<sup>177147</sup> / <sub>80</sub>		
3 Max. motor shaft diameter	mm 4	4		4	3.2		4	3.2	4		
<b>Part Numbers</b>	416689	416696		416707	416737		416745	416752	416758		
1 Reduction	24:1	84:1		316:1	479:1		1185:1	1707:1	2458:1		
2 Absolute reduction	<sup>1539</sup> / <sub>65</sub>	<sup>185193</sup> / <sub>2197</sub>		<sup>2777895</sup> / <sub>8788</sub>	<sup>124659</sup> / <sub>260</sub>		<sup>41668425</sup> / <sub>35152</sub>	<sup>15000633</sup> / <sub>8788</sub>	<sup>135005697</sup> / <sub>54925</sub>		
3 Max. motor shaft diameter	mm 3.2	3.2		3.2	3.2		3.2	3.2	3.2		
<b>Part Numbers</b>		416697		416708			416746		416759		
1 Reduction		89:1		333:1			1249:1		2589:1		
2 Absolute reduction		<sup>4617</sup> / <sub>52</sub>		<sup>6925</sup> / <sub>208</sub>			<sup>1038825</sup> / <sub>832</sub>		<sup>3365793</sup> / <sub>1300</sub>		
3 Max. motor shaft diameter	mm	3.2		3.2			3.2		3.2		
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque	Nm 2	2.4	3	3	3.4	3.4	3.4	4	4	4	4
6 Max. intermittent torque at gear output	Nm 2.5	3	3.5	3.5	3.8	3.8	3.8	4.4	4.4	4.4	4.4
15 Max. overload torque <sup>1)</sup>	Nm 6	9	12	12	12	12	12	12	12	12	12
7 Max. efficiency	% 95	87	78	78	65	65	65	52	52	52	52
8 Weight	g 46	65	82	82	96	96	96	110	110	110	110
9 Average backlash no load	° 1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.5	2.5	2.5	2.5
10 Mass inertia	gcm <sup>2</sup> 0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1	mm 20.6	29.7	38.2	38.2	45.0	45.0	45.0	51.8	51.8	51.8	51.8
13 Max. transmittable power (continuous)	W 160	100	40	40	20	20	20	6	6	6	6
14 Max. transmittable power (intermittent)	W 240	150	60	60	30	30	30	9	9	9	9

<sup>1)</sup> Reduced expected life span



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts
EC 22, 240 W, A	208			110.5 119.5 128.0 128.0 135.0 135.0 141.5 141.5 141.5
EC 22, 240 W, B	208			98.1 107.5 116.0 116.0 122.4 122.4 122.4 129.5 129.5 129.5 129.5

### Application

#### General

- extreme temperature applications
- vibration tested according to MIL-STD810F/Jan2000 Fig. 514.5C-10
- operation in oil and high pressure

#### Oil & Gas Industry

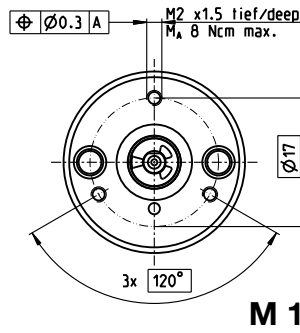
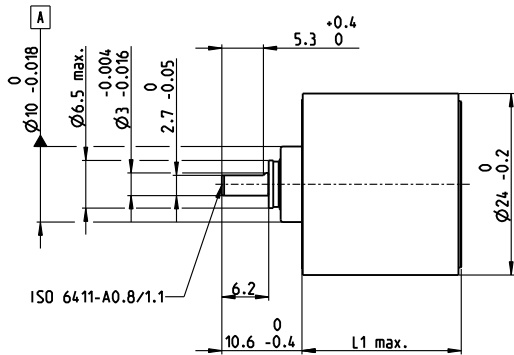
- oil, gas and geothermal wells

### Important Notice

This gearhead has been designed for applications in oil and is only equipped with minimum lubrication. Therefore it is not permitted to use it under normal air conditions.



# Spur Gearhead GS 24 A Ø24 mm, 0.1 Nm



## Technical Data

Spur Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 8 mm from flange	max. 0.038 mm
Axial play	0.03–0.30 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	500 N
Max. continuous input speed	4000 rpm
Recommended temperature range	-15...+80°C
Max. radial load, 8 mm from flange	5 N

- Stock program
- Standard program
- Special program (on request)

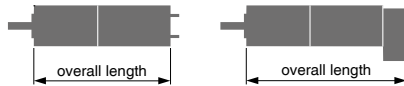
## Part Numbers

110480	110481	110482	110483	110484	110485	110486
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## Gearhead Data

	7.2:1	20:1	32:1	64:1	131:1	199:1	325:1
1 Reduction	7.2:1	20:1	32:1	64:1	131:1	199:1	325:1
2 Absolute reduction	$\frac{93}{13}$	$\frac{753424}{38025}$	$\frac{923521}{28561}$	$\frac{837}{13}$	$\frac{212629}{1625}$	$\frac{887503681}{4455516}$	$\frac{14070001}{43264}$
3 Max. motor shaft diameter	mm 2	2	2	2	2	2	2
4 Number of stages	2	4	4	4	4	6	6
5 Max. continuous torque	Nm 0.1	0.1	0.1	0.1	0.1	0.1	0.1
6 Max. intermittent torque at gear output	Nm 0.15	0.15	0.15	0.15	0.15	0.15	0.15
12 Direction of rotation, drive to output	=	=	=	=	=	=	=
7 Max. efficiency	% 81	66	66	66	66	53	53
8 Weight	g 25	28	28	28	28	30	30
9 Average backlash no load	° 1.0	2.0	2.0	2.0	2.0	3.0	3.0
10 Mass inertia	gcm <sup>2</sup> 0.008	0.01	0.008	0.007	0.006	0.008	0.006
11 Gearhead length L1*	mm 16.5	20.2	20.2	20.2	20.2	24	24

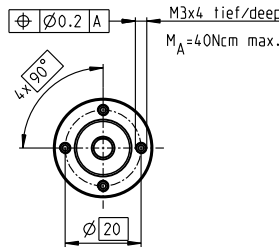
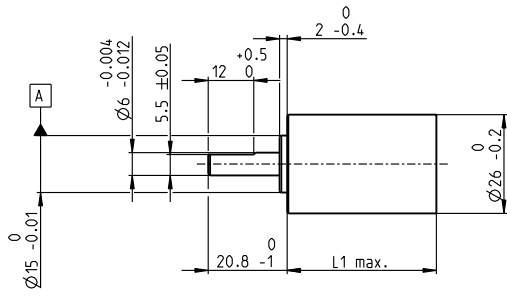
\*L1 for A-max 22 L1 is -2.8 mm



## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
A-max 19	147/148			45.5	49.2	49.2	49.2	49.2	53.0	53.0
A-max 19, 1.5 W	148	MR	429/430	50.6	54.3	54.3	54.3	54.3	58.1	58.1
A-max 19, 1.5 W	148	Enc 22	437	59.9	63.6	63.6	63.6	63.6	67.4	67.4
A-max 19, 1.5 W	148	MEnc 13	416	53.0	56.7	56.7	56.7	56.7	60.5	60.5
A-max 19, 2.5 W	149/150			48.1	51.8	51.8	51.8	51.8	55.6	55.6
A-max 19, 2.5 W	150	MR	429/430	52.4	56.1	56.1	56.1	56.1	59.9	59.9
A-max 19, 2.5 W	150	Enc 22	437	62.5	66.2	66.2	66.2	66.2	70.0	70.0
A-max 19, 2.5 W	150	MEnc 13	416	55.6	59.3	59.3	59.3	59.3	63.1	63.1
A-max 22	151-154			45.7	49.4	49.4	49.4	49.4	53.2	53.2
A-max 22	152/154	MR	429/430	50.7	54.4	54.4	54.4	54.4	58.2	58.2
A-max 22	152/154	Enc 22	437	60.1	63.8	63.8	63.8	63.8	67.6	67.6
A-max 22	152/154	MEnc 13	416	52.8	56.5	56.5	56.5	56.5	60.3	60.3

# Planetary Gearhead GP 26 A Ø26 mm, 0.75–4.5 Nm



M 1:2

### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 5 mm from flange	max. 0.1 mm
Axial play at axial load	< 6 N 0 mm > 6 N max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-30...+100°C
Extended range as option	-40...+100°C
Number of stages	1 2 3
Max. radial load, 12 mm from flange	70 N 110 N 140 N

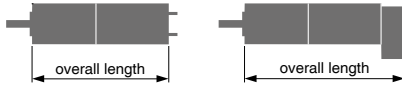
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

406757	406762	406764	406767	406128	406769	406770	406771	406092
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### Gearhead Data

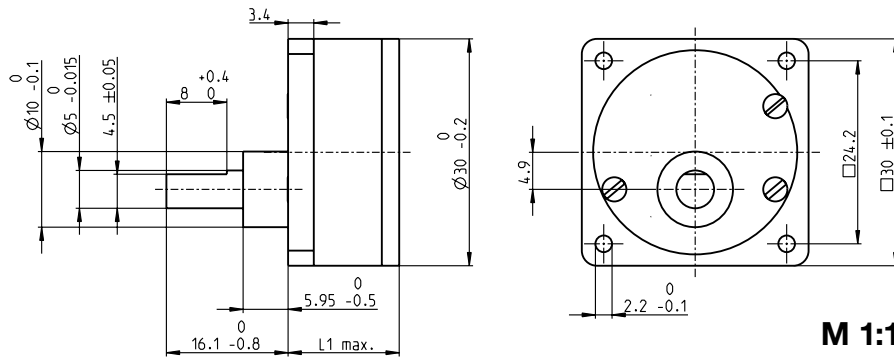
	406757	406762	406764	406767	406128	406769	406770	406771	406092
1 Reduction	5.2:1	19:1	27:1	35:1	71:1	100:1	139:1	181:1	236:1
2 Absolute reduction	57/11	3591/187	3249/121	1539/44	226233/3179	204687/2057	185193/1331	87723/484	41553/176
3 Max. motor shaft diameter	mm 3	3	3	3	3	3	3	3	3
4 Number of stages	1	2	2	2	3	3	3	3	3
5 Max. continuous torque	Nm 0.75	2.25	2.25	2.25	4.5	4.5	4.5	4.5	4.5
6 Max. intermittent torque at gear output	Nm 1.1	3.2	3.2	3.2	6.2	6.2	6.2	6.2	6.2
7 Max. efficiency	% 90	80	80	80	70	70	70	70	70
8 Weight	g 53	77	77	77	93	93	93	93	93
9 Average backlash no load	° 0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8
10 Mass inertia	gcm <sup>2</sup> 0.96	0.54	0.54	0.54	0.31	0.31	0.31	0.31	0.31
11 Gearhead length L1	mm 23.4	32.9	32.9	32.9	39.5	39.5	39.5	39.5	39.5
13 Max. transmittable power (continuous)	W 60	35	35	35	20	20	20	20	20
14 Max. transmittable power (intermittent)	W 90	50	50	50	30	30	30	30	30



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	129/131			78.0	87.5	87.5	87.5	94.1	94.1	94.1	94.1	94.1
RE 25	129/131	MR	432	89.0	98.5	98.5	98.5	105.1	105.1	105.1	105.1	105.1
RE 25	129/131	Enc 22	437	92.1	101.6	101.6	101.6	108.2	108.2	108.2	108.2	108.2
RE 25	129/131	HED_ 5540	440/442	98.8	108.3	108.3	108.3	114.9	114.9	114.9	114.9	114.9
RE 25	129/131	DCT 22	449	100.3	109.8	109.8	109.8	116.4	116.4	116.4	116.4	116.4
RE 25, 20 W	130			66.5	76.0	76.0	76.0	82.6	82.6	82.6	82.6	82.6
RE 25, 20 W	130	MR	432	77.5	87.0	87.0	87.0	93.6	93.6	93.6	93.6	93.6
RE 25, 20 W	130	HED_ 5540	441	87.3	96.8	96.8	96.8	103.4	103.4	103.4	103.4	103.4
RE 25, 20 W	130	DCT 22	449	88.8	98.3	98.3	98.3	104.9	104.9	104.9	104.9	104.9
RE 25, 20 W	130	AB 28	491	100.6	110.1	110.1	110.1	116.7	116.7	116.7	116.7	116.7
RE 25, 20 W	130	HED_ 5540/AB 28	441/491	117.8	127.3	127.3	127.3	133.9	133.9	133.9	133.9	133.9
RE 25, 20 W	131	AB 28	491	112.1	121.6	121.6	121.6	128.2	128.2	128.2	128.2	128.2
RE 25, 20 W	131	HED_ 5540/AB 28	442/491	129.3	138.8	138.8	138.8	145.4	145.4	145.4	145.4	145.4
A-max 26	155-158			68.2	77.7	77.7	77.7	84.3	84.3	84.3	84.3	84.3
A-max 26	155-158	MEnc 13	417	75.3	84.8	84.8	84.8	91.4	91.4	91.4	91.4	91.4
A-max 26	155-158	MR	432	77.0	86.5	86.5	86.5	93.1	93.1	93.1	93.1	93.1
A-max 26	155-158	Enc 22	437	82.6	92.1	92.1	92.1	98.7	98.7	98.7	98.7	98.7
A-max 26	155-158	HED_ 5540	441/443	86.6	96.1	96.1	96.1	102.7	102.7	102.7	102.7	102.7

# Spur Gearhead GS 30 A $\varnothing 30$ mm, 0.07–0.2 Nm



## Technical Data

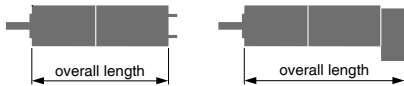
Spur Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.1 mm
Axial play	0.03–0.2 mm
Max. axial load (dynamic)	15 N
Max. force for press fits	400 N
Max. continuous input speed	5000 rpm
Recommended temperature range	-5...+80°C
Max. radial load, 5 mm from flange	35 N

Option: Low-noise version

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Gearhead Data	Part Numbers						
	110445	110446	110447	110448	110449	110450	
1 Reduction	15:1	30:1	60:1	100:1	200:1	500:1	
2 Absolute reduction	15	30	60	100	200	500	
3 Max. motor shaft diameter	mm 2	2	2	2	2	2	
4 Number of stages	3	3	4	4	5	6	
5 Max. continuous torque	Nm 0.07	0.07	0.10	0.10	0.20	0.20	
6 Max. intermittent torque at gear output	Nm 0.21	0.21	0.30	0.30	0.60	0.60	
12 Direction of rotation, drive to output	≠	≠	=	=	≠	=	
7 Max. efficiency	% 73	73	66	66	60	53	
8 Weight	g 40	40	45	45	50	55	
9 Average backlash no load	° 1.0	1.0	1.5	1.5	2.0	2.5	
10 Mass inertia	gcm <sup>2</sup> 0.17	0.14	0.12	0.10	0.10	0.10	
11 Gearhead length L1	mm 23.0	23.0	25.5	25.5	30.5	30.5	

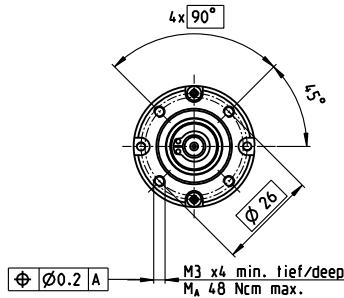
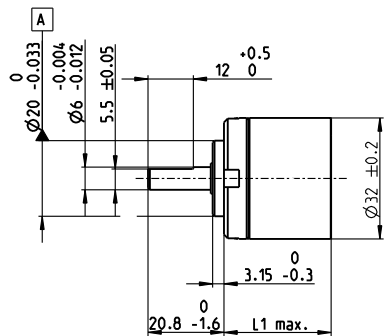


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 26	155-158			67.8	67.8	70.3	70.3	75.3	75.3
A-max 26	155-158	MEnc 13	417	74.9	74.9	77.4	77.4	82.4	82.4
A-max 26	155-158	MR	432	76.6	76.6	79.1	79.1	84.1	84.1
A-max 26	155-158	Enc 22	437	82.2	82.2	84.7	84.7	89.7	89.7
A-max 26	155-158	HED_ 5540	441/443	86.2	86.2	88.7	88.7	93.7	93.7

# Planetary Gearhead GP 32 BZ Ø32 mm, 0.75–4.5 Nm

Low Backlash



M 1:2

### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.1 mm
Axial play	max. 0.7 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	4000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3
Max. radial load, 12 mm from flange	70 N 110 N 130 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	358975	351942	358331	357988	358335	358385	358512	358513	358515	358516
<b>Gearhead Data</b>										
1 Reduction	3.7:1	5.2:1	19:1	27:1	35:1	71:1	100:1	139:1	181:1	236:1
2 Absolute reduction	<sup>63</sup> / <sub>17</sub>	<sup>57</sup> / <sub>11</sub>	<sup>3591</sup> / <sub>187</sub>	<sup>3249</sup> / <sub>121</sub>	<sup>1539</sup> / <sub>44</sub>	<sup>226233</sup> / <sub>3179</sub>	<sup>204687</sup> / <sub>2057</sub>	<sup>185193</sup> / <sub>1331</sub>	<sup>87723</sup> / <sub>484</sub>	<sup>41553</sup> / <sub>176</sub>
3 Max. motor shaft diameter	mm 5.5	3	3	3	3	3	3	3	3	3
4 Number of stages	1	1	2	2	2	3	3	3	3	3
5 Max. continuous torque	Nm 0.75	0.75	2.25	2.25	2.25	4.5	4.5	4.5	4.5	4.5
Max. continuous torque within the preloading	Nm 0.5	0.5	1.1	1.1	1.1	1.7	1.7	1.7	1.7	1.7
6 Max. intermittent torque at gear output	Nm 1.1	1.1	3.2	3.2	3.2	6.2	6.2	6.2	6.2	6.2
7 Max. efficiency	% 85	85	80	80	80	70	70	70	70	70
8 Weight	g 150	150	190	190	190	240	240	240	240	240
9 Average backlash no load	° 0.15	0.15	0.35	0.35	0.35	0.5	0.5	0.5	0.5	0.5
10 Mass inertia	gcm <sup>2</sup> 1.25	1.25	0.75	0.75	0.75	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1*	mm 33.5	33.5	43.6	43.6	43.6	53.1	53.1	53.1	53.1	53.1

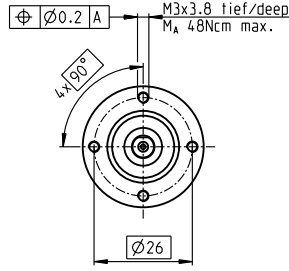
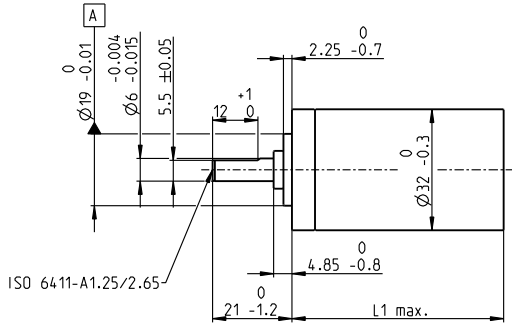
\*for EC 32 L1 is + 6.4 mm, for RE 30 L1 is + 1.0 mm



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
RE 25	129/131			88.1	88.1	98.2	98.2	98.2	107.7	107.7	107.7	107.7	107.7	
RE 25	129/131	MR	432	99.1	99.1	109.2	109.2	109.2	118.7	118.7	118.7	118.7	118.7	
RE 25	129/131	Enc 22	437	102.2	102.2	112.3	112.3	112.3	121.8	121.8	121.8	121.8	121.8	
RE 25	129/131	HED_ 5540	440/442	108.9	108.9	119.0	119.0	119.0	128.5	128.5	128.5	128.5	128.5	
RE 25	129/131	DCT 22	449	110.4	110.4	120.5	120.5	120.5	130.0	130.0	130.0	130.0	130.0	
RE 25, 20 W	130			76.6	76.6	86.7	86.7	86.7	96.2	96.2	96.2	96.2	96.2	
RE 25, 20 W	130	MR	432	87.6	87.6	97.7	97.7	97.7	107.2	107.2	107.2	107.2	107.2	
RE 25, 20 W	130	HED_ 5540	441/442	97.4	97.4	107.5	107.5	107.5	117.0	117.0	117.0	117.0	117.0	
RE 25, 20 W	130	DCT 22	449	98.9	98.9	109.0	109.0	109.0	118.5	118.5	118.5	118.5	118.5	
RE 25, 20 W	130	AB 28	491	110.7	110.7	120.8	120.8	120.8	130.3	130.3	130.3	130.3	130.3	
RE 25, 20 W	130	HED_ 5540/AB 28	441/491	127.9	127.9	138.0	138.0	138.0	147.5	147.5	147.5	147.5	147.5	
RE 25, 20 W	131	AB 28	491	122.2	122.2	132.3	132.3	132.3	141.8	141.8	141.8	141.8	141.8	
RE 25, 20 W	131	HED_ 5540/AB 28	440/491	139.4	139.4	149.5	149.5	149.5	159.0	159.0	159.0	159.0	159.0	
RE 30, 60 W	133			102.6	102.6	112.7	112.7	112.7	122.2	122.2	122.2	122.2	122.2	
RE 30, 60 W	133	MR	433	114.0	114.0	124.1	124.1	124.1	133.6	133.6	133.6	133.6	133.6	
RE 30, 60 W	133	HED_ 5540	440/442	123.4	123.4	133.5	133.5	133.5	143.0	143.0	143.0	143.0	143.0	
RE 35, 90 W	134			104.6	104.6	114.7	114.7	114.7	124.2	124.2	124.2	124.2	124.2	
RE 35, 90 W	134	MR	433	116.0	116.0	126.1	126.1	126.1	135.6	135.6	135.6	135.6	135.6	
RE 35, 90 W	134	HED_ 5540	440/442	125.3	125.3	135.4	135.4	135.4	144.9	144.9	144.9	144.9	144.9	
RE 35, 90 W	134	DCT 22	449	122.7	122.7	132.8	132.8	132.8	142.3	142.3	142.3	142.3	142.3	
RE 35, 90 W	134	AB 28	491	140.7	140.7	150.8	150.8	150.8	160.3	160.3	160.3	160.3	160.3	
RE 35, 90 W	134	HEDS 5540/AB 28	440/491	157.9	157.9	168.0	168.0	168.0	177.5	177.5	177.5	177.5	177.5	
A-max 26	155-158			78.3	78.3	88.4	88.4	88.4	97.9	97.9	97.9	97.9	97.9	
A-max 26	155-158	MEnc 13	417	85.4	85.4	95.5	95.5	95.5	105.0	105.0	105.0	105.0	105.0	
A-max 26	155-158	MR	432	87.1	87.1	97.2	97.2	97.2	106.7	106.7	106.7	106.7	106.7	
A-max 26	155-158	Enc 22	437	92.7	92.7	102.8	102.8	102.8	112.3	112.3	112.3	112.3	112.3	
A-max 26	155-158	HED_ 5540	441/443	96.7	96.7	106.8	106.8	106.8	116.3	116.3	116.3	116.3	116.3	
A-max 32	159			96.5	96.5	106.6	106.6	106.6	116.1	116.1	116.1	116.1	116.1	
A-max 32	160			95.1	95.1	105.2	105.2	105.2	114.7	114.7	114.7	114.7	114.7	
A-max 32	160	MR	433	106.3	106.3	116.4	116.4	116.4	125.9	125.9	125.9	125.9	125.9	
A-max 32	160	HED_ 5540	441/442	115.9	115.9	126.0	126.0	126.0	135.5	135.5	135.5	135.5	135.5	
EC 32, 80 W	209			100.2	100.2	110.3	110.3	110.3	119.8	119.8	119.8	119.8	119.8	
EC 32, 80 W	209	HED_ 5540	441/444	118.6	118.6	128.7	128.7	128.7	138.2	138.2	138.2	138.2	138.2	
EC 32, 80 W	209	Res 26	450	120.3	120.3	130.4	130.4	130.4	139.9	139.9	139.9	139.9	139.9	
MCD EPOS, 60 W	485			153.6	153.6	163.7	163.7	163.7	173.2	173.2	173.2	173.2	173.2	
MCD EPOS P, 60 W	485			153.6	153.6	163.7	163.7	163.7	173.2	173.2	173.2	173.2	173.2	

# Planetary Gearhead GP 32 A $\varnothing 32$ mm, 0.75–4.5 Nm



M 1:2

## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	90 N 140 N 200 N 220 N 220 N

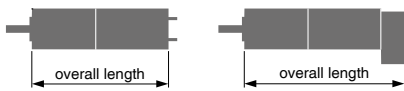
Option: Low-noise version

maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

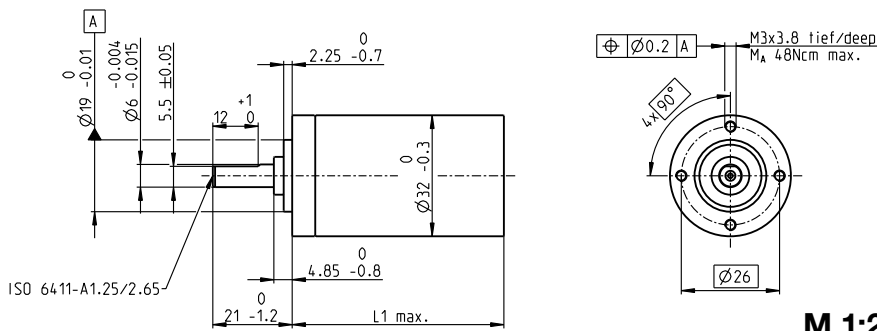
Gearhead Data	166155	166158	166163	166164	166169	166174	166179	166184	166187	166192	166197	166202
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	85112/175	19044/25	10123776/8575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter	mm 6	6	3	6	4	4	3	3	4	4	3	3
<b>Part Numbers</b>	166156	166159		166165	166170	166175	166180	166185	166188	166193	166198	166203
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	24/5	624/35		16224/245	687/56	101062/343	331776/625	36501/40	2425488/1715	536406/245	1907712/625	839523/160
3 Max. motor shaft diameter	mm 4	4		4	3	3	4	3	3	3	3	3
<b>Part Numbers</b>	166157	166160		166166	166171	166176	166181	166186	166189	166194	166199	166204
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	23/4	298/14		3887/49	3312/25	389376/1225	20631/35	279841/256	9345024/6125	2066688/875	474513/140	6436343/1024
3 Max. motor shaft diameter	mm 3	3		3	3	4	3	3	4	3	3	3
<b>Part Numbers</b>		166161		166167	166172	166177	166182		166190	166195	166200	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		576/25		14976/175	1587/10	359424/875	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter		mm 4		4	3	4	3		3	4	3	
<b>Part Numbers</b>		166162		166168	166173	166178	166183		166191	166196	166201	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		138/5		3588/35	12167/64	89401/96	158171/224		2238912/1225	2056223/784	3637933/896	
3 Max. motor shaft diameter		mm 3		3	3	3	3		3	3	3	
4 Number of stages		1	2	2	3	3	4	4	4	5	5	5
5 Max. continuous torque	Nm	0.75	2.25	2.25	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
6 Max. intermittent torque at gear output	Nm	1.1	3.4	3.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
7 Max. efficiency	%	80	75	75	70	70	60	60	60	50	50	50
8 Weight	g	118	162	162	194	194	226	226	226	258	258	258
9 Average backlash no load	°	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia	gcm <sup>2</sup>	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1	mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5



## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
RE 25	129/131			81.1	91.0	91.0	97.7	97.7	104.4	104.4	104.4	111.1	111.1	111.1	111.1
RE 25	129/131	MR	432	92.1	102.0	102.0	108.7	108.7	115.4	115.4	115.4	122.1	122.1	122.1	122.1
RE 25	129/131	Enc 22	437	95.2	105.1	105.1	111.8	111.8	118.5	118.5	118.5	125.2	125.2	125.2	125.2
RE 25	129/131	HED_5540	440/442	101.9	111.8	111.8	118.5	118.5	125.2	125.2	125.2	131.9	131.9	131.9	131.9
RE 25	129/131	DCT 22	449	103.4	113.3	113.3	120.0	120.0	126.7	126.7	126.7	133.4	133.4	133.4	133.4
RE 25, 20 W	130			69.6	79.5	79.5	86.2	86.2	92.9	92.9	92.9	99.6	99.6	99.6	99.6
RE 25, 20 W	130	MR	432	80.6	90.5	90.5	97.2	97.2	103.9	103.9	103.9	110.6	110.6	110.6	110.6
RE 25, 20 W	130	HED_5540	441/444	90.4	100.3	100.3	107.0	107.0	113.7	113.7	113.7	120.4	120.4	120.4	120.4
RE 25, 20 W	130	DCT 22	449	91.9	101.8	101.8	108.5	108.5	115.2	115.2	115.2	121.9	121.9	121.9	121.9
RE 25, 20 W	130	AB 28	491	103.7	113.6	113.6	120.3	120.3	127.0	127.0	127.0	133.7	133.7	133.7	133.7
RE 25, 20 W	130	HED_5540/AB 28	441/491	120.9	130.8	130.8	137.5	137.5	144.2	144.2	144.2	150.9	150.9	150.9	150.9
RE 25, 20 W	131	AB 28	491	115.2	125.1	125.1	131.8	131.8	138.5	138.5	138.5	145.2	145.2	145.2	145.2
RE 25, 20 W	131	HED_5540/AB 28	440/491	132.4	142.3	142.3	149.0	149.0	155.7	155.7	155.7	162.4	162.4	162.4	162.4
A-max 26	155-158			71.3	81.2	81.2	87.9	87.9	94.6	94.6	94.6	101.3	101.3	101.3	101.3
A-max 26	155-158	MEnc 13	417	78.4	88.3	88.3	95.0	95.0	101.7	101.7	101.7	108.4	108.4	108.4	108.4
A-max 26	155-158	MR	432	80.1	90.0	90.0	96.7	96.7	103.4	103.4	103.4	110.1	110.1	110.1	110.1
A-max 26	155-158	Enc 22	437	85.7	95.6	95.6	102.3	102.3	109.0	109.0	109.0	115.7	115.7	115.7	115.7
A-max 26	155-158	HED_5540	441/443	89.7	99.6	99.6	106.3	106.3	113.0	113.0	113.0	119.7	119.7	119.7	119.7

# Planetary Gearhead GP 32 A Ø32 mm, 0.75–4.5 Nm



## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	90 N 140 N 200 N 220 N 220 N

M 1:2

Option: Low-noise version

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	166155	166158	166163	166164	166169	166174	166179	166184	166187	166192	166197	166202
<b>Gearhead Data</b>												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/8575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter	mm 6	6	3	6	4	4	3	3	4	4	3	3
<b>Part Numbers</b>	166156	166159	166165	166170	166175	166180	166185	166188	166193	166198	166203	
1 Reduction	4.8:1	18:1	66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1	
2 Absolute reduction	24/5	624/35	16224/245	687/56	101062/343	331776/625	36501/40	2425488/1715	536406/245	1907712/625	839523/160	
3 Max. motor shaft diameter	mm 4	4	4	3	3	4	3	3	3	3	3	
<b>Part Numbers</b>	166157	166160	166166	166171	166176	166181	166186	166189	166194	166199	166204	
1 Reduction	5.8:1	21:1	79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1	
2 Absolute reduction	23/4	299/14	3887/49	3312/25	38976/1225	2063/35	27984/256	9345024/6125	2066688/875	474513/140	6436343/1024	
3 Max. motor shaft diameter	mm 3	3	3	3	3	3	3	4	3	3	3	
<b>Part Numbers</b>	166161	166167	166172	166177	166182	166190	166195	166200				
1 Reduction	23:1	86:1	159:1	411:1	636:1	1694:1	2548:1	3656:1				
2 Absolute reduction	576/25	14976/175	1587/10	359424/875	79488/125	1162213/686	7962624/3125	457056/125				
3 Max. motor shaft diameter	mm 4	3	4	4	3	3	4	3				
<b>Part Numbers</b>	166162	166168	166173	166178	166183	166191	166196	166201				
1 Reduction	28:1	103:1	190:1	456:1	706:1	1828:1	2623:1	4060:1				
2 Absolute reduction	138/5	3588/35	12167/64	89401/196	15817/224	2238912/1225	2056223/784	3637933/896				
3 Max. motor shaft diameter	mm 3	3	3	3	3	3	3	3				
4 Number of stages	1	2	2	3	3	4	4	5	5	5	5	
5 Max. continuous torque	Nm 0.75	2.25	2.25	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
6 Max. intermittent torque at gear output	Nm 1.1	3.4	3.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
7 Max. efficiency	% 80	75	75	70	70	60	60	60	50	50	50	50
8 Weight	g 118	162	162	194	194	226	226	258	258	258	258	258
9 Average backlash no load	° 0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia	gcm <sup>2</sup> 1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1*	mm 26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5

\*for EC 32 flat L1 is + 2.0 mm



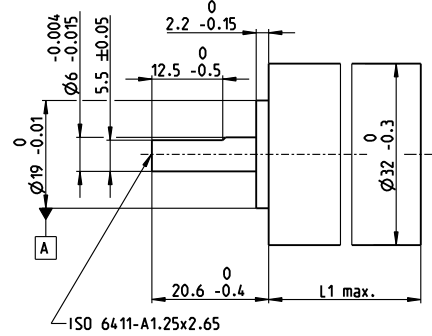
## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
RE 30, 15 W	132			94.6	104.5	104.5	111.2	111.2	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 15 W	132	MR	433	106.0	115.9	115.9	122.6	122.6	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 15 W	132	HED_5540	440/442	115.4	125.3	125.3	132.0	132.0	138.7	138.7	145.4	145.4	145.4	145.4
RE 30, 60 W	133			94.6	104.5	104.5	111.2	111.2	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 60 W	133	MR	433	106.0	115.9	115.9	122.6	122.6	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 60 W	133	HED_5540	440/442	115.4	125.3	125.3	132.0	132.0	138.7	138.7	145.4	145.4	145.4	145.4
RE 35, 90 W	134			97.6	107.5	107.5	114.2	114.2	120.9	120.9	127.6	127.6	127.6	127.6
RE 35, 90 W	134	MR	433	109.0	118.9	118.9	125.6	125.6	132.3	132.3	139.0	139.0	139.0	139.0
RE 35, 90 W	134	HED_5540	440/442	118.3	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3	148.3
RE 35, 90 W	134	DCT 22	449	115.7	125.6	125.6	132.3	132.3	139.0	139.0	145.7	145.7	145.7	145.7
RE 35, 90 W	134	AB 28	491	133.7	143.6	143.6	150.3	150.3	157.0	157.0	163.7	163.7	163.7	163.7
RE 35, 90 W	134	HEDS 5540/AB 28	440/491	150.9	160.8	160.8	167.5	167.5	174.2	174.2	180.9	180.9	180.9	180.9
A-max 32	159			89.5	99.4	99.4	106.1	106.1	112.8	112.8	119.5	119.5	119.5	119.5
A-max 32	160			88.1	98.0	98.0	104.7	104.7	111.4	111.4	118.1	118.1	118.1	118.1
A-max 32	160	MR	433	99.3	109.2	109.2	115.9	115.9	122.6	122.6	129.3	129.3	129.3	129.3
A-max 32	160	HED_5540	441/443	108.9	118.8	118.8	125.5	125.5	132.2	132.2	138.9	138.9	138.9	138.9
EC 32, 80 W	209			86.6	96.5	96.5	103.2	103.2	109.9	109.9	116.6	116.6	116.6	116.6
EC 32, 80 W	209	HED_5540	441/444	105.0	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0	135.0
EC 32, 80 W	209	Res 26	450	106.7	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7	136.7
EC 32 flat, 15 W	259			44.5	54.4	54.4	61.1	61.1	67.8	67.8	74.5	74.5	74.5	74.5
EC 32 flat, IE, IP 00	260			54.6	64.5	64.5	71.2	71.2	77.9	77.9	84.6	84.6	84.6	84.6
EC 32 flat, IE, IP 40	260			56.3	66.2	66.2	72.9	72.9	79.6	79.6	86.3	86.3	86.3	86.3

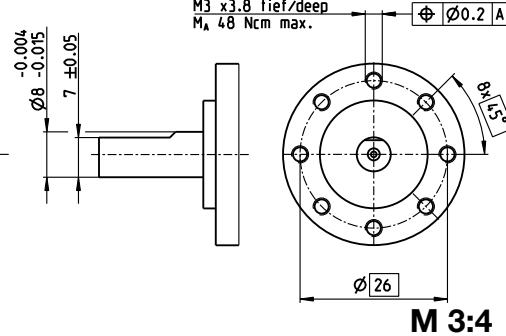
# Planetary Gearhead GP 32 AR $\varnothing 32$ mm, 0.75 Nm

for high radial loads

$\varnothing 6$  mm output shaft



$\varnothing 8$  mm output shaft



## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-40...+100°C
Output shaft diameter	6 mm 8 mm
Max. radial load, 10 mm from flange	140 N 120 N

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

425862	425861	425860
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## Gearhead Data

	425862	425861	425860
1 Reduction	3.7:1	4.8:1	5.8:1
2 Absolute reduction	$\frac{26}{7}$	$\frac{24}{5}$	$\frac{23}{4}$
3 Max. motor shaft diameter	mm 6	4	3
Output shaft diameter	mm 6	6	6
Part Numbers			
1 Reduction	3.7:1	4.8:1	5.8:1
2 Absolute reduction	$\frac{26}{7}$	$\frac{24}{5}$	$\frac{23}{4}$
3 Max. motor shaft diameter	mm 6	4	3
Output shaft diameter	mm 8	8	8
4 Number of stages	1	1	1
5 Max. continuous torque	Nm 0.75	0.75	0.75
6 Max. intermittent torque at gear output	Nm 1.1	1.1	1.1
7 Max. efficiency	% 90	90	90
8 Weight	g 111	111	111
9 Average backlash no load	° 0.7	0.7	0.7
10 Mass inertia	gcm <sup>2</sup> 1.6	0.9	0.6
11 Gearhead length L1	mm 26.2	26.2	26.2

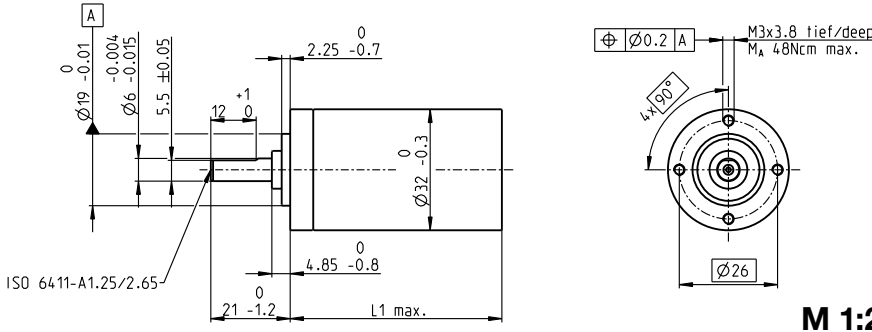


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 30, 60 W	133			94.3	94.3	94.3
RE 30, 60 W	133	MR	433	105.7	105.7	105.7
RE 30, 60 W	133	HED_5540	440/444	115.1	115.1	115.1
RE 35, 90 W	134			97.3	97.3	97.3
RE 35, 90 W	134	MR	433	108.7	108.7	108.7
RE 35, 90 W	134	HED_5540	440/444	118.0	118.0	118.0
RE 35, 90 W	134	DCT 22	449	115.4	115.4	115.4
RE 35, 90 W	134	AB 28	491	133.4	133.4	133.4
RE 35, 90 W	134	HED_5540/AB 28	440/491	150.5	150.5	150.5
EC 32, 80 W	209			86.3	86.3	86.3
EC 32, 80 W	209	HED_5540	441/443	104.7	104.7	104.7
EC 32, 80 W	209	Res 26	450	106.4	106.4	106.4

# Planetary Gearhead GP 32 C $\varnothing$ 32 mm, 1.0–6.0 Nm

Ceramic Version



M 1:2

### Technical Data

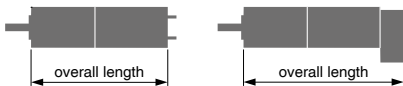
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	90 N 140 N 200 N 220 N 220 N

Option: Low-noise version

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	166930	166933	166938	166939	<b>166944</b>	166949	166954	166959	166962	166967	166972	166977
<b>Gearhead Data</b>												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/8575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter	mm 6	6	3	6	4	4	3	3	4	4	3	3
<b>Part Numbers</b>	<b>166931</b>	<b>166934</b>		<b>166940</b>	<b>166945</b>	<b>166950</b>	<b>166955</b>	<b>166960</b>	<b>166963</b>	<b>166968</b>	<b>166973</b>	<b>166978</b>
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	24/5	624/35		16224/245	687/56	101062/343	331776/625	3650/40	2425488/1715	536406/245	1907712/625	839523/160
3 Max. motor shaft diameter	mm 4	4		4	3	3	4	3	3	3	3	3
<b>Part Numbers</b>	<b>166932</b>	<b>166935</b>		<b>166941</b>	<b>166946</b>	<b>166951</b>	<b>166956</b>	<b>166961</b>	<b>166964</b>	<b>166969</b>	<b>166974</b>	<b>166979</b>
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256	9345024/6125	2066688/875	474513/140	6436343/1024
3 Max. motor shaft diameter	mm 3	3		3	3	4	3	3	4	3	3	3
<b>Part Numbers</b>		<b>166936</b>		<b>166942</b>	<b>166947</b>	<b>166952</b>	<b>166957</b>		<b>166965</b>	<b>166970</b>	<b>166975</b>	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		576/25		14976/175	1587/10	359424/875	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter		mm 4		4	3	4	3		3	4	3	
<b>Part Numbers</b>		<b>166937</b>		<b>166943</b>	<b>166948</b>	<b>166953</b>	<b>166958</b>		<b>166966</b>	<b>166971</b>	<b>166976</b>	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		138/5		3589/35	12167/64	89401/196	15817/224		2238912/1225	2056223/784	3637933/696	
3 Max. motor shaft diameter		mm 3		3	3	3	3		3	3	3	
4 Number of stages		1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque	Nm	1	3	3	6	6	6	6	6	6	6	6
6 Max. intermittent torque at gear output	Nm	1.25	3.75	3.75	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
7 Max. efficiency	%	80	75	75	70	70	60	60	60	50	50	50
8 Weight	g	118	162	162	194	194	226	226	258	258	258	258
9 Average backlash no load	°	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia	gcm <sup>2</sup>	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1	mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5



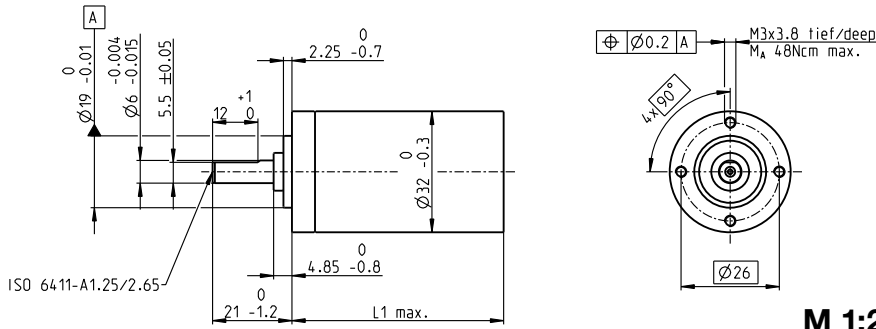
### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
RE 25, 10 W	129			81.1	91.0	91.0	97.7	97.7	104.4	104.4	111.1	111.1	111.1	111.1
RE 25, 10 W	129	MR	432	92.1	102.0	102.0	108.7	108.7	115.4	115.4	122.1	122.1	122.1	122.1
RE 25, 10 W	129	Enc 22	437	95.2	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2	125.2	125.2
RE 25, 10 W	129	HED_5540	440/442	101.9	111.8	111.8	118.5	118.5	125.2	125.2	131.9	131.9	131.9	131.9
RE 25, 10 W	129	DCT 22	449	103.4	113.3	113.3	120.0	120.0	126.7	126.7	133.4	133.4	133.4	133.4
RE 25, 20 W	130			69.6	79.5	79.5	86.2	86.2	92.9	92.9	99.6	99.6	99.6	99.6
RE 25, 20 W	130	MR	432	80.6	90.5	90.5	97.2	97.2	103.9	103.9	110.6	110.6	110.6	110.6
RE 25, 20 W	130	HED_5540	440-442	90.4	100.3	100.3	107.0	107.0	113.7	113.7	120.4	120.4	120.4	120.4
RE 25, 20 W	130	DCT 22	449	91.9	101.8	101.8	108.5	108.5	115.2	115.2	121.9	121.9	121.9	121.9
RE 25, 20 W	130	AB 28	491	103.7	113.6	113.6	120.3	120.3	127.0	127.0	133.7	133.7	133.7	133.7
RE 25, 20 W	130	HED_5540/AB 28	440/491	120.9	130.8	130.8	137.5	137.5	144.2	144.2	150.9	150.9	150.9	150.9
RE 25, 20 W	131	AB 28	491	115.2	125.1	125.1	131.8	131.8	138.5	138.5	145.2	145.2	145.2	145.2
RE 25, 20 W	131	HED_5540/AB 28	440/491	132.4	142.3	142.3	149.0	149.0	155.7	155.7	162.4	162.4	162.4	162.4
RE 30, 60 W	133			94.6	104.5	104.5	111.2	111.2	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 60 W	133	MR	433	106.0	115.9	115.9	122.6	122.6	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 60 W	133	HED_5540	440/442	115.4	125.3	125.3	132.0	132.0	138.7	138.7	145.4	145.4	145.4	145.4
RE 35, 90 W	134			97.6	107.5	107.5	114.2	114.2	120.9	120.9	127.6	127.6	127.6	127.6
RE 35, 90 W	134	MR	433	109.0	118.9	118.9	125.6	125.6	132.3	132.3	139.0	139.0	139.0	139.0
RE 35, 90 W	134	HED_5540	440/442	118.3	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3	148.3
RE 35, 90 W	134	DCT 22	449	115.7	125.6	125.6	132.3	132.3	139.0	139.0	145.7	145.7	145.7	145.7
RE 35, 90 W	134	AB 28	491	133.7	143.6	143.6	150.3	150.3	157.0	157.0	163.7	163.7	163.7	163.7
RE 35, 90 W	134	HEDS 5540/AB 28	440/491	150.9	160.8	160.8	167.5	167.5	174.2	174.2	180.9	180.9	180.9	180.9
A-max 26	155-158			71.3	81.2	81.2	87.9	87.9	94.6	94.6	101.3	101.3	101.3	101.3
A-max 26	156-158	MEnc 13	417	78.4	88.3	88.3	95.0	95.0	101.7	101.7	108.4	108.4	108.4	108.4
A-max 26	156-158	MR	432	80.1	90.0	90.0	96.7	96.7	103.4	103.4	110.1	110.1	110.1	110.1
A-max 26	156-158	Enc 22	437	85.7	95.6	95.6	102.3	102.3	109.0	109.0	115.7	115.7	115.7	115.7
A-max 26	156-158	HED_5540	441/443	89.7	99.6	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7	119.7
A-max 32	159			89.5	99.4	99.4	106.1	106.1	112.8	112.8	119.5	119.5	119.5	119.5
A-max 32	160			88.1	98.0	98.0	104.7	104.7	111.4	111.4	118.1	118.1	118.1	118.1
A-max 32	160	MR	433	99.3	109.2	109.2	115.9	115.9	122.6	122.6	129.3	129.3	129.3	129.3
A-max 32	160	HED_5540	441/443	108.9	118.8	118.8	125.5	125.5	132.2	132.2	138.9	138.9	138.9	138.9



# Planetary Gearhead GP 32 C Ø32 mm, 1.0–6.0 Nm

Ceramic Version



## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	90 N 140 N 200 N 220 N 220 N

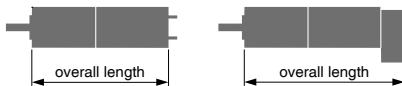
Option: Low-noise version

maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	166930	166933	166938	166939	166944	166949	166954	166959	166962	166967	166972	166977
<b>Gearhead Data</b>												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/4575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter mm	6	6	3	6	4	4	3	3	4	4	3	3
<b>Part Numbers</b>	<b>166931</b>	<b>166934</b>		<b>166940</b>	<b>166945</b>	<b>166950</b>	<b>166955</b>	<b>166960</b>	<b>166963</b>	<b>166968</b>	<b>166973</b>	<b>166978</b>
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40	2425488/1715	536406/245	1907712/625	839523/160
3 Max. motor shaft diameter mm	4	4		4	3	3	4	3	3	3	3	3
<b>Part Numbers</b>	<b>166932</b>	<b>166935</b>		<b>166941</b>	<b>166946</b>	<b>166951</b>	<b>166956</b>	<b>166961</b>	<b>166964</b>	<b>166969</b>	<b>166974</b>	<b>166979</b>
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256	9345024/6125	2066688/875	474513/140	6436343/1024
3 Max. motor shaft diameter mm	3	3		3	3	4	3	3	4	3	3	3
<b>Part Numbers</b>		<b>166936</b>		<b>166942</b>	<b>166947</b>	<b>166952</b>	<b>166957</b>		<b>166965</b>	<b>166970</b>	<b>166975</b>	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		576/25		14976/175	1587/10	359424/875	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter mm		4		4	3	4	3		3	4	3	
<b>Part Numbers</b>		<b>166937</b>		<b>166943</b>	<b>166948</b>	<b>166953</b>	<b>166958</b>		<b>166966</b>	<b>166971</b>	<b>166976</b>	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		138/5		3588/35	12167/64	89401/196	158171/224		2238912/1225	2056223/784	3637933/896	
3 Max. motor shaft diameter mm		3		3	3	3	3		3	3	3	
4 Number of stages		1	2	2	3	3	4	4	5	5	5	5
5 Max. continuous torque Nm		1	3	3	6	6	6	6	6	6	6	6
6 Max. intermittent torque at gear output Nm		1.25	3.75	3.75	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
7 Max. efficiency %		80	75	75	70	70	60	60	60	50	50	50
8 Weight g		118	162	162	194	194	226	226	226	258	258	258
9 Average backlash no load °		0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm <sup>2</sup>		1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1 mm		26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5

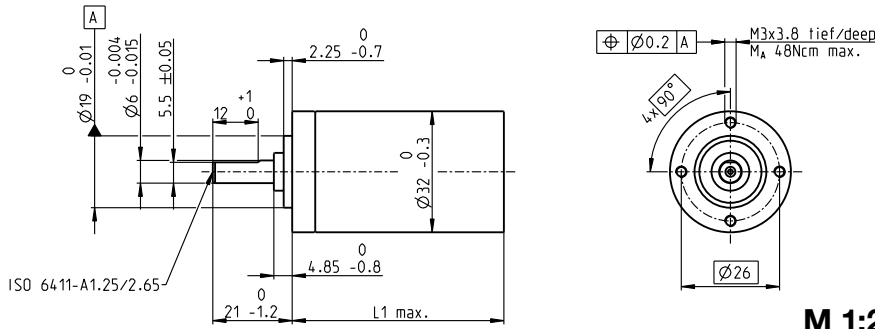


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
EC 32, 80 W	209			86.6	96.5	96.5	103.2	103.2	109.9	109.9	116.6	116.6	116.6	116.6	
EC 32, 80 W	209	HED_5540	441/444	105.0	114.9	114.9	121.6	121.6	128.3	128.3	128.3	135.0	135.0	135.0	135.0
EC 32, 80 W	209	Res 26	450	106.7	116.6	116.6	123.3	123.3	130.0	130.0	130.0	136.7	136.7	136.7	136.7
EC-max 22, 25 W	221			75.1	85.0	85.0	91.7	91.7	98.4	98.4	98.4	105.1	105.1	105.1	105.1
EC-max 22, 25 W	221	MR	431	84.8	94.7	94.7	101.4	101.4	108.1	108.1	108.1	114.8	114.8	114.8	114.8
EC-max 22, 25 W	221	AB 20	488	110.7	120.5	120.5	127.2	127.2	133.9	133.9	133.9	140.6	140.6	140.6	140.6
EC-max 30, 40 W	222			68.9	78.8	78.8	85.5	85.5	92.2	92.2	92.2	98.9	98.9	98.9	98.9
EC-max 30, 40 W	222	MR	432	81.1	91.0	91.0	97.7	97.7	104.4	104.4	104.4	111.1	111.1	111.1	111.1
EC-max 30, 40 W	222	HEDL 5540	443	89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
EC-max 30, 40 W	222	AB 20	488	104.5	114.4	114.4	121.1	121.1	127.8	127.8	127.8	134.5	134.5	134.5	134.5
EC-max 30, 40 W	222	HEDL 5540/AB 20	444/488	125.1	135.0	135.0	141.7	141.7	148.4	148.4	148.4	155.1	155.1	155.1	155.1
EC-max 30, 60 W	223			90.9	100.8	100.8	107.4	107.4	114.7	114.7	114.7	121.8	121.8	121.8	121.8
EC-max 30, 60 W	223	MR	432	103.1	113.0	113.0	119.7	119.7	126.4	126.4	126.4	133.1	133.1	133.1	133.1
EC-max 30, 60 W	223	HEDL 5540	444	111.5	121.4	121.4	128.0	128.0	134.7	134.7	134.7	141.4	141.4	141.4	141.4
EC-max 30, 60 W	223	AB 20	488	126.5	136.4	136.4	143.0	143.0	149.7	149.7	149.7	156.4	156.4	156.4	156.4
EC-max 30, 60 W	223	HEDL 5540/AB 20	444/488	147.9	157.2	157.2	163.8	163.8	170.5	170.5	170.5	177.2	177.2	177.2	177.2
EC-4pole 22, 90 W	229			75.2	85.1	85.1	91.8	91.8	98.5	98.5	98.5	105.2	105.2	105.2	105.2
EC-4pole 22, 90 W	229	16 EASY/XT/Abs.	418-422	87.4	97.3	97.3	104.0	104.0	110.7	110.7	110.7	117.4	117.4	117.4	117.4
EC-4pole 22, 90 W	229	16 EASY Abs. XT	424	87.9	97.8	97.8	104.5	104.5	111.2	111.2	111.2	117.9	117.9	117.9	117.9
EC-4pole 22, 90 W	229	16 RIO	435	85.9	95.8	95.8	102.5	102.5	109.2	109.2	109.2	115.9	115.9	115.9	115.9
EC-4pole 22, 90 W	229	AEDL/HEDL	438/444	96.7	106.6	106.6	113.3	113.3	120.0	120.0	120.0	126.7	126.7	126.7	126.7
EC-4pole 22, 120 W	230			92.6	102.5	102.5	109.2	109.2	115.9	115.9	115.9	122.6	122.6	122.6	122.6
EC-4pole 22, 120 W	230	16 EASY/XT/Abs.	418-422	104.8	114.7	114.7	121.4	121.4	128.1	128.1	128.1	134.8	134.8	134.8	134.8
EC-4pole 22, 120 W	230	16 EASY Abs. XT	424	105.3	115.3	115.3	121.9	121.9	128.6	128.6	128.6	135.3	135.3	135.3	135.3
EC-4pole 22, 120 W	230	16 RIO	435	103.3	113.3	113.3	119.9	119.9	126.6	126.6	126.6	133.3	133.3	133.3	133.3
EC-4pole 22, 120 W	230	AEDL/HEDL	438/444	114.1	124.0	124.0	130.7	130.7	137.4	137.4	137.4	144.1	144.1	144.1	144.1
EC 32 flat, 15 W	259			44.5	54.4	54.4	61.1	61.1	67.8	67.8	67.8	74.5	74.5	74.5	74.5
EC 32 flat IE, IP 00	260			54.6	64.5	64.5	71.2	71.2	77.9	77.9	77.9	84.6	84.6	84.6	84.6
EC 32 flat IE, IP 40	260			56.3	66.2	66.2	72.9	72.9	79.6	79.6	79.6	86.3	86.3	86.3	86.3

# Planetary Gearhead GP 32 C Ø32 mm, 1.0–6.0 Nm

Ceramic Version



M 1:2

### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	90 N 140 N 200 N 220 N 220 N

Option: Low-noise version

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	166930	166933	166938	166939	166944	166949	166954	166959	166962	166967	166972	166977
<b>Gearhead Data</b>												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	<sup>26</sup> / <sub>7</sub>	<sup>676</sup> / <sub>49</sub>	<sup>529</sup> / <sub>16</sub>	<sup>17576</sup> / <sub>343</sub>	<sup>13824</sup> / <sub>125</sub>	<sup>421824</sup> / <sub>1715</sub>	<sup>86112</sup> / <sub>175</sub>	<sup>19044</sup> / <sub>25</sub>	<sup>10123776</sup> / <sub>8575</sub>	<sup>8626176</sup> / <sub>4375</sub>	<sup>495144</sup> / <sub>175</sub>	<sup>109503</sup> / <sub>25</sub>
3 Max. motor shaft diameter	mm 6	6	3	6	4	4	3	3	4	4	3	3
<b>Part Numbers</b>	166931	166934		166940	166945	166950	166955	166960	166963	166968	166973	166978
1 Reduction	4.8:1	18:1		66:1	123:1	295:1	531:1	913:1	1414:1	2189:1	3052:1	5247:1
2 Absolute reduction	<sup>24</sup> / <sub>5</sub>	<sup>624</sup> / <sub>35</sub>		<sup>16224</sup> / <sub>245</sub>	<sup>6877</sup> / <sub>56</sub>	<sup>101062</sup> / <sub>343</sub>	<sup>331776</sup> / <sub>625</sub>	<sup>36501</sup> / <sub>40</sub>	<sup>2425488</sup> / <sub>1715</sub>	<sup>536406</sup> / <sub>245</sub>	<sup>1907712</sup> / <sub>625</sub>	<sup>839523</sup> / <sub>160</sub>
3 Max. motor shaft diameter	mm 4	4		4	3	3	4	3	3	3	3	3
<b>Part Numbers</b>	166932	166935		166941	166946	166951	166956	166961	166964	166969	166974	166979
1 Reduction	5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1	1526:1	2362:1	3389:1	6285:1
2 Absolute reduction	<sup>23</sup> / <sub>4</sub>	<sup>299</sup> / <sub>14</sub>		<sup>3887</sup> / <sub>49</sub>	<sup>3312</sup> / <sub>25</sub>	<sup>389376</sup> / <sub>1225</sub>	<sup>20631</sup> / <sub>35</sub>	<sup>279841</sup> / <sub>256</sub>	<sup>9345024</sup> / <sub>6125</sub>	<sup>2066688</sup> / <sub>875</sub>	<sup>474513</sup> / <sub>140</sub>	<sup>6436343</sup> / <sub>1024</sub>
3 Max. motor shaft diameter	mm 3	3		3	3	4	3	3	4	3	3	3
<b>Part Numbers</b>		166936		166942	166947	166952	166957		166965	166970	166975	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3656:1	
2 Absolute reduction		<sup>576</sup> / <sub>25</sub>		<sup>14976</sup> / <sub>175</sub>	<sup>1587</sup> / <sub>10</sub>	<sup>359424</sup> / <sub>875</sub>	<sup>79488</sup> / <sub>125</sub>		<sup>1162213</sup> / <sub>686</sub>	<sup>7962624</sup> / <sub>3125</sub>	<sup>457056</sup> / <sub>125</sub>	
3 Max. motor shaft diameter		mm 4		4	3	4	3		3	4	3	
<b>Part Numbers</b>		166937		166943	166948	166953	166958		166966	166971	166976	
1 Reduction		28:1		103:1	190:1	456:1	706:1		1828:1	2623:1	4060:1	
2 Absolute reduction		<sup>138</sup> / <sub>5</sub>		<sup>3588</sup> / <sub>35</sub>	<sup>12167</sup> / <sub>64</sub>	<sup>89401</sup> / <sub>196</sub>	<sup>15817</sup> / <sub>224</sub>		<sup>2238912</sup> / <sub>1225</sub>	<sup>2056223</sup> / <sub>784</sub>	<sup>3637933</sup> / <sub>896</sub>	
3 Max. motor shaft diameter		mm 3		3	3	3	3		3	3	3	
4 Number of stages		1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque	Nm	1	3	3	6	6	6	6	6	6	6	6
6 Max. intermittent torque at gear output	Nm	1.25	3.75	3.75	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
7 Max. efficiency	%	80	75	75	70	70	60	60	60	50	50	50
8 Weight	g	118	162	162	194	194	226	226	258	258	258	258
9 Average backlash no load	°	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia	gcm <sup>2</sup>	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1	mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5



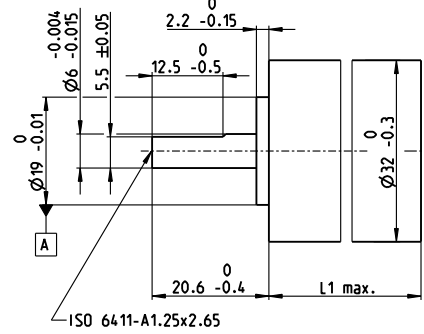
### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
EC-i 30, 20 W	239			68.6	78.5	78.5	85.2	85.2	91.9	91.9	98.6	98.6	98.6	98.6
EC-i 30, 30 W	240			68.8	78.7	78.7	85.4	85.4	92.1	92.1	98.8	98.8	98.8	98.8
EC-i 30, 30 W	240	16 EASY/Abs.	418-422	80.5	90.4	90.4	97.1	97.1	103.8	103.8	110.5	110.5	110.5	110.5
EC-i 30, 30 W	240	16 RIO	435	79.0	88.9	88.9	95.6	95.6	102.3	102.3	109.0	109.0	109.0	109.0
EC-i 30, 30 W	240	AEDL/HEDL	438/445	89.5	99.4	99.4	106.1	106.1	112.8	112.8	119.5	119.5	119.5	119.5
EC-i 30, 45 W	241			68.8	78.7	78.7	85.4	85.4	92.1	92.1	98.8	98.8	98.8	98.8
EC-i 30, 45 W	241	16 EASY/Abs.	418-422	80.5	90.4	90.4	97.1	97.1	103.8	103.8	110.5	110.5	110.5	110.5
EC-i 30, 45 W	241	16 RIO	435	79.0	88.9	88.9	95.6	95.6	102.3	102.3	109.0	109.0	109.0	109.0
EC-i 30, 45 W	241	AEDL/HEDL	438/445	89.5	99.4	99.4	106.1	106.1	112.8	112.8	119.5	119.5	119.5	119.5
EC-i 30, 50 W	242			90.8	100.7	100.7	107.4	107.4	114.1	114.1	120.8	120.8	120.8	120.8
EC-i 30, 50 W	242	16 EASY/Abs.	419-423	102.5	112.4	112.4	119.1	119.1	125.8	125.8	132.5	132.5	132.5	132.5
EC-i 30, 50 W	242	16 RIO	436	101.0	110.9	110.9	117.6	117.6	124.3	124.3	131.0	131.0	131.0	131.0
EC-i 30, 50 W	242	AEDL/HEDL	438/445	111.5	121.4	121.4	128.1	128.1	134.8	134.8	141.5	141.5	141.5	141.5
EC-i 30, 75 W	243			90.8	100.7	100.7	107.4	107.4	114.1	114.1	120.8	120.8	120.8	120.8
EC-i 30, 75 W	243	16 EASY/Abs.	419-423	102.5	112.4	112.4	119.1	119.1	125.8	125.8	132.5	132.5	132.5	132.5
EC-i 30, 75 W	243	16 RIO	436	101.0	110.9	110.9	117.6	117.6	124.3	124.3	131.0	131.0	131.0	131.0
EC-i 30, 75 W	243	AEDL/HEDL	438/445	111.5	121.4	121.4	128.1	128.1	134.8	134.8	141.5	141.5	141.5	141.5
EC-i 40, 50 W	244			58.3	68.2	68.2	74.9	74.9	81.6	81.6	88.3	88.3	88.3	88.3
EC-i 40, 50 W	244	16 EASY/Abs.	419-423	70.0	79.9	79.9	86.6	86.6	93.3	93.3	100.0	100.0	100.0	100.0
EC-i 40, 50 W	244	16 RIO	436	72.8	82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8	102.8
EC-i 40, 50 W	244	AEDL/HEDL	439/446	81.3	91.2	91.2	97.9	97.9	104.6	104.6	111.3	111.3	111.3	111.3
EC-i 40, 70 W	246			68.3	78.2	78.2	84.9	84.9	91.6	91.6	98.3	98.3	98.3	98.3
EC-i 40, 70 W	246	16 EASY/Abs.	419-423	80.0	89.9	89.9	96.6	96.6	103.3	103.3	110.0	110.0	110.0	110.0
EC-i 40, 70 W	246	16 RIO	436	82.8	92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8	112.8
EC-i 40, 70 W	246	AEDL/HEDL	439/446	91.3	101.2	101.2	107.9	107.9	114.6	114.6	121.3	121.3	121.3	121.3
MCD EPOS, 60 W	485			150.2	160.1	160.1	166.8	166.8	173.5	173.5	180.2	180.2	180.2	180.2
MCD EPOS P, 60 W	485			150.2	160.1	160.1	166.8	166.8	173.5	173.5	180.2	180.2	180.2	180.2

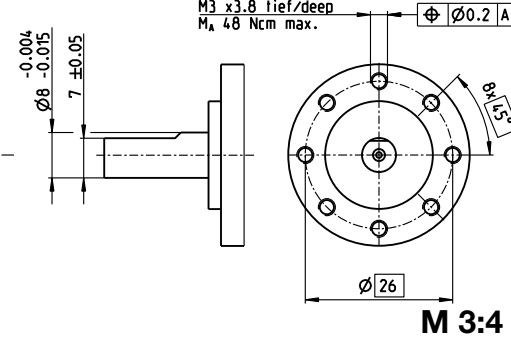
# Planetary Gearhead GP 32 CR $\varnothing 32$ mm, 1.0 Nm

for high radial loads, ceramic version

$\varnothing 6$  mm output shaft



$\varnothing 8$  mm output shaft



## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Output shaft diameter	6 mm 8 mm
Max. radial load, 10 mm from flange	140 N 120 N

maxon gear

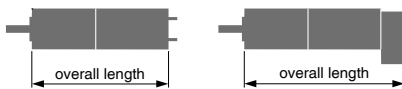
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

425240	425241	425242
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## Gearhead Data

	425240	425241	425242
1 Reduction	3.7:1	4.8:1	5.8:1
2 Absolute reduction	$\frac{26}{7}$	$\frac{24}{5}$	$\frac{23}{4}$
3 Max. motor shaft diameter	mm 6	4	3
Output shaft diameter	mm 6	6	6
<b>Part Numbers</b>			
	413746	425160	425161
1 Reduction	3.7:1	4.8:1	5.8:1
2 Absolute reduction	$\frac{26}{7}$	$\frac{24}{5}$	$\frac{23}{4}$
3 Max. motor shaft diameter	mm 6	4	3
Output shaft diameter	mm 8	8	8
4 Number of stages	1	1	1
5 Max. continuous torque	Nm 1.0	1.0	1.0
6 Max. intermittent torque at gear output	Nm 1.25	1.25	1.25
7 Max. efficiency	% 90	90	90
8 Weight	g 111	111	111
9 Average backlash no load	° 0.7	0.7	0.7
10 Mass inertia	gcm <sup>2</sup> 1.6	0.9	0.6
11 Gearhead length L1	mm 26.2	26.2	26.2

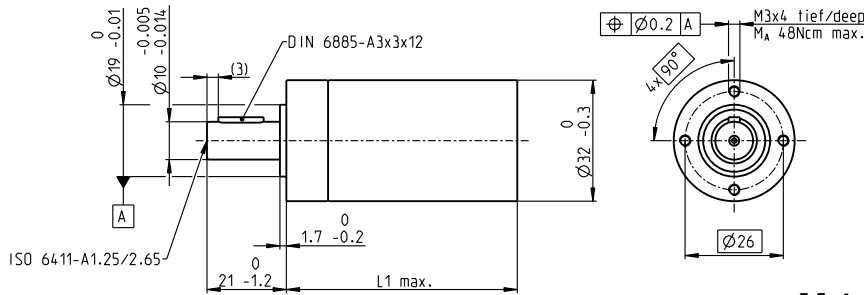


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 30, 60 W	133			94.3	94.3	94.3
RE 30, 60 W	133	MR	433	105.7	105.7	105.7
RE 30, 60 W	133	HED_5540	440/442	115.1	115.1	115.1
RE 35, 90 W	134			97.3	97.3	97.3
RE 35, 90 W	134	MR	433	108.7	108.7	108.7
RE 35, 90 W	134	HED_5540	440/442	118.0	118.0	118.0
RE 35, 90 W	134	DCT 22	449	115.4	115.4	115.4
RE 35, 90 W	134	AB 28	491	133.4	133.4	133.4
RE 35, 90 W	134	HED_5540/AB 28	440/491	150.5	150.5	150.5
EC 32, 80 W	209			86.3	86.3	86.3
EC 32, 80 W	209	HED_5540	441/443	104.7	104.7	104.7
EC 32, 80 W	209	Res 26	450	106.4	106.4	106.4

# Planetary Gearhead GP 32 HP $\varnothing 32$ mm, 4.0–8.0 Nm

High Power



M 1:2

### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	2 3 4
Max. radial load, 10 mm from flange	200 N 250 N 300 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	320247	326663	326664	326668	326672	324947	324952
<b>Gearhead Data</b>							
1 Reduction	14:1	33:1	51:1	111:1	190:1	456:1	706:1
2 Absolute reduction	676/49	529/16	17576/343	13824/125	456976/2401	89401/196	158171/224
3 Max. motor shaft diameter	mm 6	3	6	4	6	3	3
<b>Part Numbers</b>	326659		326665	326669	324942	324948	324953
1 Reduction	18:1		66:1	123:1	246:1	492:1	762:1
2 Absolute reduction	624/35		16224/245	6877/56	421824/1715	86112/175	19044/25
3 Max. motor shaft diameter	mm 6		6	3	6	6	4
<b>Part Numbers</b>	326660		326666	326670	324944	324949	324954
1 Reduction	21:1		79:1	132:1	295:1	531:1	913:1
2 Absolute reduction	299/14		3887/49	3312/25	101062/343	331776/625	36501/40
3 Max. motor shaft diameter	mm 6		6	4	6	4	3
<b>Part Numbers</b>	326661		326667	326671	324945	324950	
1 Reduction	23:1		86:1	159:1	318:1	589:1	
2 Absolute reduction	576/25		14976/175	1587/10	389376/1225	20631/35	
3 Max. motor shaft diameter	mm 4		6	3	6	6	
<b>Part Numbers</b>	326662		320297		324946	324951	
1 Reduction	28:1		103:1		411:1	636:1	
2 Absolute reduction	138/5		3588/35		359424/875	79488/125	
3 Max. motor shaft diameter	mm 4		6		6	4	
4 Number of stages	2	2	3	3	4	4	4
5 Max. continuous torque	Nm 4	4	8	8	8	8	8
6 Max. intermittent torque at gear output	Nm 6	6	12	12	12	12	12
7 Max. efficiency	% 75	75	70	70	60	60	60
8 Weight	g 178	178	213	213	249	249	249
9 Average backlash no load	° 0.8	0.8	1.0	1.0	1.0	1.0	1.0
10 Mass inertia	gcm <sup>2</sup> 1.6	0.5	1.5	0.7	1.5	1.5	0.7
11 Gearhead length L1	mm 48.3	48.3	55.0	55.0	61.7	61.7	61.7

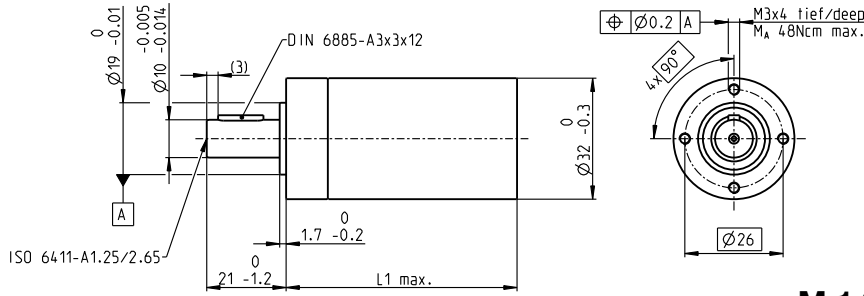


### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
RE 35, 90 W	134			119.4	119.4	126.1	126.1	142.8	132.8	132.8
RE 35, 90 W	134	MR	433	130.8	130.8	137.5	137.5	144.2	144.2	144.0
RE 35, 90 W	134	HEDL 5540	440/442	140.1	140.1	146.8	146.8	153.5	153.5	153.5
RE 35, 90 W	134	DCT 22	449	137.5	137.5	144.2	144.2	150.9	150.9	150.9
RE 35, 90 W	134	AB 28	491	155.5	155.5	162.2	162.2	168.9	168.9	168.9
RE 35, 90 W	134	HEDS 5540/AB 28	440/491	172.7	172.7	179.4	179.4	186.1	186.1	186.1
EC-max 30, 40 W	222			90.2	90.2	96.9	96.9	103.6	103.6	103.6
EC-max 30, 40 W	222	MR	432	102.4	102.4	109.1	109.1	115.8	115.8	115.8
EC-max 30, 40 W	222	HEDL 5540	444	110.8	110.8	117.5	117.5	124.2	124.2	124.2
EC-max 30, 40 W	222	AB 20	488	125.8	125.8	132.5	132.5	139.2	139.2	139.2
EC-max 30, 40 W	222	HEDL 5540/AB 20	444/488	146.4	146.4	153.1	153.1	159.8	159.8	159.8
EC-max 30, 60 W	223			112.2	112.2	118.9	118.9	125.6	125.6	125.6
EC-max 30, 60 W	223	MR	432	124.4	124.4	131.1	131.1	137.8	137.8	137.8
EC-max 30, 60 W	223	HEDL 5540	444	132.8	132.8	139.5	139.5	146.2	146.2	146.2
EC-max 30, 60 W	223	AB 20	488	147.8	147.8	154.5	154.5	161.2	161.2	161.2
EC-max 30, 60 W	223	HEDL 5540/AB 20	444/488	168.4	168.4	175.1	175.1	181.8	181.8	181.8
EC-4pole 30, 100 W	231			95.2	95.2	101.9	101.9	108.6	108.6	108.6
EC-4pole 30, 100 W	231	16 EASY/XT/Abs.	418-422	109.1	109.1	115.8	115.8	122.5	122.5	122.5
EC-4pole 30, 100 W	231	16 EASY Abs. XT	424	109.6	109.6	116.3	116.3	123.0	123.0	123.0
EC-4pole 30, 100 W	231	16 RIO	435	107.6	107.6	114.3	114.3	121.0	121.0	121.0
EC-4pole 30, 100 W	231	AEDL/HEDL	438/444	115.8	115.8	122.5	122.5	129.2	129.2	129.2
EC-4pole 30, 100 W	231	AB 20	488	131.4	131.4	138.1	138.1	144.8	144.8	144.8
EC-4pole 30, 100 W	231	16 EASY/XT/Abs./AB 20	418/488	145.5	145.5	152.5	152.5	158.9	158.9	158.9
EC-4pole 30, 100 W	231	16 EASY Abs. XT/AB 20	424/488	146.0	146.0	153.0	153.0	159.4	159.4	159.4
EC-4pole 30, 100 W	231	16 RIO/AB 20	435/488	144.0	144.0	151.0	151.0	157.4	157.4	157.4
EC-4pole 30, 100 W	231	AEDL/HEDL/AB 20	438/488	152.2	152.2	158.9	158.9	165.6	165.6	165.6

# Planetary Gearhead GP 32 HP $\varnothing 32$ mm, 4.0–8.0 Nm

High Power



M 1:2

## Technical Data

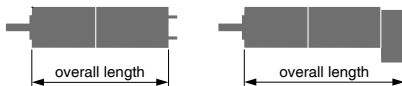
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	2 3 4
Max. radial load, 10 mm from flange	200 N 250 N 300 N

maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	320247	326663	326664	326668	326672	324947	324952
<b>Gearhead Data</b>							
1 Reduction	14:1	33:1	51:1	111:1	190:1	456:1	706:1
2 Absolute reduction	676/49	529/16	17576/343	13824/125	456976/2401	89401/196	158171/224
3 Max. motor shaft diameter mm	6	3	6	4	6	3	3
<b>Part Numbers</b>	326659		326665	326669	324942	324948	324953
1 Reduction	18:1		66:1	123:1	246:1	492:1	762:1
2 Absolute reduction	624/35		16224/245	6877/56	421824/1715	86112/175	19044/25
3 Max. motor shaft diameter mm	6		6	3	6	6	4
<b>Part Numbers</b>	326660		326666	326670	324944	324949	324954
1 Reduction	21:1		79:1	132:1	295:1	531:1	913:1
2 Absolute reduction	299/14		3887/49	3312/25	101062/343	331776/625	36501/40
3 Max. motor shaft diameter mm	6		6	4	6	4	3
<b>Part Numbers</b>	326661		326667	326671	324945	324950	
1 Reduction	23:1		86:1	159:1	318:1	589:1	
2 Absolute reduction	576/25		14976/175	1587/10	389376/1225	20631/35	
3 Max. motor shaft diameter mm	4		6	3	6	6	
<b>Part Numbers</b>	326662		320297		324946	324951	
1 Reduction	28:1		103:1		411:1	636:1	
2 Absolute reduction	138/5		3588/35		359424/875	79488/125	
3 Max. motor shaft diameter mm	4		6		6	4	
4 Number of stages	2	2	3	3	4	4	4
5 Max. continuous torque Nm	4	4	8	8	8	8	8
6 Max. intermittent torque at gear output Nm	6	6	12	12	12	12	12
7 Max. efficiency %	75	75	70	70	60	60	60
8 Weight g	178	178	213	213	249	249	249
9 Average backlash no load °	0.8	0.8	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm <sup>2</sup>	1.6	0.5	1.5	0.7	1.5	1.5	0.7
11 Gearhead length L1 mm	48.3	48.3	55.0	55.0	61.7	61.7	61.7

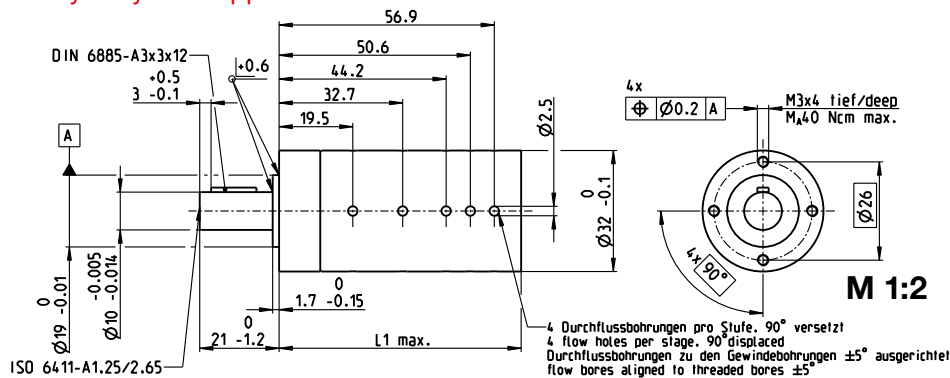


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
EC-4pole 30, 200 W 233				112.2	112.2	118.9	118.9	125.6	125.6	125.6
EC-4pole 30, 200 W 233		16 EASY/XT/Abs.	418/422	126.1	126.1	132.8	132.8	139.5	139.5	139.5
EC-4pole 30, 200 W 233		16 EASY Abs. XT	424	126.6	126.6	133.3	133.3	140.0	140.0	140.0
EC-4pole 30, 200 W 233		16 RIO	435	124.6	124.4	131.3	131.3	138.0	138.0	138.0
EC-4pole 30, 200 W 233		HEDL 5540	444	132.8	132.8	139.5	139.5	146.2	146.2	146.2
EC-4pole 30, 200 W 233		AB 20	488	148.4	148.4	155.1	155.1	161.8	161.8	161.8
EC-4pole 30, 200 W 233		16 EASY/XT/Abs./AB 20	418/488	162.5	162.5	169.2	169.2	175.9	175.9	175.9
EC-4pole 30, 200 W 233		16 EASY Abs. XT/AB 20	424/488	163.0	163.0	169.7	169.7	176.4	176.4	176.4
EC-4pole 30, 200 W 233		16 RIO/AB 20	435/488	161.0	161.0	167.7	167.7	174.4	174.4	174.4
EC-4pole 30, 200 W 233		HEDL 5540/AB 20	444/488	169.2	169.2	175.9	175.9	182.6	182.6	182.6
MCD EPOS, 60 W 485				168.2	168.2	174.9	174.9	181.6	181.6	181.6
MCD EPOS P, 60 W 485				168.2	168.2	174.9	174.9	181.6	181.6	181.6

# Planetary Gearhead GP 32 HD Ø32 mm, 3.0–8.0 Nm

Heavy Duty – for application in oil



Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	< 8000 rpm
Recommended temperature range	-55...+200°C
Extended range as option	-55...+260°C
Number of stages	1 2 3 4 5
Max. radial load, 10 mm from flange	120 N 200 N 250 N 300 N 300 N

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Gearhead Data (provisional)	526077	526080	526086	526092	526095	526101	526106	526112	526117	526123
1 Reduction	3.7:1	14:1	51:1	123:1	190:1	492:1	707:1	1694:1	2548:1	4060:1
2 Absolute reduction	26 <sub>7</sub>	676 <sub>49</sub>	17576 <sub>343</sub>	6877 <sub>56</sub>	456976 <sub>2401</sub>	86112 <sub>175</sub>	11881376 <sub>16807</sub>	1162213 <sub>686</sub>	7962624 <sub>3125</sub>	3637933 <sub>896</sub>
3 Max. motor shaft diameter	mm 6	6	6	3	6	6	6	6	4	6
<b>Part Numbers</b>	526078	526081	526087	526093	526096	526102	526107	526113	526118	526124
1 Reduction	4.8:1	18:1	66:1	132:1	246:1	531:1	914:1	1828:1	2623:1	4380:1
2 Absolute reduction	24 <sub>5</sub>	624 <sub>35</sub>	16224 <sub>245</sub>	3312 <sub>25</sub>	421824 <sub>1715</sub>	331776 <sub>625</sub>	10967424 <sub>12005</sub>	2238912 <sub>1225</sub>	2056223 <sub>784</sub>	109503 <sub>25</sub>
3 Max. motor shaft diameter	mm 4	6	6	4	6	4	6	6	6	4
<b>Part Numbers</b>	526079*	526082	526088	526094*	526097	526103	526108	526114	526119	526125
1 Reduction	5.8:1	21:1	79:1	159:1	295:1	589:1	1094:1	1972:1	2829:1	5247:1
2 Absolute reduction	23 <sub>4</sub>	299 <sub>14</sub>	3887 <sub>49</sub>	1587 <sub>10</sub>	101062 <sub>343</sub>	20631 <sub>35</sub>	2627612 <sub>2401</sub>	8626176 <sub>4375</sub>	495144 <sub>175</sub>	839523 <sub>160</sub>
3 Max. motor shaft diameter	mm 3	6	6	3	6	6	6	4	6	4
<b>Part Numbers</b>		526083	526089		526098	526104	526109	526115	526120	526126*
1 Reduction		23:1	86:1		318:1	636:1	1181:1	2189:1	3052:1	6285:1
2 Absolute reduction		576 <sub>25</sub>	14976 <sub>175</sub>		389376 <sub>1225</sub>	79488 <sub>125</sub>	10123776 <sub>8575</sub>	536406 <sub>245</sub>	1907712 <sub>625</sub>	6436343 <sub>1024</sub>
3 Max. motor shaft diameter	mm	4	6		6	4	6	6	4	3
<b>Part Numbers</b>		526084	526090		526099	526105	526110	526116	526121	
1 Reduction		28:1	103:1		411:1	762:1	1414:1	2362:1	3389:1	
2 Absolute reduction		138 <sub>5</sub>	3588 <sub>35</sub>		359424 <sub>875</sub>	19044 <sub>25</sub>	2425488 <sub>1715</sub>	2066688 <sub>875</sub>	474513 <sub>140</sub>	
3 Max. motor shaft diameter	mm	4	6		6	4	6	6	6	
<b>Part Numbers</b>		526085*	526091		526100		526111		526122	
1 Reduction		33:1	111:1		456:1		1526:1		3656:1	
2 Absolute reduction		529 <sub>16</sub>	13824 <sub>125</sub>		89401 <sub>196</sub>		9345024 <sub>6125</sub>		457056 <sub>125</sub>	
3 Max. motor shaft diameter	mm	3	4		6		4		4	
4 Number of stages		1	2	3	4	4	5	5	5	5
5 Max. continuous torque	Nm	3	4	8	8	8	8	8	8	8
6 Max. intermittent torque at gear output	Nm	4.5	6	12	12	12	12	12	12	12
15 Max. overload torque <sup>1)</sup>	Nm	9	12	24	24	24	24	24	24	24
7 Max. efficiency	%	95	87	78	78	65	65	53	53	53
8 Weight	g	176	234	277	277	309	309	340	340	340
9 Average backlash no load	°	0.7	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia	gcm <sup>2</sup>	1.59	1.59	1.45	1.45	1.45	1.45	1.45	1.45	1.45
11 Gearhead length L1	mm	32.9	45.3	55.1	55.1	61.6	61.6	68.1	68.1	68.1
13 Max. transmittable power (continuous)	W	320	200	80	80	40	40	12	12	12
14 Max. transmittable power (intermittent)	W	480	300	120	120	60	60	18	18	18

