

HIGH PRECISION DRIVES AND SYSTEMS.

2018/2019

maxon motor

driven by precision

Selection Guide

DC Motor

EC Motor
(BLDC Motor)

Gearhead

**Screw
drive**

Sensor

**Motor
control**

**Compact
Drive**

Accessories

Ceramic

**Contact
information**

View the entire range of products online.

shop.maxonmotor.com



maxon selection guide

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

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

4–25_Welcome to maxon motor

27–36_maxon selection guide

34_Accessories overview

38–58_Technology – short and to the point

59–61_Standard Specification

63–162_maxon DC motor

Brushed DC motors with ironless winding.

163–279_maxon EC motor (BLDC)

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

281–362_maxon gear

Precision planetary and spur gearheads.

363–382_maxon screw drive

Compact screw drives with steel or ceramic screws.

383–439_maxon sensor

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

441–471_maxon motor control

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

473–476_maxon compact drive

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

477–485_maxon accessories

Brakes, end caps and connection cable.

491–501_maxon ceramic

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

503–506_Contact

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



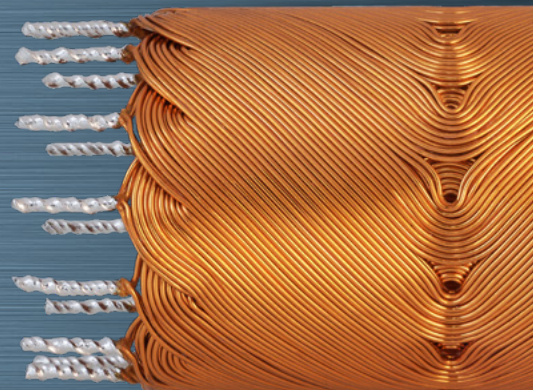
Founded in Switzerland. Available worldwide.

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.

Dear Customers:

Our motors only truly come into their own when they are installed in a system. This is why maxon also develops and produces gearheads, sensors, and controllers. Cross-platform system solutions from a single source: These will remain our focus in the future. For this reason, we joined forces with zub machine control AG in 2017, an extremely competent and experienced Swiss vendor of master controllers.

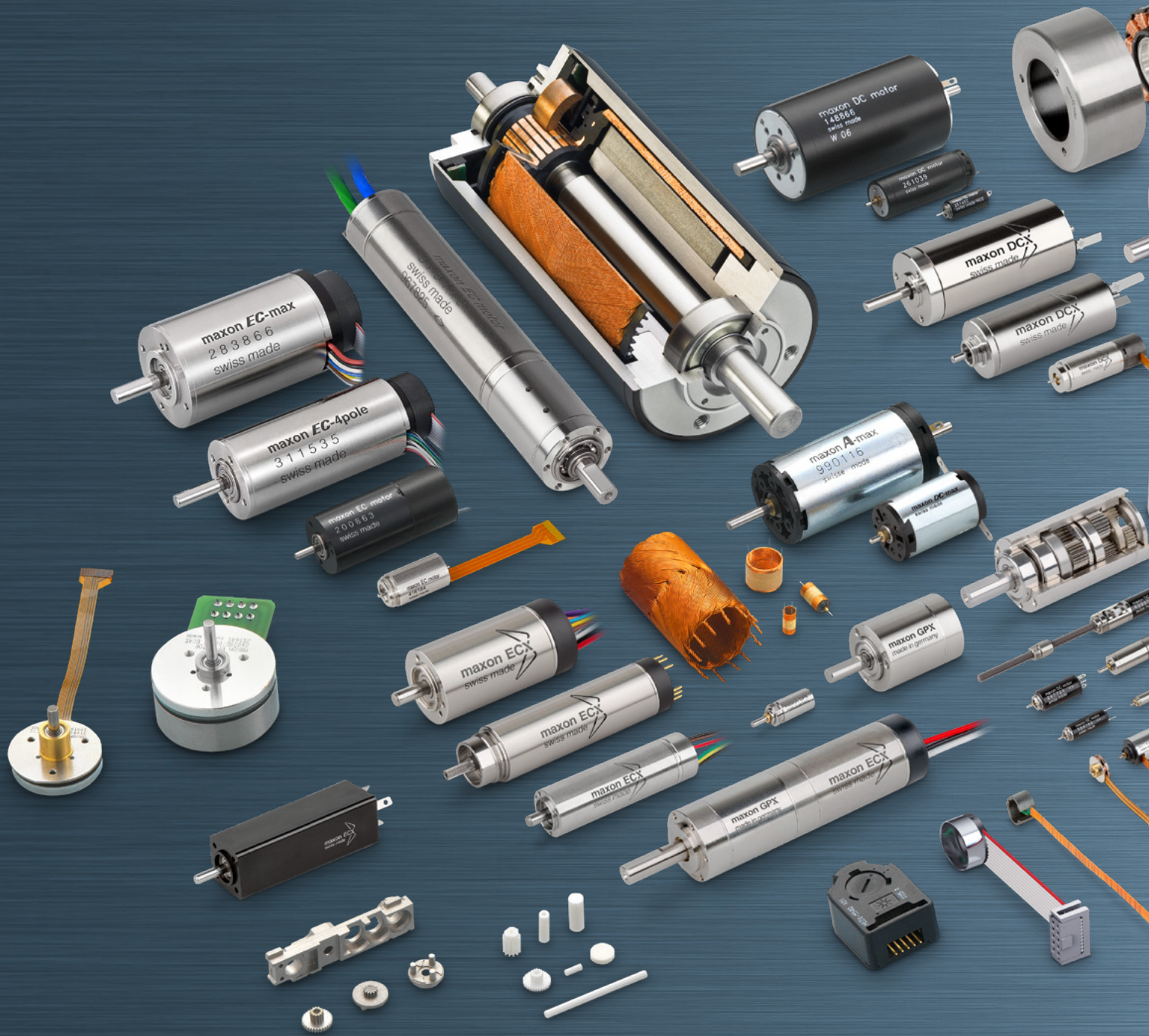
Perfectly matched components are in demand in many industries, in particular robotics. In this catalog, you will also find new motors which accommodate the requirements of this growing industry. The brushless DC motor EC-i 30 is not only compact and powerful, but also affordable and available with a short lead time – ideal for the development of prototypes. We have also expanded our ECX Speed series. These DC motors with the proven ironless maxon winding can be configured online.

Our new frameless motors have already found many admirers. The separate delivery of stator and rotor allows customers to integrate these powerhouses into their system in any way they like. By the way, the 260-W version of the EC frameless 90 flat is our first mass-produced motor with an output torque of over 1 Nm. In a nutshell: It is powerful, precise, and reliable – exactly the characteristics that have made maxon motor stand out for years.

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

Eugen Elmiger
CEO





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 and
position controllers.

Ceramic components

Custom ceramic components and standard compo-
nents such as ceramic axles, 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.

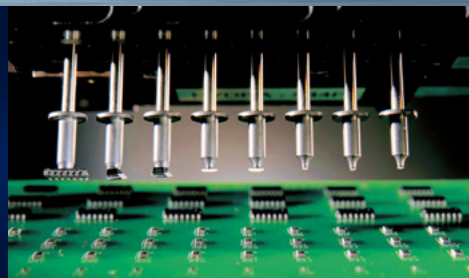
Precision drives from maxon motor are in operation in a wide number of industries. The most famous example comes from astronautics: NASA's Mars rovers prove that maxon drives can perform their work with absolute reliability, even under the harshest conditions. It then should come as no surprise that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

The best maxon drives at a glance.

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

Unrivaled 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 120 000 rpm, smooth-running, almost no heat development.

Efficient

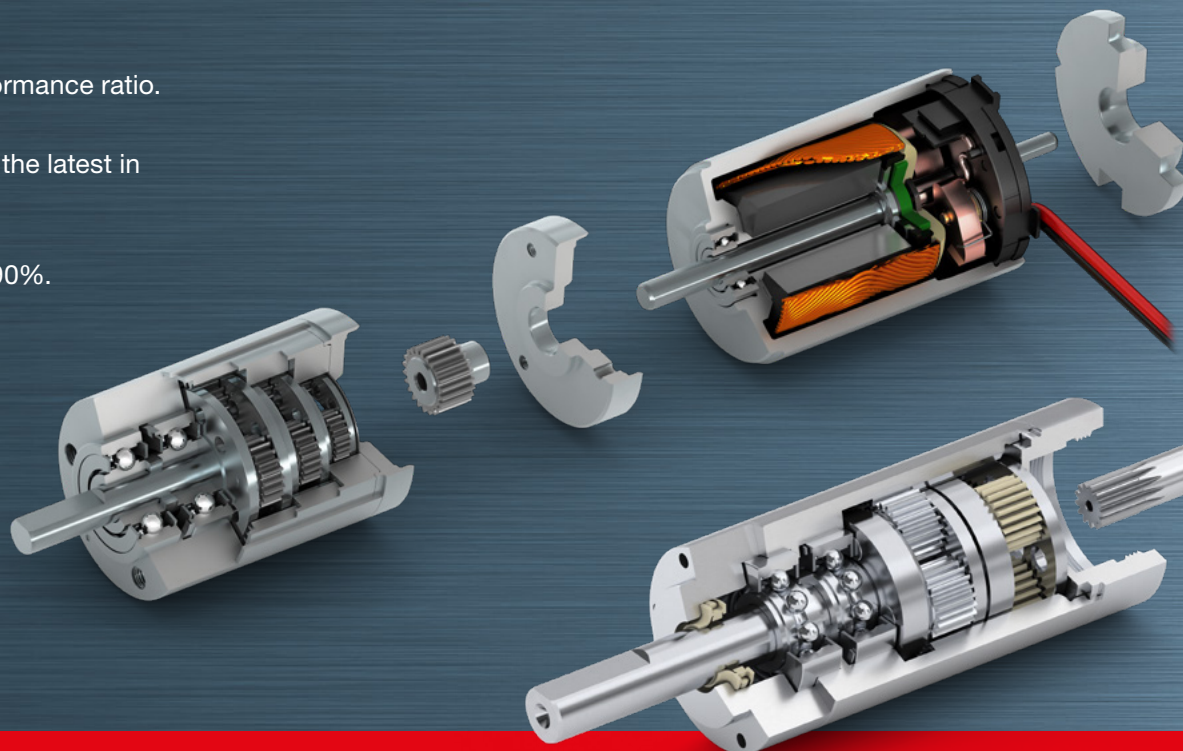
Efficiency of more than 90%.

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 90%.

Sterilizable

Sterilizable for up to 2000 cycles.

Encoder

maxon ENX

Compact

Metal housing with a length of only 8.5 mm.

Robust

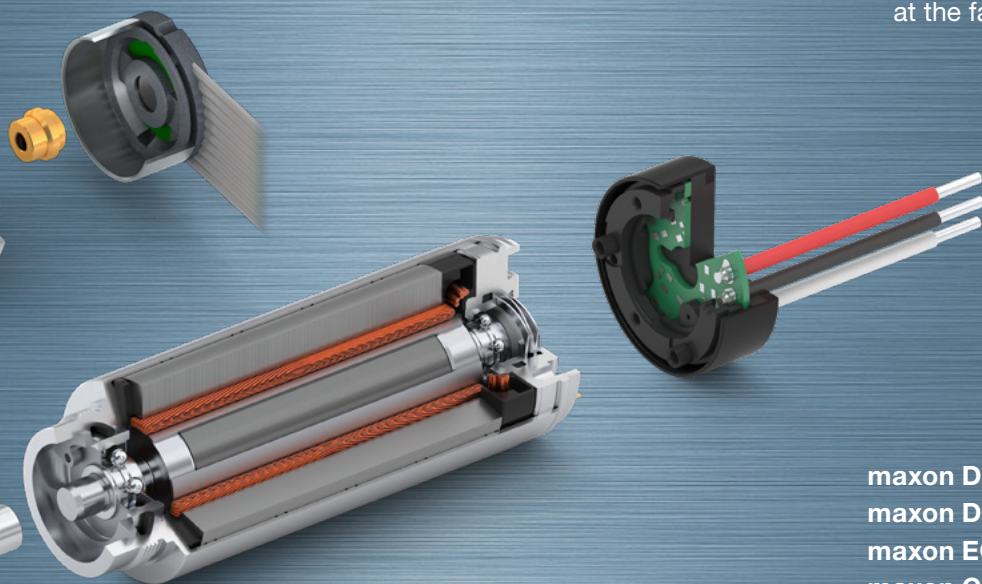
Mechanically robust housing and interference-free operation.

Differential signals

3-channel encoder with differential output signals.

Flexible

Counts per turn can be custom programmed at the factory – 1 to 1024 cpt.



maxon DCX motor	66–87
maxon DC-max motor	90–95
maxon ECX SPEED motor	166–200
maxon GPX gear	284–314
maxon ENX encoder	386–399

xdrives.maxonmotor.com

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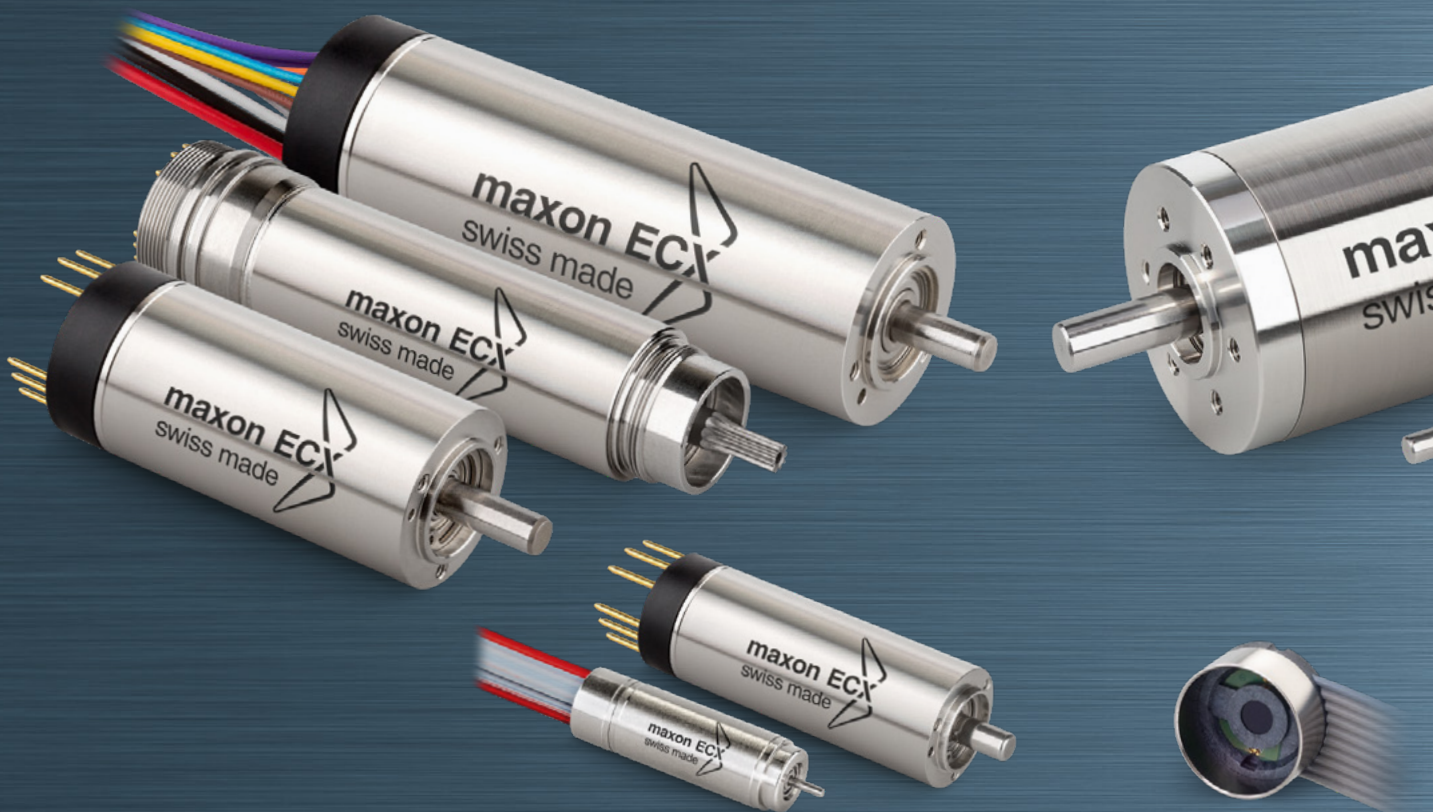
maxon X drives

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



11 READY IN DAYS



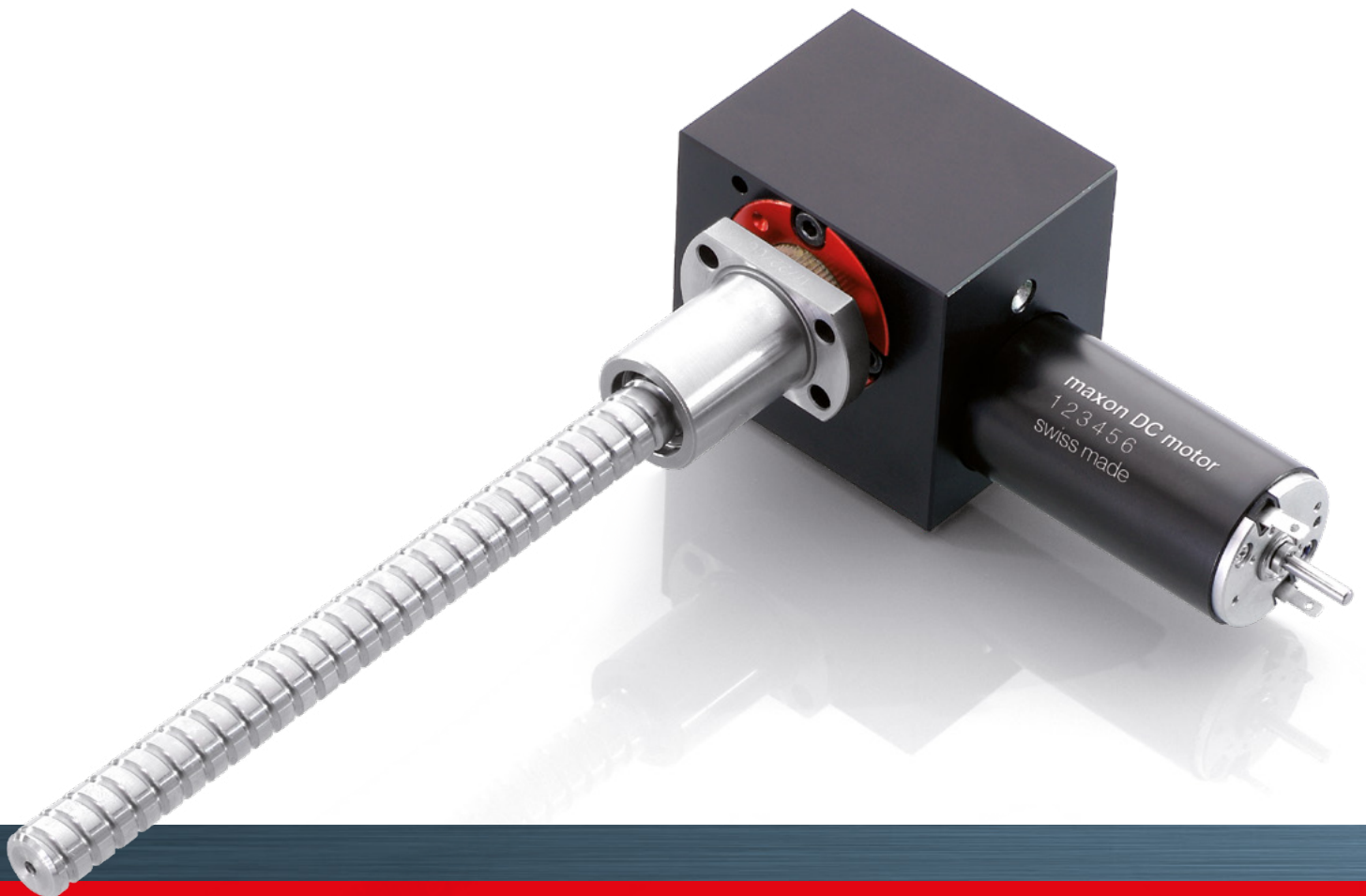
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We will find the right solution.

Customized drive systems

Our engineers are specialists and know what counts in fields like aerospace, robotics, or the medical industry. Together with our customers, we develop the perfect drive solution for each application. We modify standard products, design customized attachments, or develop complete mechatronical drive systems. Our know-how and our sales and service network are available for you worldwide. Please contact us to discuss your specific application.





Small

Ceramic carriage for precise linear movements – precise to a few μm . All-in-one unit with brushless DC motor, planetary gearhead and inductive encoder. Dimensions: 44 x 12 x 12 mm.



Worm gear

Multi-stage gearhead with output shaft in worm design. Lightweight, reliable and cost-optimized unit with $\varnothing 15$ mm motor.



Compact

The increasing miniaturization requires the highest level of functionality in the smallest of spaces. Parts manufactured with MIM technology can be mass-produced economically. Gearhead $\varnothing 10$ mm.



Linear drive

A compact reversing gear with threaded screw mounted free of axial play transmits the movement to the desired location.



Precise

Only high-precision drive solutions can provide the micro-mechanical movements of today's machines. This is a must for diverse areas of application. Motor $\varnothing 13$ mm.



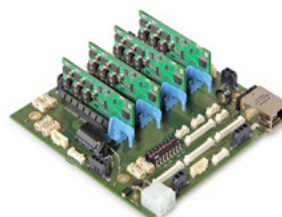
Hollow shaft

Gearheads and motors with hollow shafts allow two speeds at the same location, or can let through different media, such as air, vacuum or light.



Free of backlash

The backlash-free unit of motor and worm gear withstands the highest cyclic demands. Increased service life due to maintenance-free drive solution. Available width: 25 mm.



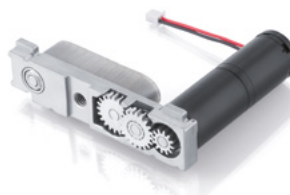
Multi-axis system

Several axes have to be adjusted synchronously within a very small space. Modular controllers adapt to the environment. Motherboard, multi-axis system: 110 x 110 mm.



Efficient

Electrical hand tools in the fields of medical and dental technology require minimal heat development and low noise. These requirements put high demands on the drive solutions. Efficiency >90 %.



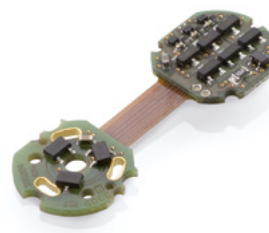
Torque density

Sophisticated combinations of motors and mechanical mounting equipment using MIM technology ensure high reliability and top torque density for safety engineering applications.



Robust

The motors are operated at an ambient temperature of -66 °C to $+85$ °C. The drive system has been designed to withstand high vibrations and impacts.



Integrated controller

In addition to fitting into very small spaces and meeting high safety requirements, this folding printed circuit board also withstands high temperatures. For $\varnothing 22$ mm motor.

Modify!

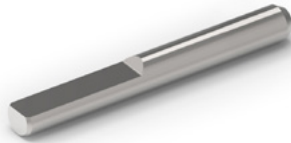
The online configurator

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

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



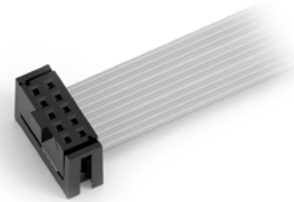
Bearings

- Ball bearing
- Sleeve bearing
- Lubrication



Electrical connection

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



Flange

- Centering collar
- Bolt circle
- Thread



Output component

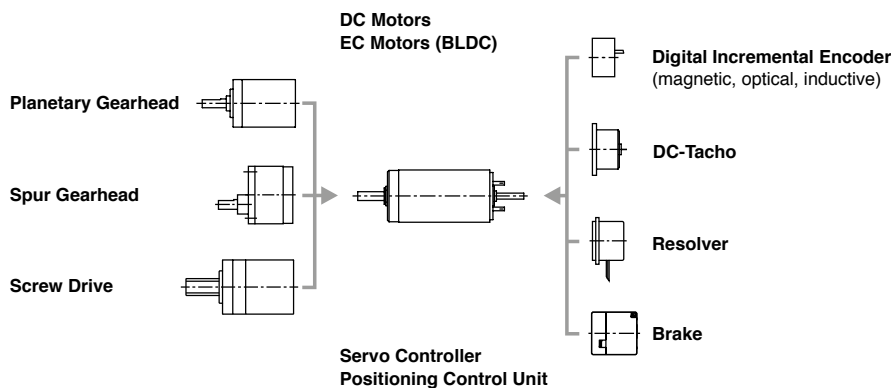
- Pinion
- Pulley



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



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 9001:2008

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 9100:2009 (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 13485:2003

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 14001:2004

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.

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

2002/96/EU WEEE

2008/98/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.



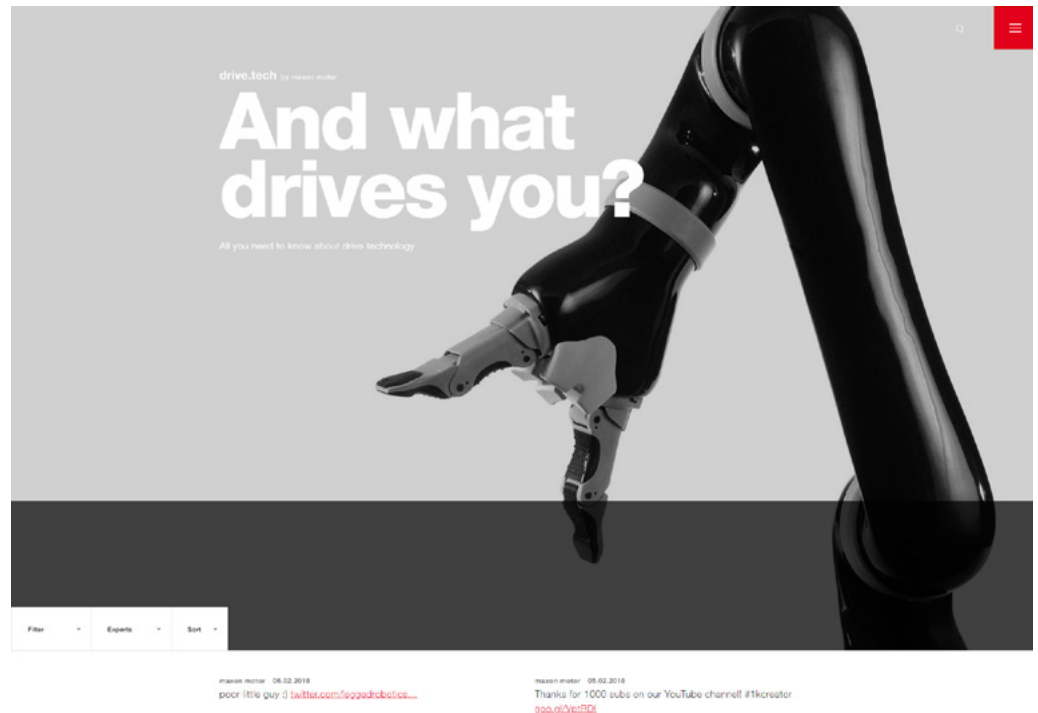
maxon online shop

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



driven magazine: Read and experience.

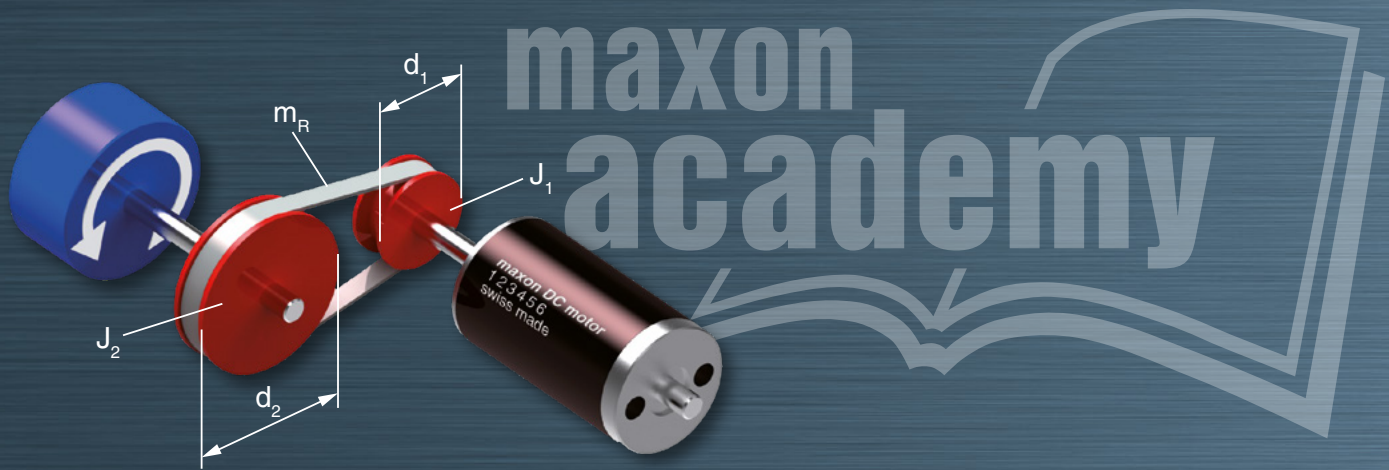
In driven, the maxon motor magazine, we present exciting applications, expert interviews, and tips and tricks from the field of drive technology. High-quality, entertaining and informativ. driven is published twice per year and comes both in a print version and as an app for downloading. Happy reading!

magazine.maxonmotor.com

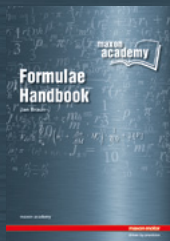


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$$M_{in,\alpha} = \left(J_{in} + J_1 + \frac{J_2}{\eta} \cdot \frac{d_1^2}{d_2^2} + \frac{J_X}{\eta} \cdot \frac{d_1^2}{d_X^2} + \frac{m_L + m_B}{\eta} \cdot \frac{d_1^2}{4} \right) \cdot \frac{\pi}{30} \cdot \frac{\Delta n_{in}}{\Delta t_a}$$



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

168	ECX SPEED 13 M Ø13 mm, brushless, 12 Watt		NEW
169	ECX SPEED 13 M Ø13 mm, brushless, 25 Watt	High Power	NEW
172	ECX SPEED 13 L Ø13 mm, brushless, 25 Watt		NEW
173	ECX SPEED 13 L Ø13 mm, brushless, 50 Watt	High Power	NEW
180	ECX SQUARE 16 L Ø16 mm, brushless, 20 Watt	sensorless	NEW
185	ECX SPEED 19 M Ø19 mm, brushless, 30 Watt		NEW
186	ECX SPEED 19 M Ø19 mm, brushless, 60 Watt	High Power	NEW
189	ECX SPEED 19 L Ø19 mm, brushless, 60 Watt		NEW
190	ECX SPEED 19 L Ø19 mm, brushless, 120 Watt	High Power	NEW
241	EC-i 30 Ø30 mm, brushless, 20 Watt IE		NEW
242	EC-i 30 Ø30 mm, brushless, 30 Watt		NEW
243	EC-i 30 Ø30 mm, brushless, 45 Watt	High Torque	NEW
244	EC-i 30 Ø30 mm, brushless, 50 Watt		NEW
245	EC-i 30 Ø30 mm, brushless, 75 Watt	High Torque	NEW
271	EC 90 flat, Ø90 mm, brushless, 160 Watt		NEW
272	EC 90 flat, Ø90 mm, brushless, 260 Watt		NEW
274	EC frameless 45 flat, Ø43.4 mm, brushless, 30 Watt		NEW
275	EC frameless 45 flat, Ø43.4 mm, brushless, 50 Watt		NEW
276	EC frameless 45 flat, Ø43.4 mm, brushless, 70 Watt		NEW
277	EC frameless 60 flat, Ø60 mm, brushless, 100 Watt		NEW
278	EC frameless 90 flat, Ø90 mm, brushless, 160 Watt		NEW
279	EC frameless 90 flat, Ø90 mm, brushless, 260 Watt		NEW
395	ENX 19 EASY INT Ø19 mm, encoder, incremental 1024 cpt/absolute 4096 steps		NEW
396	ENX 22 EASY INT Ø22 mm, encoder, incremental 1024 cpt/absolute 4096 steps		NEW
446	ESCON Module 50/8, servo controllers up to 400/750 Watt		NEW
446	ESCON Module 50/8 HE, servo controllers up to 400/750 Watt		NEW
453	EPOS4 50/5, positioning controller up to 250/750 Watt		NEW
455	EPOS4 Compact 50/8 EtherCAT, positioning controller up to 400/1500 Watt		NEW
456	EPOS4 Compact 50/15 EtherCAT, positioning controller up to 750/1500 Watt		NEW
456	EPOS4 70/15, positioning controller up to 1050/2100 Watt		NEW
486	ECX 13 End caps	sterilizable	NEW
487	ECX 16 End caps	sterilizable	NEW
488	ECX 19 End caps	sterilizable	NEW
489	ECX 22 End caps	sterilizable	NEW



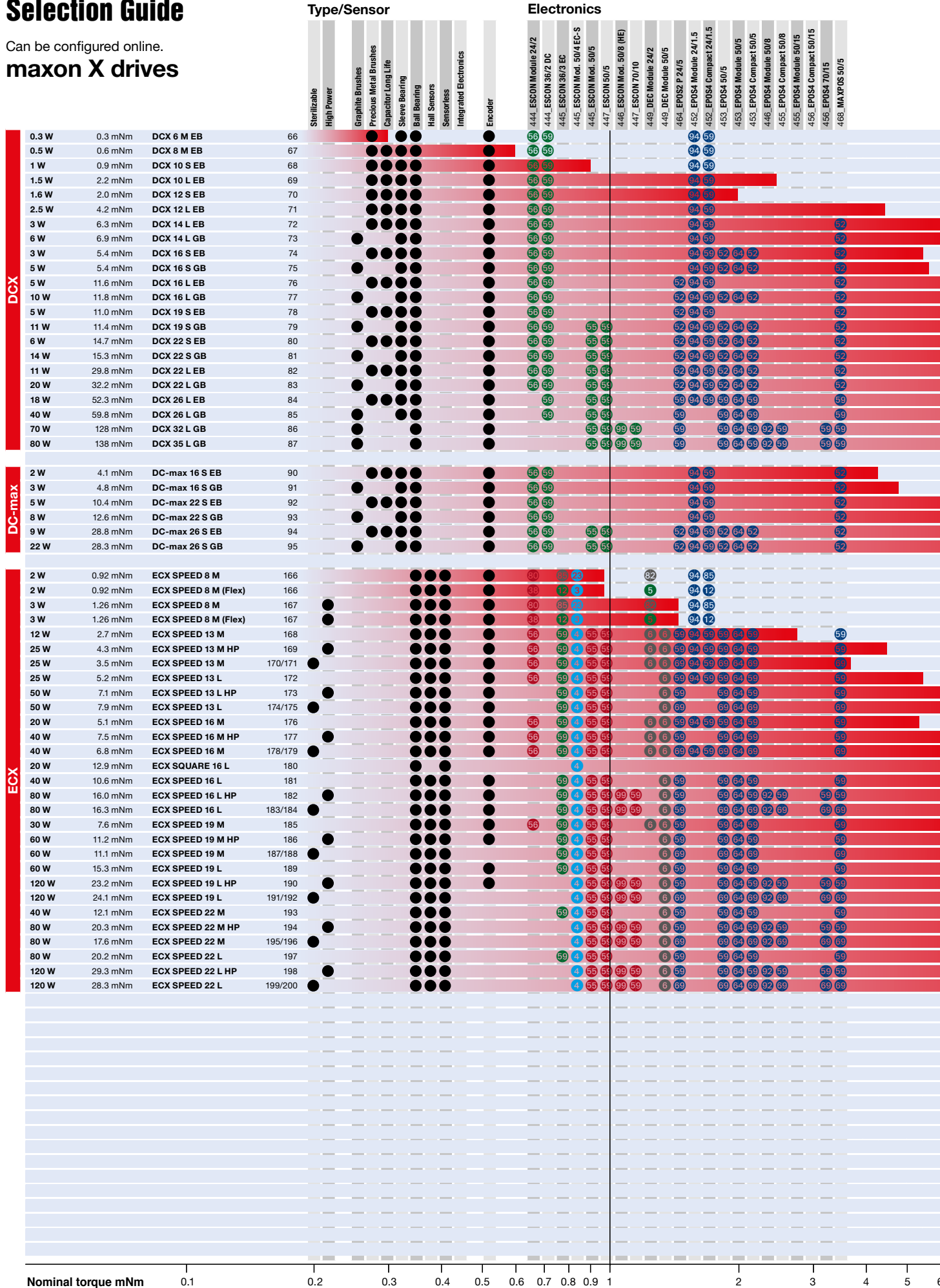
maxon selection guide

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!

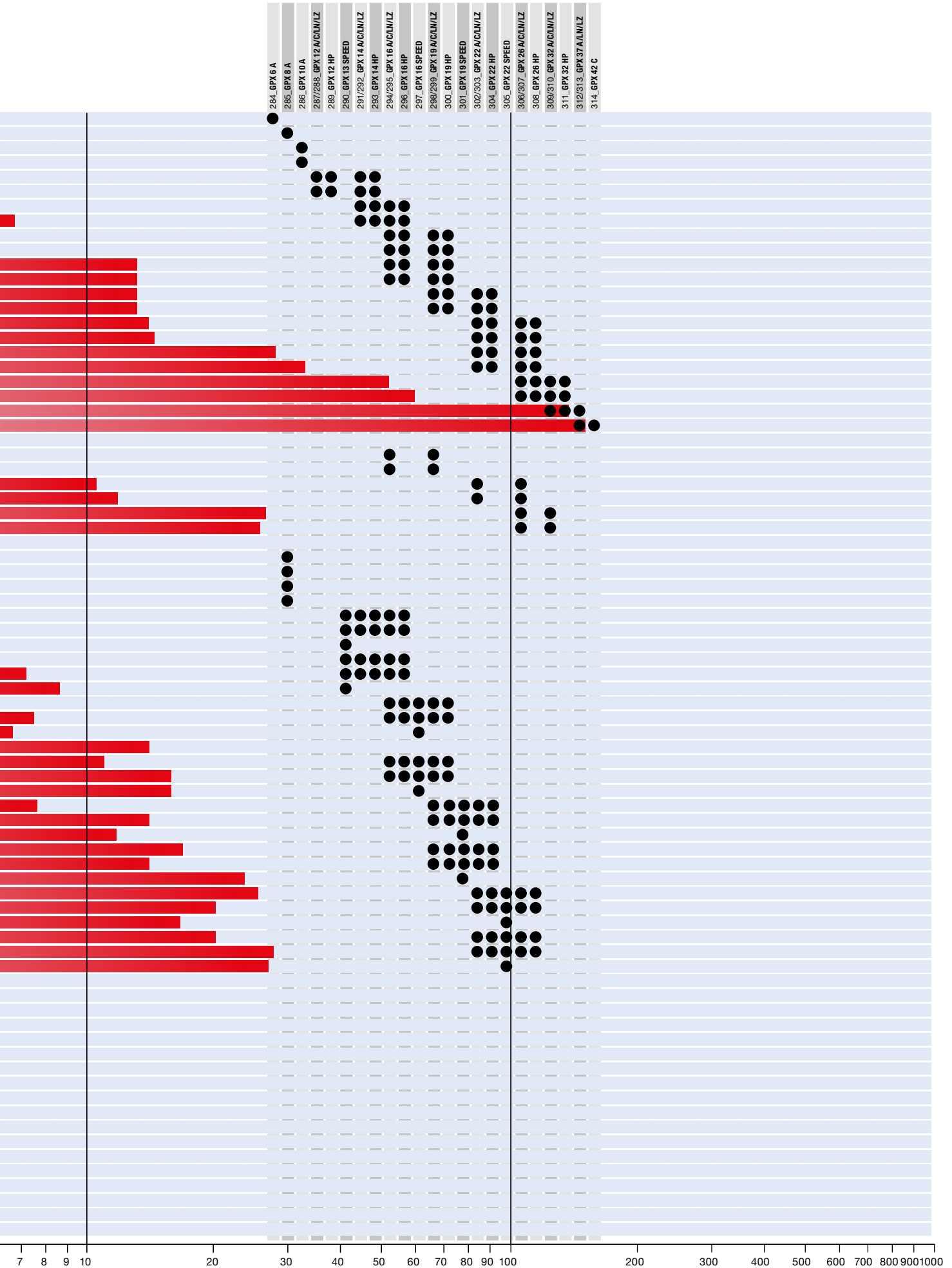
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Selection Guide

Can be configured online.
maxon X drives



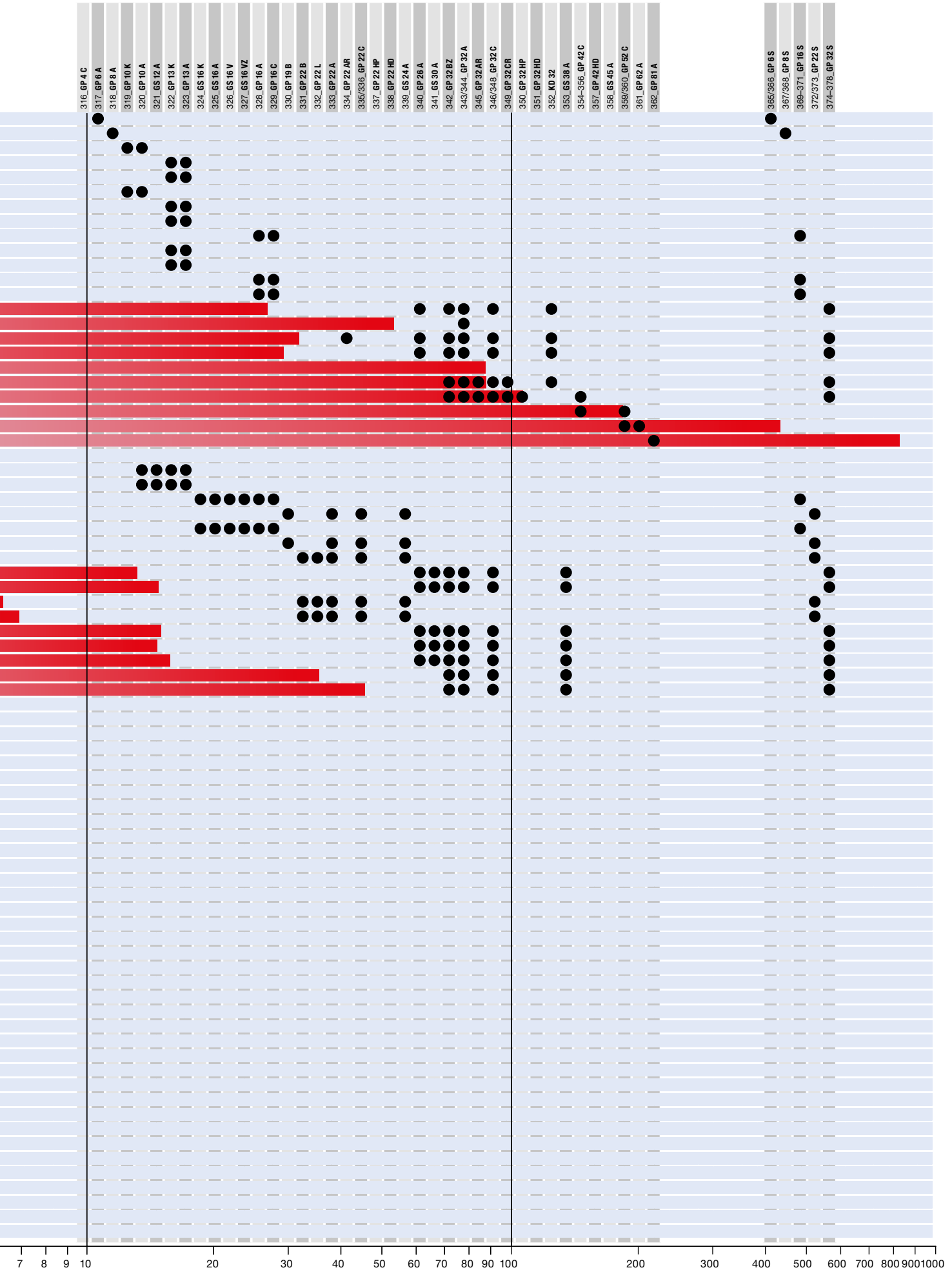
Gears



● For motors with / without sensors

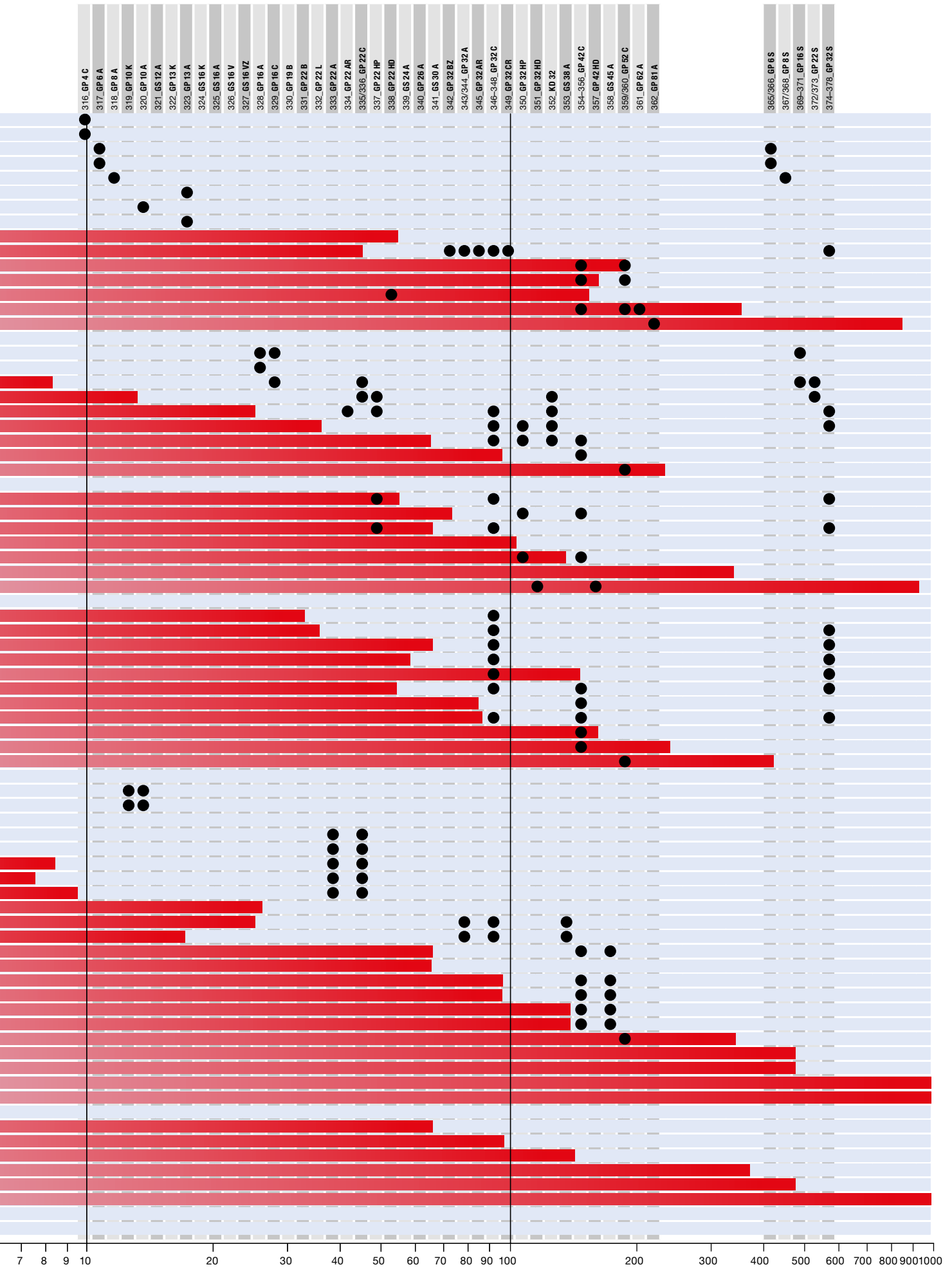
Gears

Screw Drives



Gears

Screw Drives



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 28–35.

1	Can be connected directly. No accessories required.	55	ESCON Module Motherboard 438779 required. Can be connected directly with suitable configuration.
2	Can be connected directly. Plug must be removed.	56	ESCON Module 24/2 Motherboard 486400 required. Can be connected directly with suitable configuration.
3	ESCON Module Motherboard Sensorless 450237 and adapter 220310 required.	57	ESCON Module 24/2 Motherboard 486400 and adapter 223774 required. Connector needs to be removed.
4	ESCON Module Motherboard Sensorless 450237 required. Can be connected directly with suitable configuration.	58	Evaluation board 361435 and adapter 354046 required.
5	Evaluation board 370652 required.	59	Can be connected directly with suitable configuration.
6	Evaluation board 370652 required. Can be connected directly with suitable configuration.	60	Adapter 223774 required.
7	ESCON Module Motherboard Sensorless 450237 required. Plug must be removed.	61	Adapter 223774 and extension cable 3409.506 (6 poles plug must be removed) required.
8	Evaluation board 370652 and extension cable 339380 required.	62	Evaluation board 361435 required. Can be connected directly. Attach jumpers to printed circuit board.
9	Adapter 220300 required.	63	ESCON Module Motherboard 438779 and adapter 459875 required.
10	Extension cable 339380 required.	64	Intended for use with customer-specific Motherboard. Combination with EPOS4 CB 50/5 CAN (534133) yields EPOS4 Compact 50/5 CAN (541718).
11	Adapter 418721 required.	65	Can be connected directly. Attach solder bridges (jumpers) to printed circuit board.
12	Adapter 418723 required.	66	Adapter 223774 required. Plug must be removed.
13	ESCON Module Motherboard Sensorless 450237 and extension cable 339380 required.	67	Extension cable 403964 required.
14	ESCON Module 50/8 Motherboard 586048 required. Connectors at the motor need to be removed.	68	Adapter 425931 and extension cable 354046 required. Connector needs to be removed.
15	Adapter 220300, extension cable 275878 and extension cable 275851 required.	69	Cable 275851 and cable 275878 required.
16	Extension cable 354045 required.	70	Extension cable 354046 required.
17	Plug set 384915 required. Plug must be removed.	71	Adapter 405120 required.
18	Plug set 384915 required.	72	Evaluation board 361435 and adapter 405120 required.
19	Evaluation board 370652 required. Connectors at the motor need to be removed.	73	Evaluation board 361435 required.
20	ESCON Module 50/8 Motherboard 586048 required.	74	Extension cable 302948 required.
21	ESCON Module 50/8 Motherboard 586048 and extension cable 339380 required.	75	ESCON Module Motherboard 438779 and extension cable 354046 required.
22	Adapter 262359 and cable 354046 required. Connector needs to be removed.	76	ESCON Module Motherboard 438779 and adapter 223774 required. Plug must be removed.
23	ESCON Module Motherboard Sensorless 450237 and adapter 498157 required.	77	Adapter 498157 and cable 403962 required.
24	ESCON Module 24/2 Motherboard 486400 required.	78	Evaluation board 361435, adapter 425931, and extension cable 354046 required. Connector needs to be removed.
25	Evaluation board 370652 and adapter 425931 required.	79	ESCON Module Motherboard 438779, adapter 223774, and extension cable 3409.506 (6-pin plug must be removed) are required.
26	Adapter 418719 required.	80	ESCON Module 24/2 Motherboard 486400 and adapter 498157 required.
27	Adapter 425931 and cable 354046 (remove connector on one end) required. Install solder bridge (jumper) on circuit board.	81	Evaluation Board 361435 and adapter 498157 required.
28	ESCON Module Motherboard 438779 and adapter 220300 required.	82	DEC Module Evaluation board 370652 and adapter 498157 required.
29	Adapter 459875 required.	83	Adapter 488167 and cable 300586 required.
30	ESCON Module Motherboard 438779 required. Plug must be removed.	84	Adapter 488167 and cable 451290 required.
31	ESCON Module Motherboard 438779 and extension cable 339380 required.	85	Adapter 498157 required.
32	Extension cable 442086 required.	86	Adapter 498157 and cable 302948 required.
33	Plug set 451746 required. Plug must be removed.	87	Evaluation board 361435, Adapter 498157 and extension cable 275851 and cable 275878 required.
34	Plug set 451746 required.	88	ESCON Module Motherboard 438779 required.
35	Adapter 262359, cable 354046 and extension cable 3409.506 (6-pin connector needs to be removed) required.	89	Plug set 520859 required. Plug must be removed.
36	ESCON Module Motherboard 586048, adapter 223774, and extension cable 3409.506 (6-pin connector needs to be removed) required.	90	Plug set 520859 required.
37	ESCON Module Motherboard 586048 and adapter 223774 required. Connector needs to be removed.	91	Adapter 488167 and cable 520852 required.
38	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 425931 required.	92	Intended for use with customer-specific Motherboard. Combination with EPOS4 CB Power CAN (520884) yields EPOS4 Compact 50/8 CAN (520885).
39	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 220300 required.	93	Intended for use with customer-specific Motherboard. Combination with EPOS4 CB Power CAN (520884) yields EPOS4 Compact 50/15 CAN (520886).
40	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 405120 required.	94	Intended for use with customer-specific Motherboard. Combination with EPOS4 CB 24/1.5 CAN (536997) yields EPOS4 Compact 24/1.5 CAN (546714).
41	ESCON Module 24/2 Motherboard 486400 required; connector needs to be removed.	95	Adapter 488167 and cable 378173 required.
42	ESCON Module 50/8 Motherboard 586048 and extension cable 354046 required.	96	Adapter 425931, cable 403962 and cable 354046 (Plug must be removed from one side) required.
43	ESCON Module 24/2 Motherboard 486400 and extension cable 339380 required.	97	Adapter 549609 required.
44	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 459875 required.	98	ESCON Module Motherboard 438779 and Adapter 549609 required.
45	Can be connected directly. Attach solder bridge (Jumper) to printed circuit board.	99	ESCON Module 50/8 Motherboard 586048 required. Can be connected directly with suitable configuration.
46	Can be connected directly. Connect via encoder connection.		
47	Adapter 327086 required.		
48	Extension cable 303490 required.		
49	Evaluation board 361435 and adapter 327086 required. Connect via encoder connection.		
50	Evaluation board 361435 required. Connect via encoder connection.		
51	Evaluation board 361435 and extension cable 275851 required.		
52	Extension cable 275851 required.		
53	Adapter 327086 required. Attach solder bridge (Jumper) to printed circuit board.		
54	Extension cable 403962 required, for motors with terminals.		

Selection Guide

Encoder, DC tachometer, resolver.
maxon sensor

Recommended Electronics

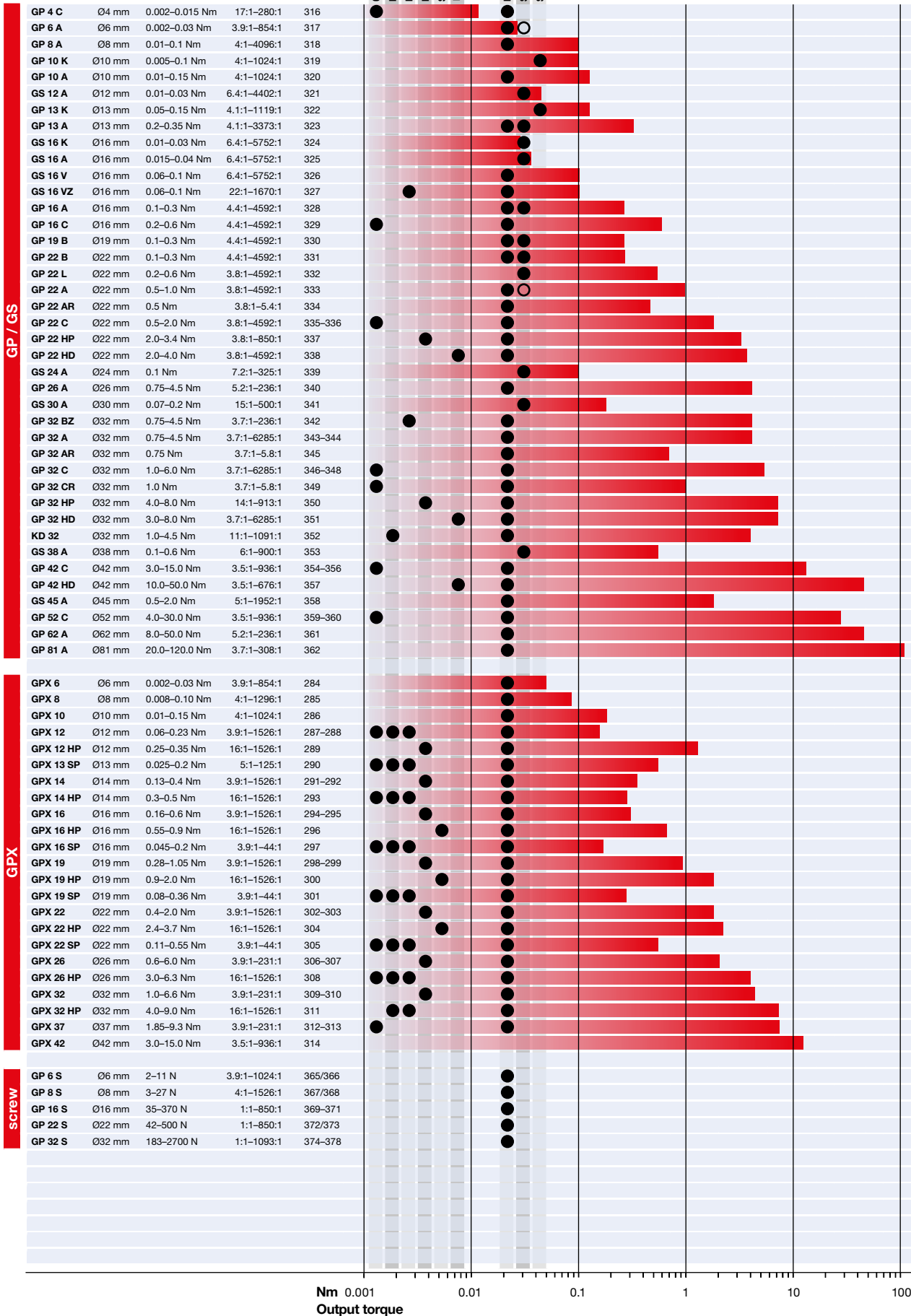
				Sterilizable	444_ESCON Module 24/2	444_ESCON36/2 DC	445_ESCON 36/3 EC	445_ESCON Mod. 50/4 EC-S	445_ESCON Mod. 50/5	447_ESCON 50/5	446_ESCON Mod. 50/5 (HE)	447_ESCON 70/10	449_DEC Module 24/2	449_DEC Module 50/5	464_EPOS2 P 24/5	452_EPOS4 Module 24/1.5	452_EPOS4 Compact 24/1.5	453_EPOS4 50/5	453_EPOS4 Compact 50/5	446_EPOS4 Module 50/8	455_EPOS4 Compact 50/8	455_EPOS4 Module 50/15	456_EPOS4 Compact 50/15	456_EPOS4 70/15	468_MA XPOS 50/5		
ENX	ENX 6/8 MAG	64–256 CPT, 3 channel	386		30	85										94	85										
	ENX 8 EASY INT	1–1024 CPT, 3 channel	388		30											94	85										
	ENX 8 EASY INT Absolute	4096 steps, Single Turn	389													94	91										
	ENX 10 EASY/QUAD	1–1024 CPT, 2/3 channel	390		40	1		98	97		97				97	94	97	97	64	97	92	97				97	
	ENX 13 EASY INT	1–1024 CPT, 3 channel	391		24			88	1						1	94	1	1	64	1						1	
	ENX 13 EASY INT Absolute	4096 steps, Single Turn	391													94	90	90	64	90							
	ENX 16 EASY	1–1024 CPT, 3 channel	392		24	1		88	1	20	1				1	94	1	1	64	1	92	1	93	1	1	1	1
	ENX 16 EASY Absolute	4096 steps, Single Turn	393													94	91	91	64	91	92	91	93	91	91	84	
	ENX 16 EASY INT	1–1024 CPT, 3 channel	394		24			88	1	20	1				1	94	1	1	64	1	92	1				1	
	ENX 16 EASY INT Absolute	4096 steps, Single Turn	394													94	90	90	64	90	92	90					
	ENX 19 EASY INT	1–1024 CPT, 3 channel	395		24			88	1	20	1					94	1	1	64	1	92	1					
	ENX 19 EASY INT Absolute	4096 steps, Single Turn	395													94	90	90	64	90	92	90					
	ENX 22 EASY INT	1–1024 CPT, 3 channel	396					88	1	20	1					94	1	1	64	1	92	1					
	ENX 22 EASY INT Absolute	4096 steps, Single Turn	396													94	90	90	64	90	92	90					
	ENX 6/8 OPT	128 CPT, 3 channel	397		30	85										94	85										
ENX 16 RIO	512–65536 CPT, 3 channel	399		24	1		88	1	20	1				1	94	1	1	64	1	92	1	93	1	1	1	1	
sensor	Encoder MILE	256–2048 CPT, 2 channel, LD	402					75	70						70	94	70	64	70	92	70					70	
	Encoder MILE	256–2048 CPT, 2 channel, LD, cable	402		24			88	1						1	94	1	1	64	1						1	
	Encoder MILE	512–4096 CPT, 2 channel, LD	403					88	1	20	1				1			1	64	1	92	1				1	
	Encoder MILE	512–6400 CPT, 2 channel, LD	404					75	70	42	70				70			70	64	70	92	70				70	
	Encoder MILE	512–6400 CPT, 2 channel, LD, cable	404					88	1	20	1				1			1	64	1	92	1				1	
	Encoder 6 MAG	64–256 CPT, 3 channel	405		30											94	85										
	Encoder MEnc 10	12 CPT, 2 channel	406																								
	Encoder MEnc 13	16 CPT, 2 channel	407–408		57	66		76	22																		
	Encoder 16 EASY	128–1024 CPT, 3 channel, LD	409					88	1	20	1				1			1	64	1	92	1	93	1	1	1	1
	Encoder 16 EASY Absolute SSI	4096 steps, Single Turn	411																91	64	91	92	91	93	91	91	84
	Encoder 16 EASY Absolute BISS-C	4096 steps, Single Turn	411																								84
	Encoder MR, type S	16 CPT, 2 channel	413		57	66		76	22																		
	Encoder MR, type S	64–256 CPT, 2 channel, LD	414			47													94	53							53
	Encoder MR, type S	100 CPT, 2 channel, LD	414			68													94	27							
	Encoder MR, type S	64–256 CPT, 2 channel	415		57	66		76	22										94	66							
	Encoder MR, type M	32 CPT, 2/3 channel	416		57	66		76	22										94	66	66	64	66				
	Encoder MR, type M	128–512 CPT, 2/3 channel, LD	417		44	65		63	29										94	65	65	64	65				65
	Encoder MR, type M	128–512 CPT, 2/3 channel, LD	418		24	1		88	1	20	1					1	94	1	1	64	1	92	1	93	1	1	1
	Encoder MR, type ML	128–1000 CPT, 3 channel, LD	419		24	1		88	1							1	94	1	1	64	1	92	1	93	1	1	1
	Encoder MR, type L	256–1024 CPT, 3 channel, LD	420		24	1		88	1	20	1					1	94	1	1	64	1	92	1	93	1	1	1
	Encoder 6 OPT	128 CPT, 3 channel	421																								
	Encoder 16 RIO	512–65536 CPT, 3 channel	423					88	1	20	1					1	94	1	1	64	1	92	1	93	1	1	1
	Encoder 2RMHF	3000–5000 CPT, 3 channel, LD	425					88	1	20	1					1			1	64	1	92	1				1
	Encoder Enc 22	100 CPT, 2 channel	426																								
	Encoder AEDL 5810	1024–5000 CPT, 3 channel, LD	427		24	1		88	1	20	1					1	94	1	1	64	1	92	1	93	1	1	1
Encoder HEDS 5540	500 CPT, 3 channel	429–430		79	61		79	35	36	35																	
Encoder HEDL 5540	500 CPT, 3 channel	431–431		24	1		88	1	20	1					1	94	1	1	64	1	92	1	93	1	1	1	
Encoder HEDL 9140	500 CPT, 3 channel	436–437					76	22	37	22					60			64	60	92	60	93	60	60	60	60	
DC tachometer DCT 22	0.52 V	438		24	67		88	1	20	1																	

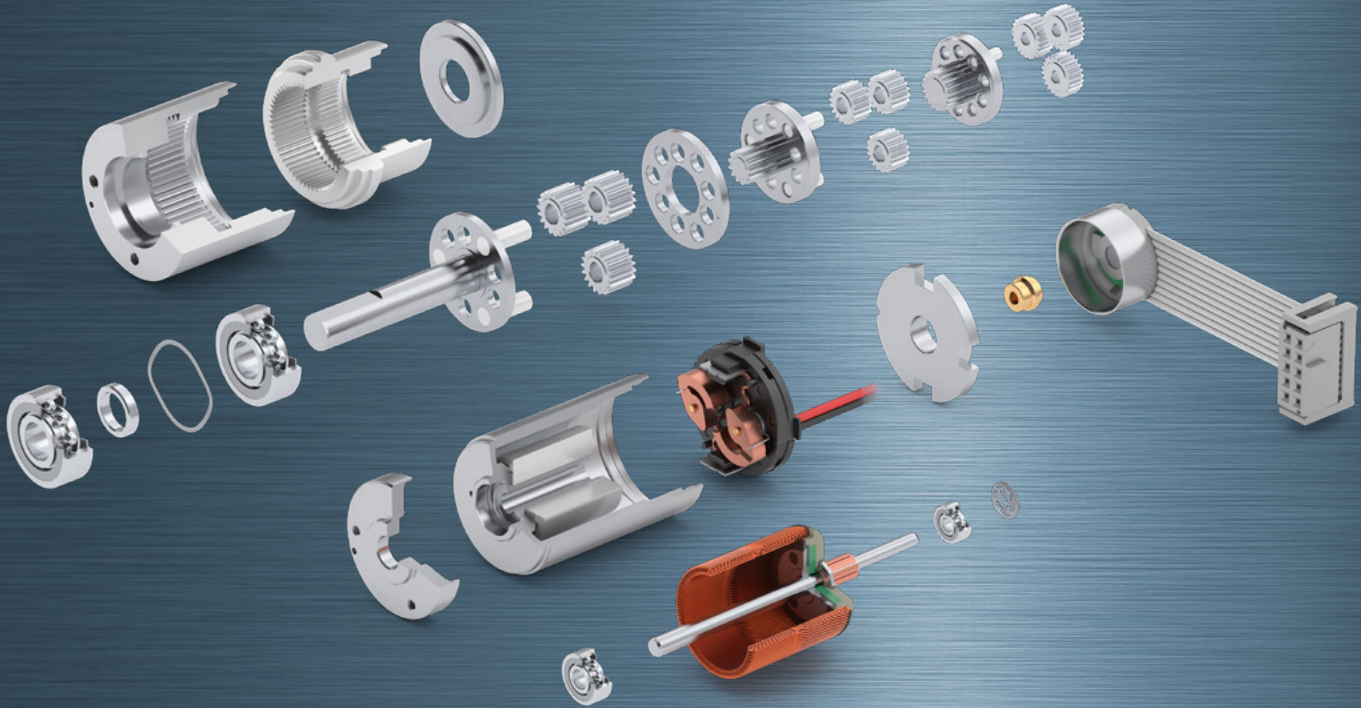
Selection Guide

Planetary and spur gearheads.

maxon gear maxon screw drive

Type Bearing





DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

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.

Selection Guide	27–36
maxon DC motor	38–39
maxon EC motor	40–43
maxon gear	44–45
maxon sensor	46–47
maxon motor control	48–49
Key information	50–57
Conversion tables	58
Standard Specification	59–61

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.

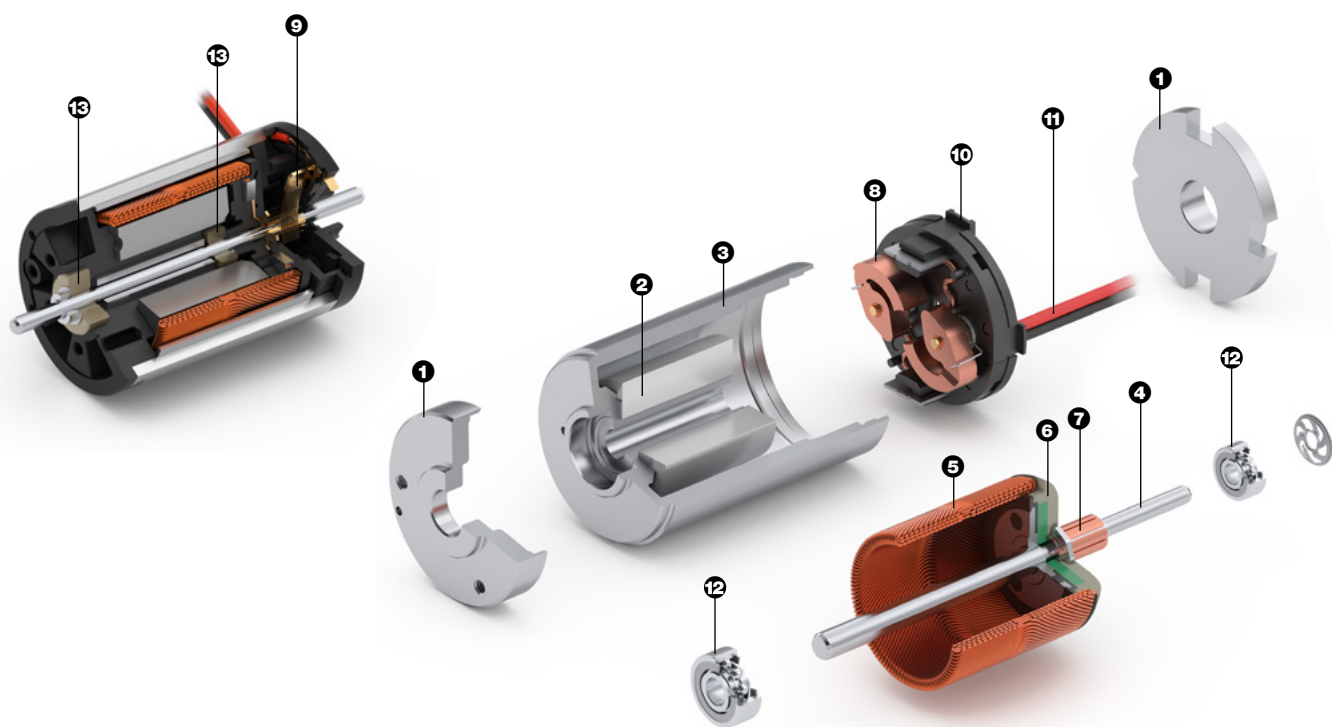
2. Speed: the higher the speed, the greater the mechanical wear.

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

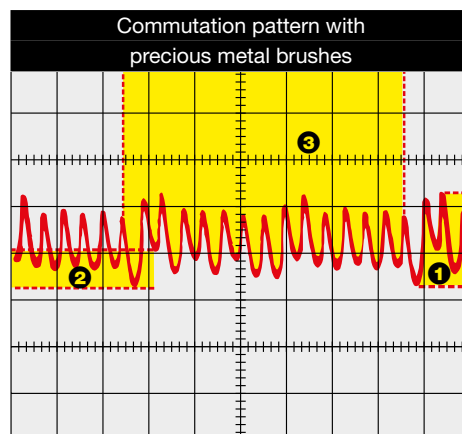
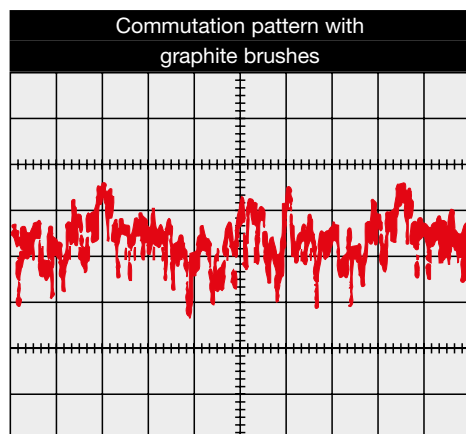
The commutation pattern is uniform and free of spikes, as opposed to that of other motors. The combination of precious metal brushes and maxon rotor system results in minimum of high-frequency interference, which otherwise leads to major problems in electrical circuits. The motors need practically no 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 64 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 maxon EC motors:

- 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 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

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

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

Electronical commutation

Block commutation

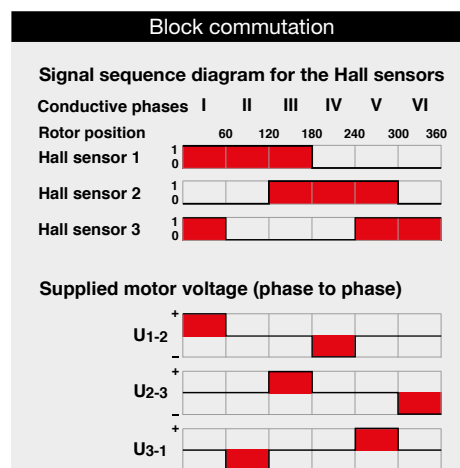
Rotor position is reported by three in-built Hall sensors. The Hall sensors arranged offset by 120° provide six different signal combinations per revolution. The three partial windings are now supplied in six different conducting phases in accordance with the sensor information. The current and voltage 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
- The data of the maxon EC motors are determined with block commutation.

Possible applications

- Highly dynamic servo drives
- Start/stop operation
- Positioning tasks



- 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).

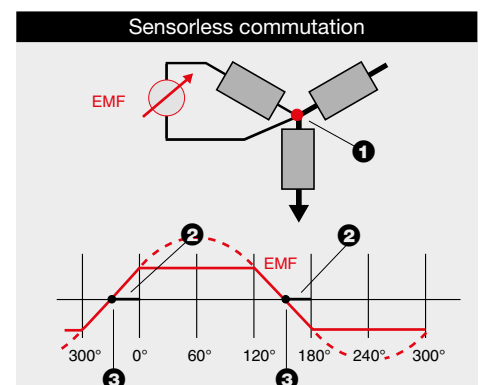
To allow EC motors to be commuted without sensors in a Δ arrangement, a virtual star point is usually created in the electronics.

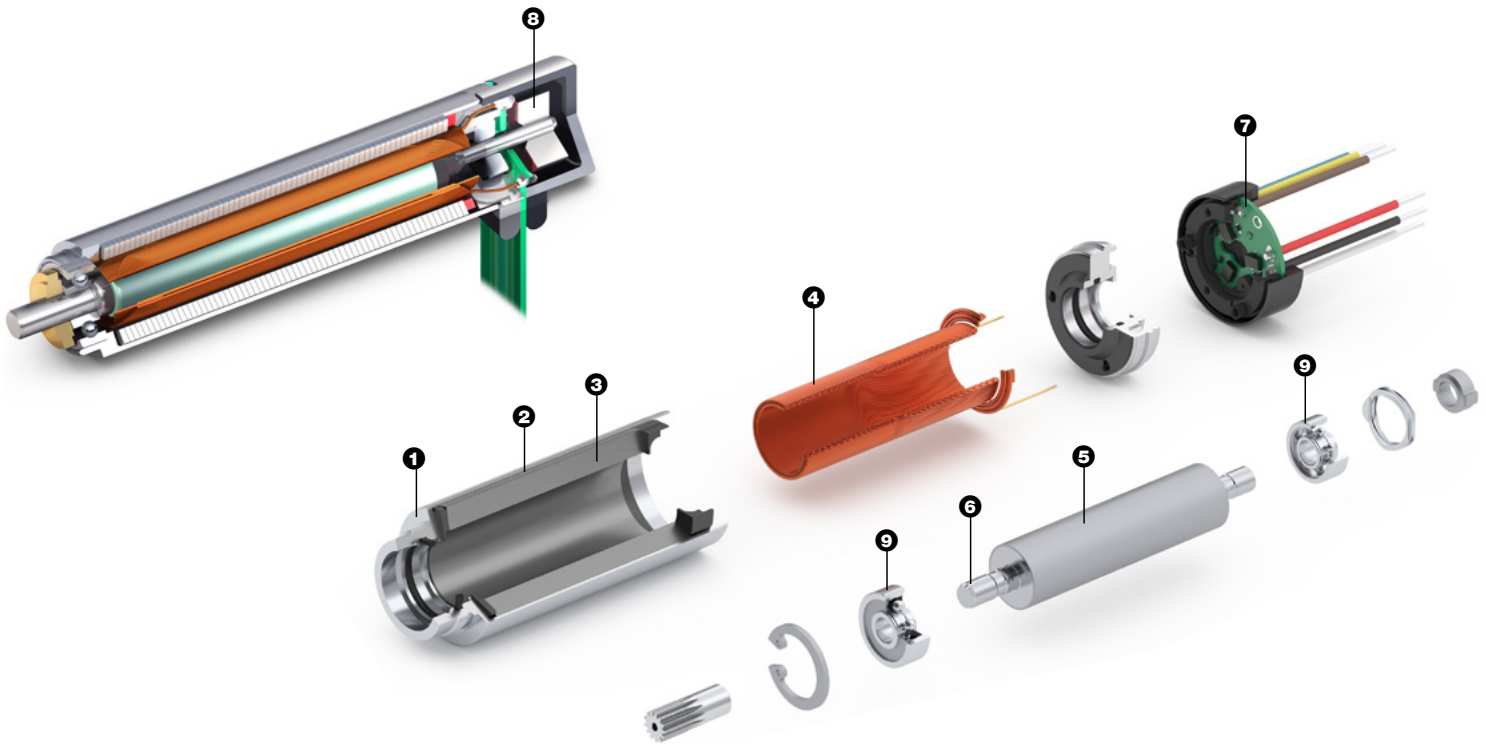
Properties of sensorless commutation

- Torque ripple of 14% (block commutation)
- No defined start-up
- Not suitable for low speeds
- Not suitable for dynamic applications

Possible applications

- Continuous operation at higher speeds
- Fans





Hall sensor circuit

Sinusoidal commutation

The high resolution signals from the encoder or resolver are used for generating sine-shape 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.

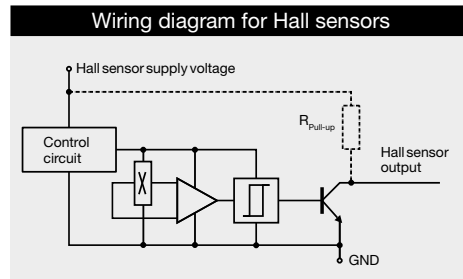
Properties of sinusoidal commutation

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

Possible applications

- Highly dynamic servo drives
- Positioning tasks

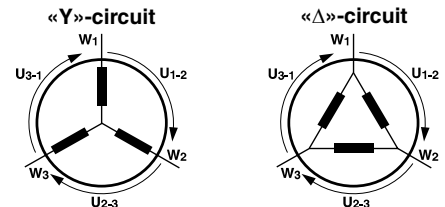
The open collector output of Hall sensors does not normally have its own pull-up resistance, as this is integral in maxon controllers. Any exceptions are specifically mentioned in the relevant motor data sheets.



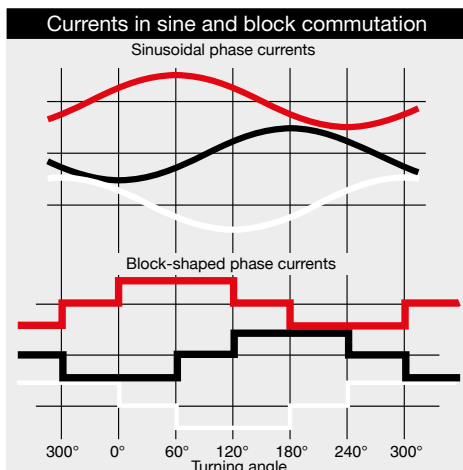
The power consumption of a Hall sensor is typically 4 mA (for output of Hall sensor = "HI").

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.



The maximum permissible winding temperature is 125°C or 155°C, depending on motor type.



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

For further explanations, please see page 164 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 maxon EC flat motors and EC-i motors:

- 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 maxon EC flat motors:

- 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

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

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

Program

- EC-i
- EC flat motor
- 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
- The data of the maxon EC motors are determined with block commutation.

Possible applications

- Highly dynamic servo drives
- Start/stop operation
- Positioning tasks

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
- Not suitable for dynamic applications

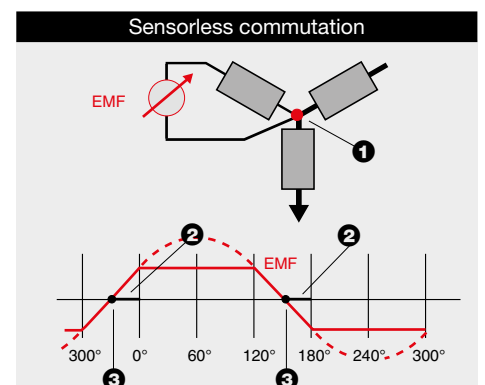
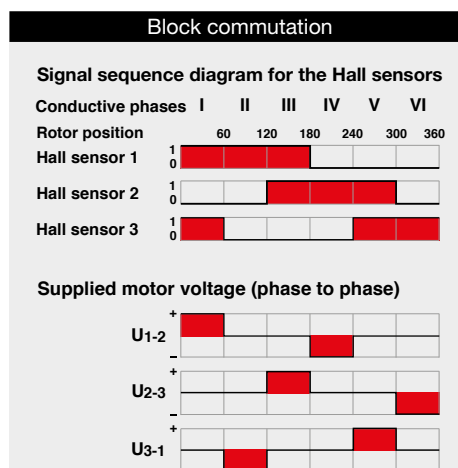
Possible applications

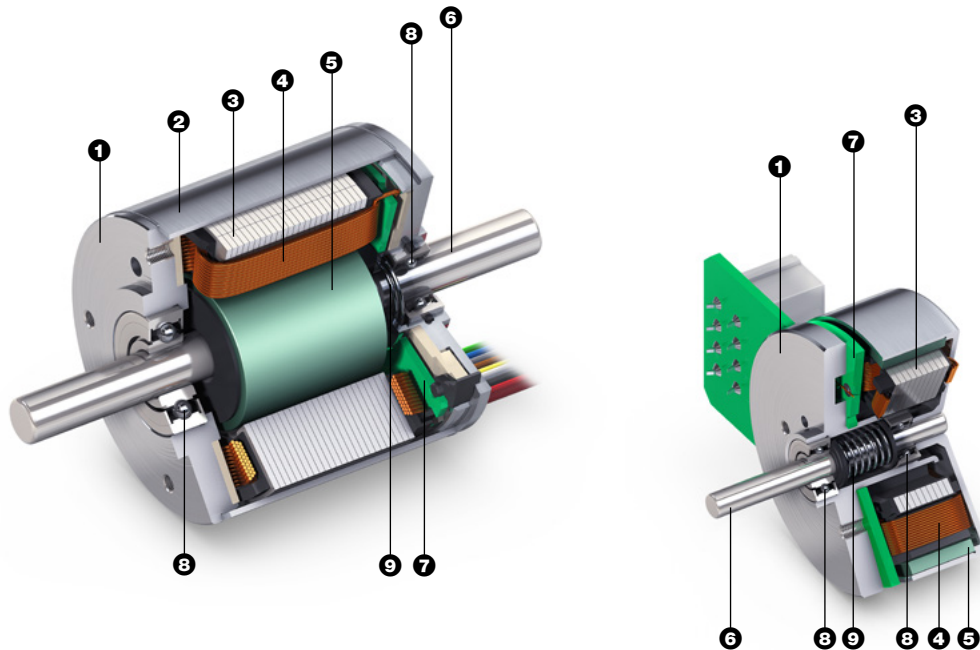
- Continuous operation at higher speeds
- Fans, pumps

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.



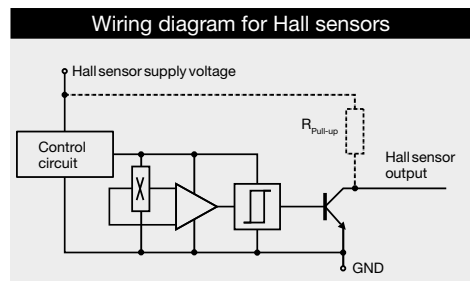


Hall sensor circuit

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").

Frameless EC Motoren

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. This enables engineers to integrate the frameless motors into the specific application to save installation space.

Features

- 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

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

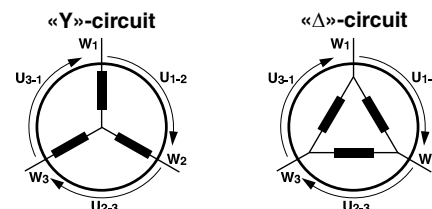
Legend

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

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. Flat motors and EC-i are normally "Y"-circuited.



The maximum permissible winding temperature is 125°C (EC-i 155°C).

For further explanations, please see page 164 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
- η : 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)

- 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

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

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

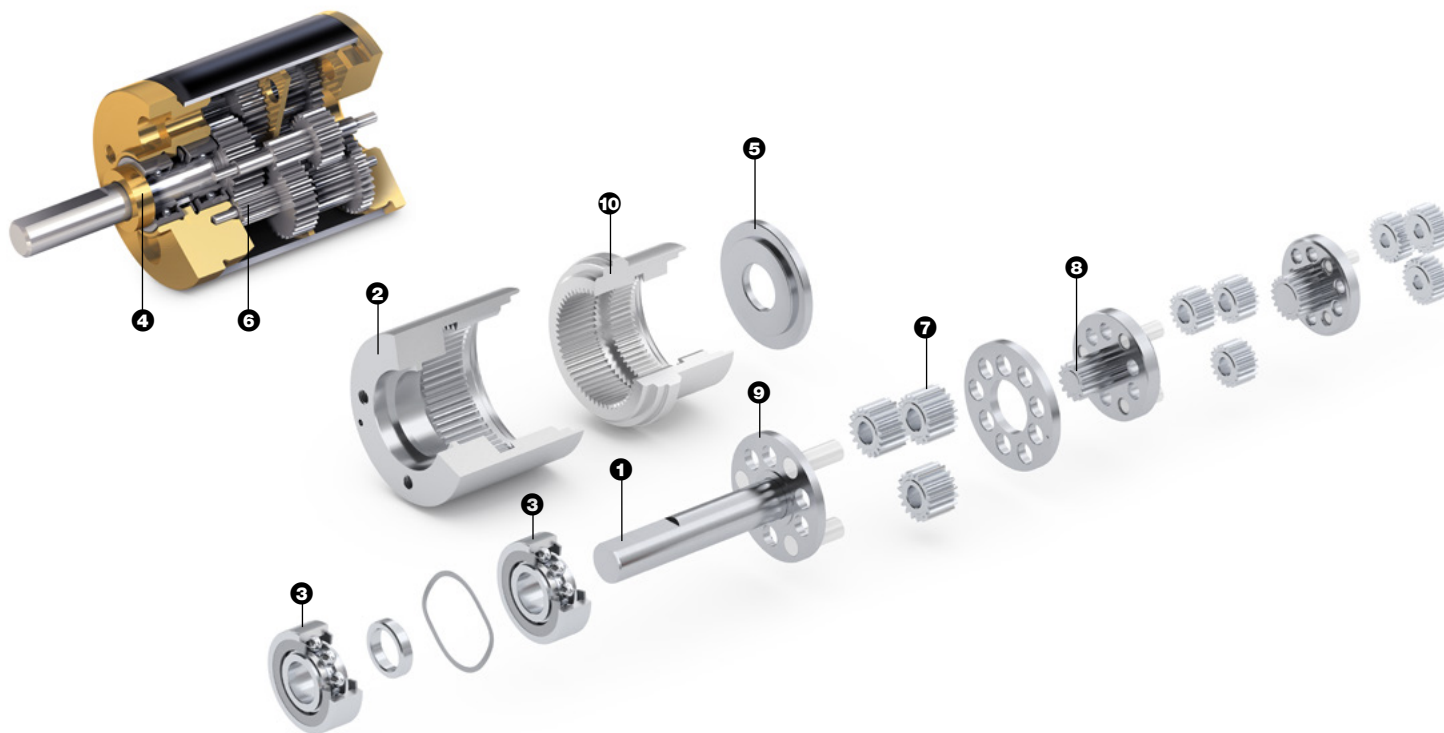
If the gear is selected, the data converted to the motor axis (n_{mot} , M_{mot}) are used to select the motor. The maxon modular system defines the proper motor-gear combinations.

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 – \varnothing 12–45 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

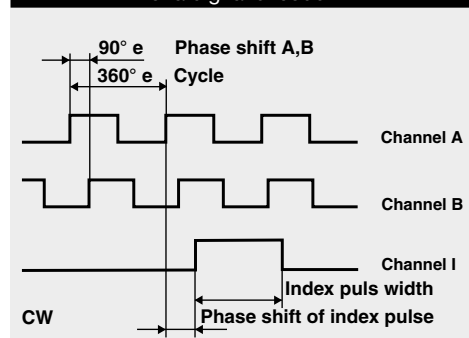
Encoder signals

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 slopes. 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 slopes of index channel I can be used for a precise reference position. The line driver is a driver built into the encoder

Representation of the output signal of a digital encoder



Program

- MILE (inductive encoders)
- RIO, EAST, MAG, MR, MEnc (magnetic encoders)
- OPT, 2RMHF, Enc, HEDL, HEDS, AEDL (optical encoders)
- DC-Tacho, Res (analog sensors)

to improve the signal quality through steeper slopes. 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.

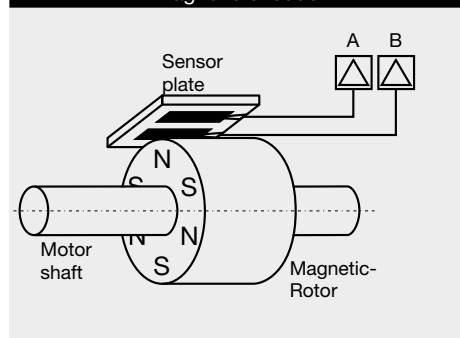
Magnetic encoders

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

Schematic design of a magnetic encoder



- 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

- 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)

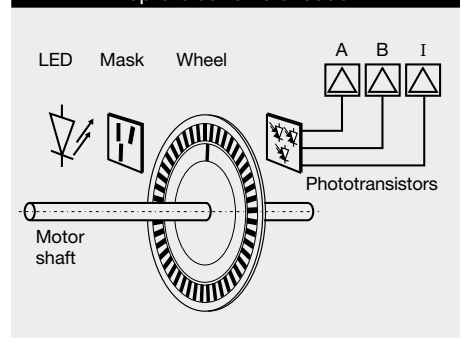
Optical encoders

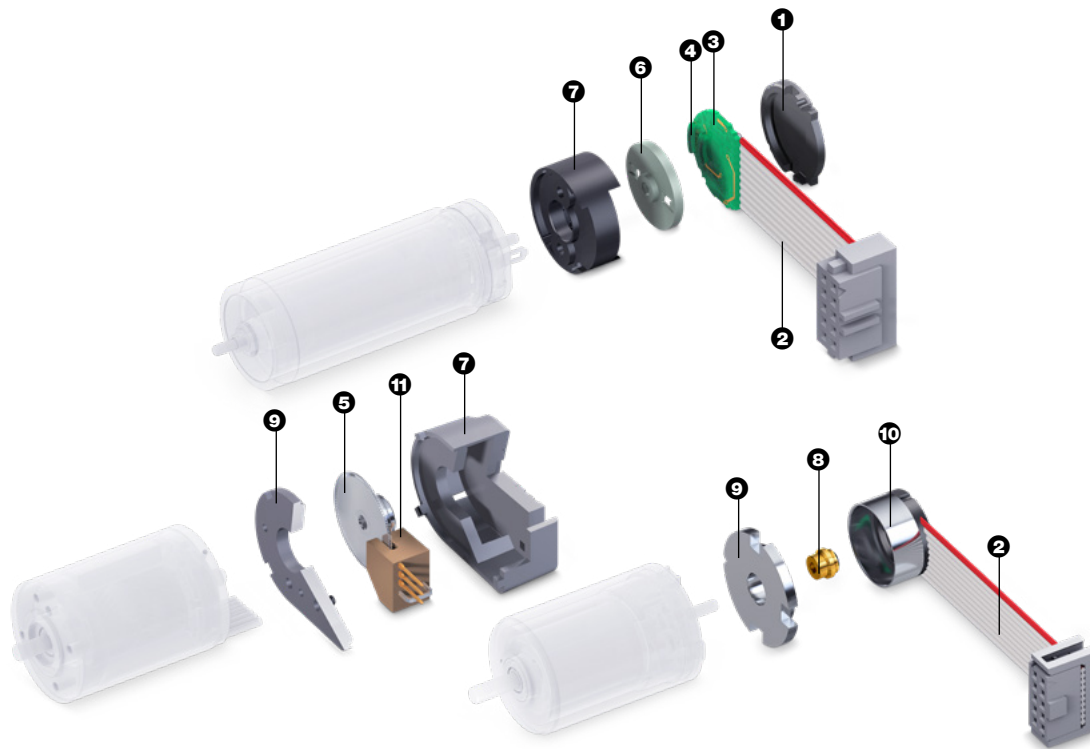
In optical encoders, an LED emits light through a finely structured code wheel (HEDL, AEDL, HEDS, 2RMHF, Enc22) or directed at a structured reflector (RIO) attached to the motor shaft. The receiver converts the light/dark signals into electrical currents, which are amplified and turned into electrical 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

Schematic design of an opto-electronic encoder





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)

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.

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

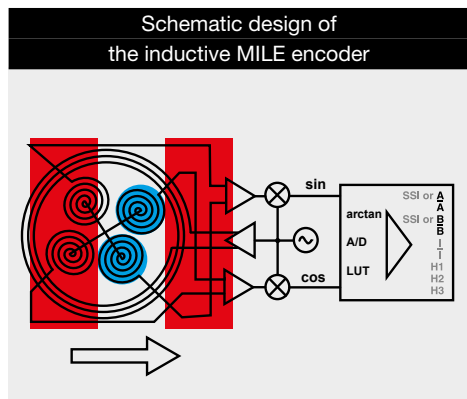
Resolver

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 φ 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



Recommendations on encoder selection						
(✓) Conditionally applicable	QUAD	MEnc	MR	EASY	MILE	optical
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		✓				

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

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**

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.

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. 46: Encoder signals).

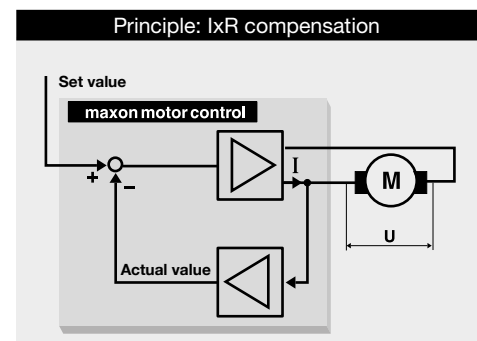
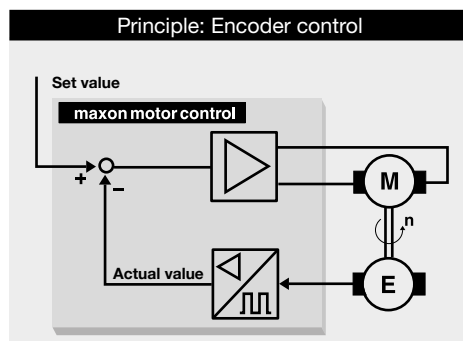
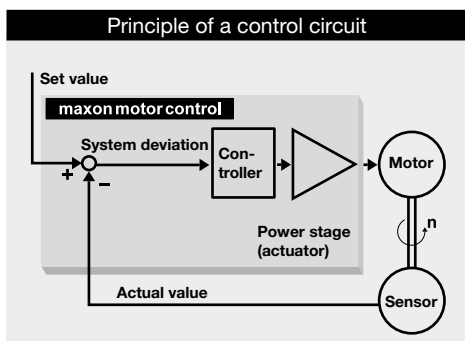
- Digital encoders are often found in positioning controls, in order to derive and measure the travel or angle.
- Digital encoders are not subject to mechanical wear.
- If an EC motor's Hall sensor signals are used for control, then the result is similar to using an incremental encoder with a low resolution.

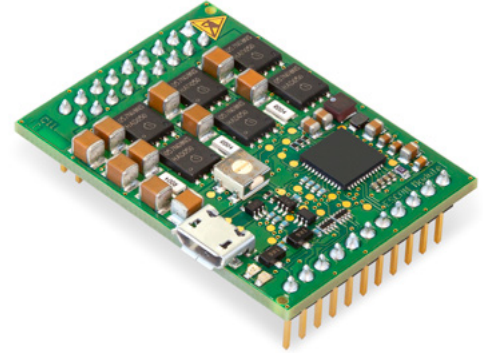
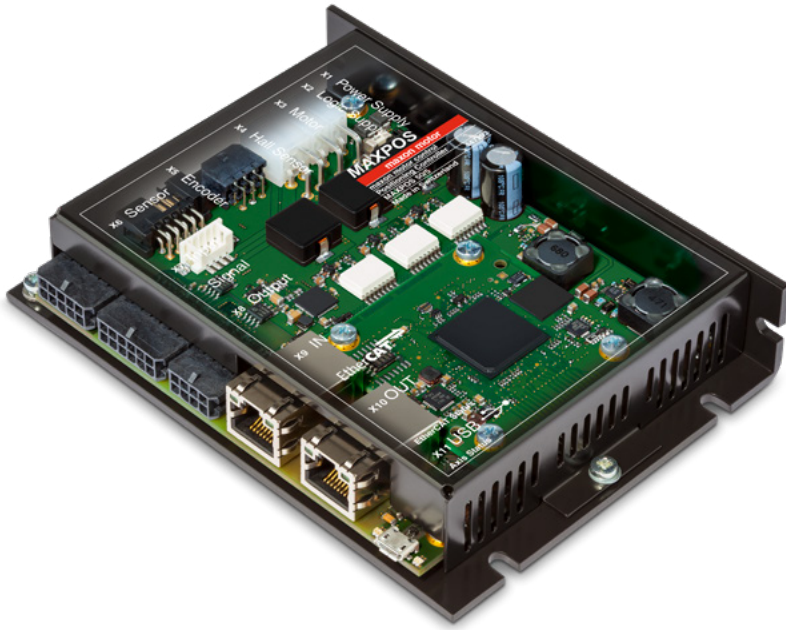
IxR compensation

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





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

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.

In the case of position controllers (motion controllers), the set values are usually specified by means of digital commands that are transmitted to the controller using a field bus telegram (e.g. RS232, USB, CANopen, EtherCAT).

Operating quadrants

4-Q operation

- The 4-quadrant operation allows controlled and dynamic motor operation and brake operation in two directions of rotation (all 4 quadrants).
- 4-quadrant operation is a prerequisite for positioning tasks.

1-Q operation

- Only motor operation (Quadrant I or Quadrant III)
- Direction reverse via digital signal
- Typical: amplifier for EC motors

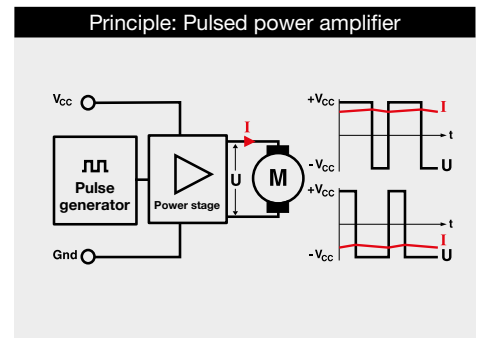
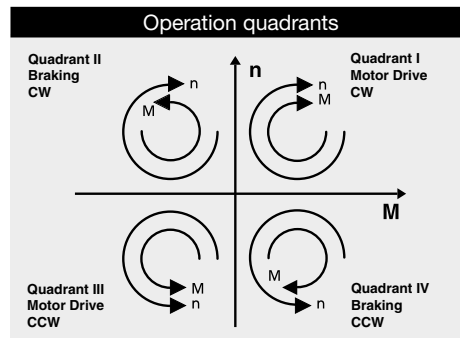
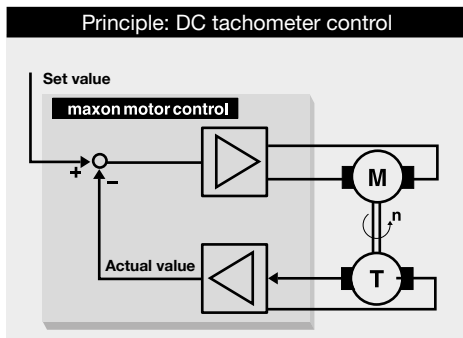
For further explanations, please see page 441.

Timed 4-Q power stages

To control the power stage transistors, the maxon controllers use a 3-level pulse width modulation (PWM). The voltage present at the motor switches between the supply voltage and 0 V at short intervals (50 kHz and more). If the Off interval gets larger at the cost of the On interval, the decisive average voltage value (pulse width modulation) and motor speed drops. If the motor voltage is negative, the supply voltage is applied with reversed polarity.

Properties of the 3-level PWM power stage in contrast to linear control

- More complex power stage
- Smoothing of the current ripple by means of auxiliary chokes (integrated into maxon controllers)
- Only a small amount of energy is converted to heat.
- High efficiency



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 η 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).

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

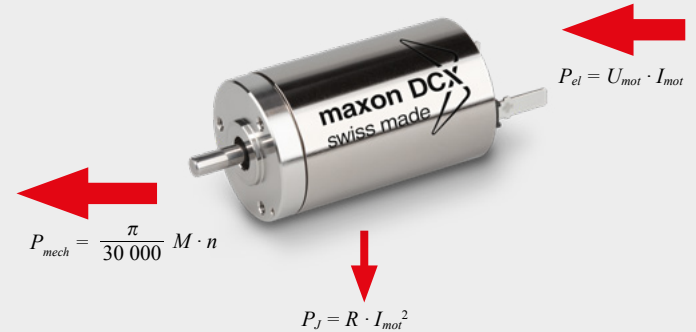
See also: Technology – short and to the point, explanation of the motor

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 56).

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)

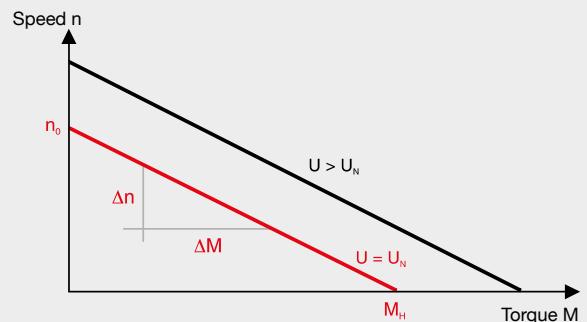


Motor constants

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

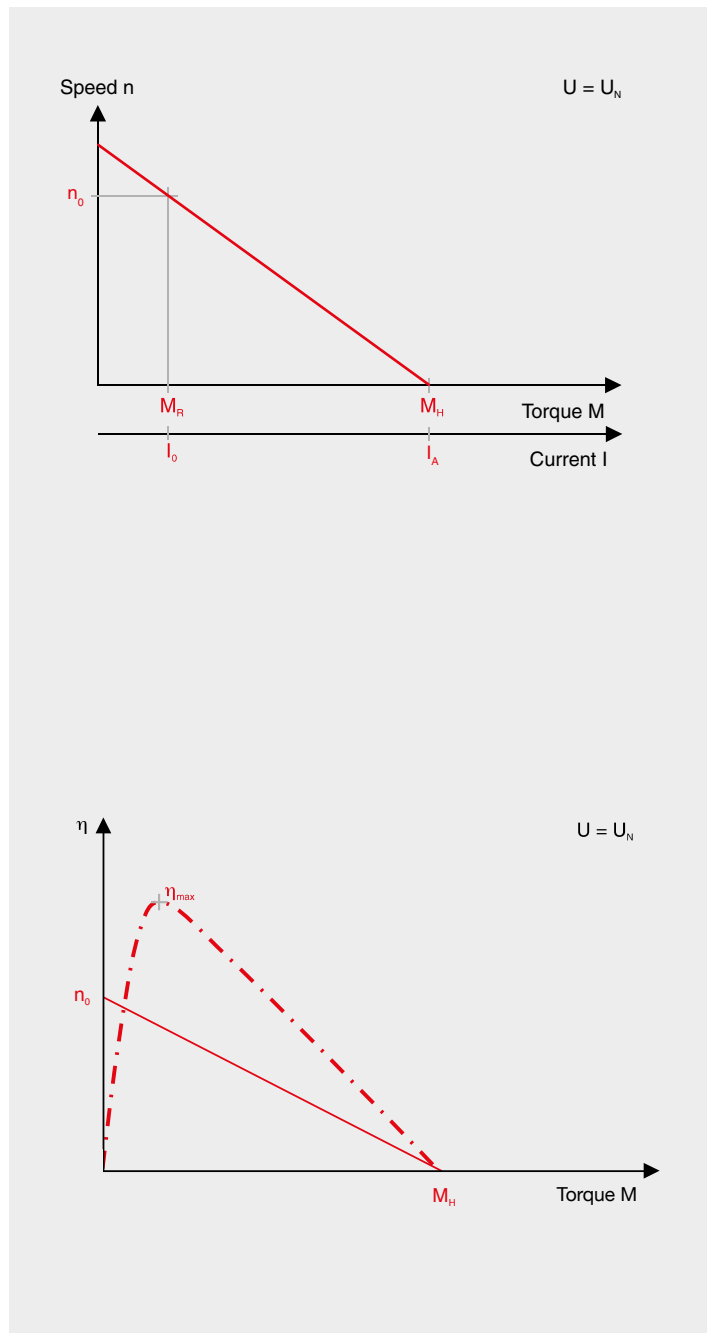
The efficiency η describes the relationship of mechanical power delivered to electrical power consumed.

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

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.

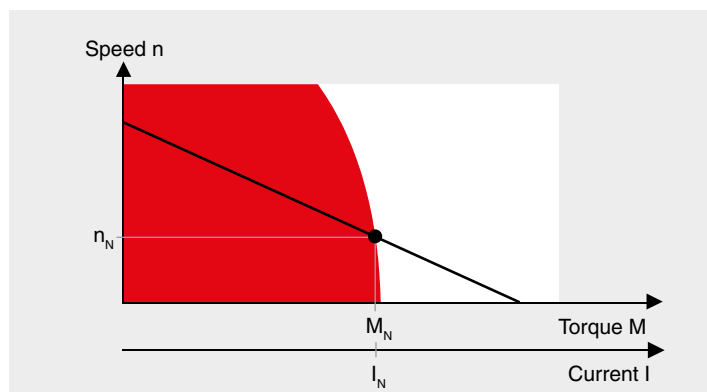


Rated operating point

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

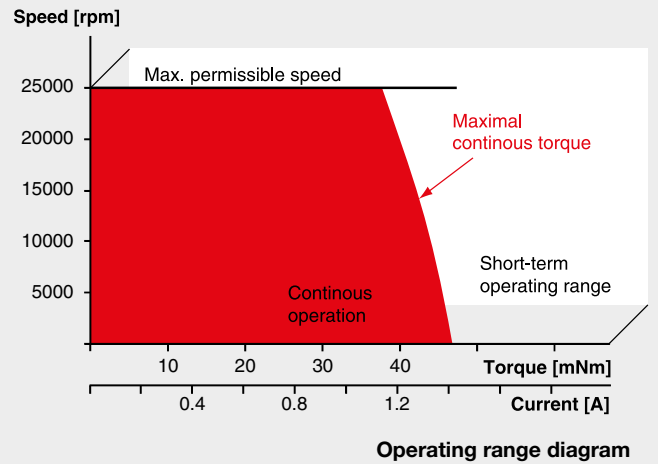
for DC motors is primarily limited by the commutation system. The commutator and brushes wear more rapidly at very high speeds. The reasons are:

- 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.

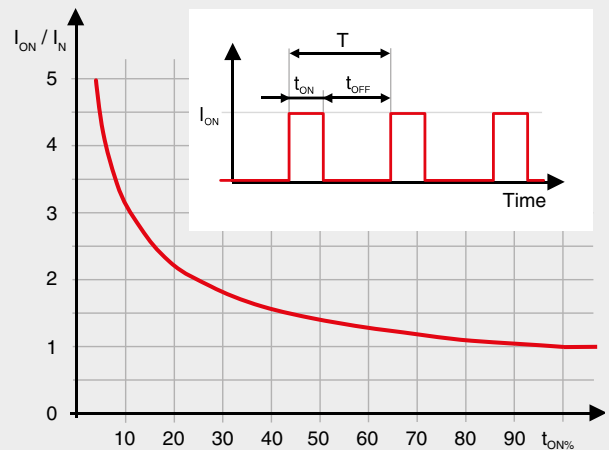
Maximum winding temperature

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.



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 τ_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.

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

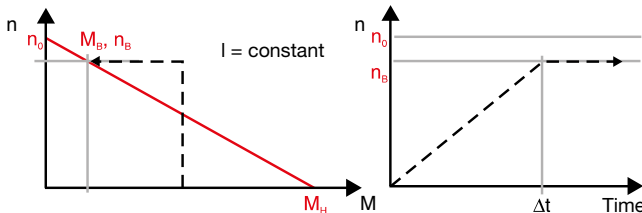
Acceleration

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.



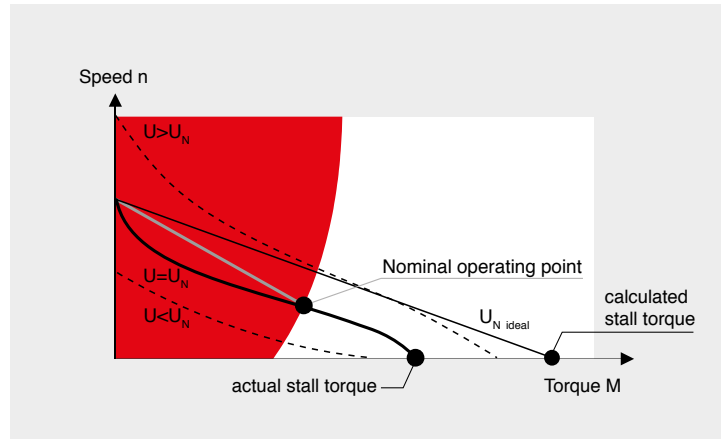
- Angular acceleration α (in rad/s²) at constant current I or constant torque M with an additional load of inertia J_L :

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

- Run-up time Δt (in ms) at a speed change Δn with an additional load inertia J_L :

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

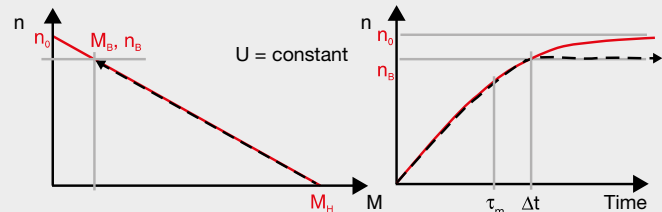
(all variables in units according to the catalog)



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 τ_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 τ_m (in ms) of the unloaded motor:

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

- Mechanical time constants τ_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 α_{max} (in rad/s²) of the unloaded motor:

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

- Maximum angular acceleration α_{max} (in rad/s²) 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.

Calibrating

The tolerances can be limited by controlled de-magnetization of the motors. Motor data can be accurately specified down to 1 to 3%. However, the motor characteristic values lie in the lower portion of the standard tolerance range.

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 ΔT_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} .

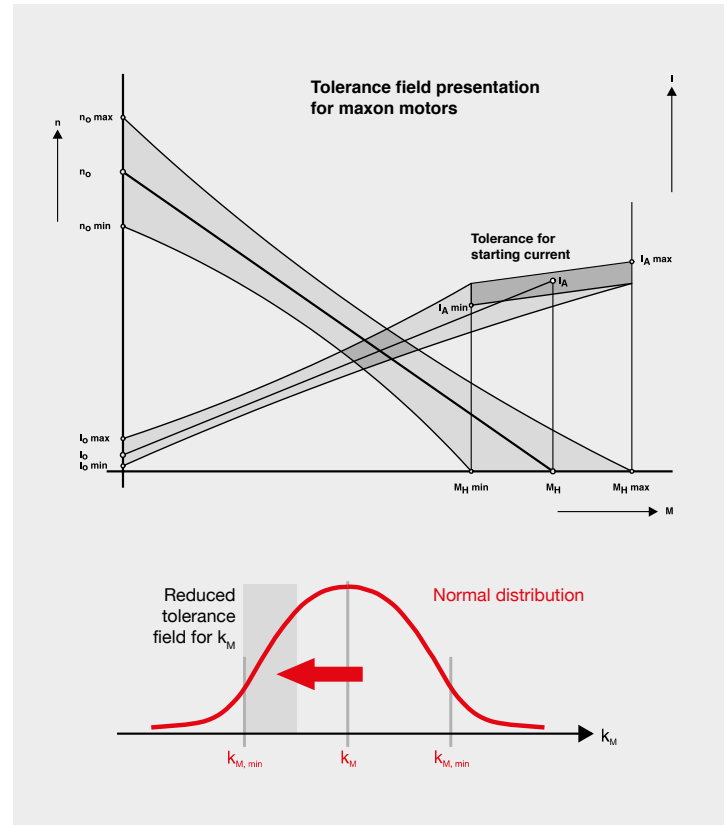
$$T_W - T_U = \Delta T_W = (R_{th1} + R_{th2}) \cdot P_J$$

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:

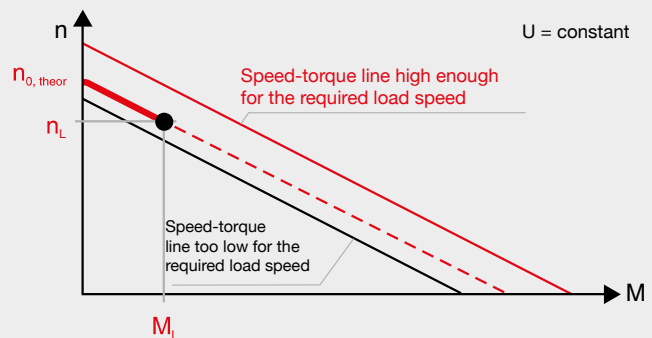
Often the load points (especially the torque) are not known or are difficult to determine. In such cases you can operate your device with a measuring motor roughly estimated according to size and power. Vary the voltage until the desired operating points and motion sequences have been achieved. Measure 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?

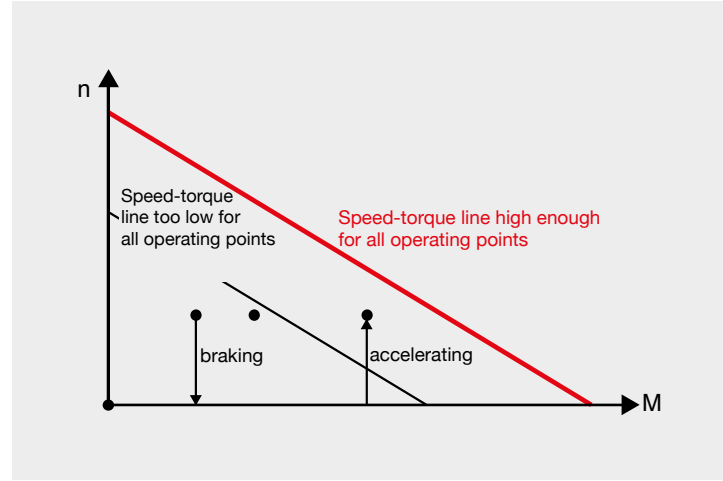


Regulated servo drives

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):

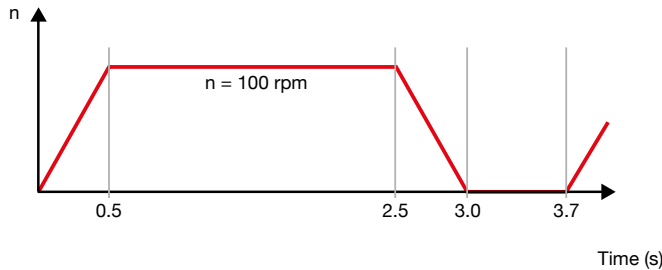
$$k_n \cdot U_{max} = n_0 + n_L + \frac{\Delta n}{\Delta M} M_L$$

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 gcm² = 0.03 kgm². 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 ²	gcm ²
J_L	Moment of inertia of the load	kgm ²	gcm ²
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
α_{Cu}	Resistance coefficient of Cu		= 0.0039
α_{max}	Max. angle acceleration		rad/s ²
$\Delta n/\Delta M$	Curve gradient*		rpm/mNm
ΔT_W	Temperature difference winding/ambient	K	K
Δt	Run up time	s	ms
η	(Motor) efficiency		%
η_G	(Gear) efficiency*		%
η_{max}	Max. efficiency*		%
τ_m	Mechanical time constant*	s	ms
τ_S	Therm. time constant of the motor*	s	s
τ_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⁻¹ 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

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

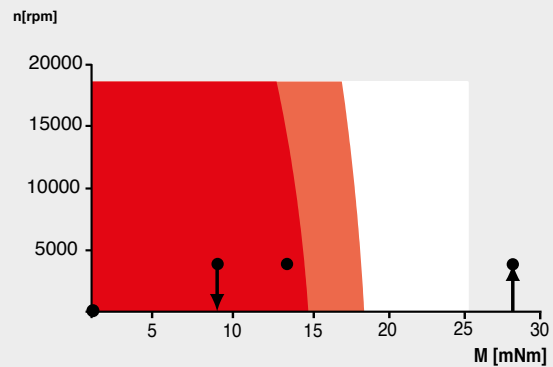
This current is smaller than the maximum current (4 A) of the controller and the power supply unit (3 A).

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

Quantities and their basic units in the International System of Measurements (SI)

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

Conversion Example

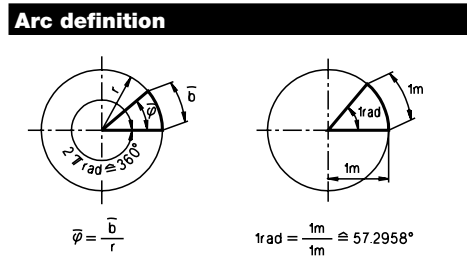
A known unit
B unit sought

known:	multiply by	sought:
oz-in	7.06	mNm

- Factors used for ...**
- ... conversions:**
 1 oz = 2.834952313 · 10⁻² kg
 1 in = 2.54 · 10⁻² m
- ... gravitational acceleration:**
 g = 9.80665 m s⁻²
 = 386.08858 in s⁻²
- ... derived units:**
 1 yd = 3 ft = 36 in
 1 lb = 16 oz = 7000 gr (grains)
 1 kp = 1 kg · 9.80665 ms⁻²
 1 N = 1 kgms⁻²
 1 W = 1 Nms⁻¹ = 1 kgm²s⁻³
 1 J = 1 Nm = 1 Ws

Decimal multiples and fractions of units

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



Units used in this brochure

Power P [W]

B \ A	oz-in-s ⁻¹	oz-in-min ⁻¹	in-lbf-s ⁻¹	ft-lbf-s ⁻¹	W = N · ms ⁻¹	mW	kpm s ⁻¹	mNm min ⁻¹
W = N · ms ⁻¹	7.06 · 10 ⁻³	1.17 · 10 ⁻⁴	0.113	1.356	1	1 · 10 ⁻³	9.807	² / ₆₀₀₀₀
mW	7.06	0.117	112.9	1.356 · 10 ³	1 · 10 ³	1	9.807 · 10 ³	² / ₆₀
oz-in-s ⁻¹	1	1/60	16	192	141.6	0.142	1.39 · 10 ³	2.36 · 10 ⁻³
ft-lbf-s ⁻¹	¹ / ₁₉₂	¹ / ₁₁₅₂₀	¹ / ₁₂	1	0.737	0.737 · 10 ⁻³	7.233	1.23 · 10 ⁻⁵
kpm s ⁻¹	7.20 · 10 ⁻⁴	1.2 · 10 ⁻⁵	1.15 · 10 ⁻²	0.138	0.102	0.102 · 10 ⁻³	1	1.70 · 10 ⁻⁶

Torque M [Nm]

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

Moment of Inertia J [kg m²]

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

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 ⁻³	0.454	64.79 · 10 ⁻⁶	1	1 · 10 ⁻³	N	0.278	4.448	1	9.807	9.807 · 10 ⁻³
g	28.35	0.454 · 10 ³	64.79 · 10 ⁻³	1 · 10 ³	1	kp	0.028	0.454	0.102	1	1 · 10 ⁻³
oz	1	16	2.28 · 10 ⁻³	35.27	35.27 · 10 ³	oz	1	16	3.600	35.27	35.27 · 10 ⁻³
lb	¹ / ₁₆	1	¹ / ₇₀₀₀	2.205	2.205 · 10 ³	lbf	¹ / ₁₆	1	0.225	2.205	2.205 · 10 ⁻³
gr (grain)	437.5	7000	1	15.43 · 10 ³	15.43 · 10 ⁶	pdl	2.011	32.17	7.233	70.93	70.93 · 10 ⁻³

Length l [m]

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

Angular Velocity ω [s⁻¹] **Angular Acceleration** α [s⁻²]

B \ A	s ⁻¹ = Hz	rpm	rad s ⁻¹	B \ A	min ⁻²	s ⁻²	rad s ⁻²	min ⁻¹ s ⁻¹
rad s ⁻¹	2π	^π / ₃₀	1	s ⁻²	¹ / ₃₆₀₀	1	¹ / _{2π}	¹ / ₆₀
rpm	¹ / ₆₀	1	³⁰ / _π	rad s ⁻²	^π / ₁₈₀₀	2π	1	^π / ₃₀

Linear Velocity v [m s⁻¹]

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

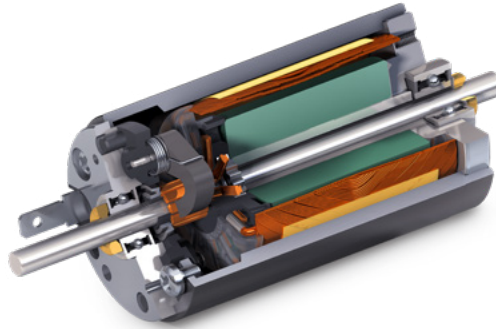
Temperature T [K]

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

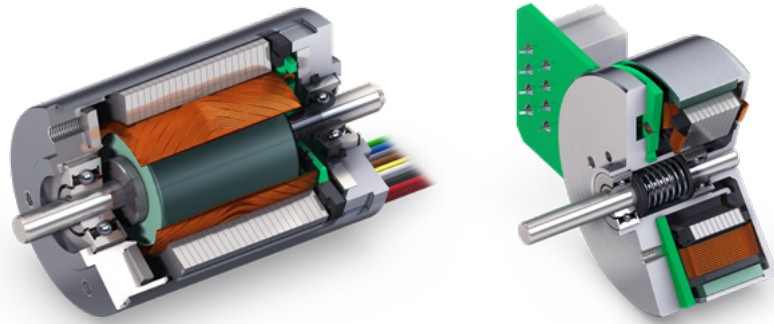
maxon standard specification

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.

Standard specification no. 100 maxon DC motor



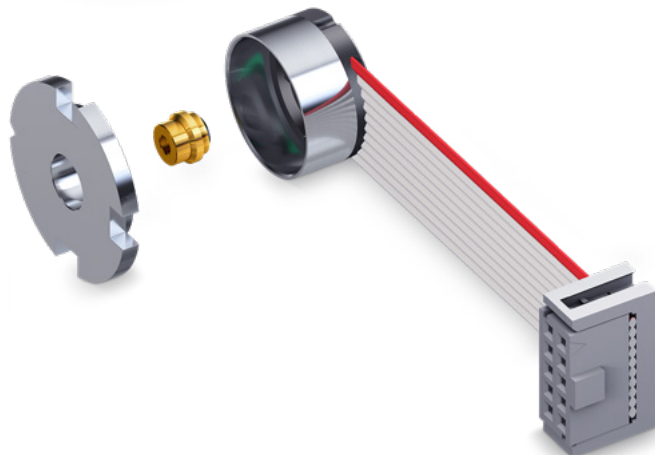
Standard specification no. 101 maxon EC motor



Standard specification no. 102 maxon gear maxon screw drive



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:

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

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

Current draw	Minimum/maximum value
Signal level	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:

Current draw	Minimum/maximum value
Signal integrity	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.

For your personal notes.

Brushed DC motors with ironless windings.

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DCX 8 M Ø8 mm, Precious metal brushes, 0.5 Watt	67
DCX 10 S Ø10 mm, Precious metal brushes, 1 Watt	68
DCX 10 L Ø10 mm, Precious metal brushes, 1.5 Watt	69
DCX 12 S Ø12 mm, Precious metal brushes, 1.6 Watt	70
DCX 12 L Ø12 mm, Precious metal brushes, 2.5 Watt	71
DCX 14 L Ø14 mm, Precious metal brushes, 3 Watt	72
DCX 14 L Ø14 mm, Graphite brushes, 6 Watt	73
DCX 16 S Ø16 mm, Precious metal brushes, 3 Watt	74
DCX 16 S Ø16 mm, Graphite brushes, 5 Watt	75
DCX 16 L Ø16 mm, Precious metal brushes, 5 Watt	76
DCX 16 L Ø16 mm, Graphite brushes, 10 Watt	77
DCX 19 S Ø19 mm, Precious metal brushes, 5 Watt	78
DCX 19 S Ø19 mm, Graphite brushes, 11 Watt	79
DCX 22 S Ø22 mm, Precious metal brushes, 6 Watt	80
DCX 22 S Ø22 mm, Graphite brushes, 14 Watt	81
DCX 22 L Ø22 mm, Precious metal brushes, 11 Watt	82
DCX 22 L Ø22 mm, Graphite brushes, 20 Watt	83
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DC-max 16 S Ø16 mm, Precious metal brushes, 2 Watt	90
DC-max 16 S Ø16 mm, Graphite brushes, 3 Watt	91
DC-max 22 S Ø22 mm, Precious metal brushes, 5 Watt	92
DC-max 22 S Ø22 mm, Graphite brushes, 8 Watt	93
DC-max 26 S Ø26 mm, Precious metal brushes, 9 W	94
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RE 8 Ø8 mm, Precious metal brushes, 0.5 Watt	99
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RE 13 Ø13 mm, Graphite brushes, 1.5 Watt	112–115
RE 13 Ø13 mm, Graphite brushes, 3.0 Watt	116–119
RE 16 Ø16 mm, Precious metal brushes CLL, 2 Watt	120
RE 16 Ø16 mm, Precious metal brushes CLL, 3.2 Watt	121–122
RE 16 Ø16 mm, Graphite brushes, 4.5 Watt	123–124
RE 25 Ø25 mm, Precious metal brushes CLL, 10 Watt	125
RE 25 Ø25 mm, Graphite brushes, 20 Watt	126–127
RE 30 Ø30 mm, Precious metal brushes, 15 Watt	128
RE 30 Ø30 mm, Graphite brushes, 60 Watt	129
RE 35 Ø35 mm, Graphite brushes, 90 Watt	130
RE 40 Ø40 mm, Precious metal brushes, 25 Watt	131
RE 40 Ø40 mm, Graphite brushes, 150 Watt	132
RE 50 Ø50 mm, Graphite brushes, 200 Watt	133
RE 65 Ø65 mm, Graphite brushes, 250 Watt	134
A-max Program	137–162
12 Ø12 mm, Precious metal brushes CLL, 0.75/0.5 Watt	137–138
16 Ø16 mm, Precious metal brushes CLL, 2/1.2 Watt	139–140
16 Ø16 mm, Graphite brushes, 2 Watt	141–142
19 Ø19 mm, Precious metal brushes CLL, 2.5/1.5 Watt	143–144
19 Ø19 mm, Graphite brushes, 2.5 Watt	145–146
22 Ø22 mm, Precious metal brushes CLL, 5/3.5 Watt	147–148
22 Ø22 mm, Graphite brushes, 6 Watt	149–150
26 Ø26 mm, Precious metal brushes CLL, 4/7/4.5 Watt	151–154
26 Ø26 mm, Graphite brushes, 6/11 Watt	155–158
32 Ø32 mm, Graphite brushes, 15/20 Watt	159–162

DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive


Accessories

Ceramic

Contact
information

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_A 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_N [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 n₀ [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 I₀ [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_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 that, at 25°C ambient temperature, heats the winding up to the maximum permissible temperature (= max. permissible continuous current). I_N decreases as speed increases due to additional friction losses.

7 Stall torque M_H [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_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 can often not be reached due to the amplifier's current limits.

9 Max. efficiency η_{max} [%]

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_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]

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_R [gcm²]

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 τ_w [s]

and

20 Thermal time constant motor τ_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 [°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

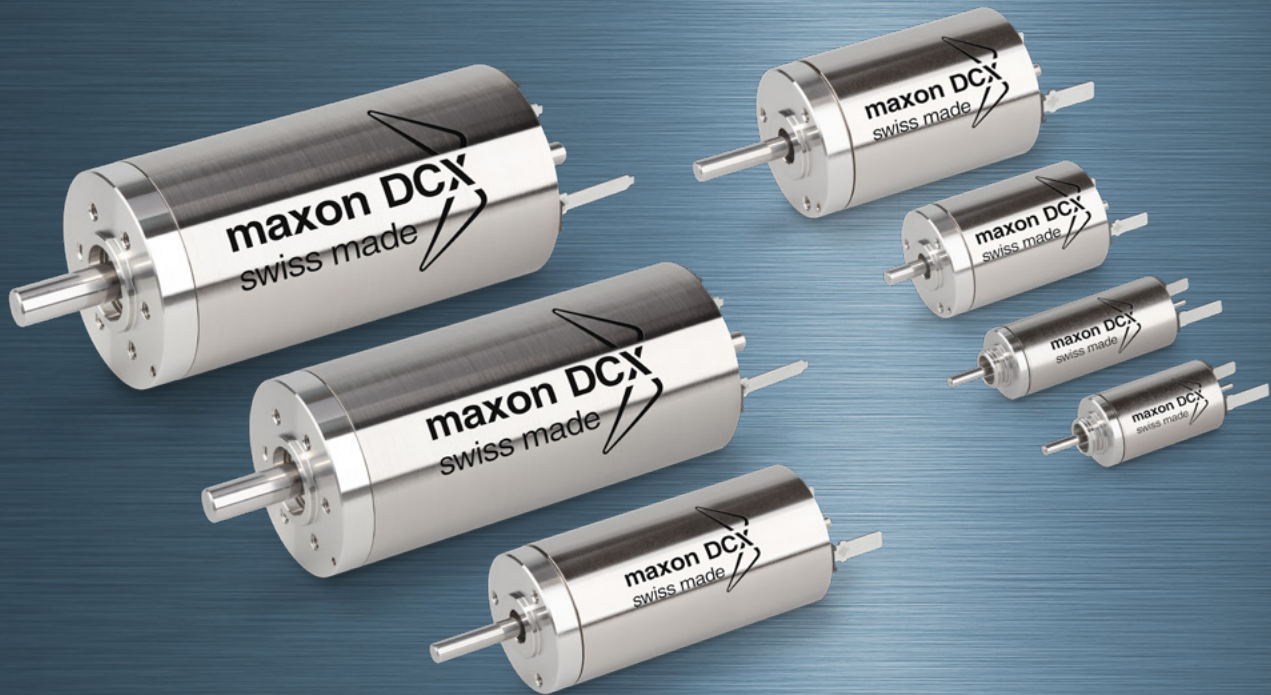
31 Weight of motor [g]

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

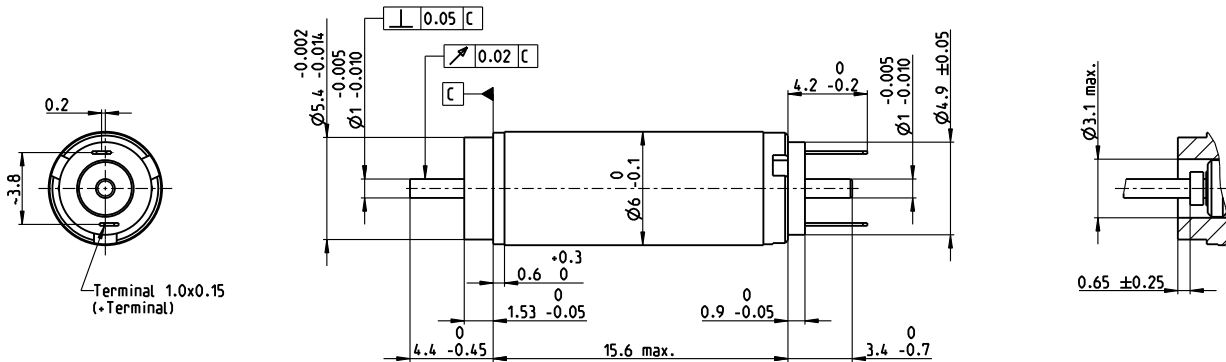
Standard Specification No. 100	60
Explanation of the DC motors	64
DCX Program	66–87
DC-max Program	90–95
RE Program	98–134
A-max Program	137–162

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

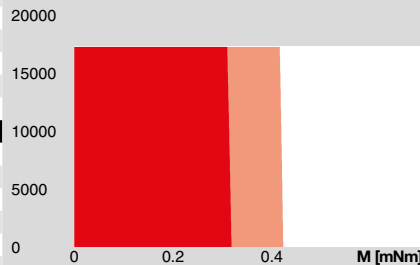
1_	Nominal voltage	V	1.5	3	4.5	6
2_	No load speed	rpm	17300	17500	17400	17400
3_	No load current	mA	34.1	17.1	11.4	8.54
4_	Nominal speed	rpm	4950	5940	5730	5690
5_	Nominal torque (max. continuous torque)	mNm	0.309	0.332	0.326	0.325
6_	Nominal current (max. continuous current)	A	0.425	0.228	0.149	0.111
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 ²	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

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	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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
284_GPX 6 A	1-5	386_ENX 6 MAG 397_ENX 6 OPT	444_ESCON Module 24/2 444_ESCON 36/2 DC 452_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

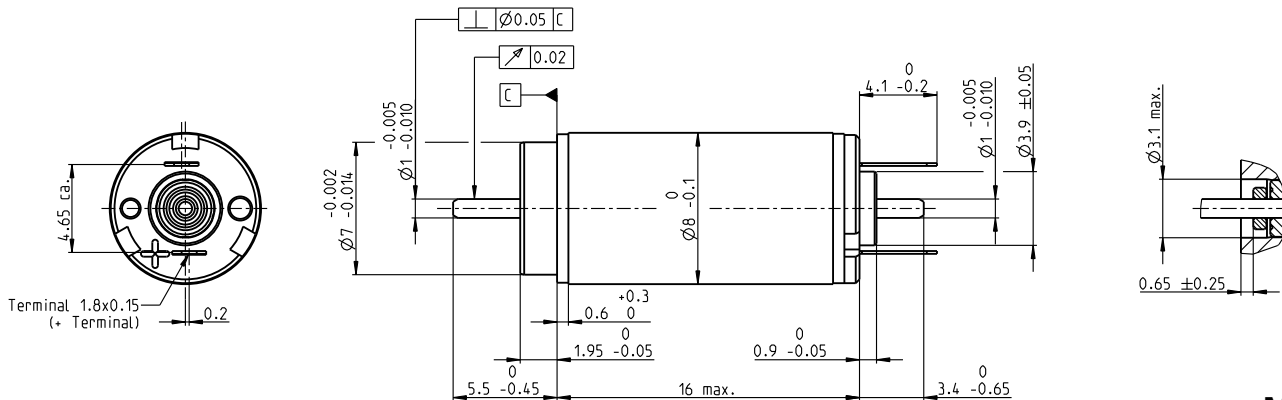
Bearing: Sleeve bearings/ball bearings preloaded
 Commutation: Precious metal brushes
 Flange front/back: Standard flange
 Shaft front/back: Length
 Electric connection: Terminals or cables (encoder always with Flex)

DCX 8 M Precious Metal Brushes

DC motor Ø8 mm



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



M 5:2

maxon DCX

Motor Data

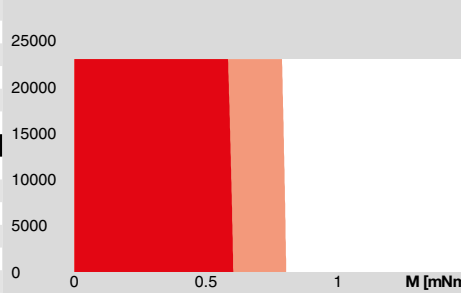
1_	Nominal voltage	V	2.4	4.2	6	7.2	9	12
2_	No load speed	rpm	11500	11700	11000	11900	11900	12900
3_	No load current	mA	11.9	6.93	4.51	4.12	3.3	2.74
4_	Nominal speed	rpm	4780	4950	4190	4820	5190	5800
5_	Nominal torque (max. continuous torque)	mNm	0.653	0.649	0.641	0.62	0.652	0.614
6_	Nominal current (max. 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 ²	0.038	0.0379	0.0372	0.035	0.038	0.035

Thermal data

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

Operating Range

n [rpm] Winding 6 V



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

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) (static, shaft supported)	N	8.8 / 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) (static, shaft supported)	N	10 / 100
28_	Max. radial load [mm from flange]	N	0.4 [5]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
285_GPX 8 A	1-5	387_ENX 8 MAG 398_ENX 8 OPT	444_ESCON Module 24/2 444_ESCON 36/2 DC 452_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	4.4
32_	Typical noise level	dBA	-

Configuration

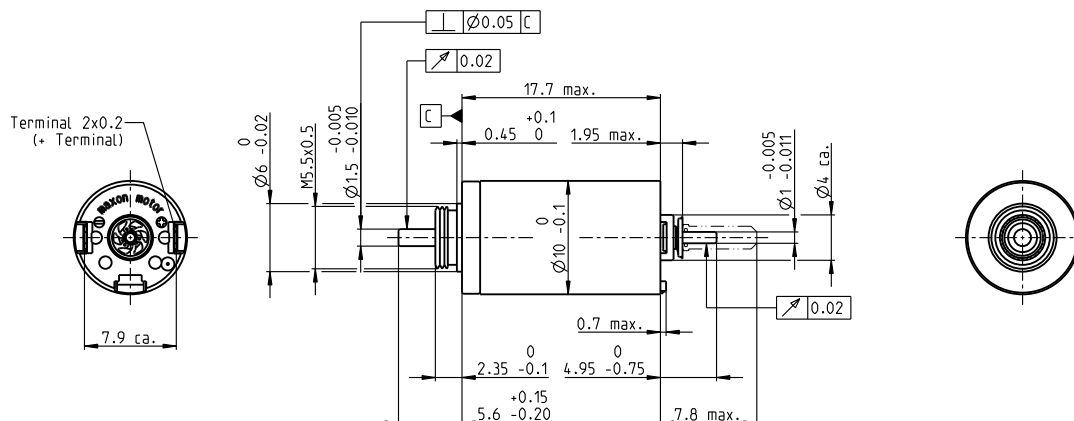
Bearing: Sleeve bearings/ball bearings preloaded
 Commutation: Precious metal brushes with or without CLL
 Flange front/back: Standard flange
 Shaft front/back: Length
 Electric connection: Terminals or cables (encoder always with Flex)

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

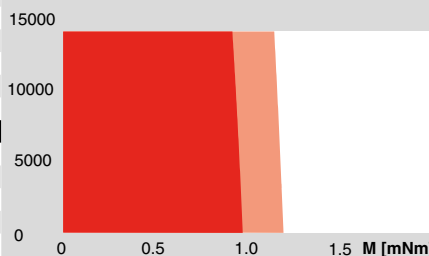
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	12600	13000	12600	12600	12600	12500
3_	No load current	mA	84.1	43.8	28	21	14	10.5
4_	Nominal speed	rpm	4530	4690	4270	4100	3930	3890
5_	Nominal torque (max. continuous torque)	mNm	0.918	0.948	0.944	0.927	0.909	0.905
6_	Nominal current (max. continuous current)	A	0.924	0.49	0.316	0.233	0.152	0.114
7_	Stall torque	mNm	1.49	1.54	1.48	1.43	1.38	1.37
8_	Stall current	A	1.39	0.742	0.463	0.335	0.215	0.16
9_	Max. efficiency	%	58	58	58	57	56	56
10_	Terminal resistance	Ω	1.08	4.04	9.72	17.9	41.8	74.9
11_	Terminal inductance	mH	0.014	0.051	0.122	0.217	0.488	0.868
12_	Torque constant	mNm/A	1.07	2.07	3.2	4.27	6.4	8.53
13_	Speed constant	rpm/V	8950	4600	2980	2240	1490	1120
14_	Speed/torque gradient	rpm/mNm	9030	8970	9060	9400	9750	9830
15_	Mechanical time constant	ms	7.24	7.19	7.21	7.22	7.27	7.26
16_	Rotor inertia	gcm ²	0.077	0.077	0.076	0.073	0.071	0.071

Thermal data

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

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)	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	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)	N	30
	(static, shaft supported)	N	120
28_	Max. radial load [mm from flange]	N	0.8 [5]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
286_GPX 10 A	1-5	390_ENX 10 EASY 390_ENX 10 QUAD	444_ESCON Module 24/2 444_ESCON 36/2 DC 452_EPOS4 Module/Comp. 24/1.5

Other specifications

29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	6.3
32_	Typical noise level	dBA	35

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

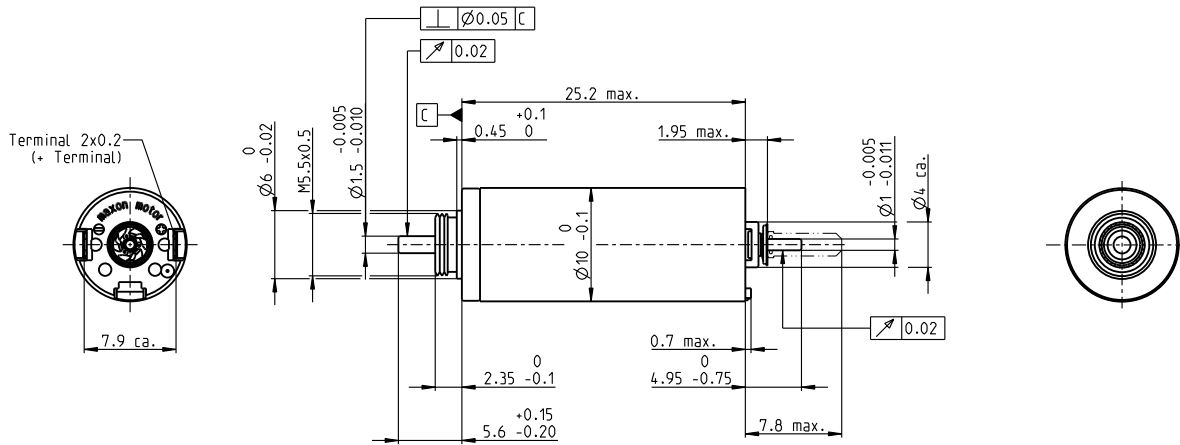
DCX 10 L Precious Metal Brushes

DC motor Ø10 mm



maxon DCX

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



M 3:2

Motor Data

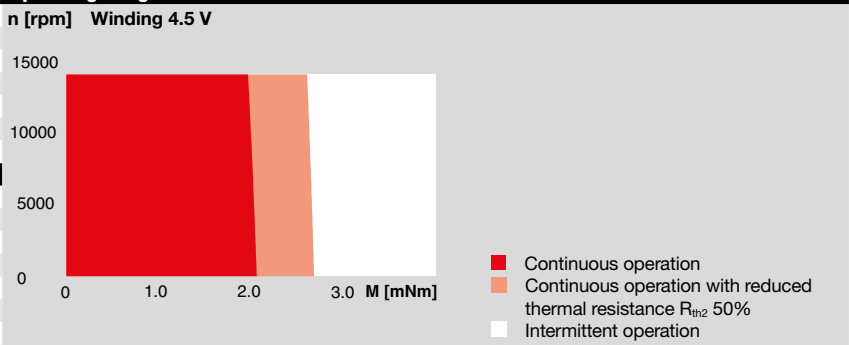
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	11600	12200	12000	12200	12000	11300
3_	No load current	mA	72.1	38.7	25.2	19.3	12.6	8.71
4_	Nominal speed	rpm	9230	6930	7110	6640	6780	5980
5_	Nominal torque (max. continuous torque)	mNm	1.04	2.05	2.2	1.94	2.06	2.03
6_	Nominal current (max. continuous 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 ²	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

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)	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	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)	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	37

Configuration

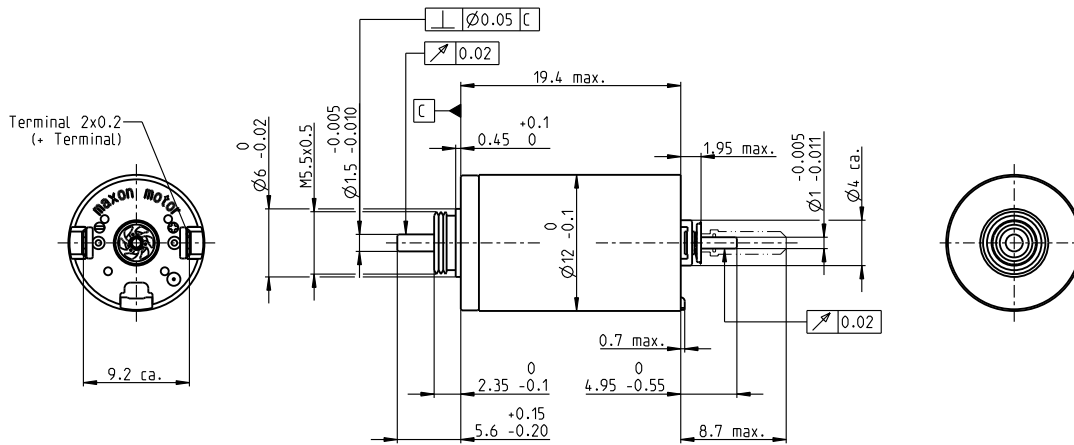
Bearing: Sleeve bearings/ball bearings preloaded
 Commutation: Precious metal brushes with or without CLL
 Flange front/back: Standard flange/Flange with thread holes/no flange
 Shaft front/back: Length
 Electric connection: Terminals or cable/cable length/connector type

DCX 12 S Precious Metal Brushes

DC motor Ø12 mm



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



M 3:2

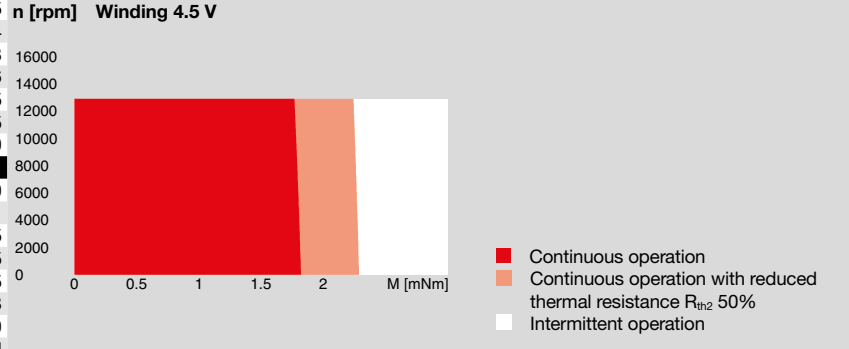
Motor Data

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 ²	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

Operating Range



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]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
287_GPX 12 A/C	1-4	390_ENX 10 EASY	444_ESCON Module 24/2
288_GPX 12 LN/LZ	1-4	390_ENX 10 QUAD	444_ESCON 36/2 DC
289_GPX 12 HP	2-4		452_EPOS4 Module/Comp. 24/1.5
291_GPX 14 A/C	3-4		
292_GPX 14 LN/LZ	3-4		
293_GPX 14 HP	4		

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

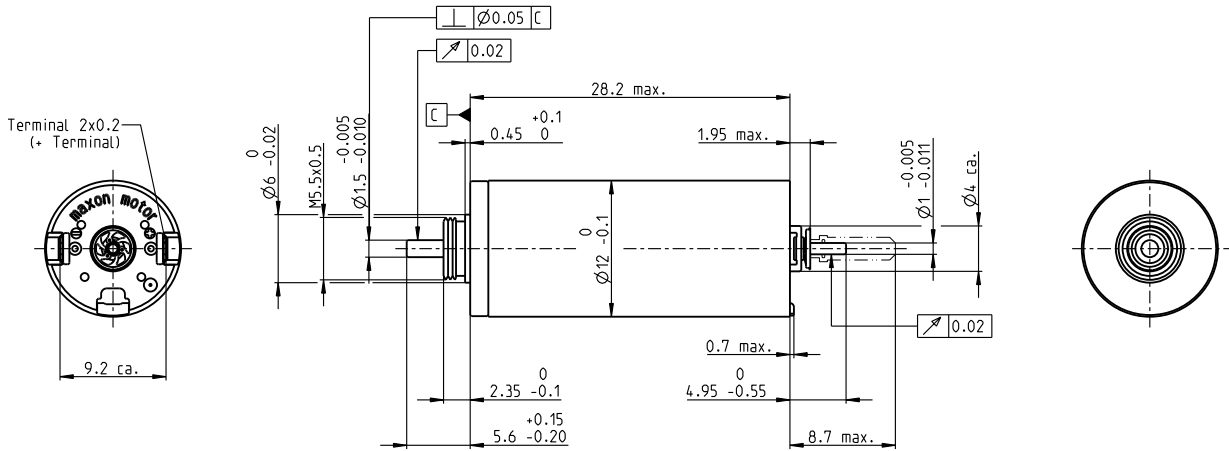
DCX 12 L Precious Metal Brushes

DC motor Ø12 mm



maxon DCX

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



M 3:2

Motor Data

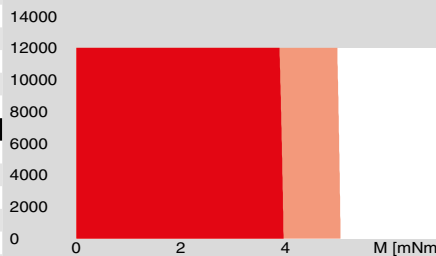
1_	Nominal voltage	V	3	4.5	6	9	12	18
2_	No load speed	rpm	8810	8820	8810	8820	8810	8810
3_	No load current	mA	31.3	20.9	15.7	10.4	7.83	5.22
4_	Nominal speed	rpm	6230	5640	5540	5750	5560	5540
5_	Nominal torque (max. continuous torque)	mNm	2.88	4.02	3.88	4.13	3.89	3.87
6_	Nominal current (max. continuous 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 ²	0.484	0.533	0.496	0.559	0.498	0.495

Thermal data

17_	Thermal resistance housing-ambient	K/W	31
18_	Thermal resistance winding-housing	K/W	10.3
19_	Thermal time constant winding	s	10.1
20_	Thermal time constant motor	s	194
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	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
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]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
287_GPX 12 A/C	1-4	390_ENX 10 EASY	444_ESCON Module 24/2
288_GPX 12 LN/LZ	1-4	390_ENX 10 QUAD	444_ESCON 36/2 DC
289_GPX 12 HP	2-4		452_EPOS4 Module/Comp. 24/1.5
291_GPX 14 A/C	3-4		
292_GPX 14 LN/LZ	3-4		
293_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

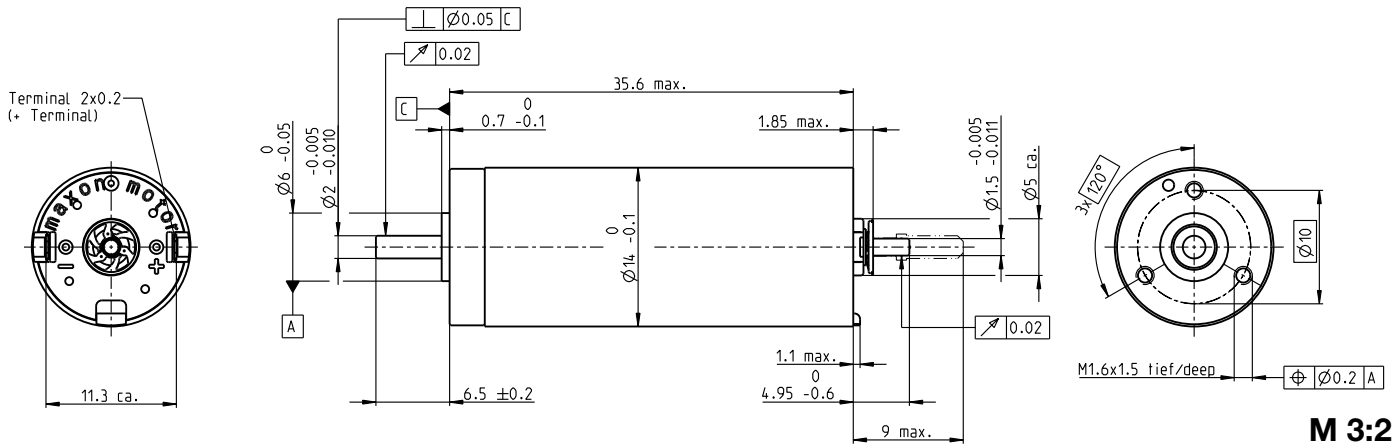
Bearing: Sleeve bearings/ball bearings preloaded
 Commutation: Precious metal brushes with or without CLL
 Flange front/back: Standard flange/Flange with thread holes/no flange
 Shaft front/back: Length
 Electric connection: Terminals or cable/cable length/connector type

DCX 14 L Precious Metal Brushes

DC motor Ø14 mm



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



M 3:2

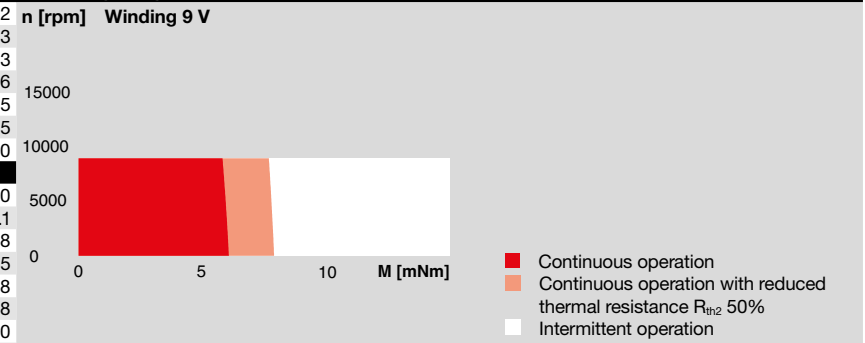
Motor Data

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 ²	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



Mechanical data ball bearings

23_	Max. speed	rpm	8680
24_	Axial play	mm	0...0.1
24_	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
27_	(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
24_	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
27_	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	2 [5]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
291_GPX 14 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
292_GPX 14 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
293_GPX 14 HP	2-3 [4]		452_EPOS4 Module/Comp. 24/1.5
294_GPX 16 A/C	3-4		468_MAXPOS 50/5
295_GPX 16 LN/LZ	3-4		
296_GPX 16 HP	4		

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

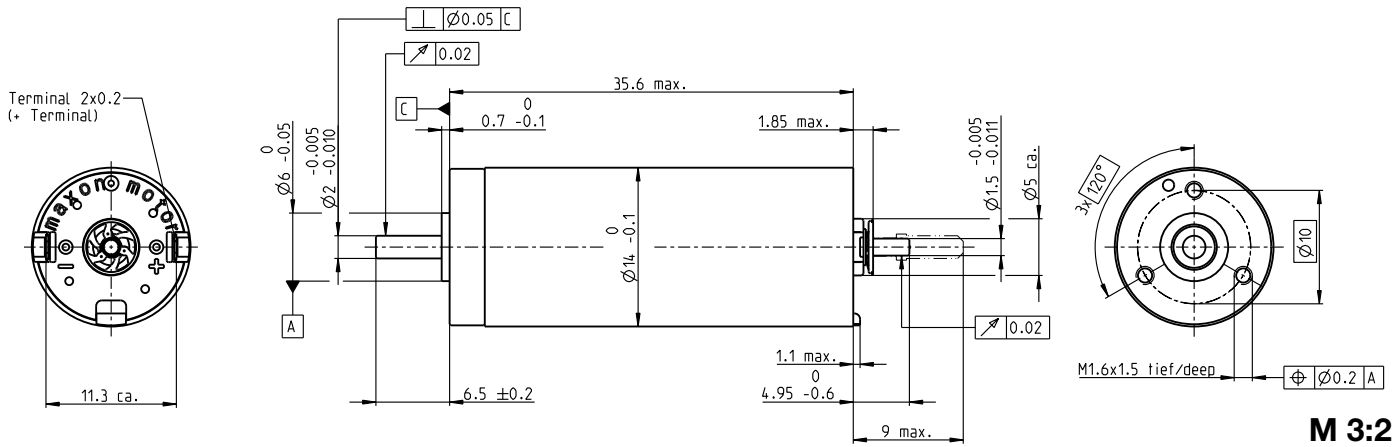
DCX 14 L Graphite Brushes

DC motor Ø14 mm



maxon DCX

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



M 3:2

Motor Data

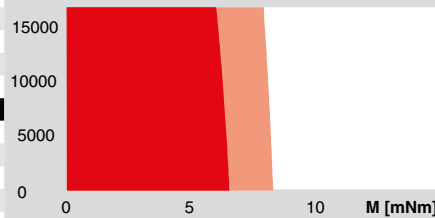
		4.5	6	9	12	18	24	
1_	Nominal voltage	V	4.5	6	9	12	18	24
2_	No load speed	rpm	11600	10400	11700	10300	11600	10300
3_	No load current	mA	73.9	46.4	37	23.2	18.5	11.6
4_	Nominal speed	rpm	8460	7430	8750	7370	8760	7300
5_	Nominal torque (max. continuous torque)	mNm	6.36	6.96	6.88	6.91	6.94	6.66
6_	Nominal 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 ²	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.]	maxon sensor	maxon motor control
24_	291_GPX 14 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
	292_GPX 14 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
25_	293_GPX 14 HP	2-3 [4]		452_EPOS4 Module/Comp. 24/1.5
26_	294_GPX 16 A/C	3-4		468_MAXPOS 50/5
27_	295_GPX 16 LN/LZ	3-4		
28_	296_GPX 16 HP	4		

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

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

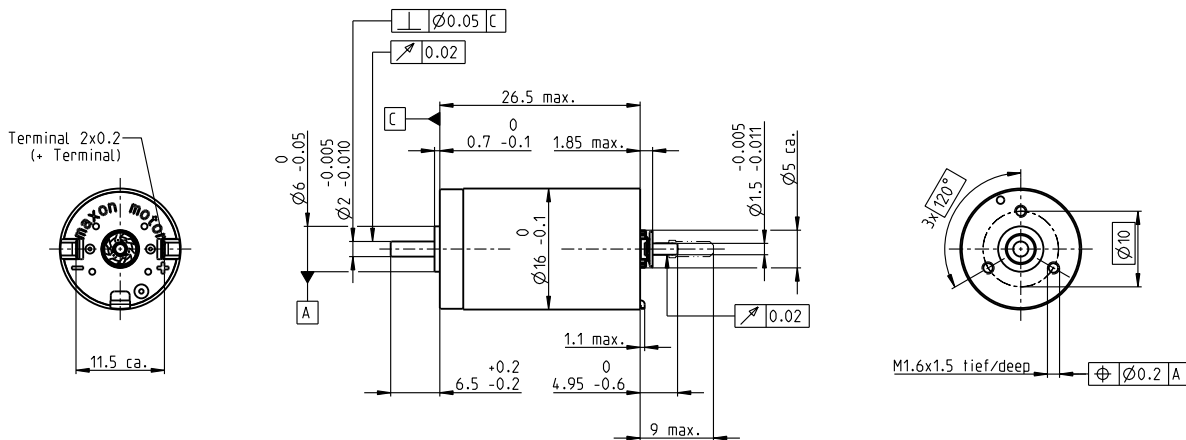
xdrives.maxonmotor.com

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

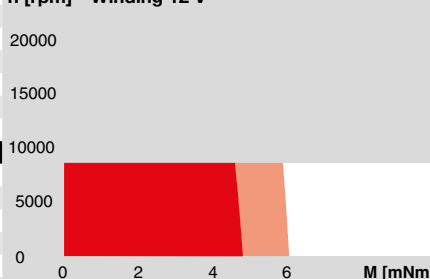
1_	Nominal voltage	V	3	4.5	6	9	12	18	24
2_	No load speed	rpm	6320	6320	6610	6320	6260	6340	6250
3_	No load current	mA	44.6	29.7	23.4	14.9	11	7.43	5.51
4_	Nominal speed	rpm	3350	3300	3760	3270	3320	3530	3200
5_	Nominal torque (max. continuous torque)	mNm	5.15	5.05	5.36	5	5.19	5.45	4.99
6_	Nominal current (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 ²	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



■ 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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
294_GPX 16 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
295_GPX 16 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
296_GPX 16 HP	2-3 [4]	392_ENX 16 EASY	452_EPOS4 Module/Comp. 24/1.5
298_GPX 19 A/C	3-4	393_ENX 16 EASY Abs.	453_EPOS4 50/5
299_GPX 19 LN/LZ	3-4	399_ENX 16 RIO	453_EPOS4 Module/Comp. 50/5
300_GPX 19 HP	4		468_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	40

Configuration

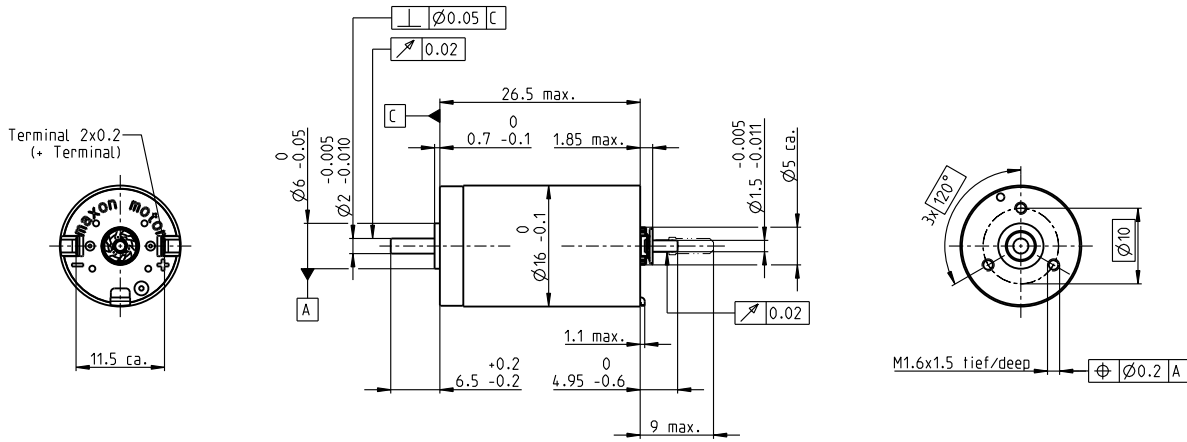
Bearing: Ball bearings preloaded/sleeve bearings
 Commutation: Precious metal brushes with CLL/graphite brushes
 Flange front/back: Standard flange/configurable flange/no flange
 Shaft front/back: Length/diameter/flat face
 Electric connection: Terminals or cable/alignment of connection/cable length/connector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

DCX 16 S Graphite Brushes

DC motor Ø16 mm



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



M 1:1

Motor Data

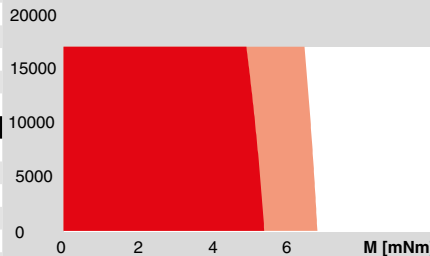
1_	Nominal voltage	V	6	9	12	18	24	48
2_	No load speed	rpm	12700	12700	13200	12700	12700	12600
3_	No load current	mA	63.9	42.6	35.4	22.4	16.8	8.28
4_	Nominal speed	rpm	9400	9400	9850	9260	9430	9250
5_	Nominal torque (max. continuous torque)	mNm	5.45	5.4	5.36	5.21	5.43	5.32
6_	Nominal current (max. continuous 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 ²	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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
294_GPX 16 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
295_GPX 16 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
296_GPX 16 HP	2-3 [4]	392_ENX 16 EASY	445_ESCON Module 50/5
298_GPX 19 A/C	3-4	393_ENX 16 EASY Abs.	447_ESCON 50/5
299_GPX 19 LN/LZ	3-4	399_ENX 16 RIO	452_EPOS4 Module/Comp. 24/1.5
300_GPX 19 HP	4		453_EPOS4 50/5
			453_EPOS4 Module/Comp. 50/5
			468_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

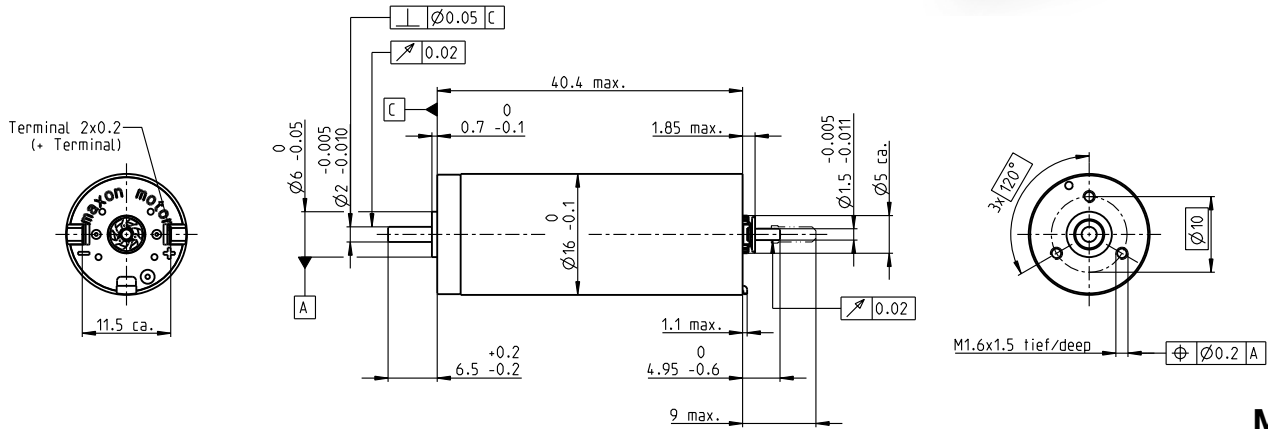
Configuration

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

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

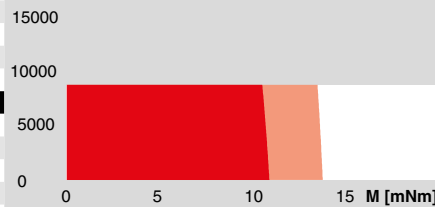
1_	Nominal voltage	V	3	6	9	12	18	24
2_	No load speed	rpm	6400	6620	6410	6400	6400	6560
3_	No load current	mA	62.5	32.6	20.8	15.6	10.4	8.05
4_	Nominal speed	rpm	5450	4920	4620	4490	4510	4630
5_	Nominal torque (max. continuous torque)	mNm	5.06	10.0	11.6	10.8	10.9	10.7
6_	Nominal current (max. continuous 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 ²	2.18	2.36	2.59	2.28	2.33	2.23

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...+85
	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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
294_GPX 16 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
295_GPX 16 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
296_GPX 16 HP	2-3 [4]	392_ENX 16 EASY	452_EPOS4 Module/Comp. 24/1.5
298_GPX 19 A/C	3-4	393_ENX 16 EASY Abs.	464_EPOS2 P 24/5
299_GPX 19 LN/LZ	3-4	399_ENX 16 RIO	468_MAXPOS 50/5
300_GPX 19 HP	4		

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	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

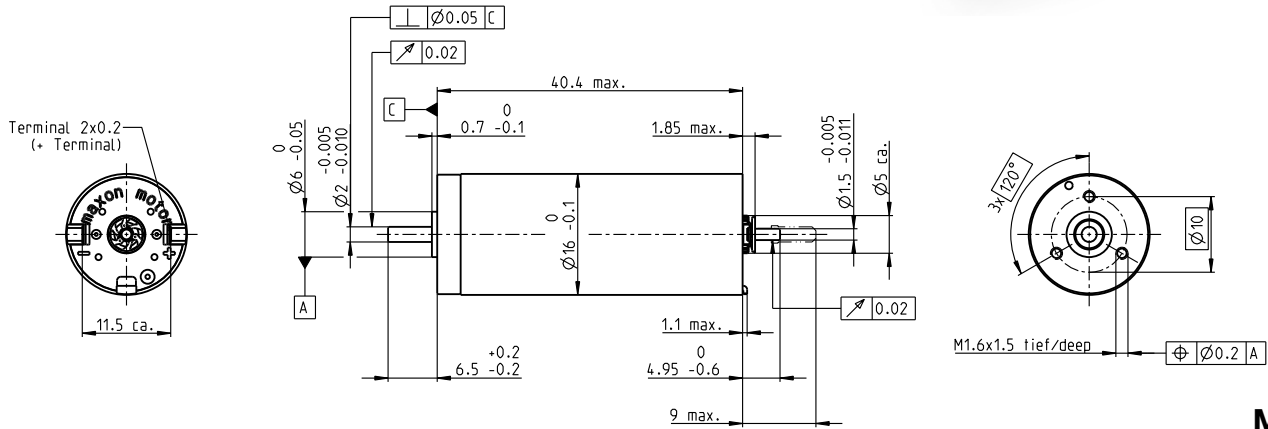
DCX 16 L Graphite Brushes

DC motor Ø16 mm

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



maxon DCX



M 1:1

Motor Data

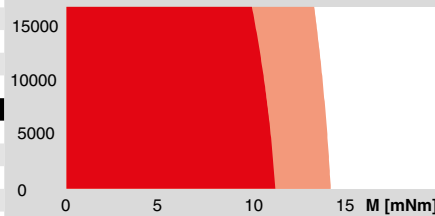
		6	9	12	18	24	36	
1_	Nominal voltage	V	6	9	12	18	24	36
2_	No load speed	rpm	12800	13100	13200	12800	12800	12800
3_	No load current	mA	73.5	50.7	38.6	24.5	18.4	12.3
4_	Nominal speed	rpm	11000	11000	10700	10600	10600	10700
5_	Nominal torque (max. continuous torque)	mNm	8.58	11.8	10.4	11.6	11.3	11.6
6_	Nominal 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 ²	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

	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
23_	294_GPX 16 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
24_	295_GPX 16 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
25_	300_GPX 16 HP	2-3 [4]	392_ENX 16 EASY	452_EPOS4 Module/Comp. 24/1.5
26_	298_GPX 19 A/C	3-4	393_ENX 16 EASY Abs.	453_EPOS4 50/5
27_	299_GPX 19 LN/LZ	3-4	399_ENX 16 RIO	453_EPOS4 Module/Comp. 50/5
28_	300_GPX 19 HP	4		464_EPOS2 P 24/5
				468_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

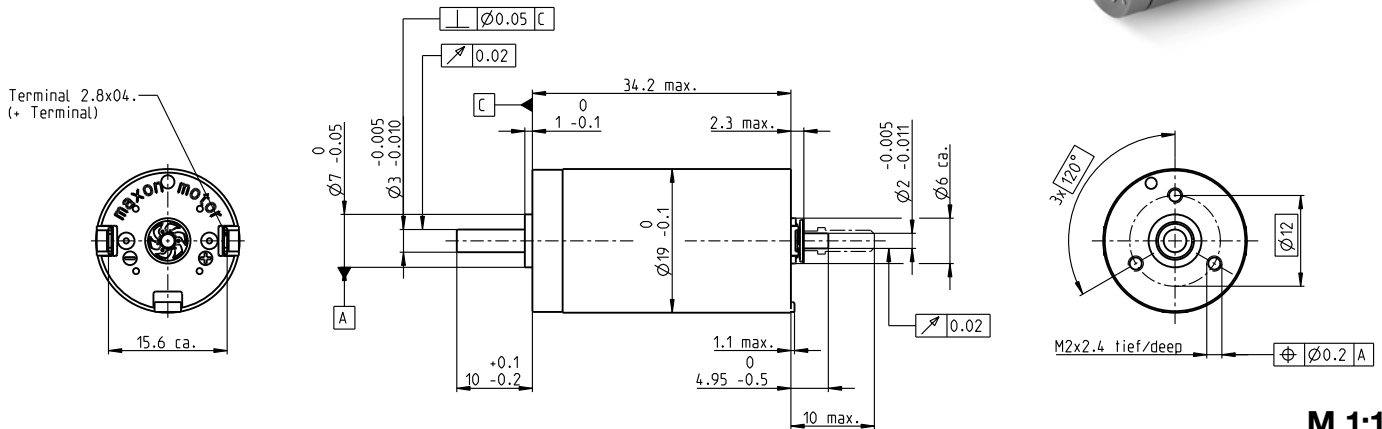
Bearing: Ball bearings preloaded/sleeve bearings
 Commutation: Precious metal brushes with CLL/graphite brushes
 Flange front/back: Standard flange/configurable flange/no flange
 Shaft front/back: Length/diameter/flat face
 Electric connection: Terminals or cable/alignment of connection/cable length/connector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

xdrives.maxonmotor.com

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

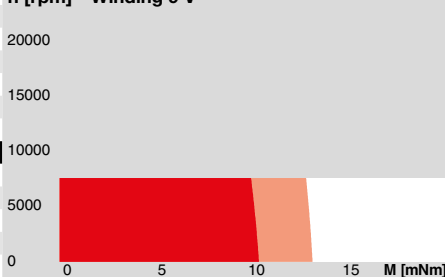
1_	Nominal voltage	V	4.5	6	9	12	18	24
2_	No load speed	rpm	6440	6350	6260	6360	6360	6350
3_	No load current	mA	72	53	34.6	26.5	17.7	13.2
4_	Nominal speed	rpm	5080	4540	4350	4490	4490	4480
5_	Nominal torque (max. continuous torque)	mNm	7.46	10.3	10.8	11.0	11.0	10.9
6_	Nominal current (max. continuous 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 ²	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

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	7500
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	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]

maxon Modular System

23_	Max. speed	rpm	7500	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
24_	Axial play	mm	0...0.2	298_GPX 19 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
24_	Preload	N	0	299_GPX 19 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
25_	Radial play	mm	0.02	300_GPX 19 HP	2-3 [4]	392_ENX 16 EASY	452_EPOS4 Module/Comp. 24/1.5
26_	Max. axial load (dynamic)	N	0.1	302_GPX 22 A/C	3-4	393_ENX 16 EASY Abs.	464_EPOS2 P 24/5
27_	Max. force for press fits (static)	N	80	303_GPX 22 LN/LZ	3-4	399_ENX 16 RIO	468_MAXPOS 50/5
27_	(static, shaft supported)	N	440	304_GPX 22 HP	4		
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

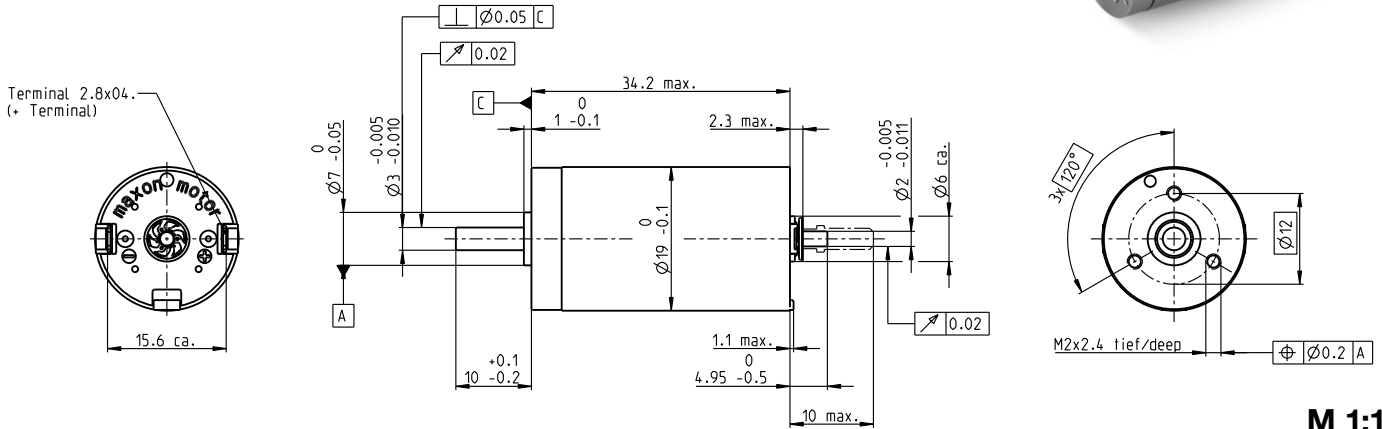
DCX 19 S Graphite Brushes

DC motor Ø19 mm

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



maxon DCX



M 1:1

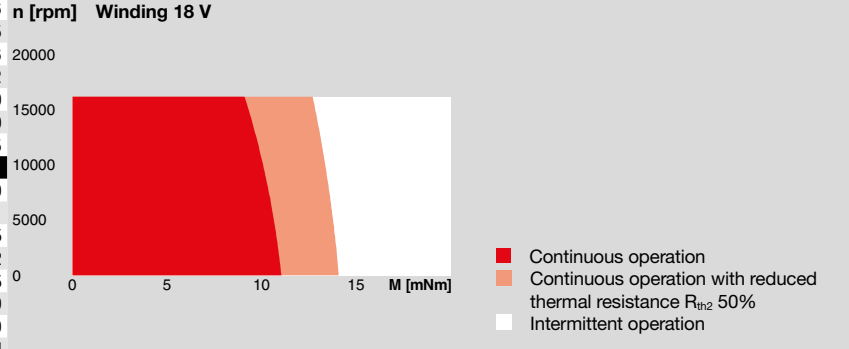
Motor Data

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 ²	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



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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
298_GPX 19 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
299_GPX 19 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
300_GPX 19 HP	2-3 [4]	392_ENX 16 EASY	445_ESCON Module 50/5
302_GPX 22 A/C	3-4	393_ENX 16 EASY Abs.	447_ESCON 50/5
303_GPX 22 LN/LZ	3-4	399_ENX 16 RIO	452_EPOS4 Module/Comp. 24/1.5
304_GPX 22 HP	4		453_EPOS4 50/5
			453_EPOS4 Module/Comp. 50/5
			464_EPOS2 P 24/5
			468_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

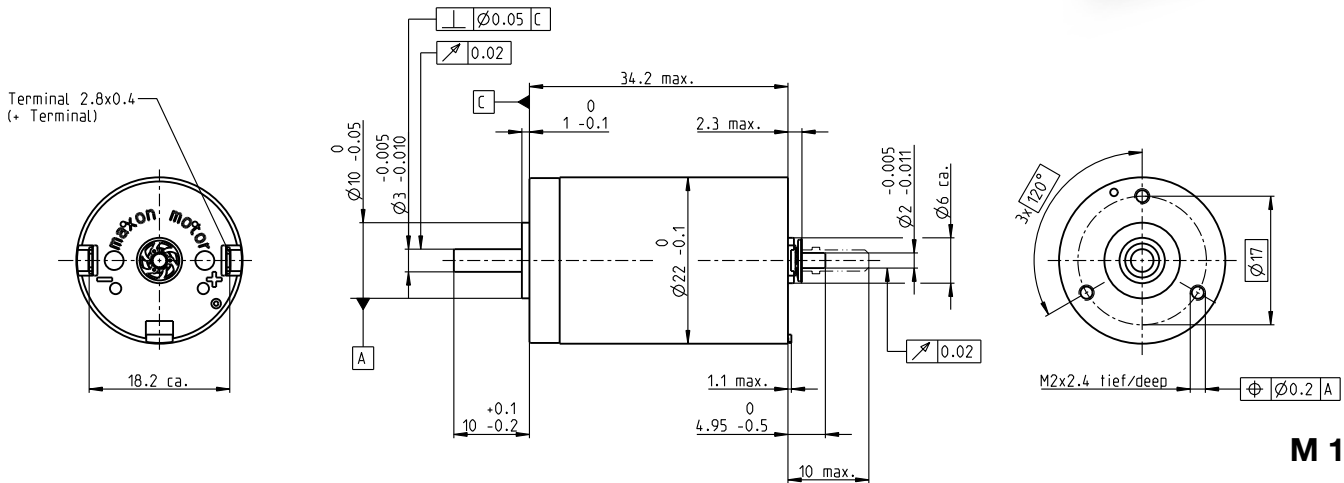
Bearing: Ball bearings preloaded/sleeve bearings
 Commutation: Precious metal brushes with CLL/graphite brushes
 Flange front/back: Standard flange/configurable flange/no flange
 Shaft front/back: Length/diameter/flat face
 Electric connection: Terminals or cable/alignment of connection/cable length/connector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

DCX 22 S Precious Metal Brushes

DC motor Ø22 mm



Key Data: 6/10 W, 14.5 mNm, 7160 rpm



Motor Data

1_	Nominal voltage	V	6	12	18	24	36	48
2_	No load speed	rpm	6200	6200	6110	6340	6550	5890
3_	No load current	mA	39.2	19.6	12.8	10.1	7.09	4.55
4_	Nominal speed	rpm	4960	4670	4560	4700	4940	4240
5_	Nominal torque (max. continuous torque)	mNm	10.7	14.7	14.5	13.6	13.8	13.6
6_	Nominal current (max. continuous current)	A	1.20	0.817	0.531	0.388	0.272	0.180
7_	Stall torque	mNm	53.7	59.7	57.5	52.7	56.5	48.6
8_	Stall current	A	5.85	3.25	2.06	1.47	1.08	0.63
9_	Max. efficiency	%	84	85	85	84	85	84
10_	Terminal resistance	Ω	1.02	3.69	8.75	16.3	33.3	76.2
11_	Terminal inductance	mH	0.058	0.231	0.535	0.881	1.86	4.08
12_	Torque constant	mNm/A	9.18	18.4	28.0	35.9	52.2	77.2
13_	Speed constant	rpm/V	1040	520	342	266	183	124
14_	Speed/torque gradient	rpm/mNm	116	104	107	121	117	122
15_	Mechanical time constant	ms	6.14	6.07	6.09	5.93	6.15	6.19
16_	Rotor inertia	gcm ²	5.05	5.55	5.44	4.67	5.03	4.84

Thermal data

17_	Thermal resistance housing-ambient	K/W	16	Operating Range				
18_	Thermal resistance winding-housing	K/W	7	n [rpm]	Winding 18 V			
19_	Thermal time constant winding	s	20	20000				
20_	Thermal time constant motor	s	528	15000				
21_	Ambient temperature ball bearings	°C	-40...85	10000				
21_	Ambient temperature sleeve bearings	°C	-30...85	5000				
22_	Max. winding temperature	°C	100	0				

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]					
28_	Max. radial load [mm from flange]	N	16 [5]					

Mechanical data sleeve bearings

23_	Max. speed	rpm	7160	maxon Modular System		
24_	Axial play	mm	0...0.2	maxon gear	Stages [opt.]	maxon sensor
24_	Preload	N	0	302_GPX 22 A/C	1-2 [3-4]	390_ENX 10 EASY
25_	Radial play	mm	0.02	303_GPX 22 LN/LZ	1-2 [3-4]	444_ESCON 36/2 DC
26_	Max. axial load (dynamic)	N	0.1	304_GPX 22 HP	2-3 [4]	392_ENX 16 EASY
27_	Max. force for press fits (static)	N	80	306_GPX 26 A/C	3	393_ENX 16 EASY Abs.
27_	(static, shaft supported)	N	440	307_GPX 26 LN/LZ	3	399_ENX 16 RIO
28_	Max. radial load [mm from flange]	N	3 [5]	308_GPX 26 HP	4	427_ENC AEDL 5810
						430_ENC 30 HEDS 5540
						431_ENC 30 HEDL 5540
						444_ESCON Module 24/2
						444_ESCON 36/2 DC
						445_ESCON Module 50/5
						447_ESCON 50/5
						452_EPOS4 Module/Comp. 24/1.5
						453_EPOS4 50/5
						453_EPOS4 Module/Comp. 50/5
						464_EPOS2 P 24/5
						468_MAXPOS 50/5

Other specifications

29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	66
32_	Typical noise level	dB(A)	48

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

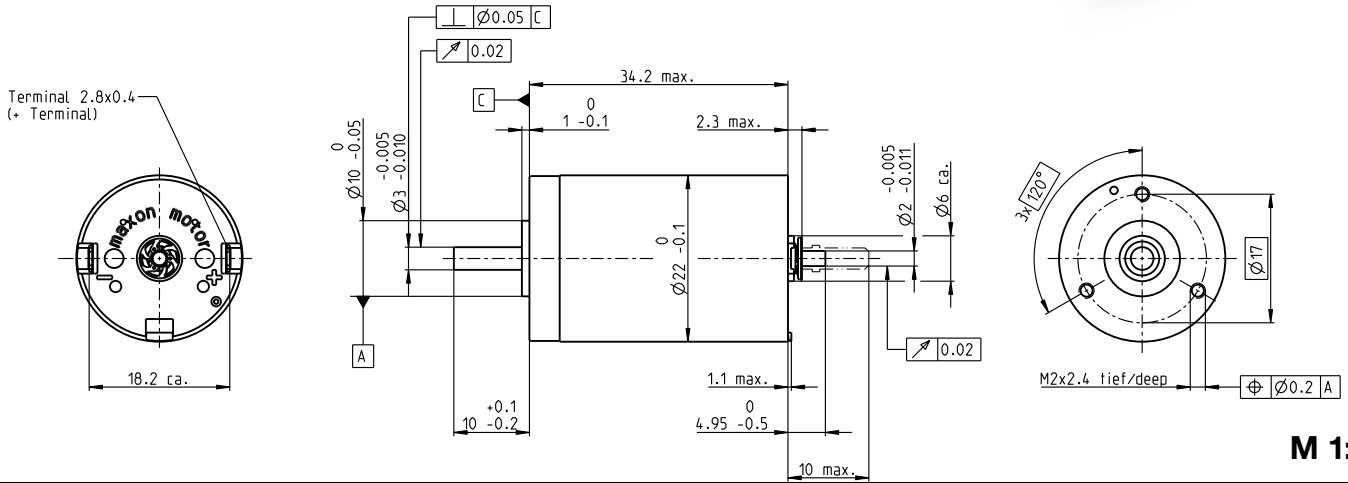
DCX 22 S Graphite Brushes

DC motor Ø22 mm



maxon DCX

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



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 ²	5.27	5.05	5.22	5.55	5.44	4.67

Thermal data

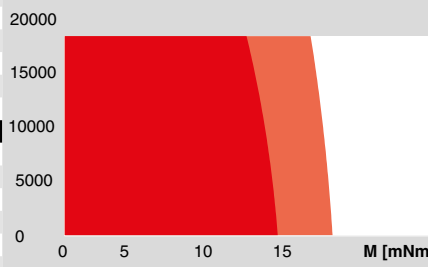
17_	Thermal resistance housing-ambient	K/W	16
18_	Thermal resistance winding-housing	K/W	7
19_	Thermal time constant winding	s	20
20_	Thermal time constant motor	s	528
21_	Ambient temperature ball bearings	°C	-40...+100
21_	Ambient temperature sleeve bearings	°C	-30...+100
22_	Max. winding temperature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

Mechanical data ball bearings

23_	Max. speed	rpm	18000
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]

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
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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
302_GPX 22 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
303_GPX 22 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
304_GPX 22 HP	2-3 [4]	392_ENX 16 EASY	445_ESCON Module 50/5
306_GPX 26 A/C	3	393_ENX 16 EASY Abs.	447_ESCON 50/5
307_GPX 26 LN/LZ	3	399_ENX 16 RIO	452_EPOS4 Module/Comp. 24/1.5
308_GPX 26 HP	4	427_ENC AEDL 5810	453_EPOS4 50/5
		430_ENC 30 HEDS 5540	453_EPOS4 Module/Comp. 50/5
		431_ENC 30 HEDL 5540	464_EPOS2 P 24/5
			468_MAXPOS 50/5

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

Configuration

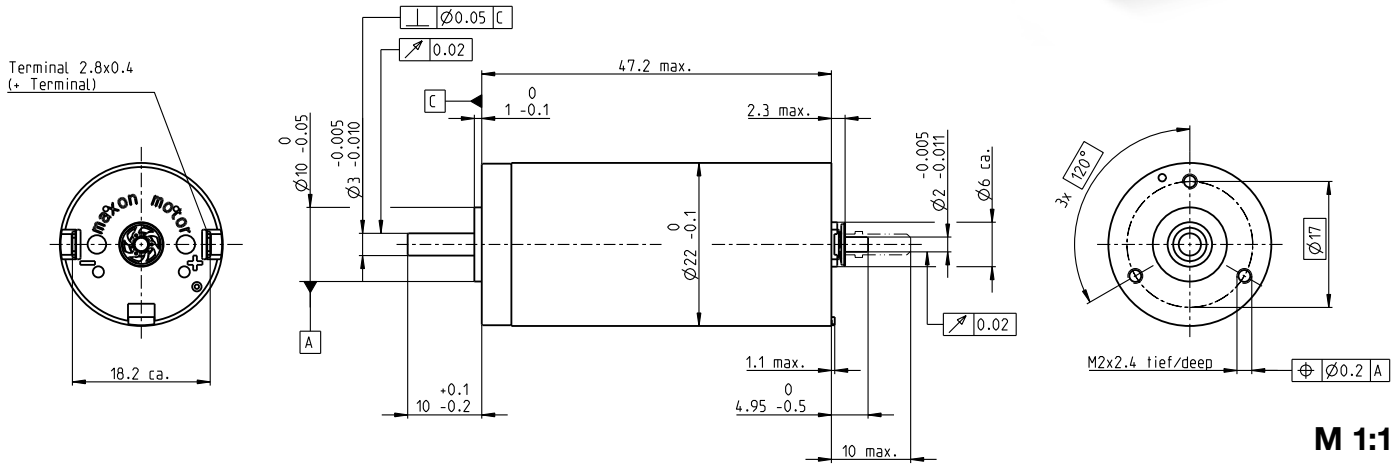
Bearing: Ball bearings preloaded/sleeve bearings
 Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
 Flange front/back: Standard flange/configurable flange/no flange
 Shaft front/back: Length/diameter/flat face
 Electric connection: Terminals or cable/alignment of connection/cable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

DCX 22 L Precious Metal Brushes

DC motor Ø22 mm



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



Motor Data

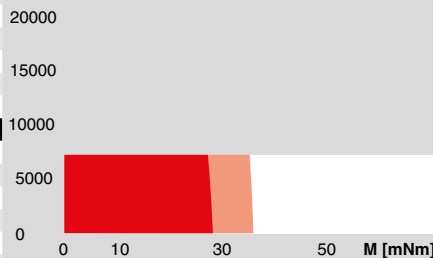
1_	Nominal voltage	V	6	9	12	18	24	36	48
2_	No load speed	rpm	5870	5870	4980	5740	5060	6020	5220
3_	No load current	mA	51.0	34	20.0	16.4	10.2	8.82	5.36
4_	Nominal speed	rpm	5380	5210	4000	4780	4070	5040	4180
5_	Nominal torque (max. continuous torque)	mNm	14.1	21.4	29.5	29.8	29.2	29.2	27.8
6_	Nominal current (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 ²	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

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	7160
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	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]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
302_GPX 22 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
303_GPX 22 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
304_GPX 22 HP	2-3 [4]	392_ENX 16 EASY	445_ESCON Module 50/5
306_GPX 26 A/C	3	393_ENX 16 EASY Abs.	447_ESCON 50/5
307_GPX 26 LN/LZ	3	399_ENX 16 RIO	452_EPOS4 Module/Comp. 24/1.5
308_GPX 26 HP	4	427_ENC AEDL 5810	453_EPOS4 50/5
		429_ENC 30 HEDS 5540	453_EPOS4 Module/Comp. 50/5
		431_ENC 30 HEDL 5540	464_EPOS2 P 24/5
			468_MAXPOS 50/5

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

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

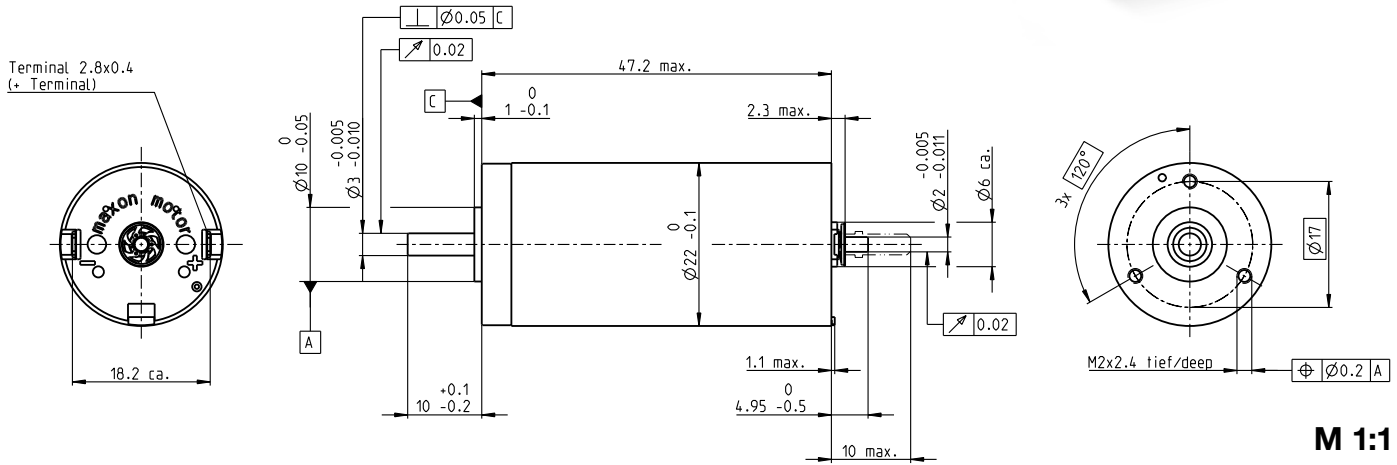
DCX 22 L Graphite Brushes

DC motor Ø22 mm

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



maxon DCX



Motor Data

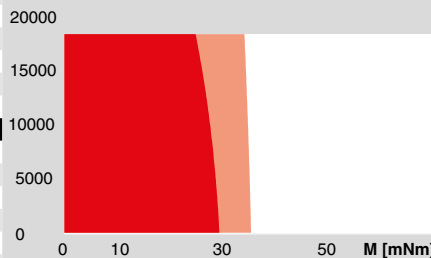
1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	12300	11700	11800	9970	11400	10100
3_	No load current	mA	118	81.8	54.6	31.8	26.3	16.2
4_	Nominal speed	rpm	11400	10700	10800	8920	10400	9020
5_	Nominal torque (max. continuous torque)	mNm	27.0	30.5	32.2	31.5	30.0	30.3
6_	Nominal current (max. 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 ²	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

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	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]

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]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
302_GPX 22 A/C	1-2 [3-4]	390_ENX 10 EASY	444_ESCON Module 24/2
303_GPX 22 LN/LZ	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON 36/2 DC
304_GPX 22 HP	2-3 [4]	392_ENX 16 EASY	445_ESCON Module 50/5
306_GPX 26 A/C	3	393_ENX 16 EASY Abs.	447_ESCON 50/5
307_GPX 26 LN/LZ	3	399_ENX 16 RIO	452_EPOS4 Module/Comp. 24/1.5
308_GPX 26 HP	4	427_ENC AEDL 5810	453_EPOS4 50/5
		429_ENC 30 HEDS 5540	453_EPOS4 Module/Comp. 50/5
		431_ENC 30 HEDL 5540	464_EPOS2 P 24/5
			468_MAXPOS 50/5

Other specifications

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

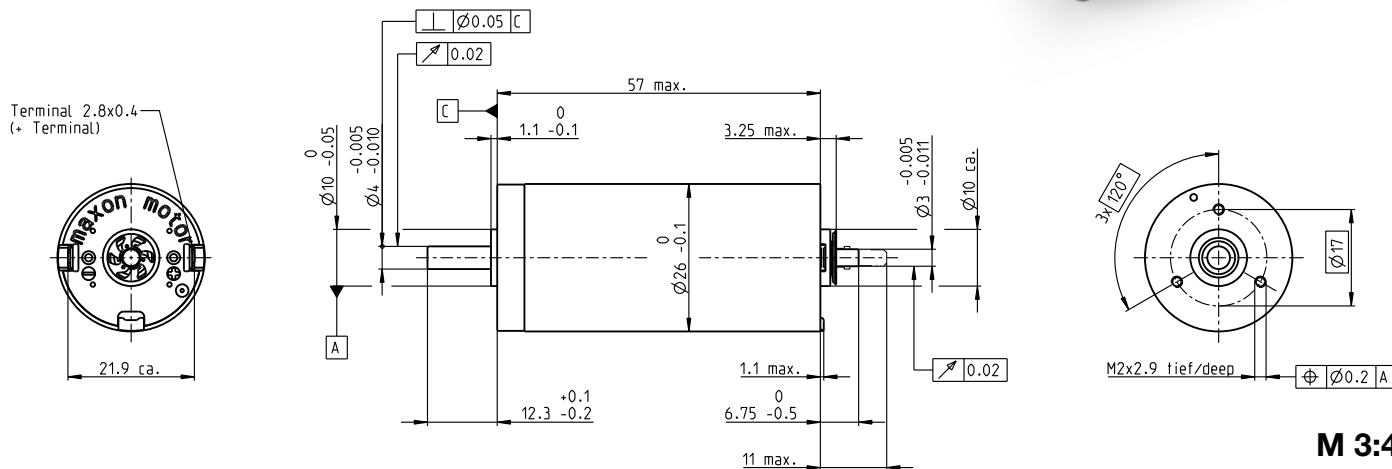
Configuration

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 26 L Precious Metal Brushes

DC motor Ø26 mm

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



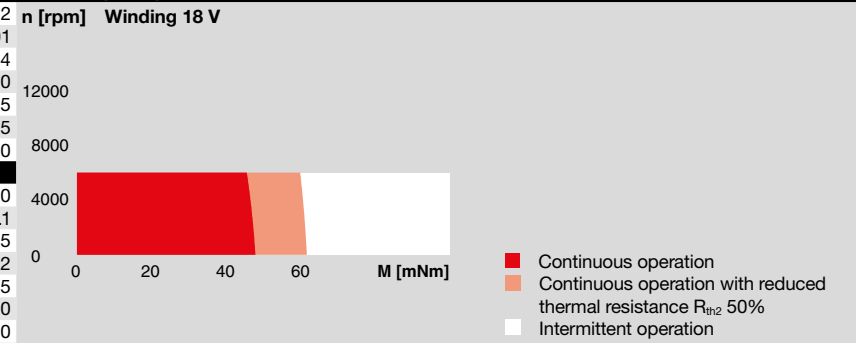
Motor Data

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 ²	21.3	21.4	19.4	21.2	20.1	19.7

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...+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	5900
24_	Axial play	mm	0...0.1
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	5.5
27_	Max. force for press fits (static)	N	40
28_	Max. radial load [mm from flange]	N	500
28_	Max. radial load [mm from flange]	N	20.5 [5]

Mechanical data sleeve bearings

23_	Max. speed	rpm	5900
24_	Axial play	mm	0...0.2
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
28_	Max. radial load [mm from flange]	N	500
28_	Max. radial load [mm from flange]	N	5.5 [5]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
306_GPX 26 A/C	1-2 [3]	390_ENX 10 EASY	444_ESCON 36/2 DC
307_GPX 26 LN/LZ	1-2 [3]	390_ENX 10 QUAD	445_ESCON Module 50/5
308_GPX 26 HP	2-3 [4]	392_ENX 16 EASY	447_ESCON 50/5
309_GPX 32 A/C	3	393_ENX 16 EASY Abs.	452_EPOS4 Module/Comp. 24/1.5
310_GPX 32 LN/LZ	3	399_ENX 16 RIO	453_EPOS4 50/5
311_GPX 32 HP	4	427_ENC AEDL 5810	453_EPOS4 Module/Comp. 50/5
		429_ENC 30 HEDS 5540	464_EPOS2 P 24/5
		431_ENC 30 HEDL 5540	468_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

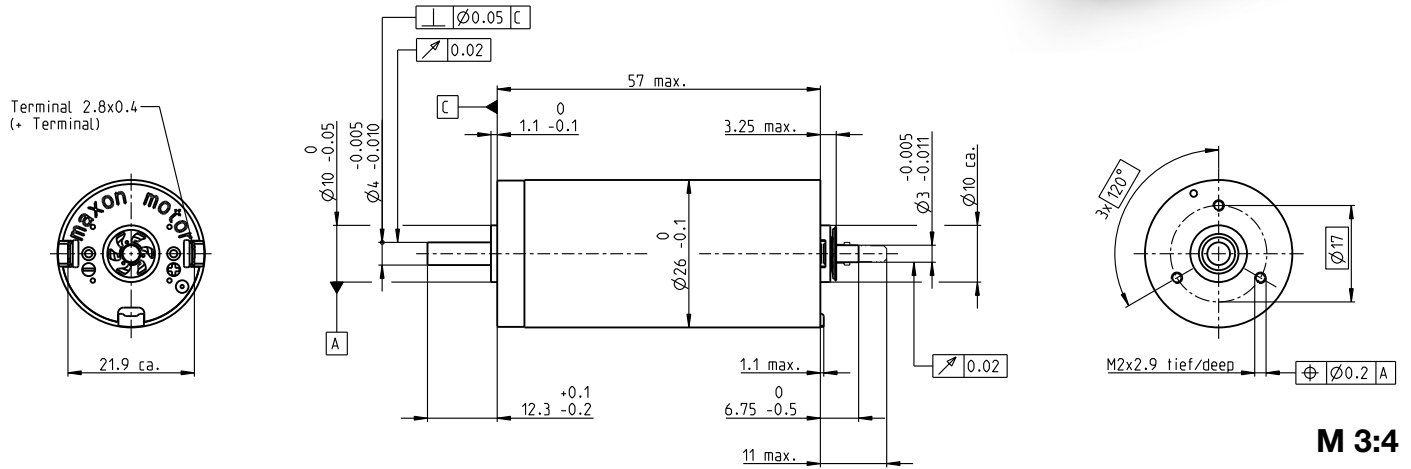
DCX 26 L Graphite Brushes

DC motor Ø26 mm

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



maxon DCX



M 3:4

Motor Data

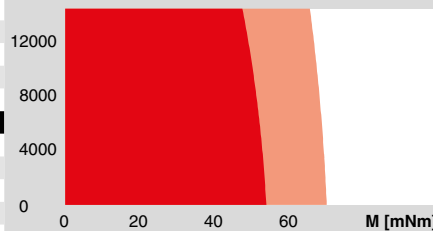
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	10600	11100	10700	11100	10700	10900
3_	No load current	mA	131	93	65.7	46.5	32.9	27.3
4_	Nominal speed	rpm	9460	10000	9690	10000	9730	10000
5_	Nominal torque (max. continuous torque)	mNm	46.9	54.3	57.8	54	59.1	59.8
6_	Nominal current (max. continuous 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 ²	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.]	maxon sensor	maxon motor control
306_GPX 26 A/C	1-2 [3]	390_ENX 10 EASY	444_ESCON 36/2 DC
307_GPX 26 LN/LZ	1-2 [3]	390_ENX 10 QUAD	445_ESCON Module 50/5
308_GPX 26 HP	2-3 [4]	392_ENX 16 EASY	447_ESCON 50/5
309_GPX 32 A/C	3	393_ENX 16 EASY Abs.	453_EPOS4 50/5
310_GPX 32 LN/LZ	3	399_ENX 16 RIO	453_EPOS4 Module/Comp. 50/5
311_GPX 32 HP	4	427_ENC AEDL 5810	464_EPOS2 P 24/5
		429_ENC 30 HEDS 5540	468_MAXPOS 50/5
		431_ENC 30 HEDL 5540	

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).

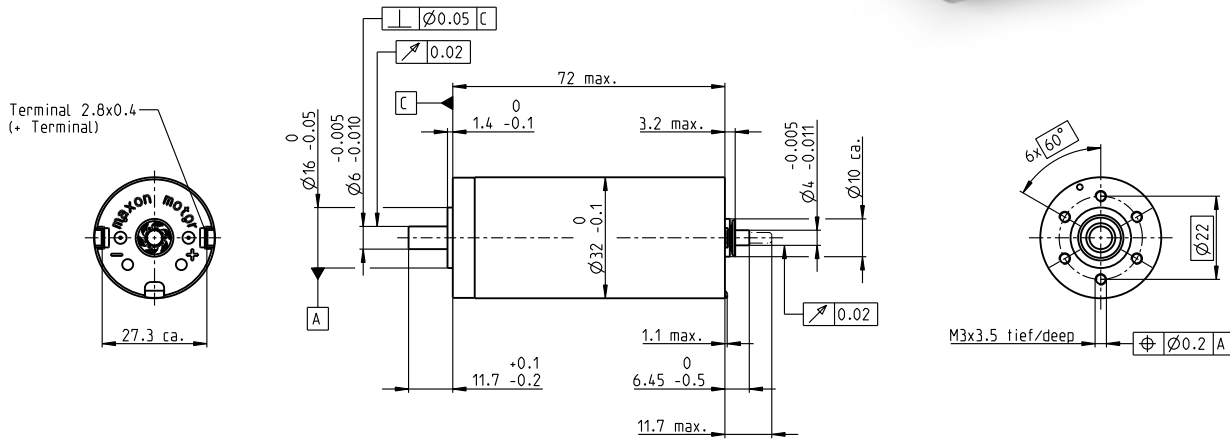
Configuration

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

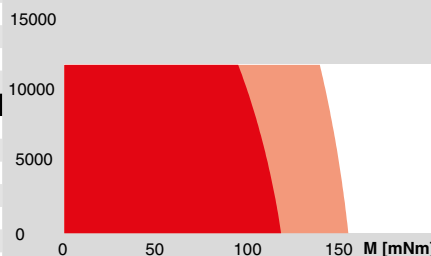
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	7120	8630	8270	7940	7780	5840
3_	No load current	mA	274	234	164	103	75.2	41.6
4_	Nominal speed	rpm	6560	8070	7710	7410	7260	5290
5_	Nominal torque (max. continuous torque)	mNm	89.4	101	108	119	123	128
6_	Nominal current (max. continuous current)	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 ²	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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
309_GPX 32 A/C	1-2 [3]	390_ENX 10 EASY	445_ESCON Module 50/5
310_GPX 32 LN/LZ	1-2 [3]	390_ENX 10 QUAD	446_ESCON Module 50/8 HE
311_GPX 32 HP	2-3 [4]	392_ENX 16 EASY	447_ESCON 50/5
312_GPX 37 A	3	393_ENX 16 EASY Abs.	447_ESCON 70/10
313_GPX 37 LN/LZ	3	399_ENX 16 RIO	453_EPOS4 50/5
		425_ENC 2RMHF	453_EPOS4 Module/Comp. 50/5
		427_ENC AEDL 5810	454_EPOS4 Module/Comp. 50/8
		429_ENC 30 HEDS 5540	456_EPOS4 70/15
		431_ENC 30 HEDL 5540	464_EPOS2 P 24/5
			468_MAXPOS 50/5

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

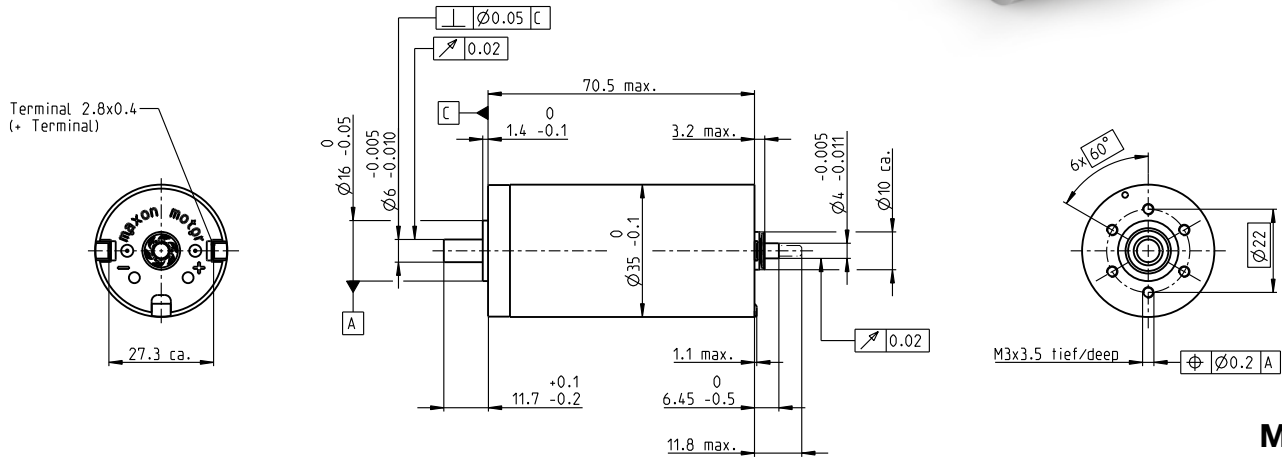
DCX 35 L Graphite Brushes

DC motor Ø35 mm

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



maxon DCX



M 1:2

Motor Data

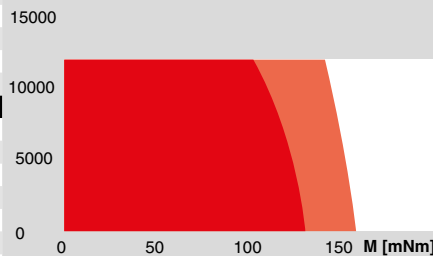
1_	Nominal voltage	V	12	18	24	36	48	60
2_	No load speed	rpm	8130	7200	7720	7940	6670	7690
3_	No load current	mA	320	177	146	101	58.6	57.5
4_	Nominal speed	rpm	7610	6640	7160	7410	6140	7160
5_	Nominal torque (max. continuous torque)	mNm	77.7	120	121	128	138	132
6_	Nominal current (max. continuous current)	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 ²	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

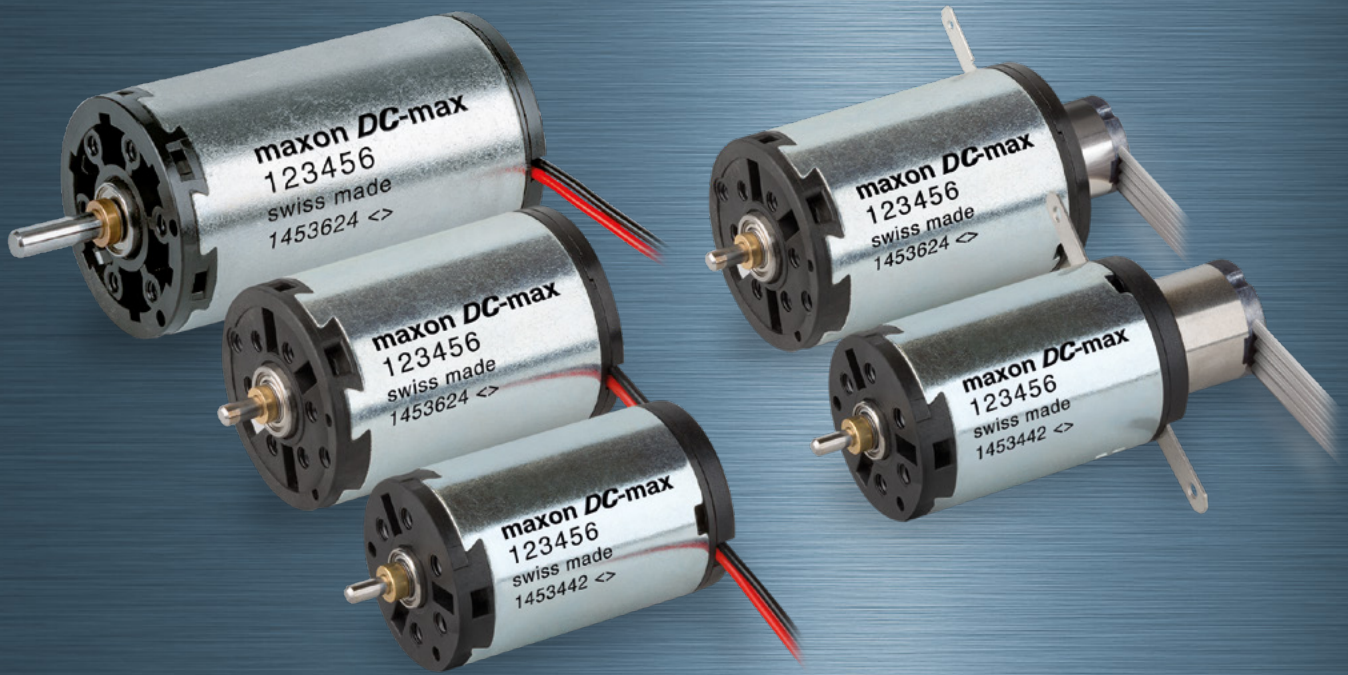
maxon gear	Stages [opt.]	maxon sensor	maxon motor control
312_GPX 37 A	1-2	390_ENX 10 EASY	445_ESCON Module 50/5
313_GPX 37 LN/LZ	1-2	390_ENX 10 QUAD	446_ESCON Module 50/8 HE
314_GPX 42 C	1-4	392_ENX 16 EASY	447_ESCON 50/5
		393_ENX 16 EASY Abs.	447_ESCON 70/10
		399_ENX 16 RIO	453_EPOS4 50/5
		425_ENC 2RMHF	453_EPOS4 Module/Comp. 50/5
		427_ENC AEDL 5810	454_EPOS4 Module/Comp. 50/8
		429_ENC 30 HEDS 5540	456_EPOS4 70/15
		431_ENC 30 HEDL 5540	464_EPOS2 P 24/5
			468_MAXPOS 50/5

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

xdrives.maxonmotor.com

For your personal notes.



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

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

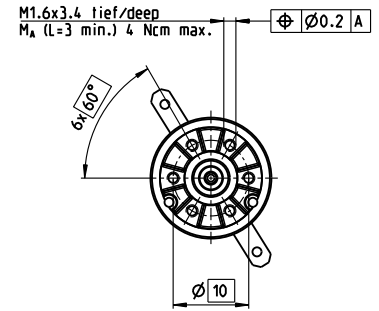
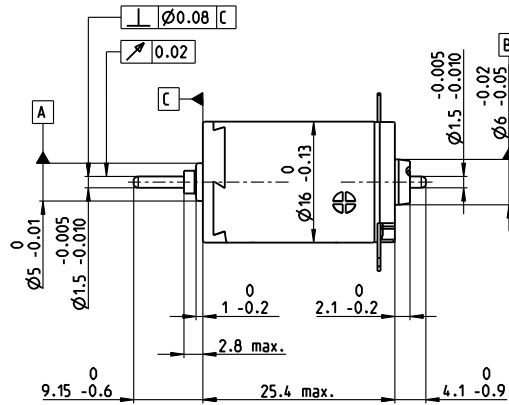
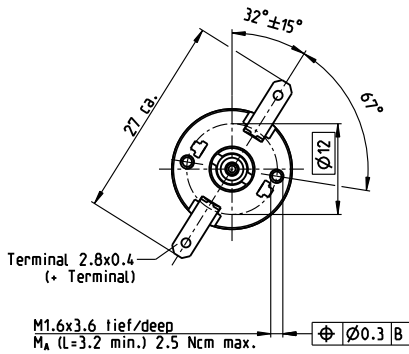
Standard Specification No. 100	60
Explanation of the DC motors	64
DCX Program	66-87
DC-max Program	90-95
RE Program	98-134
A-max Program	137-162

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

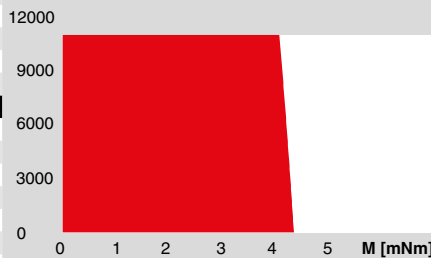
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	7890	7560	7470
3_	No load current	mA	14.7	6.90	3.40
4_	Nominal speed	rpm	4830	4390	4210
5_	Nominal torque (max. continuous torque)	mNm	4.06	3.92	3.80
6_	Nominal current (max. continuous current)	A	0.577	0.267	0.128
7_	Stall torque	mNm	10.5	9.44	8.75
8_	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 ²	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

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	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]

Other specifications

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

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
294_GPX 16 A/C	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON Module 24/2
295_GPX 16 LN/LZ	1-2 [3-4]	390_ENX 10 EASY	444_ESCON 36/2 DC
298_GPX 19 A/C	3-4		452_EPOS4 Module/Comp. 24/1.5
299_GPX 19 LN/LZ	3-4		468_MAXPOS 50/5

Configuration

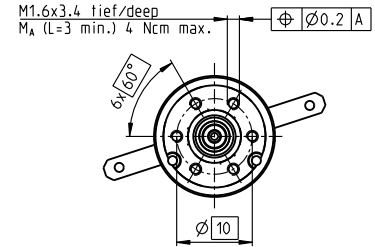
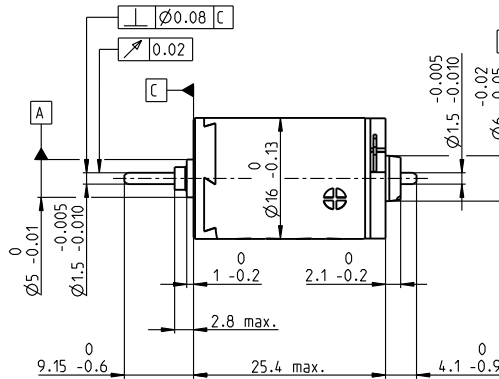
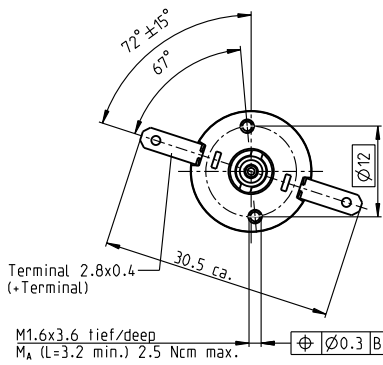
Bearing: Sleeve bearings/ball bearings
 Commutation: Precious metal brushes with CLL/Graphite Brushes
 Shaft front/back: Length
 Electric connection: Terminals/cable

DC-max 16 S Graphite Brushes

DC motor Ø16 mm



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



M 1:1

Motor Data

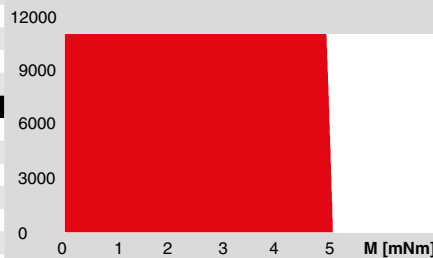
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	9870	9860	9920
3_	No load current	mA	67.3	33.6	16.8
4_	Nominal speed	rpm	6770	6200	6580
5_	Nominal torque (max. continuous torque)	mNm	3.71	4.31	4.76
6_	Nominal current (max. continuous current)	A	0.720	0.413	0.227
7_	Stall torque	mNm	12.1	11.9	14.4
8_	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 ²	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

n [rpm] Winding 24 V



- 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
			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]

Other specifications

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

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
294_GPX 16 A/C	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON Module 24/2
295_GPX 16 LN/LZ	1-2 [3-4]	390_ENX 10 EASY	444_ESCON 36/2 DC
298_GPX 19 A/C	3-4		452_EPOS4 Module/Comp. 24/1.5
299_GPX 19 LN/LZ	3-4		468_MAXPOS 50/5

Configuration

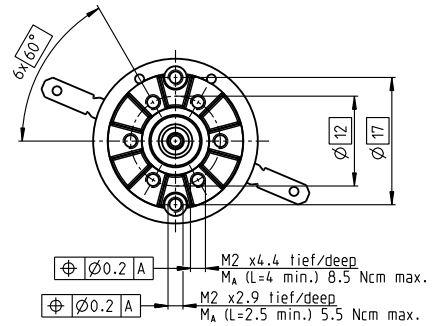
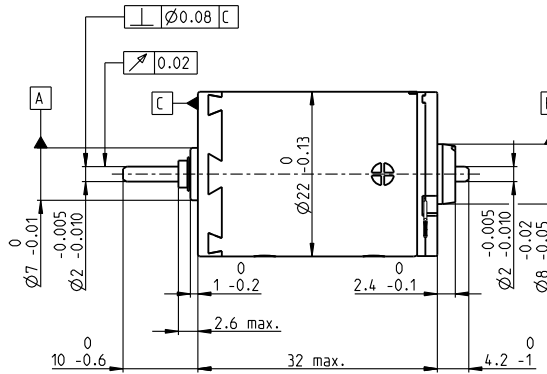
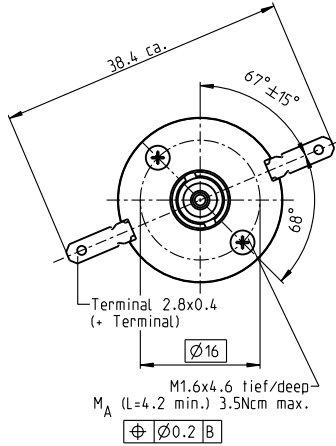
Bearing: Sleeve bearings/ball bearings
 Commutation: Precious metal brushes with CLL/Graphite Brushes
 Shaft front/back: Length
 Electric connection: Terminals/cable

DC-max 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

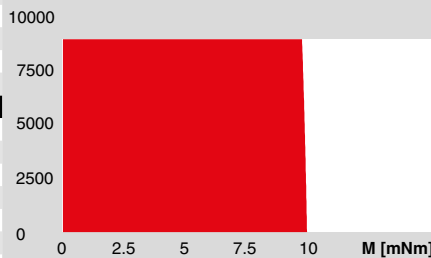
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	5480	5890	5090
3_	No load current	mA	20.8	11.7	4.62
4_	Nominal speed	rpm	4280	4240	3440
5_	Nominal torque (max. continuous torque)	mNm	8.54	10.3	10.4
6_	Nominal current (max. continuous current)	A	0.840	0.543	0.236
7_	Stall torque	mNm	39.0	36.9	33.3
8_	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 ²	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

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	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	0.15...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
		N	2.8 [5]

Other specifications

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

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
302_GPX 22 A/C	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON Module 24/2
303_GPX 22 LN/LZ	1-2 [3-4]	390_ENX 10 EASY	444_ESCON 36/2 DC
306_GPX 26 A/C	3		452_EPOS4 Module/Comp. 24/1.5
307_GPX 26 LN/LZ	3		468_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

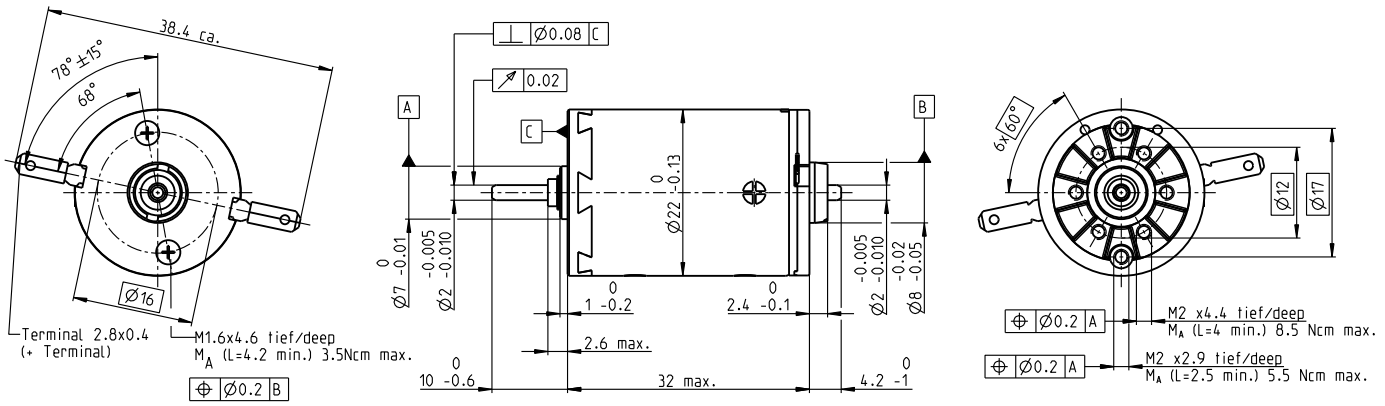
DC-max 22 S Graphite Brushes

DC motor Ø22 mm



maxon DC-max

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



M 1:1

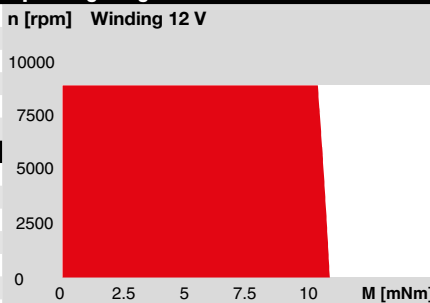
Motor Data

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 ²	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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
302_GPX 22 A/C	1-2 [3-4]	390_ENX 10 QUAD	444_ESCON Module 24/2
303_GPX 22 LN/LZ	1-2 [3-4]	390_ENX 10 EASY	444_ESCON 36/2 DC
306_GPX 26 A/C	3		452_EPOS4 Module/Comp. 24/1.5
307_GPX 26 LN/LZ	3		468_MAXPOS 50/5

Other specifications

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

Configuration

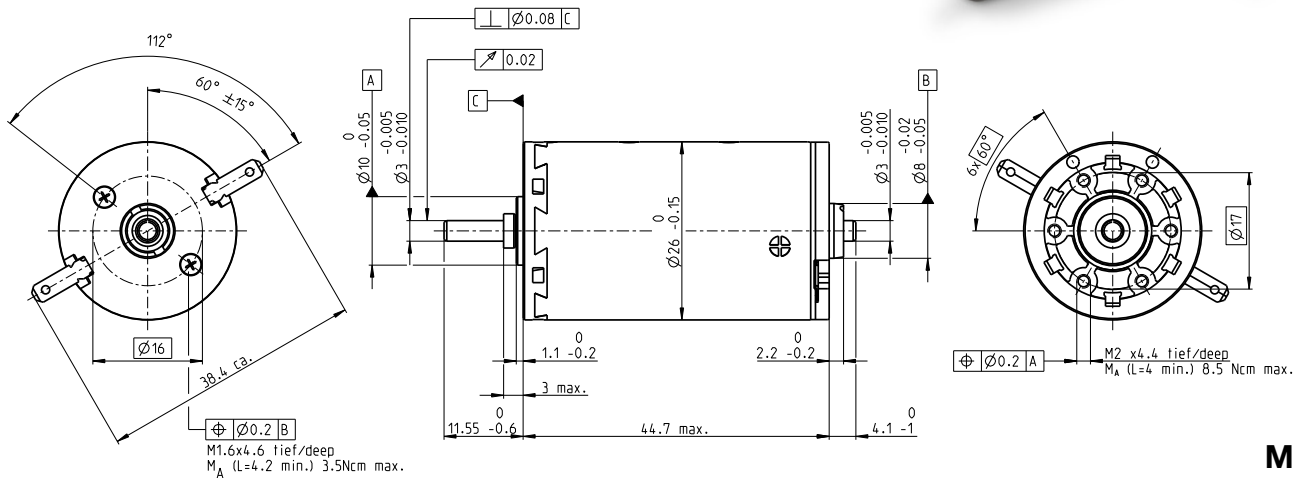
Bearing: Sleeve bearings/ball bearings
 Commutation: Precious metal brushes with CLL/Graphite Brushes
 Shaft front/back: Length
 Electric connection: Terminals/cable

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

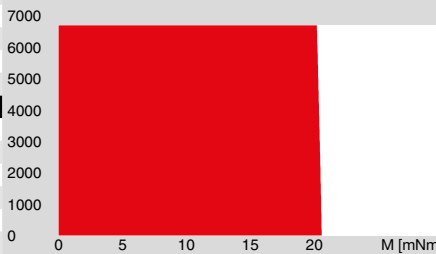
1_	Nominal voltage	V	12	24
2_	No load speed	rpm	4460	4370
3_	No load current	mA	27.1	13.2
4_	Nominal speed	rpm	3790	3450
5_	Nominal torque (max. continuous torque)	mNm	20.8	28.8
6_	Nominal current (max. continuous current)	A	0.84	0.564
7_	Stall torque	mNm	140	138
8_	Stall current	A	5.49	2.64
9_	Max. 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 ²	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
		N	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
		N	5.5 [5]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
306_GPX 26 A/C	1-2 [3]	390_ENX 10 QUAD	444_ESCON Module 24/2
307_GPX 26 LN/LZ	1-2 [3]	392_ENX 16 EASY	444_ESCON 36/2 DC
309_GPX 32 A/C	3	393_ENX 16 EASY Abs.	445_ESCON Module 50/5
310_GPX 32 LN/LZ	3		447_ESCON 50/5
			452_EPOS4 Module/Comp. 24/1.5
			453_EPOS4 50/5
			453_EPOS4 Module/Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Other specifications

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

Configuration

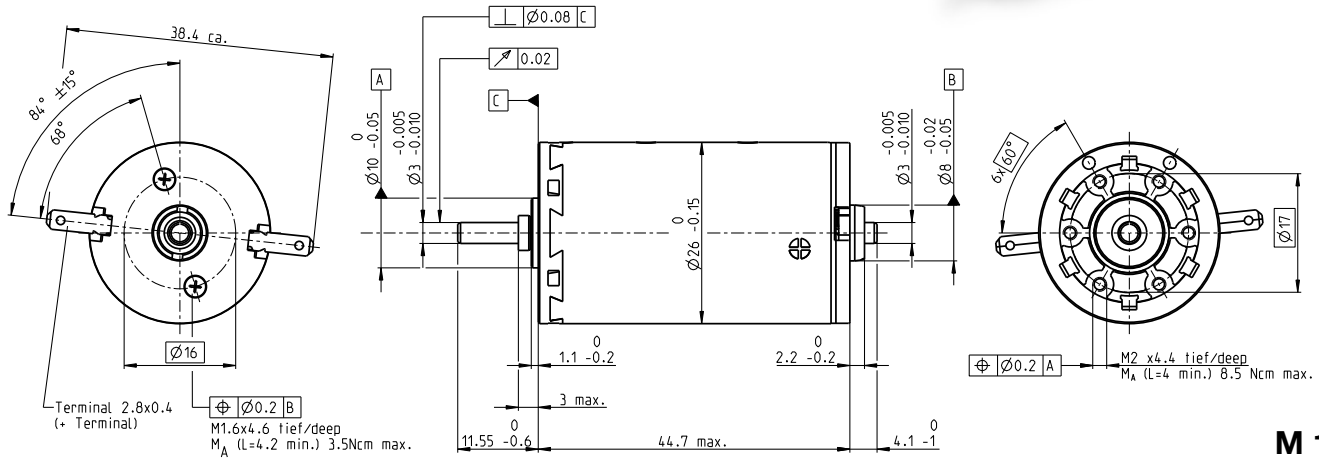
Bearing: Sleeve bearings/ball bearings
 Commutation: Precious metal brushes with CLL/Graphite Brushes
 Shaft front/back: Length
 Electric connection: Terminals/cable

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

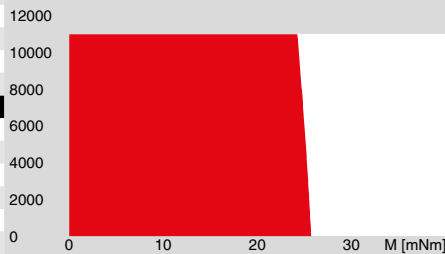
1_	Nominal voltage	V	24	48
2_	No load speed	rpm	8920	8730
3_	No load current	mA	53	25.7
4_	Nominal speed	rpm	8100	7840
5_	Nominal torque (max. continuous torque)	mNm	26.3	28.3
6_	Nominal current (max. continuous current)	A	1.08	0.567
7_	Stall torque	mNm	287	277
8_	Stall current	A	11.2	5.31
9_	Max. efficiency	%	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 ²	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_{th2} 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
		N	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
		N	5.5 [5]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
306_GPX 26 A/C	1-2 [3]	390_ENX 10 QUAD	444_ESCON Module 24/2
307_GPX 26 LN/LZ	1-2 [3]	392_ENX 16 EASY	444_ESCON 36/2 DC
309_GPX 32 A/C	3	393_ENX 16 EASY Abs.	445_ESCON Module 50/5
310_GPX 32 LN/LZ	3		447_ESCON 50/5
			452_EPOS4 Module/Comp. 24/1.5
			453_EPOS4 50/5
			453_EPOS4 Module/Comp. 50/5
			464_EPOS2 P 24/5
			468_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.



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

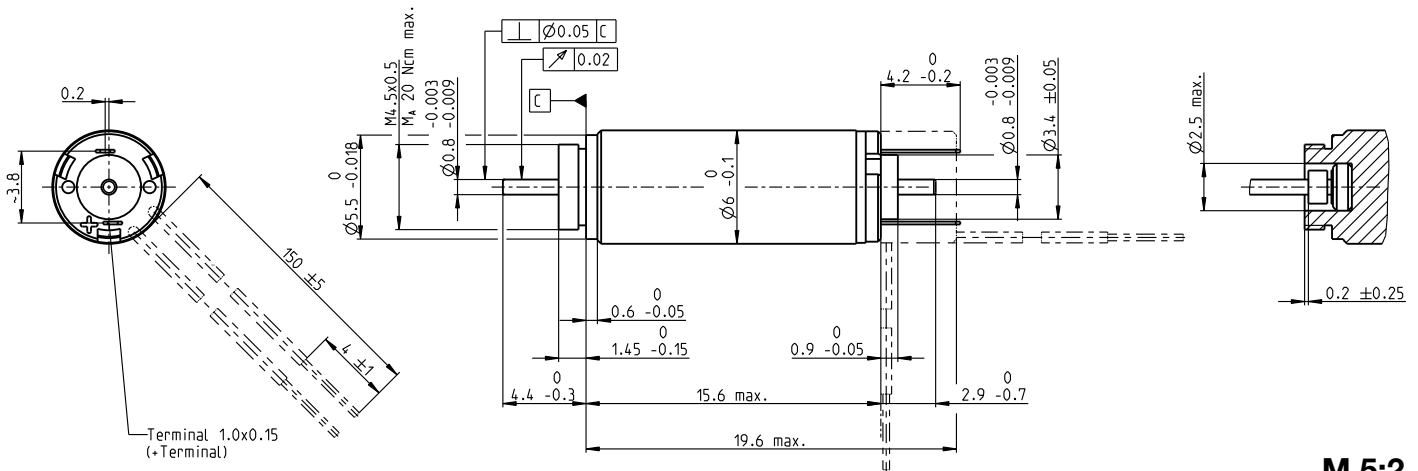
Contact
information

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.

Standard Specification No. 100	60
Explanation of the DC motors	64
DCX Program	66-87
DC-max Program	90-95
RE Program	98-134
A-max Program	137-162

RE 6 Ø6 mm, Precious Metal Brushes, 0.3 Watt



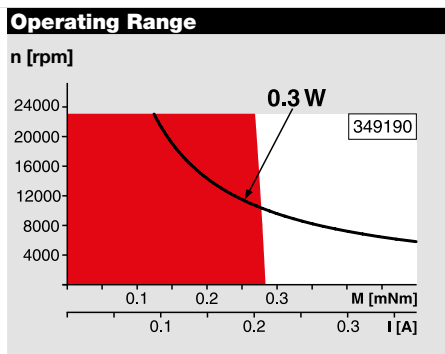
M 5:2

- Stock program
- Standard program
- Special program (on request)

		Part Numbers			
B with cables		386780	386781	386782	386783
A with terminals		349189	349190	349191	349192

Motor Data					
Values at nominal voltage					
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
Characteristics					
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 ²	0.015	0.0167	0.0163	0.0162

Specifications	
Thermal data	
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
Mechanical data (sleeve bearings)	
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
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	5
31 Weight of motor	2.3 g



Comments

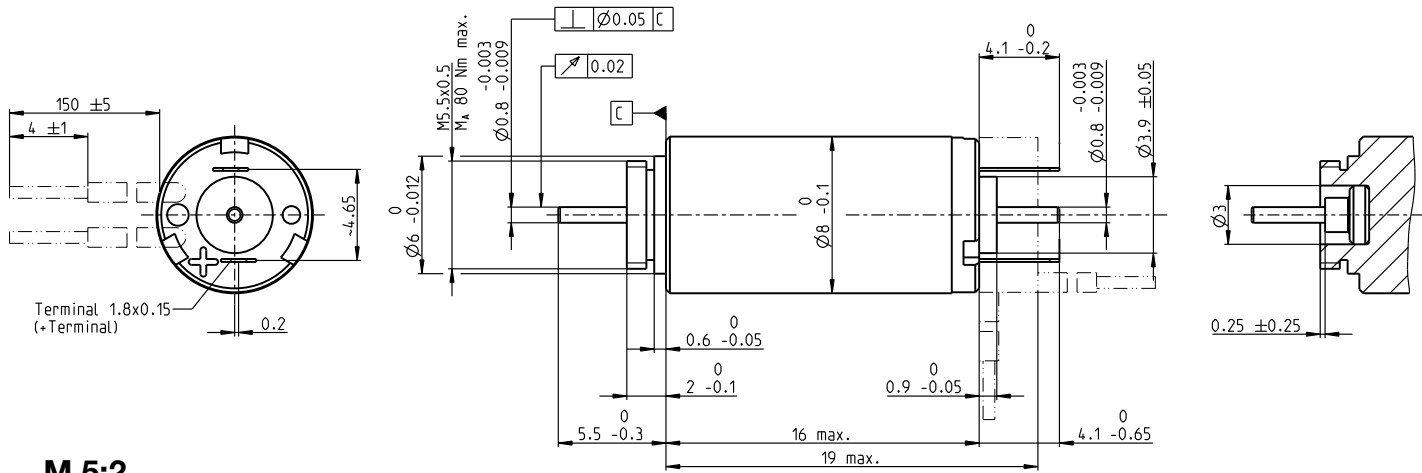
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

Values listed in the table are nominal. Explanation of the figures on page 64.

maxon Modular System Overview on page 28–36

<p>Planetary Gearhead Ø6 mm 0.002 - 0.03 Nm Page 317</p> <p>Screw Drive Ø6 mm Page 365–366</p>		<p>Recommended Electronics: Notes Page 30</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p>
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RE 8 Ø8 mm, Precious Metal Brushes, 0.5 Watt



M 5:2

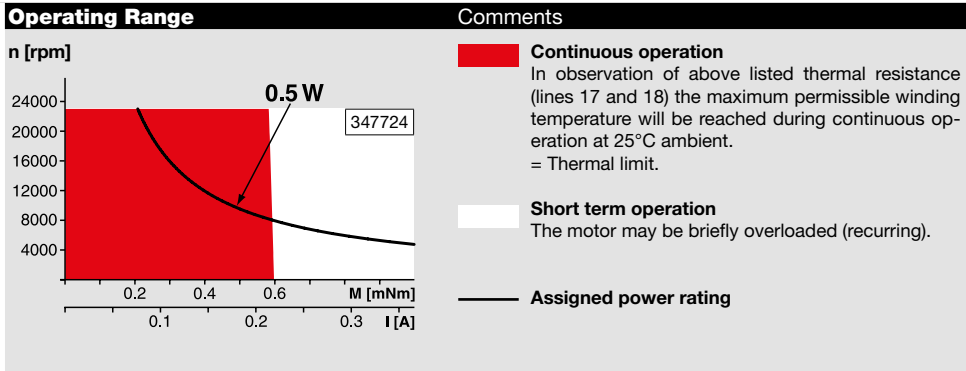
- Stock program
- Standard program
- Special program (on request)

		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 ²	0.0388	0.0383	0.0375	0.0358	0.0387	0.0355	

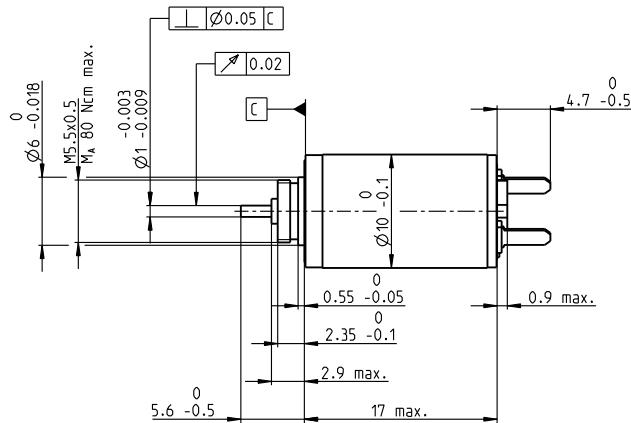
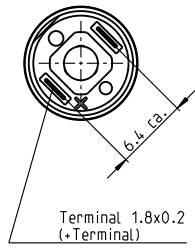
Specifications		
Thermal data		
17	Thermal resistance housing-ambient	48 K/W
18	Thermal resistance winding-housing	22 K/W
19	Thermal time constant winding	2.96 s
20	Thermal time constant motor	21.3 s
21	Ambient temperature	-20...+65°C
22	Max. winding temperature	+85°C
Mechanical data (sleeve bearings)		
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 64.



maxon Modular System		Overview on page 28-36
<p>Planetary Gearhead Ø8 mm 0.01 - 0.1 Nm Page 318</p> <p>Screw Drive Ø8 mm Page 367-368</p>		<p>Recommended Electronics: Page 30</p> <p>Notes</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p> <p>EPOS4 Mod./Comp. 24/1.5 452</p>
		<p>for type A: Encoder MR 100 CPT, 2 channels Page 414</p> <p>for type A: Encoder 8 OPT 50 CPT, 2 channels Page 422</p>

RE 10 Ø10 mm, Precious Metal Brushes, 0.75 Watt



M 3:2

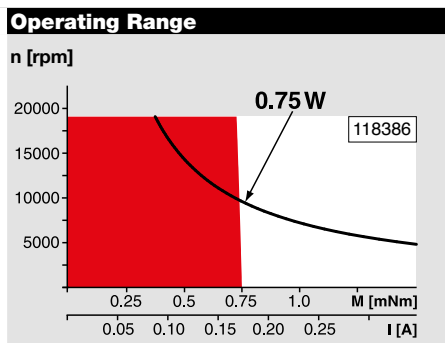
- Stock program
- Standard program
- Special program (on request)

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 ²	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	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	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	7 g



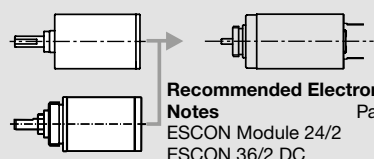
Comments

- 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 Overview on page 28-36

Planetary Gearhead
 Ø10 mm
 0.005 - 0.1 Nm
 Page 319

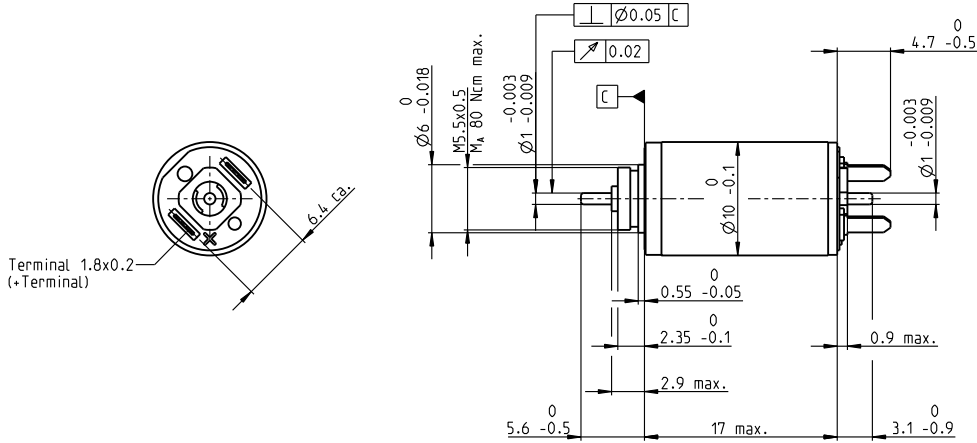
Planetary Gearhead
 Ø10 mm
 0.01 - 0.15 Nm
 Page 320



Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
EPOS4 Mod./Comp. 24/1.5	452

RE 10 Ø10 mm, Precious Metal Brushes, 0.75 Watt



M 3:2

- Stock program
- Standard program
- Special program (on request)

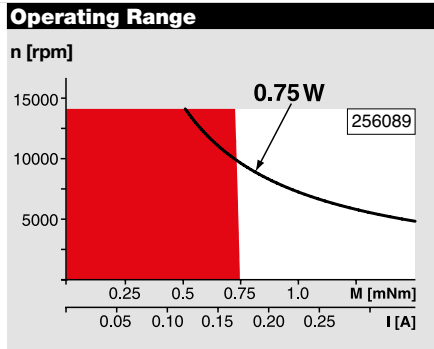
Part Numbers

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 ²	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



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 64.

maxon Modular System

Planetary Gearhead
Ø10 mm
0.005 - 0.1 Nm
Page 319

Planetary Gearhead
Ø10 mm
0.01 - 0.15 Nm
Page 320

Recommended Electronics:

Notes Page 30

ESCON Module 24/2 444

ESCON 36/2 DC 444

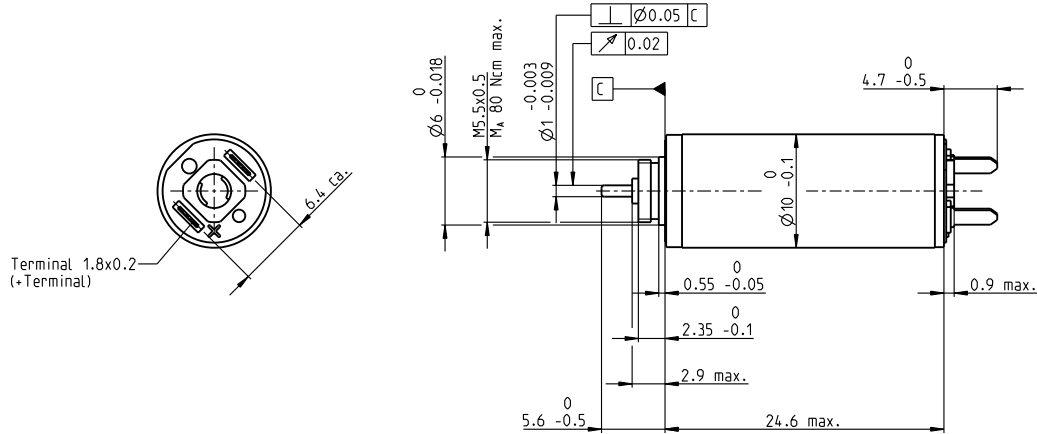
EPOS4 Mod./Comp. 24/1.5 452

Encoder MR
16 CPT,
2 channels
Page 413

Encoder MR
64 - 256 CPT,
2 channels
Page 414

Encoder MEnc
Ø10 mm
12 CPT, 2 channels
Page 406

RE 10 Ø10 mm, Precious Metal Brushes, 1.5 Watt



M 3:2

- Stock program
- Standard program
- Special program (on request)

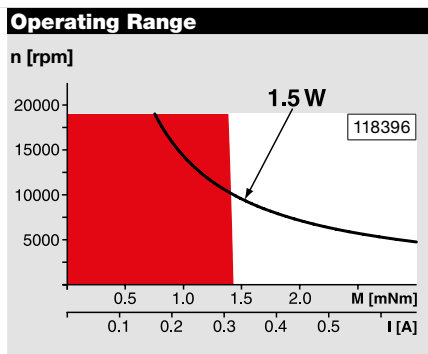
Part Numbers

118392	118393	118394	118395	118396	118397	118398	118399	118400
--------	--------	--------	--------	--------	--------	--------	--------	--------

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 ²	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

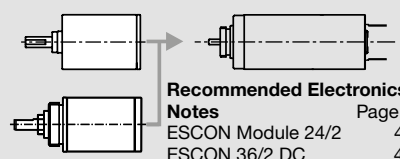
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	10 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

maxon Modular System Overview on page 28-36

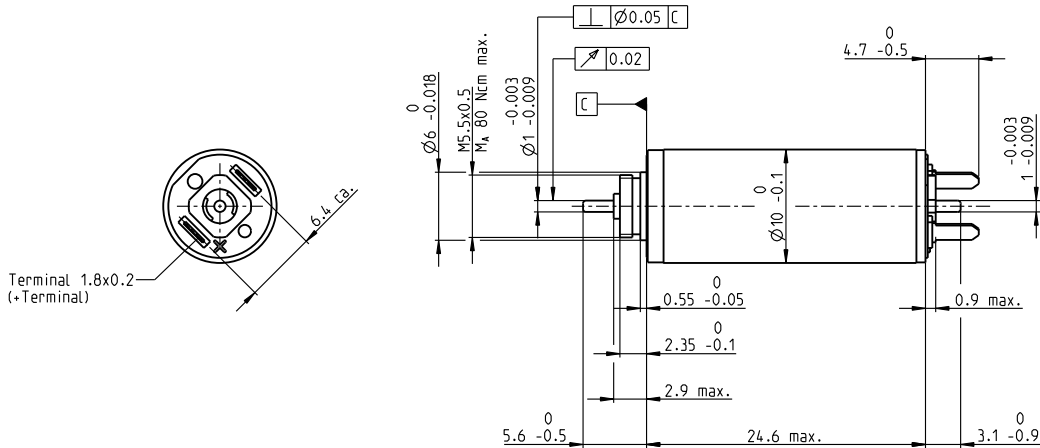
Planetary Gearhead
Ø10 mm
0.005 - 0.1 Nm
Page 319

Planetary Gearhead
Ø10 mm
0.01 - 0.15 Nm
Page 320



Recommended Electronics:
Notes Page 30
ESCON Module 24/2 444
ESCON 36/2 DC 444

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																					
Values at nominal voltage																					
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										
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 ²	0.104	0.102	0.102	0.1	0.105	0.113	0.109	0.11	0.111										

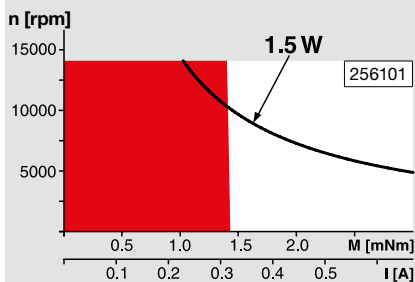
Specifications

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	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	10 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

Operating Range



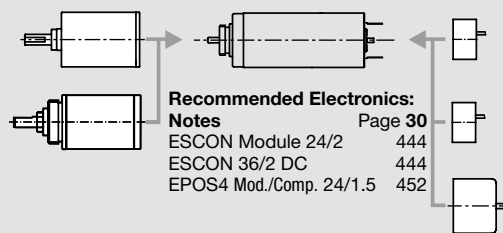
Comments

- 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

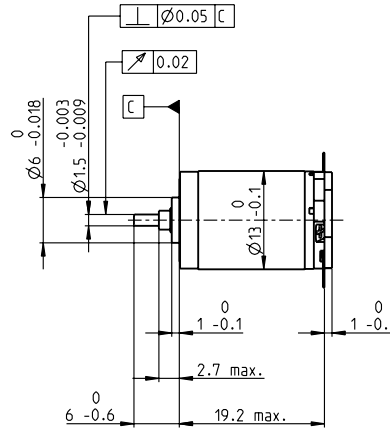
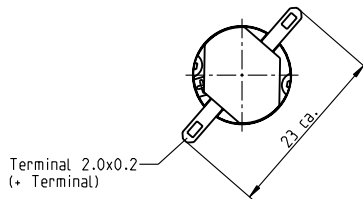
Overview on page 28-36

- Planetary Gearhead**
Ø10 mm
0.005 - 0.1 Nm
Page 319
- Planetary Gearhead**
Ø10 mm
0.01 - 0.15 Nm
Page 320



- Encoder MR**
16 CPT,
2 channels
Page 413
- Encoder MR**
64 - 256 CPT,
2 channels
Page 414
- Encoder MEnc**
Ø10 mm
12 CPT, 2 channels
Page 406

RE 13 Ø13 mm, Precious Metal Brushes, 1.2 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

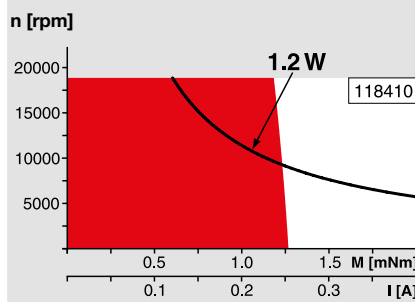
Motor Data

	118401	118402	118403	118404	118405	118406	118407	118408	118409	118410	118411	118412	118413	118414	118415	
Values at nominal voltage																
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
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	1.6
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 ²	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	12 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**

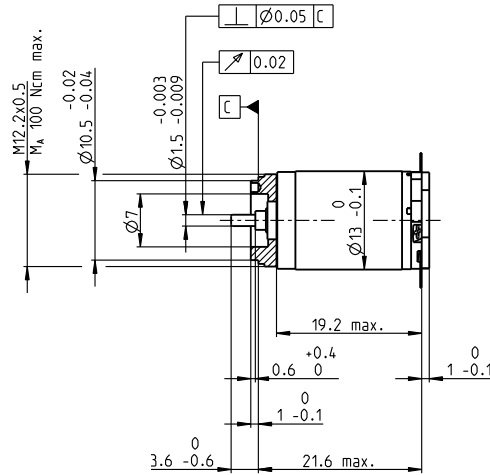
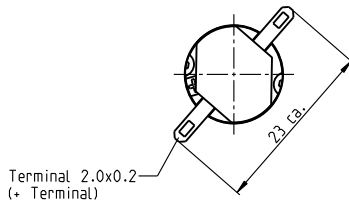
maxon Modular System

Overview on page 28-36

Values listed in the table are nominal.
Explanation of the figures on page 64.

Recommended Electronics:
Notes Page 30
 ESCON Module 24/2 444
 ESCON 36/2 DC 444

RE 13 Ø13 mm, Precious Metal Brushes, 1.2 Watt



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 ²	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

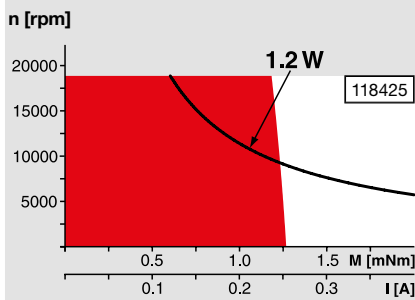
Specifications

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 64.

Operating Range

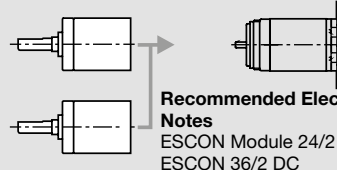


Comments

- 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

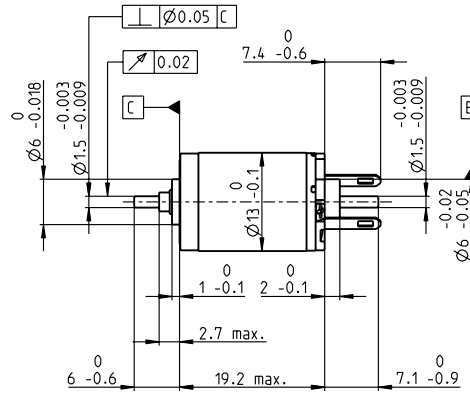
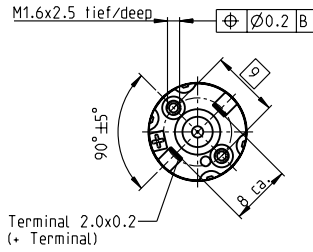
- Planetary Gearhead**
Ø13 mm
0.05 - 0.15 Nm
Page 322
- Planetary Gearhead**
Ø13 mm
0.2 - 0.35 Nm
Page 323



- Recommended Electronics:**
Notes Page 30
- ESCON Module 24/2 444
- ESCON 36/2 DC 444

Overview on page 28-36

RE 13 Ø13 mm, Precious Metal Brushes, 0.75 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

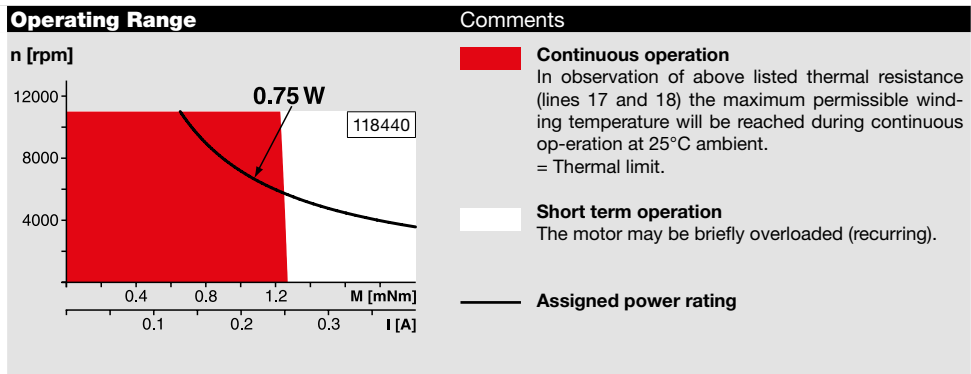
Part Numbers

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 ²	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	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	1.4 N
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 64.



maxon Modular System Overview on page 28-36

Recommended Electronics:

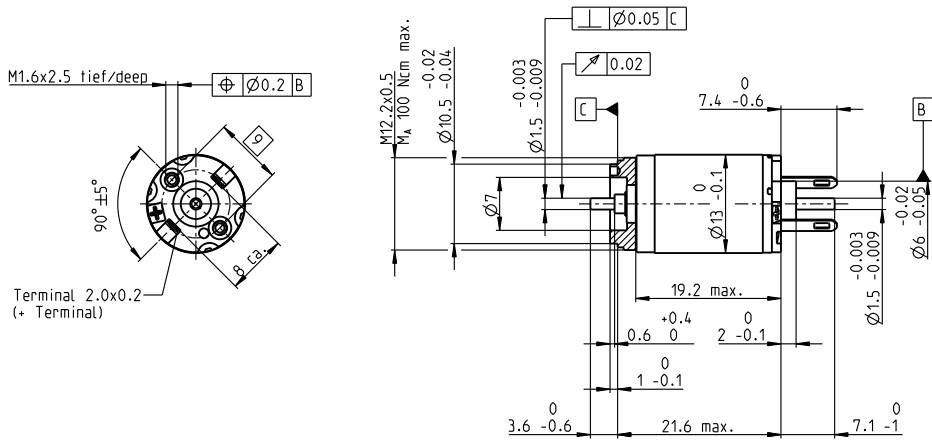
Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

Encoder MR
16 CPT,
2 channels
Page 413

Encoder MR
64 - 256 CPT,
2 channels
Page 414/415

Encoder MEnc
Ø13 mm
16 CPT, 2 channels
Page 407

RE 13 Ø13 mm, Precious Metal Brushes, 0.75 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

118446	118447	118448	118449	118450	118451	118452	118453	118454	118455	118456	118457	118458	118459	118460
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data		118446	118447	118448	118449	118450	118451	118452	118453	118454	118455	118456	118457	118458	118459	118460
Values at nominal voltage																
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	1.61	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
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 ²	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

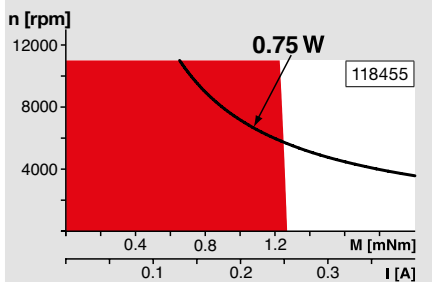
Specifications

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	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	170 N
	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 64.