<sup>1)</sup> Reduced lift time expectancy



## maxon Modular System

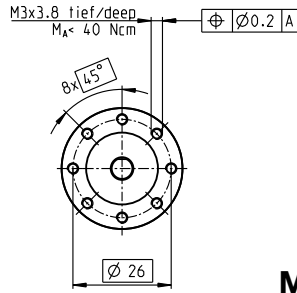
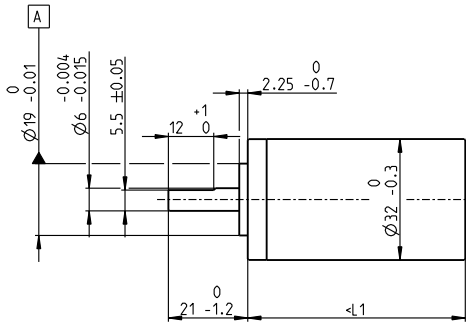
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts
EC-4pole 32 HD oil, A	235			194.0 206.5 216.5 216.5 223.0 223.0 229.5 229.5 229.5
EC-4pole 32 HD oil, B	235			174.0 186.5 196.5 196.5 203.0 203.0 209.5 209.5 209.5

\*Overall length + 2 mm

Application	Important Notice
<b>General</b>	This gearhead has been designed for applications in oil and is only equipped with minimum lubrication. Therefore it is not permitted to use it under normal air conditions.
- extreme temperature applications	
- vibration tested according to MIL-STD810F/Jan2000 Fig. 514.5C-10	
- operation in oil and high pressure	
<b>Oil &amp; Gas Industry</b>	
- oil, gas and geothermal wells	

# Koaxdrive KD 32 Ø32 mm, 1.0–4.5 Nm

Low Noise



M 1:2

## Technical Data

Planetary Gearhead	special toothing
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Number of stages	1 2 3
Max. radial load, 10 mm from flange	90 N 140 N 200 N

Option: higher reduction ratio on request

maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

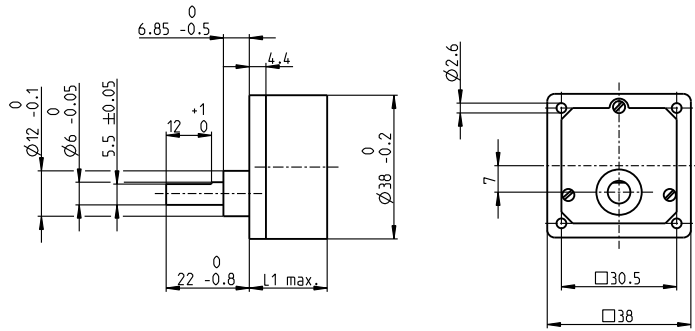
	354722	354725	354962	354730	354731	354734	354737	354963	354742
<b>Gearhead Data</b>									
1 Reduction	11:1	41:1	82:1	158:1	152:1	253:1	392:1	705:1	1091:1
2 Absolute reduction	11/1	286/7	408/5	792/5	7436/49	6336/25	9792/25	9867/14	17457/16
7 Max. efficiency	% 78	70	65	61	63	63	59	55	55
10 Mass inertia	gcm <sup>2</sup> 0.65	0.60	0.60	0.35	0.60	0.60	0.35	0.35	0.22
<b>Part Numbers</b>	354723	354726	354728	354744	354732	354735	354738	354740	
1 Reduction	17:1	53:1	98:1	190:1	196:1	304:1	455:1	760:1	
2 Absolute reduction	17/1	264/5	391/4	759/4	6864/35	1518/5	22308/49	19008/25	
7 Max. efficiency	% 72	70	65	65	63	63	55	55	
10 Mass inertia	gcm <sup>2</sup> 0.38	0.60	0.35	0.35	0.60	0.60	0.22	0.22	
<b>Part Numbers</b>	354724	354727	354729		354733	354736	354739	354741	
1 Reduction	33:1	63:1	123:1		235:1	364:1	588:1	911:1	
2 Absolute reduction	33/1	442/7	858/7		11492/49	5819/16	20592/35	4554/5	
7 Max. efficiency	% 68	70	61		63	63	59	55	
10 Mass inertia	gcm <sup>2</sup> 0.65	0.60	0.22		0.60	0.60	0.35	0.22	
3 Max. motor shaft diameter	mm 3	3	3	3	3	3	3	3	3
4 Number of stages	1	2	2	2	3	3	3	3	3
5 Max. continuous torque	Nm 1	3.5	3.5	3.5	4.5	4.5	4.5	4.5	4.5
6 Max. intermittent torque at gear output	Nm 1.25	4.4	4.4	4.4	6.5	6.5	6.5	6.5	6.5
8 Weight	g 130	230	230	230	262	262	262	262	262
9 Average backlash no load	° 3.5	1	1	1	1	1	1	1	1
11 Gearhead length L1	mm 40.7	57.9	57.9	57.9	67.6	67.6	67.6	67.6	67.6



## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 25	129/131			95.3	112.5	112.5	112.5	122.2	122.2	122.2	122.2
RE 25	129/131	MR	432	106.3	123.5	123.5	123.5	133.2	133.2	133.2	133.2
RE 25	129/131	Enc 22	437	109.4	126.6	126.6	126.6	136.3	136.3	136.3	136.3
RE 25	129/131	HED_5540	440/442	116.1	133.3	133.3	133.3	143.0	143.0	143.0	143.0
RE 25	129/131	DCT 22	449	117.6	134.8	134.8	134.8	144.5	144.5	144.5	144.5
RE 25, 20 W	130			83.8	101.0	101.0	101.0	110.7	110.7	110.7	110.7
RE 25, 20 W	130	MR	432	94.8	112.0	112.0	112.0	121.7	121.7	121.7	121.7
RE 25, 20 W	130	HED_5540	441/442	104.6	121.8	121.8	121.8	131.5	131.5	131.5	131.5
RE 25, 20 W	130	DCT 22	449	106.1	123.3	123.3	123.3	133.0	133.0	133.0	133.0
RE 25, 20 W	130	AB 28	491	117.9	135.1	135.1	135.1	144.8	144.8	144.8	144.8
RE 25, 20 W	130	HED_5540/AB 28	441/491	135.1	152.3	152.3	152.3	162.0	162.0	162.0	162.0
RE 30, 60 W	133			108.8	126.0	126.0	126.0	135.7	135.7	135.7	135.7
RE 30, 60 W	133	MR	433	120.2	137.4	137.4	137.4	147.1	147.1	147.1	147.1
RE 30, 60 W	133	HEDL 5540	442	129.6	146.8	146.8	146.8	156.5	156.5	156.5	156.5
EC-max 22, 12 W	220			72.8	90.0	90.0	90.0	99.7	99.7	99.7	99.7
EC-max 22, 12 W	220	MR	431	82.4	99.6	99.6	99.6	109.3	109.3	109.3	109.3
EC-max 22, 12 W	220	AB 20	488	108.4	125.6	125.6	125.6	135.3	135.3	135.3	135.3
EC-max 22, 25 W	221			89.3	106.5	106.5	106.5	116.2	116.2	116.2	116.2
EC-max 22, 25 W	221	MR	431	98.9	116.1	116.1	116.1	125.8	125.8	125.8	125.8
EC-max 22, 25 W	221	AB 20	488	125.0	142.2	142.2	142.2	151.9	151.9	151.9	151.9
EC-max 30, 40 W	222			82.8	100.0	100.0	100.0	109.7	109.7	109.7	109.7
EC-max 30, 40 W	222	MR	432	95.0	112.2	112.2	112.2	121.9	121.9	121.9	121.9
EC-max 30, 40 W	222	HEDL 5540	444	103.4	120.6	120.6	120.6	130.3	130.3	130.3	130.3
EC-max 30, 40 W	222	AB 20	488	118.4	135.6	135.6	135.6	145.3	145.3	145.3	145.3
EC-max 30, 40 W	222	HEDL 5540/AB 20	444/488	139.2	156.2	156.2	156.2	165.8	165.8	165.8	165.8
EC-max 30, 60 W	223			104.8	122.0	122.0	122.0	131.7	131.7	131.7	131.7
EC-max 30, 60 W	223	MR	432	117.0	134.2	134.2	134.2	143.9	143.9	143.9	143.9
EC-max 30, 60 W	223	HEDL 5540	444	125.4	142.6	142.6	142.6	152.3	152.3	152.3	152.3
EC-max 30, 60 W	223	AB 20	488	140.4	157.6	157.6	157.6	167.3	167.3	167.3	167.3
EC-max 30, 60 W	223	HEDL 5540/AB 20	444/488	161.2	178.2	178.2	178.2	187.8	187.8	187.8	187.8

# Spur Gearhead GS 38 A $\varnothing 38$ mm, 0.1–0.6 Nm



### Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	sleeve bearing
Radial play, 12 mm from flange	max. 0.1 mm
Axial play	0.03–0.2 mm
Max. axial load (dynamic)	30 N
Max. force for press fits	500 N
Max. continuous input speed	5000 rpm
Recommended temperature range	-5...+80°C
Number of stages	1 2 3 4 5
Max. radial load, 12 mm from flange	50 N 50 N 50 N 50 N 50 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

### Gearhead Data

	110451	110452	110453	110454	110455	110456	110457	110458	110459
1 Reduction	6:1	10:1	18:1	30:1	60:1	100:1	200:1	500:1	900:1
2 Absolute reduction	6	10	18	30	60	100	200	500	900
3 Max. motor shaft diameter mm	3	3	3	3	3	3	3	3	3
4 Number of stages	2	2	3	3	4	4	5	6	6
5 Max. continuous torque Nm	0.1	0.1	0.2	0.2	0.3	0.3	0.6	0.6	0.6
6 Max. intermittent torque at gear output Nm	0.3	0.3	0.6	0.6	0.9	0.9	1.8	1.8	1.8
12 Direction of rotation, drive to output	=	=	≠	≠	=	=	≠	=	=
7 Max. efficiency %	81	81	73	73	66	66	59	53	53
8 Weight g	55	55	60	60	65	65	70	75	75
9 Average backlash no load °	1.0	1.0	1.5	1.5	2.0	2.0	2.5	3.0	3.0
10 Mass inertia gcm <sup>2</sup>	0.7	0.6	0.4	0.4	0.3	0.3	0.2	0.2	0.2
11 Gearhead length L1* mm	20.6	20.6	23.1	23.1	25.6	25.6	28.1	30.6	30.6

\*for EC 32 flat L1 is + 2.0 mm



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
A-max 26	155-158			65.4	65.4	67.9	67.9	70.4	70.4	72.9	75.4	75.4
A-max 26	156-158	MEnc 13	417	72.5	72.5	75.0	75.0	77.5	77.5	80.0	82.5	82.5
A-max 26	156-158	MR	432	74.2	74.2	76.7	76.7	79.2	79.2	81.7	84.2	84.2
A-max 26	156-158	Enc 22	437	79.8	79.8	82.3	82.3	84.8	84.8	87.3	89.8	89.8
A-max 26	156-158	HED_ 5540	441/443	83.8	83.8	86.3	86.3	88.8	88.8	91.3	93.8	93.8
A-max 32	159			83.6	83.6	86.1	86.1	88.6	88.6	91.1	93.6	93.6
A-max 32	160			82.2	82.2	84.7	84.7	87.2	87.2	89.7	92.2	92.2
A-max 32	160	MR	433	93.4	93.4	95.9	95.9	98.4	98.4	100.9	103.4	103.4
A-max 32	160	HED_ 5540	441/443	103.0	103.0	105.5	105.5	108.0	108.0	110.5	113.0	113.0
EC 32 flat, 15 W	259			38.6	38.6	41.1	41.1	43.6	43.6	46.1	48.6	48.6
EC 32 flat, IE, IP 00	260			48.7	48.7	51.2	51.2	53.7	53.7	56.2	58.7	58.7
EC 32 flat, IE, IP 40	260			50.4	50.4	52.9	52.9	55.4	55.4	57.9	60.4	60.4

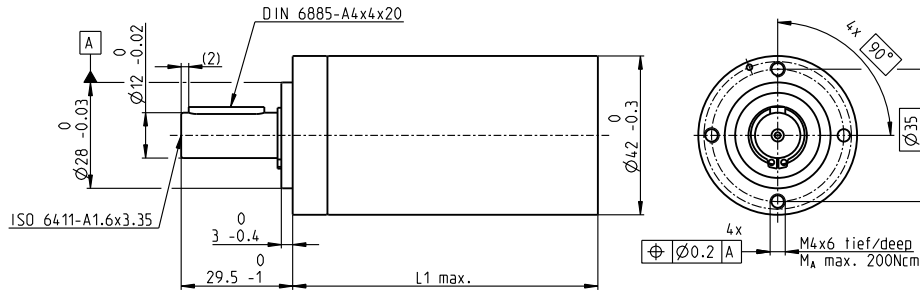


# Planetary Gearhead GP 42 C Ø42 mm, 3.0–15.0 Nm

Ceramic Version

## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 12 mm from flange	max. 0.06 mm
Axial play at axial load	< 5 N     0 mm
	> 5 N     max. 0.3 mm
Max. axial load (dynamic)	150 N
Max. force for press fits	300 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1    2    3    4
Max. radial load, 12 mm from flange	120 N   240 N   360 N   360 N



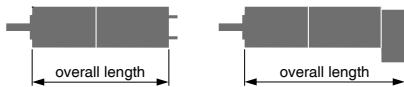
maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

		203113	203115	203119	203120	203124	203129	203128	203133	203137	203141
<b>Gearhead Data</b>											
1 Reduction		3.5:1	12:1	26:1	43:1	81:1	156:1	150:1	285:1	441:1	756:1
2 Absolute reduction		$7/2$	$49/4$	26	$343/8$	$2197/27$	156	$2401/16$	$15379/54$	441	756
10 Mass inertia	gcm <sup>2</sup>	14	15	9.1	15	9.4	9.1	15	15	14	14
3 Max. motor shaft diameter	mm	10	10	8	10	8	8	10	10	10	10
<b>Part Numbers</b>		203114	203116	260552*	203121	203125	260553*	203130	203134	203138	203142
1 Reduction		4.3:1	15:1	36:1	53:1	91:1	216:1	186:1	319:1	488:1	936:1
2 Absolute reduction		$13/3$	$91/6$	$36/1$	$637/12$	91	$216/1$	$4459/24$	$637/2$	$4394/9$	936
10 Mass inertia	gcm <sup>2</sup>	9.1	15	5.0	15	15	5.0	15	15	9.4	9.1
3 Max. motor shaft diameter	mm	8	10	4	10	10	4	10	10	8	8
<b>Part Numbers</b>		260551*	203117		203122	203126		203131	203135	203139	260554*
1 Reduction		6:1	19:1		66:1	113:1		230:1	353:1	546:1	1296:1
2 Absolute reduction		$6/1$	$169/9$		$1183/18$	$338/3$		$8281/36$	$28561/81$	546	$1296/1$
10 Mass inertia	gcm <sup>2</sup>	4.9	9.4		15	9.4		15	9.4	14	5.0
3 Max. motor shaft diameter	mm	4	8		10	8		10	8	10	4
<b>Part Numbers</b>			203118		203123	203127		203132	203136	203140	
1 Reduction			21:1		74:1	126:1		257:1	394:1	676:1	
2 Absolute reduction			21		$147/2$	126		$1029/4$	$1183/3$	676	
10 Mass inertia	gcm <sup>2</sup>		14		15	14		15	15	9.1	
3 Max. motor shaft diameter	mm		10		10	10		10	10	8	
4 Number of stages		1	2	2	3	3	3	4	4	4	4
5 Max. continuous torque	Nm	3.0	7.5	7.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0
6 Max. intermittent torque at gear output	Nm	4.5	11.3	11.3	22.5	22.5	22.5	22.5	22.5	22.5	22.5
7 Max. efficiency	%	90	81	81	72	72	72	64	64	64	64
8 Weight	g	260	360	360	460	460	460	560	560	560	560
9 Average backlash no load	°	0.6	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0
11 Gearhead length L1**	mm	41.0	55.5	55.5	70.0	70.0	70.0	84.5	84.5	84.5	84.5

\*no combination with EC 45 (150/250 W) and EC-1 40  
\*\*for EC 45 flat L1 is -3.6 mm



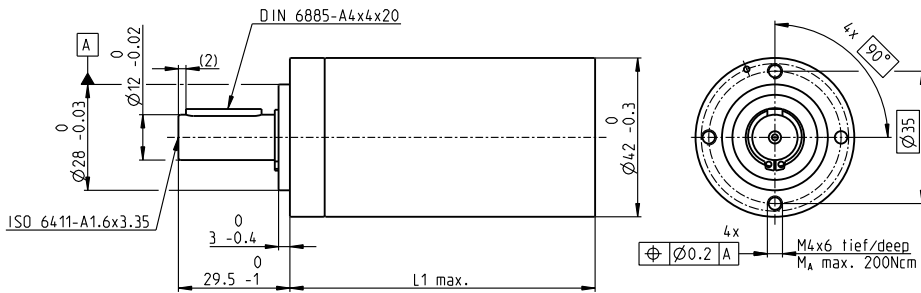
## maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 35, 90 W	134					112.1	126.6	126.6	141.1	141.1	141.1	155.6	155.6	155.6
RE 35, 90 W	134	MR	433			123.5	138.0	138.0	152.5	152.5	152.5	167.0	167.0	167.0
RE 35, 90 W	134	HED_5540	440/442			132.8	147.3	147.3	161.8	161.8	161.8	176.3	176.3	176.3
RE 35, 90 W	134	DCT 22	449			130.2	144.7	144.7	159.2	159.2	159.2	173.7	173.7	173.7
RE 35, 90 W	134			AB 28	491	148.2	162.7	162.7	177.2	177.2	177.2	191.7	191.7	191.7
RE 35, 90 W	134	HED_5540	440/442	AB 28	491	165.4	179.9	179.9	194.4	194.4	194.4	208.9	208.9	208.9
RE 40, 150 W	136					112.1	126.6	126.6	141.1	141.1	141.1	155.6	155.6	155.6
RE 40, 150 W	136	MR	433			123.5	138.0	138.0	152.5	152.5	152.5	167.0	167.0	167.0
RE 40, 150 W	136	HED_5540	440/443			132.8	147.3	147.3	161.8	161.8	161.8	176.3	176.3	176.3
RE 40, 150 W	136	HEDL 9140	447			166.2	180.7	180.7	195.2	195.2	195.2	209.7	209.7	209.7
RE 40, 150 W	136			AB 28	491	148.2	162.7	162.7	177.2	177.2	177.2	191.7	191.7	191.7
RE 40, 150 W	136			AB 28	492	156.2	170.7	170.7	185.2	185.2	185.2	199.7	199.7	199.7
RE 40, 150 W	136	HED_5540	440/443	AB 28	491	165.4	179.9	179.9	194.4	194.4	194.4	208.9	208.9	208.9
RE 40, 150 W	136	HEDL 9140	447	AB 28	492	176.7	191.2	191.2	205.7	205.7	205.7	220.2	220.2	220.2
EC 40, 170 W	210					121.1	135.6	135.6	150.1	150.1	150.1	164.6	164.6	164.6
EC 40, 170 W	210	HED_5540	441/443			144.5	159.0	159.0	173.5	173.5	173.5	188.0	188.0	188.0
EC 40, 170 W	210	Res 26	450			148.3	162.8	162.8	177.3	177.3	177.3	191.8	191.8	191.8
EC 40, 170 W	210			AB 32	493	163.8	178.3	178.3	192.8	192.8	192.8	207.3	207.3	207.3
EC 40, 170 W	210	HED_5540	441/443	AB 32	493	182.2	196.7	196.7	211.2	211.2	211.2	225.7	225.7	225.7
EC 45, 150 W	211					152.3	166.8	166.8	181.3	181.3	181.3	195.8	195.8	195.8
EC 45, 150 W	211	HEDL 9140	447			167.9	182.4	182.4	196.9	196.9	196.9	211.4	211.4	211.4
EC 45, 150 W	211	Res 26	450			152.3	166.8	166.8	181.3	181.3	181.3	195.8	195.8	195.8
EC 45, 150 W	211			AB 28	492	159.7	174.2	174.2	188.7	188.7	188.7	203.2	203.2	203.2
EC 45, 150 W	211	HEDL 9140	447	AB 28	492	176.7	191.2	191.2	205.7	205.7	205.7	220.2	220.2	220.2
EC 45, 250 W	212					185.1	199.6	199.6	214.1	214.1	214.1	228.6	228.6	228.6
EC 45, 250 W	212	HEDL 9140	447			200.7	215.2	215.2	229.7	229.7	229.7	244.2	244.2	244.2
EC 45, 250 W	212	Res 26	450			185.1	199.6	199.6	214.1	214.1	214.1	228.6	228.6	228.6
EC 45, 250 W	212			AB 28	492	192.5	207.0	207.0	221.5	221.5	221.5	236.0	236.0	236.0
EC 45, 250 W	212	HEDL 9140	447	AB 28	492	209.5	224.0	224.0	238.5	238.5	238.5	253.0	253.0	253.0

# Planetary Gearhead GP 42 C $\varnothing 42$ mm, 3.0–15.0 Nm

Ceramic Version

maxon gear



### Technical Data

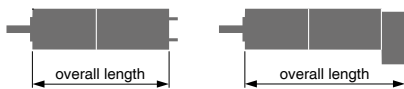
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 12 mm from flange	max. 0.06 mm
Axial play at axial load	< 5 N 0 mm > 5 N max. 0.3 mm
Max. axial load (dynamic)	150 N
Max. force for press fits	300 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	120 N 240 N 360 N 360 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

Gearhead Data		203113	203115	203119	203120	203124	203129	203128	203133	203137	203141
1 Reduction		3.5:1	12:1	26:1	43:1	81:1	156:1	150:1	285:1	441:1	756:1
2 Absolute reduction		$\frac{7}{2}$	$\frac{49}{4}$	26	$\frac{343}{8}$	$\frac{2197}{27}$	156	$\frac{2401}{16}$	$\frac{15379}{54}$	441	756
10 Mass inertia	gcm <sup>2</sup>	14	15	9.1	15	9.4	9.1	15	15	14	14
3 Max. motor shaft diameter	mm	10	10	8	10	8	8	10	10	10	10
Part Numbers		203114	203116	260552*	203121	203125	260553*	203130	203134	203138	203142
1 Reduction		4.3:1	15:1	36:1	53:1	91:1	216:1	186:1	319:1	488:1	936:1
2 Absolute reduction		$\frac{13}{3}$	$\frac{91}{6}$	$\frac{36}{1}$	$\frac{637}{12}$	91	$\frac{216}{1}$	$\frac{4459}{24}$	$\frac{637}{2}$	$\frac{4394}{9}$	936
10 Mass inertia	gcm <sup>2</sup>	9.1	15	5.0	15	15	5.0	15	15	9.4	9.1
3 Max. motor shaft diameter	mm	8	10	4	10	10	4	10	10	8	8
Part Numbers		260551*	203117		203122	203126		203131	203135	203139	260554*
1 Reduction		6:1	19:1		66:1	113:1		230:1	353:1	546:1	1296:1
2 Absolute reduction		$\frac{6}{1}$	$\frac{169}{9}$		$\frac{1183}{18}$	$\frac{338}{3}$		$\frac{8281}{36}$	$\frac{28561}{81}$	546	$\frac{1296}{1}$
10 Mass inertia	gcm <sup>2</sup>	4.9	9.4		15	9.4		15	9.4	14	5.0
3 Max. motor shaft diameter	mm	4	8		10	8		10	8	10	4
Part Numbers			203118		203123	203127		203132	203136	203140	
1 Reduction			21:1		74:1	126:1		257:1	394:1	676:1	
2 Absolute reduction			21		$\frac{147}{2}$	126		$\frac{1029}{4}$	$\frac{1183}{3}$	676	
10 Mass inertia	gcm <sup>2</sup>		14		15	14		15	15	9.1	
3 Max. motor shaft diameter	mm		10		10	10		10	10	8	
4 Number of stages		1	2	2	3	3	3	4	4	4	4
5 Max. continuous torque	Nm	3.0	7.5	7.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0
6 Max. intermittent torque at gear output	Nm	4.5	11.3	11.3	22.5	22.5	22.5	22.5	22.5	22.5	22.5
7 Max. efficiency	%	90	81	81	72	72	72	64	64	64	64
8 Weight	g	260	360	360	460	460	460	560	560	560	560
9 Average backlash no load	°	0.6	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0
11 Gearhead length L1**	mm	41.0	55.5	55.5	70.0	70.0	70.0	84.5	84.5	84.5	84.5

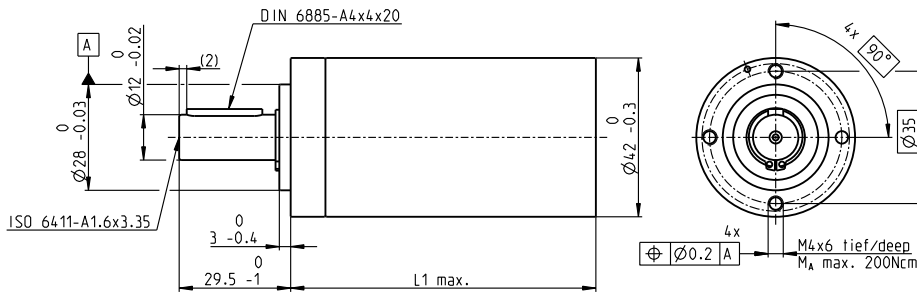
\*no combination with EC 45 (150/250 W) and EC-1 40  
\*\*for EC 45 flat L1 is -3.6 mm



maxon Modular System												
+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
EC-max 30, 60 W	223					105.1	119.6	119.6	134.1	134.1	134.1	148.6
EC-max 30, 60 W	223	MR	432			117.3	131.8	131.8	146.3	146.3	146.3	160.8
EC-max 30, 60 W	223	HEDL 5540	444			125.7	140.2	140.2	154.7	154.7	154.7	169.2
EC-max 30, 60 W	223			AB 20	488	141.2	155.1	155.1	169.5	169.5	169.5	184.2
EC-max 30, 60 W	223	HEDL 5540	444	AB 20	488	161.4	175.9	175.9	190.4	190.4	190.4	204.9
EC-max 40, 70 W	224					99.1	113.6	113.6	128.1	128.1	128.1	142.6
EC-max 40, 70 W	224	MR	433			115.0	129.5	129.5	144.0	144.0	144.0	158.5
EC-max 40, 70 W	224	HEDL 5540	444			122.5	137.0	137.0	151.5	151.5	151.5	166.0
EC-max 40, 70 W	224			AB 28	490	133.5	148.0	148.0	162.5	162.5	162.5	177.0
EC-max 40, 70 W	224	HEDL 5540	444	AB 28	490	151.8	166.3	166.3	180.8	180.8	180.8	195.3
EC-4pole 30, 100 W	231					88.1	102.6	102.6	117.1	117.1	117.1	131.6
EC-4pole 30, 100 W	231	16 EASY/XT/Abs.	418-422			102.0	116.5	116.5	131.0	131.0	131.0	145.5
EC-4pole 30, 100 W	231	16 EASY Abs. XT	424			102.5	117.0	117.0	131.5	131.5	131.5	146.0
EC-4pole 30, 100 W	231	16 RIO	435			100.5	115.0	115.0	129.5	129.5	129.5	144.0
EC-4pole 30, 100 W	231	AEDL/HEDL	438/444			108.7	123.2	123.2	137.7	137.7	137.7	152.2
EC-4pole 30, 100 W	231			AB 20	488	124.3	138.8	138.8	153.3	153.3	153.3	167.8
EC-4pole 30, 100 W	231	16 EASY/XT/Abs.	418-422	AB 20	488	138.4	152.9	152.9	167.4	167.4	167.4	181.9
EC-4pole 30, 100 W	231	16 EASY Abs. XT	424	AB 20	488	138.9	153.4	153.4	167.9	167.9	167.9	182.4
EC-4pole 30, 100 W	231	16 RIO	435	AB 20	488	136.9	151.4	151.4	165.9	165.9	165.9	180.4
EC-4pole 30, 100 W	231	AEDL/HEDL	438/444	AB 20	488	145.1	159.6	159.6	174.1	174.1	174.1	188.6
EC-4pole 30, 200 W	233					105.1	119.6	119.6	134.1	134.1	134.1	148.6
EC-4pole 30, 200 W	233	16 EASY/XT/Abs.	418-422			119.0	133.5	133.5	148.0	148.0	148.0	162.5
EC-4pole 30, 200 W	233	16 EASY Abs. XT	424			119.5	134.0	134.0	148.5	148.5	148.5	163.0
EC-4pole 30, 200 W	233	16 RIO	435			117.5	132.0	132.0	146.5	146.5	146.5	161.0
EC-4pole 30, 200 W	233	AEDL/HEDL	438/444			125.7	140.2	140.2	154.7	154.7	154.7	169.2
EC-4pole 30, 200 W	233			AB 20	488	141.3	155.8	155.8	170.3	170.3	170.3	184.8
EC-4pole 30, 200 W	233	16 EASY/XT/Abs.	418-422	AB 20	488	155.4	169.9	169.9	184.4	184.4	184.4	198.9
EC-4pole 30, 200 W	233	16 EASY Abs. XT	424	AB 20	488	155.9	170.4	170.4	184.9	184.9	184.9	199.4

# Planetary Gearhead GP 42 C $\varnothing 42$ mm, 3.0–15.0 Nm

Ceramic Version



M 1:2

## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 12 mm from flange	max. 0.06 mm
Axial play at axial load	< 5 N 0 mm > 5 N max. 0.3 mm
Max. axial load (dynamic)	150 N
Max. force for press fits	300 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	120 N 240 N 360 N 360 N

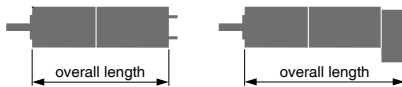
maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	203113	203115	203119	203120	203124	203129	203128	203133	203137	203141
<b>Gearhead Data</b>										
1 Reduction	3.5:1	12:1	26:1	43:1	81:1	156:1	150:1	285:1	441:1	756:1
2 Absolute reduction	$\frac{7}{2}$	$\frac{49}{4}$	26	$\frac{343}{8}$	$\frac{2197}{27}$	156	$\frac{2401}{16}$	$\frac{15379}{54}$	441	756
10 Mass inertia	gcm <sup>2</sup> 14	15	9.1	15	9.4	9.1	15	15	14	14
3 Max. motor shaft diameter	mm 10	10	8	10	8	8	10	10	10	10
<b>Part Numbers</b>	<b>203114</b>	<b>203116</b>	<b>260552*</b>	<b>203121</b>	<b>203125</b>	<b>260553*</b>	<b>203130</b>	<b>203134</b>	<b>203138</b>	<b>203142</b>
1 Reduction	4.3:1	15:1	36:1	53:1	91:1	216:1	186:1	319:1	488:1	936:1
2 Absolute reduction	$\frac{13}{3}$	$\frac{91}{6}$	$\frac{36}{1}$	$\frac{637}{12}$	91	$\frac{216}{1}$	$\frac{4459}{24}$	$\frac{637}{2}$	$\frac{4394}{9}$	936
10 Mass inertia	gcm <sup>2</sup> 9.1	15	5.0	15	15	5.0	15	15	9.4	9.1
3 Max. motor shaft diameter	mm 8	10	4	10	10	4	10	10	8	8
<b>Part Numbers</b>	<b>260551*</b>	<b>203117</b>		<b>203122</b>	<b>203126</b>		<b>203131</b>	<b>203135</b>	<b>203139</b>	<b>260554*</b>
1 Reduction	6:1	19:1		66:1	113:1		230:1	353:1	546:1	1296:1
2 Absolute reduction	$\frac{6}{1}$	$\frac{169}{9}$		$\frac{1183}{18}$	$\frac{338}{3}$		$\frac{8281}{36}$	$\frac{28561}{81}$	546	$\frac{1296}{1}$
10 Mass inertia	gcm <sup>2</sup> 4.9	9.4		15	9.4		15	9.4	14	5.0
3 Max. motor shaft diameter	mm 4	8		10	8		10	8	10	4
<b>Part Numbers</b>		<b>203118</b>		<b>203123</b>	<b>203127</b>		<b>203132</b>	<b>203136</b>	<b>203140</b>	
1 Reduction		21:1		74:1	126:1		257:1	394:1	676:1	
2 Absolute reduction		21		$\frac{147}{2}$	126		$\frac{1029}{4}$	$\frac{1183}{3}$	676	
10 Mass inertia	gcm <sup>2</sup>	14		15	14		15	15	9.1	
3 Max. motor shaft diameter	mm	10		10	10		10	10	8	
4 Number of stages		1	2	2	3	3	4	4	4	4
5 Max. continuous torque	Nm	3.0	7.5	7.5	15.0	15.0	15.0	15.0	15.0	15.0
6 Max. intermittent torque at gear output	Nm	4.5	11.3	11.3	22.5	22.5	22.5	22.5	22.5	22.5
7 Max. efficiency	%	90	81	81	72	72	72	64	64	64
8 Weight	g	260	360	360	460	460	460	560	560	560
9 Average backlash no load	°	0.6	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0
11 Gearhead length L1**	mm	41.0	55.5	55.5	70.0	70.0	70.0	84.5	84.5	84.5

\*no combination with EC 45 (150/250 W) and EC-I 40  
\*\*for EC 45 flat L1 is -3.6 mm

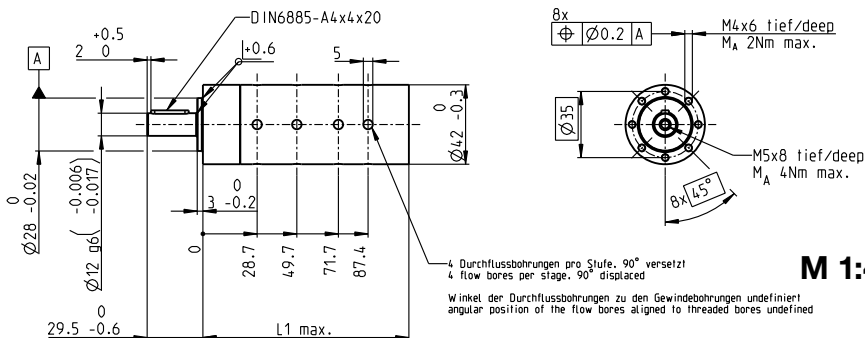


## maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC-4pole 30, 200 W	233	16 RIO	435	AB 20	488	153.9	168.4	168.4	182.9	182.9	182.9	197.4	197.4	197.4	197.4
EC-4pole 30, 200 W	233	AEDL/HEDL	438/444	AB 20	488	162.1	176.6	176.6	191.1	191.1	191.1	205.6	205.6	205.6	205.6
EC-i 40, 50 W	244/245					67.1	81.6	81.6	96.1	96.1	96.1	110.6	110.6	110.6	110.6
EC-i 40, 50 W	244/245	16 EASY/Abs.	418/422			78.8	93.3	93.3	107.8	107.8	107.8	122.3	122.3	122.3	122.3
EC-i 40, 50 W	244/245	16 RIO	435			81.6	96.1	96.1	110.6	110.6	110.6	125.1	125.1	125.1	125.1
EC-i 40, 50 W	244/245	AEDL/HEDL	438/444			90.1	104.6	104.6	119.1	119.1	119.1	133.6	133.6	133.6	133.6
EC-i 40, 70 W	246/247					77.1	91.6	91.6	106.1	106.1	106.1	120.6	120.6	120.6	120.6
EC-i 40, 70 W	246/247	16 EASY/Abs.	418/422			88.8	103.3	103.3	117.8	117.8	117.8	132.3	132.3	132.3	132.3
EC-i 40, 70 W	246/247	16 RIO	435			91.6	106.1	106.1	120.6	120.6	120.6	135.1	135.1	135.1	135.1
EC-i 40, 70 W	246/247	AEDL/HEDL	438/444			100.1	114.6	114.6	129.1	129.1	129.1	143.6	143.6	143.6	143.6
EC-i 40, 100 W	248					97.1	111.6	111.6	126.1	126.1	126.1	140.6	140.6	140.6	140.6
EC-i 40, 100 W	248	16 EASY/Abs.	418/422			108.8	123.3	123.3	137.8	137.8	137.8	152.3	152.3	152.3	152.3
EC-i 40, 100 W	248	16 RIO	435			111.6	126.1	126.1	140.6	140.6	140.6	155.1	155.1	155.1	155.1
EC-i 40, 100 W	248	AEDL/HEDL	438/444			120.1	134.6	134.6	149.1	149.1	149.1	163.6	163.6	163.6	163.6
EC 45 flat, 30 W	262					53.9	68.4	68.4	82.9	82.9	82.9	97.4	97.4	97.4	97.4
EC 45 flat, 30 W	262	MILE	412			56.9	71.4	71.4	85.9	85.9	85.9	100.4	100.4	100.4	100.4
EC 45 flat, 50 W	263					58.8	73.3	73.3	87.8	87.8	87.8	102.3	102.3	102.3	102.3
EC 45 flat, 50 W	263	MILE	412			60.1	74.6	74.6	89.1	89.1	89.1	103.6	103.6	103.6	103.6
EC 45 flat, 70 W	264					64.2	78.7	78.7	93.2	93.2	93.2	107.7	107.7	107.7	107.7
EC 45 flat, 70 W	264	MILE	412			65.9	80.4	80.4	94.9	94.9	94.9	109.4	109.4	109.4	109.4
EC 45 flat, IE, IP 00	265					72.7	87.2	87.2	101.7	101.7	101.7	116.2	116.2	116.2	116.2
EC 45 flat, IE, IP 40	265					74.9	89.4	89.4	103.9	103.9	103.9	118.4	118.4	118.4	118.4
EC 45 flat, IE, IP 00	266					77.7	92.2	92.2	106.7	106.7	106.7	121.2	121.2	121.2	121.2
EC 45 flat, IE, IP 40	266					79.9	94.4	94.4	108.9	108.9	108.9	123.4	123.4	123.4	123.4
MCD EPOS, 60 W	485					161.1	175.6	175.6	190.1	190.1	190.1	204.6	204.6	204.6	204.6
MCD EPOS P, 60 W	485					161.1	175.6	175.6	190.1	190.1	190.1	204.6	204.6	204.6	204.6

# Planetary Gearhead GP 42 HD $\varnothing 42$ mm, 10.0–50.0 Nm

Heavy Duty – for application in oil



### Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 12 mm from flange	max. 0.05 mm
Axial play	max. 0.2 mm
Max. axial load (dynamic)	250 N
Max. force for press fits	450 N
Direction of rotation, drive to output	=
Max. continuous input speed	< 8000 rpm
Recommended temperature range	-55...+200°C
Extended range as option	-55...+260°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	250 N 480 N 720 N 720 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

Gearhead Data (provisional)	454742	454744	454745	476936	454280	476945	476949
1 Reduction	3.5:1	12:1	43:1	81:1	150:1	285:1	441:1
2 Absolute reduction	$7/2$	$49/4$	$343/8$	$2197/27$	$2401/16$	$15379/54$	$441/1$
10 Mass inertia gcm <sup>2</sup>	17.5	29	35.5	23.9	41.3	33.1	30.6
3 Max. motor shaft diameter mm	10	10	10	8	10	8	10
<b>Part Numbers</b>	476927	476928	476933	476937	476942	476946	476950
1 Reduction	4.3:1	15:1	53:1	91:1	186:1	319:1	488:1
2 Absolute reduction	$13/3$	$91/6$	$637/12$	$91/1$	$4459/24$	$637/2$	$4394/9$
10 Mass inertia gcm <sup>2</sup>	11.1	23.3	31.8	25.4	37.6	34.2	26.3
3 Max. motor shaft diameter mm	8	8	10	8	10	10	8
<b>Part Numbers</b>		476929	476934	476938	476943	476947	476951
1 Reduction		19:1	66:1	113:1	230:1	353:1	546:1
2 Absolute reduction		$169/9$	$1183/18$	$338/3$	$8281/36$	$28561/81$	$546/1$
10 Mass inertia gcm <sup>2</sup>		19.1	28.1	21.2	36.6	28.9	28.1
3 Max. motor shaft diameter mm		8	8	8	10	8	8
<b>Part Numbers</b>			454746		476944	476948	476952
1 Reduction			74:1		257:1	394:1	676:1
2 Absolute reduction			$147/2$		$1029/4$	$1183/3$	$676/1$
10 Mass inertia gcm <sup>2</sup>			28.2		37.6	30.4	23.9
3 Max. motor shaft diameter mm			10		10	8	8
4 Number of stages	1	2	3	3	4	4	4
5 Max. continuous torque Nm	10	20	40	40	50	50	50
6 Max. intermittent torque at gear output Nm	15	30	60	60	75	75	75
15 Max. overload torque <sup>1)</sup> Nm	20	40	80	80	100	100	100
7 Max. efficiency %	95	87	78	78	65	65	65
8 Weight g	430	600	710	710	780	780	780
9 Average backlash no load °	0.6	0.8	0.8	1.0	1.0	1.0	1.0
11 Gearhead length L1 mm	57.7	79.9	102.2	102.2	116.9	116.9	116.9
13 Max. transmittable power (continuous) W	2000	880	300	300	62	62	62
14 Max. transmittable power (intermittent) W	3000	1320	450	450	93	93	93

<sup>1)</sup> Reduced lift time expectancy

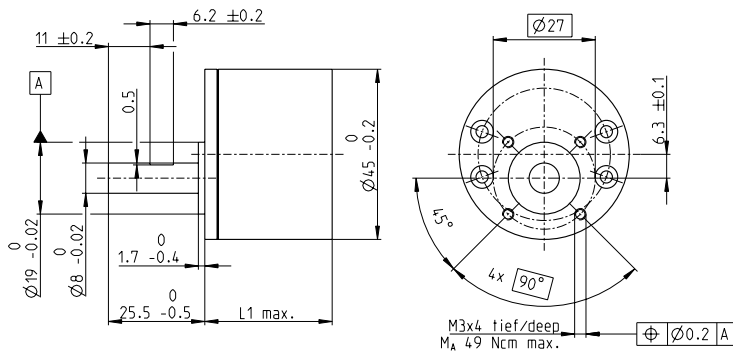


### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
EC-4pole 32 HD oil, A	235			221.3	243.5	265.8	265.8	280.5	280.5
EC-4pole 32 HD oil, B	235			201.3	223.5	245.8	245.8	260.5	260.5

Application	Important Notice
<b>General</b>	This gearhead has been designed for applications in oil and is only equipped with minimum lubrication. Therefore it is not permitted to use it under normal air conditions.
- extreme temperature applications	
- vibration tested according to MIL-STD810F/Jan2000 Fig. 514.5C-10	
- operation in oil and high pressure	
<b>Oil &amp; Gas Industry</b>	
- oil, gas and geothermal wells	

# Spur Gearhead GS 45 A Ø45 mm, 0.5–2.0 Nm



## Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.15 mm
Axial play	0.02–0.2 mm
Max. axial load (dynamic)	60 N
Max. force for press fits	60 N
Max. continuous input speed	6000 rpm
Recommended temperature range	-15...+80°C
Number of stages	2 3 4 5 6
Max. radial load, 10 mm from flange	120 N 180 N 190 N 190 N 190 N

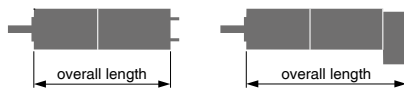
## M 1:2

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	301177	301175	301181	301186	301191
<b>Gearhead Data</b>					
1 Reduction	5:1	18:1	61:1	212:1	732:1
2 Absolute reduction	51/10	459/26	20655/338	125862/595	492790/673
10 Mass inertia	gcm <sup>2</sup> 3.7	1.6	1.0	0.8	0.8
3 Max. motor shaft diameter	mm 3	3	3	3	3
<b>Part Numbers</b>	301178	301173	301182	301187	301192
1 Reduction	7:1	26:1	89:1	310:1	1072:1
2 Absolute reduction	209/28	9405/364	66632/745	183281/592	307572/287
10 Mass inertia	gcm <sup>2</sup> 3.1	1.4	1.0	0.8	0.8
3 Max. motor shaft diameter	mm 3	3	3	3	3
<b>Part Numbers</b>	301179	266595	301184	301188	301193
1 Reduction	9:1	32:1	111:1	385:1	1334:1
2 Absolute reduction	2295/247	8523/265	334/3	173809/451	198769/149
10 Mass inertia	gcm <sup>2</sup> 2.1	1.4	0.6	0.5	0.4
3 Max. motor shaft diameter	mm 3	3	3	3	3
<b>Part Numbers</b>	301180	301171	301185	301189	301194
1 Reduction	14:1	47:1	163:1	564:1	1952:1
2 Absolute reduction	2475/182	6221/132	141157/861	161860/287	1929023/988
10 Mass inertia	gcm <sup>2</sup> 2.2	0.9	0.5	0.5	0.4
3 Max. motor shaft diameter	mm 3	3	3	3	3
4 Number of stages	2	3	4	5	6
5 Max. continuous torque	Nm 0.5	2.0	2.0	2.0	2.0
6 Max. intermittent torque at gear output	Nm 0.75	2.5	2.5	2.5	2.5
12 Direction of rotation, drive to output	=	≠	=	≠	=
7 Max. efficiency	% 87	76	66	59	53
8 Weight	g 224	224	255	287	313
9 Average backlash no load	° 1.6	2.0	2.4	2.8	3.2
11 Gearhead length L1*	mm 23.5	23.5	26.9	30.4	33.8

\*for EC 45 flat, IE, L1 is max. + 4.0 mm



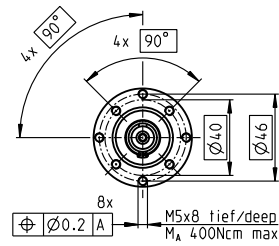
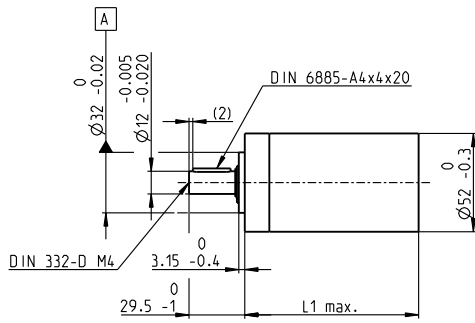
## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
EC 45 flat, 30 W	262			40.0	40.0	43.4	46.9	50.3
EC 45 flat, 30 W	262	MILE	412	43.0	43.0	46.4	49.9	53.3
EC 45 flat, 50 W	263			44.9	44.9	48.3	51.8	55.2
EC 45 flat, 50 W	263	MILE	412	46.2	46.2	49.6	53.1	56.5
EC 45 flat, 70 W	264			50.3	50.3	53.7	57.2	60.6
EC 45 flat, 70 W	264	MILE	412	52.0	52.0	55.4	58.9	62.3
EC 45 flat, IE, IP 00	265			59.2	59.2	62.6	66.1	69.5
EC 45 flat, IE, IP 40	265			61.4	61.4	64.8	68.3	71.7
EC 45 flat, IE, IP 00	266			64.2	64.2	67.6	71.1	74.5
EC 45 flat, IE, IP 40	266			66.4	66.4	69.8	73.3	76.7



# Planetary Gearhead GP 52 C $\varnothing 52$ mm, 4.0–30.0 Nm

Ceramic Version



M 1:4

## Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 12 mm from flange	max. 0.06 mm
Axial play at axial load	< 5 N 0 mm > 5 N max. 0.3 mm
Max. axial load (dynamic)	200 N
Max. force for press fits	500 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-15...+80°C
Extended range as option	-40...+100°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	420 N 630 N 900 N 900 N

maxon gear

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

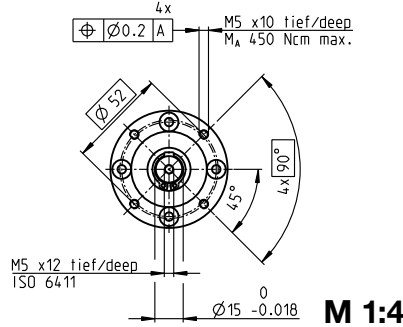
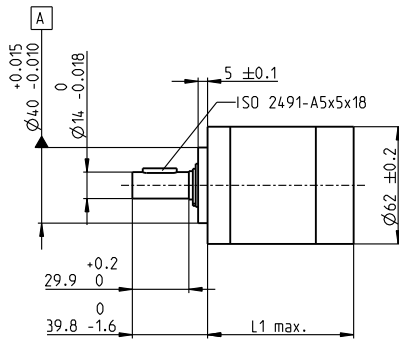
	223080	223083	223089	223094	223097	223104	223109
<b>Gearhead Data</b>							
1 Reduction	3.5:1	12:1	43:1	91:1	150:1	319:1	546:1
2 Absolute reduction	$\frac{7}{2}$	$\frac{49}{4}$	$\frac{343}{8}$	91	$\frac{2401}{16}$	$\frac{637}{2}$	546
10 Mass inertia	gcm <sup>2</sup> 20.7	17.6	17.3	16.7	17.3	16.8	16.4
3 Max. motor shaft diameter	mm 10	10	10	10	10	10	10
<b>Part Numbers</b>	223081	223084	223090	223095	223099	223105	223110
1 Reduction	4.3:1	15:1	53:1	113:1	186:1	353:1	676:1
2 Absolute reduction	$\frac{13}{3}$	$\frac{91}{6}$	$\frac{637}{12}$	$\frac{338}{3}$	$\frac{4459}{24}$	$\frac{28561}{81}$	676
10 Mass inertia	gcm <sup>2</sup> 12	16.8	17.2	9.3	17.3	9.4	9.1
3 Max. motor shaft diameter	mm 8	10	10	8	10	8	8
<b>Part Numbers</b>		223085	223091	223096	223101	223106	223111
1 Reduction		19:1	66:1	126:1	230:1	394:1	756:1
2 Absolute reduction		$\frac{169}{9}$	$\frac{1183}{18}$	126	$\frac{8281}{36}$	$\frac{1183}{3}$	756
10 Mass inertia	gcm <sup>2</sup>	9.5	16.7	16.4	16.8	16.7	16.4
3 Max. motor shaft diameter	mm	8	10	10	10	10	10
<b>Part Numbers</b>		223086	223092	223098	223102	223107	223112
1 Reduction		21:1	74:1	156:1	257:1	441:1	936:1
2 Absolute reduction		21	$\frac{147}{2}$	156	$\frac{1029}{4}$	441	936
10 Mass inertia	gcm <sup>2</sup>	16.5	17.2	9.1	17.3	16.5	9.1
3 Max. motor shaft diameter	mm	10	10	8	10	10	8
<b>Part Numbers</b>		223087	223093		223103	223108	
1 Reduction		26:1	81:1		285:1	488:1	
2 Absolute reduction		26	$\frac{2197}{27}$		$\frac{15379}{54}$	$\frac{4394}{9}$	
10 Mass inertia	gcm <sup>2</sup>	9.1	9.4		16.7	9.4	
3 Max. motor shaft diameter	mm	8	8		10	8	
4 Number of stages		1	2	3	4	4	4
5 Max. continuous torque	Nm	4	15	30	30	30	30
6 Max. intermittent torque at gear output	Nm	6	22.5	45	45	45	45
7 Max. efficiency	%	91	83	75	75	68	68
8 Weight	g	460	620	770	770	920	920
9 Average backlash no load	°	0.6	0.8	1.0	1.0	1.0	1.0
11 Gearhead length L1	mm	49.0	65.0	78.5	78.5	92.0	92.0



## maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC 45, 250 W	212					193.1	209.1	222.6	222.6	236.1	236.1	236.1			
EC 45, 250 W	212	HEDL 9140	447			208.7	224.7	238.2	238.2	251.7	251.7	251.7			
EC 45, 250 W	212	Res 26	450			193.1	209.1	222.6	222.6	236.1	236.1	236.1			
EC 45, 250 W	212			AB 28	492	200.5	216.5	230.0	230.0	243.5	243.5	243.5			
EC 45, 250 W	212	HEDL 9140	447	AB 28	492	217.5	233.5	247.0	247.0	260.5	260.5	260.5			
EC-max 40, 120 W	225					137.1	153.1	166.6	166.6	180.1	180.1	180.1			
EC-max 40, 120 W	225	MR	433			153.0	169.0	182.5	182.5	196.0	196.0	196.0			
EC-max 40, 120 W	225	HEDL 5540	444			160.5	176.5	190.0	190.0	203.5	203.5	203.5			
EC-max 40, 120 W	225			AB 28	490	171.5	187.5	201.0	201.0	214.5	214.5	214.5			
EC-max 40, 120 W	225	HEDL 5540	444	AB 28	490	189.8	205.8	219.3	219.3	232.8	232.8	232.8			
EC-i 52, 180 W	249					129.1	145.1	158.6	158.6	172.1	172.1	172.1			
EC-i 52, 180 W	249	16 EASY/Abs.	418/422			142.8	158.8	172.3	172.3	185.8	185.8	185.8			
EC-i 52, 180 W	249	16 RIO	435			142.8	158.8	172.3	172.3	185.8	185.8	185.8			
EC-i 52, 180 W	249	AEDL 5810	438/439			151.9	168.9	181.4	181.4	194.9	194.9	194.9			
EC-i 52, 180 W	249	HEDL 5540	442-446			151.9	168.9	181.4	181.4	194.9	194.9	194.9			
EC-i 52, 200 W	250					159.1	175.1	188.6	188.6	202.1	202.1	202.1			
EC-i 52, 200 W	250	16 EASY/XT/Abs.	419-423			172.8	188.8	202.3	202.3	215.8	215.8	215.8			
EC-i 52, 200 W	250	16 EASY Abs. XT	425			173.3	189.3	202.8	202.8	216.3	216.3	216.3			
EC-i 52, 200 W	250	16 RIO	436			172.8	188.8	202.3	202.3	215.8	215.8	215.8			
EC-i 52, 200 W	250	AEDL 5810	438/439			181.9	198.9	211.4	211.4	224.9	224.9	224.9			
EC-i 52, 200 W	250	HEDL 5540	442-446			181.9	198.9	211.4	211.4	224.9	224.9	224.9			
EC 60 flat, 100 W	267					89.8	105.8	119.3	119.3	132.8	132.8	132.8			
EC 60 flat, 100 W	267	MILE	412			90.8	106.8	120.3	120.3	133.8	133.8	133.8			
EC 60 flat, 150 W	268					89.8	105.8	119.3	119.3	132.8	132.8	132.8			
EC 60 flat, 150 W	268	MILE	412			90.8	106.8	120.3	120.3	133.8	133.8	133.8			
EC 60 flat, 200 W	269					97.6	113.6	127.1	127.1	140.6	140.6	140.6			

# Planetary Gearhead GP 62 A $\varnothing 62$ mm, 8.0–50.0 Nm



### Technical Data

Planetary Gearhead	straight teeth
Output shaft	steel
Bearing at output	ball bearing
Radial play, 7 mm from flange	max. 0.08 mm
Axial play	max. 1 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	1000 N
Direction of rotation, drive to output	=
Max. continuous input speed	3000 rpm
Recommended temperature range	-30...+140°C
Number of stages	1 2 3
Max. radial load, 24 mm from flange	240 N 360 N 570 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	110499	110501	110502	110503	110504	110505	110506	110507	110508
<b>Gearhead Data</b>									
1 Reduction	5.2:1	19:1	27:1	35:1	71:1	100:1	139:1	181:1	236:1
2 Absolute reduction	<sup>57</sup> / <sub>11</sub>	<sup>3591</sup> / <sub>187</sub>	<sup>3249</sup> / <sub>121</sub>	<sup>1539</sup> / <sub>44</sub>	<sup>228223</sup> / <sub>3179</sub>	<sup>204687</sup> / <sub>2057</sub>	<sup>185193</sup> / <sub>1331</sub>	<sup>87723</sup> / <sub>484</sub>	<sup>41553</sup> / <sub>176</sub>
3 Max. motor shaft diameter	mm 8	8	8	8	8	8	8	8	8
4 Number of stages	1	2	2	2	3	3	3	3	3
5 Max. continuous torque	Nm 8	25	25	25	50	50	50	50	50
6 Max. intermittent torque at gear output	Nm 12	37	37	37	75	75	75	75	75
7 Max. efficiency	% 80	75	75	75	70	70	70	70	70
8 Weight	g 950	1250	1250	1250	1540	1540	1540	1540	1540
9 Average backlash no load	° 1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
10 Mass inertia	gcm <sup>2</sup> 109	100	105	89	104	105	102	88	89
11 Gearhead length L1	mm 72.5	88.3	88.3	88.3	104.2	104.2	104.2	104.2	104.2

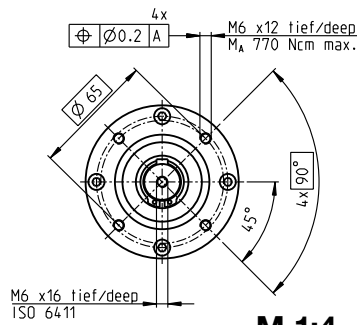
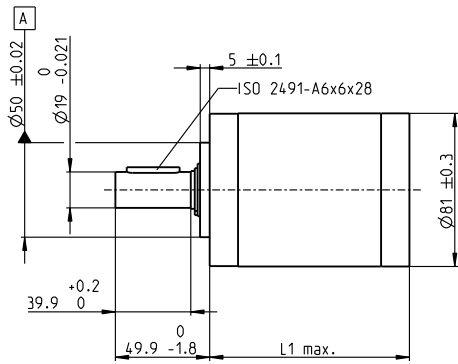


### maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 50, 200 W	137					180.6	196.4	196.4	196.4	212.3	212.3	212.3	212.3
RE 50, 200 W	137	HEDS 5540	441			201.3	217.1	217.1	217.1	233.0	233.0	233.0	233.0
RE 50, 200 W	137	HEDL 5540	443			201.3	217.1	217.1	217.1	233.0	233.0	233.0	233.0
RE 50, 200 W	137	HEDL 9140	448			243.0	258.8	258.8	258.8	274.7	274.7	274.7	274.7
RE 50, 200 W	137			AB 44	495	243.0	258.8	258.8	258.8	274.7	274.7	274.7	274.7
RE 50, 200 W	137	HEDL 9140	448	AB 44	495	256.0	271.8	271.8	271.8	287.7	287.7	287.7	287.7
EC 45, 250 W	212					216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3
EC 45, 250 W	212	HEDL 9140	447			232.2	248.0	248.0	248.0	263.9	263.9	263.9	263.9
EC 45, 250 W	212	Res 26	450			216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3
EC 45, 250 W	212			AB 28	492	224.0	239.8	239.8	239.8	255.7	255.7	255.7	255.7
EC 45, 250 W	212	HEDL 9140	447	AB 28	492	241.0	256.8	256.8	256.8	272.7	272.7	272.7	272.7



# Planetary Gearhead GP 81 A $\varnothing 81$ mm, 20.0–120.0 Nm



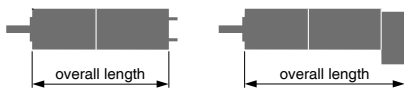
## Technical Data

Planetary Gearhead	straight teeth
Output shaft	steel
Bearing at output	ball bearing
Radial play, 8 mm from flange	max. 0.1 mm
Axial play	max. 1 mm
Max. force for press fits	1500 N
Direction of rotation, drive to output	=
Max. continuous input speed	3000 rpm
Recommended temperature range	-30...+140°C
Number of stages	1 2 3
Max. radial load, 24 mm from flange	400 N 600 N 1000 N
Max. axial load (dynamic)	80 N 120 N 200 N

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Gearhead Data	Part Numbers					
	110408	110409	110410	110411	110412	110413
1 Reduction	3.7:1	14:1	25:1	51:1	93:1	308:1
2 Absolute reduction	$\frac{63}{17}$	$\frac{3969}{289}$	$\frac{1701}{68}$	$\frac{250047}{4913}$	$\frac{107163}{1156}$	$\frac{19683}{64}$
3 Max. motor shaft diameter mm	14	14	14	14	14	14
4 Number of stages	1	2	2	3	3	3
5 Max. continuous torque Nm	20	60	60	120	120	120
6 Max. intermittent torque at gear output Nm	30	90	90	180	180	180
7 Max. efficiency %	80	75	75	70	70	70
8 Weight g	2300	3000	3000	3700	3700	3700
9 Average backlash no load °	0.5	0.55	0.55	0.6	0.6	0.6
10 Mass inertia gcm <sup>2</sup>	165	155	125	88	154	89
11 Gearhead length L1 mm	92.0	113.7	113.7	135.3	135.3	135.3



## maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
RE 65, 250 W	138					223.5	245.2	245.2	266.8	266.8	266.8
RE 65, 250 W	138	HEDS 5540	441			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	138	HEDL 5540	443			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	138	HEDL 9140	448			279.6	301.3	301.3	322.9	322.9	322.9
RE 65, 250 W	138			AB 44	495	279.6	301.3	301.3	322.9	322.9	322.9
RE 65, 250 W	138	HEDL 9140	448	AB 44	495	297.6	319.3	319.3	340.9	340.9	340.9
EC 60, 400 W	213					269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	213	HEDL 9140	447			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	213	Res 26	450			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	213			AB 41	494	283.0	304.7	304.7	326.3	326.3	326.3
EC 60, 400 W	213	HEDL 9140	447	AB 41	494	307.0	328.7	328.7	350.3	350.3	350.3





DC Motor  
EC Motor (BLDC Motor)  
Gearhead  
Screw drive  
Sensor

Motor & Motion control  
Compact Drive

Accessories & Batteries

Ceramic

Contact information

# maxon screw drive

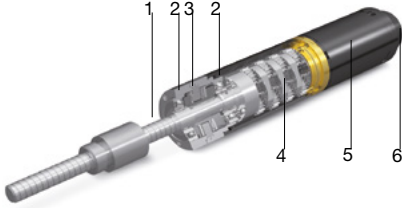
Compact, easy to configure linear actuators as part of a complete system with integrated thrust bearing for high axial loads. Versions available with metric lead screw, trapezoidal lead screw or ball screw.

<b>Standard Specification No. 102</b>	65
<b>Important considerations</b>	372
<b>GP 6 S</b> Ø6 mm, metric lead screw	373
<b>GP 6 S</b> Ø6 mm, metric lead screw, ceramic	374
<b>GP 8 S</b> Ø8 mm, metric lead screw	375
<b>GP 8 S</b> Ø8 mm, metric lead screw, ceramic	376
<b>GP 16 S</b> Ø16 mm, ball screw	377
<b>GP 16 S</b> Ø16 mm, metric lead screw	378
<b>GP 16 S</b> Ø16 mm, metric lead screw, ceramic	379
<b>GP 22 S</b> Ø22 mm, ball screw	380
<b>GP 22 S</b> Ø22 mm, metric lead screw	381
<b>GP 32 S</b> Ø32 mm, ball screw	382
<b>GP 32 S</b> Ø32 mm, metric lead screw	384
<b>GP 32 S</b> Ø32 mm, trapezoidal lead screw	386
<b>Options</b>	388–390

# Screw Drive Basics

## Design

- ❶ Screw, directly implemented in the gearhead
- ❷ Radial bearing
- ❸ Axial bearing
- ❹ Planetary gearhead 0–4 stages
- ❺ Motor
- ❻ Encoder



The particular type of screw required must first be established before a screw drive can be designed. Every type of screw has different characteristics and a number of specific limits. These limits are taken into account in the technical data.

### Ball screw:

- highly efficient
- not self-locking
- high load capacity

### Metric lead screw:

- self-locking
- low costs

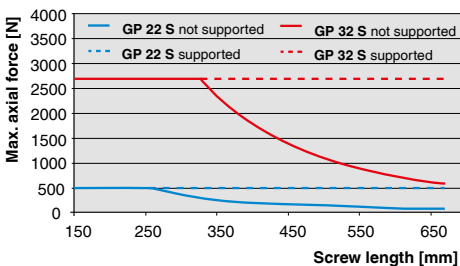
### Trapezoidal lead screw:

- same as metric lead screw
- higher load capacity than metric lead screw

## Feed force

For the calculation of the feed force acceleration and friction forces as well as gravity have to be taken into consideration. Exceeding the maximum permissible load must be avoided, as this damages the screw. The maximum permissible feed force is displayed for standard screws. For longer screws, the permissible feed force can be limited by the critical compressive force of the screw. In this case, supporting the end of the screw may be necessary.

Limitation for ball screws



## Torque

The required torque of the screw  $M_a$  [mNm] is calculated with the feed force  $F_L$  [N] (load), the thread lead  $p$  [mm] and the efficiency of the screw  $\eta_1$ .

$$M_a = \frac{F_L \cdot p}{2 \cdot \pi \cdot \eta_1}$$

In combination with the gearhead, the required motor torque  $M_{mot}$  [mNm] is:

$$M_{mot} = \frac{F_a \cdot p}{2 \cdot \pi \cdot i \cdot \eta}$$

Where  $i$  is the gearhead reduction ratio and  $\eta$  the efficiency of the complete screw drive.

## Technical Data

The “Technical Data” block contains generally applicable data on screw, nut and gearhead. These are independent of the gearhead reduction ratio.

### Length

The data sheets show the screw drives with the standard lengths. Other lengths are available as an option in 5 mm steps up to a given maximum length. Please give detailed requirements for special lengths.

### Max. efficiency/mass inertia

The values stated refer to the screw alone (without gearhead). The values with gearhead are given in the “Gearhead data” main data field.

### Nut

Standard screw drives are supplied with a thread nut. Flange or cylinder nuts are also available as an option. See details with corresponding reference number on page 388.

### Bearing

The output stage and the screw are supported by preloaded axial bearings. This means that the high axial forces can be absorbed directly by the gearhead without additional support.

## Speed and feed velocity

Feed velocity  $v_L$  [mm/s] is linked to output speed  $n$  [rpm] by the lead  $p$  [mm].

$$v_L = \frac{p \cdot n}{60}$$

In combination with the gearhead, the motor speed  $n_{mot}$  [rpm] is:

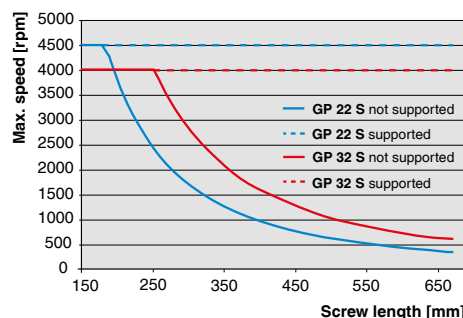
$$n_{mot} = \frac{v_L \cdot 60 \cdot i}{p}$$

Where  $i$  is the gearhead reduction ratio and  $p$  the screw lead.

The screw speed is limited by the resonance frequency of the screw and for ball screws additionally by the ball return system.

In addition, the maximum permissible speed of the gearhead has to be considered.

Max. speed at ball screws



## Explanation

### 7 Max. efficiency

The given efficiency is a maximum value that applies when loaded with maximum feed force. Efficiency falls sharply with very small loads. The stated value refers to the complete screw drive (gearhead and screw).

### 20 Max. feed velocity

Specifies the maximum permissible feed velocity.

### 21 Max. feed force (continuous)

Is the maximum permissible feed force which may be continuously applied. Exceeding this value results in a reduced service life.

### 22 Max. feed force (intermittent)

Is the maximum permissible feed force which may be intermittently applied. “Intermittently” is defined as follows:

- during max. 1 second
- during max. 10% of operation

Exceeding these values results in a reduced service life.

### 23 Mechanical positioning accuracy

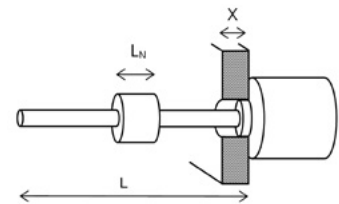
In this value, following factors are taken into consideration:

- backlash of the gearhead
- accuracy of the screw
- axial play of the nut

## Maximum stroke

The maximum possible stroke depends on the length of the screw  $L$  [mm]. The length of the nut  $L_N$  [mm] and the thickness of its mounting plate  $X$  [mm] must be taken into consideration.

$$Stroke = L - (L_N + X + stroke\ reserve + opt.\ SPIN02)$$



## Mounting and safety instructions

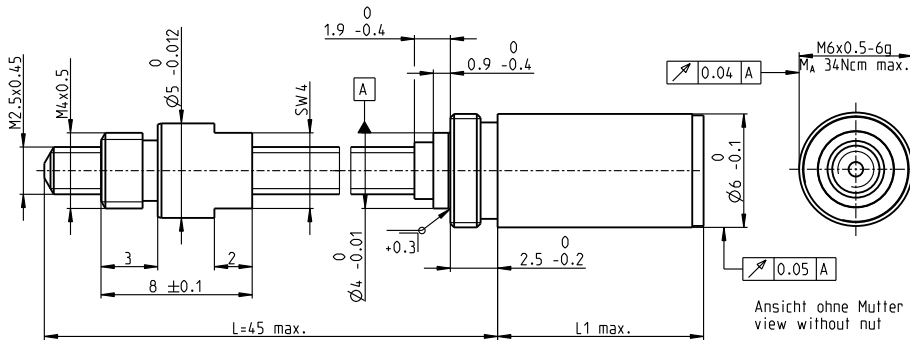
Using a ball screw with a flange nut, the mounting through a hole is only possible with the optional rectangular mounting flange.

The ball screw nut may never be removed. As the balls are preloaded remounting would be impossible.

The screw may never block during operation, as this could damage the screw nut or gearhead. Service life crucially depends on the precision with which the gear is fixed to the screw nut. Eccentricities and angle errors sometimes result in massive radial loading which must never exceed the given maximum value.

Additional information can be found in the maxon online shop at the item under down-loads.

# Screw Drive GP 6 S $\varnothing 6$ mm, Metric Lead Screw



Technical Data	
Screw	M2.5 x 0.45, stainless steel
Standard length	45 mm
Special length (5 mm steps)	max. 80 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.088 mm
Planetary gearhead	straight teeth
Bearing	ball bearing
Radial play, 5 mm from flange	< 0.12 mm
Axial play	preloaded
Max. continuous input speed	12 000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	10 N
Number of stages	1 2 3 4 5
Max. radial load, 5 mm from flange	5 N 5 N 5 N 5 N 5 N

M 2.5:1

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Screw Drive Data	Part Numbers				
	428758	428757	428756	420663	428755
1 Reduction	3.9 : 1	15 : 1	57 : 1	221 : 1	854 : 1
2 Absolute reduction	$\frac{27}{7}$	$\frac{729}{49}$	$\frac{19683}{343}$	$\frac{531441}{2401}$	$\frac{1438907}{16807}$
20 Max. feed velocity <sup>1</sup>	mm/s 15	10	2.6	0.7	0.2
21 Max. feed force (continuous) <sup>1</sup>	N 2	3	4	6	10
22 Max. feed force (intermittent) <sup>1</sup>	N 6	8	12	15	15
4 Number of stages	1	2	3	4	5
7 Max. efficiency gearhead incl. screw	% 28	24	21	19	16
8 Weight <sup>1</sup>	g 2.9	3.3	3.7	4.1	4.5
9 Average backlash no load	° 1.8	2.0	2.2	2.5	2.8
23 Mechanical positioning accuracy <sup>1</sup>	mm 0.106	0.107	0.107	0.107	0.108
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup> 0.001	0.001	0.001	0.001	0.001
11 Gearhead length L1	mm 6.9	9.4	12.0	14.5	17.1

<sup>1</sup> based on screw length 45 mm



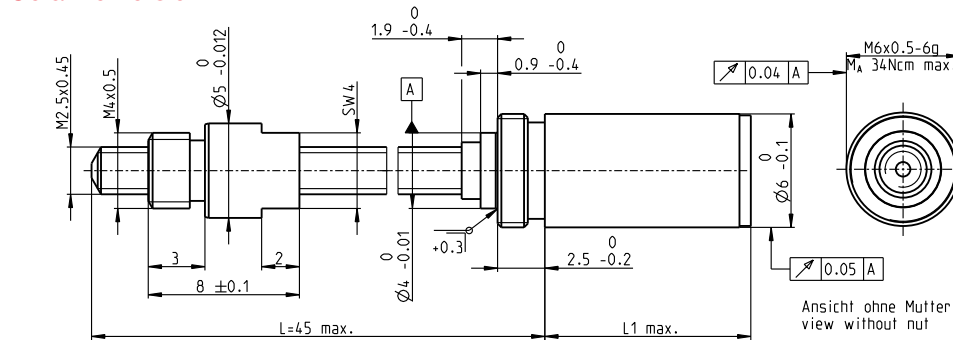
## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 6, 0.3 W, A	102			22.6	25.1	27.7	30.2	32.8
RE 6, 0.3 W, B	102			26.6	29.1	31.7	34.2	36.8

maxon screw drive

# Screw Drive GP 6 S Ø6 mm, Metric Lead Screw

Ceramic Version



M 5:2

### Technical Data

Screw	M2.5 x 0.45, ceramic
Standard length	45 mm
Special length (5 mm steps)	max. 80 mm
Nut (standard)	thread nut
Material	stainless steel
Axial play	< 0.079 mm
Planetary gearhead	straight teeth
Bearing	ball bearing
Radial play, 5 mm from flange	< 0.12 mm
Axial play	preloaded
Max. continuous input speed	12000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	10 N
Number of stages	1 2 3 4 5
Max. radial load, 5 mm from flange	5 N 5 N 5 N 5 N 5 N

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

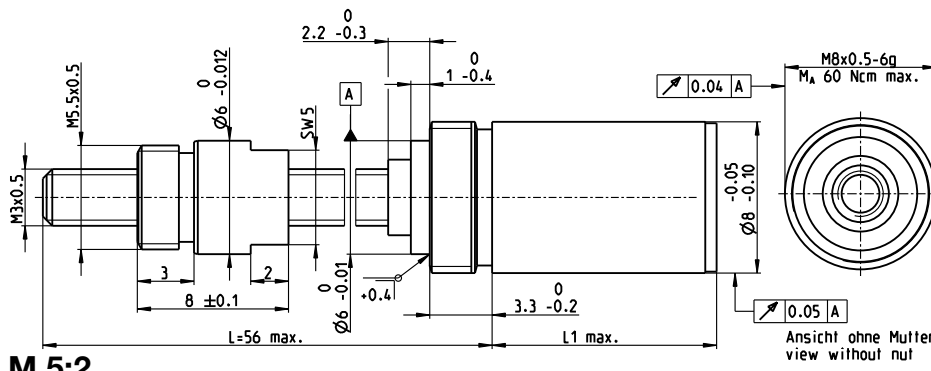
Screw Drive Data	Part Numbers				
	437380	437379	437378	437377	437375
1 Reduction	3.9 : 1	15 : 1	57 : 1	221 : 1	854 : 1
2 Absolute reduction	$\frac{27}{7}$	$\frac{729}{49}$	$\frac{19683}{343}$	$\frac{531441}{2401}$	$\frac{1438907}{16807}$
20 Max. feed velocity <sup>1</sup>	mm/s 25	10	2.6	0.7	0.2
21 Max. feed force (continuous) <sup>1</sup>	N 2	3	5	7	11
22 Max. feed force (intermittent) <sup>1</sup>	N 6	10	15	15	15
4 Number of stages	1	2	3	4	5
7 Max. efficiency gearhead incl. screw	% 39	34	30	27	23
8 Weight <sup>1</sup>	g 2.9	3.3	3.7	4.1	4.5
9 Average backlash no load	° 1.8	2.0	2.2	2.5	2.8
23 Mechanical positioning accuracy <sup>1</sup>	mm 0.081	0.082	0.082	0.082	0.083
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup> 0.001	0.001	0.001	0.001	0.001
11 Gearhead length L1	mm 6.9	9.4	12.0	14.5	17.1

<sup>1</sup> based on screw length 45 mm



+ Motor		+ Sensor/Brake		Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
Page	Page							
RE 6, 0.3 W, A	102			22.6	25.1	27.7	30.2	32.8
RE 6, 0.3 W, B	102			26.6	29.1	31.7	34.2	36.8

# Screw Drive GP 8 S Ø8 mm, Metric Lead Screw



## Technical Data

Screw	M3 x 0.5, stainless steel
Standard length	56 mm
Special length (5 mm steps)	max. 100 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.1 mm
Planetary gearhead	straight teeth
Bearing	ball bearing
Radial play, 5 mm from flange	< 0.08 mm
Axial play	preloaded
Max. continuous input speed	12 000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	25 N
Number of stages	1 2 3 4 5
Max. radial load, 5 mm from flange	5 N 5 N 5 N 5 N 5 N

**M 5:2**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Screw Drive Data	Part Numbers				
	473643	473644	473645	473646	473647
1 Reduction	4:1	16:1	64:1	256:1	1024:1
2 Absolute reduction	4/1	16/1	64/1	256/1	1024/1
20 Max. feed velocity <sup>1</sup>	mm/s	15	6.3	1.6	0.4
21 Max. feed force (continuous) <sup>1</sup>	N	3	6	9	14
22 Max. feed force (intermittent) <sup>1</sup>	N	8	18	27	27
4 Number of stages		1	2	3	4
7 Max. efficiency gearhead incl. screw	%	27	24	22	19
8 Weight <sup>1</sup>	g	6.3	6.9	7.5	8.1
9 Average backlash no load	°	1.8	2.0	2.2	2.5
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.112	0.112	0.112	0.112
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	0.005	0.004	0.004	0.004
11 Gearhead length L1	mm	7.0	9.6	12.2	14.8

<sup>1</sup> based on screw length 56 mm



## maxon Modular System

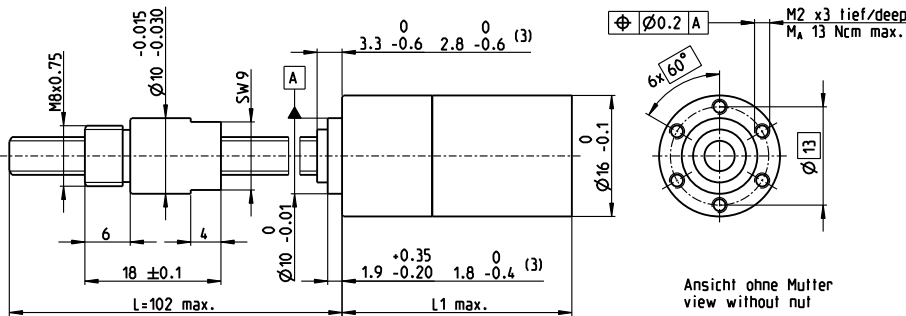
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 8, 0.5 W, A	103			23.7	26.3	28.9	31.5	34.1
RE 8, 0.5 W, B	103			26.7	29.3	31.9	34.5	37.1
RE 8, 0.5 W, A	103	MR	427	30.3	32.9	35.5	38.1	40.7
RE 8, 0.5 W, A	103	Enc 8 OPT	434	31.9	34.5	37.1	39.7	42.3

maxon screw drive





# Screw Drive GP 16 S $\varnothing$ 16 mm, Ball Screw



M 1:1

## Technical Data

Screw	$\varnothing$ 5 x 2, stainless steel
Standard length	102 mm
Special length (5 mm steps)	max. 200 mm
Nut (standard)	thread nut
Material	X46Cr13, hardened
Axial play	< 0.01 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/axial bearing
Radial play, 6 mm from flange	< 0.08 mm
Axial play	preloaded
Max. continuous input speed <sup>2</sup>	12 000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	500 N
Number of stages	0 1 2 3 4
Max. radial load, 6 mm from flange	20 N 40 N 60 N 80 N 80 N

maxon screw drive

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Screw Drive Data (provisional)	424221	424222	424223	424219	424224	
1 Reduction	1:1	4.4:1	19:1	84:1	370:1	
2 Absolute reduction	1/1	57/13	3249/169	185193/2197	10556001/28561	
20 Max. feed velocity <sup>1</sup>	mm/s	150	90.9	21.1	4.8	
21 Max. feed force (continuous) <sup>1</sup>	N	54	64	104	171	
22 Max. feed force (intermittent) <sup>1</sup>	N	149	176	287	403	
<b>Part Numbers</b>		424731	424733	424745	424749	
1 Reduction		5.4:1	24:1	104:1	455:1	
2 Absolute reduction		27/5	1539/65	87723/645	5000211/10985	
20 Max. feed velocity <sup>1</sup>	mm/s	74.1	16.7	3.8	0.9	
21 Max. feed force (continuous) <sup>1</sup>	N	69	113	184	300	
22 Max. feed force (intermittent) <sup>1</sup>	N	189	311	403	403	
<b>Part Numbers</b>			424744	424747	424750	
1 Reduction			29:1	128:1	561:1	
2 Absolute reduction			729/25	41553/325	2368521/4225	
20 Max. feed velocity <sup>1</sup>	mm/s		13.8	3.1	0.7	
21 Max. feed force (continuous) <sup>1</sup>	N		120	197	322	
22 Max. feed force (intermittent) <sup>1</sup>	N		331	403	403	
<b>Part Numbers</b>				424748	424751	
1 Reduction				157:1	690:1	
2 Absolute reduction				19683/125	1121931/1625	
20 Max. feed velocity <sup>1</sup>	mm/s			2.5	0.6	
21 Max. feed force (continuous) <sup>1</sup>	N			211	345	
22 Max. feed force (intermittent) <sup>1</sup>	N			403	403	
<b>Part Numbers</b>					424752	
1 Reduction					850:1	
2 Absolute reduction					531441/625	
20 Max. feed velocity <sup>1</sup>	mm/s				0.5	
21 Max. feed force (continuous) <sup>1</sup>	N				370	
22 Max. feed force (intermittent) <sup>1</sup>	N				403	
4 Number of stages		0	1	2	3	4
7 Max. efficiency gearhead incl. screw	%	93	87	79	71	63
8 Weight <sup>1</sup>	g	52	58	61	65	69
9 Average backlash no load	°	1.0	1.4	1.6	2.0	2.4
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.039	0.041	0.042	0.044	0.046
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	0.23	0.11	0.05	0.05	0.05
11 Gearhead length L1	mm	19.2	22.3	27.4	31.0	34.6

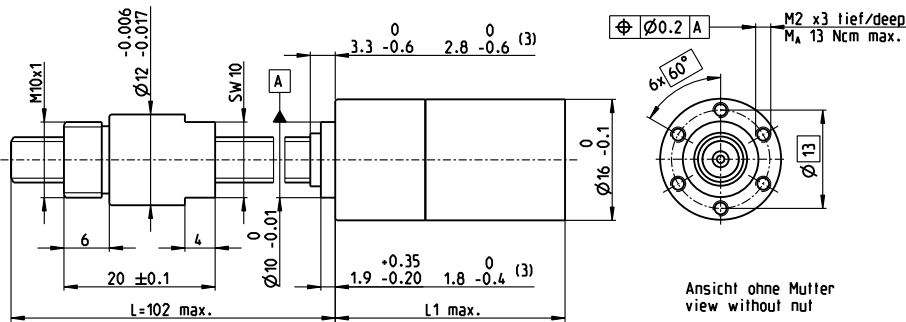
<sup>1</sup> based on screw length 102 mm (standard length)    <sup>2</sup> for reduction 1:1 = 4500 rpm    <sup>3</sup> for reduction 1:1



## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 16, 2 W	124			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	124	MR	429/430	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	125/126			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	126	MR	429/430	64.7	67.8	72.9	76.5	80.1
RE 16, 3.2 W	126	MEnc 13	416	65.8	68.9	74.0	77.6	81.2
RE 16, 4.5 W	127/128			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	128	MR	429/430	67.7	70.8	75.9	79.5	83.1
RE 16, 4.5 W	128	MEnc 13	416	68.9	72.0	77.1	80.7	84.3
A-max 16	143-146			-	47.8	52.9	56.5	60.1
A-max 16	144/146	MR	429/430	-	52.8	57.9	61.5	65.1
A-max 16	144/146	MEnc 13	416	-	55.9	61.0	64.6	68.2
EC-max 16, 5 W	217			-	46.4	51.5	55.1	58.7
EC-max 16, 5 W	217	MR	431	-	53.7	58.8	62.4	66.0
EC-max 16, 8 W	219			-	58.4	63.5	67.1	70.7
EC-max 16, 8 W	219	MR	431	-	65.7	70.8	74.4	78.0

# Screw Drive GP 16 S Ø16 mm, Metric Lead Screw



## Technical Data

Screw	M6 x 1, stainless steel
Standard length	102 mm
Special length (5 mm steps)	max. 200 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.134 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/axial bearing
Radial play, 6 mm from flange	< 0.08 mm
Axial play	preloaded
Max. continuous input speed <sup>2</sup>	12 000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	500 N
Number of stages	0 1 2 3 4
Max. radial load, 6 mm from flange	20 N 40 N 60 N 80 N 80 N

M 1:1

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Screw Drive Data (provisional)	424231	424232	424233	424234	424235
1 Reduction	1:1	4.4:1	19:1	84:1	370:1
2 Absolute reduction	1/1	57/13	3249/169	185193/2197	10556001/28561
20 Max. feed velocity <sup>1</sup>	mm/s	50.0	45.5	10.5	2.4
21 Max. feed force (continuous) <sup>1</sup>	N	35	37	60	98
22 Max. feed force (intermittent) <sup>1</sup>	N	134	138	224	315
<b>Part Numbers</b>		424797	424798	424800	424806
1 Reduction		5.4:1	24:1	104:1	455:1
2 Absolute reduction		27/6	1539/65	87729/845	5000211/10985
20 Max. feed velocity <sup>1</sup>	mm/s		37.0	8.3	1.9
21 Max. feed force (continuous) <sup>1</sup>	N		39	64	105
22 Max. feed force (intermittent) <sup>1</sup>	N		148	243	315
<b>Part Numbers</b>			424799	424803	424807
1 Reduction			29:1	128:1	561:1
2 Absolute reduction			729/25	41553/325	2368521/4225
20 Max. feed velocity <sup>1</sup>	mm/s		6.9	1.6	0.4
21 Max. feed force (continuous) <sup>1</sup>	N		69	112	184
22 Max. feed force (intermittent) <sup>1</sup>	N		258	315	315
<b>Part Numbers</b>				424804	424808
1 Reduction				157:1	690:1
2 Absolute reduction				19683/125	1121931/1625
20 Max. feed velocity <sup>1</sup>	mm/s			1.3	0.3
21 Max. feed force (continuous) <sup>1</sup>	N			120	197
22 Max. feed force (intermittent) <sup>1</sup>	N			315	315
<b>Part Numbers</b>					424809
1 Reduction					850:1
2 Absolute reduction					531441/625
20 Max. feed velocity <sup>1</sup>	mm/s				0.2
21 Max. feed force (continuous) <sup>1</sup>	N				211
22 Max. feed force (intermittent) <sup>1</sup>	N				315
4 Number of stages		0	1	2	3
7 Max. efficiency gearhead incl. screw	%	28	27	24	22
8 Weight <sup>1</sup>	g	55	61	64	68
9 Average backlash no load	°	1.0	1.4	1.6	2.0
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.166	0.167	0.167	0.169
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	0.23	0.11	0.05	0.05
11 Gearhead length L1	mm	19.2	22.3	27.4	31.0

<sup>1</sup> based on screw length 102 mm (standard length)    <sup>2</sup> for reduction 1:1 = 3000 rpm    <sup>3</sup> for reduction 1:1

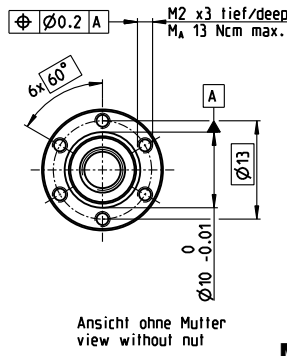
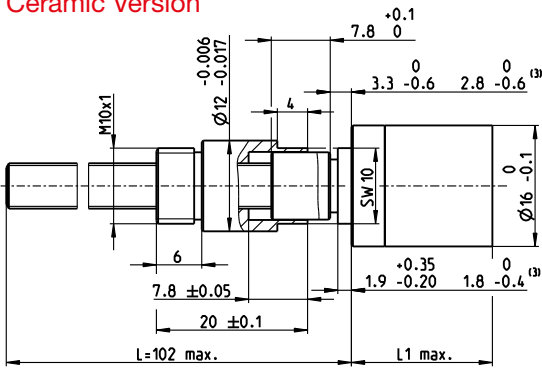


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 16, 2 W	124			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	124	MR	429/430	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	125/126			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	126	MR	429/430	64.7	67.8	72.9	76.5	80.1
RE 16, 3.2 W	126	MEnc 13	416	65.8	68.9	74.0	77.6	81.2
RE 16, 4.5 W	127/128			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	128	MR	429/430	67.7	70.8	75.9	79.5	83.1
RE 16, 4.5 W	128	MEnc 13	416	68.9	72.0	77.1	80.7	84.3
A-max 16	143-146			-	47.8	52.9	56.5	60.1
A-max 16	144/146	MR	429/430	-	52.8	57.9	61.5	65.1
A-max 16	144/146	MEnc 13	416	-	55.9	61.0	64.6	68.2
EC-max 16, 5 W	217			-	46.4	51.5	55.1	58.7
EC-max 16, 5 W	217	MR	431	-	53.7	58.8	62.4	66.0
EC-max 16, 8 W	219			-	58.4	63.5	67.1	70.7
EC-max 16, 8 W	219	MR	431	-	65.7	70.8	74.4	78.0

# Screw Drive GP 16 S Ø16 mm, Metric Lead Screw

Ceramic Version



Technical Data	
Screw	M6 x 1, ceramic
Standard length	102 mm
Special length (5 mm steps)	max. 200 mm
Nut (standard)	thread nut
Material	X8CrNiS18-9
Axial play	< 0.134 mm
Planetary gearhead	straight teeth
Bearing	ball bearing
Radial play, 6 mm from flange	< 0.08 mm
Axial play	preloaded
Max. continuous input speed <sup>2</sup>	12 000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	500 N
Number of stages	0 1 2 3 4
Max. radial load, 6 mm from flange	20 N 40 N 60 N 80 N 80 N

M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

Screw Drive Data (provisional)	424241	424242	424243	424244	424245	
1 Reduction	1:1	4.4:1	19:1	84:1	370:1	
2 Absolute reduction	1/1	57/13	3249/169	185193/2197	10556001/28561	
20 Max. feed velocity <sup>1</sup>	mm/s	50.0	45.5	10.5	2.4	
21 Max. feed force (continuous) <sup>1</sup>	N	44	46	74	122	
22 Max. feed force (intermittent) <sup>1</sup>	N	134	138	224	315	
<b>Part Numbers</b>		424811	424812	424814	424819	
1 Reduction		5.4:1	24:1	104:1	455:1	
2 Absolute reduction		27/5	1539/65	87723/645	5000211/10985	
20 Max. feed velocity <sup>1</sup>	mm/s	37.0	8.3	1.9	0.4	
21 Max. feed force (continuous) <sup>1</sup>	N	49	80	131	215	
22 Max. feed force (intermittent) <sup>1</sup>	N	148	243	315	315	
<b>Part Numbers</b>			424813	424815	424820	
1 Reduction			29:1	128:1	561:1	
2 Absolute reduction			729/25	41553/325	2368521/4225	
20 Max. feed velocity <sup>1</sup>	mm/s		6.9	1.6	0.4	
21 Max. feed force (continuous) <sup>1</sup>	N		86	141	230	
22 Max. feed force (intermittent) <sup>1</sup>	N		258	315	315	
<b>Part Numbers</b>				424818	424821	
1 Reduction				157:1	690:1	
2 Absolute reduction				19683/125	1121931/1625	
20 Max. feed velocity <sup>1</sup>	mm/s			1.3	0.3	
21 Max. feed force (continuous) <sup>1</sup>	N			150	246	
22 Max. feed force (intermittent) <sup>1</sup>	N			315	315	
<b>Part Numbers</b>					424822	
1 Reduction					850:1	
2 Absolute reduction					531441/625	
20 Max. feed velocity <sup>1</sup>	mm/s				0.2	
21 Max. feed force (continuous) <sup>1</sup>	N				264	
22 Max. feed force (intermittent) <sup>1</sup>	N				315	
4 Number of stages		0	1	2	3	4
7 Max. efficiency gearhead incl. screw	%	41	38	34	31	28
8 Weight <sup>1</sup>	g	55	61	64	68	72
9 Average backlash no load	°	1.0	1.4	1.6	2.0	2.4
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.166	0.167	0.167	0.169	0.170
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	0.23	0.11	0.05	0.05	0.05
11 Gearhead length L1	mm	19.2	22.3	27.4	31.0	34.6

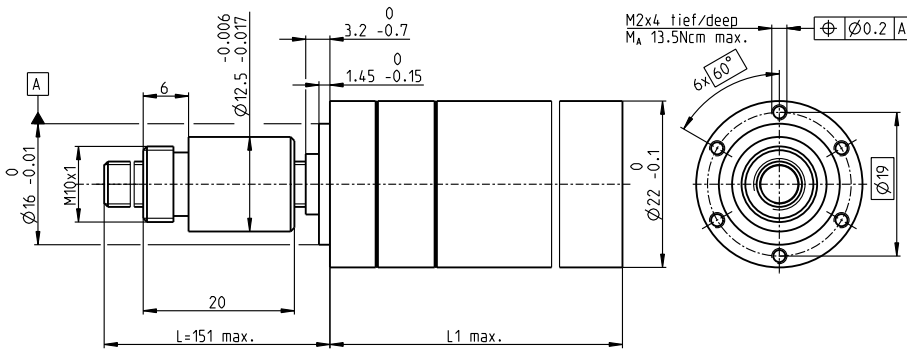
<sup>1</sup> based on screw length 102 mm (standard length)    <sup>2</sup> for reduction 1:1 = 3000 rpm    <sup>3</sup> for reduction 1:1



maxon Modular System								
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 16, 2 W	124			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	124	MR	429/430	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	125/126			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	126	MR	429/430	64.7	67.8	72.9	76.5	80.1
RE 16, 3.2 W	126	MEnc 13	416	65.8	68.9	74.0	77.6	81.2
RE 16, 4.5 W	127/128			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	128	MR	429/430	67.7	70.8	75.9	79.5	83.1
RE 16, 4.5 W	128	MEnc 13	416	68.9	72.0	77.1	80.7	84.3
A-max 16	143-146			-	47.8	52.9	56.5	60.1
A-max 16	144/146	MR	429/430	-	52.8	57.9	61.5	65.1
A-max 16	144/146	MEnc 13	416	-	55.9	61.0	64.6	68.2
EC-max 16, 5 W	217			-	46.4	51.5	55.1	58.7
EC-max 16, 5 W	217	MR	431	-	53.7	58.8	62.4	66.0
EC-max 16, 8 W	219			-	58.4	63.5	67.1	70.7
EC-max 16, 8 W	219	MR	431	-	65.7	70.8	74.4	78.0

maxon screw drive

# Screw Drive GP 22 S Ø22 mm, Ball Screw



Technical Data	
Screw	Ø6 x 2, stainless steel
Standard length	151 mm
Special length (5 mm steps)	max. 300 mm
Nut (standard)	thread nut
Material	100CR6, hardened
Axial play	< 0.01 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed <sup>2</sup>	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	500 N
Number of stages	0 1 2 3 4
Max. radial load, 15 mm from flange	80 N 80 N 130 N 180 N 180 N

M 1:1

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

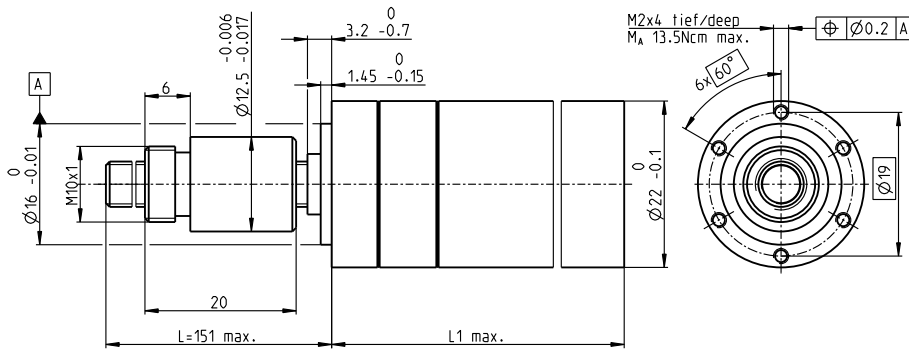
Screw Drive Data	363863	363864	363867	363871	363872	363877	363882	363887	363892
1 Reduction	1:1	3.8:1	14:1	29:1	53:1	89:1	198:1	333:1	479:1
2 Absolute reduction	1/1	15/4	225/16	729/25	3375/64	4617/52	50625/256	69255/208	124659/260
20 Max. feed velocity <sup>1</sup>	mm/s	150	70	19	9.2	5.0	3.0	0.8	0.6
21 Max. feed force (continuous) <sup>1</sup>	N	77	100	154	196	240	285	372	443
22 Max. feed force (intermittent) <sup>1</sup>	N	183	236	365	465	500	500	500	500
<b>Part Numbers</b>		<b>363865</b>	<b>364041</b>		<b>363873</b>	<b>363878</b>	<b>363883</b>	<b>363888</b>	<b>363893</b>
1 Reduction		4.4:1	16:1		62:1	104:1	231:1	370:1	561:1
2 Absolute reduction		57/13	885/62		12825/208	87723/645	192375/832	10556001/28561	2368521/4225
20 Max. feed velocity <sup>1</sup>	mm/s	61	17		4.3	2.6	1.2	0.7	0.5
21 Max. feed force (continuous) <sup>1</sup>	N	105	161		253	300	392	458	500
22 Max. feed force (intermittent) <sup>1</sup>	N	248	381		500	500	500	500	500
<b>Part Numbers</b>		<b>363866</b>	<b>363868</b>		<b>363874</b>	<b>363879</b>	<b>363884</b>	<b>363889</b>	<b>363894</b>
1 Reduction		5.4:1	19:1		72:1	109:1	270:1	389:1	590:1
2 Absolute reduction		27/5	3249/169		48735/676	2181/20	731025/2704	263169/676	59049/100
20 Max. feed velocity <sup>1</sup>	mm/s	49	14		3.7	2.4	1.0	0.7	0.5
21 Max. feed force (continuous) <sup>1</sup>	N	112	170		266	305	413	466	500
22 Max. feed force (intermittent) <sup>1</sup>	N	266	404		500	500	500	500	500
<b>Part Numbers</b>			<b>363869</b>		<b>363875</b>	<b>363880</b>	<b>363885</b>	<b>363890</b>	<b>363895</b>
1 Reduction			20:1		76:1	128:1	285:1	410:1	690:1
2 Absolute reduction			81/4		1215/16	41553/325	18225/64	6561/16	1121931/1625
20 Max. feed velocity <sup>1</sup>	mm/s		13		3.5	2.1	0.9	0.7	0.4
21 Max. feed force (continuous) <sup>1</sup>	N		173		270	322	420	474	500
22 Max. feed force (intermittent) <sup>1</sup>	N		411		500	500	500	500	500
<b>Part Numbers</b>			<b>363870</b>		<b>363876</b>	<b>363881</b>	<b>363886</b>	<b>363891</b>	<b>363896</b>
1 Reduction			24:1		84:1	157:1	316:1	455:1	850:1
2 Absolute reduction			1539/65		185193/2197	19683/125	2777895/8788	5000211/10985	531441/625
20 Max. feed velocity <sup>1</sup>	mm/s		11		3.2	1.7	0.8	0.6	0.3
21 Max. feed force (continuous) <sup>1</sup>	N		184		280	345	435	491	500
22 Max. feed force (intermittent) <sup>1</sup>	N		437		500	500	500	500	500
4 Number of stages		0	1	2	3	3	4	4	4
7 Max. efficiency gearhead incl. screw	%	96	81	67	67	57	57	47	47
8 Weight <sup>1</sup>	g	103	103	115	115	128	128	141	141
9 Average backlash no load	°	1.0	1.0	1.2	1.2	1.6	1.6	2.0	2.0
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.039	0.039	0.040	0.040	0.042	0.042	0.044	0.044
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	10	1.0	0.4	0.4	0.3	0.3	0.3	0.3
11 Gearhead length L1	mm	38.0	38.0	44.8	44.8	51.6	51.6	58.4	58.4

<sup>1</sup> based on screw length 151 mm (standard length)    <sup>2</sup> for reduction 1:1 = 4500 rpm



maxon Modular System											
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts							
A-max 19	147-150			-	64.2	71.0	71.0	77.8	77.8	84.6	84.6
A-max 19, 1.5 W	148	MR	429/430	-	69.3	76.1	76.1	82.9	82.9	89.7	89.7
A-max 19, 1.5 W	148	Enc 22	437	-	78.6	85.4	85.4	92.2	92.2	99.0	99.0
A-max 19, 1.5 W	148	MEnc 13	416	-	71.7	78.5	78.5	85.3	85.3	92.1	92.1
A-max 19, 2.5 W	149/150			-	66.8	73.6	73.6	80.4	80.4	87.2	87.2
A-max 19, 2.5 W	150	MR	429/430	-	71.1	77.9	77.9	84.7	84.7	91.5	91.5
A-max 19, 2.5 W	150	Enc 22	437	-	81.2	88.0	88.0	94.8	94.8	101.6	101.6
A-max 19, 2.5 W	150	MEnc 13	416	-	74.3	81.1	81.1	87.9	87.9	94.7	94.7
A-max 22	151-154			-	67.2	74.0	74.0	80.8	80.8	87.6	87.6
A-max 22	152/154	MR	429/430	-	72.2	79.0	79.0	85.8	85.8	92.6	92.6
A-max 22	152/154	Enc 22	437	-	81.6	88.4	88.4	95.2	95.2	102.0	102.0
A-max 22	152/154	MEnc 13	416	-	74.3	81.1	81.1	87.9	87.9	94.7	94.7
EC-max 16, 8 W	219			-	71.4	78.2	78.2	85.0	85.0	91.8	91.8
EC-max 16, 8 W	219	MR	413	-	78.7	85.5	85.5	92.3	92.3	99.1	99.1
EC-max 22, 12 W	220			-	70.1	76.9	76.9	83.7	83.7	90.5	90.5
EC-max 22, 12 W	220	MR	413	-	79.8	86.6	86.6	93.4	93.4	100.2	100.2
EC-max 22, 12 W	220	AB 20	488	-	105.7	112.5	112.5	119.3	119.3	126.1	126.1

# Screw Drive GP 22 S Ø22 mm, Metric Lead Screw



## Technical Data

Screw	M6 x 1, stainless steel
Standard length	151 mm
Special length (5 mm steps)	max. 300 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.008 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed <sup>2</sup>	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	550 N
Number of stages	0 1 2 3 4
Max. radial load, 15 mm from flange	80 N 80 N 130 N 180 N 180 N

M 1:1

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Screw Drive Data	363826	363827	363830	363834	363835	363840	363845	363850	363855
1 Reduction	1:1	3.8:1	14:1	29:1	53:1	89:1	198:1	333:1	479:1
2 Absolute reduction	1/1	15/4	225/16	729/25	3375/64	4617/52	50625/256	6925/208	124659/260
20 Max. feed velocity <sup>1</sup>	mm/s	101	35	9.5	4.6	2.5	0.7	0.4	0.3
21 Max. feed force (continuous) <sup>1</sup>	N	42	60	92	118	144	223	266	300
22 Max. feed force (intermittent) <sup>1</sup>	N	118	167	259	330	350	350	350	350
<b>Part Numbers</b>		363828	364040		363836	363841	363846	363851	363856
1 Reduction		4.4:1	16:1		62:1	104:1	231:1	370:1	561:1
2 Absolute reduction		57/13	885/62		12825/208	87723/645	192375/632	10556001/28561	2368521/4225
20 Max. feed velocity <sup>1</sup>	mm/s	30	8.3		2.2	1.3	0.6	0.4	0.2
21 Max. feed force (continuous) <sup>1</sup>	N	63	97		152	180	235	275	316
22 Max. feed force (intermittent) <sup>1</sup>	N	176	270		350	350	350	350	350
<b>Part Numbers</b>		363829	363831		363837	363842	363847	363852	363857
1 Reduction		5.4:1	19:1		72:1	109:1	270:1	389:1	590:1
2 Absolute reduction		27/5	3249/169		48735/676	2187/20	731025/2704	263169/676	59049/100
20 Max. feed velocity <sup>1</sup>	mm/s	25	7.0		1.9	1.2	0.5	0.3	0.2
21 Max. feed force (continuous) <sup>1</sup>	N	67	102		159	183	248	280	321
22 Max. feed force (intermittent) <sup>1</sup>	N	188	286		350	350	350	350	350
<b>Part Numbers</b>			363832		363838	363843	363848	363853	363858
1 Reduction			20:1		76:1	128:1	285:1	410:1	690:1
2 Absolute reduction			81/4		1215/16	41553/325	18225/64	6561/16	1121931/1625
20 Max. feed velocity <sup>1</sup>	mm/s		6.7		1.8	1.0	0.5	0.3	0.2
21 Max. feed force (continuous) <sup>1</sup>	N		104		162	193	252	285	339
22 Max. feed force (intermittent) <sup>1</sup>	N		291		350	350	350	350	350
<b>Part Numbers</b>			363833		363839	363844	363849	363854	363859
1 Reduction			24:1		84:1	157:1	316:1	455:1	850:1
2 Absolute reduction			1539/65		185193/2197	19683/125	2777895/6788	500021/10985	531441/625
20 Max. feed velocity <sup>1</sup>	mm/s		5.6		1.6	0.8	0.4	0.3	0.2
21 Max. feed force (continuous) <sup>1</sup>	N		111		168	207	261	295	350
22 Max. feed force (intermittent) <sup>1</sup>	N		310		350	350	350	350	350
4 Number of stages		0	1	2	3	3	4	4	4
7 Max. efficiency gearhead incl. screw	%	42	35	29	29	25	20	20	20
8 Weight <sup>1</sup>	g	103	103	116	116	128	128	141	141
9 Average backlash no load	°	1.0	1.0	1.2	1.2	1.6	1.6	2.0	2.0
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.034	0.034	0.034	0.034	0.034	0.037	0.037	0.037
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	10	1.0	0.4	0.4	0.3	0.3	0.3	0.3
11 Gearhead length L1	mm	38.0	38.0	44.8	44.8	51.6	51.6	58.4	58.4

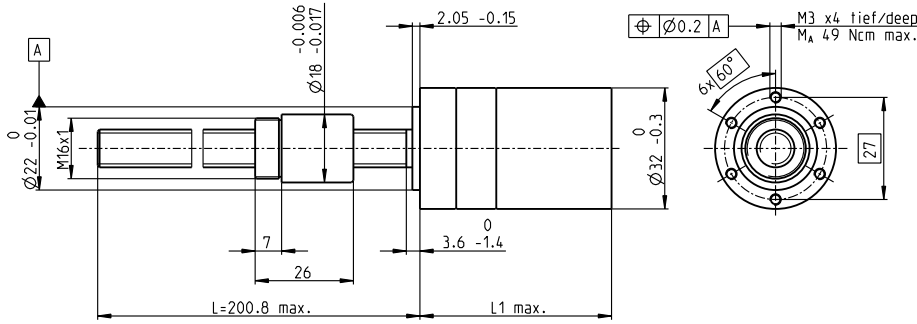
<sup>1</sup> based on screw length 151 mm (standard length)    <sup>2</sup> for reduction 1:1 = 6088 rpm



## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 19	147-150			-	64.2	71.0	71.0	77.8	77.8	84.6	84.6
A-max 19, 1.5 W	148	MR	429/430	-	69.3	76.1	76.1	82.9	82.9	89.7	89.7
A-max 19, 1.5 W	148	Enc 22	437	-	78.6	85.4	85.4	92.2	92.2	99.0	99.0
A-max 19, 1.5 W	148	MEnc 13	416	-	71.7	78.5	78.5	85.3	85.3	92.1	92.1
A-max 19, 2.5 W	149/150			-	66.8	73.6	73.6	80.4	80.4	87.2	87.2
A-max 19, 2.5 W	150	MR	429/430	-	71.1	77.9	77.9	84.7	84.7	91.5	91.5
A-max 19, 2.5 W	150	Enc 22	437	-	81.2	88.0	88.0	94.8	94.8	101.6	101.6
A-max 19, 2.5 W	150	MEnc 13	416	-	74.3	81.1	81.1	87.9	87.9	94.7	94.7
A-max 22	151-154			-	67.2	74.0	74.0	80.8	80.8	87.6	87.6
A-max 22	152/154	MR	429/430	-	72.2	79.0	79.0	85.8	85.8	92.6	92.6
A-max 22	152/154	Enc 22	437	-	81.6	88.4	88.4	95.2	95.2	102.0	102.0
A-max 22	152/154	MEnc 13	416	-	74.3	81.1	81.1	87.9	87.9	94.7	94.7
EC-max 16, 8 W	219			-	71.4	78.2	78.2	85.0	85.0	91.8	91.8
EC-max 16, 8 W	219	MR	413	-	78.7	85.5	85.5	92.3	92.3	99.1	99.1
EC-max 22, 12 W	220			-	70.1	76.9	76.9	83.7	83.7	90.5	90.5
EC-max 22, 12 W	220	MR	413	-	79.8	86.6	86.6	93.4	93.4	100.2	100.2
EC-max 22, 12 W	220	AB 20	488	-	105.7	112.5	112.5	119.3	119.3	126.1	126.1

# Screw Drive GP 32 S Ø32 mm, Ball Screw



Technical Data	
Screw	Ø10 x 2, stainless steel
Standard length	200.8 mm
Special length (5 mm steps)	max. 600 mm
Nut (standard)	thread nut
Material	100CR6, hardened
Axial play	< 0.01 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed <sup>2</sup>	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	2700 N
Number of stages	0 1 2 3 4
Max. radial load, 15 mm from flange	200 N 200 N 350 N 400 N 400 N

M 1:2

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

Screw Drive Data	363970	363971	363974	363979	363980	363985	363990	363995	364000
1 Reduction	1:1	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1
2 Absolute reduction	1/1	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25
20 Max. feed velocity <sup>1</sup>	mm/s	133	72	19	8.1	5.2	2.4	1.1	0.5
21 Max. feed force (continuous) <sup>1</sup>	N	386	474	739	983	1137	1473	1921	2420
22 Max. feed force (intermittent) <sup>1</sup>	N	1023	1255	1956	2604	2700	2700	2700	2700
<b>Part Numbers</b>		363972	363975		363981	363986	363991	363996	364001
1 Reduction		4.8:1	18:1		66:1	123:1	295:1	531:1	913:1
2 Absolute reduction		24/5	624/35		16224/245	687/56	101062/343	331776/625	36501/40
20 Max. feed velocity <sup>1</sup>	mm/s	56	15		4.0	2.2	0.9	0.5	0.3
21 Max. feed force (continuous) <sup>1</sup>	N	517	803		1239	1524	2041	2482	2700
22 Max. feed force (intermittent) <sup>1</sup>	N	1369	2127		2700	2700	2700	2700	2700
<b>Part Numbers</b>		363973	363976		363982	363987	363992	363997	364002
1 Reduction		5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1
2 Absolute reduction		23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256
20 Max. feed velocity <sup>1</sup>	mm/s	46	13		3.4	2.0	0.8	0.5	0.2
21 Max. feed force (continuous) <sup>1</sup>	N	551	846		1315	1561	2092	2569	2700
22 Max. feed force (intermittent) <sup>1</sup>	N	1458	2239		2700	2700	2700	2700	2700
<b>Part Numbers</b>			363977		363983	363988	363993	363998	
1 Reduction			23:1		86:1	159:1	411:1	636:1	
2 Absolute reduction			576/25		14976/175	1587/10	359424/675	79488/125	
20 Max. feed velocity <sup>1</sup>	mm/s		12		3.1	1.7	0.6	0.4	
21 Max. feed force (continuous) <sup>1</sup>	N		872		1353	1661	2279	2636	
22 Max. feed force (intermittent) <sup>1</sup>	N		2308		2700	2700	2700	2700	
<b>Part Numbers</b>			363978		363984	363989	363994	363999	
1 Reduction			28:1		103:1	190:1	456:1	706:1	
2 Absolute reduction			138/5		3588/35	12167/64	89401/196	158171/224	
20 Max. feed velocity <sup>1</sup>	mm/s		9.5		2.6	1.4	0.6	0.4	
21 Max. feed force (continuous) <sup>1</sup>	N		931		1437	1762	2359	2700	
22 Max. feed force (intermittent) <sup>1</sup>	N		2465		2700	2700	2700	2700	
4 Number of stages		0	1	2	2	3	3	4	4
7 Max. efficiency gearhead incl. screw	%	94	75	71	71	66	66	56	56
8 Weight <sup>1</sup>	g	304	304	331	331	359	359	387	387
9 Average backlash no load	°	0.7	0.7	0.8	0.8	1.0	1.0	1.0	1.0
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.037	0.037	0.037	0.037	0.039	0.039	0.039	0.039
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	42.3	4.2	0.9	0.9	0.7	0.7	0.7	0.7
11 Gearhead length L1	mm	51.0	51.0	57.7	57.7	64.4	64.4	71.1	71.1

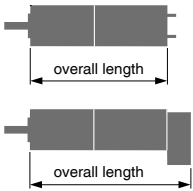
<sup>1</sup> based on screw length 200.8 mm (standard length)    <sup>2</sup> for reduction 1:1 = 4000 rpm

### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	129/131			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7	125.7
RE 25	129/131	MR	432	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7
RE 25	129/131	Enc 22	437	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8	139.8
RE 25	129/131	HED_5540	440/442	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5	146.5
RE 25	129/131	DCT 22	449	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0	148.0
RE 25, 20 W	130			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2	114.2
RE 25, 20 W	130	MR	432	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2	125.2
RE 25, 20 W	130	HED_5540	440/442	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0
RE 25, 20 W	130	DCT 22	449	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5	136.5
RE 25, 20 W	130	AB 28	491	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3
RE 25, 20 W	130	HED_5540/AB 28	440/491	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5	165.5
RE 25, 20 W	131	AB 28	491	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8	159.8
RE 25, 20 W	131	HED_5540/AB 28	440/491	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0	177.0
RE 30, 60 W	133			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2	139.2
RE 30, 60 W	133	MR	433	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6	150.6
RE 30, 60 W	133	HED_5540	440/442	139.9	139.9	146.6	146.6	153.3	153.3	160.0	160.0	160.0

Continuation of the modular system on pages 384 and 386.

# Screw Drive GP 32 S Ø32 mm, Ball Screw

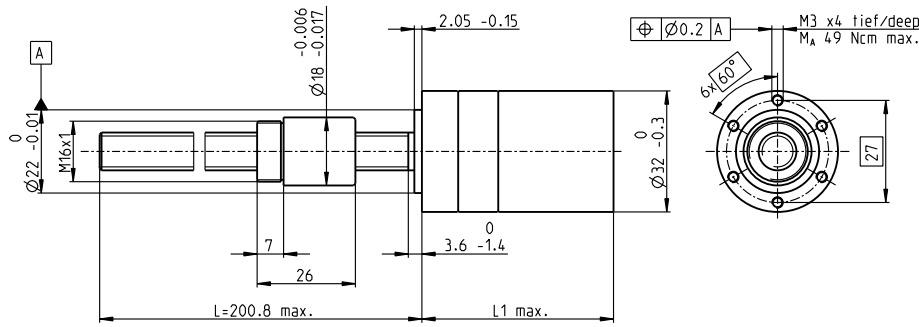


Part Numbers								
363970	363971	363974	363979	363980	363985	363990	363995	364000
	363972	363975		363981	363986	363991	363996	364001
	363973	363976		363982	363987	363992	363997	364002
		363977		363983	363988	363993	363998	
		363978		363984	363989	363994	363999	

maxon screw drive

maxon Modular System											
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 35, 90 W	134			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2
RE 35, 90 W	134	MR	433	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6
RE 35, 90 W	134	HED_5540	440/442	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9
RE 35, 90 W	134	DCT 22	449	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3
RE 35, 90 W	134	AB 28	491	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3
RE 35, 90 W	134	HEDS 5540/AB 28	440/491	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5
A-max 26	158			-	95.8	102.5	102.5	109.2	109.2	115.9	115.9
A-max 26	158	MEnc 13	417	-	102.9	109.6	109.6	116.3	116.3	123.0	123.0
A-max 26	158	MR	432	-	104.6	111.3	111.3	118.0	118.0	124.7	124.7
A-max 26	158	Enc 22	437	-	110.2	116.9	116.9	123.6	123.6	130.3	130.3
A-max 26	158	HED_5540	441/443	-	114.2	120.9	120.9	127.6	127.6	134.3	134.3
A-max 32	159			-	114.0	120.7	120.7	127.4	127.4	134.1	134.1
A-max 32	160			-	112.6	119.3	119.3	126.0	126.0	132.7	132.7
A-max 32	160	MR	433	-	123.8	130.5	130.5	137.2	137.2	143.9	143.9
A-max 32	160	HED_5540	440/442	-	133.4	140.1	140.1	146.8	146.8	153.5	153.5
EC 32, 80 W	209			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2
EC 32, 80 W	209	HED_5540	440/442	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6
EC 32, 80 W	209	Res 26	450	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3
EC-max 22, 25 W	221			-	99.6	106.3	106.3	113.0	113.0	119.7	119.7
EC-max 22, 25 W	221	MR	433	-	109.3	116.0	116.0	122.7	122.7	129.4	129.4
EC-max 22, 25 W	221	AB 20	488	-	135.4	142.1	142.1	148.8	148.8	155.5	155.5
EC-max 30, 40 W	222			-	93.1	99.8	99.8	106.5	106.5	113.2	113.2
EC-max 30, 40 W	222	MR	433	-	105.3	112.0	112.0	118.7	118.7	125.4	125.4
EC-max 30, 40 W	222	HEDL 5540	443	-	113.7	120.4	120.4	127.1	127.1	133.8	133.8
EC-max 30, 40 W	222	AB 20	488	-	128.9	135.6	135.6	142.3	142.3	148.3	148.3
EC-max 30, 40 W	222	HEDL 5540/AB 20	443/488	-	149.5	156.2	156.2	162.9	162.9	169.6	169.6
EC-4pole 22, 90 W	229			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8
EC-4pole 22, 90 W	229	16 EASY/XT/Abs.	418-422	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0
EC-4pole 22, 90 W	229	16 EASY Abs. XT	424	112.4	112.4	119.1	119.1	125.8	125.8	132.5	132.5
EC-4pole 22, 90 W	229	16 RIO	435	110.4	110.4	117.1	117.1	123.8	123.8	130.5	130.5
EC-4pole 22, 90 W	229	AEDL/HEDL	438/444	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3
EC-4pole 22,120 W	230			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2
EC-4pole 22,120 W	230	16 EASY/XT/Abs.	418-422	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4
EC-4pole 22,120 W	230	16 EASY Abs. XT	424	129.8	129.8	136.5	136.5	143.2	143.2	149.9	149.9
EC-4pole 22,120 W	230	16 RIO	435	127.8	127.8	134.5	134.5	141.2	141.2	147.9	147.9
EC-4pole 22,120 W	230	AEDL/HEDL	438/444	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7
EC-i 30, 30 W	240			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4
EC-i 30, 30 W	240	16 EASY/Abs.	418/422	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1
EC-i 30, 30 W	240	16 RIO	435	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6
EC-i 30, 30 W	240	AEDL/HEDL	438/443	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1
EC-i 30, 45 W	241			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4
EC-i 30, 45 W	241	16 EASY/Abs.	418/422	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1
EC-i 30, 45 W	241	16 RIO	435	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6
EC-i 30, 45 W	241	AEDL/HEDL	438/443	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1
EC-i 30, 50 W	242			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4
EC-i 30, 50 W	242	16 EASY/Abs.	418/422	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1
EC-i 30, 50 W	242	16 RIO	435	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6
EC-i 30, 50 W	242	AEDL/HEDL	438/443	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1
EC-i 30, 75 W	243			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4
EC-i 30, 75 W	243	16 EASY/Abs.	418/422	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1
EC-i 30, 75 W	243	16 RIO	435	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6
EC-i 30, 75 W	243	AEDL/HEDL	438/443	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1
EC-i 40, 50 W	244			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8
EC-i 40, 50 W	244	16 EASY/Abs.	418/422	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5
EC-i 40, 50 W	244	16 RIO	435	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3
EC-i 40, 50 W	244	AEDL/HEDL	438/443	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8
EC-i 40, 70 W	246			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8
EC-i 40, 70 W	246	16 EASY/Abs.	418/422	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5
EC-i 40, 70 W	246	16 RIO	435	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3
EC-i 40, 70 W	246	AEDL/HEDL	438/443	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8
MCD EPOS, 60 W	485			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2
MCD EPOS P 60 W	485			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2

# Screw Drive GP 32 S Ø32 mm, Metric Lead Screw



## Technical Data

Screw	M10 x 1, stainless steel
Standard length	200.8 mm
Special length (5 mm steps)	max. 600 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.008 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed <sup>2</sup>	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	2700 N
Number of stages	0 1 2 3 4
Max. radial load,	
15 mm from flange	200 N 200 N 350 N 400 N 400 N

**M 1:2**

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Screw Drive Data	363900	363901	363904	363909	363910	363915	363920	363925	363930
1 Reduction	1:1	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1
2 Absolute reduction	1/1	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25
20 Max. feed velocity <sup>1</sup>	mm/s	100	36	9.5	4.0	2.6	1.2	0.5	0.2
21 Max. feed force (continuous) <sup>1</sup>	N	183	257	400	533	616	798	1040	1311
22 Max. feed force (intermittent) <sup>1</sup>	N	455	638	995	1324	1350	1350	1350	1350
<b>Part Numbers</b>		363902	363905		363911	363916	363921	363926	363931
1 Reduction		4.8:1	18:1		66:1	123:1	295:1	531:1	913:1
2 Absolute reduction		24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40
20 Max. feed velocity <sup>1</sup>	mm/s	28	7.4		2.0	1.1	0.5	0.3	0.1
21 Max. feed force (continuous) <sup>1</sup>	N	280	435		671	826	1105	1345	1350
22 Max. feed force (intermittent) <sup>1</sup>	N	696	1082		1350	1350	1350	1350	1350
<b>Part Numbers</b>		363903	363906		363912	363917	363922	363927	363932
1 Reduction		5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1
2 Absolute reduction		23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256
20 Max. feed velocity <sup>1</sup>	mm/s	23	6.3		1.7	1.0	0.4	0.2	0.1
21 Max. feed force (continuous) <sup>1</sup>	N	298	458		712	845	1133	1350	1350
22 Max. feed force (intermittent) <sup>1</sup>	N	742	1139		1350	1350	1350	1350	1350
<b>Part Numbers</b>			363907		363913	363918	363923	363928	
1 Reduction			23:1		86:1	159:1	411:1	636:1	
2 Absolute reduction			576/25		14976/175	1587/10	359424/675	79488/125	
20 Max. feed velocity <sup>1</sup>	mm/s		5.8		1.6	0.8	0.3	0.2	
21 Max. feed force (continuous) <sup>1</sup>	N		472		733	899	1234	1350	
22 Max. feed force (intermittent) <sup>1</sup>	N		1174		1350	1350	1350	1350	
<b>Part Numbers</b>			363908		363914	363919	363924	363929	
1 Reduction			28:1		103:1	190:1	456:1	706:1	
2 Absolute reduction			138/5		3588/35	12167/64	89401/196	158171/224	
20 Max. feed velocity <sup>1</sup>	mm/s		4.8		1.3	0.7	0.3	0.2	
21 Max. feed force (continuous) <sup>1</sup>	N		504		778	955	1278	1350	
22 Max. feed force (intermittent) <sup>1</sup>	N		1253		1350	1350	1350	1350	
4 Number of stages		0	1	2	2	3	3	4	4
7 Max. efficiency gearhead incl. screw	%	27	22	20	20	19	19	16	16
8 Weight <sup>1</sup>	g	304	304	331	331	359	359	387	387
9 Average backlash no load	°	0.7	0.7	0.8	0.8	1.0	1.0	1.0	1.0
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.033	0.033	0.033	0.033	0.034	0.034	0.034	0.034
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	43.3	3.0	0.9	0.9	0.7	0.7	0.7	0.7
11 Gearhead length L1	mm	51.0	51.0	57.7	57.7	64.4	64.4	71.1	71.1

<sup>1</sup> based on screw length 200.8 mm (standard length)    <sup>2</sup> for reduction 1:1 = 5984 rpm

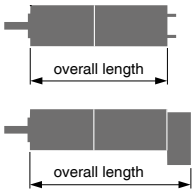


## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 25	129/131			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7
RE 25	129/131	MR	432	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7
RE 25	129/131	Enc 22	437	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8
RE 25	129/131	HED_5540	440/442	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5
RE 25	129/131	DCT 22	449	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0
RE 25, 20 W	130			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2
RE 25, 20 W	130	MR	432	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2
RE 25, 20 W	130	HED_5540	440/442	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0
RE 25, 20 W	130	DCT 22	449	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5
RE 25, 20 W	130	AB 28	491	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3
RE 25, 20 W	130	HED_5540/AB 28	440/491	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5
RE 25, 20 W	131	AB 28	491	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8
RE 25, 20 W	131	HED_5540/AB 28	440/491	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0
RE 30, 60 W	133			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2
RE 30, 60 W	133	MR	433	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6
RE 30, 60 W	133	HED_5540	440/442	139.9	139.9	146.6	146.6	153.3	153.3	160.0	160.0



# Screw Drive GP 32 S Ø32 mm, Metric Lead Screw

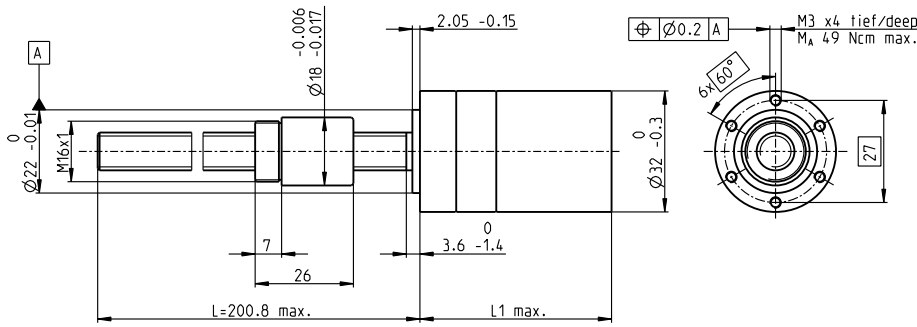


Part Numbers								
363900	363901	363904	363909	363910	363915	363920	363925	363930
	363902	363905		363911	363916	363921	363926	363931
	363903	363906		363912	363917	363922	363927	363932
		363907		363913	363918	363923	363928	
		363908		363914	363919	363924	363929	

maxon Modular System											
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 35, 90 W	134			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2
RE 35, 90 W	134	MR	433	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6
RE 35, 90 W	134	HED_5540	440/442	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9
RE 35, 90 W	134	DCT 22	449	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3
RE 35, 90 W	134	AB 28	491	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3
RE 35, 90 W	134	HEDS 5540/AB 28	440/491	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5
A-max 26	158			-	95.8	102.5	102.5	109.2	109.2	115.9	115.9
A-max 26	158	MEnc 13	417	-	102.9	109.6	109.6	116.3	116.3	123.0	123.0
A-max 26	158	MR	432	-	104.6	111.3	111.3	118.0	118.0	124.7	124.7
A-max 26	158	Enc 22	437	-	110.2	116.9	116.9	123.6	123.6	130.3	130.3
A-max 26	158	HED_5540	441/443	-	114.2	120.9	120.9	127.6	127.6	134.3	134.3
A-max 32	159			-	114.0	120.7	120.7	127.4	127.4	134.1	134.1
A-max 32	160			-	112.6	119.3	119.3	126.0	126.0	132.7	132.7
A-max 32	160	MR	433	-	123.8	130.5	130.5	137.2	137.2	143.9	143.9
A-max 32	160	HED_5540	440/442	-	133.4	140.1	140.1	146.8	146.8	153.5	153.5
EC 32, 80 W	209			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2
EC 32, 80 W	209	HED_5540	440/442	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6
EC 32, 80 W	209	Res 26	450	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3
EC-max 22, 25 W	221			-	99.6	106.3	106.3	113.0	113.0	119.7	119.7
EC-max 22, 25 W	221	MR	433	-	109.3	116.0	116.0	122.7	122.7	129.4	129.4
EC-max 22, 25 W	221	AB 20	488	-	135.4	142.1	142.1	148.8	148.8	155.5	155.5
EC-max 30, 40 W	222			-	93.1	99.8	99.8	106.5	106.5	113.2	113.2
EC-max 30, 40 W	222	MR	433	-	105.3	112.0	112.0	118.7	118.7	125.4	125.4
EC-max 30, 40 W	222	HEDL 5540	443	-	113.7	120.4	120.4	127.1	127.1	133.8	133.8
EC-max 30, 40 W	222	AB 20	488	-	128.9	135.6	135.6	142.3	142.3	148.3	148.3
EC-max 30, 40 W	222	HEDL 5540/AB 20	443/488	-	149.5	156.2	156.2	162.9	162.9	169.6	169.6
EC-4pole 22, 90 W	229			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8
EC-4pole 22, 90 W	229	16 EASY/XT/Abs.	418-422	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0
EC-4pole 22, 90 W	229	16 EASY Abs. XT	424	112.4	112.4	119.1	119.1	125.8	125.8	132.5	132.5
EC-4pole 22, 90 W	229	16 RIO	435	110.4	110.4	117.1	117.1	123.8	123.8	130.5	130.5
EC-4pole 22, 90 W	229	AEDL/HEDL	438/444	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3
EC-4pole 22,120 W	230			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2
EC-4pole 22,120 W	230	16 EASY/XT/Abs.	418-422	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4
EC-4pole 22,120 W	230	16 EASY Abs. XT	424	129.8	129.8	136.5	136.5	143.2	143.2	149.9	149.9
EC-4pole 22,120 W	230	16 RIO	435	127.8	127.8	134.5	134.5	141.2	141.2	147.9	147.9
EC-4pole 22,120 W	230	AEDL/HEDL	438/444	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7
EC-i 30, 30 W	240			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4
EC-i 30, 30 W	240	16 EASY/Abs.	418/422	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1
EC-i 30, 30 W	240	16 RIO	435	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6
EC-i 30, 30 W	240	AEDL/HEDL	438/443	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1
EC-i 30, 45 W	241			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4
EC-i 30, 45 W	241	16 EASY/Abs.	418/422	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1
EC-i 30, 45 W	241	16 RIO	435	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6
EC-i 30, 45 W	241	AEDL/HEDL	438/443	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1
EC-i 30, 50 W	242			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4
EC-i 30, 50 W	242	16 EASY/Abs.	418/422	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1
EC-i 30, 50 W	242	16 RIO	435	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6
EC-i 30, 50 W	242	AEDL/HEDL	438/443	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1
EC-i 30, 75 W	243			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4
EC-i 30, 75 W	243	16 EASY/Abs.	418/422	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1
EC-i 30, 75 W	243	16 RIO	435	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6
EC-i 30, 75 W	243	AEDL/HEDL	438/443	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1
EC-i 40, 50 W	244			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8
EC-i 40, 50 W	244	16 EASY/Abs.	418/422	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5
EC-i 40, 50 W	244	16 RIO	435	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3
EC-i 40, 50 W	244	AEDL/HEDL	438/443	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8
EC-i 40, 70 W	246			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8
EC-i 40, 70 W	246	16 EASY/Abs.	418/422	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5
EC-i 40, 70 W	246	16 RIO	435	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3
EC-i 40, 70 W	246	AEDL/HEDL	438/443	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8
MCD EPOS, 60 W	485			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2
MCD EPOS P 60 W	485			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2

maxon screw drive

# Screw Drive GP 32 S Ø32 mm, Trapezoidal Lead Screw



Technical Data	
Screw	TR10 x 2, stainless steel
Standard length	200.8 mm
Special length (5 mm steps)	max. 600 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.008 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed <sup>2</sup>	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) <sup>1</sup>	2700 N
Number of stages	0 1 2 3 4
Max. radial load,	
15 mm from flange	200 N 200 N 350 N 400 N 400 N

M 1:2

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

Screw Drive Data	363936	363937	363940	363945	363946	363951	363956	363961	363966
1 Reduction	1:1	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1
2 Absolute reduction	1/1	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25
20 Max. feed velocity <sup>1</sup>	mm/s	186	72	19	8.1	5.2	2.4	1.1	0.5
21 Max. feed force (continuous) <sup>1</sup>	N	216	296	462	614	710	921	1200	1530
22 Max. feed force (intermittent) <sup>1</sup>	N	528	723	1127	1500	1530	1530	1530	1530
<b>Part Numbers</b>		363938	363941		363947	363952	363957	363962	363967
1 Reduction		4.8:1	18:1		66:1	123:1	295:1	531:1	913:1
2 Absolute reduction		24/5	624/35		16224/245	687/56	101062/343	331776/625	36501/40
20 Max. feed velocity <sup>1</sup>	mm/s	56	15		4.0	2.2	0.9	0.5	0.3
21 Max. feed force (continuous) <sup>1</sup>	N	323	502		774	953	1275	1530	1530
22 Max. feed force (intermittent) <sup>1</sup>	N	789	1226		1530	1530	1530	1530	1530
<b>Part Numbers</b>		363939	363942		363948	363953	363958	363963	363968
1 Reduction		5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1
2 Absolute reduction		24/5	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256
20 Max. feed velocity <sup>1</sup>	mm/s	46	13		3.4	2.0	0.8	0.5	0.2
21 Max. feed force (continuous) <sup>1</sup>	N	344	529		822	975	1308	1530	1530
22 Max. feed force (intermittent) <sup>1</sup>	N	840	1291		1530	1530	1530	1530	1530
<b>Part Numbers</b>			363943		363949	363954	363959	363964	
1 Reduction			23:1		86:1	159:1	411:1	636:1	
2 Absolute reduction			576/25		14976/175	1587/10	359424/675	79488/125	
20 Max. feed velocity <sup>1</sup>	mm/s		12		3.1	1.7	0.6	0.4	
21 Max. feed force (continuous) <sup>1</sup>	N		545		846	1038	1424	1530	
22 Max. feed force (intermittent) <sup>1</sup>	N		1330		1530	1530	1530	1530	
<b>Part Numbers</b>			363944		363950	363955	363960	363965	
1 Reduction			28:1		103:1	190:1	456:1	706:1	
2 Absolute reduction			138/5		3588/35	12167/64	89401/196	158171/224	
20 Max. feed velocity <sup>1</sup>	mm/s		9.5		1.3	0.7	0.3	0.2	
21 Max. feed force (continuous) <sup>1</sup>	N		582		898	1101	1475	1530	
22 Max. feed force (intermittent) <sup>1</sup>	N		1420		1530	1530	1530	1530	
4 Number of stages		0	1	2	2	3	3	4	4
7 Max. efficiency gearhead incl. screw	%	47	38	35	35	33	33	28	28
8 Weight <sup>1</sup>	g	304	304	331	331	359	359	387	387
9 Average backlash no load	°	0.7	0.7	0.8	0.8	1.0	1.0	1.0	1.0
23 Mechanical positioning accuracy <sup>1</sup>	mm	0.035	0.035	0.035	0.035	0.037	0.037	0.037	0.037
10 Mass inertia gearhead incl. screw <sup>1</sup>	gcm <sup>2</sup>	42.3	2.4	0.9	0.9	1.0	1.0	1.0	1.0
11 Gearhead length L1	mm	51.0	51.0	57.7	57.7	64.4	64.4	71.1	71.1

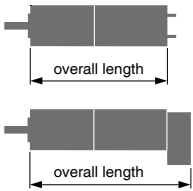
<sup>1</sup> based on screw length 200.8 mm (standard length)    <sup>2</sup> for reduction 1:1 = 5569 rpm



### maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 25	129/131			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7
RE 25	129/131	MR	432	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7
RE 25	129/131	Enc 22	437	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8
RE 25	129/131	HED_5540	440/442	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5
RE 25	129/131	DCT 22	449	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0
RE 25, 20 W	130			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2
RE 25, 20 W	130	MR	432	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2
RE 25, 20 W	130	HED_5540	440/442	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0
RE 25, 20 W	130	DCT 22	449	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5
RE 25, 20 W	130	AB 28	491	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3
RE 25, 20 W	130	HED_5540/AB 28	440/491	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5
RE 25, 20 W	131	AB 28	491	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8
RE 25, 20 W	131	HED_5540/AB 28	440/491	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0
RE 30, 60 W	133			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2
RE 30, 60 W	133	MR	433	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6
RE 30, 60 W	133	HED_5540	440/442	139.9	139.9	146.6	146.6	153.3	153.3	160.0	160.0

# Screw Drive GP 32 S Ø32 mm, Trapezoidal Lead Screw



## Part Numbers

363936	363937	363940	363945	363946	363951	363956	363961	363966
	363938	363941		363947	363952	363957	363962	363967
	363939	363942		363948	363953	363958	363963	363968
		363943		363949	363954	363959	363964	
		363944		363950	363955	363960	363965	

## maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 35, 90 W	134			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2	142.2
RE 35, 90 W	134	MR	433	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6	153.6
RE 35, 90 W	134	HED_5540	440/442	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9	162.9
RE 35, 90 W	134	DCT 22	449	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3	160.3
RE 35, 90 W	134	AB 28	491	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3	178.3
RE 35, 90 W	134	HEDS 5540/AB 28	440/491	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5	195.5
A-max 26	158			-	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
A-max 26	158	MEnc 13	417	-	102.9	109.6	109.6	116.3	116.3	123.0	123.0	123.0
A-max 26	158	MR	432	-	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
A-max 26	158	Enc 22	437	-	110.2	116.9	116.9	123.6	123.6	130.3	130.3	130.3
A-max 26	158	HED_5540	441/443	-	114.2	120.9	120.9	127.6	127.6	134.3	134.3	134.3
A-max 32	159			-	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
A-max 32	160			-	112.6	119.3	119.3	126.0	126.0	132.7	132.7	132.7
A-max 32	160	MR	433	-	123.8	130.5	130.5	137.2	137.2	143.9	143.9	143.9
A-max 32	160	HED_5540	440/442	-	133.4	140.1	140.1	146.8	146.8	153.5	153.5	153.5
EC 32, 80 W	209			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2	131.2
EC 32, 80 W	209	HED_5540	440/442	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6	149.6
EC 32, 80 W	209	Res 26	450	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3	151.3
EC-max 22, 25 W	221			-	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7
EC-max 22, 25 W	221	MR	433	-	109.3	116.0	116.0	122.7	122.7	129.4	129.4	129.4
EC-max 22, 25 W	221	AB 20	488	-	135.4	142.1	142.1	148.8	148.8	155.5	155.5	155.5
EC-max 30, 40 W	222			-	93.1	99.8	99.8	106.5	106.5	113.2	113.2	113.2
EC-max 30, 40 W	222	MR	433	-	105.3	112.0	112.0	118.7	118.7	125.4	125.4	125.4
EC-max 30, 40 W	222	HEDL 5540	443	-	113.7	120.4	120.4	127.1	127.1	133.8	133.8	133.8
EC-max 30, 40 W	222	AB 20	488	-	128.9	135.6	135.6	142.3	142.3	148.3	148.3	148.3
EC-max 30, 40 W	222	HEDL 5540/AB 20	443/488	-	149.5	156.2	156.2	162.9	162.9	169.6	169.6	169.6
EC-4pole 22, 90 W	229			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8	119.8
EC-4pole 22, 90 W	229	16 EASY/XT/Abs.	418-422	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0	132.0
EC-4pole 22, 90 W	229	16 EASY Abs. XT	424	112.4	112.4	119.1	119.1	125.8	125.8	132.5	132.5	132.5
EC-4pole 22, 90 W	229	16 RIO	435	110.4	110.4	117.1	117.1	123.8	123.8	130.5	130.5	130.5
EC-4pole 22, 90 W	229	AEDL/HEDL	438/444	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3	141.3
EC-4pole 22,120 W	230			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2	137.2
EC-4pole 22,120 W	230	16 EASY/XT/Abs.	418-422	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4	149.4
EC-4pole 22,120 W	230	16 EASY Abs. XT	424	129.8	129.8	136.5	136.5	143.2	143.2	149.9	149.9	149.9
EC-4pole 22,120 W	230	16 RIO	435	127.8	127.8	134.5	134.5	141.2	141.2	147.9	147.9	147.9
EC-4pole 22,120 W	230	AEDL/HEDL	438/444	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7	158.7
EC-i 30, 30 W	240			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 30 W	240	16 EASY/Abs.	418/422	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 30 W	240	16 RIO	435	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 30 W	240	AEDL/HEDL	438/443	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	241			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 45 W	241	16 EASY/Abs.	418/422	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 45 W	241	16 RIO	435	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 45 W	241	AEDL/HEDL	438/443	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 50 W	242			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 50 W	242	16 EASY/Abs.	418/422	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 50 W	242	16 RIO	435	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 50 W	242	AEDL/HEDL	438/443	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	243			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 75 W	243	16 EASY/Abs.	418/422	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 75 W	243	16 RIO	435	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 75 W	243	AEDL/HEDL	438/443	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 40, 50 W	244			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8
EC-i 40, 50 W	244	16 EASY/Abs.	418/422	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5	114.5
EC-i 40, 50 W	244	16 RIO	435	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3	117.3
EC-i 40, 50 W	244	AEDL/HEDL	438/443	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 70 W	246			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8
EC-i 40, 70 W	246	16 EASY/Abs.	418/422	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5	124.5
EC-i 40, 70 W	246	16 RIO	435	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3	127.3
EC-i 40, 70 W	246	AEDL/HEDL	438/443	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8
MCD EPOS, 60 W	485			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2	191.2
MCD EPOS P 60 W	485			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2	191.2

# Screw Drive Options

Option	to GP 6 S	to GP 8 S
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**Special length**  
Order reference SPIN01

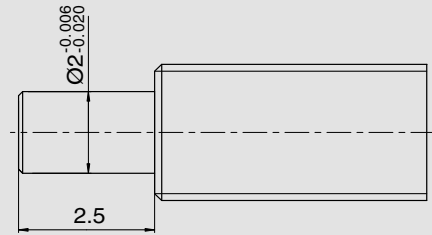
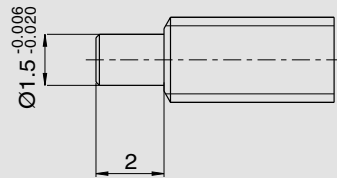
Without specification, the screw is supplied in the standard length 45 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.

Without specification, the screw is supplied in the standard length 56 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.

**Screw end**  
Order reference SPIN02

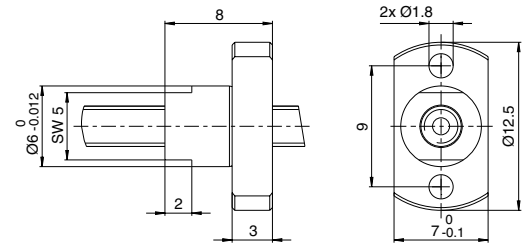
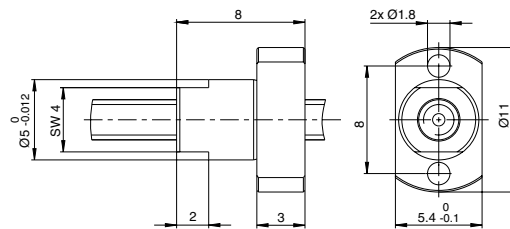
In order to support the end of the screw by an additional bearing, it can be delivered according to the illustration.

Customer specific screw ends on request.



**Flange nut**  
Order reference SPIN04

Flange nut instead of the standard thread nut.



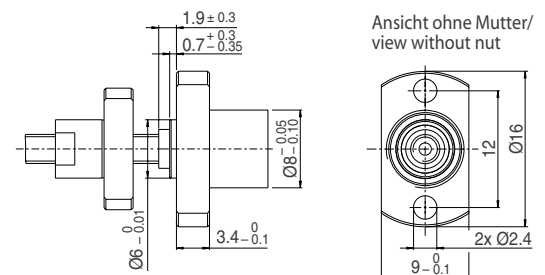
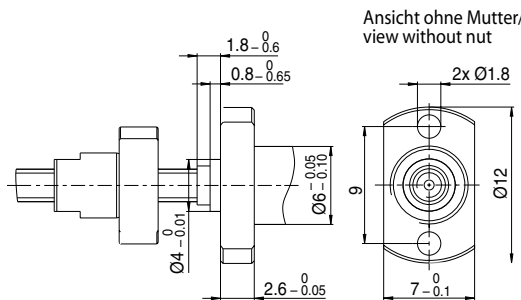
**Low backlash ball screw nut**  
Order reference SPIN05

Not available for GP 6 S.

Not available for GP 8 S.

**Rectangular mounting flange**  
Order reference SPIN06

Screw drive with rectangular mounting flange allows mounting from the gearhead side.



# Screw Drive Options

Option	to GP 16 S	to GP 22 S
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**Special length**  
Order reference SPIN01

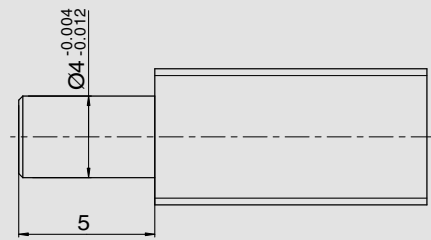
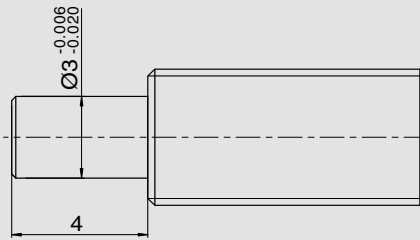
Without specification, the screw is supplied in the standard length 102 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.

Without specification, the screw is supplied in the standard length 151 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.

**Screw end**  
Order reference SPIN02

In order to support the end of the screw by an additional bearing, it can be delivered according to the illustration.

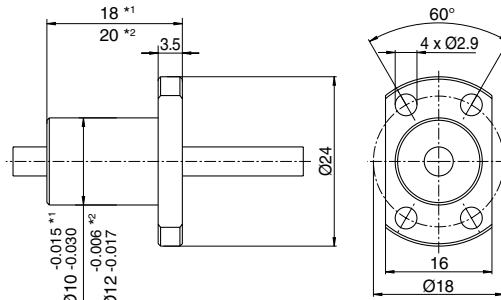
Customer specific screw ends on request.



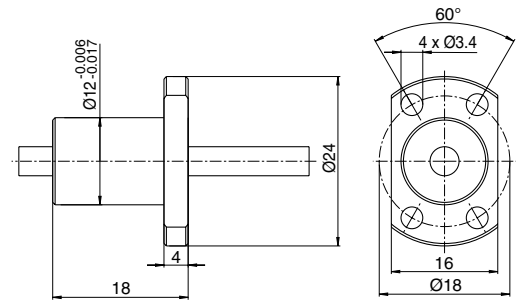
**Flange nut**  
Order reference SPIN04

Flange nut instead of the standard thread nut.

If using a ball screw, the rectangular mounting flange (SPIN 06) must be used.



\*1 Kugelumlaufspindel / Ball screw  
\*2 Metrische Spindel / Metric lead screw



**Low backlash ball screw nut**  
Order reference SPIN05

Not available for GP 16 S.

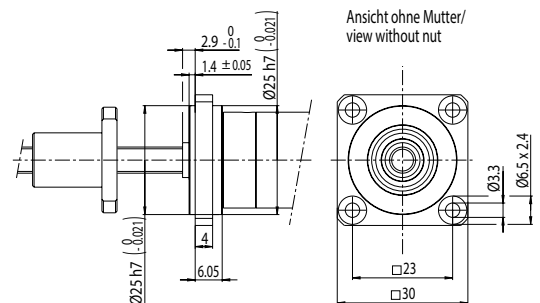
Axial play is almost eliminated through increased preloading of the ball screw nut. Although, the increased load can lead to greater wear.

**Rectangular mounting flange**  
Order reference SPIN06

Screw drive with rectangular mounting flange allows mounting from the gearhead side.

On request.

If using a ball screw with flange nut, the rectangular assembly flange must be used for mounting.



# Screw Drive Options

Option	to GP 32 S
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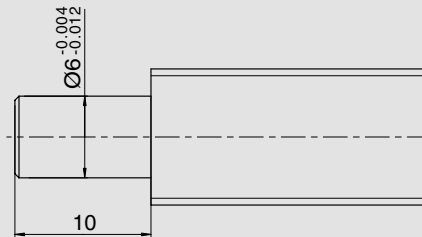
**Special length**  
Order reference SPIN01

Without specification, the screw is supplied in the standard length 200.8 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.

**Screw end**  
Order reference SPIN02

In order to support the end of the screw by an additional bearing, it can be delivered according to the illustration.

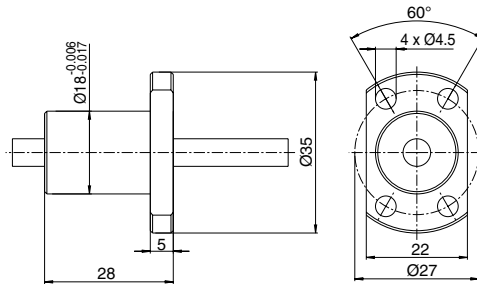
Customer specific screw ends on request.



**Flange nut**  
Order reference SPIN04

Flange nut instead of the standard thread nut.

If using a ball screw, the rectangular mounting flange (SPIN 06) must be used.



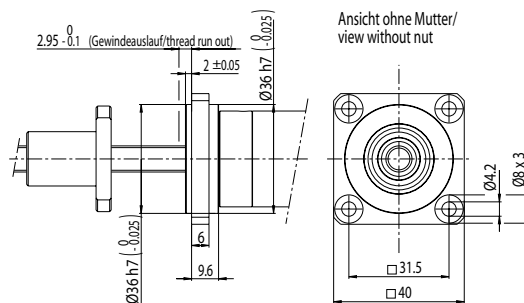
**Low backlash ball screw nut**  
Order reference SPIN05

Axial play is almost eliminated through increased preloading of the ball screw nut. Although, the increased load can lead to greater wear.

**Rectangular mounting flange**  
Order reference SPIN06

Screw drive with rectangular mounting flange allows mounting from the gearhead side.

If using a ball screw with flange nut, the rectangular assembly flange must be used for mounting.



# Inductive, magnetic, and optical encoders. DC tachos and resolvers.

**Standard Specification No. 103** 65

**Inductive encoder**

<b>Encoder MILE</b> 256–2048 CPT, 2 channel	412
<b>Encoder MILE</b> 512–4096 CPT, 2 channel	413
<b>Encoder MILE</b> 512–6400 CPT, 2 channel	414

**Magnetic encoders** (ENX can be configured online)

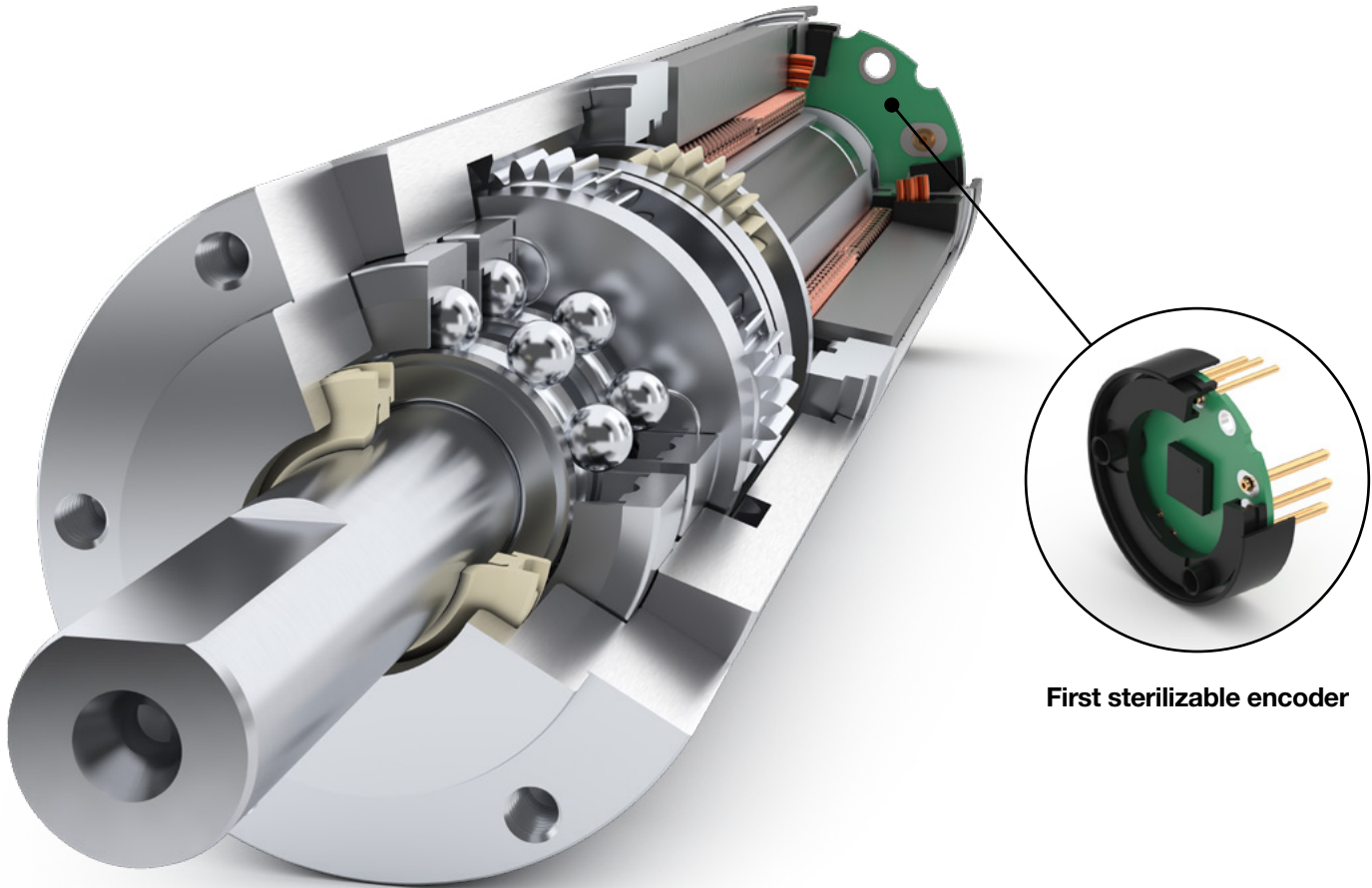
<b>ENX 6 MAG</b> 64–256 CPT,	394
<b>ENX 8 MAG</b> 64–256 CPT,	395
<b>ENX 8 EASY INT</b> 1–1024 CPT, 3 channel	396
<b>ENX 8 EASY INT Absolute</b> 4096 steps per turn	397
<b>ENX 10 EASY/QUAD</b> 1–1024 CPT, 2/3 channel	398
<b>ENX 10 EASY XT</b> 1–1024 CPT, 3 channel <b>NEW</b>	399
<b>ENX 13 EASY INT</b> 1–1024 CPT, 4096 steps per turn	400
<b>ENX 16 EASY</b> 1024 CPT, 3 channel	401
<b>ENX 16 EASY XT</b> 1–1024 CPT, 3 channel <b>NEW</b>	402
<b>ENX 16 EASY Absolute</b> 4096 steps per turn	403
<b>ENX 16 EASY Absolute XT</b> 4096 steps per turn <b>NEW</b>	404
<b>ENX 16 EASY INT</b> 1–1024 CPT, 4096 steps per turn	405
<b>ENX 19 EASY INT</b> 1–1024 CPT, 4096 steps per turn	406
<b>ENX 22 EASY INT</b> 1–1024 CPT, 4096 steps per turn	407
<b>Encoder MEnc 10</b> 12 CPT, 2 channel	415
<b>Encoder MEnc 13</b> 16 CPT, 2 channel	416–417
<b>Encoder 16 EASY</b> 128–1024 CPT, 3 channel	418–419
<b>Encoder 16 EASY XT</b> 128–1024 CPT, 3 channel <b>NEW</b>	420–421
<b>Encoder 16 EASY Absolute</b> 4096 steps per turn	422–423
<b>Encoder 16 EASY Absolute XT</b> 4096 steps per turn <b>NEW</b>	424–425
<b>Encoder MR</b> 16–1024 CPT, 2/3 channel	426–433

**Optical Encoder** (ENX can be configured online)

<b>ENX 6 OPT</b> 128 CPT, 3 channel	408
<b>ENX 8 OPT</b> 128 CPT, 3 channel	409
<b>ENX 16 RIO</b> 512–65536 CPT, 3 channel	410
<b>Encoder 8 OPT</b> 50 CPT, 2 channel	434
<b>Encoder 16 RIO</b> 1024–32768 CPT, 3 channel	435–436
<b>Encoder Enc 22</b> 100 CPT, 2 channel	437
<b>Encoder AEDL 5810</b> 1024–5000 CPT, 3 channel	438–439
<b>Encoder HEDS 5540</b> 500 CPT, 3 channel	440–441
<b>Encoder HEDL 5540</b> 500 CPT, 3 channel	442–446
<b>Encoder HEDL 9140</b> 500 CPT, 3 channel	447–448

**DC Tacho/Resolver** 449–450

<b>DC-Tacho DCT 22</b> 0.52 V	449
<b>Resolver Res 26</b> 10 V	450



First sterilizable encoder

# The first sterilizable drive system.

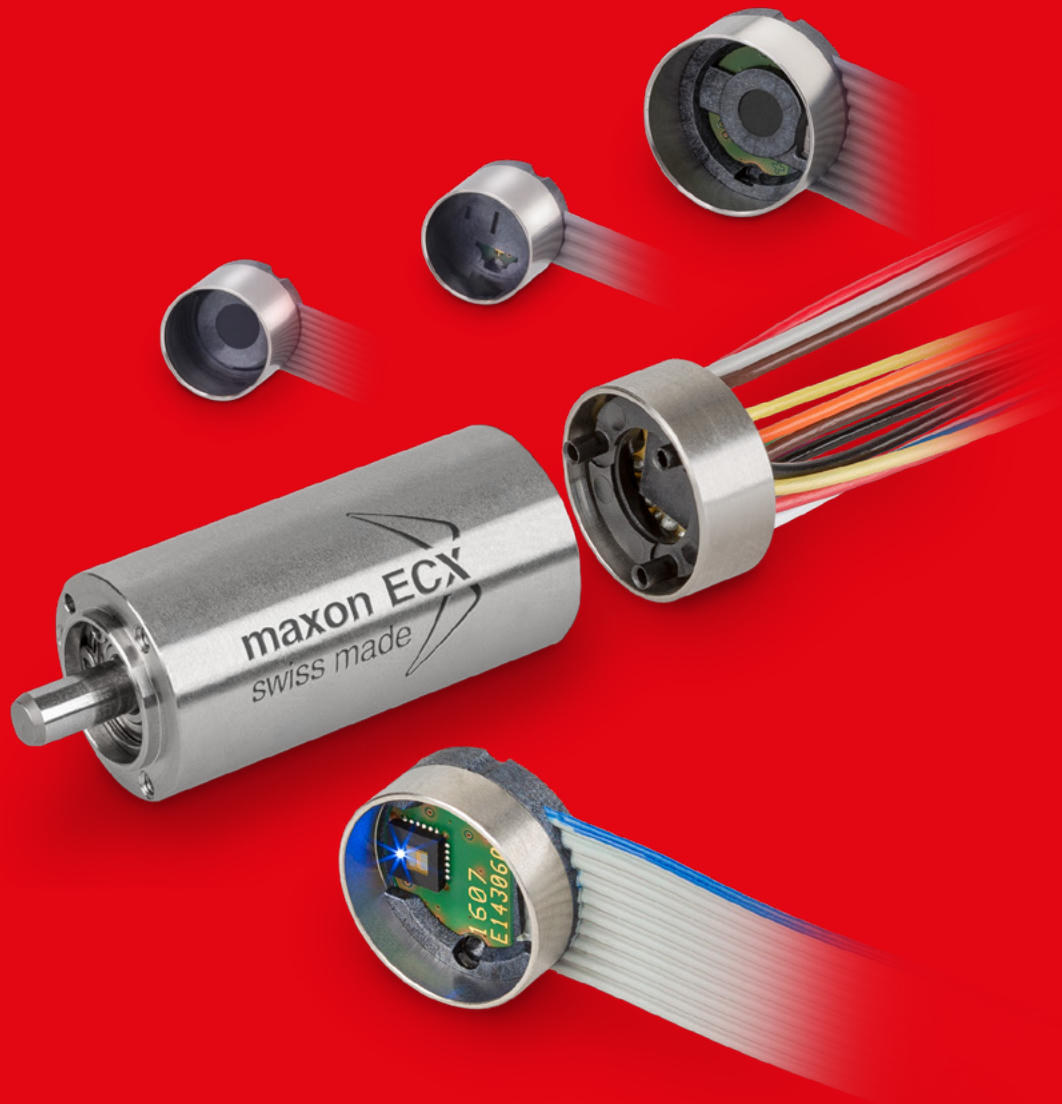
maxon's sterilizable encoder offers customers a complete system with high speed BLDC motor, gearhead and encoder that survives more than 1000 autoclave cycles.

## Advantages of a sterilizable drive system

maxon ECX motor	Up to 120'000 rpm, smooth-running.
maxon GPX gearhead	Transmission of high torque and speed. Up to 90% efficiency.
maxon ENX encoder	Integrated incremental (1024 impulses) or absolute (4096 steps) encoder.
Fast delivery	Configurable online and ready for delivery within 11 days.

[sterilizable.maxonmotor.com](http://sterilizable.maxonmotor.com)





# maxon ENX

maxon ENX encoders make an impression with their robust design and high signal quality. The 3-channel encoders with differential signals guarantee interference-free function even under the very high load, and the optical RIO encoder delivers the highest resolution in a small space. maxon ENX encoders can be configured online and are ready for delivery within 11 working days. [enx.maxonmotor.com](http://enx.maxonmotor.com)

<b>Standard Specification No. 103</b>	65
<b>ENX Program</b> (can be configured online)	394–410
<b>Inductive encoders</b>	412–414
<b>Magnetic encoders</b>	415–433
<b>Optical encoders</b>	434–448
<b>DC Tacho/Resolver</b>	449–450

# ENX 6 MAG

Encoder Ø6 mm, 64...256 CPT



Key Data	ENX 6 MAG Incremental	ENX 6 MAG Incremental, Commutation Signal
Number of channels	3	3
Max. counts per turn	256	256
Encoder length L	mm 6.1	6.1
Ambient temperature	°C -40...125	-40.. 125
Weight	g 1	1

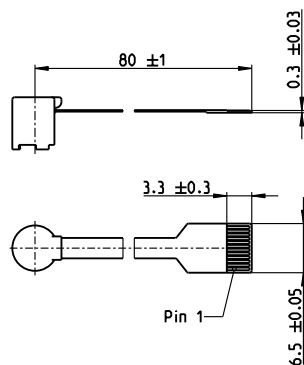
Selection criteria	ENX 6 MAG Incremental	ENX 6 MAG Incremental, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	▲	▲
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	ENX 6 MAG Incremental	ENX 6 MAG Incremental, Commutation Signal
Supply voltage Vcc	V 3.0...3.6	3.0.. 3.6
Typical current draw	mA 10	10
Max. operating frequency	kHz 107	107
Max. Speed	min <sup>-1</sup> 100000	100000
Connection	FPC, 12 pole, pitch 0.5 mm Pin 1 Motor+ (DC), W1 (BLDC) Pin 2 Motor- (DC), W2 (BLDC) Pin 3 Not connected (DC), W3 (BLDC) Pin 4 GND Pin 5 V <sub>CC</sub> Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9-11 Do not connect <sup>1</sup> Pin 12 Not connected Output signal: CMOS compatible Output current per channel: +4 mA	FPC, 12 pole, pitch 0.5 mm Pin 1 W1 Pin 2 W2 Pin 3 W3 Pin 4 GND Pin 5 V <sub>CC</sub> Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9 H1 Pin 10 H2 Pin 11 H3 Pin 12 Not connected Output signal: CMOS compatible Output current per channel: +4 mA

Configuration	ENX 6 MAG Incremental	ENX 6 MAG Incremental, Commutation Signal
Counts per turn <sup>1</sup>	64, 128, 256	64, 128, 256

maxon Modular System	Page	Dimensions Standard Version	Notes
maxon DC motor			
DCX 6 M	70		
maxon EC motor			
ECX SPEED 6 M	164-165		



<sup>1</sup> Applying voltage to these pins may destroy the encoder.

**Compatible connector:**  
Molex 52745-1297, TE 1-1734839-2  
Adapter 498157 required for all maxon controllers

**Please note:** max. continuous current 0.5 A

[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

# ENX 8 MAG

Encoder Ø8 mm, 64...256 CPT



Key Data	ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Number of channels	3	3
Max. counts per turn	256	256
Encoder length L	mm 5.8	5.8
Ambient temperature	°C -40...125	-40...125
Weight	g 1	1

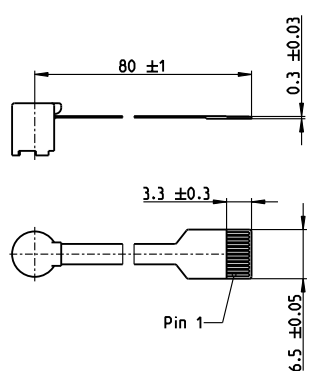
Selection criteria	ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	▲	▲
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Supply voltage Vcc	V 3.0...3.6	3.0...3.6
Typical current draw	mA 10	10
Max. operating frequency	kHz 107	107
Max. Speed	min <sup>-1</sup> 100000	100000
Connection	FPC, 12 pole, pitch 0.5 mm Pin 1 Motor+ (DC), W1 (BLDC) Pin 2 Motor- (DC), W2 (BLDC) Pin 3 Not connected (DC), W3 (BLDC) Pin 4 GND Pin 5 V <sub>CC</sub> Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9-11 Do not connect <sup>1</sup> Pin 12 Not connected Output signal: CMOS compatible Output current per channel: +4 mA	FPC, 12 pole, pitch 0.5 mm Pin 1 W1 Pin 2 W2 Pin 3 W3 Pin 4 GND Pin 5 V <sub>CC</sub> Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9 H1 Pin 10 H2 Pin 11 H3 Pin 12 Not connected Output signal: CMOS compatible Output current per channel: +4 mA

Configuration	ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Counts per turn <sup>1</sup>	64, 128, 256	64, 128, 256

maxon Modular System	Page	Dimensions Standard Version	Notes
maxon DC motor			
DCX 8 M	71		
maxon EC motor			
ECX SPEED 8 M	166-167		



<sup>1</sup> Applying voltage to these pins may destroy the encoder.

**Compatible connector:**  
Molex 52745-1297, TE 1-1734839-2  
Adapter 498157 required for all maxon controllers

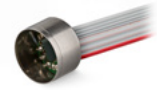
**Please note:** max. continuous current 0.5 A

[xdrives.maxonmotor.com](http://xdrives.maxonmotor.com)

# ENX 8 EASY INT

## Encoder Ø8 mm, 1...1024 CPT

Integrated into motor

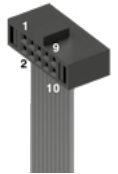
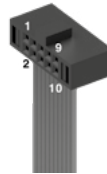


Key Data	EASY Incremental Differential	EASY Incremental, Commutation Signal
Number of channels	3	3
Max. counts per turn	1024	1024
Encoder length L	mm 0 (integrated into motor)	0 (integrated into motor)
Ambient temperature <sup>2</sup>	°C -20...100 (-40...100)	-20...100 (-40...100)
Weight	g <4	<4

Selection criteria	EASY Incremental Differential	EASY Incremental, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable    ▲ suitable to a limited extent    ● not suitable

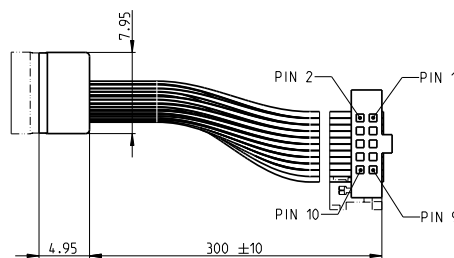
Specifications	EASY Incremental Differential	EASY Incremental, Commutation Signal
Supply voltage Vcc	V 5 ±0.5	5 ±0.5
Typical current draw	mA 17	17
Max. operating frequency	kHz 500	500
Max. Speed	rpm 80000	80000
Connector <sup>3</sup>	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Do not connect (BiSS-C Data <sup>4</sup> ) Pin 2 V <sub>CC</sub> 4.5...5.5 Pin 3 GND Pin 4 Do not connect (BiSS-C CLK <sup>4</sup> ) Pin 5 Channel Ā Pin 6 Channel A Pin 7 Channel B̄ Pin 8 Channel B Pin 9 Channel Ī Pin 10 Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Do not connect (BiSS-C Data) Pin 2 V <sub>CC</sub> 4.5...5.5 Pin 3 GND Pin 4 Do not connect (BiSS-C CLK) Pin 5 H1 Pin 6 Channel A Pin 7 H2 Pin 8 Channel B Pin 9 H3 Pin 10 Channel I Output signal: CMOS compatible Output current per channel: + 20 mA  Adapter Micromotor (Art.-No. 498157) required for all maxon controllers.