Operating Range



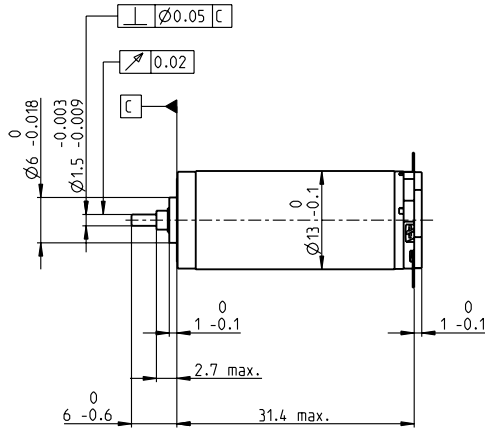
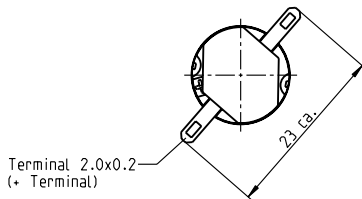
Comments

- 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

<p>Planetary Gearhead Ø13 mm 0.05 - 0.15 Nm Page 322</p> <p>Planetary Gearhead Ø13 mm 0.2 - 0.35 Nm Page 323</p>	<p>Recommended Electronics:</p> <p>Notes</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p> <p>MAXPOS 50/5 468</p> <p>Page 30</p>	<p style="text-align: right;">Overview on page 28-36</p> <p>Encoder MR 16 CPT, 2 channels Page 413</p> <p>Encoder MR 64 - 256 CPT, 2 channels Page 414/415</p> <p>Encoder MEnc Ø13 mm 16 CPT, 2 channels Page 407</p>
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RE 13 Ø13 mm, Precious Metal Brushes, 2.5 Watt



M 1:1

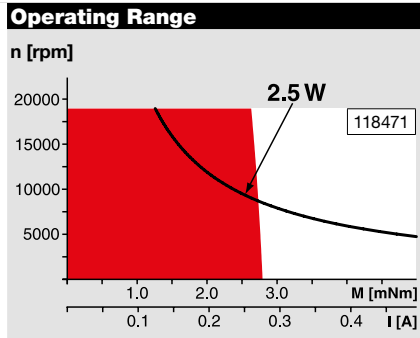
- Stock program
- Standard program
- Special program (on request)

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 ²	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).

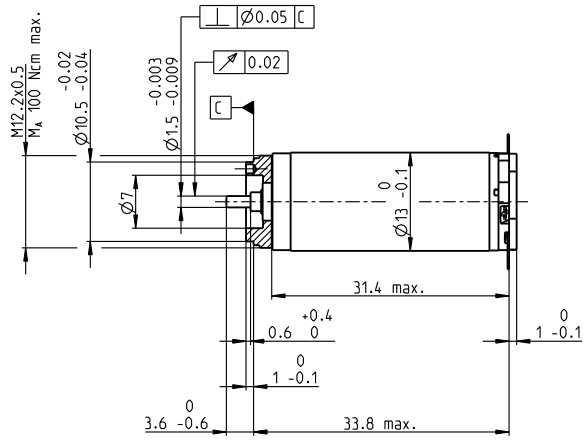
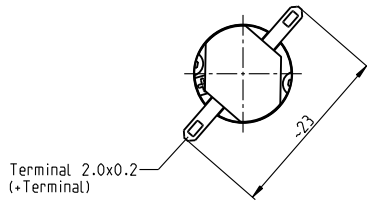
Assigned power rating

maxon Modular System Overview on page 28-36

Recommended Electronics:	
Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447

Values listed in the table are nominal.
Explanation of the figures on page 64.

RE 13 Ø13 mm, Precious Metal Brushes, 2.5 Watt



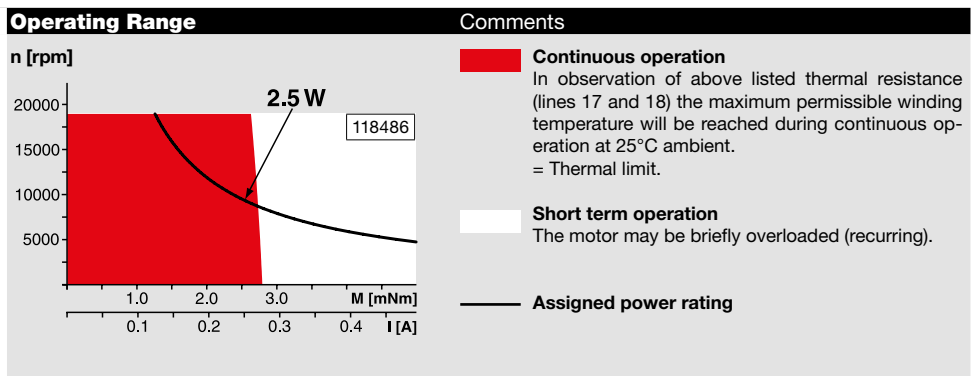
M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

Motor Data		118476	118477	118478	118479	118480	118481	118482	118483	118484	118485	118486	118487	118488	118489	118490
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 ²	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



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 Overview on page 28-36

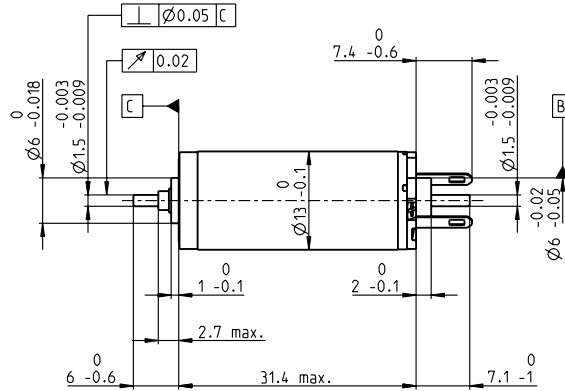
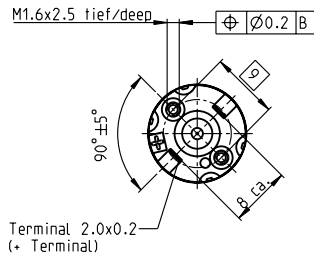
Planetary Gearhead
 Ø13 mm
 0.05 - 0.15 Nm
 Page 322

Planetary Gearhead
 Ø13 mm
 0.2 - 0.35 Nm
 Page 323

Recommended Electronics:
Notes Page 30

ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447

RE 13 Ø13 mm, Precious Metal Brushes, 2 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

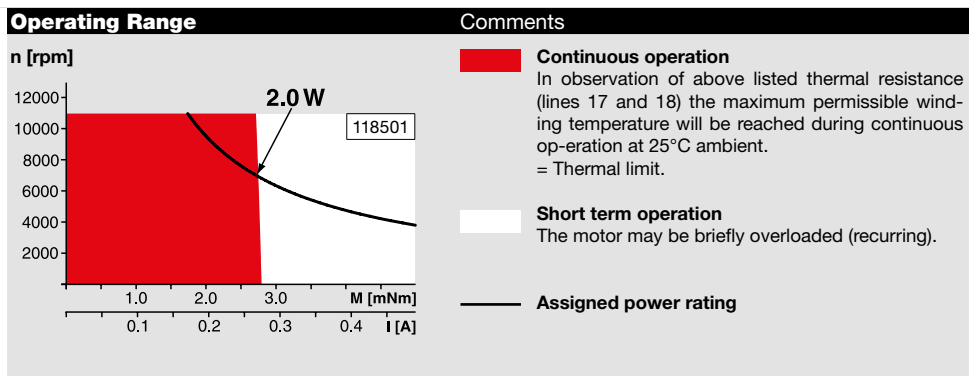
Part Numbers

118491	118492	118493	118494	118495	118496	118497	118498	118499	118500	118501	118502	118503	118504	118505
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Motor Data																
Values at nominal voltage																
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
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 ²	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	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
(static, shaft supported)	95 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

Values listed in the table are nominal.
 Explanation of the figures on page 64.



maxon Modular System Overview on page 28-36

Recommended Electronics:

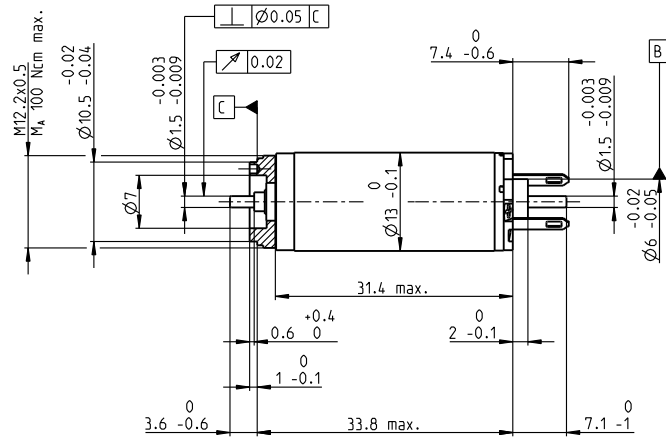
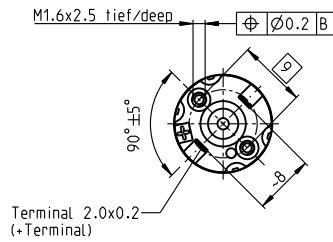
Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

Encoder MR
 16 CPT,
 2 channels
 Page 413

Encoder MR
 64 - 256 CPT,
 2 channels
 Page 414/415

Encoder MEnc
 Ø13 mm
 16 CPT, 2 channels
 Page 407

RE 13 \varnothing 13 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																
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
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 ²	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

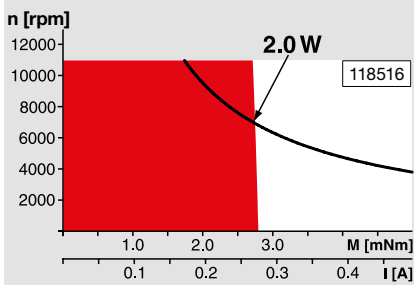
Thermal data	
17 Thermal resistance housing-ambient	33 K/W
18 Thermal resistance winding-housing	7.0 K/W
19 Thermal time constant winding	4.88 s
20 Thermal time constant motor	229 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. speed	11000 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	95 N
	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 64.

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

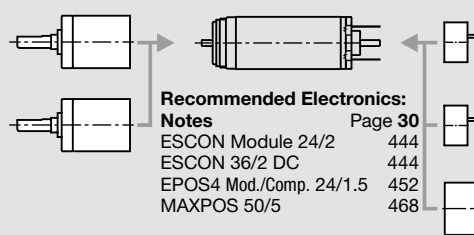
Overview on page 28-36

Planetary Gearhead

\varnothing 13 mm
0.05 - 0.15 Nm
Page 322

Planetary Gearhead

\varnothing 13 mm
0.2 - 0.35 Nm
Page 323



Encoder MR

16 CPT,
2 channels
Page 413

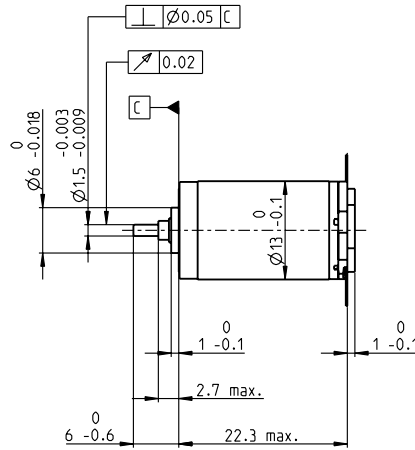
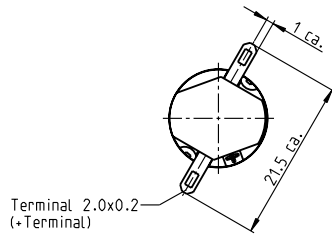
Encoder MR

64 - 256 CPT,
2 channels
Page 414/415

Encoder MEnc

\varnothing 13 mm
16 CPT, 2 channels
Page 407

RE 13 Ø13 mm, Graphite Brushes, 1.5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

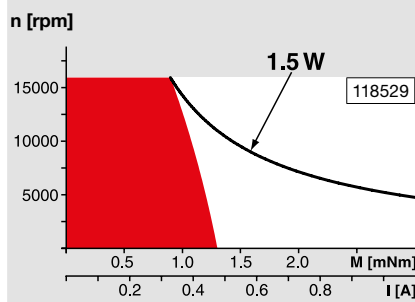
Motor Data

	118521	118522	118523	118524	118525	118526	118527	118528	118529	118530	118531	118532	118533	118534	118535	
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 ²	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	5.18 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
Other specifications	
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**

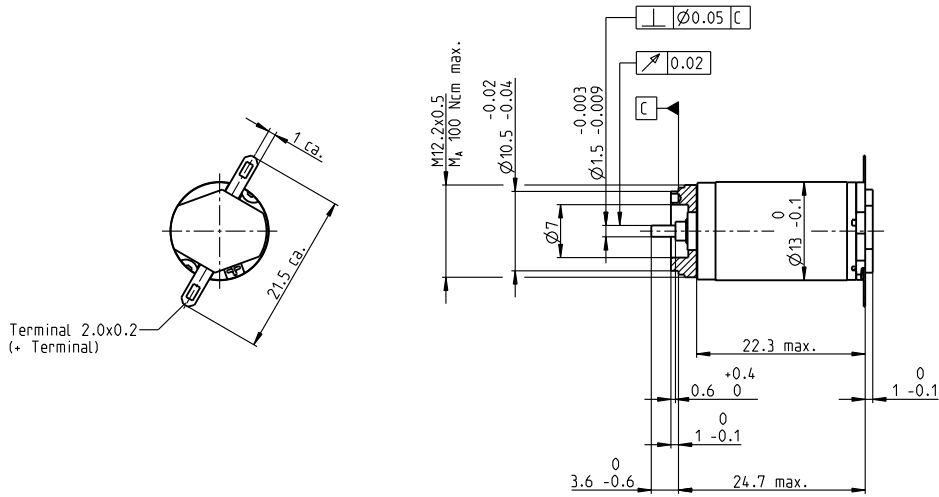
maxon Modular System

Overview on page 28–36

Values listed in the table are nominal.
Explanation of the figures on page 64.

Recommended Electronics:
Notes Page **30**
 ESCON Module 24/2 444
 ESCON 36/2 DC 444

RE 13 Ø13 mm, Graphite Brushes, 1.5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

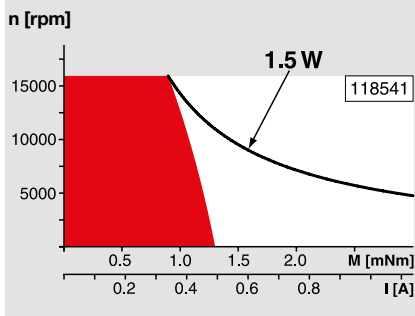
118536	118537	118538	118539	118540	118541	118542	118543	118544	118545	118546	118547	118548	118549	118550
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Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	1.2	1.5	2.4	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2 No 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 ²	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



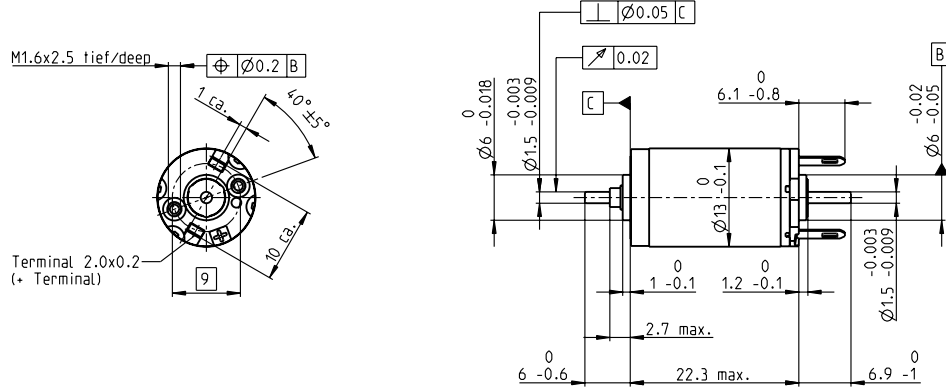
Comments

- 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**

maxon Modular System

<p>29 Number of pole pairs 1</p> <p>30 Number of commutator segments 7</p> <p>31 Weight of motor 17 g</p> <p>Values listed in the table are nominal. Explanation of the figures on page 64.</p>	<p>Planetary Gearhead Ø13 mm 0.05 - 0.15 Nm Page 322</p> <p>Planetary Gearhead Ø13 mm 0.2 - 0.35 Nm Page 323</p>	<p style="text-align: right;">Overview on page 28-36</p> <p>Recommended Electronics: Notes Page 30</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</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

118555 | 118556 | 118557 | 118558 | 118559 | 118560 | 118561 | 118562 | 118563 | 118564 | 118565 | 118566

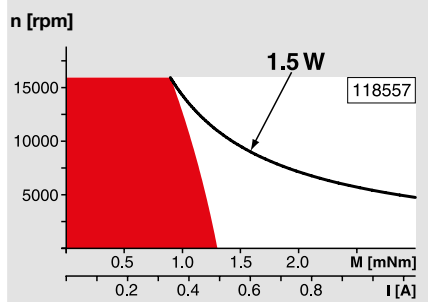
Motor Data													
Values at nominal voltage													
1 Nominal voltage	V	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2 No load speed	rpm	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3 No load current	mA	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4 Nominal speed	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 ²	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	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 64.

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 Overview on page 28-36

Encoder MR
16 CPT,
2 channels
Page 413

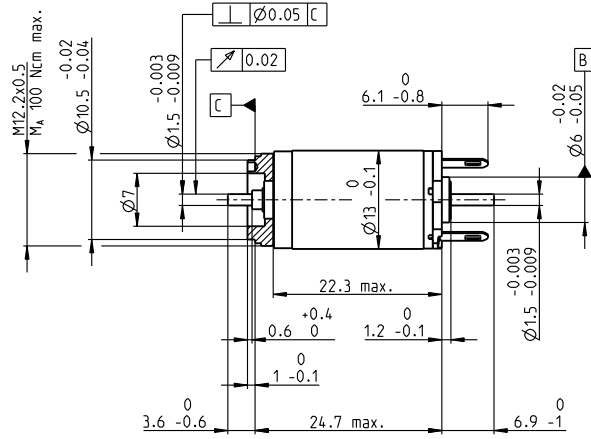
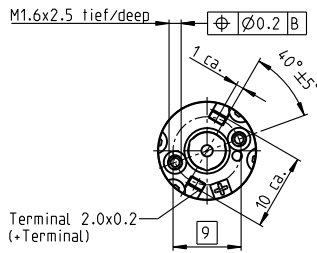
Encoder MR
64 - 256 CPT,
2 channels
Page 414/415

Encoder MEnc
Ø13 mm
16 CPT, 2 channels
Page 407

Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

RE 13 Ø13 mm, Graphite Brushes, 1.5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

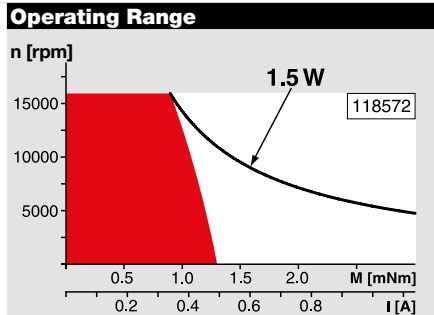
Part Numbers

118570	118571	118572	118573	118574	118575	118576	118577	118578	118579	118580	118581
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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 ²	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
	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	18 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

maxon Modular System

Planetary Gearhead
Ø13 mm
0.05 - 0.15 Nm
Page 322

Planetary Gearhead
Ø13 mm
0.2 - 0.35 Nm
Page 323

Encoder MR
16 CPT,
2 channels
Page 413

Encoder MR
64 - 256 CPT,
2 channels
Page 414/415

Encoder MENC
Ø13 mm
16 CPT, 2 channels
Page 407

Recommended Electronics: Page 30

ESCON Module 24/2 444

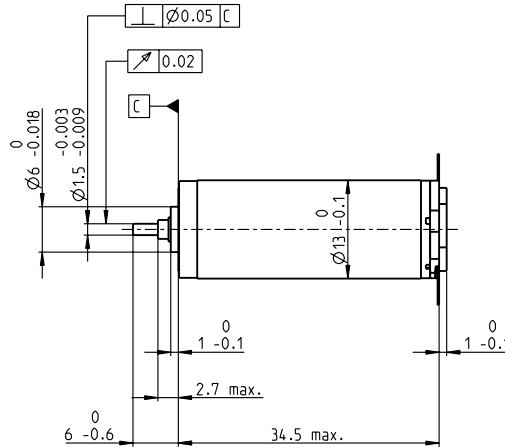
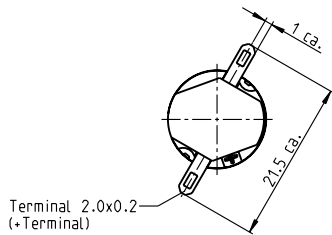
ESCON 36/2 DC 444

EPOS4 Mod./Comp. 24/1.5 452

MAXPOS 50/5 468

Overview on page 28-36

RE 13 Ø13 mm, Graphite Brushes, 3 Watt



M 1:1

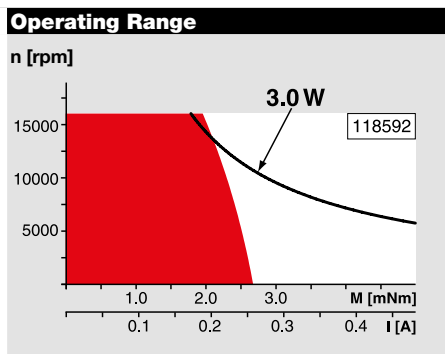
- Stock program
- Standard program
- Special program (on request)

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	2.32	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 ²	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	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

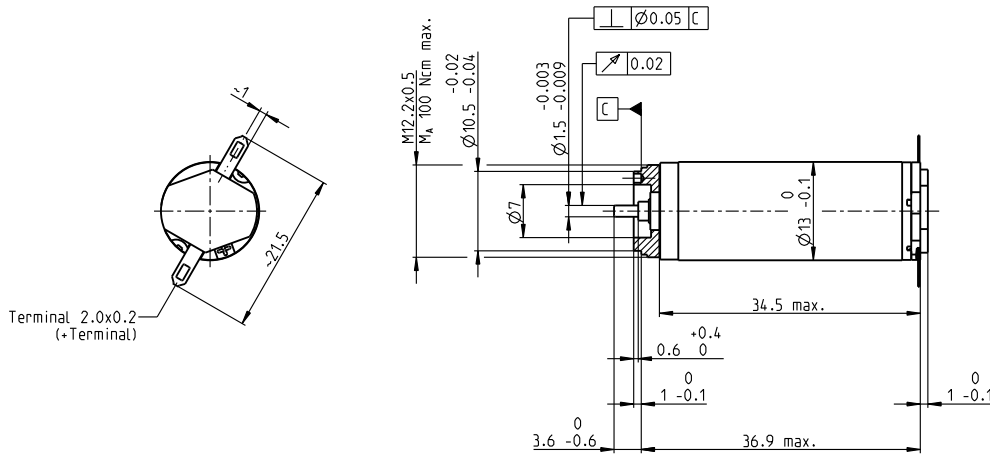
Values listed in the table are nominal.
Explanation of the figures on page 64.

maxon Modular System Overview on page 28-36

Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447

RE 13 Ø13 mm, Graphite Brushes, 3 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

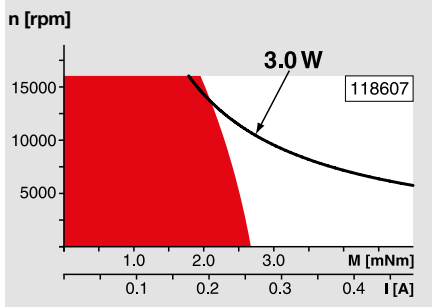
Part Numbers

118597	118598	118599	118600	118601	118602	118603	118604	118605	118606	118607	118608	118609	118610	118611
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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 ²	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

- 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



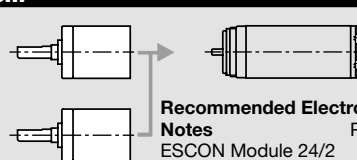
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

- Other specifications**
- 29 Number of pole pairs: 1
 - 30 Number of commutator segments: 7
 - 31 Weight of motor: 27 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

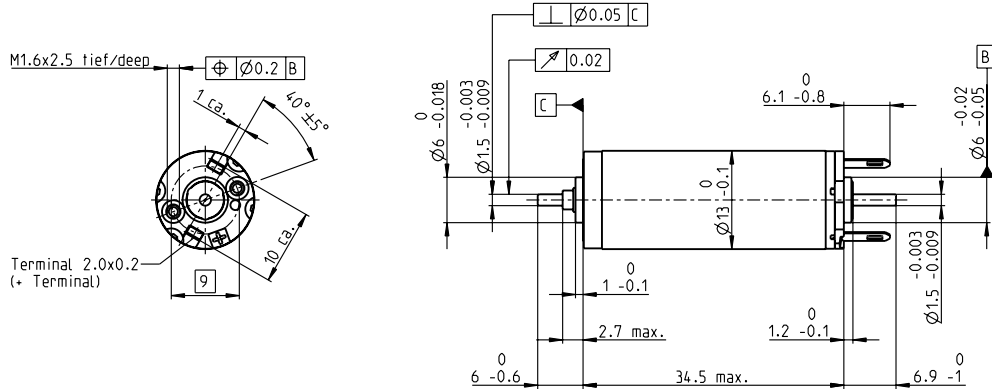
maxon Modular System Overview on page 28-36

- Planetary Gearhead**
Ø13 mm
0.05 - 0.15 Nm
Page 322
- Planetary Gearhead**
Ø13 mm
0.2 - 0.35 Nm
Page 323



- Recommended Electronics:**
- | | |
|-------------------|---------|
| Notes | Page 30 |
| ESCON Module 24/2 | 444 |
| ESCON 36/2 DC | 444 |
| ESCON Module 50/5 | 445 |
| ESCON 50/5 | 447 |

RE 13 Ø13 mm, Graphite Brushes, 3 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

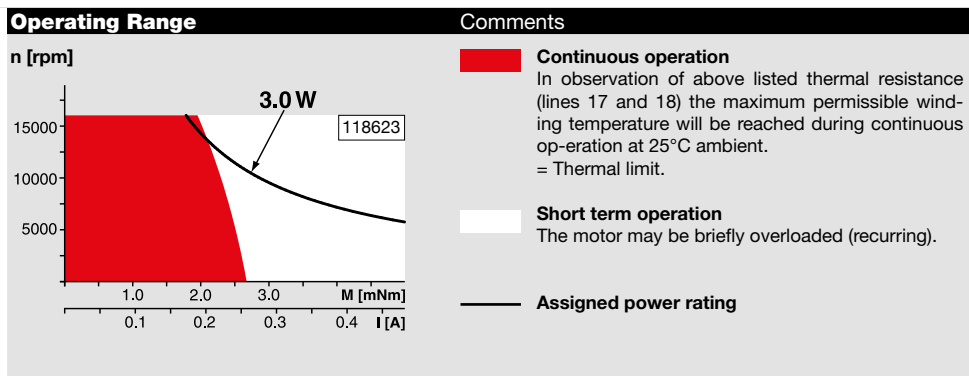
Part Numbers

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 ²	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	24 g

Values listed in the table are nominal.
Explanation of the figures on page 64.



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Recommended Electronics:

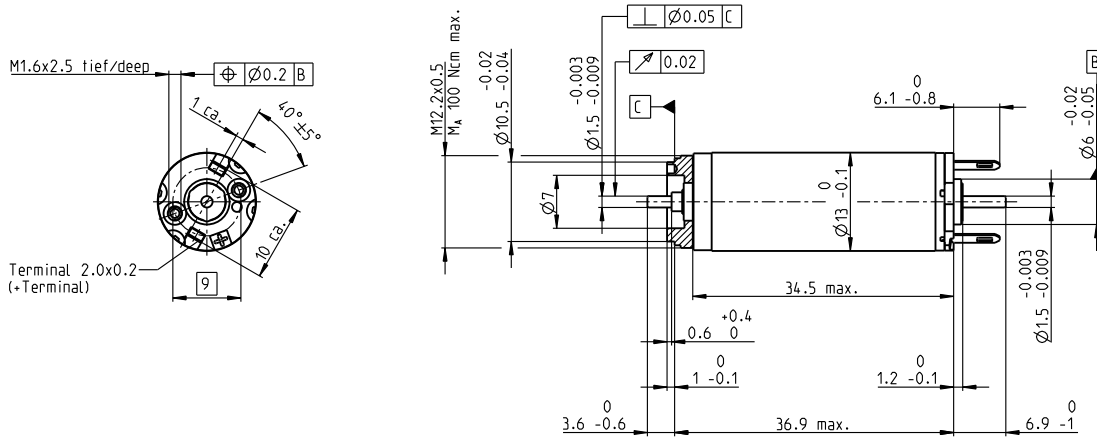
Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

Encoder MR
16 CPT,
2 channels
Page 413

Encoder MR
64 - 256 CPT,
2 channels
Page 414/415

Encoder MEnc
Ø13 mm
16 CPT, 2 channels
Page 407

RE 13 Ø13 mm, Graphite Brushes, 3 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

Motor Data

Values at nominal voltage		118628	118629	118630	118631	118632	118633	118634	118635	118636	118637	118638	118639	118640	118641	118642
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 ²	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

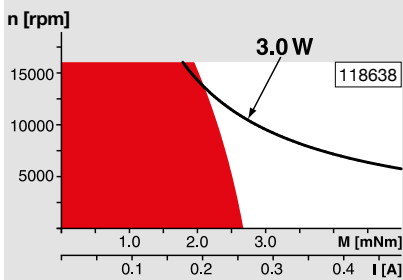
Thermal data	
17 Thermal resistance housing-ambient	33 K/W
18 Thermal resistance winding-housing	7.0 K/W
19 Thermal time constant winding	4.88 s
20 Thermal time constant motor	259 s
21 Ambient temperature	-20...+65°C
22 Max. winding temperature	+85°C

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 64.

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

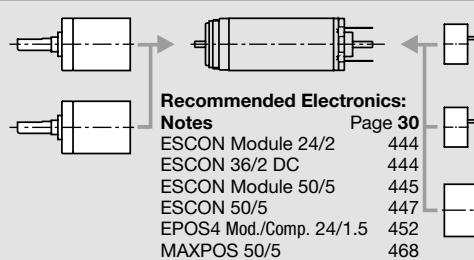
Overview on page 28-36

Planetary Gearhead

Ø13 mm
0.05 - 0.15 Nm
Page 322

Planetary Gearhead

Ø13 mm
0.2 - 0.35 Nm
Page 323



Encoder MR

16 CPT,
2 channels
Page 413

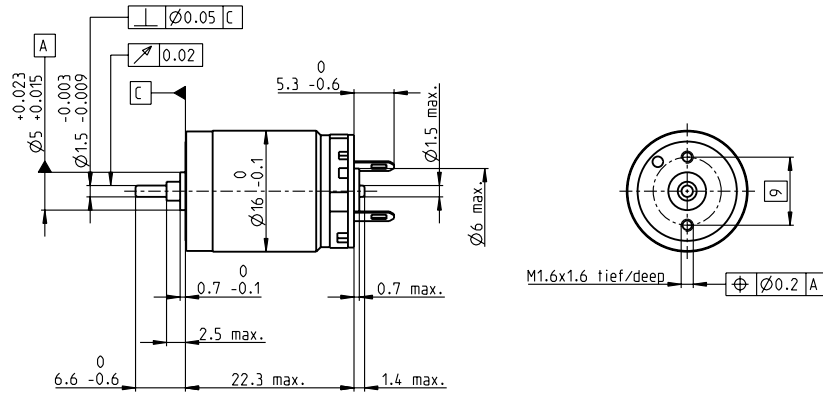
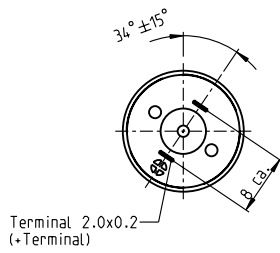
Encoder MR

64 - 256 CPT,
2 channels
Page 414/415

Encoder MEnc

Ø13 mm
16 CPT, 2 channels
Page 407

RE 16 Ø16 mm, Precious Metal Brushes CLL, 2 Watt



M 1:1

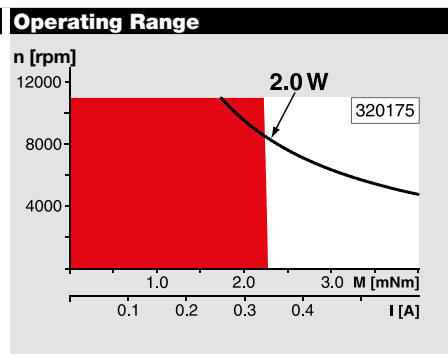
- Stock program
- Standard program
- Special program (on request)

Part Numbers

320173	320174	320175	320176	320177	320178	320179
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Motor Data								
Values at nominal voltage								
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
Characteristics								
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 ²	0.65	0.626	0.609	0.61	0.58	0.565	0.546

Specifications	
Thermal data	
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
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)	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 64.	

maxon Modular System

- Planetary Gearhead**
Ø16 mm
0.1 - 0.3 Nm
Page 328
- Planetary Gearhead**
Ø16 mm
0.2 - 0.6 Nm
Page 329
- Screw Drive**
Ø16 mm
Page 369-371

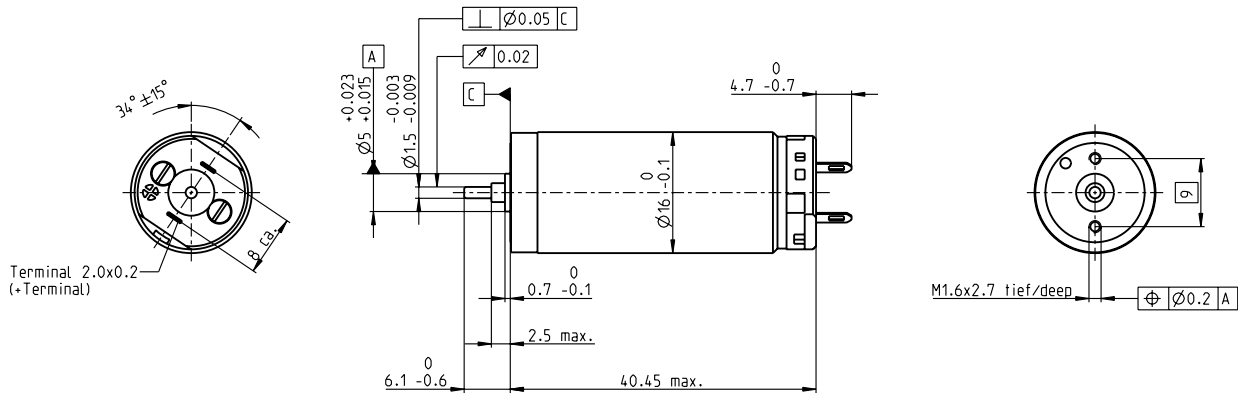
Recommended Electronics: Page 30

- Notes
- ESCON Module 24/2 444
- ESCON 36/2 DC 444
- EPOS4 Mod./Comp. 24/1.5 452
- MAXPOS 50/5 468

Encoder MR
32 CPT,
2 / 3 channels
Page 416

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 417

RE 16 Ø16 mm, Precious Metal Brushes CLL, 3.2 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

Motor Data

Values at nominal voltage	118678	118679	118680	118681	118682	118683	118684	118685	118686	118687	118688	118689	118690	118691	118692	
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	5.48	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 ²	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

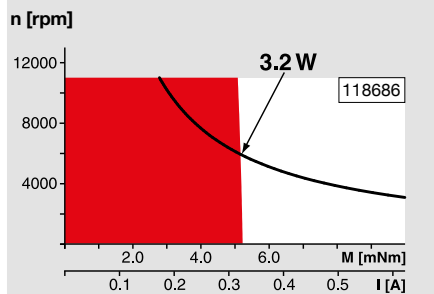
Specifications

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 64.

Operating Range



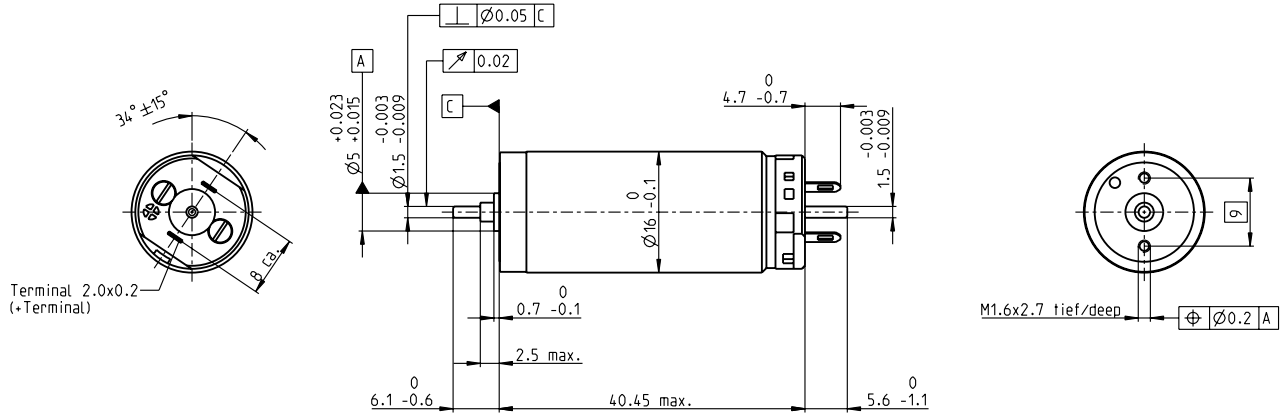
Comments

- 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 Overview on page 28-36

<p>Planetary Gearhead Ø16 mm 0.1 - 0.3 Nm Page 328</p> <p>Planetary Gearhead Ø16 mm 0.2 - 0.6 Nm Page 329</p> <p>Screw Drive Ø16 mm Page 369-371</p>		<p>Recommended Electronics: Notes Page 30</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p> <p>ESCON Module 50/5 445</p> <p>ESCON 50/5 447</p> <p>EPOS4 50/5 453</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

Motor Data

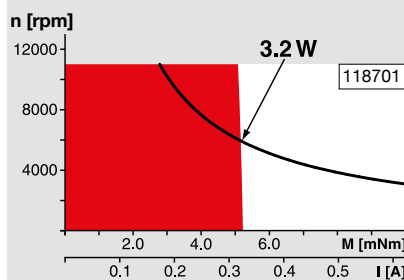
	118693	118694	118695	118696	118697	118698	118699	118700	118701	118702	118703	118704	118705	118706	118707	
Values at nominal voltage																
1 Nominal voltage	V	1.8	2.4	3	3.2	4.5	4.8	7.2	9	12	12	15	18	24	30	48
2 No load speed	rpm	4990	6360	6890	6270	6740	5700	6890	6740	7130	5990	6010	5900	7250	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 ²	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
- 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 64.

Operating Range



Comments

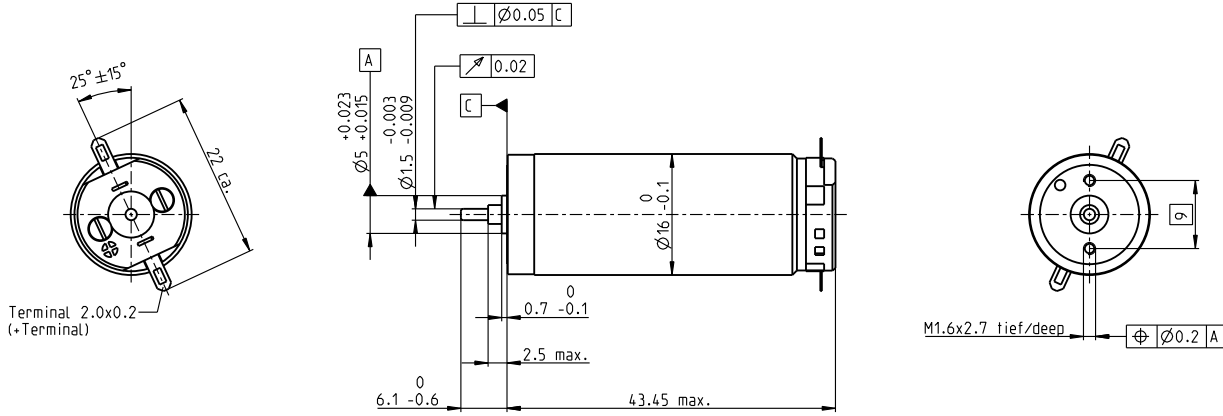
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Overview on page 28-36

<p>Planetary Gearhead Ø16 mm 0.1 - 0.3 Nm Page 328</p> <p>Planetary Gearhead Ø16 mm 0.2 - 0.6 Nm Page 329</p> <p>Screw Drive Ø16 mm Page 369-371</p>		<p>Recommended Electronics: Notes Page 30</p> <ul style="list-style-type: none"> ESCON Module 24/2: 444 ESCON 36/2 DC: 444 ESCON Module 50/5: 445 ESCON 50/5: 447 EPOS4 Mod./Comp. 24/1.5: 452 EPOS4 50/5: 453 EPOS4 Mod./Comp. 50/5: 453 MAXPOS 50/5: 468 	<p>Encoder MR 32 CPT, 2 / 3 channels Page 416</p> <p>Encoder MR 128 / 256 / 512 CPT, 2 / 3 channels Page 417</p> <p>Encoder MEnc Ø13 mm 16 CPT, 2 channels Page 407</p>
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RE 16 Ø16 mm, Graphite Brushes, 4.5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

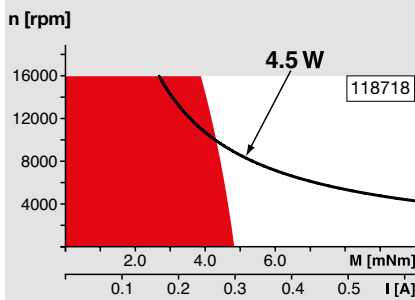
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Motor Data																
Values at nominal voltage																
1 Nominal voltage	V	4.8	4.8	6	7.2	9	12	15	18	24	30	36	45	48	48	48
2 No load speed	rpm	12700	12100	13200	13600	13100	13900	14000	13200	14000	14700	14100	14500	14200	10100	5320
3 No 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
Characteristics																
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 ²	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

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	40 g

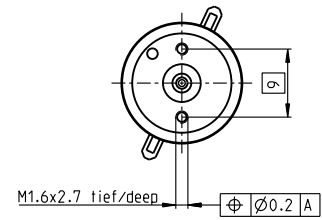
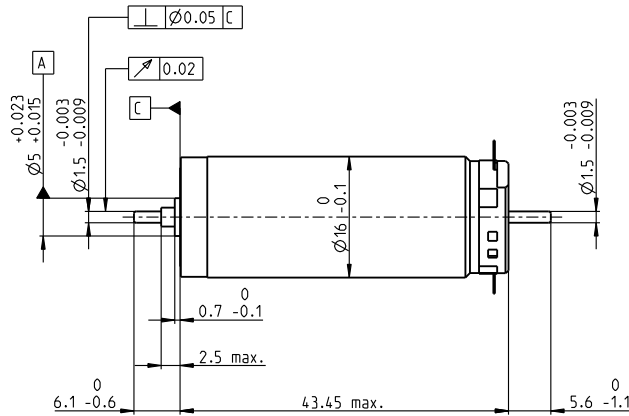
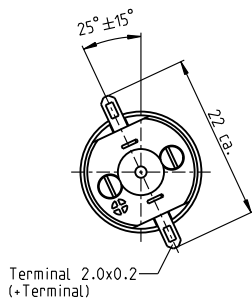
Values listed in the table are nominal.
Explanation of the figures on page 64.

maxon Modular System

<p>Planetary Gearhead Ø16 mm 0.1 - 0.3 Nm Page 328</p> <p>Planetary Gearhead Ø16 mm 0.2 - 0.6 Nm Page 329</p> <p>Screw Drive Ø16 mm Page 369-371</p>		<p>Recommended Electronics: Notes Page 30</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p> <p>ESCON Module 50/5 445</p> <p>ESCON 50/5 447</p> <p>EPOS4 50/5 453</p>
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Overview on page 28-36

RE 16 Ø16 mm, Graphite Brushes, 4.5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

118725	118726	118727	118728	118729	118730	118731	118732	118733	118734	118735	118736	118737	118738	118739
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Motor Data																	
Values at nominal voltage																	
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
Characteristics																	
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	0.285	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 ²	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

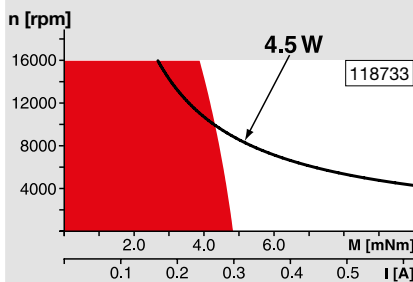
Specifications

- 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 459 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 / 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 64.

Operating Range



Comments

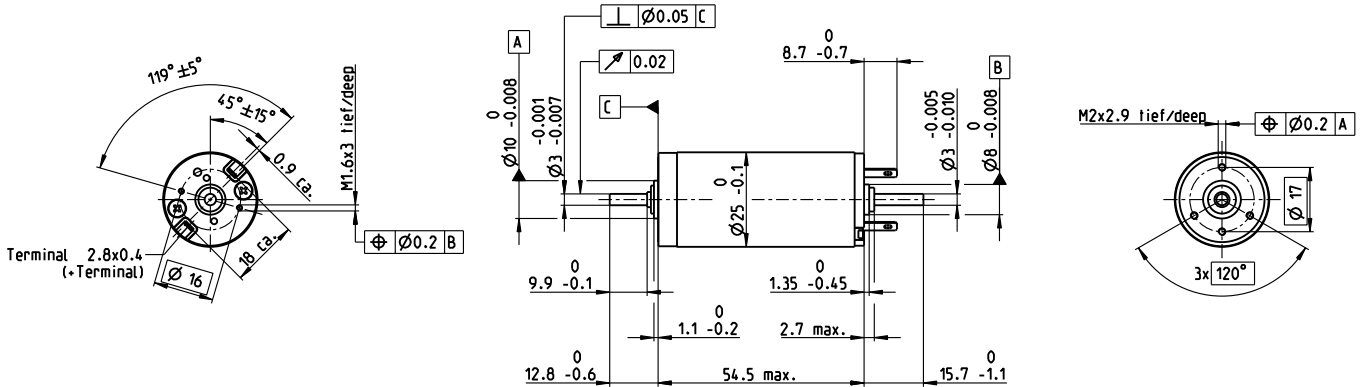
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Overview on page 28-36

<p>Planetary Gearhead Ø16 mm 0.1 - 0.3 Nm Page 328</p> <p>Planetary Gearhead Ø16 mm 0.2 - 0.6 Nm Page 329</p> <p>Screw Drive Ø16 mm Page 369-371</p>		<p>Encoder MR 32 CPT, 2 / 3 channels Page 416</p> <p>Encoder MR 128 / 256 / 512 CPT, 2 / 3 channels Page 417</p> <p>Encoder MEnc Ø13 mm 16 CPT, 2 channels Page 407</p>
<p>Recommended Electronics:</p> <p>Notes Page 30</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p> <p>ESCON Module 50/5 445</p> <p>ESCON 50/5 447</p> <p>EPOS4 Mod./Comp. 24/1.5 452</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>MAXPOS 50/5 468</p>		

RE 25 Ø25 mm, Precious Metal Brushes CLL, 10 Watt



M 1:2

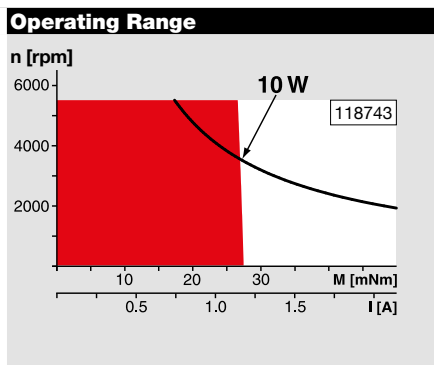
- Stock program
- Standard program
- Special program (on request)

Part Numbers

Motor Data	118740	118741	118742	118743	118744	118745	118746	118747	118748	
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 ²	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	-20...+85°C
22 Max. winding temperature	+100°C
Mechanical data (ball bearings)	
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



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	11
31 Weight of motor	130 g

CLL = Capacitor Long Life

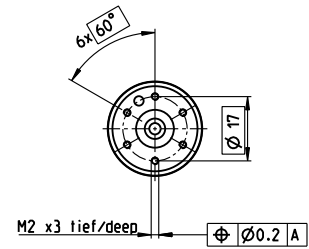
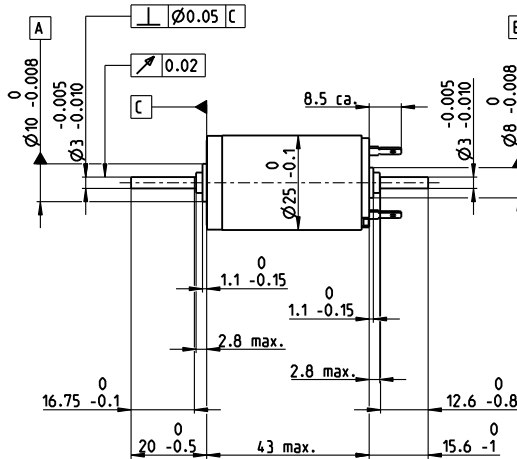
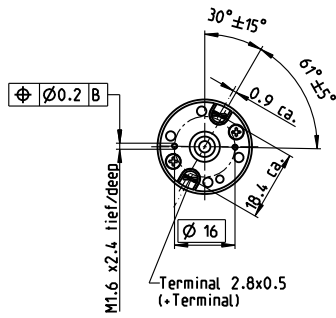
Values listed in the table are nominal.
Explanation of the figures on page 64.

Option
Preloaded ball bearings

maxon Modular System Overview on page 28-36

<p>Planetary Gearhead Ø26 mm 0.75 - 4.5 Nm Page 340</p> <p>Planetary Gearhead Ø32 mm 0.75 - 6.0 Nm Page 342/343/346</p> <p>Koaxdrive Ø32 mm 1.0 - 4.5 Nm Page 352</p> <p>Screw Drive Ø32 mm Page 374-378</p>		<p>Recommended Electronics: Page 30</p> <p>Notes</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p> <p>ESCON Module 50/5 445</p> <p>ESCON 50/5 447</p> <p>EPOS4 Mod./Comp. 24/1.5 452</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>MAXPOS 50/5 468</p>	<p>Encoder MR 128 - 1000 CPT, 3 channels Page 419</p> <p>Encoder Enc 22 mm 100 CPT, 2 channels Page 426</p> <p>Encoder HED_ 5540 500 CPT, 3 channels Page 429/431</p> <p>DC-Tacho DCT Ø22 mm 0.52 V Page 438</p>
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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

Motor Data

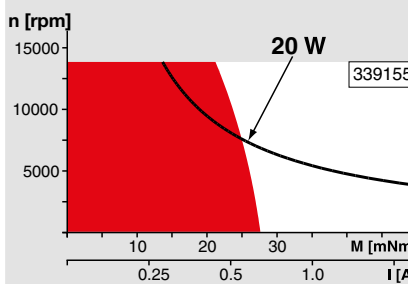
Values at nominal voltage		7.2	9	12	18	24	30	36	48	48	48	48
1 Nominal voltage	V	7.2	9	12	18	24	30	36	48	48	48	48
2 No load speed	rpm	10500	9710	9620	10400	10900	9210	10100	9540	8450	6720	4650
3 No load current	mA	133	93.2	68.1	50.6	40.2	25	23.7	16.4	13.7	9.89	6
4 Nominal speed	rpm	8970	8260	8310	9190	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 ²	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: 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 64.

Operating Range



Comments

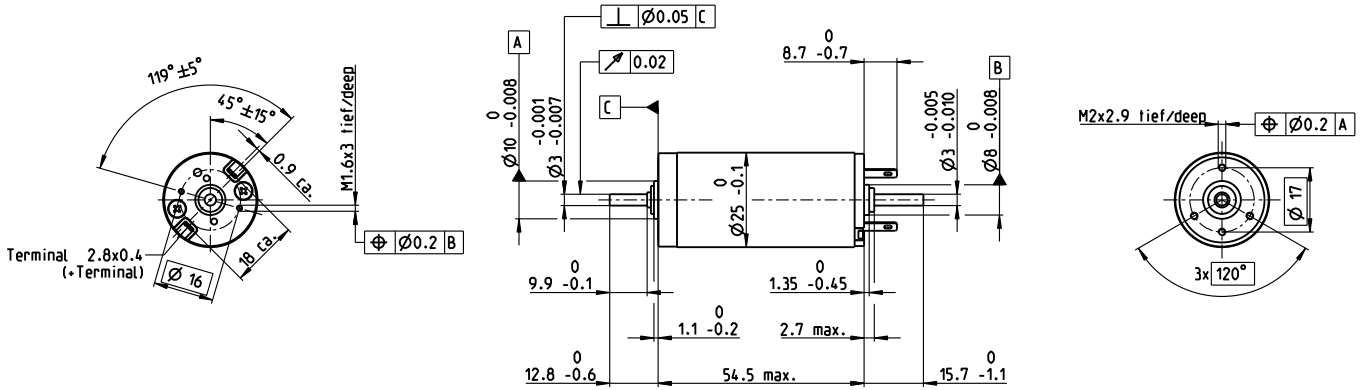
- **Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- **Assigned power rating**

maxon Modular System

Overview on page 28–36

<p>Planetary Gearhead Ø22 mm 0.5 Nm Page 334</p> <p>Planetary Gearhead Ø26 mm 0.75 - 4.5 Nm Page 340</p> <p>Planetary Gearhead Ø32 mm 0.75 - 6.0 Nm Page 342/343/346</p> <p>Koaxdrive Ø32 mm 1.0 - 4.5 Nm Page 352</p> <p>Screw Drive Ø32 mm Page 374–378</p>		<p>Recommended Electronics:</p> <p>Notes Page 30</p> <p>ESCON Module 24/2: 444</p> <p>ESCON 36/2 DC: 444</p> <p>ESCON Module 50/5: 445</p> <p>ESCON 50/5: 447</p> <p>EPOS4 Mod./Comp. 24/1.5: 452</p> <p>EPOS4 50/5: 453</p> <p>EPOS4 Mod./Comp. 50/5: 453</p> <p>EPOS2 P 24/5: 464</p> <p>MAXPOS 50/5: 468</p>	<p>Encoder MR 128 - 1000 CPT, 3 channels Page 419</p> <p>Encoder HED_ 5540 500 CPT, 3 channels Page 430/431</p> <p>DC-Tacho DCT Ø22 mm 0.52 V Page 438</p> <p>Brake AB 28 24 VDC 0.4 Nm Page 480</p>
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RE 25 Ø25 mm, Graphite Brushes, 20 Watt



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	

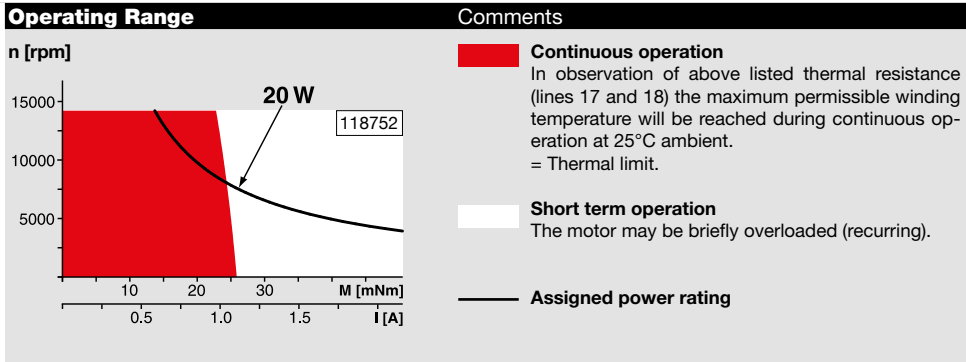
Motor Data										
Values at nominal voltage										
1 Nominal voltage	V	9	15	18	24	30	42	48	48	48
2 No load speed	rpm	10000	9660	10200	9560	9860	11100	10300	8240	5050
3 No load current	mA	110	60.8	53.9	36.9	30.5	25.2	20.1	15.2	8.52
4 Nominal speed	rpm	8970	8430	8850	8330	8640	9920	9160	7040	3830
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 ²	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

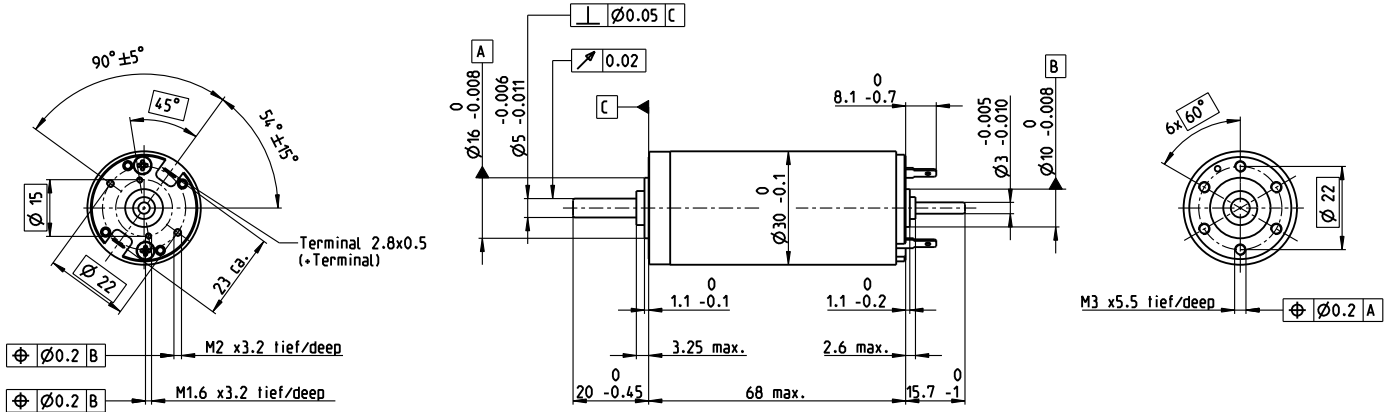
Values listed in the table are nominal.
Explanation of the figures on page 64.

Option
Preloaded ball bearings



maxon Modular System		Overview on page 28-36
<p>Planetary Gearhead Ø26 mm 0.75 - 4.5 Nm Page 340</p> <p>Planetary Gearhead Ø32 mm 0.75 - 6.0 Nm Page 342/343/346</p> <p>Koaxdrive Ø32 mm 1.0 - 4.5 Nm Page 352</p> <p>Screw Drive Ø32 mm Page 374-378</p>		<p>Encoder MR 128 - 1000 CPT, 3 channels Page 419</p> <p>Encoder Enc 22 mm 100 CPT, 2 channels Page 426</p> <p>Encoder HED_ 5540 500 CPT, 3 channels Page 429/431</p> <p>DC-Tacho DCT Ø22 mm 0.52 V Page 438</p> <p>Brake AB 28 24 VDC 0.4 Nm Page 480</p>
<p>Recommended Electronics: Page 30</p> <p>Notes</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p> <p>ESCON Module 50/5 445</p> <p>ESCON 50/5 447</p> <p>EPOS4 Mod./Comp. 24/1.5 452</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>EPOS2 P 24/5 464</p> <p>MAXPOS 50/5 468</p>		

RE 30 Ø30 mm, Precious Metal Brushes, 15 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
448593	448594	448595	448596	

Motor Data (provisional)					
Values at nominal voltage					
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
Characteristics					
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 ²	35.9	33.5	33.1	34.7

Specifications

Thermal data	
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

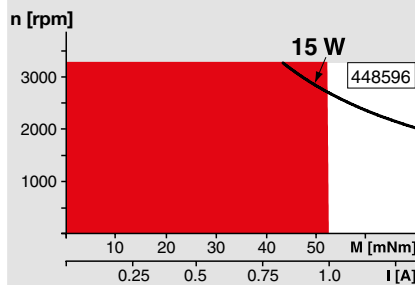
Mechanical data (ball bearings)	
23 Max. speed	3300 rpm
24 Axial play at axial load	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5.6 N
27 Max. force for press fits (static) (static, shaft supported)	110 N / 1200 N
28 Max. radial load, 5 mm from flange	28 N

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 64.

Option
Preloaded ball bearings

Operating Range



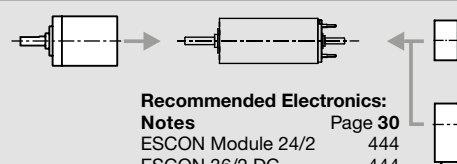
Comments

- 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

Overview on page 28–36

Planetary Gearhead
Ø32 mm
0.75 - 4.5 Nm
Page 344

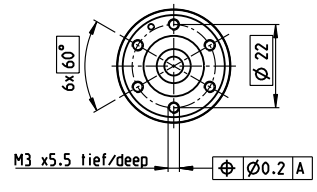
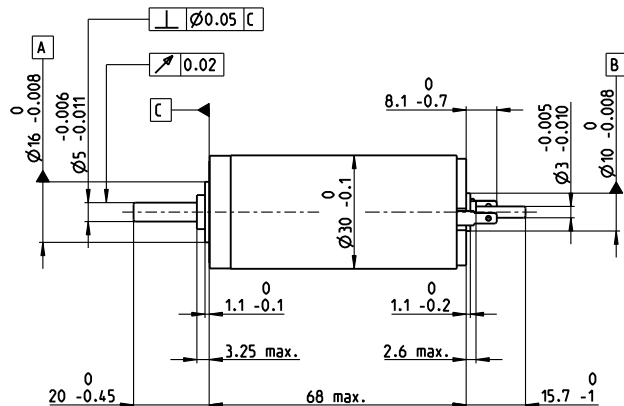
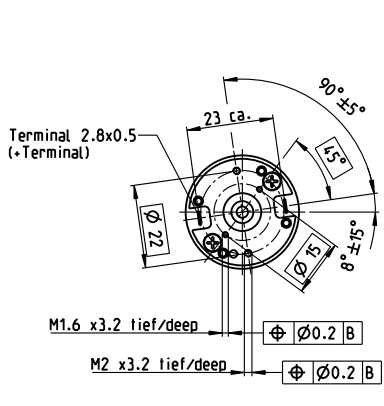


Recommended Electronics:	
Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder MR
256 - 1024 CPT,
3 channels
Page 420

Encoder HED_ 5540
500 CPT,
3 channels
Page 429/431

RE 30 Ø30 mm, Graphite Brushes, 60 Watt



M 1:2

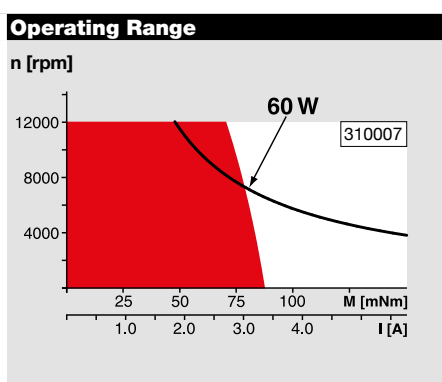
- Stock program
- Standard program
- Special program (on request)

Part Numbers					
	310005	310006	310007	310008	310009
according to dimensional drawing	268193	268213	268214	268215	268216
shaft length 15.7 shortened to 8.7 mm					

Motor Data	
Values at nominal voltage	
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	%
Characteristics	
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 ²

	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	
Thermal data	
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
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)	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



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

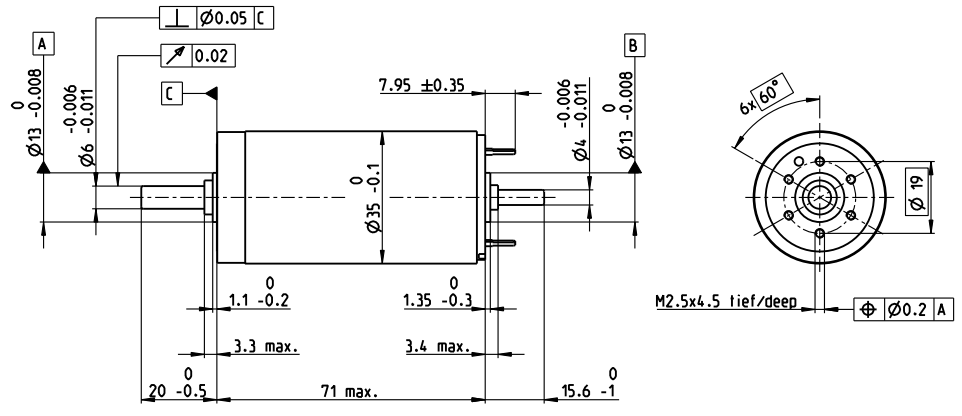
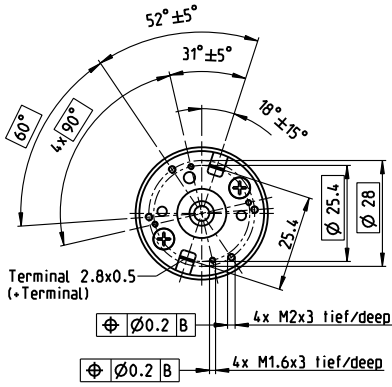
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	260 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

maxon Modular System Overview on page 28–36

<p>Planetary Gearhead Ø32 mm 0.75 - 6.0 Nm Page 342–349</p> <p>Koaxdrive Ø32 mm 1.0 - 4.5 Nm Page 352</p> <p>Screw Drive Ø32 mm Page 374–378</p>		<p>Recommended Electronics:</p> <p>Notes</p> <p>ESCON 36/2 DC 444</p> <p>ESCON Module 50/5 445</p> <p>ESCON 50/5 447</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>EPOS2 P 24/5 464</p> <p>MAXPOS 50/5 468</p>	<p>Encoder MR 256 - 1024 CPT, 3 channels Page 420</p> <p>Encoder HED_ 5540 500 CPT, 3 channels Page 429/431</p>
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RE 35 Ø35 mm, Graphite Brushes, 90 Watt



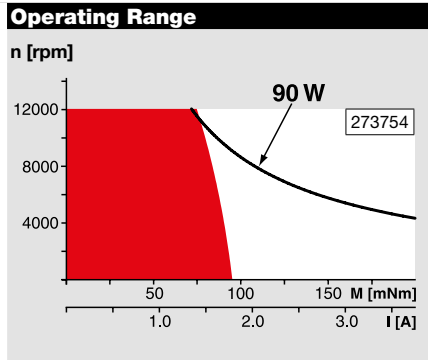
M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers													
according to dimensional drawing shaft length 15.6 shortened to 4 mm													
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	

Motor Data																			
Values at nominal voltage																			
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					
Characteristics																			
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 ²	67.9	79	67.9	72.3	67.7	67.2	65.4	65.7	65.7	63.8	63	61	60.6					

Specifications	
Thermal data	
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
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)	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



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	340 g

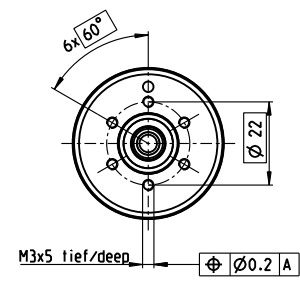
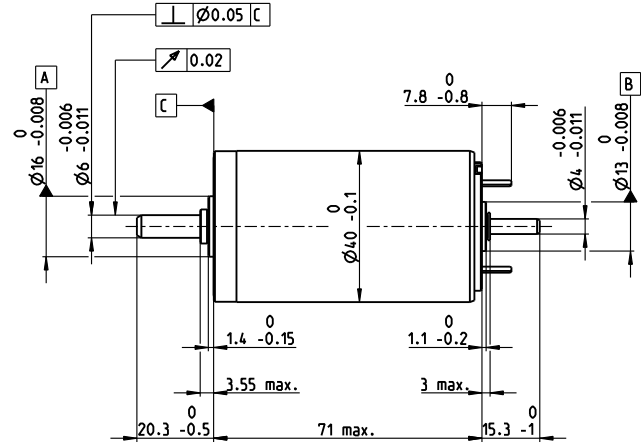
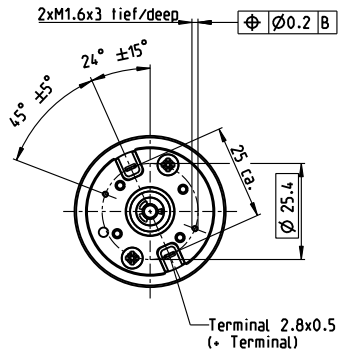
Values listed in the table are nominal.
Explanation of the figures on page 64.

Option
Hollow shaft as special design
Preloaded ball bearings

maxon Modular System Overview on page 28-36

<p>Planetary Gearhead Ø32 mm 0.75 - 6.0 Nm Page 342-349</p> <p>Planetary Gearhead Ø32 mm 4.0 - 8.0 Nm Page 350</p> <p>Planetary Gearhead Ø42 mm 3 - 15 Nm Page 354</p> <p>Screw Drive Ø32 mm Page 374-378</p>		<p>Recommended Electronics: Notes Page 30</p> <p>ESCON Mod. 50/5 445</p> <p>ESCON 50/5 447</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>EPOS2 P 24/5 464</p> <p>MAXPOS 50/5 468</p>	<p>Encoder MR 256 - 1024 CPT, 3 channels Page 420</p> <p>Encoder HED_ 5540 500 CPT, 3 channels Page 429/431</p> <p>DC-Tacho DCT Ø22 mm 0.52 V Page 438</p> <p>Brake AB 28 24 VDC 0.4 Nm Page 480</p> <p>End cap Page 485</p>
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RE 40 \varnothing 40 mm, Precious Metal Brushes, 25 Watt



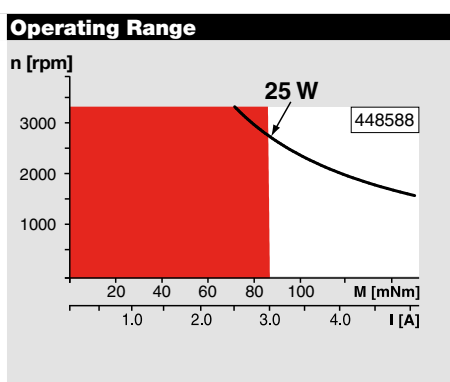
M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

Motor Data (provisional)	448588	448589	448590	448591	448592	
Values at nominal voltage						
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
Characteristics						
10 Terminal resistance	Ω	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 ²	142	137	119	121	120

Specifications	
Thermal data	
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
Mechanical data (ball bearings)	
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
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	480 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 64.

Option
 Preloaded ball bearings

maxon Modular System Overview on page 28-36

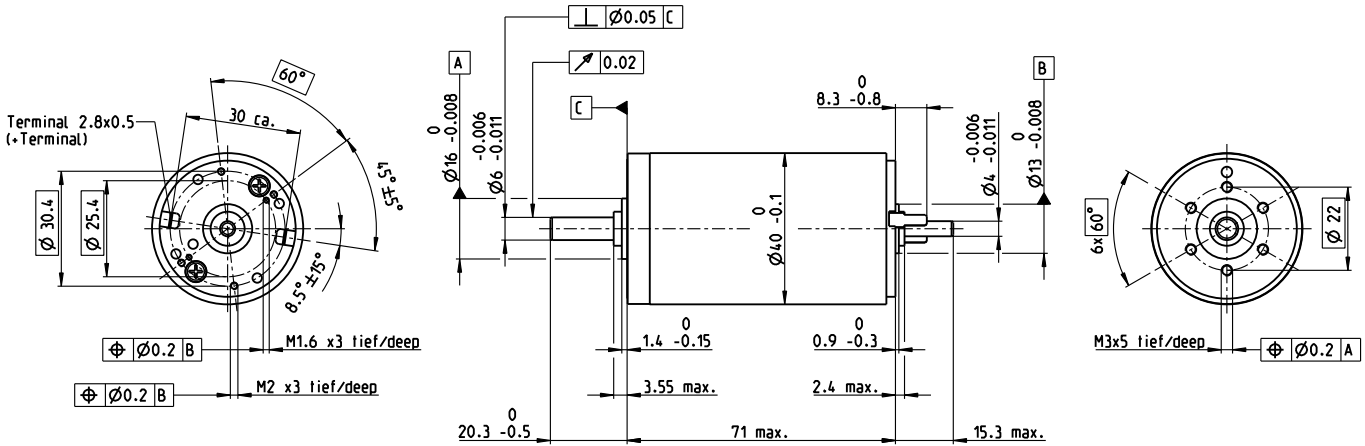
Encoder MR
 256 - 1024 CPT,
 3 channels
 Page 420

Encoder HED_ 5540
 500 CPT,
 3 channels
 Page 429/432

Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

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
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Motor Data

Values at nominal voltage		148866	148867	148877	218008	218009	218010	218011	218012	218013	218014
1	Nominal voltage	V	12	24	48	48	48	48	48	48	48
2	No load speed	rpm	6920	7580	7590	6420	5560	3330	2690	2130	1420
3	No load current	mA	241	137	68.6	53.7	43.7	21.9	16.6	12.5	9.66
4	Nominal speed	rpm	6380	6940	7000	5810	4930	2710	2060	1510	1080
5	Nominal torque (max. continuous torque)	mNm	94.9	177	187	186	180	189	190	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
7	Stall torque	mNm	1720	2420	2560	2040	1620	1020	814	655	523
8	Stall current	A	105	80.2	42.4	28.6	19.7	7.43	4.79	3.06	1.97
9	Max. efficiency	%	88	91	92	91	91	89	89	88	86
Characteristics											
10	Terminal resistance	Ω	0.115	0.299	1.13	1.68	2.44	6.46	10	15.7	24.4
11	Terminal inductance	mH	0.024	0.082	0.33	0.46	0.613	1.7	2.62	4.14	6.41
12	Torque constant	mNm/A	16.4	30.2	60.3	71.3	82.2	137	170	214	266
13	Speed constant	rpm/V	581	317	158	134	116	69.7	56.2	44.7	35.9
14	Speed / torque gradient	rpm/mNm	4.05	3.14	2.97	3.16	3.45	3.29	3.31	3.27	3.29
15	Mechanical time constant	ms	5.89	4.67	4.28	4.2	4.19	4.16	4.15	4.15	4.16
16	Rotor inertia	gcm ²	139	142	137	127	116	121	120	120	118

Specifications

Thermal data		
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
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)	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
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	480 g

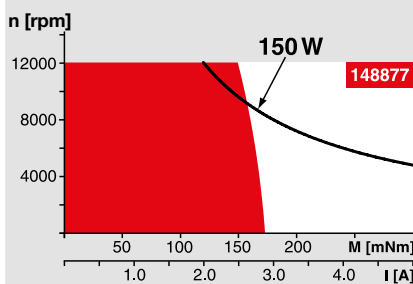
Values listed in the table are nominal.
Explanation of the figures on page 64.

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

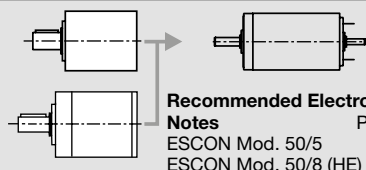
Overview on page 28–36

Planetary Gearhead

Ø42 mm
3 - 15 Nm
Page 354

Planetary Gearhead

Ø52 mm
4 - 30 Nm
Page 359



Recommended Electronics:

Notes	Page 30
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Module 50/8	454
EPOS4 Comp. 50/8 CAN	454
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder MR

256 - 1024 CPT,
3 channels
Page 420

Encoder HED_ 5540

500 CPT,
3 channels
Page 429/432

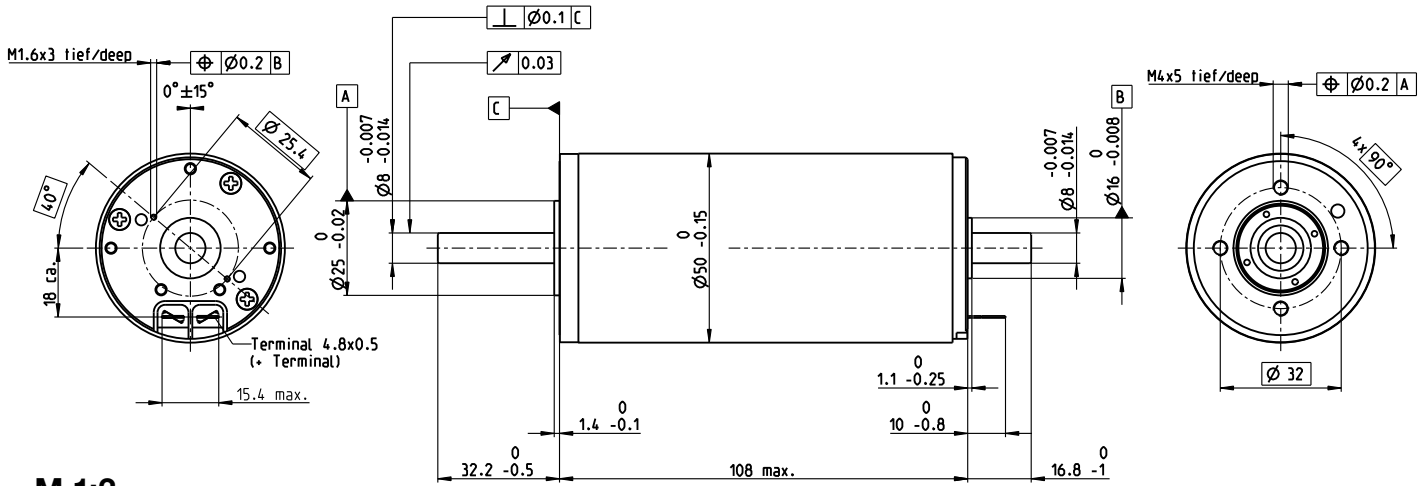
Brake AB 28

24 VDC
0.4 Nm
Page 480

Industrial Version IP54*

Encoder HEDL 9140
Page 436
Brake AB 28
Page 481
End cap
Page 485

RE 50 Ø50 mm, Graphite Brushes, 200 Watt



- Stock program
- Standard program
- Special program (on request)

Part Numbers			
578296	578297	578298	578299
618570	618571	618572	618573

Industrial Version IP54*

Motor Data		Industrial Version IP54*			
Values at nominal voltage					
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
Characteristics					
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 ²	536	560	542	560

Specifications

Thermal data	
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

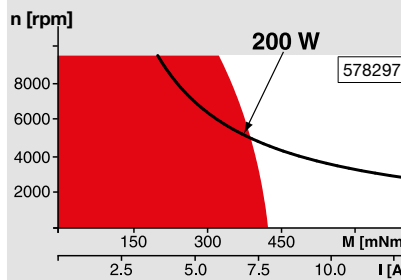
Mechanical data (preloaded ball bearings)	
23 Max. speed	9500 rpm
24 Axial play at axial load < 11.5 N	0 mm
> 11.5 N	0.1 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	30 N
27 Max. force for press fits (static) (static, shaft supported)	150 N 6000 N
28 Max. radial load, 15 mm from flange	110 N

Other specifications	
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 64.

* 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).

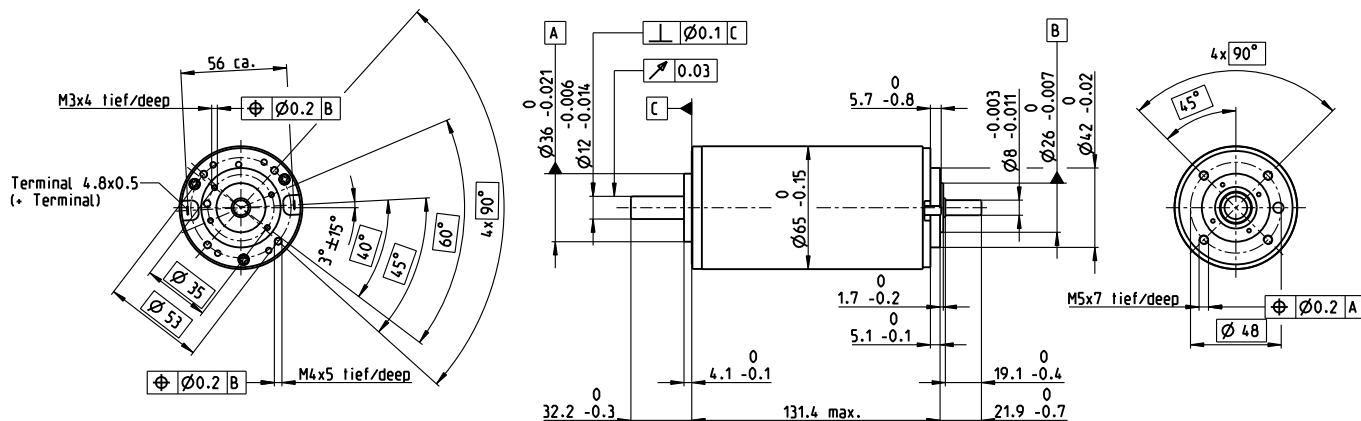
— Assigned power rating

maxon Modular System

Overview on page 28–36

<p>Planetary Gearhead Ø52 mm 4 - 30 Nm Page 359</p> <p>Planetary Gearhead Ø62 mm 8 - 50 Nm Page 361</p>		<p>Recommended Electronics:</p> <p>Notes Page 30</p> <p>ESCON Mod. 50/5 445</p> <p>ESCON Mod. 50/8 (HE) 446</p> <p>ESCON 50/5 447</p> <p>ESCON 70/10 447</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>EPOS4 Module 50/8 454</p> <p>EPOS4 Comp. 50/8 CAN 454</p> <p>EPOS4 Module 50/15 455</p> <p>EPOS4 Comp. 50/15 CAN 455</p> <p>EPOS4 70/15 456</p> <p>MAXPOS 50/5 468</p>	<p>Encoder HEDS 5540 500 CPT, 3 channels Page 430</p> <p>Encoder HEDL 5540 500 CPT, 3 channels Page 432</p> <p>Industrial Version IP54* Encoder HEDL 9140 Page 437</p> <p>Brake AB 44 Page 484</p> <p>End cap Page 485</p>
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RE 65 Ø65 mm, Graphite Brushes, 250 Watt



M 1:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers

Industrial Version IP54*

353294	353295	353296	353297	353298	353299	353300	353301
388984	388985	388986	388987	388988	388989	388990	388991

Motor Data

Values at nominal voltage		18	24	36	48	60	70	70	70
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
Characteristics		0.0609	0.0821	0.174	0.365	0.568	0.891	1.06	1.41
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 ²	1380	1290	1380	1340	1320	1310	1280	1340

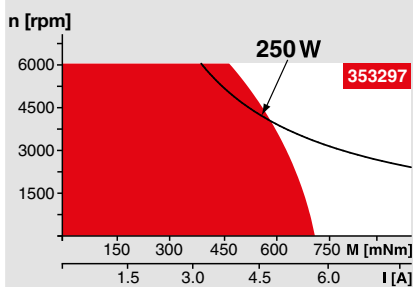
Specifications

- Thermal data**
- 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
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed 5500 rpm
 - 24 Axial play at axial load < 25 N 0 mm
 - > 25 N 0.1 mm
 - 25 Radial play preloaded 70 N
 - 26 Max. axial load (dynamic) 70 N
 - 27 Max. force for press fits (static) (static, shaft supported) 420 N
 - 12000 N
 - 28 Max. radial load, 15 mm from flange 350 N
- Other specifications**
- 29 Number of pole pairs 2
 - 30 Number of commutator segments 26
 - 31 Weight of motor 2100 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

* 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

Overview on page 28–36

Planetary Gearhead
Ø81 mm
20 - 120 Nm
Page 362



Recommended Electronics:

Notes	Page 30
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
EPOS4 Module 50/8	454
EPOS4 Comp. 50/8 CAN	454
EPOS4 Module 50/15	455
EPOS4 Comp. 50/15 CAN	455
EPOS4 70/15	456
MAXPOS 50/5	468

Encoder HEDS 5540
500 CPT,
3 channels
Page 430

Encoder HEDL 5540
500 CPT,
3 channels
Page 432

Industrial Version IP54*
Encoder HEDL 9140
Page 437
Brake AB 44
Page 484
End cap
Page 485



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

maxon A-max

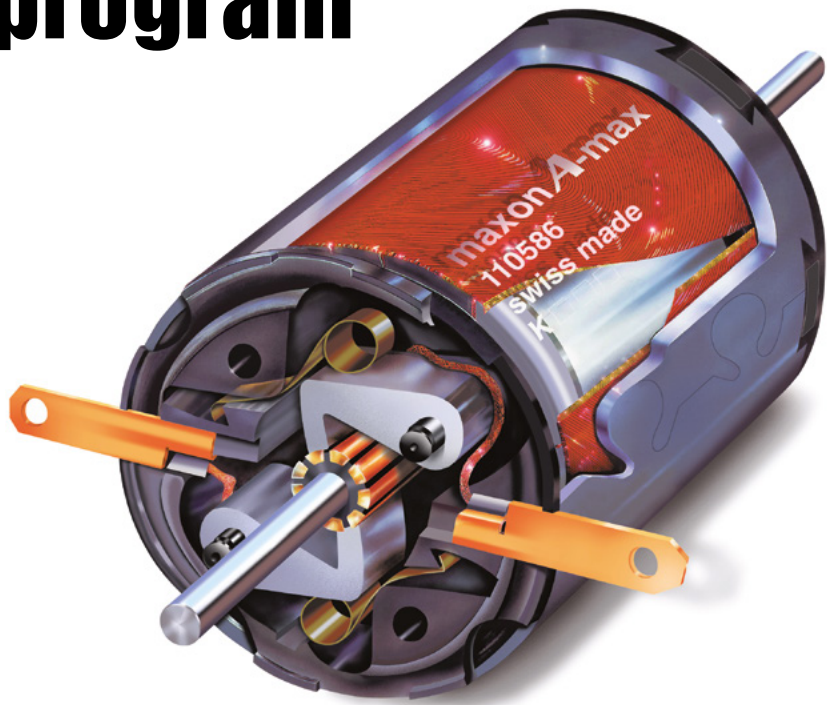
- Good price-performance ratio
- Equipped with AlNiCo magnets
- High and consistent quality thanks to mastery and monitoring of the processes
- Automated manufacturing process
- Open for customer-oriented modifications

Standard Specification No. 100	60
Explanation of the DC motors	64

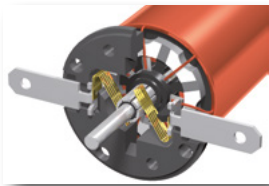
DCX Program	66-87
DC-max Program	90-95
RE Program	98-134
A-max Program	137-162

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.



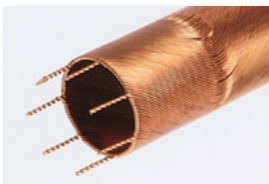
Reduced-diameter commutator, employing more segments, provides longer life.



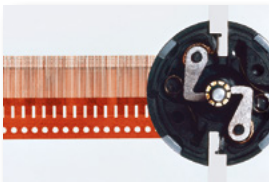
Hybrid process forms the stator by assembling motor housing, magnet and end cap in one step using injection molding of PPA plastic. Customers can select either sleeve or ball bearings.



Glass-fibre reinforced polyphthalamide plastic (PPA), impact-resistant, heat-resistant up to 125°C and noise absorbing.

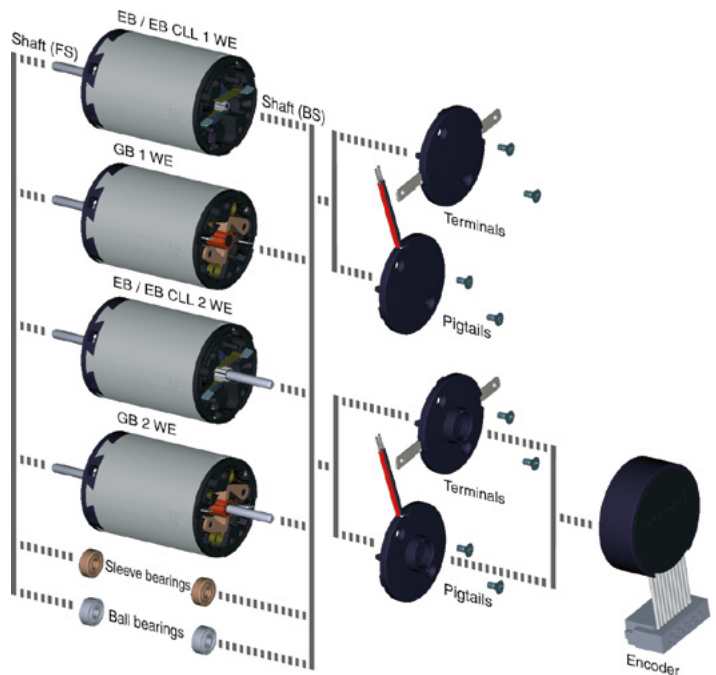


Proven winding technology provides a high-performance relationship between the coil and magnet system.



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

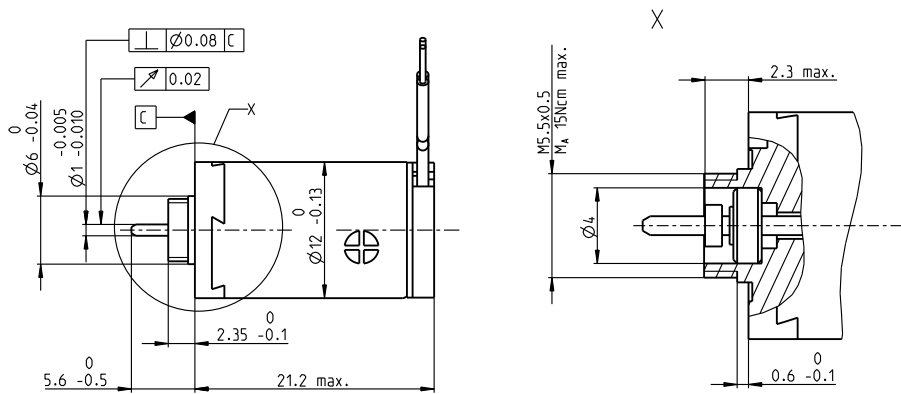
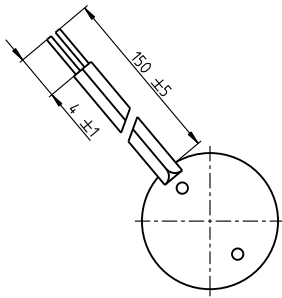


	WE = Shaft end	A-max 12 1 WE	A-max 12 2 WE	A-max 16 1 WE	A-max 16 2 WE	A-max 19 1 WE	A-max 19 2 WE	A-max 22 1 WE	A-max 22 2 WE	A-max 26 1 WE	A-max 26 2 WE	A-max 32 1 WE	A-max 32 2 WE
X = Standard X = Option													
Precious Metal Brushes (EB)			X	X	X	X	X	X	X	X	X	X	X
Precious Metal Brushes (EB) and 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
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
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	2.6	2.6	2.6	3.0	3.0
	max.			9.4	10.0	16.6	16.6	16.0	16.0	16.0	16.0	19.3	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)

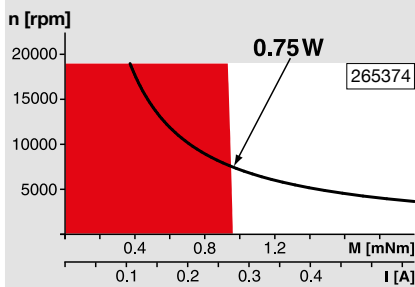
Part Numbers

200937	265374	265375	265376	265377	265378
--------	--------	--------	--------	--------	--------

Motor Data								
Values at nominal voltage								
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								
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 ²	0.218	0.246	0.241	0.238	0.235	0.183	

Specifications **Operating Range** **Comments**

- Thermal data**
- 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)**
- 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



- 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 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 64.

maxon Modular System Overview on page 28–36

Planetary Gearhead
Ø10 mm
0.01 - 0.15 Nm
Page 320

Spur Gearhead
Ø12 mm
0.01 - 0.03 Nm
Page 321

Planetary Gearhead
Ø13 mm
0.05 - 0.15 Nm
Page 322

Planetary Gearhead
Ø13 mm
0.2 - 0.35 Nm
Page 323

Recommended Electronics:

Notes Page 30

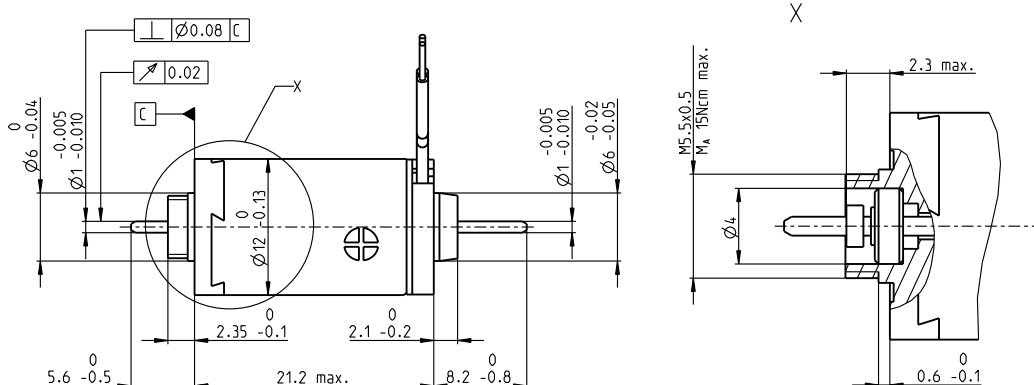
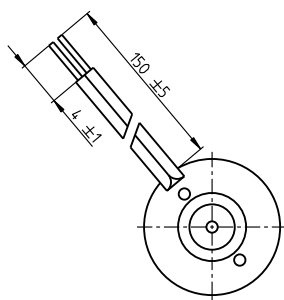
ESCON Module 24/2 444

ESCON 36/2 DC 444

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	V	3	4.5	6	9	12	15
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		Ω	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 ²	0.218	0.246	0.241	0.238	0.235	0.183

Specifications

Thermal data		
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	267 s
21	Ambient temperature	-30...+65°C
22	Max. winding temperature	+85°C

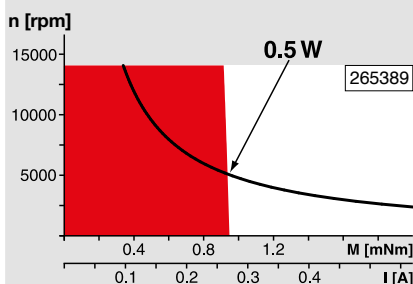
Mechanical data (sleeve bearings)		
23	Max. speed	14000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static, shaft supported)	15 N
28	Max. radial load, 4 mm from flange	70 N

Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	12 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 64.

Operating Range

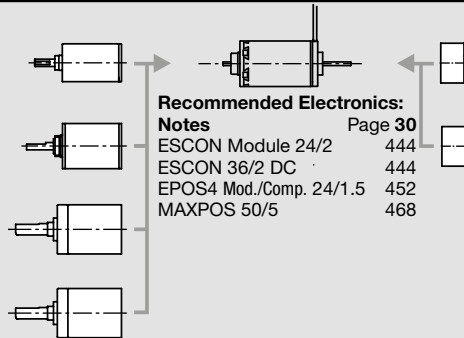


Comments

- 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

- Planetary Gearhead**
Ø10 mm
0.01 - 0.15 Nm
Page 320
- Spur Gearhead**
Ø12 mm
0.01 - 0.03 Nm
Page 321
- Planetary Gearhead**
Ø13 mm
0.05 - 0.15 Nm
Page 322
- Planetary Gearhead**
Ø13 mm
0.2 - 0.35 Nm
Page 323



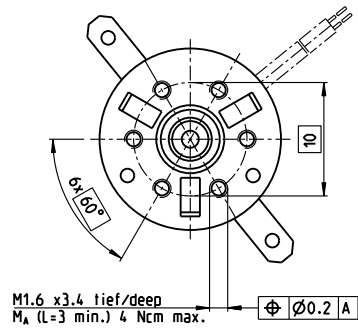
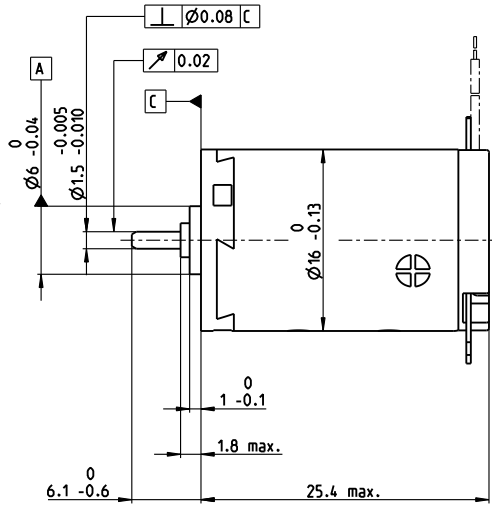
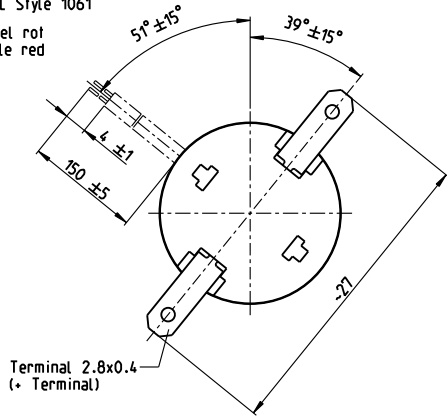
Recommended Electronics:
Notes Page 30
 ESCON Module 24/2 444
 ESCON 36/2 DC 444
 EPOS4 Mod./Comp. 24/1.5 452
 MAXPOS 50/5 468

Overview on page 28-36

- Encoder MR**
16 CPT,
2 channels
Page 413
- Encoder MR**
64 - 256 CPT,
2 channels
Page 414

A-max 16 Ø16 mm, Precious Metal Brushes CLL, 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	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 ²	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

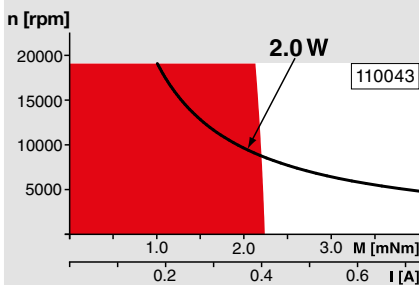
CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28-36

Spur Gearhead

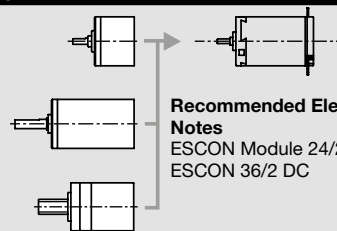
Ø16 mm
0.01 - 0.1 Nm
Page 324-327

Planetary Gearhead

Ø16 mm
0.1 - 0.6 Nm
Page 328/329

Screw Drive

Ø16 mm
Page 369-371



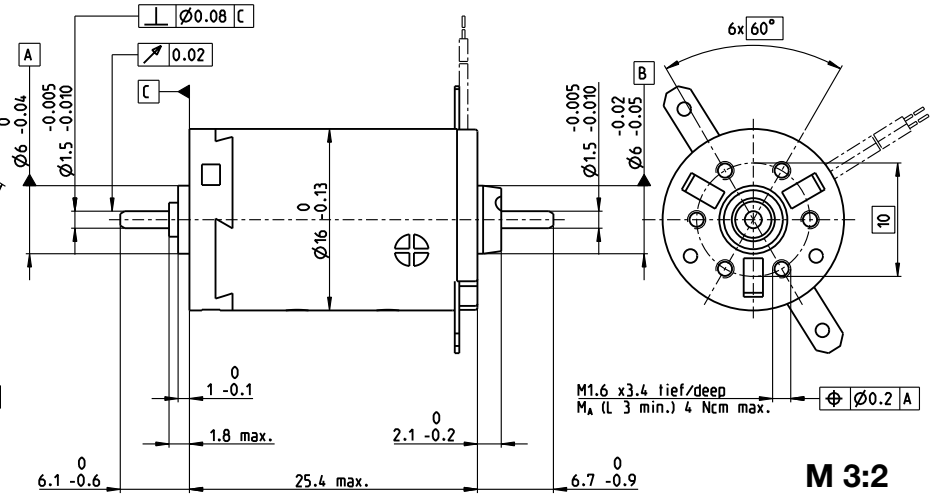
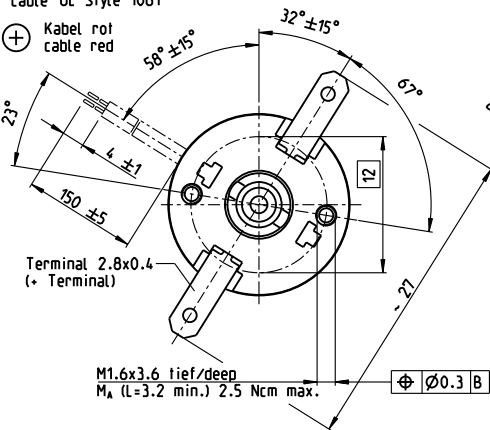
Recommended Electronics:

Notes Page 30
ESCON Module 24/2 444
ESCON 36/2 DC 444

A-max 16 Ø16 mm, Precious Metal Brushes CLL, 1.2 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	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
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	0.0519	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 ²	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 / 280 N
28 Max. radial load, 5 mm from flange	1.4 N

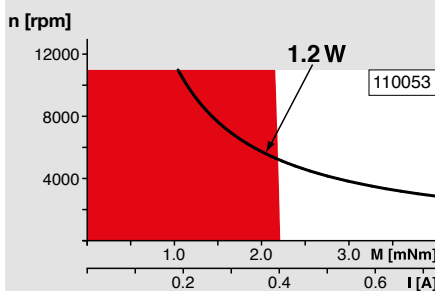
Mechanical data (ball bearings)	
23 Max. speed	11 000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	2.2 N
27 Max. force for press fits (static) (static, shaft supported)	30 N / 280 N
28 Max. radial load, 5 mm from flange	7.8 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	22 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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).

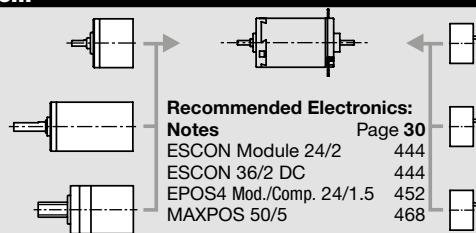
— Assigned power rating

maxon Modular System

Spur Gearhead
Ø16 mm
0.01 - 0.1 Nm
Page 324-327

Planetary Gearhead
Ø16 mm
0.1 - 0.6 Nm
Page 328/329

Screw Drive
Ø16 mm
Page 369-371



Recommended Electronics:
Notes Page 30
ESCON Module 24/2 444
ESCON 36/2 DC 444
EPOS4 Mod./Comp. 24/1.5 452
MAXPOS 50/5 468

Overview on page 28-36

Encoder MR
32 CPT,
2 / 3 channels
Page 416

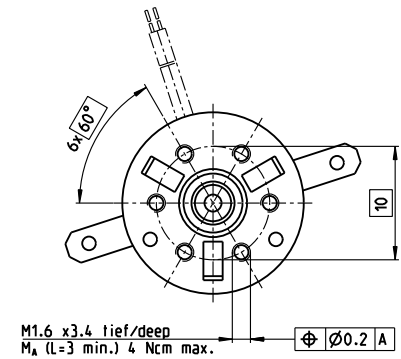
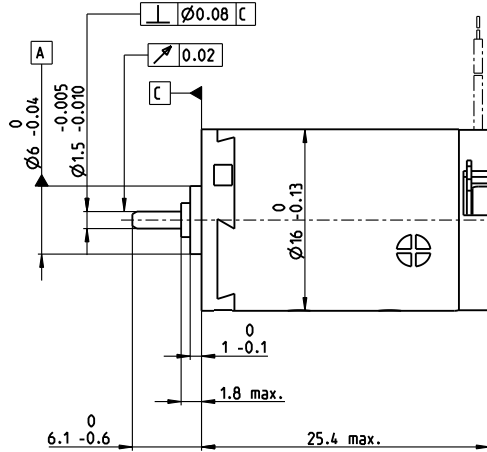
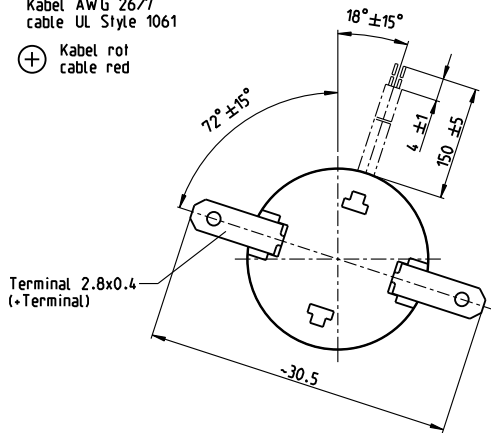
Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 417

Encoder MEnc
Ø13 mm
16 CPT, 2 channels
Page 407

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		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 ²	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

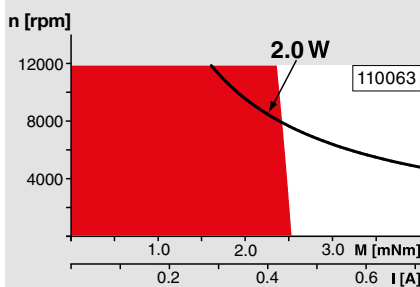
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	21 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28–36

Spur Gearhead

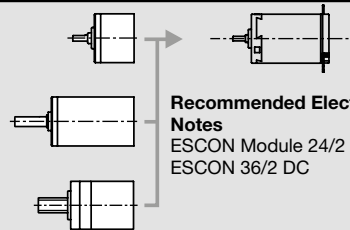
Ø16 mm
0.01 - 0.1 Nm
Page 324–327

Planetary Gearhead

Ø16 mm
0.1 - 0.6 Nm
Page 328/329

Screw Drive

Ø16 mm
Page 369–371

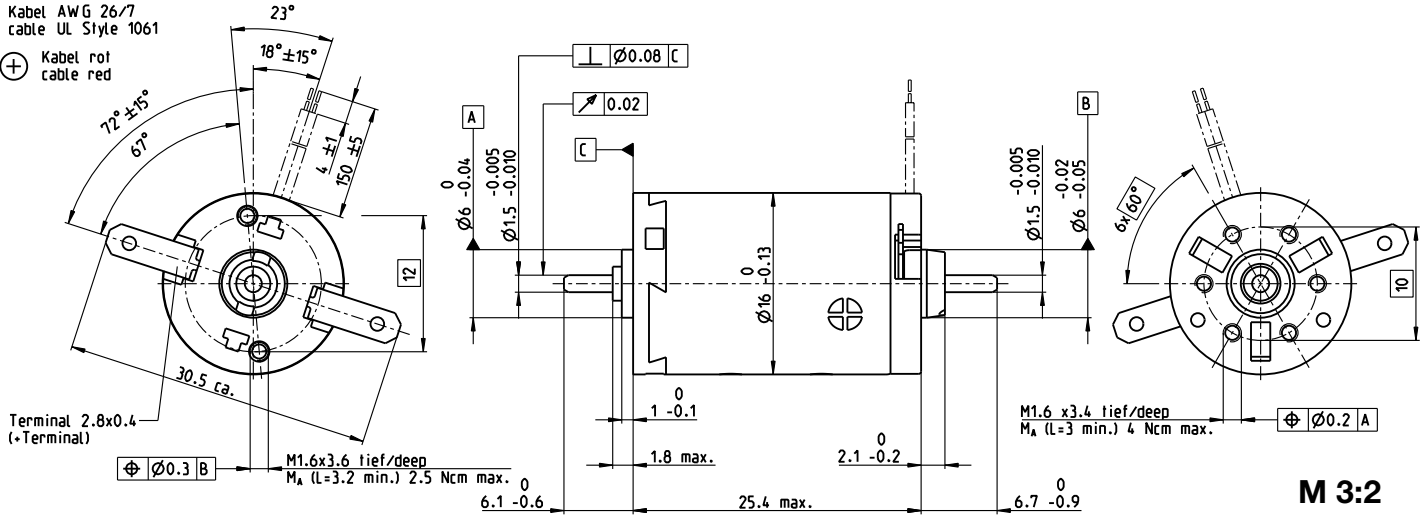


Recommended Electronics:

Notes Page 30
ESCON Module 24/2 444
ESCON 36/2 DC 444

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

	110071	110072	110073	110074	110075	110076	110077	110078	110079	110080
with terminals										
with cables	139825	352870	352871	352872	352873	352874	352875	352876	352877	352878

Motor Data

Values at nominal voltage		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 ²	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793

Specifications

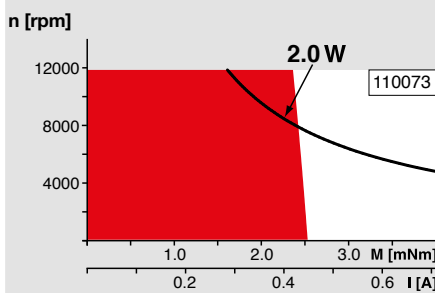
Thermal data	
17 Thermal resistance housing-ambient	29.8 K/W
18 Thermal resistance winding-housing	5.5 K/W
19 Thermal time constant winding	3.55 s
20 Thermal time constant motor	165 s
21 Ambient temperature	-30...+85°C
22 Max. winding temperature	+125°C
Mechanical data (sleeve bearings)	
23 Max. speed	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
Mechanical data (ball bearings)	
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
Other specifications	
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 64.

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

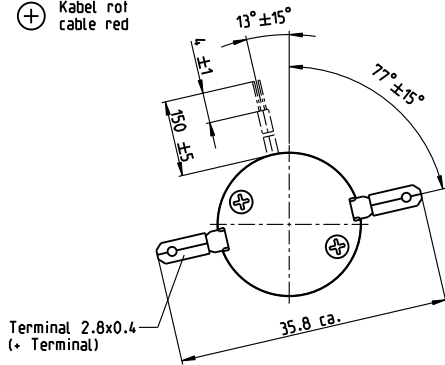
Overview on page 28-36

Spur Gearhead Ø16 mm 0.01 - 0.1 Nm Page 324-327		Encoder MR 32 CPT, 2 / 3 channels Page 416
Planetary Gearhead Ø16 mm 0.1 - 0.6 Nm Page 328/329		Encoder MR 128 / 256 / 512 CPT, 2 / 3 channels Page 417
Screw Drive Ø16 mm Page 369-371		Encoder MEnc Ø13 mm 16 CPT, 2 channels Page 407
Recommended Electronics:		
Notes	Page 30	
ESCON Module 24/2	444	
ESCON 36/2 DC	444	
EPOS4 Mod./Comp. 24/1.5	452	
MAXPOS 50/5	468	

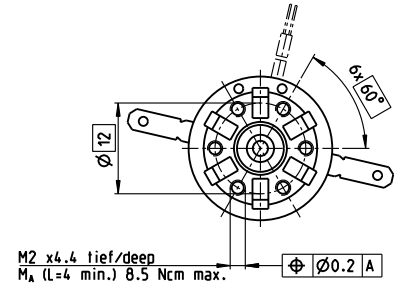
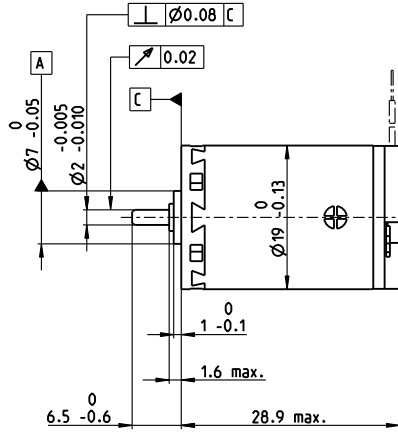
A-max 19 Ø19 mm, Precious Metal Brushes CLL, 2.5 Watt

Kabel AWG 26/7
cable UL Style 1061

⊕ Kabel rot
cable red



M 1:1



maxon A-max

- 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 ²	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

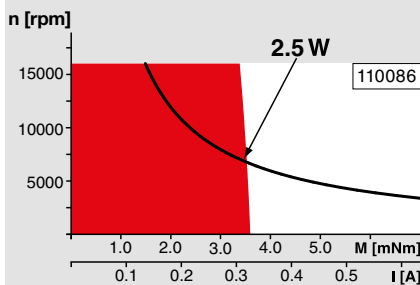
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	33 g
CLL = Capacitor Long Life	

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28-36

Planetary Gearhead

Ø19 mm
0.1 - 0.3 Nm
Page 330

Planetary Gearhead

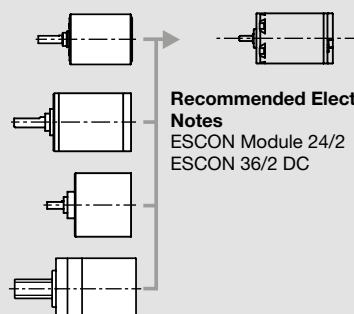
Ø22 mm
0.5 - 2.0 Nm
Page 333/335

Spur Gearhead

Ø24 mm
0.1 Nm
Page 339

Screw Drive

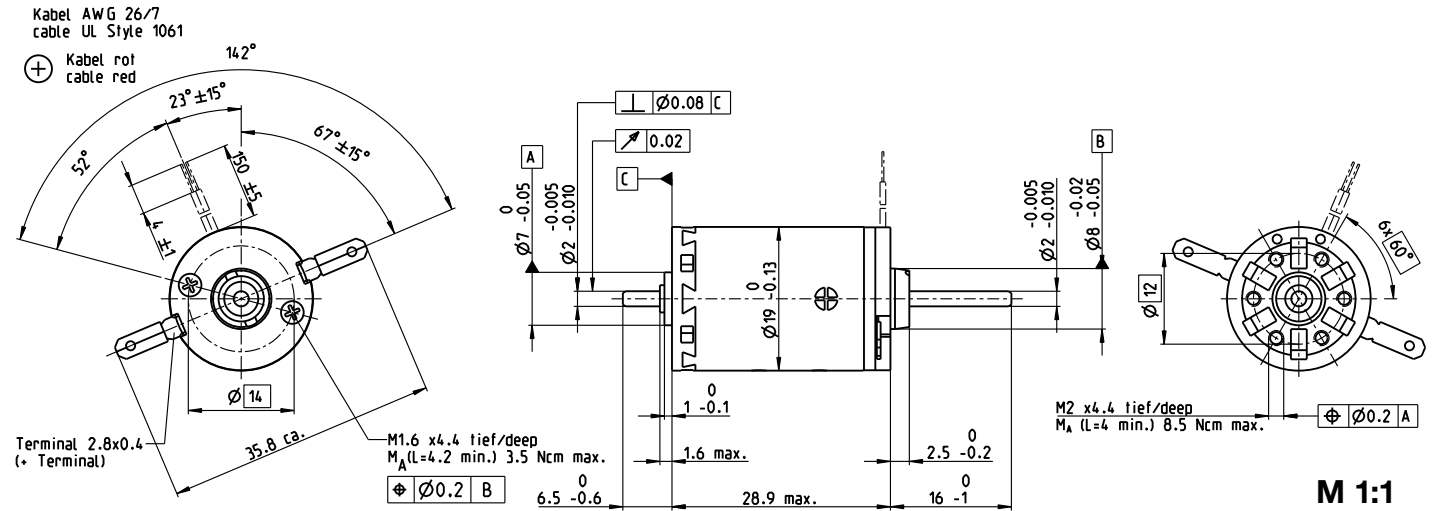
Ø22 mm
Page 372/373



Recommended Electronics:

Notes Page 30
ESCON Module 24/2 444
ESCON 36/2 DC 444

A-max 19 Ø19 mm, Precious Metal Brushes CLL, 1.5 Watt

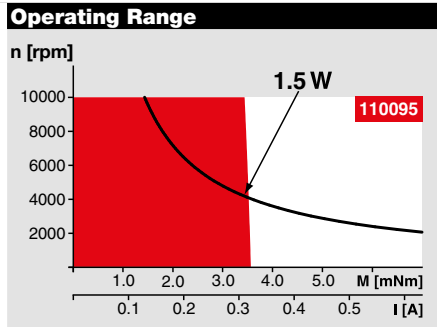


- Stock program
- Standard program
- Special program (on request)

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 ²	2.54	2.08	2.18	2.15	2.17	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	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



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**

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	11.9 N
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor g	34 g
CLL = Capacitor Long Life	
Values listed in the table are nominal. Explanation of the figures on page 64.	
Option	
Ball bearings in place of sleeve bearings Without CLL	

maxon Modular System

Planetary Gearhead
Ø19 mm
0.1 - 0.3 Nm
Page 330

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 333/335

Spur Gearhead
Ø24 mm
0.1 Nm
Page 339

Screw Drive
Ø22 mm
Page 372/373

Overview on page 28–36

Encoder MR
32 CPT,
2 / 3 channels
Page 416

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 417

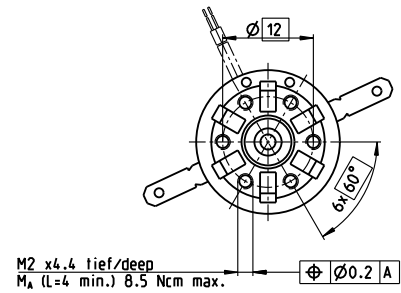
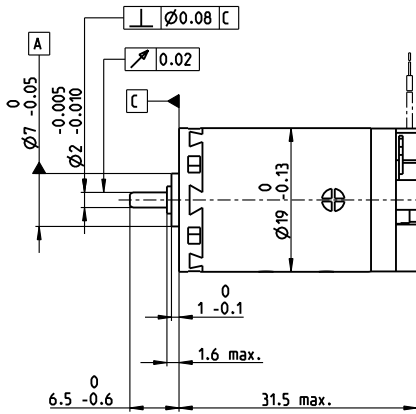
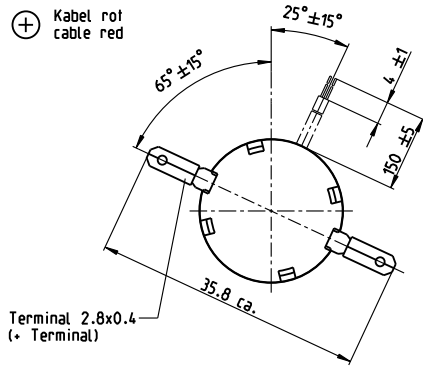
Encoder Enc
22 mm
100 CPT, 2 channels
Page 426

Encoder MEnc
Ø13 mm
16 CPT, 2 channels
Page 407

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 ²	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

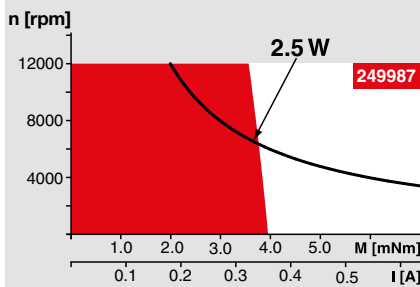
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	33 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28–36

Planetary Gearhead

Ø19 mm
0.1 - 0.3 Nm
Page 330

Planetary Gearhead

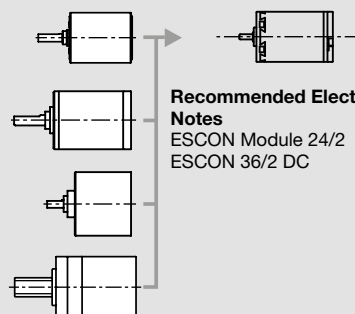
Ø22 mm
0.5 - 2.0 Nm
Page 333/335

Spur Gearhead

Ø24 mm
0.1 Nm
Page 339

Screw Drive

Ø22 mm
Page 372/373



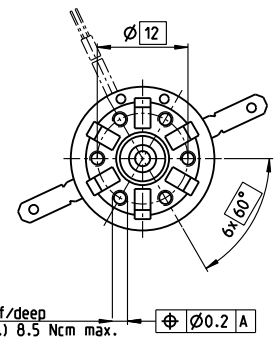
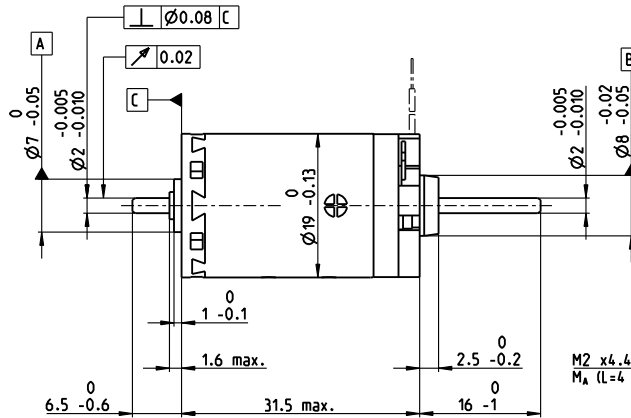
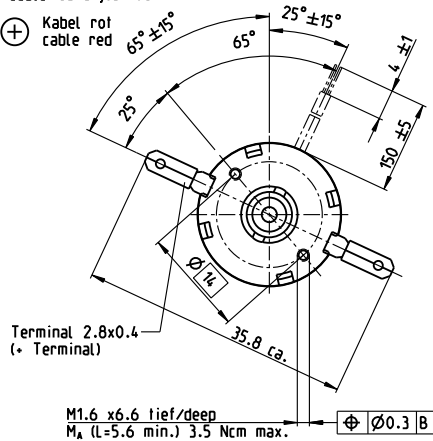
Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444

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 ²	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

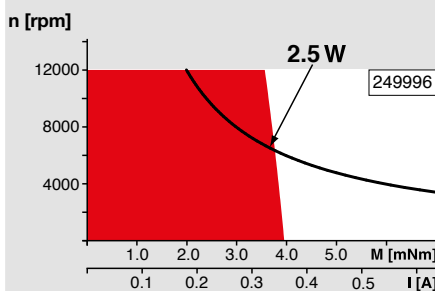
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	34 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

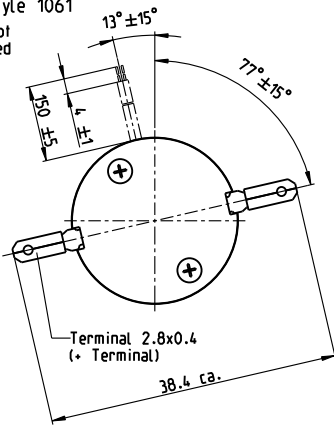
Overview on page 28–36

Planetary Gearhead Ø19 mm 0.1 - 0.3 Nm Page 330		Encoder MR 32 CPT, 2 / 3 channels Page 416
Planetary Gearhead Ø22 mm 0.5 - 2.0 Nm Page 333/335		Encoder MR 128 / 256 / 512 CPT, 2 / 3 channels Page 417
Spur Gearhead Ø24 mm 0.1 Nm Page 339		Encoder Enc 22 mm 100 CPT, 2 channels Page 426
Screw Drive Ø22 mm Page 372/373		Encoder MEnc Ø13 mm 16 CPT, 2 channels Page 407

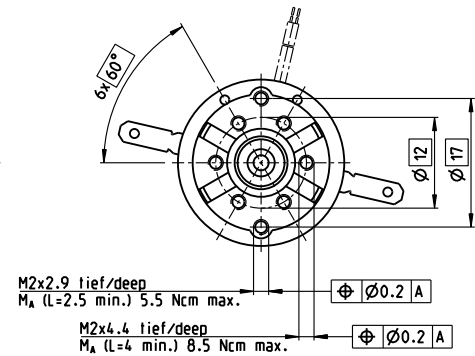
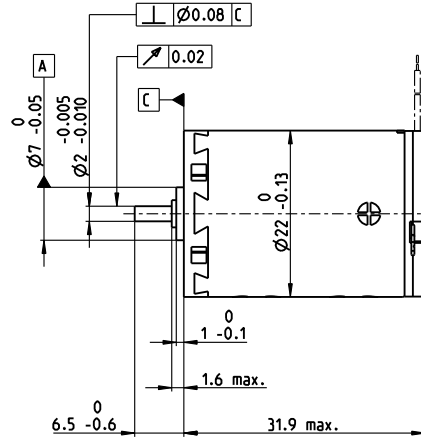
Recommended Electronics:
Notes Page 30
 ESCON Module 24/2 444
 ESCON 36/2 DC 444
 EPOS4 Mod./Comp. 24/1.5 452
 MAXPOS 50/5 468

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		6	9	9	12	12	15	18	24	30	36	48	48
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 ²	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

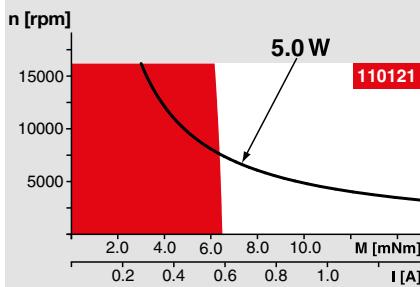
CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28-36

Planetary Gearhead

Ø22 mm
0.1 - 0.6 Nm
Page 331/332

Planetary Gearhead

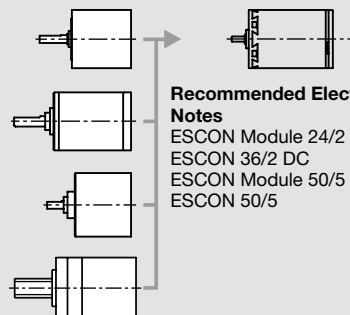
Ø22 mm
0.5 - 2.0 Nm
Page 333/335

Spur Gearhead

Ø24 mm
0.1 Nm
Page 339

Screw Drive

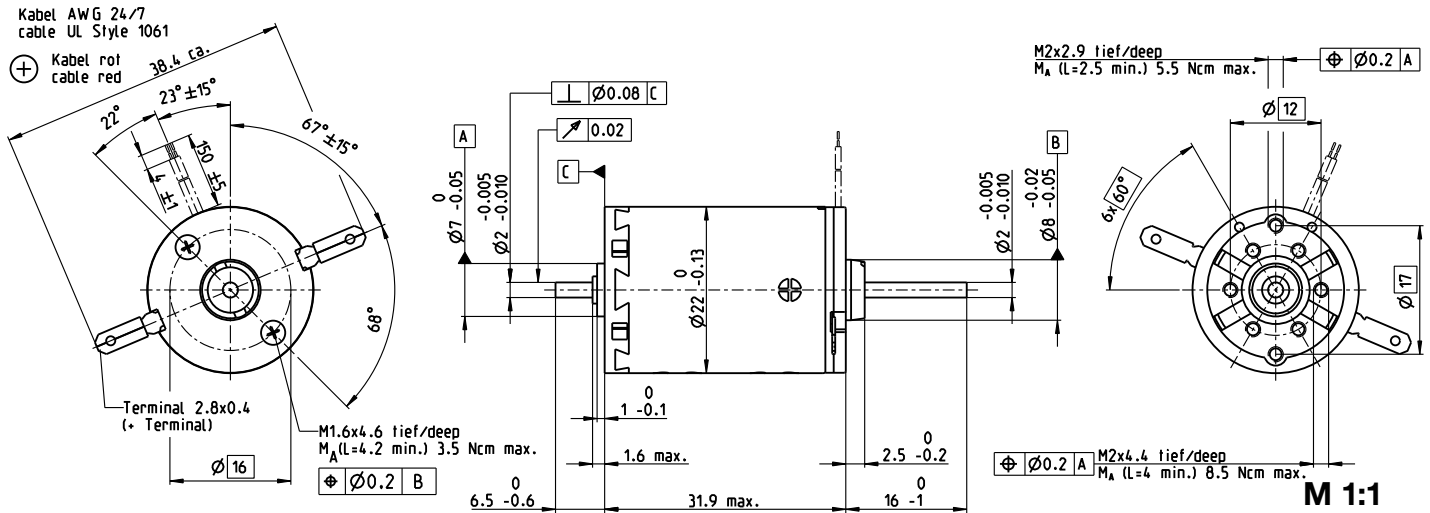
Ø22 mm
Page 372/373



Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447

A-max 22 Ø22 mm, Precious Metal Brushes CLL, 3.5 Watt



- Stock program
- Standard program
- Special program (on request)

Part Numbers

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

Values at nominal voltage		4.5	6	7.2	7.2	7.2	9	12	15	18	24	36	42	
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
Characteristics		Ω	1.72	3.36	4.27	5.39	6.78	8.9	13.8	21.2	32.9	59	122	147
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 ²	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

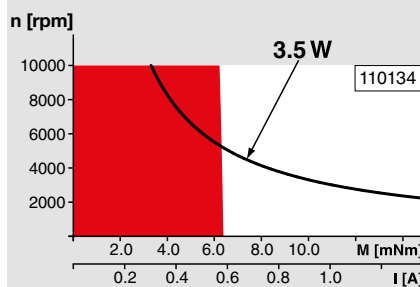
Mechanical data (ball bearings)		
23	Max. speed	10000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static) (static, shaft supported)	45 N / 440 N
28	Max. radial load, 5 mm from flange	12.3 N

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 64.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range



Comments

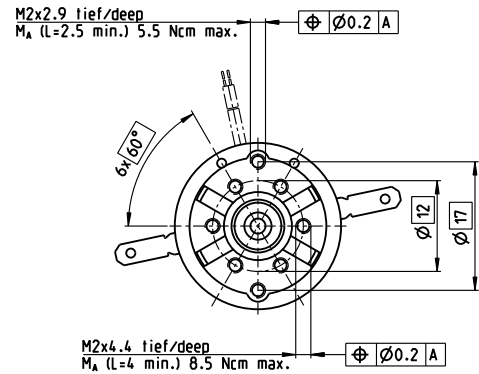
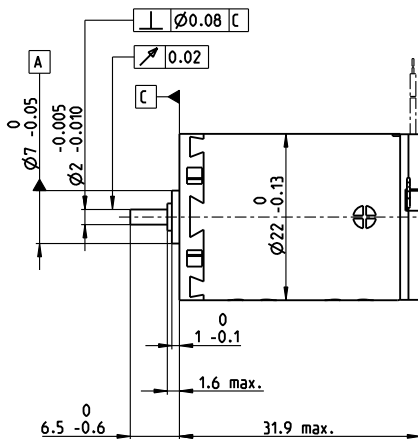
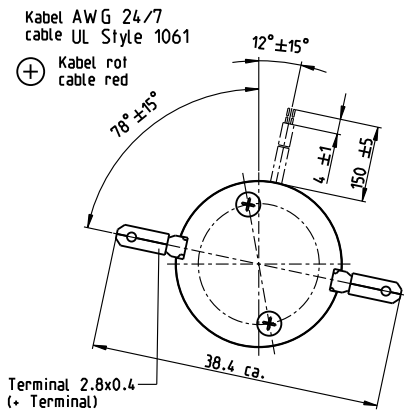
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Planetary Gearhead Ø22 mm 0.1 - 0.6 Nm Page 331/332		Encoder MR 32 CPT, 2 / 3 channels Page 416
Planetary Gearhead Ø22 mm 0.5 - 2.0 Nm Page 333/335		Encoder MR 128 / 256 / 512 CPT, 2 / 3 channels Page 417
Spur Gearhead Ø24 mm 0.1 Nm Page 339		Encoder Enc 22 mm 100 CPT, 2 channels Page 426
Screw Drive Ø22 mm Page 372/373		Encoder MEnc Ø13 mm 16 CPT, 2 channels Page 408

A-max 22 Ø22 mm, Graphite Brushes, 6 Watt

maxon A-max



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

with terminals	110143	110145	110146	110147	110148	110149	110150	110151	110152	110153	110154	110155
with cables	139840	353017	199807	320206	323856	108828	199424	202921	267433	325492	313302	353019

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	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 ²	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

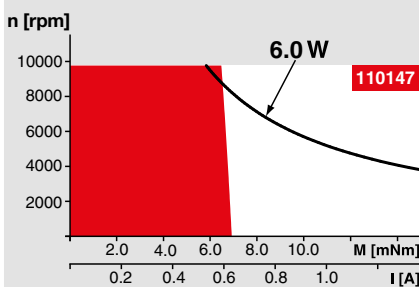
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	54 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28–36

Planetary Gearhead

Ø22 mm
0.1 - 0.6 Nm
Page 331/332

Planetary Gearhead

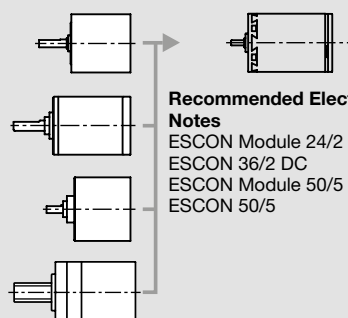
Ø22 mm
0.5 - 2.0 Nm
Page 333/335

Spur Gearhead

Ø24 mm
0.1 Nm
Page 339

Screw Drive

Ø22 mm
Page 372/373



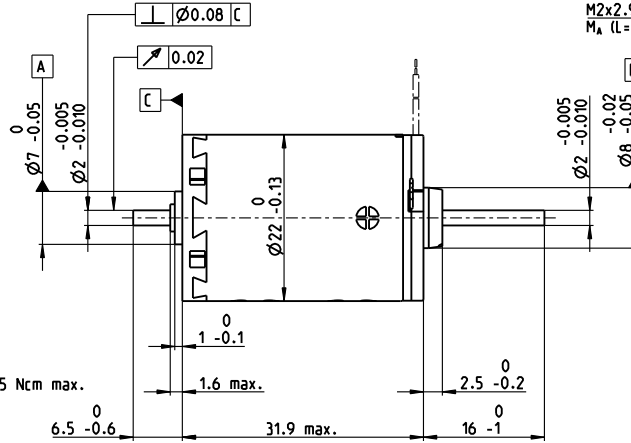
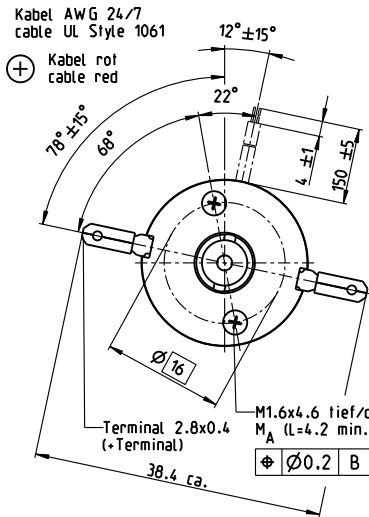
Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447

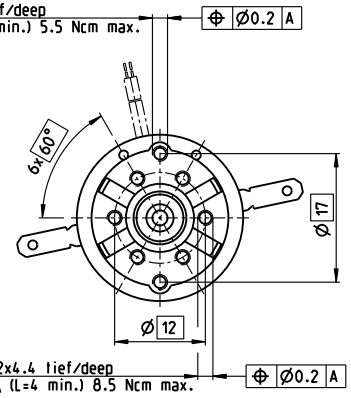
A-max 22 Ø22 mm, Graphite Brushes, 6 Watt

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	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	21.3	20.5	20.4	20.2	20.3	20.2	20.1	20.1	20.1	20.1	20.2	20.1
16 Rotor inertia	gcm ²	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...+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

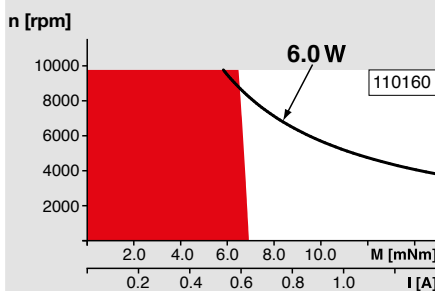
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	9
31 Weight of motor	54 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28–36

Planetary Gearhead

Ø22 mm
0.1 - 0.6 Nm
Page 331/332

Planetary Gearhead

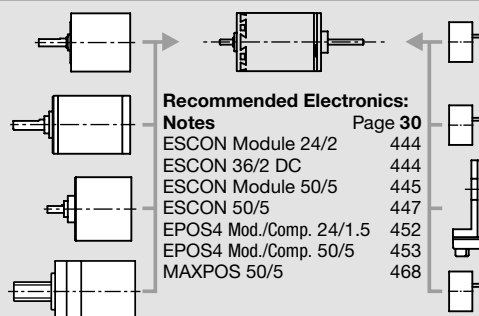
Ø22 mm
0.5 - 2.0 Nm
Page 333/335

Spur Gearhead

Ø24 mm
0.1 Nm
Page 339

Screw Drive

Ø22 mm
Page 372/373



Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 Mod./Comp. 50/5	453
MAXPOS 50/5	468

Encoder MR

32 CPT,
2 / 3 channels
Page 416

Encoder MR

128 / 256 / 512 CPT,
2 / 3 channels
Page 417

Encoder Enc

22 mm
100 CPT, 2 channels
Page 426

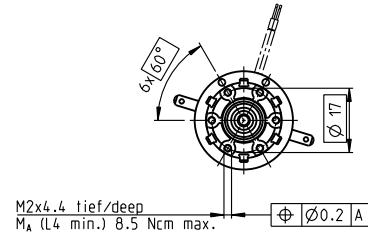
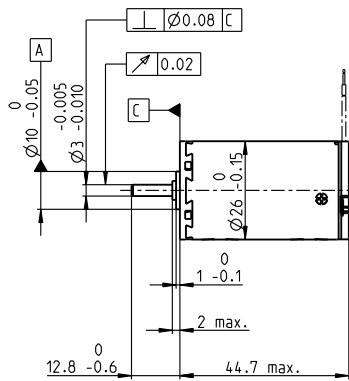
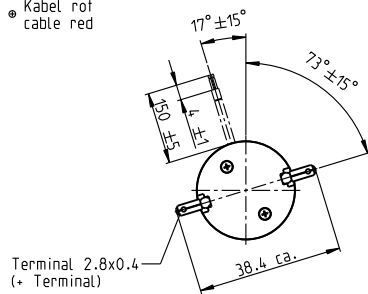
Encoder MEnc

Ø13 mm
16 CPT, 2 channels
Page 408

A-max 26 Ø26 mm, Precious Metal Brushes CLL, 4 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	110169	110170	110171	110172	110173	110174	110175	110176	110177	110178	110179	110180
with cables	353039	353040	353041	353042	220031	353043	353044	353045	353046	353047	353048	353049

Motor Data

Values at nominal voltage			4.5	4.5	4.5	7.2	12	12	15	18	18	24	30	42
1	Nominal voltage	V	4.5	4.5	4.5	7.2	12	12	15	18	18	24	30	42
2	No load speed	rpm	6120	5230	3860	5110	5590	5020	5430	5980	5340	5670	5890	5520
3	No load current	mA	60	47.4	30.4	28.5	19.6	16.7	15	14.5	12.2	10	8.5	5.51
4	Nominal speed	rpm	5140	3910	2400	3290	3470	2880	3190	3690	3160	3500	3680	3270
5	Nominal torque (max. continuous torque)	mNm	5.45	6.46	8.95	10.9	12.4	12.4	11.8	11.4	12.1	12.1	11.9	11.7
6	Nominal current (max. continuous current)	A	0.84	0.84	0.84	0.84	0.631	0.565	0.464	0.414	0.392	0.312	0.255	0.168
7	Stall torque	mNm	32.6	24.9	23.3	30.2	32.8	29.3	28.6	29.9	29.9	31.8	31.9	28.9
8	Stall current	A	4.7	3.08	2.12	2.27	1.62	1.3	1.1	1.05	0.94	0.797	0.665	0.403
9	Max. efficiency	%	79	77	78	79	80	79	78	78	79	79	79	79
Characteristics			0.958	1.46	2.12	3.17	7.41	9.24	13.7	17.1	19.2	30.1	45.1	104
10	Terminal resistance	Ω	0.958	1.46	2.12	3.17	7.41	9.24	13.7	17.1	19.2	30.1	45.1	104
11	Terminal inductance	mH	0.101	0.138	0.254	0.372	0.862	1.07	1.42	1.69	2.13	3.35	4.85	10.8
12	Torque constant	mNm/A	6.94	8.09	11	13.3	20.2	22.5	26	28.3	31.8	39.9	48	71.6
13	Speed constant	rpm/V	1380	1180	869	718	472	423	367	337	300	239	199	133
14	Speed / torque gradient	rpm/mNm	190	213	168	171	173	173	193	203	181	181	187	194
15	Mechanical time constant	ms	24.6	24.4	23.8	23.7	23.6	23.6	23.8	23.9	23.7	23.7	23.8	24
16	Rotor inertia	gcm ²	12.3	10.9	13.6	13.2	13.1	13	11.8	11.2	12.5	12.5	12.2	11.8

Specifications

Thermal data			13.2 K/W
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		423 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		100 g

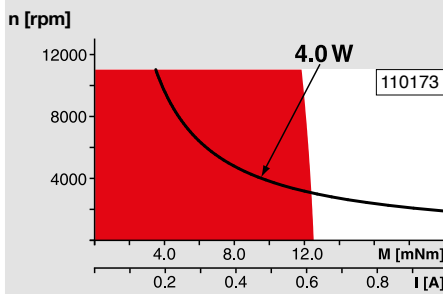
CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28-36

Planetary Gearhead

Ø26 mm
0.75 - 4.5 Nm
Page 340

Spur Gearhead

Ø30 mm
0.07 - 0.2 Nm
Page 341

Planetary Gearhead

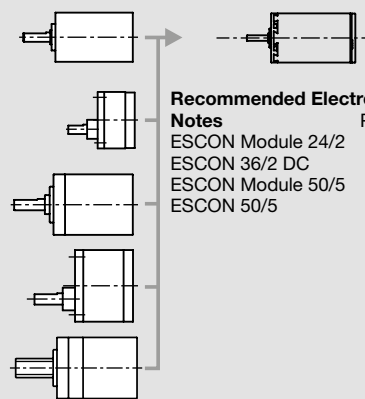
Ø32 mm
0.75 - 6.0 Nm
Page 342/343/346

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 353

Screw Drive

Ø32 mm
Page 374-379



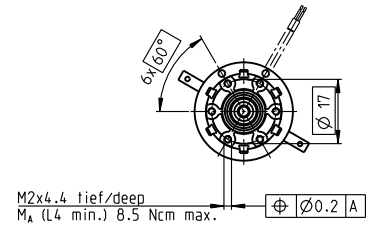
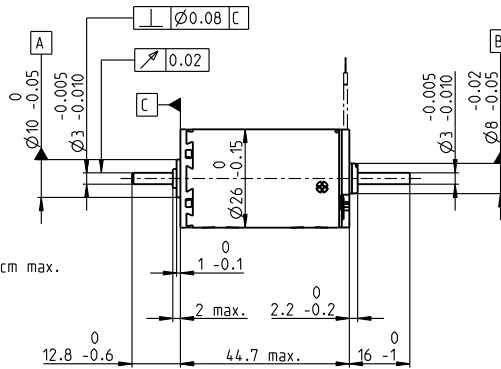
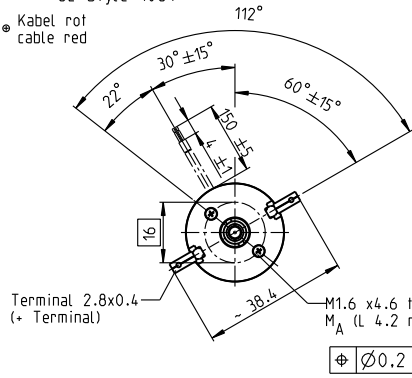
Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447

A-max 26 Ø26 mm, Precious Metal Brushes CLL, 4 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	110192	110193	110194	110195	110196	110197	110198	110199	110200	110201	110202	110203
with cables	353064	353065	353066	353067	205635	353068	353069	353070	353071	353072	353073	353074

Motor Data

Values at nominal voltage		3.6	4.5	6	7.2	9	9	12	15	18	21	24	30
1 Nominal voltage	V	3.6	4.5	6	7.2	9	9	12	15	18	21	24	30
2 No load speed	rpm	4890	5230	5160	5110	4190	3750	4340	4980	5340	4960	4700	3930
3 No load current	mA	64.2	57.1	41.7	34.3	20.3	17.3	16.1	15.9	14.7	11.2	9.08	5.57
4 Nominal speed	rpm	3920	3920	3710	3300	2060	1610	2090	2680	3170	2790	2490	1670
5 Nominal torque (max. continuous torque)	mNm	5.42	6.38	8.82	10.8	12.5	12.5	11.8	11.4	12	12.1	11.9	11.7
6 Nominal current (max. continuous current)	A	0.84	0.84	0.84	0.84	0.633	0.567	0.465	0.415	0.391	0.312	0.255	0.168
7 Stall torque	mNm	26	24.9	31	30.1	24.5	21.9	22.8	24.8	29.8	27.7	25.5	20.6
8 Stall current	A	3.76	3.08	2.83	2.27	1.22	0.974	0.878	0.879	0.94	0.697	0.532	0.288
9 Max. efficiency	%	76	75	78	78	76	76	75	76	77	77	76	75
Characteristics		0.958	1.46	2.12	3.17	7.41	9.24	13.7	17.1	19.2	30.1	45.1	104
10 Terminal resistance	Ω	0.958	1.46	2.12	3.17	7.41	9.24	13.7	17.1	19.2	30.1	45.1	104
11 Terminal inductance	mH	0.101	0.138	0.254	0.372	0.861	1.07	1.42	1.69	2.13	3.35	4.85	10.8
12 Torque constant	mNm/A	6.92	8.07	11	13.3	20.2	22.5	25.9	28.3	31.7	39.8	47.9	71.4
13 Speed constant	rpm/V	1380	1180	872	720	473	425	368	338	301	240	199	134
14 Speed / torque gradient	rpm/mNm	191	214	169	172	174	174	194	204	182	182	188	195
15 Mechanical time constant	ms	24.7	24.5	23.9	23.8	23.7	23.7	23.9	24	23.9	23.8	24	24.1
16 Rotor inertia	gcm ²	12.3	10.9	13.6	13.2	13.1	13	11.8	11.2	12.5	12.5	12.2	11.8

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	660 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 / 1200 N
28 Max. radial load, 5 mm from flange	5.5 N

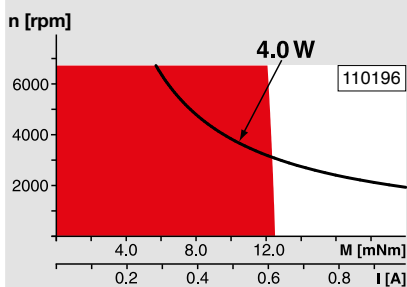
Mechanical data (ball bearings)	
23 Max. speed	6700 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	5.0 N
27 Max. force for press fits (static) (static, shaft supported)	75 N / 1200 N
28 Max. radial load, 5 mm from flange	20.5 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	100 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

Option
Ball bearings in place of sleeve bearings
Without CLL

Operating Range

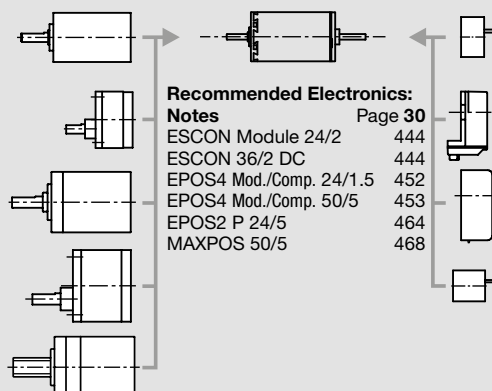


Comments

- 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

- Planetary Gearhead**
Ø26 mm
0.75 - 4.5 Nm
Page 340
- Spur Gearhead**
Ø30 mm
0.07 - 0.2 Nm
Page 341
- Planetary Gearhead**
Ø32 mm
0.75 - 6.0 Nm
Page 342/343/346
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 353
- Screw Drive**
Ø32 mm
Page 374-379



- Recommended Electronics:**
- | Notes | Page 30 |
|-------------------------|---------|
| ESCON Module 24/2 | 444 |
| ESCON 36/2 DC | 444 |
| EPOS4 Mod./Comp. 24/1.5 | 452 |
| EPOS4 Mod./Comp. 50/5 | 453 |
| EPOS2 P 24/5 | 464 |
| MAXPOS 50/5 | 468 |

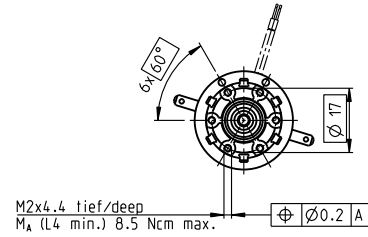
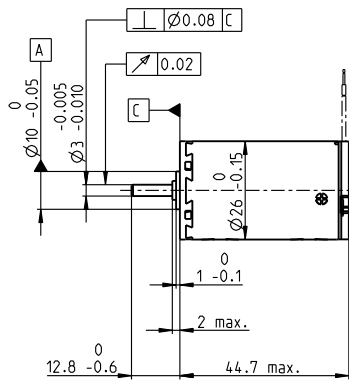
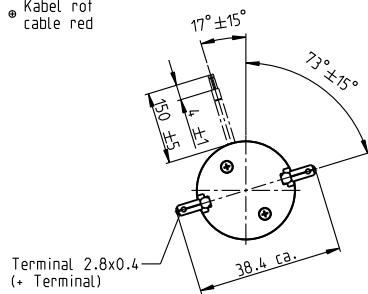
- Overview on page 28-36
- Encoder MR**
128 - 1000 CPT,
3 channels
Page 419
 - Encoder Enc**
22 mm
100 CPT, 2 channels
Page 426
 - Encoder HED_ 5540**
500 CPT,
3 channels
Page 430/432
 - Encoder MEnc**
Ø13 mm
16 CPT, 2 channels
Page 408

A-max 26 Ø26 mm, Precious Metal Brushes CLL, 7 Watt

High Power

Kabel AWG 24/7
cable UL Style 1061

* Kabel not
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
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	0.04	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 ²	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

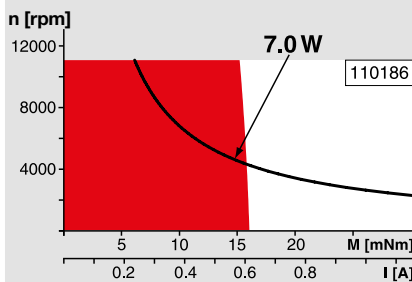
CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28-36

Planetary Gearhead

Ø26 mm
0.75 - 4.5 Nm
Page 340

Spur Gearhead

Ø30 mm
0.07 - 0.2 Nm
Page 341

Planetary Gearhead

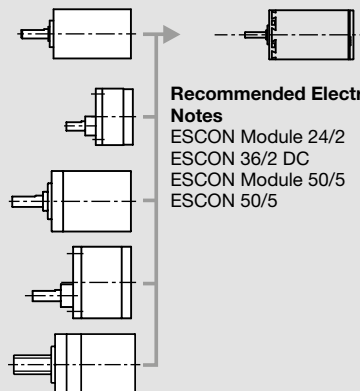
Ø32 mm
0.75 - 6.0 Nm
Page 342/343/346

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 353

Screw Drive

Ø32 mm
Page 374-379



Recommended Electronics:

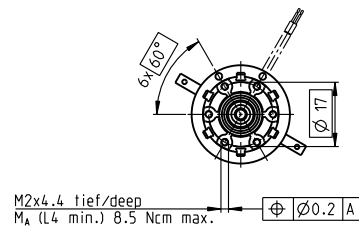
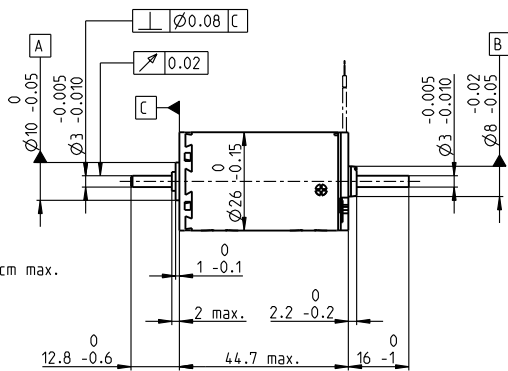
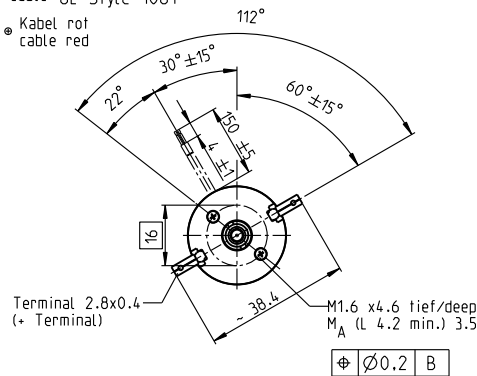
Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447

A-max 26 Ø26 mm, Precious Metal Brushes CLL, 4.5 Watt

High Power

Kabel AWG 24/7
cable UL Style 1061

● Kabel rot
cable red



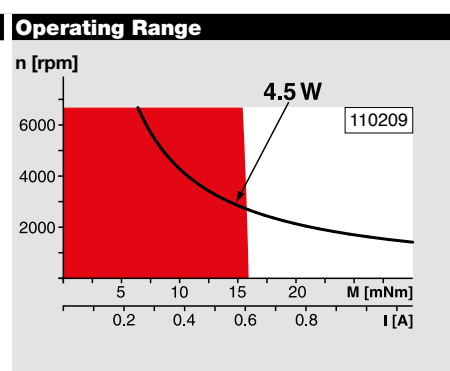
M 1:2

- 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																		
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 ²	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
	5.5 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**

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
	20.5 N
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	119 g
CLL = Capacitor Long Life	
Values listed in the table are nominal. Explanation of the figures on page 64.	
Option Ball bearings in place of sleeve bearings Without CLL	

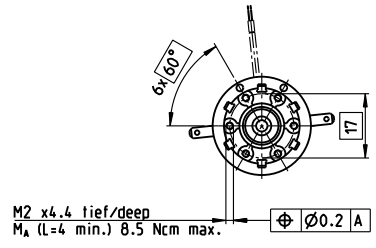
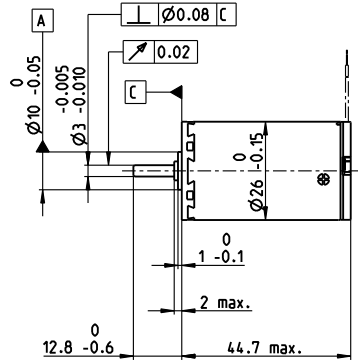
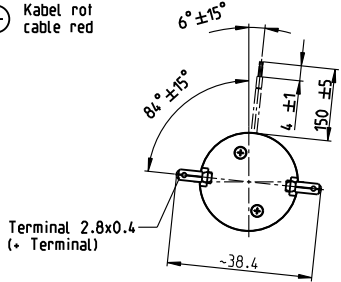
maxon Modular System Overview on page 28–36

<p>Planetary Gearhead Ø26 mm 0.75 - 4.5 Nm Page 340</p> <p>Spur Gearhead Ø30 mm 0.07 - 0.2 Nm Page 341</p> <p>Planetary Gearhead Ø32 mm 0.75 - 6.0 Nm Page 342/343/346</p> <p>Spur Gearhead Ø38 mm 0.1 - 0.6 Nm Page 353</p> <p>Screw Drive Ø32 mm Page 374–379</p>		<p>Recommended Electronics: Notes Page 30</p> <p>ESCON Module 24/2 444</p> <p>ESCON 36/2 DC 444</p> <p>EPOS4 Mod./Comp. 24/1.5 452</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>EPOS2 P 24/5 464</p> <p>MAXPOS 50/5 468</p>	<p>Encoder MR 128 - 1000 CPT, 3 channels Page 419</p> <p>Encoder Enc 22 mm 100 CPT, 2 channels Page 426</p> <p>Encoder HED_ 5540 500 CPT, 3 channels Page 430/432</p> <p>Encoder MEnc Ø13 mm 16 CPT, 2 channels Page 408</p>
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A-max 26 Ø26 mm, Graphite Brushes, 6 Watt

Kabel AWG 24/7
cable UL Style 1061

⊕ Kabel rot
cable red



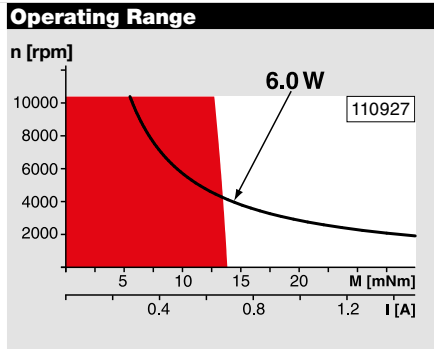
M 1:2

- Stock program
- Standard program
- Special program (on request)

		Part Numbers											
with terminals		110923	110924	110925	110926	110927	110928	110929	110930	110931	110932	110933	110934
with cables		353132	353133	353134	353135	340503	353136	353137	353138	353139	353140	353141	353605

Motor Data													
Values at nominal voltage													
1 Nominal voltage	V	7.2	9	12	12	18	18	24	24	30	36	42	48
2 No load speed	rpm	9790	10500	10300	8510	8380	7510	8680	7950	8890	8500	8230	6280
3 No load current	mA	121	106	77.7	60.2	39.4	34.2	31	27.7	25.5	20.1	16.5	10.3
4 Nominal speed	rpm	8580	8840	8510	6210	5890	5000	6050	5250	6350	5950	5630	3590
5 Nominal torque (max. continuous torque)	mNm	6.67	7.91	11	13.6	14.5	14.6	13.7	13.4	14.1	14.1	13.9	13.8
6 Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	0.755	0.679	0.554	0.498	0.467	0.373	0.305	0.203
7 Stall torque	mNm	54.6	51.4	63.4	50.9	49.4	44	45.7	39.8	49.8	47.6	44.6	32.9
8 Stall current	A	7.89	6.36	5.79	3.84	2.45	1.96	1.76	1.41	1.57	1.2	0.931	0.461
9 Max. efficiency	%	77	76	78	77	76	76	76	74	76	76	76	73
Characteristics													
10 Terminal resistance	Ω	0.912	1.41	2.07	3.13	7.36	9.19	13.6	17	19.1	30.1	45.1	104
11 Terminal inductance	mH	0.101	0.138	0.254	0.372	0.861	1.07	1.42	1.69	2.13	3.35	4.85	10.8
12 Torque constant	mNm/A	6.92	8.07	11	13.3	20.2	22.5	25.9	28.3	31.7	39.8	47.9	71.4
13 Speed constant	rpm/V	1380	1180	872	720	473	425	368	338	301	240	199	134
14 Speed / torque gradient	rpm/mNm	182	207	165	170	173	174	193	204	181	181	188	195
15 Mechanical time constant	ms	23.5	23.7	23.4	23.5	23.6	23.6	23.8	24	23.8	23.8	23.9	24.1
16 Rotor inertia	gcm ²	12.3	10.9	13.6	13.2	13.1	13	11.8	11.2	12.5	12.5	12.2	11.8

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	423 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)	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**

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)	80 N
28 Max. radial load, 5 mm from flange	5.5 N

maxon Modular System Overview on page 28–36

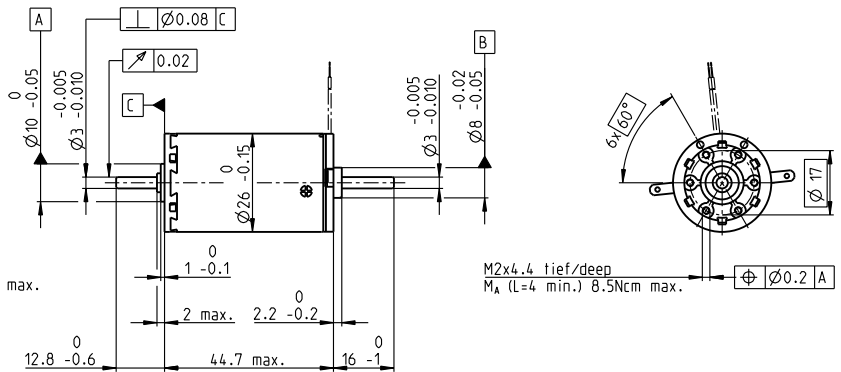
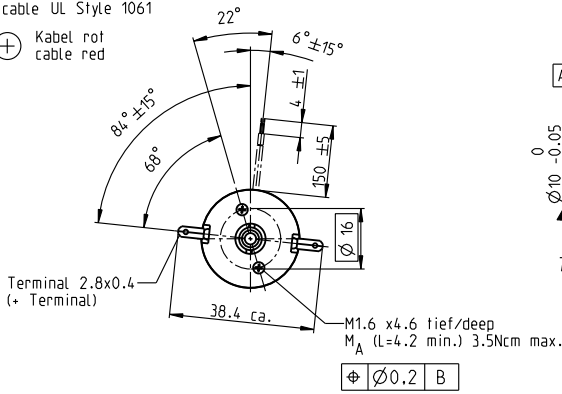
- Planetary Gearhead**
Ø26 mm
0.75 - 4.5 Nm
Page 340
- Spur Gearhead**
Ø30 mm
0.07 - 0.2 Nm
Page 341
- Planetary Gearhead**
Ø32 mm
0.75 - 6.0 Nm
Page 342/343/346
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 353
- Screw Drive**
Ø32 mm
Page 374–379

Recommended Electronics:
Notes Page 30
 ESCON Module 24/2 444
 ESCON 36/2 DC 444
 ESCON Module 50/5 445
 ESCON 50/5 447

A-max 26 Ø26 mm, Graphite Brushes, 6 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	110946	110947	110948	110949	110950	110951	110952	110953	110954	110955	110956	110957
with cables	353143	353144	353145	353146	353147	353148	353149	353150	353151	353152	353153	353154

Motor Data

Values at nominal voltage		7.2	9	12	12	18	18	24	24	30	36	42	48
1 Nominal voltage	V	7.2	9	12	12	18	18	24	24	30	36	42	48
2 No load speed	rpm	9790	10500	10300	8510	8380	7510	8680	7950	8890	8500	8230	6280
3 No load current	mA	121	106	77.7	60.2	39.4	34.2	31	27.7	25.5	20.1	16.5	10.3
4 Nominal speed	rpm	8580	8840	8510	6210	5890	5000	6050	5250	6350	5950	5630	3590
5 Nominal torque (max. continuous torque)	mNm	6.67	7.91	11	13.6	14.5	14.6	13.7	13.4	14.1	14.1	13.9	13.8
6 Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	0.755	0.679	0.554	0.498	0.467	0.373	0.305	0.203
7 Stall torque	mNm	54.6	51.4	63.4	50.9	49.4	44	45.7	39.8	49.8	47.6	44.6	32.9
8 Stall current	A	7.89	6.36	5.79	3.84	2.45	1.96	1.76	1.41	1.57	1.2	0.931	0.461
9 Max. efficiency	%	77	76	78	77	76	76	76	74	76	76	76	73
Characteristics		0.912	1.41	2.07	3.13	7.36	9.19	13.6	17	19.1	30.1	45.1	104
10 Terminal resistance	Ω	0.912	1.41	2.07	3.13	7.36	9.19	13.6	17	19.1	30.1	45.1	104
11 Terminal inductance	mH	0.101	0.138	0.254	0.372	0.861	1.07	1.42	1.69	2.13	3.35	4.85	10.8
12 Torque constant	mNm/A	6.92	8.07	11	13.3	20.2	22.5	25.9	28.3	31.7	39.8	47.9	71.4
13 Speed constant	rpm/V	1380	1180	872	720	473	425	368	338	301	240	199	134
14 Speed / torque gradient	rpm/mNm	182	207	165	170	173	174	193	204	181	181	188	195
15 Mechanical time constant	ms	23.5	23.7	23.4	23.5	23.6	23.6	23.8	24	23.8	23.8	23.9	24.1
16 Rotor inertia	gcm ²	12.3	10.9	13.6	13.2	13.1	13	11.8	11.2	12.5	12.5	12.2	11.8

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	660 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

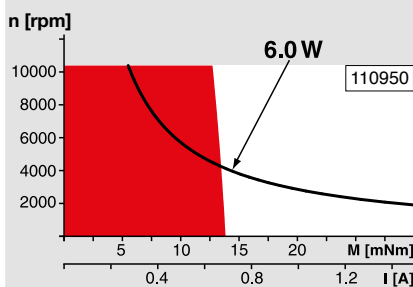
Mechanical data (sleeve bearings)	
23 Max. speed	10400 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1.7 N
27 Max. force for press fits (static) (static, shaft supported)	80 N
28 Max. radial load, 5 mm from flange	1200 N

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	100 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28–36

Planetary Gearhead

Ø26 mm
0.75 - 4.5 Nm
Page 340

Spur Gearhead

Ø30 mm
0.07 - 0.2 Nm
Page 341

Planetary Gearhead

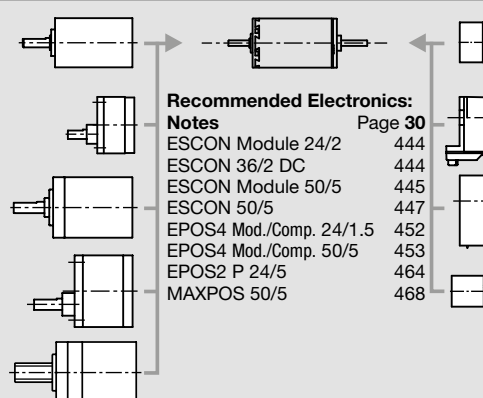
Ø32 mm
0.75 - 6.0 Nm
Page 342/343/346

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 353

Screw Drive

Ø32 mm
Page 374–379



Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder MR

128 - 1000 CPT,
3 channels
Page 419

Encoder Enc

22 mm
100 CPT, 2 channels
Page 426

Encoder HED_ 5540

500 CPT,
3 channels
Page 430/432

Encoder MEnc

Ø13 mm
16 CPT, 2 channels
Page 408

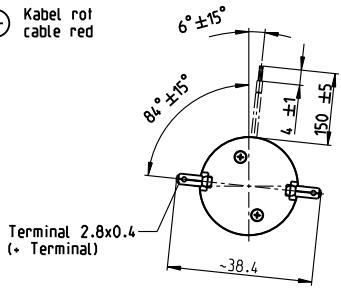
A-max 26 Ø26 mm, Graphite Brushes, 11 Watt

High Power

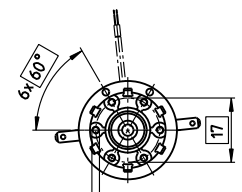
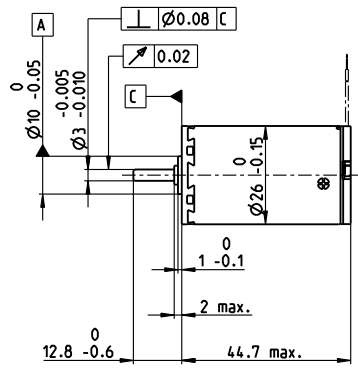
maxon A-max

Kabel AWG 24/7
cable UL Style 1061

⊕ Kabel rot
cable red



Terminal 2.8x0.4
(+ Terminal)



M2 x4.4 tief/deep
M_A (L=4 min.) 8.5 Ncm max.

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		6	7.2	12	15	18	24	30	36	42	48	48
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 ²	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)	75 N
28 Max. radial load, 5 mm from flange	20 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)	80 N
28 Max. radial load, 5 mm from flange	5.5 N

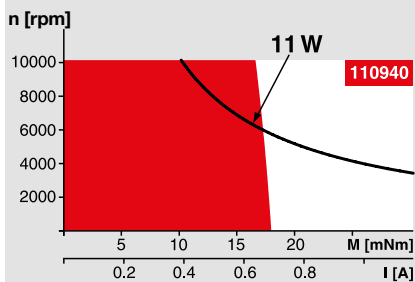
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	117 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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

Overview on page 28–36

Planetary Gearhead

Ø26 mm
0.75 - 4.5 Nm
Page 340

Spur Gearhead

Ø30 mm
0.07 - 0.2 Nm
Page 341

Planetary Gearhead

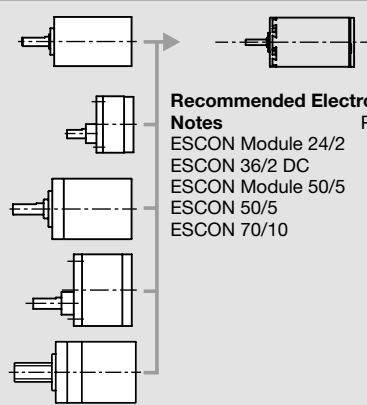
Ø32 mm
0.75 - 6.0 Nm
Page 342/343/346

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 353

Screw Drive

Ø32 mm
Page 374–379



Recommended Electronics:

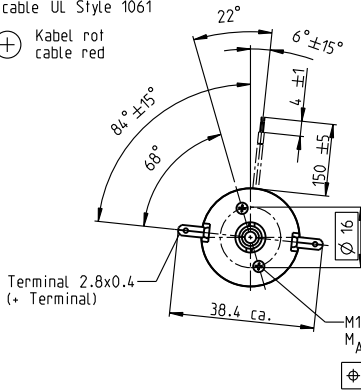
Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
ESCON 70/10	447

A-max 26 Ø26 mm, Graphite Brushes, 11 Watt

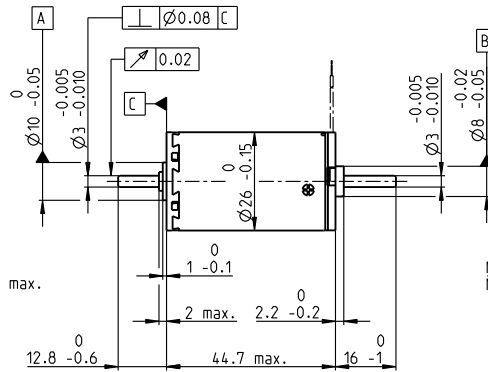
High Power

Kabel AWG 24/7
cable UL Style 1061

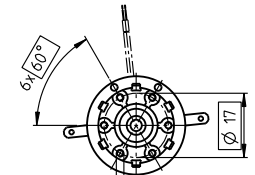
⊕ Kabel rot
cable red



M1.6 x4.6 tief/deep
M_A (L=4.2 min.) 3.5Ncm max.
⊕ Ø0.2 B



M2x4.4 tief/deep
M_A (L=4 min.) 8.5Ncm max.
⊕ Ø0.2 A



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

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

Values at nominal voltage		6	7.2	12	15	18	24	30	36	42	48	48
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 ²	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 / 1200 N
28 Max. radial load, 5 mm from flange	20 N

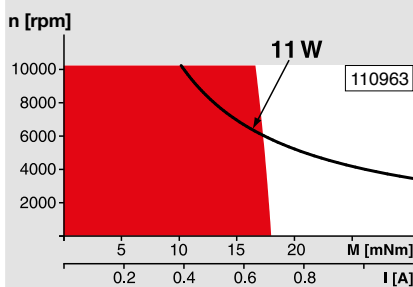
Mechanical data (sleeve bearings)	
23 Max. speed	10400 rpm
24 Axial play	0.1 - 0.2 mm
25 Radial play	0.012 mm
26 Max. axial load (dynamic)	1.7 N
27 Max. force for press fits (static) (static, shaft supported)	80 N / 1200 N
28 Max. radial load, 5 mm from flange	5.5 N

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 64.

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

Overview on page 28–36

Planetary Gearhead

Ø26 mm
0.75 - 4.5 Nm
Page 340

Spur Gearhead

Ø30 mm
0.07 - 0.2 Nm
Page 341

Planetary Gearhead

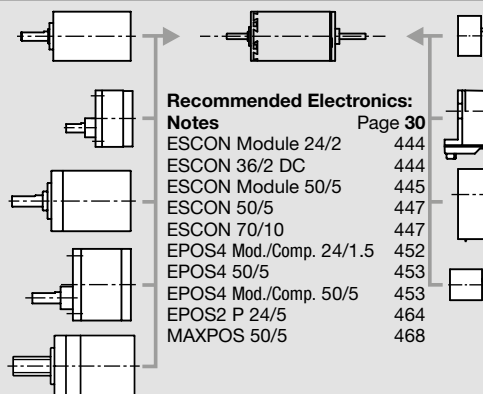
Ø32 mm
0.75 - 6.0 Nm
Page 342/343/346

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 353

Screw Drive

Ø32 mm
Page 374–379



Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
ESCON 70/10	447
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder MR

128 - 1000 CPT,
3 channels
Page 419

Encoder Enc

22 mm
100 CPT, 2 channels
Page 426

Encoder HED_ 5540

500 CPT,
3 channels
Page 430/432

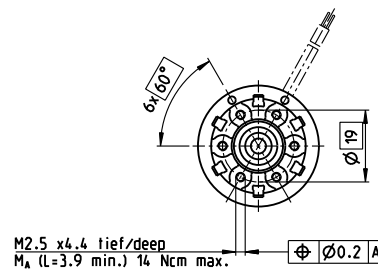
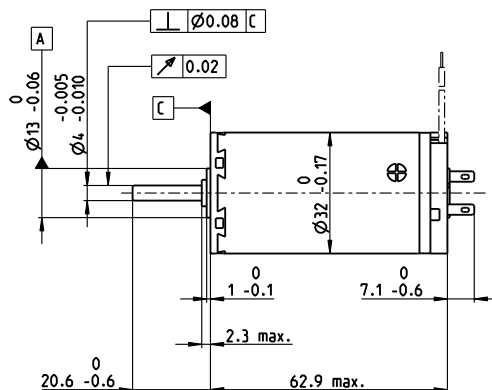
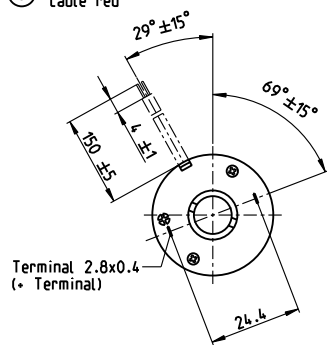
Encoder MEnc

Ø13 mm
16 CPT, 2 channels
Page 408

A-max 32 Ø32 mm, Graphite Brushes, 15 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	236643	236644	236645	236646	236647	236648	236649	236650
with cables	353184	353185	353186	353187	353188	353189	353190	353191

Motor Data

Values at nominal voltage		6	9	12	18	24	30	36	48
1 Nominal voltage	V	6	9	12	18	24	30	36	48
2 No load speed	rpm	5870	4940	4680	5280	5930	5870	5830	3870
3 No load current	mA	154	83.5	58.6	44.9	38.7	30.6	25.3	11.8
4 Nominal speed	rpm	4110	3090	2920	3590	4210	4160	4100	2090
5 Nominal torque (max. continuous torque)	mNm	36.5	35	37.2	38.3	37.3	37.5	37.1	37
6 Nominal current (max. continuous current)	A	3.95	2.12	1.6	1.23	1.01	0.806	0.66	0.328
7 Stall torque	mNm	127	95.3	101	122	130	130	127	81.6
8 Stall current	A	13.2	5.58	4.19	3.78	3.42	2.7	2.17	0.7
9 Max. efficiency	%	78	76	77	79	80	80	80	76
Characteristics									
10 Terminal resistance	Ω	0.454	1.61	2.86	4.76	7.03	11.1	16.6	68.6
11 Terminal inductance	mH	0.066	0.209	0.416	0.739	1.04	1.66	2.43	9.71
12 Torque constant	mNm/A	9.58	17.1	24.1	32.2	38.2	48.2	58.3	117
13 Speed constant	rpm/V	996	559	396	297	250	198	164	81.9
14 Speed / torque gradient	rpm/mNm	47.2	52.8	47	44	46	45.6	46.6	48.2
15 Mechanical time constant	ms	21.9	21.7	21.4	21.3	21.3	21.3	21.4	21.5
16 Rotor inertia	gcm ²	44.2	39.2	43.5	46.2	44.2	44.6	43.8	42.6

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	791 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)	5.0 N
27 Max. force for press fits (static)	110 N
28 Max. radial load, 5 mm from flange	10.5 N

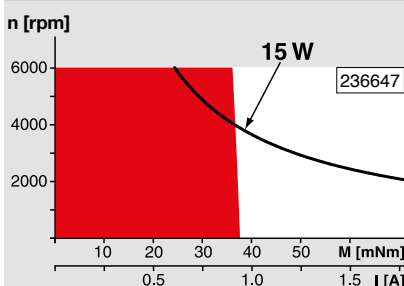
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	211 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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.

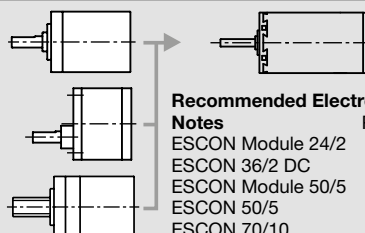
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

Overview on page 28–36

- Planetary Gearhead**
Ø32 mm
0.75 - 6.0 Nm
Page 342–344/346–347
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 353
- Screw Drive**
Ø32 mm
Page 374–379

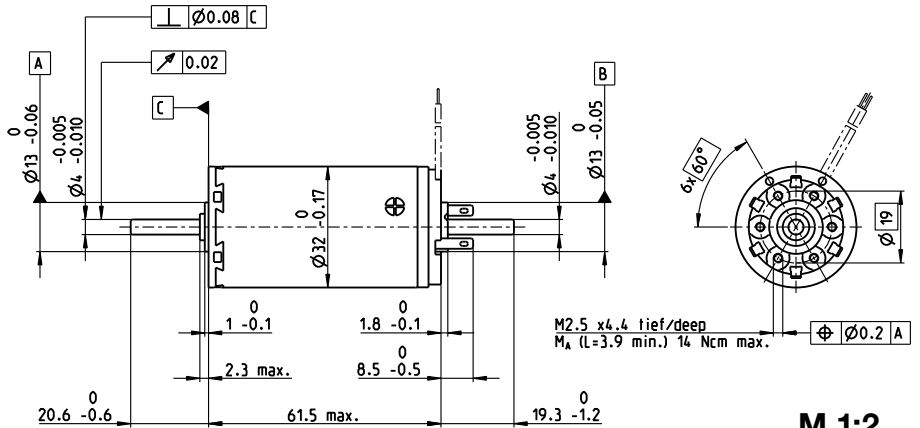
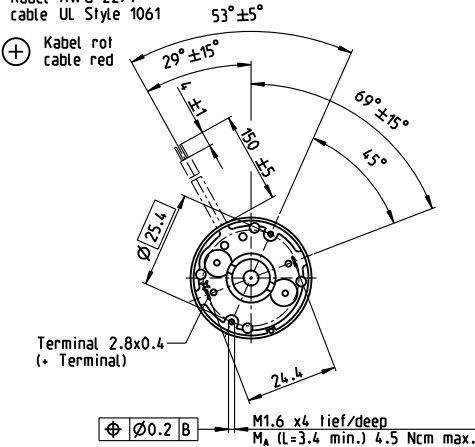


- Recommended Electronics:**
Notes Page 30
- ESCON Module 24/2 444
 - ESCON 36/2 DC 444
 - ESCON Module 50/5 445
 - ESCON 50/5 447
 - ESCON 70/10 447

A-max 32 Ø32 mm, Graphite Brushes, 15 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	236651	236652	236653	236654	236655	236656	236657	236658
with cables	353220	353221	353222	353223	353224	353225	353226	353227

Motor Data

Values at nominal voltage		6	9	12	18	24	30	36	48	
1	Nominal voltage	V	6	9	12	18	24	30	36	48
2	No load speed	rpm	5870	4940	4680	5280	5930	5870	5830	3870
3	No load current	mA	154	83.5	58.6	44.9	38.7	30.6	25.3	11.8
4	Nominal speed	rpm	4110	3090	2920	3590	4210	4160	4100	2090
5	Nominal torque (max. continuous torque)	mNm	36.5	35	37.2	38.3	37.3	37.5	37.1	37
6	Nominal current (max. continuous current)	A	3.95	2.12	1.6	1.23	1.01	0.806	0.66	0.328
7	Stall torque	mNm	127	95.3	101	122	130	130	127	81.6
8	Stall current	A	13.2	5.58	4.19	3.78	3.42	2.7	2.17	0.7
9	Max. efficiency	%	78	76	77	79	80	80	80	76
Characteristics			0.454	1.61	2.86	4.76	7.03	11.1	16.6	68.6
10	Terminal resistance	Ω	0.454	1.61	2.86	4.76	7.03	11.1	16.6	68.6
11	Terminal inductance	mH	0.066	0.209	0.416	0.739	1.04	1.66	2.43	9.71
12	Torque constant	mNm/A	9.58	17.1	24.1	32.2	38.2	48.2	58.3	117
13	Speed constant	rpm/V	996	559	396	297	250	198	164	81.9
14	Speed / torque gradient	rpm/mNm	47.2	52.8	47	44	46	45.6	46.6	48.2
15	Mechanical time constant	ms	21.9	21.7	21.4	21.3	21.3	21.3	21.4	21.5
16	Rotor inertia	gcm ²	44.2	39.2	43.5	46.2	44.2	44.6	43.8	42.6

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	791 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
28	Max. radial load, 5 mm from flange	2000 N

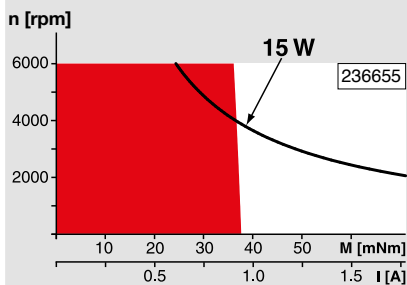
Mechanical data (sleeve bearings)		
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static) (static, shaft supported)	110 N
28	Max. radial load, 5 mm from flange	2000 N

Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	210 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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.

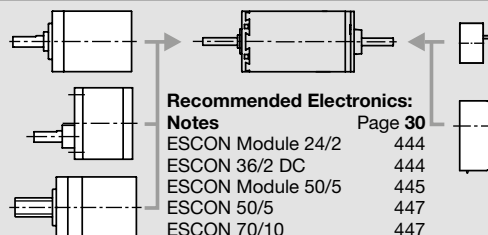
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 28-36

- Planetary Gearhead**
Ø32 mm
0.75 - 6.0 Nm
Page 342-344/346-347
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 353
- Screw Drive**
Ø32 mm
Page 374-379



Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
ESCON 70/10	447
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

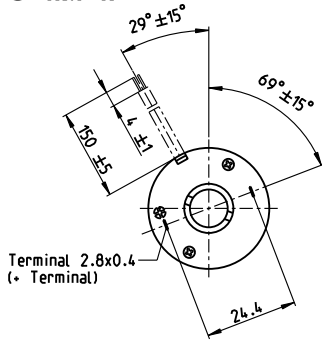
- Encoder MR**
256 - 1024 CPT,
3 channels
Page 420
- Encoder HED_ 5540**
500 CPT,
3 channels
Page 430/432

A-max 32 Ø32 mm, Graphite Brushes, 20 Watt

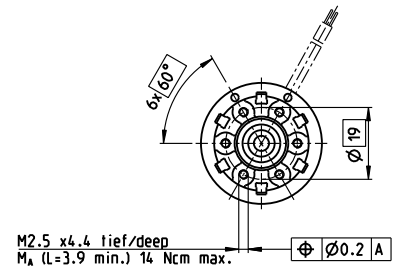
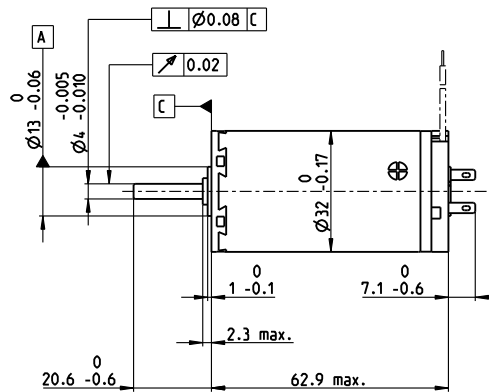
High Power

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 ²	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

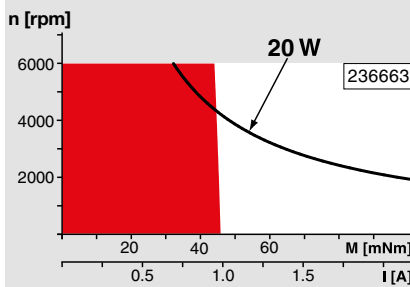
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	13
31 Weight of motor	240 g

Values listed in the table are nominal.
Explanation of the figures on page 64.

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.

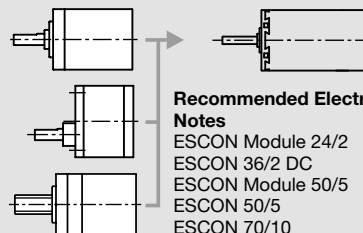
Short term operation
The motor may be briefly overloaded (recurring).

— **Assigned power rating**

maxon Modular System

Overview on page 28–36

- Planetary Gearhead**
Ø32 mm
0.75 - 6.0 Nm
Page 342–344/346–347
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 353
- Screw Drive**
Ø32 mm
Page 374–379

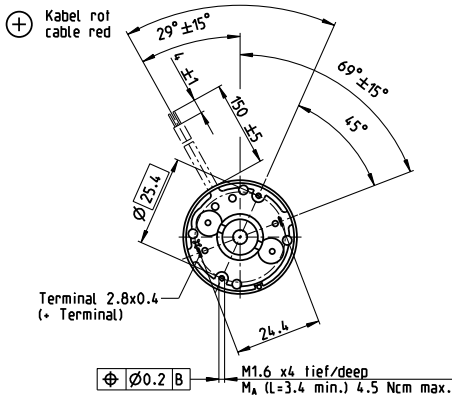


- Recommended Electronics:**
Notes Page 30
- ESCON Module 24/2 444
 - ESCON 36/2 DC 444
 - ESCON Module 50/5 445
 - ESCON 50/5 447
 - ESCON 70/10 447

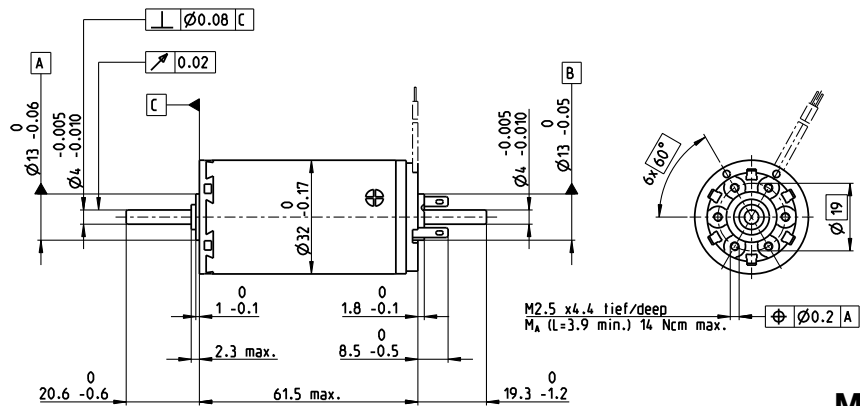
A-max 32 Ø32 mm, Graphite Brushes, 20 Watt

High Power

Kabel AWG 22/7
cable UL Style 1061



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 ²	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

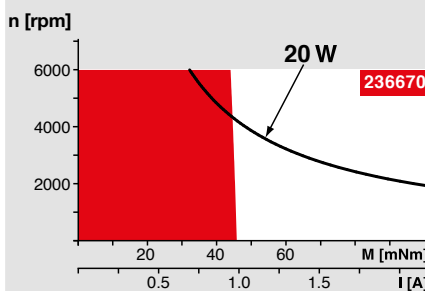
Mechanical data (sleeve bearings)		
23	Max. speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static) (static, shaft supported)	110 N / 2000 N
28	Max. radial load, 5 mm from flange	10.5 N

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 64.

Option
Sleeve bearings in place of ball bearings

Operating Range



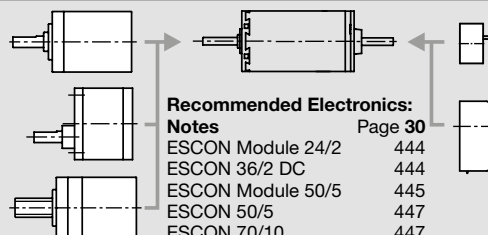
Comments

- 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

Overview on page 28–36

- Planetary Gearhead**
Ø32 mm
0.75 - 6.0 Nm
Page 342–344/346–347
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 353
- Screw Drive**
Ø32 mm
Page 374–379



Recommended Electronics:

Notes	Page 30
ESCON Module 24/2	444
ESCON 36/2 DC	444
ESCON Module 50/5	445
ESCON 50/5	447
ESCON 70/10	447
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

- Encoder MR**
256 - 1024 CPT,
3 channels
Page 420
- Encoder HED_ 5540**
500 CPT,
3 channels
Page 430/432


Brushless DC motors (BLDC) with ironless or iron core windings.

Standard Specification No. 101	60
Explanation	164
ECX Program (can be configured online)	166–200
ECX SPEED 8 M Ø26 mm, brushless, 2 Watt	166
ECX SPEED 8 M HP Ø8 mm, brushless, 3 Watt	167
ECX SPEED 13 M Ø13 mm, 12 Watt	NEW 168
ECX SPEED 13 M HP Ø13 mm, 25 Watt	NEW 169
ECX SPEED 13 M Ø13 mm, steril., 25 Watt	170
ECX SPEED 13 M Ø13 mm, steril., ceramic, 25 W	171
ECX SPEED 13 L Ø13 mm, 25 Watt	NEW 172
ECX SPEED 13 L HP Ø13 mm, 50 Watt	NEW 173
ECX SPEED 13 L Ø13 mm, steril., 50 W	174
ECX SPEED 13 L Ø13 mm, steril., ceramic, 50 W	175
ECX SPEED 16 M Ø16 mm, 20 Watt	176
ECX SPEED 16 M HP Ø16 mm, 40 Watt	177
ECX SPEED 16 M Ø16 mm, steril., 40 Watt	178
ECX SPEED 16 M Ø16 mm, steril., ceramic, 40 W	179
ECX SQUARE 16 L □16 mm, sensorless, 20 W	NEW 180
ECX SPEED 16 L Ø16 mm, 40 Watt	181
ECX SPEED 16 L HP Ø16 mm, 80 Watt	182
ECX SPEED 16 L Ø16 mm, steril., 80 Watt	183
ECX SPEED 16 L Ø16 mm, steril., ceramic, 80 W	184
ECX SPEED 19 M Ø19 mm, 30 Watt	NEW 185
ECX SPEED 19 M HP Ø19 mm, 60 Watt	NEW 186
ECX SPEED 19 M Ø19 mm, steril., 60 Watt	187
ECX SPEED 19 M Ø19 mm, steril., ceramic, 60 W	188
ECX SPEED 19 L Ø19 mm, 60 Watt	NEW 189
ECX SPEED 19 L HP Ø19 mm, 120 Watt	NEW 190
ECX SPEED 19 L Ø19 mm, steril., 120 W	191
ECX SPEED 19 L Ø19 mm, steril., ceramic, 120 W	192
ECX SPEED 22 M Ø22 mm, 40 Watt	193
ECX SPEED 22 M HP Ø22 mm, 80 Watt	194
ECX SPEED 22 M Ø22 mm, steril., 80 W	195
ECX SPEED 22 M Ø22 mm, steril., ceramic, 80 W	196
ECX SPEED 22 L Ø22 mm, 80 Watt	197
ECX SPEED 22 L HP Ø22 mm, 120 Watt	198
ECX SPEED 22 L Ø22 mm, steril., 120 Watt	199
ECX SPEED 22 L Ø22 mm, steril., ceramic, 120 W	200
EC Program	202–216
EC 4 Ø4 mm, brushless, 0.5/1 Watt	202–203
EC 6 Ø6 mm, brushless, 1.5/2 Watt	204–205
EC 8 Ø8 mm, brushless, 2 Watt	206
EC 10 Ø10 mm, brushless, 8 Watt	207
EC 13 Ø13 mm, brushless, 6/12 Watt	208–209
EC 22 Ø22 mm, brushless, 80/240 Watt	HD 210–211
EC 32 Ø32 mm, brushless, 80 Watt	212
EC 40 Ø40 mm, brushless, 170 Watt	213
EC 45 Ø45 mm, brushless, 150/250 Watt	214–215
EC 60 Ø60 mm, brushless, 400 Watt	216

EC-max Program	219–227
EC-max 16 Ø16 mm, brushless, 5/8 Watt	219–221
EC-max 22 Ø22 mm, brushless, 12/25 Watt	222–223
EC-max 30 Ø30 mm, brushless, 40/60 Watt	224–225
EC-max 40 Ø40 mm, brushless, 70/120 Watt	226–227
EC-4pole Program	231–237
22 Ø22 mm, brushless, 90/ 120 Watt	231–232
30 Ø30 mm, brushless, 100 Watt	233
30 Ø30 mm, brushless, sterilizable, 150 Watt	234
30 Ø30 mm, brushless, 200 Watt	235
32 Ø32 mm, brushless, 220/480 Watt	HD 236–237
EC-i Program	241–251
EC-i 30 Ø30 mm, brushless, 20 Watt	IE NEW 241
EC-i 30 Ø30 mm, brushless, 30 Watt	NEW 242
EC-i 30 Ø30 mm, brushless, 45 Watt High Torque	NEW 243
EC-i 30 Ø30 mm, brushless, 50 Watt	NEW 244
EC-i 30 Ø30 mm, brushless, 75 Watt High Torque	NEW 245
EC-i 40 Ø40 mm, brushless, 50 Watt	246
EC-i 40 Ø40 mm, brushless, 50 Watt High Torque	247
EC-i 40 Ø40 mm, brushless, 70 Watt	248
EC-i 40 Ø40 mm, brushless, 70 Watt High Torque	249
EC-i 40 Ø40 mm, brushless, 100 Watt High Torque	250
EC-i 52 Ø52 mm, brushless, 180 Watt High Torque	251
EC flat Program	254–272
EC 9.2 flat Ø10 mm, brushless, 0.5 Watt	254
EC 10 flat Ø10 mm, brushless, 0.2 Watt	255
EC 14 flat Ø13.6 mm, brushless, 1.5 Watt	256
EC 20 flat Ø20 mm, brushless, 3/5 Watt	257–258
EC 20 flat Ø20 mm, brushless, 2/5 Watt	IE 259–260
EC 32 flat Ø32 mm, brushless, 6/15 Watt	261–262
EC 32 flat Ø32 mm, brushless, 15 Watt	IE 263
EC 45 flat Ø42.8 mm, brushless, 12 Watt	264
EC 45 flat Ø42.9 mm, brushless, 30 Watt	265
EC 45 flat Ø42.8 mm, brushless, 50/70 Watt	266–267
EC 45 flat Ø45 mm, brushless, 30/50 Watt	IE 268–269
EC 60 flat Ø60 mm, brushless, 100 Watt	270
EC 90 flat Ø90 mm, brushless, 160 Watt	NEW 271
EC 90 flat Ø90 mm, brushless, 260 Watt	NEW 272
EC frameless Program	NEW 274–279
EC frameless 45 flat Ø43.4 mm, brushless, 30 Watt	274
EC frameless 45 flat Ø43.4 mm, brushless, 50 Watt	275
EC frameless 45 flat Ø43.4 mm, brushless, 70 Watt	276
EC frameless 60 flat Ø60 mm, brushless, 100 Watt	277
EC frameless 90 flat Ø90 mm, brushless, 160 Watt	278
EC frameless 90 flat Ø90 mm, brushless, 260 Watt	279

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 40 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. For the EC 10 flat motor the nominal operating point is given varying at half no load speed, as the thermal limit is not reached at nominal voltage.

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 η_{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 [Ω]

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 slow 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 53).

15 Mechanical time constant τ_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 [gcm²]

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 τ_w [s]

and

20 Thermal time constant motor τ_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 [°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} [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]

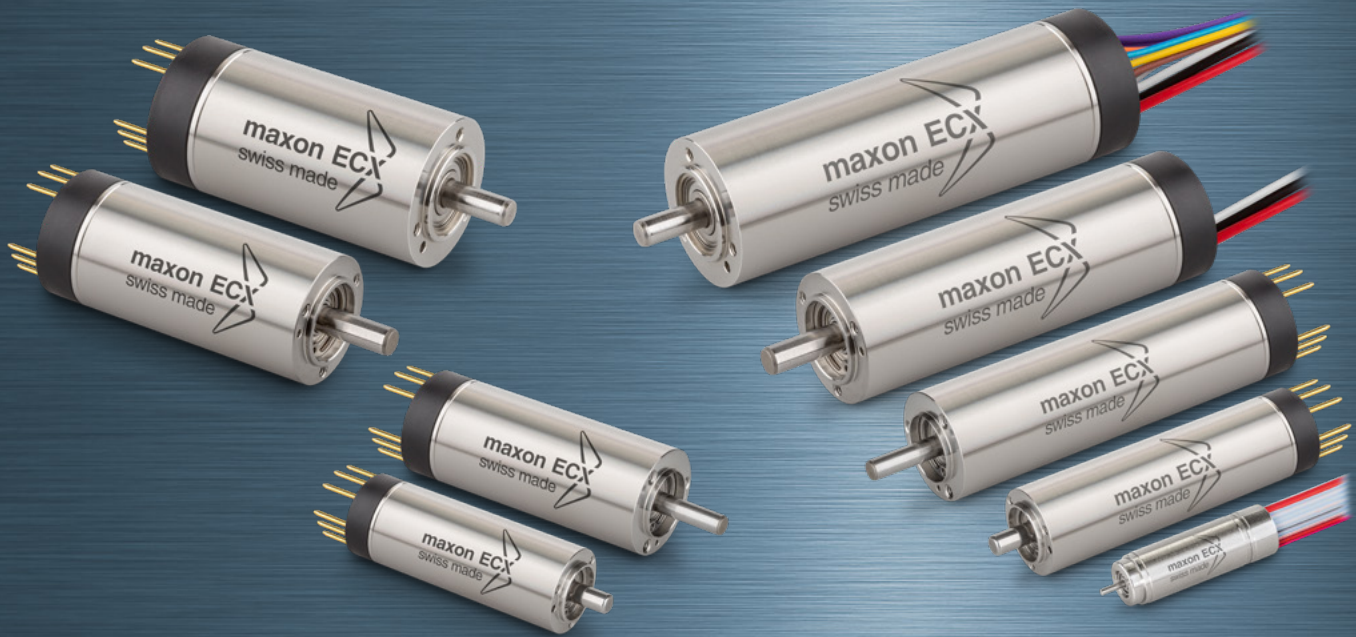
Set speed value n_c is based on the product $n_c = k_c \cdot U_c$.

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

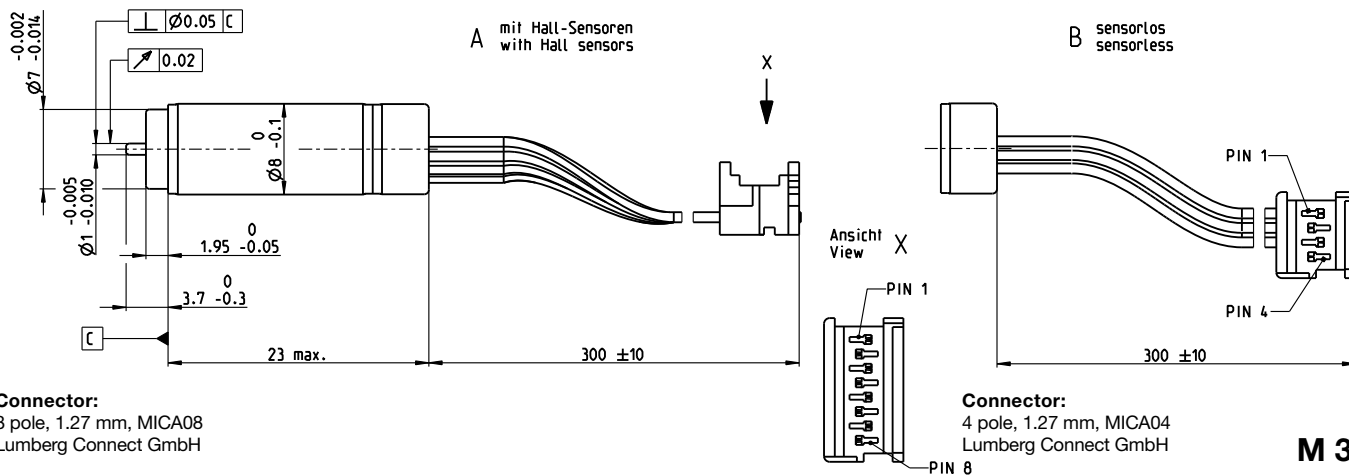
The brushless ECX motors (BLDC) are the perfect solution for applications that need 0–120 000 rpm. Quiet, highly efficient, durable and perfectly tailored to your needs. Available in standard, high-power and sterilizable versions. maxon ECX motors can be configured online and are ready for delivery within 11 working days. ecx.maxonmotor.com

Standard Specification No. 101	60
Explanation	164
ECX SPEED Program	166–200
EC Program	202–216
EC-max Program	219–227
EC-4pole Program	231–237
EC-i Program	241–251
EC flat Program	254–272
EC frameless Program	274–279

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

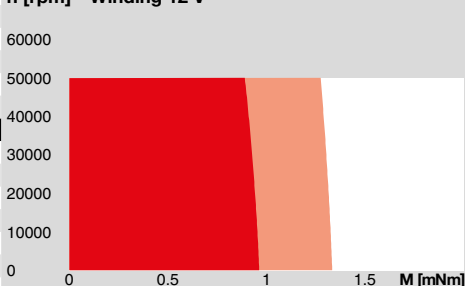
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	35400	43300	42200
3_	No load current	mA	105	69.0	33.2
4_	Nominal speed	rpm	24200	33100	32300
5_	Nominal torque (max. continuous torque)	mNm	0.917	0.874	0.877
6_	Nominal current (max. continuous current)	A	0.687	0.406	0.198
7_	Stall torque	mNm	3.04	3.88	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 ²	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 ¹	°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	10
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
285_GPX 8 A	1-5	387_ENX 8 MAG	444_ESCON Module 24/2
		388_ENX 8 EASY INT	445_ESCON 36/3 EC
		389_ENX 8 EASY INT Abs.	445_ESCON Module 50/4 EC-S
		398_ENX 8 OPT	449_DEC Module 24/2
			452_EPOS4 Mod./Comp. 24/1.5

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

Notes

¹ 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

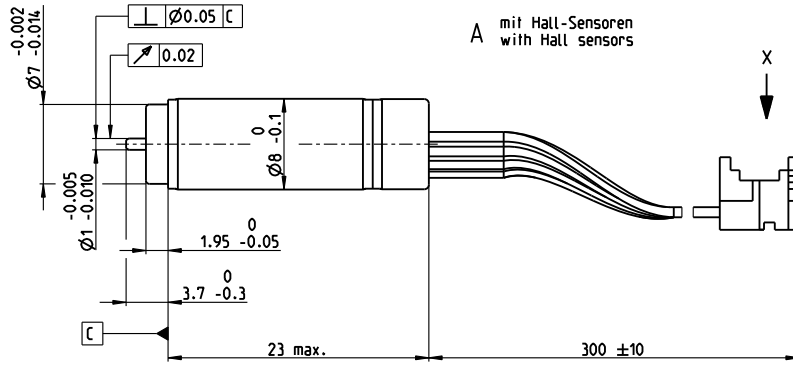
BLDC motor Ø8 mm

High Power

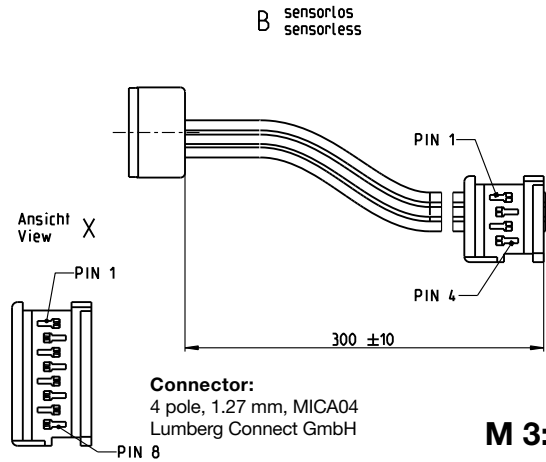
Key Data: 3/6 W, 1.26 mNm, 50000 rpm



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

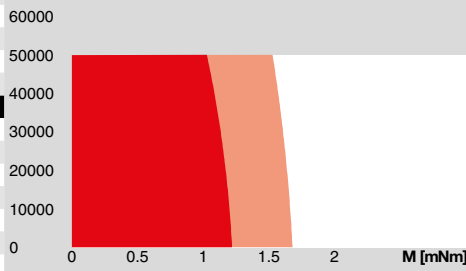
		6	9	12
1_ Nominal voltage	V	6	9	12
2_ No load speed	rpm	35500	29100	30500
3_ No load current	mA	128	63.4	50.9
4_ Nominal speed	rpm	26700	21200	22800
5_ Nominal torque (max. continuous torque)	mNm	1.23	1.26	1.26
6_ Nominal current (max. continuous current)	A	0.902	0.497	0.391
7_ Stall torque	mNm	5.18	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 ²	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 ¹	°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	10
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
285_GPX 8 A	1-5	387_ENX 8 MAG	444_ESCON Module 24/2
		388_ENX 8 EASY INT	445_ESCON 36/3 EC
		389_ENX 8 EASY INT Abs.	445_ESCON Module 50/4 EC-S
		398_ENX 8 OPT	449_DEC Module 24/2
			452_EPOS4 Mod./Comp. 24/1.5

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

Notes

¹ 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.

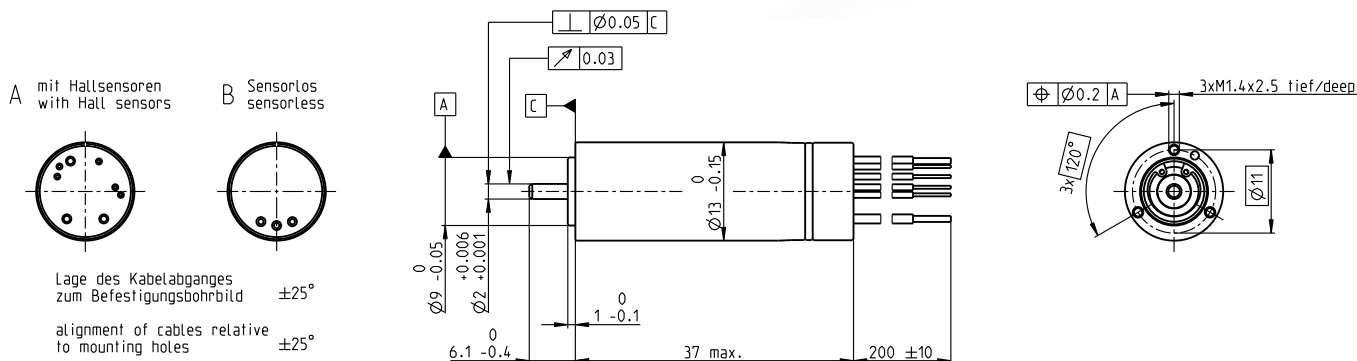
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ECX SPEED 13 M brushless BLDC motor Ø13 mm

NEW



Key Data: 12/12.8 W, 2.7 mNm, 50000 rpm



M 1:1

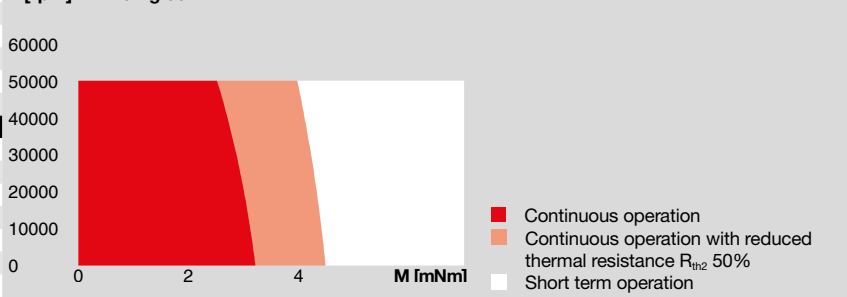
Motor Data

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 ²	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 ¹	°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]

maxon Modular System

Other specifications	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
29_ Number of pole pairs	290_GPX 13 SPEED	1-3	for motor type A:	444_ESCON Module 24/2
30_ Number of phases	291_GPX 14 A/C	1-2 [3-4]	391_ENX 13 EASY INT	445_ESCON 36/3 EC
31_ Weight of motor	292_GPX 14 LN/LZ	1-2 [3-4]	for motor type B:	445_ESCON Module 50/4 EC-S
32_ Typical noise level [rpm]	293_GPX 14 HP	2-3 [4]	391_ENX 13 EASY INT Abs.	445_ESCON Module 50/5
	294_GPX 16 A/C	3-4		447_ESCON 50/5
	295_GPX 16 LN/LZ	3-4		449_DEC Module 24/2
	296_GPX 16 HP	4		449_DEC Module 50/5
				452_EPOS4 Mod./Comp. 24/1.5
				453_EPOS4 50/5
				453_EPOS4 Mod./Comp. 50/5
				464_EPOS2 P 24/5
				468_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 _{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.

Configuration
 Flange front: thread in flange/center thread
 Flange back: metal ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 486.

ECX SPEED 13 M brushless

BLDC motor Ø13 mm

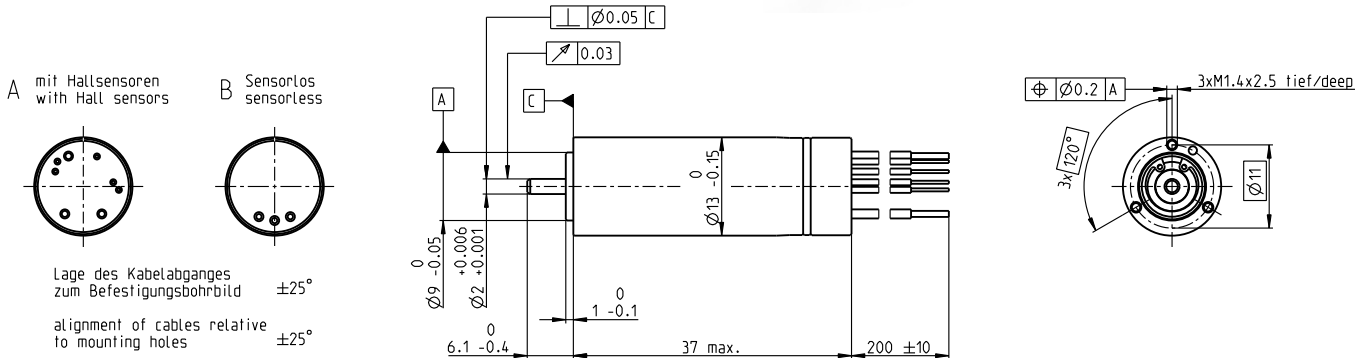
High Power

Key Data: 25/29.7 W, 4.3 mNm, 70000 rpm

NEW



maxon ECX



M 1:1

Motor Data

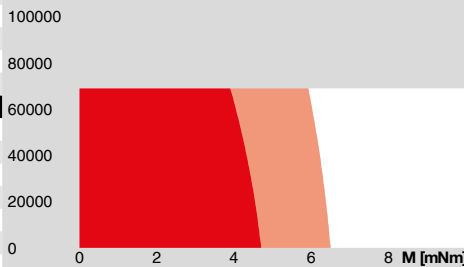
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	66700	66700	66700	64000
3_	No load current	mA	273	205	137	95.6
4_	Nominal speed	rpm	62700	63000	63000	60400
5_	Nominal torque (max. continuous torque)	mNm	4.33	4.3	4.04	4.22
6_	Nominal current (max. continuous current)	A	1.95	1.45	0.917	0.682
7_	Stall 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 ²	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 ¹	°C	-20...+100
22_	Max. winding temperature	°C	155

Operating Range

n [rpm] winding 36 V



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]

maxon Modular System

Other specifications	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
29_ Number of pole pairs	290_GPX 13 SPEED	1-3	for motor type A:	444_ESCON Module 24/2
30_ Number of phases	291_GPX 14 A/C	1-2 [3-4]	391_ENX 13 EASY INT	445_ESCON 36/3 EC
31_ Weight of motor	292_GPX 14 LN/LZ	1-2 [3-4]	for motor type B:	445_ESCON Module 50/4 EC-S
32_ Typical noise level [rpm]	293_GPX 14 HP	2-3 [4]	391_ENX 13 EASY INT Abs.	445_ESCON Module 50/5
	294_GPX 16 A/C	3-4		447_ESCON 50/5
	295_GPX 16 LN/LZ	3-4		449_DEC Module 24/2
	296_GPX 16 HP	4		449_DEC Module 50/5
				452_EPOS4 Mod./Comp. 24/1.5
				453_EPOS4 50/5
				453_EPOS4 Mod./Comp. 50/5
				464_EPOS2 P 24/5
				468_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 _{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.

Configuration

Flange front: thread in flange/center thread
 Flange back: metal ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 486.

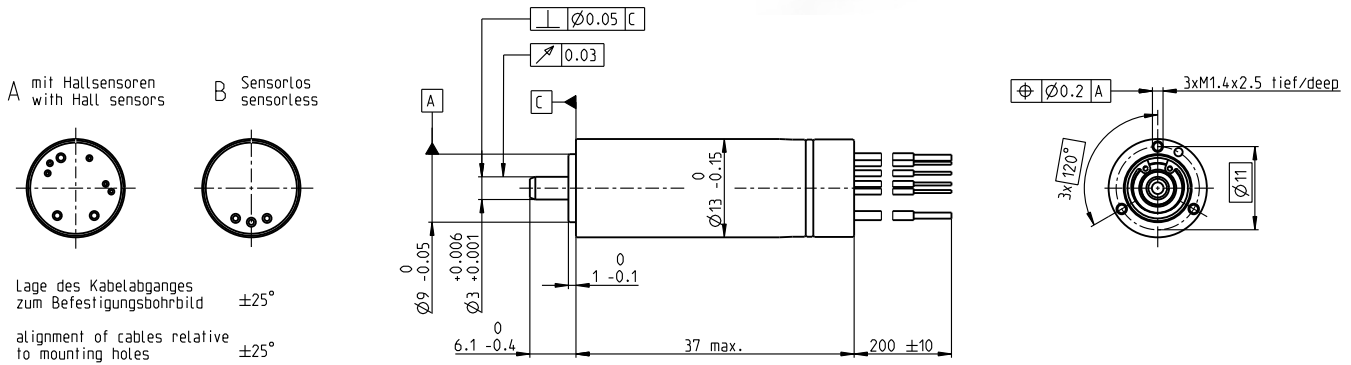
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ECX SPEED 13 M brushless

BLDC motor Ø13 mm

Sterilizable

Key Data: 25/25 W, 3.3 mNm, 90000 rpm



M 1:1

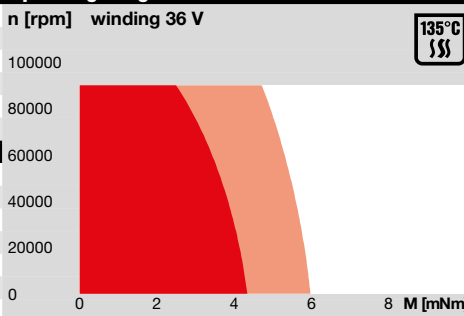
Motor Data

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 ²	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



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	maxon gear Stages [opt.]	maxon sensor for motor type A:	maxon motor control
30_	Number of phases	3	290_GPX 13 SPEED 1-3	391_ENX 13 EASY INT	444_ESCON Module 24/2
31_	Weight of motor	g		for motor type B:	445_ESCON Module 36/3 EC
32_	Typical noise level [rpm]	dBA	46 [50000]	391_ENX 13 EASY INT Abs.	445_ESCON Module 50/4 EC-S
					447_ESCON 50/5
					449_DEC Module 24/2
					449_DEC Module 50/5
					452_EPOS4 Mod./Comp. 24/1.5
					453_EPOS4 50/5
					453_EPOS4 Mod./Comp. 50/5
					464_EPOS2 P 24/5
					468_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_{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.

Configuration

Flange front: thread in flange/center thread
 Flange back: metal ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 486.

ECX SPEED 13 M brushless

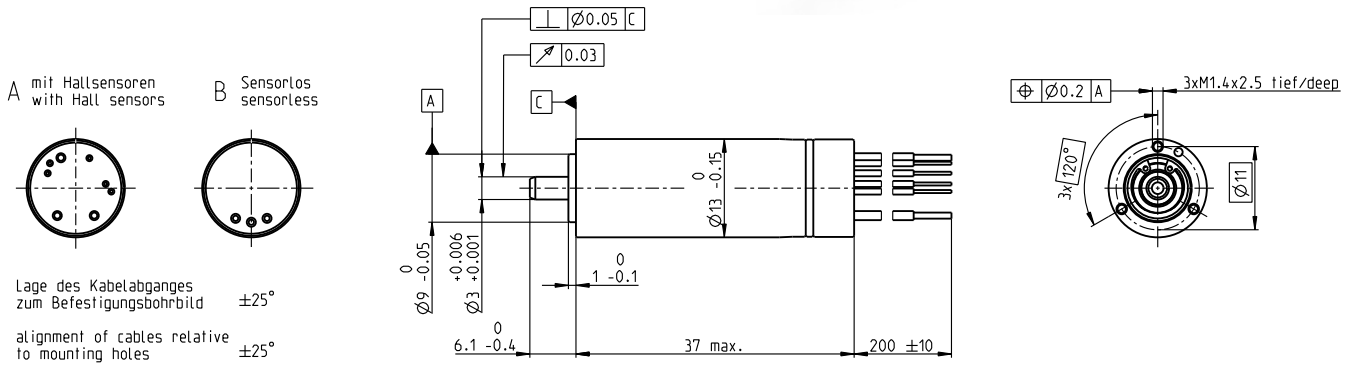
BLDC motor Ø13 mm

Sterilizable, Ceramic Bearings

Key Data: 25/27 W, 3.6 mNm, 120 000 rpm



maxon ECX



M 1:1

Motor Data

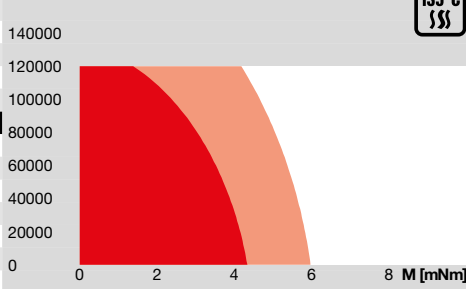
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	77600	77600	77600	74500
3_	No load current	mA	186	140	93.3	65.7
4_	Nominal speed	rpm	73900	74100	74200	71000
5_	Nominal torque (max. continuous torque)	mNm	3.02	2.99	2.8	3.03
6_	Nominal current (max. continuous current)	A	1.55	1.15	0.724	0.557
7_	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 ²	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

n [rpm] winding 36 V



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 [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 _{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
290_GPX 13 SPEED	1-3	for motor type A:	444_ESCON Module 24/2
		391_ENX 13 EASY INT	445_ESCON 36/3 EC
		for motor type B:	445_ESCON Module 50/4 EC-S
		391_ENX 13 EASY INT Abs.	445_ESCON Module 50/5
			447_ESCON 50/5
			449_DEC Module 24/2
			449_DEC Module 50/5
			452_EPOS4 Mod./Comp. 24/1.5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 486.

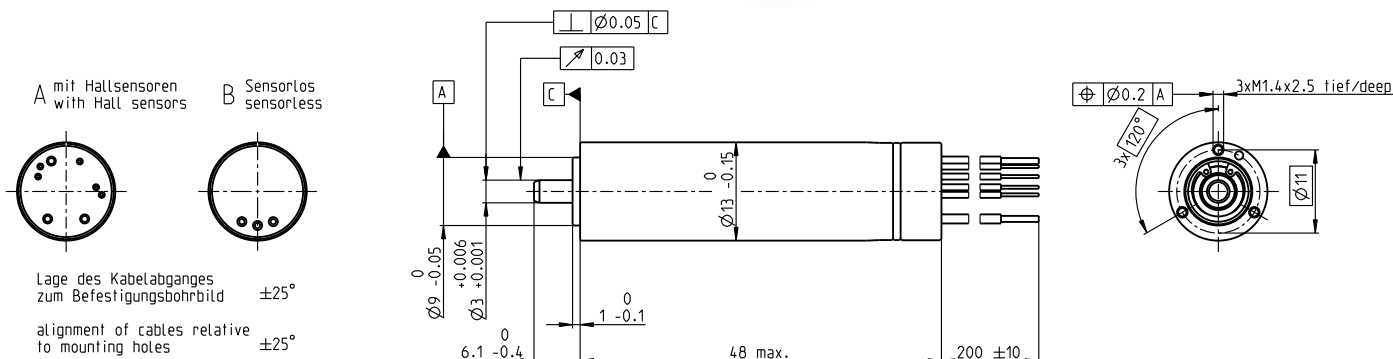
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ECX SPEED 13 L brushless BLDC motor Ø13 mm

NEW



Key Data: 25/27 W, 5.2 mNm, 50000 rpm



M 1:1

Motor Data

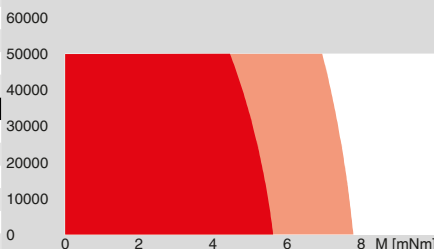
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	42300	43100	42300	42700
3_	No load current	mA	165	128	82.5	62.8
4_	Nominal speed	rpm	38000	39100	38400	38700
5_	Nominal torque (max. continuous torque)	mNm	4.84	5.1	5.23	5.13
6_	Nominal current (max. continuous current)	A	1.35	1.08	0.724	0.539
7_	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 ²	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 ¹	°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...0.28
	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	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
30_	Number of phases	3	290_GPX 13 SPEED	1-3	for motor type A:	444_ESCON Module 24/2
31_	Weight of motor	g	291_GPX 14 A/C	1-2 [3-4]	391_ENX 13 EASY INT	445_ESCON 36/3 EC
32_	Typical noise level [rpm]	dBA	292_GPX 14 LN/LZ	1-2 [3-4]	for motor type B:	445_ESCON Module 50/4 EC-S
			293_GPX 14 HP	2-3 [4]	391_ENX 13 EASY INT Abs.	445_ESCON Module 50/5
			294_GPX 16 A/C	3-4		447_ESCON 50/5
			295_GPX 16 LN/LZ	3-4		449_DEC Module 50/5
			296_GPX 16 HP	4		452_EPOS4 Mod./Comp. 24/1.5
						453_EPOS4 50/5
						453_EPOS4 Mod./Comp. 50/5
						464_EPOS2 P 24/5
						468_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 $V_{CC} 5 \pm 0.5$ 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.

Configuration

Flange front: thread in flange/center thread
 Flange back: metal ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 486.

ECX SPEED 13 L brushless

BLDC motor $\varnothing 13$ mm

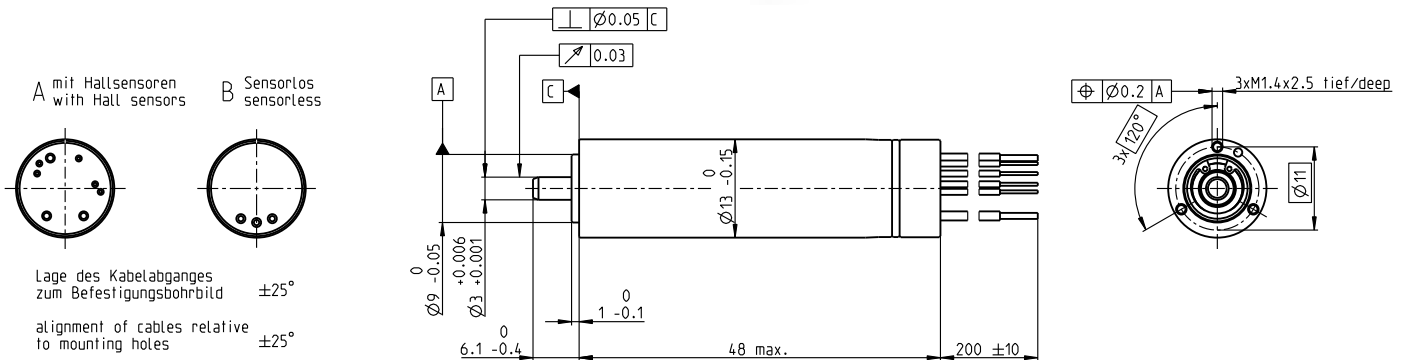
High Power

Key Data: 50/54 W, 7.1 mNm, 70000 rpm

NEW



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 ²	0.349	0.349	0.349	0.349

Thermal data

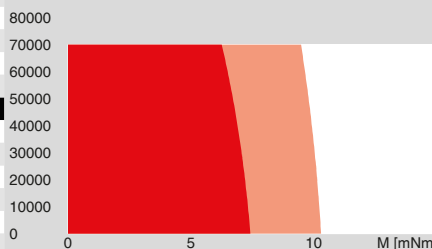
17_	Thermal resistance housing-ambient	K/W	24.4
18_	Thermal resistance winding-housing	K/W	1.6
19_	Thermal time constant winding	s	1.68
20_	Thermal time constant motor	s	411
21_	Ambient temperature ¹	$^{\circ}$ C	-20...+100
22_	Max. winding temperature	$^{\circ}$ C	155

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	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
30_	Number of phases	3	290_GPX 13 SPEED	1-3	for motor type A:	445_ESCON 36/3 EC
31_	Weight of motor	g	291_GPX 14 A/C	1-2 [3-4]	391_ENX 13 EASY INT	445_ESCON Module 50/4 EC-S
32_	Typical noise level [rpm]	dBA	292_GPX 14 LN/LZ	1-2 [3-4]	for motor type B:	445_ESCON Module 50/5
			293_GPX 14 HP	2-3 [4]	391_ENX 13 EASY INT Abs.	447_ESCON 50/5
			294_GPX 16 A/C	3-4		449_DEC Module 50/5
			295_GPX 16 LN/LZ	3-4		453_EPOS4 50/5
			296_GPX 16 HP	4		453_EPOS4 Mod./Comp. 50/5
						464_EPOS2 P 24/5
						468_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_{CC} 5 \pm 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
 290_GPX 13 SPEED 1-3
 291_GPX 14 A/C 1-2 [3-4]
 292_GPX 14 LN/LZ 1-2 [3-4]
 293_GPX 14 HP 2-3 [4]
 294_GPX 16 A/C 3-4
 295_GPX 16 LN/LZ 3-4
 296_GPX 16 HP 4

maxon sensor
 for motor type A:
 391_ENX 13 EASY INT
 for motor type B:
 391_ENX 13 EASY INT Abs.

maxon motor control
 445_ESCON 36/3 EC
 445_ESCON Module 50/4 EC-S
 445_ESCON Module 50/5
 447_ESCON 50/5
 449_DEC Module 50/5
 453_EPOS4 50/5
 453_EPOS4 Mod./Comp. 50/5
 464_EPOS2 P 24/5
 468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
 Flange back: metal ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 486.

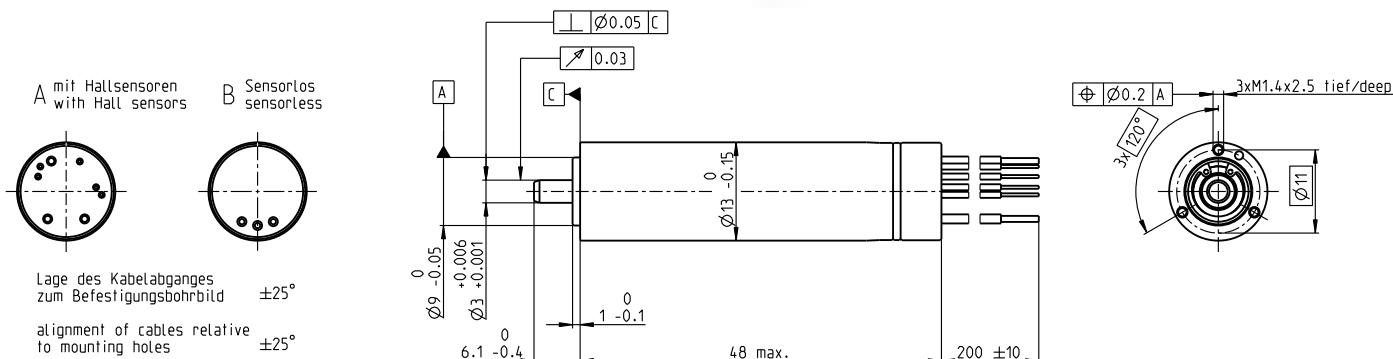
xdrives.maxonmotor.com

ECX SPEED 13 L brushless

BLDC motor Ø13 mm

Sterilizable

Key Data: 50/62 W, 7.8 mNm, 90000 rpm



M 1:1

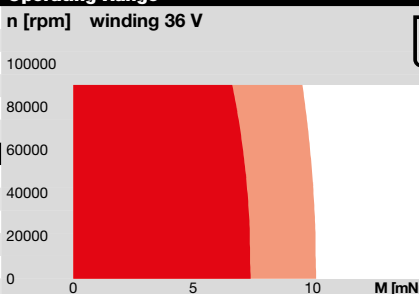
Motor Data

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 ²	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



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 _{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
290_GPX 13 SPEED	1-3	for motor type A: 391_ENX 13 EASY INT	445_ESCON 36/3 EC
		for motor type B: 391_ENX 13 EASY INT Abs.	445_ESCON Module 50/4 EC-S
			445_ESCON Module 50/5
			447_ESCON 50/5
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 486.

ECX SPEED 13 L brushless

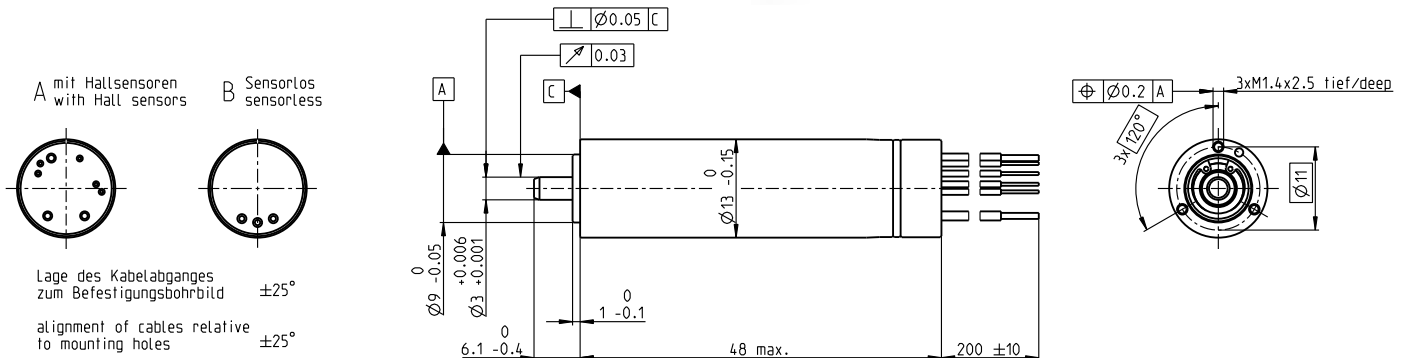
BLDC motor Ø13 mm

Sterilizable, Ceramic Bearings

Key Data: 50/79 W, 7.9 mNm, 120000 rpm



maxon ECX



M 1:1

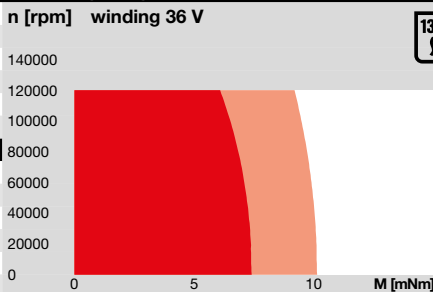
Motor Data

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 ²	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



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	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	maxon gear Stages [opt.]	maxon sensor for motor type A:	maxon motor control
30_	Number of phases	3	290_GPX 13 SPEED 1-3	391_ENX 13 EASY INT	445_ESCON 36/3 EC
31_	Weight of motor	g		for motor type B:	445_ESCON Module 50/4 EC-S
32_	Typical noise level [rpm]	dBA	47 [50000]	391_ENX 13 EASY INT Abs.	445_ESCON Module 50/5
					447_ESCON 50/5
					449_DEC Module 50/5
					453_EPOS4 50/5
					453_EPOS4 Mod./Comp. 50/5
					464_EPOS2 P 24/5
					468_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 _{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.

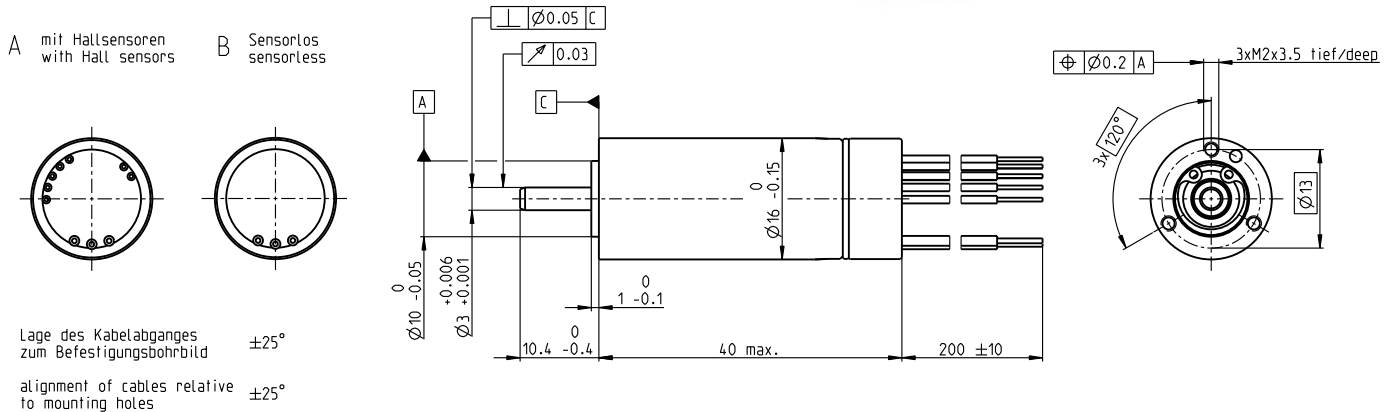
Configuration

Flange front: thread in flange/center thread
Flange back: metal ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 486.

ECX SPEED 16 M brushless BLDC motor $\varnothing 16$ mm



Key Data: 20/26 W, 5.1 mNm, 55000 rpm



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	Ω	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 ²	0.806	0.806	0.806	0.806

Thermal data			Operating Range	
17_	Thermal resistance housing-ambient	K/W	20.3	n [rpm] winding 36 V
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 ¹	$^\circ\text{C}$	-20...-100	
22_	Max. winding temperature	$^\circ\text{C}$	125	

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	maxon gear 294_GPX 16 A/C 1-2 [3-4] 295_GPX 16 LN/LZ 1-2 [3-4] 296_GPX 16 HP 2-3 [4] 297_GPX 16 SPEED 1-2 298_GPX 19 A/C 3-4 299_GPX 19 LN/LZ 3-4 300_GPX 19 HP 4
30_	Number of phases	3	
31_	Weight of motor	g	50
32_	Typical noise level [rpm]	dBA	50 [50000]

maxon sensor		maxon motor control	
for motor type A:		444_ESCON Module 24/2	
392_ENX 16 EASY INT		445_ESCON 36/3 EC	
for motor type B:		445_ESCON Module 50/4 EC-S	
393_ENX 16 EASY INT Abs.		445_ESCON Module 50/5	
		447_ESCON 50/5	
		449_DEC Module 24/2	
		449_DEC Module 50/5	
		452_EPOS4 Mod./Comp. 24/1.5	
		453_EPOS4 50/5	
		453_EPOS4 Mod./Comp. 50/5	
		464_EPOS2 P 24/5	
		468_MAXPOS 50/5	

Configuration

Flange front: thread in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 487.

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_{Hall} 3...24 VDC
 blue GND
 yellow Hall sensor 1
 brown Hall sensor 2
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 41. 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 $^\circ\text{C}$: 10 kOhm $\pm 1\%$, beta (25-85 $^\circ\text{C}$): 3490 K

ECX SPEED 16 M brushless BLDC motor Ø16 mm

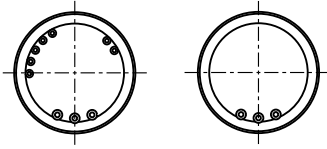
High Power

Key Data: 40/50 W, 7.5 mNm, 70000 rpm



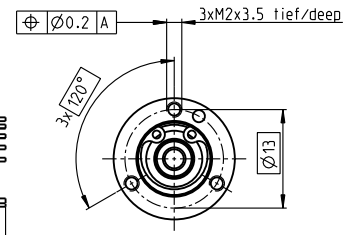
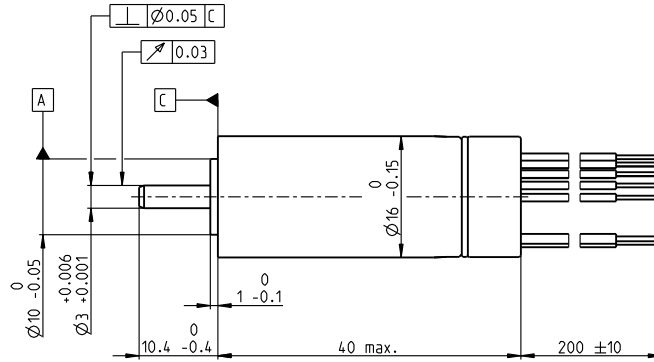
maxon ECX

A mit 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

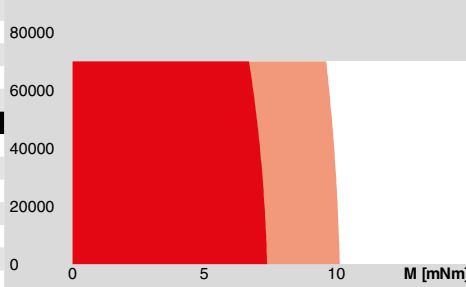
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	55100	58300	56400	56400
3_	No load current	mA	276	227	143	107
4_	Nominal speed	rpm	50800	54000	52200	52200
5_	Nominal torque (max. continuous torque)	mNm	7.53	7.21	7.4	7.44
6_	Nominal current (max. continuous current)	A	2.67	2.05	1.35	1.01
7_	Stall 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 ²	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 ¹	°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	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]

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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41. 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
294_GPX 16 A/C	1–2 [3–4]	for motor type A:	444_ESCON Module 24/2
295_GPX 16 LN/LZ	1–2 [3–4]	392_ENX 16 EASY INT	445_ESCON 36/3 EC
296_GPX 16 HP	2–3 [4]	for motor type B:	445_ESCON Module 50/4 EC-S
297_GPX 16 SPEED	1–2	393_ENX 16 EASY INT Abs.	445_ESCON Module 50/5
298_GPX 19 A/C	3–4		447_ESCON 50/5
299_GPX 19 LN/LZ	3–4		449_DEC Module 24/2
300_GPX 19 HP	4		449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

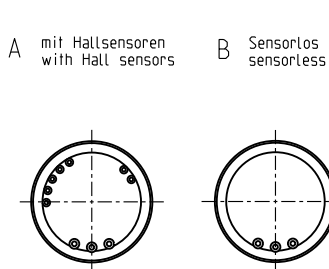
Flange front: thread in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 487.

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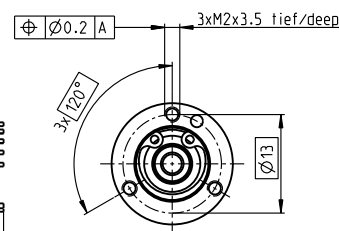
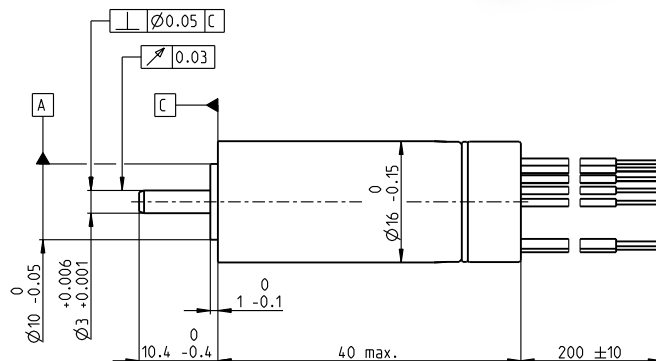
ECX SPEED 16 M brushless BLDC motor Ø16 mm

Sterilizable

Key Data: 40/50 W, 6.8 mNm, 70000 rpm



Lage des Kabelabganges zum Befestigungsbohrbild ±25°
alignment of cables relative to mounting holes ±25°



M 1:1

Motor Data

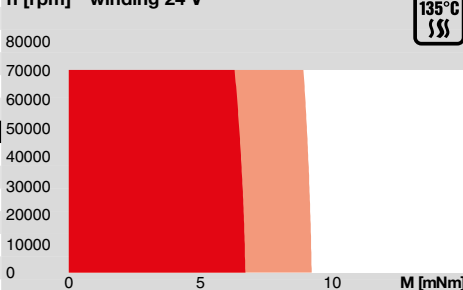
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	61500	65000	57700	58900
3_	No load current	mA	275	227	124	96.2
4_	Nominal speed	rpm	56400	60000	52700	53900
5_	Nominal torque (max. continuous torque)	mNm	6.84	6.56	6.56	6.6
6_	Nominal current (max. continuous current)	A	2.69	2.07	1.21	0.935
7_	Stall 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 ²	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 24 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.

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]

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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41. 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
297_GPX 16 SPEED	1–2	for motor type A:	444_ESCON Module 24/2
		392_ENX 16 EASY INT	445_ESCON 36/3 EC
		for motor type B:	445_ESCON Module 50/4 EC-S
		393_ENX 16 EASY INT Abs.	445_ESCON Module 50/5
			447_ESCON 50/5
			449_DEC Module 24/2
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 487.

ECX SPEED 16 M brushless

BLDC motor Ø16 mm

Sterilizable, Ceramic Bearings

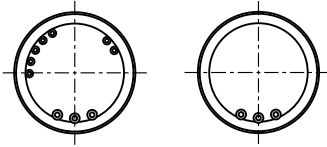
Key Data: 40/68 W, 6.6 mNm, 120000 rpm



maxon ECX

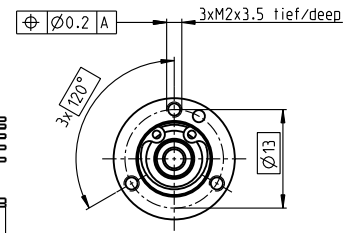
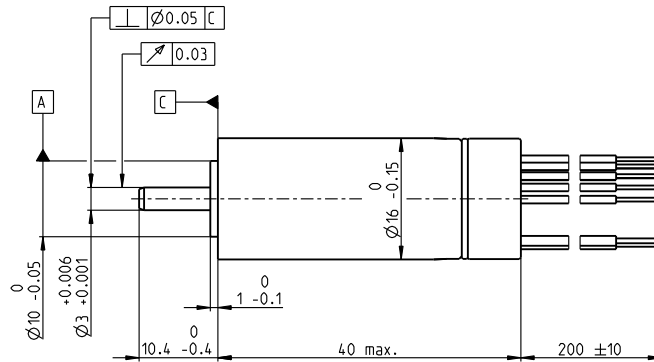
A mit Hallensoren
with Hall sensors

B Sensorlos
sensorless



Lage des Kabelabganges
zum Befestigungsbohrbild ±25°

alignment of cables relative
to mounting holes ±25°



M 1:1

Motor Data

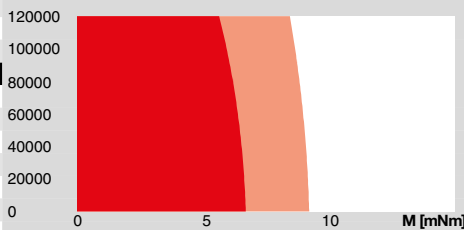
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	61400	64900	57600	58800
3_	No load current	mA	328	271	147	114
4_	Nominal speed	rpm	56500	60000	52700	54000
5_	Nominal torque (max. continuous torque)	mNm	6.63	6.34	6.38	6.41
6_	Nominal current (max. continuous current)	A	2.67	2.04	1.2	0.927
7_	Stall 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 ²	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 24 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.

Mechanical data ball bearings

23_	Max. speed	rpm	120000
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_{Hall} 3...24 VDC
blue GND
yellow Hall sensor 1
brown Hall sensor 2
grey Hall sensor 3

Wiring diagram for Hall sensors see page 41. 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
297_GPX 16 SPEED	1–2	for motor type A: 392_ENX 16 EASY INT	444_ESCON Module 24/2 445_ESCON 36/3 EC 445_ESCON Module 50/4 EC-S
		for motor type B: 393_ENX 16 EASY INT Abs.	445_ESCON Module 50/5 447_ESCON 50/5 449_DEC Module 24/2 449_DEC Module 50/5 453_EPOS4 50/5 453_EPOS4 Mod./Comp. 50/5 464_EPOS2 P 24/5 468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 487.

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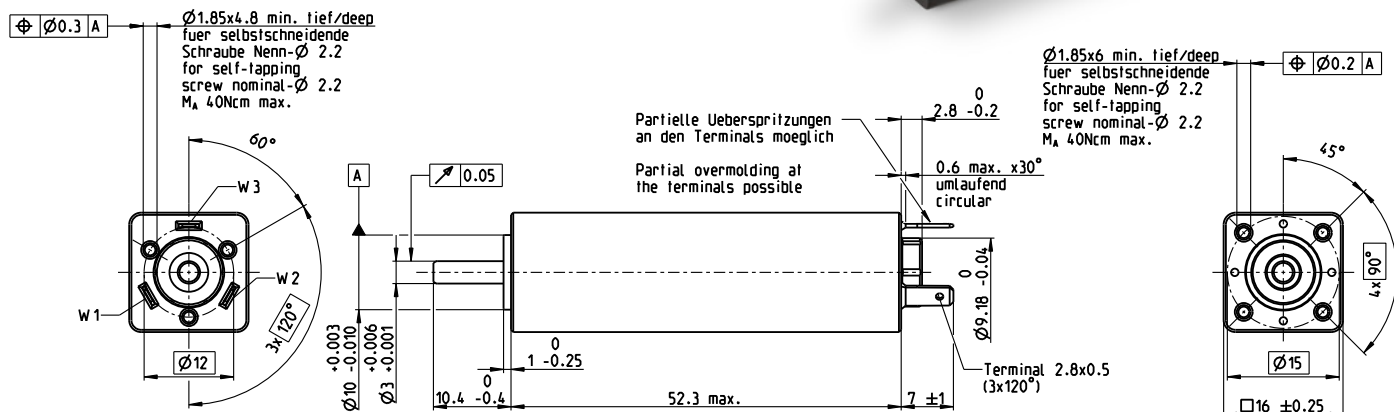
ECX SQUARE 16 L brushless

BLDC motor □16 mm

Sensorless

NEW

Key Data: 20/36 W, 12.9 mNm, 50000 rpm



M 1:1

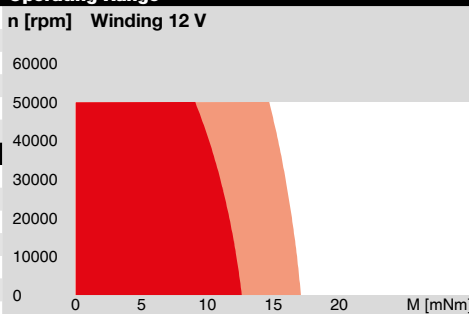
Motor Data

1_	Nominal voltage	V	6	9	12	18
2_	No load speed	rpm	17600	19500	18500	20500
3_	No load current	mA	452	253	156	107
4_	Nominal speed	rpm	14500	16200	15200	17200
5_	Nominal torque (max. continuous torque)	mNm	11.8	12	12.9	12.5
6_	Nominal current (max. continuous current)	A	4.09	2.97	2.23	1.6
7_	Stall torque	mNm	70.8	73.8	77	81.5
8_	Stall current	A	22.3	17	12.6	9.83
9_	Max. efficiency	%	74.1	77.6	79.4	80.5
10_	Terminal resistance	Ω	0.27	0.528	0.954	1.83
11_	Terminal inductance	mH	0.0153	0.0283	0.0565	0.104
12_	Torque constant	mNm/A	3.18	4.33	6.12	8.29
13_	Speed constant	rpm/V	3000	2210	1560	1150
14_	Speed/torque gradient	rpm/mNm	254	269	243	254
15_	Mechanical time constant	ms	2.69	2.84	2.57	2.69
16_	Rotor inertia	gcm ²	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 ¹	°C	-20...+100
22_	Max. winding temperature	°C	125

Operating Range



Mechanical data ball bearings

23_	Max. speed	rpm	50000
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	-

maxon Modular System

maxon gear	maxon sensor	maxon motor control 445_ESCON Module 50/4 EC-S
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Connection

W1	Motor winding 1
W2	Motor winding 2
W3	Motor winding 3

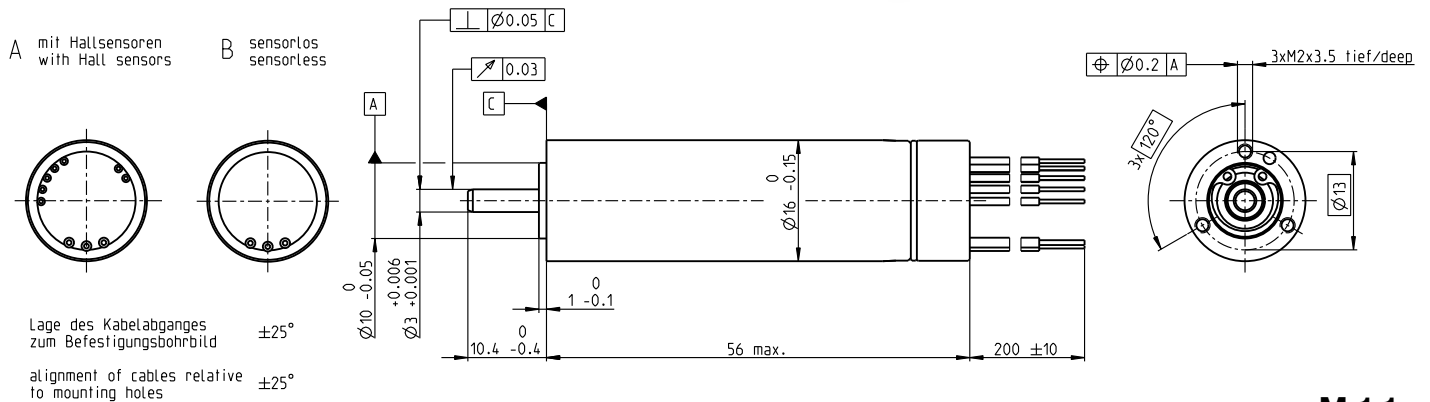
Configuration

ECX SPEED 16 L brushless BLDC motor $\varnothing 16$ mm

Key Data: 40/52 W, 10.6 mNm, 50000 rpm



maxon ECX



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 ²	0.997	0.997	0.997	0.997

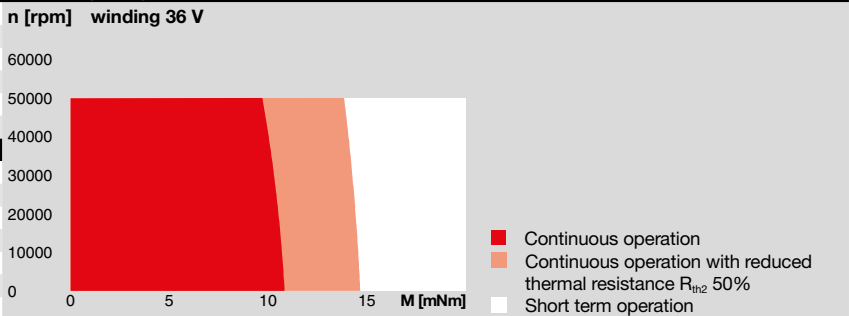
Thermal data

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 ¹	$^\circ\text{C}$	-20...+100
22_	Max. winding temperature	$^\circ\text{C}$	155

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]

Operating Range



Other specifications

29_	Number of pole pairs	1	maxon gear	Stages [opt.]	maxon sensor	maxon motor control
30_	Number of phases	3	294_GPX 16 A/C	1-2 [3-4]	for motor type A:	445_ESCON 36/3 EC
31_	Weight of motor	g	295_GPX 16 LN/LZ	1-2 [3-4]	392_ENX 16 EASY INT	445_ESCON Module 50/4 EC-S
32_	Typical noise level [rpm]	dBA	296_GPX 16 HP	2-3 [4]	for motor type B:	445_ESCON Module 50/5
			297_GPX 16 SPEED	1-2	393_ENX 16 EASY INT Abs.	447_ESCON 50/5
			298_GPX 19 A/C	3-4		449_DEC Module 50/5
			299_GPX 19 LN/LZ	3-4		453_EPOS4 50/5
			300_GPX 19 HP	4		453_EPOS4 Mod./Comp. 50/5
						464_EPOS2 P 24/5
						468_MAXPOS 50/5

maxon Modular System

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

orange	V_{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41. 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 $^\circ\text{C}$: 10 kOhm $\pm 1\%$, beta (25-85 $^\circ\text{C}$): 3490 K

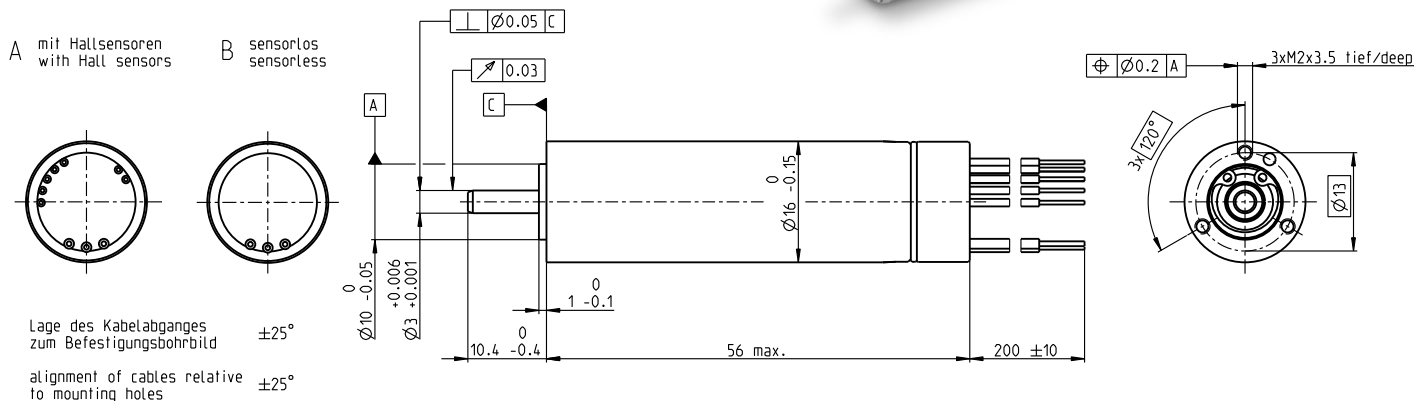
Configuration

Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 487.

ECX SPEED 16 L brushless BLDC motor Ø16 mm

High Power

Key Data: 80/107 W, 16 mNm, 70000 rpm



M 1:1

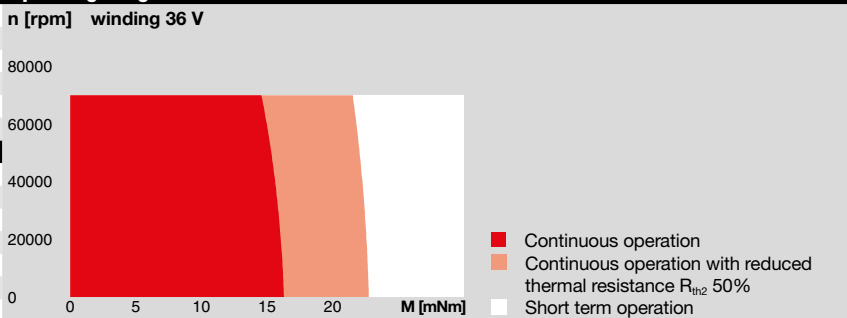
Motor Data

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 ²	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 ¹	°C	-20...+100
22_	Max. winding temperature	°C	155

Operating Range



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 72.6
32_	Typical noise level [rpm]	dBA 52 [50000]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
294_GPX 16 A/C	1-2 [3-4]	for motor type A:	445_ESCON 36/3 EC
295_GPX 16 LN/LZ	1-2 [3-4]	392_ENX 16 EASY INT	445_ESCON Module 50/4 EC-S
296_GPX 16 HP	2-3 [4]	for motor type B:	445_ESCON Module 50/5
297_GPX 16 SPEED	1-2	393_ENX 16 EASY INT Abs.	445_ESCON Module 50/4 EC-S
298_GPX 19 A/C	3-4		446_ESCON Module 50/8 HE
299_GPX 19 LN/LZ	3-4		447_ESCON 50/5
300_GPX 19 HP	4		447_ESCON 70/10
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 487.