Configuration	EASY Incremental Differential	EASY Incremental, Commutation Signal
Counts per turn <sup>1</sup>	1...128, 256, 512, 1024	1...128, 256, 512, 1024
Cable length	mm 50, 100, 150, 200, 250, 300	50, 100, 150, 200, 250, 300
Cable insulation <sup>2</sup>	PVC/PO/FEP	PVC/PO/FEP
Alignment of cable outlet in relation to motor flange	° axial	axial

maxon Modular System	Page	Dimensions Standard Version	M 3:4	Notes
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maxon EC motor				
ECX SPEED 8 M	166-167			

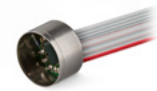


<sup>1</sup> maxon controllers require a resolution of at least 16 counts per turn and commutation signals.  
<sup>2</sup> For PVC-cable (-20...100°C)  
 For PO- and FEP cable (-40...100°C)  
<sup>3</sup> H1, index and angle zero are aligned with angle commutation zero (see p. 44).  
<sup>4</sup> Applying voltage to these pins may destroy the encoder.

# ENX 8 EASY INT Absolute

Encoder Ø8 mm, 4096 steps, Single Turn

Integrated into motor

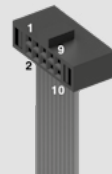
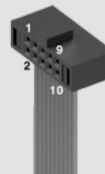


Key Data	EASY Absolute	EASY Absolute, Commutation Signal
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Encoder length L	mm 0 (integrated into motor)	0 (integrated into motor)
Ambient temperature <sup>1</sup>	°C -20...100 (-40...100)	-20...100 (-40...100)
Weight	g <4	<4

Selection criteria	EASY Absolute	EASY Absolute, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Absolute	EASY Absolute, Commutation Signal
Supply voltage V <sub>cc</sub>	V 5 ±0.5	5 ±0.5
Typical current draw	mA 17	17
Max. operating frequency	kHz 80000	80000
Connector <sup>2</sup>	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Data Pin 2 V <sub>cc</sub> 4.5...5.5 Pin 3 GND Pin 4 CLK Pin 5 Do not connect (A̅) Pin 6 Do not connect (A) Pin 7 Do not connect (B̅) Pin 8 Do not connect (B) Pin 9 Do not connect (I) Pin 10 Do not connect (I) Output signal: CMOS compatible Output current per channel: + 20 mA  Adapter EASY Absolute (Part number 488167) required for all maxon controllers.	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Data Pin 2 V <sub>cc</sub> 4.5...5.5 Pin 3 GND Pin 4 CLK Pin 5 H1 Pin 6 Do not connect (A) Pin 7 H2 Pin 8 Do not connect (B) Pin 9 H3 Pin 10 Do not connect (I) Output signal: CMOS compatible Output current per channel: + 20 mA

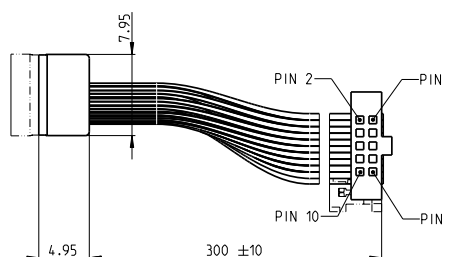


Configuration	EASY Absolute	EASY Absolute, Commutation Signal
Signal protocol	BiSS-C, SSI	BiSS-C, SSI
Cable length	mm 50, 100, 150, 200, 250, 300	50, 100, 150, 200, 250, 300
Cable insulation <sup>1</sup>	PVC/PO/FEP	PVC/PO/FEP
Alignment of cable outlet in relation to motor flange	axial	axial

maxon Modular System	Page	Dimensions Standard Version	M 3:4	Notes
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maxon EC motor				
ECX SPEED 8 M	166-167			

<sup>1</sup> For PVC-cable (-20...100°C)  
 For PO- and FEP cable (-40...100°C)  
<sup>2</sup> H1, index and angle zero are aligned with angle commutation zero (see p. 44).



# ENX 10 EASY/QUAD

## Encoder Ø10 mm, 1...1024 CPT

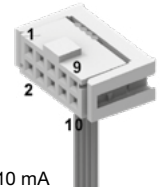
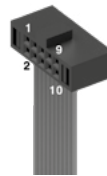


Key Data	EASY Incremental Differential	QUAD Incremental
Number of channels	3	2
Max. counts per turn	1024	1
Encoder length L <sup>4</sup>	mm 8.5	9.0
Ambient temperature	°C -40 ... +100	-40 ... +100
Weight	g <5	<5

Selection criteria	EASY Incremental Differential	QUAD Incremental
Speed and rotation direction detection	■	■
Speed and position control	■	▲
Compact and robust design	■	■
High resolution	■	●
Cost effective	■	■

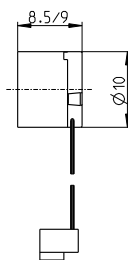
■ suitable    ▲ suitable to a limited extent    ● not suitable

Specifications	EASY Incremental Differential	QUAD Incremental
Supply voltage V <sub>cc</sub>	V 5 ±0.5	3.0–24
Typical current draw	mA 22	5.5
Max. operating frequency	kHz 500	2
Max. Speed	rpm 30000	30000
Connector	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series	10-pin 2.54 mm multipoint connector <sup>3</sup> (IEC/EN 60603-13 / DIN41651)
	Pin 1 Do not connect <sup>1</sup> (BiSS-C Data) Pin 2 V <sub>cc</sub> Pin 3 GND Pin 4 Do not connect <sup>1</sup> (BiSS-C CLK) Pin 5 Channel A Pin 6 Channel A Pin 7 Channel B Pin 8 Channel B Pin 9 Channel I Pin 10 Channel I	Pin 1 Not connected Pin 2 V <sub>cc</sub> Pin 3 Channel A Pin 4 Channel B Pin 5 GND Pin 6 Not connected Pin 7 Not connected Pin 8 Not connected Pin 9 Not connected Pin 10 Not connected
	Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	Output signal: TTL compatible Output current per channel: + 10 mA



Configuration	EASY Incremental Differential	QUAD Incremental
Counts per turn <sup>2</sup>	1 ... 1024	1
Cable length	mm 50, 100, 150, 200, 300, 500, 1000	50, 100, 150, 200, 300, 500, 1000
Alignment of cable outlet in relation to motor flange	° 15	15

maxon Modular System	Page	Dimensions Standard Configuration	M 1:1	Notes
<b>maxon DC motor</b>				
DCX 10 S	EASY, QUAD	72		<sup>1</sup> Applying voltage to these pins can destroy the encoder. <sup>2</sup> maxon controllers require a resolution of at least 16 counts per turn. <sup>3</sup> Option: 6-pol 2.54 mm pin header. <sup>4</sup> For attachment to DCX motors: plus 2-4 mm thick intermediate plate.  Option: ENX 10 EASY available with FFC cable, 0.5 mm pitch, matching connector Molex 52745-1097, adapter 506579 required for maxon controllers.
DCX 10 L	EASY, QUAD	73		
DCX 12 S	EASY, QUAD	74		
DCX 12 L	EASY, QUAD	75		
DCX 14 L	EASY, QUAD	76–77		
DCX 16 S	EASY, QUAD	78–79		
DCX 16 L	EASY, QUAD	80–81		
DCX 19 S	EASY, QUAD	82–83		
DCX 22 S	EASY, QUAD	84–85		
DCX 22 L	EASY, QUAD	86–87		
DCX 26 L	EASY, QUAD	88–89		
DCX 32 L	EASY, QUAD	90		
DCX 35 L	EASY, QUAD	91		
DC-max 16 S	EASY, QUAD	94–95		
DC-max 22 S	EASY, QUAD	96–97		
DC-max 26 S	QUAD	98–99		



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# ENX 10 EASY XT

Encoder Ø10 mm, 1...1024 CPT

**NEW**

maxon ENX



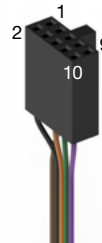
Key Data	EASY Incremental single-ended
Number of channels	3
Max. counts per turn	1024
Encoder length L <sup>2</sup>	mm 8.5
Ambient temperature	°C -55 ... +125
Weight	g <5

Selection criteria	EASY Incremental single-ended
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	▲

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Incremental single-ended
Supply voltage V <sub>cc</sub>	V 5 ±0.5
Typical current draw	mA 22
Max. operating frequency	kHz 1600
Max. Speed	rpm 30000
Connector	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651)

- Pin 1 Not connected
- Pin 2 V<sub>cc</sub>
- Pin 3 GND
- Pin 4 Not connected
- Pin 5 Not connected
- Pin 6 Channel A
- Pin 7 Not connected
- Pin 8 Channel B
- Pin 9 Not connected
- Pin 10 Channel I



Output signal: TTL compatible  
Output current per channel: + 10 mA

Configuration	EASY Incremental single-ended
Counts per turn <sup>1</sup>	1 ... 1024
Cable length	mm 300
Alignment of cable outlet in relation to motor flange	° 15

maxon Modular System	Page	Dimensions Standard Configuration	M 1:1	Notes
<b>maxon DC motor</b>				
DCX 10 S	72			<sup>1</sup> maxon controllers require a resolution of at least 16 counts per turn. <sup>2</sup> For attachment to DCX motors: plus 2-4 mm thick intermediate plate.
DCX 10 L	73			
DCX 12 S	74			
DCX 12 L	75			
DCX 14 L	76-77			
DCX 16 S	78-79			
DCX 16 L	80-81			
DCX 19 S	82-83			
DCX 22 S	84-85			
DCX 22 L	86-87			
DCX 26 L	88-89			
DCX 32 L	90			
DCX 35 L	91			

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# ENX 13 EASY INT

Encoder Ø13 mm, 1...1024 CPT/4096 steps, Single Turn

Sterilizable, integrated into motor

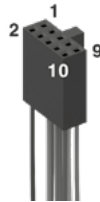


Key Data	EASY Incremental Differential	EASY Absolute
Number of channels	3	
Max. counts per turn	1024	
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L	mm 0 (integrated into motor)	0 (integrated into motor)
Ambient temperature	°C -40...100	-40...100
Weight	g <5	<5

Selection criteria	EASY Incremental Differential	EASY Absolute
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable    ▲ suitable to a limited extent    ● not suitable

Specifications	EASY Incremental Differential	EASY Absolute																												
Supply voltage V <sub>cc</sub>	V 5 ± 0.5	5 ± 0.5																												
Typical current draw	mA 22	22																												
Max. operating frequency	kHz 4000																													
Max. Speed	rpm 200 000	200 000																												
Connector <sup>2</sup>	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 28	without connector																												
	<table border="0"> <tr> <td>Pin 1</td> <td>Do not connect</td> </tr> <tr> <td>Pin 2 (black)</td> <td>V<sub>cc</sub></td> </tr> <tr> <td>Pin 3 (brown)</td> <td>GND</td> </tr> <tr> <td>Pin 4</td> <td>Do not connect</td> </tr> <tr> <td>Pin 5 (red)</td> <td>Channel A</td> </tr> <tr> <td>Pin 6 (orange)</td> <td>Channel A</td> </tr> <tr> <td>Pin 7 (yellow)</td> <td>Channel B</td> </tr> <tr> <td>Pin 8 (green)</td> <td>Channel B</td> </tr> <tr> <td>Pin 9 (blue)</td> <td>Channel I</td> </tr> <tr> <td>Pin 10 (violet)</td> <td>Channel I</td> </tr> </table>	Pin 1	Do not connect	Pin 2 (black)	V <sub>cc</sub>	Pin 3 (brown)	GND	Pin 4	Do not connect	Pin 5 (red)	Channel A	Pin 6 (orange)	Channel A	Pin 7 (yellow)	Channel B	Pin 8 (green)	Channel B	Pin 9 (blue)	Channel I	Pin 10 (violet)	Channel I	<table border="0"> <tr> <td>green</td> <td>Data</td> </tr> <tr> <td>black</td> <td>V<sub>cc</sub></td> </tr> <tr> <td>brown</td> <td>GND</td> </tr> <tr> <td>yellow</td> <td>CLK</td> </tr> </table>	green	Data	black	V <sub>cc</sub>	brown	GND	yellow	CLK
Pin 1	Do not connect																													
Pin 2 (black)	V <sub>cc</sub>																													
Pin 3 (brown)	GND																													
Pin 4	Do not connect																													
Pin 5 (red)	Channel A																													
Pin 6 (orange)	Channel A																													
Pin 7 (yellow)	Channel B																													
Pin 8 (green)	Channel B																													
Pin 9 (blue)	Channel I																													
Pin 10 (violet)	Channel I																													
green	Data																													
black	V <sub>cc</sub>																													
brown	GND																													
yellow	CLK																													
	Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	Output signal: CMOS compatible Output current per channel: + 20 mA																												



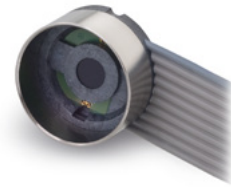
Configuration	EASY Incremental Differential	EASY Absolute
Counts per turn <sup>1</sup>	1...1024	
Signal protocol		BiSS-C, SSI
Cable length	mm 200, 500	200, 500
Electric connection		cable length/pin connection/connector

maxon Modular System	Page	Sterilization information	Notes
<b>maxon EC motor</b>			
ECX SPEED 13 M	168-171	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>135°C</b>  <b>SSS</b> </div> Typically 1000 autoclave cycles  Sterilization with steam Temperature +134 ± 4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 minutes	<sup>1</sup> maxon controllers require a resolution of at least 16 counts per turn and commutation signals. <sup>2</sup> H1, index and angle zero are aligned with angle commutation zero (see p. 44).
ECX SPEED 13 L	172-175		
		The connector is not sterilizable and needs to be removed first.	



# ENX 16 EASY

Encoder Ø16 mm, 1...1024 CPT

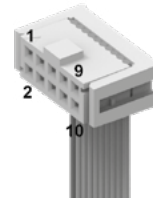


Key Data	EASY Incremental Differential	
Number of channels		3
Max. counts per turn		1024
Encoder length L <sup>2</sup>	mm	8.5
Ambient temperature	°C	-40 ... +100
Weight	g	7

Selection criteria	EASY Incremental Differential	
Speed and rotation direction detection	■	
Speed and position control	■	
Compact and robust design	■	
High resolution	■	
Cost effective	■	

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Incremental Differential	
Supply voltage V <sub>cc</sub>	V	5 ±0.5
Typical current draw	mA	22
Max. operating frequency	kHz	500
Max. Speed	rpm	30000
Connector	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651)	
	Pin 1 N.C.	
	Pin 2 V <sub>cc</sub>	
	Pin 3 GND	
	Pin 4 N.C.	
	Pin 5 Channel Ā	
	Pin 6 Channel A	
	Pin 7 Channel B̄	
	Pin 8 Channel B	
	Pin 9 Channel Ī	
	Pin 10 Channel I	
	Output signal: EIA-Standard RS 422	
	Output current per channel: ± 20 mA	



Configuration	EASY Incremental Differential	
Counts per turn <sup>1</sup>		1 ... 1024
Cable length	mm	50, 100, 150, 200, 300, 500, 1000
Alignment of cable outlet in relation to motor flange	°	15

maxon Modular System	Page	Dimensions Standard Version	M 3:4	Notes
<b>maxon DC motor</b>				
DCX 16 S	78–79			<sup>1</sup> maxon controllers require a resolution of at least 16 counts per turn. <sup>2</sup> For attachment to DCX motors: plus 2-4 mm thick intermediate plate.
DCX 16 L	80–81			
DCX 19 S	82–83			
DCX 22 S	84–85			
DCX 22 L	86–87			
DCX 26 L	88–89			
DCX 32 L	90			
DCX 35 L	91			
DC-max 26 S	98–99			

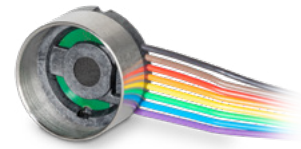
Also available in combination with BLDC motors (see pages 418–419)

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# ENX 16 EASY XT

## Encoder Ø16 mm, 1...1024 CPT

**NEW**

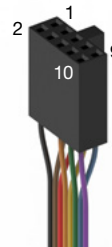


Key Data	EASY Incremental Differential
Number of channels	3
Max. counts per turn	1024
Encoder length L <sup>2</sup>	mm 8.5
Ambient temperature	°C -55 ... +125
Weight	g 7

Selection criteria	EASY Incremental Differential
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	▲

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Incremental Differential
Supply voltage V <sub>cc</sub>	V 5 ±0.5
Typical current draw	mA 22
Max. operating frequency	kHz 1600
Max. Speed	rpm 30000
Connector	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) Pin 1 N.C. Pin 2 V <sub>cc</sub> Pin 3 GND Pin 4 N.C. Pin 5 Channel $\bar{A}$ Pin 6 Channel A Pin 7 Channel $\bar{B}$ Pin 8 Channel B Pin 9 Channel $\bar{I}$ Pin 10 Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA



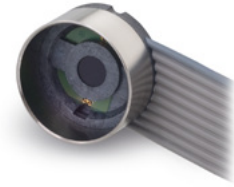
Configuration	EASY Incremental Differential
Counts per turn <sup>1</sup>	1 ... 1024
Cable length	mm 500, 1000, 1500
Alignment of cable outlet in relation to motor flange	° 15

maxon Modular System	Page	Dimensions Standard Version	M 3:4	Notes
<b>maxon DC motor</b>				
DCX 16 S	78–79			<sup>1</sup> maxon controllers require a resolution of at least 16 counts per turn. <sup>2</sup> For attachment to DCX motors: plus 2-4 mm thick intermediate plate.
DCX 16 L	80–81			
DCX 19 S	82–83			
DCX 22 S	84–85			
DCX 22 L	86–87			
DCX 26 L	88–89			
DCX 32 L	90			
DCX 35 L	91			
Also available in combination with BLDC motors (see pages 420–421)				

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# ENX 16 EASY Absolute

Encoder Ø16 mm, 4096 steps, Single Turn



Key Data	EASY Absolute	
Steps per turn	4096	
Resolution (bit single turn)	12	
Encoder length L <sup>1</sup>	mm 8.5	
Ambient temperature	°C -40 ... +100	
Weight	g 7	

Selection criteria	EASY Absolute	
Speed and rotation direction detection	■	
Speed and position control	■	
Compact and robust design	■	
High resolution	■	
Cost effective	■	

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Absolute	
Supply voltage V <sub>cc</sub>	V 5 ±0.5	
Typical current draw	mA 17	
Max. Speed	rpm 30000	
Connector	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) Pin 1 Data Pin 2 V <sub>cc</sub> Pin 3 GND Pin 4 CLK Pin 5 Do not connect (A) Pin 6 Do not connect (A) Pin 7 Do not connect (B) Pin 8 Do not connect (B) Pin 9 Do not connect (I) Pin 10 Do not connect (I) Output signal: CMOS compatible Output current per channel ± 20 mA	

Configuration	EASY Absolute	
Signal protocol	BiSS-C, SSI	
Cable length	mm 50, 100, 150, 200, 300, 500, 1000	
Alignment of cable outlet in relation to motor flange	° 15	

maxon Modular System	Page	Dimensions Standard Version	M 3:4	Notes
<b>maxon DC motor</b>				
DCX 16 S	78–79			Adapter EASY Absolute (Part number 488167) required for all maxon controllers. <sup>1</sup> For attachment to DCX motors: added 2-4 mm thick intermediate plate.
DCX 16 L	80–81			
DCX 19 S	82–83			
DCX 22 S	84–85			
DCX 22 L	86–87			
DCX 26 L	88–89			
DCX 32 L	90			
DCX 35 L	91			
DC-max 26 S	98–99			

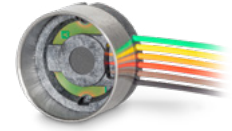
Also available in combination with BLDC motors (see pages 422–423)

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# ENX 16 Absolute XT

Encoder Ø16 mm, 4096 steps, Single Turn

**NEW**

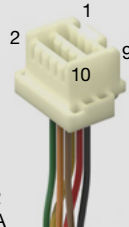


Key Data	EASY Absolute Differential
Steps per turn	4096
Resolution (bit single turn)	12
Encoder length L <sup>1</sup>	mm 9.0
Ambient temperature	°C -55 ... +125
Weight	g 7

Selection criteria	EASY Absolute Differential
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	■
Cost effective	▲

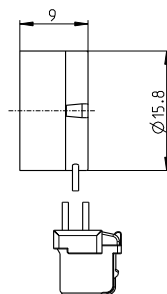
■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Absolute Differential
Supply voltage Vcc	V 5 ±0.25
Typical current draw	mA 22
Max. Speed	rpm 30000
Connector	10-pin 1.5 mm multipoint connector Molex Clik-Mate (503154) Pin 1 Not connected Pin 2 Not connected Pin 3 Not connected Pin 4 Not connected Pin 5 CLK Pin 6 CLK\ Pin 7 Data Pin 8 Data\ Pin 9 GND Pin 10 V <sub>CC</sub> Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA



Configuration	EASY Absolute Differential
Signal protocol	BiSS-C, SSI
Cable length	mm 500, 1000
Alignment of cable outlet in relation to motor flange	° 15

maxon Modular System	Page	Dimensions Standard Version	M 3:4	Notes
<b>maxon DC motor</b>				
DCX 16 S	78-79			<sup>1</sup> For attachment to DCX motors: added 2-4 mm thick intermediate plate.
DCX 16 L	80-81			
DCX 19 S	82-83			
DCX 22 S	84-85			
DCX 22 L	86-87			
DCX 26 L	88-89			
DCX 32 L	90			
DCX 35 L	91			



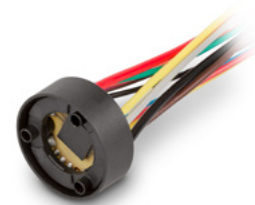
Also available in combination with BLDC motors (see pages 424-425)

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# ENX 16 EASY INT

Encoder Ø16 mm, 1...1024 CPT / 4096 steps, Single Turn

Sterilizable, integrated into motor

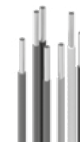
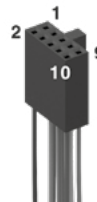


Key Data	EASY Incremental Differential	EASY Absolute
Number of channels	3	
Max. counts per turn	1024	
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L	mm -1 (integrated into motor)	-1 (integrated into motor)
Ambient temperature	°C -40...100	-40...100
Weight	g <5	<5


Selection criteria	EASY Incremental Differential	EASY Absolute
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Incremental Differential <sup>3</sup>	EASY Absolute
Supply voltage V <sub>cc</sub>	V 5 ± 0.5	5 ± 0.5
Typical current draw	mA 22	22
Max. operating frequency	kHz 4000	
Max. Speed	rpm 200000	200000
Connector <sup>2</sup>	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 28	without connector
	Pin 1 Do not connect Pin 2 (black) V <sub>cc</sub> Pin 3 (brown) GND Pin 4 Do not connect Pin 5 (red) Channel $\bar{A}$ Pin 6 (orange) Channel A Pin 7 (yellow) Channel $\bar{B}$ Pin 8 (green) Channel B Pin 9 (blue) Channel $\bar{I}$ Pin 10 (violet) Channel I	cable AWG 28 green Data black V <sub>cc</sub> brown GND yellow CLK
	Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	Output signal: CMOS compatible Output current per channel + 20 mA



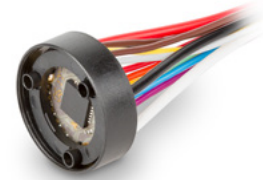
Configuration	EASY Incremental Differential	EASY Absolute
Counts per turn <sup>1</sup>	1...1024	
Signalprotokoll		BiSS-C, SSI
Cable length	mm 200, 500	200, 500
Electric connection		cable length/pin connection/connector

maxon Modular System	Page	Sterilization information	Notes
<b>maxon EC motor</b>			
ECX SPEED 16 M	176–179	 Typically 1000 autoclave cycles Sterilization with steam Temperature +134 ± 4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 minutes	<sup>1</sup> maxon controllers require a resolution of at least 16 counts per turn and commutation signals. <sup>2</sup> H1, index and angle zero are aligned with angle commutation zero (see p. 44).
ECX SPEED 16 L	180–183		
		The connector is not sterilizable and needs to be removed first.	

# ENX 19 EASY INT

Encoder Ø19 mm, 1...1024 CPT / 4096 steps, Single Turn

Sterilizable, integrated into motor

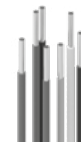
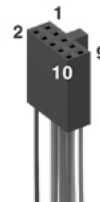


Key Data	EASY Incremental Differential	EASY Absolute
Number of channels	3	
Max. counts per turn	1024	
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L	mm -1.4 (integrated into motor)	-1.4 (integrated into motor)
Ambient temperature	°C -40...100	-40...100
Weight	g <5	<5


Selection criteria	EASY Incremental Differential	EASY Absolute
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable    ▲ suitable to a limited extent    ● not suitable

Specifications	EASY Incremental Differential <sup>3</sup>	EASY Absolute
Supply voltage V <sub>cc</sub>	V 5 ± 0.5	5 ± 0.5
Typical current draw	mA 22	22
Max. operating frequency	kHz 4000	
Max. Speed	rpm 200 000	200 000
Connector <sup>2</sup>	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 26	without connector
	Pin 1 Do not connect	cable AWG 26
	Pin 2 (black) V <sub>cc</sub>	green Data
	Pin 3 (brown) GND	black V <sub>cc</sub>
	Pin 4 Do not connect	brown GND
	Pin 5 (red) Channel $\bar{A}$	yellow CLK
	Pin 6 (orange) Channel A	
	Pin 7 (yellow) Channel $\bar{B}$	
	Pin 8 (green) Channel B	
	Pin 9 (blue) Channel $\bar{I}$	
	Pin 10 (violet) Channel I	
	Output signal: EIA-Standard RS 422	Output signal: CMOS compatible
	Output current per channel: ± 20 mA	Output current per channel + 20 mA



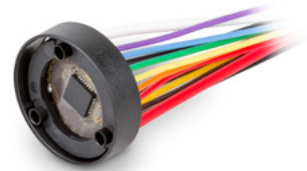
Configuration	EASY Incremental Differential	EASY Absolute
Counts per turn <sup>1</sup>	1...1024	
Signalprotokoll		BiSS-C, SSI
Cable length	mm 200, 500	200, 500
Electric connection		cable length/pin connection/connector

maxon Modular System	Page	Sterilization information	Notes
<b>maxon EC motor</b>			
ECX SPEED 19 M	184–187	 Typically 1000 autoclave cycles	<sup>1</sup> maxon controllers require a resolution of at least 16 counts per turn and commutation signals. <sup>2</sup> H1, index and angle zero are aligned with angle commutation zero (see p. 44).
ECX SPEED 19 L	188–191		
		Sterilization with steam Temperature +134 ± 4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 minutes	
		The connector is not sterilizable and needs to be removed first.	

# ENX 22 EASY INT

Encoder Ø22 mm, 1...1024 CPT / 4096 steps, Single Turn

Sterilizable, integrated into motor

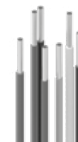
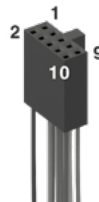


Key Data	EASY Incremental Differential	EASY Absolute
Number of channels	3	
Max. counts per turn	1024	
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L	mm -1.5 (integrated into motor)	-1.5 (integrated into motor)
Ambient temperature	°C -40...100	-40...100
Weight	g <5	<5


Selection criteria	EASY Incremental Differential	EASY Absolute
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	■	■
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Incremental Differential <sup>3</sup>	EASY Absolute
Supply voltage V <sub>cc</sub>	V 5 ± 0.5	5 ± 0.5
Typical current draw	mA 22	22
Max. operating frequency	kHz 4000	
Max. Speed	rpm 200000	200000
Connector <sup>2</sup>	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 26 Pin 1 Do not connect Pin 2 (black) V <sub>cc</sub> Pin 3 (brown) GND Pin 4 Do not connect Pin 5 (red) Channel $\bar{A}$ Pin 6 (orange) Channel A Pin 7 (yellow) Channel $\bar{B}$ Pin 8 (green) Channel B Pin 9 (blue) Channel $\bar{I}$ Pin 10 (violet) Channel I Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	without connector  cable AWG 26 green Data black V <sub>cc</sub> brown GND yellow CLK  Output signal: CMOS compatible Output current per channel + 20 mA



Configuration	EASY Incremental Differential	EASY Absolute
Counts per turn <sup>1</sup>	1...1024	
Signalprotokoll		BiSS-C, SSI
Cable length	mm 200, 500	200, 500
Electric connection		cable length/pin connection/connector

maxon Modular System	Page	Sterilization information	Notes
maxon EC motor			
ECX SPEED 22 M	192-195	 Typically 1000 autoclave cycles Sterilization with steam Temperature +134 ± 4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 minutes  The connector is not sterilizable and needs to be removed first.	<sup>1</sup> maxon controllers require a resolution of at least 16 counts per turn and commutation signals. <sup>2</sup> H1, index and angle zero are aligned with angle commutation zero (see p. 44).
ECX SPEED 22 L	196-199		

# ENX 6 OPT

Encoder Ø6 mm, 128 CPT



Key Data		ENX 6 OPT Incremental
Number of channels		3
Max. counts per turn		128
Encoder length L	mm	5.8
Ambient temperature	°C	-20...85
Weight	g	1

Selection criteria	ENX 6 OPT Incremental
Speed and rotation direction detection	■
Speed and position control	■
Compact and robust design	■
High resolution	▲
Cost effective	■

■ suitable    ▲ suitable to a limited extent    ● not suitable

Specifications	ENX 6 OPT Incremental
Supply voltage Vcc	V 3.0...6.0
Typical current draw	mA 4
Max. operating frequency	kHz 1000
Max. Speed	min <sup>-1</sup> 60000
Connection	FPC, 12 pole, pitch 0.5 mm Pin 1 Motor+ (DC), W1 (BLDC) Pin 2 Motor- (DC), W2 (BLDC) Pin 3 Not connected (DC), W3 (BLDC) Pin 4 GND Pin 5 V <sub>CC</sub> Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9-12 Not connected Output signal: CMOS compatible Output current per channel + 5 mA

Configuration	ENX 6 OPT Incremental
Counts per turn	128

maxon Modular System	Seite	Dimensions Standard Version	Notes
<b>maxon DC motor</b>			
DCX 6 M	70		
<b>maxon EC motor (only sensorless motors)</b>			
ECX SPEED 6 M	164-165		<p><sup>1</sup> Applying voltage to these pins may destroy the encoder.</p> <p><b>Compatible connector:</b>            Molex 52745-1297, TE 1-1734839-2            Adapter 498157 required for all maxon controllers</p> <p><b>Please note:</b> max. continuous current 0.5 A</p>

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# ENX 8 OPT

Encoder Ø8 mm, 128 CPT



Key Data	ENX 8 OPT Incremental	
Number of channels		3
Max. counts per turn		128
Encoder length L	mm	5.8
Ambient temperature	°C	-20...85
Weight	g	1

Selection criteria	ENX 8 OPT Incremental	
Speed and rotation direction detection	■	
Speed and position control	■	
Compact and robust design	■	
High resolution	▲	
Cost effective	■	

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	ENX 8 OPT Incremental	
Supply voltage Vcc	V	3.0...6.0
Typical current draw	mA	4
Max. operating frequency	kHz	1000
Max. Speed	min <sup>-1</sup>	60000
Connection	FPC, 12 pole, pitch 0.5 mm Pin 1 Motor+ (DC), W1 (BLDC) Pin 2 Motor- (DC), W2 (BLDC) Pin 3 Not connected (DC), W3 (BLDC) Pin 4 GND Pin 5 V <sub>CC</sub> Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9-12 Not connected Output signal: CMOS compatible Output current per channel + 5 mA	

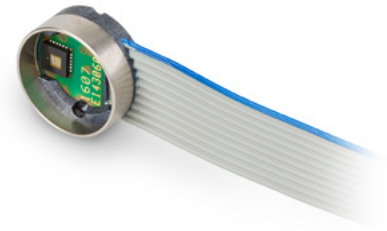
Configuration	ENX 8 OPT Incremental	
Counts per turn		128

maxon Modular System	Seite	Dimensions Standard Version	Notes
<b>maxon DC motor</b>			
DCX 8 M	71		<sup>1</sup> Applying voltage to these pins may destroy the encoder.  <b>Compatible connector:</b> Molex 52745-1297, TE 1-1734839-2 Adapter 498157 required for all maxon controllers  <b>Please note:</b> max. continuous current 0.5 A
<b>maxon EC motor (only sensorless motors)</b>			
ECX SPEED 8 M	166-167		

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# ENX 16 RIO

Encoder Ø16 mm, 512 ... 65536 CPT

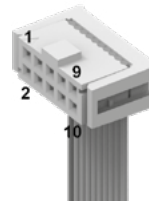


Key Data		RIO Incremental, optical	
Number of channels		3	
Max. counts per turn		65536	
Encoder length L <sup>1</sup>	mm	7.0	
Ambient temperature	°C	-40 ... +100	
Weight	g	15	

Selection criteria		RIO Incremental, optical	
Speed and rotation direction detection		■	
Speed and position control		■	
Compact and robust design		■	
High resolution		■	
Cost effective		■	

■ suitable    ▲ suitable to a limited extent    ● not suitable

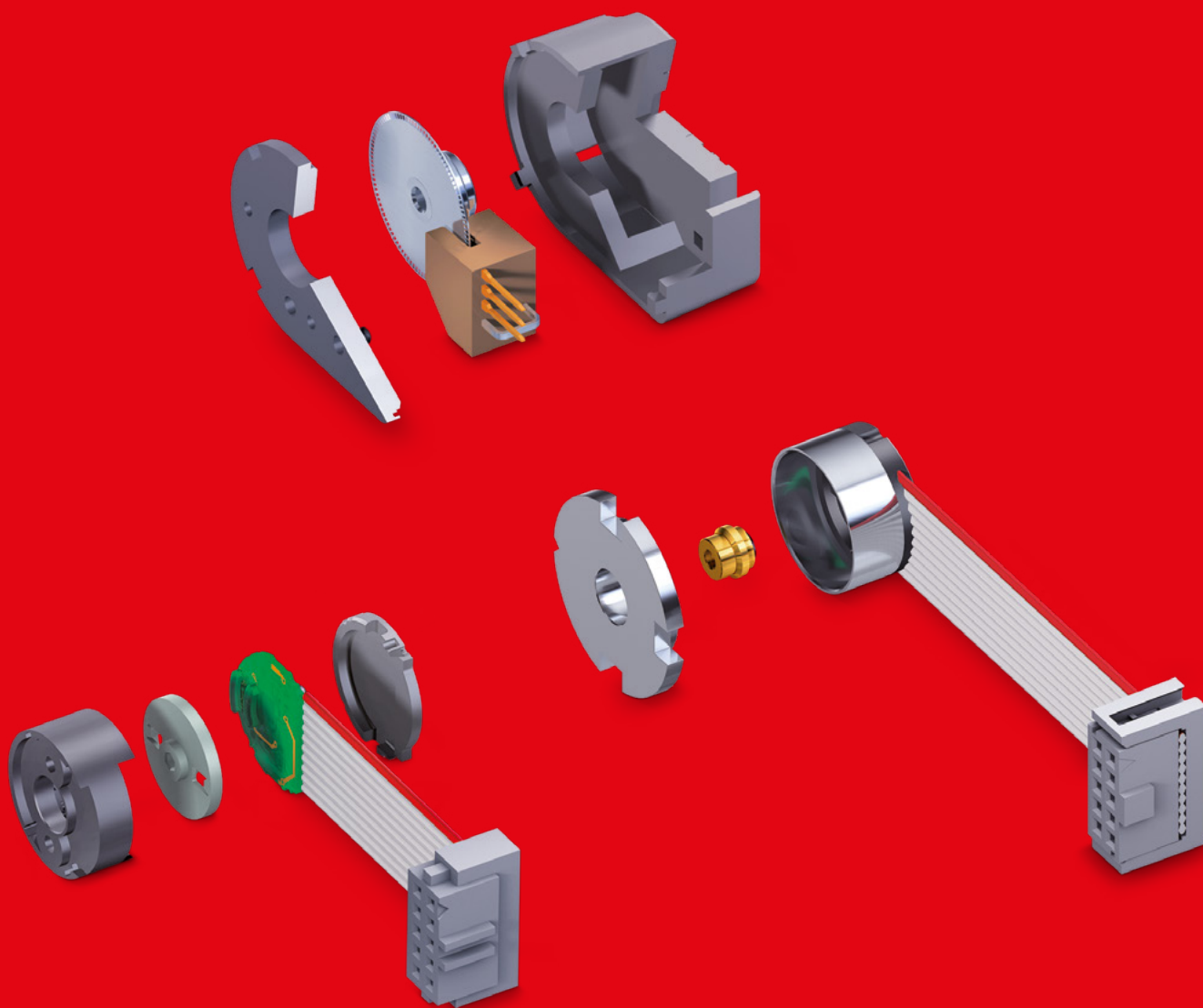
Specifications		RIO Incremental, optical	
Supply voltage V <sub>cc</sub>	V	5 ± 10%	
Typical current draw	mA	50	
Max. operating frequency	kHz	3125	
Max. Speed	min <sup>-1</sup>	40000	
Connection		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651)	
		Pin 1 Do not connect	
		Pin 2 V <sub>cc</sub>	
		Pin 3 GND	
		Pin 4 Do not connect	
		Pin 5 Channel A	
		Pin 6 Channel A	
		Pin 7 Channel B	
		Pin 8 Channel B	
		Pin 9 Channel I	
		Pin 10 Channel I	
		Output signal: EIA-Standard RS 422	
		Output current per channel: ± 20 mA	



Configuration		RIO Incremental, optical	
Counts per turn		512... 65536 (in steps of 256)	
Cable length	mm	50, 100, 150, 200, 300, 500, 1000	
Alignment of cable outlet in relation to motor flange	°	15	

maxon Modular System	Seite	Dimensions Standard Version	Notes
<b>maxon DC motor</b>			
DCX 16 S	78–79		<sup>1</sup> Applying voltage to these pins may destroy the encoder.
DCX 16 L	80–81		
DCX 19 S	82–83		
DCX 22 S	84–85		
DCX 22 L	86–87		
DCX 26 L	88–89		
DCX 32 L	90		
DCX 35 L	91		
Also available in combination with BLDC motors (see pages 435–436)			

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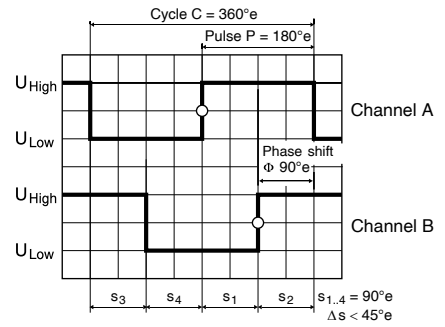
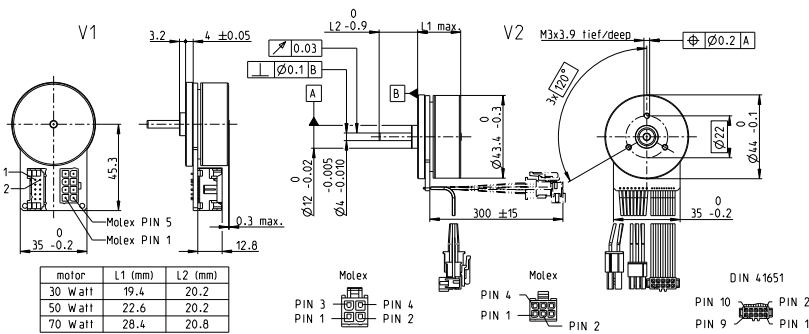
# maxon sensor

Robust encoders, DC tachometers, and resolvers with high accuracy and high signal resolution. Due to resonance, these are mainly mounted on motors with a continuous shaft. The assembly requires adjustment to the motors and may only be done in the delivery plant.

<b>Standard Specification No. 103</b>	65
<b>ENX Program</b> (can be configured online)	394–410
<b>Inductive encoders</b>	412–414
<b>Magnetic encoders</b>	415–433
<b>Optical encoders</b>	434–448
<b>DC Tacho/Resolver</b>	449–450

# Encoder MILE 256–2048 CPT, 2 Channels, with Line Driver

Integrated into motor



**M 1:4**

motor	L1 (mm)	L2 (mm)
30 Watt	19.4	20.2
50 Watt	22.6	20.2
70 Watt	28.4	20.8

Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

**Article Numbers**

	462002	462003	462004	462005
V1 with connector				
V2 with cable and connector	613318	613319	613320	613321

**Type**

Counts per turn	256	512	1024	2048
Number of channels	2	2	2	2
Max. operating frequency (kHz)	1000	1000	1000	1000
Max. speed (rpm)	10000	10000	10000	10000



**maxon Modular System**

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead			
EC 45 flat, 30 W, A	262					19.4	19.4	19.4	19.4
EC 45 flat, 30 W, A	262	GP 42, 3 - 15 Nm	363			●	●	●	●
EC 45 flat, 30 W, A	262	GS 45, 0.5 - 2.0 Nm	365			●	●	●	●
EC 45 flat, 50 W, A	263					22.6	22.6	22.6	22.6
EC 45 flat, 50 W, A	263	GP 42, 3 - 15 Nm	363			●	●	●	●
EC 45 flat, 50 W, A	263	GS 45, 0.5 - 2.0 Nm	365			●	●	●	●
EC 45 flat, 70 W, A	264					28.4	28.4	28.4	28.4
EC 45 flat, 70 W, A	264	GP 42, 3 - 15 Nm	363			●	●	●	●
EC 45 flat, 70 W, A	264	GS 45, 0.5 - 2.0 Nm	365			●	●	●	●

**Technical Data**

Supply voltage $V_{CC}$	$5 B \pm 10\%$
Typical current draw	15 mA
Output signal	CMOS compatible
State length $s_n 90^\circ e$ (1000 rpm)	$45 \dots 135^\circ e$
Signal rise time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 1 \text{ k}\Omega$ , $25^\circ C$ )	100 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 1 \text{ k}\Omega$ , $25^\circ C$ )	100 ns
Operating temperature range	$-40 \dots +100^\circ C$
Moment of inertia of code wheel	$\leq 3.5 \text{ gcm}^2$
Output current per channel	max. 4 mA
Open collector output of the Hall sensors with integrated pull-up resistor	$10 \text{ k}\Omega \pm 20\%$
Wiring diagram for Hall sensors see p. 47	

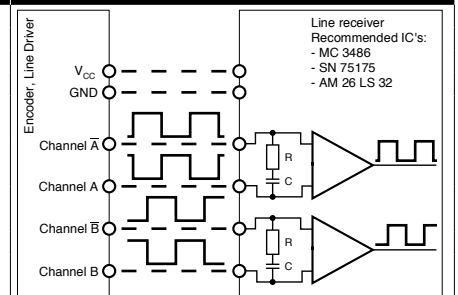
**Pin Allocation**

<b>Connection V1</b>	
<b>Motor + Sensors</b>	
Pin 1	Hall sensor 1
Pin 2	Hall sensor 2
Pin 3	$V_{Hall}$ 4.5...18 VDC
Pin 4	Motor winding 3
Pin 5	Hall sensor 3
Pin 6	GND
Pin 7	Motor winding 1
Pin 8	Motor winding 2
<b>Encoder</b>	
Pin 1	N.C.
Pin 2	$V_{CC}$
Pin 3	GND
Pin 4	N.C.
Pin 5	Channel A
Pin 6	Channel A
Pin 7	Channel B
Pin 8	Channel B
Pin 9	Do not connect
Pin 10	Do not connect
<b>Pin type:</b>	
39-28-1083 Molex	
DIN 41651/EN 60603-13	

**Connection V2**

<b>Sensors (AWG 24)</b>	
Pin 1	Hall sensor 1
Pin 2	Hall sensor 2
Pin 3	Hall sensor 3
Pin 4	GND
Pin 5	$V_{Hall}$ 4.5...18 VDC
Pin 6	N.C.
<b>Motor (AWG 24)</b>	
Pin 1	Motor winding 1
Pin 2	Motor winding 2
Pin 3	Motor winding 3
Pin 4	Not connected
<b>Encoder (AWG 28)</b>	
Pin 1	N.C.
Pin 2	$V_{CC}$
Pin 3	GND
Pin 4	N.C.
Pin 5	Channel A
Pin 6	Channel A
Pin 7	Channel B
Pin 8	Channel B
Pin 9	Do not connect
Pin 10	Do not connect
<b>Pin type:</b>	
43025-600 Molex	
39-01-2040 Molex	
DIN 41651/EN 60603-13	

**Pin Allocation**

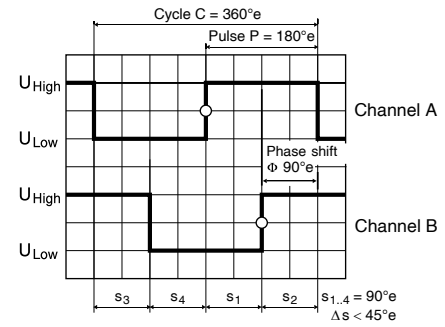
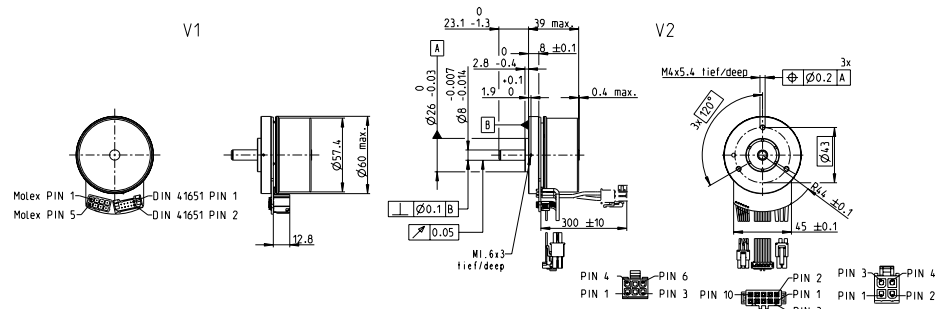


Opt. terminal resistance  $R = \text{typical } 120 \Omega$   
Capacitor  $C \geq 0.1 \text{ nF}$  per m line length

# Encoder MILE 512-4096 CPT, 2 Channels, with Line Driver

Integrated into motor

maxon sensor



**M 1:6**

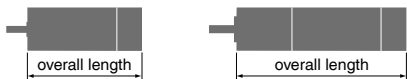
Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

	651156	651163	651166	651168
V1 with connector				
V2 with cable and connector	421985	421986	421987	421988

Type	651156	651163	651166	651168
Counts per turn	512	1024	2048	4096
Number of channels	2	2	2	2
Max. operating frequency (kHz)	1000	1000	1000	1000
Max. speed (rpm)	6000	6000	6000	6000



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC 60 flat, 100 W	267					39.0 / 39.0
EC 60 flat, 100 W	267	GP 52, 4 - 30 Nm	367			● / ●
EC 60 flat, 150 W	268					39.0 / 39.0
EC 60 flat, 150 W	268	GP 52, 4 - 30 Nm	367			● / ●

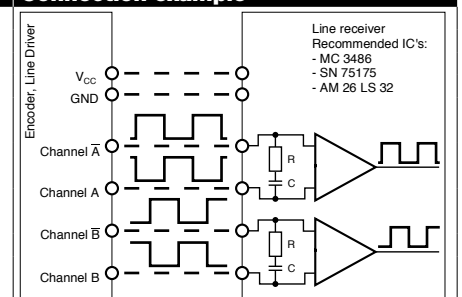
### Technical Data

Supply voltage $V_{CC}$	$5 V \pm 10\%$
Typical current draw	15 mA
Output signal	CMOS compatible
State length $s_n$ (1000 rpm)	$90^\circ e \pm <45^\circ e$
Signal rise time (typically, at $C_L = 25 pF, R_L = 1 k\Omega, 25^\circ C$ )	100 ns
Signal fall time (typically, at $C_L = 25 pF, R_L = 1 k\Omega, 25^\circ C$ )	100 ns
Operating temperature range	$-40...+100^\circ C$
Moment of inertia of code wheel	$\leq 13 gcm^2$
Output current per channel	max. 4 mA
Open collector output of the Hall sensors with integrated pull-up resistor	$10 k\Omega \pm 20\%$
Wiring diagram for Hall sensors see p. 47	

### Pin Allocation

Connection V1	Connection V2
<b>Motor + Sensors</b>	<b>Sensors (AWG 24)</b>
Pin 1 Hall sensor 1	Pin 1 Hall sensor 1
Pin 2 Hall sensor 2	Pin 2 Hall sensor 2
Pin 3 $V_{Hall} 4.5...18 VDC$	Pin 3 Hall sensor 3
Pin 4 Motor winding 3	Pin 4 GND
Pin 5 Hall sensor 3	Pin 5 $V_{Hall} 4.5...18 VDC$
Pin 6 GND	Pin 6 N.C.
Pin 7 Motor winding 1	<b>Motor (AWG 16)</b>
Pin 8 Motor winding 2	Pin 1 Motor winding 1
	Pin 2 Motor winding 2
	Pin 3 Motor winding 3
	Pin 4 Not connected
<b>Encoder</b>	<b>Encoder (AWG 28)</b>
Pin 1 N.C.	Pin 1 N.C.
Pin 2 $V_{CC}$	Pin 2 $V_{CC}$
Pin 3 GND	Pin 3 GND
Pin 4 N.C.	Pin 4 N.C.
Pin 5 Channel A	Pin 5 Channel A
Pin 6 Channel A	Pin 6 Channel A
Pin 7 Channel B	Pin 7 Channel B
Pin 8 Channel B	Pin 8 Channel B
Pin 9 Do not connect	Pin 9 Do not connect
Pin 10 Do not connect	Pin 10 Do not connect
<b>Pin type:</b>	
46015-0806 Molex	43025-600 Molex
DIN 41651/EN 60603-13	39-01-2040 Molex
	DIN 41651/EN 60603-13

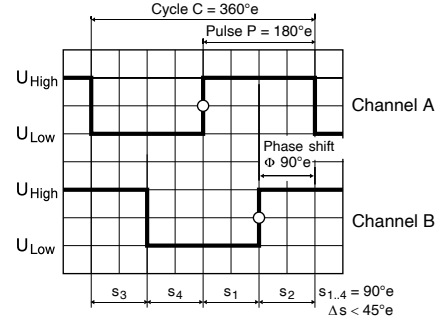
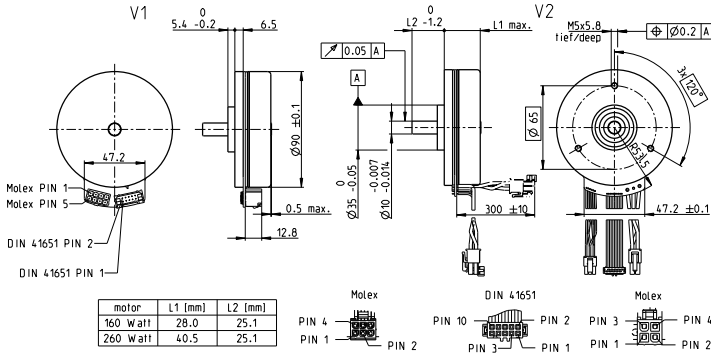
### Connection example



Opt. terminal resistance  $R =$  typical  $120 \Omega$   
Capacitor  $C \geq 0.1 nF$  per m line length

# Encoder MILE 512-6400 CPT, 2 Channels, with Line Driver

Integrated into motor



**M 1:6**

Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

	621796	621789	621795	621790	621794	621791	621793	621792
V1 with connector	607517	607510	607516	607511	607515	607512	607514	607513

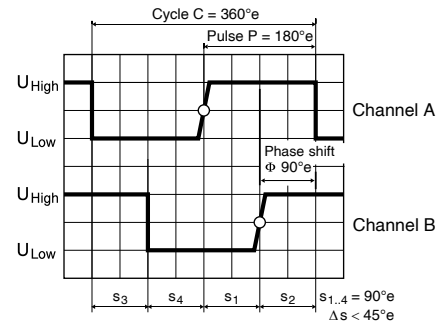
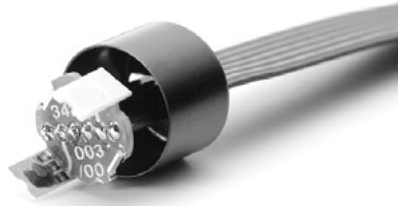
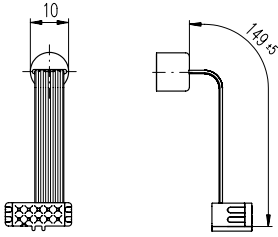
Type	512	800	1024	1600	2048	3200	4096	6400
Counts per turn	2	2	2	2	2	2	2	2
Number of channels	1000	1000	1000	1000	1000	1000	1000	1000
Max. operating frequency (kHz)	5000	5000	5000	5000	5000	5000	5000	5000
Max. speed (rpm)								



maxon Modular System						Overall length [mm] / ● see Gearhead			
+ Motor	Page	+ Gearhead	Page	+ Brake	Page				
EC 90 flat, 160 W	270					28.0	28.0	28.0	28.0
EC 90 flat, 220 W	271					28.0	28.0	28.0	28.0
EC 90 flat, 260 W	273					40.5	40.5	40.5	40.5
EC 90 flat, 400 W	274					40.5	40.5	40.5	40.5

Technical Data	Pin Allocation	Connection example
<p>Supply voltage <math>V_{CC}</math> 5 V ± 10%</p> <p>Typical current draw 15 mA</p> <p>Output signal driver used: CMOS compatible</p> <p>State length <math>s_n</math> (500 rpm) 90°e ± &lt;45°e</p> <p>Signal rise and fall times (typically, at <math>C_L = 25</math> pF, <math>R_L = 1</math> kΩ, 25°C) 100 ns</p> <p>Operating temperature range -40...+100 °C</p> <p>Moment of inertia of code wheel ≤ 65 gcm<sup>2</sup></p> <p>Output current per channel max. 4 mA</p> <p>Open collector output of the Hall sensors with integrated pull-up resistor 10 kΩ ± 20%</p> <p>Wiring diagram for Hall sensors see p. 47</p>	<p><b>Connection V1</b></p> <p><b>Motor + Sensors</b></p> <p>Pin 1 Hall sensor 1</p> <p>Pin 2 Hall sensor 2</p> <p>Pin 3 <math>V_{Hall}</math> 3.5...18 VDC</p> <p>Pin 4 Motor winding 3</p> <p>Pin 5 Hall sensor 3</p> <p>Pin 6 GND</p> <p>Pin 7 Motor winding 1</p> <p>Pin 8 Motor winding 2</p> <p><b>Encoder</b></p> <p>Pin 1 N.C.</p> <p>Pin 2 <math>V_{CC}</math></p> <p>Pin 3 GND</p> <p>Pin 4 N.C.</p> <p>Pin 5 Channel A</p> <p>Pin 6 Channel A</p> <p>Pin 7 Channel B</p> <p>Pin 8 Channel B</p> <p>Pin 9 Do not connect</p> <p>Pin 10 Do not connect</p> <p><b>Pin type:</b></p> <p>46015-0806 Molex</p> <p>DIN 41651/EN 60603-13</p>	<p><b>Connection V2</b></p> <p><b>Sensors (AWG24)</b></p> <p>Pin 1 Hall sensor 1</p> <p>Pin 2 Hall sensor 2</p> <p>Pin 3 Hall sensor 3</p> <p>Pin 4 GND</p> <p>Pin 5 <math>V_{Hall}</math> 3.5...18 VDC</p> <p>Pin 6 NTC*</p> <p><b>Motor (AWG 16)</b></p> <p>Pin 1 Motor winding 1</p> <p>Pin 2 Motor winding 2</p> <p>Pin 3 Motor winding 3</p> <p>Pin 4 Not connected</p> <p><b>Encoder (AWG 28)</b></p> <p>Pin 1 N.C.</p> <p>Pin 2 <math>V_{CC}</math></p> <p>Pin 3 GND</p> <p>Pin 4 N.C.</p> <p>Pin 5 Channel A</p> <p>Pin 6 Channel A</p> <p>Pin 7 Channel B</p> <p>Pin 8 Channel B</p> <p>Pin 9 Do not connect</p> <p>Pin 10 Do not connect</p> <p><b>Encoder (AWG 28)</b></p> <p>Pin 1 N.C.</p> <p>Pin 2 <math>V_{CC}</math></p> <p>Pin 3 GND</p> <p>Pin 4 N.C.</p> <p>Pin 5 Channel A</p> <p>Pin 6 Channel A</p> <p>Pin 7 Channel B</p> <p>Pin 8 Channel B</p> <p>Pin 9 Do not connect</p> <p>Pin 10 Do not connect</p>
<p>Additional information can be found under 'Downloads' in the maxon online shop.</p>	<p>*NTC resistance 25°C: 5 kΩ ± 1%, beta (25-85°C): 3490K</p>	<p>Line receiver Recommended IC's:</p> <ul style="list-style-type: none"> <li>- MC 3486</li> <li>- SN 75175</li> <li>- AM 26 LS 32</li> </ul> <p>Opt. terminal resistance R = typical 120 Ω</p> <p>Capacitor C ≥ 0.1 nF per m line length</p>

# Encoder MEnc 10 12 CPT, 2 Channels



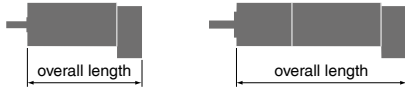
Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

138061

Type	
Counts per turn <sup>1</sup>	12
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	100000



### maxon Modular System

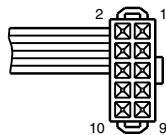
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 10, 0.75 W	105			25.1
RE 10, 0.75 W	105	GP 10, 0.005 - 0.1 Nm	325	●
RE 10, 0.75 W	105	GP 10, 0.01 - 0.15 Nm	326	●
RE 10, 1.5 W	107			32.7
RE 10, 1.5 W	107	GP 10, 0.005 - 0.1 Nm	325	●
RE 10, 1.5 W	107	GP 10, 0.01 - 0.15 Nm	326	●

### Technical Data

Supply voltage $V_{CC}$	3.8 - 24 V
Typical current draw	6 mA
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.03 gcm <sup>2</sup>
Operating temperature range	-20...+80 °C
Open collector output with integrated pull-up resistance	10 k $\Omega$ $\pm$ 20%

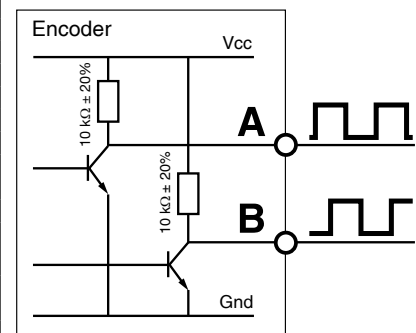
<sup>1</sup> maxon controllers require a resolution of at least 16 pulses.

### Pin Allocation

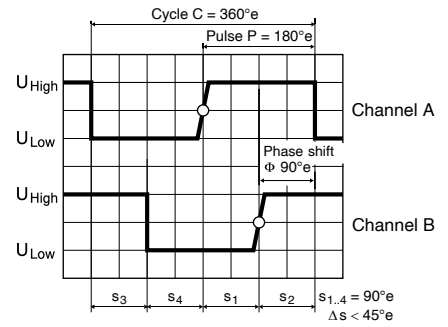
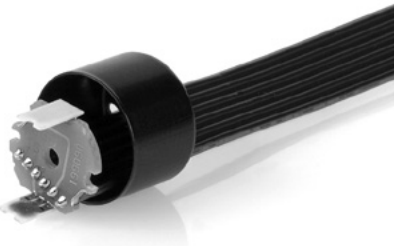
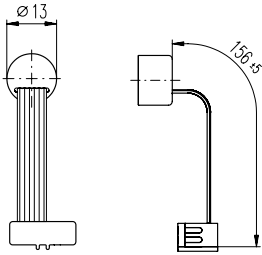


- 1 Motor +
  - 2  $V_{CC}$
  - 3 Channel A
  - 4 Channel B
  - 5 GND
  - 6 Motor -
- Pin type DIN 41651/  
EN 60603-13  
(Type 3M 89110-0101 HA)  
flat band cable AWG 28

### Connection example



# Encoder MEnc 13 16 CPT, 2 Channels



Direction of rotation cw (definition cw p. 64)

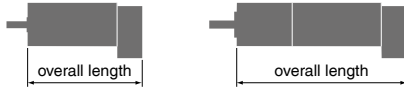
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

110778

### Type

Counts per turn	16
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	75000



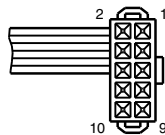
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 13, 0.75 W	110/111			27.0/29.4
RE 13, 0.75 W	111	GP 13, 0.05 - 0.15 Nm	328	●
RE 13, 0.75 W	111	GP 13, 0.2 - 0.35 Nm	329	●
RE 13, 2 W	114/115			39.2/41.6
RE 13, 2 W	115	GP 13, 0.05 - 0.15 Nm	328	●
RE 13, 2 W	115	GP 13, 0.2 - 0.35 Nm	329	●
RE 13, 1.5 W	118/119			30.3/32.7
RE 13, 1.5 W	119	GP 13, 0.05 - 0.15 Nm	328	●
RE 13, 1.5 W	119	GP 13, 0.2 - 0.35 Nm	329	●
RE 13, 3 W	122/123			42.5/44.9
RE 13, 3 W	123	GP 13, 0.05 - 0.15 Nm	328	●
RE 13, 3 W	123	GP 13, 0.2 - 0.35 Nm	329	●
RE 16, 3.2 W	126			46.5
RE 16, 3.2 W	126	GP 16, 0.1 - 0.6 Nm	334/335	●
RE 16, 3.2 W	126	GP 16 S	377/378	●
RE 16, 4.5 W	128			49.7
RE 16, 4.5 W	128	GP 16, 0.1 - 0.6 Nm	334/335	●
RE 16, 4.5 W	128	GP 16 S	377/378	●
A-max 16	144/146			33.5
A-max 16	144/146	GS 16, 0.01 - 0.03 Nm	330/331	●
A-max 16	144/146	GS 16, 0.06 - 0.1 Nm	332/333	●
A-max 16	144/146	GP 16, 0.1 - 0.3 Nm	334	●
A-max 16	144/146	GP 16 S	377/378	●
A-max 19	148/150			36.4/39.0
A-max 19	148/150	GP 19, 0.1 - 0.3 Nm	336	●
A-max 19	148/150	GP 22, 0.5 - 2.0 Nm	339/341	●
A-max 19	148/150	GS 24, 0.1 Nm	345	●
A-max 19	148/150	GP 22 S	380/381	●

### Technical Data

Supply voltage $V_{CC}$	3.8 - 24 V
Typical current draw	6 mA
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm <sup>2</sup>
Operating temperature range	-20...+80 °C
Open collector output with integrated pull-up resistance	10 kΩ ± 20%

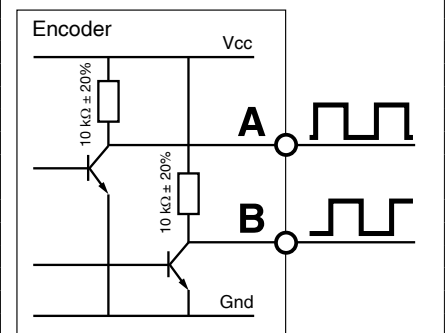
### Pin Allocation



- 1 Motor +
- 2  $V_{CC}$
- 3 Channel A
- 4 Channel B
- 5 GND
- 6 Motor -

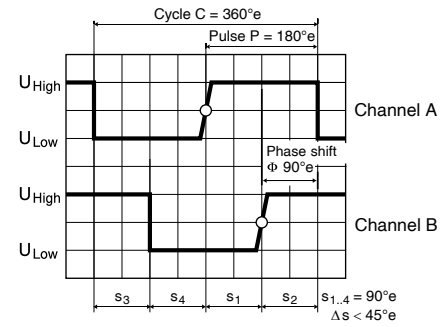
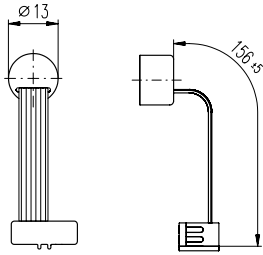
Pin type  
DIN 41651/EN 60603-13  
(Type 3M 89110-0101 HA)  
flat band cable AWG 28

### Connection example





# Encoder MEnc 13 16 CPT, 2 Channels



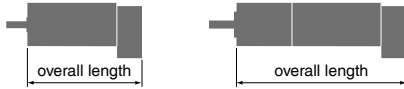
Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

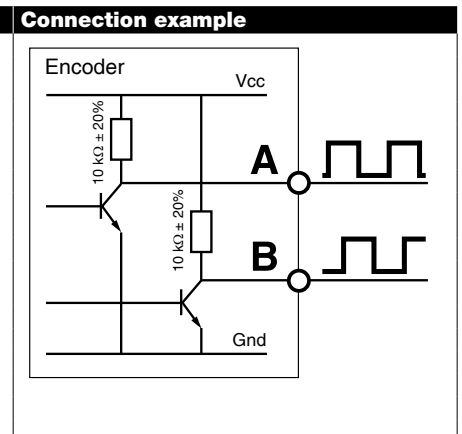
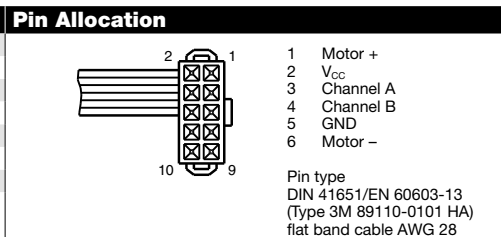
110778

Type	
Counts per turn	16
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	75 000

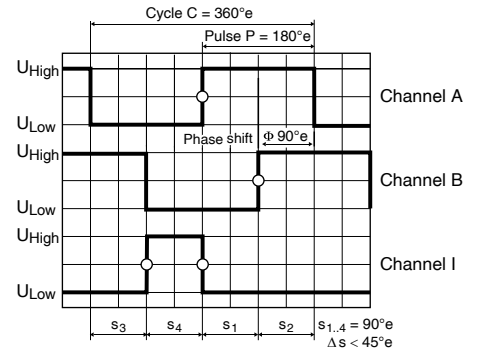
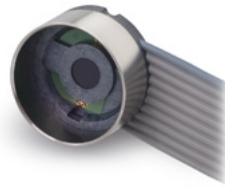
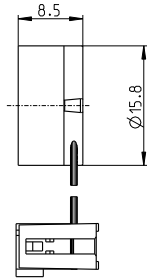


maxon Modular System				
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
A-max 22	152/154			39.0
A-max 22	152/154	GP 22, 0.1 - 0.6 Nm	337/338	●
A-max 22	152/154	GP 22, 0.5 - 2.0 Nm	339/341	●
A-max 22	152/154	GS 24, 0.1 Nm	345	●
A-max 22	152/154	GP 22 S	380/381	●
A-max 26	155-158			51.8
A-max 26	155-158	GP 26, 0.75 - 4.5 Nm	346	●
A-max 26	155-158	GS 30, 0.07 - 0.2 Nm	347	●
A-max 26	155-158	GP 32, 0.75 - 4.5 Nm	348	●
A-max 26	155-158	GP 32, 0.75 - 4.5 Nm	349	●
A-max 26	155-158	GS 38, 0.1 - 0.6 Nm	360	●
A-max 26	155-158	GP 32 S	382-387	●

Technical Data	
Supply voltage $V_{CC}$	3.8 - 24 V
Typical current draw	6 mA
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm <sup>2</sup>
Operating temperature range	-20...+80 °C
Open collector output with integrated pull-up resistance	10 kΩ ± 20%



# Encoder 16 EASY 128–1024 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

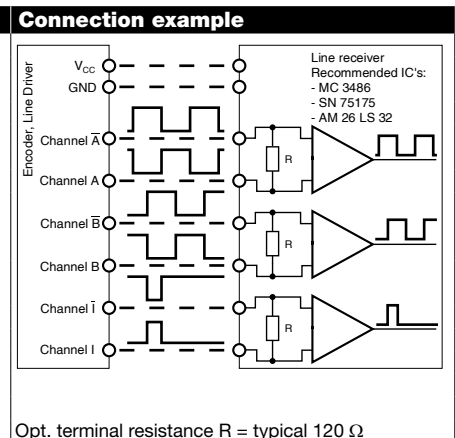
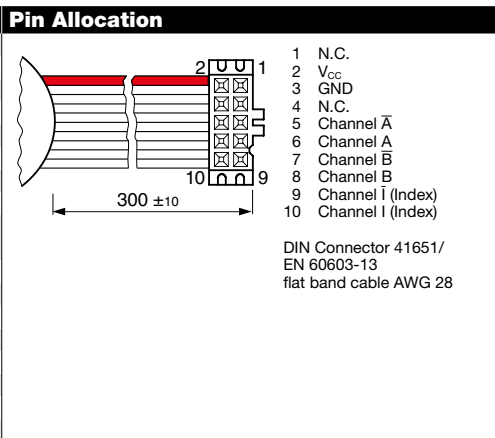
Part Numbers					
499356	499357	499358	499359	499360	499361

Type (provisional)	499356	499357	499358	499359	499360	499361
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	1600	1600	1600	1600	1600	1600
Max. speed (rpm)	30000	30000	30000	30000	30000	30000
Phase shift $\Phi$ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70

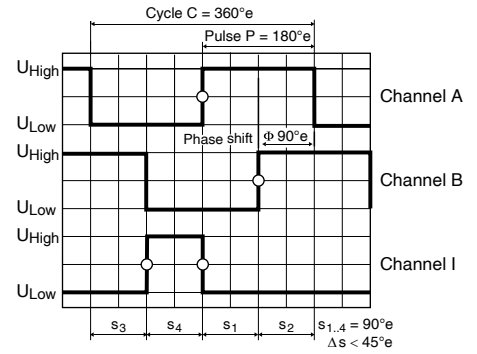
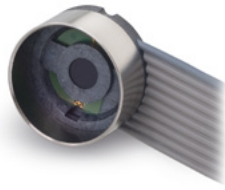
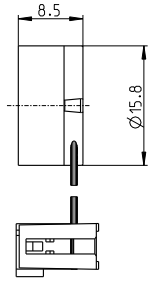


maxon Modular System										
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
EC-4pole 22, 90 W	229					60.8	60.8	60.8	60.8	60.8
EC-4pole 22, 90 W	229	GP 22, 2.0 - 3.4 Nm	343			●	●	●	●	●
EC-4pole 22, 90 W	229	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-4pole 22, 90 W	229	GP 32 S	382-387			●	●	●	●	●
EC-4pole 22, 120 W	230					78.2	78.2	78.2	78.2	78.2
EC-4pole 22, 120 W	230	GP 22, 2.0 - 3.4 Nm	343			●	●	●	●	●
EC-4pole 22, 120 W	230	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-4pole 22, 120 W	230	GP 32 S	382-387			●	●	●	●	●
EC-4pole 30, 100 W	231					60.9	60.9	60.9	60.9	60.9
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356			●	●	●	●	●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362			●	●	●	●	●
EC-4pole 30, 100 W	231			AB 20	488	97.3	97.3	97.3	97.3	97.3
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●	●	●	●	●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●	●	●	●	●
EC-4pole 30, 200 W	233					77.9	77.9	77.9	77.9	77.9
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356			●	●	●	●	●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362			●	●	●	●	●
EC-4pole 30, 200 W	233			AB 20	488	114.3	114.3	114.3	114.3	114.3
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●	●	●	●	●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●	●	●	●	●
EC-i 30, 30 W	240					53.7	53.7	53.7	53.7	53.7
EC-i 30, 30 W	240	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 30, 30 W	240	GP 32 S	382-387			●	●	●	●	●
EC-i 30, 45 W	241					53.7	53.7	53.7	53.7	53.7
EC-i 30, 45 W	241	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 30, 45 W	241	GP 32 S	382-387			●	●	●	●	●

Technical Data	
Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at $C_L = 200$ pF, $R_L = 100$ Ω)	20 ns
The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 44.	
Additional information can be found in the maxon online shop under downloads.	
The index signal I is synchronized with channel A or B.	



# Encoder 16 EASY 128–1024 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

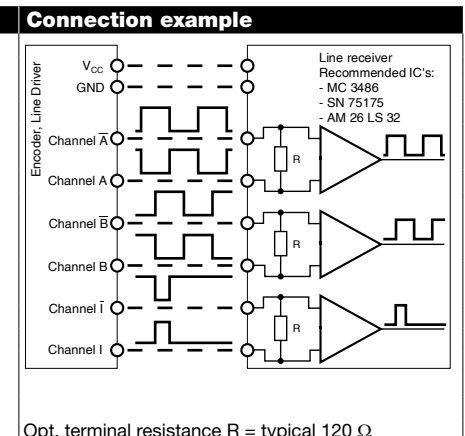
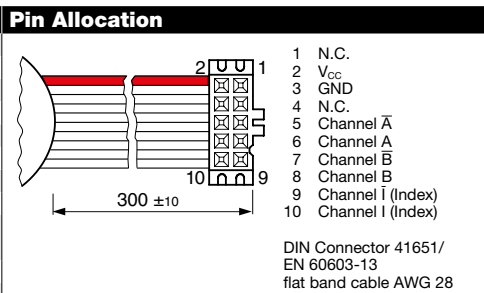
Part Numbers						
499356	499357	499358	499359	499360	499361	

Type (provisional)	128	256	500	512	1000	1024
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	1600	1600	1600	1600	1600	1600
Max. speed (rpm)	30000	30000	30000	30000	30000	30000
Phase shift $\Phi$ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70



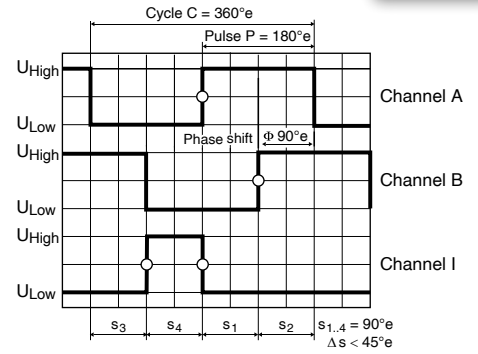
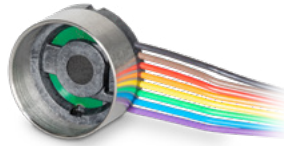
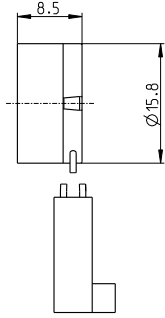
maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-i 30, 50 W	242					75.7 75.7 75.7 75.7 75.7 75.7
EC-i 30, 50 W	242	GP 32, 1.0 - 6.0 Nm	353			● ● ● ● ● ●
EC-i 30, 50 W	242	GP 32 S	382-387			● ● ● ● ● ●
EC-i 30, 75 W	243					75.7 75.7 75.7 75.7 75.7 75.7
EC-i 30, 75 W	243	GP 32, 1.0 - 6.0 Nm	353			● ● ● ● ● ●
EC-i 30, 75 W	243	GP 32 S	382-387			● ● ● ● ● ●
EC-i 40, 50 W	244-245					37.7 37.7 37.7 37.7 37.7 37.7
EC-i 40, 50 W	244	GP 32, 1.0 - 6.0 Nm	353			● ● ● ● ● ●
EC-i 40, 50 W	244	GP 32 S	382-387			● ● ● ● ● ●
EC-i 40, 50 W	244-245	GP 42, 3.0 - 15.0 Nm	361			● ● ● ● ● ●
EC-i 40, 70 W	246-247					47.7 47.7 47.7 47.7 47.7 47.7
EC-i 40, 70 W	246	GP 32, 1.0 - 6.0 Nm	353			● ● ● ● ● ●
EC-i 40, 70 W	246	GP 32 S	382-387			● ● ● ● ● ●
EC-i 40, 70 W	246-247	GP 42, 3.0 - 15.0 Nm	361			● ● ● ● ● ●
EC-i 40, 100 W	248					67.7 67.7 67.7 67.7 67.7 67.7
EC-i 40, 100 W	248	GP 42, 3.0 - 15.0 Nm	361			● ● ● ● ● ●
EC-i 52, 180 W	249					93.7 93.7 93.7 93.7 93.7 93.7
EC-i 52, 180 W	249	GP 52, 4.0 - 30.0 Nm	366			● ● ● ● ● ●
EC-i 52, 200 W	250					123.7 123.7 123.7 123.7 123.7 123.7
EC-i 52, 200 W	250	GP 52, 4.0 - 30.0 Nm	366			● ● ● ● ● ●

Technical Data	
Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at $C_L = 200$ pF, $R_L = 100$ Ω)	20 ns
The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 44.	
Additional information can be found in the maxon online shop under downloads.	
The index signal I is synchronized with channel A or B.	



# Encoder 16 EASY XT 128–1024 CPT, 3 Channels, with Line Driver RS 422

**NEW**



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

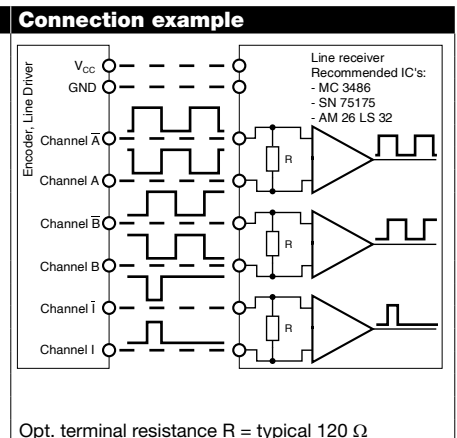
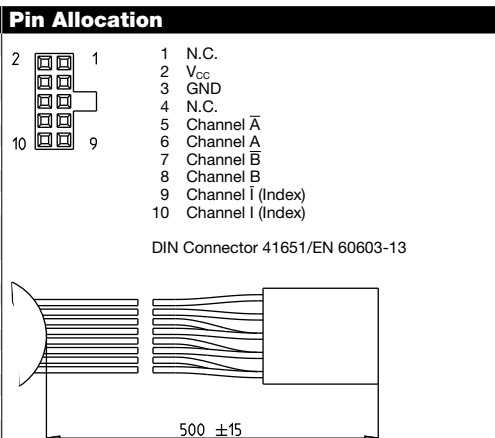
Part Numbers					
584776	606052	577614	542079	577671	530965

Type (provisional)	128	256	500	512	1000	1024
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	1600	1600	1600	1600	1600	1600
Max. speed (rpm)	30000	30000	30000	30000	30000	30000
Phase shift $\Phi$ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70



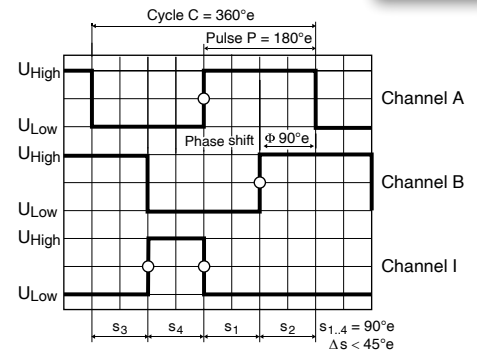
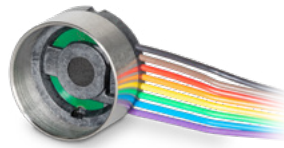
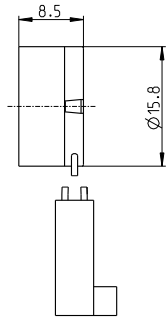
maxon Modular System										
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
EC-4pole 22, 90 W	229					60.8	60.8	60.8	60.8	60.8
EC-4pole 22, 90 W	229	GP 22, 2.0 - 3.4 Nm	343			●	●	●	●	●
EC-4pole 22, 90 W	229	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-4pole 22, 90 W	229	GP 32 S	382-387			●	●	●	●	●
EC-4pole 22, 120 W	230					78.2	78.2	78.2	78.2	78.2
EC-4pole 22, 120 W	230	GP 22, 2.0 - 3.4 Nm	343			●	●	●	●	●
EC-4pole 22, 120 W	230	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-4pole 22, 120 W	230	GP 32 S	382-387			●	●	●	●	●
EC-4pole 30, 100 W	231					60.9	60.9	60.9	60.9	60.9
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356			●	●	●	●	●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362			●	●	●	●	●
EC-4pole 30, 100 W	231			AB 20	488	97.3	97.3	97.3	97.3	97.3
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●	●	●	●	●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●	●	●	●	●
EC-4pole 30, 200 W	233					77.9	77.9	77.9	77.9	77.9
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356			●	●	●	●	●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362			●	●	●	●	●
EC-4pole 30, 200 W	233			AB 20	488	114.3	114.3	114.3	114.3	114.3
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●	●	●	●	●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●	●	●	●	●
EC-i 30, 30 W	240					53.7	53.7	53.7	53.7	53.7
EC-i 30, 30 W	240	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 30, 30 W	240	GP 32 S	382-387			●	●	●	●	●
EC-i 30, 45 W	241					53.7	53.7	53.7	53.7	53.7
EC-i 30, 45 W	241	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 30, 45 W	241	GP 32 S	382-387			●	●	●	●	●

Technical Data	
Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-55...+125 °C
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at $C_L = 200$ pF, $R_L = 100$ Ω)	10 ns
The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 44.	
Additional information can be found in the maxon online shop under downloads.	
The index signal I is synchronized with channel A or B.	



# Encoder 16 EASY XT 128–1024 CPT, 3 Channels, with Line Driver RS 422

**NEW**

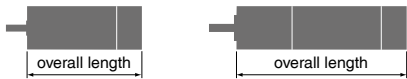


Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

Part Numbers						
584776	606052	577614	542079	577671	<b>530965</b>	

Type (provisional)						
Counts per turn	128	256	500	512	1000	1024
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	1600	1600	1600	1600	1600	1600
Max. speed (rpm)	30000	30000	30000	30000	30000	30000
Phase shift $\Phi$ (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70
Index pulse width (°e)	90 ± 45	90 ± 45	90 ± 60	90 ± 45	90 ± 80	90 ± 70



## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead					
EC-i 30, 50 W	242					75.7	75.7	75.7	75.7	75.7	75.7
EC-i 30, 50 W	242	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●	●
EC-i 30, 50 W	242	GP 32 S	382-387			●	●	●	●	●	●
EC-i 30, 75 W	243					75.7	75.7	75.7	75.7	75.7	75.7
EC-i 30, 75 W	243	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●	●
EC-i 30, 75 W	243	GP 32 S	382-387			●	●	●	●	●	●
EC-i 40, 50 W	244-245					37.7	37.7	37.7	37.7	37.7	37.7
EC-i 40, 50 W	244	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●	●
EC-i 40, 50 W	244	GP 32 S	382-387			●	●	●	●	●	●
EC-i 40, 50 W	244-245	GP 42, 3.0 - 15.0 Nm	361			●	●	●	●	●	●
EC-i 40, 70 W	246-247					47.7	47.7	47.7	47.7	47.7	47.7
EC-i 40, 70 W	246	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●	●
EC-i 40, 70 W	246	GP 32 S	382-387			●	●	●	●	●	●
EC-i 40, 70 W	246-247	GP 42, 3.0 - 15.0 Nm	361			●	●	●	●	●	●
EC-i 40, 100 W	248					67.7	67.7	67.7	67.7	67.7	67.7
EC-i 40, 100 W	248	GP 42, 3.0 - 15.0 Nm	361			●	●	●	●	●	●
EC-i 52, 180 W	249					93.7	93.7	93.7	93.7	93.7	93.7
EC-i 52, 180 W	249	GP 52, 4.0 - 30.0 Nm	366			●	●	●	●	●	●
EC-i 52, 200 W	250					123.7	123.7	123.7	123.7	123.7	123.7
EC-i 52, 200 W	250	GP 52, 4.0 - 30.0 Nm	366			●	●	●	●	●	●

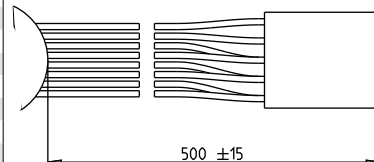
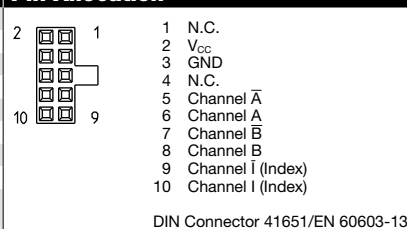
## Technical Data

Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-55...+125 °C
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, at $C_L = 200$ pF, $R_L = 100$ Ω)	10 ns

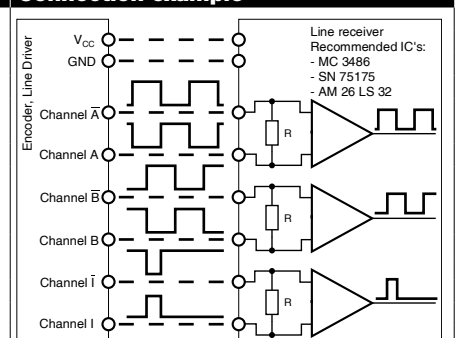
The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 44.

Additional information can be found in the maxon online shop under downloads.  
The index signal I is synchronized with channel A or B.

## Pin Allocation



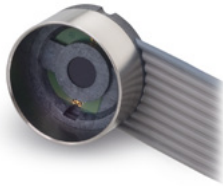
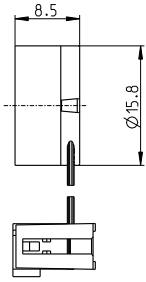
## Connection example



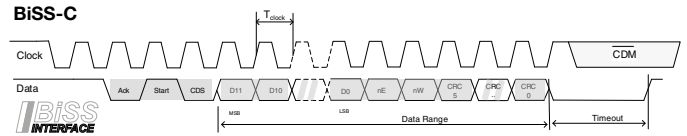
Opt. terminal resistance R = typical 120 Ω

maxon sensor

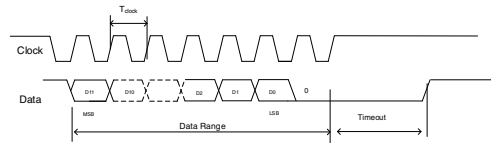
# Encoder 16 EASY Absolute 4096 steps, Single Turn



### BiSS-C



### SSI



Angle values increase when direction of rotation is cw (definition of 'cw' on p. 64)

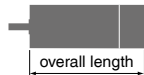
- Stock program
- Standard program
- Special program (on request)

### Part numbers

488783	488782
--------	--------

### Type (provisional)

Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30000	30000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.6	0.04
Max. clock frequency CLK (MHz)	10	4
Min. timeout (µs)	2	16



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-4pole 22, 90 W	229					60.8 / 60.8
EC-4pole 22, 90 W	229	GP 22, 2.0 - 3.4 Nm	343			● / ●
EC-4pole 22, 90 W	229	GP 32, 1.0 - 6.0 Nm	353			● / ●
EC-4pole 22, 90 W	229	GP 32 S	382-387			● / ●
EC-4pole 22, 120 W	230					78.2 / 78.2
EC-4pole 22, 120 W	230	GP 22, 2.0 - 3.4 Nm	343			● / ●
EC-4pole 22, 120 W	230	GP 32, 1.0 - 6.0 Nm	353			● / ●
EC-4pole 22, 120 W	230	GP 32 S	382-387			● / ●
EC-4pole 30, 100 W	231					60.9 / 60.9
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356			● / ●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362			● / ●
EC-4pole 30, 100 W	231			AB 20	488	97.3 / 97.3
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	● / ●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	● / ●
EC-4pole 30, 200 W	233					77.9 / 77.9
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356			● / ●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362			● / ●
EC-4pole 30, 200 W	233			AB 20	488	114.3 / 114.3
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	● / ●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	● / ●
EC-i 30, 30 W	240					53.7 / 53.7
EC-i 30, 30 W	240	GP 32, 1.0 - 6.0 Nm	353			● / ●
EC-i 30, 30 W	240	GP 32 S	382-387			● / ●
EC-i 30, 45 W	241					53.7 / 53.7
EC-i 30, 45 W	241	GP 32, 1.0 - 6.0 Nm	353			● / ●
EC-i 30, 45 W	241	GP 32 S	382-387			● / ●

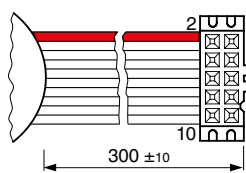
### Technical data

Supply voltage $V_{CC}$	$5 V \pm 10\%$
Typical current draw	17 mA
Output signal	CMOS compatible
Output current, data	max. 20 mA
Current draw, typ. (no load)	17 mA
Setup time after Power On	max. 4 ms
Hysteresis	$0.17^\circ$ mech
Moment of inertia of code wheel	$\leq 0.09 \text{ gcm}^2$
Operating temperature range	$-40 \dots +100^\circ \text{C}$

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 44.

Additional information can be found under 'Downloads' in the maxon online shop.

### Pin assignment

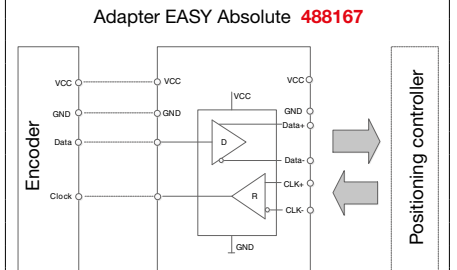


- 1 Data
- 2  $V_{CC}$
- 3 GND
- 4 CLK
- 5 Do not connect (A)
- 6 Do not connect (A)
- 7 Do not connect (B)
- 8 Do not connect (B)
- 9 Do not connect (I)
- 10 Do not connect (I)

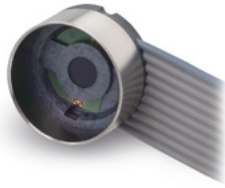
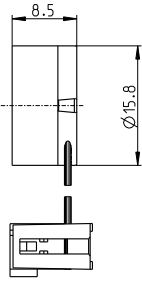
DIN Connector 41651/  
EN 60603-13  
flat ribbon cable AWG 28

Adapter EASY Absolute **488167**  
(required for all maxon controllers).

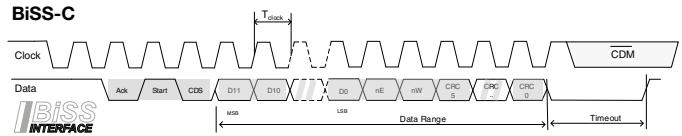
### Connection example



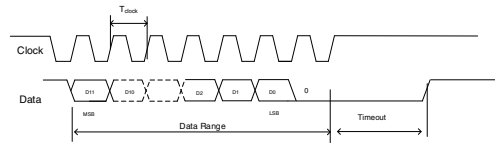
# Encoder 16 EASY Absolute 4096 steps, Single Turn



## BiSS-C



## SSI

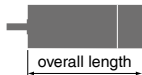


Angle values increase when direction of rotation is cw (definition of 'cw' on p. 64)

- Stock program
- Standard program
- Special program (on request)

Part numbers	
488783	488782

Type (provisional)	488783	488782
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30000	30000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.6	0.04
Max. clock frequency CLK (MHz)	10	4
Min. timeout (µs)	2	16

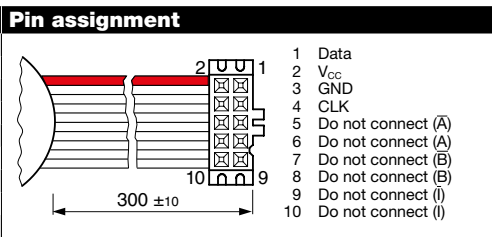


maxon Modular System						Overall length [mm] / ● see Gearhead	
+ Motor	Page	+ Gearhead	Page	+ Brake	Page		
EC-i 30, 50 W	242					75.7	75.7
EC-i 30, 50 W	242	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 30, 50 W	242	GP 32 S	382-387			●	●
EC-i 30, 75 W	243					75.7	75.7
EC-i 30, 75 W	243	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 30, 75 W	243	GP 32 S	382-387			●	●
EC-i 40, 50 W	244-245					37.7	37.7
EC-i 40, 50 W	244	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 40, 50 W	244	GP 32 S	382-387			●	●
EC-i 40, 50 W	244-245	GP 42, 3.0 - 15.0 Nm	361			●	●
EC-i 40, 70 W	246-247					47.7	47.7
EC-i 40, 70 W	246	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 40, 70 W	246	GP 32 S	382-387			●	●
EC-i 40, 70 W	246-247	GP 42, 3.0 - 15.0 Nm	361			●	●
EC-i 40, 100 W	248					67.7	67.7
EC-i 40, 100 W	248	GP 42, 3.0 - 15.0 Nm	361			●	●
EC-i 52, 180 W	249					93.7	93.7
EC-i 52, 180 W	249	GP 52, 4.0 - 30.0 Nm	366			●	●
EC-i 52, 200 W	250					123.7	123.7
EC-i 52, 200 W	250	GP 52, 4.0 - 30.0 Nm	366			●	●

Technical data	
Supply voltage V <sub>CC</sub>	5 V ± 10%
Typical current draw	17 mA
Output signal	CMOS compatible
Output current, data	max. 20 mA
Current draw, typ. (no load)	17 mA
Setup time after Power On	max. 4 ms
Hysteresis	0.17° mech
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Operating temperature range	-40...+100 °C

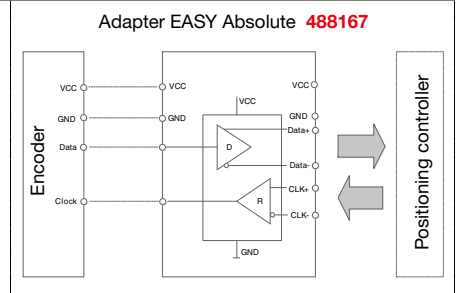
The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 44.

Additional information can be found under 'Downloads' in the maxon online shop.



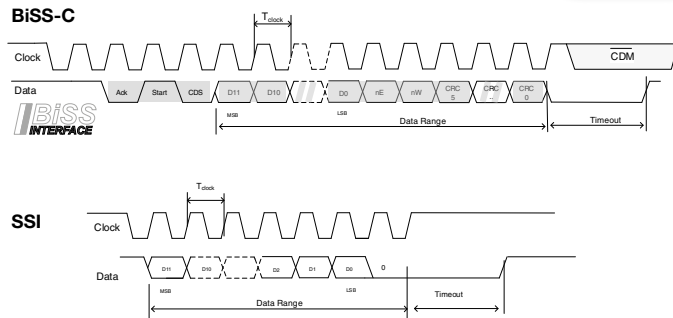
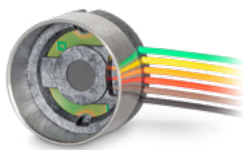
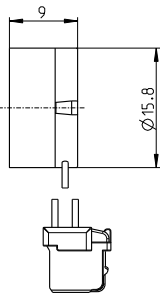
Adapter EASY Absolute **488167** (required for all maxon controllers).

## Connection example



# Encoder 16 EASY Absolute XT 4096 steps, Single Turn

**NEW**

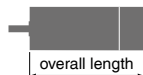


Angle values increase when direction of rotation is cw (definition of 'cw' on p. 64)

- Stock program
- Standard program
- Special program (on request)

Part numbers	
588632	588631

Type (provisional)	588632	588631
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30 000	30 000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.05	0.04
Max. clock frequency CLK (MHz)	10	4
Min. timeout (µs)	adaptive	20



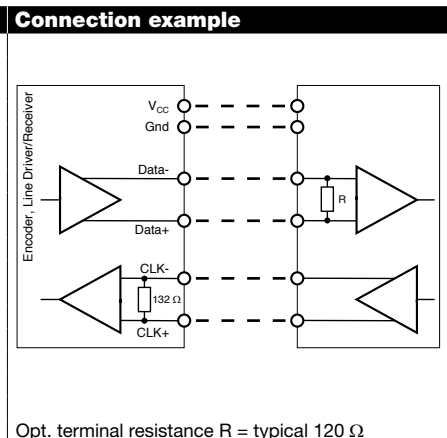
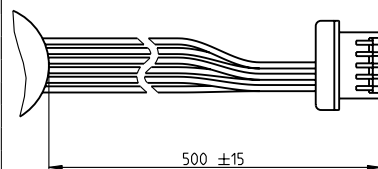
maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-4pole 22, 90 W	229					61.3 / 61.3
EC-4pole 22, 90 W	229	GP 22, 2.0 - 3.4 Nm	343			● / ●
EC-4pole 22, 90 W	229	GP 32, 1.0 - 6.0 Nm	353			● / ●
EC-4pole 22, 90 W	229	GP 32 S	382-387			● / ●
EC-4pole 22, 120 W	230					78.7 / 78.2
EC-4pole 22, 120 W	230	GP 22, 2.0 - 3.4 Nm	343			● / ●
EC-4pole 22, 120 W	230	GP 32, 1.0 - 6.0 Nm	353			● / ●
EC-4pole 22, 120 W	230	GP 32 S	382-387			● / ●
EC-4pole 30, 100 W	231					61.4 / 61.4
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356			● / ●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362			● / ●
EC-4pole 30, 100 W	231			AB 20	488	97.8 / 97.8
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	● / ●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	● / ●
EC-4pole 30, 200 W	233					78.4 / 78.4
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356			● / ●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362			● / ●
EC-4pole 30, 200 W	233			AB 20	488	114.8 / 114.8
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	● / ●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	● / ●
EC-i 30, 30 W	240					54.2 / 54.2
EC-i 30, 30 W	240	GP 32, 1.0 - 6.0 Nm	353			● / ●
EC-i 30, 30 W	240	GP 32 S	382-387			● / ●
EC-i 30, 45 W	241					54.2 / 54.2
EC-i 30, 45 W	241	GP 32, 1.0 - 6.0 Nm	353			● / ●
EC-i 30, 45 W	241	GP 32 S	382-387			● / ●

Technical data	
Supply voltage $V_{CC}$	5 V ± 5%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Output current, data	max. 20 mA
Setup time after Power On	max. 4 ms
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Operating temperature range	-55...+125 °C

The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 44.

Additional information can be found under 'Downloads' in the maxon online shop.

Pin assignment	
1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	CLK
6	CLKI
7	Data
8	Data\
9	GND
10	Vcc

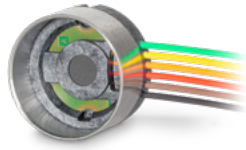
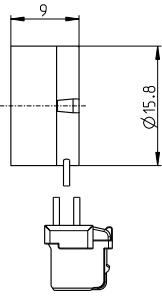




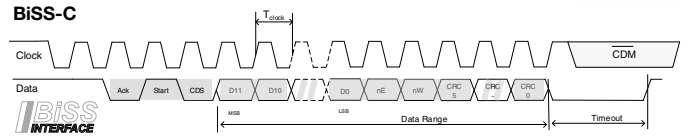
# Encoder 16 EASY Absolute XT 4096 steps, Single Turn

**NEW**

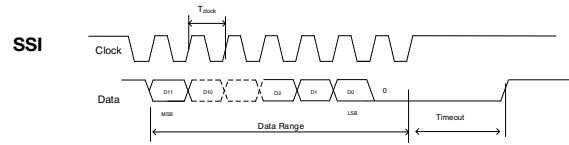
maxon sensor



### BiSS-C



### SSI

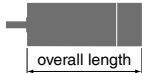


Angle values increase when direction of rotation is cw (definition of 'cw' on p. 64)

Part numbers	
588632	588631

- Stock program
- Standard program
- Special program (on request)

Type (provisional)	588632	588631
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30000	30000
Data encoding	Binary	Gray Symmetric
Min. clock frequency CLK (MHz)	0.05	0.04
Max. clock frequency CLK (MHz)	10	4
Min. timeout (µs)	adaptive	20



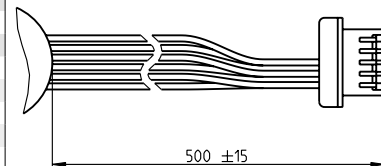
maxon Modular System						Overall length [mm] / ● see Gearhead	
+ Motor	Page	+ Gearhead	Page	+ Brake	Page		
EC-i 30, 50 W	242					76.2	76.2
EC-i 30, 50 W	242	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 30, 50 W	242	GP 32 S	382-387			●	●
EC-i 30, 75 W	243					76.2	76.2
EC-i 30, 75 W	243	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 30, 75 W	243	GP 32 S	382-387			●	●
EC-i 40, 50 W	244-245					38.2	38.2
EC-i 40, 50 W	244	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 40, 50 W	244	GP 32 S	382-387			●	●
EC-i 40, 50 W	244-245	GP 42, 3.0 - 15.0 Nm	361			●	●
EC-i 40, 70 W	246-247					48.2	48.2
EC-i 40, 70 W	246	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 40, 70 W	246	GP 32 S	382-387			●	●
EC-i 40, 70 W	246-247	GP 42, 3.0 - 15.0 Nm	361			●	●
EC-i 40, 100 W	248					68.2	68.2
EC-i 40, 100 W	248	GP 42, 3.0 - 15.0 Nm	361			●	●
EC-i 52, 180 W	249					94.2	94.2
EC-i 52, 180 W	249	GP 52, 4.0 - 30.0 Nm	366			●	●
EC-i 52, 200 W	250					124.2	124.2
EC-i 52, 200 W	250	GP 52, 4.0 - 30.0 Nm	366			●	●

Technical data	
Supply voltage $V_{CC}$	5 V ± 5%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Output current, data	max. 20 mA
Setup time after Power On	max. 4 ms
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Operating temperature range	-55...+125 °C

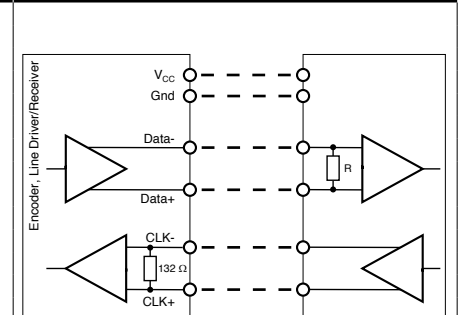
The angle value 0 is matched to the commutation phase of winding 1 (in acc. with Hall 1 signal on motors with Hall sensors, block commutation), see p. 44.

Additional information can be found under 'Downloads' in the maxon online shop.

Pin assignment	
1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	CLK
6	CLK\
7	Data
8	Data\
9	GND
10	Vcc

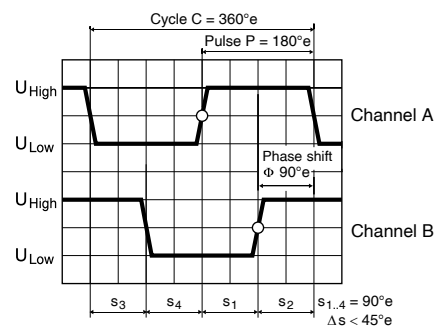


### Connection example



Opt. terminal resistance R = typical 120 Ω

# Encoder MR Type S, 16 CPT, 2 Channels



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

201933 224702

## Type

Counts per turn	16	16
Number of channels	2	2
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	30000	30000



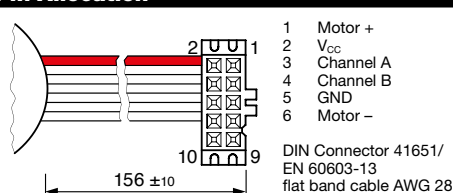
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead
RE 10, 0.75 W	105			10	22.8
RE 10, 0.75 W	105	GP 10, 0.005 - 0.15 Nm	325/326	10	●
RE 10, 1.5 W	107			10	30.4
RE 10, 1.5 W	107	GP 10, 0.005 - 0.15 Nm	325/326	10	●
RE 13, 0.75 W	110			13	26.3
RE 13, 0.75 W	111			13	28.7
RE 13, 0.75 W	111	GP 13, 0.05 - 0.15 Nm	328	13	●
RE 13, 0.75 W	111	GP 13, 0.2 - 0.35 Nm	329	13	●
RE 13, 2 W	114			13	38.5
RE 13, 2 W	115			13	40.9
RE 13, 2 W	115	GP 13, 0.05 - 0.15 Nm	328	13	●
RE 13, 2 W	115	GP 13, 0.2 - 0.35 Nm	329	13	●
RE 13, 1.5 W	118			13	28.4
RE 13, 1.5 W	119			13	30.8
RE 13, 1.5 W	119	GP 13, 0.05 - 0.15 Nm	328	13	●
RE 13, 1.5 W	119	GP 13, 0.2 - 0.35 Nm	329	13	●
RE 13, 3 W	122			13	40.6
RE 13, 3 W	123			13	43.0
RE 13, 3 W	123	GP 13, 0.05 - 0.15 Nm	328	13	●
RE 13, 3 W	123	GP 13, 0.2 - 0.35 Nm	329	13	●
A-max 12, 0.5 W	142			12	25.3
A-max 12, 0.5 W	142	GP 10, 0.01 - 0.15 Nm	326	12	●
A-max 12, 0.5 W	142	GS 12, 0.01 - 0.03 Nm	327	12	●
A-max 12, 0.5 W	142	GP 13, 0.05 - 0.15 Nm	328	12	●
A-max 12, 0.5 W	142	GP 13, 0.2 - 0.35 Nm	329	12	●

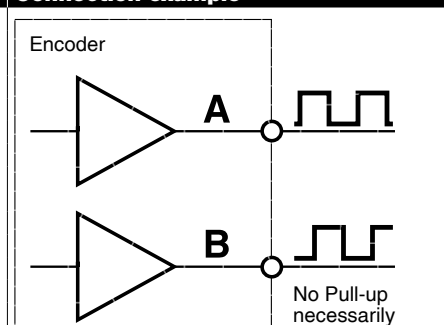
## Technical Data

Supply voltage $V_{CC}$	2.7 - 5.5 V
Typical current draw	7 mA
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Operating temperature range	$-40 \dots +85^\circ \text{C}$
Moment of inertia of code wheel	$\leq 0.005 \text{ gcm}^2$
Output current per channel	max. 5 mA

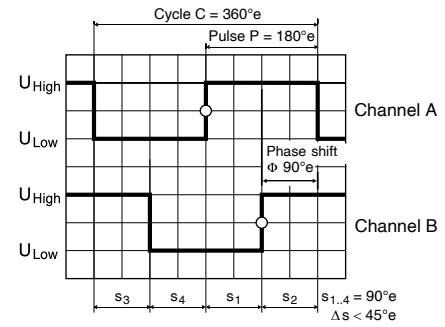
## Pin Allocation



## Connection example



# Encoder MR Type S, 64–256 CPT, 2 Channels, with Line Driver



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- ▨ Special program (on request)

## Part Numbers

323049 323050 334910 **323051** 323052 323053 323054

Type	323049	323050	334910	<b>323051</b>	323052	323053	323054
Counts per turn	64	64	100	128	128	256	256
Number of channels	2	2	2	2	2	2	2
Max. operating frequency (kHz)	80	80	100	160	160	320	320
Max. speed (rpm)	75000	75000	60000	75000	75000	75000	75000



## maxon Modular System

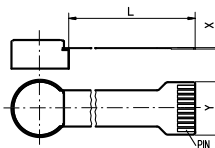
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead
RE 8, 0.5 W, A	103			8	22.6
RE 8, 0.5 W, A	103	GP 8, 0.01 - 0.1 Nm	324	8	●
RE 8, 0.5 W, A	103	GP 8 S	375-376	8	●
RE 10, 0.75 W	105			10	22.8
RE 10, 0.75 W	105	GP 10, 0.005 - 0.15 Nm	325/326	10	●
RE 10, 1.5 W	107			10	30.4
RE 10, 1.5 W	107	GP 10, 0.005 - 0.15 Nm	325/326	10	●
RE 13, 0.75 W	110			13	26.3
RE 13, 0.75 W	111			13	28.7
RE 13, 0.75 W	111	GP 13, 0.05 - 0.15 Nm	328	13	●
RE 13, 0.75 W	111	GP 13, 0.2 - 0.35 Nm	329	13	●
RE 13, 2 W	114			13	38.5
RE 13, 2 W	115			13	40.9
RE 13, 2 W	115	GP 13, 0.05 - 0.15 Nm	328	13	●
RE 13, 2 W	115	GP 13, 0.2 - 0.35 Nm	329	13	●
RE 13, 1.5 W	118			13	28.4
RE 13, 1.5 W	119			13	30.8
RE 13, 1.5 W	119	GP 13, 0.05 - 0.15 Nm	328	13	●
RE 13, 1.5 W	119	GP 13, 0.2 - 0.35 Nm	329	13	●
RE 13, 3 W	122			13	40.6
RE 13, 3 W	123			13	43.0
RE 13, 3 W	123	GP 13, 0.05 - 0.15 Nm	328	13	●
RE 13, 3 W	123	GP 13, 0.2 - 0.35 Nm	329	13	●
A-max 12, 0.5 W	142			12	25.3
A-max 12, 0.5 W	142	GP 10, 0.01 - 0.15 Nm	326	12	●
A-max 12, 0.5 W	142	GS 12, 0.01 - 0.03 Nm	327	12	●
A-max 12, 0.5 W	142	GP 13, 0.05 - 0.15 Nm	328	12	●
A-max 12, 0.5 W	142	GP 13, 0.2 - 0.35 Nm	329	12	●

## Technical Data

Supply voltage $V_{CC}$	5 V ± 5%
Typical current draw	11 mA
Output signal	TTL compatible
Phase shift $\Phi$	90° ± 45°
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.005 gcm <sup>2</sup>
Output current per channel	max. 5 mA

## Pin Allocation

**Part Numbers 323049–323054**  
 Pin 1–10 / X = 0.3 ± 0.05 / Y = 11 – 0.1 / L = 80 ± 3  
 Compatible connector:  
 Molex 52207-1033, Tyco 1-84953-0  
 Pitch 1.0 mm, top contact style

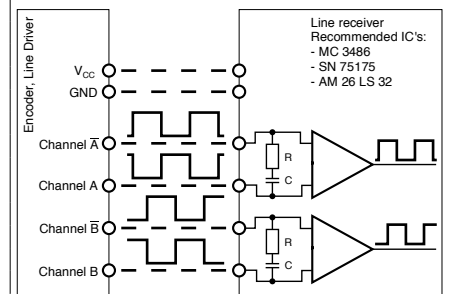


**Part Numbers 334910**  
 Pin 1–8 / X = 0.3 ± 0.03 / Y = 4.5 ± 0.07 / L = 84 ± 3  
 Compatible connector:  
 Molex 52745-0897

- 1 Motor +
- 2  $V_{CC}$
- 3 GND
- 4 Motor –
- 5 Channel A
- 6 Channel B
- 7 Channel B
- 8 Channel A
- 9 N.C.
- 10 N.C.

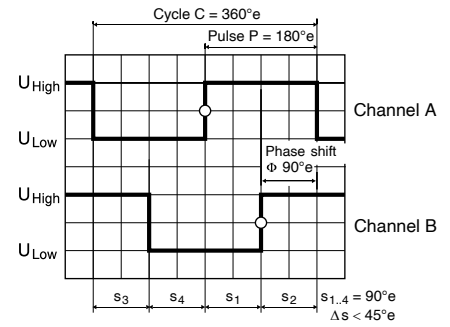
- 1 Motor +
- 2  $V_{CC}$
- 3 GND
- 4 Motor –
- 5 Channel A
- 6 Channel A
- 7 Channel B
- 8 Channel B

## Connection example



Terminal resistance R = typical 120 Ω  
 Capacitor C ≥ 0.1 nF per m line length

# Encoder MR Type S, 64–256 CPT, 2 Channels



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

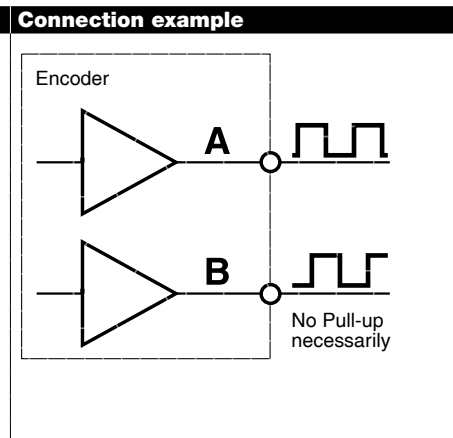
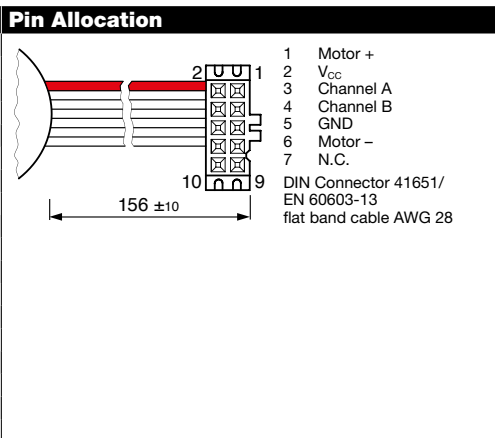
Part Numbers		
241057	241060	241062

Type			
Counts per turn	64	128	256
Number of channels	2	2	2
Max. operating frequency (kHz)	80	160	320
Max. speed (rpm)	75000	75000	75000

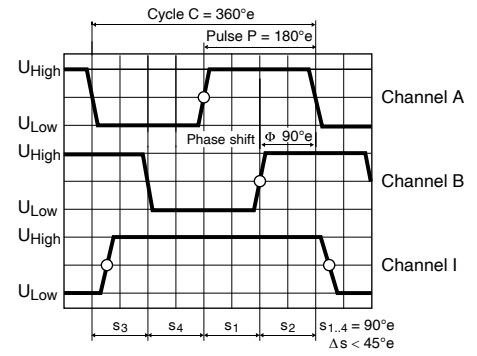


maxon Modular System							
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead		
RE 13, 0.75 W	110			13	26.3	26.3	26.3
RE 13, 0.75 W	111			13	28.7	28.7	28.7
RE 13, 0.75 W	111	GP 13, 0.05 - 0.15 Nm	328	13	●	●	●
RE 13, 0.75 W	111	GP 13, 0.2 - 0.35 Nm	329	13	●	●	●
RE 13, 2 W	114			13	38.5	38.5	38.5
RE 13, 2 W	115			13	40.9	40.9	40.9
RE 13, 2 W	115	GP 13, 0.05 - 0.15 Nm	328	13	●	●	●
RE 13, 2 W	115	GP 13, 0.2 - 0.35 Nm	329	13	●	●	●
RE 13, 1.5 W	118			13	28.4	28.4	28.4
RE 13, 1.5 W	119			13	30.8	30.8	30.8
RE 13, 1.5 W	119	GP 13, 0.05 - 0.15 Nm	328	13	●	●	●
RE 13, 1.5 W	119	GP 13, 0.2 - 0.35 Nm	329	13	●	●	●
RE 13, 3 W	122			13	40.6	40.6	40.6
RE 13, 3 W	123			13	43.0	43.0	43.0
RE 13, 3 W	123	GP 13, 0.05 - 0.15 Nm	328	13	●	●	●
RE 13, 3 W	123	GP 13, 0.2 - 0.35 Nm	329	13	●	●	●

Technical Data	
Supply voltage $V_{CC}$	5 V ± 5%
Typical current draw	11 mA
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.005 gcm <sup>2</sup>
Output current per channel	max. 5 mA



# Encoder MR Type M, 32 CPT, 2/3 Channels



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

201935	201938
--------	--------

Type	201935	201938
Counts per turn	32	32
Number of channels	2	3
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	15000	15000



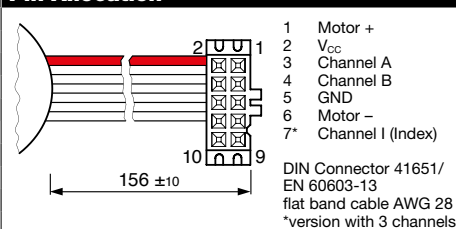
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead
RE 16, 2 W	124			16	28.0 / 28.0
RE 16, 2 W	124	GP 16, 0.1 - 0.6 Nm	334/335	16	● / ●
RE 16, 2 W	124	GP 16 S	377/378	16	● / ●
RE 16, 3.2 W	126			16	45.4 / 45.4
RE 16, 3.2 W	126	GP 16, 0.1 - 0.6 Nm	334/335	16	● / ●
RE 16, 3.2 W	126	GP 16 S	377/378	16	● / ●
RE 16, 4.5 W	128			16	48.4 / 48.4
RE 16, 4.5 W	128	GP 16, 0.1 - 0.6 Nm	334/335	16	● / ●
RE 16, 4.5 W	128	GP 16 S	377/378	16	● / ●
A-max 16	144/146			16	30.4 / 30.4
A-max 16	144/146	GS 16, 0.01 - 0.1 Nm	330-333	16	● / ●
A-max 16	144/146	GP 16, 0.1 - 0.3 Nm	334	16	● / ●
A-max 16	144/146	GP 16 S	377/378	16	● / ●
A-max 19, 1.5 W	148			19	34.0 / 34.0
A-max 19, 1.5 W	148	GP 19, 0.1 - 0.3 Nm	336	19	● / ●
A-max 19, 1.5 W	148	GP 22, 0.5 - 2.0 Nm	341	19	● / ●
A-max 19, 1.5 W	148	GS 24, 0.1 Nm	345	19	● / ●
A-max 19, 1.5 W	148	GP 22 S	380/381	19	● / ●
A-max 19, 2.5 W	150			19	35.8 / 35.8
A-max 19, 2.5 W	150	GP 19, 0.1 - 0.3 Nm	336	19	● / ●
A-max 19, 2.5 W	150	GP 22, 0.5 - 2.0 Nm	341	19	● / ●
A-max 19, 2.5 W	150	GS 24, 0.1 Nm	345	19	● / ●
A-max 19, 2.5 W	150	GP 22 S	380/381	19	● / ●
A-max 22	152/154			22	36.9 / 36.9
A-max 22	152/154	GP 22, 0.1 - 0.6 Nm	337/338	22	● / ●
A-max 22	152/154	GP 22, 0.5 - 2.0 Nm	337-341	22	● / ●
A-max 22	152/154	GS 24, 0.1 Nm	345	22	● / ●
A-max 22	152/154	GP 22 S	380/381	22	● / ●

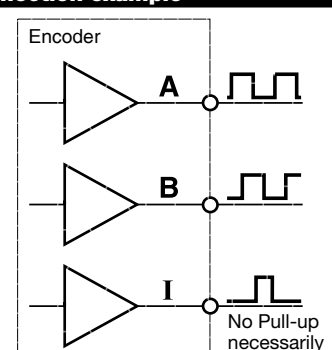
## Technical Data

Supply voltage $V_{CC}$	2.7 - 5.5 V
Typical current draw 2 channel	6 mA
Typical current draw 3 channel	9 mA
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	$\leq 0.09$ gcm <sup>2</sup>
Output current per channel	max. 5 mA

## Pin Allocation

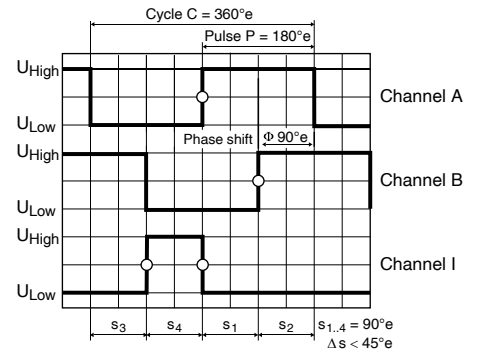


## Connection example



The index signal I is not synchronized with channel A or B. The length of the index signal can last more than one cycle.

# Encoder MR Type M, 128–512 CPT, 2/3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

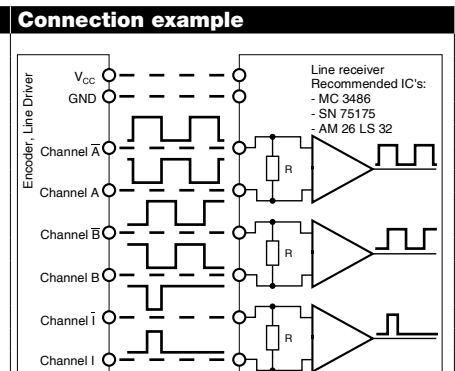
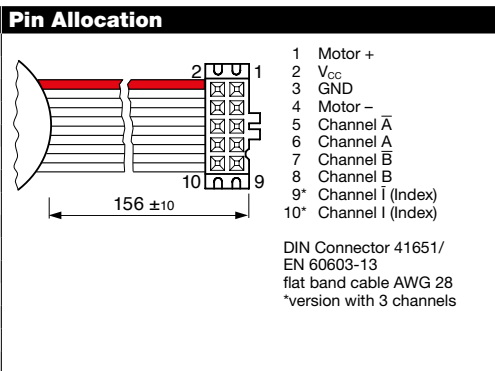
Part Numbers						
228179	228177	228181	228182	201937	<b>201940</b>	

Type							
Counts per turn		128	128	256	256	512	512
Number of channels		2	3	2	3	2	3
Max. operating frequency (kHz)		80	80	160	160	320	320
Max. speed (rpm)		37500	37500	37500	37500	37500	37500



maxon Modular System										
+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead					
RE 16, 2 W	124			16	28.0	28.0	28.0	28.0	28.0	28.0
RE 16, 2 W	124	GP 16, 0.1 - 0.6 Nm	334/335	16	●	●	●	●	●	●
RE 16, 2 W	124	GP 16 S	377/378	16	●	●	●	●	●	●
RE 16, 3.2 W	126			16	45.4	45.4	45.4	45.4	45.4	45.4
RE 16, 3.2 W	126	GP 16, 0.1 - 0.6 Nm	334/335	16	●	●	●	●	●	●
RE 16, 3.2 W	126	GP 16 S	377/378	16	●	●	●	●	●	●
RE 16, 4.5 W	128			16	48.4	48.4	48.4	48.4	48.4	48.4
RE 16, 4.5 W	128	GP 16, 0.1 - 0.6 Nm	334/335	16	●	●	●	●	●	●
RE 16, 4.5 W	128	GP 16 S	377/378	16	●	●	●	●	●	●
A-max 16	144/146			16	30.4	30.4	30.4	30.4	30.4	30.4
A-max 16	144/146	GS 16, 0.01 - 0.1 Nm	330-333	16	●	●	●	●	●	●
A-max 16	144/146	GP 16, 0.1 - 0.6 Nm	334/335	16	●	●	●	●	●	●
A-max 16	144/146	GP 16 S	377/378	16	●	●	●	●	●	●
A-max 19, 1.5 W	148			19	34.0	34.0	34.0	34.0	34.0	34.0
A-max 19, 1.5 W	148	GP 19, 0.1 - 0.3 Nm	336	19	●	●	●	●	●	●
A-max 19, 1.5 W	148	GP 22, 0.5 - 2.0 Nm	339/341	19	●	●	●	●	●	●
A-max 19, 1.5 W	148	GS 24, 0.1 Nm	345	19	●	●	●	●	●	●
A-max 19, 1.5 W	148	GP 22 S	380/381	19	●	●	●	●	●	●
A-max 19, 2.5 W	150			19	35.8	35.8	35.8	35.8	35.8	35.8
A-max 19, 2.5 W	150	GP 19, 0.1 - 0.3 Nm	336	19	●	●	●	●	●	●
A-max 19, 2.5 W	150	GP 22, 0.5 - 2.0 Nm	339/341	19	●	●	●	●	●	●
A-max 19, 2.5 W	150	GS 24, 0.1 Nm	345	19	●	●	●	●	●	●
A-max 19, 2.5 W	150	GP 22 S	380/381	19	●	●	●	●	●	●
A-max 22	152/154			22	36.9	36.9	36.9	36.9	36.9	36.9
A-max 22	152/154	GP 22, 0.1 - 0.6 Nm	337/338	22	●	●	●	●	●	●
A-max 22	152/154	GP 22, 0.5 - 2.0 Nm	339/341	22	●	●	●	●	●	●
A-max 22	152/154	GS 24, 0.1 Nm	345	22	●	●	●	●	●	●
A-max 22	152/154	GP 22 S	380/381	22	●	●	●	●	●	●

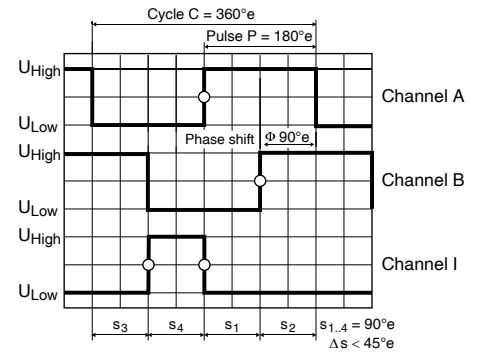
Technical Data	
Supply voltage V <sub>CC</sub>	5 V ± 5%
Typical current draw 2 channel	11 mA
Typical current draw 3 channel	14 mA
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Output current per channel	max. 5 mA



The index signal I is synchronized with channel A or B.

Opt. terminal resistance R > 1 kΩ

# Encoder MR Type M, 128–512 CPT, 2/3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

228179	228177	228181	228182	201937	201940
--------	--------	--------	--------	--------	--------

Type	228179	228177	228181	228182	201937	201940
Counts per turn	128	128	256	256	512	512
Number of channels	2	3	2	3	2	3
Max. operating frequency (kHz)	80	80	160	160	320	320
Max. speed (rpm)	37 500	37 500	37 500	37 500	37 500	37 500

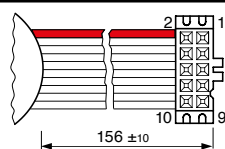
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead					
EC-max 16, 5 W	217			16	31.3	31.3	31.3	31.3	31.3	31.3
EC-max 16, 5 W	217	GP 16, 0.1 - 0.6 Nm	334/335	16	●	●	●	●	●	●
EC-max 16, 5 W	217	GP 16 S	377-379	16	●	●	●	●	●	●
EC-max 16, 8 W	219			16	43.3	43.3	43.3	43.3	43.3	43.3
EC-max 16, 8 W	219	GP 16, 0.2 - 0.6 Nm	335	16	●	●	●	●	●	●
EC-max 16, 8 W	219	GP 22, 0.5 - 2.0 Nm	342	16	●	●	●	●	●	●
EC-max 16, 8 W	219	GP 16 S/GP 22 S	377/381	16	●	●	●	●	●	●
EC-max 22, 12 W	220			16	41.7	41.7	41.7	41.7	41.7	41.7
EC-max 22, 12 W	220	GP 22, 0.5 - 2.0 Nm	342	16	●	●	●	●	●	●
EC-max 22, 12 W	220	KD 32, 1.0 - 4.5 Nm	359	16	●	●	●	●	●	●
EC-max 22, 12 W	220	GP 22 S	380/381	16	●	●	●	●	●	●
EC-max 22, 25 W	221			16	58.2	58.2	58.2	58.2	58.2	58.2
EC-max 22, 25 W	221	GP 22/GP 32	343/353	16	●	●	●	●	●	●
EC-max 22, 25 W	221	GP 32 S	382-387	16	●	●	●	●	●	●

## Technical Data

Supply voltage $V_{CC}$	5 V ± 5%
Typical current draw 2 channel	11 mA
Typical current draw 3 channel	14 mA
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.09 gcm <sup>2</sup>
Output current per channel	max. 5 mA

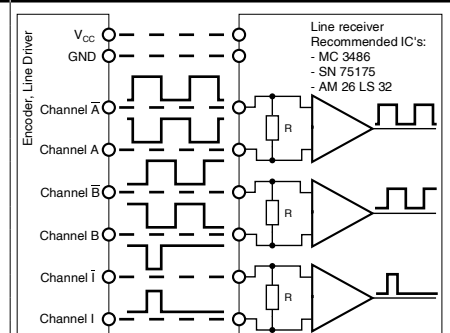
## Pin Allocation



- 1 N.C.
- 2  $V_{CC}$
- 3 GND
- 4 N.C.
- 5 Channel  $\bar{A}$
- 6 Channel A
- 7 Channel  $\bar{B}$
- 8 Channel B
- 9\* Channel  $\bar{I}$  (Index)
- 10\* Channel I (Index)

DIN Connector 41651/  
EN 60603-13  
flat band cable AWG 28  
\*version with 3 channels

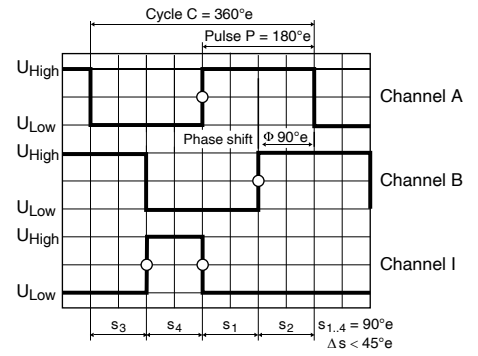
## Connection example



Opt. terminal resistance  $R > 1 \text{ k}\Omega$

The index signal I is synchronized with channel A or B.

# Encoder MR Type ML, 128–1000 CPT, 3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

225771	225773	225778	225805	225780
Counts per turn	128	256	500	1000
Number of channels	3	3	3	3
Max. operating frequency (kHz)	80	160	200	200
Max. speed (rpm)	37 500	37 500	24 000	12 000

### Type

Counts per turn	128	256	500	512	1000
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	80	160	200	320	200
Max. speed (rpm)	37 500	37 500	24 000	37 500	12 000



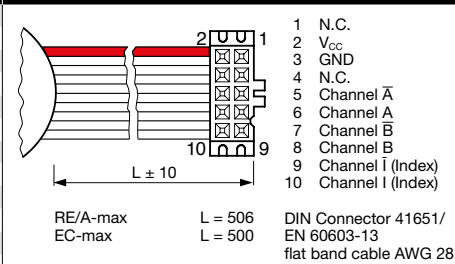
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead				
RE 25	129/131			25	65.5	65.5	65.5	65.5	65.5
RE 25	129/131	GP 26, 0.75 - 4.5 Nm	346	25	●	●	●	●	●
RE 25	129/131	GP 32, 0.75 - 6.0 Nm	348-353	25	●	●	●	●	●
RE 25	129/131	KD 32, 1.0 - 4.5 Nm	359	25	●	●	●	●	●
RE 25	129/131	GP 32 S	382-387	25	●	●	●	●	●
RE 25, 20 W	130			25	54.0	54.0	54.0	54.0	54.0
RE 25, 20 W	130	GP 22, 0.5 - 1.0 Nm	339	25	●	●	●	●	●
RE 25, 20 W	130	GP 26, 0.75 - 4.5 Nm	346	25	●	●	●	●	●
RE 25, 20 W	130	GP 32, 0.75 - 6.0 Nm	348-353	25	●	●	●	●	●
RE 25, 20 W	130	KD 32, 1.0 - 4.5 Nm	359	25	●	●	●	●	●
RE 25, 20 W	130	GP 32 S	382-387	25	●	●	●	●	●
A-max 26	155-158			25	53.5	53.5	53.5	53.5	53.5
A-max 26	155-158	GP 26, 0.75 - 4.5 Nm	346	25	●	●	●	●	●
A-max 26	155-158	GS 30, 0.07 - 0.2 Nm	347	25	●	●	●	●	●
A-max 26	155-158	GP 32, 0.75 - 6.0 Nm	348-353	25	●	●	●	●	●
A-max 26	155-158	GS 38, 0.1 - 0.6 Nm	360	25	●	●	●	●	●
A-max 26	155-158	GP 32 S	382-387	25	●	●	●	●	●
EC-max 30, 40 W	222			25			54.2		54.2
EC-max 30, 40 W	222	GP 32, 1 - 8.0 Nm	353/356	25	●	●	●	●	●
EC-max 30, 40 W	222	KD 32, 1.0 - 4.5 Nm	359	25	●	●	●	●	●
EC-max 30, 40 W	222	GP 32 S	382-387	25	●	●	●	●	●
EC-max 30, 60 W	223			25			76.2		76.2
EC-max 30, 60 W	223	GP 32, 1 - 8.0 Nm	353/356	25	●	●	●	●	●
EC-max 30, 60 W	223	KD 32, 1.0 - 4.5 Nm	359	25	●	●	●	●	●
EC-max 30, 60 W	223	GP 42, 3 - 15 Nm	362	25	●	●	●	●	●

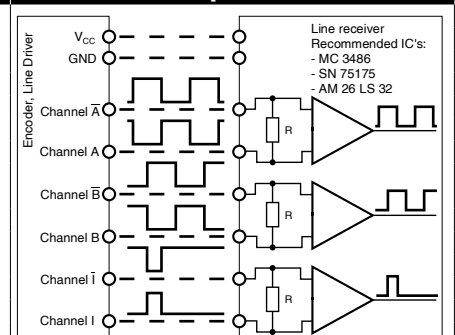
### Technical Data

Supply voltage $V_{CC}$	5 V ± 5%
Typical current draw	14 mA
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.7 gcm <sup>2</sup>
Output current per channel	max. 5 mA

### Pin Allocation



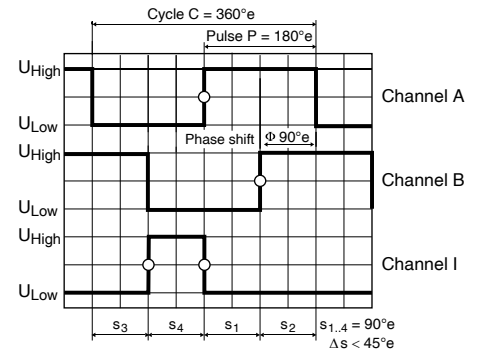
### Connection example



The index signal I is synchronized with channel A or B.



# Encoder MR Type L, 256–1024 CPT, 3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

225783	228452	225785	228456	225787
--------	--------	--------	--------	--------

Type	225783	228452	225785	228456	225787
Counts per turn	256	500	512	1000	1024
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	80	200	160	200	320
Max. speed (rpm)	18750	24000	18750	12000	18750



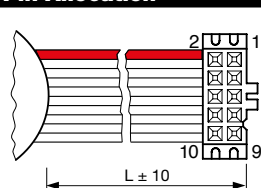
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead					
RE 30, 15 W	132			32	79.4	79.4	79.4	79.4	79.4	79.4
RE 30, 15 W	132	GP 32, 0.75 - 4.5 Nm	350	32	●	●	●	●	●	●
RE 30, 60 W	133			32	79.4	79.4	79.4	79.4	79.4	79.4
RE 30, 60 W	133	GP 32, 0.75 - 4.5 Nm	348	32	●	●	●	●	●	●
RE 30, 60 W	133	GP 32, 0.75 - 6.0 Nm	350-355	32	●	●	●	●	●	●
RE 30, 60 W	133	GP 32 S	382-387	32	●	●	●	●	●	●
RE 35, 90 W	134			32	82.4	82.4	82.4	82.4	82.4	82.4
RE 35, 90 W	134	GP 32, 0.75 - 4.5 Nm	348	32	●	●	●	●	●	●
RE 35, 90 W	134	GP 32, 0.75 - 6.0 Nm	350-355	32	●	●	●	●	●	●
RE 35, 90 W	134	GP 32, 4.0 - 8.0 Nm	356	32	●	●	●	●	●	●
RE 35, 90 W	134	GP 42, 3 - 15 Nm	361	32	●	●	●	●	●	●
RE 35, 90 W	134	GP 32 S	382-387	32	●	●	●	●	●	●
RE 40, 25 W	135			32	82.4	82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	136			32	82.4	82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	136	GP 42, 3 - 15 Nm	361	32	●	●	●	●	●	●
RE 40, 150 W	136	GP 52, 4 - 30 Nm	366	32	●	●	●	●	●	●
A-max 32	160			32	72.7	72.7	72.7	72.7	72.7	72.7
A-max 32	160	GP 32, 0.75 - 6.0 Nm	350-353	32	●	●	●	●	●	●
A-max 32	160	GS 38, 0.1 - 0.6 Nm	360	32	●	●	●	●	●	●
A-max 32	160	GP 32 S	382-387	32	●	●	●	●	●	●
EC-max 40, 70 W	224			31.8	73.9	73.9	73.9	73.9	73.9	73.9
EC-max 40, 70 W	224	GP 42, 3 - 15 Nm	362	31.8	●	●	●	●	●	●
EC-max 40, 120 W	225			31.8	103.9	103.9	103.9	103.9	103.9	103.9
EC-max 40, 120 W	225	GP 52, 4 - 30 Nm	367	31.8	●	●	●	●	●	●

## Technical Data

Supply voltage $V_{CC}$	5 V ± 5%
Typical current draw	14 mA
Output signal	TTL compatible
Phase shift $\Phi$	90° ± 45°e
Index pulse width	90° ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 1.7 gcm <sup>2</sup>
Output current per channel	max. 5 mA

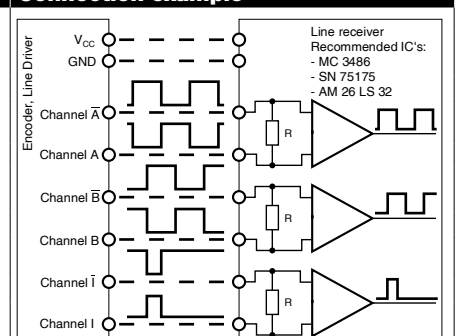
## Pin Allocation



RE/A-max L = 506  
EC-max L = 500

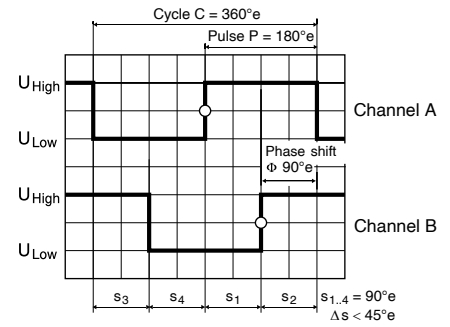
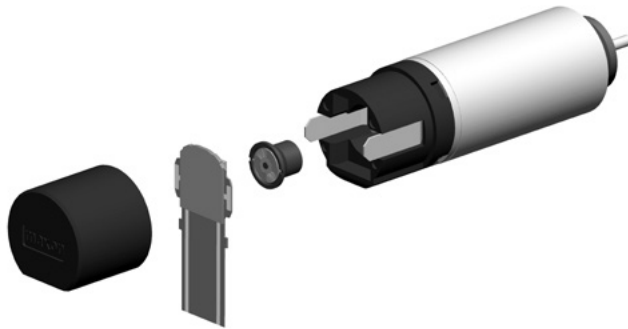
- 1 N.C.
  - 2  $V_{CC}$
  - 3 GND
  - 4 N.C.
  - 5 Channel  $\bar{A}$
  - 6 Channel A
  - 7 Channel  $\bar{B}$
  - 8 Channel B
  - 9 Channel I (Index)
  - 10 Channel  $\bar{I}$  (Index)
- DIN Connector 41651/  
EN 60603-13  
flat band cable AWG 28

## Connection example



Opt. terminal resistance  $R > 1 \text{ k}\Omega$

# Encoder 8 OPT 50 CPT, 2 Channels



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

473594

### Type (provisional)

Counts per turn	50
Number of channels	2
Max. operating frequency (kHz)	15
Max. speed (rpm)	18000



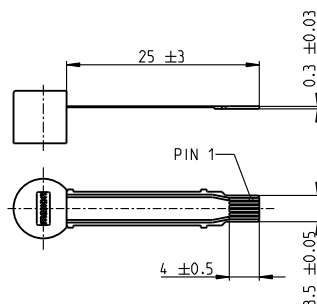
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead
RE 8, 0.5 W, A	103			8	24.2
RE 8, 0.5 W, A	103	GP 8, 0.01 - 0.1 Nm	324	8	●
RE 8, 0.5 W, A	103	GP 8 S	375-376	8	●

### Technical Data

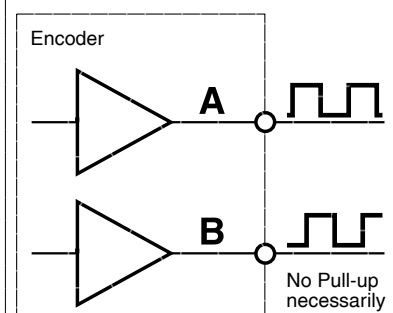
Supply voltage $V_{CC}$ <sup>1)</sup>	2.6–3.0 V
Typical current draw	12 mA
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Operating temperature range	-20...+85 °C
Moment of inertia of code wheel	$\leq 0.001 \text{ gcm}^2$
Output current per channel	min. -1 mA, max. 8 mA

### Pin Allocation



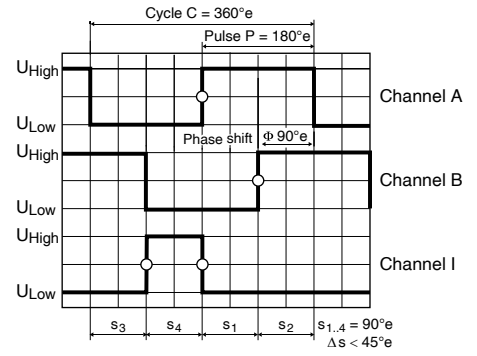
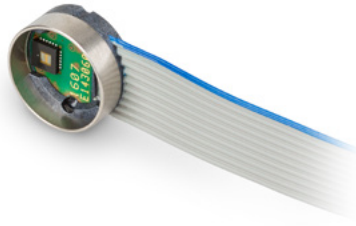
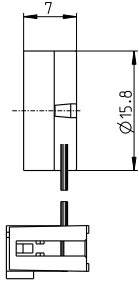
Compatible connector:  
Molex 52745-0697

### Connection example



<sup>1)</sup> Not in combination with maxon controllers.

# Encoder 16 RIO 1024–32 768 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

575826	575827	575828	575829	575830
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### Type (provisional)

Counts per turn	1024	4096	8192	16384	32768
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	780	3125	3125	3125	3125
Max. speed (rpm)	40000	40000	20000	10000	5000
Phase shift $\Phi$ (°e)	90+/-5	90+/-10	90+/-15	90+/-30	90+/-45
Index pulse width (°e)	90+/-5	90+/-10	90+/-15	90+/-30	90+/-45



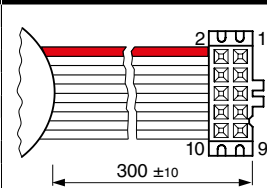
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
EC-4pole 22, 90 W	229					59.3	59.3	59.3	59.3	59.3
EC-4pole 22, 90 W	229	GP 22, 2.0 - 3.4 Nm	343			●	●	●	●	●
EC-4pole 22, 90 W	229	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-4pole 22, 90 W	229	GP 32 S	382-387			●	●	●	●	●
EC-4pole 22, 120 W	230					76.7	76.7	76.7	76.7	76.7
EC-4pole 22, 120 W	230	GP 22, 2.0 - 3.4 Nm	343			●	●	●	●	●
EC-4pole 22, 120 W	230	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-4pole 22, 120 W	230	GP 32 S	382-387			●	●	●	●	●
EC-4pole 30, 100 W	231					59.4	59.4	59.4	59.4	59.4
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356			●	●	●	●	●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362			●	●	●	●	●
EC-4pole 30, 100 W	231			AB 20	488	95.8	95.8	95.8	95.8	95.8
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●	●	●	●	●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●	●	●	●	●
EC-4pole 30, 200 W	233					76.4	76.4	76.4	76.4	76.4
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356			●	●	●	●	●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362			●	●	●	●	●
EC-4pole 30, 200 W	233			AB 20	488	112.8	112.8	112.8	112.8	112.8
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●	●	●	●	●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●	●	●	●	●
EC-i 30, 30 W	240					52.2	52.2	52.2	52.2	52.2
EC-i 30, 30 W	240	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 30, 30 W	240	GP 32 S	382-387			●	●	●	●	●
EC-i 30, 45 W	241					52.2	52.2	52.2	52.2	52.2
EC-i 30, 45 W	241	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 30, 45 W	241	GP 32 S	382-387			●	●	●	●	●

### Technical Data

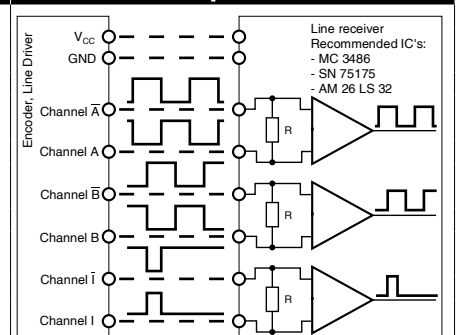
Supply voltage $V_{CC}$	$5 V \pm 10\%$
Typical current draw	50 mA
Output signal	EIA Standard RS 422
Operating temperature range	$-40 \dots +100^\circ C$
Moment of inertia of code wheel	$\leq 1.2 \text{ gcm}^2$
Output current per channel	$\pm 20 \text{ mA}$
Min. state duration s	20 ns
Signal rise and fall times (typically, at $C_L = 200 \text{ pF}$ , $R_L = 100 \Omega$ )	5 ns

### Pin Allocation



- 1 N.C.
  - 2  $V_{CC}$
  - 3 GND
  - 4 N.C.
  - 5 Channel  $\bar{A}$
  - 6 Channel A
  - 7 Channel  $\bar{B}$
  - 8 Channel B
  - 9 Channel  $\bar{I}$  (Index)
  - 10 Channel I (Index)
- DIN Connector 41651/  
EN 60603-13  
flat band cable AWG 28

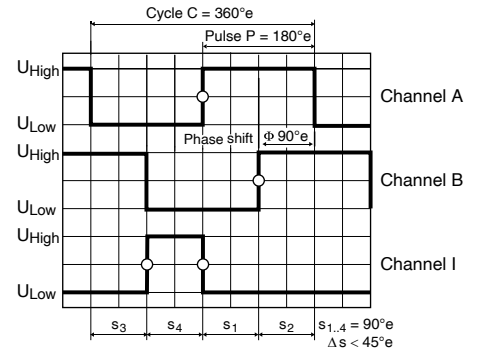
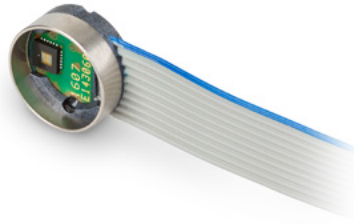
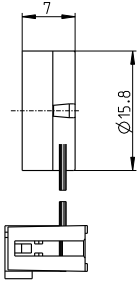
### Connection example



Opt. terminal resistance R = typical 120  $\Omega$

The index signal I is synchronized with channel A or B.

# Encoder 16 RIO 1024–32 768 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

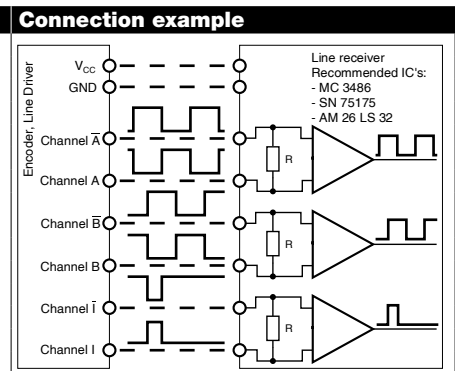
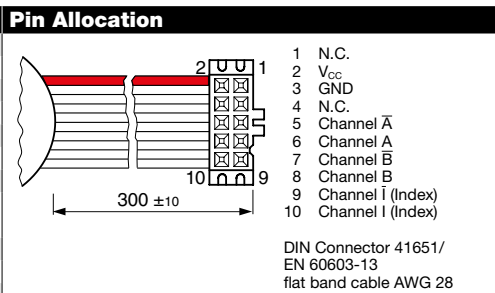
Part Numbers				
575826	575827	575828	575829	575830

Type (provisional)					
Counts per turn	1024	4096	8192	16384	32768
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	780	3125	3125	3125	3125
Max. speed (rpm)	40000	40000	20000	10000	5000
Phase shift $\Phi$ (°e)	90+/-5	90+/-10	90+/-15	90+/-30	90+/-45
Index pulse width (°e)	90+/-5	90+/-10	90+/-15	90+/-30	90+/-45



maxon Modular System						Overall length [mm] / ● see Gearhead				
+ Motor	Page	+ Gearhead	Page	+ Brake	Page					
EC-i 30, 50 W	242					74.2	74.2	74.2	74.2	74.2
EC-i 30, 50 W	242	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 30, 50 W	242	GP 32 S	382-387			●	●	●	●	●
EC-i 30, 75 W	243					74.2	74.2	74.2	74.2	74.2
EC-i 30, 75 W	243	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 30, 75 W	243	GP 32 S	382-387			●	●	●	●	●
EC-i 40, 50 W	244-245					40.5	40.5	40.5	40.5	40.5
EC-i 40, 50 W	244	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 40, 50 W	244	GP 32 S	382-387			●	●	●	●	●
EC-i 40, 50 W	244-245	GP 42, 3.0 - 15.0 Nm	361			●	●	●	●	●
EC-i 40, 70 W	246-247					50.5	50.5	50.5	50.5	50.5
EC-i 40, 70 W	246	GP 32, 1.0 - 6.0 Nm	353			●	●	●	●	●
EC-i 40, 70 W	246	GP 32 S	382-387			●	●	●	●	●
EC-i 40, 70 W	246-247	GP 42, 3.0 - 15.0 Nm	361			●	●	●	●	●
EC-i 40, 100 W	248					70.5	70.5	70.5	70.5	70.5
EC-i 40, 100 W	248	GP 42, 3.0 - 15.0 Nm	361			●	●	●	●	●
EC-i 52, 180 W	249					96.5	96.5	96.5	96.5	96.5
EC-i 52, 180 W	249	GP 52, 4.0 - 30.0 Nm	366			●	●	●	●	●
EC-i 52, 200 W	250					122.2	122.2	122.2	122.2	122.2
EC-i 52, 200 W	250	GP 52, 4.0 - 30.0 Nm	366			●	●	●	●	●

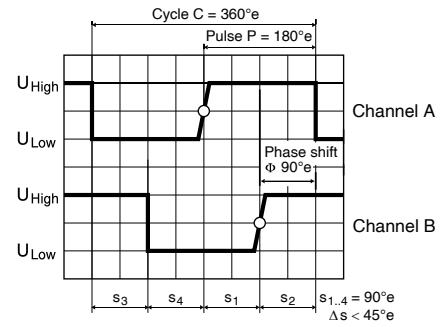
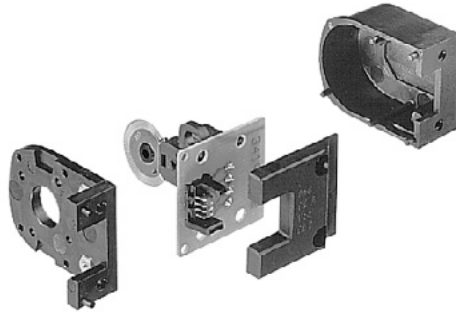
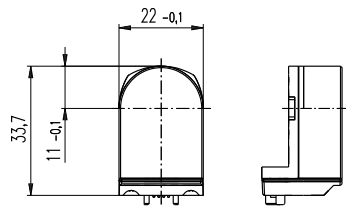
Technical Data	
Supply voltage $V_{CC}$	5 V $\pm$ 10%
Typical current draw	50 mA
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	$\leq 1.2 \text{ gcm}^2$
Output current per channel	$\pm 20 \text{ mA}$
Min. state duration $s$	20 ns
Signal rise and fall times (typically, at $C_L = 200 \text{ pF}$ , $R_L = 100 \Omega$ )	5 ns



The index signal I is synchronized with channel A or B.

Opt. terminal resistance R = typical 120  $\Omega$

# Encoder Enc 22 100 CPT, 2 Channels



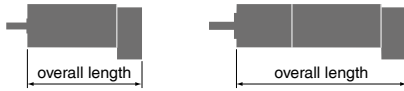
Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

103935	110520	110521
--------	--------	--------

Type	103935	110520	110521
Counts per turn	100	100	100
Number of channels	2	2	2
Max. operating frequency (kHz)	20	20	20
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	2	3



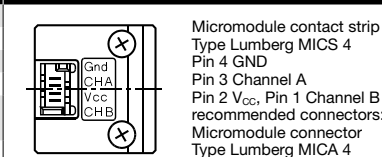
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 25	129/131			68.6
RE 25	129/131	GP 26, 0.75 - 4.5 Nm	346	●
RE 25	129/131	GP 32, 0.75 - 4.5 Nm	348	●
RE 25	129/131	GP 32, 0.75 - 4.5 Nm	349	●
RE 25	129/131	GP 32, 1.0 - 6.0 Nm	352	●
RE 25	129/131	GP 32 S	382-387	●
A-max 19, 1.5 W	148			43.3
A-max 19, 1.5 W	148	GP 19, 0.1 - 0.3 Nm	336	●
A-max 19, 1.5 W	148	GP 22, 0.1 - 2.0 Nm	339/341	●
A-max 19, 1.5 W	148	GS 24, 0.1 Nm	345	●
A-max 19, 1.5 W	148	GP 22 S	380/381	●
A-max 19, 2.5 W	150			45.9
A-max 19, 2.5 W	150	GP 19, 0.1 - 0.3 Nm	336	●
A-max 19, 2.5 W	150	GP 22, 0.1 - 2.0 Nm	339/341	●
A-max 19, 2.5 W	150	GS 24, 0.1 Nm	345	●
A-max 19, 2.5 W	150	GP 22 S	380/381	●
A-max 22	152/154			46.3
A-max 22	152/154	GP 22, 0.1 - 0.3 Nm	337	●
A-max 22	152/154	GP 22, 0.2 - 0.6 Nm	338	●
A-max 22	152/154	GP 22, 0.1 - 2.0 Nm	337-341	●
A-max 22	152/154	GS 24, 0.1 Nm	345	●
A-max 22	152/154	GP 22 S	380/381	●
A-max 26	155-158			59.1
A-max 26	155-158	GP 26, 0.75 - 4.5 Nm	346	●
A-max 26	155-158	GS 30, 0.07 - 0.2 Nm	347	●
A-max 26	155-158	GP 32, 0.75 - 4.5 Nm	348	●
A-max 26	155-158	GP 32, 0.75 - 4.5 Nm	349	●
A-max 26	155-158	GP 32, 1.0 - 6.0 Nm	353	●
A-max 26	155-158	GS 38, 0.1 - 0.6 Nm	360	●
A-max 26	155-158	GP 32 S	382-387	●

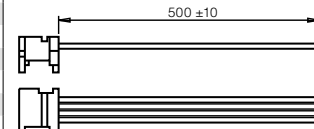
### Technical Data

Supply voltage $V_{CC}$	$5 V \pm 10\%$
Typical current draw	18 mA
Output signal	TTL compatible
Phase shift $\Phi$	$90^\circ \pm 45^\circ$
Signal rise time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 11 \text{ k}\Omega$ , $25^\circ\text{C}$ )	200 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 11 \text{ k}\Omega$ , $25^\circ\text{C}$ )	50 ns
Operating temperature range	$-20 \dots +85^\circ\text{C}$
Moment of inertia of code wheel	$\leq 0.05 \text{ gcm}^2$
Output current per channel	min. -1 mA, max. 5 mA

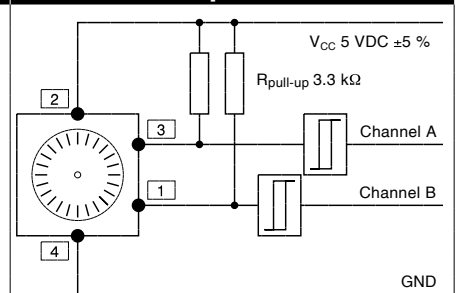
### Pin Allocation



Order number for connector with cable: 3419.506

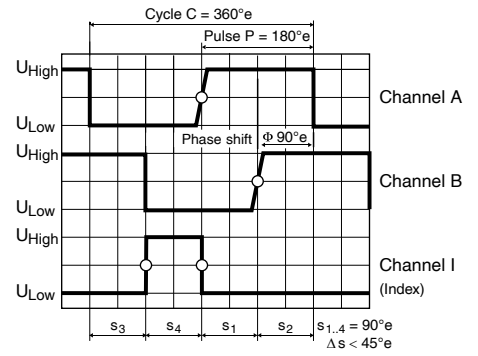
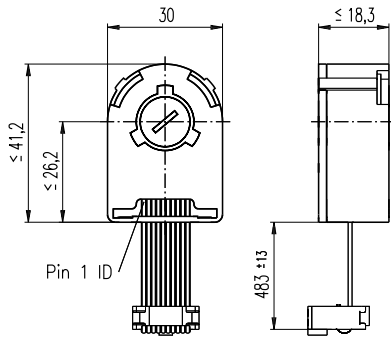


### Connection example



Ambient temperature range  $\theta_U = 22 - 25^\circ\text{C}$

# Encoder AEDL 5810 1024–5000 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

516205	516206	516207	516208	516209	533330	X drives	X drives
--------	--------	--------	--------	--------	--------	----------	----------

Type	1024	5000	1024	5000	5000	5000	1024	5000
Counts per turn	1024	5000	1024	5000	5000	5000	1024	5000
Number of channels	3	3	3	3	3	3	3	3
Max. operating frequency (kHz)	250	1000	250	1000	1000	1000	250	1000
Max. speed (rpm)	14000	12000	14000	12000	12000	12000	14000	12000
Shaft diameter (mm)	3	3	4	4	6	8	2-4	2-4
Phase shift $\Phi$ (°e)	90 ± 25	90 ± 45	90 ± 25	90 ± 45	90 ± 45	90 ± 45	90 ± 25	90 ± 45

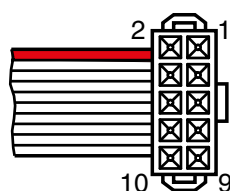
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
EC-4pole 22, 90 W	229					70.1	70.1
EC-4pole 22, 90 W	229	GP 22/GP 32	343/353			●	●
EC-4pole 22, 90 W	229	GP 32 S	382-387			●	●
EC-4pole 22, 120 W	230					87.5	87.5
EC-4pole 22, 120 W	230	GP 22/GP 32	343/353			●	●
EC-4pole 22, 120 W	230	GP 32 S	382-387			●	●
EC-4pole 30, 100 W	231					67.6	67.6
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356			●	●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362			●	●
EC-4pole 30, 100 W	231			AB 20	488	104.0	104.0
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●	●
EC-4pole 30, 100 W	231	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●	●
EC-4pole 30, 200 W	233					84.6	84.6
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356			●	●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362			●	●
EC-4pole 30, 200 W	233			AB 20	488	121.0	121.0
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●	●
EC-4pole 30, 200 W	233	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●	●
EC-i 30, 30 W	240					62.7	62.7
EC-i 30, 30 W	240	GP 32, 1.0 - 6.0 Nm	353			●	●
EC-i 30, 30 W	240	GP 32 S	382-387			●	●
EC-i 30, 45 W	241					62.7	62.7
EC-i 30, 45 W	241	GP 32, 1.0 - 6.0 Nm	354			●	●
EC-i 30, 45 W	241	GP 32 S	382-387			●	●
EC-i 30, 50 W	242					84.7	84.7
EC-i 30, 50 W	242	GP 32, 1.0 - 6.0 Nm	354			●	●
EC-i 30, 50 W	242	GP 32 S	382-387			●	●
EC-i 30, 75 W	243					84.7	84.7
EC-i 30, 75 W	243	GP 32, 1.0 - 6.0 Nm	354			●	●
EC-i 30, 75 W	243	GP 32 S	382-387			●	●

### Technical Data

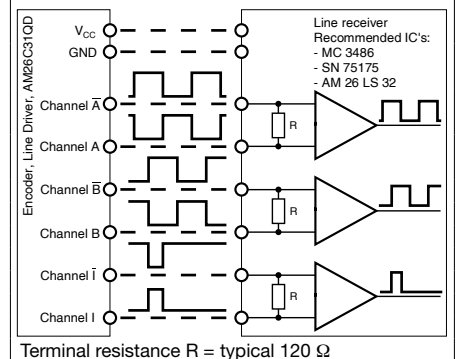
Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	30 mA
Output signal driver used:	EIA Standard RS 422 AM26C31QD
Signal rise time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Signal fall time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm <sup>2</sup>
Output current per channel	± 20 mA

### Pin Allocation



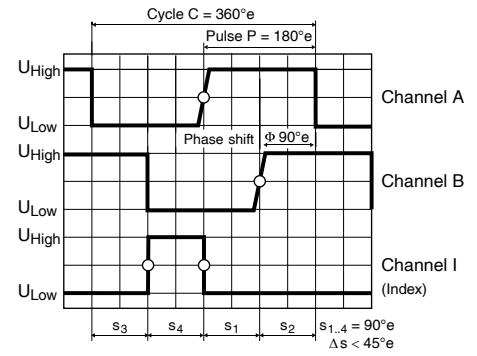
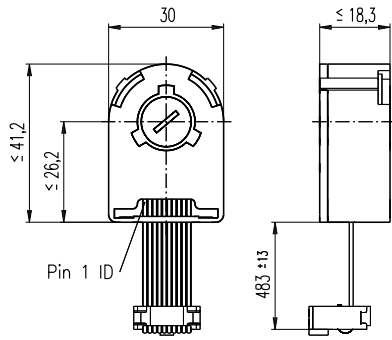
- 1 N.C.
  - 2  $V_{CC}$
  - 3 GND
  - 4 N.C.
  - 5 Channel A
  - 6 Channel B
  - 7 Channel B
  - 8 Channel B
  - 9 Channel I (Index)
  - 10 Channel I (Index)
- Pin type DIN 41651/  
EN 60603-13  
flat band cable AWG 28

### Connection example



The index signal I is synchronized with channel A or B.

# Encoder AEDL 5810 1024–5000 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

516205	516206	516207	516208	516209	533330	X drives	X drives
--------	--------	--------	--------	--------	--------	----------	----------

Type	516205	516206	516207	516208	516209	533330	X drives	X drives
Counts per turn	1024	5000	1024	5000	5000	5000	1024	5000
Number of channels	3	3	3	3	3	3	3	3
Max. operating frequency (kHz)	250	1000	250	1000	1000	1000	250	1000
Max. speed (rpm)	14000	12000	14000	12000	12000	12000	14000	12000
Shaft diameter (mm)	3	3	4	4	6	8	2-4	2-4
Phase shift $\Phi$ (°e)	90 ± 25	90 ± 45	90 ± 25	90 ± 45	90 ± 45	90 ± 45	90 ± 25	90 ± 45

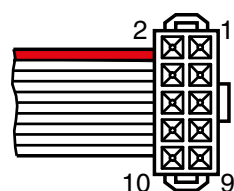
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-i 40, 50 W	244-245					49.0
EC-i 40, 50 W	244	GP 32, 1.0 - 6.0 Nm	354			●
EC-i 40, 50 W	244	GP 32 S	382-387			●
EC-i 40, 50 W	244-245	GP 42, 3.0 - 15.0 Nm	362			●
EC-i 40, 70 W	246/247					59.0
EC-i 40, 70 W	246	GP 32, 1.0 - 6.0 Nm	354			●
EC-i 40, 70 W	246	GP 32 S	382-387			●
EC-i 40, 70 W	246/247	GP 42, 3.0 - 15.0 Nm	363			●
EC-i 40, 100 W	248					79.0
EC-i 40, 100 W	248	GP 42, 3.0 - 15.0 Nm	362			●
EC-i 52, 180 W	249					100.7
EC-i 52, 180 W	249	GP 52, 4.0 - 30.0 Nm	367			●
EC-i 52, 200 W	250					
EC-i 52, 200 W	250	GP 52, 4.0 - 30.0 Nm	367			
DCX 22 S	84-85					online
DCX 22 L	86-87					online
DCX 26 L	88-89					online
DCX 32 L	90					online
DCX 35 L	91					online

### Technical Data

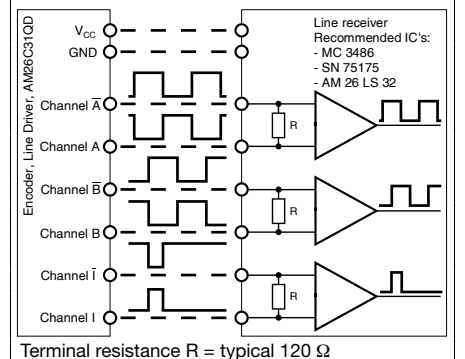
Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	30 mA
Output signal driver used:	EIA Standard RS 422 AM26C31QD
Signal rise time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Signal fall time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm <sup>2</sup>
Output current per channel	± 20 mA

### Pin Allocation

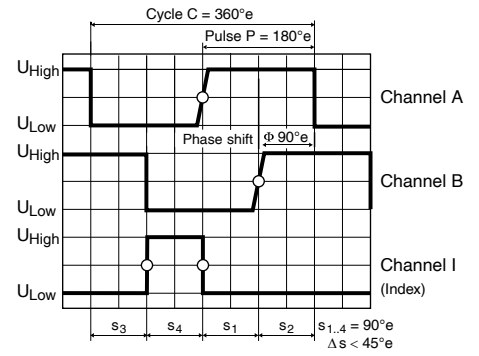
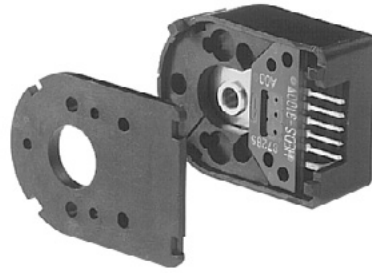
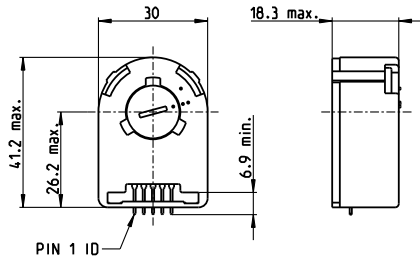


- 1 N.C.
  - 2  $V_{CC}$
  - 3 GND
  - 4 N.C.
  - 5 Channel  $\bar{A}$
  - 6 Channel A
  - 7 Channel  $\bar{B}$
  - 8 Channel B
  - 9 Channel I (Index)
  - 10 Channel I (Index)
- Pin type DIN 41651/  
EN 60603-13  
flat band cable AWG 28

### Connection example



# Encoder HEDS 5540 500 CPT, 3 Channels



Direction of rotation cw (definition cw p. 64)

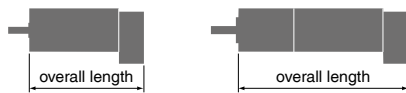
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

110511	110513	110515	X drives
--------	--------	--------	----------

### Type

Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	2-4



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25	129/131					75.3
RE 25	129/131	GP 26, 0.75 - 4.5 Nm	346			●
RE 25	129/131	GP 32, 0.75 - 6.0 Nm	348-352			●
RE 25	129/131	KD 32, 1.0 - 4.5 Nm	359			●
RE 25	129/131	GP 32 S	382-387			●
RE 25, 20 W	131			AB 28	491	105.8
RE 25, 20 W	131	GP 26, 0.75 - 4.5 Nm	346	AB 28	491	●
RE 25, 20 W	131	GP 32, 0.75 - 6.0 Nm	348-352	AB 28	491	●
RE 25, 20 W	131	KD 32, 1.0 - 4.5 Nm	359	AB 28	491	●
RE 25, 20 W	131	GP 32 S	382-387	AB 28	491	●
RE 30, 15 W	132					88.8
RE 30, 15 W	132	GP 32, 0.75 - 4.5 Nm	350			●
RE 30, 60 W	133					88.8
RE 30, 60 W	133	GP 32, 0.75 - 6.0 Nm	348-355			●
RE 30, 60 W	133	KD 32, 1.0 - 4.5 Nm	359			●
RE 30, 60 W	133	GP 32 S	382-387			●
RE 35, 90 W	134					91.7
RE 35, 90 W	134	GP 32, 0.75 - 8.0 Nm	348-356			●
RE 35, 90 W	134	GP 42, 3.0 - 15 Nm	361			●
RE 35, 90 W	134	GP 32 S	382-387			●
RE 35, 90 W	134			AB 28	491	124.3
RE 35, 90 W	134	GP 32, 0.75 - 8.0 Nm	348-356	AB 28	491	●
RE 35, 90 W	134	GP 42, 3.0 - 15 Nm	361	AB 28	491	●
RE 35, 90 W	134	GP 32 S	382-387	AB 28	491	●
RE 40, 25 W	135					91.7
RE 40, 150 W	136					●
RE 40, 150 W	136	GP 42, 3.0 - 15 Nm	361			●
RE 40, 150 W	136	GP 52, 4.0 - 30 Nm	366			●
RE 40, 150 W	136			AB 28	491	124.3
RE 40, 150 W	136	GP 42, 3.0 - 15 Nm	361	AB 28	491	●
RE 40, 150 W	136	GP 52, 4.0 - 30 Nm	366	AB 28	491	●
DCX 22 S	84-85					online
DCX 22 L	86-87					online
DCX 26 L	88-89					online
DCX 32 L	90					online
DCX 35 L	91					online

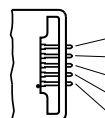
### Technical Data

Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	55 mA
Output signal	TTL compatible
Phase shift $\Phi$	90°e ± 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	40 ns
Index pulse width (nominal)	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	≤ 0.6 gcm <sup>2</sup>
Max. angular acceleration	250000 rad s <sup>-2</sup>
Output current per channel	min. -1 mA, max. 5 mA

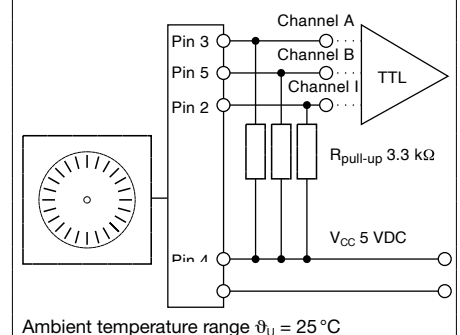
The index signal I is synchronized with channel A or B.