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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41. 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)

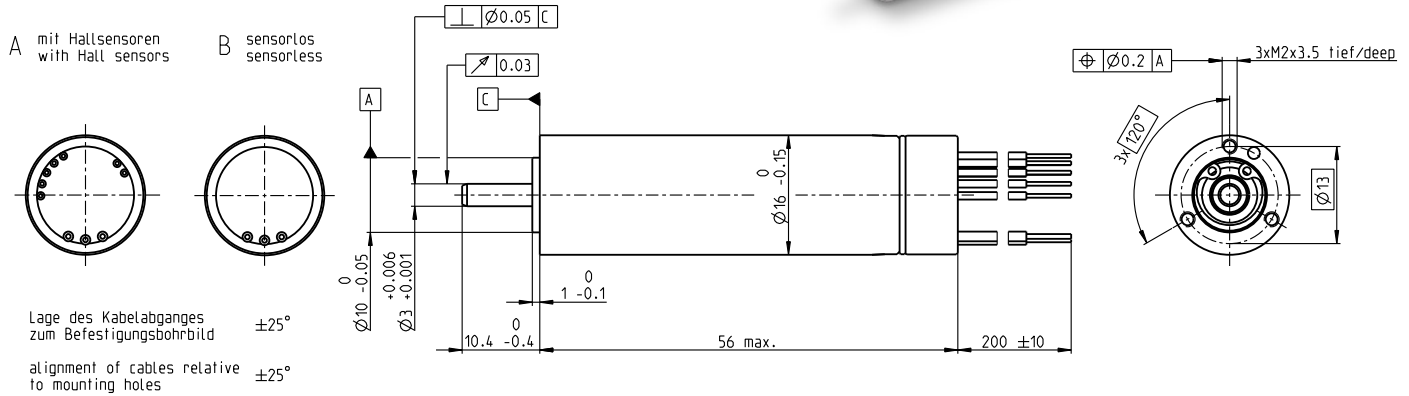
purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

ECX SPEED 16 L brushless BLDC motor Ø16 mm

Sterilizable

Key Data: 80/108 W, 16.3 mNm, 70000 rpm



maxon ECX

M 1:1

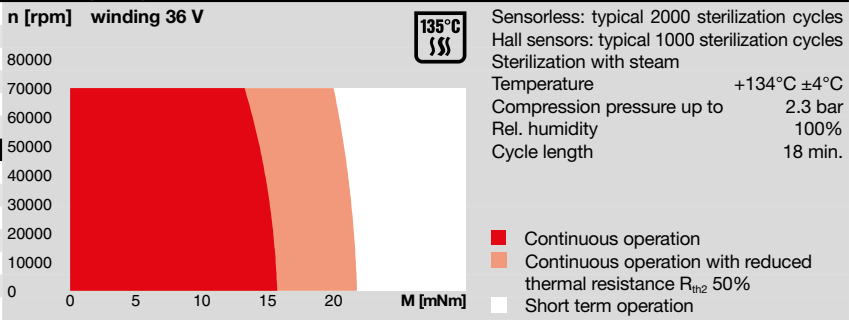
Motor Data

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 ²	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	1.28
20_	Thermal time constant motor	s	588
21_	Ambient temperature	°C	-40...+100
22_	Max. winding temperature	°C	155

Operating Range



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 72.6
32_	Typical noise level [rpm]	dBA 52 [50000]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
297_GPX 16 SPEED	1-2	for motor type A:	445_ESCON 36/3 EC
		392_ENX 16 EASY INT	445_ESCON Module 50/4 EC-S
		for motor type B:	445_ESCON Module 50/5
		393_ENX 16 EASY INT Abs.	446_ESCON Module 50/8 HE
			447_ESCON 50/5
			447_ESCON 70/10
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 487.

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_{Hall} 3...24 VDC
blue GND
yellow Hall sensor 1
brown Hall sensor 2
grey Hall sensor 3

Wiring diagram for Hall sensors see page 41. 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

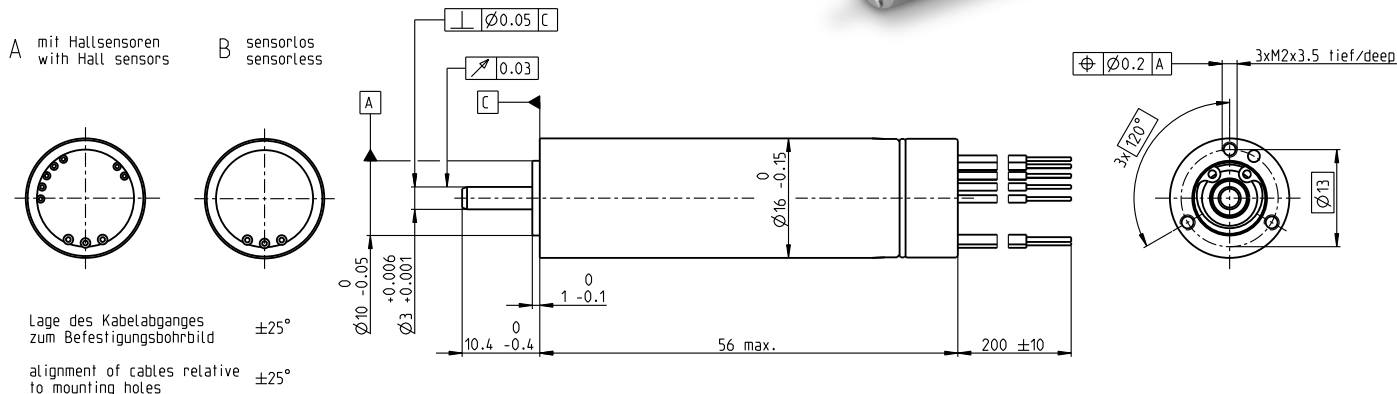
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ECX SPEED 16 L brushless

BLDC motor Ø16 mm

Sterilizable, Ceramic Bearings

Key Data: 80/132 W, 15.7 mNm, 120000 rpm



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 ²	0.952	0.952	0.952	0.952

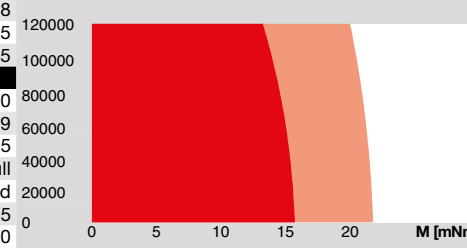
Thermal data

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
n [rpm] winding 36 V

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...0.29
	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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
297_GPX 16 SPEED	1-2	for motor type A:	445_ESCON 36/3 EC
		392_ENX 16 EASY INT	445_ESCON Module 50/4 EC-S
		for motor type B:	445_ESCON Module 50/5
		393_ENX 16 EASY INT Abs.	446_ESCON Module 50/8 HE
			447_ESCON 50/5
			447_ESCON 70/10
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 487.

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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41. 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

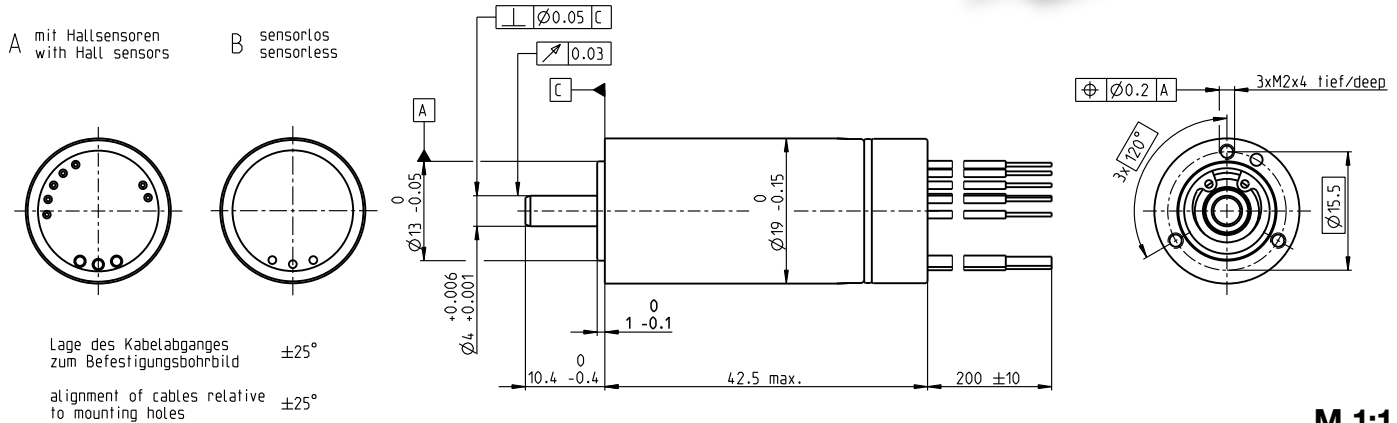
ECX SPEED 19 M brushless BLDC motor Ø19 mm

NEW



maxon ECX

Key Data: 30/37 W, 7.6 mNm, 50000 rpm



Motor Data

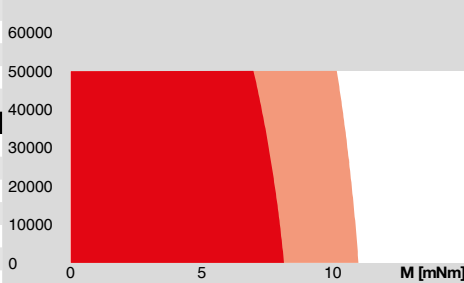
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	45200	47700	45200	47100
3_	No load current	mA	250	205	125	100
4_	Nominal speed	rpm	41000	43600	41100	42900
5_	Nominal torque (max. continuous torque)	mNm	7.61	7.47	7.57	7.08
6_	Nominal current (max. continuous current)	A	2.23	1.74	1.11	0.82
7_	Stall 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 ²	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 ¹	°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	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.]	maxon sensor	maxon motor control
298_GPX 19 A/C	1-2 [3-4]	for motor type A:	444_ESCON Module 24/2
299_GPX 19 LN/LZ	1-2 [3-4]	395_ENX 19 EASY INT	445_ESCON 36/3 EC
300_GPX 19 HP	2-3 [4]	for motor type B:	445_ESCON Module 50/4 EC-S
301_GPX 19 SPEED	1-2	395_ENX 19 EASY INT Abs.	445_ESCON Module 50/5
302_GPX 22 A/C	3-4		447_ESCON 50/5
303_GPX 22 LN/LZ	3-4		449_DEC Module 24/2
304_GPX 22 HP	4		449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Module/Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 488.

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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

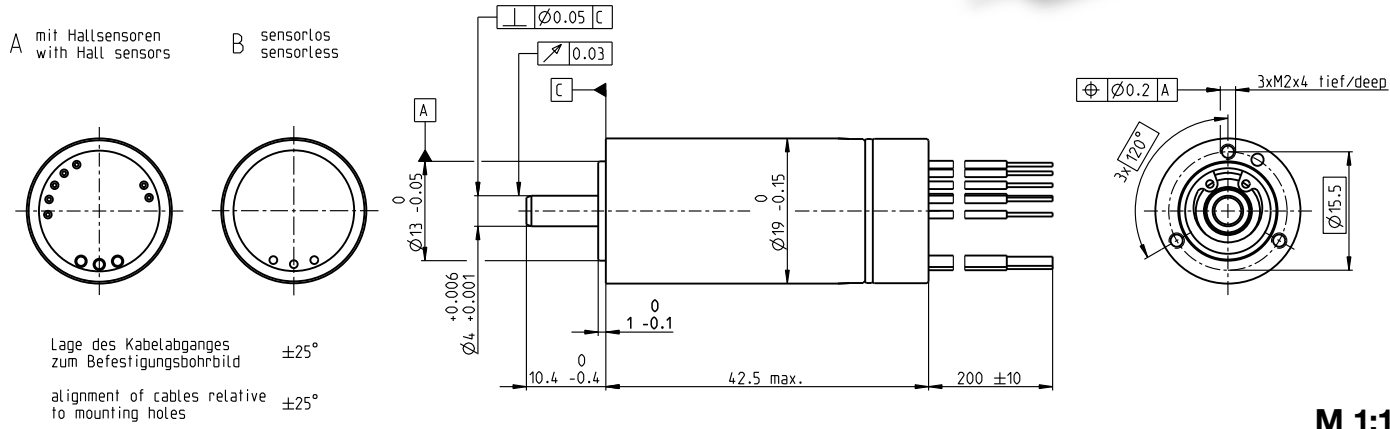
Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

ECX SPEED 19 M brushless BLDC motor Ø19 mm

High Power

Key Data: 60/71 W, 11.2 mNm, 65000 rpm

NEW



M 1:1

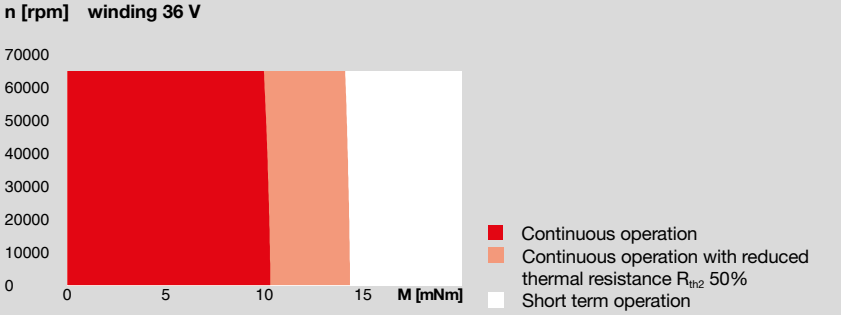
Motor Data

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 ²	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 ¹	°C	-20...+100
22_	Max. winding temperature	°C	155

Operating Range



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	298_GPX 19 A/C	Stages [opt.]	1-2 [3-4]	maxon sensor	for motor type A:	maxon motor control	445_ESCON 36/3 EC
30_	Number of phases	3	299_GPX 19 LN/LZ		1-2 [3-4]	395_ENX 19 EASY INT	for motor type B:	445_ESCON Module 50/4 EC-S	445_ESCON Module 50/5
31_	Weight of motor	g	78	300_GPX 19 HP	2-3 [4]	395_ENX 19 EASY INT Abs.		447_ESCON 50/5	449_DEC Module 50/5
32_	Typical noise level [rpm]	dBA	48 [50000]	301_GPX 19 SPEED	1-2			453_EPOS4 50/5	453_EPOS4 Mod./Comp. 50/5
				302_GPX 22 A/C	3-4			464_EPOS2 P 24/5	468_MAXPOS 50/5
				303_GPX 22 LN/LZ	3-4				
				304_GPX 22 HP	4				

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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

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 19 A/C	1-2 [3-4]	for motor type A:	445_ESCON 36/3 EC
299_GPX 19 LN/LZ	1-2 [3-4]	395_ENX 19 EASY INT	445_ESCON Module 50/4 EC-S
300_GPX 19 HP	2-3 [4]	for motor type B:	445_ESCON Module 50/5
301_GPX 19 SPEED	1-2	395_ENX 19 EASY INT Abs.	447_ESCON 50/5
302_GPX 22 A/C	3-4		449_DEC Module 50/5
303_GPX 22 LN/LZ	3-4		453_EPOS4 50/5
304_GPX 22 HP	4		453_EPOS4 Mod./Comp. 50/5

Configuration

Flange front: thread in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 488.

ECX SPEED 19 M brushless

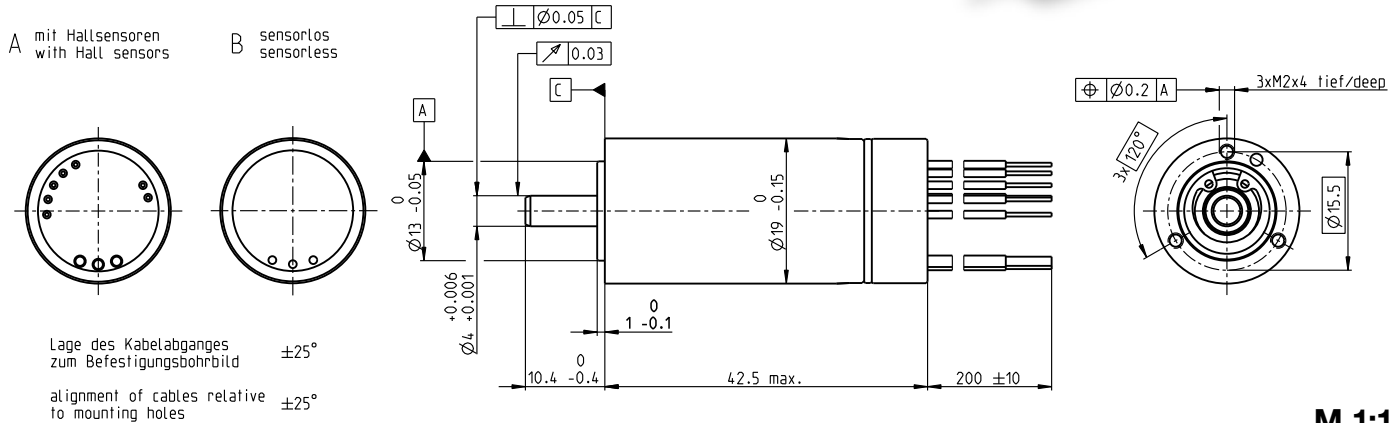
BLDC motor Ø19 mm

Sterilizable

Key Data: 60/65 W, 11.1 mNm, 70000 rpm



maxon ECX



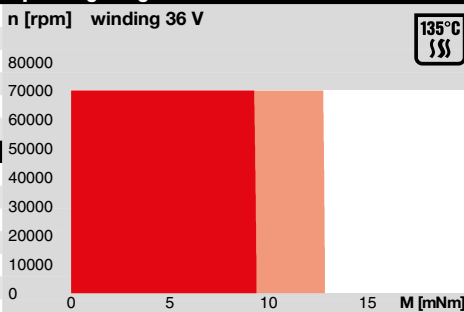
Motor Data

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 ²	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



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	maxon gear Stages [opt.]	maxon sensor for motor type A:	maxon motor control
30_	Number of phases	3	301_GPX 19 SPEED 1-2	395_ENX 19 EASY INT	445_ESCON 36/3 EC
31_	Weight of motor	g		for motor type B:	445_ESCON Module 50/4 EC-S
32_	Typical noise level [rpm]	dBA	48 [50000]	395_ENX 19 EASY INT Abs.	445_ESCON Module 50/5
					447_ESCON 50/5
					449_DEC Module 50/5
					453_EPOS4 50/5
					453_EPOS4 Mod./Comp. 50/5
					464_EPOS2 P 24/5
					468_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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

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 in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 488.

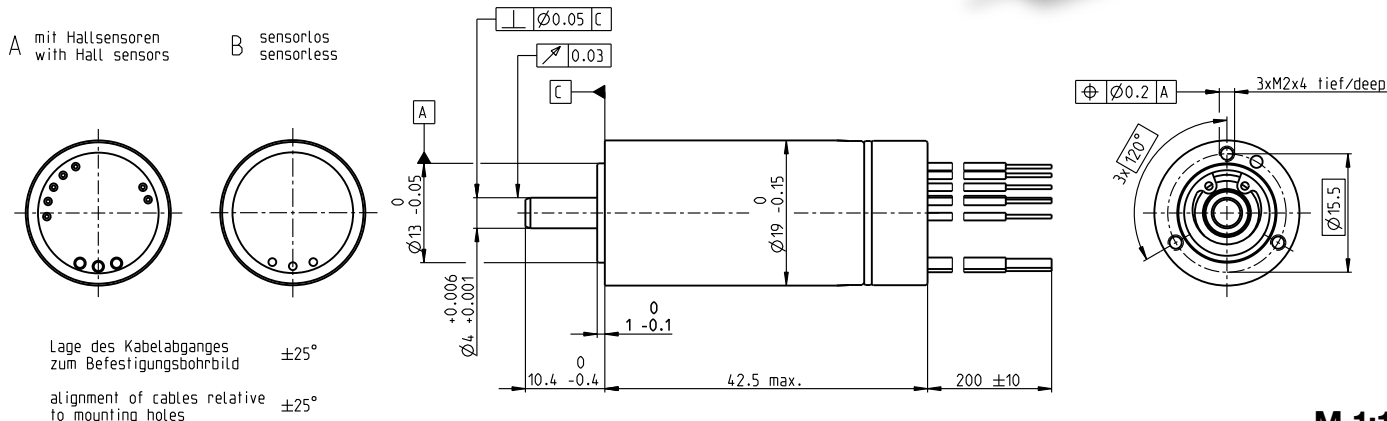
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ECX SPEED 19 M brushless

BLDC motor Ø19 mm

Sterilizable, Ceramic Bearings

Key Data: 60/92 W, 10.9 mNm, 100000 rpm



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 ²	1.15	1.15	1.15	1.15

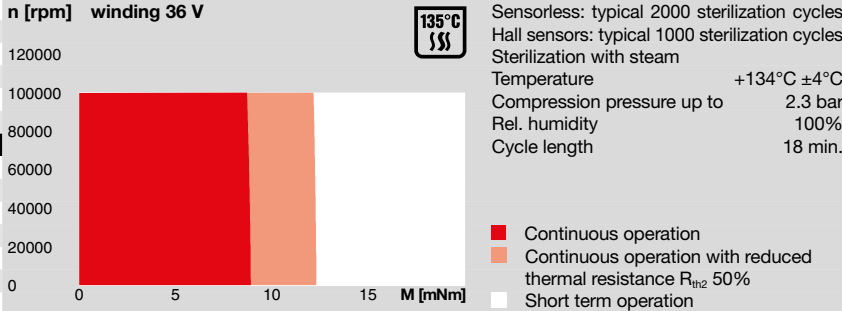
Thermal data

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

Mechanical data ball bearings

23_	Max. speed	rpm	100000
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



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.]	maxon sensor	maxon motor control
301_GPX 19 SPEED	1-2	for motor type A: 395_ENX 19 EASY INT	445_ESCON 36/3 EC
		for motor type B: 395_ENX 19 EASY INT Abs.	445_ESCON Module 50/4 EC-S
			445_ESCON Module 50/5
			447_ESCON 50/5
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 488.

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)
purple NTC
purple NTC
Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

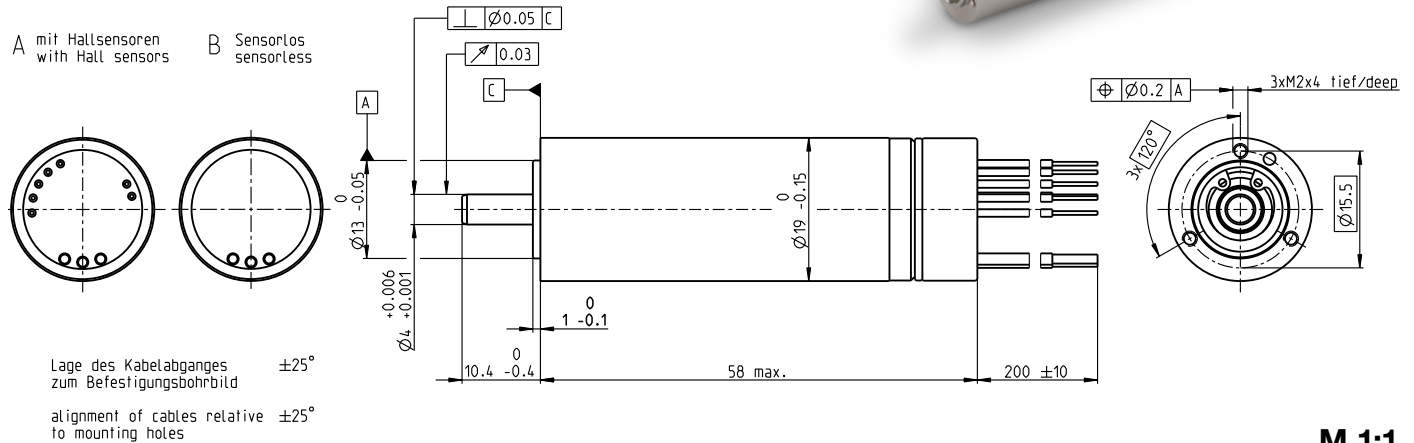
ECX SPEED 19 L brushless BLDC motor Ø19 mm

NEW



maxon ECX

Key Data: 60/73 W, 15.3 mNm, 50000 rpm



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 ²	1.67	1.67	1.67

Thermal data		Operating Range	
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 ¹	°C	-20...-100
22_	Max. winding temperature	°C	155

n [rpm] winding 36 V

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		maxon Modular System	
29_	Number of pole pairs	1	maxon gear
30_	Number of phases	3	298_GPX 19 A/C
31_	Weight of motor	g 108	299_GPX 19 LN/LZ
32_	Typical noise level [rpm]	dBA 51 [50000]	300_GPX 19 HP
			301_GPX 19 SPEED
			302_GPX 22 A/C
			303_GPX 22 LN/LZ
			304_GPX 22 HP
			maxon sensor
			maxon motor control

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_{Hall} 3...24 VDC
blue GND
yellow Hall sensor 1
brown Hall sensor 2
grey Hall sensor 3

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)
purple NTC
purple NTC
Resistance 25°C: 10 kOhm ±1%, beta (25–85°C): 3490 K

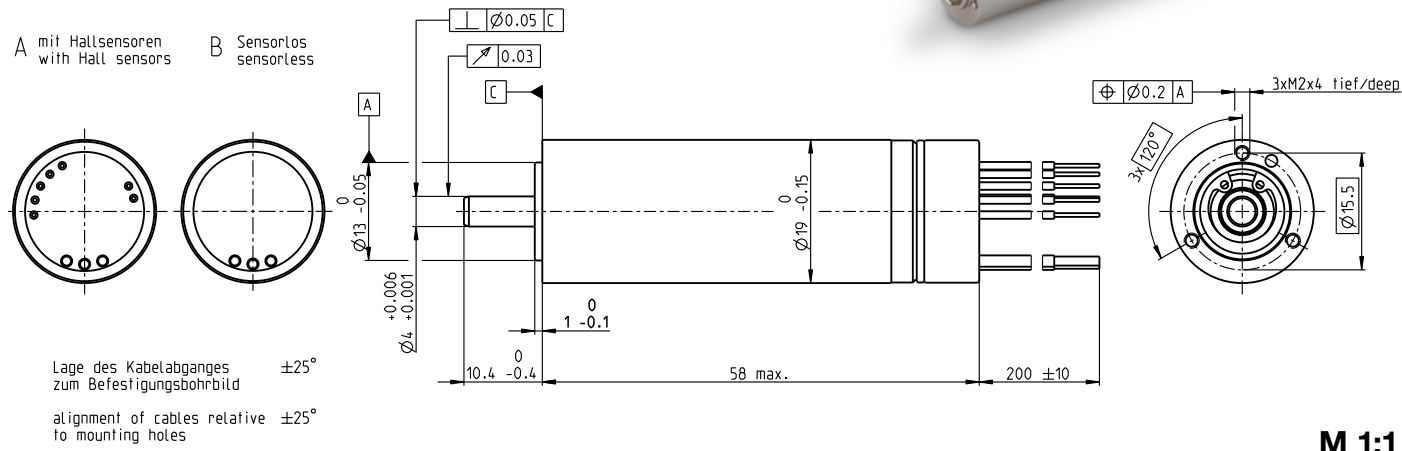
Configuration
Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 488.

ECX SPEED 19 L brushless BLDC motor Ø19 mm

High Power

Key Data: 120/133 W, 23.2 mNm, 65000 rpm

NEW



M 1:1

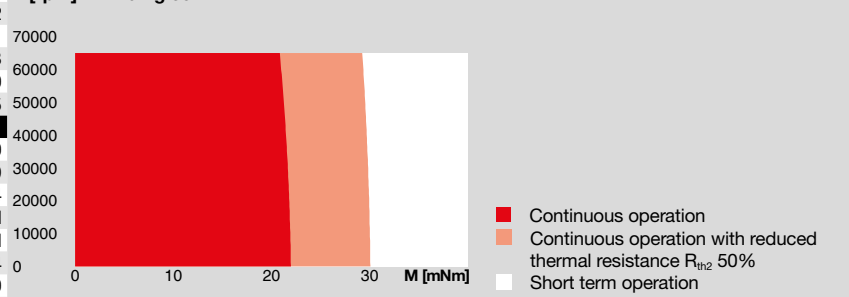
Motor Data

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 ²	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 ¹	°C	-20...+100
22_	Max. winding temperature	°C	155

Operating Range



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.]	maxon sensor	maxon motor control
298_GPX 19 A/C	1-2 [3-4]	for motor type A:	445_ESCON Module 50/4 EC-S
299_GPX 19 LN/LZ	1-2 [3-4]	395_ENX 19 EASY INT	445_ESCON Module 50/5
300_GPX 19 HP	2-3 [4]	for motor type B:	446_ESCON Module 50/8 HE
301_GPX 19 SPEED	1-2	395_ENX 19 EASY INT Abs.	447_ESCON 50/5
302_GPX 22 A/C	3-4		447_ESCON 70/10
303_GPX 22 LN/LZ	3-4		449_DEC Module 50/5
304_GPX 22 HP	4		453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

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 in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 488.

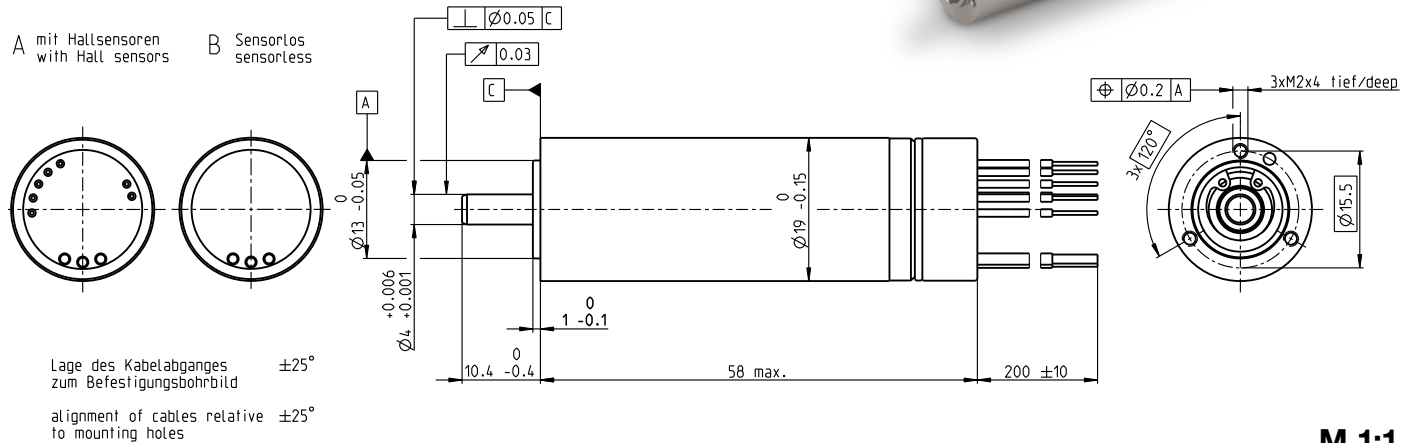
ECX SPEED 19 L brushless BLDC motor Ø19 mm

Sterilizable

Key Data: 120/147 W, 23.9 mNm, 70000 rpm



maxon ECX



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 ²	1.79	1.79	1.79	1.79

Thermal data		Operating Range	
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

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
301_GPX 19 SPEED	1-2	for motor type A: 395_ENX 19 EASY INT	445_ESCON Module 50/4 EC-S
		for motor type B: 395_ENX 19 EASY INT Abs.	445_ESCON Module 50/5
			446_ESCON Module 50/8 HE
			447_ESCON 50/5
			447_ESCON 70/10
			449_DEC Module 50/5
			453_EPOS4 50/5
			454_EPOS4 Mod./Comp. 50/5
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

135°C

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.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

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_{Hall} 3...24 VDC
 blue GND
 yellow Hall sensor 1
 brown Hall sensor 2
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)
 purple NTC
 purple NTC
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

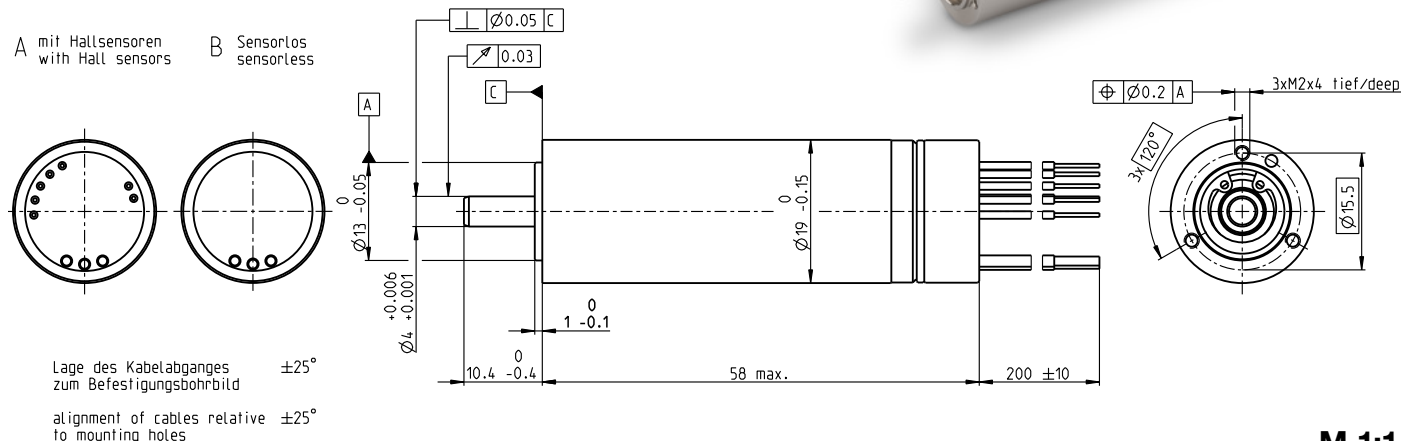
Configuration
 Flange front: thread in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 488.

ECX SPEED 19 L brushless

BLDC motor Ø19 mm

Sterilizable, Ceramic Bearings

Key Data: 120/206 W, 24.1 mNm, 100 000 rpm



M 1:1

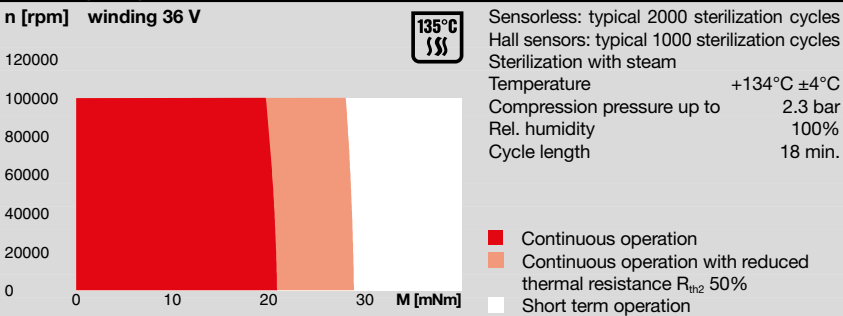
Motor Data

1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	60800	60800	57600	63400
3_	No load current	mA	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 ²	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

Operating Range



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 108
32_	Typical noise level [rpm]	dBA 51 [50000]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
301_GPX 19 SPEED	1-2	for motor type A:	445_ESCON Module 50/4 EC-S
		395_ENX 19 EASY INT	445_ESCON Module 50/5
		for motor type B:	446_ESCON Module 50/8 HE
		395_ENX 19 EASY INT Abs.	447_ESCON 50/5
			447_ESCON 70/10
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC

Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

Configuration

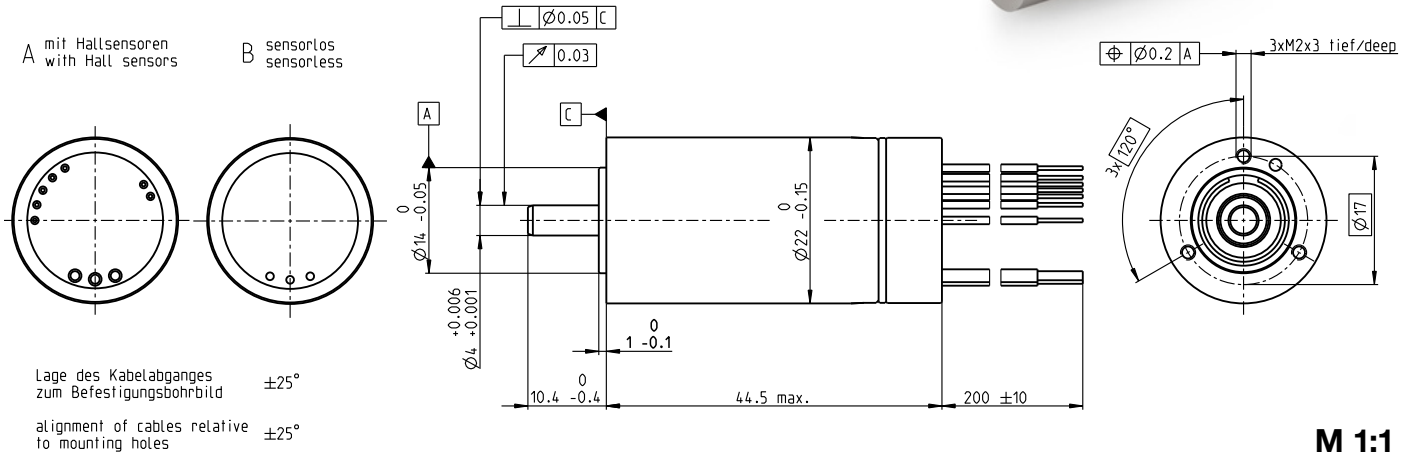
Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 488.

ECX SPEED 22 M brushless BLDC motor Ø22 mm

Key Data: 40/51 W, 12.1 mNm, 45000 rpm



maxon ECX



Motor Data

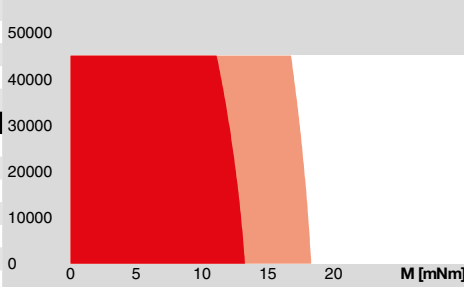
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	40400	40000	40500	40400
3_	No load current	mA	378	279	189	141
4_	Nominal speed	rpm	37300	37100	37700	37500
5_	Nominal torque (max. continuous torque)	mNm	10.7	11.5	12.1	11.9
6_	Nominal current (max. continuous current)	A	2.89	2.28	1.61	1.18
7_	Stall 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 ²	2.13	2.13	2.13	2.13

Thermal data

17_	Thermal resistance housing-ambient	K/W	15
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 ¹	°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	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]

Other specifications

29_	Number of pole pairs	1	302_GPX 22 A/C	Stages [opt.]	1-2 [3-4]	maxon sensor	for motor type A:	maxon motor control	445_ESCON 36/3 EC
30_	Number of phases	3	303_GPX 22 LN/LZ		1-2 [3-4]	396_ENX 22 EASY INT		445_ESCON Module 50/4 EC-S	
31_	Weight of motor	g	98	304_GPX 22 HP		2-3 [4]	for motor type B:	445_ESCON Module 50/5	
32_	Typical noise level [rpm]	dBA	53 [45000]	305_GPX 22 SPEED		1-2	396_ENX 22 EASY INT Abs.	447_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_{Hall} 3...24 VDC
blue GND
yellow Hall sensor 1
brown Hall sensor 2
grey Hall sensor 3

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)

purple NTC
purple NTC
Resistance 25°C: 10 kOhm $\pm 1\%$, beta (25-85°C): 3490 K

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
302_GPX 22 A/C	1-2 [3-4]	for motor type A:	445_ESCON 36/3 EC
303_GPX 22 LN/LZ	1-2 [3-4]	396_ENX 22 EASY INT	445_ESCON Module 50/4 EC-S
304_GPX 22 HP	2-3 [4]	for motor type B:	445_ESCON Module 50/5
305_GPX 22 SPEED	1-2	396_ENX 22 EASY INT Abs.	447_ESCON 50/5
306_GPX 26 A/C	3		449_DEC Module 50/5
307_GPX 26 LN/LZ	3		453_EPOS4 50/5
308_GPX 26 HP	4		453_EPOS4 Mod./Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 489.

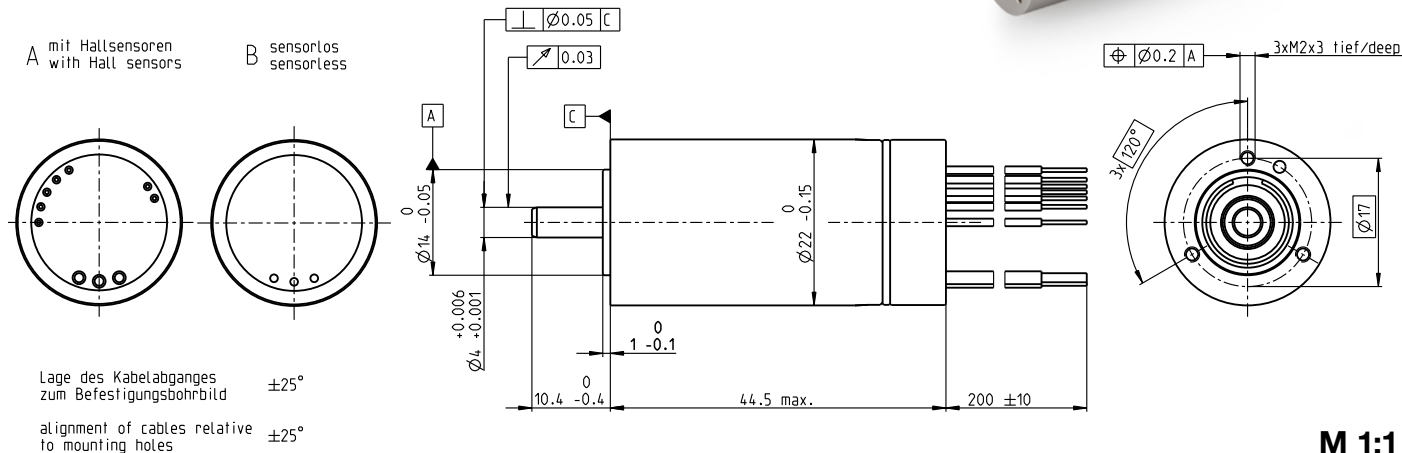
xdrives.maxonmotor.com

ECX SPEED 22 M brushless

BLDC motor Ø22 mm

High Power

Key Data: 80/115 W, 20.3 mNm, 60000 rpm



M 1:1

Motor Data

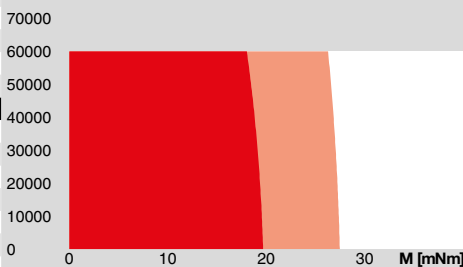
1_	Nominal voltage	V	18	24	36	48
2_	No load speed	rpm	50900	58100	55500	52500
3_	No load current	mA	324	302	186	128
4_	Nominal speed	rpm	48200	55600	53000	49900
5_	Nominal torque (max. continuous torque)	mNm	20.3	20.1	20	18.3
6_	Nominal current (max. continuous current)	A	6.28	5.36	3.4	2.21
7_	Stall 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 ²	2.15	2.15	2.15	2.15

Thermal data

17_	Thermal resistance housing-ambient	K/W	15
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 ¹	°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	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 98
32_	Typical noise level [rpm]	dBA 53 [50000]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
302_GPX 22 A/C	1-2 [3-4]	for motor type A:	445_ESCON Module 50/4 EC-S
303_GPX 22 LN/LZ	1-2 [3-4]	396_ENX 22 EASY INT	445_ESCON Module 50/5
304_GPX 22 HP	2-3 [4]	for motor type B:	446_ESCON Module 50/8 HE
305_GPX 22 SPEED	1-2	396_ENX 22 EASY INT Abs.	447_ESCON 50/5
306_GPX 26 A/C	3		447_ESCON 70/10
307_GPX 26 LN/LZ	3		449_DEC Module 50/5
308_GPX 26 HP	4		453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

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 in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 489.

ECX SPEED 22 M brushless

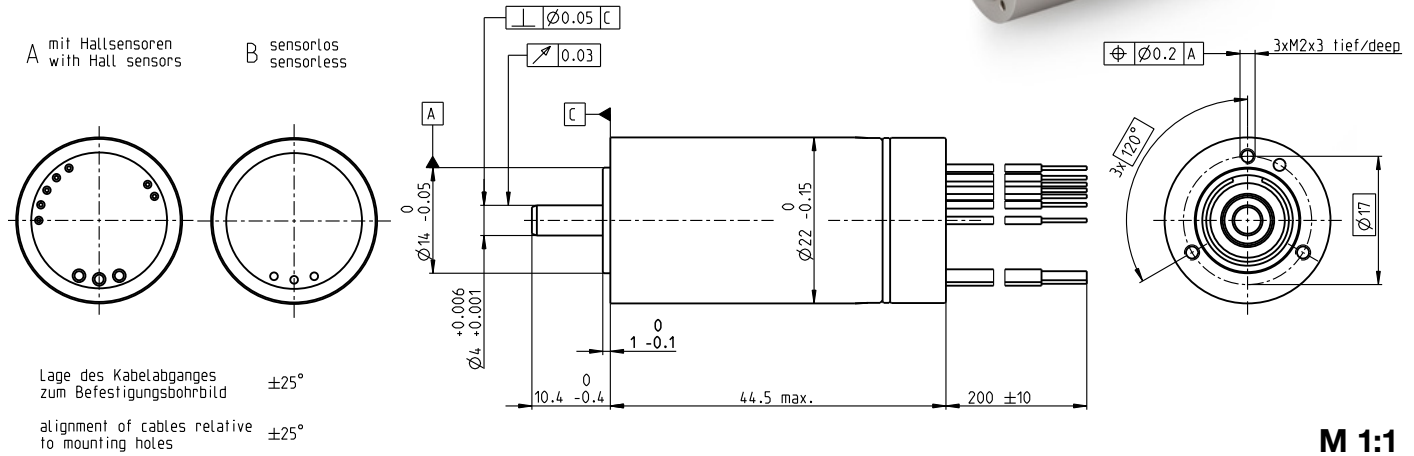
BLDC motor Ø22 mm

Sterilizable

Key Data: 80/97 W, 17.6 mNm, 60000 rpm



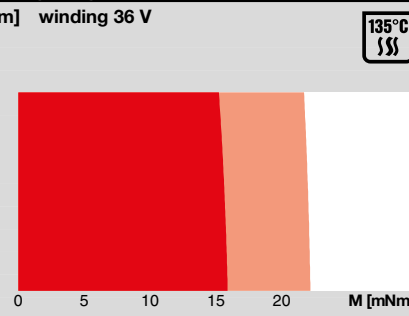
maxon ECX



M 1:1

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 ²	1.91	1.91	1.91	1.91

Thermal data		Operating Range	
17_	Thermal resistance housing-ambient	K/W	15
18_	Thermal resistance winding-housing	K/W	0.6
19_	Thermal time constant winding	s	1.25
20_	Thermal time constant motor	s	417
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155



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]

maxon Modular System			
29_	Number of pole pairs	1	maxon gear 305_GPX 22 SPEED 1-2
30_	Number of phases	3	maxon sensor for motor type A: 396_ENX 22 EASY INT
31_	Weight of motor	g 106	for motor type B: 396_ENX 22 EASY INT Abs.
32_	Typical noise level [rpm]	dBA 54 [50000]	maxon motor control 445_ESCON Module 50/4 EC-S

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_{Hall} 3...24 VDC
blue GND
yellow Hall sensor 1
brown Hall sensor 2
grey Hall sensor 3

Wiring diagram for Hall sensors see page 41

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 in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor

For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 489.

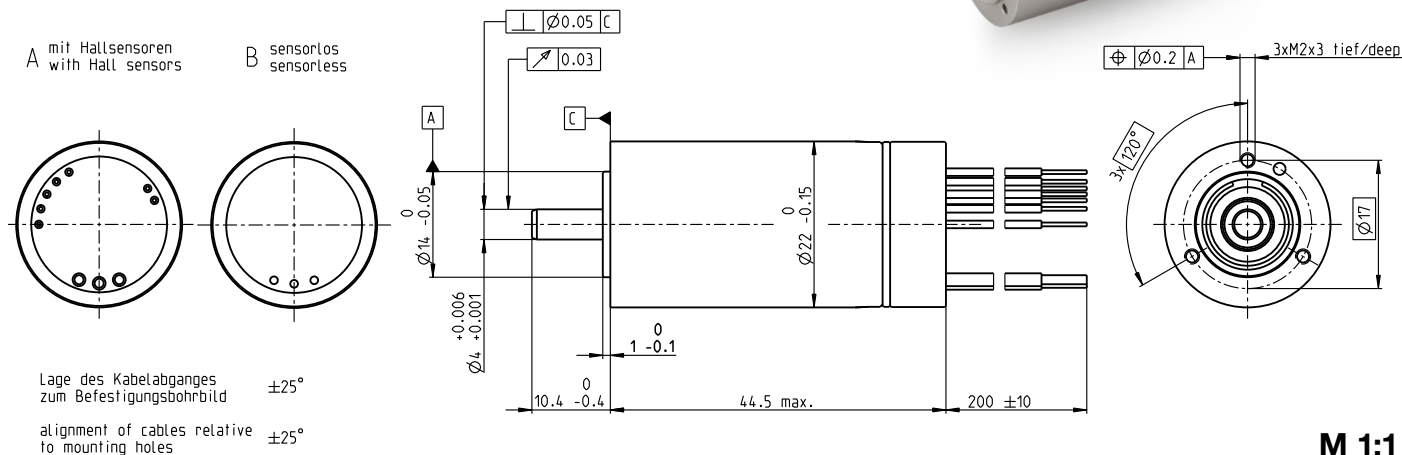
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ECX SPEED 22 M brushless

BLDC motor Ø22 mm

Sterilizable, Ceramic Bearings

Key Data: 80/127 W, 16.9 mNm, 85000 rpm



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 ²	1.91	1.91	1.91	1.91

Thermal data		Operating Range	
17_	Thermal resistance housing-ambient	K/W	15
18_	Thermal resistance winding-housing	K/W	0.6
19_	Thermal time constant winding	s	1.25
20_	Thermal time constant motor	s	417
21_	Ambient temperature	°C	-40...+135
22_	Max. winding temperature	°C	155

n [rpm] winding 36 V

Mechanical data ball bearings			
23_	Max. speed	rpm	85 000
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			
29_	Number of pole pairs	1	maxon gear 305_GPX 22 SPEED 1-2 Stages [opt.]
30_	Number of phases	3	maxon sensor for motor type A: 396_ENX 22 EASY INT
31_	Weight of motor	g	106
32_	Typical noise level [rpm]	dBA	54 [50000]
			maxon sensor for motor type B: 396_ENX 22 EASY INT Abs.
			maxon motor control 445_ESCON Module 50/4 EC-S
			445_ESCON Module 50/5
			446_ESCON Module 50/8 HE
			447_ESCON 50/5
			447_ESCON 70/10
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_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_{Hall} 3...24 VDC
 blue GND
 yellow Hall sensor 1
 brown Hall sensor 2
 grey Hall sensor 3

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)
 purple NTC
 purple NTC
 Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

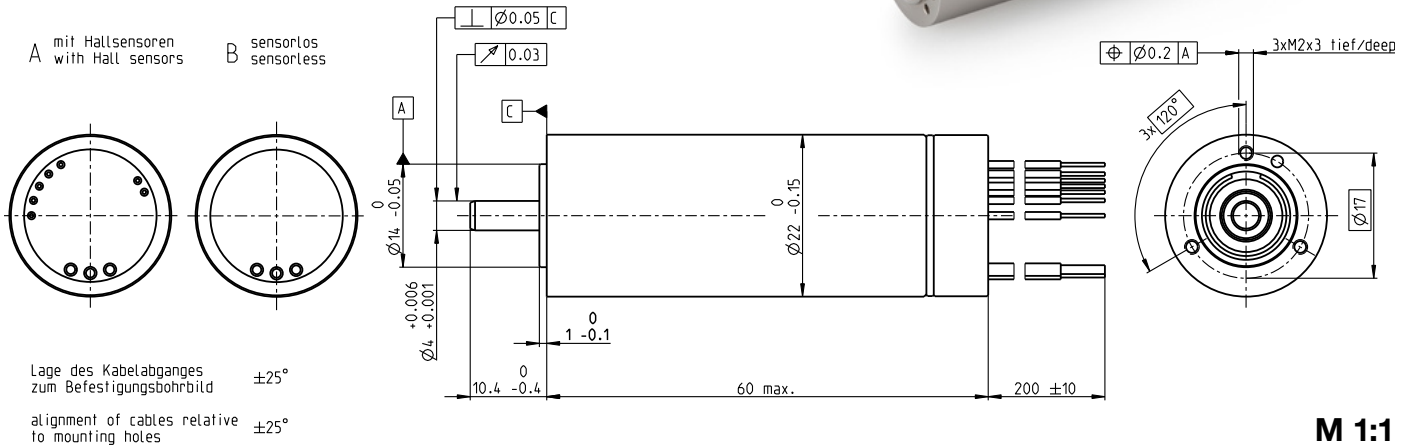
Configuration
 Flange front: thread in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 489.

ECX SPEED 22 L brushless BLDC motor Ø22 mm

Key Data: 80/81 W, 20.2 mNm, 45000 rpm



maxon ECX



Motor Data

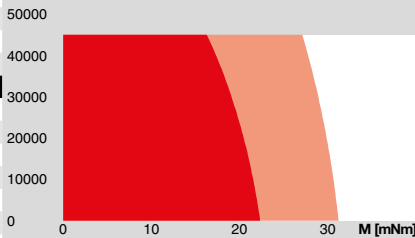
1_	Nominal voltage	V	24	36	48
2_	No load speed	rpm	38000	36800	37400
3_	No load current	mA	337	214	164
4_	Nominal speed	rpm	36000	34800	35600
5_	Nominal torque (max. continuous torque)	mNm	18.2	19.3	20.2
6_	Nominal current (max. continuous current)	A	3.35	2.27	1.8
7_	Stall torque	mNm	383	407	461
8_	Stall 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 ²	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 ¹	°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	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]

Other specifications

29_	Number of pole pairs	1	
30_	Number of phases	3	
31_	Weight of motor	g	140
32_	Typical noise level [rpm]	dBA	54 [45000]

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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

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
302_GPX 22 A/C	1–2 [3–4]	for motor type A:	445_ESCON 36/3 EC
303_GPX 22 LN/LZ	1–2 [3–4]	396_ENX 22 EASY INT	445_ESCON Module 50/4 EC-S
304_GPX 22 HP	2–3 [4]	for motor type B:	445_ESCON Module 50/5
305_GPX 22 SPEED	1–2	396_ENX 22 EASY INT Abs.	447_ESCON 50/5
306_GPX 26 A/C	3		449_DEC Module 50/5
307_GPX 26 LN/LZ	3		453_EPOS4 50/5
308_GPX 26 HP	4		453_EPOS4 Mod./Comp. 50/5
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

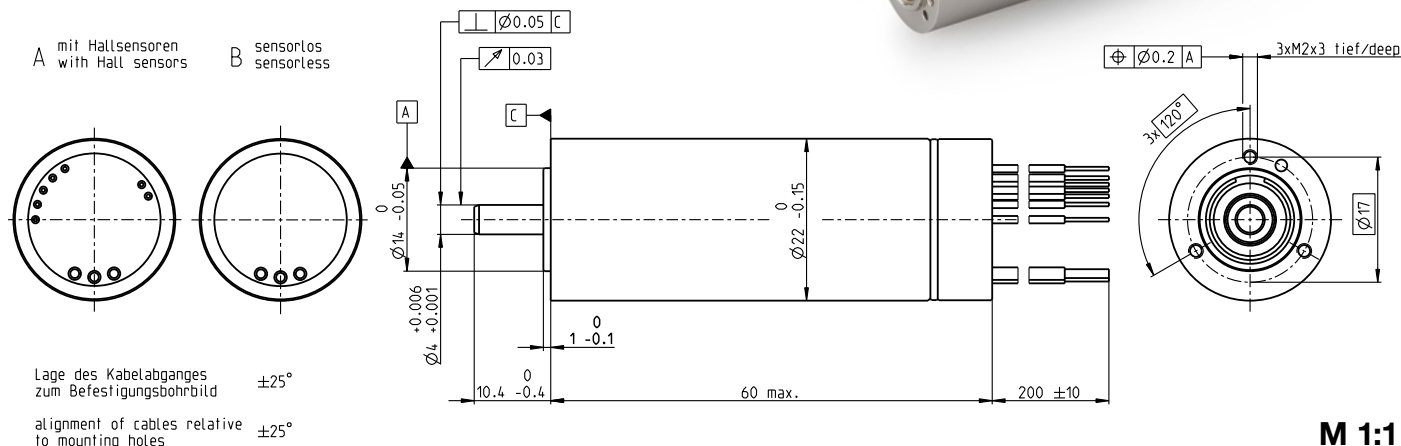
Flange front: thread in flange/center thread
 Flange back: plastic ring/external thread
 Shaft front: length/diameter
 Electric connection: cable length/pin connection/connector
 Temperature Sensor: NTC-Thermistor
 For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 489.

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ECX SPEED 22 L brushless BLDC motor Ø22 mm

High Power

Key Data: 120/153 W, 29.3 mNm, 60000 rpm



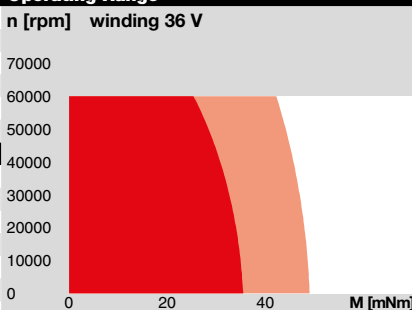
Motor Data

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 ²	3.94	3.94	3.94

Thermal data

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 ¹	°C	-20...+100
22_	Max. winding temperature	°C	155

Operating Range



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 140
32_	Typical noise level [rpm]	dBA 54 [50000]

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
302_GPX 22 A/C	1-2 [3-4]	for motor type A:	445_ESCON Module 50/4 EC-S
303_GPX 22 LN/LZ	1-2 [3-4]	396_ENX 22 EASY INT	445_ESCON Module 50/5
304_GPX 22 HP	2-3 [4]	for motor type B:	446_ESCON Module 50/8 HE
305_GPX 22 SPEED	1-2	396_ENX 22 EASY INT Abs.	447_ESCON 50/5
306_GPX 26 A/C	3		447_ESCON 70/10
307_GPX 26 LN/LZ	3		449_DEC Module 50/5
308_GPX 26 HP	4		453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_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 _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

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 in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection/connector
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 489.

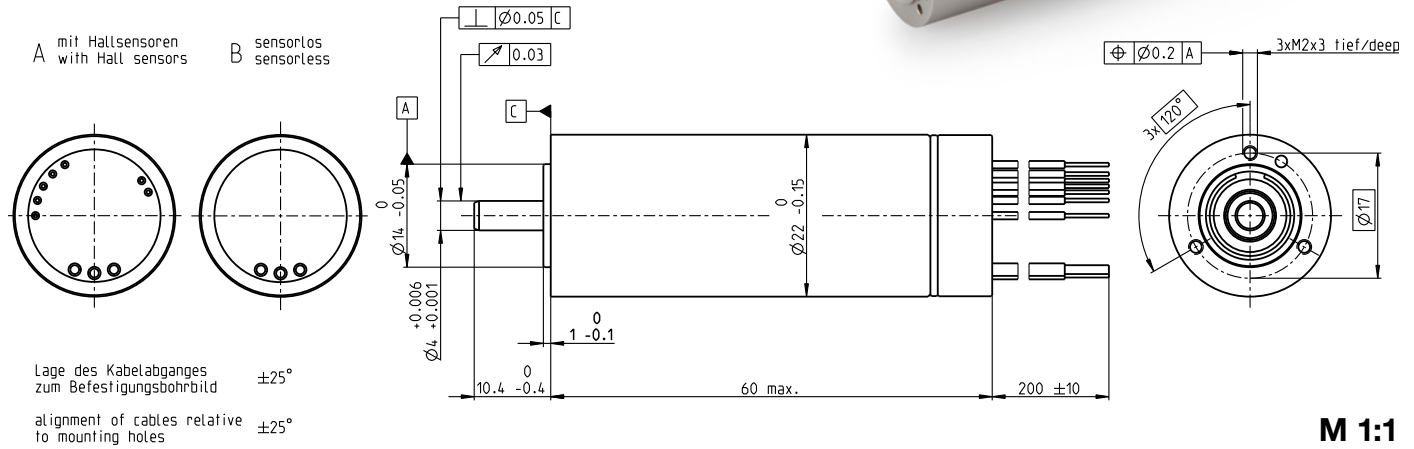
ECX SPEED 22 L brushless BLDC motor Ø22 mm

Sterilizable

Key Data: 120/162 W, 28.3 mNm, 60000 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	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 ²	2.36	2.36	2.36

Thermal data		Operating Range	
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

maxon Modular System

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
305_GPX 22 SPEED	1-2	for motor type A: 396_ENX 22 EASY INT	445_ESCON Module 50/4 EC-S
		for motor type B: 396_ENX 22 EASY INT Abs.	445_ESCON Module 50/5
			446_ESCON Module 50/8 HE
			447_ESCON 50/5
			447_ESCON 70/10
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

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.

- Continuous operation
- Continuous operation with reduced thermal resistance R_{th2} 50%
- Short term operation

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]

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_{Hall} 3...24 VDC
blue GND
yellow Hall sensor 1
brown Hall sensor 2
grey Hall sensor 3

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)
purple NTC
purple NTC
Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K

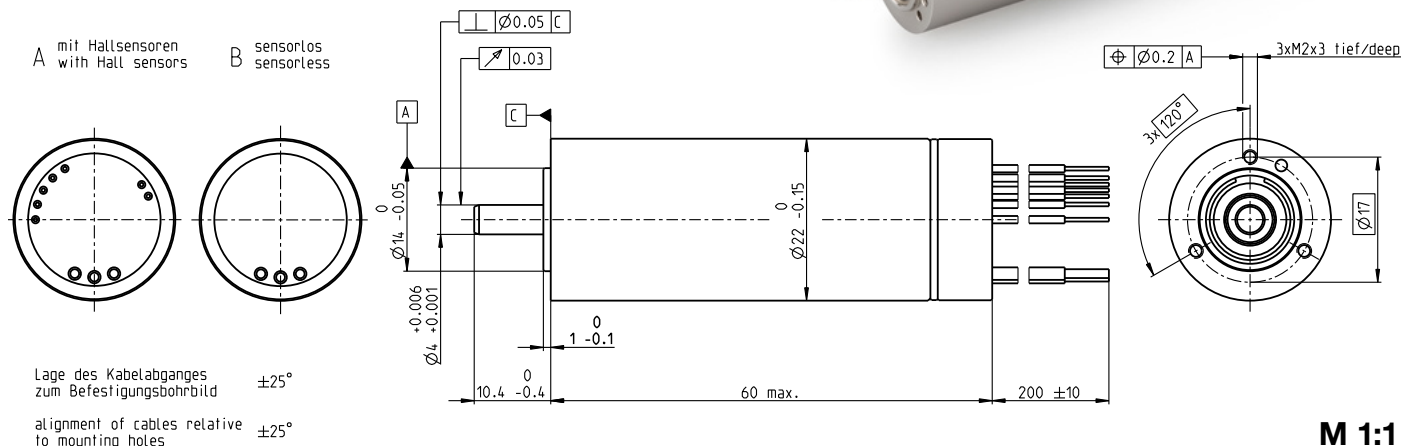
Configuration
Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 489.

ECX SPEED 22 L brushless

BLDC motor Ø22 mm

Sterilizable, Ceramic Bearings

Key Data: 120/169 W, 27.1 mNm, 85000 rpm



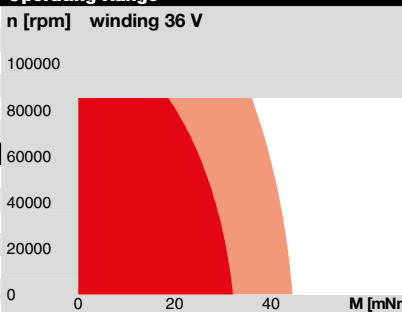
Motor Data

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 ²	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



Mechanical data ball bearings

23_	Max. speed	rpm	85000
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

maxon gear	Stages [opt.]	maxon sensor	maxon motor control
305_GPX 22 SPEED	1-2	for motor type A: 396_ENX 22 EASY INT	445_ESCON Module 50/4 EC-S
		for motor type B: 396_ENX 22 EASY INT Abs.	445_ESCON Module 50/5
			446_ESCON Module 50/8 HE
			447_ESCON 50/5
			447_ESCON 70/10
			449_DEC Module 50/5
			453_EPOS4 50/5
			453_EPOS4 Mod./Comp. 50/5
			454_EPOS4 Mod./Comp. 50/8
			456_EPOS4 70/15
			464_EPOS2 P 24/5
			468_MAXPOS 50/5

Configuration

Flange front: thread in flange/center thread
Flange back: plastic ring/external thread
Shaft front: length/diameter
Electric connection: cable length/pin connection
Temperature Sensor: NTC-Thermistor
For the configuration pin connection together with external thread on back flange, a suitable connector is available. See accessories on page 489.

Connection A and B, motor (Cable AWG 18)

red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

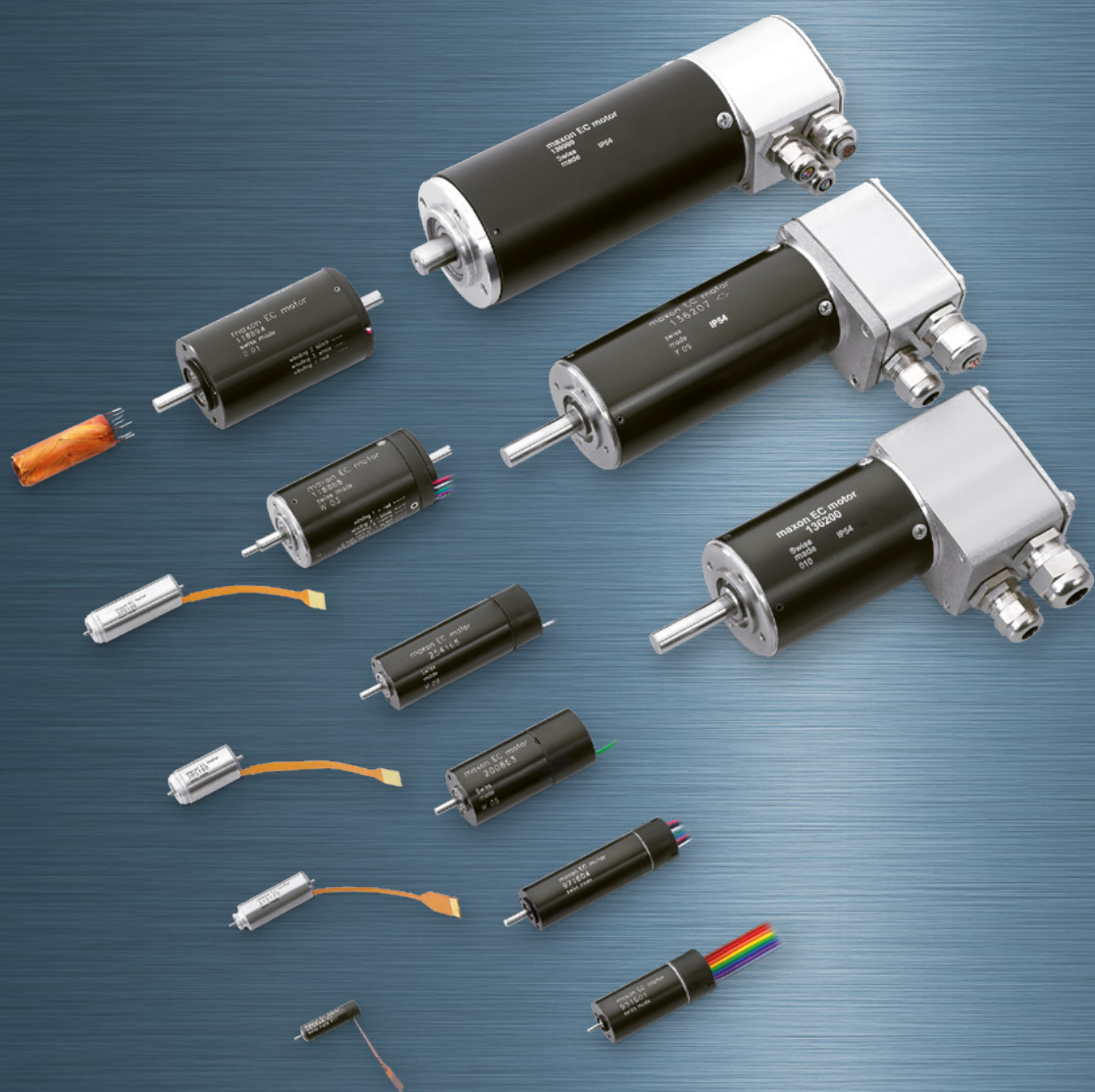
Connection A, sensors (Cable AWG 26)

orange	V _{Hall} 3...24 VDC
blue	GND
yellow	Hall sensor 1
brown	Hall sensor 2
grey	Hall sensor 3

Wiring diagram for Hall sensors see page 41

Connection NTC (Cable AWG 26)

purple	NTC
purple	NTC
Resistance 25°C: 10 kOhm ±1%, beta (25-85°C): 3490 K	



DC Motor

EC Motor (BLDC Motor)

Gearhead

Screw drive

Sensor

Motor control

Compact Drive

Accessories

Ceramic

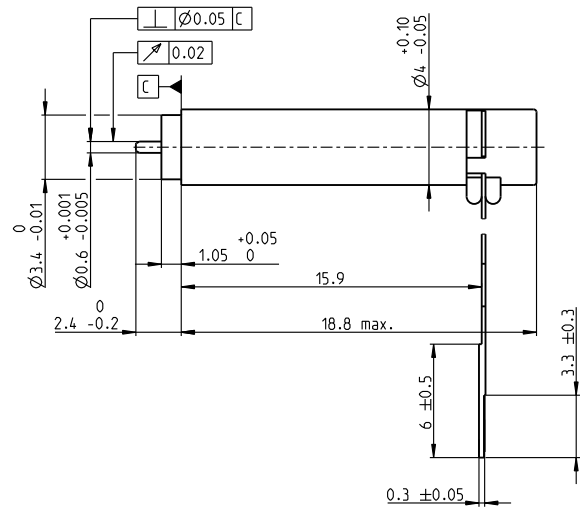
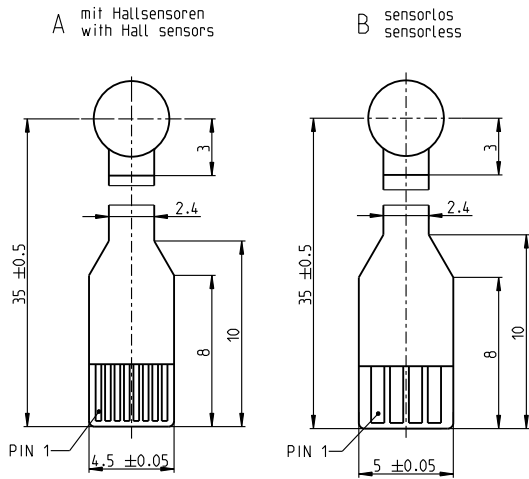
Contact information

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.

Standard Specification No. 101	60
Explanation of the EC motors	164
ECX SPEED Program	166-200
EC Program	202-216
EC-max Program	219-227
EC-4pole Program	231-237
EC-i Program	241-251
EC flat Program	254-272
EC frameless Program	274-279

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		3 V	6 V
1 Nominal voltage	V	3	6
2 No load speed	rpm	34700	35700
3 No load current	mA	23.4	12.1
4 Nominal speed	rpm	13600	15300
5 Nominal torque	mNm	0.215	0.222
6 Nominal current	A	0.292	0.154
7 Stall torque	mNm	0.367	0.402
8 Stall current	A	0.468	0.263
9 Max. efficiency	%	61	63
Characteristics			
10 Terminal resistance phase to phase	Ω	6.42	22.8
11 Terminal inductance phase to phase	mH	0.0231	0.0881
12 Torque constant	mNm/A	0.784	1.53
13 Speed constant	rpm/V	12200	6240
14 Speed/torque gradient	rpm/mNm	99600	93200
15 Mechanical time constant	ms	1.16	1.08
16 Rotor inertia	gcm ²	0.00111	0.00111

Specifications

Thermal data	
17 Thermal resistance housing-ambient	129 K/W
18 Thermal resistance winding-housing	2.78 K/W
19 Thermal time constant winding	0.13 s
20 Thermal time constant motor	78.0 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

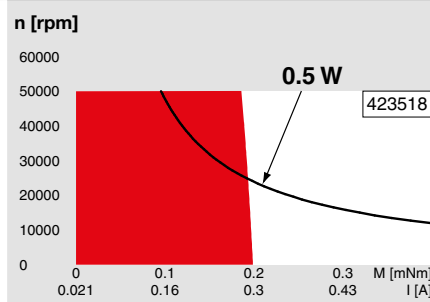
Values listed in the table are nominal.

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 _{Hall} 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 41

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).

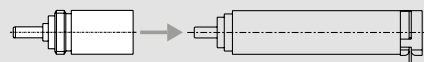
Assigned power rating

maxon Modular System

Overview on page 28-36

Planetary Gearhead

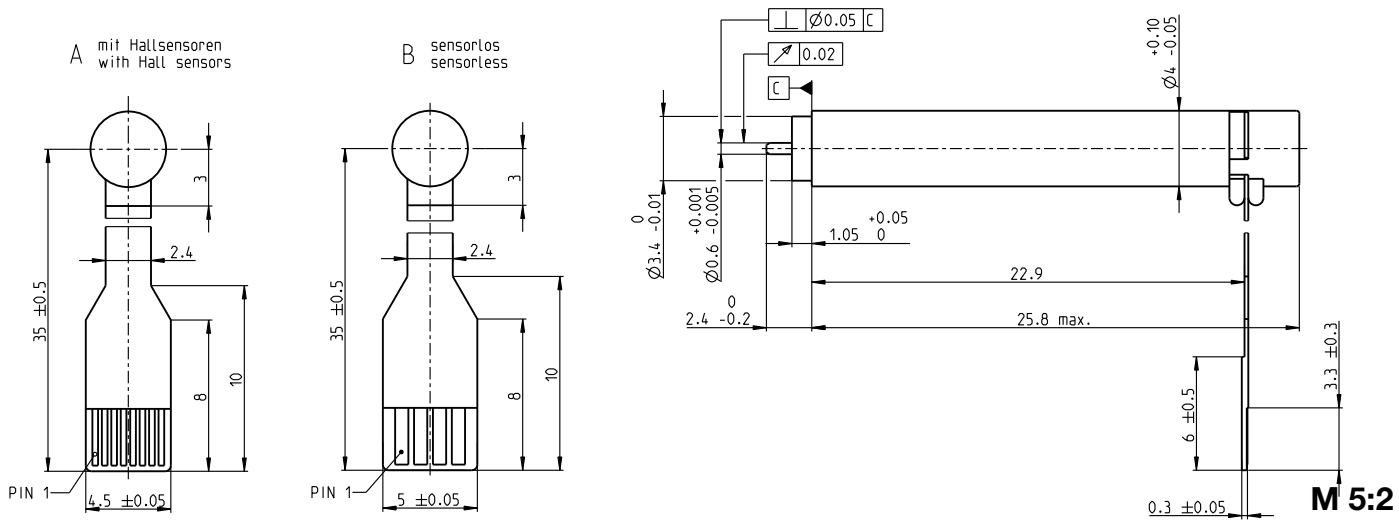
Ø4 mm
0.002 - 0.015 Nm
Page 316



Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445

EC 4 Ø4 mm, brushless, 1.0 Watt

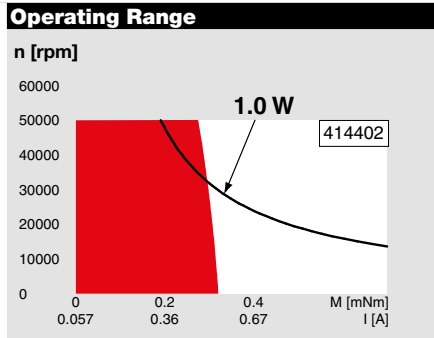


- Stock program
- Standard program
- Special program (on request)

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	39800	29900
3 No load current	mA	77.6	24.8
4 Nominal speed	rpm	22900	13300
5 Nominal torque (max. continuous torque)	mNm	0.319	0.341
6 Nominal current (max. continuous current)	A	0.532	0.209
7 Stall torque	mNm	0.774	0.639
8 Stall current	A	1.15	0.358
9 Max. efficiency	%	56	56
Characteristics			
10 Terminal resistance phase to phase	Ω	2.6	16.7
11 Terminal inductance phase to phase	mH	0.00946	0.0668
12 Torque constant	mNm/A	0.671	1.78
13 Speed constant	rpm/V	14200	5360
14 Speed/torque gradient	rpm/mNm	55200	50300
15 Mechanical time constant	ms	0.953	0.868
16 Rotor inertia	gcm ²	0.00165	0.00165

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	97.4 K/W
18 Thermal resistance winding-housing	1.46 K/W
19 Thermal time constant winding	0.114 s
20 Thermal time constant motor	88.6 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

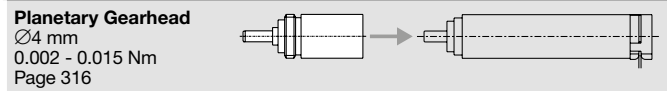
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.

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 Overview on page 28-36



Values listed in the table are nominal.

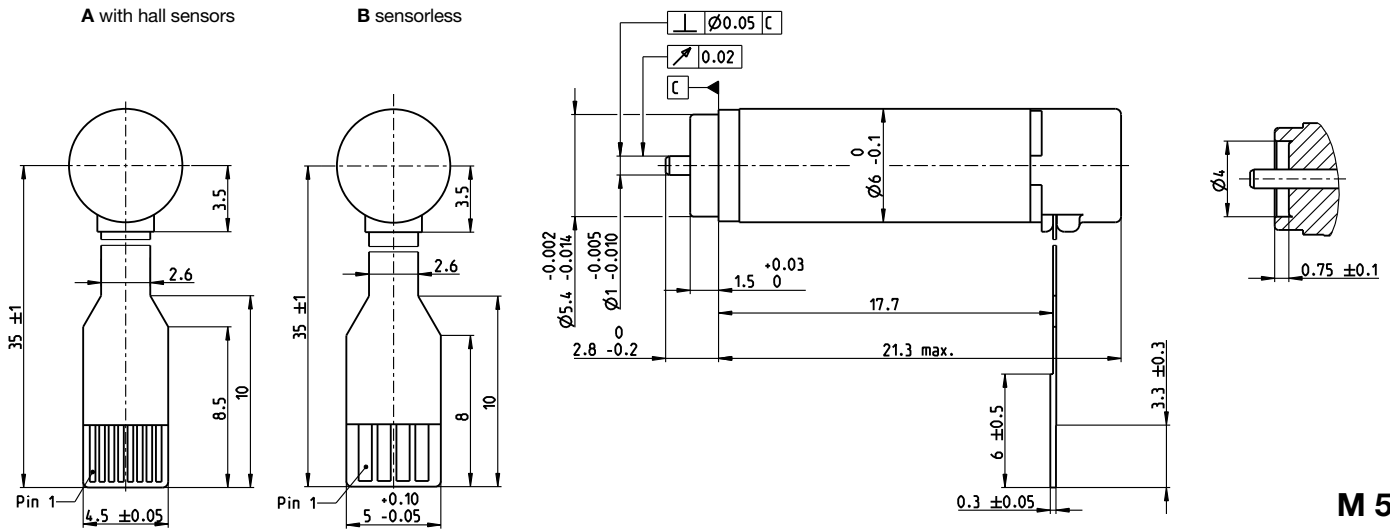
Connection	with hall sensors	sensorless
Pin 1	Motor winding 1	Motor winding 1
Pin 2	Motor winding 2	Motor winding 2
Pin 3	Motor winding 3	Motor winding 3
Pin 4	V _{Hall} 3.8...24 VDC	N.C.
Pin 5	GND	
Pin 6	Hall sensor 1	
Pin 7	Hall sensor 2	
Pin 8	Hall sensor 3	
Connector	Part number	Part number
MOLEX	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 41

Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445

EC 6 Ø6 mm, brushless, 1.5 Watt



M 5:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
A with Hall sensors	455020 468897
B sensorless	455019 468896

Motor Data (provisional)

Values at nominal voltage		455020	468897
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	%	56	50
Characteristics			
10 Terminal resistance phase to phase	Ω	8.72	63.8
11 Terminal inductance phase to phase	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 ²	0.00703	0.00703

Specifications

Thermal data	
17 Thermal resistance housing-ambient	67.1 K/W
18 Thermal resistance winding-housing	16.8 K/W
19 Thermal time constant winding	1.57 s
20 Thermal time constant motor	71.8 s
21 Ambient temperature	-20...+100°C
22 Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)	
23 Max. speed	100000 rpm
24 Axial play at axial load < 0.15 N	0 mm
24 Axial play at axial load > 0.15 N	max. 0.06 mm
25 Radial play	preloaded
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	2 N

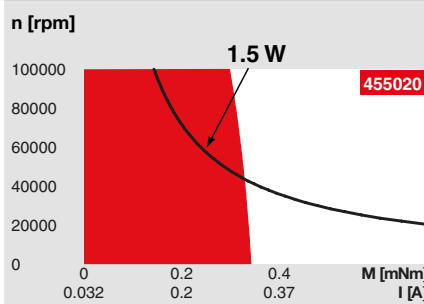
Other specifications	
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	3 g

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 _{Hall} 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 41

Operating Range

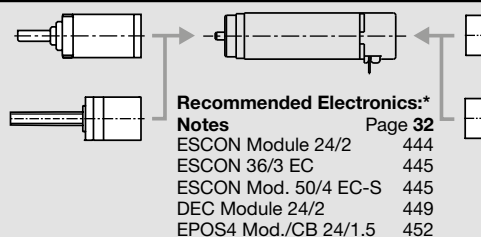


Comments

- 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

- 1 **Planetary Gearhead**
Ø6 mm
0.002 - 0.03 Nm
Page 317
- 3 **Screw Drive**
Ø6 mm
Page 365-366



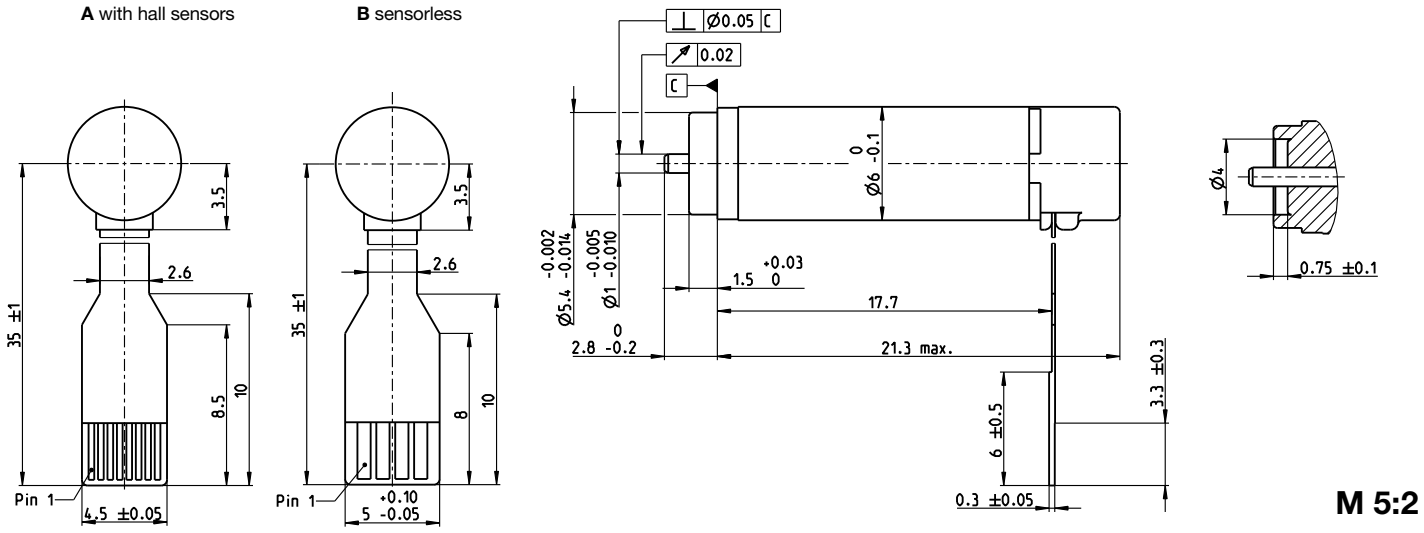
- Recommended Electronics* Page 32**
- ESCON Module 24/2 444
- ESCON 36/3 EC 445
- ESCON Mod. 50/4 EC-S 445
- DEC Module 24/2 449
- EPOS4 Mod./CB 24/1.5 452

*Not in combination with encoder 6 OPT. Adapter acc. to Overview on page 35.

Overview on page 28-36

- Encoder 6 MAG**
64-256 CPT,
Page 405
- For motor type B:**
Encoder 6 OPT
128 CPT,
Page 421

EC 6 Ø6 mm, brushless, 2 Watt



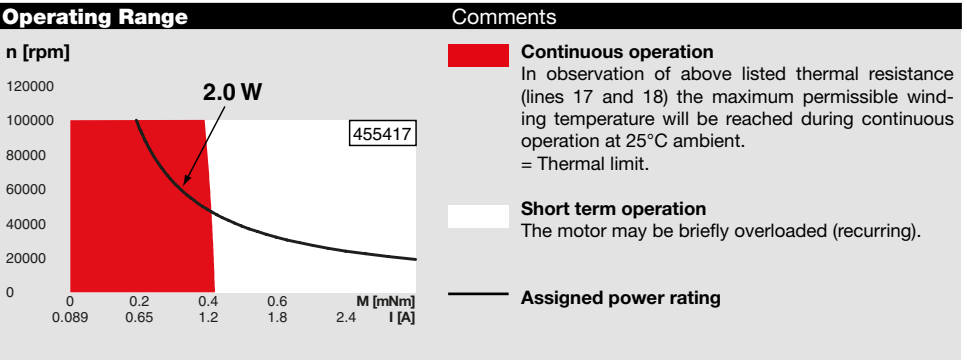
M 5:2

- Stock program
- Standard program
- Special program (on request)

		Part Numbers		
A with Hall sensors		455417	455418	455419
B sensorless		455420	455421	455422

Motor Data (provisional)					
Values at nominal voltage					
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	%	66	67	69
Characteristics					
10	Terminal resistance phase to phase	Ω	0.766	3.49	12.4
11	Terminal inductance phase to phase	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 ²	0.00703	0.00703	0.00703

Specifications		
Thermal data		
17	Thermal resistance housing-ambient	65.8 K/W
18	Thermal resistance winding-housing	13.2 K/W
19	Thermal time constant winding	1.34 s
20	Thermal time constant motor	70.4 s
21	Ambient temperature	-20...+100°C
22	Max. winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. speed	100000 rpm
24	Axial play at axial load < 0.15 N	0 mm
	> 0.15 N	max. 0.06 mm
25	Radial play	preloaded
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	2 N



Other specifications		
29	Number of pole pairs	3
30	Number of phases	3
31	Weight of motor	3 g

Values listed in the table are nominal.

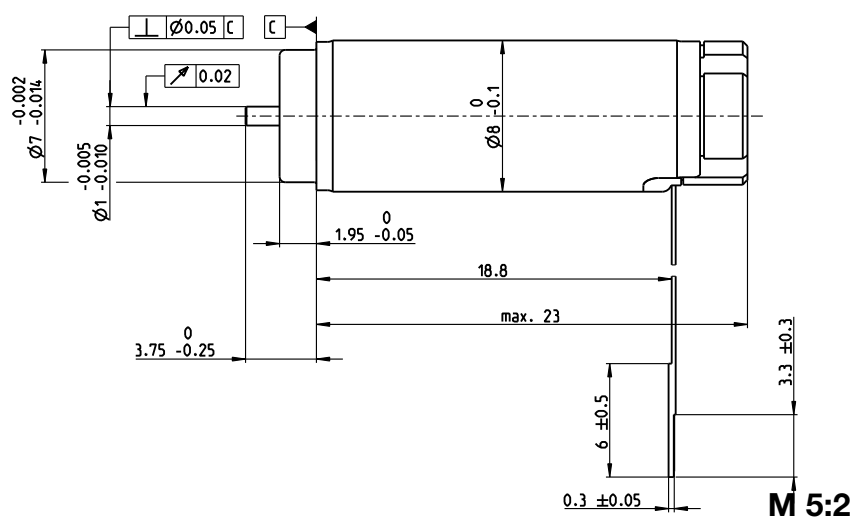
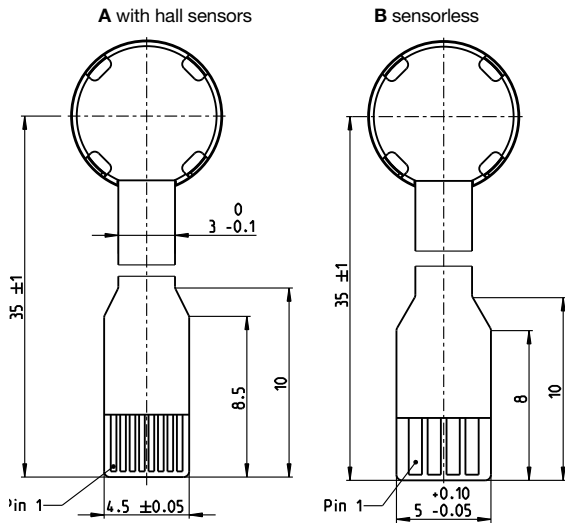
Connection	with hall sensors	sensorless
Pin 1	Motor winding 1	Motor winding 1
Pin 2	Motor winding 2	Motor winding 2
Pin 3	Motor winding 3	Motor winding 3
Pin 4	V _{Hall} 3.8...24 VDC	N.C.
Pin 5	GND	
Pin 6	Hall sensor 1	
Pin 7	Hall sensor 2	
Pin 8	Hall sensor 3	

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 41

maxon Modular System		Overview on page 28–36
Planetary Gearhead Ø6 mm 0.002 - 0.03 Nm Page 317		Encoder 6 MAG 64–256 CPT, Page 405
Screw Drive Ø6 mm Page 365–366		For motor type B: Encoder 6 OPT 128 CPT, Page 421
Recommended Electronics: * Notes Page 32		
ESCON Module 24/2 444 ESCON 36/3 EC 445 ESCON Mod. 50/4 EC-S 445 DEC Module 24/2 449 EPOS4 Mod./CB 24/1.5 452		
*Not in combination with encoder 6 OPT. Adapter acc. to Overview on page 35.		

EC 8 $\varnothing 8$ mm, brushless, 2 Watt



- Stock program
- Standard program
- Special program (on request)

Part Numbers

	468334	468335	468336
A with Hall sensors			
B sensorless			

Motor Data

Values at nominal voltage		6	12	24
1 Nominal voltage	V	6	12	24
2 No load speed	rpm	35900	43800	42700
3 No load current	mA	69.2	46	22.1
4 Nominal speed	rpm	24000	32800	32000
5 Nominal torque (max. continuous torque)	mNm	0.977	0.942	0.944
6 Nominal current (max. continuous current)	A	0.691	0.41	0.2
7 Stall torque	mNm	3.05	3.9	3.93
8 Stall current	A	1.98	1.54	0.755
9 Max. efficiency	%	67	69	70
Characteristics				
10 Terminal resistance phase to phase	Ω	3.02	7.8	31.8
11 Terminal inductance phase to phase	mH	0.039	0.106	0.447
12 Torque constant	mNm/A	1.54	2.53	5.21
13 Speed constant	rpm/V	6200	3770	1830
14 Speed/torque gradient	rpm/mNm	12200	11600	11200
15 Mechanical time constant	ms	3.19	3.03	2.92
16 Rotor inertia	gcm ²	0.024961	0.024961	0.024961

Specifications

Thermal data	
17 Thermal resistance housing-ambient	51.2 K/W
18 Thermal resistance winding-housing	3.5 K/W
19 Thermal time constant winding	0.832 s
20 Thermal time constant motor	154 s
21 Ambient temperature	-20...+100°C
22 Max. winding temperature	125°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	80000 rpm
24 Axial play at axial load < 0.15 N	0 mm
24 Axial play at axial load > 0.15 N	max. 0.06 mm
25 Radial play	preloaded
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	2 N

Other specifications

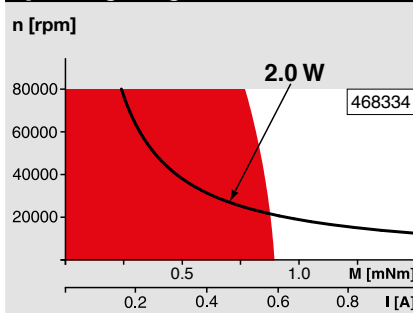
29 Number of pole pairs	1
30 Number of phases	3
31 Weight of motor	6 g

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 _{Hall} 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 41

Operating Range



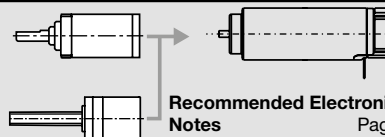
Comments

- 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

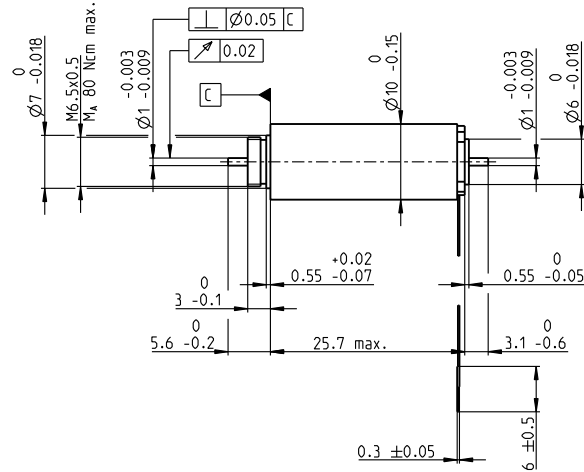
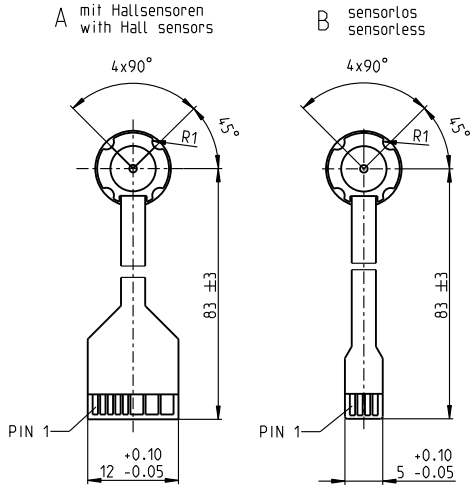
Overview on page 28–36

- 1 **Planetary Gearhead**
 $\varnothing 8$ mm
0.01 – 0.1 Nm
Page 318
- 3 **Screw Drive**
 $\varnothing 8$ mm
Page 367–368



- Recommended Electronics:**
- Notes Page 32
- ESCON Module 24/2 444
- ESCON 36/3 EC 445
- ESCON Mod. 50/4 EC-S 445
- DEC Module 24/2 449

EC 10 Ø10 mm, brushless, 8 Watt

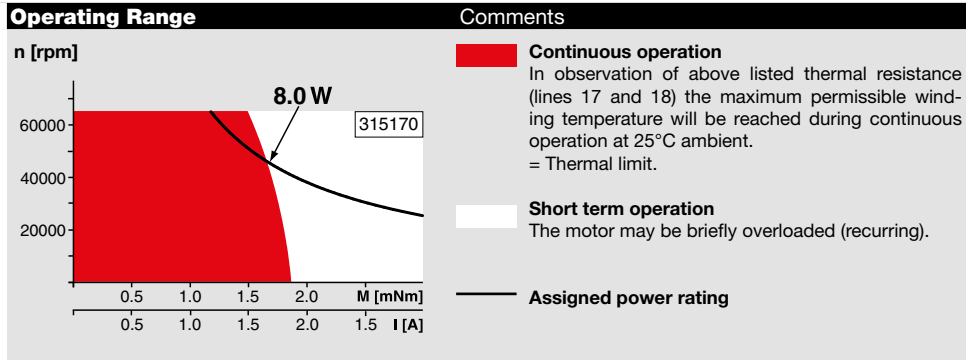


- Stock program
- Standard program
- Special program (on request)

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 ²	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	65000 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	with Hall sensors	sensorless
Pin 1	V _{Hall} 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	Part number	Part number
see p. 471	220300	220310
Connector	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see page 41

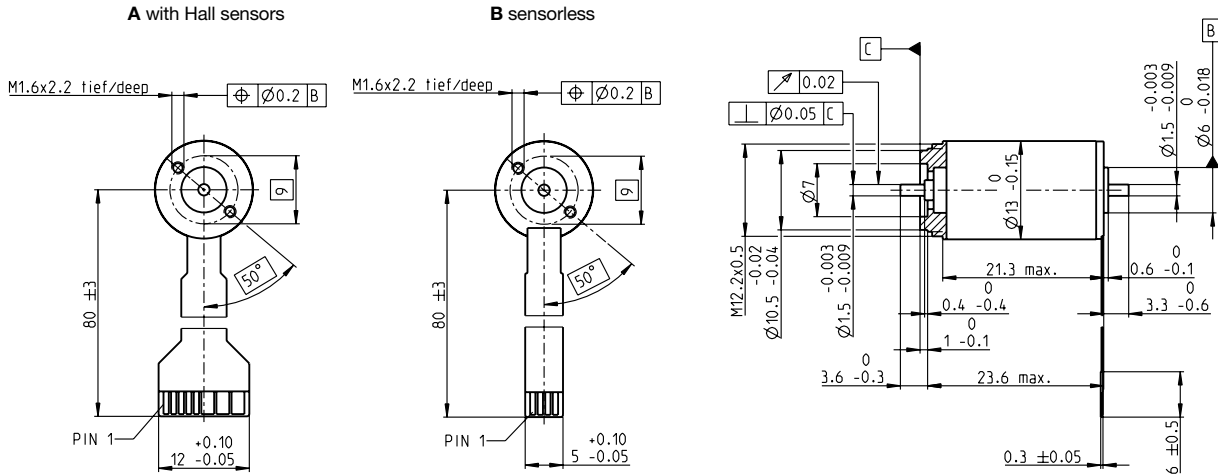
maxon Modular System Overview on page 28-36

Planetary Gearhead
Ø10 mm
0.01 - 0.15 Nm
Page 320

Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449

EC 13 Ø13 mm, brushless, 6 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

		Part Numbers				
A with Hall sensors		416184	430152	430153	430154	430155
B sensorless		426333	430156	430157	430158	430159

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	28800	30600	27500	27900	27700
3 No load current	mA	168	121	78.6	53.5	39.8
4 Nominal speed	rpm	20200	22700	19500	19700	19400
5 Nominal torque (max. continuous torque)	mNm	2.23	2.36	2.32	2.24	2.21
6 Nominal current (max. continuous current)	A	1.31	0.976	0.646	0.425	0.312
7 Stall torque	mNm	7.79	9.53	8.27	8	7.72
8 Stall current	A	4.08	3.52	2.06	1.35	0.973
9 Max. efficiency	%	64	67	65	65	64
Characteristics						
10 Terminal resistance phase to phase	Ω	1.47	2.56	5.82	13.3	24.7
11 Terminal inductance phase to phase	mH	0.021	0.042	0.091	0.198	0.357
12 Torque constant	mNm/A	1.91	2.71	4.01	5.92	7.94
13 Speed constant	rpm/V	5000	3520	2380	1610	1200
14 Speed/torque gradient	rpm/mNm	3850	3330	3460	3630	3740
15 Mechanical time constant	ms	7.83	6.76	7.02	7.38	7.59
16 Rotor inertia	gcm ²	0.194	0.194	0.194	0.194	0.194

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 32 K/W
 - 18 Thermal resistance winding-housing 2.46 K/W
 - 19 Thermal time constant winding 0.72 s
 - 20 Thermal time constant motor 188 s
 - 21 Ambient temperature -40...+100°C
 - 22 Max. winding temperature +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. speed 50000 rpm
 - 24 Axial play at axial load < 1.8 N 0 mm
 - > 1.8 N max. 0.05 mm
 - 25 Radial play preloaded
 - 26 Max. axial load (dynamic) 1.5 N
 - 27 Max. force for press fits (static) 18 N
 - (static, shaft supported) 250 N
 - 28 Max. radial load, 5 mm from flange 4 N

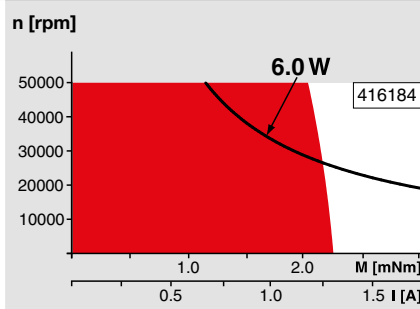
- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of phases 3
 - 31 Weight of motor 19 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V _{Hall} 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	Part number	Part number
see p. 471	220300	220310
Connector	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see page 41

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

Overview on page 28-36

Planetary Gearhead

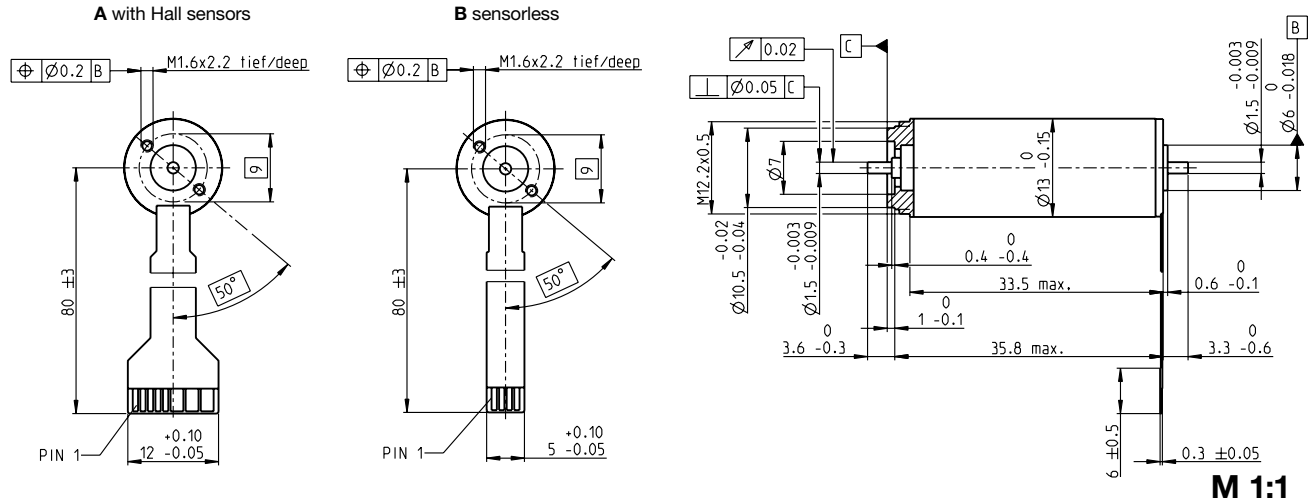
Ø13 mm
0.2 - 0.35 Nm
Page 323



Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449

EC 13 Ø13 mm, brushless, 12 Watt

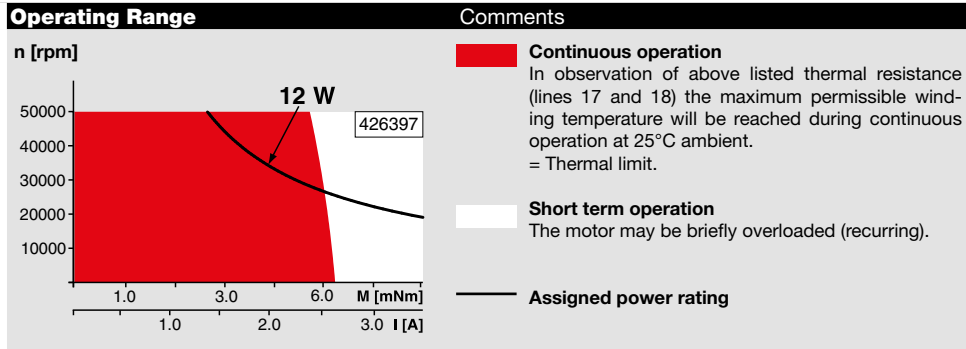


- Stock program
- Standard program
- Special program (on request)

Part Numbers						
A with Hall sensors	426397	430160	430161	430162	430163	430164
B sensorless	426576	430166	430167	430168	430169	430170

Motor Data							
Values at nominal voltage							
1 Nominal voltage	V	6	9	12	18	24	36
2 No load speed	rpm	24100	24200	24100	24900	24100	26600
3 No load current	mA	198	132	98.9	68.9	49.5	38.2
4 Nominal speed	rpm	18200	19100	18800	20000	19000	21700
5 Nominal torque (max. continuous torque)	mNm	5.15	5.64	5.13	5.53	5.18	5.38
6 Nominal current (max. continuous current)	A	2.37	1.72	1.18	0.871	0.598	0.456
7 Stall torque	mNm	21.7	27.4	23.8	28.8	24.8	30.3
8 Stall current	A	9.31	7.85	5.1	4.24	2.67	2.38
9 Max. efficiency	%	74	76	75	77	75	77
Characteristics							
10 Terminal resistance phase to phase	Ω	0.644	1.15	2.35	4.24	9	15.1
11 Terminal inductance phase to phase	mH	0.0103	0.0233	0.0413	0.0879	0.165	0.308
12 Torque constant	mNm/A	2.33	3.49	4.66	6.8	9.32	12.7
13 Speed constant	rpm/V	4100	2730	2050	1410	1020	751
14 Speed/torque gradient	rpm/mNm	1130	896	1030	877	990	893
15 Mechanical time constant	ms	3.86	3.05	3.52	2.99	3.37	3.04
16 Rotor inertia	gcm ²	0.325	0.325	0.325	0.325	0.325	0.325

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	23.9 K/W
18 Thermal resistance winding-housing	1.26 K/W
19 Thermal time constant winding	0.603 s
20 Thermal time constant motor	263 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+155°C
Mechanical data (preloaded ball bearings)	
23 Max. speed	50000 rpm
24 Axial play at axial load < 1.8 N	0 mm
> 1.8 N	max. 0.05 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	1.5 N
27 Max. force for press fits (static)	18 N
(static, shaft supported)	250 N
28 Max. radial load, 5 mm from flange	4 N

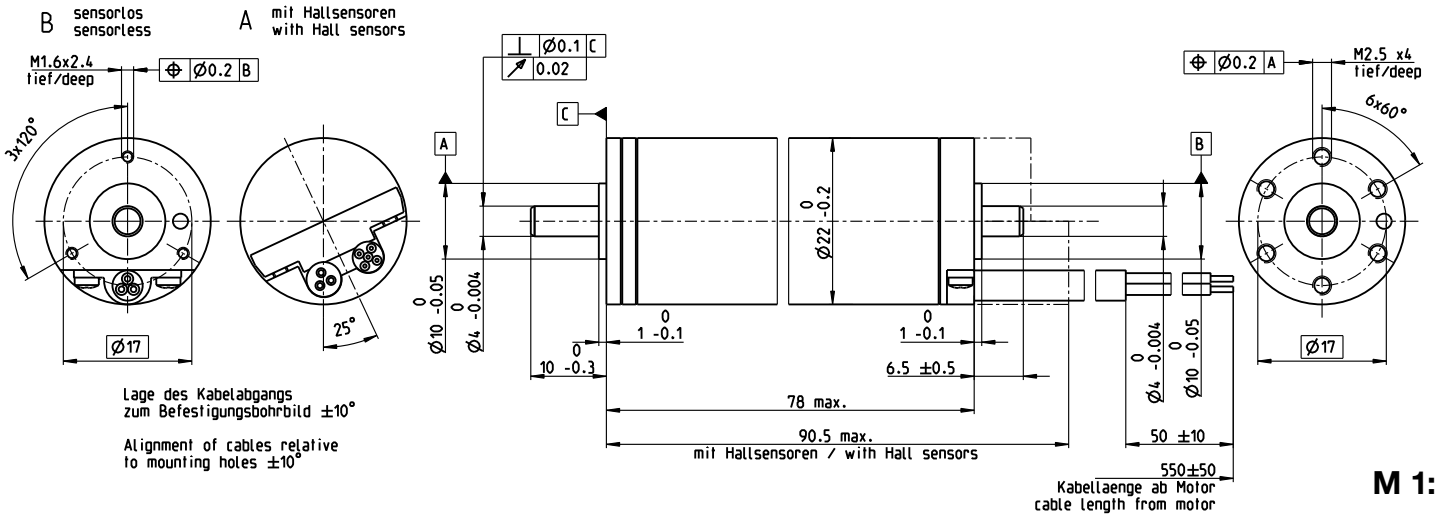


Other specifications		
29 Number of pole pairs		1
30 Number of phases		3
31 Weight of motor		29 g
Connection		
Pin 1	with Hall sensors	sensorless
Pin 2	V _{Hall} 4.5...24 VDC	Motor winding 1
Pin 3	Hall sensor 3	Motor winding 2
Pin 4	Hall sensor 1	Motor winding 3
Pin 5	Hall sensor 2	N.C.
Pin 6	GND	
Pin 7	Motor winding 3	
Pin 8	Motor winding 2	
	Motor winding 1	
Adapter		
see p. 471	Part number	Part number
	220300	220310
Connector		
	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419
Pin for design with Hall sensors: FPC, 11-pol, Pitch 1.0 mm, top contact style Wiring diagram for Hall sensors see page 41		

maxon Modular System		Overview on page 28-36
Planetary Gearhead		
Ø13 mm		
0.2 - 0.35 Nm		
Page 323		
Recommended Electronics:		
Notes	Page 32	
ESCON Module 24/2	444	
ESCON 36/3 EC	445	
ESCON Mod. 50/4 EC-S	445	
ESCON Module 50/5	445	
ESCON 50/5	447	
DEC Module 24/2	449	
DEC Module 50/5	449	

EC 22 Ø22 mm, brushless, 80 Watt

Heavy Duty – for applications in air



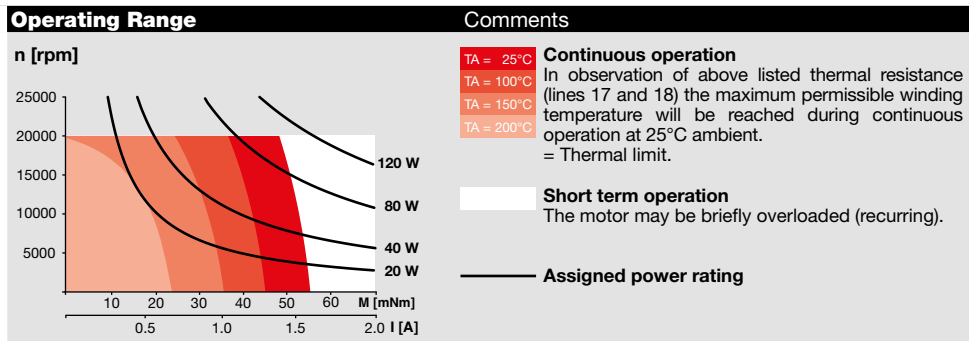
- Stock program
- Standard program
- Special program (on request)

Part Numbers	
A with Hall sensors	426448
B sensorless	426449

Motor Data (provisional)	25	100	150	200	
Values at nominal voltage and ambient temperature °C					
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 ¹⁾	rpm	11400	11700	12200	13200
5 Nominal torque (max. continuous torque) ¹⁾	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
Characteristics					
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 ²	7.63	7.63	7.63	7.63

¹⁾ Values for operation in thermal equilibrium.

Specifications	
Thermal data	
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
Mechanical data (preloaded ball bearings)	
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
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_{Hall} 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

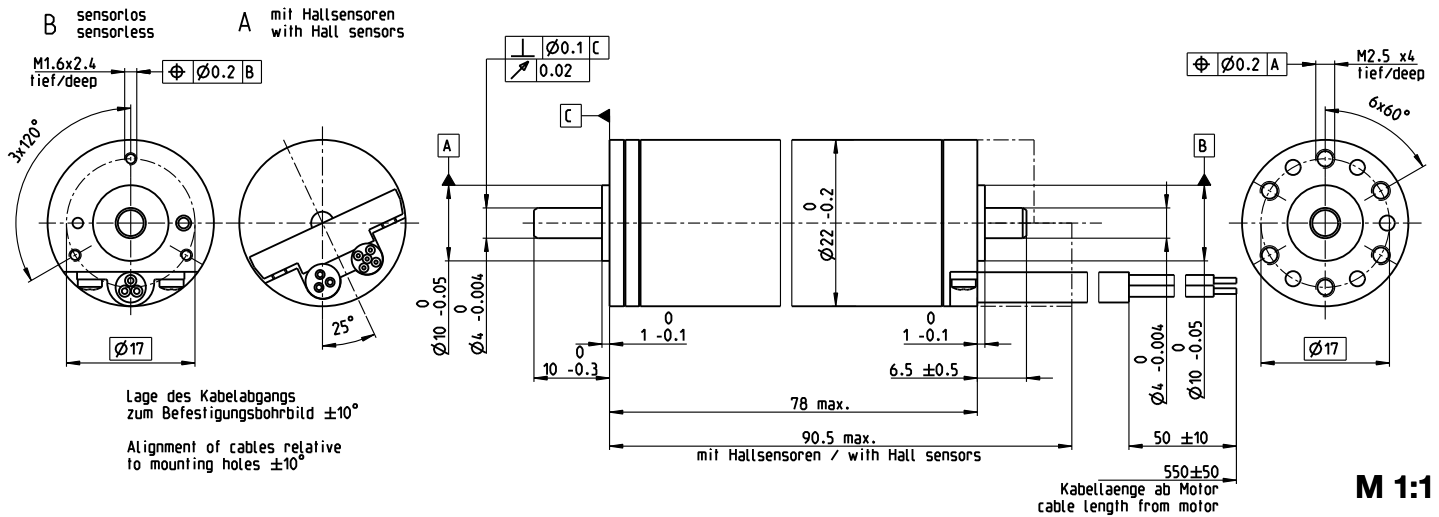
Wiring diagram for Hall sensors see p. 41

Application	Notice
<p>General</p> <ul style="list-style-type: none"> - 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 <p>Aerospace</p> <ul style="list-style-type: none"> - gas turbine starter/generators for aircraft engines - regulation of combustion engines <p>Oil & Gas Industry</p> <ul style="list-style-type: none"> - oil, gas and geothermal wells <p>Robotics</p> <ul style="list-style-type: none"> - robotic exploration vehicles <p>Industry</p> <ul style="list-style-type: none"> - pumps and valves for liquid metal cooling systems/turbine fuel and steam control - valve adjustment for gas and steam power plants 	<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>

EC 22 Ø22 mm, brushless, 240 Watt

Heavy Duty – for applications in oil

maxon EC motor



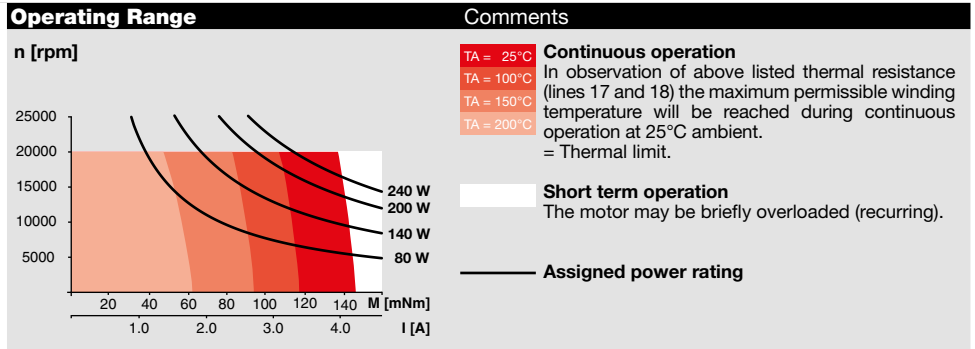
- Stock program
- Standard program
- Special program (on request)

Part Numbers	
A with Hall Sensors	426450
B sensorless	426451

Motor Data (provisional)	25	100	150	200	
Values at nominal voltage and ambient temperature °C					
1 Nominal voltage	V	48	48	48	48
2 No load speed	rpm	12900	13400	13600	13800
3 No load current	mA	384	177	183	188
4 Nominal speed ¹⁾	rpm	8410	8510	9130	10600
5 Nominal torque (max. continuous torque) ¹⁾	mNm	149	120	92.2	55.8
6 Nominal current (max. continuous current)	A	4.48	3.61	2.88	1.86
7 Stall torque	mNm	460	346	295	256
8 Stall current	A	13.4	10.3	8.98	7.93
9 Max. efficiency	%	71	77	75	73
Characteristics					
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 ²	7.63	7.63	7.63	7.63

¹⁾ Values in thermal steady state.

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	0.793 K/W
18 Thermal resistance winding-housing	0.754 K/W
19 Thermal time constant winding	4.78 s
20 Thermal time constant motor	40.2 s
21 Ambient temperature	-55...+200°C
22 Max. winding temperature	+240°C
Mechanical data (preloaded ball bearings)	
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
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

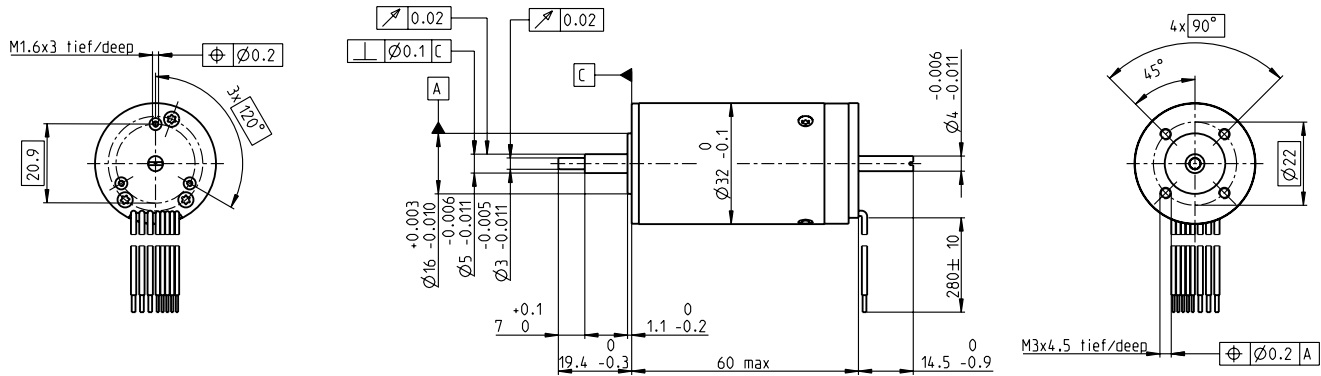
Connection A, motor cable PTFE (AWG 19)
 red Motor winding 1
 black Motor winding 2
 white Motor winding 3
Connection A, sensors cable PTFE (AWG 24)
 green V_{Hall} 4.5...24 V
 blue GND
 red Hall sensor 1
 black Hall sensor 2
 white Hall sensor 3
Connection B, motor cable PTFE (AWG 19)
 red Motor winding 1
 black Motor winding 2
 white Motor winding 3
 Wiring diagram for Hall sensors see p. 41

Application	Notice
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	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 Overview on page 28–36

Planetary Gearhead
 Ø22 mm
 2.0 - 4.0 Nm
 Page 338

EC 32 Ø32 mm, brushless, 80 Watt



M 1:2

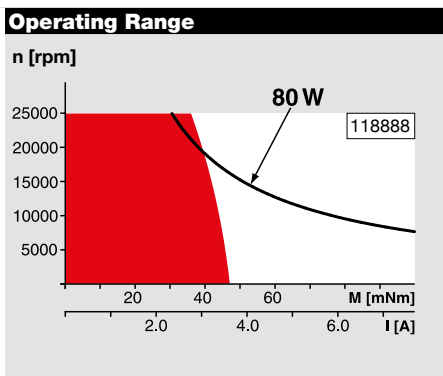
- Stock program
- Standard program
- Special program (on request)

Part Numbers

118891	118892	118888	118889	118893	118890
--------	--------	--------	--------	--------	--------

Motor Data		118891	118892	118888	118889	118893	118890
Values at nominal voltage							
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
Characteristics							
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 ²	20	20	20	20	20	20

Specifications	
Thermal data	
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
Mechanical data (preloaded ball bearings)	
23 Max. speed ¹⁾	25000 rpm
24 Axial play at axial load < 8 N	0 mm
> 8 N	max. 0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	5.6 N
27 Max. force for press fits (static) (static, shaft supported)	98 N
(static, shaft supported)	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 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

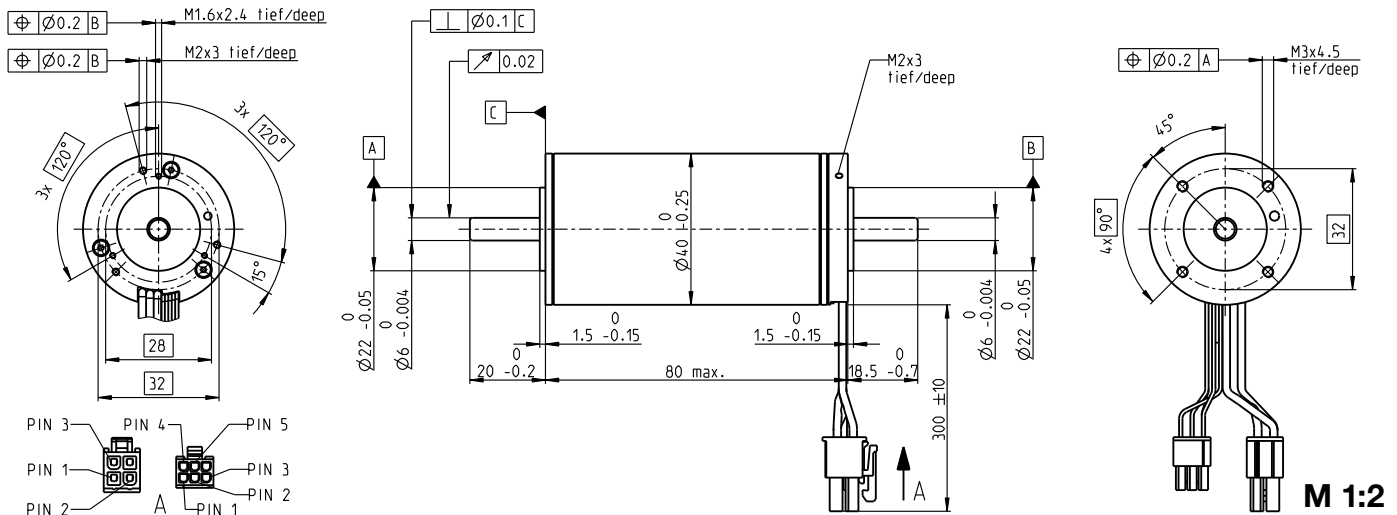
Connection sensors (Cable AWG 26) ¹⁾	
green	V _{Hall} 4.5...24 VDC
blue	GND
red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3

Wiring diagram for Hall sensors see p. 41

¹⁾ Not lead through in combination with resolver.

maxon Modular System		Overview on page 28–36
Planetary Gearhead Ø32 mm 0.75 - 4.5 Nm Page 342		Encoder HED_5540 500 CPT, 3 channels Page 430/432 Resolver Res 26 Ø26 mm 10 V Page 439
Planetary Gearhead Ø32 mm 0.75 - 6.0 Nm Page 344–349		Recommended Electronics: Notes
Screw Drive Ø32 mm Page 374–378		
		Page 32 ESCON 36/3 EC 445 ESCON Mod. 50/5 445 ESCON Mod. 50/4 EC-S 445 ESCON Mod. 50/8 (HE) 446 ESCON 50/5 447 ESCON 70/10 447 DEC Module 50/5 449 EPOS4 50/5 453 EPOS4 Mod./Comp. 50/5 453 EPOS4 Module 50/8 454 EPOS4 Comp. 50/8 CAN 454 EPOS4 70/15 456 EPOS2 P 24/5 464 MAXPOS 50/5 468

EC 40 Ø40 mm, brushless, 170 Watt

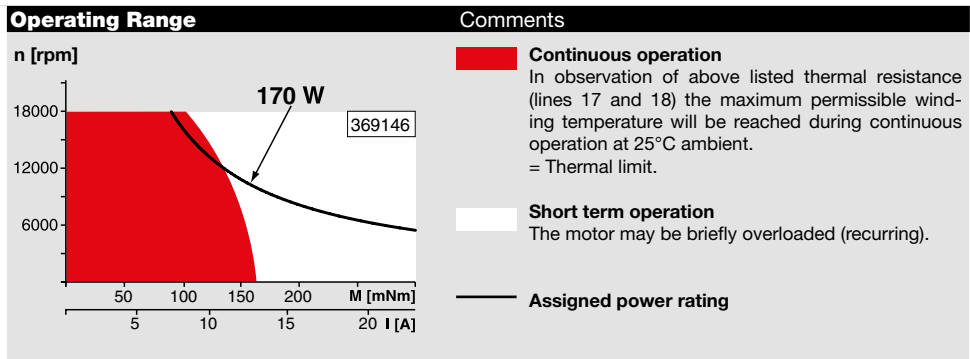


- Stock program
- Standard program
- Special program (on request)

Part Numbers				
369146	393023	393024	393025	

Motor Data (provisional)					
Values at nominal voltage					
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
Characteristics					
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 ²	53.8	53.8	53.8	53.8

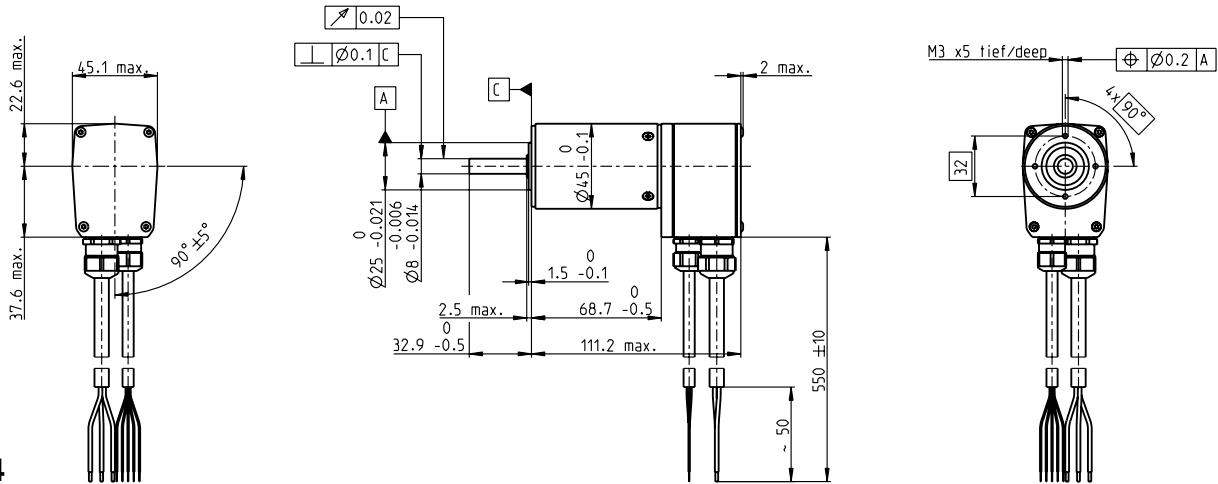
Specifications		
Thermal data		
17 Thermal resistance housing-ambient	5.21 K/W	
18 Thermal resistance winding-housing	1.05 K/W	
19 Thermal time constant winding	18.7 s	
20 Thermal time constant motor	1910 s	
21 Ambient temperature	-40...+100°C	
22 Max. winding temperature	+155°C	
Mechanical data (preloaded ball bearings)		
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) (static, shaft supported)	106 N	
28 Max. radial load, 5 mm from flange	5500 N	
	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		
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 _{Hall} 3...24 VDC	Pin 5
	N.C.	Pin 6
Connector		
Molex	430-25-0600	
Wiring diagram for Hall sensors see p. 41		

maxon Modular System		Overview on page 28–36
Planetary Gearhead Ø42 mm 3 - 15 Nm Page 354		Encoder HED_5540 500 CPT, 3 channels Page 430/432
Planetary Gearhead Ø52 mm 4 - 30 Nm Page 359		Resolver Res 26 Ø26 mm 10 V Page 439
Recommended Electronics:		Brake AB 32 24 VDC 0.4 Nm Page 482
Notes		Page 32
ESCON Mod. 50/5	445	
ESCON Mod. 50/4 EC-S	445	
ESCON Mod. 50/8 (HE)	446	
ESCON 50/5	447	
ESCON 70/10	447	
DEC Module 50/5	449	
EPOS4 50/5	453	
EPOS4 Mod./Comp. 50/5	453	
EPOS4 Mod./Comp. 50/8	454	
EPOS4 Mod./Comp. 50/15	455	
EPOS4 70/15	456	
EPOS2 P 24/5	464	
MAXPOS 50/5	468	

EC 45 Ø45 mm, brushless, 150 Watt



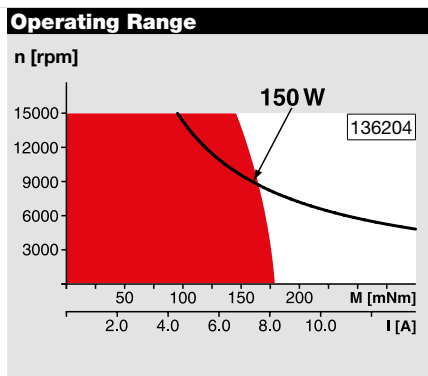
M 1:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers

Motor Data		136202	136196	136203	136197	136204	136198	136205	136200	136206	136201
Values at nominal voltage											
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
Characteristics											
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 ²	119	119	119	119	119	119	119	119	119	119

Specifications	
Thermal data	
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
Mechanical data (preloaded ball bearings)	
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
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 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)¹⁾
 white Hall sensor 3
 brown Hall sensor 2
 green Hall sensor 1
 yellow GND
 grey V_{Hall} 4.5 ... 24 VDC
 Wiring diagram for Hall sensors see p. 41

¹⁾ Not lead through in combination with resolver.

maxon Modular System

Planetary Gearhead
 Ø42 mm
 3 - 15 Nm
 Page 354

Planetary Gearhead
 Ø52 mm
 4 - 30 Nm
 Page 360

Recommended Electronics:
Notes Page 32

ESCON 36/3 EC	445
ESCON Mod. 50/5	445
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 Mod./Comp. 50/15	455
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

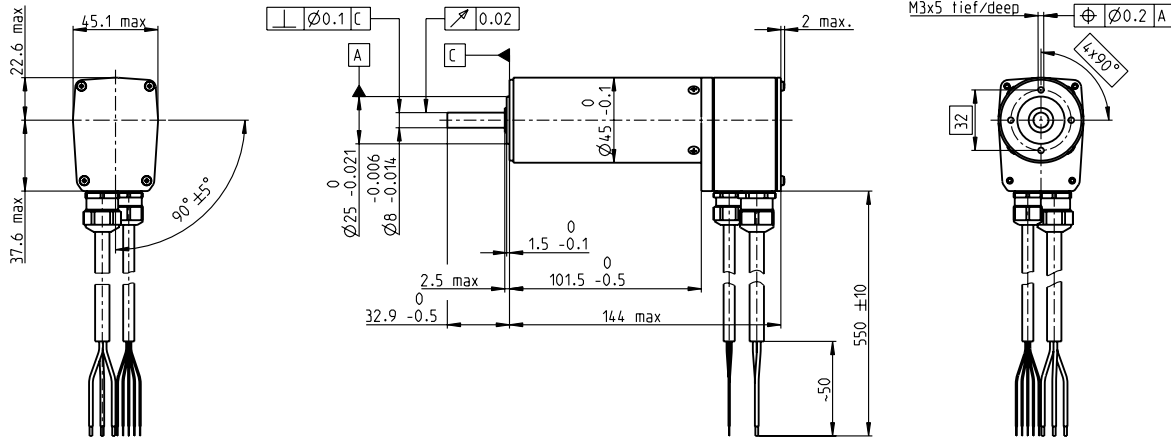
Encoder HEDL 9140
 500 CPT,
 3 channels
 Page 436

Resolver Res 26
 Ø26 mm
 10 V
 Page 439

Brake AB 28
 24 VDC
 0.4 Nm
 Page 481

*Protection level only when installed with flange-side seal.