### Pin Allocation

Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	$V_{CC}$	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

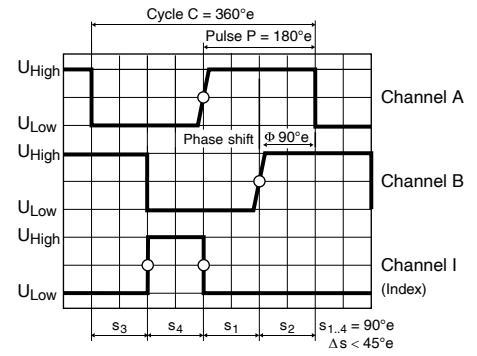
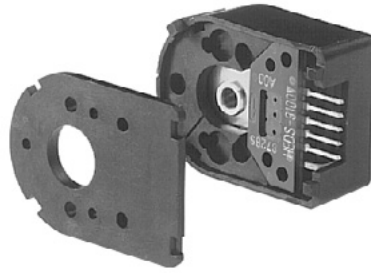
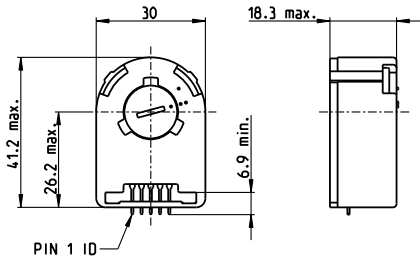


### Connection example





# Encoder HEDS 5540 500 CPT, 3 Channels



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

110511	110513	110515	110517
--------	--------	--------	--------

Type	110511	110513	110515	110517
Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8

## maxon Modular System

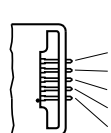
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25, 20 W	130					63.8
RE 25, 20 W	130	GP 26, 0.75 - 4.5 Nm	346			●
RE 25, 20 W	130	GP 32, 0.75 - 4.5 Nm	348			●
RE 25, 20 W	130	GP 32, 0.75 - 6.0 Nm	349/352			●
RE 25, 20 W	130	KD 32, 1.0 - 4.5 Nm	359			●
RE 25, 20 W	130	GP 32 S	382-387			●
RE 25, 20 W	130			AB 28	491	94.3
RE 25, 20 W	130	GP 22, 0.5 Nm	340			●
RE 25, 20 W	130	GP 26, 0.75 - 4.5 Nm	346	AB 28	491	●
RE 25, 20 W	130	GP 32, 0.75 - 4.5 Nm	348	AB 28	491	●
RE 25, 20 W	130	GP 32, 0.75 - 6.0 Nm	349/352	AB 28	491	●
RE 25, 20 W	130	KD 32, 1.0 - 4.5 Nm	359	AB 28	491	●
RE 25, 20 W	130	GP 32 S	382-387	AB 28	491	●
RE 50, 200 W	137					128.7
RE 50, 200 W	137	GP 52, 4 - 30 Nm	366			●
RE 50, 200 W	137	GP 62, 8 - 50 Nm	368			●
RE 65, 250 W	138					157.3
RE 65, 250 W	138	GP 81, 20 - 120 Nm	369			●
A-max 26	155-158					63.1
A-max 26	155-158	GP 26, 0.75 - 4.5 Nm	346			●
A-max 26	155-158	GS 30, 0.07 - 0.2 Nm	347			●
A-max 26	155-158	GP 32, 0.75 - 4.5 Nm	348			●
A-max 26	155-158	GP 32, 0.75 - 6.0 Nm	349/352			●
A-max 26	155-158	GS 38, 0.1 - 0.6 Nm	360			●
A-max 26	155-158	GP 32 S	382-387			●
A-max 32	160					82.3
A-max 32	160	GP 32, 0.75 - 6.0 Nm	348-353			●
A-max 32	160	GS 38, 0.1 - 0.6 Nm	360			●
A-max 32	160	GP 32 S	382-387			●
EC 32, 80 W	209					78.4
EC 32, 80 W	209	GP 32, 0.75 - 6.0 Nm	348-355			●
EC 32, 80 W	209	GP 32 S	382-387			●
EC 40, 170 W	210					103.4
EC 40, 170 W	210	GP 42, 3.0 - 15 Nm	361			●
EC 40, 170 W	210	GP 52, 4.0 - 30 Nm	366			●

## Technical Data

Supply voltage $V_{CC}$	$5 V \pm 10\%$
Typical current draw	55 mA
Output signal	TTL compatible
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 2.7 \text{ k}\Omega$ , $25^\circ \text{C}$ )	180 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 2.7 \text{ k}\Omega$ , $25^\circ \text{C}$ )	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +100^\circ \text{C}$
Moment of inertia of code wheel	$\leq 0.6 \text{ gcm}^2$
Max. angular acceleration	$250000 \text{ rad s}^{-2}$
Output current per channel	min. -1 mA, max. 5 mA

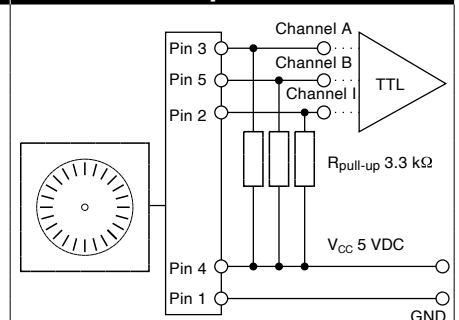
The index signal I is synchronized with channel A or B.

## Pin Allocation



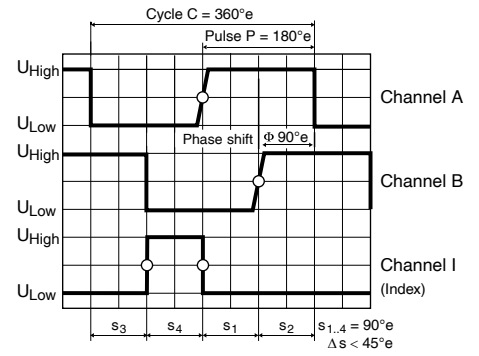
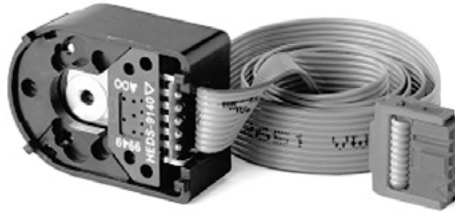
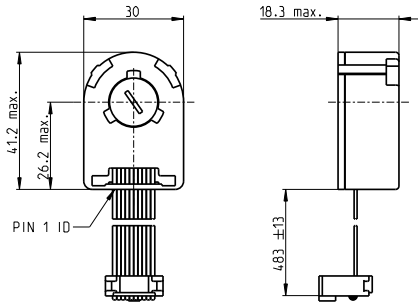
Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	$V_{CC}$	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

## Connection example



Ambient temperature range  $\vartheta_U = 25^\circ \text{C}$

# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

110512	110514	110516	110518	X drives
Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8

### Type

Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2-4

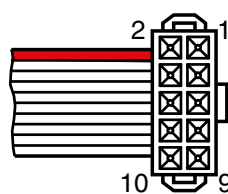
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25	129/131					75.3
RE 25	129/131	GP 26/GP 32	346/348			●
RE 25	129/131	KD 32, 1.0 - 4.5 Nm	359			●
RE 25	129/131	GP 32, 0.75 - 6.0 Nm	349/352			●
RE 25	129/131	GP 32 S	382-387			●
RE 25, 20 W	130					63.8
RE 25, 20 W	130	GP 22, 0.5 Nm	340			●
RE 25, 20 W	130	GP 26/GP 32	346/348			●
RE 25, 20 W	130	KD 32, 1.0 - 4.5 Nm	359			●
RE 25, 20 W	130	GP 32, 0.75 - 6.0 Nm	349/352			●
RE 25, 20 W	130	GP 32 S	382-387			●
RE 25, 20 W	130			AB 28	491	94.3
RE 25, 20 W	130	GP 26/GP 32	346/348	AB 28	491	●
RE 25, 20 W	130	KD 32, 1.0 - 4.5 Nm	359	AB 28	491	●
RE 25, 20 W	130	GP 32, 0.75 - 6.0 Nm	349/352	AB 28	491	●
RE 25, 20 W	130	GP 32 S	382-387	AB 28	491	●
RE 25, 20 W	131			AB 28	491	105.8
RE 25, 20 W	131	GP 26/GP 32	346/348	AB 28	491	●
RE 25, 20 W	131	KD 32, 1.0 - 4.5 Nm	359	AB 28	491	●
RE 25, 20 W	131	GP 32, 0.75 - 6.0 Nm	349/352	AB 28	491	●
RE 25, 20 W	131	GP 32 S	382-387	AB 28	491	●
RE 30, 15 W	132					88.8
RE 30, 15 W	132	GP 32, 0.75 - 4.5 Nm	350			●
RE 30, 60 W	133					88.8
RE 30, 60 W	133	GP 32, 0.75 - 6.0 Nm	348-355			●
RE 30, 60 W	133	KD 32, 1.0 - 4.5 Nm	359			●
RE 30, 60 W	133	GP 32 S	382-387			●
RE 35, 90 W	134					91.7
RE 35, 90 W	134	GP 32, 0.75 - 8.0 Nm	348-356			●
RE 35, 90 W	134	GP 42, 3.0 - 15.0 Nm	361			●
RE 35, 90 W	134	GP 32 S	382-387			●
RE 35, 90 W	134			AB 28	491	124.3
RE 35, 90 W	134	GP 32, 0.75 - 8.0 Nm	348-356	AB 28	491	●
RE 35, 90 W	134	GP 42, 3.0 - 15.0 Nm	361	AB 28	491	●
RE 35, 90 W	134	GP 32 S	383-387	AB 28	491	●

### Technical Data

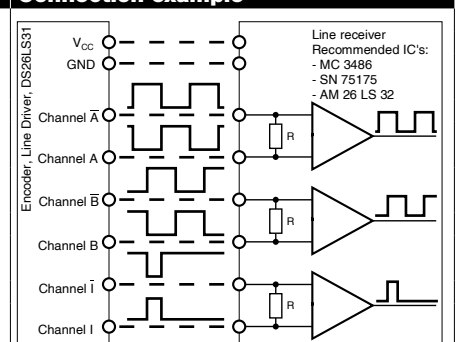
Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	55 mA
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\Phi$	90°e ± 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	≤ 0.6 gcm <sup>2</sup>
Max. angular acceleration	250000 rad s <sup>-2</sup>
Output current per channel	± 20 mA

### Pin Allocation



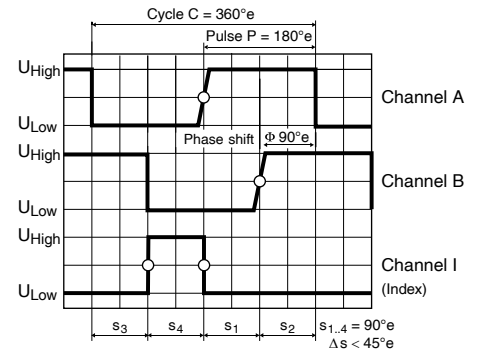
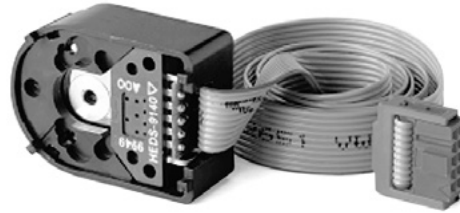
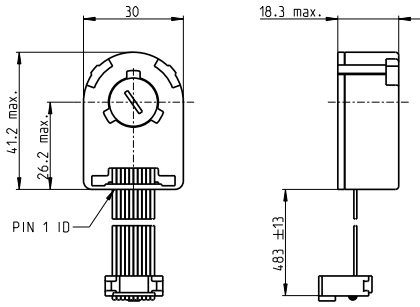
- 1 N.C.
  - 2  $V_{CC}$
  - 3 GND
  - 4 N.C.
  - 5 Channel  $\bar{A}$
  - 6 Channel A
  - 7 Channel B
  - 8 Channel  $\bar{B}$
  - 9 Channel I (Index)
  - 10 Channel I (Index)
- Pin type DIN 41651/ EN 60603-13 flat band cable AWG 28

### Connection example



The index signal I is synchronized with channel A or B.

# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422

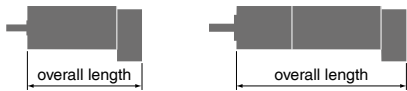


Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

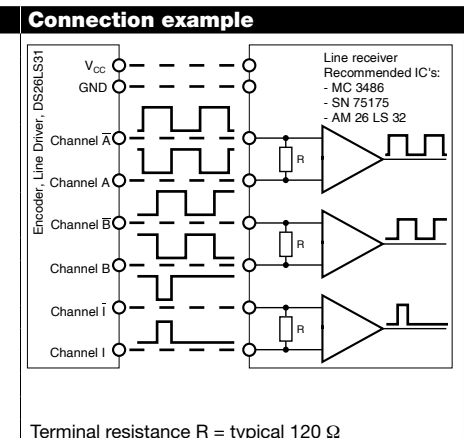
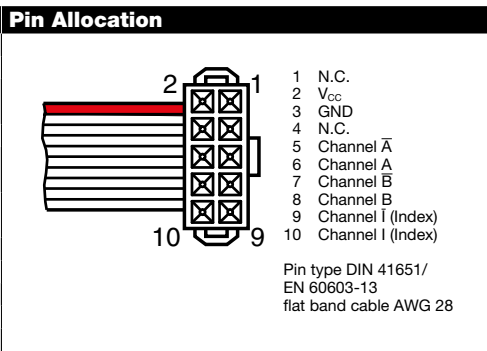
Part Numbers				
110512	110514	110516	110518	X drives

Type	110512	110514	110516	110518	X drives
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2-4



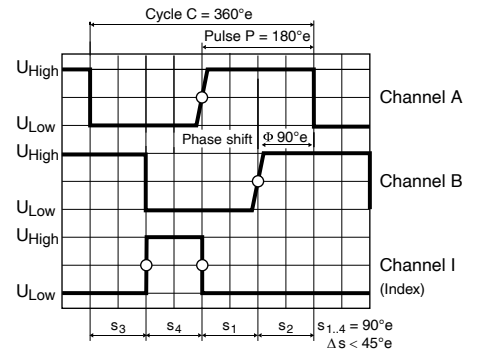
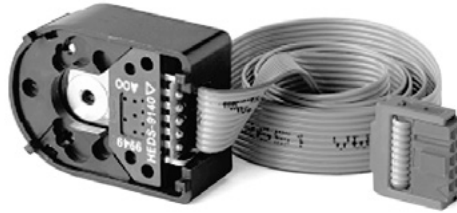
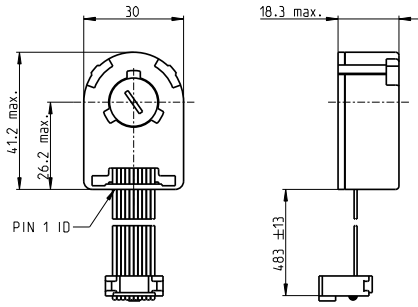
maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 40, 25 W	135					91.7
RE 40, 150 W	136					91.7
RE 40, 150 W	136	GP 42, 3.0 - 15.0 Nm	361			●
RE 40, 150 W	136	GP 52, 4.0 - 30.0 Nm	366			●
RE 40, 150 W	136			AB 28	491	124.3
RE 40, 150 W	136	GP 42, 3.0 - 15.0 Nm	361	AB 28	491	●
RE 40, 150 W	136	GP 52, 4.0 - 30.0 Nm	366	AB 28	491	●
RE 50, 200 W	137					128.7
RE 50, 200 W	137	GP 52, 4.0 - 30.0 Nm	367			●
RE 50, 200 W	137	GP 62, 8.0 - 50.0 Nm	368			●
RE 65, 250 W	138					157.3
RE 65, 250 W	138	GP 81, 20.0 - 120.0 Nm	369			●
A-max 26	155-158					63.1
A-max 26	155-158	GP 26, 0.75 - 4.5 Nm	346			●
A-max 26	155-158	GS 30/GP 32	347/350			●
A-max 26	155-158	GP 32, 0.75 - 6.0 Nm	349/352			●
A-max 26	155-158	GS 38, 0.1 - 0.6 Nm	360			●
A-max 26	155-158	GP 32 S	382-387			●
A-max 32	160					82.3
A-max 32	160	GP 32, 0.75 - 6.0 Nm	348-353			●
A-max 32	160	GS 38, 0.1 - 0.6 Nm	360			●
A-max 32	160	GP 32 S	382-387			●
EC 32, 80 W	209					78.4
EC 32, 80 W	209	GP 32, 0.75 - 6.0 Nm	348-355			●
EC 32, 80 W	209	GP 32 S	382-387			●
EC 40, 170 W	210					103.4
EC 40, 170 W	210	GP 42, 3.0 - 15.0 Nm	361			●
EC 40, 170 W	210	GP 52, 4.0 - 30.0 Nm	366			●

Technical Data	
Supply voltage $V_{CC}$	5 V ± 10%
Typical current draw	55 mA
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\Phi$	90°e ± 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	≤ 0.6 gcm <sup>2</sup>
Max. angular acceleration	250 000 rad s <sup>-2</sup>
Output current per channel	± 20 mA



The index signal I is synchronized with channel A or B.

# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



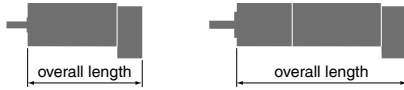
Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

110512	110514	110516	110518	X drives
--------	--------	--------	--------	----------

Type	110512	110514	110516	110518	X drives
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2-4

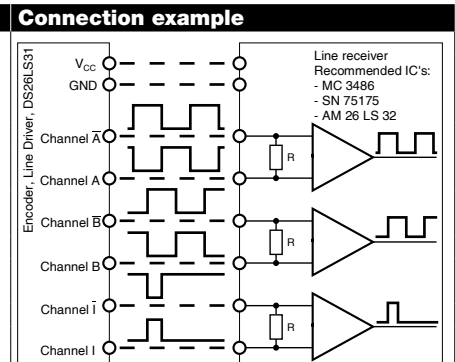
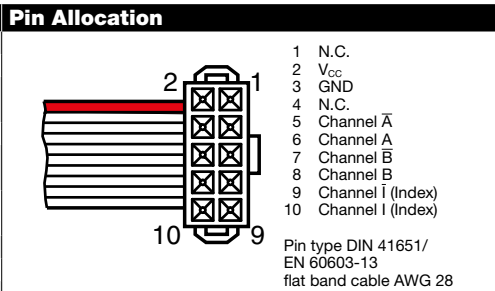


## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-max 30, 40 W	222					62.6
EC-max 30, 40 W	222	GP 32, 1.0 - 8.0 Nm	353/356			●
EC-max 30, 40 W	222	KD 32, 1.0 - 4.5 Nm	359			●
EC-max 30, 40 W	222	GP 32 S	382-387			●
EC-max 30, 40 W	222			AB 20	488	98.4
EC-max 30, 40 W	222	GP 32, 1.0 - 8.0 Nm	353/356	AB 20	488	●
EC-max 30, 40 W	222	KD 32, 1.0 - 4.5 Nm	359	AB 20	488	●
EC-max 30, 40 W	222	GP 32 S	382-387	AB 20	488	●
EC-max 30, 60 W	223					84.6
EC-max 30, 60 W	223	GP 32, 1.0 - 8.0 Nm	353/356			●
EC-max 30, 60 W	223	KD 32, 1.0 - 4.5 Nm	359			●
EC-max 30, 60 W	223	GP 42, 3.0 - 15.0 Nm	362			●
EC-max 30, 60 W	223			AB 20	488	120.4
EC-max 30, 60 W	223	GP 32, 1.0 - 8.0 Nm	353/356	AB 20	488	●
EC-max 30, 60 W	223	KD 32, 1.0 - 4.5 Nm	359	AB 20	488	●
EC-max 30, 60 W	223	GP 42, 3.0 - 15.0 Nm	362	AB 20	488	●
EC-max 40, 70 W	224					81.4
EC-max 40, 70 W	224	GP 42, 3.0 - 15.0 Nm	362			●
EC-max 40, 70 W	224			AB 28	490	110.7
EC-max 40, 70 W	224	GP 42, 3.0 - 15.0 Nm	362	AB 28	490	●
EC-max 40, 120 W	225					111.4
EC-max 40, 120 W	225	GP 52, 4.0 - 30.0 Nm	367			●
EC-max 40, 120 W	225			AB 28	490	140.7
EC-max 40, 120 W	225	GP 52, 4.0 - 30.0 Nm	367	AB 28	490	●
EC-4pole 22, 90 W	229					70.1
EC-4pole 22, 90 W	229	GP 22/GP 32	343/353			●
EC-4pole 22, 90 W	229	GP 32 S	382-387			●
EC-4pole 22, 120 W 230						87.5
EC-4pole 22, 120 W 230		GP 22/GP 32	343/353			●
EC-4pole 22, 120 W 230		GP 32 S	382-387			●

### Technical Data

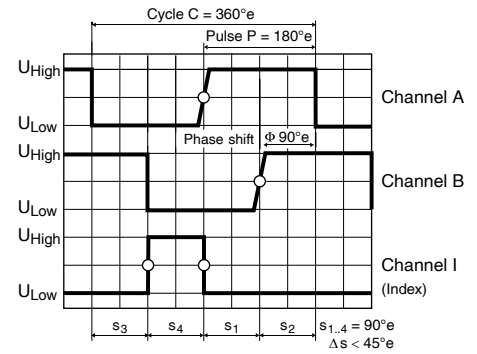
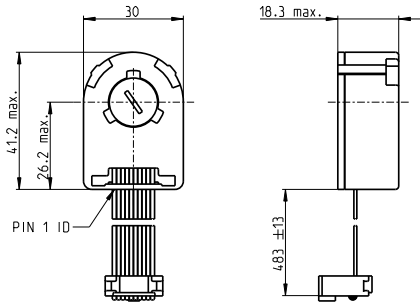
Supply voltage $V_{CC}$	$5\text{ V} \pm 10\%$
Typical current draw	55 mA
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\phi$	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25\text{ pF}$ , $R_L = 2.7\text{ k}\Omega$ , $25^\circ\text{C}$ )	180 ns
Signal fall time (typically, at $C_L = 25\text{ pF}$ , $R_L = 2.7\text{ k}\Omega$ , $25^\circ\text{C}$ )	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +100^\circ\text{C}$
Moment of inertia of code wheel	$\leq 0.6\text{ gcm}^2$
Max. angular acceleration	$250\,000\text{ rad s}^{-2}$
Output current per channel	$\pm 20\text{ mA}$



The index signal I is synchronized with channel A or B.

Terminal resistance R = typical 120  $\Omega$

# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 64)

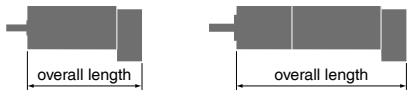
- Stock program
- Standard program
- Special program (on request)

## Part Numbers

110512	110514	110516	110518	X drives
Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8

## Type

Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2-4



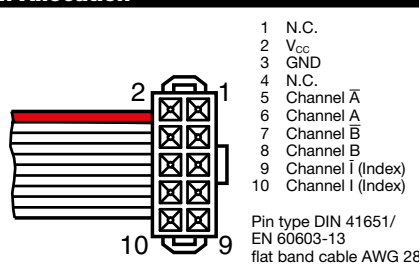
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-4pole 30, 100 W 231						67.6
EC-4pole 30, 100 W 231		GP 32, 4.0 - 8.0 Nm	356			●
EC-4pole 30, 100 W 231		GP 42, 3 - 15 Nm	362			●
EC-4pole 30, 100 W 231				AB 20	488	104.0
EC-4pole 30, 100 W 231		GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●
EC-4pole 30, 100 W 231		GP 42, 3 - 15 Nm	362	AB 20	488	●
EC-4pole 30, 200 W 233						84.6
EC-4pole 30, 200 W 233		GP 32, 4.0 - 8.0 Nm	356			●
EC-4pole 30, 200 W 233		GP 42, 3 - 15 Nm	362			●
EC-4pole 30, 200 W 233				AB 20	488	121.0
EC-4pole 30, 200 W 233		GP 32, 4.0 - 8.0 Nm	356	AB 20	488	●
EC-4pole 30, 200 W 233		GP 42, 3 - 15 Nm	362	AB 20	488	●
EC-i 30, 30 W	240					62.7
EC-i 30, 30 W	240	GP 32, 1.0 - 6.0 Nm	353			●
EC-i 30, 30 W	240	GP 32 S	382-387			●
EC-i 30, 45 W	241					62.7
EC-i 30, 45 W	241	GP 32, 1.0 - 6.0 Nm	354			●
EC-i 30, 45 W	241	GP 32 S	382-387			●
EC-i 30, 50 W	242					84.7
EC-i 30, 50 W	242	GP 32, 1.0 - 6.0 Nm	354			●
EC-i 30, 50 W	242	GP 32 S	382-387			●
EC-i 30, 75 W	243					84.7
EC-i 30, 75 W	243	GP 32, 1.0 - 6.0 Nm	354			●
EC-i 30, 75 W	243	GP 32 S	382-387			●

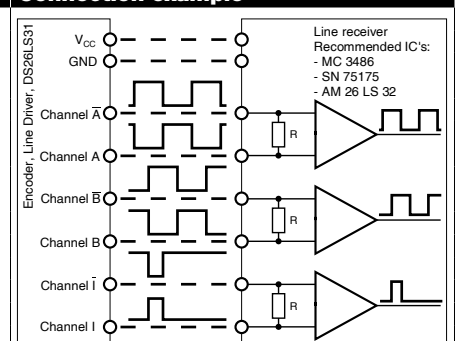
## Technical Data

Supply voltage $V_{CC}$	$5 V \pm 10\%$
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift $\phi$	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 2.7 \text{ k}\Omega$ , $25^\circ\text{C}$ )	180 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 2.7 \text{ k}\Omega$ , $25^\circ\text{C}$ )	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +100^\circ\text{C}$
Moment of inertia of code wheel	$\leq 0.6 \text{ gcm}^2$
Max. angular acceleration	$250\,000 \text{ rad s}^{-2}$
Output current per channel	$\pm 20 \text{ mA}$

## Pin Allocation



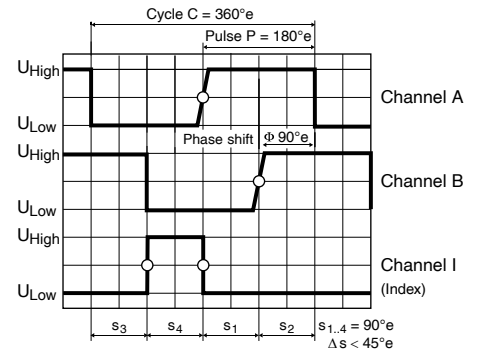
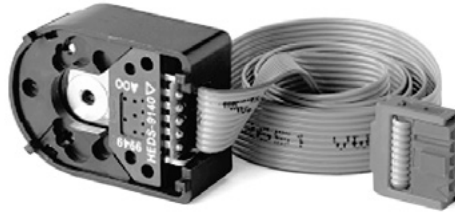
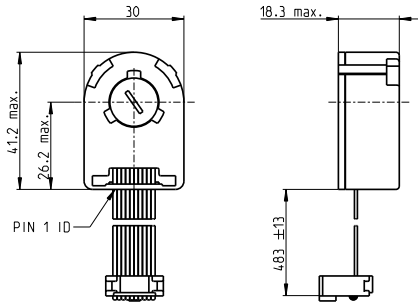
## Connection example



Terminal resistance R = typical 120  $\Omega$

The index signal I is synchronized with channel A or B.

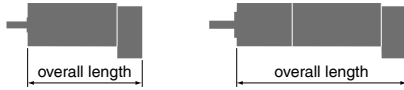
# Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



- Stock program
- Standard program
- Special program (on request)

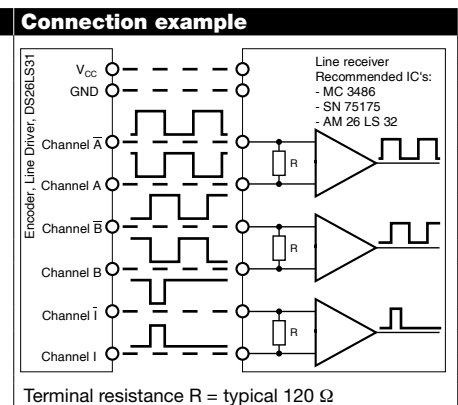
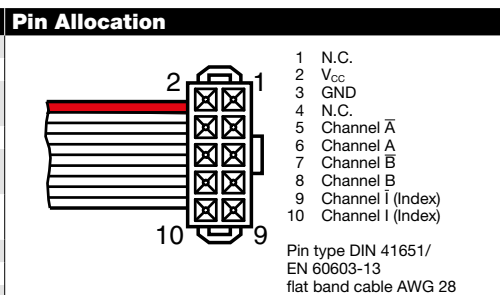
Part Numbers					
110512	110514	110516	110518	X drives	

Type	110512	110514	110516	110518	X drives
Counts per turn	500	500	500	500	500
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8	2-4



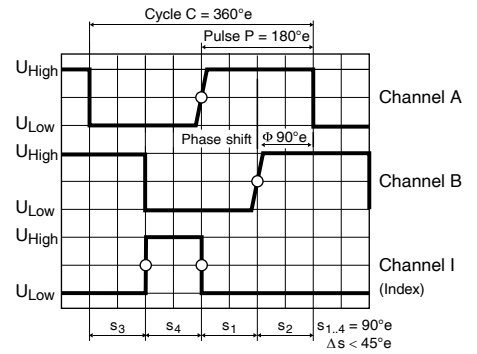
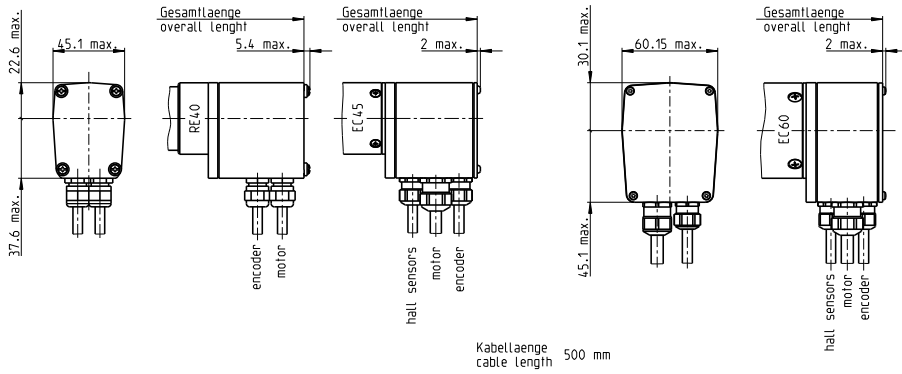
maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see Gearhead
EC-i 40, 50 W	244/245					49.0
EC-i 40, 50 W	244	GP 32, 1.0 - 6.0 Nm	353			•
EC-i 40, 50 W	244/245	GP 42, 3.0 - 15.0 Nm	362			•
EC-i 40, 50 W	244	GP 32 S	382-387			•
EC-i 40, 70 W	246/247					59.0
EC-i 40, 70 W	246	GP 32, 1.0 - 6.0 Nm	353			•
EC-i 40, 70 W	246/247	GP 42, 3.0 - 15.0 Nm	362			•
EC-i 40, 70 W	246	GP 32 S	382-387			•
EC-i 40, 100 W	248					79.0
EC-i 40, 100 W	248	GP 42, 3.0 - 15.0 Nm	362			•
EC-i 52, 180 W	249					100.7
EC-i 52, 180 W	249	GP 52, 4.0 - 30.0 Nm	366			•
EC-i 52, 200 W	250					
EC-i 52, 200 W	250	GP 52, 4.0 - 30.0 Nm	366			
DCX 22 S	84-85					online
DCX 22 L	86-87					online
DCX 26 L	88-89					online
DCX 32 L	90					online
DCX 35 L	91					online

Technical Data	
Supply voltage $V_{CC}$	5 V $\pm$ 10%
Typical current draw	55 mA
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\Phi$	90°e $\pm$ 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k $\Omega$ , 25°C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	$\leq 0.6$ gcm <sup>2</sup>
Max. angular acceleration	250000 rad s <sup>-2</sup>
Output current per channel	$\pm 20$ mA



The index signal I is synchronized with channel A or B.

# Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422



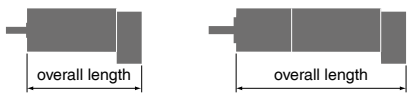
Direction of rotation cw (definition cw p. 64)

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

137959

Type	
Counts per turn	500
Number of channels	3
Max. operating frequency (kHz)	100
Max. speed (rpm)	12000



## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 40, 150 W	136					125.1
RE 40, 150 W	136	GP 42, 3 - 15 Nm	361			●
RE 40, 150 W	136	GP 52, 4 - 30 Nm	366			●
RE 40, 150 W	136			AB 28	492	135.6
RE 40, 150 W	136	GP 42, 3 - 15 Nm	361	AB 28	492	●
RE 40, 150 W	136	GP 52, 4 - 30 Nm	366	AB 28	492	●
EC 45, 150 W	211					126.8
EC 45, 150 W	211	GP 42, 3 - 15 Nm	361			●
EC 45, 150 W	211	GP 52, 4 - 30 Nm	366			●
EC 45, 150 W	211			AB 28	492	135.6
EC 45, 150 W	211	GP 42, 3 - 15 Nm	361	AB 28	492	●
EC 45, 150 W	211	GP 52, 4 - 30 Nm	366	AB 28	492	●
EC 45, 250 W	212					159.6
EC 45, 250 W	212	GP 42, 3 - 15 Nm	362			●
EC 45, 250 W	212	GP 52, 4 - 30 Nm	366			●
EC 45, 250 W	212	GP 62, 8 - 50 Nm	368			●
EC 45, 250 W	212			AB 28	492	168.4
EC 45, 250 W	212	GP 42, 3 - 15 Nm	361	AB 28	492	●
EC 45, 250 W	212	GP 52, 4 - 30 Nm	366	AB 28	492	●
EC 45, 250 W	212	GP 62, 8 - 50 Nm	368	AB 28	492	●
EC 60, 400 W	213					177.3
EC 60, 400 W	213	GP 81, 20 - 120 Nm	369			●
EC 60, 400 W	213			AB 41	494	214.9
EC 60, 400 W	213	GP 81, 20 - 120 Nm	369	AB 41	494	●

## Technical Data

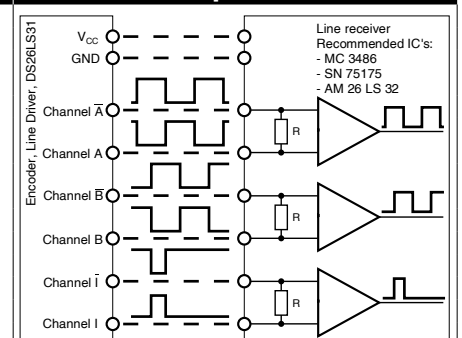
Supply voltage $V_{CC}$	$5 V \pm 10\%$
Typical current draw	55 mA
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\Phi$	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 11 \text{ k}\Omega$ , $25^\circ \text{C}$ )	180 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 11 \text{ k}\Omega$ , $25^\circ \text{C}$ )	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +85^\circ \text{C}$
Moment of inertia of code wheel	$\leq 0.6 \text{ gcm}^2$
Max. angular acceleration	$250\,000 \text{ rad s}^{-2}$
Output current per channel	$\pm 20 \text{ mA}$

## Pin Allocation

Cable white	=	2	$V_{CC}$ 5 VDC
Cable brown	=	3	GND
Cable green	=	5	Channel A
Cable yellow	=	6	Channel A
Cable grey	=	7	Channel B
Cable pink	=	8	Channel B
Cable blue	=	9	Channel I (Index)
Cable red	=	10	Channel I (Index)

Cable size  $8 \times 0.25 \text{ mm}^2$

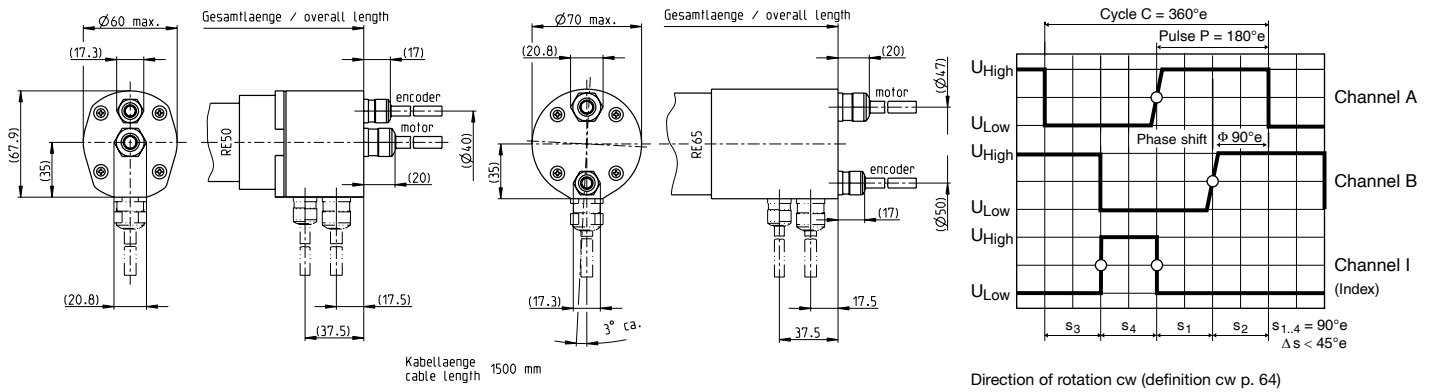
## Connection example



Terminal resistance  $R = \text{typical } 120 \Omega$

The index signal I is synchronized with channel A or B.

# Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422



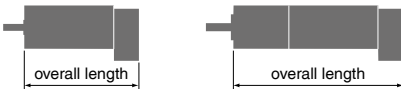
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

cable outlet axial	386051	386001
cable outlet radial	386053	386002

### Type

Counts per turn	500	500
Number of channels	3	3
Max. operating frequency (kHz)	100	100
Max. speed (rpm)	12 000	12 000



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 50, 200 W	137					170.4
RE 50, 200 W	137	GP 52, 4 - 30 Nm	366			●
RE 50, 200 W	137	GP 62, 8 - 50 Nm	368			●
RE 50, 200 W	137			AB 44	495	183.4
RE 50, 200 W	137	GP 52, 4 - 30 Nm	366	AB 44	495	●
RE 50, 200 W	137	GP 62, 8 - 50 Nm	368	AB 44	495	●
RE 65, 250 W	138					187.5
RE 65, 250 W	138	GP 81, 20 - 120 Nm	369			●
RE 65, 250 W	138			AB 44	495	205.5
RE 65, 250 W	138	GP 81, 20 - 120 Nm	369	AB 44	495	●

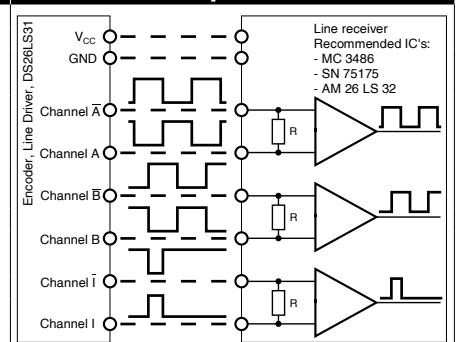
### Technical Data

Supply voltage $V_{CC}$	$5 V \pm 10\%$
Typical current draw	55 mA
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift $\phi$	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 11 \text{ k}\Omega$ , $25^\circ \text{C}$ )	180 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$ , $R_L = 11 \text{ k}\Omega$ , $25^\circ \text{C}$ )	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +85^\circ \text{C}$
Moment of inertia of code wheel	$\leq 0.6 \text{ gcm}^2$
Max. angular acceleration	$250\,000 \text{ rad s}^{-2}$
Output current per channel	$\pm 20 \text{ mA}$
Protection to	IP54

### Pin Allocation

Encoder	
Cable white	= $V_{CC}$ 5 VDC
Cable brown	= GND
Cable green	= Channel $\bar{A}$
Cable yellow	= Channel A
Cable grey	= Channel $\bar{B}$
Cable pink	= Channel B
Cable blue	= Channel $\bar{I}$ (Index)
Cable red	= Channel I (Index)
Cable size $8 \times 0.25 \text{ mm}^2$	
Motor	
Cable white	= Motor +
Cable brown	= Motor -
Cable size $2 \times 1.0 \text{ mm}^2$	

### Connection example

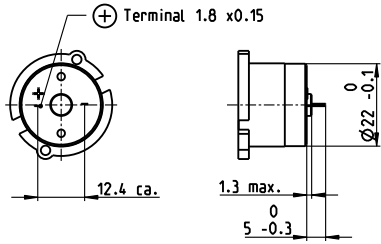


The index signal I is synchronized with channel A or B.

Terminal resistance R = typical 120  $\Omega$



# DC Tacho DCT 22 0.52 Volt



## Important Information

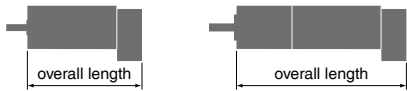
- Tacho with moving coil, maxon system.
- Tacho with precious metal commutation.
- To establish total inertia add motor and tacho inertias.
- With the output shaft turning CW as seen from the mounting surface, the tacho output voltage will be positive at the + terminal.
- A high impedance load is recommended at tacho terminals.
- The tacho current should be kept low.
- The indicated resonance frequency refers to the motor-tacho rotor system.

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

118909	118910
--------	--------

Type	3	4
Shaft diameter (mm)		



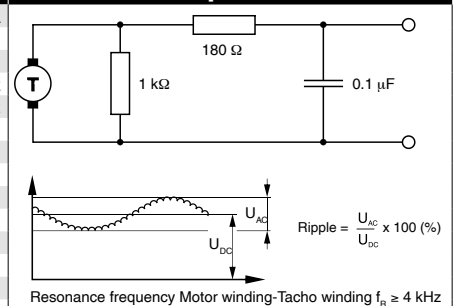
## maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 25	129/131			76.8
RE 25	129/131	GP 26, 0.75 - 4.5 Nm	346	●
RE 25	129/131	GP 32, 0.75 - 4.5 Nm	348/349	●
RE 25	129/131	GP 32, 1.0 - 6.0 Nm	352	●
RE 25	129/131	GP 32, 1.0 - 4.5 Nm	359	●
RE 25	129/131	GP 32 S	382-387	●
RE 25, 20 W	130			65.3
RE 25, 20 W	130	GP 22, 0.5 - 1.0 Nm	339	●
RE 25, 20 W	130	GP 26, 0.75 - 4.5 Nm	346	●
RE 25, 20 W	130	GP 32, 0.75 - 4.5 Nm	348/349	●
RE 25, 20 W	130	GP 32, 0.75 - 6.0 Nm	352	●
RE 25, 20 W	130	KD 32, 1.0 - 4.5 Nm	359	●
RE 25, 20 W	130	GP 32 S	382-387	●
RE 35, 90 W	134			89.1
RE 35, 90 W	134	GP 32, 0.75 - 6.0 Nm	348-355	●
RE 35, 90 W	134	GP 32, 4.0 - 8.0 Nm	356	●
RE 35, 90 W	134	GP 42, 3.0 - 15 Nm	361	●
RE 35, 90 W	134	GP 32 S	382-387	●

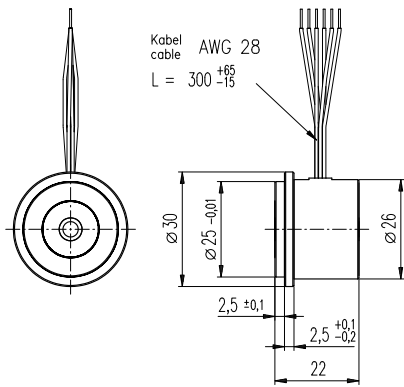
## Technical Data

Output voltage per 1000 rpm	0.52 V	Max. current	10 mA
Terminal resistance tacho	37.7 Ω	Tolerance of the output voltage	± 15 %
Typical peak to peak ripple	≤ 6 %	Rotor inertia (tacho only)	< 3 gcm <sup>2</sup>
Ripple frequency per turn	14	Resonance frequency with motors on p. 129-131	> 2 kHz
Linear voltage tolerance, 500 to 5000 rpm	± 0.2 %	with motors on p. 134	> 4.5 kHz
Linear voltage tolerance with 10 kΩ load resistance	± 0.7 %	Temperature range	-20 ... +65 °C
Polarity error	± 0.1 %		
Temperature coefficient of EMF (magnet)	-0.02 % /°C	Option: Pigtails in place of solder terminals.	
Temperature coefficient of coil resistance	+0.4 % /°C		

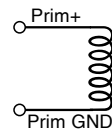
## Connection example



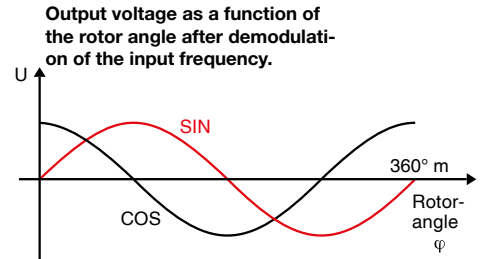
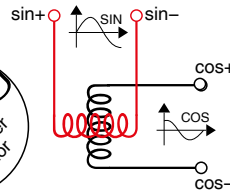
# Resolver Res 26 10 Volt



Primary



Secondary



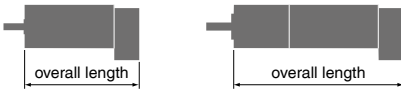
- Stock program
- Standard program
- Special program (on request)

### Part Numbers

166488	133405	268912	199287
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### Type

Shaft diameter (mm)	4	6	6	6
Max. speed (rpm)	10000	10000	10000	10000



### maxon Modular System

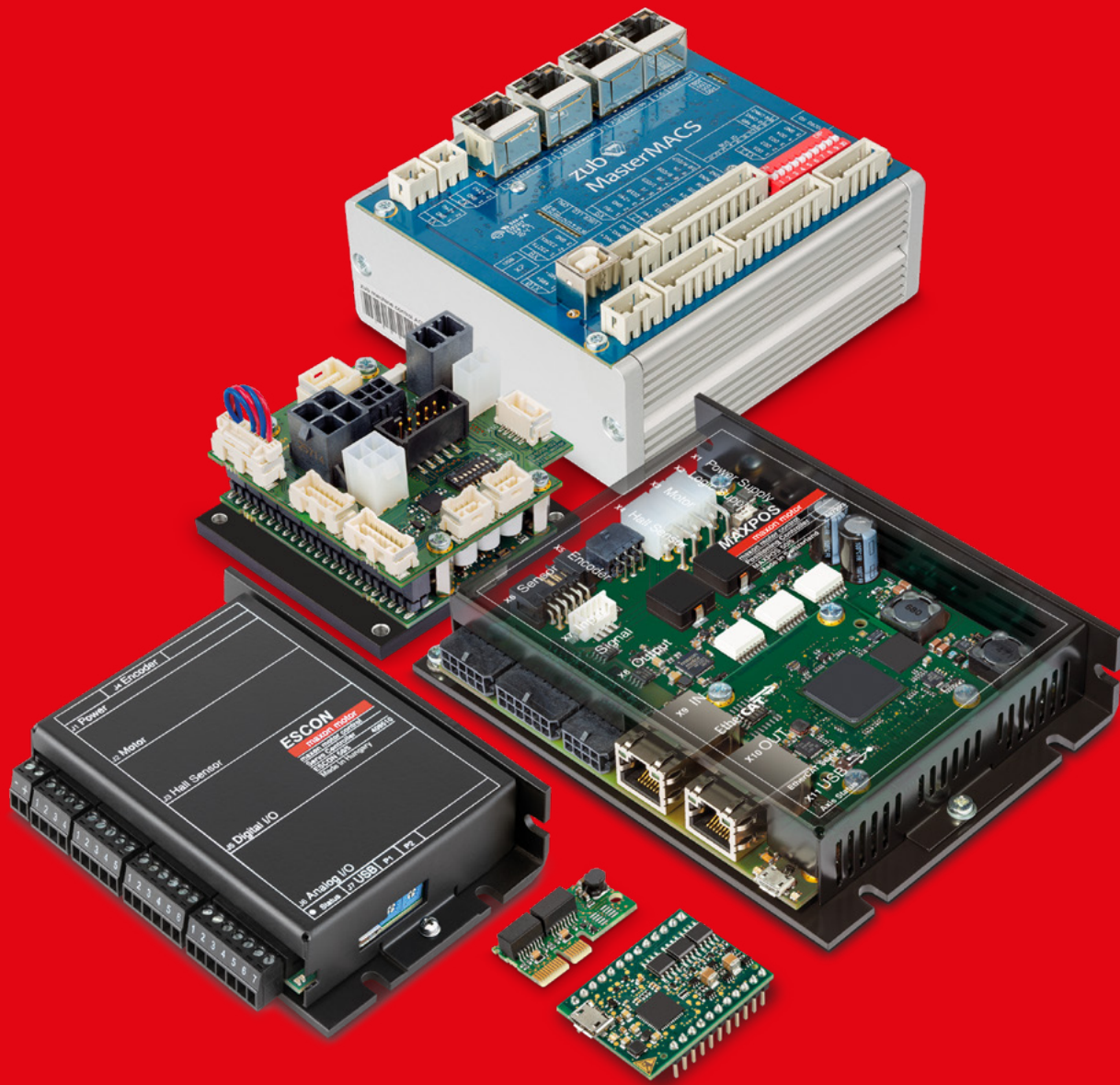
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
EC 32, 80 W	209			80.1
EC 32, 80 W	209	GP 32, 0.75 - 6.0 Nm	348-355	●
EC 32, 80 W	209	GP 32 S	382-387	●
EC 40, 170 W	210			107.2
EC 40, 170 W	210	GP 42, 3.0 - 15 Nm	361	●
EC 40, 170 W	210	GP 52, 4.0 - 30 Nm	366	●
EC 45, 150 W	211			111.2
EC 45, 150 W	211	GP 42, 3.0 - 15 Nm	361	●
EC 45, 150 W	211	GP 52, 4.0 - 30 Nm	366	●
EC 45, 250 W	212			144.0
EC 45, 250 W	212	GP 42, 3.0 - 15 Nm	361	●
EC 45, 250 W	212	GP 52, 4.0 - 30 Nm	366	●
EC 45, 250 W	212	GP 62, 8.0 - 50 Nm	368	●
EC 60, 400 W	213			177.3
EC 60, 400 W	213	GP 81, 20 - 120 Nm	369	●

### Technical Data

Input voltage	10 V peak, 10 kHz
Transmission ratio	0.5
Electrical error	± 10 minutes
Rotor inertia	6 gcm <sup>2</sup>
Weight	40 g
Operating temperature range	-55 ... +155°C

### Pin Allocation

Prim +	EC 32/EC 40 red/white	EC 45/EC 60 white
Prim GND	yellow/white	brown
cos +	red	green
sin +	yellow	yellow
cos -	schwarz	grey
sin -	blue	pink



# maxon motor & motion control

Various 4-quadrant PWM servo controllers for permanent magnet-activated brushed DC motors and brushless EC motors meet all requirements in terms of performance and functionality. Thanks to the fast current controller and dynamic speed controller, outstanding control characteristics are achieved. Combined with maxon high-dynamic motors and ZUB master controllers, the positioning controllers constitute complete solutions for highly demanding motion control applications.

<b>ESCON servo controllers</b>		452-457
<b>1-Q-EC servoamplifier</b>		458-459
<b>Positioning control units EPOS4</b>	<b>NEW</b>	460-467
<b>Positioning control unit EPOS2 P</b>		468-470
<b>Positioning control unit MAXPOS</b>		471-473
<b>MACS Motion-Controller</b>	<b>NEW</b>	474-478
<b>Summary maxon motor control</b>		479
<b>Summary accessories</b>		480-481

# ESCON Overview

The ESCON servo controllers are small-sized, powerful 4-quadrant PWM servo controller for the highly efficient control of permanent magnet-activated DC motors.

The featured operating modes – speed control (closed loop), speed control (open loop), and current control – meet the highest requirements. The ESCON servo controllers are designed being commanded by an analog set value and

features extensive analog and digital I/O functionality and are being configured via USB interface using the graphical user interface “ESCON Studio” for Windows PCs.



Depending on the ESCON variant, the following **motor types** can be operated

- **DC motor:** Permanent-magnet DC motor
- **EC motor:** Brushless, electronically commutated permanent-magnet DC motor (BLDC) with and without Hall sensors.

Various **operating modes** allow an adaptable use in a wide range of drive systems

- **Current controller:** The current controller compares the actual motor current (torque) with the applied set value. In case of deviation, the motor current is dynamically readjusted.
- **Speed controller (closed loop):** The closed loop speed controller compares the actual speed signal with the applied set value. In case of deviation, the speed is dynamically readjusted.
- **Speed controller (open loop):** The open loop speed controller feeds the motor with a voltage proportional to the applied speed set value. Changes in load are compensated using the IxR methodology.

**Speed measurement by**

- **Digital incremental encoder:** The encoders deliver simple square signals for further processing. Their impulses are counted to determine the speed. Channels A and B are phase-shifted signals, which are being compared to determine the direction of rotation.
- **DC tach:** The DC tachometer delivers a speed-proportional analog voltage.
- **Available Hall sensors:** The Hall sensors deliver six different combinations of switching impulses per electrical turn which are counted to determine speed. They also deliver phase-shifted signals that are being compared to determine the direction of rotation.
- **Sensorless EC:** The speed is determined by the progression of the induced voltage. The electronics evaluates the zero crossing of the induced voltage (EMF).

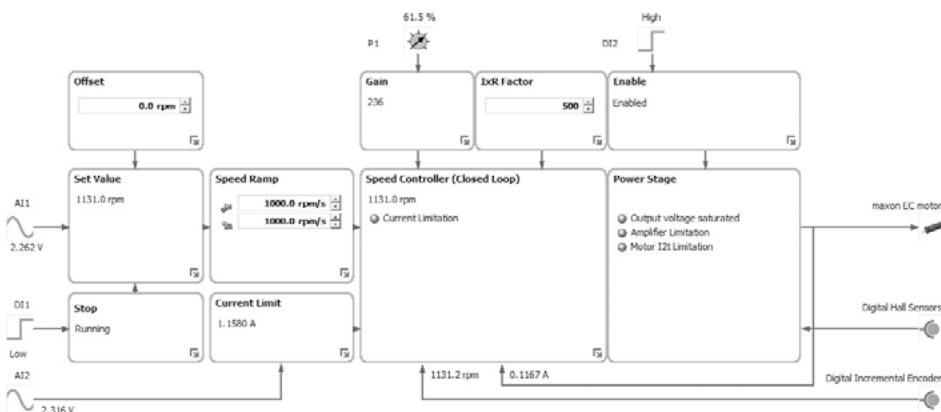
To the numerous **inputs and outputs**, various functionalities can be assigned to.

**Set value** (speed or current), **current limitation**, as well as **offset** can be assigned as follows.

- **Analog value:** The value is defined by an analog voltage set via external or internal potentiometer.
- **PWM value:** The value is defined by fixed frequency and amplitude. The desired change is achieved by variation of the duty cycle of 10...90%.
- **RC Servo Value:** The value is set with a signal pulse with a duration of 1.0...2.0 ms.
- **Fixed value:** The value is defined by a fixed preset value.
- **2 fixed values:** Value 1 is defined by a fixed preset value 1. Value 2 is defined by a fixed preset value 2. A digital input is used to switch between the two preset values.

Various functionalities are available to **enable** the power stage.

- **Enable:** Enables or disables the power stage.
- **Enable & Direction:** Enables or disables the power stage and determines the motor shaft's direction of rotation.



ESCON Studio (Controller Monitor)

## Software

Installation Program: ESCON Setup

Graphical User Interface: ESCON Studio

- ✓ Startup Wizard
- ✓ Regulation Tuning
- ✓ Diagnostic
- ✓ Firmware Update
- ✓ Controller Monitor
- ✓ Parameters
- ✓ Data Recording
- ✓ Online Help

Language: German, English, French, Italian, Spanish, Japanese, Chinese

Operating System: Windows 10, Windows 8, Windows 7, Windows XP SP3

Communication interface: USB 2.0/3.0 (full speed)

- **Enable CW:** Enables or disables the power stage in direction of rotation-dependent sense. The rotor can only turn clockwise (CW).
- **Enable CCW:** Enables or disables the power stage in direction of rotation-dependent sense. The rotor can only turn counterclockwise (CCW).
- **Enable CW & CCW:** Enables or disables the power stage in direction of rotation-dependent sense. The signals are interlocked against each other.

The **ramp function** permits controlled acceleration/deceleration of the motor shaft in both, open loop and closed loop speed controller mode.

- **Analog ramp:** The ramp is defined by a variable analog value.
- **Fixed ramp:** The ramp is defined by a fixed preset value.

**Stop:** The motor shaft decelerates with preset speed ramp until complete standstill.

**Ready:** The Ready signal can be used to transmit the operational status (respectively fault) to a superior control.

**Speed and Current Comparator:** The digital output is set depending on the actual value.

- **Limit:** The digital output is set as soon as the preset value is reached. It remains set as long as the value is exceeded.
- **Range:** The digital output is set as soon as the preset value range is reached. It remains set as long as the value remains in range.
- **Deviation:** The digital output is set as soon as the preset value deviation (based on the set value) is in range.

With the integrated **potentiometers** the additional following functions can be adjusted

- **Current Gain:** Adjustment of the current controller gain.
- **Speed Gain:** Adjustment of the speed controller gain.
- **IxR Factor:** The voltage drop caused by terminal resistance will be compensated in the range of [0...1000...2000].

Analog outputs allow monitoring of

- **Actual current:** Actually measured motor winding current.
- **Actual current averaged:** Actually measured motor winding current filtered by first order digital low-pass filter with a cut-off frequency of 5 Hz.

**Easy startup**

Startup and parameterization are performed using the intuitive graphical user interface "ESCON Studio" with the help of simple to use, menu-guided wizards. The following wizards are available: Startup, Regulation Tuning, Firmware Update, Controller Monitor, Parameters, Data Recording, and Diagnostics.

**Protective equipment**

The servo controller has protective circuits against overcurrent, excess temperature, under- and overvoltage, against voltage transients, and against short-circuits in the motor cable. Furthermore it is equipped with protected digital inputs and outputs and an adjustable current limitation for protecting the motor and the load. The motor current and the actual speed of the motor shaft can be monitored by means of the analog output voltage.

**Comprehensive documentation**

Using the "Feature Comparison Chart", the suitable ESCON servo controller can easily be determined. The "Hardware Reference" comprises the specifications of the hardware in detail. The documents "Firmware Version" and "Release Notes" describe changes and improvements of firmware and software. In addition, the graphical user interface "ESCON Studio" features a comprehensive online help.



- **Actual speed:** Actually measured motor speed.
- **Actual speed averaged:** Actually measured motor speed filtered by 1st order digital low-pass filter with a cut-off frequency of 5 Hz.
- **Demand Current:** Demanded motor winding current.
- **Demand Speed:** Demanded motor speed.
- **Temperature Power Stage:** Actually measured power stage temperature.
- **Fixed value:** The output voltage is said fixed to the preset value.

**Accessories ESCON (not included in delivery)**

	Module 24/2	36/2 DC	36/3 EC	Module 50/4 EC-S	Module 50/5	50/5	Module 50/8	Module 50/8 HE	70/10
404404 ESCON 36/2 DC Connector Set	—	✓	—	—	—	—	—	—	—
425255 ESCON 36/3 EC Connector Set	—	—	✓	—	—	—	—	—	—
403962 DC Motor Cable	—	✓	—	—	—	—	—	—	—
403964 I/O Cable 7core (analog I/O's)	—	✓	—	—	—	—	—	—	—
403965 I/O Cable 6core (digital I/O's)	—	✓	—	—	—	—	—	—	—
275934 Encoder Cable	—	✓	—	—	✓	—	—	—	—
403957 Power Cable	—	✓	—	—	—	—	—	—	—
403968 USB Type A - micro B Cable	✓	✓	✓	✓	✓	✓	✓	✓	—
418719 Adapter BLACK FPC11poles	—	—	✓	—	—	—	—	—	—
418723 Adapter BLUE FPC8poles	—	—	✓	—	—	—	—	—	—
418721 Adapter GREEN FPC8poles	—	—	✓	—	—	—	—	—	—
486400 ESCON Module 24/2 Motherboard	✓	—	—	—	—	—	—	—	—
438779 ESCON Module Motherboard	—	—	—	—	✓	—	—	—	—
586048 ESCON Module 50/8 Motherboard	—	—	—	—	—	✓	✓	—	—
450237 ESCON Module Motherboard Sensorless	—	—	—	✓	—	—	—	—	—
409286 ESCON USB Stick	✓	✓	✓	✓	✓	✓	✓	✓	—
586142 ESCON Module 50/8 Thermal Pad	—	—	—	—	—	✓	—	—	—

# ESCON Feature Comparison Chart



	ESCON Module 24/2	ESCON 36/2 DC
DC motors up to (continuous / maximum)	48 W / 144 W	72 W / 144 W
EC motors up to (continuous / maximum)	48 W / 144 W	–
<b>Sensors</b>		
	Digital Incremental Encoder (2 channel with or without Line Driver)	Digital Incremental Encoder (2 channel with or without Line Driver)
	DC Tacho	DC Tacho
	Without sensor (DC motors)	Without sensor (DC motors)
	Digital Hall Sensors (EC motors)	–
<b>Operating mode</b>		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
<b>Electrical data</b>		
Nominal operating voltage $V_{CC}$	10 - 24 VDC	10 - 36 VDC
Max. output voltage	$0.98 \times V_{CC}$	$0.98 \times V_{CC}$
Max. output current	6 A (<4 s)	4 A (<60 s)
Continuous output current	2 A	2 A
Pulse width modulation frequency	53.6 kHz	53.6 kHz
Sampling rate PI current controller	53.6 kHz	53.6 kHz
Sampling rate PI speed controller	5.36 kHz	5.36 kHz
Max. efficiency	92%	95%
Max. speed (DC)	limited by max. speed (motor) and max. output voltage (controller)	limited by max. speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	150 000 rpm	–
Built-in motor choke	–	300 $\mu$ H / 2 A
<b>Inputs/Outputs</b>		
Hall sensor signals	H1, H2, H3	–
Encoder signals	A, A\, B, B\	A, A\, B, B\
Max. encoder input frequency differential (single-ended)	1 MHz (100 kHz)	1 MHz (100 kHz)
Potentiometers	–	1
Digital inputs	2	2
Digital inputs/outputs	2	2
Analog inputs	2	2
Resolution, Range, Circuit	12-bit, -10...+10 V, differential	12-bit, -10...+10 V, differential
Analog outputs	2	2
Resolution, Range, Max. output current	12-bit, -4...+4 V, 1 mA	12-bit, -4...+4 V, 1 mA
Auxiliary voltage output	+5 VDC (IL $\leq$ 10 mA)	+5 VDC (IL $\leq$ 10 mA)
Hall sensor supply voltage	+5 VDC (IL $\leq$ 30 mA)	–
Encoder supply voltage	+5 VDC (IL $\leq$ 70 mA)	+5 VDC (IL $\leq$ 70 mA)
Status Indicators	Operation: green LED / Error: red LED	Operation: green LED / Error: red LED
<b>Environmental conditions</b>		
Temperature – Operation	-30...+60°C	-30...+45°C
Temperature – Extended range	+60...+80°C; Derating: -0.100 A/°C	+45...+81°C; Derating: -0.056 A/°C
Temperature – Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
<b>Mechanical data</b>		
Weight	Approx. 7 g	Approx. 30 g
Dimensions (L x W x H)	35.6 x 26.7 x 12.7 mm	55.0 x 40.0 x 16.1 mm
Mounting holes	Plugable (socket headers with 2.54 mm pitch)	for screws M2.5
<b>Part numbers</b>		
	<b>466023</b> ESCON Module 24/2	<b>403112</b> ESCON 36/2 DC
	Order accessories separately, from page 480	Order accessories separately, from page 480

# ESCON Feature Comparison Chart



ESCON 36/3 EC	ESCON Module 50/4 EC-S	ESCON Module 50/5
97 W / 324 W	200 W / 600 W	250 W / 750 W
<b>Sensors</b>		
–	–	Digital Incremental Encoder (2 channel with or without Line Driver)
–	–	DC Tacho
–	Without sensor (EC motors)	Without sensor (DC motors)
Digital Hall Sensors (EC motors)	–	Digital Hall Sensors (EC motors)
<b>Operating mode</b>		
Current controller (torque control), Speed controller (closed and open loop)	Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
<b>Electrical data</b>		
10 - 36 VDC	10 - 50 VDC	10 - 50 VDC
0.98 x V <sub>CC</sub>	0.96 x V <sub>CC</sub>	0.98 x V <sub>CC</sub>
9 A (<4 s)	12 A (<30 s)	15 A (<20 s)
2.7 A	4 A	5 A
53.6 kHz	53.6 kHz	53.6 kHz
53.6 kHz	–	53.6 kHz
5.36 kHz	5.36 kHz	5.36 kHz
95%	97%	98%
–	–	limited by max. speed (motor) and max. output voltage (controller)
150 000 rpm	120 000 rpm	150 000 rpm
3 x 47 µH / 2.7 A	–	–
<b>Inputs/Outputs</b>		
H1, H2, H3	–	H1, H2, H3
–	–	A, A\, B, B\
–	–	1 MHz (100 kHz)
1	1	1
2	2	2
2	2	2
2	2	2
12-bit, -10...+10 V, differential	12-bit, -10...+10 V, differential	12-bit, -10...+10 V, differential
2	2	2
12-bit, -4...+4 V, 1 mA	12-bit, -4...+4 V, 1 mA	12-bit, -4...+4 V, 1 mA
+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤110 mA)	+5 VDC (IL ≤10 mA)
+5 VDC (IL ≤30 mA)	–	+5 VDC (IL ≤30 mA)
–	–	+5 VDC (IL ≤70 mA)
Operation: green LED / Error: red LED	Operation: green LED / Error: red LED	Operation: green LED / Error: red LED
<b>Environmental conditions</b>		
-30...+45°C	-30...+45°C	-30...+45°C
+45...+78°C; Derating: -0.082 A/°C	+45...+65°C; Derating -0.200 A/°C	+45...+75°C; Derating: -0.167 A/°C
-40...+85°C	-40...+85°C	-40...+85°C
5...90%	5...90%	5...90%
<b>Mechanical data</b>		
Approx. 36 g	Approx. 11 g	Approx. 12 g
55.0 x 40.0 x 19.8 mm	43.2 x 31.8 x 12.7 mm	43.2 x 31.8 x 12.7 mm
for screws M2.5	Plugable (socket headers with 2.54 mm pitch)	Plugable (socket headers with 2.54 mm pitch)
<b>Part numbers</b>		
<b>414533</b> ESCON 36/3 EC	<b>446925</b> ESCON Module 50/4 EC-S	<b>438725</b> ESCON Module 50/5
Order accessories separately, from page 480	Order accessories separately, from page 480	Order accessories separately, from page 480

# ESCON Feature Comparison Chart



	ESCON Module 50/8	ESCON Module 50/8 HE
DC motors up to (continuous / maximum)	400 W / 750 W	400 W / 750 W
EC motors up to (continuous / maximum)	400 W / 750 W	400 W / 750 W
<b>Sensors</b>		
	Digital Incremental Encoder (2 channel with or without Line Driver)	Digital Incremental Encoder (2 channel with or without Line Driver)
	DC Tacho	DC Tacho
	Without sensor (DC motors)	Without sensor (DC motors)
	Digital Hall Sensors (EC motors)	Digital Hall Sensors (EC motors)
<b>Operating mode</b>		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
<b>Electrical data</b>		
Nominal operating voltage $V_{CC}$	10 - 50 VDC	10 - 50 VDC
Max. output voltage	$0.98 \times V_{CC}$	$0.98 \times V_{CC}$
Max. output current	15 A (<20 s)	15 A (<20 s)
Continuous output current	8 A	8 A
Pulse width modulation frequency	53.6 kHz	53.6 kHz
Sampling rate PI current controller	53.6 kHz	53.6 kHz
Sampling rate PI speed controller	5.36 kHz	5.36 kHz
Max. efficiency	99%	99%
Max. speed (DC)	limited by max. speed (motor) and max. output voltage (controller)	limited by max. speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	150 000 rpm	150 000 rpm
Built-in motor choke	-	-
<b>Inputs/Outputs</b>		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\	A, A\, B, B\
Max. encoder input frequency differential (single-ended)	1 MHz (100 kHz)	1 MHz (100 kHz)
Potentiometers	-	-
Digital inputs	2	2
Digital inputs/outputs	2	2
Analog inputs	2	2
Resolution, Range, Circuit	12-bit, -10...+10 V, differential	12-bit, -10...+10 V, differential
Analog outputs	2	2
Resolution, Range, Max. output current	12-bit, -4...+4 V, 1 mA	12-bit, -4...+4 V, 1 mA
Auxiliary voltage output	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)
Hall sensor supply voltage	+5 VDC (IL ≤30 mA)	+5 VDC (IL ≤30 mA)
Encoder supply voltage	+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)
Status Indicators	Operation: green LED / Error: red LED	Operation: green LED / Error: red LED
<b>Environmental conditions</b>		
Temperature – Operation	-40...+45°C	-40...+65°C
Temperature – Extended range	+45...+85°C; Derating: see device reference	+65...+92°C; Derating: see device reference
Temperature – Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
<b>Mechanical data</b>		
Weight	Approx. 16 g	Approx. 84 g
Dimensions (L x W x H)	53.3 x 37.5 x 14.5 mm	53.3 x 37.5 x 30.6 mm
Mounting holes	Plugable (socket headers with 2.54 mm pitch)	Plugable (socket headers with 2.54 mm pitch)
<b>Part numbers</b>		
	<b>532872</b> ESCON Module 50/8	<b>586137</b> ESCON Module 50/8 HE
	Order accessories separately, from page 480	Order accessories separately, from page 480



# ESCON Feature Comparison Chart



	ESCON 50/5	ESCON 70/10
DC motors up to (continuous / maximum)	250 W / 750 W	700 W / 2100 W
EC motors up to (continuous / maximum)	250 W / 750 W	700 W / 2100 W
<b>Sensors</b>		
	Digital Incremental Encoder (2 channel with or without Line Driver)	Digital Incremental Encoder (2 channel with or without Line Driver)
	DC Tacho	DC Tacho
	Without sensor (DC motors)	Without sensor (DC motors)
	Digital Hall Sensors (EC motors)	Digital Hall Sensors (EC motors)
<b>Operating mode</b>		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
<b>Electrical data</b>		
Nominal operating voltage $V_{CC}$	10 - 50 VDC	10 - 70 VDC
Max. output voltage	$0.98 \times V_{CC}$	$0.95 \times V_{CC}$
Max. output current	15 A (<20 s)	30 A (<20 s)
Continuous output current	5 A	10 A
Pulse width modulation frequency	53.6 kHz	53.6 kHz
Sampling rate PI current controller	53.6 kHz	53.6 kHz
Sampling rate PI speed controller	5.36 kHz	5.36 kHz
Max. efficiency	95%	98%
Max. speed (DC)	limited by max. speed (motor) and max. output voltage (controller)	limited by max. speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	150000 rpm	150000 rpm
Built-in motor choke	3 x 30 $\mu$ H / 5 A	3 x 15 $\mu$ H / 10 A
<b>Inputs/Outputs</b>		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\	A, A\, B, B\
Max. encoder input frequency differential (single-ended)	1 MHz (100 kHz)	1 MHz (100 kHz)
Potentiometers	2	2
Digital inputs	2	2
Digital inputs/outputs	2	2
Analog inputs	2	2
Resolution, Range, Circuit	12-bit, -10...+10 V, differential	12-bit, -10...+10 V, differential
Analog outputs	2	2
Resolution, Range, Max. output current	12-bit, -4...+4 V, 1 mA	12-bit, -4...+4 V, 1 mA
Auxiliary voltage output	+5 VDC (IL $\leq$ 10 mA)	+5 VDC (IL $\leq$ 10 mA)
Hall sensor supply voltage	+5 VDC (IL $\leq$ 30 mA)	+5 VDC (IL $\leq$ 30 mA)
Encoder supply voltage	+5 VDC (IL $\leq$ 70 mA)	+5 VDC (IL $\leq$ 70 mA)
Status Indicators	Operation: green LED / Error: red LED	Operation: green LED / Error: red LED
<b>Environmental conditions</b>		
Temperature – Operation	-30...+45°C	-30...+45°C
Temperature – Extended range	+45...+85°C; Derating: -0.111 A/°C	+45...+82°C; Derating: -0.270 A/°C
Temperature – Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
<b>Mechanical data</b>		
Weight	Approx. 204 g	Approx. 259 g
Dimensions (L x W x H)	115 x 75.5 x 24 mm	125 x 78.5 x 27 mm
Mounting holes	for screws M4	for screws M4
<b>Part numbers</b>		
	<b>409510</b> ESCON 50/5	<b>422969</b> ESCON 70/10
	Order accessories separately, from page 480	Order accessories separately, from page 480

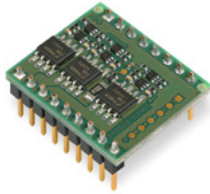
# 1-Q-EC Amplifier Summary

The basic function of EC motors electronics is the electronic commutation of the motor winding.

Simple speed controls are possible with Hall sensors. A further distinction is made between open or closed loop speed control.

1-Q amplifier functions in motor operation. Direction reverse via digital signal.

## DEC Module 24/2 1-Q-EC Amplifier



The DEC Module 24/2 (Digital EC Controller) is a 1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 48 watts. Technical data page 459.

### Operating modes

Digital speed control or open loop speed control operation can be preset by a digital signal.

### Excellent price-performance ratio

Reasonably priced 1-Q-EC amplifier optimized for OEM applications in small appliances.

### OEM Module

Miniaturized open electronics board. Two connector arrays arranged in a 2.54 mm (0.1") pattern support easy connectivity and integration into the motherboard.

### Functionality

Direction of rotation preset by a digital signal. The motor shaft can be enabled or disabled. Adjustable maximum current limitation. Set value speed input through external analog voltage. Status indicator with "Ready"-Output.

### Protection circuit

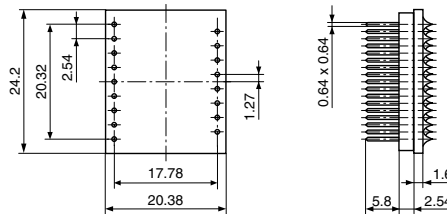
The power amplifier is protected against thermal overload and the control inputs against overvoltage.

### DEC Module 24/2

#### Connections

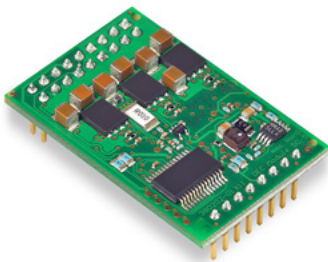
Male header 8 + 9 = 17 poles  
Pitch 2.54 mm

DEC Module 24/2 **367661**



Dimensions in [mm]

## DEC Module 50/5 1-Q-EC Amplifier



The DEC Module 50/5 (Digital EC Controller) is a 1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 250 watts. Technical data page 459.

### Operating modes

Digital speed control or open loop speed control operation can be preset by a digital signal.

### Excellent price-performance ratio

Reasonably priced 1-Q-EC amplifier optimized for OEM applications in small appliances.

### OEM Module

Miniaturized open electronics board. Connector arrays arranged in a 2.54 mm (0.1") pattern support easy connectivity and integration into the motherboard.

### Functionality

Direction of rotation preset by a digital signal. The motor shaft can be enabled or disabled. Adjustable maximum current limitation. Set value speed input through external analog voltage. Speed can be monitored through the speed monitor output. Status indicator with "Ready"-Output.

### Protection circuit

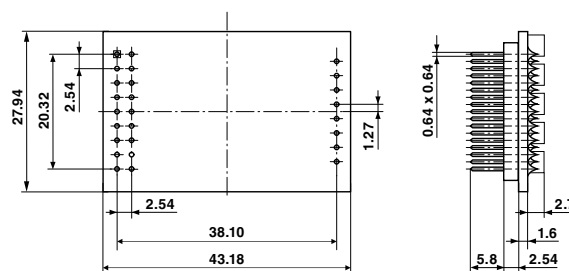
The power amplifier is protected against thermal overload and the control inputs against overvoltage.

### DEC Module 50/5

#### Connections

Male header 1 2 rows, 2 x 9 poles  
Male header 2 1 row, 8 poles  
Pitch 2.54 mm

DEC Module 50/5 **380200**



Dimensions in [mm]

# 1-Q-EC Amplifier Data



**DEC Module 24/2** 1-Q-EC Amplifier  
1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 48 watts.

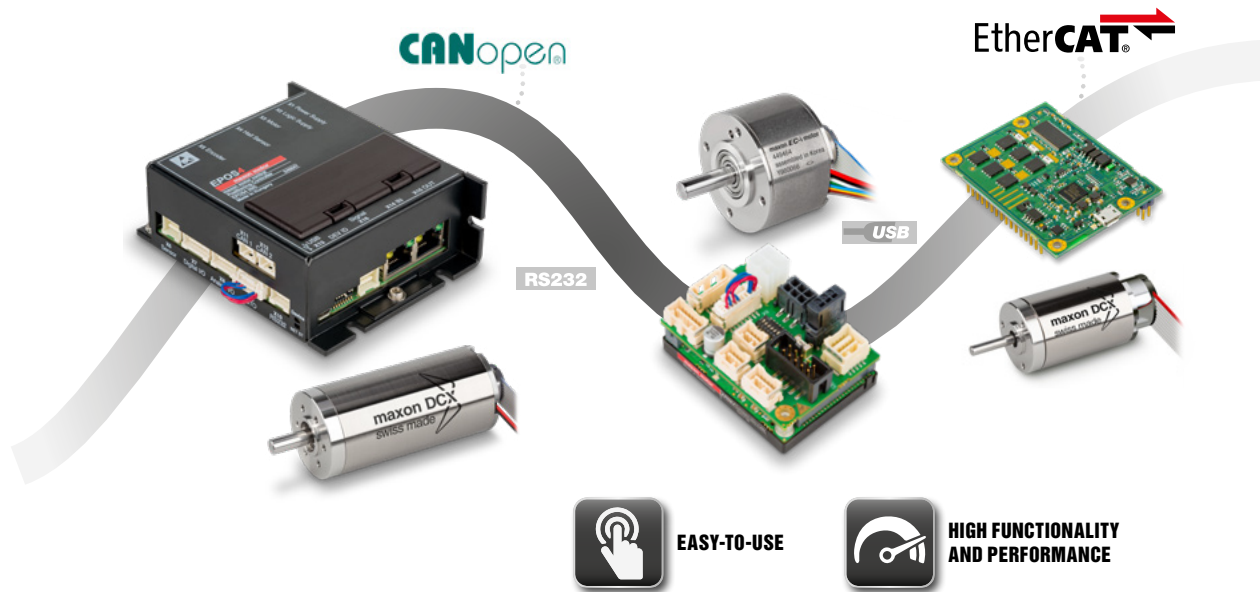


**DEC Module 50/5** 1-Q-EC Amplifier  
1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 250 watts.

	<b>DEC Module 24/2</b>	<b>DEC Module 50/5</b>
EC motors up to (continuous / maximum)	48 W / 72 W	250 W / 500 W
<b>Sensors</b>	Digital Hall Sensors	Digital Hall Sensors
<b>Operating mode</b>	Speed controller (closed and open loop)	Speed controller (closed and open loop)
<b>Electrical data</b>		
Operating voltage $V_{CC}$	8 - 24 VDC (optional 5.0 VDC)	6 - 50 VDC (optional 5.0 VDC)
Max. output voltage	$V_{CC}$	$0.95 \times V_{CC}$
Max. output current $I_{max}$	3 A	10 A
Continuous output current $I_{cont}$	2 A	5 A
Switching frequency of power stage	46.8 kHz	46.8 kHz
Max. speed (1 pole pair)	80 000 rpm	80 000 rpm
<b>Input</b>		
Set value	“Speed” 0...+5 V (1024 steps)	“Speed” 0...+5 V (1024 steps)
Current limit	“Current Limit” external resistor against GND	“Current Limit” external resistor against GND
Enable	“Enable” +2.4...24 V	“Enable” +2.4...50 V
Direction	“Direction” +2.4...24 V	“Direction” +2.4...50 V
<b>Output</b>		
Monitor		“Monitor n”, digital, (5 V)
Status reading “Ready”	“Ready”, digital, (5 V)	“Ready”, digital, (5 V)
<b>Voltage outputs</b>		
Hall sensors supply voltage $V_{CC}$ Hall	+5 VDC, max. 35 mA	+5 VDC, max. 35 mA
<b>Possible adjustments</b>	Input “Mode 0” and “Mode 1”	Input “Mode 0” and “Mode 1”
<b>Protective functions</b>		
Blockage protection	Motor current limitation if motor shaft is blocked for longer than 1.5 s	Motor current limitation if motor shaft is blocked for longer than 1.5 s
Thermal protection of power stage	$T > 95^{\circ}\text{C}$	$T > 100^{\circ}\text{C}$
Under- / Overvoltage protection	Switches off when $V_{CC} < 6.5$ V or $V_{CC} > 30$ V	Switches off when $V_{CC} < 6$ V or $V_{CC} > 56$ V
<b>Ambient temperature and humidity range</b>		
Operation	-10...+45°C	-10...+45°C
Storage	-40...+85°C	-40...+85°C
No condensation	20...80%	20...80%
<b>Mechanical data</b>		
Weight	Approx. 4 g	Approx. 9 g
Dimensions (L x W x H)	24.2 x 20.38 x 12.7 mm (see page 458)	43.18 x 27.94 x 12.7 mm (see page 458)
Mounting	mountable on socket terminal strips pitch 2.54 mm	mountable on socket terminal strips pitch 2.54 mm
<b>Connections</b>	See page 458	See page 458
<b>Part numbers</b>	<b>367661</b> DEC Module 24/2 1-Q-EC Amplifier	<b>380200</b> DEC Module 50/5 1-Q-EC Amplifier

<b>Accessories</b>		
	<b>370652</b> DEC Module Eva-Board	<b>370652</b> DEC Module Eva-Board

# EPOS4 Positioning Controllers Overview



## CANopen Slave / EtherCAT Slave

EPOS4 is the next generation of our CANopen positioning controller. It combines maximum power density with improved control performance and better functionality. The modular concept also provides for a wide variety of expansion options with Ethernet-based interfaces like EtherCAT or absolute rotary encoders. All these innovations combined with the proven concepts of the EPOS product line are consistently based on the successful principle of the Easy to use **PO**sitioning System.