EC 45 Ø45 mm, brushless, 250 Watt



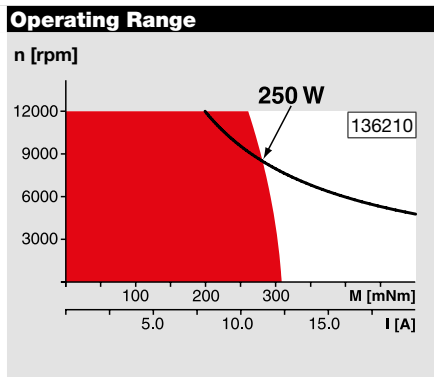
M 1:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers						
136210	136207	136211	136208	136212	136209	

Motor Data		136210	136207	136211	136208	136212	136209
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 ²	209	209	209	209	209	209

Specifications	
Thermal data	
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
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	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)¹⁾
 white Hall sensor 3
 brown Hall sensor 2
 green Hall sensor 1
 yellow GND
 grey V_{Hall} 4.5...24 VDC
 Wiring diagram for Hall sensors see p. 41

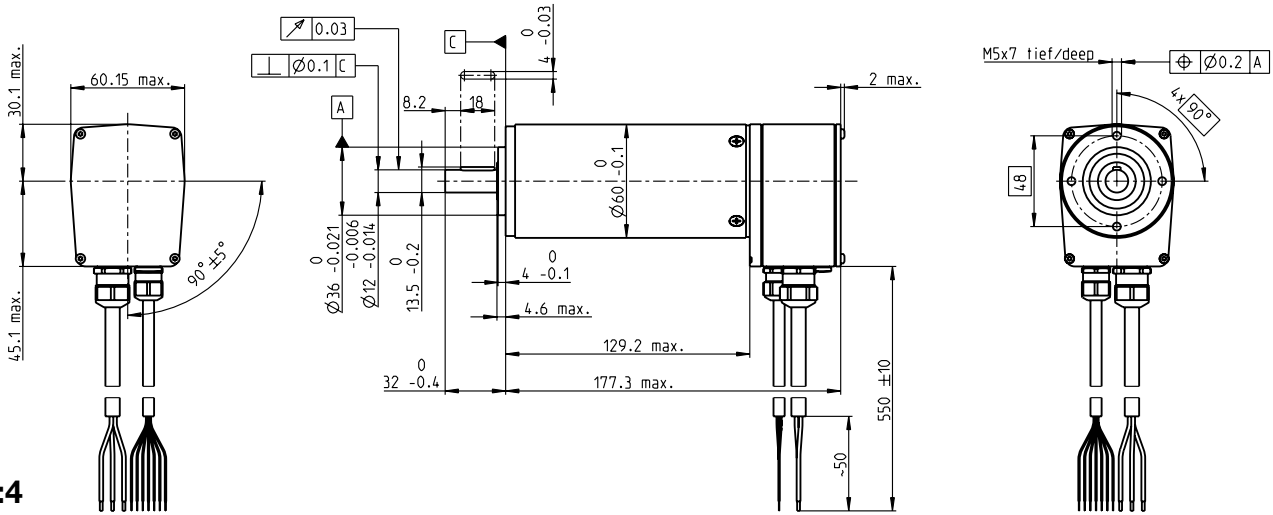
¹⁾ Not lead through in combination with resolver.

maxon Modular System Overview on page 28–36

<p>Planetary Gearhead Ø42 mm 3 - 15 Nm Page 354</p> <p>Planetary Gearhead Ø52 mm 4 - 30 Nm Page 360</p> <p>Planetary Gearhead Ø62 mm 8 - 50 Nm Page 361</p>		<p>Recommended Electronics: Notes Page 32</p> <p>ESCON Mod. 50/5 445</p> <p>ESCON Mod. 50/4 EC-S 445</p> <p>ESCON Mod. 50/8 (HE) 446</p> <p>ESCON 50/5 447</p> <p>ESCON 70/10 447</p> <p>DEC Module 50/5 449</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>EPOS4 Mod./Comp. 50/8 454</p> <p>EPOS4 Mod./Comp. 50/15 455</p> <p>EPOS4 70/15 456</p> <p>MAXPOS 50/5 468</p>	<p>Encoder HEDL 9140 500 CPT, 3 channels Page 436</p> <p>Resolver Res 26 Ø26 mm 10 V Page 439</p> <p>Brake AB 28 24 VDC 0.4 Nm Page 481</p>
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*Protection level only when installed with flange-side seal.

EC 60 Ø60 mm, brushless, 400 Watt



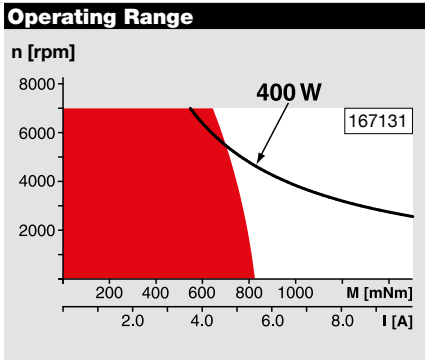
M 1:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
167132	167131

Motor Data			
Values at nominal voltage			
1	Nominal voltage	V	48
2	No load speed	rpm	5370
3	No load current	mA	670
4	Nominal speed	rpm	4960
5	Nominal torque (max. continuous torque)	mNm	768
6	Nominal current (max. continuous current)	A	9.56
7	Stall torque	mNm	11800
8	Stall current	A	139
9	Max. efficiency	%	87
Characteristics			
10	Terminal resistance phase to phase	Ω	0.345
11	Terminal inductance phase to phase	mH	0.273
12	Torque constant	mNm/A	84.9
13	Speed constant	rpm/V	113
14	Speed/torque gradient	rpm/mNm	0.457
15	Mechanical time constant	ms	3.98
16	Rotor inertia	gcm ²	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)	392 N
	(static, shaft supported)	6000 N
28	Max. radial load, 5 mm from flange	240 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
30	Number of phases
31	Weight of motor
	Protection to
	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) ¹⁾	
white	Hall sensor 3
brown	Hall sensor 2
green	Hall sensor 1
yellow	GND
grey	V _{Hall} 4.5 ... 24 VDC
blue	Temperature sensor (PTC)
pink	Temperature sensor (PTC)

¹⁾ 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. 41

maxon Modular System Overview on page 28–36

1	Planetary Gearhead	Encoder HEDL 9140
3	Ø81 mm	500 CPT,
	20 - 120 Nm	3 channels
	Page 362	Page 436

Recommended Electronics:

Notes	Page 32
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/8 (HE)	446
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 Module 50/8	454
EPOS4 Comp. 50/8 CAN	454
EPOS4 Module 50/15	455
EPOS4 Comp. 50/15 CAN	455
EPOS4 70/15	456
MAXPOS 50/5	468

Resolver Res
Ø26 mm
10 V
Page 439

Brake AB 41
24 VDC
2.0 Nm
Page 483

*Protection level only when installed with flange-side seal.



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

Motor control
Compact Drive

Accessories
Ceramic

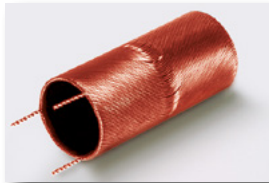
Contact information

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.

Standard Specification No. 101	60
Explanation of the EC motors	164
ECX SPEED Program	166-200
EC Program	202-216
EC-max Program	219-227
EC-4pole Program	231-237
EC-i Program	241-251
EC flat Program	254-272
EC frameless Program	274-279

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.



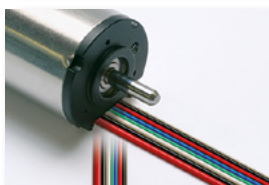
The motor housing, a simple tube made of stainless steel – non magnetic, rigid, rust-proof.



Metallic housing and flange allow good heat dissipation and mechanical stability.



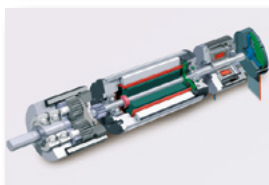
Shaft with no groove guarantees torsional stability and smooth running.



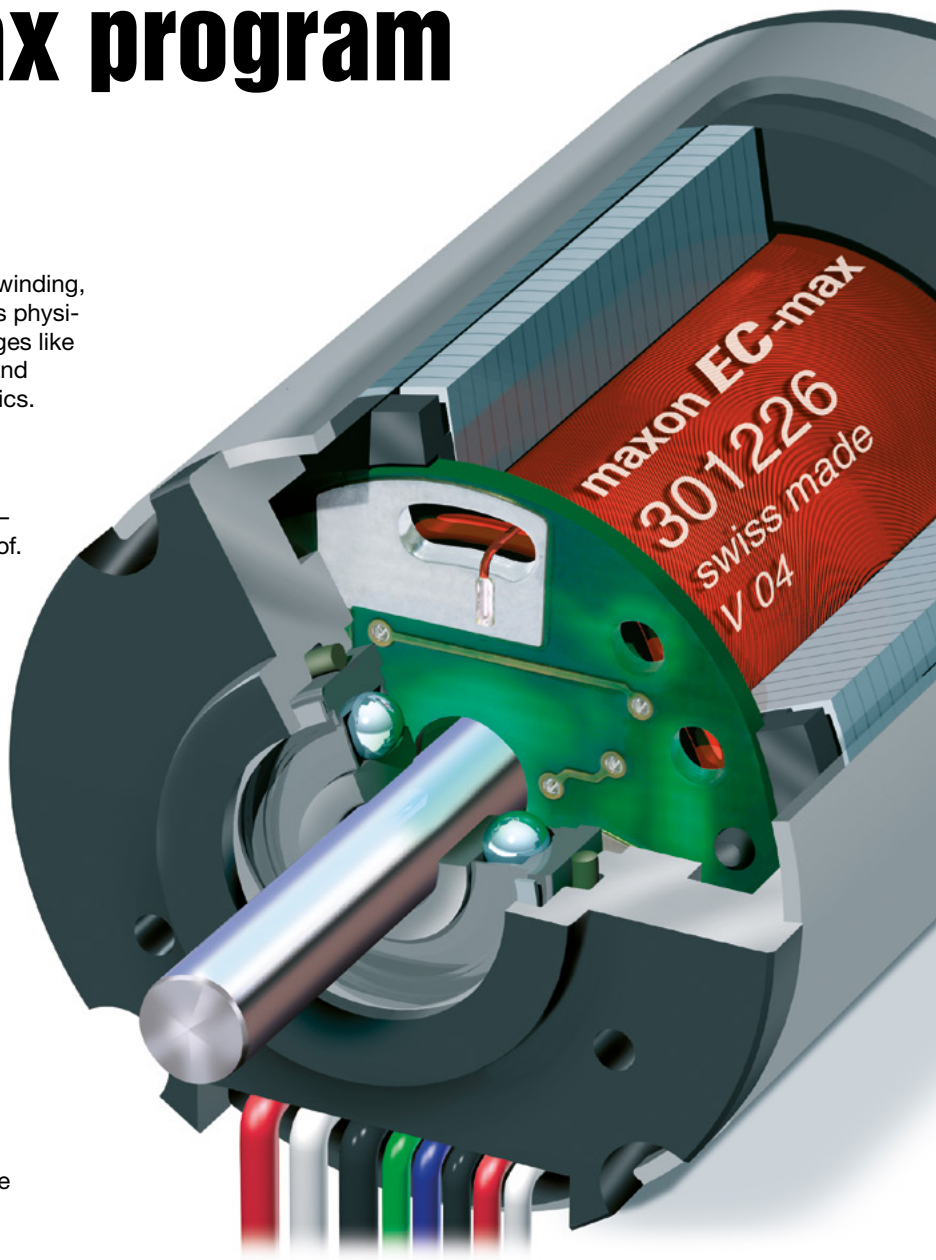
Non-tension cables can be directed both radially and axially from the motor. Wide range of plug options.



High quality, thanks to a process monitored production on the most modern assembly lines which are, in part, developed by maxon.

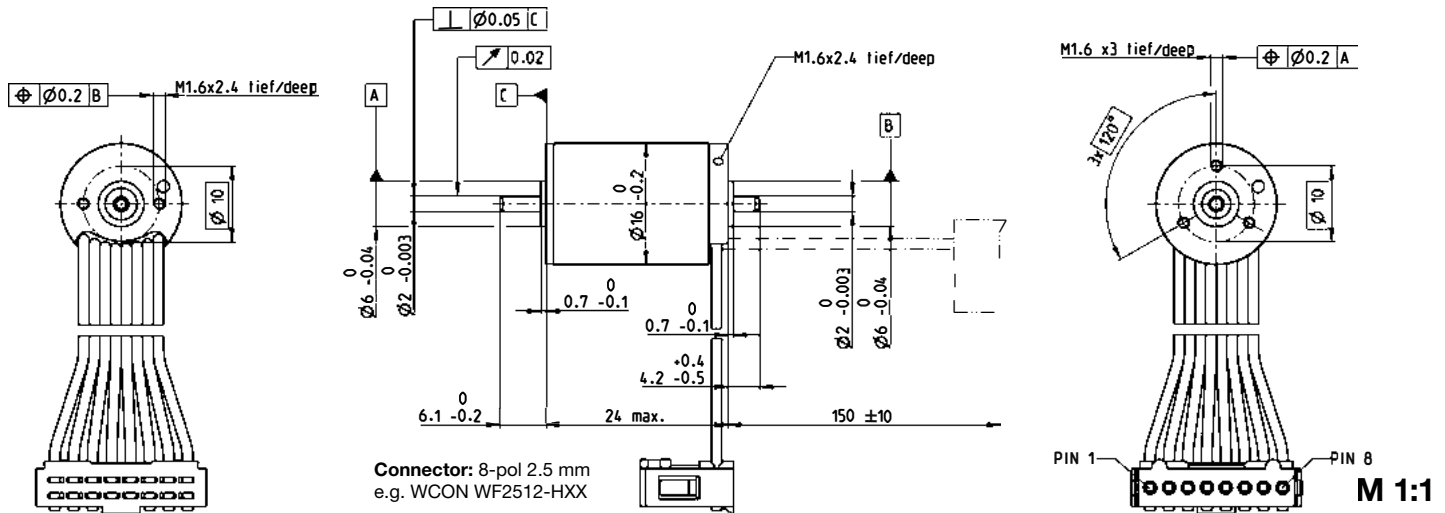


Modular construction with gears, sensors and brakes.



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 ²	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

Other specifications

- 29 Number of pole pairs: 1
- 30 Number of phases: 3
- 31 Weight of motor: 36 g

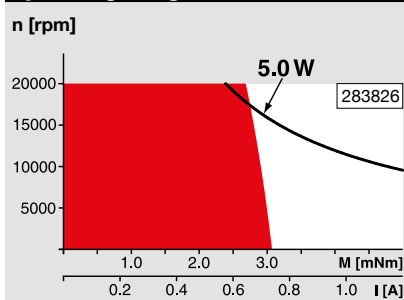
Values listed in the table are nominal.

Connection (Cable AWG 24)

brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V _{hall} 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. 41

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

Overview on page 28–36

Planetary Gearhead

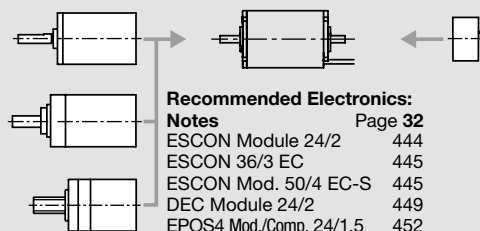
Ø16 mm
0.1 - 0.3 Nm
Page 328

Planetary Gearhead

Ø16 mm
0.2 - 0.6 Nm
Page 329

Screw Drive

Ø16 mm
Page 369–371

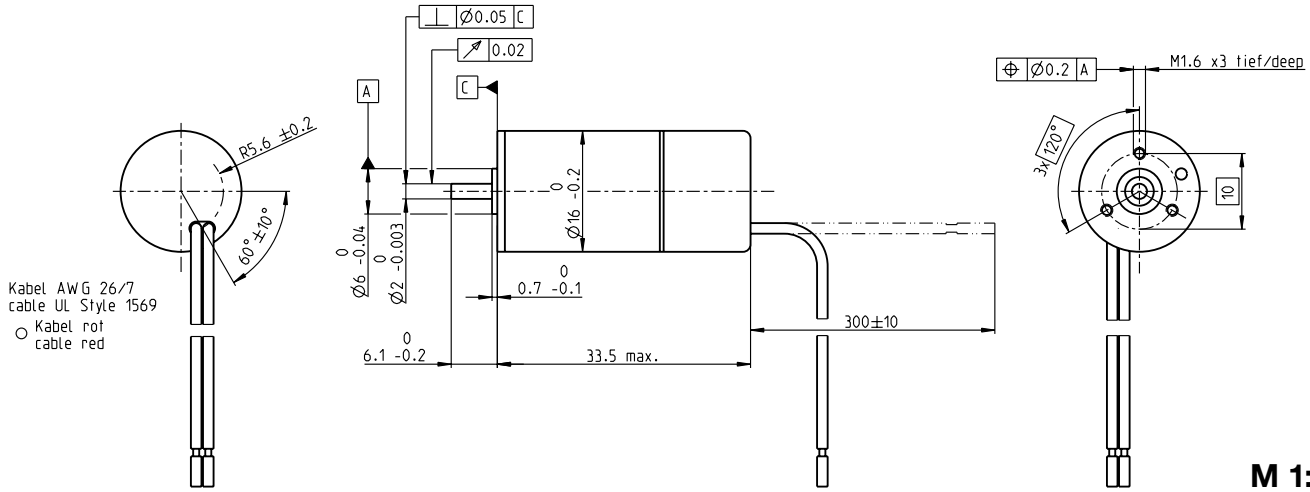


Encoder MR
128/256/512 CPT,
2/3 channels
Page 418

Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

EC-max 16 2-wire $\varnothing 16$ mm, brushless, 5 Watt



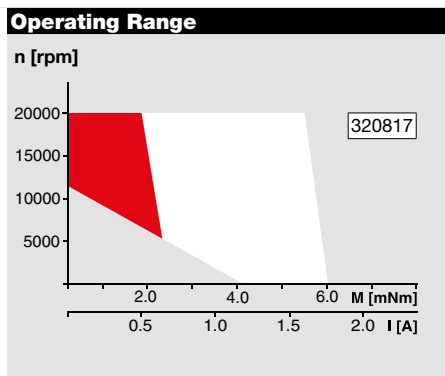
- Stock program
- Standard program
- Special program (on request)

Part Numbers

Motor Data	320816	320817	320818	320819
------------	--------	--------	--------	--------

Values at nominal voltage					
1 Nominal voltage	V	5	6	9	12
2 No load speed	rpm	14400	13700	12800	13800
3 No load current	mA	156	124	82.9	72.7
4 Nominal speed	rpm	8250	7490	6960	8080
5 Nominal torque (max. continuous torque)	mNm	2.25	2.25	2.33	2.26
6 Nominal current (max. continuous current)	A	0.907	0.716	0.467	0.37
7 Stall torque	mNm	4.61	5.25	5.39	5.76
8 Stall current	A	1.7	1.44	0.929	0.801
9 Max. efficiency	%	50	49	49	49
Characteristics					
35 Type of control		controlled	controlled	controlled	controlled
36 Supply voltage +V _{CC}	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 ²	0.428	0.428	0.428	0.428
39 Speed range	rpm	14400-44700	11300-35200	6840-21800	5360-17400

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...+85°C
22 Max. temperature of electronics (max. loading capacity of the motor is defined by the electronics)	+100°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)	18 N
28 Max. radial load, 5 mm from flange	6 N



Comments

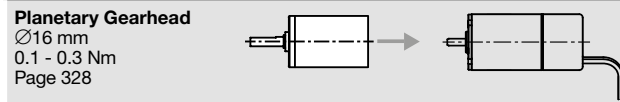
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.

Short term operation
The motor may be briefly overloaded (recurring).

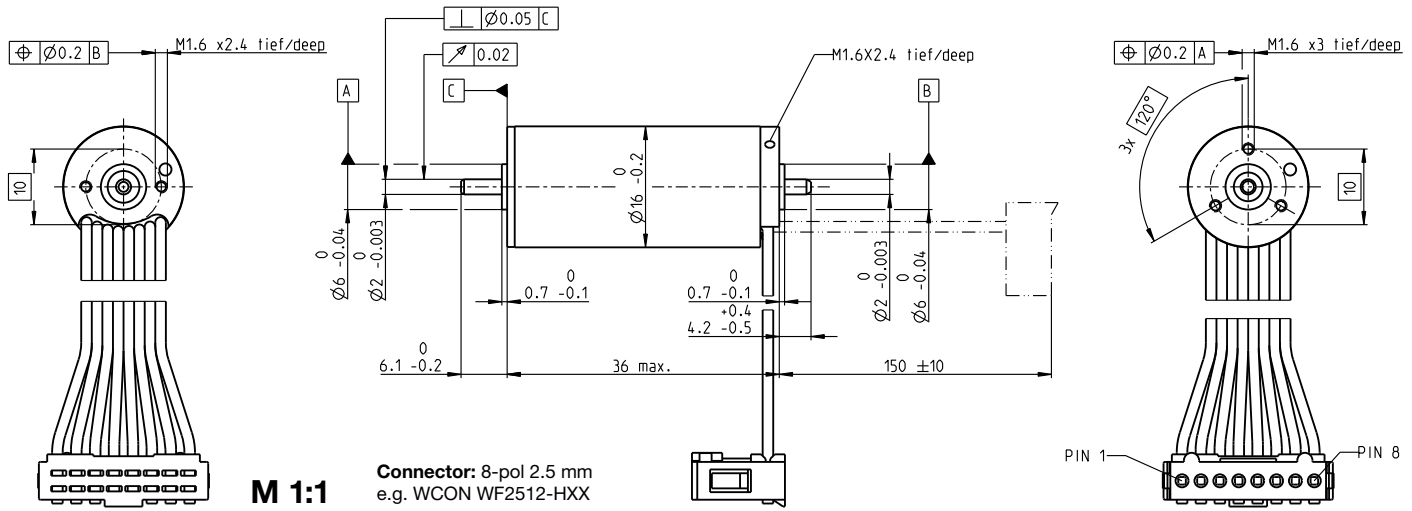
Assigned power rating

Other specifications	
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 _{CC}
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 _{CC} > 18 VDC will destroy the electronics	
Option: Direction of rotation counter-clockwise (CCW)	

maxon Modular System Overview on page 28-36



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 ²	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: 1 N
 - 26 Max. axial load (dynamic): 18 N
 - 27 Max. force for press fits (static) (static, shaft supported): 400 N
 - 28 Max. radial load, 5 mm from flange: 6 N

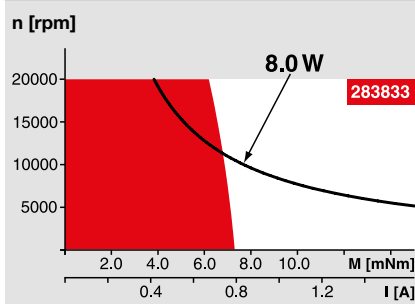
Other specifications

- 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 _{Hall} 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. 41

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

Overview on page 28–36

Planetary Gearhead

Ø16 mm
0.2 - 0.6 Nm
Page 329

Planetary Gearhead

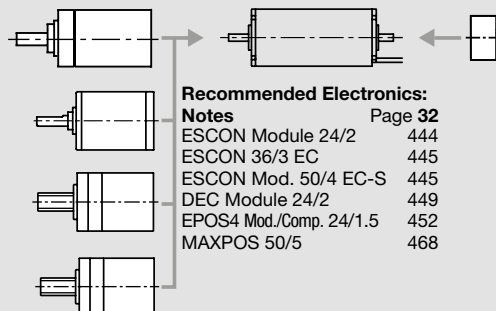
Ø22 mm
0.5 - 2.0 Nm
Page 336

Screw Drive

Ø16 mm
Page 369–371

Screw Drive

Ø22 mm
Page 372/373



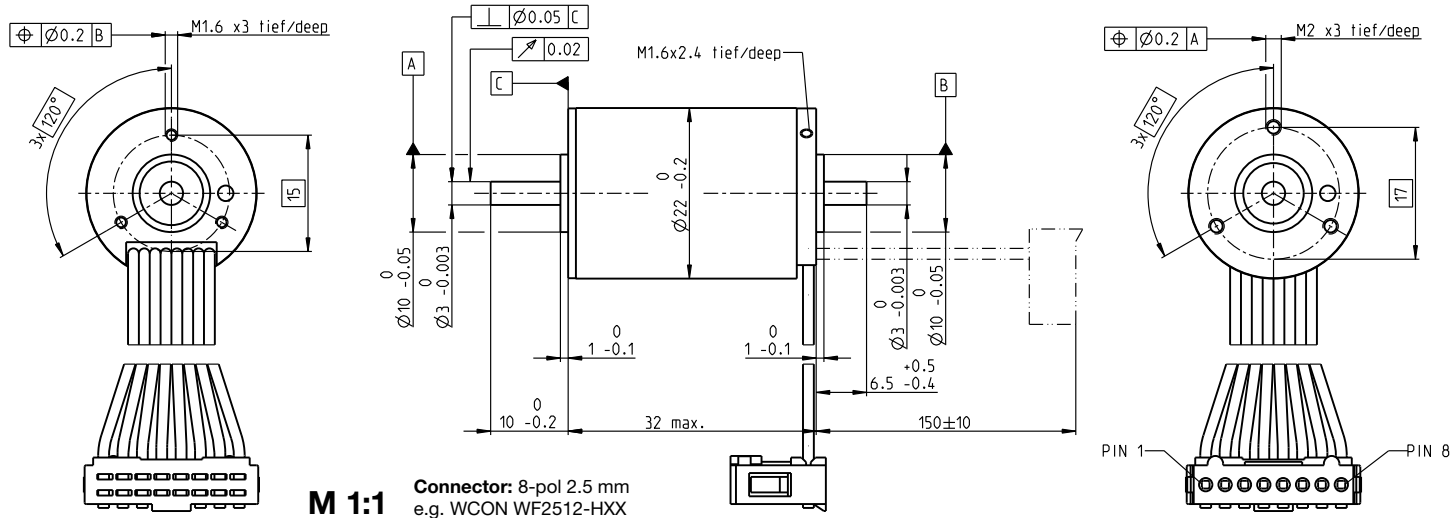
Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

Encoder MR

128/256/512 CPT,
2/3 channels
Page 418

EC-max 22 Ø22 mm, brushless, 12 Watt

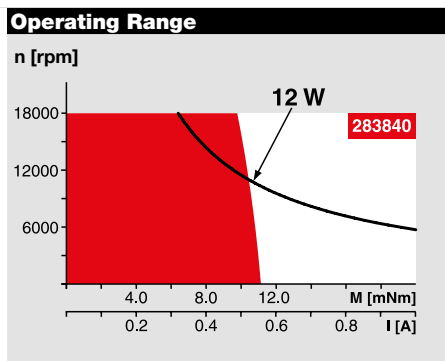


- Stock program
- Standard program
- Special program (on request)

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	11400	12100	12100	12100	12100
3 No load current	mA	282	155	103	77.3	51.6
4 Nominal speed	rpm	7230	8040	8250	8250	8210
5 Nominal torque (max. continuous torque)	mNm	10.5	10.2	10.9	10.8	10.6
6 Nominal current (max. continuous current)	A	2.41	1.25	0.88	0.657	0.432
7 Stall torque	mNm	30	31.3	35.4	35.1	34.1
8 Stall current	A	6.23	3.47	2.6	1.94	1.25
9 Max. efficiency	%	63	63	65	65	65
Characteristics						
10 Terminal resistance phase to phase	Ω	0.963	3.46	6.93	12.4	28.7
11 Terminal inductance phase to phase	mH	0.0343	0.121	0.275	0.488	1.09
12 Torque constant	mNm/A	4.81	9.02	13.6	18.1	27.2
13 Speed constant	rpm/V	1990	1060	701	526	352
14 Speed/torque gradient	rpm/mNm	397	406	356	360	371
15 Mechanical time constant	ms	9.36	9.56	8.39	8.47	8.75
16 Rotor inertia	gcm ²	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	1.69 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	
26 Max. axial load (dynamic)	3.5 N	
27 Max. force for press fits (static)	53 N	
	(static, shaft supported)	1400 N
28 Max. radial load, 5 mm from flange	16 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	83 g	

Values listed in the table are nominal.

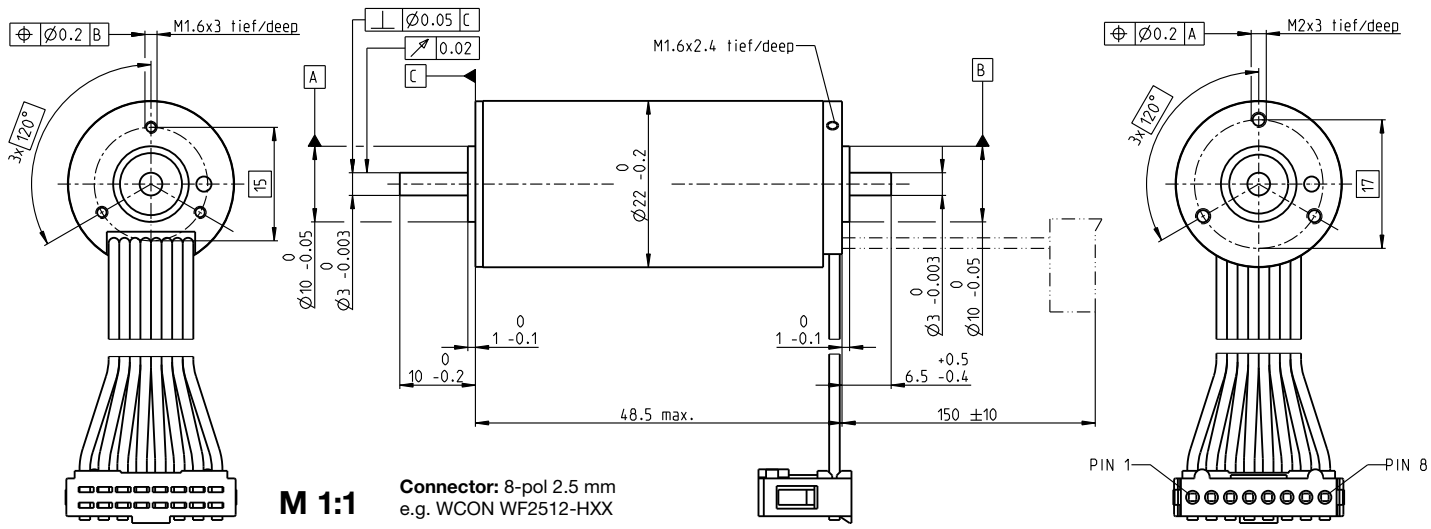
Connection (Cable AWG 24)		
brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V _{Hall} 3...24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 41

maxon Modular System		Overview on page 28–36
<p>Planetary Gearhead Ø22 mm 0.5 - 3.4 Nm Page 336/337</p> <p>Koaxdrive Ø32 mm 1.0 - 4.5 Nm Page 352</p> <p>Screw Drive Ø22 mm Page 372/373</p>		<p>Encoder MR 128/256/512 CPT, 2/3 channels Page 418</p> <p>Brake AB 20 24 VDC 0.1 Nm Page 478</p> <p>Recommended Electronics: Notes Page 32</p> <ul style="list-style-type: none"> ESCON Module 24/2 444 ESCON 36/3 EC 445 ESCON Mod. 50/4 EC-S 445 ESCON Module 50/5 445 ESCON 50/5 447 DEC Module 24/2, 50/5 449 EPOS4 Mod./Comp. 24/1.5 452 EPOS4 50/5 453 EPOS4 Mod./Comp. 50/5 453 EPOS2 P 24/5 464 MAXPOS 50/5 468

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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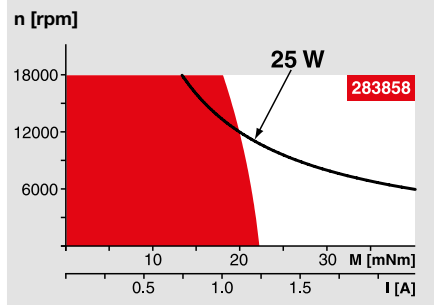
Motor Data

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
Characteristics						
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 ²	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.

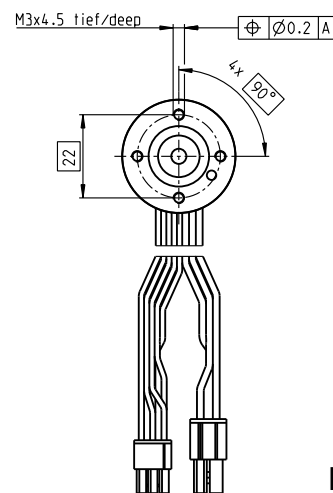
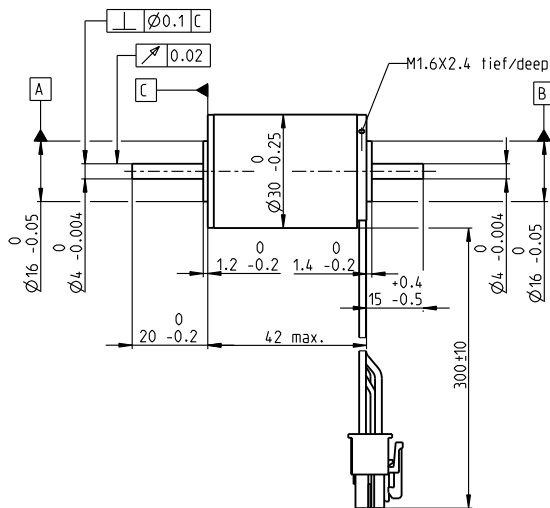
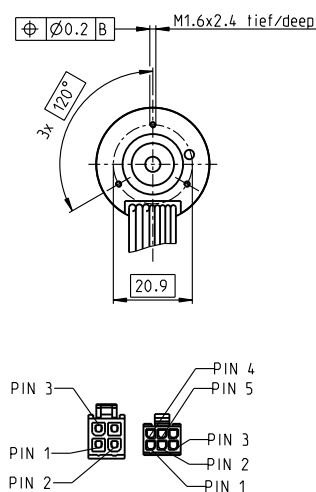
- Connection (Cable AWG 24)**
- | | | |
|--------|------------------------------|-------|
| brown | Motor winding 1 | Pin 1 |
| red | Motor winding 2 | Pin 2 |
| orange | Motor winding 3 | Pin 3 |
| yellow | V _{Hall} 3...24 VDC | Pin 4 |
| green | GND | Pin 5 |
| blue | Hall sensor 1 | Pin 6 |
| violet | Hall sensor 2 | Pin 7 |
| grey | Hall sensor 3 | Pin 8 |
- Wiring diagram for Hall sensors see p. 21

maxon Modular System

Overview on page 28–36

<p>Planetary Gearhead Ø22 mm 0.5 - 3.4 Nm Page 334/337</p> <p>Planetary Gearhead Ø32 mm 1.0 - 6.0 Nm Page 347</p> <p>Koaxdrive Ø32 mm 1.0 - 4.5 Nm Page 352</p> <p>Screw Drive Ø32 mm Page 374–378</p>	<p>Recommended Electronics:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td>ESCON Module 24/2</td> <td style="text-align: right;">444</td> </tr> <tr> <td>ESCON 36/3 EC</td> <td style="text-align: right;">445</td> </tr> <tr> <td>ESCON Mod. 50/4 EC-S</td> <td style="text-align: right;">445</td> </tr> <tr> <td>ESCON Module 50/5</td> <td style="text-align: right;">445</td> </tr> <tr> <td>ESCON 50/5</td> <td style="text-align: right;">447</td> </tr> <tr> <td>DEC Module 24/2, 50/5</td> <td style="text-align: right;">449</td> </tr> <tr> <td>EPOS4 Mod./Comp. 24/1.5</td> <td style="text-align: right;">452</td> </tr> <tr> <td>EPOS4 50/5</td> <td style="text-align: right;">453</td> </tr> <tr> <td>EPOS4 Mod./Comp. 50/5</td> <td style="text-align: right;">453</td> </tr> <tr> <td>EPOS2 P 24/5</td> <td style="text-align: right;">464</td> </tr> <tr> <td>MAXPOS 50/5</td> <td style="text-align: right;">468</td> </tr> </table>	ESCON Module 24/2	444	ESCON 36/3 EC	445	ESCON Mod. 50/4 EC-S	445	ESCON Module 50/5	445	ESCON 50/5	447	DEC Module 24/2, 50/5	449	EPOS4 Mod./Comp. 24/1.5	452	EPOS4 50/5	453	EPOS4 Mod./Comp. 50/5	453	EPOS2 P 24/5	464	MAXPOS 50/5	468	<p>Encoder MR 128/256/512 CPT, 2/3 channels Page 418</p> <p>Brake AB 20 24 VDC 0.1 Nm Page 478</p>
ESCON Module 24/2	444																							
ESCON 36/3 EC	445																							
ESCON Mod. 50/4 EC-S	445																							
ESCON Module 50/5	445																							
ESCON 50/5	447																							
DEC Module 24/2, 50/5	449																							
EPOS4 Mod./Comp. 24/1.5	452																							
EPOS4 50/5	453																							
EPOS4 Mod./Comp. 50/5	453																							
EPOS2 P 24/5	464																							
MAXPOS 50/5	468																							

EC-max 30 Ø30 mm, brushless, 40 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

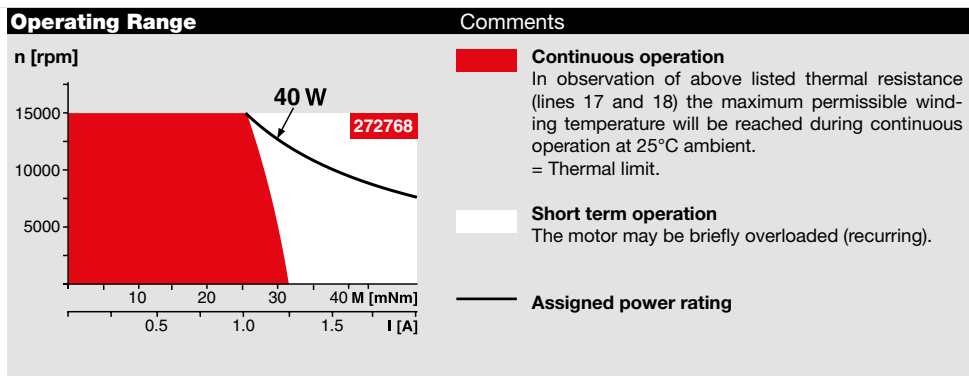
Part Numbers				
272766	272768	272769	272770	

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 ²	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
26 Max. axial load (dynamic)	5 N
27 Max. force for press fits (static)	98 N
(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

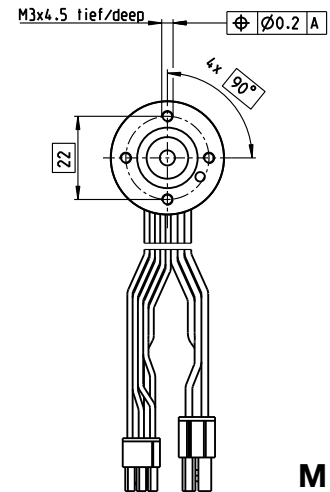
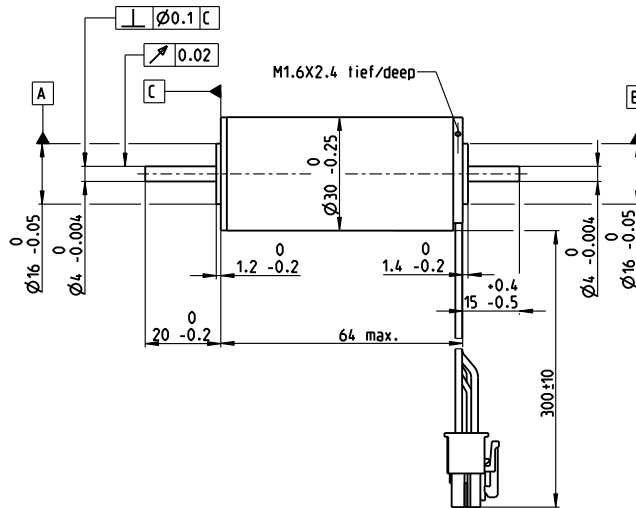
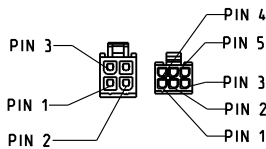
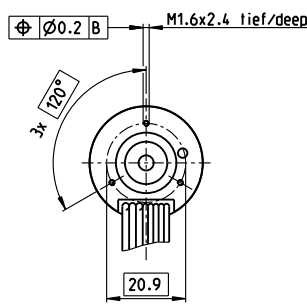
Values listed in the table are nominal.

- 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_{Hall} 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. 41



maxon Modular System		Overview on page 28–36
<p>Planetary Gearhead</p> <ul style="list-style-type: none"> Ø32 mm 1.0 - 8.0 Nm Page 347/350 <p>Koaxdrive</p> <ul style="list-style-type: none"> Ø32 mm 1.0 - 4.5 Nm Page 352 <p>Screw Drive</p> <ul style="list-style-type: none"> Ø32 mm Page 374–378 		<p>Encoder MR</p> <ul style="list-style-type: none"> 500/1000 CPT, 3 channels Page 419 <p>Encoder HEDL 5540</p> <ul style="list-style-type: none"> 500 CPT, 3 channels Page 433 <p>Brake AB 20</p> <ul style="list-style-type: none"> 24 VDC 0.1 Nm Page 478
<p>Recommended Electronics:</p> <p>Notes Page 32</p> <ul style="list-style-type: none"> ESCON Module 24/2 444 ESCON 36/3 EC 445 ESCON Mod. 50/4 EC-S 445 ESCON Module 50/5 445 ESCON 50/5 447 DEC Module 24/2 449 DEC Module 50/5 449 EPOS4 Mod./Comp. 24/1.5 452 EPOS4 50/5 453 EPOS4 Mod./Comp. 50/5 453 EPOS2 P 24/5 464 MAXPOS 50/5 468 		

EC-max 30 Ø30 mm, brushless, 60 Watt



M 1:2

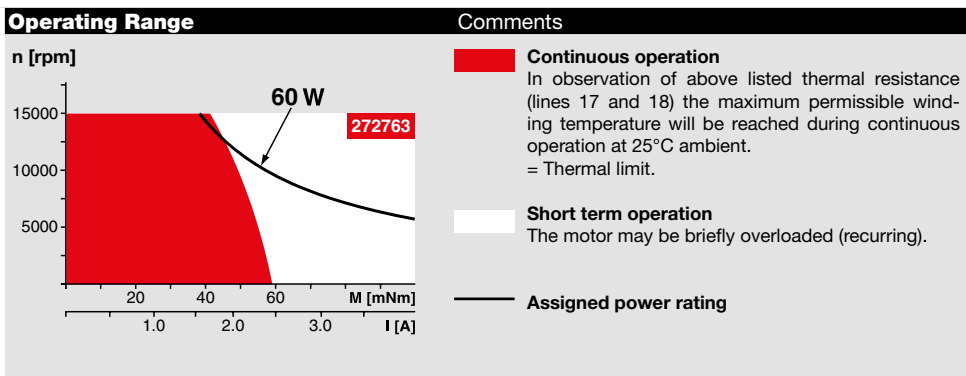
- Stock program
- Standard program
- Special program (on request)

Part Numbers

272762	272763	272764	272765
--------	--------	--------	--------

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 ²	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)	98 N
(static, shaft supported)	1300 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	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 _{Hall} 3...24 VDC	Pin 5
	N.C.	Pin 6
Connector		
Molex	Part number	
	430-25-0600	

Wiring diagram for Hall sensors see p. 41

maxon Modular System

- Planetary Gearhead**
Ø32 mm
1.0 - 8.0 Nm
Page 347/350
- Koaxdrive**
Ø32 mm
1.0 - 4.5 Nm
Page 352
- Planetary Gearhead**
Ø42 mm
3 - 15 Nm
Page 355

Recommended Electronics:

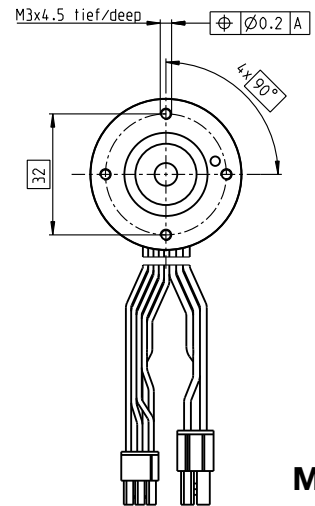
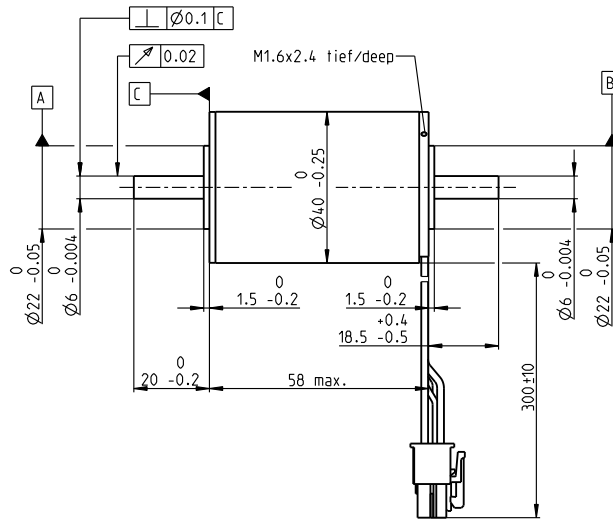
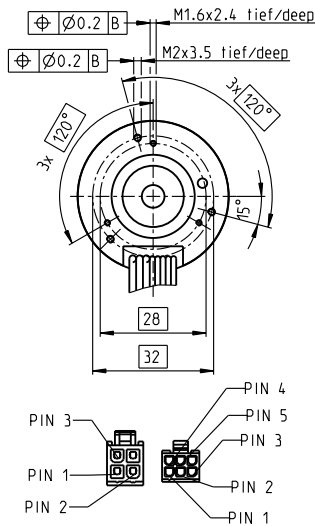
Notes	Page 32
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON 50/5	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder MR
500/1000 CPT,
3 channels
Page 419

Encoder HEDL 5540
500 CPT,
3 channels
Page 433

Brake AB 20
24 VDC
0.1 Nm
Page 478

EC-max 40 Ø40 mm, brushless, 70 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

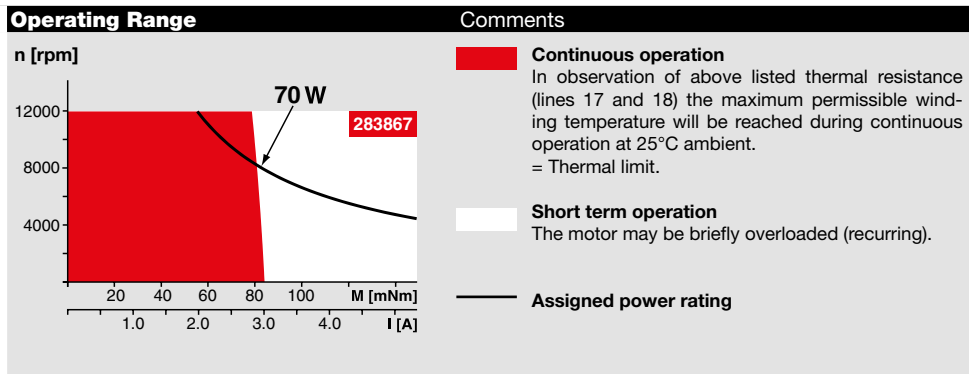
283866	283867	283868	283869
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Motor Data					
Values at nominal voltage					
1 Nominal voltage	V	12	24	36	48
2 No load speed	rpm	8030	8040	8470	9030
3 No load current	mA	584	292	209	173
4 Nominal speed	rpm	6410	6520	7030	7610
5 Nominal torque (max. continuous 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 ²	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
28 Max. radial load, 5 mm from flange	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.

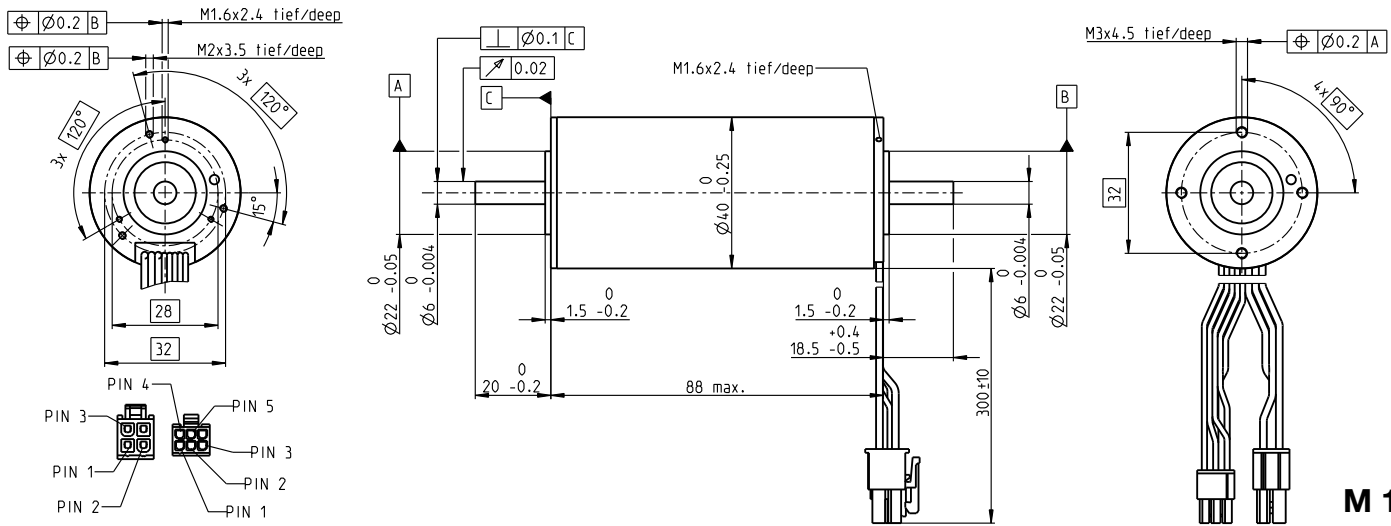
- Connection motor** (Cable AWG 20)
- red Motor winding 1 Pin 1
 - black Motor winding 2 Pin 2
 - white Motor winding 3 Pin 3
 - N.C. N.C. Pin 4
- Connector** Part number
Molex 39-01-2040
- Connection sensor** (Cable AWG 26)
- yellow Hall sensor 1 Pin 1
 - brown Hall sensor 2 Pin 2
 - grey Hall sensor 3 Pin 3
 - blue GND Pin 4
 - green V_{Hall} 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. 41



maxon Modular System Overview on page 28-36

<p>Planetary Gearhead</p> <p>Ø42 mm 3 - 15 Nm Page 355</p>		<p>Encoder MR</p> <p>256 - 1024 CPT, 3 channels Page 420</p> <p>Encoder HEDL 5540</p> <p>500 CPT, 3 channels Page 433</p> <p>Brake AB 28</p> <p>24 VDC 0.4 Nm Page 479</p>																												
<p>Recommended Electronics:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Notes</th> <th>Page 32</th> </tr> </thead> <tbody> <tr><td>ESCON 36/3 EC</td><td>445</td></tr> <tr><td>ESCON Mod. 50/5</td><td>445</td></tr> <tr><td>ESCON Mod. 50/4 EC-S</td><td>445</td></tr> <tr><td>ESCON Mod. 50/8 (HE)</td><td>446</td></tr> <tr><td>ESCON 50/5</td><td>447</td></tr> <tr><td>ESCON 70/10</td><td>447</td></tr> <tr><td>DEC Module 50/5</td><td>449</td></tr> <tr><td>EPOS4 50/5</td><td>453</td></tr> <tr><td>EPOS4 Mod./Comp. 50/5</td><td>453</td></tr> <tr><td>EPOS4 Mod./Comp. 50/8</td><td>454</td></tr> <tr><td>EPOS4 70/15</td><td>456</td></tr> <tr><td>EPOS2 P 24/5</td><td>464</td></tr> <tr><td>MAXPOS 50/5</td><td>468</td></tr> </tbody> </table>			Notes	Page 32	ESCON 36/3 EC	445	ESCON Mod. 50/5	445	ESCON Mod. 50/4 EC-S	445	ESCON Mod. 50/8 (HE)	446	ESCON 50/5	447	ESCON 70/10	447	DEC Module 50/5	449	EPOS4 50/5	453	EPOS4 Mod./Comp. 50/5	453	EPOS4 Mod./Comp. 50/8	454	EPOS4 70/15	456	EPOS2 P 24/5	464	MAXPOS 50/5	468
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EPOS2 P 24/5	464																													
MAXPOS 50/5	468																													

EC-max 40 Ø40 mm, brushless, 120 Watt



M 1:2

- Stock program
- Standard program
- Special program (on request)

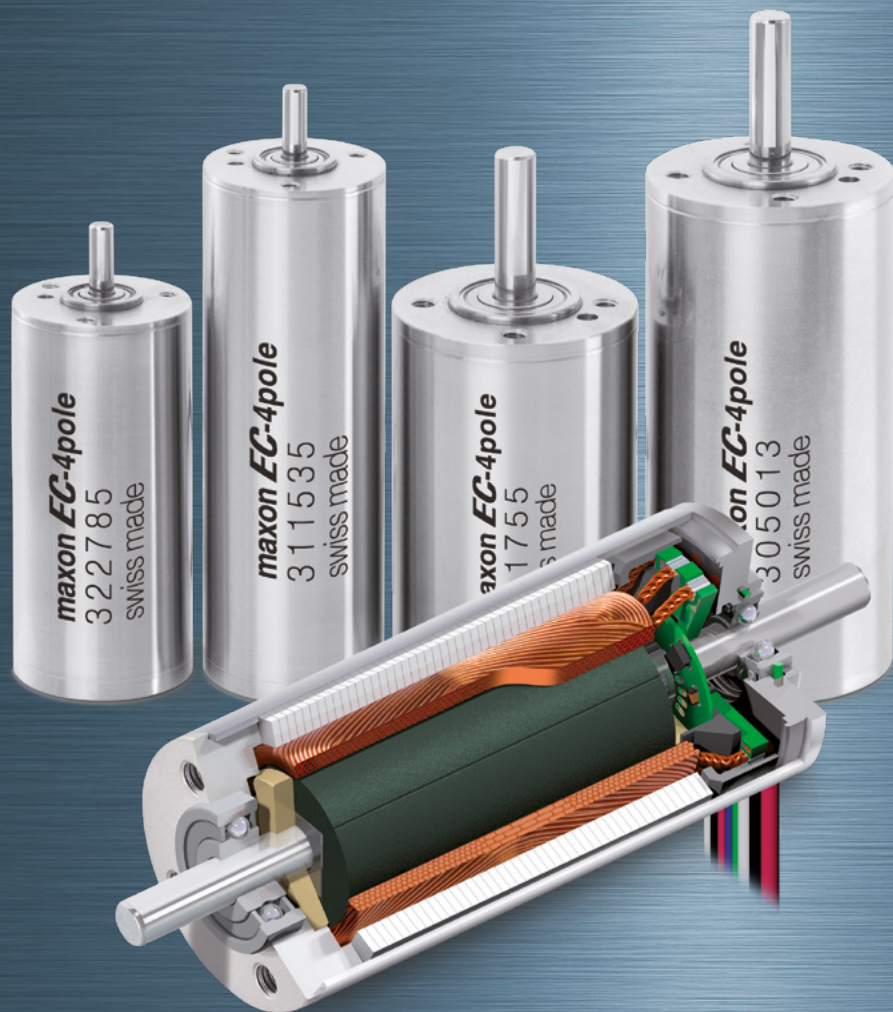
Part Numbers

283870	283871	283872	283873
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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 ²	101	101	101	101

Specifications	Operating Range	Comments
<p>Thermal data</p> <p>17 Thermal resistance housing-ambient 3.45 K/W</p> <p>18 Thermal resistance winding-housing 0.29 K/W</p> <p>19 Thermal time constant winding 3.96 s</p> <p>20 Thermal time constant motor 1240 s</p> <p>21 Ambient temperature -40...+100°C</p> <p>22 Max. winding temperature +155°C</p> <p>Mechanical data (preloaded ball bearings)</p> <p>23 Max. speed 12000 rpm</p> <p>24 Axial play at axial load < 10 N 0 mm</p> <p style="padding-left: 20px;">> 10 N 0.14 mm</p> <p>25 Radial play preloaded 8 N</p> <p>26 Max. axial load (dynamic) 211 N</p> <p>27 Max. force for press fits (static) (static, shaft supported) 4000 N</p> <p>28 Max. radial load, 5 mm from flange 80 N</p>		<p>Continuous operation</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>Short term operation</p> <p>The motor may be briefly overloaded (recurring).</p> <p>Assigned power rating</p>

Other specifications	maxon Modular System	Overview on page 28–36																																																						
<p>29 Number of pole pairs 1</p> <p>30 Number of phases 3</p> <p>31 Weight of motor 720 g</p> <p>Values listed in the table are nominal.</p> <p>Connection motor (Cable AWG 20)</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>red</td><td>Motor winding 1</td><td>Pin 1</td></tr> <tr><td>black</td><td>Motor winding 2</td><td>Pin 2</td></tr> <tr><td>white</td><td>Motor winding 3</td><td>Pin 3</td></tr> <tr><td></td><td>N.C.</td><td>Pin 4</td></tr> </table> <p>Connector Part number</p> <p>Molex 39-01-2040</p> <p>Connection sensors (Cable AWG 26)</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>yellow</td><td>Hall sensor 1</td><td>Pin 1</td></tr> <tr><td>brown</td><td>Hall sensor 2</td><td>Pin 2</td></tr> <tr><td>grey</td><td>Hall sensor 3</td><td>Pin 3</td></tr> <tr><td>blue</td><td>GND</td><td>Pin 4</td></tr> <tr><td>green</td><td>V_{Hall} 3...24 VDC</td><td>Pin 5</td></tr> <tr><td></td><td>N.C.</td><td>Pin 6</td></tr> </table> <p>Connector Part number</p> <p>Molex 430-25-0600</p> <p>Wiring diagram for Hall sensors see p. 41</p>	red	Motor winding 1	Pin 1	black	Motor winding 2	Pin 2	white	Motor winding 3	Pin 3		N.C.	Pin 4	yellow	Hall sensor 1	Pin 1	brown	Hall sensor 2	Pin 2	grey	Hall sensor 3	Pin 3	blue	GND	Pin 4	green	V _{Hall} 3...24 VDC	Pin 5		N.C.	Pin 6	<p>Planetary Gearhead</p> <p>Ø52 mm</p> <p>4 - 30 Nm</p> <p>Page 360</p> <p>Recommended Electronics:</p> <table style="width: 100%; border-collapse: collapse;"> <tr><th>Notes</th><th>Page 32</th></tr> <tr><td>ESCON Mod. 50/5</td><td>445</td></tr> <tr><td>ESCON Mod. 50/4 EC-S</td><td>445</td></tr> <tr><td>ESCON 50/5</td><td>447</td></tr> <tr><td>ESCON 70/10</td><td>447</td></tr> <tr><td>DEC Module 50/5</td><td>449</td></tr> <tr><td>EPOS4 50/5</td><td>453</td></tr> <tr><td>EPOS4 Mod./Comp. 50/5</td><td>453</td></tr> <tr><td>EPOS4 Module 50/8</td><td>454</td></tr> <tr><td>EPOS4 Comp. 50/8 CAN</td><td>454</td></tr> <tr><td>EPOS2 P 24/5</td><td>464</td></tr> <tr><td>MAXPOS 50/5</td><td>468</td></tr> </table>	Notes	Page 32	ESCON Mod. 50/5	445	ESCON Mod. 50/4 EC-S	445	ESCON 50/5	447	ESCON 70/10	447	DEC Module 50/5	449	EPOS4 50/5	453	EPOS4 Mod./Comp. 50/5	453	EPOS4 Module 50/8	454	EPOS4 Comp. 50/8 CAN	454	EPOS2 P 24/5	464	MAXPOS 50/5	468	<p>Encoder MR</p> <p>256 - 1024 CPT,</p> <p>3 channels</p> <p>Page 420</p> <p>Encoder HEDL 5540</p> <p>500 CPT,</p> <p>3 channels</p> <p>Page 433</p> <p>Brake AB 28</p> <p>24 VDC</p> <p>0.4 Nm</p> <p>Page 479</p>
red	Motor winding 1	Pin 1																																																						
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MAXPOS 50/5	468																																																							



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

Motor control
Compact Drive

Accessories

Ceramic

Contact information

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.

Standard Specification No. 101	60
Explanation of the EC motors	164
ECX SPEED Program	166-200
EC Program	202-216
EC-max Program	219-227
EC-4pole Program	231-237
EC-i Program	241-251
EC flat Program	254-272
EC frameless Program	274-279

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.



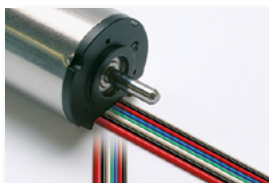
High performance capability thanks to the 4-pole magnet.



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.



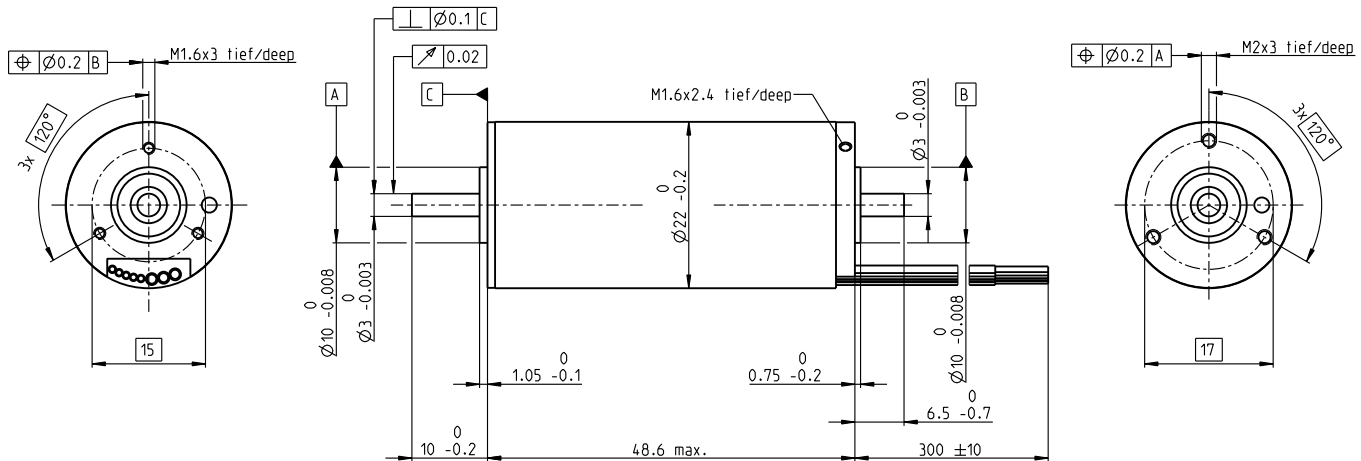
High quality, thanks to a process monitored production on the most modern assembly lines which are, in part, developed by maxon.



**The EC-motor program
delivers top performance
per volume
and weight unit.**

EC-4pole 22 Ø22 mm, brushless, 90 Watt

High Power



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

323217 **323218** 323219 323220 327739

Motor Data

Values at nominal voltage		323217	323218	323219	323220	327739
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 ²	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 < 5.0 N	0 mm
> 5.0 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

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)

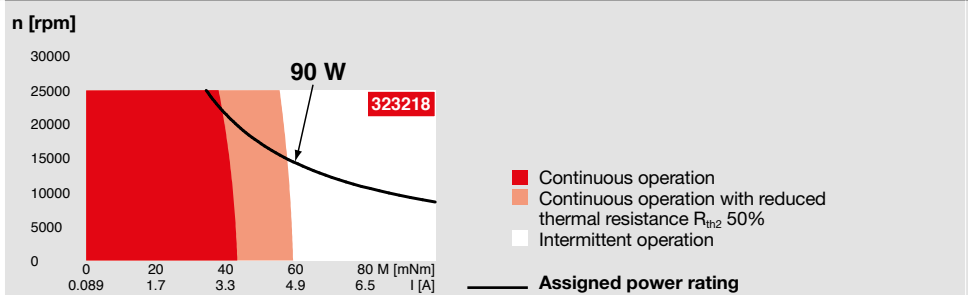
red	Motor winding 1
white	Motor winding 3
black	Motor winding 2

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. 41

Operating Range



maxon Modular System

Overview on page 28–36

Planetary Gearhead

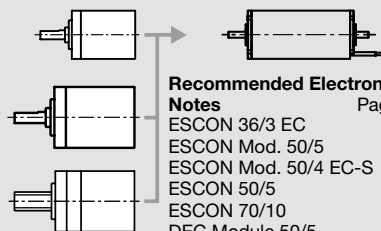
Ø22 mm
2.0 - 3.4 Nm
Page 337

Planetary Gearhead

Ø32 mm
1.0 - 6.0 Nm
Page 347

Screw Drive

Ø32 mm
Page 378



Recommended Electronics:

Notes

ESCON 36/3 EC	445
ESCON Mod. 50/5	445
ESCON Mod. 50/4 EC-S	445
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder 16 EASY

128 - 1024 CPT, 3 channels
Page 409

Encoder 16 EASY Abs.

4096 steps, Single Turn
Page 411

Encoder 16 RIO

512 - 65536 CPT, 3 channels
Page 423

Encoder AEDL 5810

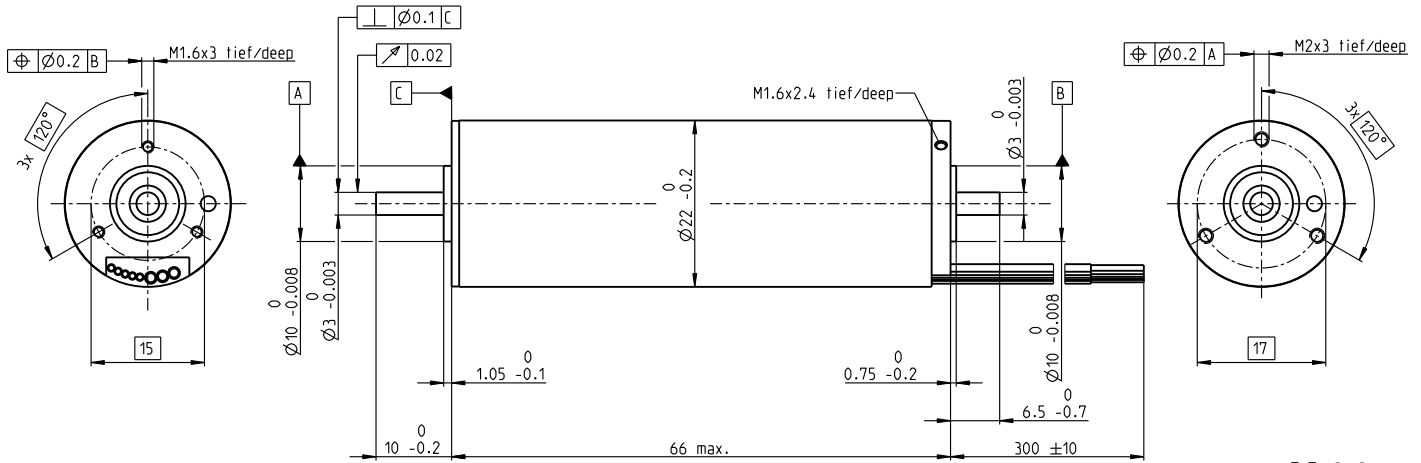
1024 - 5000 CPT, 3 channels
Page 427

Encoder HEDL 5540

500 CPT, 3 channels
Page 433

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
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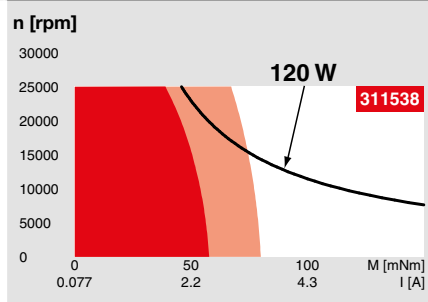
Motor Data

Values at nominal voltage		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	53.9	54.5	54	54.4
6 Nominal current (max. continuous current)	A	5.54	4.2	2.94	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 ²	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 < 5.0 N: 0 mm
 - > 5.0 N: 0.14 mm
 - 25 Radial play: 0.14 mm preloaded
 - 26 Max. axial load (dynamic): 4 N
 - 27 Max. force for press fits (static) (static, shaft supported): 53 N / 600 N
 - 28 Max. radial load, 5 mm from flange: 16 N

Operating Range



Comments

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_{Hall} 3...24 VDC
- blue GND

Wiring diagram for Hall sensors see p. 41

maxon Modular System

Overview on page 28–36

Planetary Gearhead

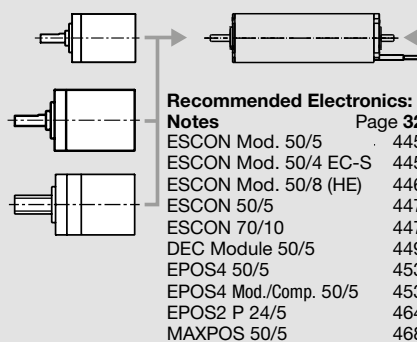
- Ø22 mm
- 2.0 - 3.4 Nm
- Page 337

Planetary Gearhead

- Ø32 mm
- 1.0 - 6.0 Nm
- Page 347

Screw Drive

- Ø32 mm
- Page 378



Encoder 16 EASY

- 128 - 1024 CPT, 3 channels
- Page 409

Encoder 16 EASY Abs.

- 4096 steps, Single Turn
- Page 411

Encoder 16 RIO

- 512 - 65536 CPT, 3 channels
- Page 423

Encoder AEDL 5810

- 1024 - 5000 CPT, 3 channels
- Page 427

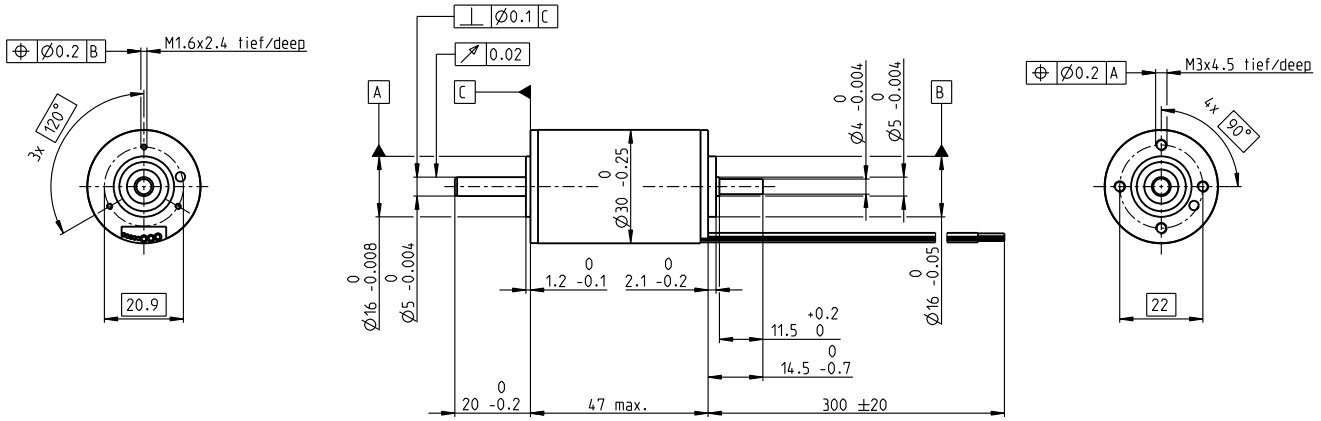
Encoder HEDL 5540

- 500 CPT, 3 channels
- Page 433

EC-4pole 30 Ø30 mm, brushless, 100 Watt

High Power

maxon EC-4pole



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
309755	309756	309757	309758	

Motor Data					
Values at nominal voltage					
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
Characteristics					
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 ²	18.3	18.3	18.3	18.3

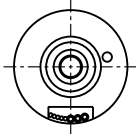
Specifications	Operating Range	Comments
Thermal data 17 Thermal resistance housing-ambient 8.96 K/W 18 Thermal resistance winding-housing 0.74 K/W 19 Thermal time constant winding 4.12 s 20 Thermal time constant motor 968 s 21 Ambient temperature -20...+100°C 22 Max. winding temperature +155°C Mechanical data (preloaded ball bearings) 23 Max. speed 25000 rpm 24 Axial play at axial load < 8.0 N 0 mm > 8.0 N 0.14 mm preloaded 25 Radial play 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		<ul style="list-style-type: none"> Continuous operation Continuous operation with reduced thermal resistance R_{th2} 50% Intermittent operation <p>— Assigned power rating</p>

maxon Modular System		Overview on page 28–36	
29 Number of pole pairs 2	30 Number of phases 3	Planetary Gearhead Ø32 mm 4 - 8 Nm Page 350	Encoder 16 EASY 128 - 1024 CPT, 3 channels Page 409 Encoder 16 EASY Abs. 4096 steps, Single Turn Page 411 Encoder 16 RIO 512 - 65536 CPT, 3 channels Page 423 Encoder 2RMHF 3000 - 5000 CPT, 3 channels Page 425 Encoder AEDL 5810 1024 - 5000 CPT, 3 channels Page 427 Encoder HEDL 5540 500 CPT, 3 channels Page 434 Brake AB 20 24 VDC, 0.1 Nm Page 478
31 Weight of motor 210 g	Planetary Gearhead Ø42 mm 3 - 15 Nm Page 355	Recommended Electronics: Notes Page 32 ESCON Mod. 50/5 445 ESCON Mod. 50/4 EC-S 445 ESCON Mod. 50/8 (HE) 446 ESCON 50/5 447 ESCON 70/10 447 DEC Module 50/5 449 EPOS4 50/5 453 EPOS4 Mod./Comp. 50/5 453 EPOS4 Module 50/8 454 EPOS4 Comp. 50/8 CAN 454 EPOS4 70/15 456 MAXPOS 50/5 468	

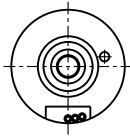
EC-4pole 30 Ø30 mm, brushless, 150 Watt

Sterilizable

A mit Hallensoren
with Hall sensors



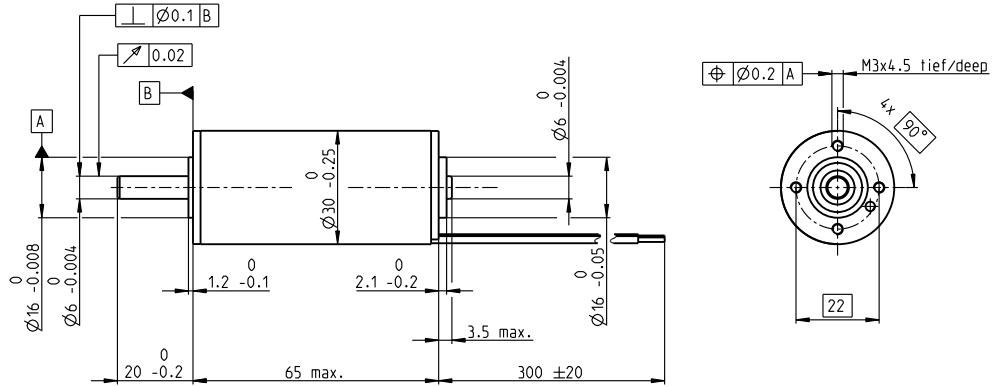
B sensorlos
sensorless



Lage des Kabelabgangs
zum Befestigungsbohrbild ±10°

Alignment of cables relative
to mounting holes ±10°

M 1:2

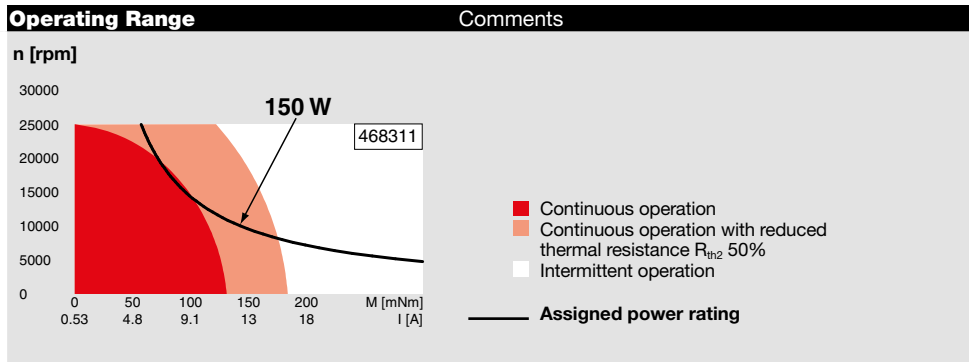


- Stock program
- Standard program
- Special program (on request)

Part Numbers	
A with Hall sensors	468311 468313
B sensorless	468312 468314

Motor Data (provisional)			
Values at nominal voltage			
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
Characteristics			
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 ²	35.2	35.2

Specifications	
Thermal data	
17 Thermal resistance housing-ambient	7.4 K/W
18 Thermal resistance winding-housing	0.209 K/W
19 Thermal time constant winding	2.11 s
20 Thermal time constant motor	1180 s
21 Ambient temperature	-40...+150°C
22 Max. permissible winding temperature	155°C
Mechanical data (preloaded ball bearings)	
23 Max. permissible speed	25000 rpm
24 Axial play at axial load < 8 N	0 mm
24 Axial play at axial load > 8 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	5.5 N
27 Max. force for press fits (static) (static, shaft supported)	73 N
27 Max. force for press fits (static) (static, shaft supported)	1300 N
28 Max. radial loading, 5 mm from flange	25 N



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)
- red Motor winding 1
 - black Motor winding 2
 - white Motor winding 3
- Connection sensors** (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. 41

Option
Hollow shaft with bore diameter up to 4.1 mm

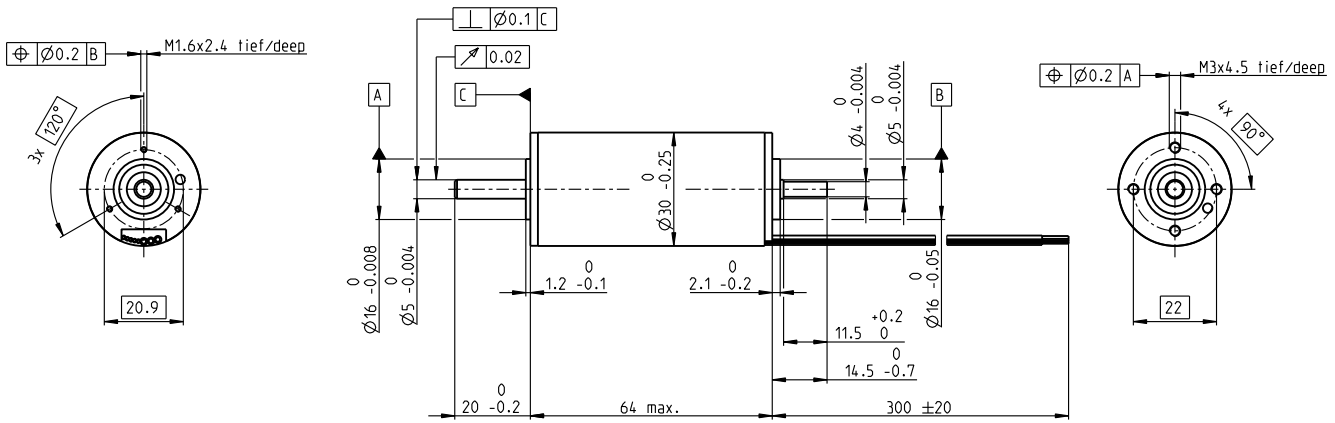
Application	Sterilization information
	Sensorless: typically 2000 autoclave cycles Hall sensor: typically 1000 autoclave cycles
Orthopedic Drills Orthopedic Saws Surgical Reamers	Sterilization with steam Temperature +134°C ± 4°C Compression pressure up to 2.3 bar Rel. humidity 100 % Cycle length 18 minutes

maxon Modular System Overview on page 28–36

Recommended Electronics:	
Notes	Page 32
ESCON Mod. 50/5	445
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449

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

Values at nominal voltage		24	36	48
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
Characteristics				
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 ²	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 < 8.0 N	0 mm
> 8.0 N	0.14 mm
25 Radial play	preloaded
26 Max. axial load (dynamic)	5.5 N
27 Max. force for press fits (static) (static, shaft supported)	73 N
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	300 g

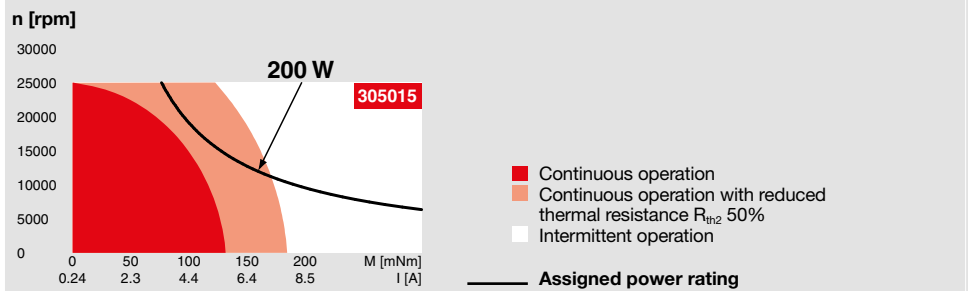
Values listed in the table are nominal.

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_{Hall} 3...24 VDC
 red/grey Hall sensor 1
 white/grey Hall sensor 3
 Wiring diagram for Hall sensors see p. 41

Operating Range

Comments



maxon Modular System

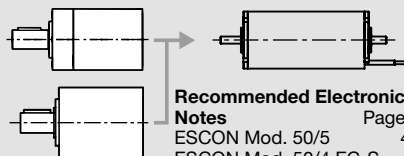
Overview on page 28–36

Planetary Gearhead

Ø32 mm
4 - 8 Nm
Page 350

Planetary Gearhead

Ø42 mm
3 - 15 Nm
Page 355



Recommended Electronics:

Notes Page 32

ESCON Mod. 50/5	445
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Module 50/8	454
EPOS4 Comp. 50/8 CAN	454
EPOS4 70/15	456
MAXPOS 50/5	468

Encoder 16 EASY

128 - 1024 CPT, 3 channels
Page 409

Encoder 16 EASY Abs.

4096 steps, Single Turn
Page 411

Encoder 16 RIO

512 - 65536 CPT, 3 channels
Page 423

Encoder 2RMHF

3000 - 5000 CPT, 3 channels
Page 425

Encoder AEDL 5810

1024 - 5000 CPT, 3 channels
Page 427

Encoder HEDL 5540

500 CPT, 3 channels
Page 434

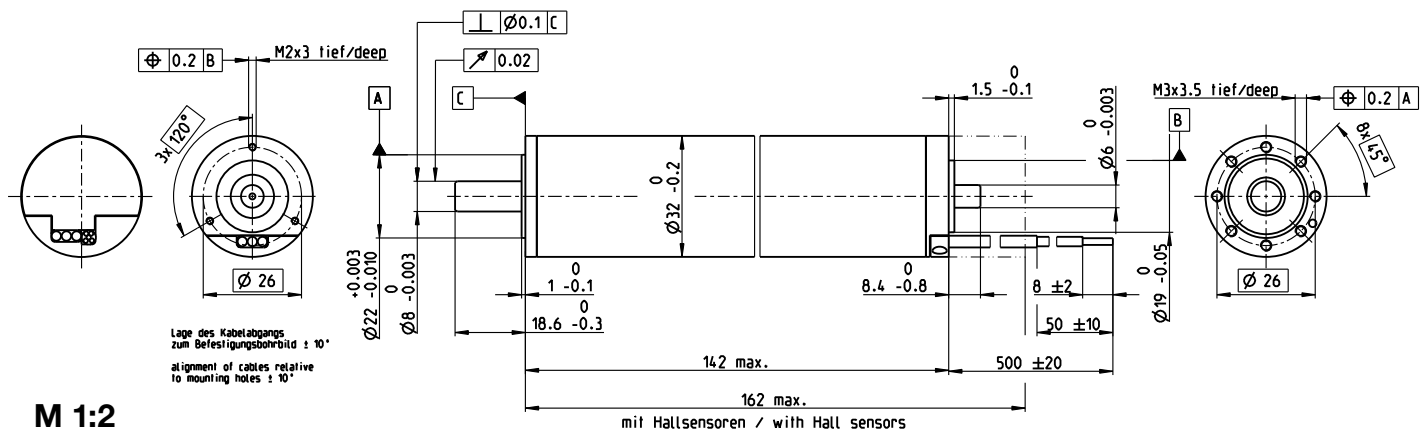
Brake AB 20

24 VDC, 0.1 Nm
Page 478

EC-4pole 32 Ø32 mm, brushless, 220 Watt

Heavy Duty – for applications in air

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	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 ¹⁾	rpm	5710	5870	6080	6470
5 Nominal torque (max. continuous torque) ¹⁾	mNm	339	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
Characteristics					
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 ²	128	128	128	128

¹⁾ 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	1460 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)	80 N
(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)

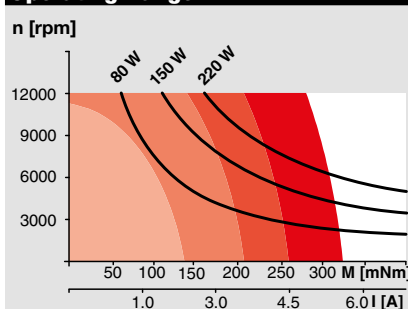
- green V_{Hall} 4.5...24 V
- blue GND
- red Hall sensor 1
- black Hall sensor 2
- white Hall sensor 3

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. 41

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)
- 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

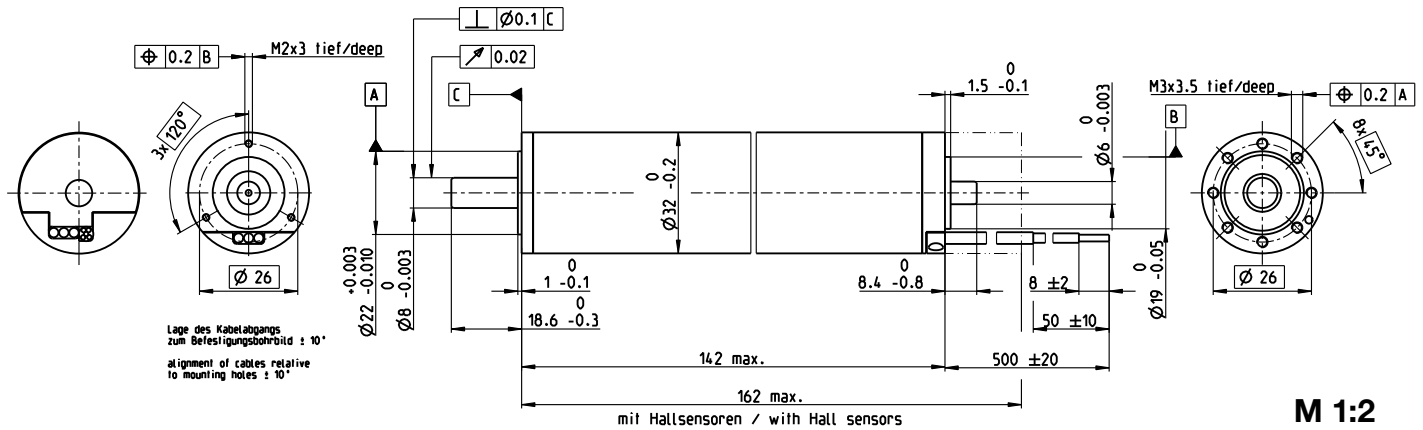
This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

EC-4pole 32 Ø32 mm, brushless, 480 Watt

Heavy Duty – for applications in oil

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 ¹⁾	rpm	4670	4420	4700	5340
5 Nominal torque (max. continuous torque) ¹⁾	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
Characteristics					
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 ²	140	140	140	140

¹⁾ 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	
	> 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	3000 N	
	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

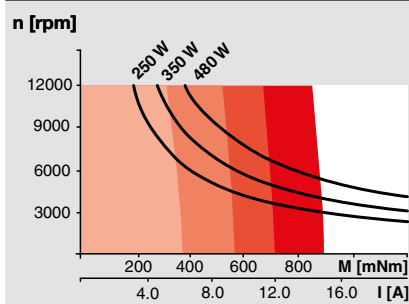
Connection A, sensors cable PTFE (AWG 24)

- green V_{Hall} 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. 41

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.

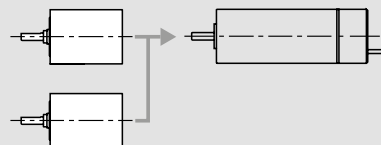
maxon Modular System

Planetary Gearhead

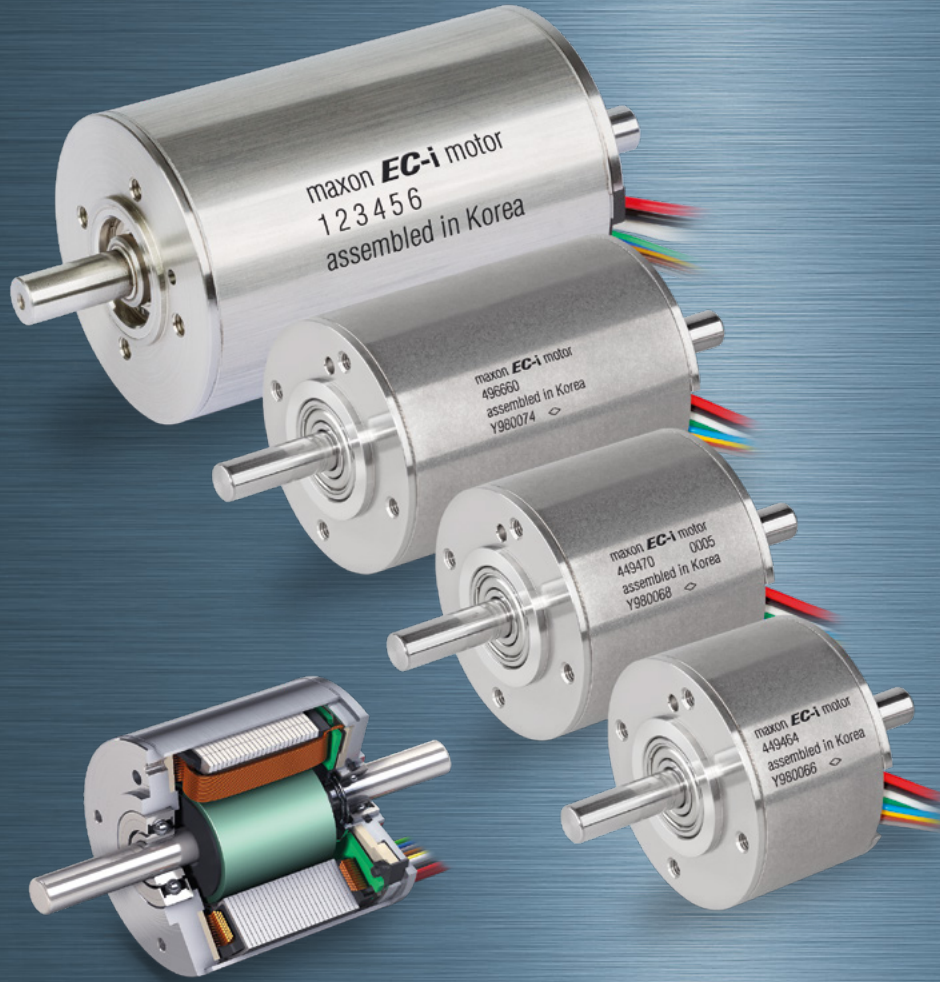
Ø32 mm
3.0 - 8.0 Nm
Page 351

Planetary Gearhead

Ø42 mm
10 - 50 Nm
Page 357



Overview on page 28–36



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

maxon EC-i

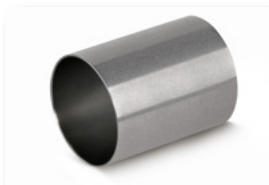
Due to an optimized magnetic circuit, the brushless DC motors with iron windings have a very high torque and very low cogging torque. The robust design with a steel flange and housing offers a wide variety of applications. The “assembled in Korea” label stands for consistently high maxon quality at a competitive price.

Standard Specification No. 101	60
Explanation of the EC motors	164
ECX SPEED Program	166–200
EC Program	202–216
EC-max Program	219–227
EC-4pole Program	231–237
EC-i Program	241–251
EC flat Program	254–272
EC frameless Program	274–279

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.



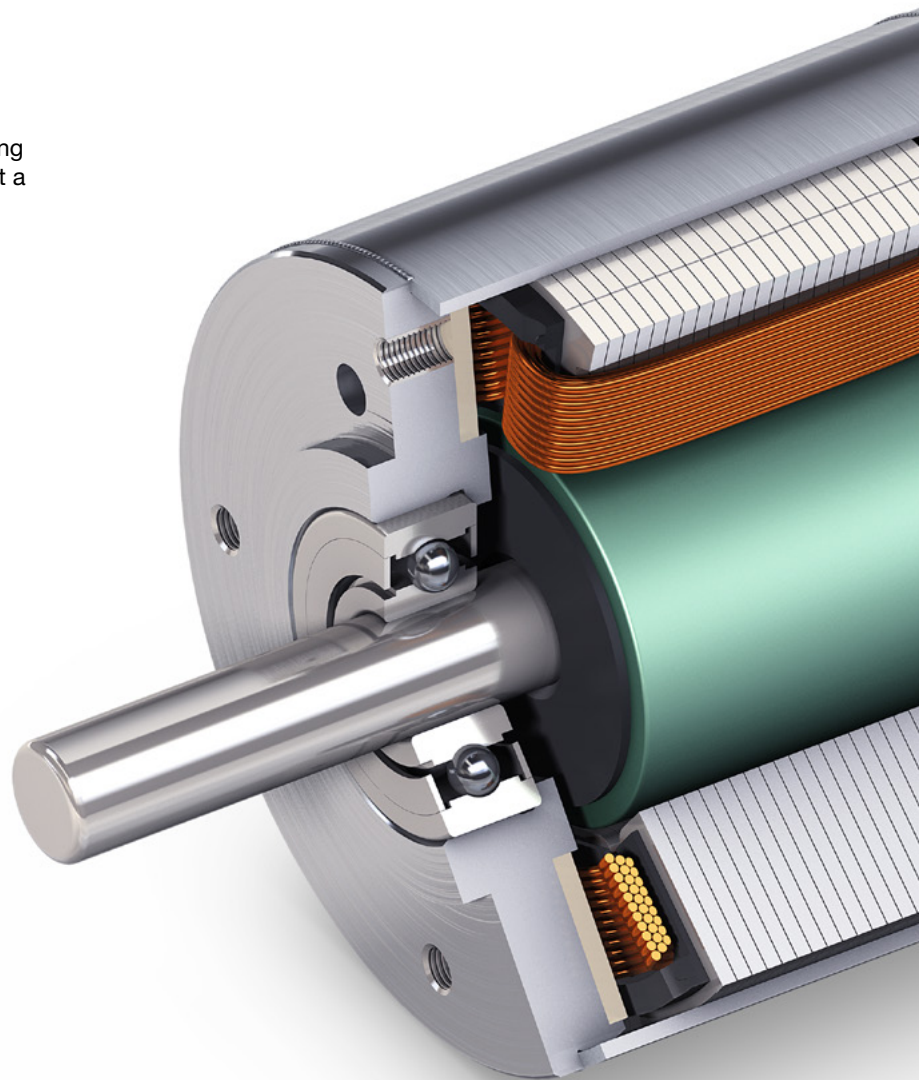
The modular rotor delivers good dynamics and large torques.



"assembled in Korea": High quality due to process-monitored manufacturing on state-of-the-art assembly lines.



Modular construction with gears, sensors and brakes.



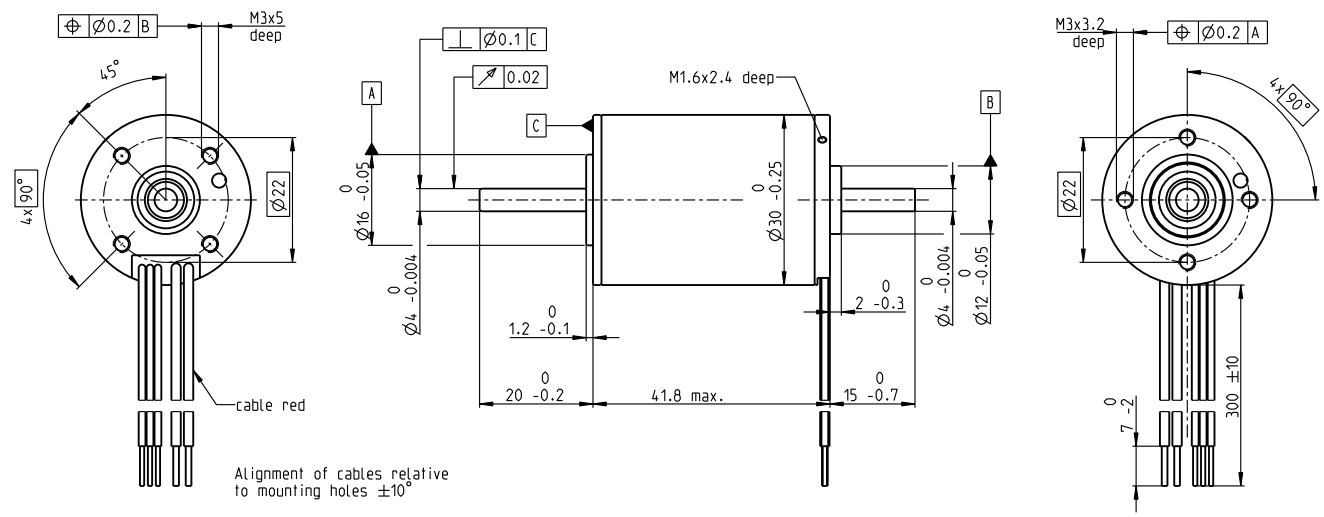
**Dynamic, high torque,
and unbeatable value.**

EC-i 30 Ø30 mm brushless, 20 Watt, with integrated electronics

4-Q-Speed Controller

NEW

maxon EC-i



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	33.6	33.6	
6 Nominal current (max. continuous current)	A	1.19	1.19	
33 Max. torque	mNm	100	100	
34 Max. current	A	6.5	6.5	
9 Max. efficiency	%	75.6	75.6	
Characteristics				
35 Type of control				
36 Supply voltage +V _{CC}	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...6000	250...6000	
40 Max. acceleration	rpm/s	6000	6000	

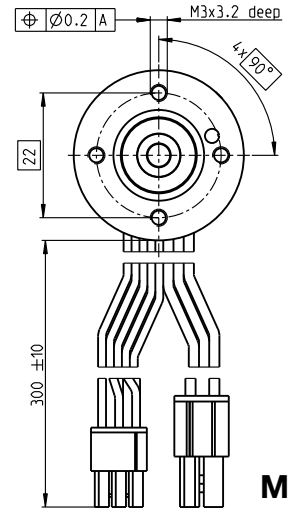
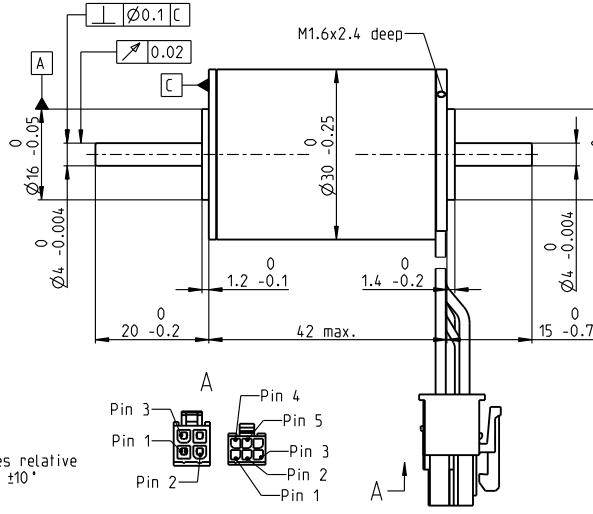
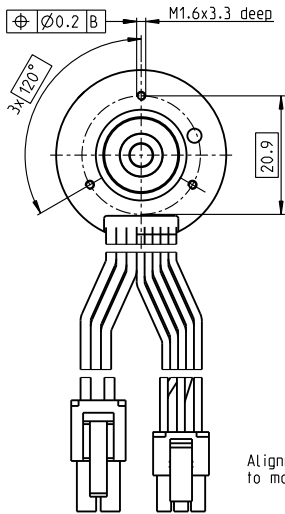
Specifications	Operating Range	Comments
Thermal data 17 Thermal resistance housing-ambient 13.0 K/W 18 Thermal resistance winding-housing 5.9 K/W 19 Thermal time constant winding 34.1 s 20 Thermal time constant motor 1030 s 21 Ambient temperature -40...+85°C 22 Max. winding temperature +155°C 41 Max. temperature of electronics 100°C Mechanical data (preloaded ball bearings) 16 Rotor inertia 6.69 gcm ² 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) 9 N 27 Max. force for press fits (static) 48.8 N (static, shaft supported) 2510 N 28 Max. radial load, 10 mm from flange 30 N		■ Continuous operation ■ Continuous operation with reduced thermal resistance R _{th2} 50% ■ Intermittent operation — Assigned power rating

Other specifications	maxon Modular System	Planetary Gearhead
31 Weight of motor 159 g 32 Direction of rotation Clockwise (CW)	Overview on page 28-36	Ø32 mm 1.0 - 6.0 Nm Page 347
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 _{CC} 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)		

EC-i 30 Ø30 mm, brushless, 30 Watt

NEW

maxon EC-i



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)

Values at nominal voltage

	V	12	24	36	48
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 ¹	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

Characteristics

	Ω	0.434	1.64	3.93	6.76
10 Terminal resistance phase to phase	Ω	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 ²	7.3	7.3	7.3	7.3

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	29.1 s
20 Thermal time constant motor	849 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 < 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
	25 N

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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

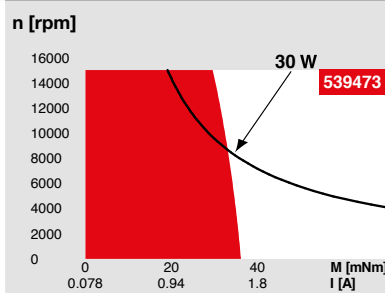
Connector Article number

Molex	430-25-0600
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Wiring diagram for Hall sensors see p. 43

¹Calculation does not include saturation effect (p. 53/164)

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

Overview on page 28–36

Planetary Gearhead

Ø32 mm

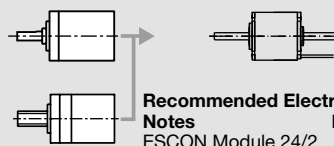
1.0 - 6.0 Nm

Page 347

Screw Drive

Ø32 mm

Page 374–378



Recommended Electronics:

Notes Page 32

ESCON Module 24/2 444

ESCON 36/3 EC 445

ESCON Mod. 50/4 EC-S 445

ESCON Mod. 50/5 445

ESCON 50/5 447

DEC Module 24/2 449

DEC Module 50/5 449

EPOS4 50/5 453

EPOS4 Mod./Comp. 50/5 453

EPOS2 P 24/5 464

MAXPOS 50/5 468

Encoder 16 EASY

128 - 1024 CPT, 3 channels

Page 409

Encoder 16 EASY Absolute

4096 steps

Page 411

Encoder 16 RIO

1024 - 32768 CPT, 3 channels

Page 423

Encoder HEDL 5540

500 CPT, 3 channels

Page 427

Encoder AEDL 5810

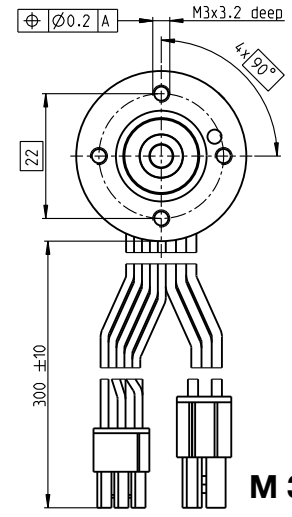
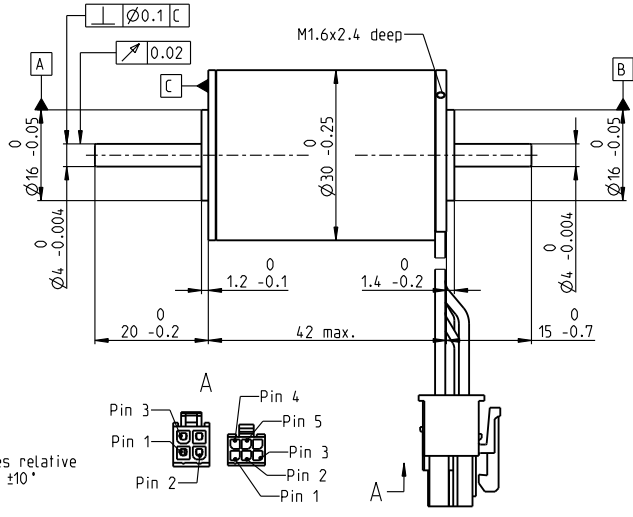
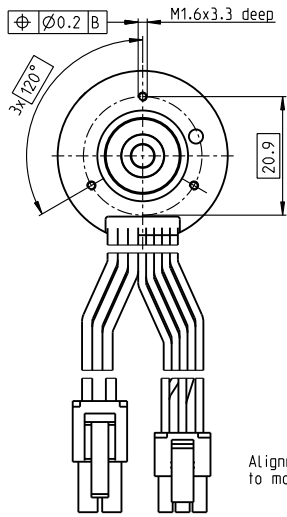
1024 - 5000 CPT, 3 channels

Page 431

EC-i 30 Ø30 mm, brushless, 45 Watt

High Torque

NEW



Alignment of cables relative to mounting holes ±10°

M 3:4

- 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 ¹	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 ²	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

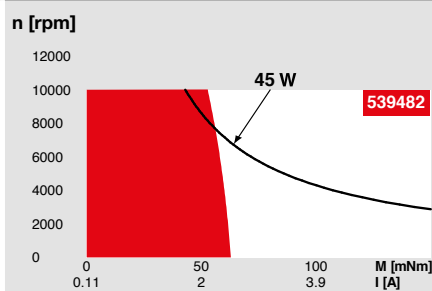
Values listed in the table are nominal.

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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number
Molex 430-25-0600
Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

Operating Range



Comments

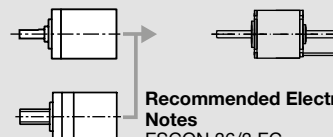
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Overview on page 28–36

Planetary Gearhead
Ø32 mm
1.0 - 6.0 Nm
Page 347

Screw Drive
Ø32 mm
Page 374–378



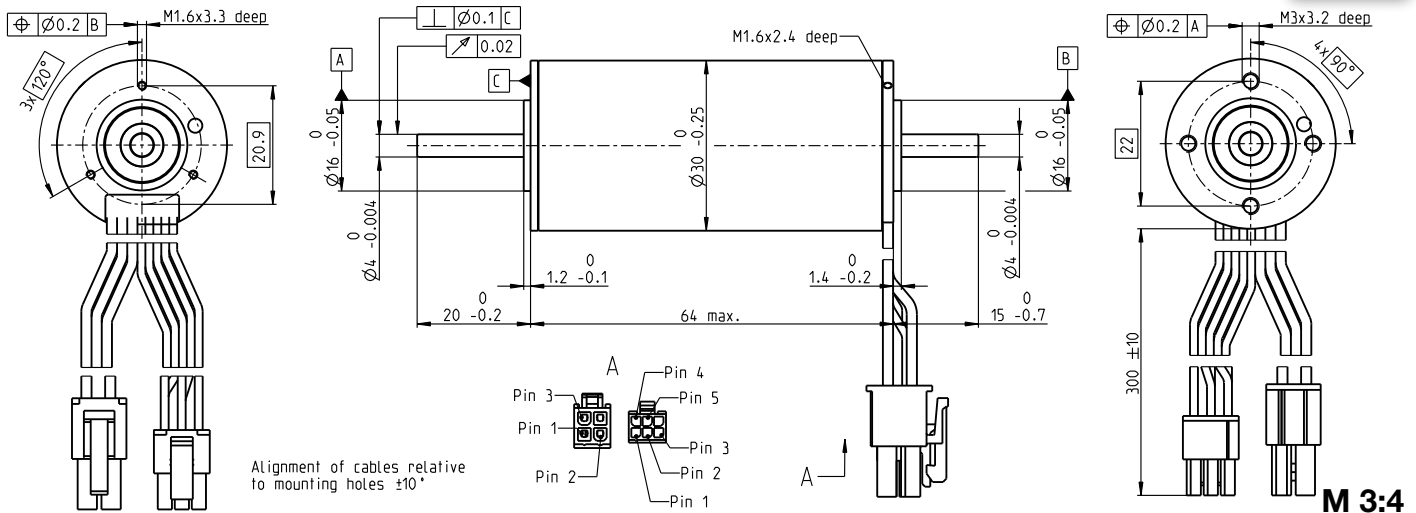
Recommended Electronics:	
Notes	Page 32
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON 50/5	447
DEC Module 50/5	449
EPOS2 P 24/5	464
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
MAXPOS 50/5	468

Encoder 16 EASY	128 - 1024 CPT, 3 channels	Page 409
Encoder 16 EASY Absolute	4096 steps	Page 411
Encoder 16 RIO	1024 - 32768 CPT, 3 channels	Page 423
Encoder HEDL 5540	500 CPT, 3 channels	Page 427
Encoder AEDL 5810	1024 - 5000 CPT, 3 channels	Page 431

EC-i 30 Ø30 mm, brushless, 50 Watt

NEW

maxon EC-i



- Stock program
- Standard program
- Special program (on request)

Part Numbers

with Hall sensors

539476	539477	539478	539479
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Motor Data (provisional)

Values at nominal voltage		12	24	36	48
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 ¹	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
Characteristics		0.201	0.713	1.57	2.35
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 ²	13.8	13.8	13.8	13.8

Specifications

Thermal data		9.01 K/W
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
Mechanical data (preloaded ball bearings)		15000 rpm
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
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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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

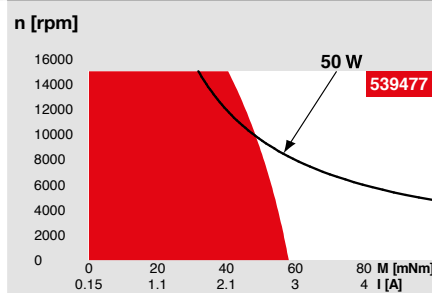
Connector Article number

Molex	430-25-0600
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Wiring diagram for Hall sensors see p. 34

¹Calculation does not include saturation effect (p. 53/164)

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

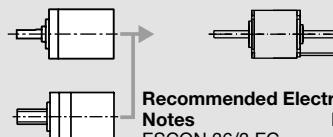
maxon Modular System

Overview on page 28–36

Planetary Gearhead

Ø32 mm
1.0 - 6.0 Nm
Page 347

Screw Drive
Ø32 mm
Page 374–378



Recommended Electronics:

Notes	Page 32
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON 50/5	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder 16 EASY

128 - 1024 CPT, 3 channels
Page 409

Encoder 16 EASY Absolute

4096 steps
Page 411

Encoder 16 RIO

1024 - 32768 CPT, 3 channels
Page 423

Encoder HEDL 5540

500 CPT, 3 channels
Page 427

Encoder AEDL 5810

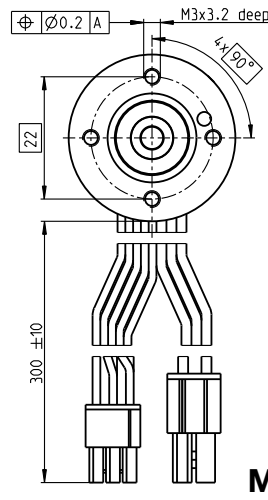
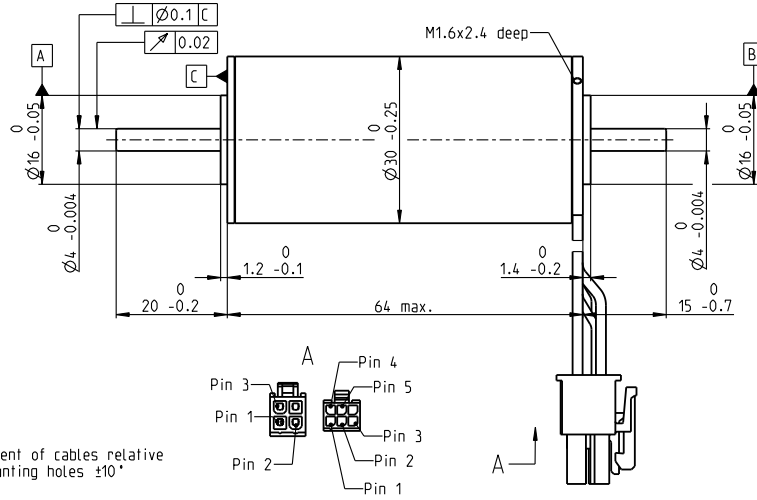
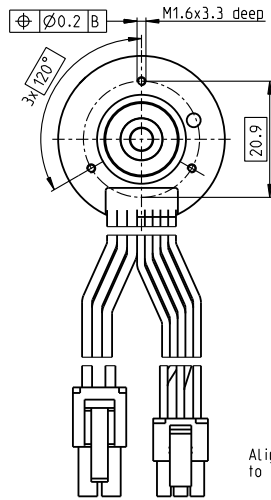
1024 - 5000 CPT, 3 channels
Page 431

EC-i 30 Ø30 mm, brushless, 75 Watt

High Torque

NEW

maxon EC-i



Alignment of cables relative to mounting holes $\pm 10^\circ$

M 3:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	539485	539486	539487	539488	539489
with Hall sensors					

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	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 ¹	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		0.118	0.218	0.38	0.782	1.39
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 ²	15.5	15.5	15.5	15.5	15.5

Specifications

Thermal data		9.01 K/W
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)		10000 rpm
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

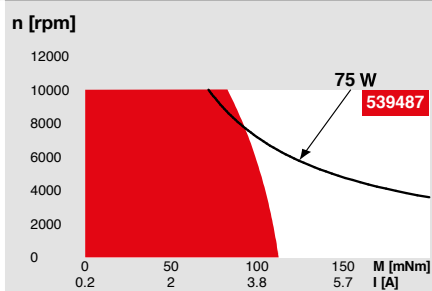
Connector Article number		
Molex		39-01-2040

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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number		
Molex		430-25-0600

Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

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**

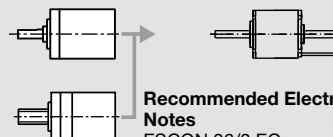
maxon Modular System

Overview on page 28–36

Planetary Gearhead

Ø32 mm
1.0 - 6.0 Nm
Page 347

Screw Drive
Ø32 mm
Page 374–378



Recommended Electronics:

Notes	Page 32
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder 16 EASY

128 - 1024 CPT, 3 channels
Page 409

Encoder 16 EASY Absolute

4096 steps
Page 411

Encoder 16 RIO

1024 - 32768 CPT, 3 channels
Page 423

Encoder HEDL 5540

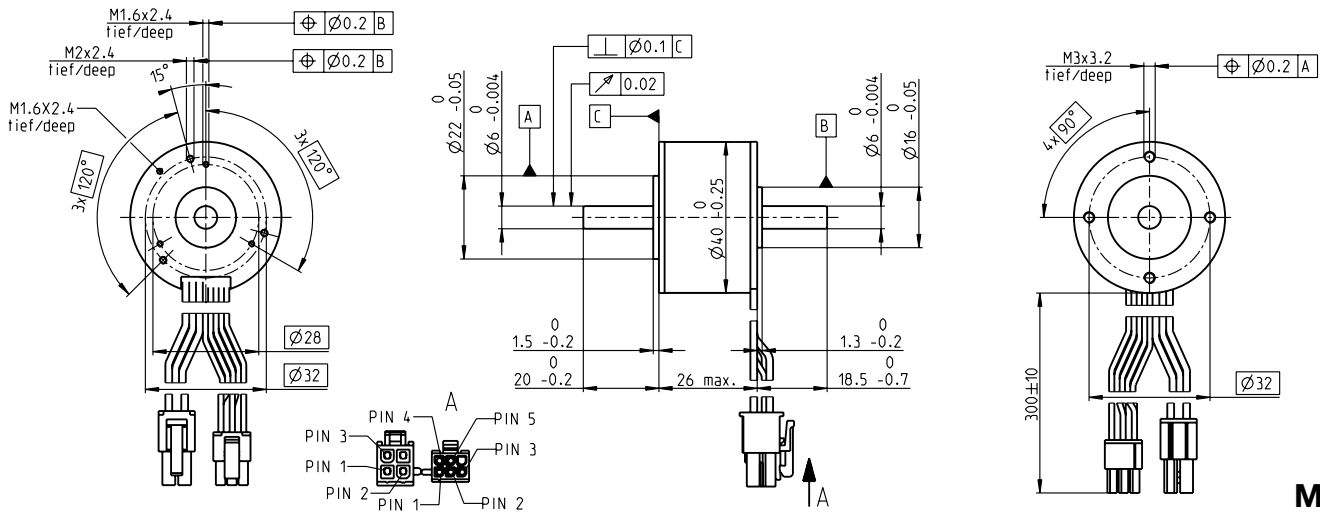
500 CPT, 3 channels

Page 427

Encoder AEDL 5810

1024 - 5000 CPT, 3 channels
Page 431

EC-i 40 Ø40 mm, brushless, 50 Watt

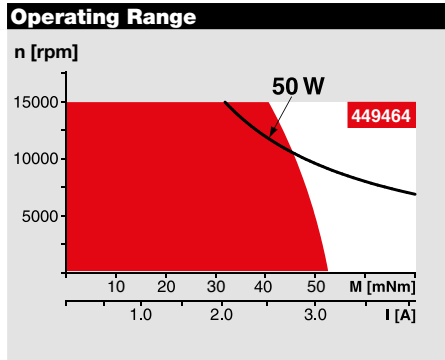


- Stock program
- Standard program
- Special program (on request)

Part Numbers	
with Hall sensors	449463 449464

Motor Data		with Hall sensors	
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 ¹	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 ²	10.5	10.5

Specifications	
Thermal data	
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
Mechanical data (preloaded ball bearings)	
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	6500 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	170 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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

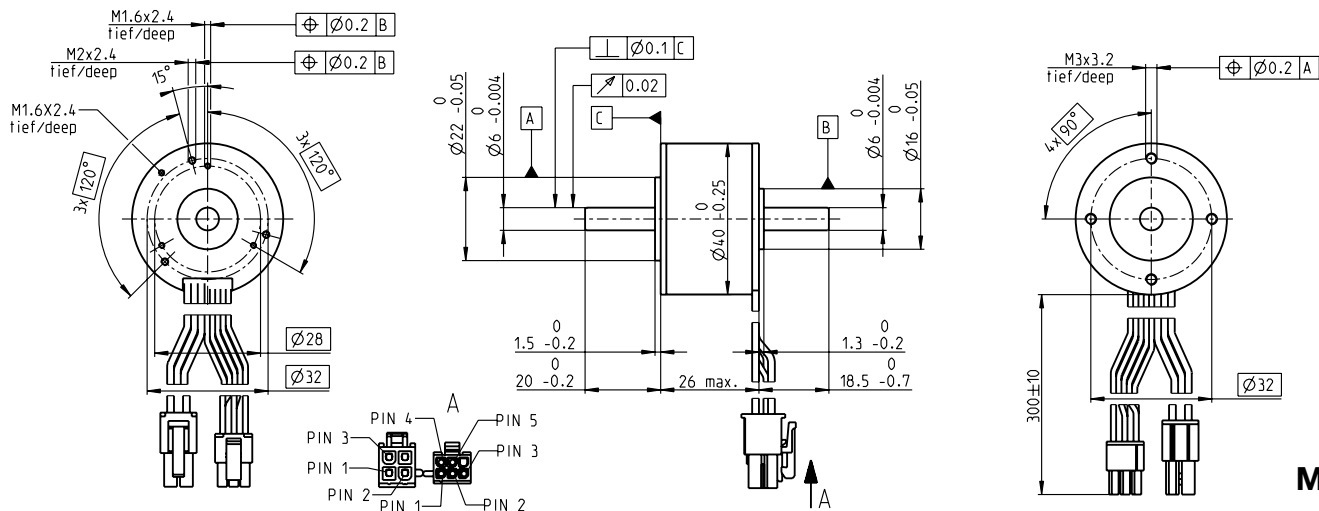
Connector Article number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

maxon Modular System		Overview on page 28–36
<p>Planetary Gearhead Ø32 mm 1.0 - 6.0 Nm Page 347</p> <p>Planetary Gearhead Ø42 mm 3 - 15 Nm Page 355</p> <p>Screw Drive Ø32 mm Page 374–378</p>		<p>Encoder 16 EASY 128 - 1024 CPT, 3 channels Page 409</p> <p>Encoder 16 EASY Absolute 4096 steps Page 411</p> <p>Encoder 16 RIO 1024 - 32768 CPT, 3 channels Page 424</p> <p>Encoder 2RMHF 3000 - 5000 CTP, 3 channels Page 425</p> <p>Encoder HEDL 5540 500 CPT, 3 channels Page 431</p> <p>Encoder AEDL 5810 1024 - 5000 CPT, 3 channels Page 427</p>
<p>Recommended Electronics:</p> <p>Notes Page 32</p> <p>ESCON 36/3 EC 445</p> <p>ESCON Mod. 50/4 EC-S 445</p> <p>ESCON Module 50/5 445</p> <p>ESCON 50/5 447</p> <p>DEC Module 50/5 449</p> <p>EPOS4 50/5 453</p> <p>EPOS4 Mod./Comp. 50/5 453</p> <p>EPOS2 P 24/5 464</p> <p>MAXPOS 50/5 468</p>		

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 ¹	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 ²	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

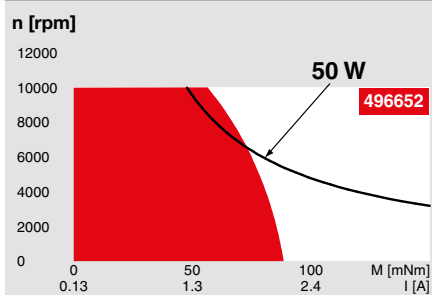
Connector	Article number
Molex	39-01-2040

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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	Article number
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

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.