As part of the new modular system, the EPOS4 controllers can be with ready-to-install connector boards into compact solutions that match a wide variety of requirements. Optional expansion modules make it possible to provide custom basic functionalities at low cost:

### Module + Connector Board = Compact



EPOS4 is a modular digital positioning controller. It is suitable for permanent magnet-activated DC motors and brushless, electronically commutated EC motors with incremental or absolute encoders with an operational range of up to 1050 W continuous power. The variety of operating modes provides high flexibility: The controllers are suitable for use in a wide range of drive systems in automation and mechatronics.

### Cyclic Synchronous Position (CSP)

The master executes the path planning and sends the target position cyclically and synchronously to the EPOS4 via the network. The position control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master.

### Cyclic Synchronous Velocity (CSV)

The master executes the path planning and sends the target speed cyclically and synchronously to the EPOS4 via the network. The speed control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and

current values to the master. The CSV mode is commonly used if a PI position control loop is closed via the master.

### Cyclic Synchronous Torque (CST)

The master executes the path planning and sends the target torque cyclically and synchronously to the EPOS4 via the network. The torque (current) control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master. The CST mode is commonly used if a PID position control loop is closed via the master.

### Point-to-point

The "Profile Position Mode" moves the position of the motor axis from point A to point B. Positioning is in relation to the axis Home position (absolute) or the actual axis position (relative).

### Position and velocity control with feed forward

The combination of feedback and feed forward control provides ideal motion behavior. Feed

## Operating modes/Control

Cyclic Synchronous Position (CSP)  
Cyclic Synchronous Velocity (CSV)  
Cyclic Synchronous Torque (CST)  
Profile Position, Profile Velocity and Homing Mode

Speed and Acceleration Feed Forward  
Sinusoidal or Block Commutation for EC motors  
Alternative set value input via step/direction, master encoder or analog commands<sup>1</sup>  
Dual-loop Position and Speed Control

## Communication/Configuration

Communication via CANopen and/or USB 2.0/3.0 and/or RS232  
Optional EtherCAT (CoE)  
USB to CAN and RS232 to CAN gateway

## Inputs/Outputs

STO (Safe Torque Off) inputs and outputs, optically isolated  
Free digital inputs, configurable e.g. for limit/reference switches  
Free digital outputs, configurable e.g. for brake  
Free analog inputs, configurable  
Free analog outputs, configurable

## Available software

EPOS Studio  
Windows DLL (32-/64-bit) with programming examples  
Linux shared object library (X86 32-/64-bit, ARMv6/v7/v8 32-bit, ARMv8 64-bit for Raspberry Pi and BeagleBone) with programming examples  
IEC 61131-3 libraries  
Firmware

## Available documentation

Feature Chart  
Hardware Reference  
Firmware Specification  
Communication Guide  
Application Notes

<sup>1</sup> on request



# EPOS4 Positioning Controllers Data

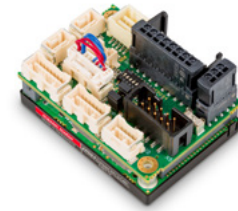
EtherCAT

CANopen

USB

RS232

GUI



## EPOS4 Module 24/1.5

OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.

## EPOS4 Compact 24/1.5 CAN

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.

Controller version	CANopen Slave with EtherCAT option	CANopen Slave
<b>Electrical data</b>		
Operating voltage $V_{CC}$	10 - 24 VDC	10 - 24 VDC
Logic supply voltage $V_C$ (optional)	10 - 24 VDC	10 - 24 VDC
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current $I_{max}$	4.5 A (<30 s)	4.5 A (<30 s)
Continuous output current $I_{cont}$	1.5 A	1.5 A
Switching frequency of power stage	100 kHz	100 kHz
Sampling rate of PI current controller	25 kHz (40 $\mu$ s)	25 kHz (40 $\mu$ s)
Sampling rate of PI speed controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Sampling rate of PID position controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	–	94 $\mu$ H / 1.5 A
<b>Inputs</b>		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (logic level)	4 (level switchable: logic/PLC)
Digital inputs "High-speed"	4, differential	4, differential
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN-ID (CAN node identification)	configurable with external wiring	configurable with DIP switch 1...5
<b>Outputs</b>		
Digital outputs	2	2
Digital outputs "High-speed"	1, differential	1, differential
Analog outputs	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
<b>Interfaces</b>		
RS232	RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)
CAN	high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	Optional 581245 EPOS4 EtherCAT Card available	–
<b>Indicator</b>		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
<b>Environmental conditions</b>		
Temperature – Operation	-30...+60 °C	-30...+45 °C
Temperature – Extended Range	+60...+73 °C; Derating: -0.115 A/°C	+45...+70 °C; Derating: -0.060 A/°C
Temperature – Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
<b>Mechanical data</b>		
Weight	approx. 17 g	approx. 58 g
Dimensions (L x W x H)	53.8 x 38.8 x 11.1 mm	55.0 x 40.0 x 31.1 mm
Mounting	Socket header 1.27 mm or M2.5 screws	M2.5 screws
<b>Part numbers</b>		
	<b>536630</b> EPOS4 Module 24/1.5	<b>546714</b> EPOS4 Compact 24/1.5 CAN
<b>Accessories</b>		
	<b>309687</b> DSR 50/5 Shunt regulator	<b>309687</b> DSR 50/5 Shunt regulator
	Order accessories separately, see page 480	Order accessories separately, see page 480

# EPOS4 Positioning Controllers Data

EtherCAT

CANopen

USB

RS232

GUI



**NEW**



## EPOS4 Compact 24/1.5 EtherCAT

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.

## EPOS4 50/5

Positioning controller in a robust housing, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

## EPOS4 Module 50/5

OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

Controller version		
<b>EtherCAT Slave</b>	<b>CANopen Slave with EtherCAT option</b>	<b>CANopen Slave with EtherCAT option</b>
<b>Electrical data</b>		
10 - 24 VDC	10 - 50 VDC	10 - 50 VDC
10 - 24 VDC	10 - 50 VDC	10 - 50 VDC
0.9 x V <sub>CC</sub>	0.9 x V <sub>CC</sub>	0.9 x V <sub>CC</sub>
4.5 A (<30 s)	15 A (<15 s)	15 A (<3 s)
1.5 A	5 A	5 A
100 kHz	50 kHz	50 kHz
25 kHz (40 μs)	25 kHz (40 μs)	25 kHz (40 μs)
2.5 kHz (400 μs)	2.5 kHz (400 μs)	2.5 kHz (400 μs)
2.5 kHz (400 μs)	2.5 kHz (400 μs)	2.5 kHz (400 μs)
50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
100 μH / 1.5 A	15 μH / 5 A	-
<b>Inputs</b>		
H1, H2, H3	H1, H2, H3	H1, H2, H3
A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)	4 (logic level)
4, differential	4, differential	4, differential
2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
configurable with DIP switch 1...5	configurable with DIP switch 1...5	configurable with external wiring
<b>Outputs</b>		
2	2	2
1, differential	1, differential	1, differential
2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
+5 VDC, max. 70 mA	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
+5 VDC, max. 30 mA	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
+5 VDC, max. 150 mA	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
<b>Interfaces</b>		
-	RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)
-	high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)
Data+; Data- (Full Speed)	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
100 Mbit/s (Full Duplex)	Optional 581245 EPOS4 EtherCAT Card available	Optional 581245 EPOS4 EtherCAT Card available
<b>Indicator</b>		
Green LED, red LED	Green LED, red LED	Green LED, red LED
<b>Environmental conditions</b>		
-30...+45 °C	-30...+50 °C	-30...+45 °C
+45...+70 °C; Derating: -0.060 A/°C	+50...+80 °C; Derating: -0.167 A/°C	+45...+75 °C; Derating: -0.167 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%
<b>Mechanical data</b>		
approx. 78 g	approx. 206 g	approx. 17 g
55.0 x 56.5 x 31.7 mm	105.0 x 83.0 x 38.7 mm	53.8 x 38.8 x 11.1 mm
M2.5 screws	Flange for M4-screws	Socket header 1.27 mm or M2.5 screws
<b>Part numbers</b>		
<b>628092</b> EPOS4 Compact 24/1.5 EtherCAT	<b>546047</b> EPOS4 50/5	<b>534130</b> EPOS4 Module 50/5
<b>Accessories</b>		
<b>309687</b> DSR 50/5 Shunt regulator	<b>309687</b> DSR 50/5 Shunt regulator	<b>309687</b> DSR 50/5 Shunt regulator

Order accessories separately, see page 480

Order accessories separately, see page 480

Order accessories separately, see page 480

# EPOS4 Positioning Controllers Data

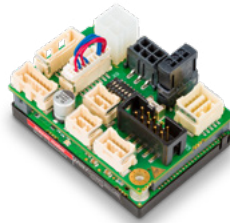
EtherCAT

CANopen

USB

RS232

GUI



**NEW**

### EPOS4 Compact 50/5 CAN

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

### EPOS4 Compact 50/5 EtherCAT

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

Controller version	CANopen Slave	EtherCAT Slave
<b>Electrical data</b>		
Operating voltage $V_{CC}$	10 - 50 VDC	10 - 50 VDC
Logic supply voltage $V_C$ (optional)	10 - 50 VDC	10 - 50 VDC
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current $I_{max}$	15 A (<3 s)	15 A (<3 s)
Continuous output current $I_{cont}$	5 A	5 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 $\mu$ s)	25 kHz (40 $\mu$ s)
Sampling rate of PI speed controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Sampling rate of PID position controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	9.4 $\mu$ H / 5 A	10 $\mu$ H / 5 A
<b>Inputs</b>		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
Digital inputs "High-speed"	4, differential	4, differential
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN-ID (CAN node identification)	configurable with DIP switch 1...5	configurable with DIP switch 1...5
<b>Outputs</b>		
Digital outputs	2	2
Digital outputs "High-speed"	1, differential	1, differential
Analog outputs	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
<b>Interfaces</b>		
RS232	RxD; TxD (max. 115 200 bit/s)	–
CAN	high; low (max. 1 Mbit/s)	–
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	–	100 Mbit/s (Full Duplex)
<b>Indicator</b>		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
<b>Environmental conditions</b>		
Temperature – Operation	-30...+25 °C	-30...+25 °C
Temperature – Extended Range	+25...+70 °C; Derating: -0.111 A/°C	+25...+70 °C; Derating: -0.111 A/°C
Temperature – Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
<b>Mechanical data</b>		
Weight	approx. 58 g	approx. 76 g
Dimensions (L x W x H)	55.0 x 40.0 x 31.1 mm	55.0 x 56.5 x 31.7 mm
Mounting	M2.5 screws	M2.5 screws
<b>Part numbers</b>	<b>541718</b> EPOS4 Compact 50/5 CAN	<b>628094</b> EPOS4 Compact 50/5 EtherCAT
<b>Accessories</b>	<b>309687</b> DSR 50/5 Shunt regulator	<b>309687</b> DSR 50/5 Shunt regulator
	Order accessories separately, see page 480	Order accessories separately, see page 480



# EPOS4 Positioning Controllers Data

EtherCAT

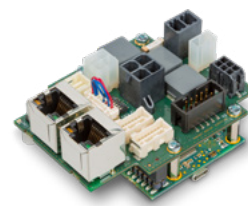
CANopen

USB

RS232

GUI

maxon motor control



## EPOS4 Module 50/8

OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 400/1500 Watt.

## EPOS4 Compact 50/8 CAN

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 400/1500 Watt.

## EPOS4 Compact 50/8 EtherCAT

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 400/1500 Watt.

<b>Controller version</b>		
<b>CANopen Slave with EtherCAT option</b>	<b>CANopen Slave</b>	<b>EtherCAT Slave</b>
<b>Electrical data</b>		
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
0.9 x V <sub>CC</sub>	0.9 x V <sub>CC</sub>	0.9 x V <sub>CC</sub>
30 A (<5 s)	30 A (<5 s)	30 A (<5 s)
8 A	8 A	8 A
50 kHz	50 kHz	50 kHz
25 kHz (40 µs)	25 kHz (40 µs)	25 kHz (40 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
–	2.2 µH / 15 A	2.2 µH / 15 A
<b>Inputs</b>		
H1, H2, H3	H1, H2, H3	H1, H2, H3
A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
4 (logic level)	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
4, differential	4, differential	4, differential
2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
configurable with external wiring	configurable with DIP switch 1...5	configurable with DIP switch 1...5
<b>Outputs</b>		
2	2	2
1, differential	1, differential	1, differential
2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
+5 VDC, max. 70 mA	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
+5 VDC, max. 30 mA	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
+5 VDC, max. 150 mA	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
<b>Interfaces</b>		
RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)	–
high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)	–
Data+; Data- (Full Speed)	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
Optional 581245 EPOS4 EtherCAT Card available	–	100 Mbit/s (Full Duplex)
<b>Indicator</b>		
Green LED, red LED	Green LED, red LED	Green LED, red LED
<b>Environmental conditions</b>		
-30...+45 °C	-30...+45 °C	-30...+45 °C
+45...+77 °C; Derating: -0.250 A/°C	+45...+77 °C; Derating: -0.250 A/°C	+45...+77 °C; Derating: -0.250 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%
<b>Mechanical data</b>		
approx. 23 g	approx. 86 g	approx. 100 g
59.5 x 46.0 x 14.1 mm	59.5 x 58.5 x 33.0 mm	59.5 x 79.5 x 35.7 mm
Socket header 2.54 mm or M2.5 screws	M2.5 screws	M2.5 screws
<b>Part numbers</b>		
<b>504384</b> EPOS4 Module 50/8	<b>520885</b> EPOS4 Compact 50/8 CAN	<b>605298</b> EPOS4 Compact 50/8 EtherCAT
<b>Accessories</b>		
<b>235811</b> DSR 70/30 Shunt regulator	<b>235811</b> DSR 70/30 Shunt regulator	<b>235811</b> DSR 70/30 Shunt regulator
Order accessories separately, see page 480	Order accessories separately, see page 480	Order accessories separately, see page 480

# EPOS4 Positioning Controllers Data

EtherCAT

CANopen

USB

RS232

GUI



### EPOS4 Module 50/15

OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 750/1500 Watt.



### EPOS4 Compact 50/15 CAN

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 750/1500 Watt.

Controller version	CANopen Slave with EtherCAT option	CANopen Slave
<b>Electrical data</b>		
Operating voltage $V_{CC}$	10 - 50 VDC	10 - 50 VDC
Logic supply voltage $V_C$ (optional)	10 - 50 VDC	10 - 50 VDC
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current $I_{max}$	30 A (<60 s)	30 A (<60 s)
Continuous output current $I_{cont}$	15 A	15 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 $\mu$ s)	25 kHz (40 $\mu$ s)
Sampling rate of PI speed controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Sampling rate of PID position controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	–	2.2 $\mu$ H / 15 A
<b>Inputs</b>		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (logic level)	4 (level switchable: logic/PLC)
Digital inputs "High-speed"	4, differential	4, differential
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN-ID (CAN node identification)	configurable with external wiring	configurable with DIP switch 1...5
<b>Outputs</b>		
Digital outputs	2	2
Digital outputs "High-speed"	1, differential	1, differential
Analog outputs	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
<b>Interfaces</b>		
RS232	RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)
CAN	high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	Optional 581245 EPOS4 EtherCAT Card available	–
<b>Indicator</b>		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
<b>Environmental conditions</b>		
Temperature – Operation	-30...+25 °C	-30...+25 °C
Temperature – Extended Range	+25...+77 °C; Derating: -0.288 A/°C	+25...+77 °C; Derating: -0.288 A/°C
Temperature – Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
<b>Mechanical data</b>		
Weight	approx. 70 g	approx. 126 g
Dimensions (L x W x H)	59.5 x 62.0 x 16.4 mm	59.5 x 65.5 x 35.1 mm
Mounting	Socket header 2.54 mm or M3 screws	M3 screws
<b>Part numbers</b>	<b>504383</b> EPOS4 Module 50/15	<b>520886</b> EPOS4 Compact 50/15 CAN
<b>Accessories</b>	<b>235811</b> DSR 70/30 Shunt regulator	<b>235811</b> DSR 70/30 Shunt regulator
	Order accessories separately, see page 480	Order accessories separately, see page 480

# EPOS4 Positioning Controllers Data



## EPOS4 Compact 50/15 EtherCAT

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 750/1500 Watt.

## EPOS4 70/15

Positioning controller in a robust housing, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 1050/2100 Watt.

maxon motor control

Controller version	EtherCAT Slave	CANopen Slave with EtherCAT option
<b>Electrical data</b>		
Operating voltage $V_{CC}$	10 - 50 VDC	10 - 70 VDC
Logic supply voltage $V_C$ (optional)	10 - 50 VDC	10 - 70 VDC
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current $I_{max}$	30 A (<60 s)	30 A (<60 s)
Continuous output current $I_{cont}$	15 A	15 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 $\mu$ s)	25 kHz (40 $\mu$ s)
Sampling rate of PI speed controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Sampling rate of PID position controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	2.2 $\mu$ H / 15 A	15 $\mu$ H / 15 A
<b>Inputs</b>		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
Digital inputs "High-speed"	4, differential	4, differential
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN-ID (CAN node identification)	configurable with DIP switch 1...5	configurable with DIP switch 1...5
<b>Outputs</b>		
Digital outputs	2	2
Digital outputs "High-speed"	1, differential	1, differential
Analog outputs	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
<b>Interfaces</b>		
RS232	–	RxD; TxD (max. 115 200 bit/s)
CAN	–	high; low (max. 1 Mbit/s)
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	100 Mbit/s (Full Duplex)	Optional 581245 EPOS4 EtherCAT Card available
<b>Indicator</b>		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
<b>Environmental conditions</b>		
Temperature – Operation	-30...+25 °C	-30...+50 °C
Temperature – Extended Range	+25...+77 °C; Derating: -0.288 A/°C	+50...+85 °C; Derating: -0.429 A/°C
Temperature – Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
<b>Mechanical data</b>		
Weight	approx. 140 g	approx. 372 g
Dimensions (L x W x H)	59.5 x 79.5 x 37.8 mm	125.0 x 94.5 x 38.7 mm
Mounting	M3 screws	Flange for M4-screws
<b>Part numbers</b>		
	<b>605299</b> EPOS4 Compact 50/15 EtherCAT	<b>594385</b> EPOS4 70/15
<b>Accessories</b>		
	<b>235811</b> DSR 70/30 Shunt regulator	<b>235811</b> DSR 70/30 Shunt regulator
	Order accessories separately, see page 480	Order accessories separately, see page 480

# EPOS2 P Programmable Positioning Controller Summary

Standalone operation



### EPOS2 P 24/5 (programmable)

- IEC 61131-3 programmable
- CANopen Master function
- Multiple axis systems via CAN Bus CANopen
- Point to point control unit (1 axis)
- Interpolated Position Mode (PVT)
- DC and EC motors up to 120 W
- 6 digital inputs (TTL and PLC level)
- 4 digital outputs
- 2 analog inputs (12-bit ADC)
- Compact design

Details page 470

Standalone operation, programmable from PC via RS232 or USB 2.0/3.0 with standard IEC 61131-3. Program languages (ST, IL, FBD, LD, SFC). CANopen master function for controlling other axes. Standard motion control library. Supervisory Control and Data Acquisition for monitoring and controlling a process via RS232; USB 2.0/3.0 or CANopen.

Typical applications:

- Work equipment manufacturing
- Tool building
- System automation tasks

### Part Number

EPOS2 P 24/5 **378308**

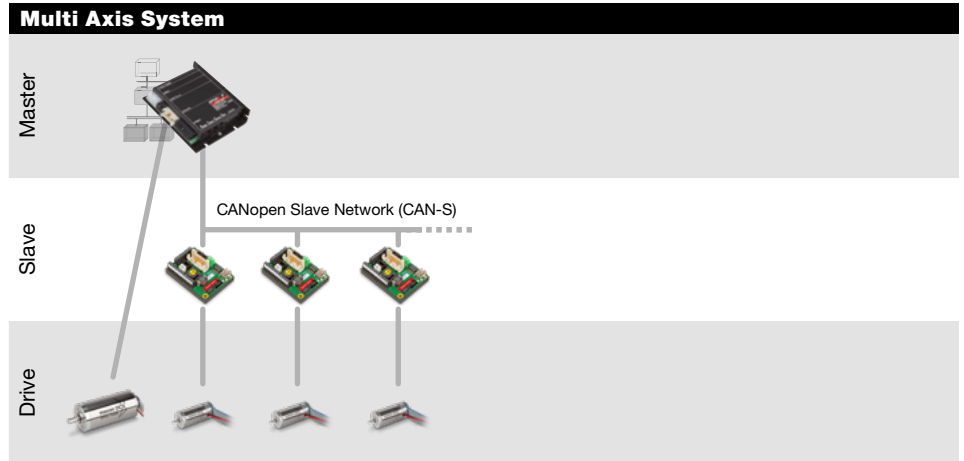
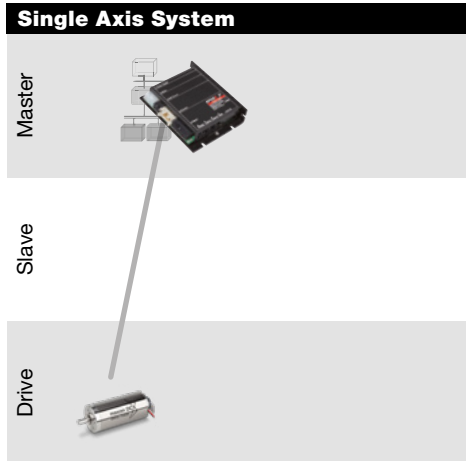
EPOS2 P is a freely programmable positioning controller with an integrated power stage, based on the EPOS2 slave version. It is suitable for DC and EC motors with incremental encoder and a continuous output power up to 120 W.

### Standalone drive systems

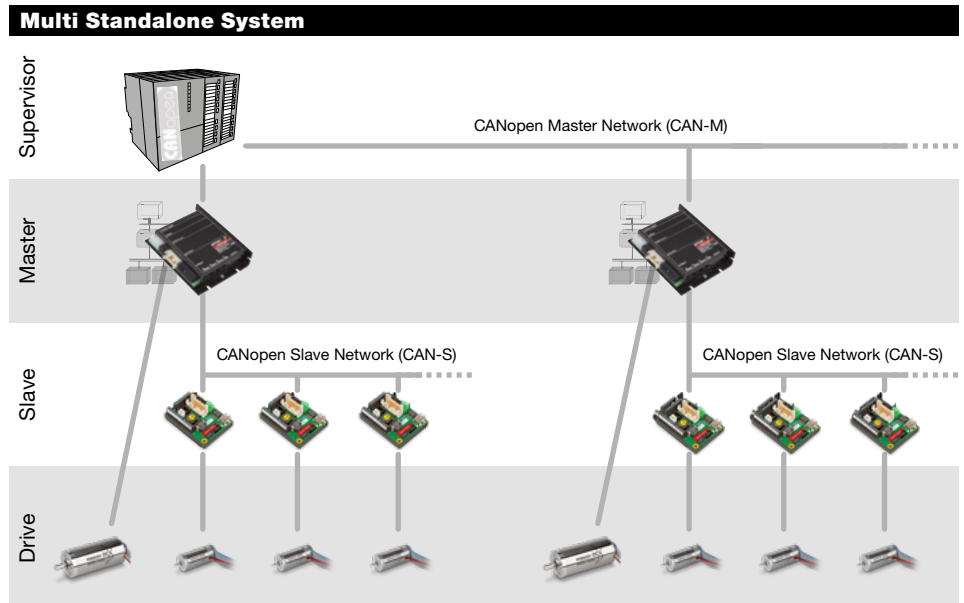
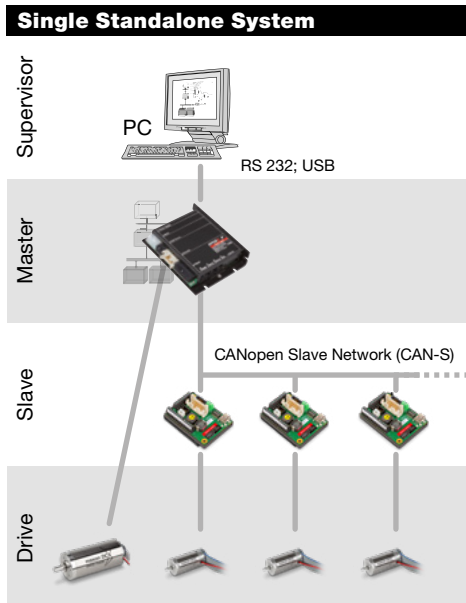
With self-compiled programs, the standalone version of EPOS2 can autonomously control single and multiple axis systems dispensing with the need for a superior intelligent control unit.

Via the CAN Bus all axes can be coordinated simultaneously. The combination with maxon motors produces drive systems for highly dynamic movements.

## Standalone



## Supervisory Control



**Technology**

The programming of applications complies with IEC 61131-3 standard. A non-volatile flash memory is used for saving. The three-stage code optimization produces IEC 61131-3 programs adjusted for the application's needs; optimized by memory, performance or a combination of both.

**EPOS Studio – programming according to IEC 61131-3**

Editors (ST, IL, FBD, LD, SFC) of the powerful “EPOS Studio” tool are available for programming according to IEC 61131-3. The integrated project browser shows all network resources. Complex programs with a large number of decentralized controls can be optimally managed with it. Drive systems are configured and networked quickly using intelligent step-by-step wizards.

**Motion control library**

The complexity and development costs of drive systems are substantially reduced. The Motion Firmware Library was implemented according to the widely-used Motion Control Standard. Standardized function blocks make implementation easy.

**maxon utility library**

Thanks to the additional maxon user library, the programming of recurring motion control tasks is simplified. By means of the “Best Practice” programs and the numerous applications examples, purposeful IEC 61131-3 application programs can be compiled.

Technical data page 470

**Performance features**

- 32 bit host processor, 60 MHz
- 1 MB memory, with 768 KB free user program memory
- typically 2.5 ms / 5000 lines IL
- 4 KB non-volatile memory
- Digital motion control signal processor

**Software features**

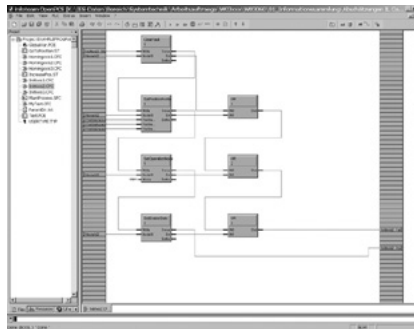
- Windows-based development environment
- IEC 61131-3 programming languages (ST, IL, FBD, LD, SFC)
- IEC 61131-3 standard libraries
- Motion control function blocks
- maxon utility function block library
- CANopen function block library
- User libraries
- Network variables and data exchange
- Online debugger with break points and watch variables
- Axis configuration and parameterization
- Online help

**Motion firmware library**

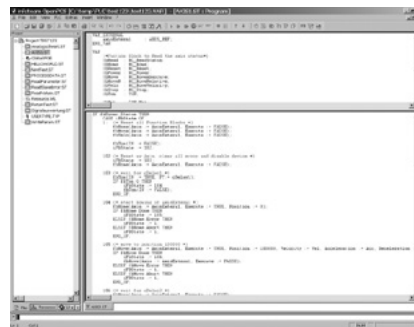
- Drive control
- Referencing (Homing)
- Speed control
- Positioning absolute and relative
- Error Management
- Parameter Handling

**Motion utility library**

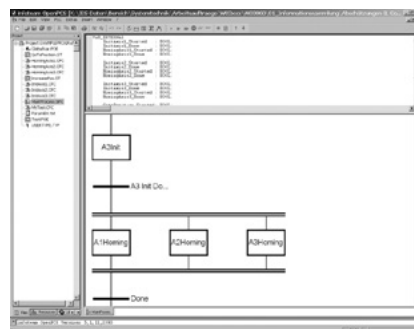
- Inputs and Outputs
- Error Handling
- Object Dictionary Access
- Homing Parameter
- Data Handling



FBD Editor



ST Editor



SFC Editor

# EPOS2 P Programmable Positioning Controller Data

CANopen

USB

RS232

GUI



## EPOS2 P 24/5

Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder to 120/240 watts.

## Additional information

### Controller versions

#### CANopen Master (programmable)

#### Electrical data

Operating voltage $V_{CC}$	11 - 24 VDC
Logic supply voltage $V_C$ (optional)	11 - 24 VDC
Max. output voltage	$0.9 \times V_{CC}$
Max. output current $I_{max}$ (<1 s)	10 A
Continuous output current $I_{cont}$	5 A
Switching frequency of power stage	50 kHz
Sample rate of PI - current controller	10 kHz
Sample rate of PI - speed controller	1 kHz
Sample rate of PID - positioning control	1 kHz
Max. speed (1 pole pair)	25 000 rpm (sinusoidal); 100 000 rpm (block)
Built-in motor choke per phase	15 $\mu$ H / 5 A

#### Input

Hall sensor signals	H1, H2, H3
Encoder signals	A, A $\bar$ , B, B $\bar$ , I, I $\bar$ (max. 5 MHz)
Digital inputs	6 (TTL and PLC level)
Analog inputs	2
	12-bit resolution, 0...+5 V
CAN-ID (CAN node identification)	Configurable with DIP switch 1...7

#### Output

Digital outputs	4
Encoder voltage output	+5 VDC, max. 100 mA
Hall sensor voltage output	+5 VDC, max. 30 mA
Auxiliary voltage output	$V_{CC}$ , max. 1300 mA

#### Interface

RS232	RxD; TxD (max. 115 200 bit/s)
CAN	high; low (max. 1 Mbit/s)
USB 2.0/3.0	Data+; Data- (full speed)

#### Indicator

Operating/Error/Program	green LED, red LED, blue LED
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#### Environmental conditions

Temperature – Operation	-10...+55°C
Temperature – Extended range	+55...+83°C; Derating: -0.179 A/°C
Temperature – Storage	-40...+85°C
Humidity (condensation not permitted)	5...90%

#### Mechanical data

Weight	Approx. 180 g
Dimensions (L x W x H)	105 x 83 x 24 mm
Mounting	Flange for M3-screws

#### Part numbers

**378308** EPOS2 P 24/5

#### Accessories

**309687** DSR 50/5 Shunt regulator

Order accessories separately, see page 480

### Operating modes

CANopen Profile Position, Profile Velocity- and Homing Mode  
 Position, Velocity and Current Mode  
 Path generating with trapezoidal or sinusoidal profiles  
 Feed forward for velocity and acceleration  
 Interpolated Position Mode (PVT)  
 Sinusoidal or block commutation for EC motors

### Communication

Programming interface (Windows) via USB 2.0/3.0 or RS232  
 Communication via CANopen, RS232 or USB 2.0/3.0 maxon protocol

### Inputs / Outputs

Free configurable digital inputs e.g. for limit switches and reference switches  
 Free configurable digital outputs e.g. for holding brakes  
 Free analog inputs

### Available software

EPOS Studio  
 programming according to IEC 61131-3  
 IEC 61131-3 standard libraries  
 motion control library  
 maxon utility function block library  
 CANopen function block library  
 maxon utility library  
 Application Examples  
 Best Practice Examples  
 Firmware

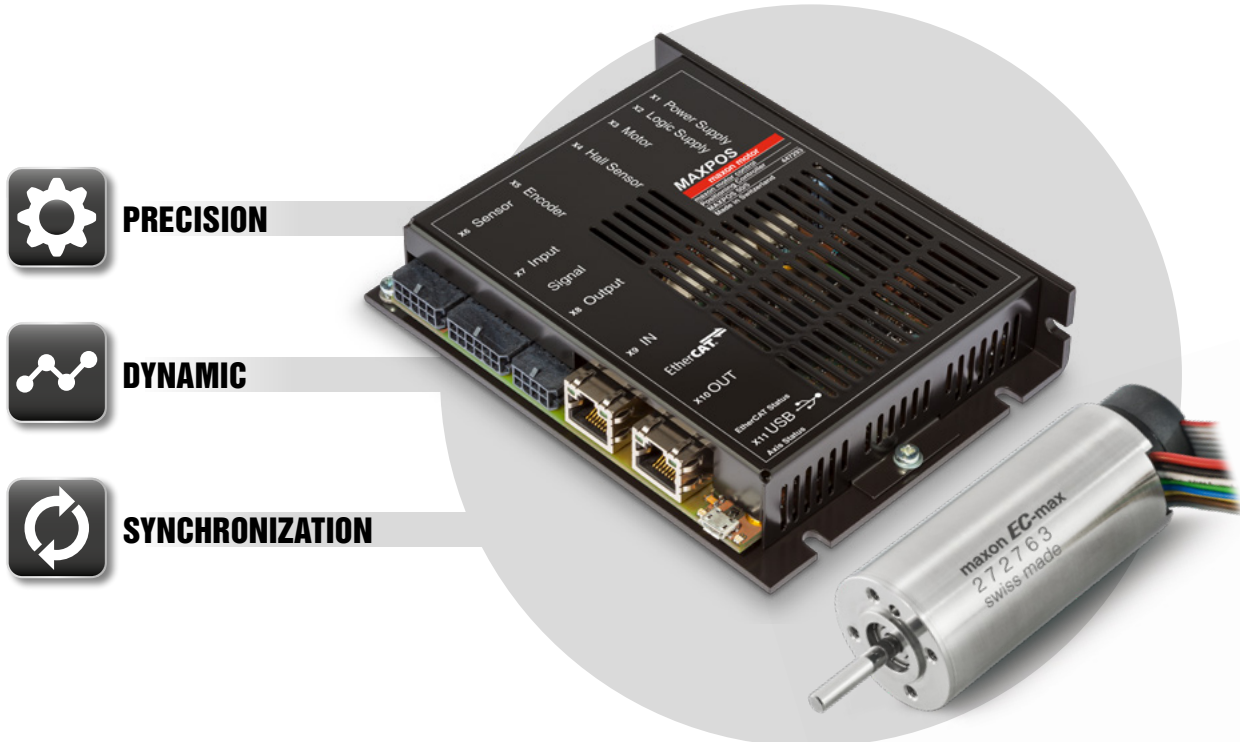
### Available documentation




Getting Started  
 Cable Starting Set  
 Hardware Reference  
 Firmware Specification  
 Programming Reference  
 Application Notes

### Cable

A comprehensive range of cables is available as an option. Details can be found on page 480.

# MAXPOS Positioning Controller Summary

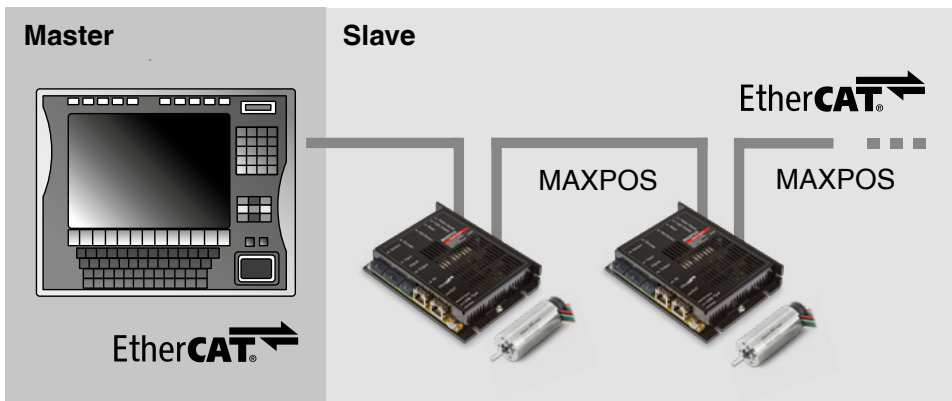


-  **PRECISION**
-  **DYNAMIC**
-  **SYNCHRONIZATION**

## MAXPOS 50/5 EtherCAT Slave

The MAXPOS 50/5 is a motion controller for highly dynamic applications and receives motion and I/O commands from the higher-level EtherCAT master controlling the process. The extremely fast controllers together with the diverse feedback options provide ideal conditions for operation in high-performance applications, raising the bar for precision and synchronization. The MAXPOS 50/5 supports CoE (CAN application layer over EtherCAT).

synchronously via the EtherCAT network to the MAXPOS. The torque (current) control loop runs in the MAXPOS. The MAXPOS delivers the measured actual position, speed and current values to the EtherCAT master. If the PID position control loop is closed via the EtherCAT master, CST mode is often used.



### Point to point

The “Profile Position Mode” moves the position of the motor axis from point A to point B. Positioning is in relation to the axis Home position (absolute) or the actual axis position (relative).

### Position and Speed control with Feed Forward

The combination of feedback and feed forward control provides ideal motion behavior. Feed forward control reduces control error. MAXPOS supports feed forward for acceleration and speed.

### Speed control

In “Profile Velocity Mode”, the motor axis is moved with a set speed. The motor axis retains speed until a new speed is set.

MAXPOS is a modular, digital positioning controller. It is suitable for permanent magnet-activated DC motors and brushless, electronically commutated EC motors with incremental or absolute encoders with an operational range of up to 250 W continuous power. A wide range of operating modes allows flexible use in a variety of fields in drive systems, automation, and mechatronics.

### Cyclic Synchronous Position (CSP)

The EtherCAT master executes the path planning and sends the target position cyclically and synchronously via the EtherCAT network to the MAXPOS. The position control loop runs in the MAXPOS. The MAXPOS delivers the measured actual po-

sition, speed and current values to the EtherCAT master.

### Cyclic Synchronous Velocity (CSV)

The EtherCAT master executes the path planning and sends the target speed cyclically and synchronously via the EtherCAT network to the MAXPOS. The speed control loop runs in the MAXPOS. The MAXPOS delivers the measured actual position, speed and current values to the EtherCAT master. If the PI position control loop is closed via the EtherCAT master, CSV mode is often used.

### Cyclic Synchronous Torque (CST)

The EtherCAT master executes the path planning and sends the target torque cyclically and

### Homing

The “Homing Mode” is for referencing to a special mechanical position. There is a wide variety of methods for achieving this.

### Feedback options

Two different encoder signals can be evaluated simultaneously. In a suitable master unit, this enables dual loop control in order to compensate for mechanical backlash and elasticity. There is a wide range of permitted sensors: Digital incremental encoders, analog incremental encoders (sin/cos), SSI and BiSS-C absolute encoders.

**Protection**

The positioning controller has protective circuits against overcurrent, excess temperature, under- and overvoltage, voltage transients, short-circuits in the motor cable, and against feedback signal loss. An adjustable current limitation protects the motor and load. The digital inputs and outputs are galvanically isolated and protected against overvoltage.

**Safe Torque Off (STO)**

With this safety feature based on IEC61800-5-2, the drive can be brought to a safe state at any time, from two independent digital inputs. The supply of torque-generating power is interrupted. The state can be monitored via an additional digital output.

**Capture inputs (Touch Probe)**

Digital inputs can be configured so that the actual position value is saved when a positive and/or negative edge of an input appears.

**Control of Holding Brakes**

Control of the holding brake can be integrated in the device status management. Thereby the delay times can be individually configured for switching on and off.

Additional information for technical data of page 473

**Standardized**

IEC 61158 type 12 EtherCAT slave: CoE (CAN Application Layer over EtherCAT) according to IEC 61800-7 profile type 1 (CiA 402) CANopen standard device profile for drives and motion control. Easily integrated in existing EtherCAT systems. It can be connected to a network of other EtherCAT units. Alternatively configurable via serial interface (USB 2.0/3.0).

**Flexible, modular**

The same technology for DC and EC motors. Configurable inputs and outputs for limit switches, reference switches, holding brakes and for other sensors and indicators near the drive.

**Easy start-up procedure**

Graphic user interface with many functions and wizards for start-up procedure, automatic control settings, I/O configuration, tests.

**Optimal control characteristics**

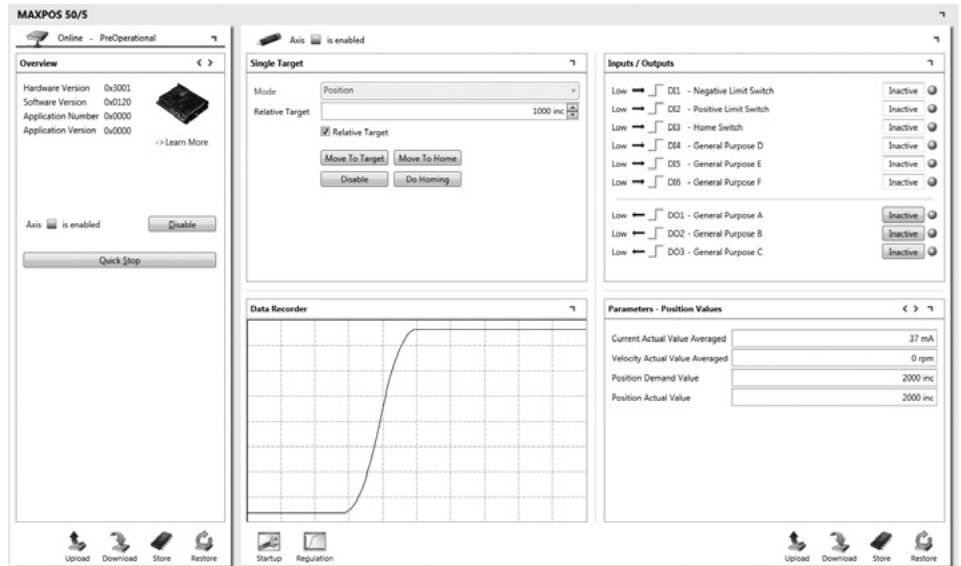
The fast controller rates and short cycle times of the EtherCAT communication enable applications with exacting requirements for the dynamics of the drive system. Control input from the EtherCAT master can be accepted by the MAXPOS at a frequency of up to 10 kHz and transmitted to the controllers. Distributed Clocks are supported to optimize synchronization of multiple drive axes. With MAXPOS, all the requirements are met for optimal performance in a wide range of high-performance applications.

**EtherCAT Master: Integration made easy**

Integration of the MAXPOS 50/5 position controller in a wide variety of master systems is simplified with the provided device description file (ESI file) and device-specific configuration instructions. For a current overview, please visit <http://maxpos.maxonmotor.com>

**State-of-the-art**

Digital position, speed and current/torque control. Sinusoidal commutation (FOC) for smooth operation of EC motors.



**Operating modes**

- Cyclic Synchronous Position (CSP),
- Cyclic Synchronous Velocity (CSV),
- Cyclic Synchronous Torque (CST)
- Profile Position-, Profile Velocity- and Homing Mode

- Feed forward for velocity and acceleration
- Sinusoidal commutation for EC motors

**Communication**

- Communication via EtherCAT with:
  - CoE/FoE
  - Distributed Clocks Support
  - CSP, CSV, CST with cycle times up to 100µs
  - Variable PDO mapping

**Configuration**

Configuration via EtherCAT or USB 2.0/3.0

**Inputs/Outputs**

- Free configurable digital inputs e.g. for limit switches and reference switches
- Free configurable digital outputs e.g. for holding brakes

**Available software**

- MAXPOS Studio (Graphical User Interface)
- Firmware

**Available documentation**

- Feature Chart
- Hardware Reference
- Firmware Specification
- Communication Guide
- Application Notes

**Cable**

A comprehensive range of cables is available as an option. Details can be found on page 480.



# MAXPOS Positioning Controller Data

High Performance

EtherCAT

USB

GUI



## MAXPOS 50/5

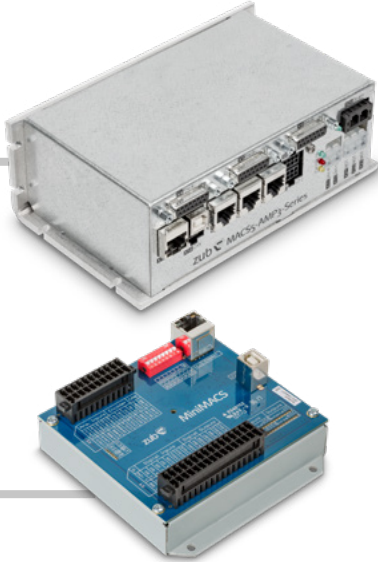
Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder to 250 watts.

maxon motor control

Controller versions	
	<b>EtherCAT Slave</b>
Electrical data	
Operating voltage $V_{CC}$	10 - 50 VDC
Logic supply voltage $V_C$ (optional)	10 - 50 VDC
Max. output voltage	$0.95 \times V_{CC}$
Max. output current $I_{max}$ (<1.5 s)	15 A
Continuous output current $I_{cont}$	5 A
Switching frequency of power stage	100 kHz
Sample rate of PI - current controller	100 kHz (10 $\mu$ s)
Sample rate of PI - speed controller	10 kHz (100 $\mu$ s)
Sample rate of PID - positioning control	10 kHz (100 $\mu$ s)
Max. speed (DC)	limited by max. speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	200000 rpm (sinusoidal)
Built-in motor choke per phase	22 $\mu$ H / 10 A
Input	
Hall sensor signals	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\, (max. 5 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock+, Clock-, Data+, Data-
Digital inputs	6 (galvanically isolated)
Output	
Digital outputs	3 (galvanically isolated)
Encoder voltage output	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA
Sensor voltage output	+5 VDC, max. 150 mA
Auxiliary voltage output	+24 VDC, max. 300 mA when $V_{CC} > 30$ VDC
	$V_{CC}-5$ V, max. 300 mA when $V_{CC} < 30$ VDC
Interface	
EtherCAT	IEEE 802.3 100 Base T (100 Mbit/s, Full Duplex)
USB 2.0/3.0	Data+; Data- (full speed)
Indicator	
Axis Status	green LED, red LED
EtherCAT Status	green LED, red LED
EtherCAT Port Activity/Link State	green LED
Environmental conditions	
Temperature – Operation	-30...+45°C
Temperature – Extended range	+45...+56°C; Derating: -0.455 A/°C
Temperature – Storage	-40...+85°C
Humidity (condensation not permitted)	5...90%
Mechanical data	
Weight	Approx. 302 g
Dimensions (L x W x H)	140 x 103.5 x 27 mm
Mounting	Flange for M4-screws
Part numbers	
	<b>447293</b> MAXPOS 50/5
Accessories	
	<b>309687</b> DSR 50/5 Shunt regulator
	Order accessories separately, see page 480

# Multi-axis Motion-Controller Summary

CANopen

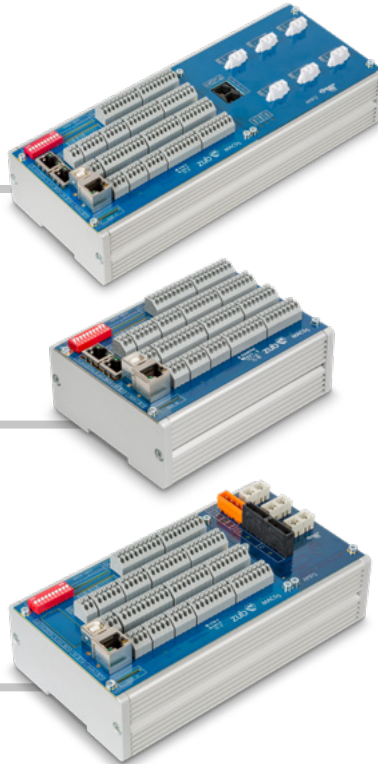


**Solutions optimized for less complex or cost-sensitive applications:**

- MiniMACS
- MACS5-AMP3-Lite
- MACS5-AMP3-Lite-HP



EtherCAT  
CANopen



**Solutions for high flexibility:**

- MACS5
- MACS5-AMP1 and MACS5-AMP2
- Variants with integrated amplifiers (50 V/up to 10 A/30 A) and various encoder inputs (also absolute)



EtherCAT  
CANopen  
PROFINET



**Solutions for highest performance:**

- MasterMACS
- Most powerful motion controller
- Various fieldbus interfaces (Ethernet, 2 x CANopen, EtherCAT master, EtherCAT slave, Profinet on request etc.)



# MiniMACS Data

## Programmable Motion Controller

NEW



### MiniMACS

The MiniMACS controllers are fully programmable motion controllers. They are suitable for less complex applications that still require compact dimensions.

maxon motion control

#### Controller versions

CANopen Master/Slave, Standalone with APOSS® win

#### Features

Motion features	Trapezoidal, jerk limited, CAM, synchronous travel
Profile generator cycle	1 kHz (1 ms)
Sampling rate of PID positioning controller with speed and acceleration feed-forward control	1 kHz (1 ms)
Maximum number of axes	3
Web server (visualization)	–
Expandable memory	–

#### Electrical data

Logic supply voltage  $V_C$  18 - 30 VDC

#### Inputs

Digital inputs	16 (PLC level)
Analog inputs	6 (10-bit resolution, 0...10 V); alternative analog option IO1 or IO2 (see MACS5)
Hall sensor signals	–
CAN-ID (CAN node identification)	configurable with DIP switch

#### Output

Digital output	14
Analog output	option IO1
Configurable with DIP switch	+5 VDC, max. 200 mA

#### Interfaces

Profinet	–
CAN	1 high; low (max. 1 Mbit/s)
RS232 / RS485	–
EtherCAT-Master / EtherCAT-Slave	–
Ethernet	1
USB 2.0/3.0	1 Data+; Data- (Full Speed)

#### Encoder inputs

Digital incremental	1 (differential, max. 5 MHz)
Hiperface/Endat	–

#### Encoder outputs

Encoder TTL outputs –

#### Indicator

LEDs	37 (status, USB, EtherCAT, IO)
Display	–

#### Environmental conditions

Temperature – Operation	0...+40°C
Temperature – Storage	-20...+85°C
Humidity (condensation not permitted)	20...80%

#### Mechanical data

Weight	500 / 300 g (DIN/compact housing)
Dimensions (L x W x H)	108 x 108 x 67 / 116 (98) x 98 x 42 mm
Mounting	DIN mounting / compact housing

**Ordering Information:** Please contact your maxon sales engineer

«There is no drive challenge that can't be solved.»

Benefit from our expertise in control solutions for state-of-the-art drive technology in devices, machinery, and systems. With our products, complex challenges like highly dynamic multi-axis positioning or synchronization can be solved in a cost-effective and efficient manner. Our use of the licensefree APOSS motion control programming language provides the versatility required to adapt our controllers perfectly to your needs.

In addition to standard products, we also offer the development of OEM custom solutions in the field of control technology and power electronics, as well as consulting and engineering services. Cost-optimized solutions and application-specific custom functions

# MACS5 Data

## Programmable Motion Controller

NEW



### MACS5 series

The MACS5 series motion controllers represent a flexible product series offering high-performance computing power, six encoder inputs and various options such as integrated amplifiers.

#### Controller versions

CANopen Master/Slave, EtherCAT Master/Slave, Standalone with APOSS® win

#### Features

Motion features	Trapezoidal, jerk limited, CAM, synchronous travel, path
Profile generator cycle	1 kHz (1 ms)
Sampling rate of PID positioning controller with speed and acceleration feed-forward control	1 kHz (1 ms)
Maximum number of axes	6
Web server (visualization)	yes
Expandable memory	SD-Card

#### Electrical data

Logic supply voltage  $V_c$  18 - 30 VDC

#### Inputs

Digital inputs	16 (PLC level, 8 latch capable)
Analog inputs	6 (10-bit resolution, 0...10 V); alternative analog option IO1 or IO2
Hall sensor signals	yes (uses one encoder input)
CAN-ID (CAN node identification)	configurable with DIP switch

#### Output

Digital output	8 (max. 100 mA)
Analog output	Option IO1
Encoder voltage output	+5 VDC, max. 200 mA per output, total 1 A

#### Interfaces

Profinet	-
CAN	2 high; low (max. 1 Mbit/s)
RS232 / RS485	1 x Rx/D; Tx/D / 1 x Data+; Data-
EtherCAT-Master / EtherCAT-Slave	1 / 1 (optional)
Ethernet	1
USB 2.0/3.0	1 Data+; Data- (Full Speed)

#### Encoder inputs

Digital incremental	6 (differential, max. 5 MHz)
SSI absolut	3 (39 kHz...5 MHz)
Analog incremental (sin/cos)	3 (max. 150 kHz)
Hiperface/Endat	-

#### Encoder outputs

Encoder TTL outputs	3 (max. 625 kHz)
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#### Indicator

LEDs	32 (status, USB, EtherCAT, IO)
------	--------------------------------

#### Environmental conditions

Temperature - Operation	0...+40°C
Temperature - Storage	-20...+85°C
Humidity (condensation not permitted)	20...80%

#### Mechanical data

Weight	ca. 800 g
Dimensions (L x W x H)	140 x 108 x 65 mm
Mounting	DIN mounting, standard rail mounting

**Ordering Information:** Please contact your maxon sales engineer

#### Options

##### Amplifier AMP1

Operating voltage $V_{cc}$ : 12 - 50 VDC
6 DC / 4 EC (BLDC) / 3 stepper motors
Max. output voltage: $0.9 \times V_{cc}$
Max. output current
$I_{cont}$ : 2 A
$I_{max}$ : 10 A
Switching frequency of power stage: 48 kHz
Sampling rate of PI current controller: 8 kHz (125 $\mu$ s)
Sampling rate of PI speed controller: 1 kHz (1 ms)

##### Amplifier AMP2

Operating voltage $V_{cc}$ : 12 - 50 VDC
6 DC / 4 EC (BLDC) / 3 stepper motors
Max. output voltage: $0.9 \times V_{cc}$
Max. output current
$I_{cont}$ : 8 A
$I_{max}$ : 30 A
Switching frequency of power stage: 48 kHz
Sampling rate of PI current controller: 8 kHz (125 $\mu$ s)
Sampling rate of PI speed controller: 1 kHz (1 ms)

##### EtherCAT-Interface IF1

Internal plug-in module EtherCAT slave (CoE, FoE) max. 100 Mbit/s

##### Analog Option IO1

1 analog input (12-bit resolution, -10...+10 V, max. 1 kHz)
$\pm 10$ V reference voltage (max. 20 mA)
3 analog output (12-bit resolution, -10...+10 V, max. 20 mA, max. 1 kHz)

##### Analog Option IO2

6 analog input (13-bit resolution, 0...10 V, max. 1 kHz)
$\pm 10$ V reference voltage (nominal 7 mA, max. 35 mA)

# MACS5-AMP3-Lite/HP Data Programmable Motion Controller

NEW

maxon motion control



**MACS5-AMP3-Lite/HP**  
motion controllers are OEM solutions in a particularly robust industrial housing. Do you need a motion controller in a special housing for your application? Contact us!

Controller versions	
	CANopen Master/Slave, EtherCAT Master, Standalone with APOSS® win
Features	
Motion features	Trapezoidal, jerk limited, CAM, synchronous travel, path
Profile generator cycle	1 kHz (1 ms)
Sampling rate of PID positioning controller with speed and acceleration feed-forward control	1 kHz (1 ms)
Maximum number of axes	3
Web server (visualization)	yes
Expandable memory	–
Electrical data	
Logic supply voltage $V_C$	18 - 30 VDC
Inputs	
Digital inputs	8 (PLC level, 4 latch capable)
Analog inputs	–
Hall sensor signals	yes (uses one encoder input)
CAN-ID (CAN node identification)	–
Output	
Digital output	4 (max. 100 mA)
Analog output	–
Encoder voltage output	+5 VDC, max. 200 mA per output, total 1 A
Interfaces	
Profinet	–
CAN	1 high; low (max. 1 Mbit/s)
RS232 / RS485	–
EtherCAT-Master / EtherCAT-Slave	1 / 0
Ethernet	1
USB 2.0/3.0	1 Data+; Data- (Full Speed)
Encoder inputs	
	max. 3 + 3
Digital incremental	3 (differential, max. 5 MHz)
SSI absolut	3 (39 kHz...5 MHz)
Analog incremental (sin/cos)	3 (max. 150 kHz)
Hiperface/Endat	–
Encoder outputs	
Encoder TTL outputs	3 (max. 625 kHz)
Indicator	
LEDs	4 (status)
Display	Option
Environmental conditions	
Temperature – Operation	0...+40°C
Temperature – Storage	-20...+85°C
Humidity (condensation not permitted)	20...80%
Mechanical data	
Weight	900 / 950 g (Lite/HP)
Dimensions (L x W x H)	180 x 108 x 80 mm
Mounting	Compact metal housing
Ordering Information: Please contact your maxon sales engineer	

Amplifier Lite (Standard)	
Operating voltage $V_{CC}$ :	12 - 50 VDC
	3 DC / 2 EC (BLDC) / 1 stepper motor(s)
Max. output voltage:	$0.9 \times V_{CC}$
Max. output current	
$I_{cont.}$ :	3.2 A
$I_{max.}$ :	7 A
Switching frequency of power stage:	48 kHz
Sampling rate of PI current controller:	8 kHz (125 $\mu$ s)
Sampling rate of PI speed controller:	1 kHz (1 ms)
Amplifier HP (Variant)	
Operating voltage $V_{CC}$ :	12 - 50 VDC
	3 DC / 2 EC (BLDC) / 1 stepper motor(s)
Max. output voltage:	$0.9 \times V_{CC}$
Max. output current	
$I_{cont.}$ :	4 A
$I_{max.}$ :	8 A
Switching frequency of power stage:	48 kHz
Sampling rate of PI current controller:	8 kHz (125 $\mu$ s)
Sampling rate of PI speed controller:	1 kHz (1 ms)

# MasterMACS Data

## Programmable Motion Controller

NEW



### MasterMACS

rounds off the motion controller portfolio with the highest computing power and multiple integrated bus interfaces as standard.

#### Controller versions

CANopen Master/Slave, EtherCAT Master, EtherCAT Slave, Standalone with APOSS® win

#### Features

Motion features	Trapezoidal, jerk limited, CAM, synchronous travel, path, kinematics
Profile generator cycle	1 kHz (1 ms)
Sampling rate of PID positioning controller with speed and acceleration feed-forward control	1 kHz (1 ms)
Maximum number of axes	32
Web server (visualization)	yes
Expandable memory	SD-Card

#### Electrical data

Logic supply voltage  $V_C$  18 - 30 VDC

#### Inputs

Digital inputs	10 (PLC level)
Analog inputs	–
Hall sensor signals	–
CAN-ID (CAN node identification)	configurable with DIP switch

#### Output

Digital output	4
Analog output	–
Encoder voltage output	+5 VDC, max. 200 mA
Profinet	on request

#### Interfaces

CAN	2 high; low (max. 1 Mbit/s)
RS232 / RS485	1 x Rx/D; Tx/D / 1 x Data+; Data-
EtherCAT-Master / EtherCAT-Slave	1 / 1
Ethernet	1
USB 2.0/3.0	1 Data+; Data- (Full Speed)

#### Encoder inputs

Digital incremental	1 (differential, max. 5 MHz)
Hiperface/Endat	–

#### Encoder outputs

Encoder TTL outputs –

#### Indicator

LEDs	8 (status, USB, EtherCAT)
Display	Option

#### Environmental conditions

Temperature – Operation	0...+40°C
Temperature – Storage	-20...+85°C
Humidity (condensation not permitted)	20...80%

#### Mechanical data

Weight	500 / 300 g (DIN/compact housing)
Dimensions (L x W x H)	108 x 108 x 67 / 125 (108) x 98 x 42 mm
Mounting	DIN mounting / compact housing

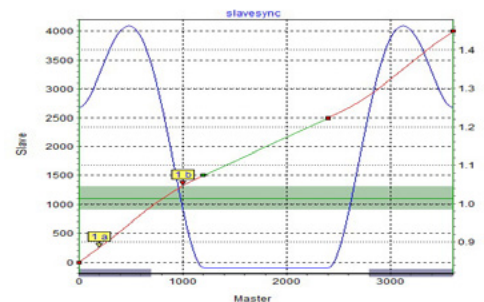
**Ordering Information:** Please contact your maxon sales engineer

#### APOSS® win

enables simplified implementation of complex motion control applications.

The programming follows the structure of high-level languages such as C, but expands their range of commands to include powerful motion control commands.

Graphical tools make implementation easier. With APOSS, even complex positioning and synchronization tasks are initiated by simple commands (e.g. POSA, POSR, SYNCV, SYNCV, SYNCC) and processed independently in the background.



#### APOSS-IDE

The APOSS development environment (IDE: Integrated Development Environment) is a Windows-based tool for programming and networking via CAN, EtherCAT and Ethernet, and for testing and analyzing drive solutions.

It contains:

- Editor (with syntax highlighting)
- State machine support
- Debugging
- Online help
- Interactive graphic editors (e.g., CAM, Array, Path Editor, etc.)
- Optimization (smart oscilloscope with real-time functionality; online debugging of process data and variables)
- Advanced firmware management, etc.

# Summary maxon motor control

4-Q Servocontroller			Page
ESCON	466023	ESCON Module 24/2, for DC/EC motors, speed control (open loop/closed loop), current control, 2/6 A, 10–24 VDC	454
	403112	ESCON 36/2 DC, for DC motors, speed control (open loop/closed loop), current control, 2/4 A, 10–36 VDC	454
	414533	ESCON 36/3 EC, for EC motors, speed control (open loop/closed loop), current control, 2.7/9 A, 10–36 VDC	455
	446925	ESCON Module 50/4 EC-S, for sensorless EC motors, speed control (open loop/closed loop), 4/12 A, 10–50 VDC	455
	409510	ESCON 50/5, for DC/EC motors, speed control (open loop/closed loop), current control, 5/15 A, 10–50 VDC	457
	438725	ESCON Module 50/5, for DC/EC motors, speed control (open loop/closed loop), current control, 5/15 A, 10–50 VDC	455
	532872	ESCON Module 50/8, for DC/EC motors, speed control (open loop/closed loop), current control, 8/15 A, 10–50 VDC	456
	586137	ESCON Module 50/8 HE, for DC/EC motors, speed control (open loop/closed loop), current control, 8/15 A, 10–50 VDC	456
	422969	ESCON 70/10, for DC/EC motors, speed control (open loop/closed loop), current control, 10/30 A, 10–70 VDC	457

4-Q-DC Servoamplifier			
LSC	NRND	250521	LSC 30/2, linear 4-Q-Servoamplifier 30 V/2 A in module housing
ADS	NRND	145391	ADS 50/5, pulsed (PWM) 4-Q-DC Servoamplifier 50 V/5 A in module housing
	NRND	166143	ADS_E 50/5, pulsed (PWM) 4-Q-DC Servoamplifier 50 V/5 A in racket card (Eurocard)

1-Q-EC Amplifier			
DECS	NRND	343253	DECS 50/5, digital 1-Q-EC Amplifier 50 V/5 A, sensorless, speed control, open electronic circuit board
DEC		367661	DEC Module 24/2, digital 1-Q-EC Amplifier 24 V/2 A, speed control, OEM module
		380200	DEC Module 50/5, digital 1-Q-EC Amplifier 50 V/5 A, speed control, OEM module
	NRND	230572	DEC 50/5, digital 1-Q-EC Amplifier 50 V/5 A, speed control, current control, PWM operation

4-Q-EC Amplifier			
DEC	NRND	306089	DEC 70/10, digital 4-Q-EC Amplifier 70 V/10 A, speed control, current control

4-Q-EC Servoamplifier			
DES	NRND	205679	DES 50/5, digital 4-Q-EC Servoamplifier 50 V/5 A, sinusoidal commutation

Positioning				
EPOS4		536630	EPOS4 Module 24/1.5, digital positioning controller, 1.5 A, 10–24 VDC	
		546714	EPOS4 Compact 24/1.5 CAN, digital positioning controller, 1.5 A, 10–24 VDC	
	NEW		628092	EPOS4 Compact 24/1.5 EtherCAT, digital positioning controller, 1.5 A, 10–24 VDC
			546047	EPOS4 50/5, digital positioning controller, 5 A, 10–50 VDC
		534130	EPOS4 Module 50/5, digital positioning controller, 5 A, 10–50 VDC	
		541718	EPOS4 Compact 50/5 CAN, digital positioning controller, 5 A, 10–50 VDC	
	NEW		628094	EPOS4 Compact 50/5 EtherCAT, digital positioning controller, 5 A, 10–50 VDC
			504384	EPOS4 Module 50/8, digital positioning controller, 8 A, 10–50 VDC
			520885	EPOS4 Compact 50/8 CAN, digital positioning controller, 8 A, 10–50 VDC
			605298	EPOS4 Compact 50/8 EtherCAT, digital positioning controller, 8 A, 10–50 VDC
			504383	EPOS4 Module 50/15, digital positioning controller, 15 A, 10–50 VDC
			520886	EPOS4 Compact 50/15 CAN, digital positioning controller, 15 A, 10–50 VDC
			605299	EPOS4 Compact 50/15 EtherCAT, digital positioning controller, 15 A, 10–50 VDC
		594385	EPOS4 70/15, digital positioning controller, 15 A, 10–70 VDC	
EPOS2	NRND	380264	EPOS2 24/2 for EC motors, digital positioning controller, 2 A, 9–24 VDC	
	NRND	390003	EPOS2 24/2 for DC/EC motors, digital positioning controller, 2 A, 9–24 VDC	
	NRND	390438	EPOS2 24/2 for DC motors, digital positioning controller, 2 A, 9–24 VDC	
	NRND	530239	EPOS2 24/2 for DC(X) motors, digital positioning controller, 2 A, 9–24 VDC	
	NRND	360665	EPOS2 Module 36/2 OEM positioning controller plug-in module, 2 A, 11–36 VDC	
	NRND	392159	EPOS2 Module 24/3 OEM positioning controller plug-in module, 3 A, 11–24 VDC	
	NRND	367676	EPOS2 24/5, digital positioning controller, 5 A, 11–24 VDC	
	NRND	347717	EPOS2 50/5, digital positioning controller, 5 A, 11–50 VDC	
	NRND	375711	EPOS2 70/10, digital positioning controller, 10 A, 11–70 VDC	
EPOS2 P		378308	EPOS2 P 24/5, digital positioning controller, programmable, 5 A, 11–24 VDC	
MAXPOS		447293	MAXPOS 50/5, digital positioning controller, 5 A, 10–50 VDC	

# Summary maxon motor control Accessories

Backplane		
NRND	166873	Backplane with screw type terminal block to ADS_E 50/5 (166143) and ADS_E 50/10 (168049)
Front panel		
NRND	167850	Front panel 3HE / 5TE to ADS_E 50/5 (166143)
Motor choke		
	137303	Choke module, 3 x 0.25 mH, 5.0 A, L x W x H (90 x 70 x 49 mm) with screw type terminal block
	347919	Choke module, 3 x 0.1 mH, 10.0 A, L x W x H (90 x 70 x 49.7 mm) with screw type terminal block
Cable		
	403957	Power Cable (length 1.5 m) to 403112, 414533
	403962	DC Motor Cable (length 1.5 m) to 403112
	403964	I/O Cable 7core (length 1.5 m) for analog I/Os to 403112, 414533
	403965	I/O Cable 6core (length 1.5 m) for digital I/Os to 403112, 414533
	403968	USB Type A - micro B Cable (length 1.5 m) to 403112, 409510, 414533, 422969, 438725, 446925, 447293, 466023, 504383, 504384, 520885, 520886, 534130, 536630, 541718, 546047, 546714, 594385, 605298, 605299, 628092, 628094
	275829	Power Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 447293, 520884, 520885, 520886, 546047, 594385, 604594, 605298, 605299
	520850	Power Cable High Current (length 3 m) to 520884, 520885, 520886, 594385, 604594, 605298, 605299
	275851	Motor Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 447293, 520885, 520886, 534133, 541718, 546047, 594385, 604594, 605298, 605299, 620044, 628094
	520851	Motor Cable High Current (length 3 m) to 520884, 520886, 594385, 604594, 605299
NRND	303490	DC Motor Cable (length 3 m) to 390003
	275878	Hall Sensor Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 447293, 520884, 520885, 520886, 534133, 541718, 546047, 594385, 604594, 605298, 605299, 620044, 628094
NRND	302948	Motor/Hall Sensor Cable (length 3 m) to 390003
	275934	Encoder Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 380264, 390003, 390438, 403112, 407582, 409510, 422969, 438779, 447293, 486400, 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094
NRND	275932	Signal Cable 16core (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
NRND	300586	Signal Cable 6x2core (length 3 m) to 347717, 375711
NRND	350390	Signal Cable 4x2core (length 3 m) to 347717
NRND	378173	Signal Cable 3x2core (length 3m) to 375711
	520854	Signal Cable 7core (length 3 m) for analog I/Os with 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094
	520853	Signal Cable 8core (length 3 m) for digital I/Os and STO with 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094
NRND	275900	RS232-COM Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	520856	RS232-COM Cable (length 3 m) to 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385
NRND	350392	USB Type A - B Cable (length 3 m) to 347717, 361435
NRND	370513	USB Type A - mini B Cable (length 3 m) to 367676, 375711, 378308, 390438, 380264, 390003
NRND	275908	CAN-COM Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	520857	CAN-COM Cable (length 3 m) to 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385
NRND	275926	CAN-CAN Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	520858	CAN-CAN Cable (length 3 m) to 520884, 520885, 520886, 534133, 536907, 541718, 546047, 546714, 594385
NRND	319471	CAN-Y Cable to 390003, 378308
	422827	Ethernet Cable (length 2 m) to 447293, 546047, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094
	451290	Sensor Cable 5x2core (length 3 m) to 447293
	520852	Sensor Cable 5x2core (length 3 m) to 520884, 520885, 520886, 534133, 536907, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094
	451291	Signal Cable 12core (length 3 m) to 447293
	451292	Signal Cable 8core (length 3 m) to 447293
	404404	ESCON 36/2 DC Connector Set to 403112
	425255	ESCON 36/3 EC Connector Set to 414533
NRND	303807	EPOS2 24/2 Connector Set to 390003
NRND	351061	EPOS2 50/5 Connector Set to 347717
NRND	384915	EPOS2 24/5 Connector Set to 367676, 378308
NRND	381405	EPOS2 70/10 Connector Set to 375711
	520859	EPOS4 Connector Set to 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299, 620044, 620048, 628092, 628094
	451746	MAXPOS 50/5 Connector Set to 447293



# Summary maxon motor control Accessories

## Adapter

	220300	Adapter 11-pole flexprint connector to 8-pole screw terminal, for use with motors EC 10/13, EC 20/32/45 flat
	220310	Adapter 4-pole flexprint connector to 4-pole screw terminal, for use with EC micro motors without Hall sensors
	425931	Adapter 8-pole flexprint connector to 8-pole screw terminal, for use with motors ECX 6, ECX 8, EC 9.2 flat
	498157	Adapter Micromotor for use with motors ECX 6/8 and RE 6/8 with encoder (flexprint connector) or cable version
	473103	Adapter 6-pole flexprint connector to 6-pole screw terminal, for use with encoder 8 OPT
	223774	Adapter 10-pole spring contact strip (DIN 41651) to 8-pole screw terminal
	262359	Adapter 10-pole pin header (DIN 41651) to 10-pole screw terminal
	459875	Adapter encoder connector 2.54 mm pitch to 2.54 mm pitch (DIN 41651) with spring terminal for motor connections
	405120	Adapter encoder connector 1.27 mm pitch to 2.54 mm pitch (DIN 41651) with spring terminal for motor connections
	549609	Adapter encoder connector 1.27 mm pitch to 2.54 mm pitch (DIN 41651)
	488167	Adapter EASY Absolute to 6-pole screw terminal for use with encoder ENX 10/16 EASY Absolute
	418719	Adapter BLACK FPC11poles, for use with motors EC 10/13, EC 20/32/45 flat with 380264 and 414533
	418723	Adapter BLUE FPC8poles, for use with motors ECX 6, ECX 8, EC 9.2 flat with 380264 and 414533
NRND	418721	Adapter GREEN FPC8poles, for use with motors EC 6 (1.2 W), EC 10 flat with 380264 and 414533

## Thermal pad

586142	ESCON Module 50/8 Thermal Pad
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## Shunt regulators

309687	DSR 50/5, shunt regulator 27 VDC and 56 VDC (selectable), $P_{max}$ 300 W, $P_{cont}$ 10 W
235811	DSR 70/30, shunt regulator 12-75 VDC (adjustable), $P_{max}$ 475 W, $P_{cont}$ 25 W, module housing 180 x 103 x 26 mm

## Starter kits, Eva boards, motherboards, Connector boards

<b>DEC</b>		370652	DEC Module Evaluation Board, with switch, LED, potentiometer etc., for use with 367661 and 380200
<b>ESCON</b>		486400	ESCON Module 24/2 Motherboard with pluggable screw terminal block, for use with 466023
		438779	ESCON Module Motherboard with pluggable screw terminal block, for use with 438725
		586048	ESCON Module 50/8 Motherboard with pluggable screw terminal block, for use with 532872, 586137
		450237	ESCON Module Motherboard Sensorless with pluggable screw terminal block, for use with 446925
<b>EPOS2</b>	<b>NRND</b>	363407	EPOS2 Module 36/2 Starter Kit, consisting of 361435, 360665, 275829, 275851, 275878, 275934, 275932, 350392
	<b>NRND</b>	361435	EPOS2 Module Evaluation Board, 1-axis (with switch, LED, potentiometer and connector) for use with 360665
	<b>NRND</b>	407582	EPOS2 Module Motherboard, 1 to max. 11 axes, for use with 360665 (including 1 each red & black Power Link connector and CAN-link cable) Optional accessories: 407583 EPOS2 Motherboard USB Module (incl. 4-wire connection leads $l = 0.25$ m, 2 x M3 screws) 407584 EPOS2 Motherboard RS232 Module (incl. 6-wire connection leads $l = 0.25$ m, 2 x M3 screws) 407585 EPOS2 Motherboard I/O Expander Module (2 x M3 screws) 423536 EPOS2 Motherboard Dual Encoder Module (2 x M3 screws) 423507 EPOS2 Motherboard Power Cable ( $l = 1$ m) for use with 407582 423526 EPOS2 Motherboard USB type A Cable ( $l = 1.5$ m) for use with 407583 423530 EPOS2 Motherboard RS232 DB9 Cable ( $l = 1$ m) for use with 407584
<b>EPOS2 P</b>		327460	EPOS2 P 24/5 Starter Kit, consisting of EPOS2 P 24/5, EC motor with encoder, power supply, I/O board, cables
<b>EPOS4</b>		604594	EPOS4 CB Power EtherCAT, connector board including STO Idle Connector, compatible with 504383 and 504384
		520884	EPOS4 CB Power CAN, connector board including STO Idle Connector, compatible with 504383 and 504384
	<b>NEW</b>	620044	EPOS4 CB 50/5 EtherCAT, connector board including STO Idle Connector, compatible with 534130
		534133	EPOS4 CB 50/5 CAN, connector board including STO Idle Connector, compatible with 534130
	<b>NEW</b>	620048	EPOS4 CB 24/1.5 EtherCAT, connector board including STO Idle Connector, compatible with 536630
		536997	EPOS4 CB 24/1.5 CAN, connector board including STO Idle Connector, compatible with 536630

## Extension Cards

<b>EPOS4</b>	581245	EPOS4 EtherCAT Card for use with 536630, 546047, 534130, 504384, 504383, 594385
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# maxon compact drive

maxon's compact drives feature controllers, sensors and motors in a modern aluminium casing. The use of existing maxon products with an adapted design results in robust, space-saving drive solutions with high power density. The decentralized concept of these intelligent drives minimizes the use of centralized controllers.

**MCD EPOS/MCD EPOS P**  
**Accessories**

484-485  
486

DC Motor

EC Motor  
(BLDC Motor)

Gearhead

Screw  
drive

Sensor

Motor &  
Motion control

Compact  
Drive

Accessories &  
Batteries

Ceramic

Contact  
information

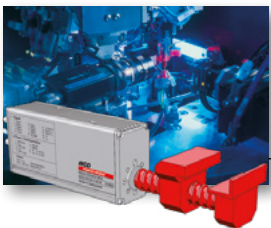
# MCD EPOS Intelligent compact drive

CANopen



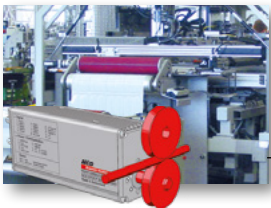
## Driving

A reliable drive solution is the key to production machinery with many years of maintenance-free operation in a variety of applications.



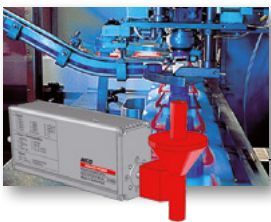
## Setting-up

The rapid set-up of processing machinery which offers both precision and long-term accuracy is the key to efficient production.



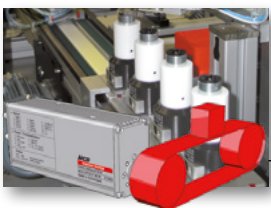
## Guiding

Products that are dynamically guided throughout the entire process ensure consistent product quality.



## Dispensing

The precise set-up of dispensing systems provides maximum flexibility through the accurate dosing of individual component quantities.



## Positioning

Several synchronized axes transport the product to the correct location with both high accuracy and sustained reproducibility.

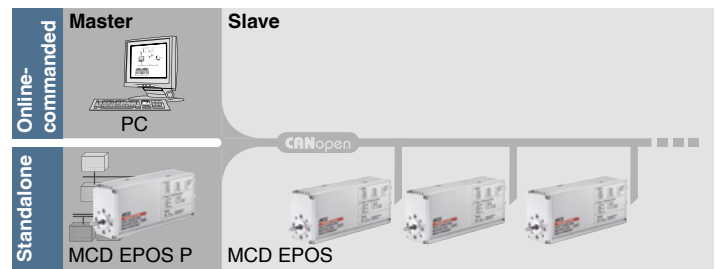


## Maintenance-free positioning drive with tried and trusted components

The combination of the brushless maxon EC motor, digital MR encoder and the fully digital EPOS positioning controller results in a highly dynamic, maintenance-free positioning drive with excellent functionality and high efficiency. The programmable version MCD EPOS P is equipped with a processor and memory for standalone operation.

## A complete system – easy start-up procedure

The compact drive's controller-motor combination is optimally tuned and ready for use. Wiring is kept to a minimum through direct connection to the CANopen bus or a PLC. Wiring errors are largely avoided and installation time is significantly reduced. The drive is controlled, parameterized and diagnosed via the CAN bus or the serial port (RS232).



## Intelligence at the right place

maxon's compact drives are fitted with several optically isolated inputs and outputs. Sensor signals and events can be evaluated directly in the drive. Cable lengths are shorter, thus reducing susceptibility to interference.

## CANopen, IEC 61131-3 and Motion Control Library – key to standardized operation

The MCD can be connected according to the CANopen standard, allowing communication with other CANopen devices. Drive programming complies with the IEC 61131-3 standard using the powerful "EPOS Studio" tool. The integration of the Motion Control Library under the widely used standards reduces program complexity and development costs.

## Everything integrated – also a question of price

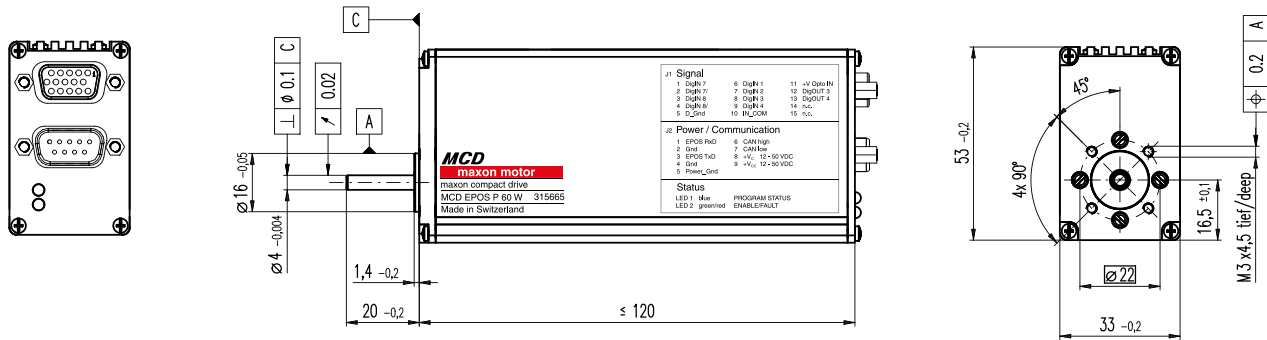
Substantial cost-savings have been made thanks to the careful selection and optimization of components. The resulting drive is available at an unsurpassed price which is well below the cost of the individual parts. Simplified mounting results in further cost-savings.

## Drives with a broad application spectrum

The requirements of compact design and enhanced functionality have been completely realized with maxon's compact drives. Their supreme flexibility ensures use in a wide range of industrial applications.

# MCD EPOS and EPOS P 60 W Compact Drive

DIGITAL CANopen  
RS232 GUI



M 1:2

## Motor Data

Nominal torque (Max. continuous torque)	54 mNm	
	( $T_U=25^\circ\text{C}$ , 5000 rpm)	
Max. torque	218 mNm	
Max. speed (restricted by econdor)	12000 rpm	
Max. efficiency	70%	
Torque constant	24.3 mNm/A	
Speed constant	393 rpm/V	
Speed/torque gradient	20.6 rpm/mNm	
Rotor inertia	21.9 gcm <sup>2</sup>	
Axial play at axial load	< 6 N	0 mm
(Preloaded ball bearings)	> 6 N	0.14 mm
Radial play	preloaded	
Max. axial load (dynamic)	5.5 N	
Max. force for press fits (static)	100 N	
Max. radial load, 5 mm from flange	25 N	

## Pin layout

### Connector J1: Signal

D Sub connector High Density 15 poles (female)

1 DigIN 7	6 DigIN 1	11 +V Opto IN
2 DigIN 7/	7 DigIN 2	12 DigOUT 3
3 DigIN 8	8 DigIN 3	13 DigOUT 4
4 DigIN 8/	9 DigIN 4	14 not connected
5 D_Gnd	10 IN_COM	15 not connected

### Connector J2: Power/Communication

D Sub connector 9 poles (male)

1 EPOS RxD	4 Gnd	7 CAN low
2 Gnd	5 Power_Gnd	8 +V <sub>C</sub> 12-50 VDC
3 EPOS TxD	6 CAN high	9 +V <sub>CC</sub> 12-50 VDC

## Ambient temperature/Humidity range

Protection class	IP42
Operating	-20 ... +85°C
	power derating 1.4%/K from $T_U = 25^\circ\text{C}$
Storage	-40 ... +85°C
Non condensating	20 ... 80 %
Max. case temperature	< 100°C

## Mechanical data

Weight	approx. 528 g
Dimensions (L x W x H)	120x33x53 mm
Mounting plate	four M3x4.5 threaded holes

## Electrical data

Power supply voltage +V <sub>CC</sub>	+12...+50 VDC
Logic supply voltage +V <sub>C</sub> (optional)	+12...+50 VDC
Max. output voltage	0.9 x V <sub>CC</sub>
Max. output current I <sub>max</sub>	9 A
Continuous output current I <sub>cont</sub>	2.6 A ( $T_U = 25^\circ\text{C}$ , 5000 rpm)
Switching frequency	50 kHz

## Controller

Sample rate PI-current controller	10 kHz
Sample rate PI-speed controller	1 kHz
Sample rate PID-positioning controller	1 kHz
Position resolution	0.09°
Position accuracy	± 1°
Position reproducibility	± 0.09°
Encoder	1000 Imp./3 channels

## Inputs

4 digital inputs (optically isolated)	+9...+24 VDC
2 digital inputs (differential)	EIA-standard RS-422

## Outputs

2 digital outputs (optically isolated)	max. +24 VDC (I <sub>L</sub> <350 mA)
--	---------------------------------------

## Interfaces

RS-232 (EIA-standard RS-232)	max. 115 200 bit/s
CAN (high-speed; ISO 11898 compatible)	max. 1 MBit/s
CAN ID	LSS CiA 305

## Protective functions

Current Limit (adjustable),  
Under-/over-voltage limitation,  
Temperature monitoring

## LED indicator

Bi-colour LED	green = Enable, red = Fault
	blink pattern = Operating status
Blue LED (only master version)	program status

## Performance features MCD EPOS P

32 bit host processor, 60 MHz
512 KB memory, with 256 KB free user program memory
Typical 2.5 ms/5000 lines AWL
512 Byte non-volatile memory
Digital motion control signal processor

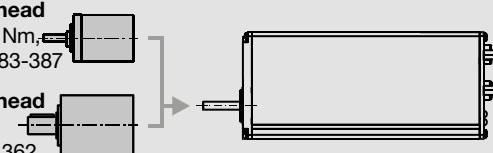
## maxon Modular System

### Planetary Gearhead

∅32 mm, 1.0-8.0 Nm,  
P. 348/354/357/383-387

### Planetary Gearhead

∅42 mm,  
3.0 - 15.0 Nm, p. 362



## Part Numbers

326343	MCD EPOS 60 W
315665	MCD EPOS P 60 W

maxon compact drive

# Programming

## EPOS operating modes

### Point to point

- Positioning the motor axis from point A to point B (absolute and relative)

### Position control with feed forward

- Reducing control error through acceleration and speed feed forward

### Speed control

- Rotating the motor axis at a pre-defined set value speed

### Torque control (current control)

- Controlling a constant torque on the motor shaft. Minimum torque ripple through sinusoidal commutation

### Homing mode

- Referencing onto a special mechanical position with more than 30 different methods

### Electronic gearing

- Synchronizing (also with intermediate factor) with an externally produced reference variable

### Step/Direction

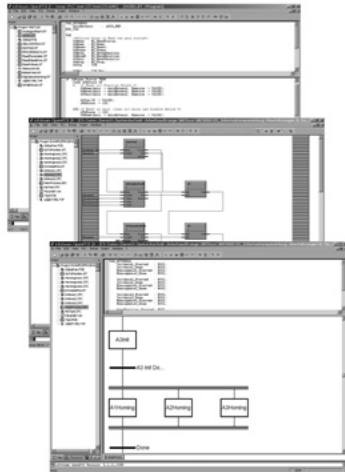
- Step-by-step movement of the motor axis

### Capture inputs (position marker)

- Saving positions when a positive and/or negative edge of an input signal appears

## EPOS Studio

Editors (ST, IL, FBD, LD, SFC) of the powerful "EPOS Studio" tool are available for programming according to IEC 61131-3. The integrated project browser shows all network resources. Complex programs with a large number of decentralized controls can be optimally managed with it. Drive systems are configured and networked quickly using intelligent step-by-step wizards.



- Windows-based development environment
- IEC 61131-3 programming languages (ST, IL, FBD, LD, SFC)
- IEC 61131-3 standard libraries
- Motion control function blocks
- maxon Utility function block library
- CANopen function block library
- User libraries
- Network variables and data exchange
- Online debugger with break points and watch variables
- Axis configuration and parameterization
- Online help

## Motion Control Library

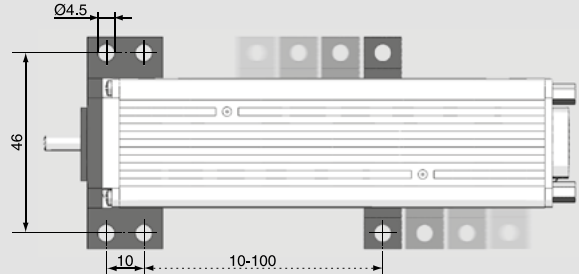
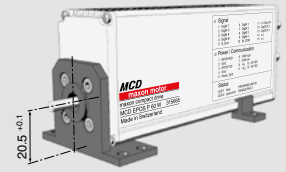
The complexity and development costs of drive systems are substantially reduced. The Motion Firmware Library was implemented according to the widely-used Motion Control Standard. Standardized function blocks make implementation easy.

- Drive control
- Referencing (Homing)
- Speed control
- Positioning absolute and relative
- Error management
- Parameter handling

# Accessories MCD EPOS 60 W

## Mounting Kit

Brackets for mounting the optional the MCD EPOS 60 W. The brackets provided can be placed in any position along the length of the MCD. Fixing screws are included.



**Part Number**  
**326930**

MCD EPOS 60 W Mounting-Kit

## Cable

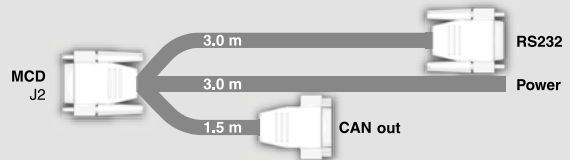
### Signal cable



**Part Number**  
**326923**

MCD EPOS Signal Cable

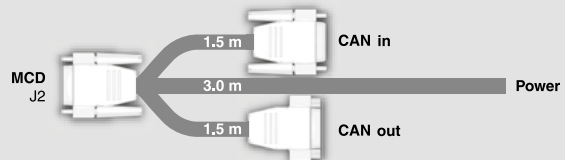
### Power/RS232-CAN cable



**Part Number**  
**325939**

MCD EPOS Power/RS232-CAN Cable

### Power/CAN-CAN cable



**Part Number**  
**325235**

MCD EPOS Power/CAN-CAN Cable

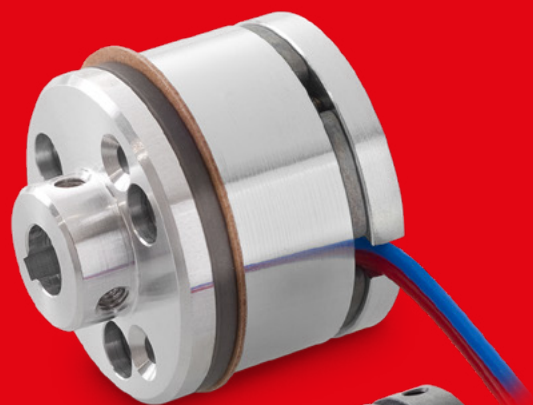
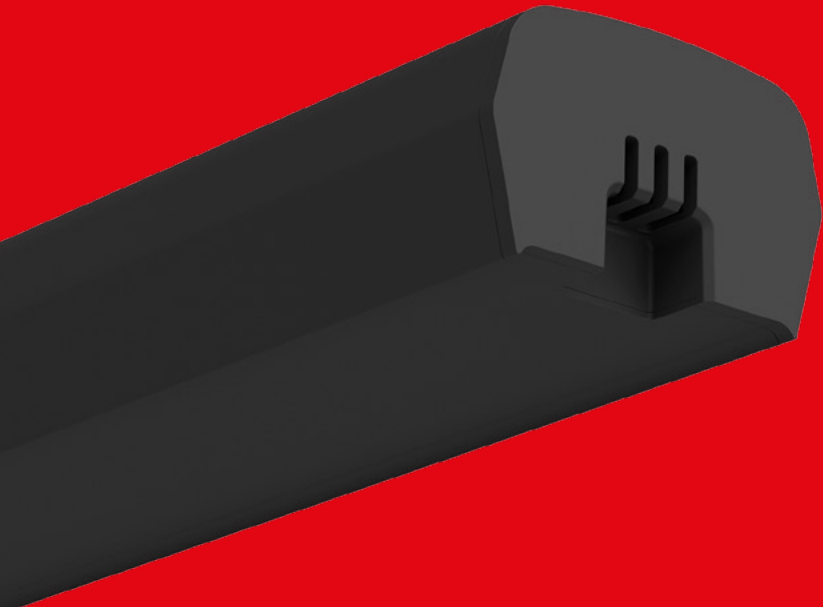
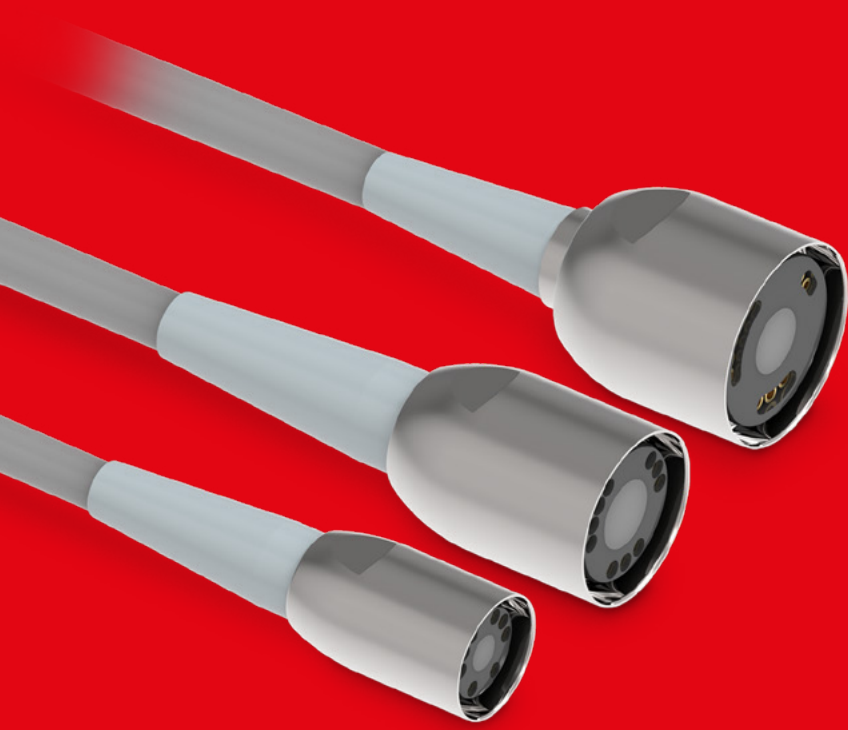
## CAN Termination plug

Is required as line termination for the CAN-Network.



**Part Number**  
**326925**

MCD EPOS CAN Termination Plug



maxon accessories

DC Motor

EC Motor  
(BLDC Motor)

Gearhead

Screw  
drive

Sensor

Motor &  
Motion control

Compact  
Drive

Accessories &  
Batteries

Ceramic

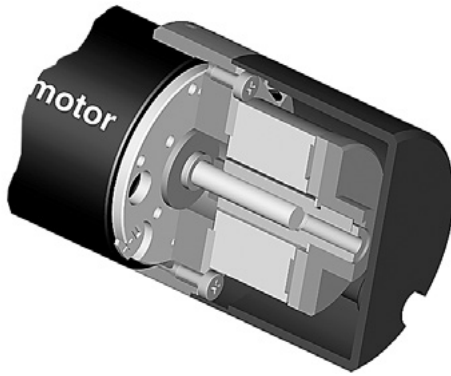
Contact  
information

# maxon accessories & batteries

Useful parts complete maxon's full range of drive technology products. Brakes may only be assembled with motors in the delivery plant.

<b>Brake AB 20</b>	24 VDC, 0.1 Nm	488–489
<b>Brake AB 28</b>	24 VDC, 0.4 Nm	490–492
<b>Brake AB 32</b>	24 VDC, 0.4 Nm	493
<b>Brake AB 41</b>	24 VDC, 2.0 Nm	494
<b>Brake AB 44</b>	24 VDC, 2.5 Nm	495
<b>End caps</b>		496
<b>ECX 13</b>	Connection cable	497
<b>ECX 16</b>	Connection cable	498
<b>ECX 19</b>	Connection cable	499
<b>ECX 22</b>	Connection cable	500
<b>Batteries and battery management system (BMS)</b>		501

# Brake AB 20 24 VDC, 0.1 Nm



### Important Information

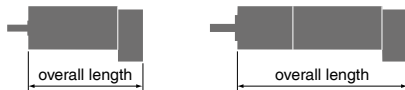
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- Schematic image: does not necessarily reflect the delivery state.

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

301212	301213
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### Type



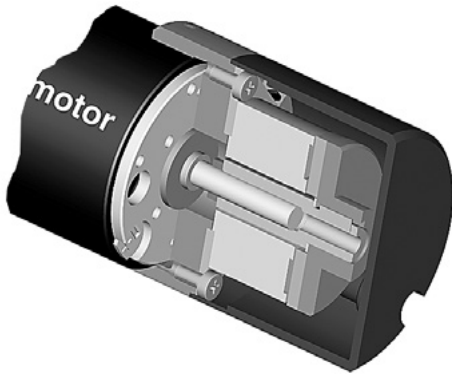
### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead
EC-max 22, 12 W	220					22	67.8
EC-max 22, 12 W	220	GP 22, 0.5 - 3.4 Nm	342-343			22	•
EC-max 22, 12 W	220	KD 32	359			22	•
EC-max 22, 12 W	220	GP 22 S	380/381			22	•
EC-max 22, 25 W	221					22	84.2
EC-max 22, 25 W	221	GP 22, 0.5 - 3.4 Nm	343			22	•
EC-max 22, 25 W	221	GP 32, 1 - 6 Nm	353			22	•
EC-max 22, 25 W	221	KD 32	359			22	•
EC-max 22, 25 W	221	GP 32 S	383-387			22	•
EC-max 30, 40 W	222					30	77.6
EC-max 30, 40 W	222	GP 32, 1.0 - 8.0 Nm	353/356			30	•
EC-max 30, 40 W	222	KD 32, 1.0 - 4.5 Nm	359			30	•
EC-max 30, 40 W	222	GP 32 S	383-387			30	•
EC-max 30, 40 W	222			HEDL 5540	444	30	98.4
EC-max 30, 40 W	222	GP 32, 1.0 - 8.0 Nm	353/356	HEDL 5540	444	30	•
EC-max 30, 40 W	222	KD 32, 1.0 - 4.5 Nm	359	HEDL 5540	444	30	•
EC-max 30, 40 W	222	GP 32 S	383-387	HEDL 5540	444	30	•
EC-max 30, 60 W	223					30	99.6
EC-max 30, 60 W	223	GP 32, 1.0 - 8.0 Nm	353/356			30	•
EC-max 30, 60 W	223	KD 32, 1.0 - 4.5 Nm	359			30	•
EC-max 30, 60 W	223	GP 42, 3 - 15 Nm	362			30	•
EC-max 30, 60 W	223			HEDL 5540	444	30	120.4
EC-max 30, 60 W	223	GP 32, 1.0 - 8.0 Nm	353/356	HEDL 5540	444	30	•
EC-max 30, 60 W	223	KD 32, 1.0 - 4.5 Nm	359	HEDL 5540	444	30	•
EC-max 30, 60 W	223	GP 42, 3 - 15 Nm	362	HEDL 5540	444	30	•
EC-4pole 30, 100 W	231					30	83.2
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356			30	•
EC-4pole 30, 100 W	231	GP 42, 3 - 15 Nm	362			30	•
EC-4pole 30, 100 W	231			16 EASY/XT/Abs.	422-424	30	97.3
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	16 EASY/XT/Abs.	422-424	30	•
EC-4pole 30, 100 W	231	GP 42, 3 - 15 Nm	362	16 EASY/XT/Abs.	422-424	30	•
EC-4pole 30, 100 W	231			16 EASY Abs. XT	424	30	97.8
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	16 EASY Abs. XT	424	30	•
EC-4pole 30, 100 W	231	GP 42, 3 - 15 Nm	362	16 EASY Abs. XT	424	30	•
EC-4pole 30, 100 W	231			16 RIO	435	30	95.8
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	16 RIO	435	30	•
EC-4pole 30, 100 W	231	GP 42, 3 - 15 Nm	362	16 RIO	435	30	•
EC-4pole 30, 100 W	231			AEDL/HEDL	438/445	30	104
EC-4pole 30, 100 W	231	GP 32, 4.0 - 8.0 Nm	356	AEDL/HEDL	438/445	30	•
EC-4pole 30, 100 W	231	GP 42, 3 - 15 Nm	362	AEDL/HEDL	438/445	30	•

Technical Data				Pin Allocation	
Max. permissible static torque at 20°C	0.1 Nm	Nominal voltage, smoothed	24 VDC ±10%	Cable (AWG 26) red blue	Designation U <sub>Brake</sub> + 24 VDC U <sub>Brake</sub> GND
Mass inertia	1.8 gcm <sup>2</sup>	Resistance	R <sub>20</sub> = 227 Ω ±6%		
Max. speed	49 000 rpm	Duty cycle	100%		
Weight	29 g	Reaction time	– Coupling	Min. cable length	350 mm
Ambient temperature range	-40...+100°C		– Opening		



# Brake AB 20 24 VDC, 0.1 Nm



## Important Information

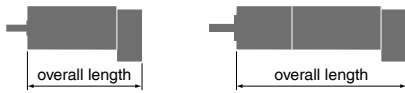
- Permanent magnet — single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- Schematic image: does not necessarily reflect the delivery state.

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

301212 301213

## Type

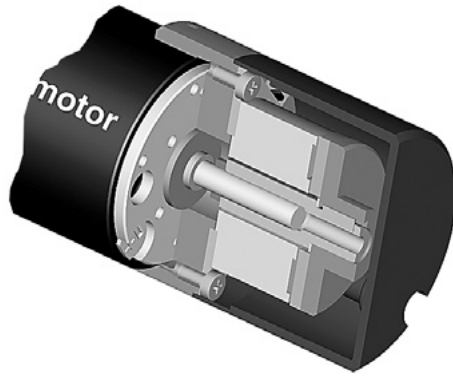


## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead
EC-4pole 30, 200 W	233					30	100.2
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356			30	•
EC-4pole 30, 200 W	233	GP 42, 3 - 15 Nm	362			30	•
EC-4pole 30, 200 W	233			16 EASY/XT/Abs.	422-424	30	114.3
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	16 EASY/XT/Abs.	422-424	30	•
EC-4pole 30, 200 W	233	GP 42, 3 - 15 Nm	362	16 EASY/XT/Abs	422-424	30	•
EC-4pole 30, 200 W	233			16 EASY Abs. XT	424	30	114.8
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	16 EASY Abs. XT	424	30	•
EC-4pole 30, 200 W	233	GP 42, 3 - 15 Nm	362	16 EASY Abs. XT	424	30	•
EC-4pole 30, 200 W	233			16 RIO	435	30	112.8
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	16 RIO	435	30	•
EC-4pole 30, 200 W	233	GP 42, 3 - 15 Nm	362	16 RIO	435	30	•
EC-4pole 30, 200 W	233			AEDL/HEDL	438/445	30	121
EC-4pole 30, 200 W	233	GP 32, 4.0 - 8.0 Nm	356	AEDL/HEDL	438/445	30	•
EC-4pole 30, 200 W	233	GP 42, 3 - 15 Nm	362	AEDL/HEDL	438/445	30	•

Technical Data				Pin Allocation	
Max. permissible static torque at 20°C	0.1 Nm	Nominal voltage, smoothed	24 VDC ±10%	<b>Cable (AWG 26)</b>	<b>Designation</b>
Mass inertia	1.8 gcm <sup>2</sup>	Resistance	R <sub>20</sub> = 227 Ω ±6%	red	U <sub>Brake</sub> + 24 VDC
Max. speed	49000 rpm	Duty cycle	100%	blue	U <sub>Brake</sub> GND
Weight	29 g	Reaction time	≤ 12 ms	Min. cable length 350 mm	
Ambient temperature range	-40...+100°C	- Coupling	≤ 6 ms		
		- Opening			

# Brake AB 28 24 VDC, 0.4 Nm



### Important Information

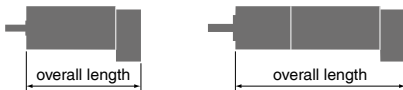
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.
- Schematic image: does not necessarily reflect the delivery state.

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

301215

### Type

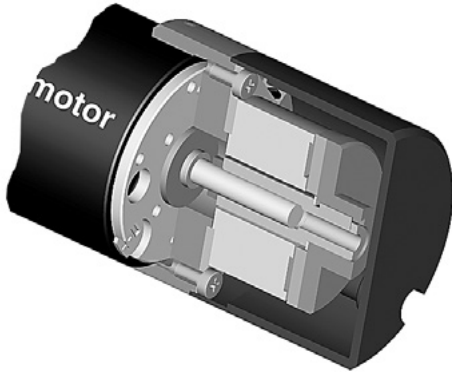


### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead
EC-max 40, 70 W	224					40	92.4
EC-max 40, 70 W	224	GP 42, 3 - 15 Nm	362			40	•
EC-max 40, 70 W	224			HEDL 5540	443	40	110.7
EC-max 40, 70 W	224	GP 42, 3 - 15 Nm	362	HEDL 5540	443	40	•
EC-max 40, 120 W	225					40	122.4
EC-max 40, 120 W	225	GP 52, 4 - 30 Nm	367			40	•
EC-max 40, 120 W	225			HEDL 5540	443	40	140.7
EC-max 40, 120 W	225	GP 52, 4 - 30 Nm	367	HEDL 5540	443	40	•

Technical Data				Pin Allocation	
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%	<b>Cable (AWG 26)</b>	<b>Designation</b>
Mass inertia	10 gcm <sup>2</sup>	Resistance	R <sub>20</sub> = 92.5 Ω ±6%	red	U <sub>Brake</sub> + 24 VDC
Max. speed	16000 rpm	Duty cycle	100%	blue	U <sub>Brake</sub> GND
Weight	0.05 kg	Reaction time	– Coupling ≤ 13 ms	Min. cable length 350 mm	
Ambient temperature range	-5...+85°C		– Opening ≤ 27 ms		

# Brake AB 28 24 VDC, 0.4 Nm



## Important Information

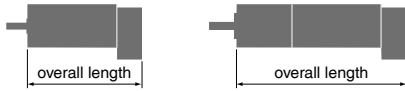
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- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.
- Schematic image: does not necessarily reflect the delivery state.

- █ Stock program
- Standard program
- Special program (on request)

## Part Numbers

228384      228387

## Type



## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead
RE 25, 20 W	130					40	77.1
RE 25, 20 W	130	GP 22, 0.5 - 1.0 Nm	340			40	•
RE 25, 20 W	130	GP 26, 0.75 - 4.5 Nm	346			40	•
RE 25, 20 W	130	GP 32, 0.75 - 4.5 Nm	348			40	•
RE 25, 20 W	130	GP 32, 0.75 - 4.5 Nm	349			40	•
RE 25, 20 W	130	GP 32, 1.0 - 6.0 Nm	352/359			40	•
RE 25, 20 W	130	GP 32 S	382-386			40	•
RE 25, 20 W	130			HED_ 5540	441/442	40	94.3
RE 25, 20 W	130	GP 22, 0.5 - 1.0 Nm	340	HED_ 5540	441/442	40	•
RE 25, 20 W	130	GP 26, 0.75 - 4.5 Nm	346	HED_ 5540	441/442	40	•
RE 25, 20 W	130	GP 32, 0.75 - 4.5 Nm	348	HED_ 5540	441/442	40	•
RE 25, 20 W	130	GP 32, 0.75 - 4.5 Nm	349	HED_ 5540	441/442	40	•
RE 25, 20 W	130	GP 32, 1.0 - 6.0 Nm	352/359	HED_ 5540	441/442	40	•
RE 25, 20 W	130	GP 32 S	382-386	HED_ 5540	441/442	40	•
RE 25, 20 W	131					40	88.6
RE 25, 20 W	131	GP 26, 0.75 - 4.5 Nm	346			40	•
RE 25, 20 W	131	GP 32, 0.75 - 4.5 Nm	348			40	•
RE 25, 20 W	131	GP 32, 0.75 - 4.5 Nm	349			40	•
RE 25, 20 W	131	GP 32, 1.0 - 6.0 Nm	352/359			40	•
RE 25, 20 W	131	GP 32 S	382-386			40	•
RE 25, 20 W	131			HED_ 5540	440/442	40	105.8
RE 25, 20 W	131	GP 26, 0.75 - 4.5 Nm	346	HED_ 5540	440/442	40	•
RE 25, 20 W	131	GP 32, 0.4 - 2.0 Nm	348	HED_ 5540	440/442	40	•
RE 25, 20 W	131	GP 32, 0.75 - 4.5 Nm	349	HED_ 5540	440/442	40	•
RE 25, 20 W	131	GP 32, 1.0 - 6.0 Nm	352/359	HED_ 5540	440/442	40	•
RE 25, 20 W	131	GP 32 S	382-386	HED_ 5540	440/442	40	•
RE 35, 90 W	134					40	107.1
RE 35, 90 W	134	GP 32, 0.75 - 6.0 Nm	348-355			40	•
RE 35, 90 W	134	GP 32, 4.0 - 8.0 Nm	356			40	•
RE 35, 90 W	134	GP 42, 3 - 15 Nm	361			40	•
RE 35, 90 W	134			HED_ 5540	440/442	40	124.3
RE 35, 90 W	134	GP 32, 0.75 - 6.0 Nm	348-355	HED_ 5540	440/442	40	•
RE 35, 90 W	134	GP 32, 4.0 - 8.0 Nm	356	HED_ 5540	440/442	40	•
RE 35, 90 W	134	GP 42, 3 - 15 Nm	361	HED_ 5540	440/442	40	•
RE 35, 90 W	134	GP 32 S	382-386			40	•
RE 35, 90 W	134	GP 32 S	382-386	HED_ 5540	440/442	40	•
RE 40, 150 W	136					45	107.1
RE 40, 150 W	136	GP 42, 3 - 15 Nm	361			45	•
RE 40, 150 W	136	GP 52, 4 - 30 Nm	366			45	•
RE 40, 150 W	136			HED_ 5540	440/442	45	124.3
RE 40, 150 W	136	GP 42, 3 - 15 Nm	361	HED_ 5540	440/442	45	•
RE 40, 150 W	136	GP 52, 4 - 30 Nm	366	HED_ 5540	440/442	45	•

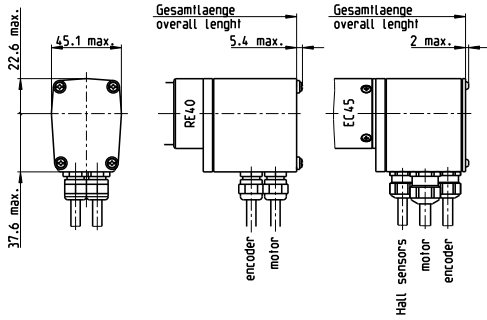
## Technical Data

Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	10 gcm <sup>2</sup>	Resistance	R <sub>20</sub> = 92.5 Ω ±6%
Max. speed	16000 rpm	Duty cycle	100%
Weight	0.05 kg	Reaction time	≤ 13 ms
Ambient temperature range	-5...+85°C	- Coupling	≤ 27 ms
		- Opening	

## Pin Allocation

Cable (AWG 26)	Designation
red	U <sub>Brake</sub> + 24 VDC
blue	U <sub>Brake</sub> GND
red	Motor+
black	Motor-
Min. cable length	350 mm

# Brake AB 28 24 VDC, 0.4 Nm



### Important Information

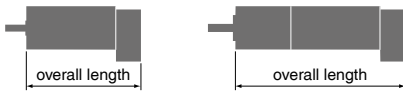
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.
- Schematic image: does not necessarily reflect the delivery state.

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

228389    228390

### Type



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
RE 40, 150 W	136					115.1
RE 40, 150 W	136	GP 42, 3 - 15 Nm	361			•
RE 40, 150 W	136	GP 52, 4 - 30 Nm	366			•
RE 40, 150 W	136			HEDL 9140	447	135.6
RE 40, 150 W	136	GP 42, 3 - 15 Nm	361	HEDL 9140	447	•
RE 40, 150 W	136	GP 52, 4 - 30 Nm	366	HEDL 9140	447	•
EC 45, 150 W	211					118.6
EC 45, 150 W	211	GP 42, 3 - 15 Nm	361			•
EC 45, 150 W	211	GP 52, 4 - 30 Nm	366			•
EC 45, 150 W	211			HEDL 9140	447	135.6
EC 45, 150 W	211	GP 42, 3 - 15 Nm	361	HEDL 9140	447	•
EC 45, 150 W	211	GP 52, 4 - 30 Nm	366	HEDL 9140	447	•
EC 45, 250 W	212					151.4
EC 45, 250 W	212	GP 42, 3 - 15 Nm	362			•
EC 45, 250 W	212	GP 52, 4 - 30 Nm	366			•
EC 45, 250 W	212	GP 62, 8 - 50 Nm	368			•
EC 45, 250 W	212			HEDL 9140	447	168.4
EC 45, 250 W	212	GP 42, 3 - 15 Nm	362	HEDL 9140	447	•
EC 45, 250 W	212	GP 52, 4 - 30 Nm	366	HEDL 9140	447	•
EC 45, 250 W	212	GP 62, 8 - 50 Nm	368	HEDL 9140	447	•

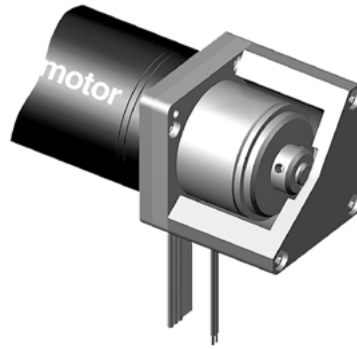
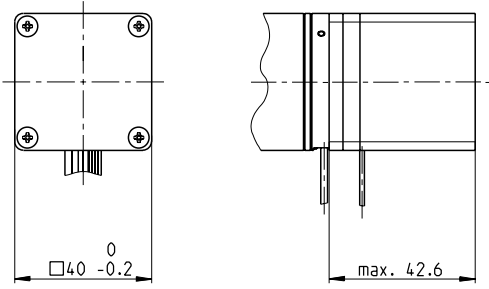
### Technical Data

Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	10 gcm <sup>2</sup>	Resistance	R <sub>20</sub> = 92.5 Ω ±6%
Max. speed	16000 rpm	Duty cycle	100%
Weight	0.05 kg	Reaction time	– Coupling ≤ 13 ms
Ambient temperature range	-5...+85°C		– Opening ≤ 27 ms

### Pin Allocation

	from motor clamp	Designation
	RE 40	
<b>Cable</b> green (AWG 20)		U <sub>Brake</sub> + 24 VDC
<b>Cable</b> yellow (AWG 20)		U <sub>Brake</sub> GND
	EC 45	
<b>Cable</b> No 4 (AWG 18)		U <sub>Brake</sub> + 24 VDC
<b>Cable</b> No 5 (AWG 18)		U <sub>Brake</sub> GND
Min. cable length		500 mm

# Brake AB 32 24 VDC, 0.4 Nm



## Important Information

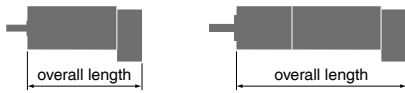
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

392335

## Type

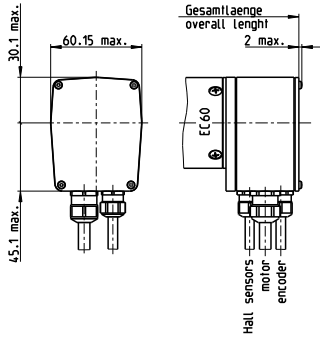


## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
EC 40, 170 W	210					122.7
EC 40, 170 W	210	GP 42, 3 - 15 Nm	361			•
EC 40, 170 W	210	GP 52, 4 - 30 Nm	366			•
EC 40, 170 W	210			HED_ 5540	441/443	141.1
EC 40, 170 W	210	GP 42, 3 - 15 Nm	361	HED_ 5540	441/443	•
EC 40, 170 W	210	GP 52, 4 - 30 Nm	366	HED_ 5540	441/443	•

Technical Data				Pin Allocation	
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%	<b>Cable (AWG 24)</b>	<b>Designation</b>
Mass inertia	19 gcm <sup>2</sup>	Resistance	R <sub>20</sub> = 100 Ω ±7%	red	U <sub>Brake</sub> + 24 VDC
Max. speed	10000 rpm	Duty cycle	100%	blue	U <sub>Brake</sub> GND
Weight	0.1 kg	Reaction time	– Coupling ≤ 13 ms	Min. cable length	350 mm
Ambient temperature range	-40...+100°C	– Opening	≤ 24 ms		

# Brake AB 41 24 VDC, 2.0 Nm



### Important Information

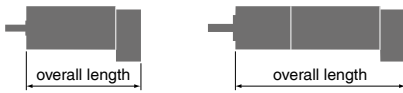
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

- Stock program
- Standard program
- Special program (on request)

### Part Numbers

228998

### Type



### maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
EC 60, 400 W	213					190.9
EC 60, 400 W	213	GP 81, 20 - 120 Nm	369			•
EC 60, 400 W	213			HEDL 9140	447	214.9
EC 60, 400 W	213	GP 81, 20 - 120 Nm	369	HEDL 9140	447	•

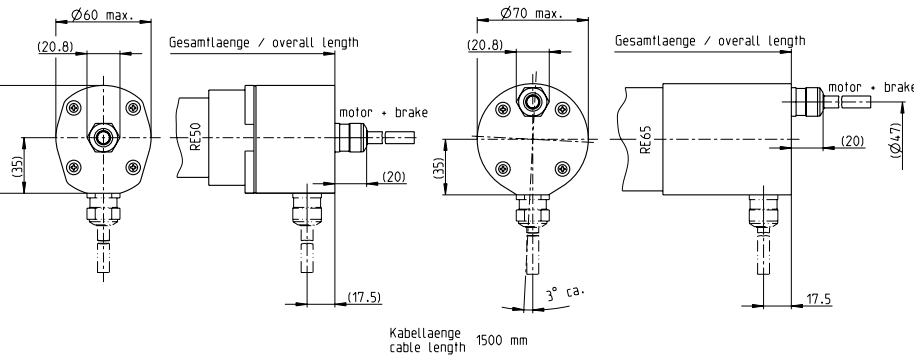
### Technical Data

Max. permissible static torque at 20°C	2.0 Nm	Nominal voltage, smoothed	24 VDC -10 ... +6%
Mass inertia	45 gcm <sup>2</sup>	Resistance	R <sub>20</sub> = 72 Ω ±7%
Max. speed	10 000 rpm	Duty cycle	100%
Weight	0.18 kg	Reaction time	– Coupling ≤ 2 ms
Ambient temperature range	-5...+85°C		– Opening ≤ 25 ms

### Pin Allocation

from motor clamp Designation		
<b>Cable</b> red	No 4 (AWG 16)	U <sub>Brake</sub> + 24 VDC
<b>Cable</b> black	No 5 (AWG 16)	U <sub>Brake</sub> GND
Min. cable length		500 mm

# Brake AB 44 24 VDC, 2.5 Nm



## Important Information

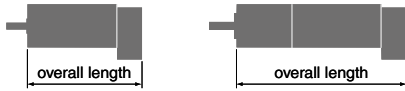
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.
- Protection: IP54

- Stock program
- Standard program
- Special program (on request)

## Part Numbers

Cable output axial	386052	385999
Cable output radial	386054	386000

## Type



## maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
RE 50, 200 W	137					170.4
RE 50, 200 W	137	GP 52, 4 - 30 Nm	366			•
RE 50, 200 W	137	GP 62, 8 - 50 Nm	368			•
RE 50, 200 W	137			HEDL 9140	448	183.4
RE 50, 200 W	137	GP 52, 4 - 30 Nm	366	HEDL 9140	448	•
RE 50, 200 W	137	GP 62, 8 - 50 Nm	368	HEDL 9140	448	•
RE 65, 250 W	138					187.5
RE 65, 250 W	138	GP 81, 20 - 120 Nm	369			•
RE 65, 250 W	138			HEDL 9140	448	205.5
RE 65, 250 W	138	GP 81, 20 - 120 Nm	369	HEDL 9140	448	•

## Technical Data

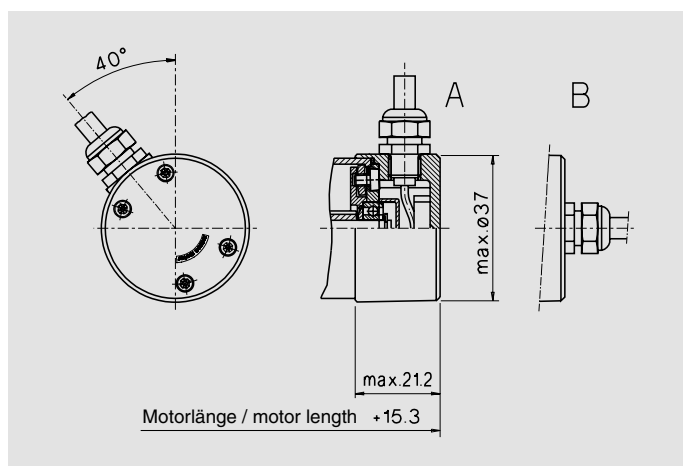
Max. permissible static torque at 20°C	2.5 Nm
Mass inertia	90 gcm <sup>2</sup>
Max. speed	10000 rpm
Weight	0.19 kg
Ambient temperature range	-40...+100°C

Nominal voltage, smoothed	24 VDC ±10%
Resistance	R <sub>20</sub> = 64 Ω ±7%
Duty cycle	100%
Reaction time	≤ 20 ms
- Coupling	≤ 35 ms
- Opening	

## Pin Allocation

Cable (AWG 18)	Designation
white	Motor+
brown	Motor-
green	U <sub>Brake</sub> + 24 VDC
yellow	U <sub>Brake</sub> GND
Min. cable length	1490 mm

## End Caps



### End cap for maxon DC motor RE 35 mm

Details for motor see page 134

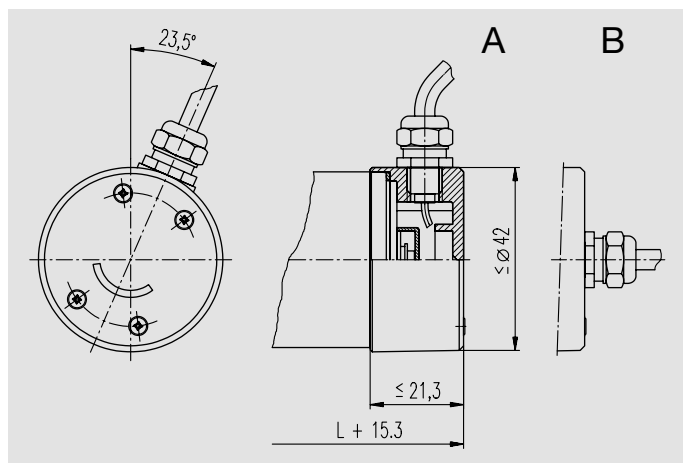
- Plastic housing
- Protection to IP54
- With 500 mm cable, AWG 20 ( $2 \times 0.5 \text{ mm}^2$ ) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

#### Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	- Pol

#### Part Numbers

<b>137235</b>	<b>A</b>	End cap with radial cable outlet (500 mm)
<b>137234</b>	<b>B</b>	End cap with axial cable outlet (500 mm)



### End cap for maxon DC motor RE 40 mm

Details for motor see page 136

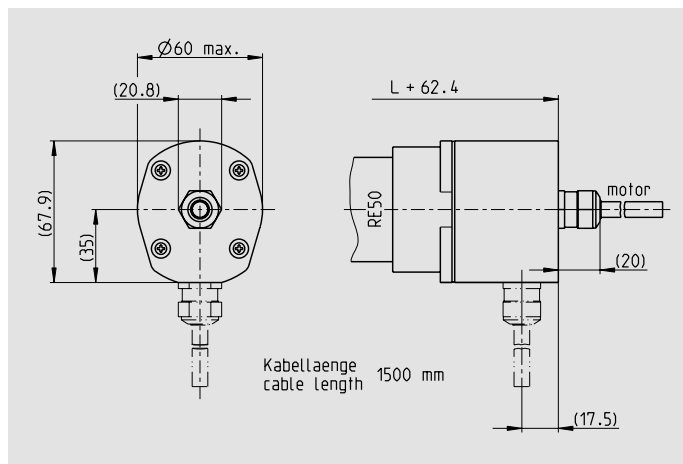
- Plastic housing
- Protection to IP54
- With 500 mm cable, AWG 20 ( $2 \times 0.5 \text{ mm}^2$ ) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

#### Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	- Pol

#### Part Numbers

<b>232341</b>	<b>A</b>	End cap with radial cable outlet (500 mm)
<b>232343</b>	<b>B</b>	End cap with axial cable outlet (500 mm)



### End cap for maxon DC motor RE 50 mm

Details for motor see page 137

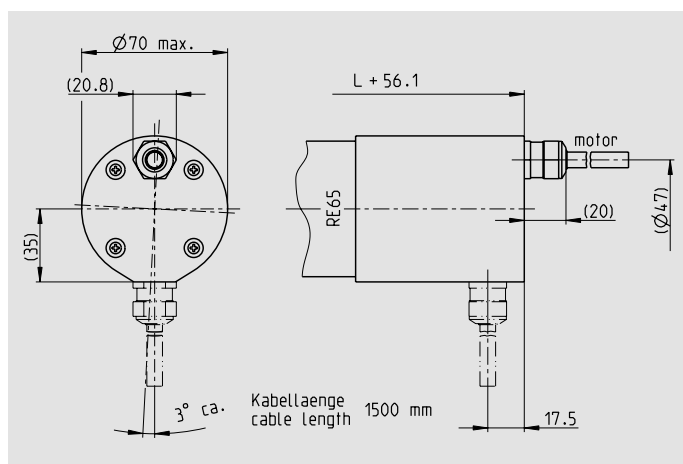
- Aluminium housing
- Protection to IP54
- With 1500 mm cable, AWG 18 ( $2 \times 1.0 \text{ mm}^2$ ) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor.

#### Pin Allocation

Cable No.	Color	Motor
1	white	+ Pol
2	brown	- Pol

#### Part Numbers

<b>386056</b>	<b>A</b>	End cap with radial cable outlet (1500 mm)
<b>386055</b>	<b>B</b>	End cap with axial cable outlet (1500 mm)



### End cap for maxon DC motor RE 65 mm

Details for motor see page 138

- Aluminium housing
- Protection to IP54
- With 1500 mm cable, AWG 18 ( $2 \times 1.0 \text{ mm}^2$ ) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor.

#### Pin Allocation

Cable No.	Color	Motor
1	white	+ Pol
2	brown	- Pol

#### Part Numbers

<b>386004</b>	<b>A</b>	End cap with radial cable outlet (1500 mm)
<b>386003</b>	<b>B</b>	End cap with axial cable outlet (1500 mm)



# ECX 13 connecting cable

## ECX 13 connecting cable

The connecting cable fits ECX 13 that are configured with a pin and external thread. Details about the motor can be found on pages 168–175 and online at [www.maxonmotor.com](http://www.maxonmotor.com).

### Characteristics:

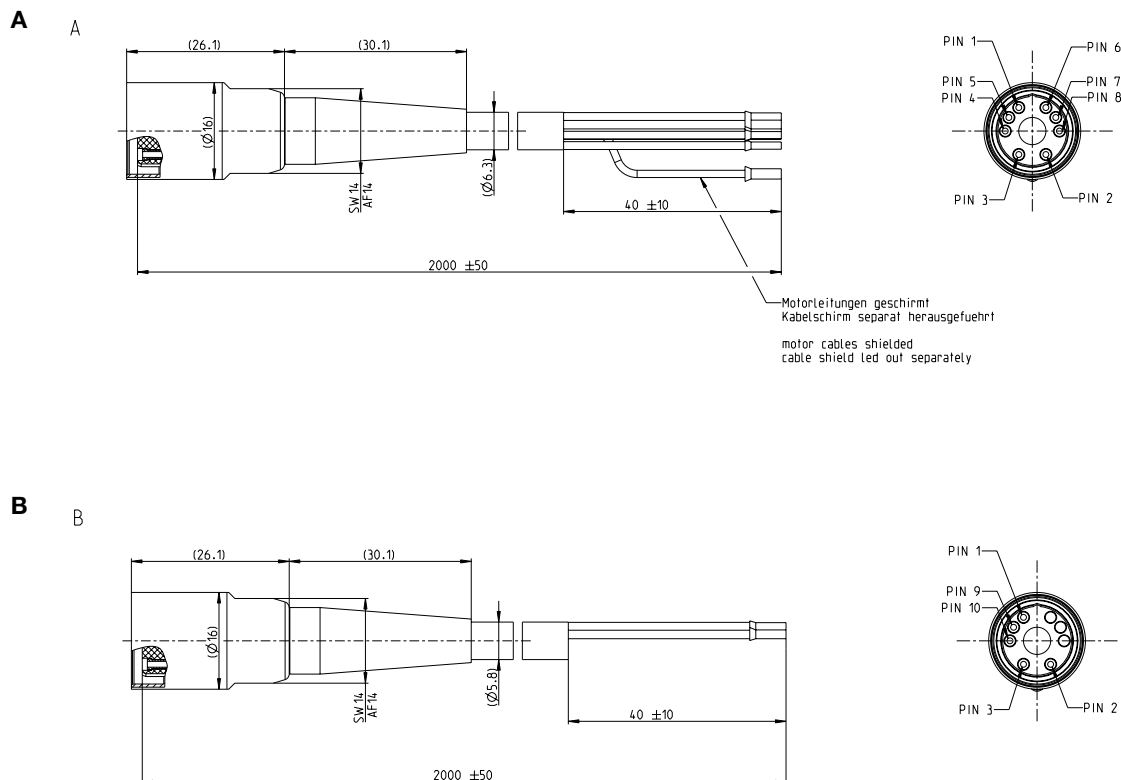
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

### Part number

585750  
592191  
595698

### Cable version

ECX 13 connecting cable, type **A**: for motors with Hall sensors or for versions with encoders  
ECX 13 connecting cable, type **B**: for motors without Hall sensors and without encoders  
ECX 13 connector set (without cable)



Cable and pin assignment, type A		
	Color	Pin
AWG 22	red	1
	black	2
	white	3
AWG 26	orange	4
	blue	5
	yellow	6
	brown	7
	green	8
	pink	no pin
	purple	no pin
	green	no pin

Cable and pin assignment, type B		
	Color	Pin
AWG 22	red	1
	black	2
	white	3
AWG 26	pink	9
	purple	10

# ECX 16 connecting cable

## ECX 16 connecting cable

The connecting cable fits ECX 13 that are configured with a pin and external thread. Details about the motor can be found on pages 176–183 and online at [www.maxonmotor.com](http://www.maxonmotor.com).

### Characteristics:

- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

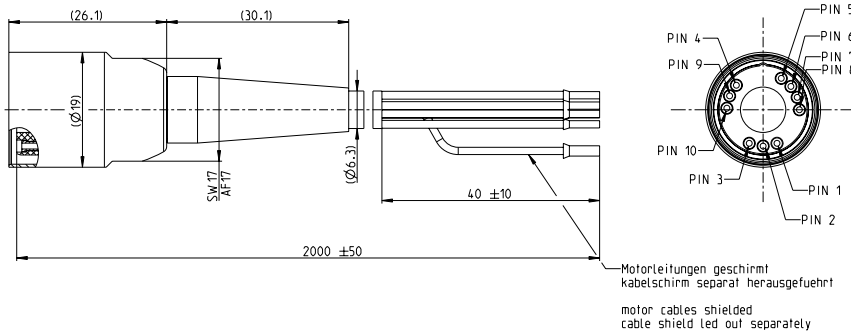
### Part number

584532  
592194  
595697

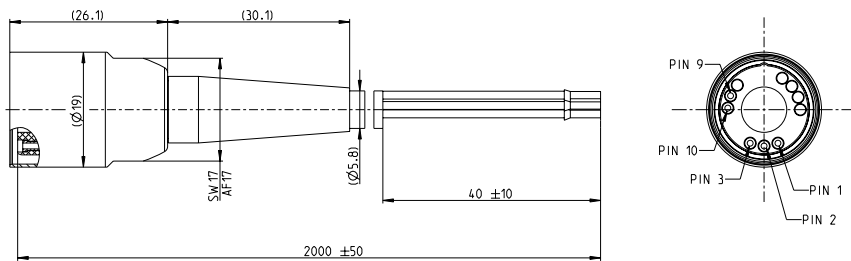
### Cable version

ECX 16 connecting cable, type **A**: for motors with Hall sensors or for versions with encoders  
ECX 16 connecting cable, type **B**: for motors without Hall sensors and without encoders  
ECX 16 connector set (without cable)

**A**



**B**



### Cable and pin assignment, type A

	Color	Pin
AWG 22	red	1
	black	2
	white	3
AWG 26	orange	4
	blue	5
	yellow	6
	brown	7
	green	8
	pink	9
	purple	10
	green	no pin

### Cable and pin assignment, type B

	Color	Pin
AWG 22	red	1
	black	2
	white	3
AWG 26	pink	9
	purple	10

# ECX 19 connecting cable

## ECX 19 connecting cable

The connecting cable fits ECX 13 that are configured with a pin and external thread. Details about the motor can be found on pages 184–191 and online at [www.maxonmotor.com](http://www.maxonmotor.com).

### Characteristics:

- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

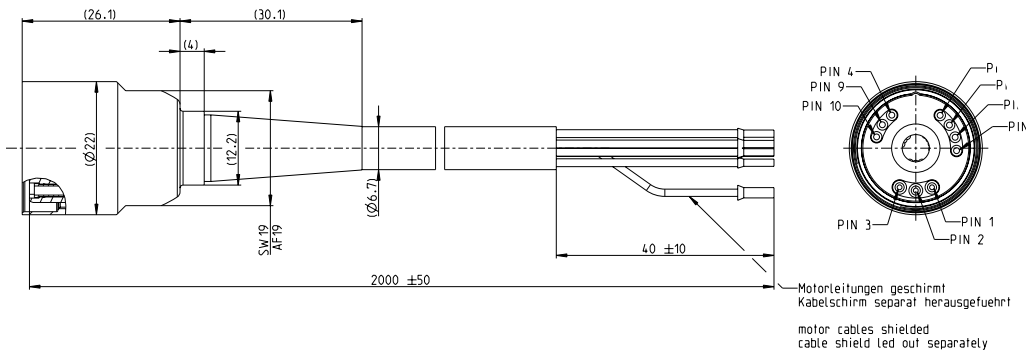
### Part number

589852  
589892  
551012

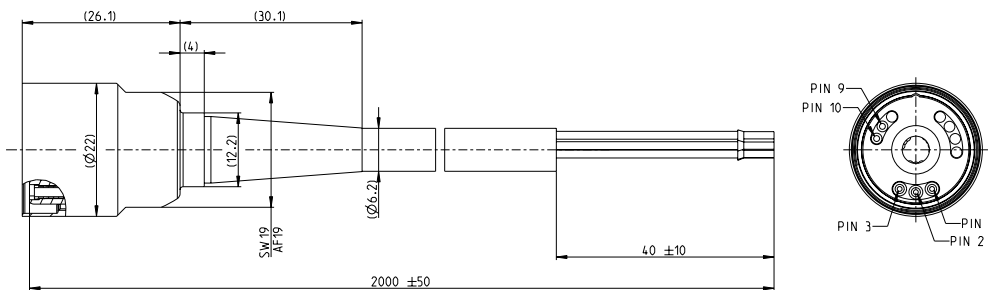
### Cable version

ECX 19 connecting cable, type **A**: for motors with Hall sensors or for versions with encoders  
ECX 19 connecting cable, type **B**: for motors without Hall sensors and without encoders  
ECX 19 connector set (without cable)

**A**



**B**



### Cable and pin assignment, type A

	Color	Pin
AWG 20	red	1
	black	2
	white	3
AWG 26	orange	4
	blue	5
	yellow	6
	brown	7
	green	8
	pink	9
	purple	10
	green	no pin

### Cable and pin assignment, type B

	Color	Pin
AWG 20	red	1
	black	2
	white	3
AWG 26	pink	9
	purple	10

# ECX 22 connecting cable

## ECX 22 connecting cable

The connecting cable fits ECX 13 that are configured with a pin and external thread. Details about the motor can be found on pages 192–199 und online auf [www.maxonmotor.com](http://www.maxonmotor.com).

### Characteristics:

- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

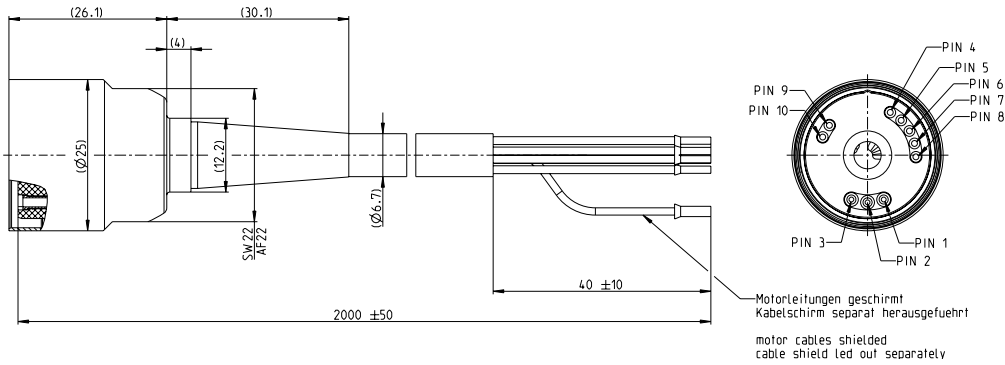
### Part number

574625  
592061  
595696

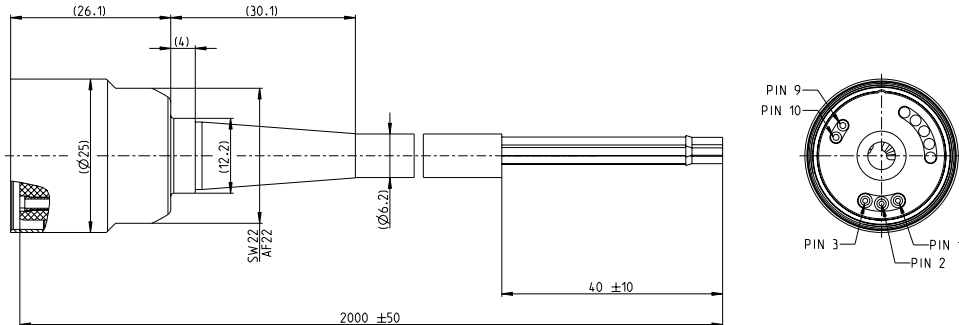
### Cable version

ECX 22 connecting cable, type **A**: for motors with Hall sensors or for versions with encoders  
ECX 22 connecting cable, type **B**: for motors without Hall sensors and without encoders  
ECX 22 connector set (without cable)

**A**



**B**



### Cable and pin assignment, type A

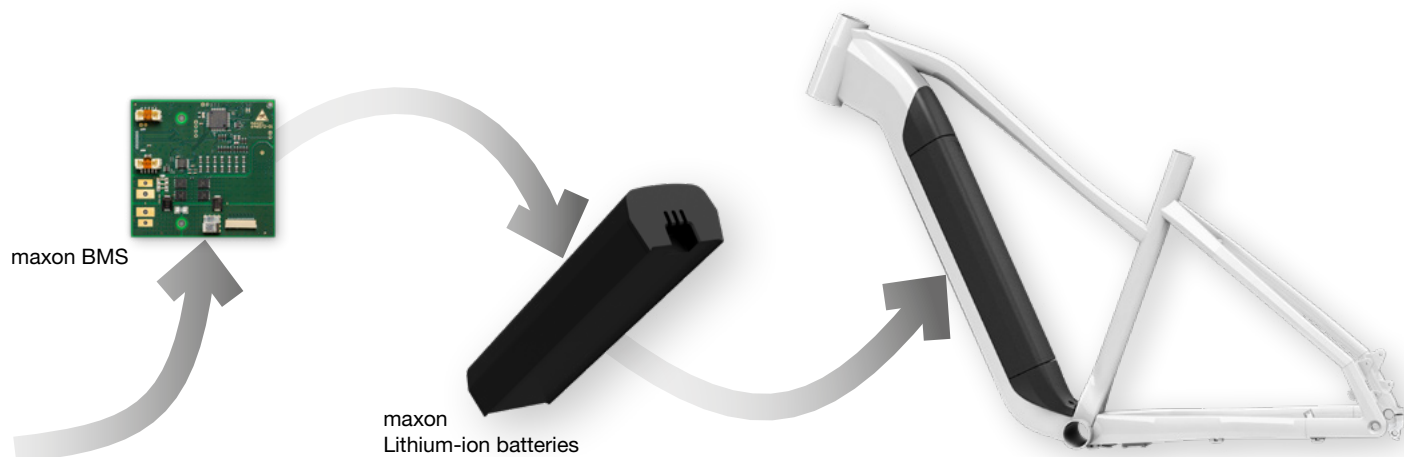
	Color	Pin
AWG 20	red	1
	black	2
	white	3
AWG 26	orange	4
	blue	5
	yellow	6
	brown	7
	green	8
	pink	9
	purple	10
	green	no pin

### Cable and pin assignment, type B

	Color	Pin
AWG 20	red	1
	black	2
	white	3
AWG 26	pink	9
	purple	10

# Batteries and battery management system (BMS)

**NEW**

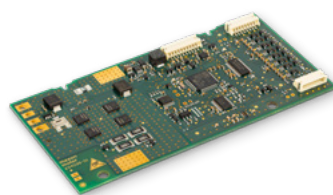


## Integrated battery solutions for your application

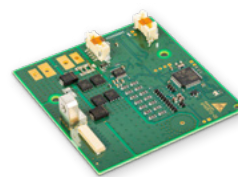
maxon battery systems based on lithium-ion cells are individually tailored to your requirements and integrated seamlessly into your application. Alongside the battery cells, battery management is a key component in your solution. maxon has its own modular solution for this.

**Please note:** The battery management system can only be purchased as part of a battery!

## Data



BMS 13-02



BMS 14-01

**CANopen**

<b>maxon Battery Management System (BMS)</b>		
Cell configuration	13 s (Range 9 s - 15 s) <sup>*</sup>	14 s
Battery types	Lilon <sup>**</sup>	Lilon <sup>**</sup>
Max. Capacity	32 Ah	32 Ah
<b>Communication</b>		
Bus interface	CANopen (CiA 301, CiA 418) A	CANopen (CiA 301, CiA 418)
<b>Electrical data</b>		
Nominal voltage	46.8 V	50.4 V
Charging Voltage	54.6 V	58.8 V
Final discharge voltage	36.4 V	39.2 V
Nominal continuous charge/discharge current	15 A	tbd
Pulse charge/discharge current 30 s	30 A	tbd
Pulse charge/discharge current 100 ms	100 A	tbd
Pulse charge/discharge current 100 μs	150 A	tbd
<b>Protection functions</b>		
Over voltage	ok ✓	ok ✓
Under voltage	ok ✓	ok ✓
Over current protection	ok ✓	ok ✓
Short circuit protection	ok ✓	ok ✓
<b>Advanced Control Capabilities</b>		
Temperature Management	ok ✓	ok ✓
Cell Balancing	ok ✓	ok ✓
Advanced battery gas gauging	ok ✓	ok ✓
<b>Mechanical Data</b>		
Dimensions	123.5 x 63 mm	80 x 76 mm

<sup>\*</sup> Population Variant of BMS

<sup>\*\*</sup> Other types on request





# maxon ceramic

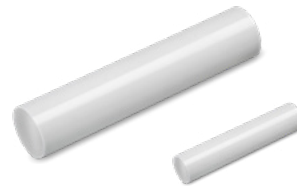
High performance industrial ceramic is used primarily for applications where customary materials would fail. maxon ceramic products include: precision screws, axles and shafts, customer-specific components for microtechnology, and scratch-resistant housing components.

<b>Innovative high-tech ceramic components</b>	504–506
<b>Material properties</b>	507–509
<b>Standard screws</b>	510
<b>System-specific nuts</b>	511–512
<b>Standard axles</b>	513

**Smooth-running and wear-proof.**  
Ceramic precision screws.



**Resilient and long-lasting.**  
Ceramic axles for power tools.



**Complex shapes for microtechnology.**  
Ceramic components for miniaturized applications.



**Protection against high temperatures  
and aggressive media.**  
Ceramic sensor housing for measuring equipment.



**Shiny, scratch-resistant surfaces.**  
Earphone housing made of black ceramic.







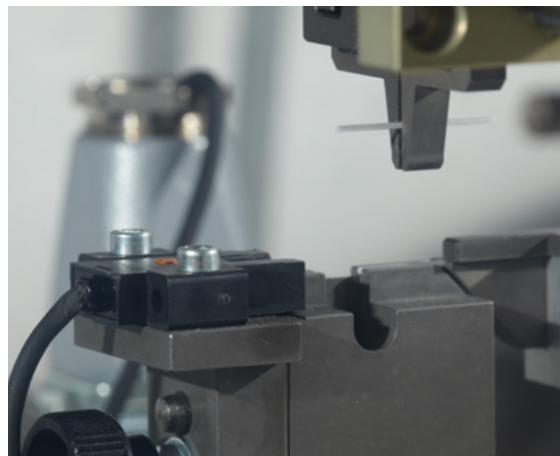
# Experience and innovation.

## maxon ceramic.

maxon ceramic in Sexau, Germany, is part of maxon motor, the global leading provider of high-precision drive systems, based in Switzerland. maxon ceramic has extensive knowledge and more than 20 years of experience in the field of powder injection molding. Customized ceramic and metallic components are produced CIM (Ceramic Injection Molding) and MIM (Metal Injection Molding).

In addition to our extensive standard program, we also offer components manufactured to customer specifications. We not only develop components for drive technology and the watch industry, but also high-precision screws made of high-performance ceramic. Our development and engineering department use cutting-edge CAD technology and make use of the finite element calculation method.

For additional information, contact your local maxon representative found at:  
[contact.maxonmotor.com](http://contact.maxonmotor.com)



## Complex shapes for microtechnology.

### Ceramic pawls in automatic watches.

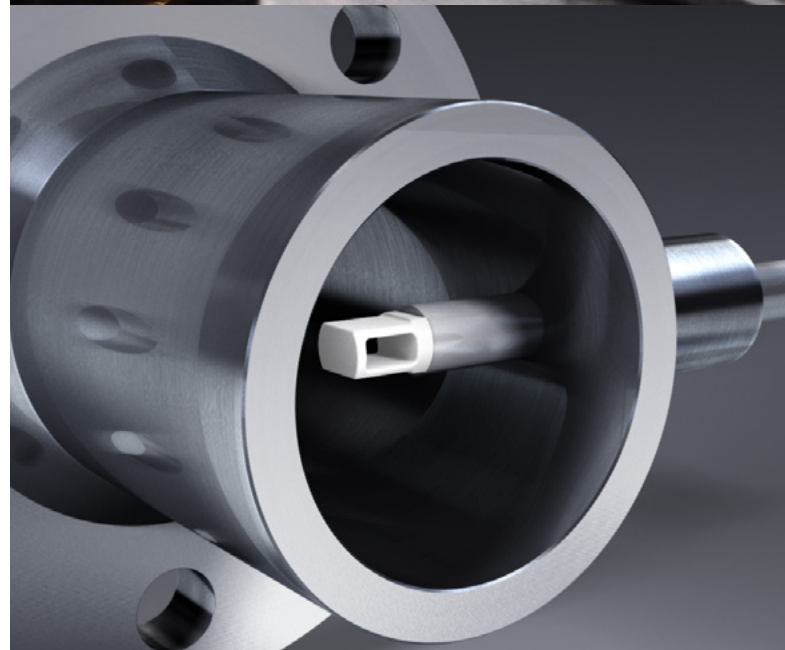
In clockwork, the tiny mechanical parts have to be machined with utmost precision for the clockwork to run reliably. With ceramic components, the meshing parts maintain precision over life spans never achieved before.



## Protection against high temperatures and aggressive media.

### Ceramic sensor housing in a flow meter.

Ceramic resists harsh conditions. As a sensor housing, it shows its resistance against high temperatures, abrasive dust in the mass flow and chemically aggressive condensate. The low heat conductance protects the electronics inside of the sensor. This passive behavior towards electric and magnetic fields make it possible to use electronic sensors.



## Shiny, scratch-resistant surfaces.

### Ceramic housing for earphones.

Ceramic surfaces feature scratch-resistance and shine. The continuous development of our polishing and shaping processes combines aesthetic design and functionality in a very special way. Ceramic housings protect the high-quality technical components inside and give the products a long-lasting high-quality exterior.





# Zirconia.

Zirconia is a high-performance industrial ceramic. It is used primarily for applications where customary materials would fail. These applications include wear optimization, as well as non-magnetic applications in a vacuum and in medical applications. Zirconia measures up to these tasks even while meeting high requirements for chemical and thermal stability as well as thermal and electrical insulation.

Zirconia shares many of the properties of steel (elasticity modulus of approx. 200 000 N/mm<sup>2</sup>, bending strength of >800 N/mm<sup>2</sup>, expansion co-efficient of 10 x 10<sup>-6</sup> 1/K). However, at 1350 HV, it is many times harder than steel. This is the main benefit when using ceramics and surfaces are virtually wearproof.

## General material properties.

Bending strength	>800 N/mm <sup>2</sup>
Elasticity modulus	2 x 10 <sup>5</sup> N/mm <sup>2</sup>
Density	≥6.03 g/cm <sup>3</sup>
Hardness	1350 HV
Heat expansion coefficient	10 x 10 <sup>-6</sup> 1/K
Thermal conductivity	2 W/mK
Dielectric constant	22 [ ]
Electrical resistance	10 <sup>8</sup> Ωm



# Precision screws made of ceramic.

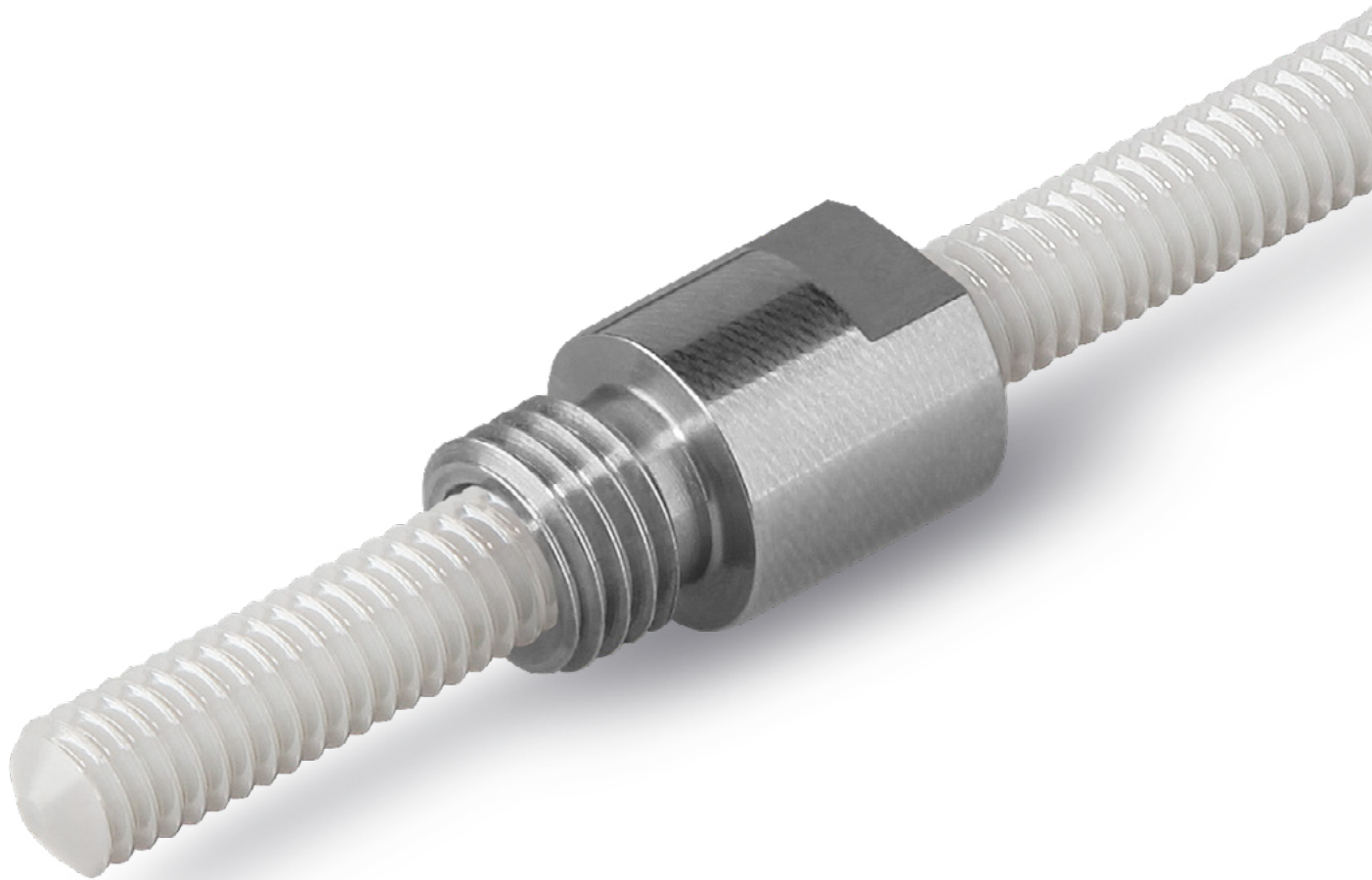
## The maxon cgs screw – smooth-running and wear-proof.

Ground ceramic surfaces are extremely suitable for sliding movements. Our ceramic screws with specially developed cgs surface (ceramic glide surface) work almost completely without slip-stick effect. Ceramic components can be positioned easily, even in areas with strong electric fields or high vacuum.

Due to the high hardness of the ceramic, the maxon cgs screws achieve an exceptionally long life span, especially in the case of dynamic operation. All these properties make ceramic screws a better alternative to customary steel screws and ball screws.

## cgs surface for ceramic screws.

To use this high-strength material for screws, maxon ceramic has designed the screw flanks with a special cgs surface structure. The result is an unprecedented wear resistance and extremely high efficiency.



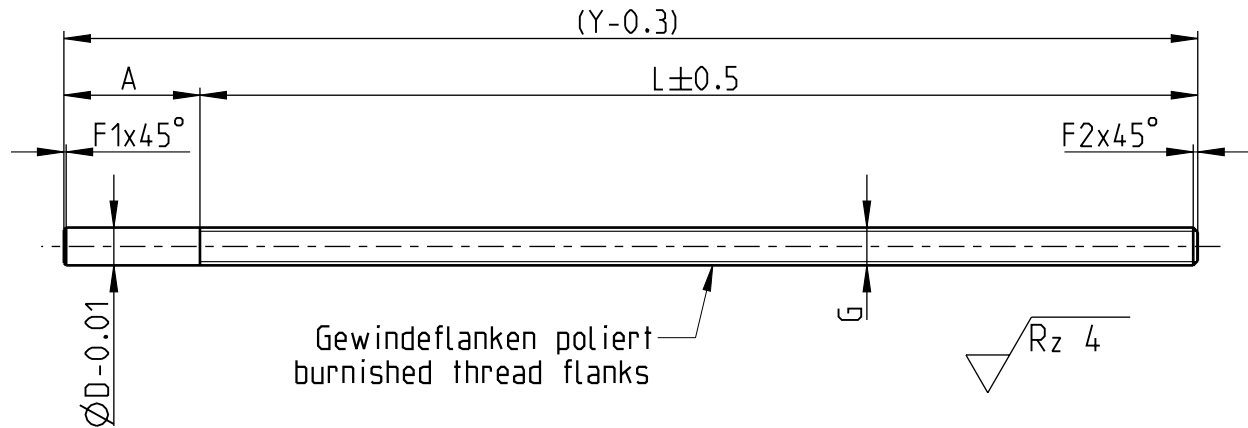


### **Ceramic as screw material makes it possible to use the screws in:**

- Applications with high power transmission
- Applications with long life span
- High temperature environments
- Magnetic and electric fields
- Chemically aggressive environments
- Cleanrooms
- High vacuum technologies

### **Benefits of ceramic screws:**

- Excellent sliding characteristics
- Extreme wear resistance
- Significant increase in life span
- Excellent efficiency
- Almost non-existent stick-slip effect
- Thermally isolating
- Screws resistant to thermal stress (~800°C)
- Electrically insulating
- No warming up in induction fields
- Chemically stable
- Corrosion-free
- Strength, Elasticity modulus and thermal expansion similar to that of steel



# maxon standard screws.

## Ceramic screws (in white).

Size	Color	Part no.	D	A max.	L max.	F1	F2	(Y) max.
M2	white	426634	2.0	18	102	0.3	0.3	120
M2.5	white	426707	2.5	18	132	0.3	0.3	150
M3	white	426715	3.0	18	132	0.4	0.4	150
M4	white	426717	4.0	18	132	0.5	0.5	150
M5	white	426730	5.0	18	132	0.6	0.6	150
M6	white	426740	6.0	18	232	0.7	0.7	250
M8	white	426763	8.0	18	232	0.8	0.8	250
M10	white	426783	10.0	18	232	1.0	1.0	250

## Ceramic screws (in black).

Size	Color	Part no.	D	A max.	L max.	F1	F2	(Y) max.
M2	black	427107	2.0	18	102	0.3	0.3	120
M2.5	black	427186	2.5	18	132	0.3	0.3	150
M3	black	427199	3.0	18	132	0.4	0.4	150
M4	black	427209	4.0	18	132	0.5	0.5	150
M5	black	427216	5.0	18	132	0.6	0.6	150
M6	black	427221	6.0	18	232	0.7	0.7	250
M8	black	427231	8.0	18	232	0.8	0.8	250



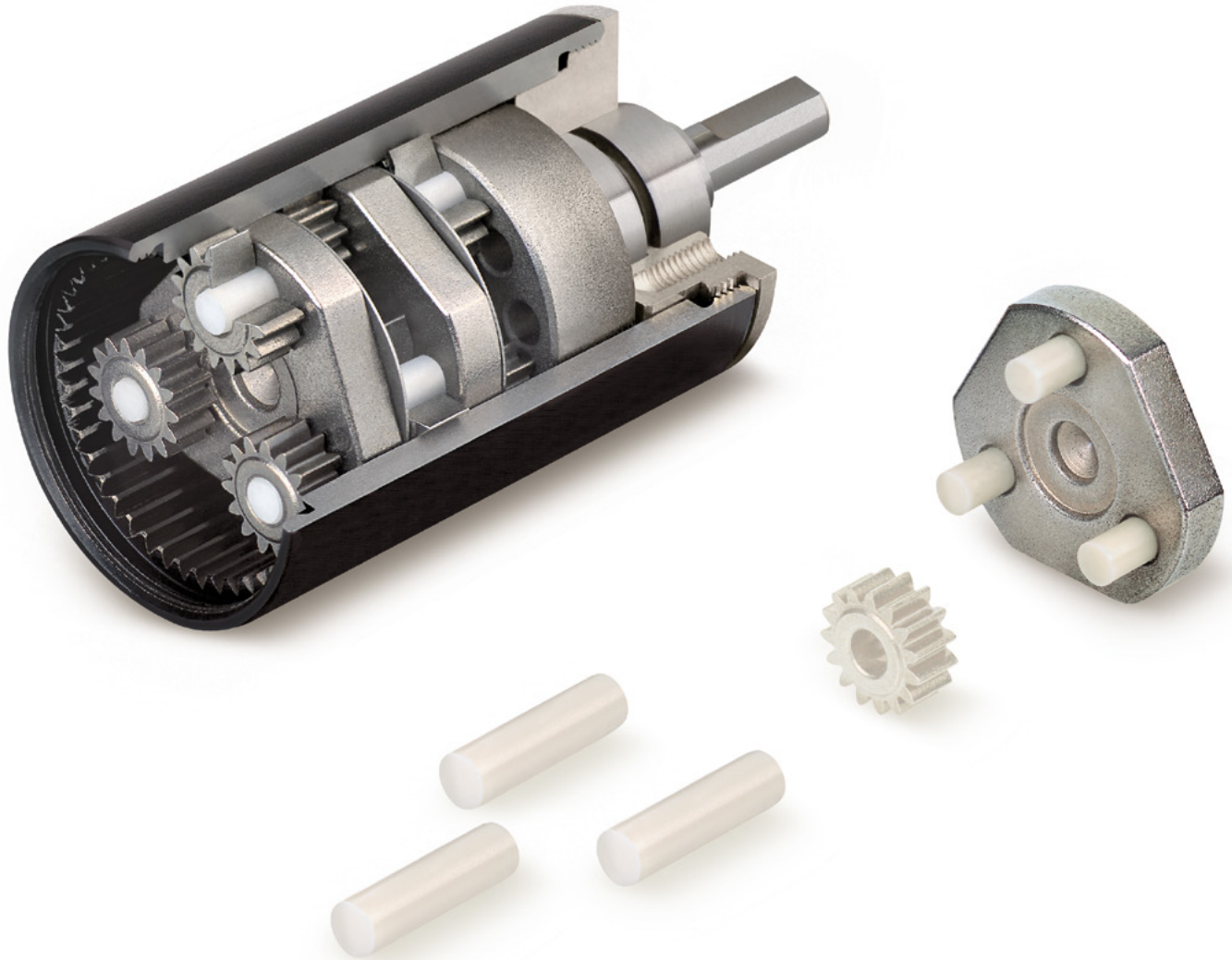
# System-specific nuts.

## The right nut for each application.

In combination with ceramic screws, nuts are available in steel, brass, bronze or plastic. For applications with very high demands to the life span, we use CVD-coated steel nuts. The nuts profit from the special maxon cgs surface of the screws, this results in significantly longer life spans than those offered by metal screws. For backlash-free applications, we offer preloaded nuts. For applications with strong magnetic or electric fields, plastic nuts are preferred. In applications involving movements with little load, the nuts may be operated without the lubricant.

## Individual solutions.

In addition to our standard program, we also offer screws and nuts tailored to your application needs. We provide screws with fine thread, special leads, as well as double-thread screws. A customer-specific integration with your bearing system is also possible. Please contact us if you are interested in learning more.



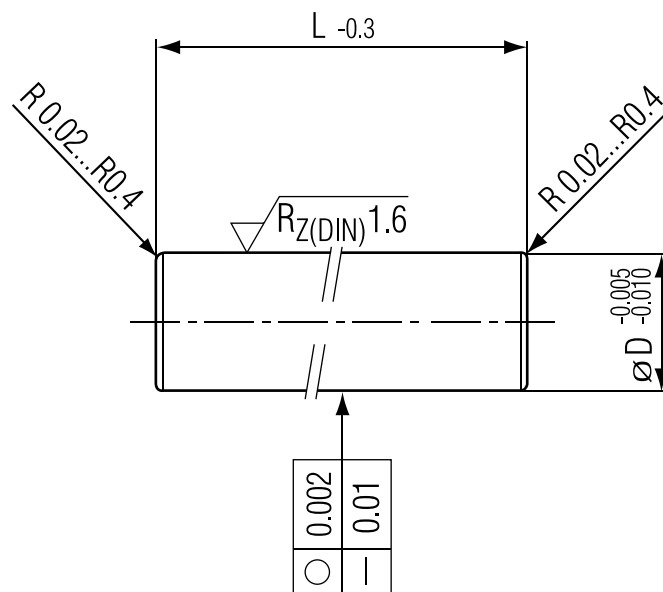
## How can the life span of planetary gearheads be increased?

Planetary gearheads have existed for centuries; their simple structure makes it possible to transmit high torque in small spaces. To increase the life span, maxon motor increased the precision of the components and set new benchmarks for efficiency and life span by using a new material.

The use of ceramic axles in our gearheads led to a separate program for ceramic rods. Ceramic axles may be used in:

- Linear guides
- Positioning pins
- Joints
- Rollers





# maxon standard axles.

## Resilient and long-lasting.

Ceramic is an excellent material for small dynamic systems. When the miniaturization of rolling bearings has reached its limits and milling of complex geometries gets difficult, ceramic as material offers decisive benefits. With its excellent sliding characteristics, the high wear resistance and the ability to shape components by means of injection molding, ceramic outperforms conventional solutions.

Ø D	L = 2.4	L = 6.4	L = 7.4	L = 10.6	L = 13.8	L = 15	L = 35	L = 40	L = 60	L = 70	L = 120
0.8	255899	255900	255901	255902	255903	255904	255905 <sup>4)</sup>	348501 <sup>4)</sup>	348502 <sup>5)</sup>	348503 <sup>6)</sup>	
1.0	255891	255892	255893	255894	255895	255896	255898 <sup>4)</sup>	348498 <sup>4)</sup>	348499 <sup>5)</sup>	348500 <sup>6)</sup>	
1.5	255883	255884	255885	255886	255887	255888	255889 <sup>4)</sup>	255890 <sup>4)</sup>	255792 <sup>5)</sup>	255793 <sup>6)</sup>	
2.0	255872	255873	348693	255875	255876	255877	255879	255880	255881	255882	
2.5	255864	143825 <sup>3)7)</sup>	255866	255867	255868	255869	255870	255871	346621	348288	
3.0	255856	255857	255858	255859	255860	255861	255862	255863	346619	346620	
4.0	255845	255846	166875 <sup>1)3)7)</sup>	137962 <sup>1)3)7)</sup>	255849	255850	255851	255853	255854	255791	255787 <sup>5)</sup>
5.0	255833	255834	255835	255836	255837	255838	255839	255840	255841	255842	255843 <sup>5)</sup>
5.5	255818	255819	255820	255786	205063 <sup>2)3)7)</sup>	255825	255826	255827	255828	255830	255831 <sup>5)</sup>
6.0	255806	255807	255808	255809	255810	255811	255812	255813	255814	255815	255816 <sup>5)</sup>
8.0	255794	255795	255796	255797	255798	255799	255800	255801	255802	255803	255804 <sup>5)</sup>

<sup>1)</sup> Diameter tolerance deviation: -0.008/-0.013

<sup>2)</sup> Diameter tolerance deviation: -0.013/-0.018

<sup>3)</sup> Rounded edges R 0.3 ± 0.1

<sup>4)</sup> Straightness tolerance deviation: 0.02 mm

<sup>5)</sup> Straightness tolerance deviation: 0.03 mm

<sup>6)</sup> Straightness tolerance deviation: 0.04 mm

<sup>7)</sup> Roundness tolerance deviation: 0.003 mm



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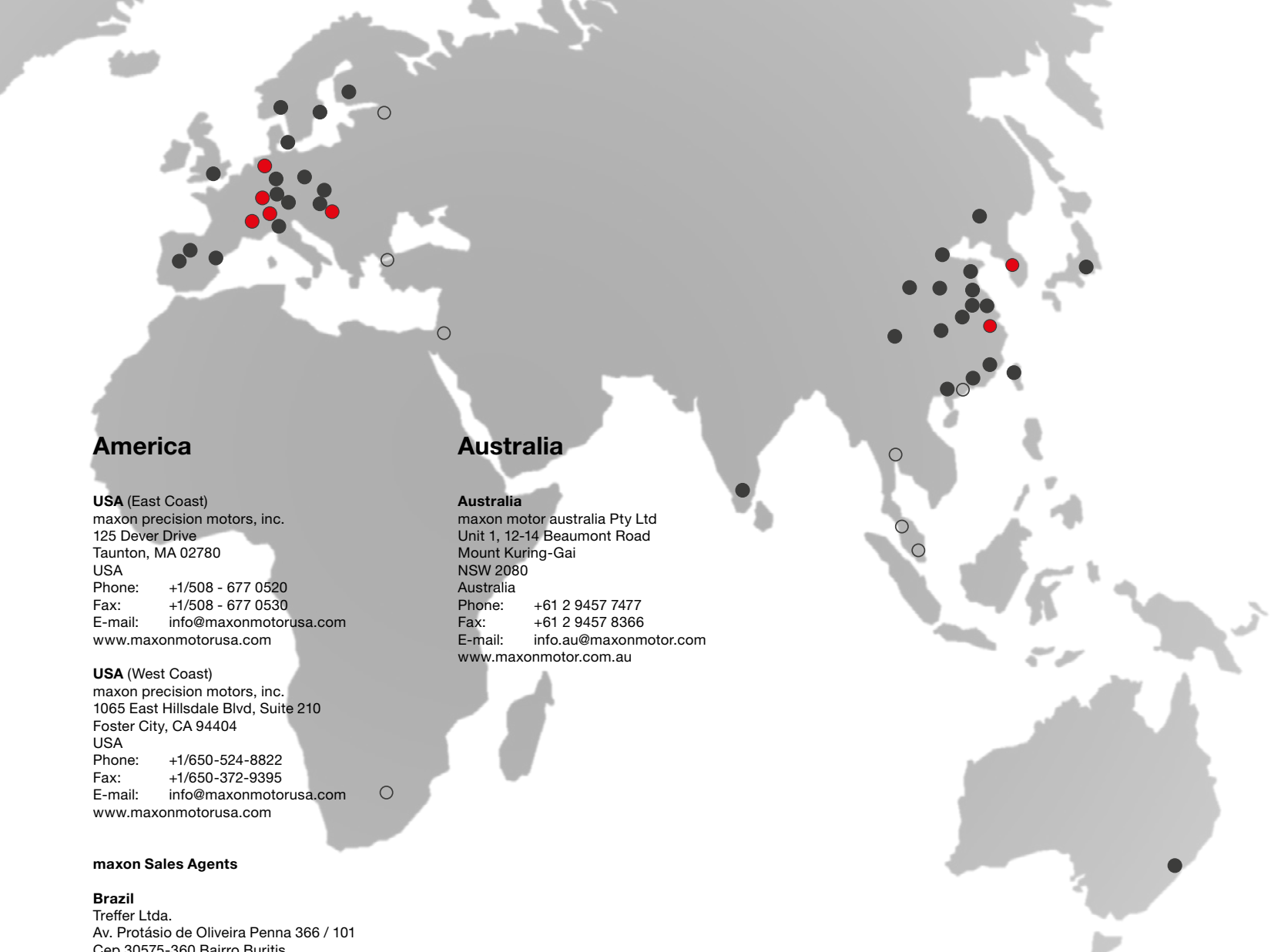
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