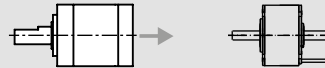
Short term operation
 The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 28–36

Planetary Gearhead
 Ø42 mm
 3 - 15 Nm
 Page 355



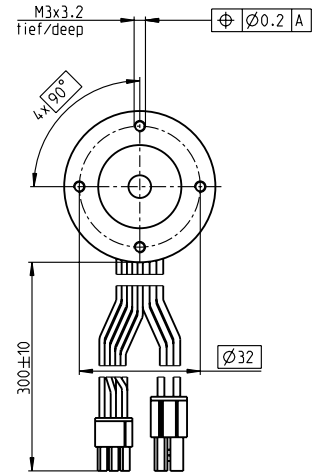
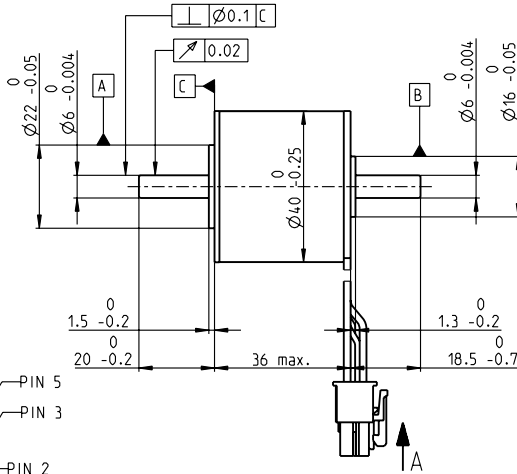
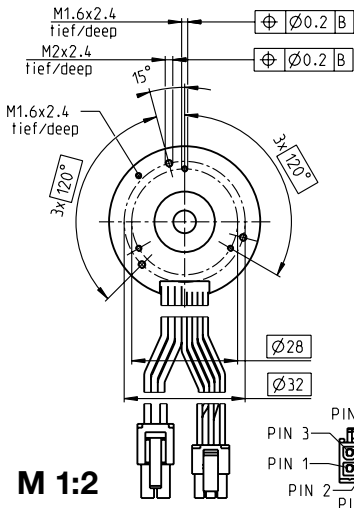
Recommended Electronics:

Notes	Page 32
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder 16 EASY

128 - 1024 CPT, 3 channels	Page 409
Encoder 16 EASY Absolute	4096 steps
	Page 411
Encoder 16 RIO	1024 - 32768 CPT, 3 channels
	Page 424
Encoder 2RMHF	3000 - 5000 CTP, 3 channels
	Page 425
Encoder HEDL 5540	500 CPT, 3 channels
	Page 431
Encoder AEDL 5810	1024 - 5000 CPT, 3 channels
	Page 427

EC-i 40 Ø40 mm, brushless, 70 Watt



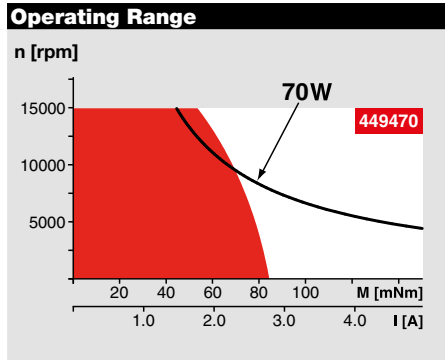
M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
with Hall sensors	449469 449470

Motor Data			
Values at nominal voltage			
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 ¹	mNm	876	1460
8 Stall current	A	52.5	46.3
9 Max. efficiency	%	84	87
Characteristics			
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 ²	24.2	24.2

Specifications	
Thermal data	
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
Mechanical data (preloaded ball bearings)	
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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

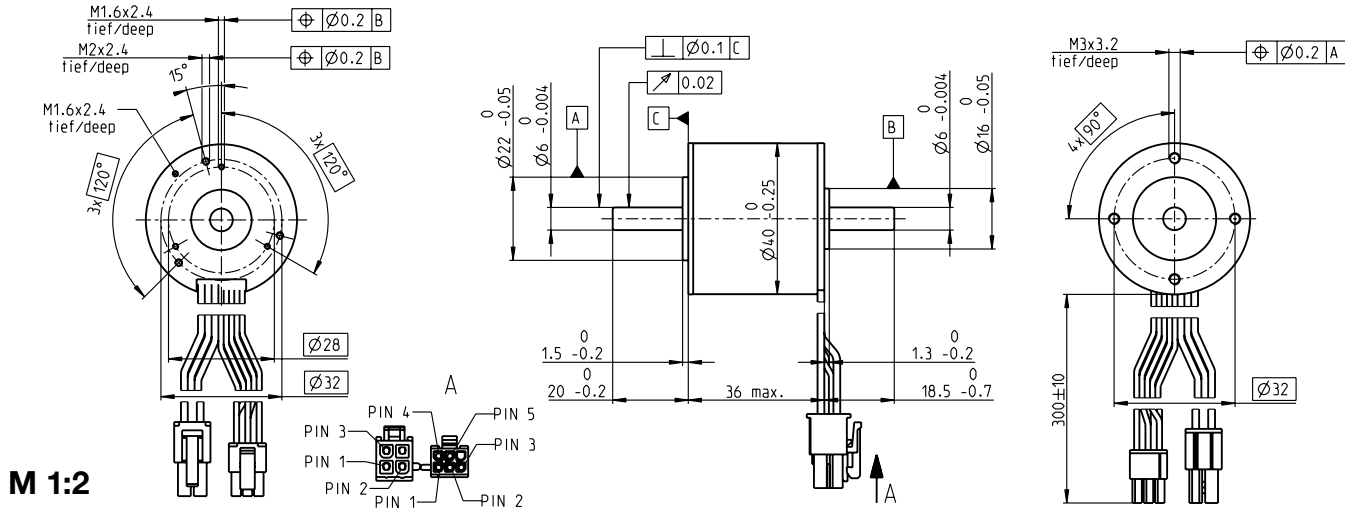
Connector Article number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

maxon Modular System		Overview on page 28–36
Planetary Gearhead Ø32 mm 1.0 - 6.0 Nm Page 347		Encoder 16 EASY 128 - 1024 CPT, 3 channels Page 409 Encoder 16 EASY Absolute 4096 steps Page 411 Encoder 16 RIO 1024 - 32768 CPT, 3 channels Page 424 Encoder 2RMHF 3000 - 5000 CPT, 3 channels Page 425 Encoder HEDL 5540 500 CPT, 3 channels Page 431 Encoder AEDL 5810 1024 - 5000 CPT, 3 channels Page 427
Planetary Gearhead Ø42 mm 3 - 15 Nm Page 355		Recommended Electronics: Notes Page 32 ESCON 36/3 EC 445 ESCON Mod. 50/4 EC-S 445 ESCON Module 50/5 445 ESCON 50/5 447 DEC Module 50/5 449 EPOS4 50/5 453 EPOS4 Mod./Comp. 50/5 453 EPOS2 P 24/5 464 MAXPOS 50/5 468
Screw Drive Ø32 mm Page 374–378		

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
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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 ¹	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 ²	23	23	23

Specifications

Thermal data	
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
Mechanical data (preloaded ball bearings)	
23 Max. speed	10000 rpm
24 Axial play at axial load < 9.0 N	0 mm
> 9.0 N	0.15 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

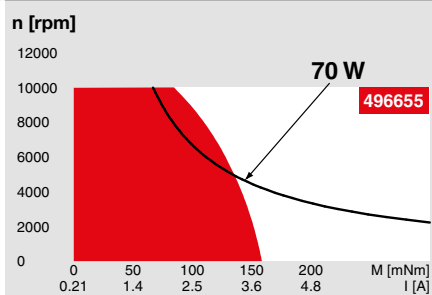
Connector Article number	
Molex	39-01-2040

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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

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

Overview on page 28–36

Planetary Gearhead
 Ø42 mm
 3 - 15 Nm
 Page 355



Recommended Electronics:

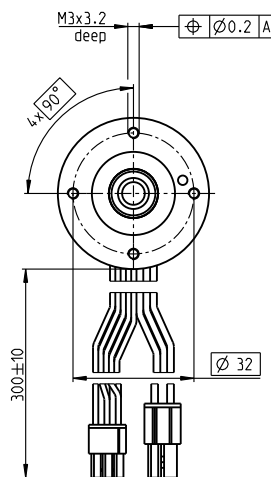
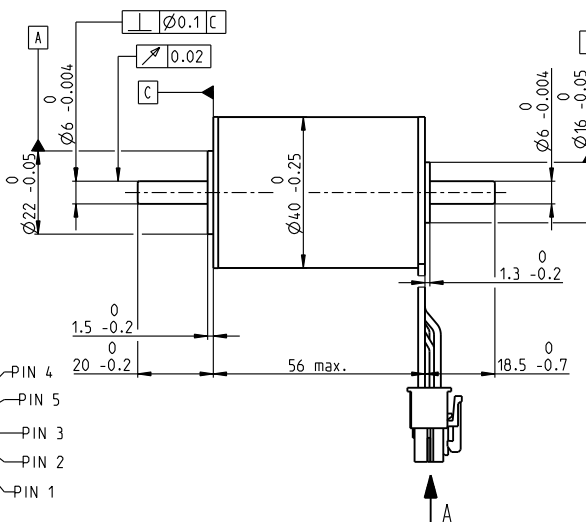
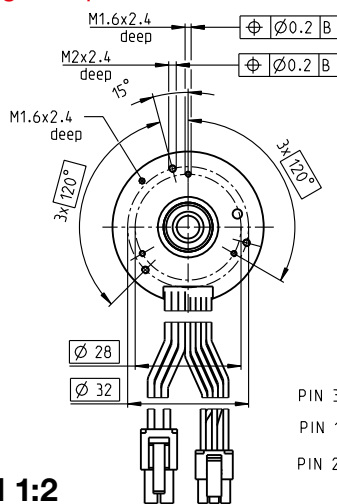
Notes	Page 32
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON 50/5	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder 16 EASY

- 128 - 1024 CPT, 3 channels
Page 409
- Encoder 16 EASY Absolute**
4096 steps
Page 411
- Encoder 16 RIO**
1024 - 32768 CPT, 3 channels
Page 424
- Encoder 2RMHF**
3000 - 5000 CTP, 3 channels
Page 425
- Encoder HEDL 5540**
500 CPT, 3 channels
Page 431
- Encoder AEDL 5810**
1024 - 5000 CPT, 3 channels
Page 427

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
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Motor Data

Values at nominal voltage		18	36	48
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 ¹	mNm	2860	3160	4330
8 Stall current	A	76.3	42.2	47.5
9 Max. efficiency	%	87	87	89
Characteristics				
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 ²	44	44	44

Specifications

Thermal data		
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	
Mechanical data (preloaded ball bearings)		
23 Max. speed	8000 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	
	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

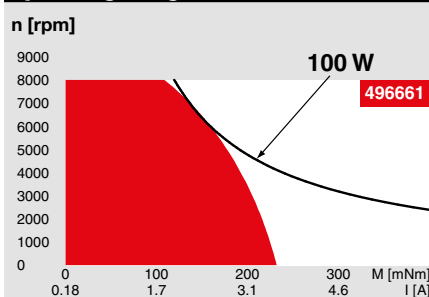
Connector Article number		
Molex	39-01-2040	

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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

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

Overview on page 28–36

Planetary Gearhead
 Ø42 mm
 3 - 15 Nm
 Page 355

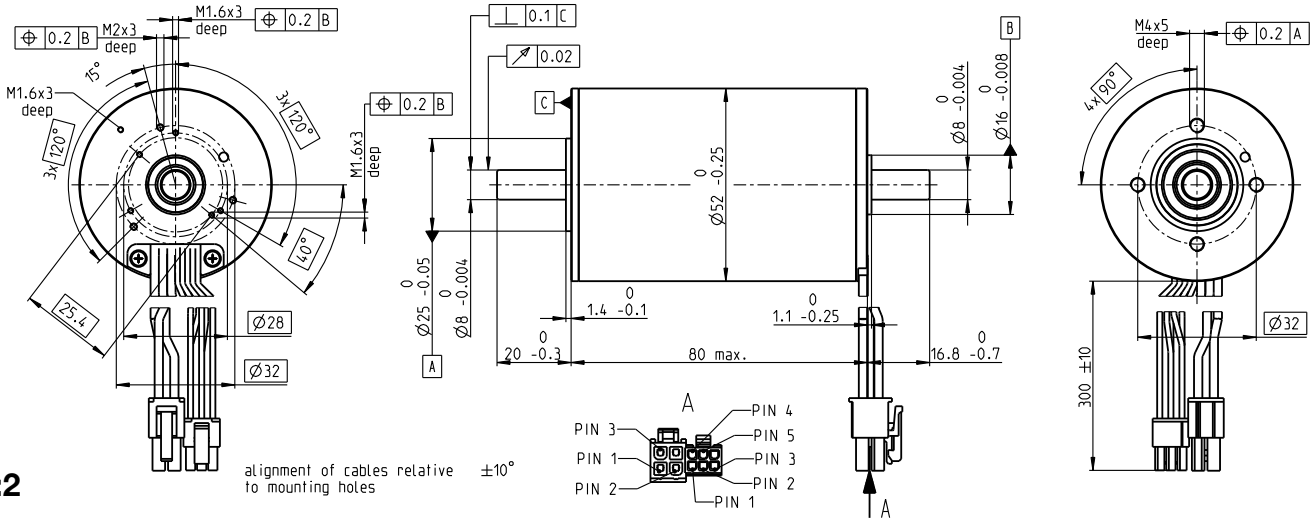


Recommended Electronics:	
Notes	Page 32
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder 16 EASY	128 - 1024 CPT, 3 channels
	Page 409
Encoder 16 EASY Absolute	4096 steps
	Page 411
Encoder 16 RIO	1024 - 32768 CPT, 3 channels
	Page 424
Encoder 2RMHF	3000 - 5000 CPT, 3 channels
	Page 425
Encoder HEDL 5540	500 CPT, 3 channels
	Page 431
Encoder AEDL 5810	1024 - 5000 CPT, 3 channels
	Page 427

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
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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 ¹	mNm	11500	13000	15900	15700
8 Stall current	A	325	268	225	169
9 Max. efficiency	%	89.3	90	90.8	90.7
Characteristics					
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 ²	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
28 Max. radial load, 5 mm from flange	6000 N
	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

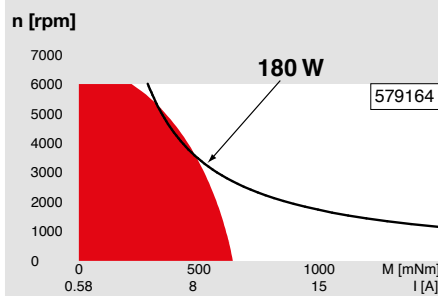
Connector Article number	
Molex	39-01-2040

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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

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

Overview on page 28–36

Planetary Gearhead
 Ø52 mm
 4 - 30 Nm
 Page 360



Recommended Electronics:

Notes	Page 32
ESCON Mod. 50/8 (HE)	446
ESCON 70/10	447
EPOS4 Module 50/8	454
EPOS4 Comp. 50/8 CAN	454
EPOS4 Module 50/15	455
EPOS4 Mod./Comp. 50/5	453
EPOS4 70/15	456
MAXPOS 50/5	468



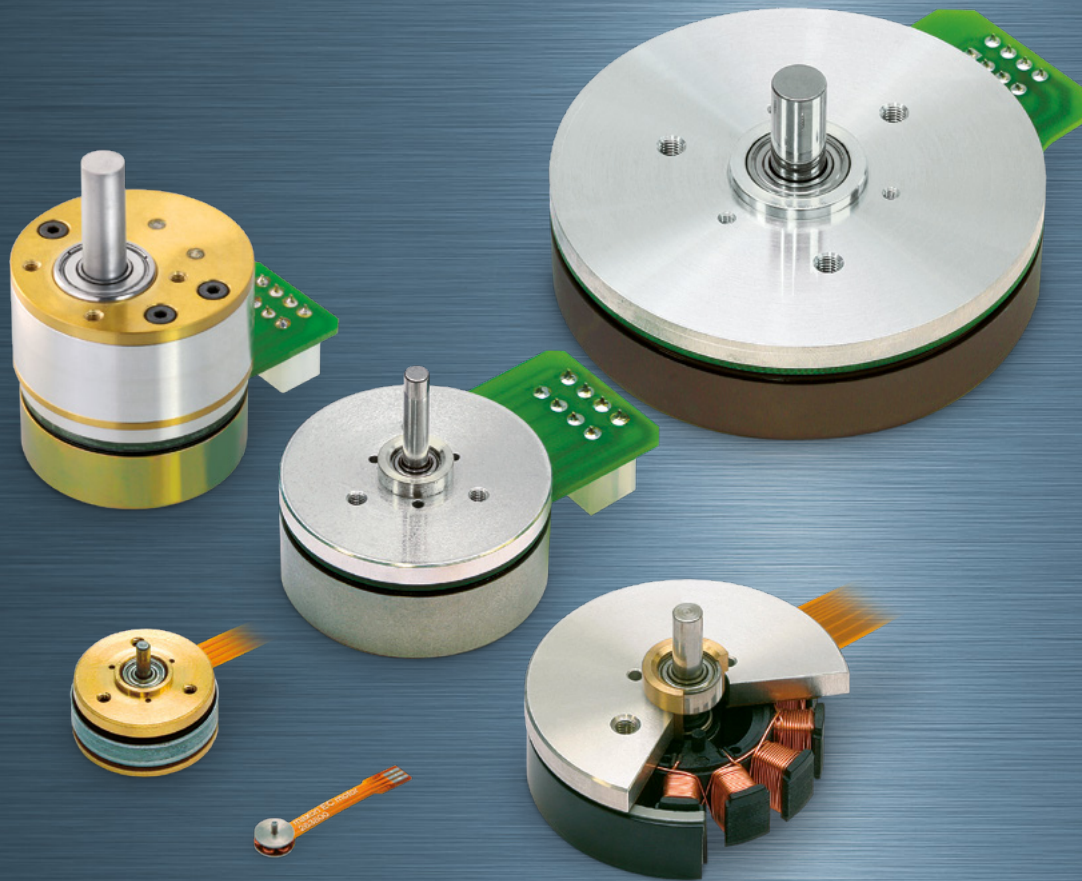
Encoder 16 EASY
 128 - 1024 CPT,
 3 channels
 Page 409

Encoder 16 EASY Absolute
 4096 steps
 Page 411

Encoder 16 RIO
 1024 - 65536 CPT,
 3 channels
 Page 424

Encoder HEDL 5540
 500 CPT,
 3 channels
 Page 431

Encoder AEDL 5810
 1024 - 5000 CPT,
 3 channels
 Page 427



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

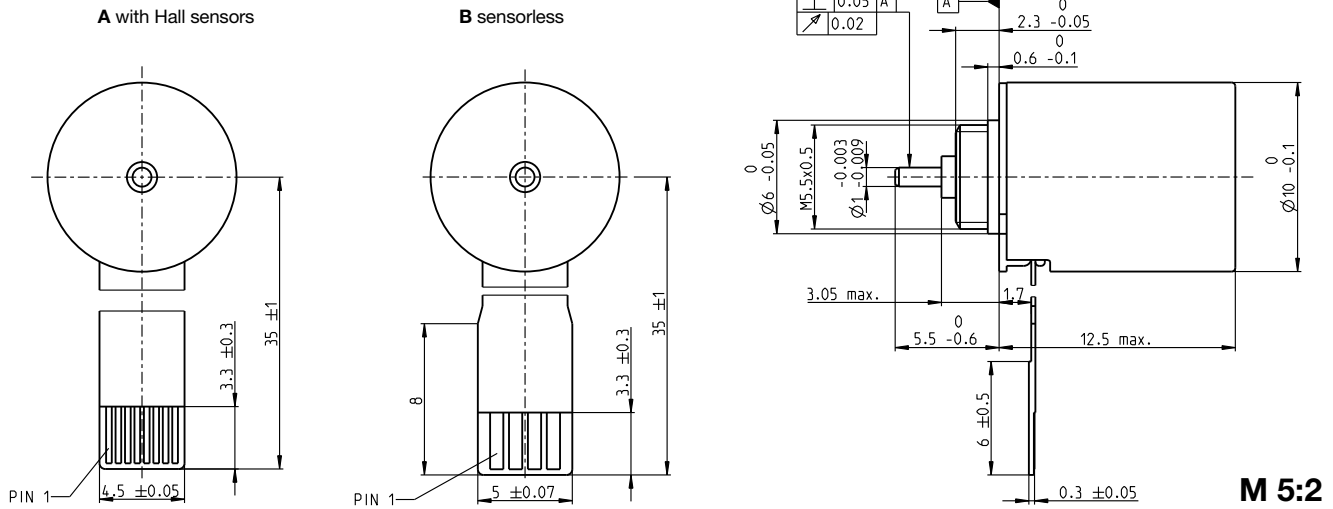
Contact
information

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.

Standard Specification No. 101	60
Explanation of the EC motors	164
ECX SPEED Program	166-200
EC Program	202-216
EC-max Program	219-227
EC-4pole Program	231-237
EC-i Program	241-251
EC flat Program	254-272
EC frameless Program	274-279

EC 9.2 flat Ø10 mm, brushless, 0.5 Watt



M 5:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers			
A with Hall sensors	362790	370444	370445
B sensorless	371119	371120	371122

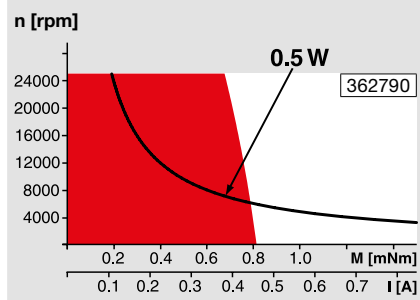
Motor Data (provisional)

Values at nominal voltage		3	4.5	6	
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 ¹	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	Ω	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 ²	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 < 0.5 N: 0 mm
 - > 0.5 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

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: 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 _{Hall} 3.8...24 VDC	Y
Pin 5	GND	
Pin 6	Hall sensor 1	
Pin 7	Hall sensor 2	
Pin 8	Hall sensor 3	

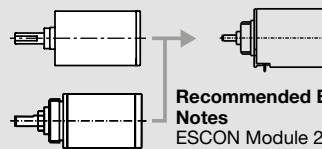
Connector	Part number	Part number
Molex	52745-0897	52207-0433
Molex		52089-0419
Tyco		84953-4

Pin for design with Hall sensors:
 FPC, 8-pol, Pitch 0.5 mm, top contact style
 Wiring diagram for Hall sensors see p. 43
Option: Sleeve bearings in place of ball bearings
¹Calculation does not include saturation effect (p. 53/164)

maxon Modular System

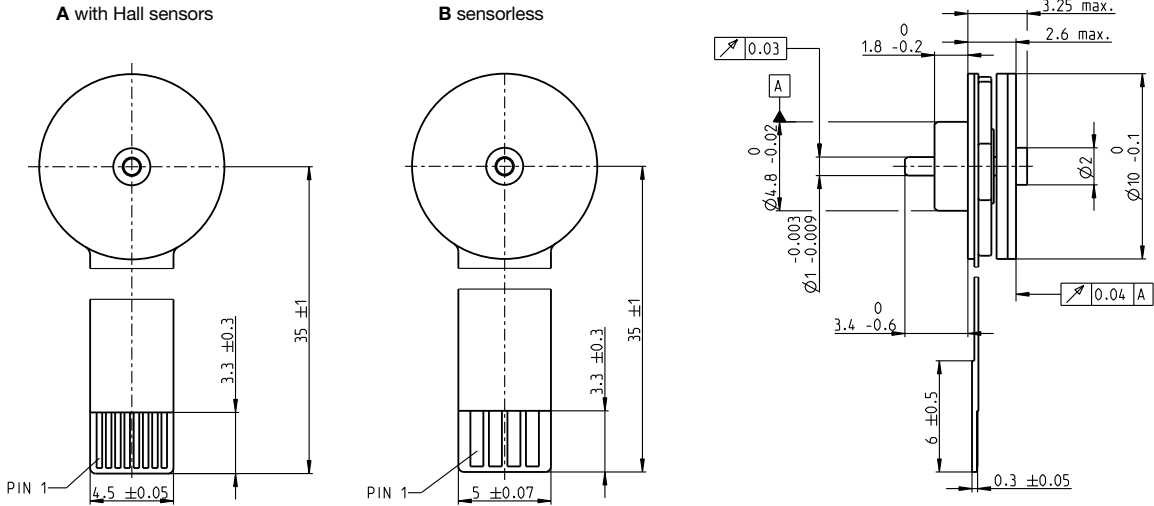
Overview on page 28–36

- Planetary Gearhead**
Ø10 mm
0.005 - 0.1 Nm
Page 319
- Planetary Gearhead**
Ø10 mm
0.01 - 0.15 Nm
Page 320



- Recommended Electronics:**
- | Notes | Page 32 |
|-------------------------|---------|
| ESCON Module 24/2 | 444 |
| ESCON 36/3 EC | 445 |
| ESCON Mod. 50/4 EC-S | 445 |
| DEC Module 24/2 | 449 |
| EPOS4 Mod./Comp. 24/1.5 | 452 |

EC 10 flat $\varnothing 10$ mm, brushless, 0.2 Watt



M 5:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

A with Hall sensors	302000
B sensorless	301999

Motor Data (provisional)

Values at nominal voltage		
1 Nominal voltage	V	4
2 No load speed	rpm	16600
3 No load current	mA	14.8
4 Nominal speed	rpm	-
5 Nominal torque	mNm	0.25
6 Nominal current	A	0.122
7 Stall torque ¹	mNm	0.202
8 Stall current	A	0.103
9 Max. efficiency	%	41
Characteristics		
10 Terminal resistance phase to phase	Ω	38.8
11 Terminal inductance phase to phase	mH	0.277
12 Torque constant	mNm/A	1.96
13 Speed constant	rpm/V	4870
14 Speed/torque gradient	rpm/mNm	96500
15 Mechanical time constant	ms	80.8
16 Rotor inertia	gcm ²	0.08

Specifications

Thermal data		
17 Thermal resistance housing-ambient	50 K/W	
18 Thermal resistance winding-housing	50 K/W	
19 Thermal time constant winding	2.22 s	
20 Thermal time constant motor	20.5 s	
21 Ambient temperature	-40...+85°C	
22 Max. winding temperature	+100°C	
Mechanical data (preloaded ball bearings)		
23 Max. speed	22000 rpm	
24 Axial play at axial load < 0.15 N	0 mm	
> 0.15 N	0.06 mm	
25 Radial play preloaded	1 N	
26 Max. axial load (dynamic)	6 N	
27 Max. force for press fits (static) (static, shaft supported)	20 N	
28 Max. radial load, 1 mm from flange	1 N	

Other specifications

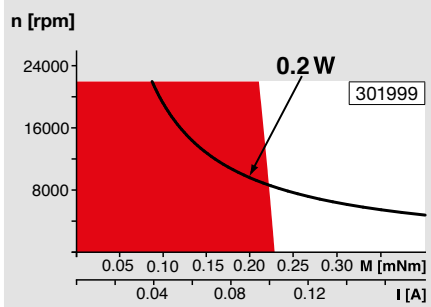
29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	0.82 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	Motor winding 3	Motor winding 1
Pin 2	Motor winding 2	Motor winding 2
Pin 3	Hall sensor 3	Motor winding 3
Pin 4	V _{Hall} 3.8...24 VDC	N.C.
Pin 5	GND	
Pin 6	Hall sensor 1	
Pin 7	Hall sensor 2	
Pin 8	Motor winding 1	
Connector	Part number	Part number
Molex	52745-0897	52207-0433
Molex		52089-0419
Tyco		84953-4

Pin for design with Hall sensors:
 FPC, 8-pol, Pitch 0.5 mm, top contact style
 Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

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

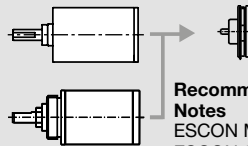
Overview on page 28-36

Planetary Gearhead

$\varnothing 10$ mm
 0.005 - 0.1 Nm
 Page 319

Planetary Gearhead

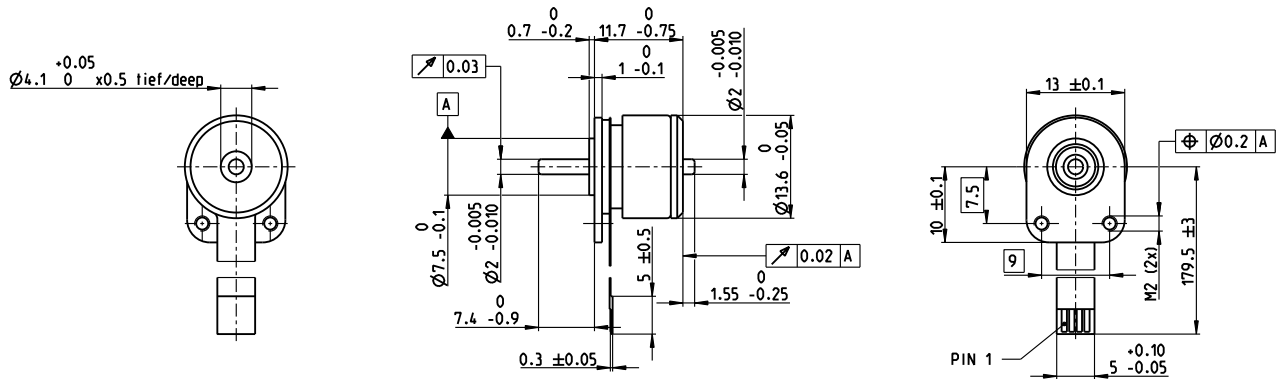
$\varnothing 10$ mm
 0.01 - 0.15 Nm
 Page 320



Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449
EPOS4 Mod./Comp. 24/1.5	452

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 ¹	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	Ω	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 ²	1.1	1.1	1.1	1.1

Specifications		Operating Range		Comments	
Thermal data				<p>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.</p> <p>Short term operation The motor may be briefly overloaded (recurring).</p> <p>Assigned power rating</p>	
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)		<p>maxon Modular System</p>		<p>Overview on page 28–36</p>	
23	Max. speed				22 000 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 / 200 N
28	Max. radial load, 5 mm from flange	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. 471 220310

Connector Part number
Tyco 84953-4

Molex 52207-0433

Molex 52089-0419

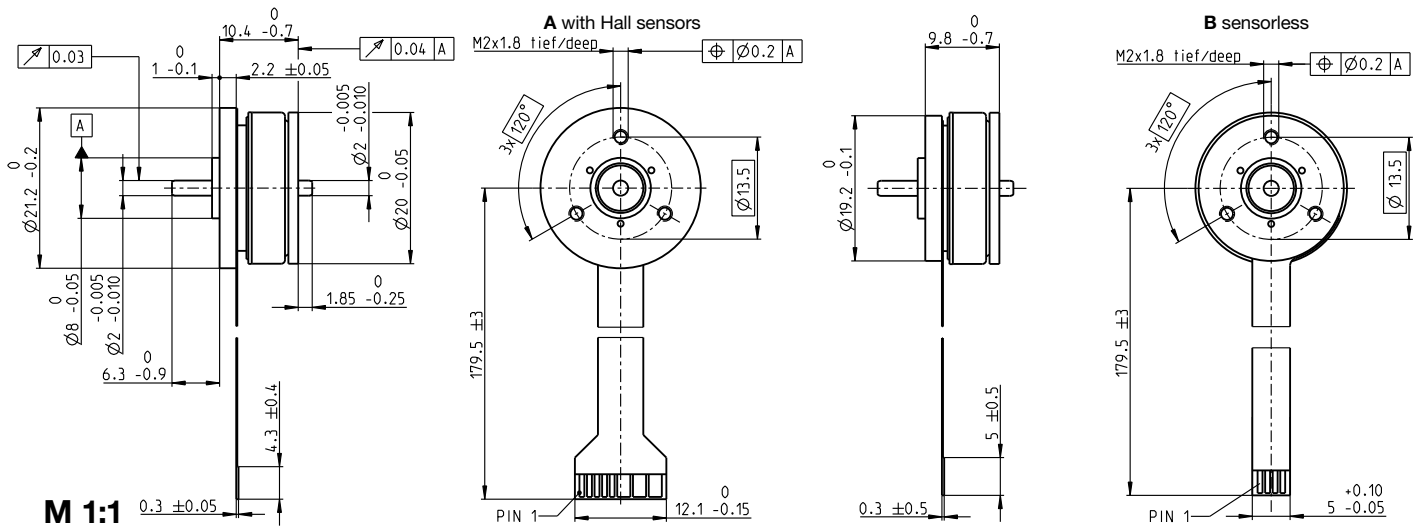
¹Calculation does not include saturation effect

(p. 53/164)

Recommended Electronics:
Notes Page 32
ESCON Mod. 50/4 EC-S 445

EC 20 flat Ø20 mm, brushless, 3 Watt

maxon flat motor



- Stock program
- Standard program
- Special program (on request)

Part Numbers

	351098	351099	351100	351101
A with Hall sensors				
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 ¹	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		6.67	9.4	23.9	77.7
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 ²	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

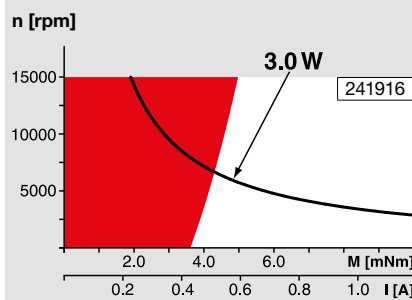
29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	15 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V _{Hall} 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. 471	220300	220310
Connector	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

Pin for design with Hall sensors:
 FPC, 11-pol, Pitch 1.0 mm, top contact style
 Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

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).

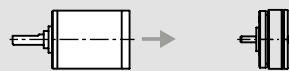
— Assigned power rating

maxon Modular System

Overview on page 28–36

Planetary Gearhead

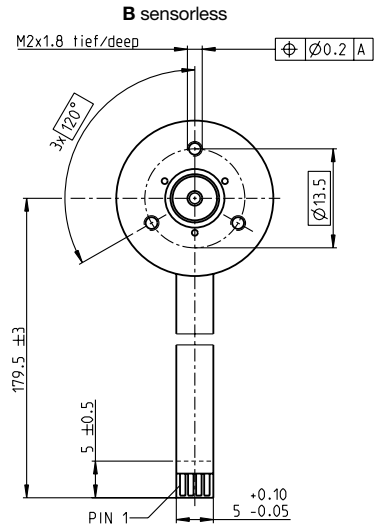
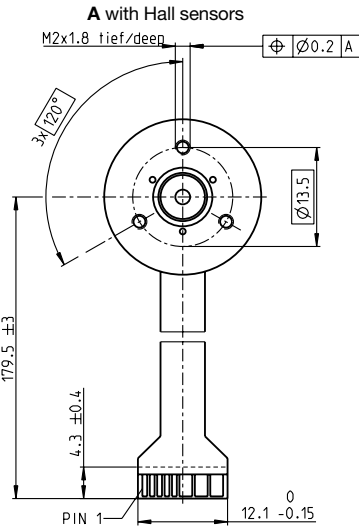
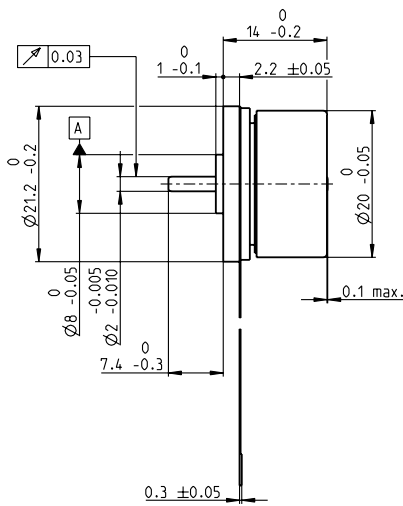
Ø22 mm
 0.5 - 2.0 Nm
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Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

EC 20 flat Ø20 mm, brushless, 5 Watt



M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	351005	351006	351007	351008
A with Hall sensors				
B sensorless	351054	351055	351056	351057

Motor Data (provisional)

Values at nominal voltage		6	9	12	24
1 Nominal voltage	V	6	9	12	24
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 ¹	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
Characteristics					
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 ²	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	

Other specifications

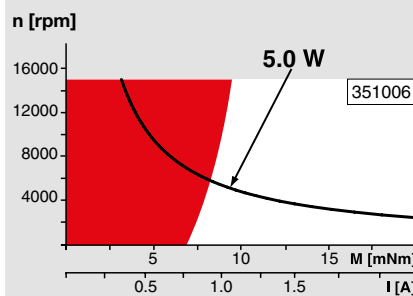
29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	22 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V _{Hall} 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. 471	220300	220310
Connector	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

Operating Range



Comments

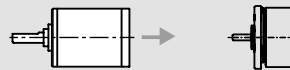
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Overview on page 28–36

Planetary Gearhead

Ø22 mm
0.5 - 2.0 Nm
Page 333/336

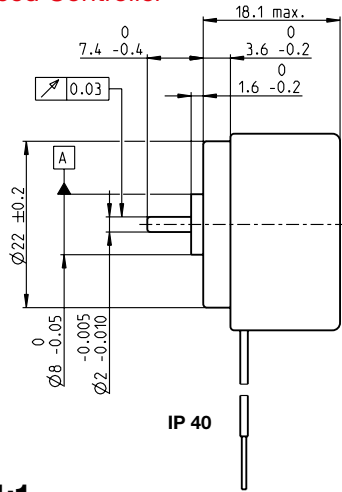


Recommended Electronics:

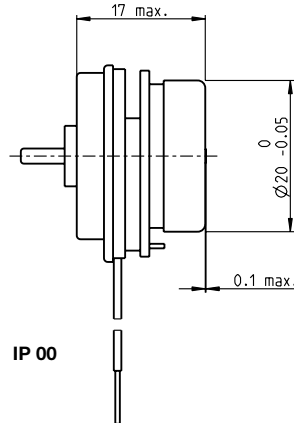
Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

EC 20 flat brushless, 2 Watt, with integrated electronics

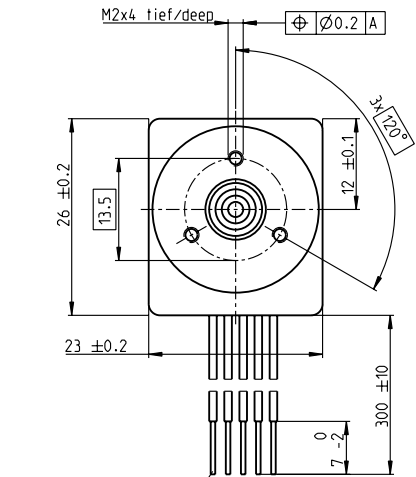
1-Q-Speed Controller



IP 40



IP 00



Kabel rot / cable red

M 1:1

- Stock program
- Standard program
- Special program (on request)

IP 40 (with cover)
IP 00 (without cover)

Part Numbers

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 _{CC}	V	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V _{CC}	= V _{CC}	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 ²
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)

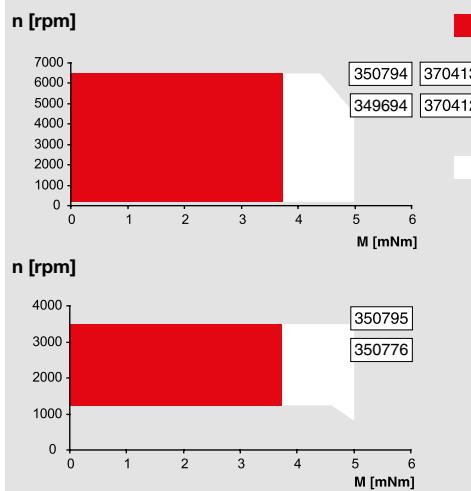
red +V_{CC} 10...28 VDC
black GND

Connection 5 wire version (Cable AWG 28)

red +V_{CC} 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

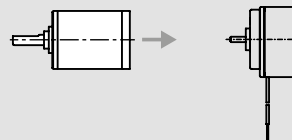
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

maxon Modular System

Overview on page 28-33

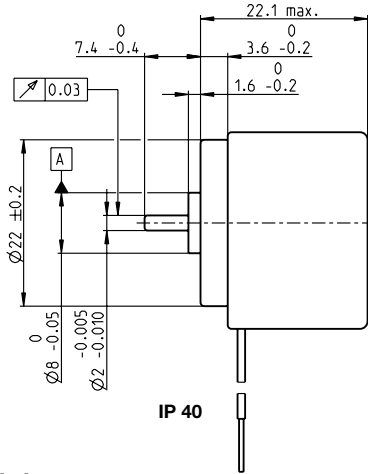
Planetary Gearhead

Ø22 mm
0.5 - 2.0 Nm
Page 333/336

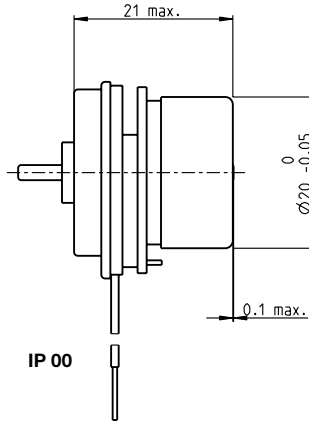


EC 20 flat brushless, 5 Watt, with integrated electronics

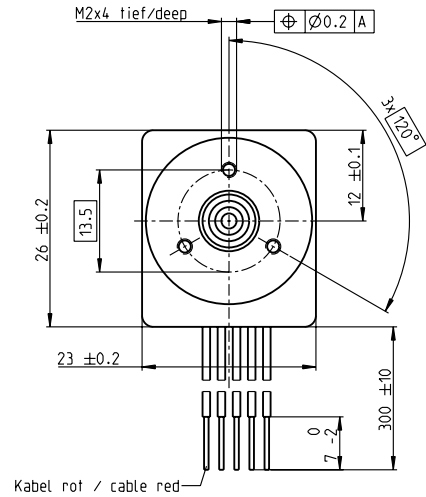
1-Q-Speed Controller



IP 40



IP 00



Kabel rot / cable red

M 1:1

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	2 wire version		5 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 _{CC}	V	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V _{CC}	= V _{CC}	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 gcm²
 - 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)

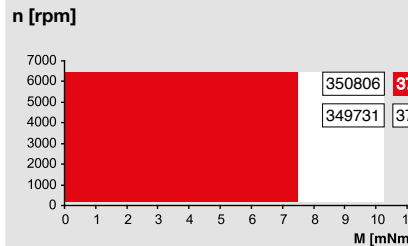
- red +V_{CC} 10...28 VDC
- black GND

Connection 5 wire version (Cable AWG 28)

- red +V_{CC} 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

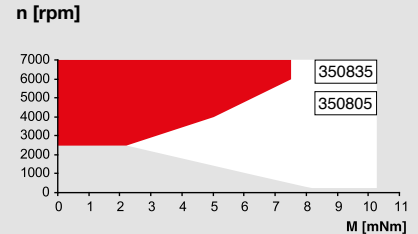
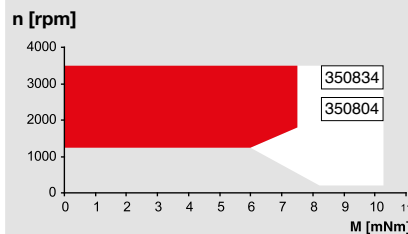
Comments



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.

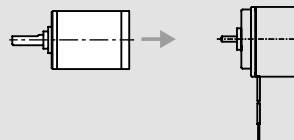


maxon Modular System

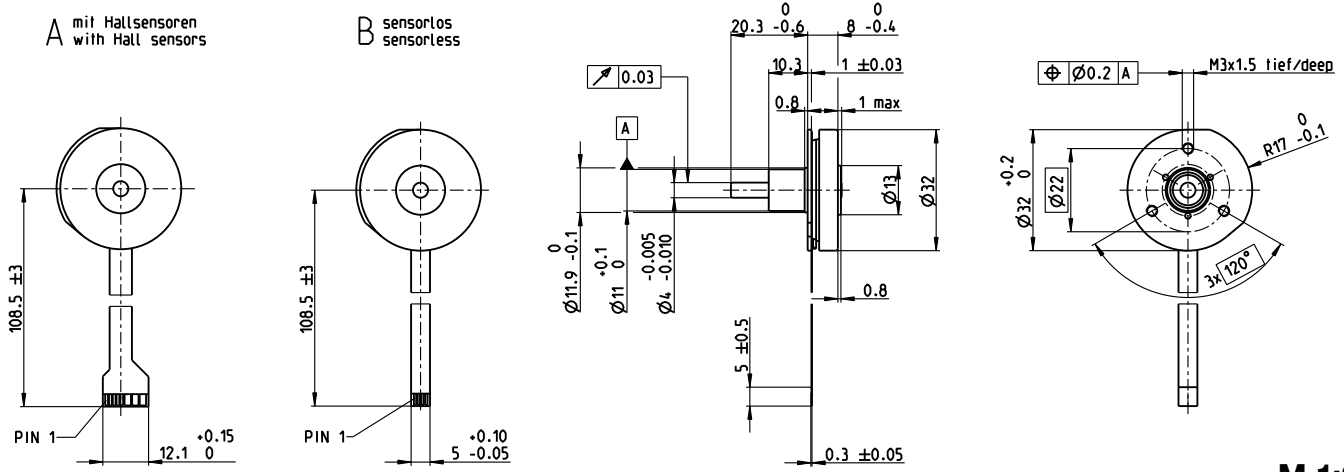
Overview on page 28–33

Planetary Gearhead

- Ø22 mm
- 0.5 - 2.0 Nm
- Page 333/336



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				
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 ¹	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 ²	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
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, 15 mm from flange	1000 N
	10.5 N

Other specifications

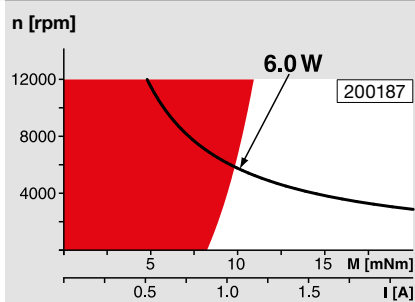
29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	32 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V _{Hall} 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. 471	220300	220310
Connector	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

Pin for design with Hall sensors:
 FPC, 11-pol, Pitch 1.0 mm, top contact style
 Wiring diagram for Hall sensors see p. 43
¹Calculation does not include saturation effect (p. 53/164)

Operating Range



Comments

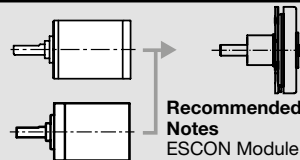
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power rating**

maxon Modular System

Overview on page 28–36

Planetary Gearhead
 Ø22 mm
 0.5 - 1.0 Nm
 Page 333

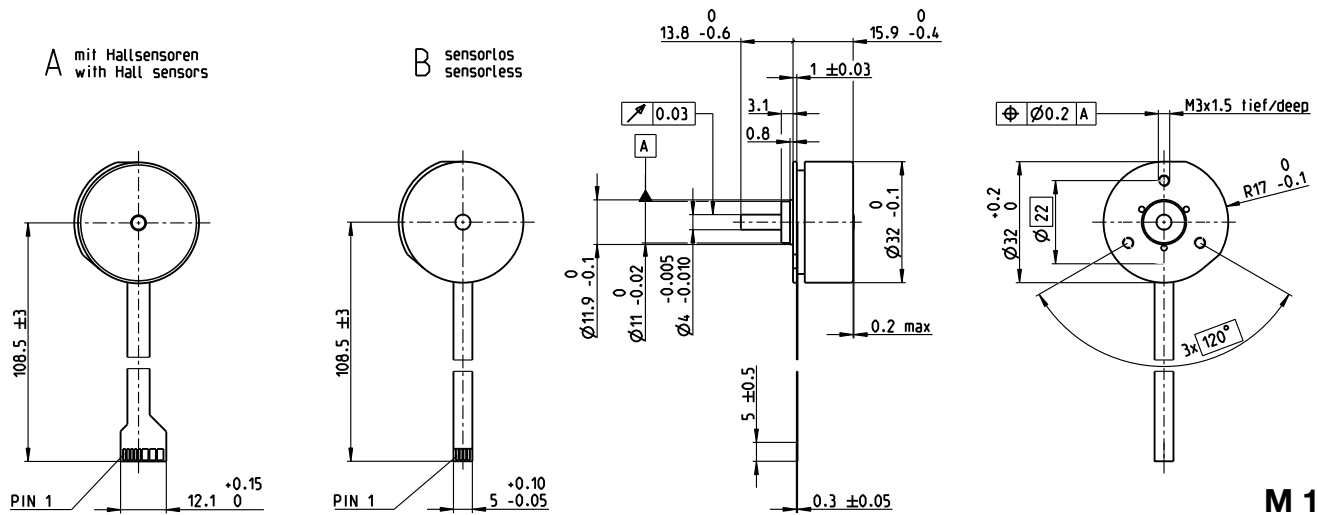
Planetary Gearhead
 Ø22 mm
 0.5 - 2.0 Nm
 Page 336



Recommended Electronics:
Notes Page 342

ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449
EPOS4 Mod./Comp. 24/1.5	452
MAXPOS 50/5	468

EC 32 flat $\varnothing 32$ mm, brushless, 15 Watt



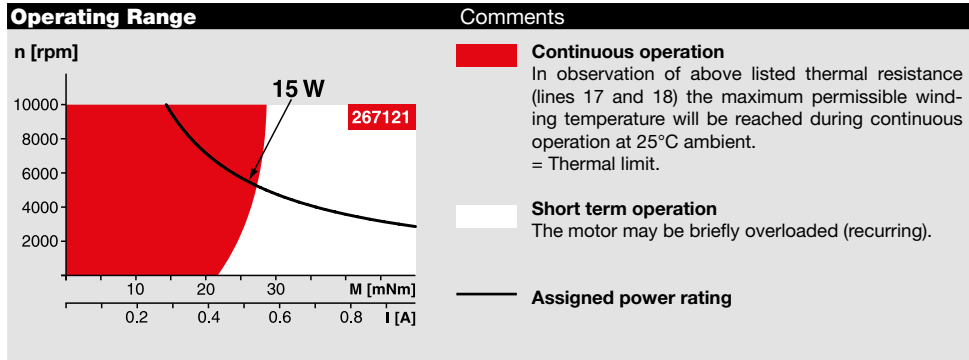
M 1:2

- 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 ¹	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 ²	35	35	35	35

Specifications	
Thermal data	
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
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. 0.6 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



- 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**

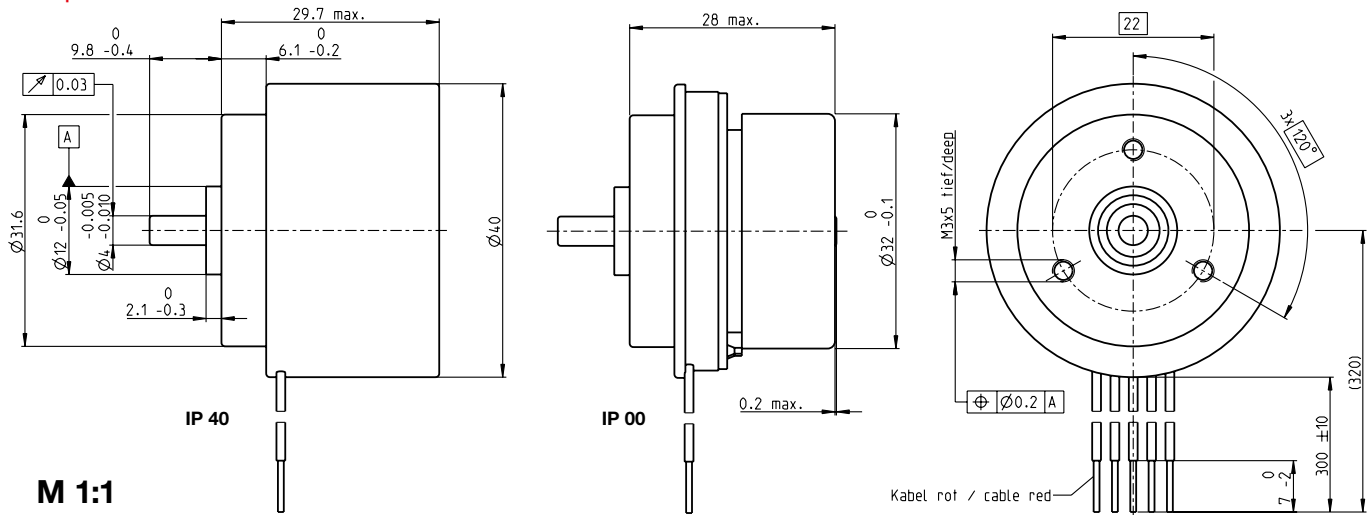
Other specifications		
29 Number of pole pairs	4	
30 Number of phases	3	
31 Weight of motor	57 g	
Values listed in the table are nominal.		
Connection		
Pin 1	with Hall sensors	sensorless
Pin 2	V _{Hall} 3.5...24 VDC	Motor winding 1
Pin 3	Hall sensor 3	Motor winding 2
Pin 4	Hall sensor 1	Motor winding 3
Pin 5	Hall sensor 2	neutral point
Pin 6	GND	
Pin 7	Motor winding 3	
Pin 8	Motor winding 2	
Pin 9	Motor winding 1	
Adapter		
see p. 471	Part number	Part number
	220300	220310
Connector		
	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419
Pin for design with Hall sensors: FPC, 11-pol, Pitch 1.0 mm, top contact style Wiring diagram for Hall sensors see p. 43 ¹ Calculation does not include saturation effect (p. 53/164)		

maxon Modular System		Overview on page 28-36
Planetary Gearhead	$\varnothing 32$ mm 0.75 - 6 Nm Page 344/347	
Spur Gearhead	$\varnothing 38$ mm 0.1 - 0.6 Nm Page 353	
Recommended Electronics:		
Notes		Page 32
ESCON Module 24/2		444
ESCON 36/3 EC		445
ESCON Mod. 50/4 EC-S		445
ESCON Module 50/5		445
ESCON 50/5		447
DEC Module 24/2		449
DEC Module 50/5		449
EPOS4 Mod./Comp. 24/1.5		452
EPOS4 50/5		453
EPOS4 Mod./Comp. 50/5		453
MAXPOS 50/5		468

EC 32 flat brushless, 15 Watt, with integrated electronics

1-Q-Speed Controller

maxon flat motor



M 1:1

- Stock program
- Standard program
- Special program (on request)

IP 40 (with cover)
IP 00 (without cover)

Part Numbers

		5 wire version		
		2 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 _{CC}	V	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V _{CC}	= V _{CC}	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 gcm²
 - 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 37 N
- Other specifications**
- 31 Weight of motor 91 g
 - 32 Direction of rotation Clockwise (CW)

Values listed in the table are nominal.

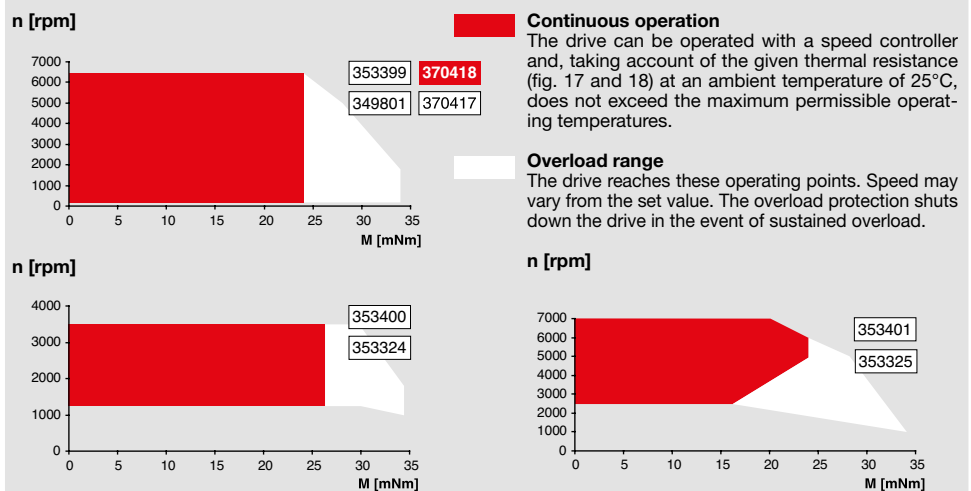
Protective functions

Overload protection, blockage protection, inverse-polarity protection, thermal overload protection, low/high voltage cut-off

Connection 2 wire version (Cable AWG 24)
red +V_{CC} 10...28 VDC
black GND

Connection 5 wire version (Cable AWG 24)
red +V_{CC} 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



maxon Modular System

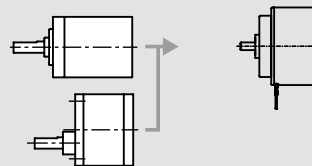
Overview on page 28-33

Planetary Gearhead

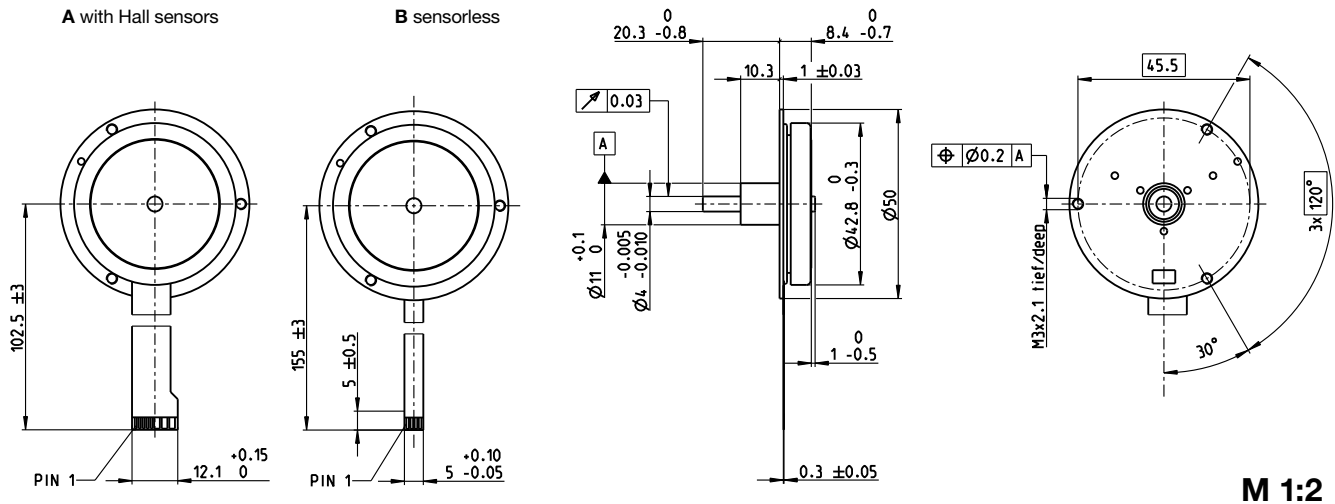
Ø32 mm
0.75 - 6 Nm
Page 344/347

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 353



EC 45 flat Ø42.8 mm, brushless, 12 Watt



- Stock program
- Standard program
- Special program (on request)

		Part Numbers					
A with Hall sensors	200188		339275		339276		
B sensorless		200141		339277		339278	

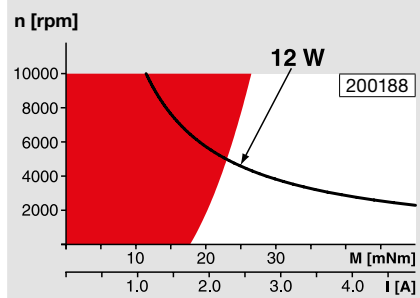
Motor Data

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 ¹	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	Ω	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 ²	52.3	52.3	52.3	52.3	52.3	52.3

Specifications

Thermal data	
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
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. 0.6 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, 15 mm from flange	12.5 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	57 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V _{Hall} 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 kΩ) on pin 1
Wiring diagram for Hall sensors see p. 43

Adapter	Part number	Part number
see p. 471	220300	220310

Connector	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
¹Calculation does not include saturation effect (p. 53/164)

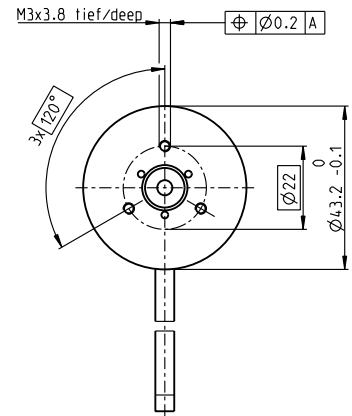
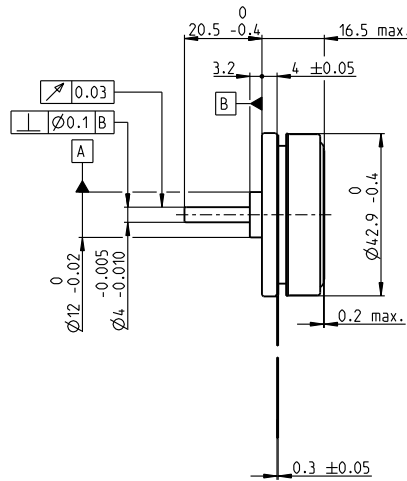
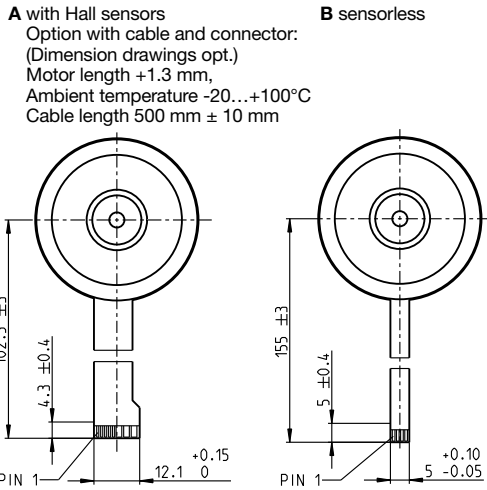
maxon Modular System

Overview on page 28–36

Recommended Electronics:	
Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
DEC Module 24/2	449
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
MAXPOS 50/5	468

EC 45 flat $\varnothing 42.9$ mm, brushless, 30 Watt

maxon flat motor



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

A with Hall sensors
Option with Cable and Connector

B sensorless

200142	339281	339282
387266	400527	400580
200189	339283	339284

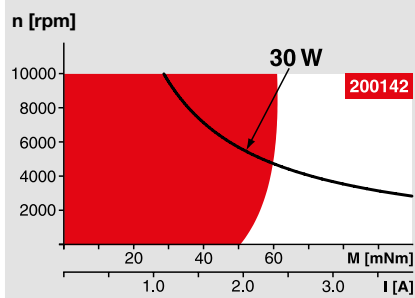
Motor Data

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 ¹	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	Ω	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 ²	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: 1000 N
 - 18 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: 75 g

Values listed in the table are nominal.

Connection	with Hall sensors	sensorless
Pin 1	V _{Hall} 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 Ω) on pin 1
Wiring diagram for Hall sensors see p. 43

Adapter	Part number	Part number
see p. 471	220300	220310

Connector	Part number	Part number
Tyco	1-84953-1	84953-4
Molex	52207-1133	52207-0433
Molex	52089-1119	52089-0419

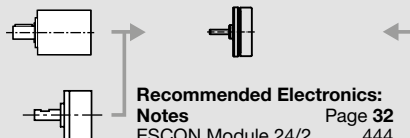
Pin for design with Hall sensors:
FPC, 11-pol, Pitch 1.0 mm, top contact style
¹Calculation does not include saturation effect (p. 53/164)

maxon Modular System

Overview on page 28–36

Planetary Gearhead

- $\varnothing 42$ mm
 - 3 - 15 Nm
 - Page 356
- ### Spur Gearhead
- $\varnothing 45$ mm
 - 0.5 - 2.0 Nm
 - Page 358

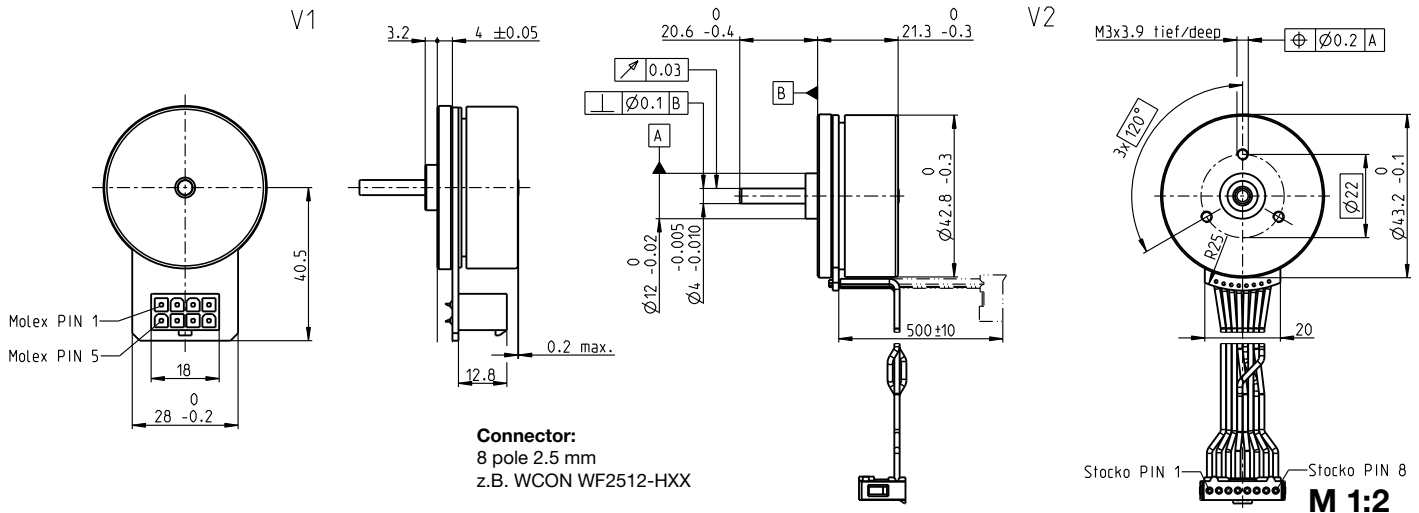


Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON 50/5	447
DEC Module 24/2	449
DEC Module 50/5	449
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

for motor type A:
Encoder MILE
256 - 2048 CPT,
2 channels
Page 402

EC 45 flat $\varnothing 42.8$ mm, brushless, 50 Watt



Connector:
8 pole 2.5 mm
z.B. WCON WF2512-HXX

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	339285	251601	339286	339287
V1 with Hall sensors				
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 ¹	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	Ω	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 ²	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	
26	Max. axial load (dynamic)	3.8 N	
27	Max. force for press fits (static) (static, shaft supported)	53 N	
		1000 N	
28	Max. radial load, 5 mm from flange	20 N	

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	V1	V2 (AWG 24)
Pin 1	Hall sensor 1*	Motor winding 1
Pin 2	Hall sensor 2*	Motor winding 2
Pin 3	V _{Hall} 4.5...18 VDC	Motor winding 3
Pin 4	Motor winding 3	V _{Hall} 4.5...18 VDC
Pin 5	Hall sensor 3*	GND
Pin 6	GND	Hall sensor 1*
Pin 7	Motor winding 1	Hall sensor 2*
Pin 8	Motor winding 2	Hall sensor 3*

*Internal pull-up (7...13 k Ω) on pin 3

Wiring diagram for Hall sensors see p. 43

Cable for V1

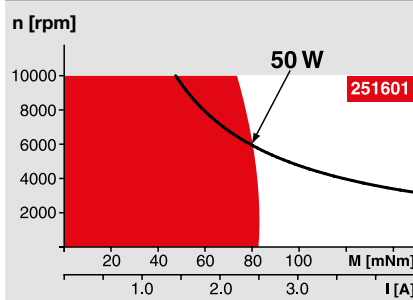
Connection cable Universal, L = 500 mm	339380
Connection cable to EPOS, L = 500 mm	354045

V2

21	Ambient temperature	-20...+100°C
----	---------------------	--------------

¹Calculation does not include saturation effect (p. 53/164)

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

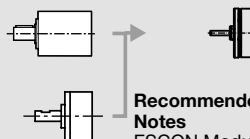
Overview on page 28–36

Planetary Gearhead

$\varnothing 42$ mm
3 - 15 Nm
Page 356

Spur Gearhead

$\varnothing 45$ mm
0.5 - 2.0 Nm
Page 358



Recommended Electronics:

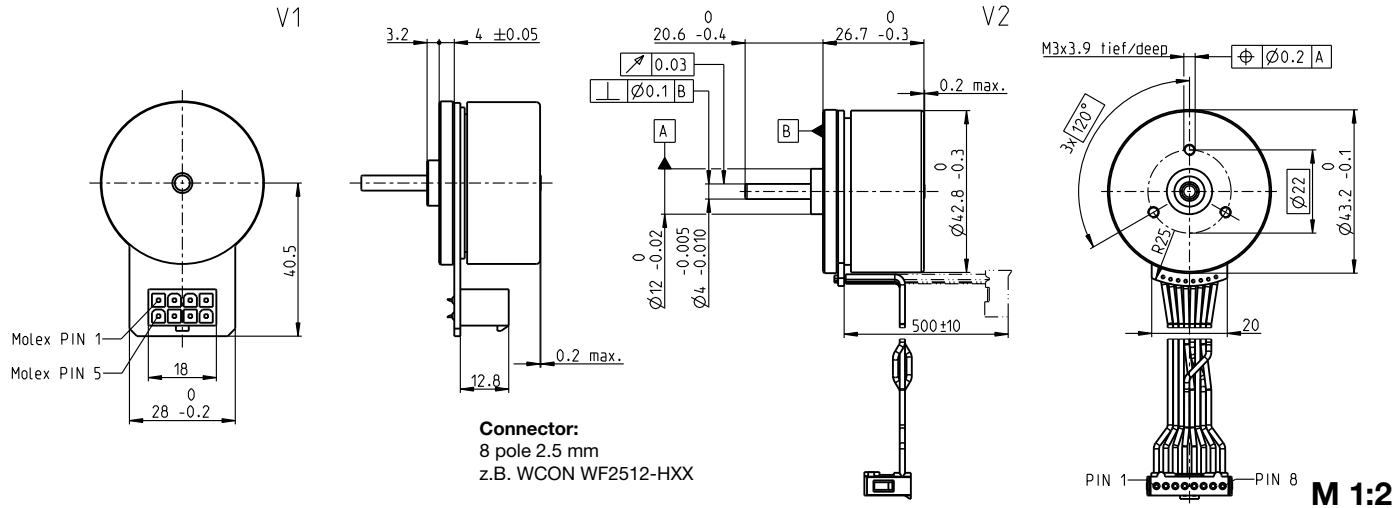
Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON 50/5	447
DEC Module 24/2	449
DEC Module 50/5	449
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

Encoder MILE

256 - 2048 CPT,
2 channels
Page 402

EC 45 flat $\varnothing 42.8$ mm, brushless, 70 Watt

maxon flat motor



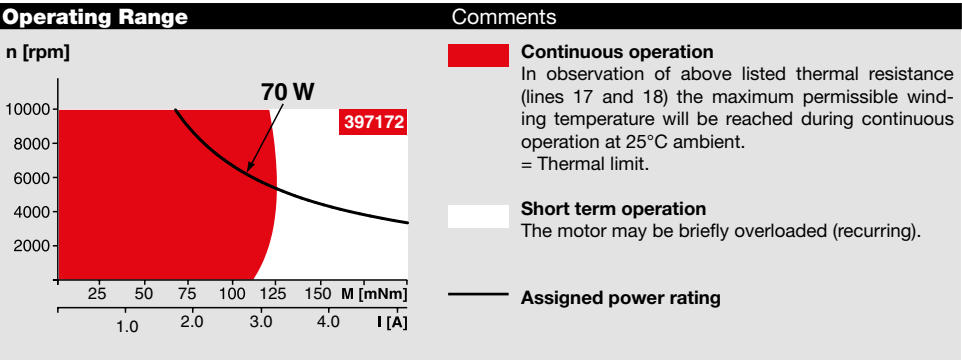
Connector:
8 pole 2.5 mm
z.B. WCON WF2512-HXX

- Stock program
- Standard program
- Special program (on request)

Part Numbers				
V1 with Hall sensors	397172	402685	402686	402687
V2 with Hall sensors and cables	411812	411814	411815	411816

Motor Data (provisional)					
Values at nominal voltage					
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 ¹	mNm	1460	1170	1100	915
8 Stall current	A	39.5	25.8	20.7	6.97
9 Max. efficiency	%	85	84	83	84
Characteristics					
10 Terminal resistance phase to phase	Ω	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	8.07	10.3	11.1	7.24
16 Rotor inertia	gcm ²	181	181	181	181

Specifications		
Thermal data		
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	
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	
26 Max. axial load (dynamic)	3.8 N	
27 Max. force for press fits (static) (static, shaft supported)	50 N	
28 Max. radial load, 5 mm from flange	1000 N	
	21 N	



Other specifications		
29 Number of pole pairs	8	
30 Number of phases	3	
31 Weight of motor	141 g	

Values listed in the table are nominal.

Connection V1		V2 (AWG 24)	
Pin 1	Hall sensor 1*	Motor winding 1	
Pin 2	Hall sensor 2*	Motor winding 2	
Pin 3	V _{Hall} 4.5 ... 18 VDC	Motor winding 3	
Pin 4	Motor winding 3	V _{Hall} 4.5 ... 18 VDC	
Pin 5	Hall sensor 3*	GND	
Pin 6	GND	Hall sensor 1*	
Pin 7	Motor winding 1	Hall sensor 2*	
Pin 8	Motor winding 2	Hall sensor 3*	

*Internal pull-up (7 ... 13 k Ω) on pin 3
Wiring diagram for Hall sensors see p. 43

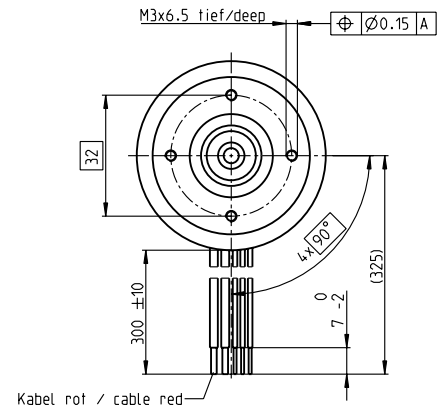
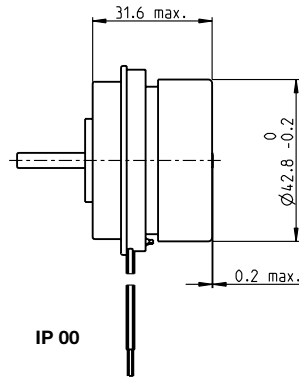
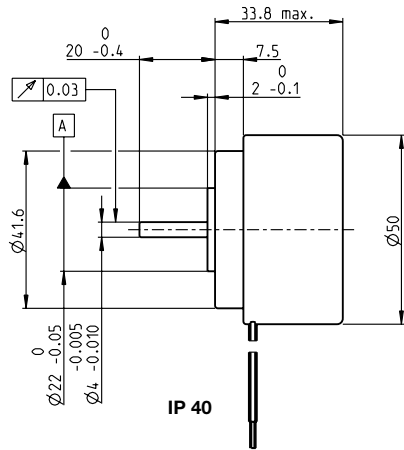
Cable for V1		
Connection cable Universal, L = 500 mm	339380	
Connection cable to EPOS, L = 500 mm	354045	

maxon Modular System		Overview on page 28–36
<p>Planetary Gearhead $\varnothing 42$ mm 3 - 15 Nm Page 356</p> <p>Spur Gearhead $\varnothing 45$ mm 0.5 - 2.0 Nm Page 358</p>		<p>Encoder MILE 256 - 2048 CPT, 2 channels Page 402</p> <p>Recommended Electronics: Notes Page 32</p> <ul style="list-style-type: none"> ESCON 36/3 EC 445 ESCON Mod. 50/4 EC-S 445 ESCON Module 50/5 445 ESCON 50/5 447 DEC Module 50/5 449 EPOS4 50/5 453 EPOS4 Mod./Comp. 50/5 453 EPOS2 P 24/5 464 MAXPOS 50/5 468

V2
21 Ambient temperature -20 ... +100°C
¹Calculation does not include saturation effect (p. 53/164)

EC 45 flat brushless, 30 Watt, with integrated electronics

1-Q-Speed Controller



M 1:2

- Stock program
- Standard program
- Special program (on request)

IP 40 (with cover)
IP 00 (without cover)

Part Numbers		2 wire version		5 wire version			
				Enable		Direction	
		353518	353519	350909	352886	370425	370424
		353516	353517				

Motor Data (provisional)

Values at nominal voltage		24	24	24	24	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 _{CC}	V	10...28	10...28	10...28	10...28	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V _{CC}	= V _{CC}	= V _{CC}	= V _{CC}	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 gcm²
 - 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

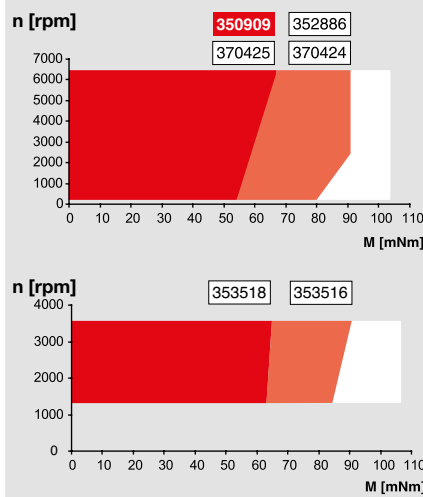
Connection 2 wire version (Cable AWG 18)

- red +V_{CC} 10...28 VDC
- black GND

Connection 5 wire version (Cable AWG 18/24)

- red +V_{CC} 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

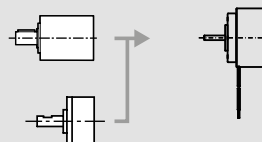
Overview on page 28-33

Planetary Gearhead

- Ø42 mm
- 3 - 15 Nm
- Page 356

Spur Gearhead

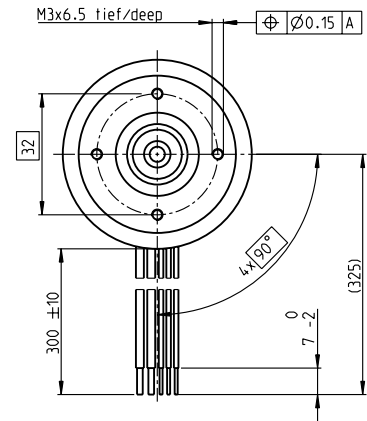
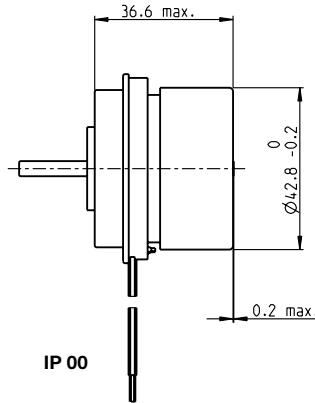
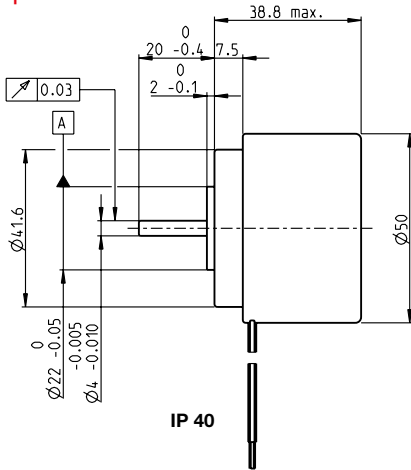
- Ø45 mm
- 0.5 - 2.0 Nm
- Page 358



EC 45 flat brushless, 50 Watt, with integrated electronics

1-Q-Speed Controller

maxon flat motor



M 1:2

- Stock program
- Standard program
- Special program (on request)

	Part Numbers					
	2 wire version		5 wire version Enable		5 wire version Direction	
IP 40 (with cover)	353526		350910		370427	
IP 00 (without cover)		353524		352887		370426

Motor Data (provisional)

Values at nominal voltage		Speed	Speed	Speed	Speed	Speed	Speed
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		Speed	Speed	Speed	Speed	Speed	Speed
35 Type of control							
36 Supply voltage +V _{CC}	V	10...28	10...28	10...28	10...28	10...28	10...28
37 Speed set value input	V	= V _{CC}	= V _{CC}	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 gcm²
 - 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 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

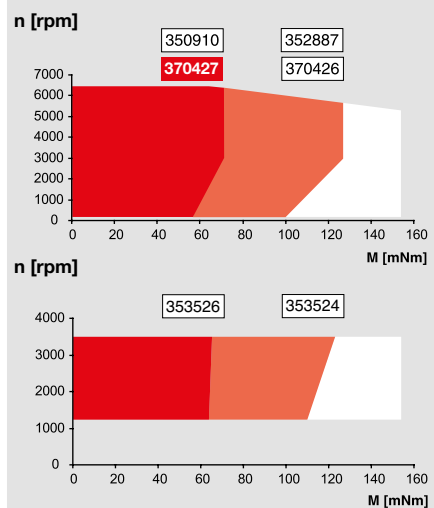
Connection 2 wire version (Cable AWG 18)

- red +V_{CC} 10...28 VDC
- black GND

Connection 5 wire version (Cable AWG 18/24)

- red +V_{CC} 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

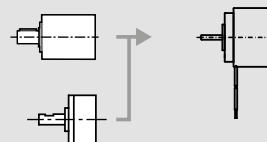
- Continuous operation**
The drive can be operated with a speed controller and, taking account of the given thermal resistance (fig. 17 and 18) at an ambient temperature of 25°C, does not exceed the maximum permissible operating temperatures.
- Overload range**
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

maxon Modular System

Overview on page 28-33

Planetary Gearhead

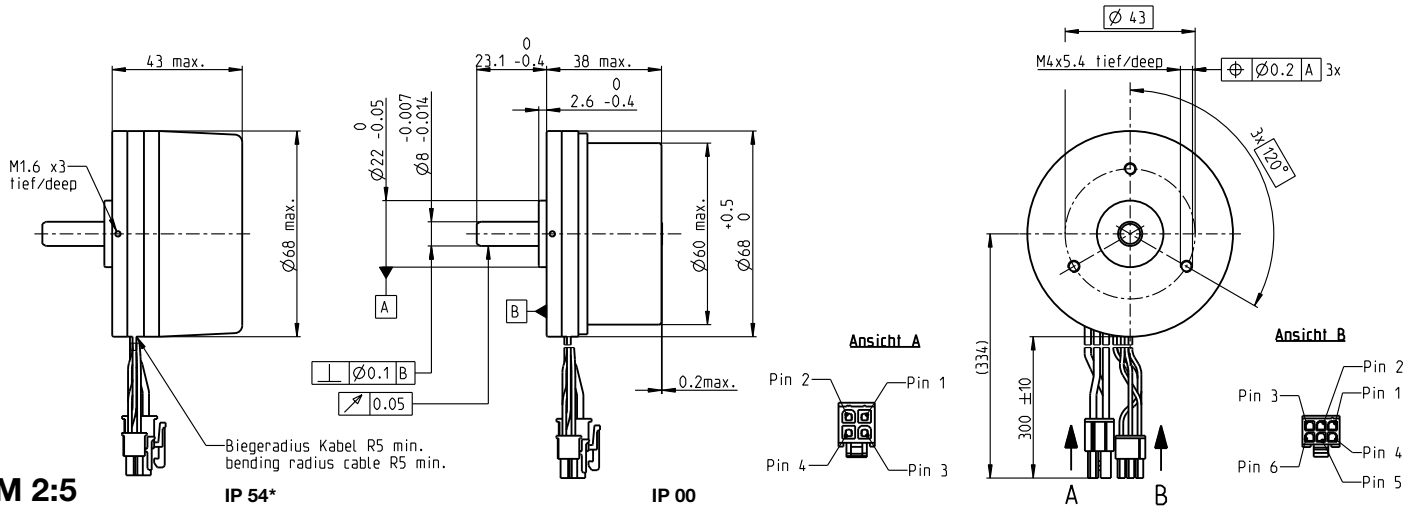
- Ø42 mm
- 3 - 15 Nm
- Page 356



Spur Gearhead

- Ø45 mm
- 0.5 - 2.0 Nm
- Page 358

EC 60 flat $\varnothing 68$ mm, brushless, 100 Watt



M 2:5

IP 54*

IP 00

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
IP 54* (with cover)	412819
IP 00 (without cover)	412823
	408057
	411678
	412821
	412825

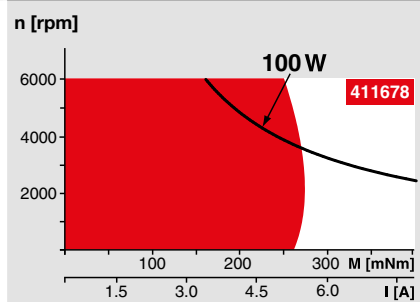
Motor Data

Values at nominal voltage		412819	412823	408057	411678	412821	412825
1 Nominal voltage	V	12	12	24	24	48	48
2 No load speed	rpm	3710	3710	4250	4250	3970	3970
3 No load current	mA	671	671	419	419	187	187
4 Nominal speed	rpm	3260	3170	3840	3740	3580	3490
5 Nominal torque (max. continuous torque)	mNm	231	279	227	289	257	319
6 Nominal current (max. continuous current)	A	7.81	9.25	4.43	5.47	2.3	2.78
7 Stall torque ¹	mNm	2850	2850	4180	4180	5010	5010
8 Stall current	A	93.5	93.5	78.2	78.2	43.8	43.8
9 Max. efficiency	%	84	84	86	86	88	88
Characteristics							
10 Terminal resistance phase to phase	Ω	0.128	0.128	0.307	0.307	1.1	1.1
11 Terminal inductance phase to phase	mH	0.0615	0.0615	0.188	0.188	0.864	0.864
12 Torque constant	mNm/A	30.5	30.5	53.4	53.4	114	114
13 Speed constant	rpm/V	313	313	179	179	83.4	83.4
14 Speed/torque gradient	rpm/mNm	1.32	1.32	1.03	1.03	0.798	0.798
15 Mechanical time constant	ms	16.7	16.7	13	13	10.1	10.1
16 Rotor inertia	gcm ²	1210	1210	1210	1210	1210	1210

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 4.34 (2.5) K/W
 - 18 Thermal resistance winding-housing 3.5 K/W
 - 19 Thermal time constant winding 40 s
 - 20 Thermal time constant motor 155 (86.9) 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
 - 26 Max. axial load (dynamic) 12 N
 - 27 Max. force for press fits (static) (static, shaft supported) 170 N
 - 8000 N
 - 28 Max. radial load, 5 mm from flange 112 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 7
- 30 Number of phases 3
- 31 Weight of motor 470 g

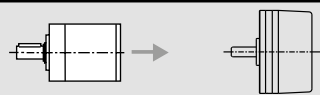
Values listed in the table are nominal.
Connection motor (Cable AWG 18)
 red Motor winding 1 Pin 1
 black Motor winding 2 Pin 2
 white Motor winding 3 Pin 3
 N.C. N.C. Pin 4

Connector Part number
 Molex 39-01-2040
Connection sensors (Cable AWG 28)
 grey Hall sensor 1 Pin 1
 grey Hall sensor 2 Pin 2
 grey Hall sensor 3 Pin 3
 grey GND Pin 4
 blue V_{Hall} 4.5...18 VDC Pin 5
 N.C. N.C. Pin 6

Connector Part number
 Molex 430-25-0600
 Wiring diagram for Hall sensors see p. 43
 * Protection class only when installed with flange-side seal.
¹ Calculation does not include saturation effect (p. 53/164)

maxon Modular System

Planetary Gearhead
 $\varnothing 52$ mm
 4 - 30 Nm
 Page 360



Recommended Electronics:

Notes	Page 32
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Module 50/8	454
EPOS4 Comp. 50/8 CAN	454
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

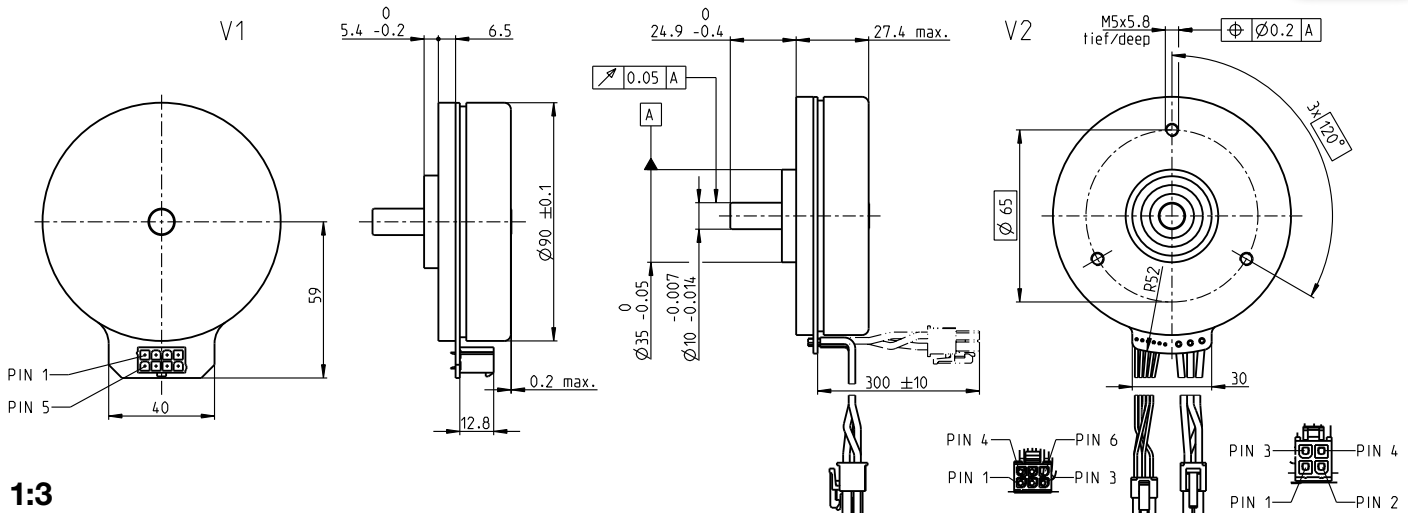
Overview on page 28-36

Encoder MILE
 512 - 4096 CPT,
 2 channels
 Page 403

EC 90 flat Ø90 mm, brushless, 160 Watt

NEW

maxon flat motor



M 1:3

- Stock program
- Standard program
- Special program (on request)

Part Numbers

Configuration	586655	515458	505592	580047
V1 with Hall sensors				
V2 with Hall sensors and cables				

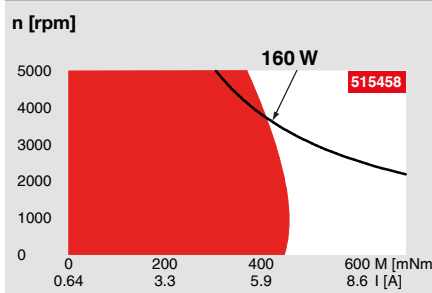
Motor Data

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 ¹	mNm	7400	7910	7580	6410
8 Stall current	A	208	111	68.9	29.6
9 Max. efficiency	%	85	85	85	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	35.6	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 ²	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: 100 N
- Other specifications**
- 29 Number of pole pairs: 11
 - 30 Number of phases: 3
 - 31 Weight of motor: 630 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

Overview on page 28–36

- Values listed in the table are nominal.
- | 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 _{Hall} 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 _{Hall} 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. 43
- | 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**
- ¹Calculation does not include saturation effect (p. 53/164)



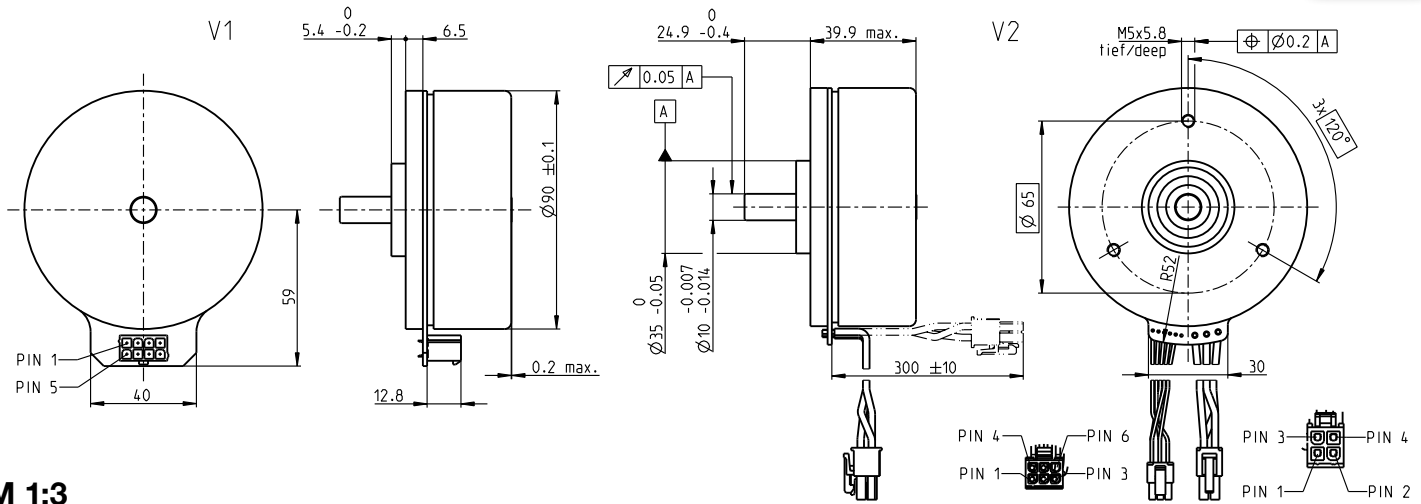
Encoder MILE
512 - 6400 CPT,
2 channels
Page 404

Recommended Electronics:

Notes	Page 32
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 Mod./Comp. 50/15	455
EPOS4 70/15	456
MAXPOS 50/5	468

EC 90 flat Ø90 mm, brushless, 260 Watt

NEW



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

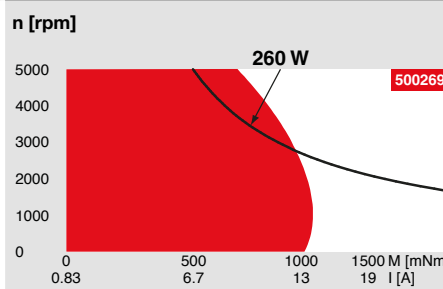
Motor Data

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 ¹	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 ²	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
 - 28 Max. radial load, 10 mm from flange: 8000 N / 130 N
- Other specifications**
- 29 Number of pole pairs: 11
 - 30 Number of phases: 3
 - 31 Weight of motor: 980 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**
- Pin 1 Hall sensor 1
 - Pin 2 Hall sensor 2
 - Pin 3 V_{hall} 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)**
- Pin 1 Hall sensor 1
 - Pin 2 Hall sensor 2
 - Pin 3 Hall sensor 3
 - Pin 4 GND
 - Pin 5 V_{hall} 4.5...24 VDC
 - Pin 6 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. 43
- 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
- ¹Calculation does not include saturation effect (p. 53/164)

maxon Modular System

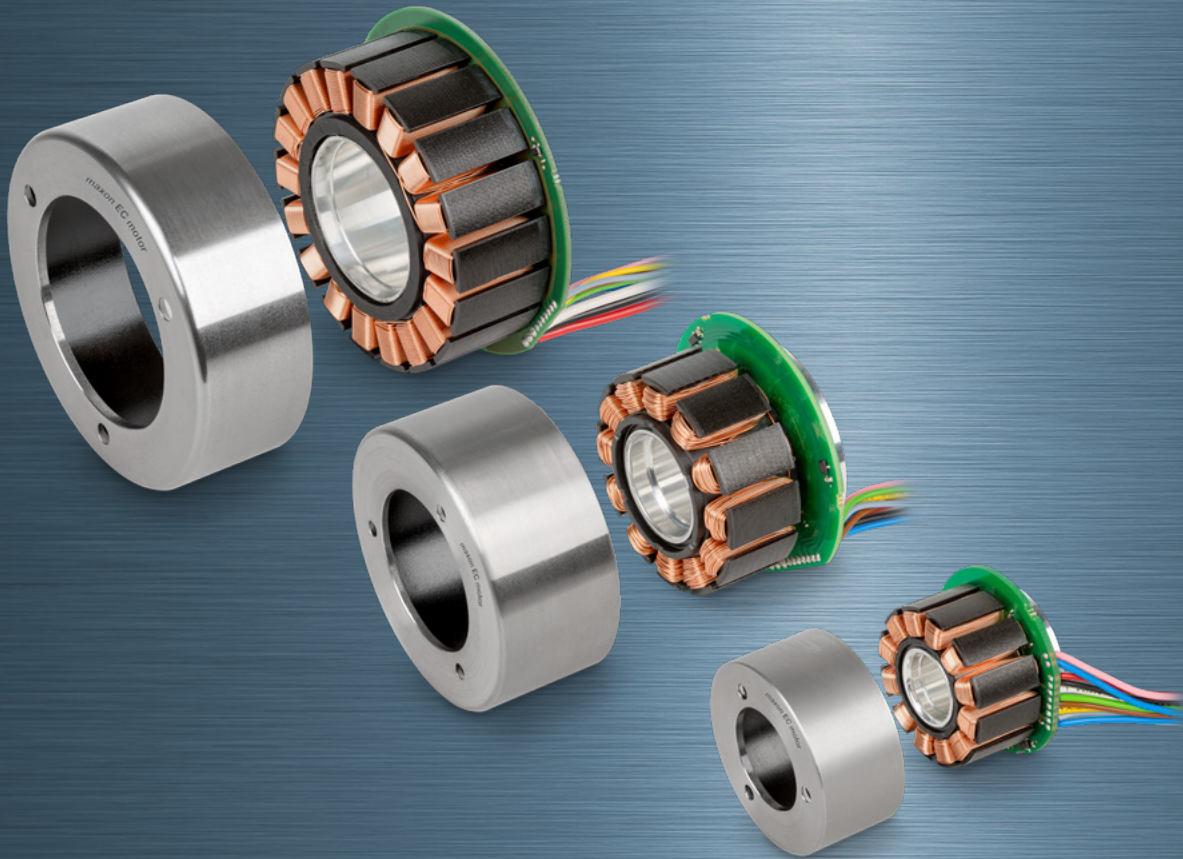
Overview on page 28–36



Encoder MILE
512 - 6400 CPT,
2 channels
Page 404

Recommended Electronics:

Notes	Page 32
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 Mod./Comp. 50/15	455
EPOS4 70/15	456
MAXPOS 50/5	468



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

maxon frameless motor

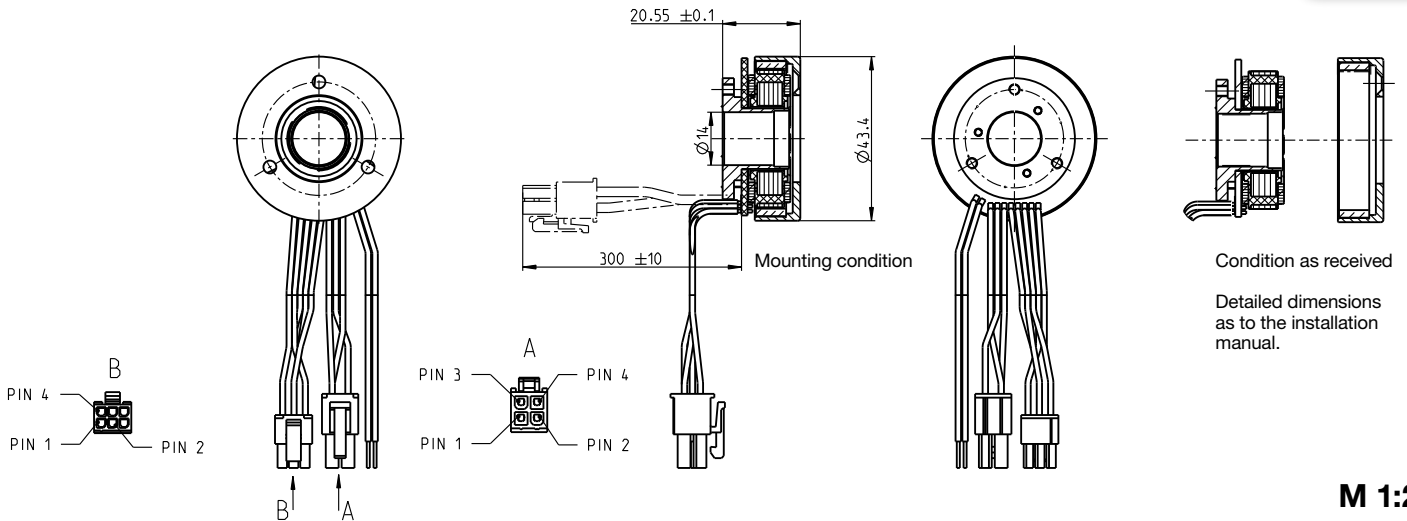
Rotor and stator are delivered separately and connected only during the assembly of the components. Frameless motors offer maximum torque density and minimum size, high overload capability, low cogging torque, and enough space for cable glands. Available in outer diameters from 43 to 90 millimeters.

Standard Specification No. 101	60
Explanation of the EC motors	164

ECX SPEED Program	166-200
EC Program	202-216
EC-max Program	219-227
EC-4pole Program	231-237
EC-i Program	241-251
EC flat Program	254-272
EC frameless Program	274-279

EC frameless 45 flat $\varnothing 43.4$ mm, brushless, 30 Watt

NEW



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

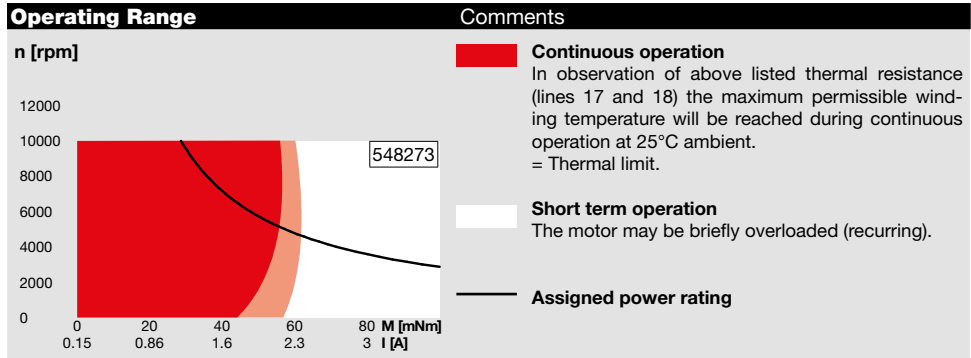
	with Hall sensors	548273	574536	574537	574538
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Motor Data		with Hall sensors	548273	574536	574537	574538
Values at nominal voltage						
1 Nominal voltage	V		12	18	24	36
2 No load speed	rpm		4360	4890	4360	4750
3 No load current	mA		163	129	81.4	61.6
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
Characteristics						
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 ²		150	150	150	150

Specifications	
Thermal data	
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
Mechanical data	
23 Max. speed	10000 rpm
Other specifications	
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_{Hall} 4.5...24 VDC Pin 5
 - N.C. Pin 6
- Connector Part number**
- Molex 430-25-0600
- Wiring diagram for Hall sensors see p. 43
- *Internal pull-up (7...13 k Ω) on pin 5
- Connection NTC** (Cable AWG 24)
- pink NTC
 - blue NTC
- Resistance 25°C: 5 k Ω \pm 1%, beta (25–85°C): 3490 K



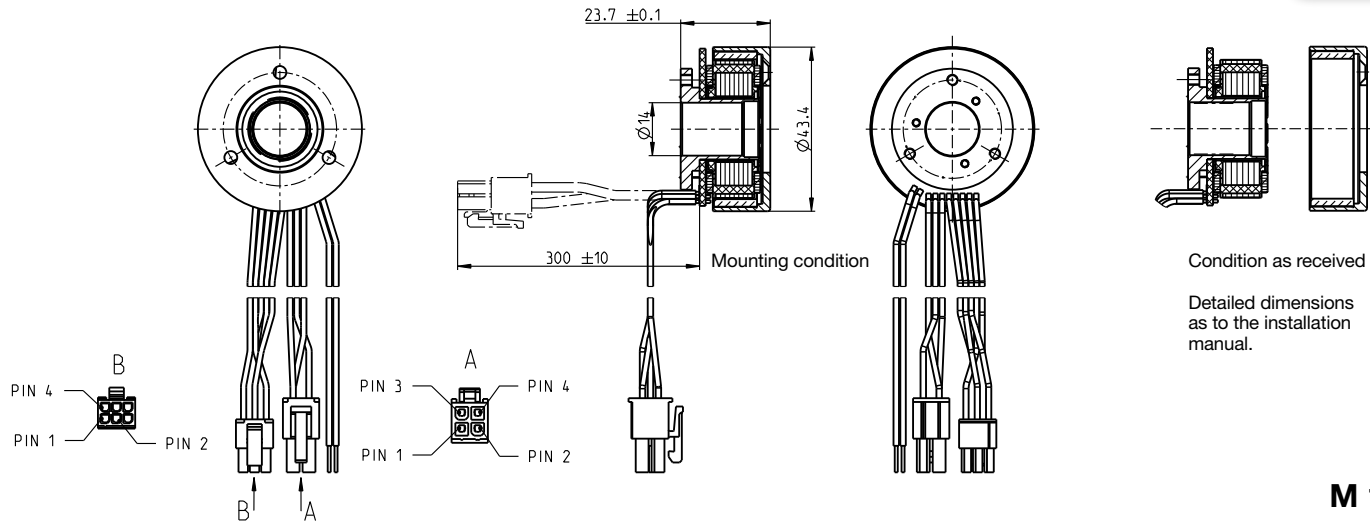
maxon Modular System Overview on page 28–36

Recommended Electronics:	
Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON 50/5	447
DEC Module 24/2	449
DEC Module 50/5	449
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

EC frameless 45 flat $\varnothing 43.4$ mm, brushless, 50 Watt

NEW

maxon frameless motor



- Stock program
- Standard program
- Special program (on request)

Part Numbers

	with Hall sensors	543631	574402	574403	574404
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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	Ω	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 ²	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

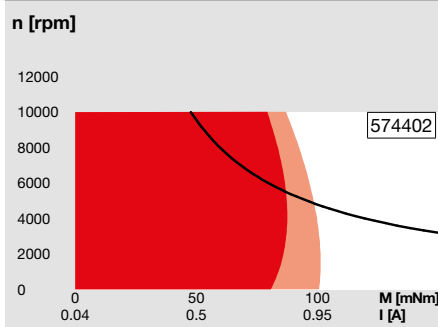
- Connector Part number**
- Molex 39-01-2040

- 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_{Hall} 4.5...24 VDC Pin 5
 - N.C. Pin 6

- Connector Part number**
- Molex 430-25-0600
- Wiring diagram for Hall sensors see p. 43
- *Internal pull-up (7...13 k Ω) on pin 5

- Connection NTC** (Cable AWG 24)
- pink NTC
 - blue NTC
- Resistance 25°C: 5 k Ω \pm 1%, beta (25–85°C): 3490 K

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

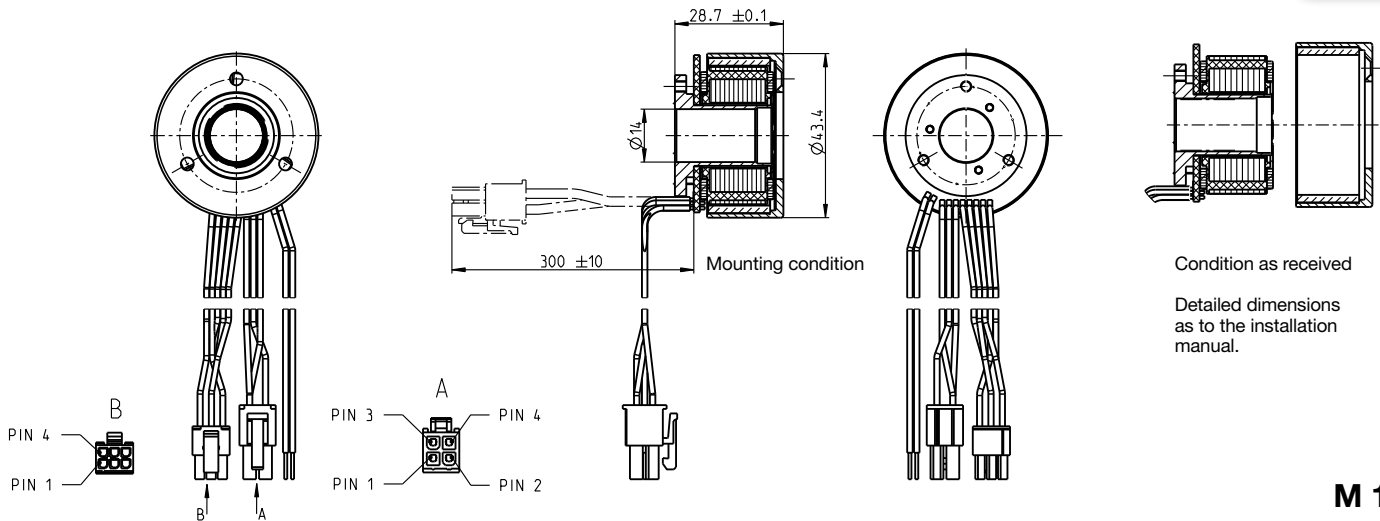
Overview on page 28–36

Recommended Electronics:

Notes	Page 32
ESCON Module 24/2	444
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON 50/5	447
DEC Module 24/2	449
DEC Module 50/5	449
EPOS4 Mod./Comp. 24/1.5	452
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

EC frameless 45 flat $\varnothing 43.4$ mm, brushless, 70 Watt

NEW



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

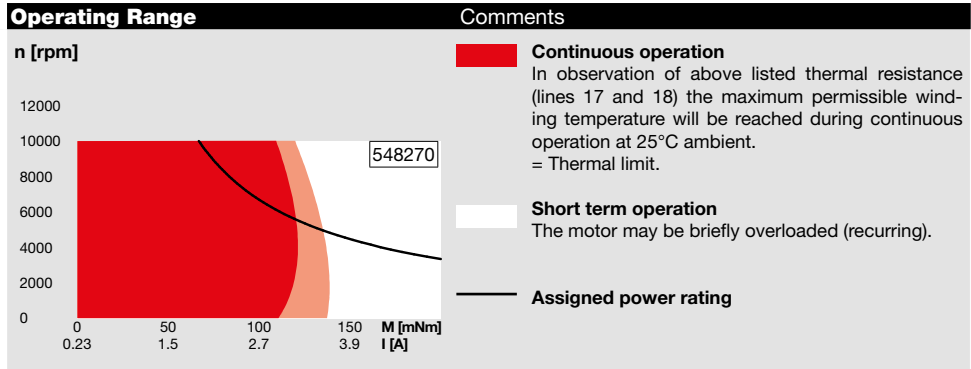
	with Hall sensors	548270	574035	574036	574037
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Motor Data		with Hall sensors	548270	574035	574036	574037
Values at nominal voltage						
1	Nominal voltage	V	24	30	36	48
2	No load speed	rpm	6110	6230	6330	3440
3	No load current	mA	234	194	166	48.1
4	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
Characteristics						
10	Terminal resistance phase to phase	Ω	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 ²	240	240	240	240

Specifications		
Thermal data		
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
Mechanical data		
23	Max. speed	10000 rpm
Other specifications		
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.

- 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_{Hall} 4.5...24 VDC Pin 5
 - N.C. Pin 6
- Connector Part number**
- Molex 430-25-0600
- Wiring diagram for Hall sensors see p. 43
- *Internal pull-up (7...13 k Ω) on pin 5
- Connection NTC** (Cable AWG 24)
- pink NTC
 - blue NTC
- Resistance 25°C: 5 k Ω \pm 1%, beta (25–85°C): 3490 K



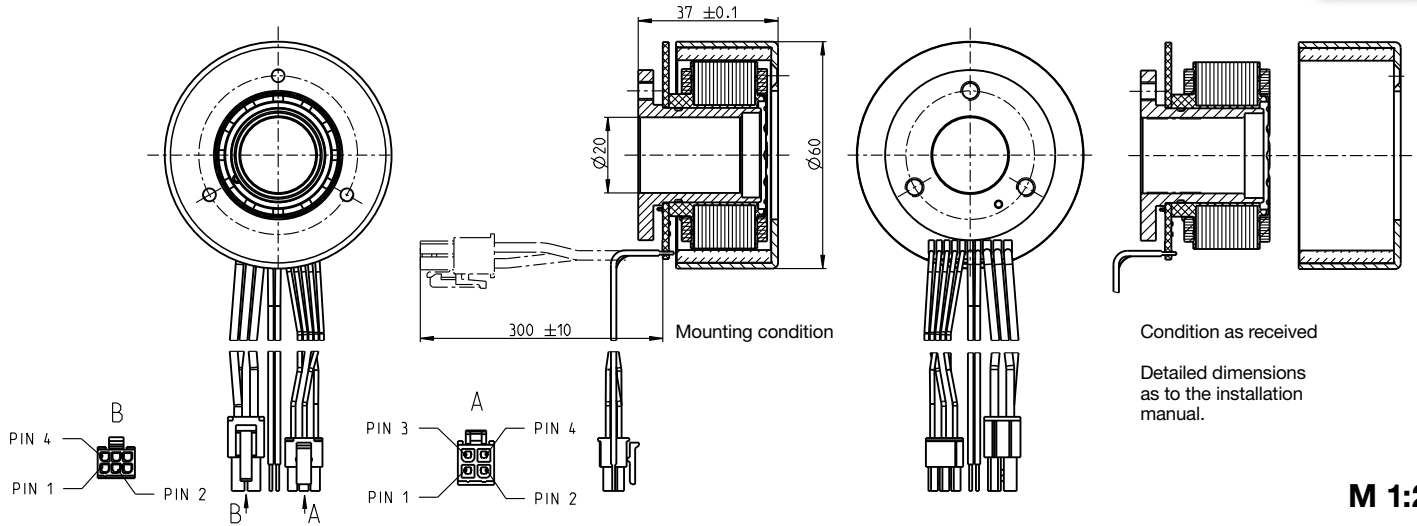
maxon Modular System Overview on page 28–36

Recommended Electronics:	
Notes	Page 32
ESCON 36/3 EC	445
ESCON Mod. 50/4 EC-S	445
ESCON Module 50/5	445
ESCON 50/5	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS2 P 24/5	464
MAXPOS 50/5	468

EC frameless 60 flat $\varnothing 60$ mm, brushless, 100 Watt

NEW

maxon frameless motor



M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
with Hall sensors	550153 542002 550154

Motor Data		550153	542002	550154
Values at nominal voltage				
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
Characteristics				
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 ²	1246	1246	1246

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	40 s
20 Thermal time constant motor	89.9 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
Mechanical data	
23 Max. speed	6000 rpm
Other specifications	
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.

Connection motor (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

Connector	Part number
Molex	39-01-2040

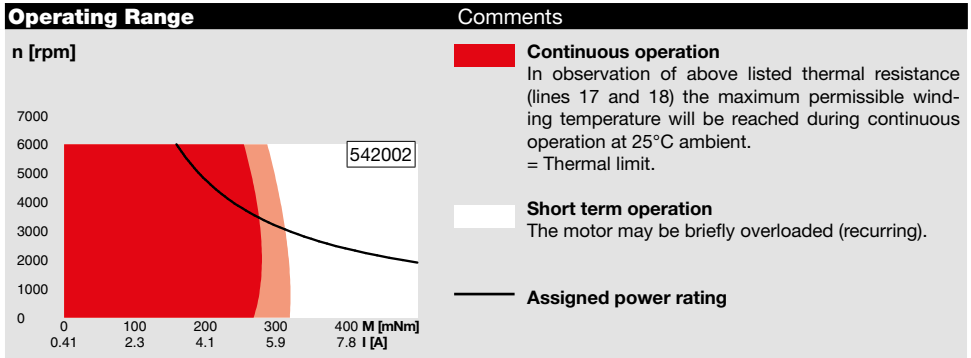
Connection sensors (Cable AWG 24)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector	Part number
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43

Connection NTC (Cable AWG 24)	
pink	NTC
blue	NTC

Resistance 25°C: 5 k Ω \pm 1%, beta (25–85°C): 3490 K



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

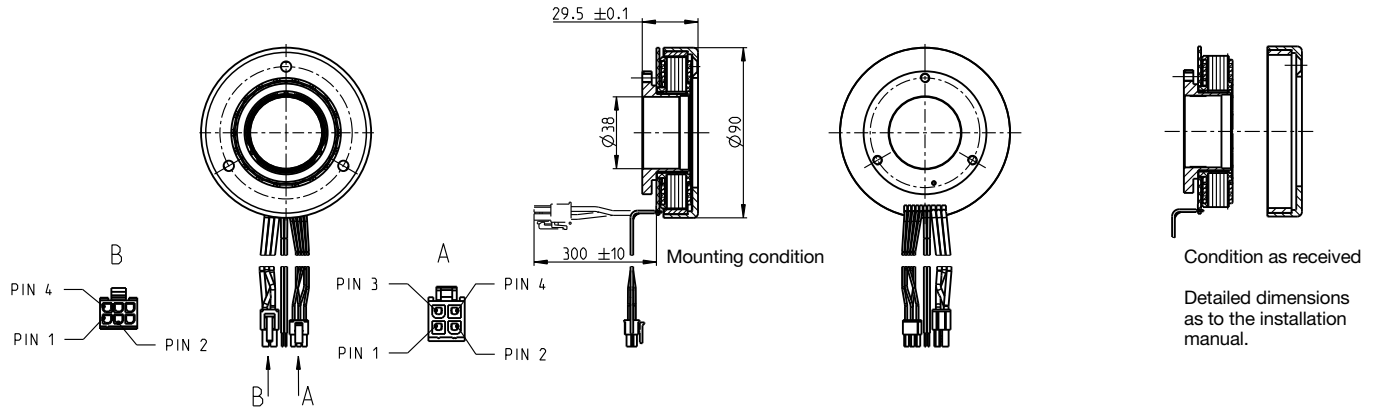
Overview on page 28–36

Recommended Electronics:

Notes	Page 32
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

EC frameless 90 flat Ø90 mm, brushless, 160 Watt

NEW



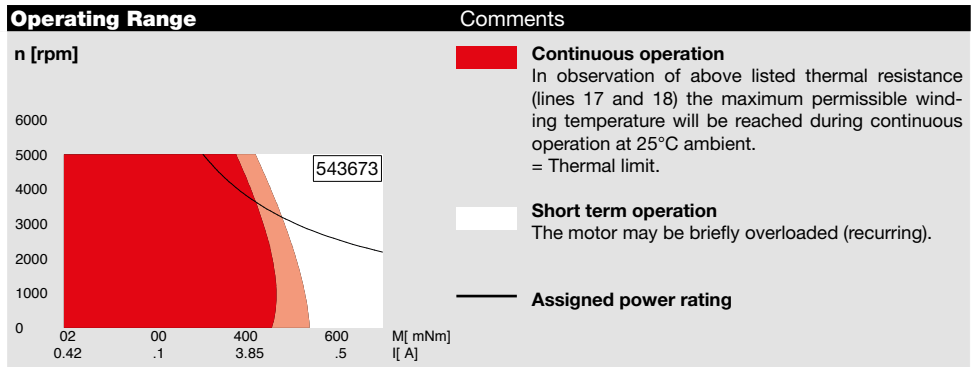
M 1:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers	
with Hall sensors	588847 543673 581301 581302

Motor Data		588847	543673	581301	581302
Values at nominal voltage					
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
Characteristics					
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 ²	3170	3170	3170	3170

Specifications	
Thermal data	
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
Mechanical data	
23 Max. speed	5000 rpm
Other specifications	
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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

Connector Part number	
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43

Connection NTC (Cable AWG 24)	
pink	NTC
blue	NTC

Resistance 25°C: 5 kΩ ±1%, beta (25–85°C): 3490 K

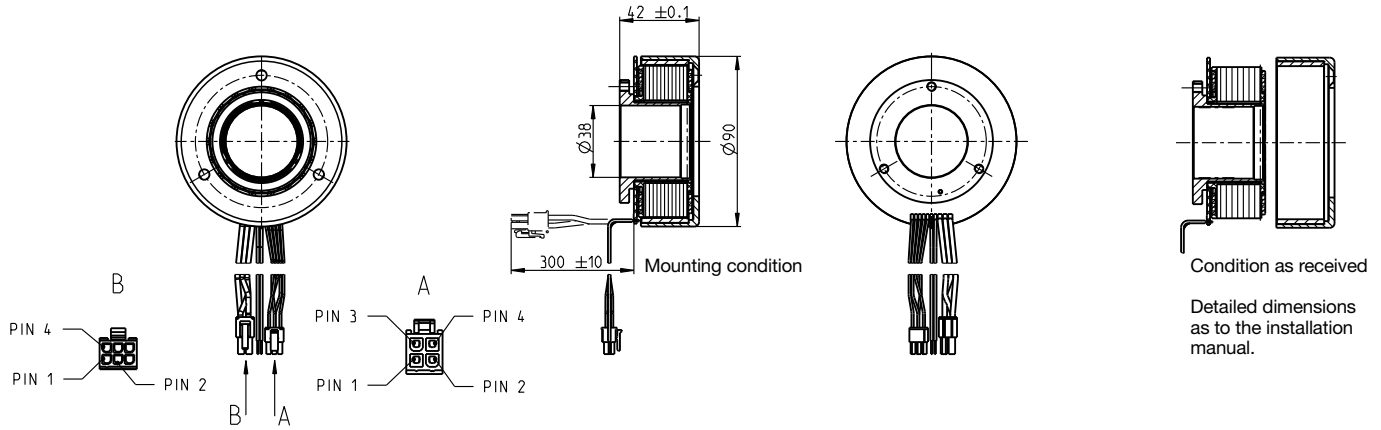
maxon Modular System Overview on page 28–36

Recommended Electronics:	
Notes	Page 32
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

EC frameless 90 flat $\varnothing 90$ mm, brushless, 260 Watt

NEW

maxon frameless motor



M 1:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	with Hall sensors	588849	542099	581294	581295
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Motor Data

Values at nominal voltage			18	30	48	60
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			0.109	0.29	0.854	1.29
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 ²		5300	5300	5300	5300

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	60.5 s
20 Thermal time constant motor	258 s
21 Ambient temperature	-40...+100°C
22 Max. winding temperature	+125°C
Mechanical data	
23 Max. speed	5000 rpm
Other specifications	
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.

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 _{Hall} 4.5...24 VDC	Pin 5
	N.C.	Pin 6

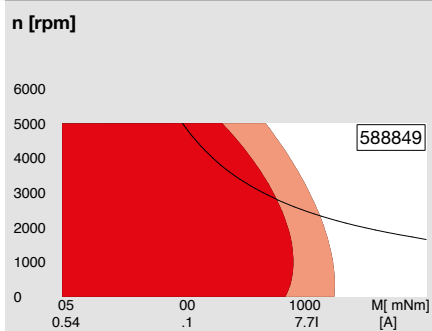
Connector	Part number
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 43

Connection NTC (Cable AWG 24)	
pink	NTC
blue	NTC

Resistance 25°C: 5 k Ω \pm 1%, beta (25–85°C): 3490 K

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

Overview on page 28–36

Recommended Electronics:


Notes	Page 32
ESCON Mod. 50/4 EC-S	445
ESCON Mod. 50/5	445
ESCON Mod. 50/8 (HE)	446
ESCON 50/5	447
ESCON 70/10	447
DEC Module 50/5	449
EPOS4 50/5	453
EPOS4 Mod./Comp. 50/5	453
EPOS4 Mod./Comp. 50/8	454
EPOS4 Mod./Comp. 50/15	455
EPOS4 70/15	456
EPOS2 P 24/5	464
MAXPOS 50/5	468

Precision planetary and spur gearheads.

Standard Specification No. 102	61	maxon gear	316–362	
Explanation	282	GP 4 C Ø4 mm, 0.002–0.015 Nm	316	DC Motor
GPX-Program (can be configured online)	284–314	GP 6 A Ø6 mm, 0.002–0.03 Nm	317	
GPX 6 A Ø6 mm, planetary gearhead	284	GP 8 A Ø8 mm, 0.01–0.1 Nm	318	
GPX 8 A Ø8 mm, planetary gearhead	285	GP 10 K Ø10 mm, 0.005–0.1 Nm	319	
GPX 10 A Ø10 mm, planetary gearhead	286	GP 10 A Ø10 mm, 0.01–0.15 Nm	320	
GPX 12 A/C/LN/LZ Ø12 mm, planetary gearhead	287–288	GS 12 A Ø12 mm, 0.01–0.03 Nm	321	EC Motor (BLDC Motor)
GPX 12 HP Ø12 mm, planetary gearhead	289	GP 13 K Ø13 mm, 0.05–0.15 Nm	322	
GPX 13 SPEED Ø13 mm, planetary gearhead, steril.	290	GP 13 A Ø13 mm, 0.2–0.35 Nm	323	
GPX 14 A/C/LN/LZ Ø14 mm, planetary gearhead	291–292	GS 16 K Ø16 mm, 0.01–0.03 Nm	324	
GPX 14 HP Ø14 mm, planetary gearhead	293	GS 16 A Ø16 mm, 0.015–0.04 Nm	325	
GPX 16 A/C/LN/LZ Ø16 mm, planetary gearhead	294–295	GS 16 V Ø16 mm, 0.06–0.1 Nm	326	Gearhead
GPX 16 HP Ø16 mm, planetary gearhead	296	GS 16 VZ Ø16 mm, 0.06–0.1 Nm	327	
GPX 16 SPEED Ø16 mm, planetary gearhead, steril.	297	GP 16 A Ø16 mm, 0.1–0.3 Nm	328	
GPX 19 A/C/LN/LZ Ø19 mm, planetary gearhead	298–299	GP 16 C Ø16 mm, 0.2–0.6 Nm	329	
GPX 19 HP Ø19 mm, planetary gearhead	300	GP 19 B Ø19 mm, 0.1–0.3 Nm	330	
GPX 19 SPEED Ø19 mm, planetary gearhead, steril.	301	GP 22 B Ø22 mm, 0.1–0.3 Nm	331	Screw drive
GPX 22 A/C/LN/LZ Ø22 mm, planetary gearhead	302–303	GP 22 L Ø22 mm, 0.2–0.6 Nm	332	
GPX 22 HP Ø22 mm, planetary gearhead	304	GP 22 A Ø22 mm, 0.5–1.0 Nm	333	
GPX 22 SPEED Ø22 mm, planetary gearhead, steril.	305	GP 22 AR Ø22 mm, 0.5 Nm	334	
GPX 26 A/C/LN/LZ Ø26 mm, planetary gearhead	306–307	GP 22 C Ø22 mm, 0.5–2.0 Nm	335–336	Sensor
GPX 26 HP Ø26 mm, planetary gearhead	308	GP 22 HP Ø22 mm, 2.0–3.4 Nm	337	
GPX 32 A/C/LN/LZ Ø32 mm, planetary gearhead	309–310	GP 22 HD Ø22 mm, 2.0–4.0 Nm	338	
GPX 32 HP Ø32 mm, planetary gearhead	311	GS 24 A Ø24 mm, 0.1 Nm	339	
GPX 37 A/LN/LZ Ø37 mm, planetary gearhead	312–313	GP 26 A Ø26 mm, 0.75–4.5 Nm	340	
GPX 42 C Ø42 mm, planetary gearhead	314	GS 30 A Ø30 mm, 0.07–0.2 Nm	341	Motor control
		GP 32 BZ Ø32 mm, 0.75–4.5 Nm	342	
		GP 32 A Ø32 mm, 0.75–4.5 Nm	343–344	
		GP 32 AR Ø32 mm, 0.75 Nm	345	Compact Drive
		GP 32 C Ø32 mm, 1.0–6.0 Nm	346–348	
		GP 32 CR Ø32 mm, 1.0 Nm	349	
		GP 32 HP Ø32 mm, 4.0–8.0 Nm	350	
		GP 32 HD Ø32 mm, 3.0–8.0 Nm	351	
		Koaxdrive KD 32 Ø32 mm, 1.0–4.5 Nm	352	
		GS 38 A Ø38 mm, 0.1–0.6 Nm	353	Accessories
		GP 42 C Ø42 mm, 3–15 Nm	354–356	
		GP 42 HD Ø42 mm, 10–50 Nm	357	
		GS 45 A Ø45 mm, 0.5–2.0 Nm	358	
		GP 52 C Ø52 mm, 4–30 Nm	359–360	
		GP 62 A Ø62 mm, 8–50 Nm	361	Ceramic
		GP 81 A Ø81 mm, 20–120 Nm	362	

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_A 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 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. It is defined as follows:

- during 1 second
 - during max. 10 % of the life expectancy
- If these values are exceeded, a reduced service life must be expected.

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 [gcm²]

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 (exception: GS 20 A).

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]

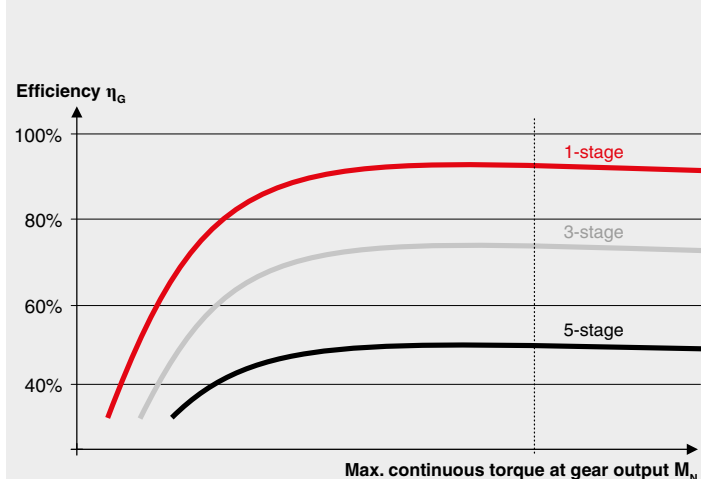
This value gives the maximum intermittent output available on the output shaft. This range may be used intermittently and repeatedly. It is defined as follows:

- during max. 1 second
 - during max. 10% of the operating cycle
- If these values are exceeded, a reduced service life must be expected.

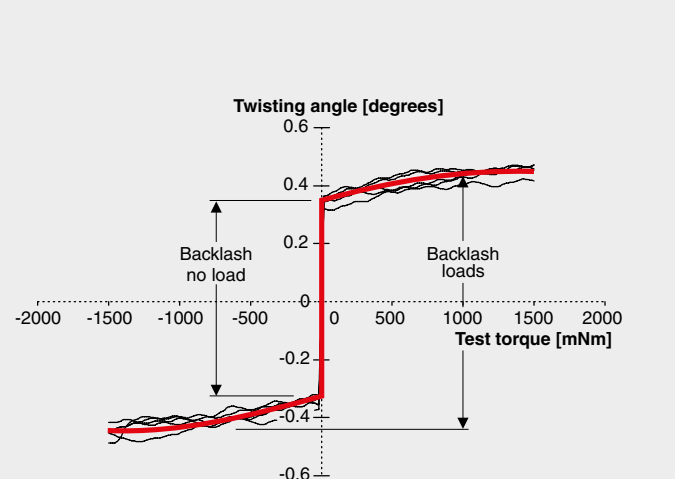
15 Max. overload torque

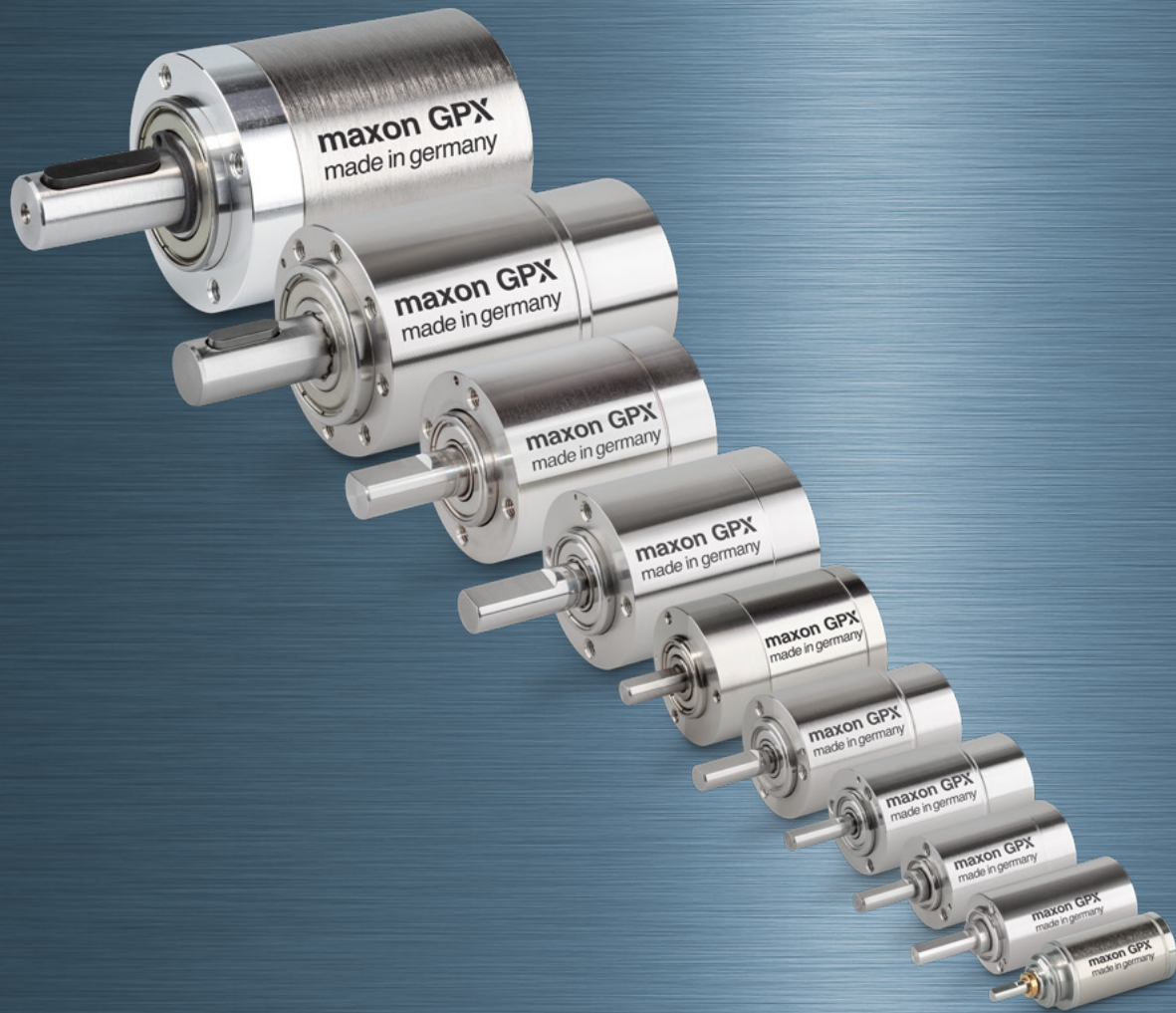
The maximal permitted torque that can be applied for a short period of time (a few seconds) without destroying the gear. It can be considered as break free torque, for example, to overcome static friction of a mechanically jammed drive.

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

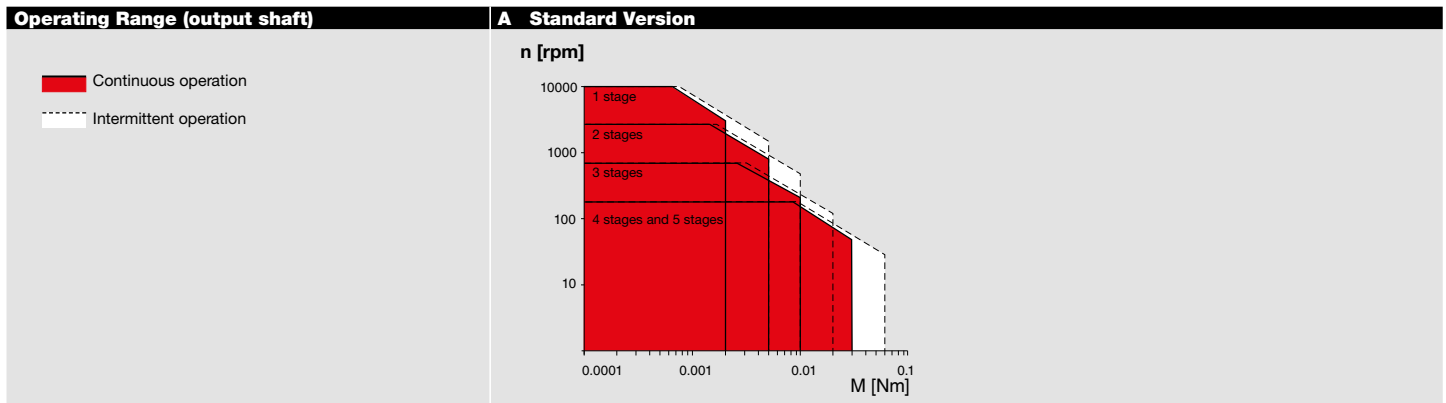
Standard Specification No. 102	61
Explanation	282
GPX Program	284–314
maxon gear	316–362

GPX 6

Planetary Gearhead $\varnothing 6$ mm



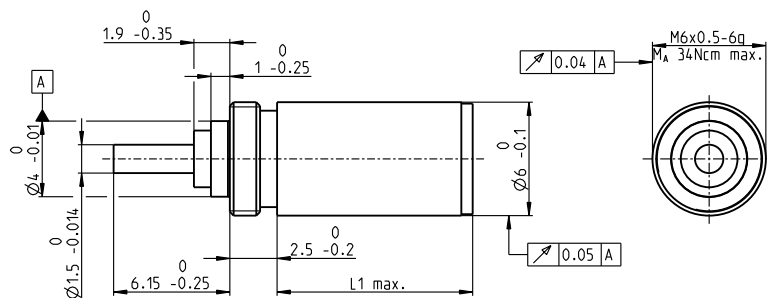
Key Data		A Standard Version
Max. transmittable power	W	0.6
Max. continuous torque	Nm	0.03
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



Specifications	A Standard Version					
		1	2	3	4	5
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	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
maxon DC motor	N _e of stages [opt.]	
DCX 6 M	1-5	66



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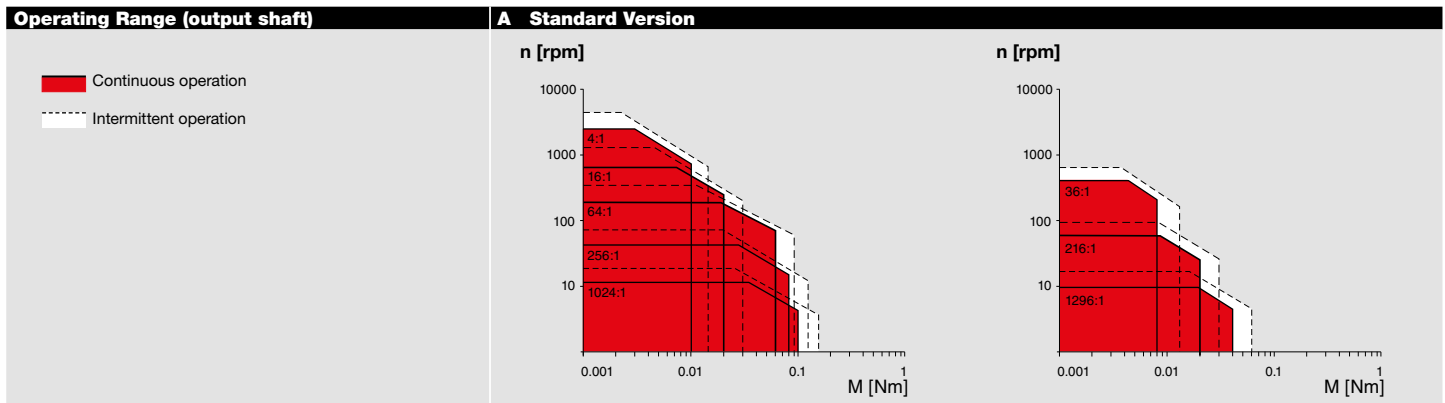
GPX 8

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	°C	-15 ... +80	
Bearing at output		Ball bearing	



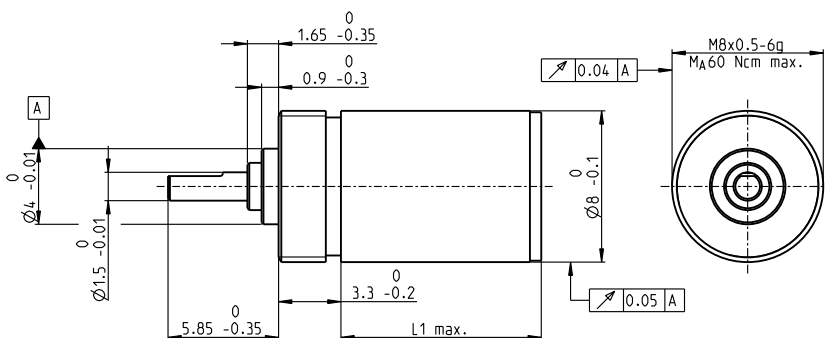
Specifications		A Standard Version								
		1	2	2	3	3	4	4	5	
Number of stages		1	2	2	3	3	4	4	5	
Max. transmittable power (continuous)	W	0.840	0.520	0.140	0.390	0.060	0.130	0.040	0.040	
Max. transmittable power (intermittent)	W	1.05	0.650	0.180	0.490	0.080	0.160	0.060	0.050	
Max. continuous torque	Nm	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	°	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	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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maxon DC motor	N _e of stages [opt.]		
DCX 8 M	1-5	67	

maxon EC motor			
ECX SPEED 8	1-5	166-167	



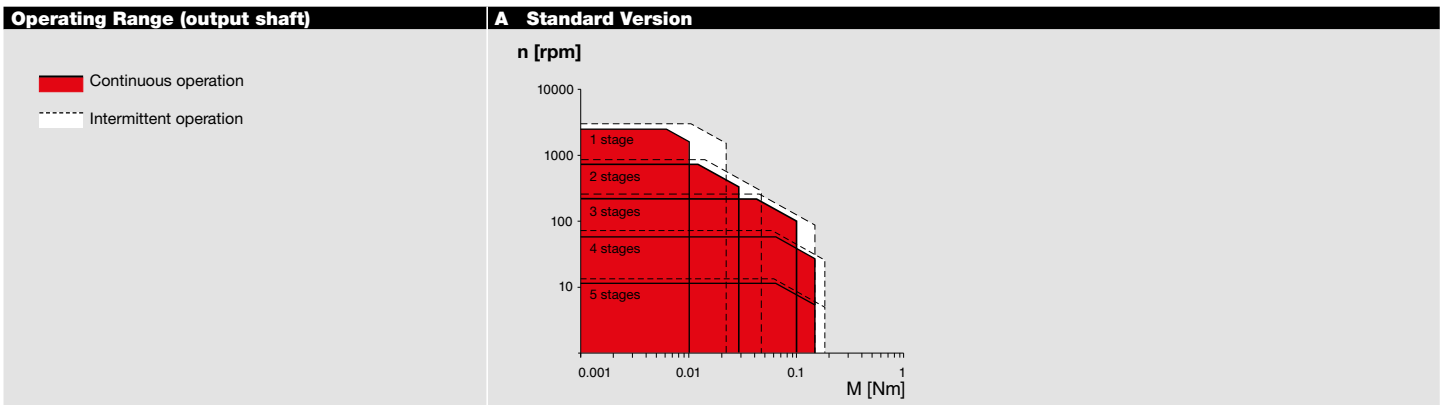
xdrives.maxonmotor.com

GPX 10

Planetary Gearhead Ø10 mm



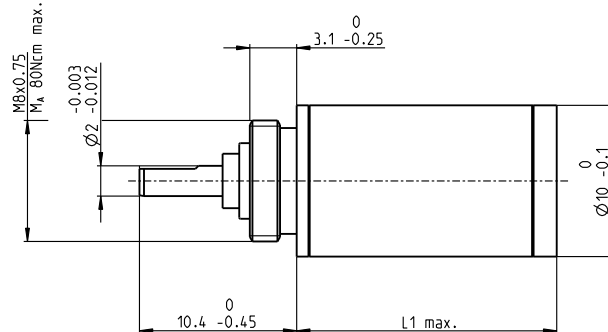
Key Data		A Standard Version	
Max. transmittable power	W	1.6	
Max. continuous torque	Nm	0.15	
Max. continuous input speed	rpm	12000	
Ambient temperature	°C	-40 ... +80	
Bearing at output		Ball bearing	



Specifications		A Standard Version				
		1	2	3	4	5
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 L1	mm	10.4	14.1	17.2	20.4	23.5
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 _e of stages [opt.]		
DCX 10 S	1-5	68	
DCX 10 L	1-5	69	



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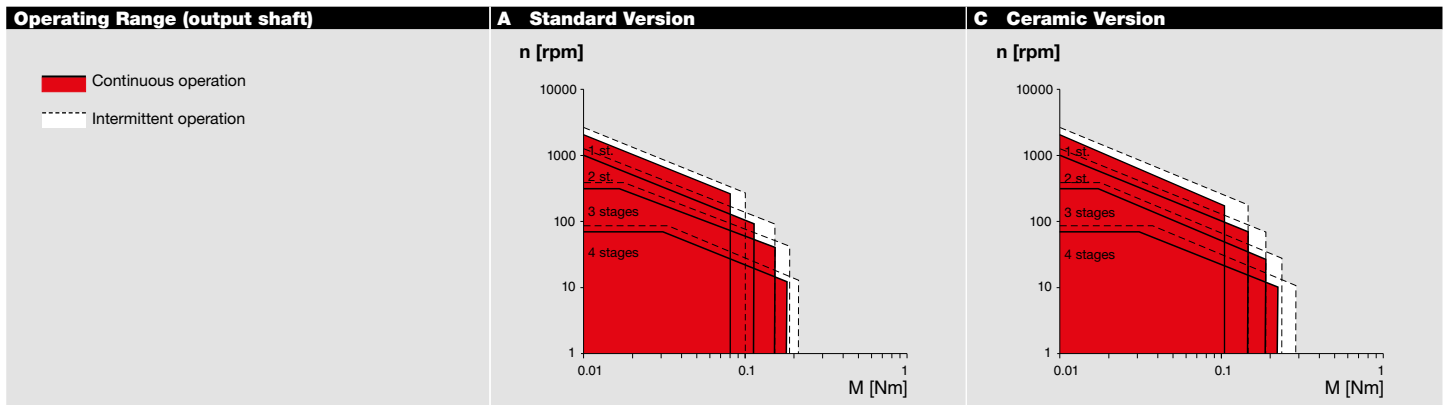
GPX 12

Planetary Gearhead $\varnothing 12$ mm



maxon GPX

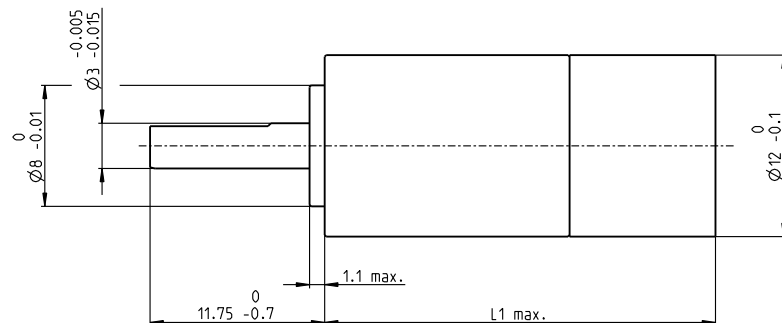
Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 2	2.4
Max. continuous torque	Nm 0.17	0.23
Max. continuous input speed	rpm 16000	16000
Ambient temperature	$^{\circ}\text{C}$ -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing



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	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_e of stages [opt.]		
DCX 12 S	1-4	70	
DCX 12 L	1-4	71	



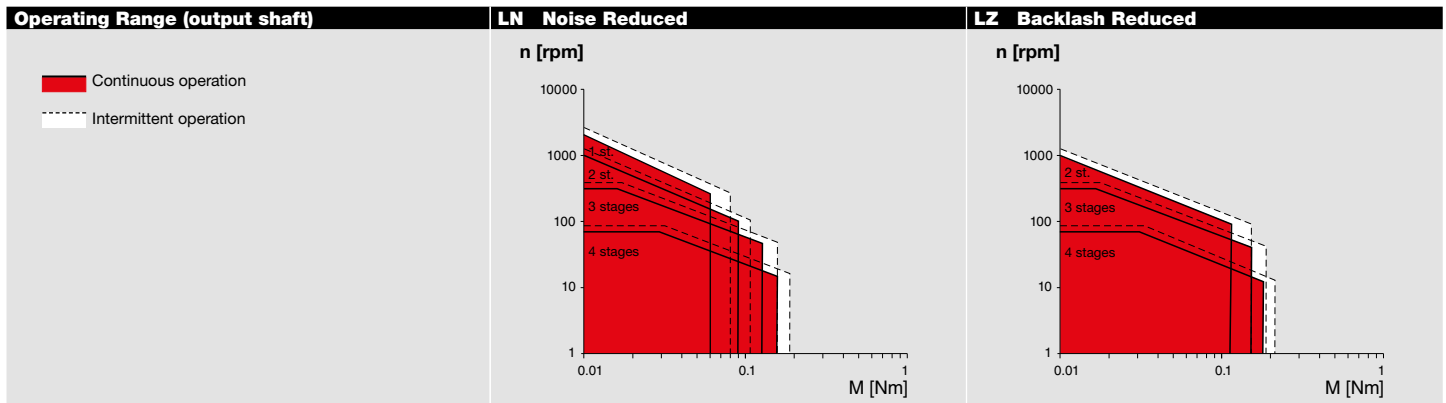
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GPX 12

Planetary Gearhead $\varnothing 12$ mm



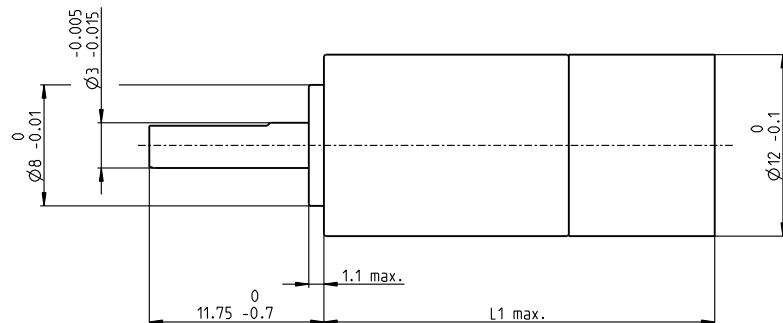
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	1.6	1
Max. continuous torque	Nm	0.14	0.2
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	



Specifications		LN Noise Reduced				LZ Backlash Reduced			
Number of stages		1	2	3	4	2	3	4	
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	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			
Number of stages		1	2	3	4	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	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
maxon DC motor	N _e of stages [opt.]	
DCX 12 S	1-4	70
DCX 12 L	1-4	71



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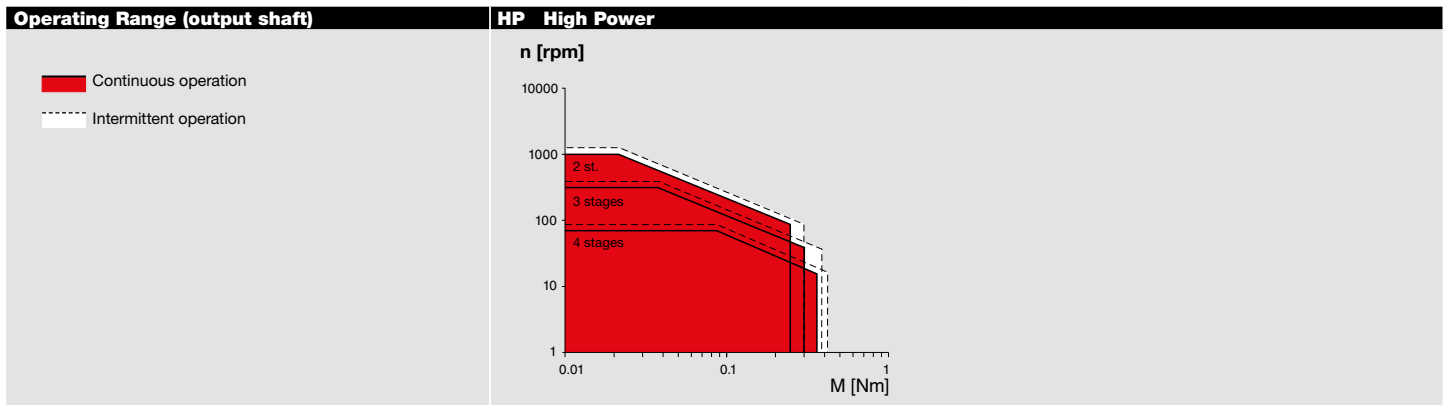
GPX 12

Planetary Gearhead Ø12 mm



maxon GPX

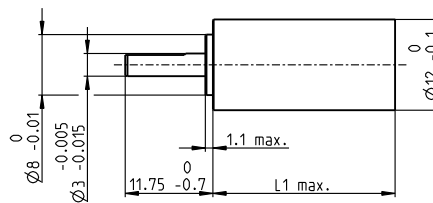
Key Data		HP High Power
Max. transmittable power	W	2.2
Max. continuous torque	Nm	0.35
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



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 L1	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 _e of stages [opt.]			
DCX 12 S	2-4	70		
DCX 12 L	2-4	71		



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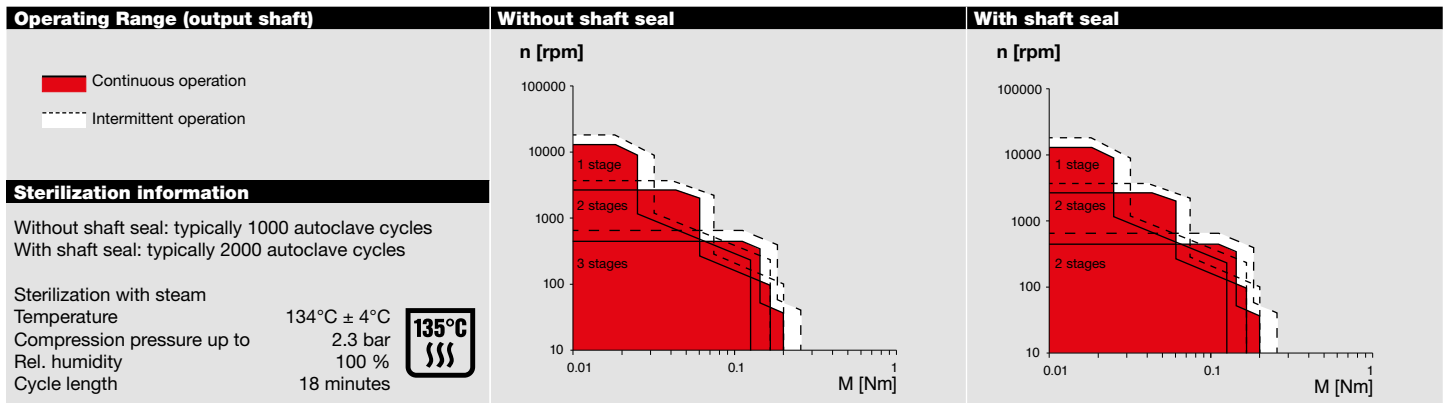
GPX 13 SPEED

Planetary Gearhead Ø13 mm

Sterilizable



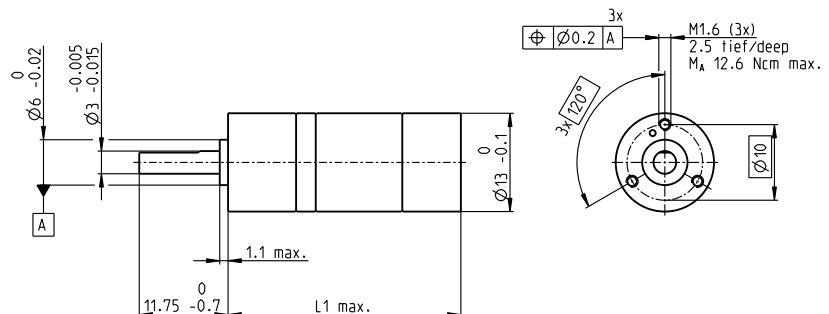
Key Data	Without shaft seal*	With shaft seal*
Max. transmittable power	W 22 (4)	22 (4)
Max. continuous torque	Nm 0.15	0.15
Max. continuous input speed	rpm 60000	60000
Ambient temperature	°C -10 ... +135	-10 ... +135
Bearing at output	Ball bearing	Ball bearing



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	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	M 1:1
maxon EC motor	N _e of stages [opt.]			
ECX SPEED 13 M	1-3	168-171		
ECX SPEED 13 L	1-3	172-175		



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*Values in parentheses apply in case of reduced speed (according to diagram).

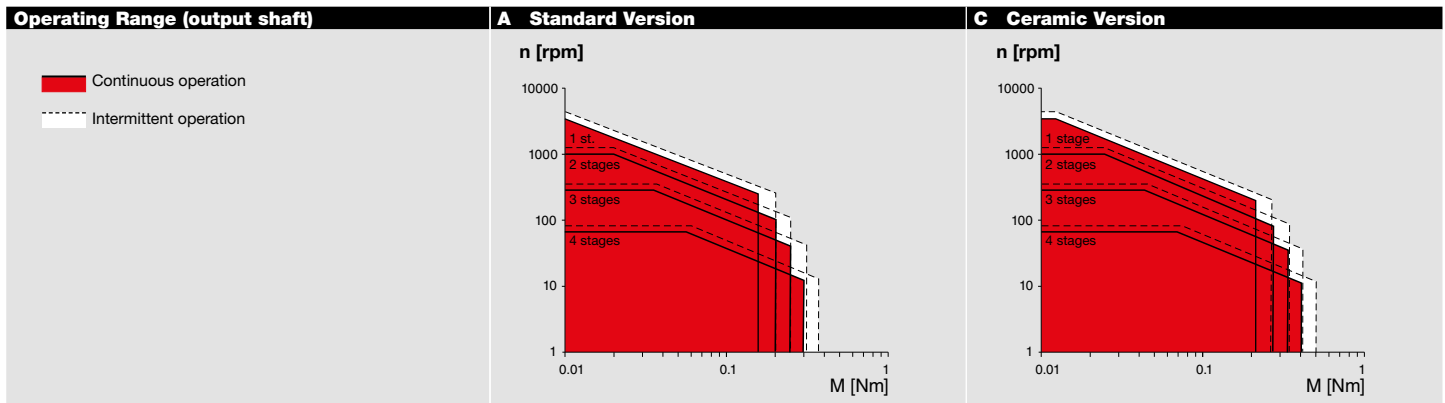
GPX 14

Planetary Gearhead $\varnothing 14$ mm



maxon GPX

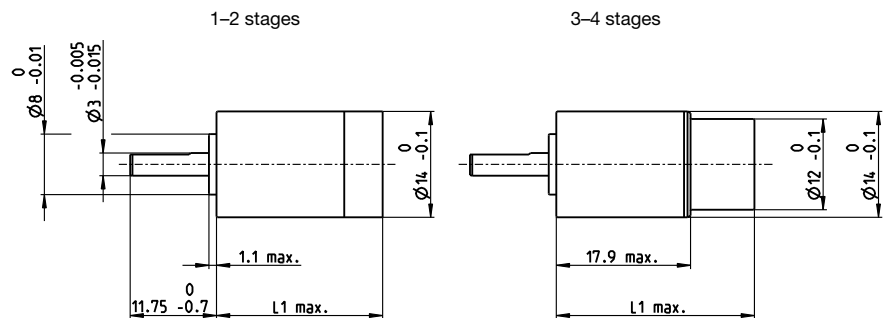
Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 4	4.8
Max. continuous torque	Nm 0.3	0.4
Max. continuous input speed	rpm 16000	16000
Ambient temperature	$^{\circ}\text{C}$ -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing



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	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
maxon DC motor	N _e of stages [opt.]		
DCX 12 S	3-4	70	
DCX 12 L	3-4	71	
DCX 14 L	1-2 [3-4]	72-73	
maxon EC motor	N _e of stages [opt.]		
ECX SPEED 13 M	1-2 [3-4]	168-171	
ECX SPEED 13 L	1-2 [3-4]	172-175	



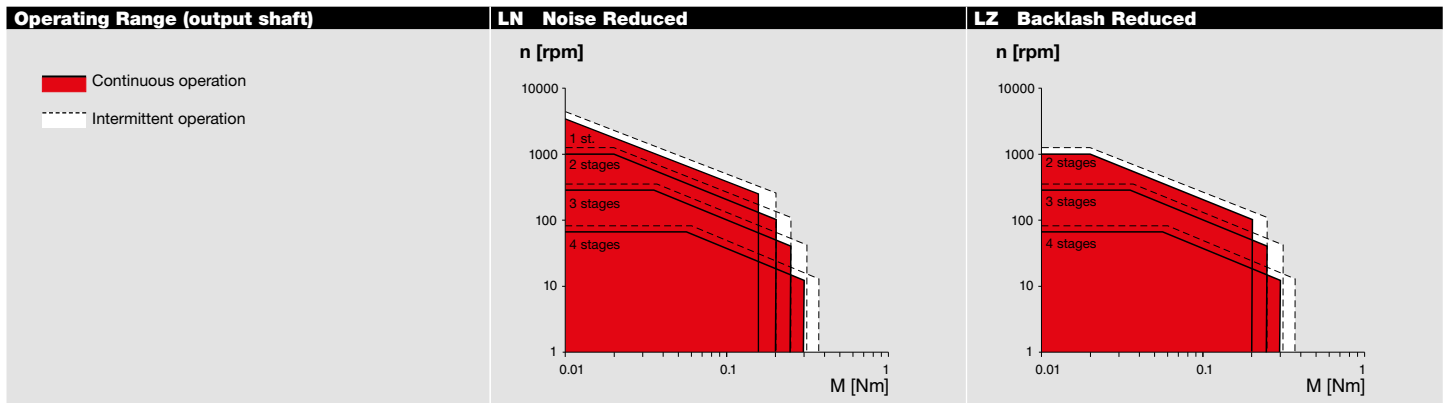
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GPX 14

Planetary Gearhead $\varnothing 14$ mm



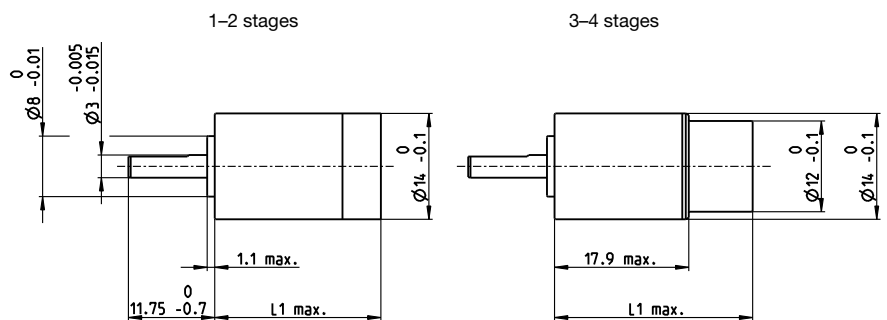
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	3.2	3
Max. continuous torque	Nm	0.24	0.3
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard 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	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	Dimensions
maxon DC motor	N _e of stages [opt.]		
DCX 12 S	3-4	70	
DCX 12 L	3-4	71	
DCX 14 L	1-2 [3-4]	72-73	
maxon EC motor	N _e of stages [opt.]		
ECX SPEED 13 M	1-2 [3-4]	168-171	
ECX SPEED 13 L	1-2 [3-4]	172-175	



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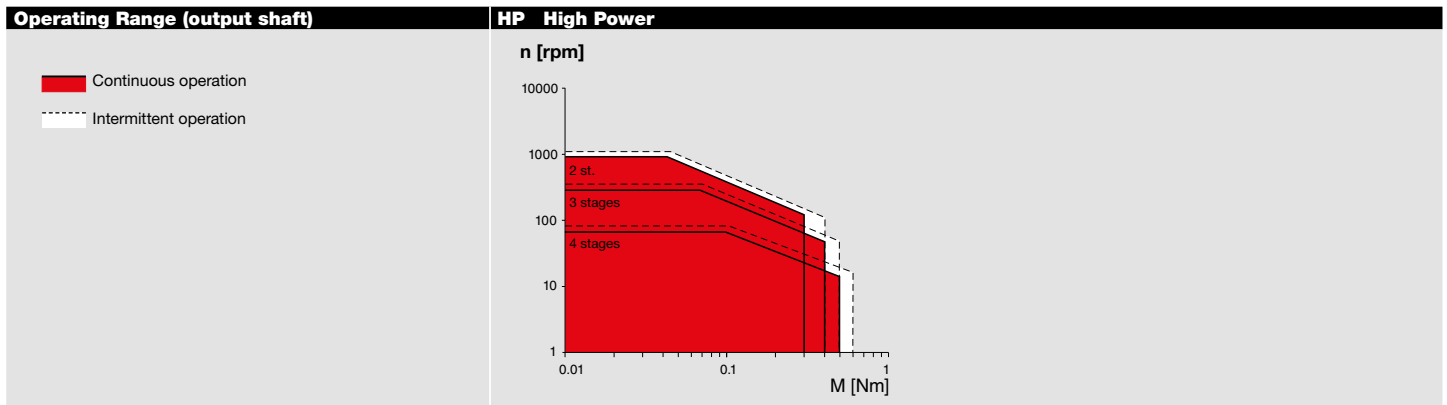
GPX 14

Planetary Gearhead Ø14 mm



maxon GPX

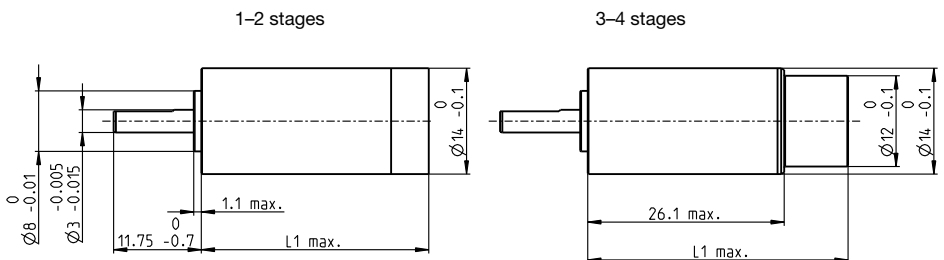
Key Data		HP High Power
Max. transmittable power	W	4.0
Max. continuous torque	Nm	0.50
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



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	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
maxon DC motor	N _e of stages [opt.]			
DCX 12 S	4	70		
DCX 12 L	4	71		
DCX 14 L	2-3 [4]	72-73		
maxon EC motor	N _e of stages [opt.]			
ECX SPEED 13 M	2-3 [4]	168-171		
ECX SPEED 13 L	2-3 [4]	172-175		



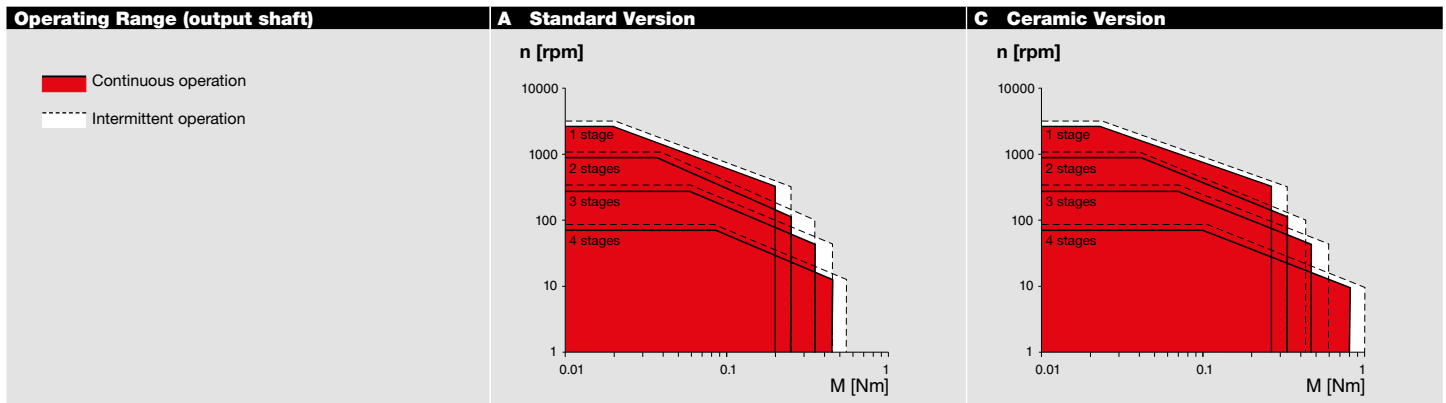
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GPX 16

Planetary Gearhead $\varnothing 16$ 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



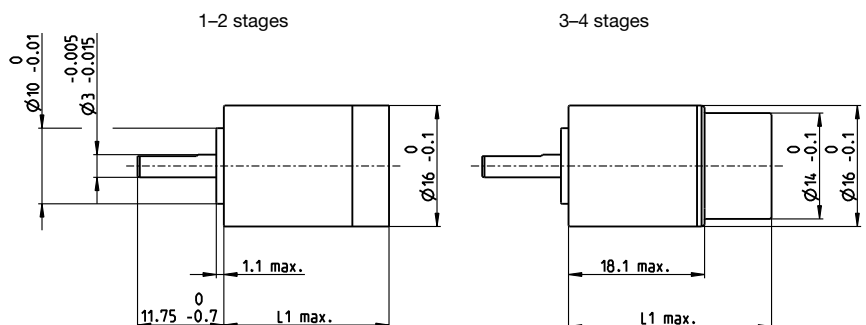
Specifications	A Standard Version				C Ceramic Version				
	1	2	3	4	1	2	3	4	
Number of stages									
Max. transmittable continuous power	W	6.5	3.2	1.6	0.60	7.8	3.8	1.9	0.7
Max. transmittable intermittent power	W	8.0	4.0	2.0	0.75	10.0	5.0	2.5	1.0
Max. continuous torque	Nm	0.20	0.25	0.35	0.45	0.27	0.33	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	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
maxon DC motor N _e of stages [opt.]	
DCX 14 L	72-73
DCX 16 S	74-75
DCX 16 L	76-77
DC-max 16 S*	90-91

maxon EC motor	N _e of stages [opt.]	Page
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]	181-184

*Limited selection of reduction ratios (see online).



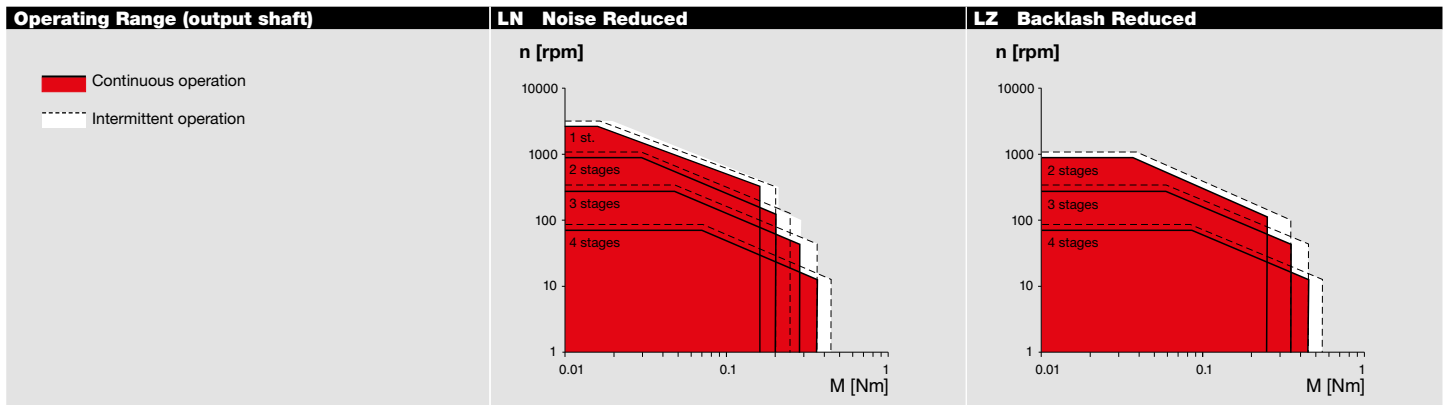
GPX 16

Planetary Gearhead Ø16 mm



maxon GPX

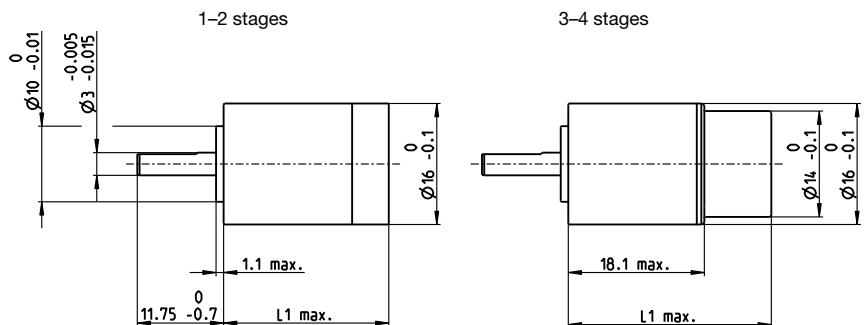
Key Data	LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W 5.2	3.2
Max. continuous torque	Nm 0.36	0.5
Max. continuous input speed	rpm 16000	16000
Ambient temperature	°C -40 ... +85	-40 ... +100
Bearing at output	Ball bearing	Ball bearing
Typical noise level	dBA -5 dBA compared to standard configuration	



Specifications	LN Noise Reduced	LZ Backlash Reduced
Number of stages	1 2 3 4	2 3 4
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	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
Number of stages	1 2 3 4	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	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
maxon DC motor	N _e of stages [opt.]			
DCX 14 L	3-4	72-73		
DCX 16 S	1-2 [3-4]	74-75		
DCX 16 L	1-2 [3-4]	76-77		
DC-max 16 S*	1-2 [3-4]	90-91		
maxon EC motor	N _e 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]	181-184		



*Limited selection of reduction ratios (see online).

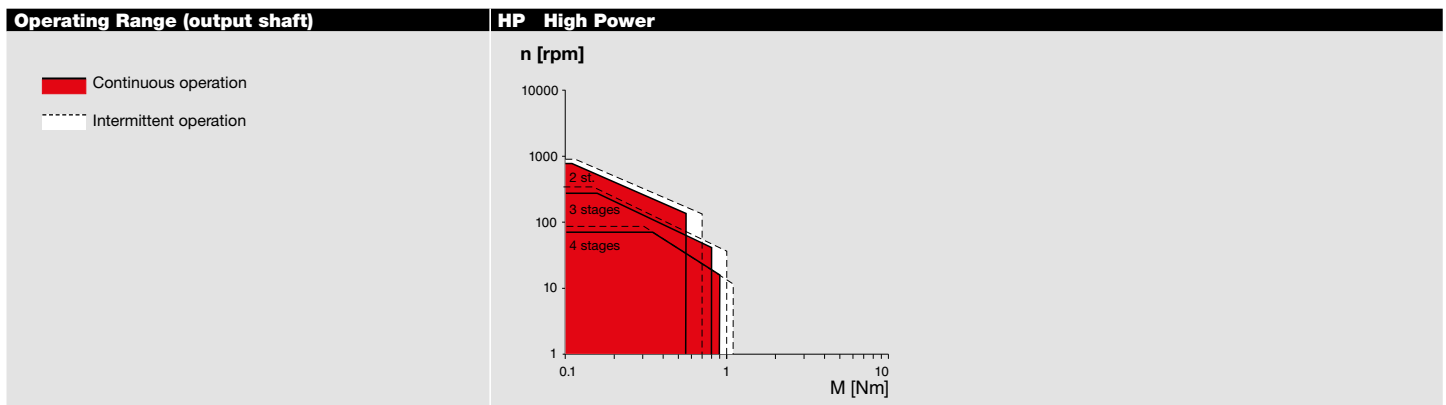
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GPX 16

Planetary Gearhead $\varnothing 16$ mm



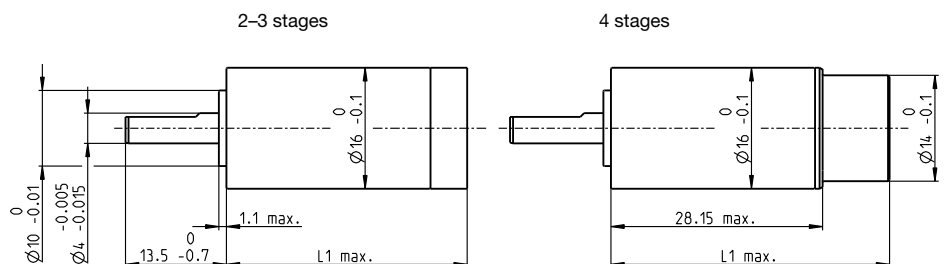
Key Data		HP High Power	
Max. transmittable power	W	8	
Max. continuous torque	Nm	0.9	
Max. continuous input speed	rpm	16000	
Ambient temperature	°C	-40 ... +100	
Bearing at output		Ball bearing	



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	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	Dimensions
maxon DC motor	N _e of stages [opt.]		
DCX 14 L	4	72-73	
DCX 16 S	2-3 [4]	74-75	
DCX 16 L	2-3 [4]	76-77	
maxon EC motor	N _e 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]	181-184	



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GPX 16 SPEED

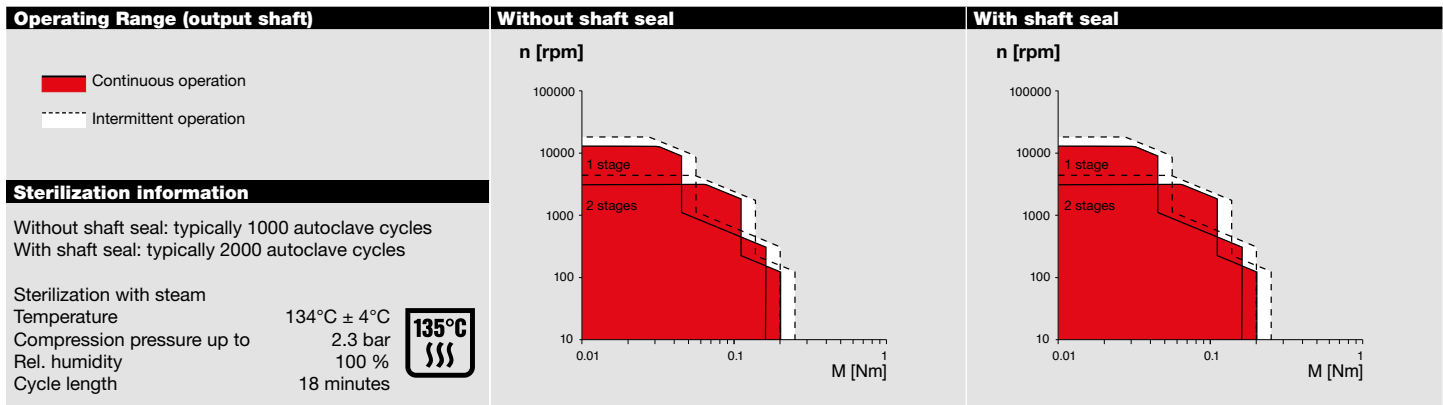
Planetary Gearhead Ø16 mm

Sterilizable



maxon GPX

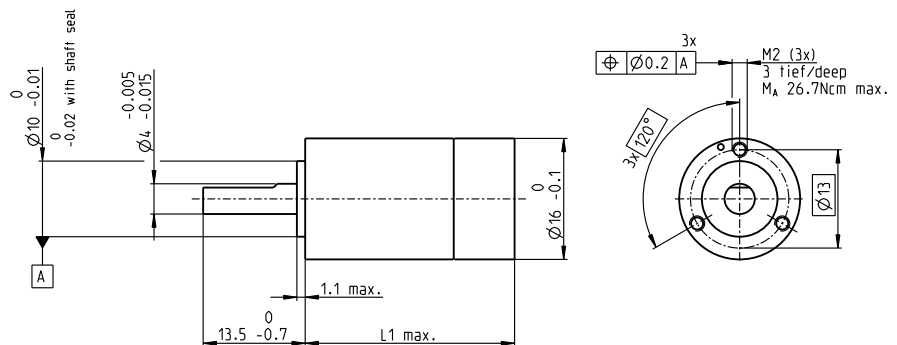
Key Data		Without shaft seal*	With shaft seal*
Max. transmittable power	W	42 (5.2)	42 (5.2)
Max. continuous torque	Nm	0.11 (0.2)	0.11 (0.2)
Max. continuous input speed	rpm	50000	50000
Ambient temperature	°C	-10 ... +135	-10 ... +135
Bearing at output		Ball bearing	Ball bearing



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	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 _e of stages [opt.]	
ECX SPEED 16 M	1-2	176-179
ECX SPEED 16 L	1-2	181-184



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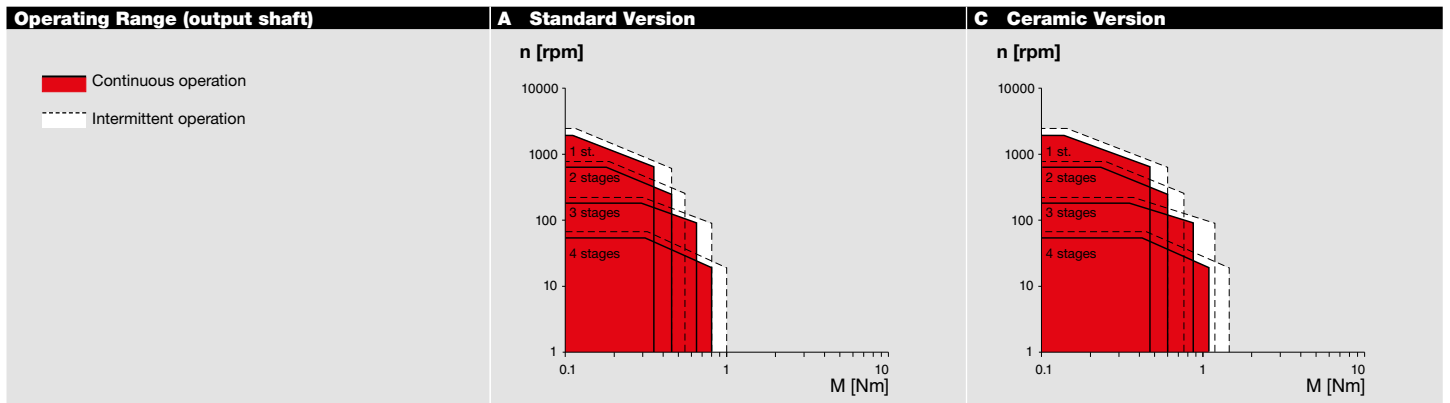
*Values in parentheses apply in case of reduced speed (according to diagram).

GPX 19

Planetary Gearhead $\varnothing 19$ 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	14 000	14 000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

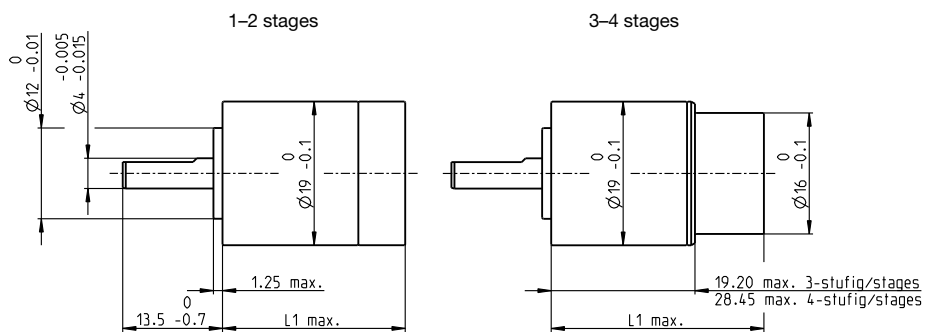


Specifications		A Standard Version				C Ceramic Version			
		1	2	3	4	1	2	3	4
Number of stages									
Max. transmittable continuous power	W	13.0	6.5	3.2	0.9	15.5	7.8	3.9	1.0
Max. transmittable intermittent power	W	16.2	8.1	4.1	1.1	19.4	9.7	4.9	1.3
Max. continuous torque	Nm	0.35	0.45	0.65	0.80	0.47	0.60	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	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			
		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	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	Dimensions
maxon DC motor N_e of stages [opt.]		
DCX 16 S	3-4	74-75
DCX 16 L	3-4	76-77
DCX 19 S	1-2 [3-4]	78-79
DC-max 16 S	3-4	90-91

maxon EC motor N_e of stages [opt.]		
ECX SPEED 16 M	3-4	176-179
ECX SPEED 16 L	3-4	181-184
ECX SPEED 19 M	1-2 [3-4]	185-188
ECX SPEED 19 L	1-2 [3-4]	189-192



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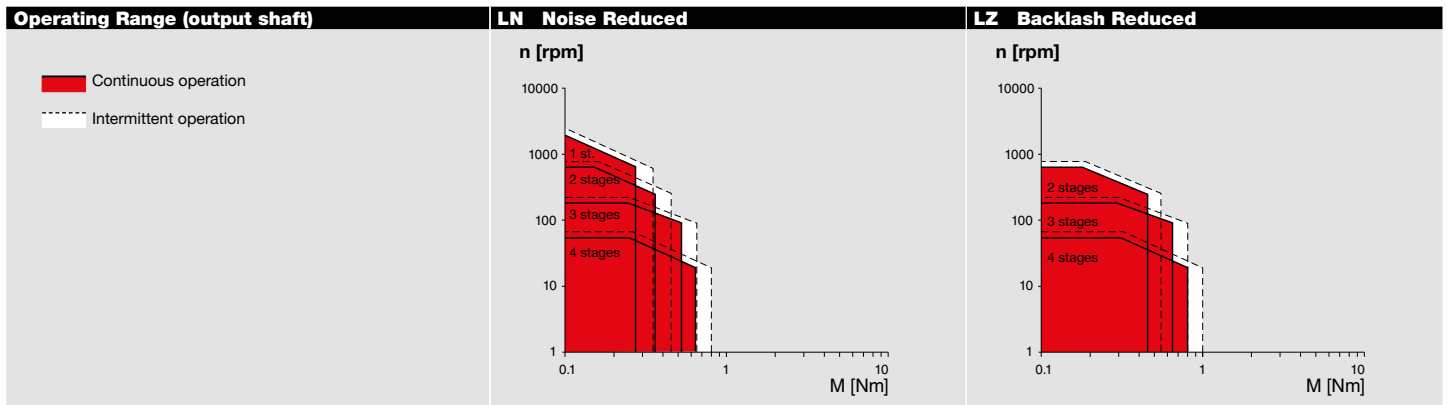
GPX 19

Planetary Gearhead Ø19 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			



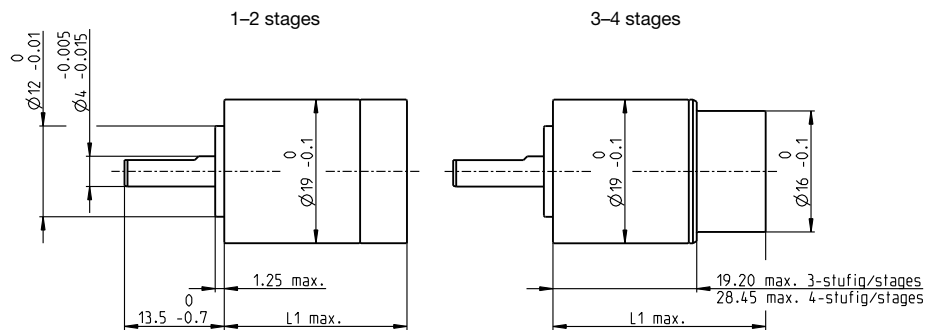
Specifications		LN Noise Reduced				LZ Backlash Reduced			
		1	2	3	4	2	3	4	
Number of stages		1	2	3	4	2	3	4	
Max. transmittable continuous power	W	10.4	5.2	2.6	0.7	6.5	3.2	0.9	
Max. transmittable intermittent power	W	13.0	6.5	3.2	0.9	8.1	4.1	1.1	
Max. continuous torque	Nm	0.28	0.36	0.52	0.64	0.45	0.65	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	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 M 1:1

maxon DC motor	N _e of stages [opt.]	Page
DCX 16 S	3-4	74-75
DCX 16 L	3-4	76-77
DCX 19 S	1-2 [3-4]	78-79
DC-max 16 S	3-4	90-91

maxon EC motor	N _e of stages [opt.]	Page
ECX SPEED 16 M	3-4	176-179
ECX SPEED 16 L	3-4	181-184
ECX SPEED 19 M	1-2 [3-4]	185-188
ECX SPEED 19 L	1-2 [3-4]	189-192



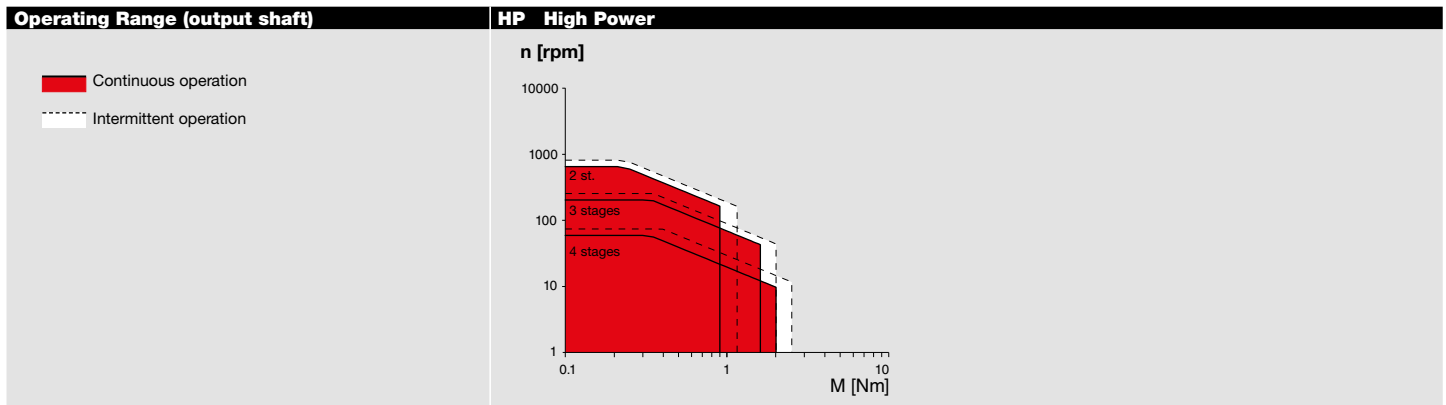
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GPX 19

Planetary Gearhead Ø19 mm



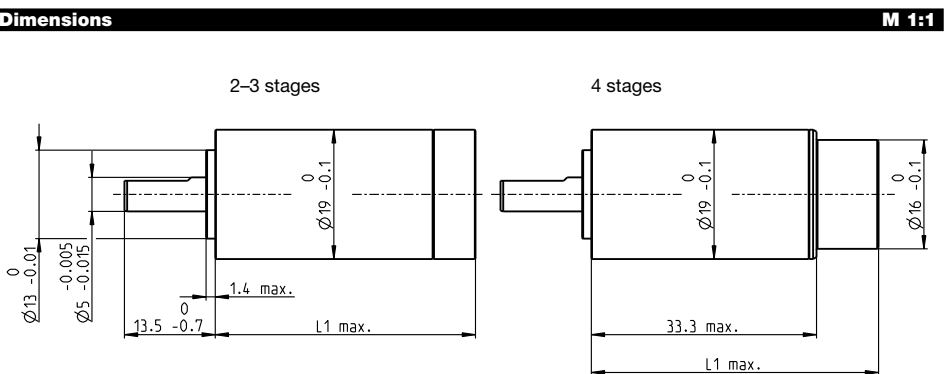
Key Data		HP High Power
Max. transmittable power	W	15
Max. continuous torque	Nm	2
Max. continuous input speed	rpm	14 000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



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	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
maxon DC motor	N _e of stages [opt.]	
DCX 16 S	4	74–75
DCX 16 L	4	76–77
DCX 19 S	2–3 [4]	78–79
maxon EC motor	N _e of stages [opt.]	
ECX SPEED 16 M	4	176–179
ECX SPEED 16 L	4	181–184
ECX SPEED 19 M	2–3 [4]	185–188
ECX SPEED 19 L	2–3 [4]	189–192



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GPX 19 SPEED

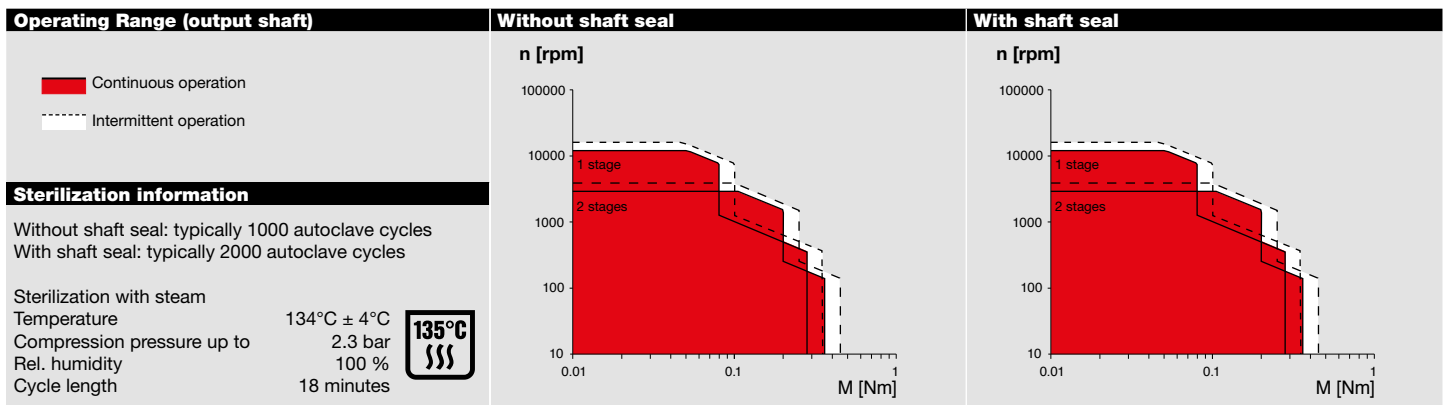
Planetary Gearhead Ø19 mm

Sterilizable



maxon GPX

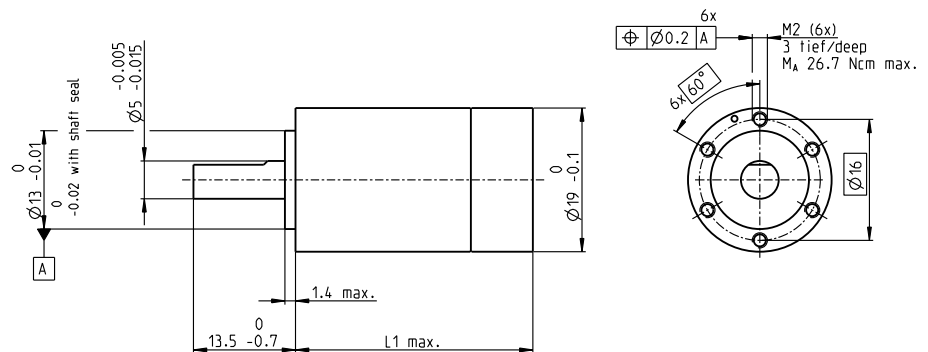
Key Data	Without shaft seal*	With shaft seal*
Max. transmittable power	W 62 (10.4)	62 (10.4)
Max. continuous torque	Nm 0.2 (0.36)	0.2 (0.36)
Max. continuous input speed	rpm 45000	45000
Ambient temperature	°C -10 ... +135	-10 ... +135
Bearing at output	Ball bearing	Ball bearing



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	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	M 1:1
maxon EC motor	N _e of stages [opt.]		
ECX SPEED 19 M	1-2	185-188	
ECX SPEED 19 L	1-2	189-192	



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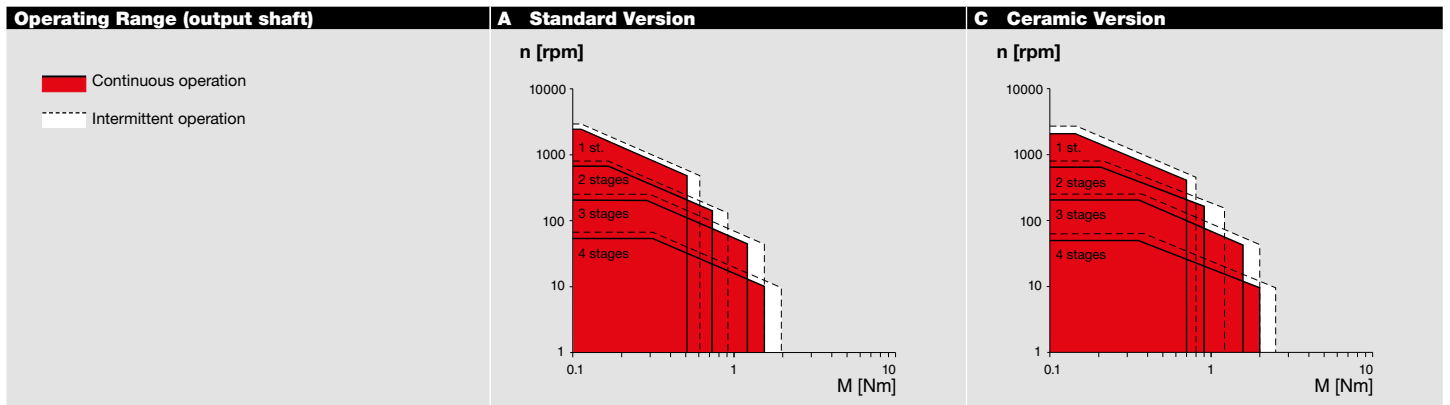
*Values in parentheses apply in case of reduced speed (according to diagram).

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



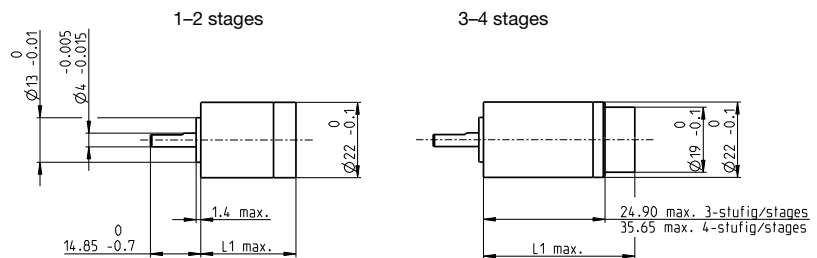
Specifications	A Standard Version	C Ceramic Version
Number of stages	1 2 3 4	1 2 3 4
Max. transmittable power (continuous)	W 24.0 12.0 6.0 1.6	30.0 15.0 7.0 2.0
Max. transmittable power (intermittent)	W 30.0 15.0 7.5 2.0	38.0 19.0 9.0 2.5
Max. continuous torque	Nm 0.50 0.70 1.20 1.50	0.70 0.90 1.60 2.00
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	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		
Flange	Standard flange/configurable flange		
Shaft	Length/flat face/cross hole		

maxon Modular System	Page
maxon DC motor	№ of stages [opt.]
DCX 19 S	3-4 78-79
DCX 22 S	1-2 [3-4] 80-81
DCX 22 L	1-2 [3-4] 82-83
DC-max 22 S*	1-2 [3-4] 92-93

maxon EC motor	№ of stages [opt.]
ECX SPEED 19 M	3-4 185-188
ECX SPEED 19 L	3-4 189-192
ECX SPEED 22 M	1-2 [3-4] 193-196
ECX SPEED 22 L	1-2 [3-4] 197-200

*Limited selection of reduction ratios (see online).



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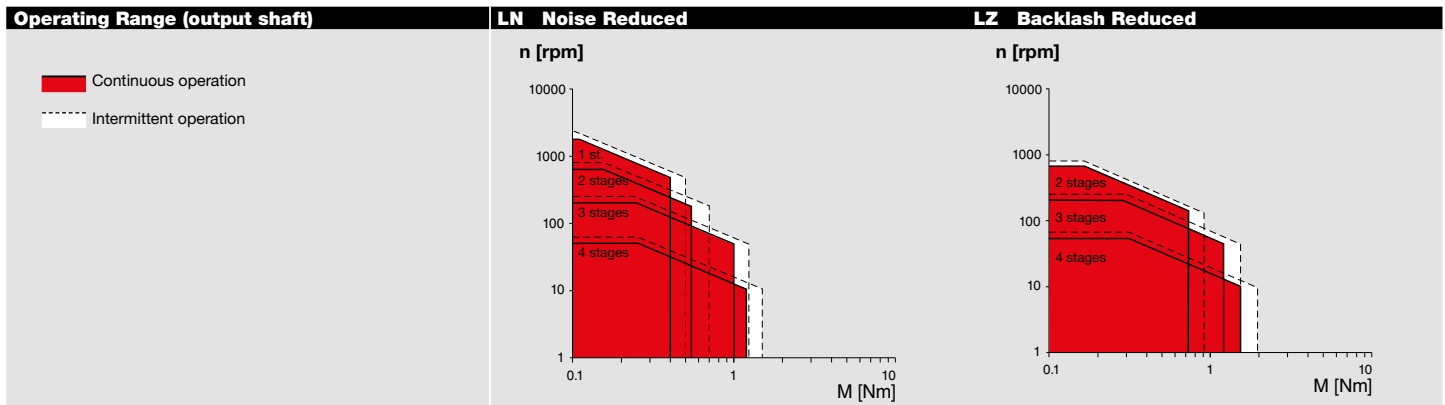
GPX 22

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			

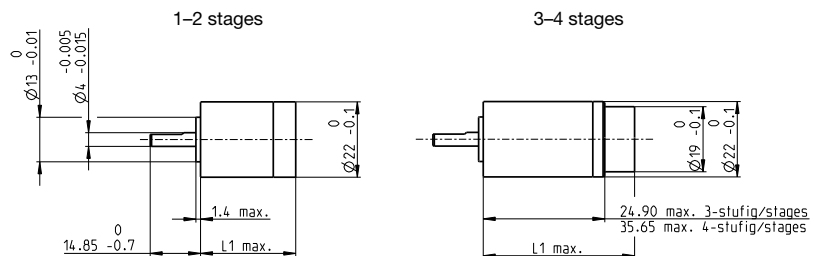


Specifications		LN Noise Reduced				LZ Backlash Reduced			
		1	2	3	4	2	3	4	
Number of stages									
Max. transmittable power (continuous)	W	20.0	10.0	5.0	1.3	12.0	6.0	1.6	
Max. transmittable power (intermittent)	W	25.0	13.0	6.3	1.6	15.0	7.5	2.0	
Max. continuous torque	Nm	0.40	0.55	1.00	1.20	0.70	1.20	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	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							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face/cross hole							

maxon Modular System		Page
maxon DC motor	N _e of stages [opt.]	
DCX 19 S	3-4	78-79
DCX 22 S	1-2 [3-4]	80-81
DCX 22 L	1-2 [3-4]	82-83
DC-max 22 S*	1-2 [3-4]	92-93

maxon EC motor		Page
maxon EC motor	N _e of stages [opt.]	
ECX SPEED 19 M	3-4	185-188
ECX SPEED 19 L	3-4	189-192
ECX SPEED 22 M	1-2 [3-4]	193-196
ECX SPEED 22 L	1-2 [3-4]	197-200



*Limited selection of reduction ratios (see online).

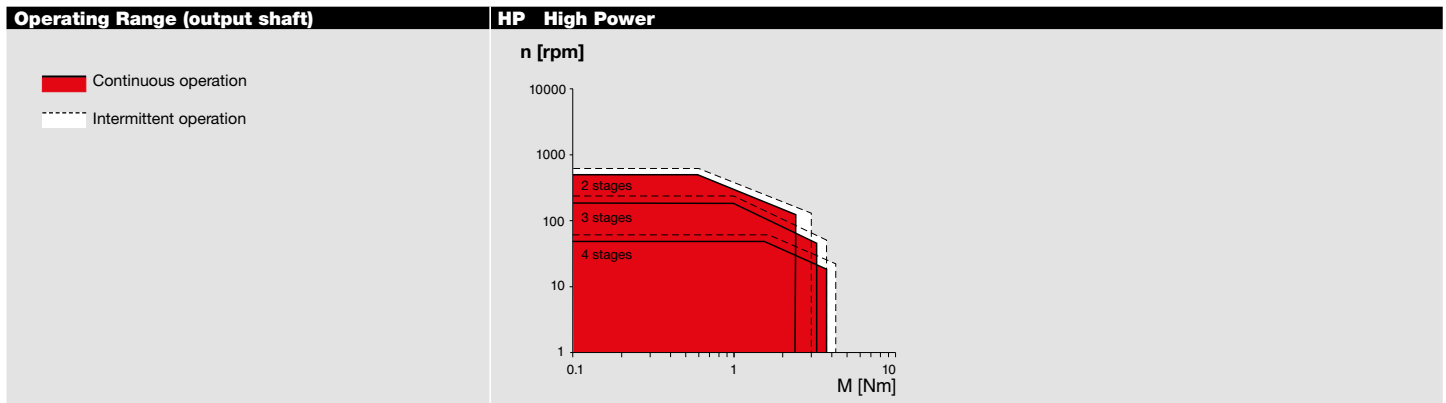
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GPX 22

Planetary Gearhead Ø22 mm



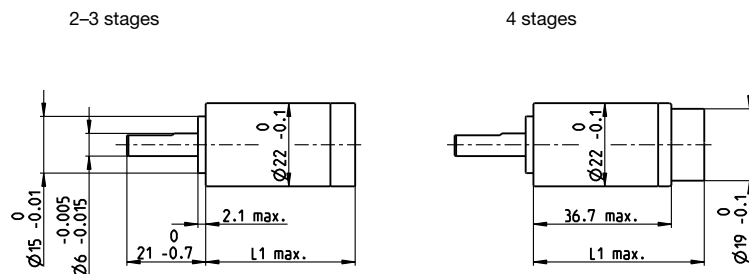
Key Data		HP High Power	
Max. transmittable power	W	30	
Max. continuous torque	Nm	3.7	
Max. continuous input speed	rpm	12000	
Ambient temperature	°C	-40 ... +100	
Bearing at output		Ball bearing	



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	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			
Flange		Standard flange			
Shaft		Length/flat face/cross hole			

maxon Modular System		Page	Dimensions
maxon DC motor	N _e of stages [opt.]		
DCX 19 S	4	78-79	
DCX 22 S	2-3 [4]	80-81	
DCX 22 L	2-3 [4]	82-83	
maxon EC motor	N _e of stages [opt.]		
ECX SPEED 19 M	4	185-188	
ECX SPEED 19 L	4	189-192	
ECX SPEED 22 M	2-3 [4]	193-196	
ECX SPEED 22 L	2-3 [4]	197-200	



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GPX 22 SPEED

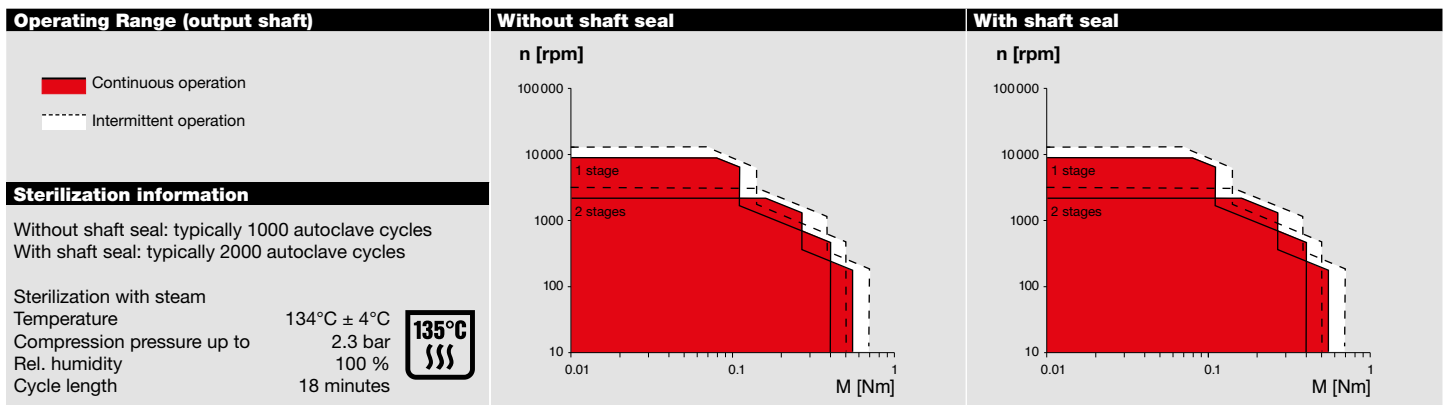
Planetary Gearhead Ø22 mm

Sterilizable



maxon GPX

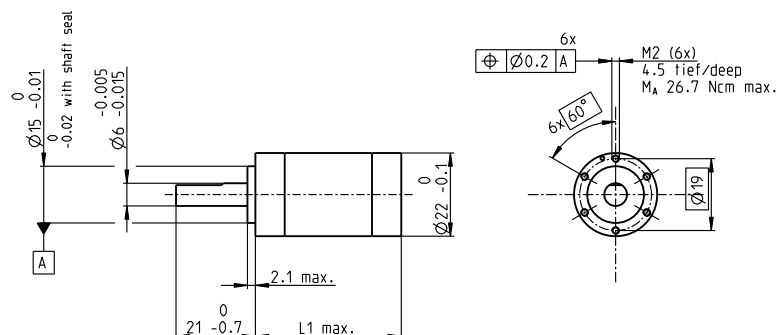
Key Data	Without shaft seal	With shaft seal
Max. transmittable power	W 74	74
Max. continuous torque	Nm 0.27	0.27
Max. continuous input speed	rpm 35000	35000
Ambient temperature	°C -10 ... +135	-10 ... +135
Bearing at output	Ball bearing	Ball bearing



Specifications	Without shaft seal*		With shaft seal*	
	1	2	1	2
Number of stages				
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	mm 30.8	40.9	38.6	48.6
Weight	g 65	86	85	106

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	M 1:2
maxon EC motor	N _e of stages [opt.]		
ECX SPEED 22 M	1-2	193-196	
ECX SPEED 22 L	1-2	197-200	



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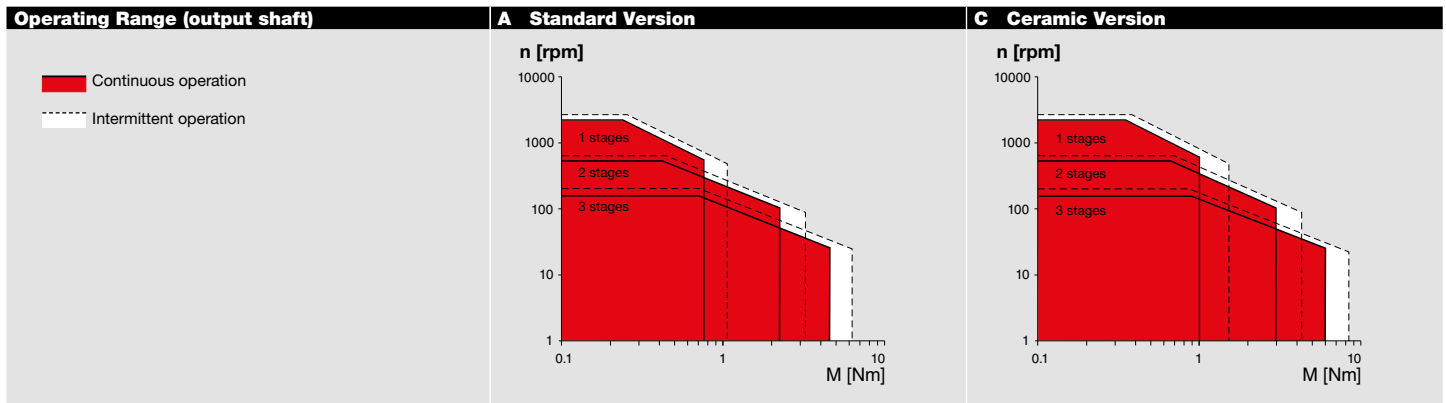
*Values in parentheses apply in case of reduced speed (according to diagram).

GPX 26

Planetary Gearhead Ø26 mm



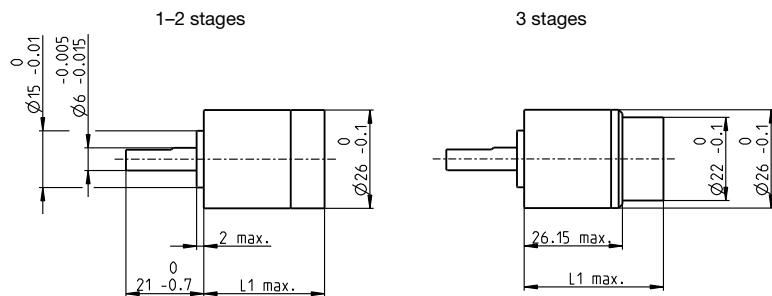
Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 48	55
Max. continuous torque	Nm 2.25	3.0
Max. continuous input speed	rpm 8000	8000
Ambient temperature	°C -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing



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	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
maxon DC motor	N _e of stages [opt.]		
DCX 22 S	3	80-81	
DCX 22 L	3	82-83	
DCX 26 L	1-2 [3]	84-85	
DC-max 22 S*	3	92-93	
DC-max 26 S*	1-2 [3]	94-95	
maxon EC motor	N _e of stages [opt.]		
ECX SPEED 22 M	3	193-196	
ECX SPEED 22 L	3	197-200	



*Limited selection of reduction ratios (see online).

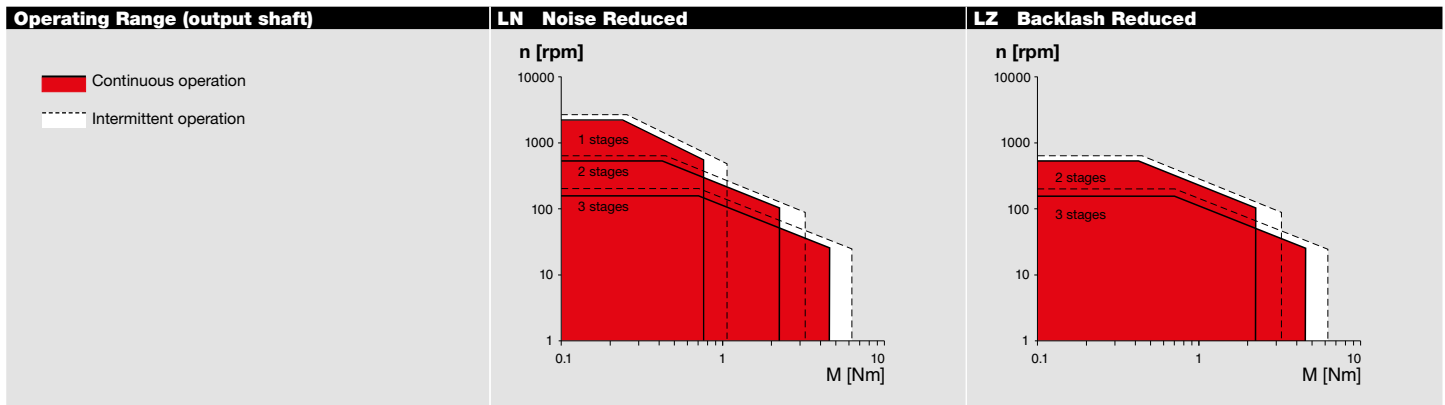
GPX 26

Planetary Gearhead Ø26 mm



maxon GPX

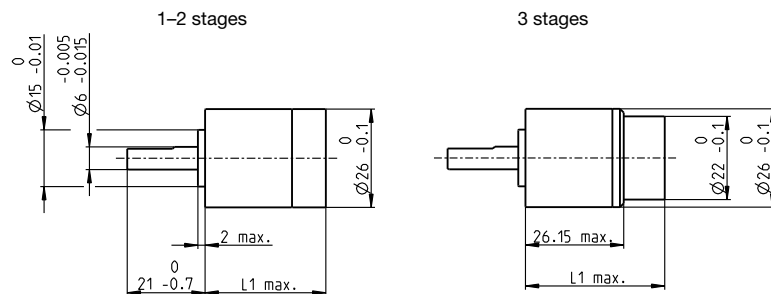
Key Data		LN Noise Reduced		LZ Backlash Reduced	
Max. transmittable power	W	38		24	
Max. continuous torque	Nm	1.8		2.3	
Max. continuous input speed	rpm	8000		8000	
Ambient temperature	°C	-40 ... +85		-40 ... +100	
Bearing at output		Ball bearing		Ball bearing	
Typical noise level	dBA	-5 dBA compared to standard configuration			



Specifications	LN Noise Reduced			LZ Backlash Reduced	
Number of stages		1	2	3	
Max. transmittable continuous power	W	38	19	10.0	
Max. transmittable intermittent power	W	48	24	12.0	
Max. continuous torque	Nm	0.60	1.80	3.60	
Max. intermittent torque	Nm	0.75	2.25	4.50	
Max. continuous input speed	rpm	7000	8000	10000	
Max. intermittent input speed	rpm	8750	10000	12500	
Max. efficiency	%	90	78	75	
Average backlash no load	°	0.75	0.95	1.1	
Max. axial load (dynamic)	N	80	80	80	
Max. radial load, 10 mm from flange	N	95	145	150	
Gearhead length L1	mm	21.3	30.2	35.5	
Weight	g	75	95	105	

Configuration	LN Noise Reduced			LZ Backlash Reduced	
Number of stages		1	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				
Flange	Standard flange/configurable flange				
Shaft	Length/flat face/cross hole				

maxon Modular System		Page	Dimensions	M 1:2
maxon DC motor	N _e of stages [opt.]			
DCX 22 S	3	80–81		
DCX 22 L	3	82–83		
DCX 26 L	1–2 [3]	84–85		
DC-max 22 S*	3	92–93		
DC-max 26 S*	1–2 [3]	94–95		
maxon EC motor	N _e of stages [opt.]			
ECX SPEED 22 M	3	193–196		
ECX SPEED 22 L	3	197–200		



*Limited selection of reduction ratios (see online).

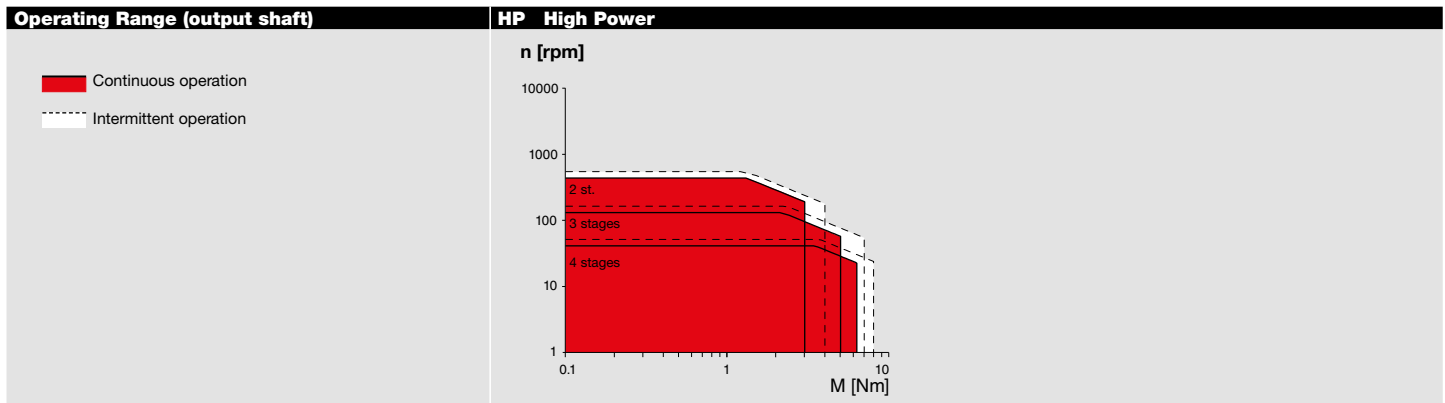
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GPX 26

Planetary Gearhead Ø26 mm



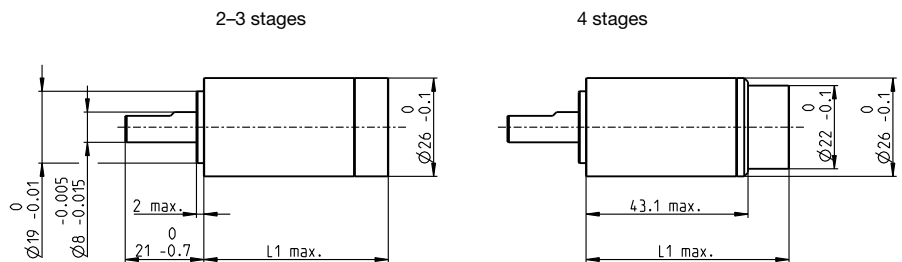
Key Data		HP High Power
Max. transmittable power	W	60
Max. continuous torque	Nm	6.3
Max. continuous input speed	rpm	10000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



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	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
maxon DC motor	N _e of stages [opt.]		
DCX 22 S	4	80-81	
DCX 22 L	4	82-83	
DCX 26 L	2-3 [4]	84-85	
maxon EC motor	N _e of stages [opt.]		
ECX SPEED 22 M	4	193-196	
ECX SPEED 22 L	4	197-200	



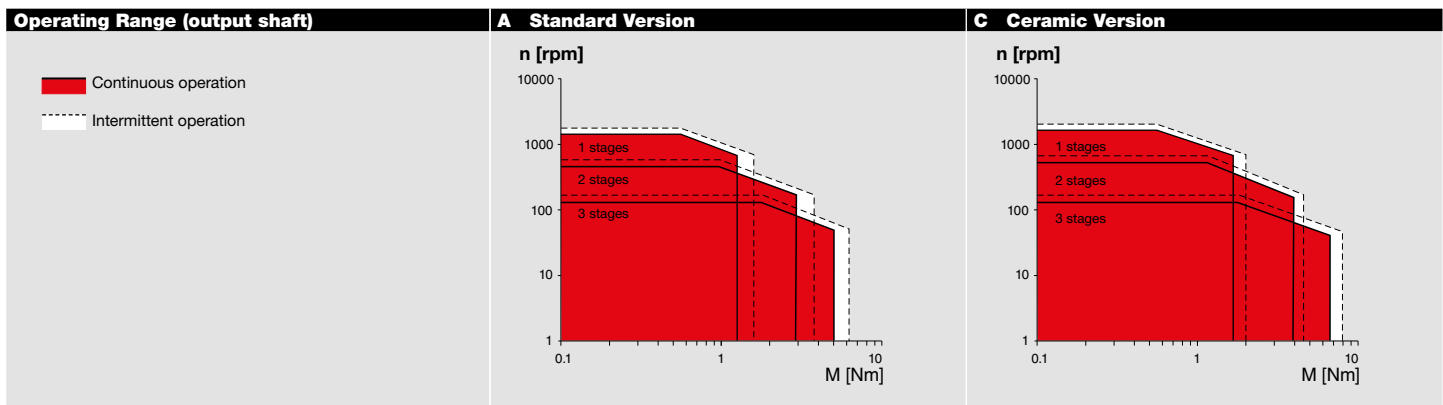
GPX 32

Planetary Gearhead Ø32 mm



maxon GPX

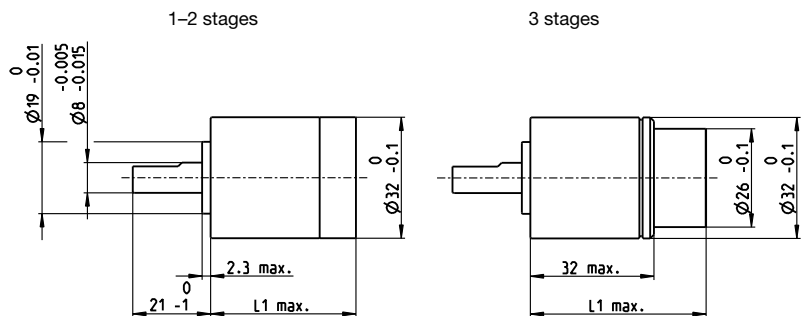
Key Data	A Standard Version	C Ceramic Version
Max. transmittable power	W 100	120
Max. continuous torque	Nm 5	6.6
Max. continuous input speed	rpm 8000	8000
Ambient temperature	°C -40 ... +100	-40 ... +100
Bearing at output	Ball bearing	Ball bearing



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	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					
Flange	Standard flange/configurable flange					
Shaft	Length/flat face/cross hole					

maxon Modular System	Page	Dimensions
maxon DC motor	N _e of stages [opt.]	
DCX 26 L	3	84-85
DCX 32 L	1-2 [3]	86
DC-max 26 S*	3	94-95



*Limited selection of reduction ratios (see online).

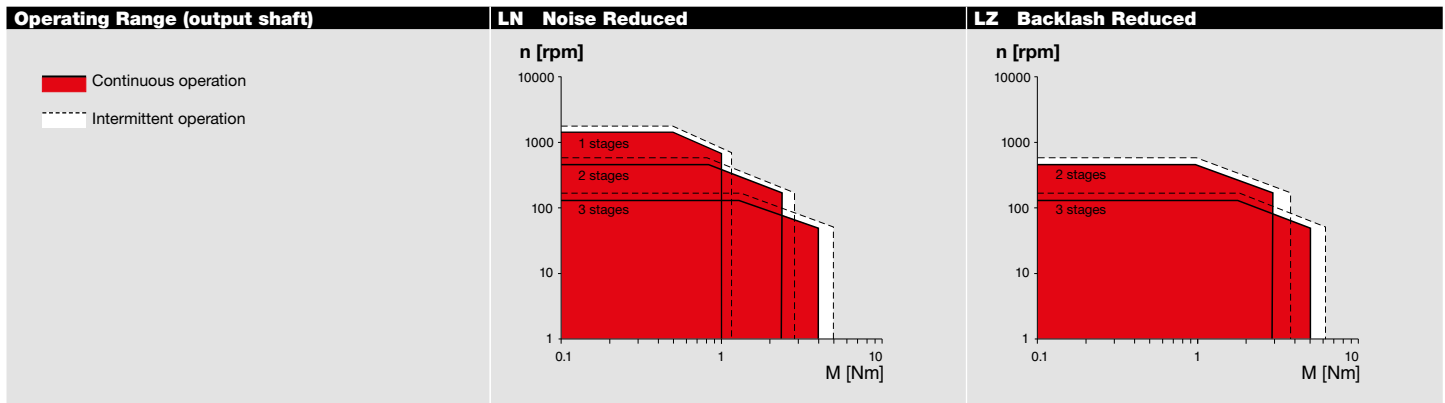
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GPX 32

Planetary Gearhead Ø32 mm



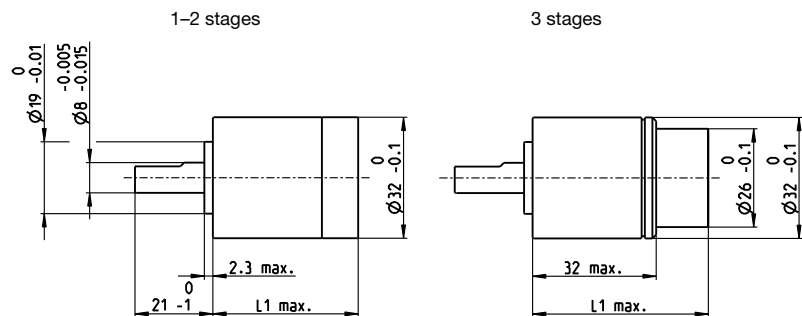
Key Data		LN Noise Reduced	LZ Backlash Reduced
Max. transmittable power	W	80	50
Max. continuous torque	Nm	4	5
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	



Specifications	LN Noise Reduced	LZ Backlash Reduced
Number of stages	1 2 3	2 3
Max. transmittable continuous power	W 80 40 20	50 25
Max. transmittable intermittent power	W 100 50 25	62 31
Max. continuous torque	Nm 1.00 2.30 4.00	2.90 5.00
Max. intermittent torque	Nm 1.30 2.90 5.00	3.60 6.25
Max. continuous input speed	rpm 6000 7000 8000	7000 8000
Max. intermittent input speed	rpm 7500 8750 10000	8750 10000
Max. efficiency	% 90 78 75	78 75
Average backlash no load	° 0.55 0.7 0.9	0.55 0.75
Max. axial load (dynamic)	N 110 110 110	110 110
Max. radial load, 10 mm from flange	N 160 180 180	180 180
Gearhead length L1	mm 26.7 36.3 43.9	36.3 43.9
Weight	g 140 185 230	185 230

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	
Flange	Standard flange/configurable flange	
Shaft	Length/flat face/cross hole	

maxon Modular System	Page	Dimensions
maxon DC motor	N _e of stages [opt.]	
DCX 26 L	3	84-85
DCX 32 L	1-2 [3]	86
DC-max 26 S*	3	94-95



*Limited selection of reduction ratios (see online).

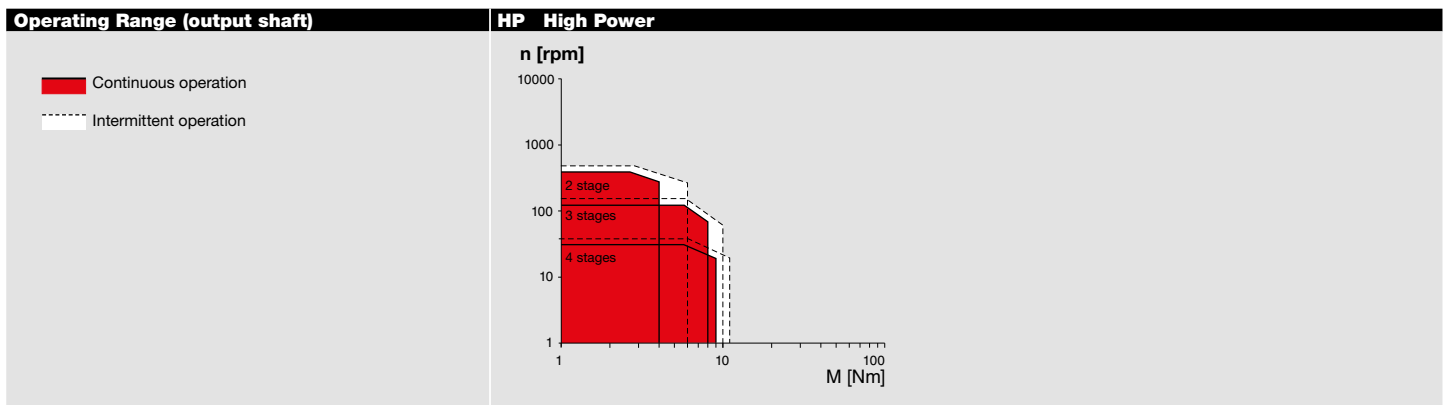
GPX 32

Planetary Gearhead $\varnothing 32$ mm



maxon GPX

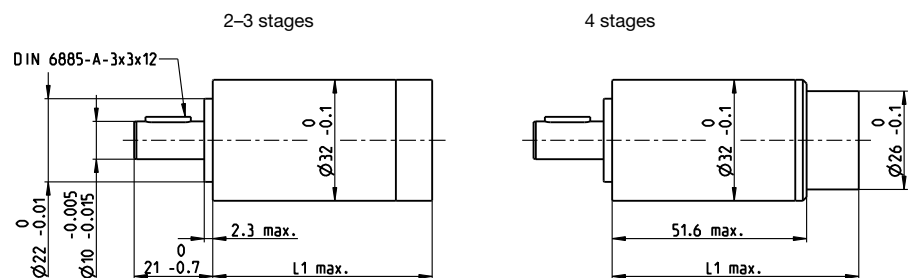
Key Data		HP High Power
Max. transmittable power	W	110
Max. continuous torque	Nm	9
Max. continuous input speed	rpm	8000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



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 L1	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		
Flange		Standard flange		
Shaft		Length/flat face/feather key		

maxon Modular System		Page	Dimensions	M 1:2
maxon DC motor	N _e of stages [opt.]			
DCX 26 L	4	84–85		
DCX 32 L	2–3 [4]	86		



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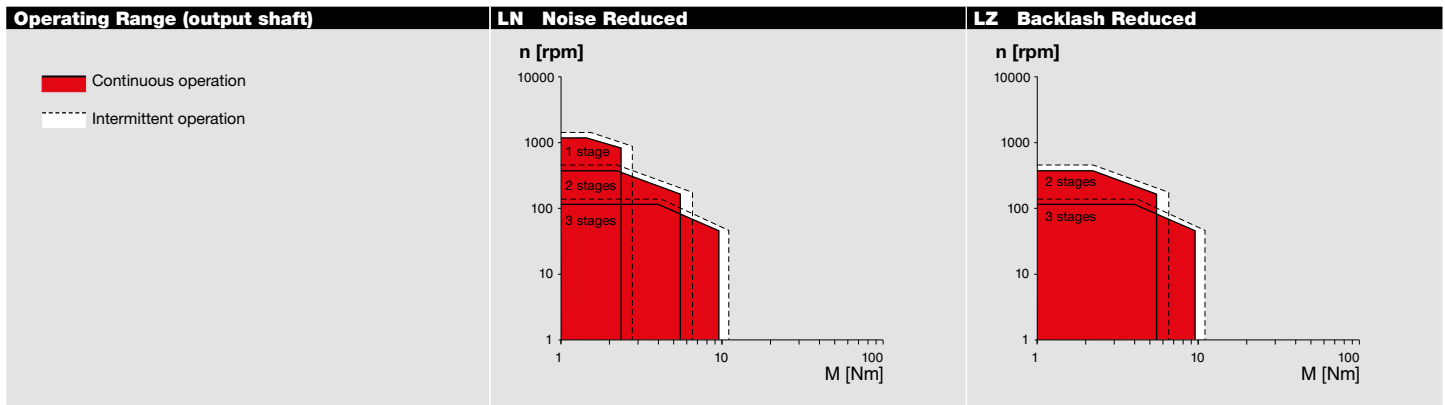
GPX 37

Planetary Gearhead $\varnothing 37$ mm



maxon GPX

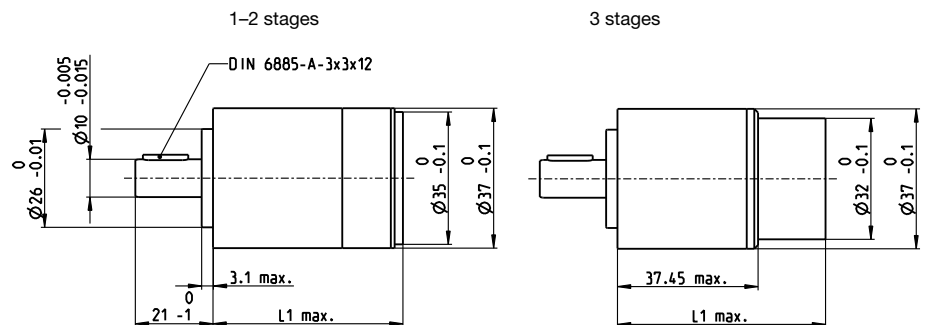
Key Data		LN Noise Reduced		LZ Backlash Reduced	
Max. transmittable power	W	150		90	
Max. continuous torque	Nm	7.4		9.3	
Max. continuous input speed	rpm	7000		7000	
Ambient temperature	°C	-40 ... +85		-40 ... +100	
Bearing at output		Ball bearing		Ball bearing	
Typical noise level	dBA	-5 dBA compared 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 L1	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
maxon DC motor	N _e of stages [opt.]		
DCX 32 L	3	86	
DCX 35 L	1-2	87	



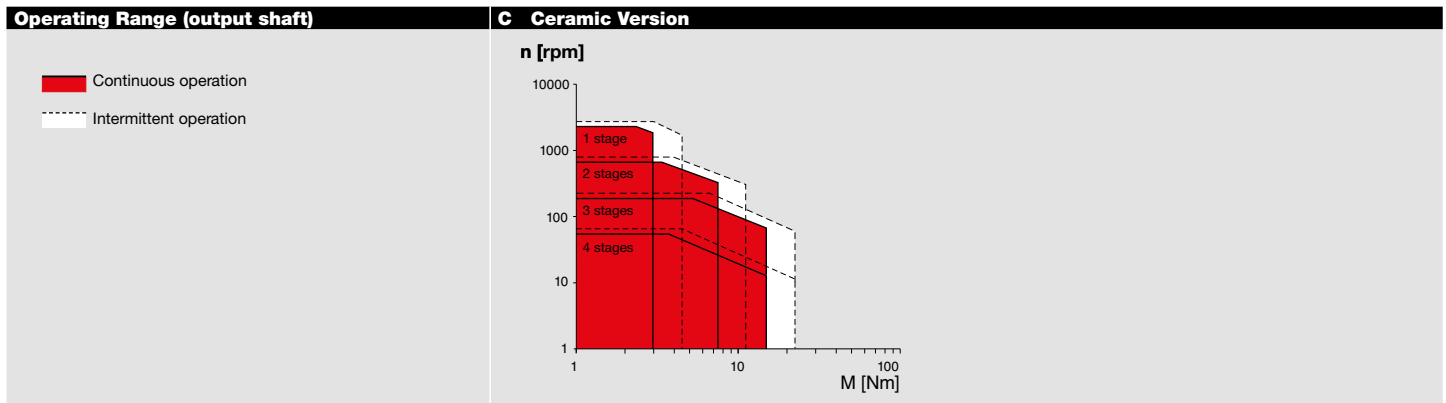
xdrives.maxonmotor.com

GPX 42

Planetary Gearhead $\varnothing 42$ mm



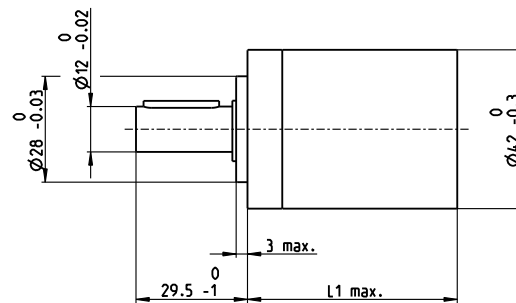
Key Data		C Ceramic Version
Max. transmittable power	W	580
Max. continuous torque	Nm	15.0
Max. continuous input speed	rpm	8000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing



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 L1	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 _e of stages [opt.]		
DCX 35 L	1-4	87	



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DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

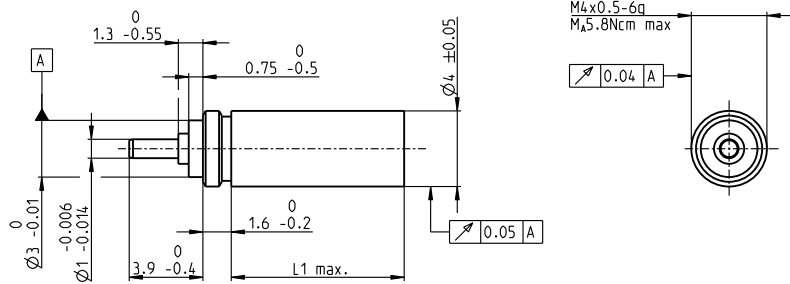
maxon gear

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.

Standard Specification No. 102	61
Explanation	282
GPX Program	284–314
maxon gear	316–362

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

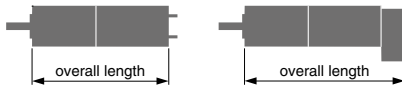
- Stock program
- Standard program
- Special program (on request)

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 ²	0.0002	0.0002	0.0002
11 Gearhead length L1	mm	6.1	7.7	9.4

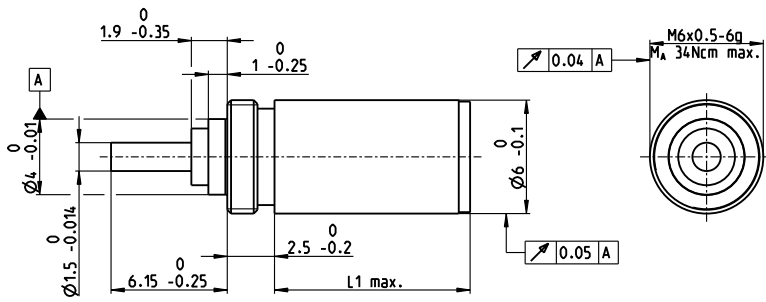


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
EC 4, 0.5 W, A	202			24.9	26.6	28.3
EC 4, 0.5 W, B	202			24.9	26.6	28.3
EC 4, 1.0 W, A	203			31.9	33.6	35.3
EC 4, 1.0 W, B	203			31.9	33.6	35.3

Planetary Gearhead GP 6 A $\varnothing 6$ mm, 0.002–0.03 Nm

maxon gear



Technical Data

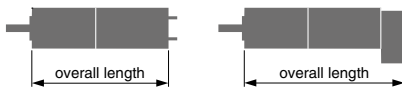
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Option	sleeve bearing
Radial play, 5 mm from flange	max. 0.12 mm
Axial play	max. 0.10 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous 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	

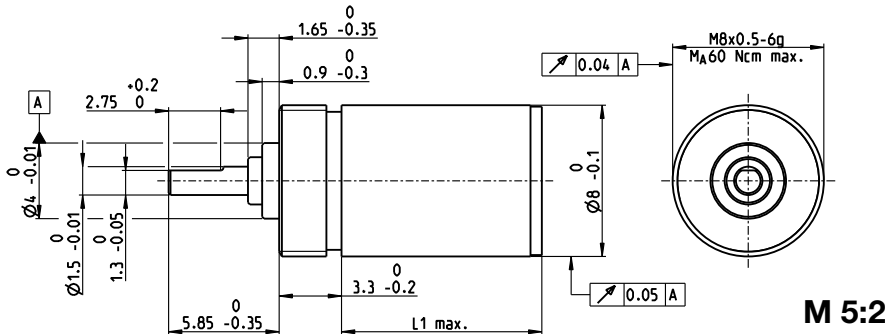
Gearhead Data						
1 Reduction		3.9:1	15:1	57:1	221:1	854:1
2 Absolute reduction		$\frac{27}{7}$	$\frac{729}{49}$	$\frac{19683}{343}$	$\frac{531441}{2401}$	$\frac{14348907}{16807}$
3 Max. motor shaft diameter	mm	1	1	1	1	1
4 Number of stages		1	2	3	4	5
5 Max. continuous torque	Nm	0.002	0.005	0.010	0.030	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 ²	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	98			21.0	23.5	26.1	28.7	31.3
RE 6, 0.3 W, B	98			25.0	27.5	30.1	32.7	35.3
EC 6, 1.5 W	204			26.7	29.2	31.8	34.4	37.0
EC 6, 1.5 W	204	Enc 6 MAG	405	28.8	31.3	33.9	36.5	39.1
EC 6, 1.5 W	204	Enc 6 OPT	421	28.8	31.3	33.9	36.5	39.1
EC 6, 2 W	205			26.7	29.2	31.8	34.4	37.0
EC 6, 2 W	205	Enc 6 MAG	405	28.8	31.3	33.9	36.5	39.1
EC 6, 2 W	205	Enc 6 OPT	421	28.8	31.3	33.9	36.5	39.1

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

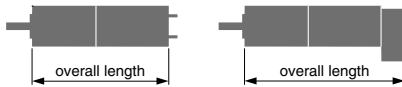
- Stock program
- Standard program
- Special program (on request)

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 ²	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

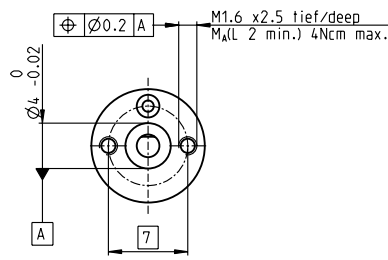
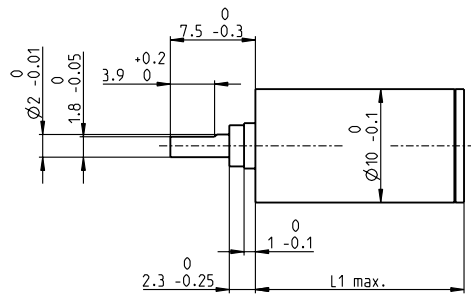


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 8, 0.5 W, A	99			22.2	24.8	25.0	27.4	27.8	30.0	30.6	32.6
RE 8, 0.5 W, B	99			25.2	27.8	28.0	30.4	30.8	33.0	33.6	35.6
RE 8, 0.5 W, A	99	MR	413/414	28.8	31.4	31.6	34.0	34.4	36.6	37.2	39.2
RE 8, 0.5 W, A	99	8 OPT	422	30.4	33.0	33.2	35.6	36.0	38.2	38.8	40.8
EC 8, 2 W	206			28.6	31.2	31.4	33.8	34.2	36.4	37.0	39.0

Planetary Gearhead GP 10 K $\varnothing 10$ mm, 0.005–0.1 Nm

Plastic Version



Technical Data

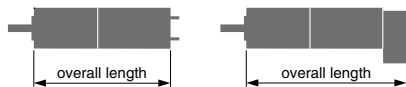
Planetary Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input 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

Gearhead Data	Part Numbers					
	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 ² 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	

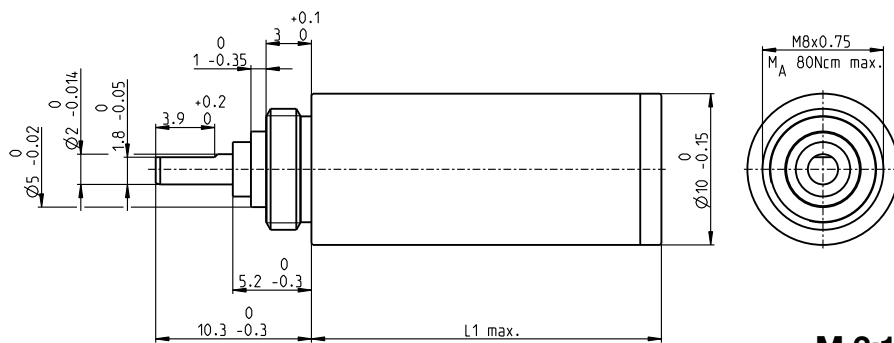


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 10, 0.75 W	100/101			27.3	31.4	35.5	39.6	43.7
RE 10, 0.75 W	101	MR	413/414	33.1	37.2	41.3	45.4	49.5
RE 10, 0.75 W	101	MEnc 10	406	35.4	39.5	43.6	47.7	51.8
RE 10, 1.5 W	102/103			34.9	39.0	43.1	47.2	51.3
RE 10, 1.5 W	103	MR	413/414	40.7	44.8	48.9	53.0	57.1
RE 10, 1.5 W	103	MEnc 10	406	43.0	47.1	51.2	55.3	59.4
EC 9.2 flat, 0.5 W	254			22.8	26.9	31.0	35.1	39.2
EC 10 flat, 0.2 W	255			13.6	17.7	21.8	25.9	30.0

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

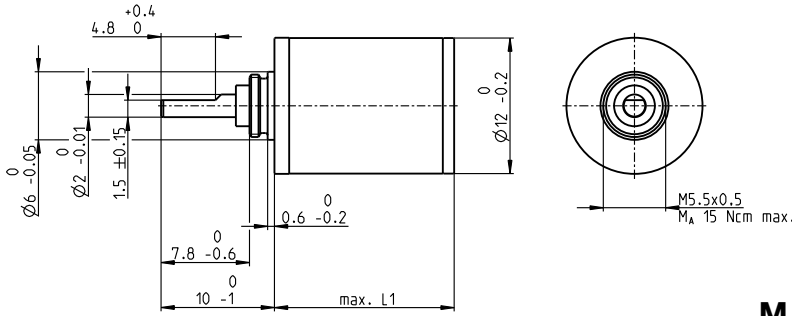
		4:1	16:1	64:1	256:1	1024:1	4:1	16:1	64:1	256:1	1024:1
1 Reduction		4:1	16:1	64:1	256:1	1024:1	4:1	16:1	64:1	256:1	1024:1
2 Absolute reduction		4	16	64	256	1024	4	16	64	256	1024
3 Max. motor shaft diameter	mm	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
4 Number of stages		1	2	3	4	5	1	2	3	4	5
5 Max. continuous 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 ²	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	100/101			27.5	31.2	34.3	37.5	40.6					
RE 10, 0.75 W	101	MR	413/414	33.3	37.0	40.1	43.3	46.4					
RE 10, 0.75 W	101	MEnc 10	406	35.6	39.3	42.4	45.6	48.7					
RE 10, 1.5 W	102/103			35.1	38.8	41.9	45.1	48.2					
RE 10, 1.5 W	103	MR	413/414	40.9	44.6	47.7	50.9	54.0					
RE 10, 1.5 W	103	MEnc 10	406	43.2	46.9	50.0	53.2	56.3					
A-max 12	137/138			31.7	35.4	38.5	41.7	44.8					
A-max 12, 0.5 W	138	MR	413/414	35.8	39.5	42.6	45.8	48.9					
EC 10, 8 W	207								36.2	39.9	43.0	46.2	49.3
EC 9.2 flat, 0.5 W	254			23.0	26.7	29.8	33.0	36.1					
EC 10 flat, 0.2 W	255			13.8	17.5	20.6	23.8	26.9					

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
Part Numbers	310302	310304	310307	313992		310313	310317
1 Reduction	9.1:1	22:1	76:1	200:1		900:1	4402:1
2 Absolute reduction	$\frac{899}{99}$	$\frac{12493}{567}$	$\frac{387283}{5103}$	$\frac{22462414}{112266}$		$\frac{372178963}{413343}$	$\frac{25737606749}{5845851}$
3 Max. motor shaft diameter	mm 1.0	1.2	1.2	1.0		1.2	1.0
Part Numbers		310305	310308	310310		310314	
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 ²	0.002	0.002	0.002	0.002	0.002	0.002
11 Gearhead length L1	mm	10	12	14	16	16	18

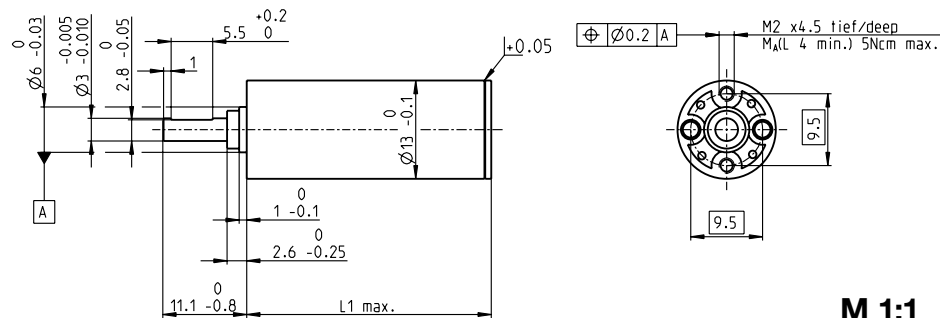


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
A-max 12	137/138			31.3	33.3	35.3	37.3	37.3	39.3	41.3
A-max 12, 0.5 W	138	MR	413/414	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



M 1:1

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

- Stock program
- Standard program
- Special program (on request)

Part Numbers

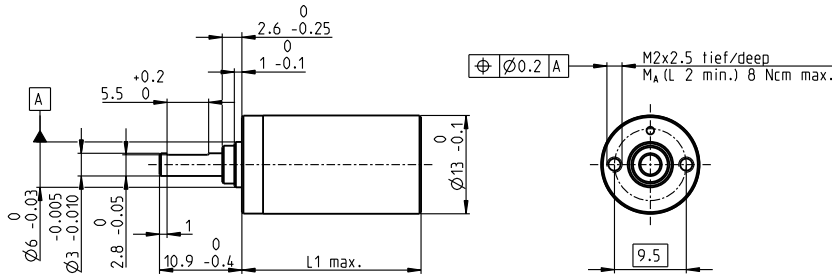
	137149	137150	137151	137152	137153
Gearhead Data					
1 Reduction	4.1:1	17:1	67:1	275:1	1119:1
2 Absolute reduction	$\frac{57}{14}$	$\frac{3249}{196}$	$\frac{185193}{2744}$	$\frac{10556001}{38416}$	$\frac{601692057}{537824}$
3 Max. motor shaft diameter	mm 1.5	1.	1.5	1.5	1.5
4 Number of stages	1	2	3	4	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 ² 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	105/107			34.8	40.7	44.4	48.1	51.8
RE 13, 0.75 W	107	MR	413-415	41.9	47.8	51.5	55.2	58.9
RE 13, 0.75 W	107	MEnc 13	407	42.6	48.5	52.2	55.9	59.6
RE 13	109/111			47.0	52.9	56.6	60.3	64.0
RE 13, 2 W	111	MR	413-415	54.1	60.0	63.7	67.4	71.1
RE 13, 2 W	111	MEnc 13	407	54.8	60.7	64.4	68.1	71.8
RE 13, 1.5 W	113/115			37.9	43.8	47.5	51.2	54.9
RE 13, 1.5 W	115	MR	413-415	44.0	49.9	53.6	57.3	61.0
RE 13, 1.5 W	115	MEnc 13	407	45.9	51.8	55.5	59.2	62.9
RE 13, 3 W	117/119			50.1	56.0	59.7	63.4	67.1
RE 13, 3 W	119	MR	413-415	56.2	62.1	65.8	69.5	73.2
RE 13, 3 W	119	MEnc 13	407	58.1	64.0	67.7	71.4	75.1
A-max 12	137/138			36.8	42.7	46.4	50.1	53.8
A-max 12, 0.5 W	138	MR	413-415	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)

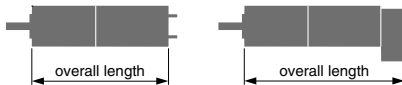
Part Numbers

	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
Part Numbers	352365	352366	352367	352368	352369
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 ² 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

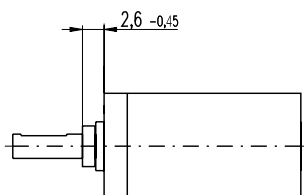
* for A-max 12 is L1 + 0.3 mm



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 13	105/107			35.4	39.3	43.1	47.0	50.8
RE 13, 0.75 W	107	MR	413-415	42.5	46.4	50.2	54.1	57.9
RE 13, 0.75 W	107	MEnc 13	407	43.2	47.1	50.9	54.8	58.6
RE 13	109/111			47.6	51.5	55.3	59.2	63.0
RE 13, 2 W	111	MR	413-415	54.7	58.6	62.4	66.3	70.1
RE 13, 2 W	111	MEnc 13	407	55.4	59.3	63.1	67.0	70.8
RE 13, 1.5 W	113/115			38.5	42.4	46.2	50.1	53.9
RE 13, 1.5 W	115	MR	413-415	44.6	48.5	52.3	56.2	60.0
RE 13, 1.5 W	115	MEnc 13	407	46.5	50.4	54.2	58.1	61.9
RE 13, 3 W	117/119			50.7	54.6	58.4	62.3	66.1
RE 13, 3 W	119	MR	413-415	56.8	60.7	64.5	68.4	72.2
RE 13, 3 W	119	MEnc 13	407	58.7	62.6	66.4	70.3	74.1
A-max 12	137/138			37.6	41.5	45.3	49.2	53.0
A-max 12, 0.5 W	138	MR	413-415	41.7	45.6	49.4	53.3	57.1
EC 13, 6 W	208			37.4	41.3	45.1	49.0	52.8
EC 13, 12 W	209			49.6	53.5	57.3	61.2	65.0

Option Ball Bearing



Gearhead length: L1 + 0.2 mm

Part Numbers

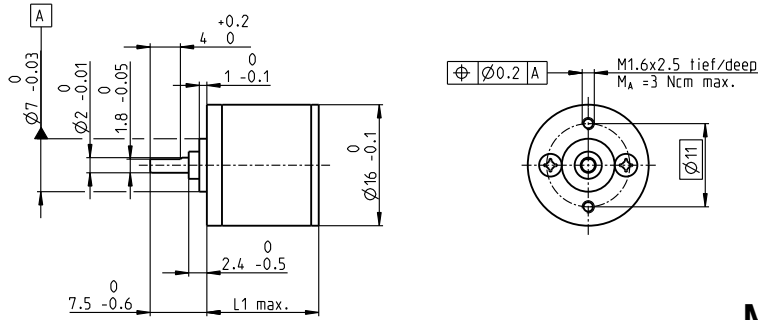
	144300	131:1	352393
4.1:1	144300	131:1	352393
5.1:1	352391	275:1	144303
17:1	144301	664:1	352394
26:1	352392	1119:1	144304
67:1	144302	3373:1	352395

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	

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

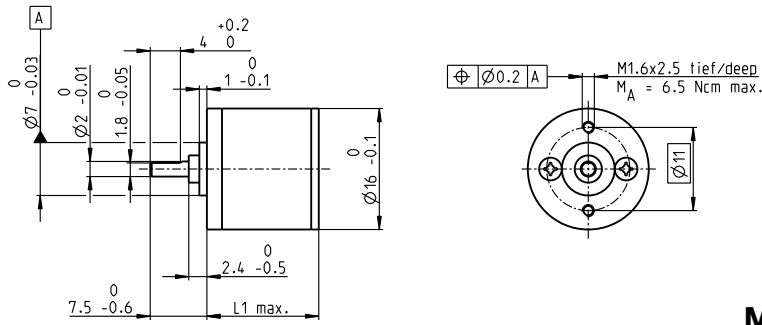
	201463	201465	201467	201469	201471	201473
Gearhead Data						
1 Reduction	6.4:1	22:1	76:1	261:1	900:1	3101:1
2 Absolute reduction	$\frac{403}{63}$	$\frac{12493}{567}$	$\frac{387283}{5103}$	$\frac{12005773}{45927}$	$\frac{372178963}{413343}$	$\frac{11537547853}{3720087}$
3 Max. motor shaft diameter mm	1.5	1.5	1.5	1.5	1.5	1.5
Part Numbers	207405	207406	207407	207408	207409	207410
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
Part Numbers	201464	201466	201468	201470	201472	201474
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 ²	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	139-142			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	140/142	MR	416/417	42.3	43.3	45.3	47.3	49.3	51.3
A-max 16	140/142	MEnc 13	407	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

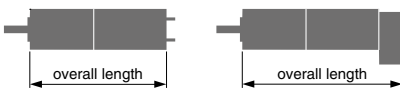
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.15 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	30 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+100°C
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
Gearhead Data						
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
Part Numbers	207834	207835	207836	207837	207838	207839
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
Part Numbers	144410	143762	143764	143766	143768	143770
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 ² 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

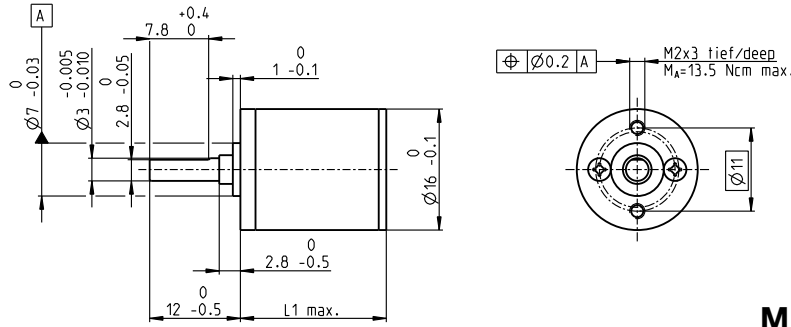


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	139-142			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	140/142 MR		416/417	42.3	43.3	45.3	47.3	49.3	51.3
A-max 16	140/142 MEnc 13		407	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



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

M 1:1

- 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
Part Numbers	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
Part Numbers	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 ²	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

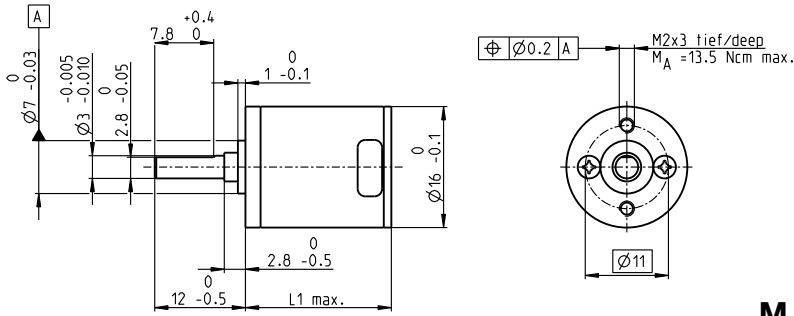


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	139-142			39.8	42.8	44.8	46.8	48.8	50.8
A-max 16	140/142 MR		416/417	44.8	47.8	49.8	51.8	53.8	55.8
A-max 16	140/142 MEnc 13		407	47.9	50.9	52.9	54.9	56.9	58.9

Spur Gearhead GS 16 VZ $\varnothing 16$ mm, 0.06–0.1 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

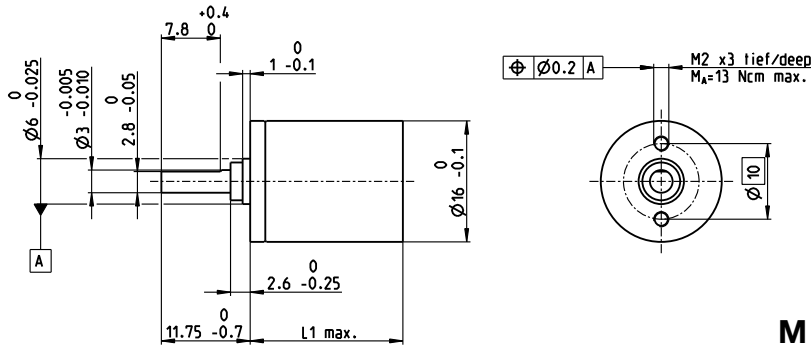
	327789	327796	327800
1 Reduction	76:1	261:1	900:1
2 Absolute reduction	387283/5103	12005773/45927	372178963/413343
3 Max. motor shaft diameter	mm 1.5	1.5	1.5
Part Numbers			
1 Reduction	108:1	371:1	1278:1
2 Absolute reduction	863939/8019	26782109/72171	830245379/649539
3 Max. motor shaft diameter	mm 1.5	1.5	1.5
Part Numbers			
1 Reduction	141:1	485:1	1670:1
2 Absolute reduction	923527/6561	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 ² 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	139-142			44.8	46.8	48.8
A-max 16	140/142 MR		416/417	49.8	51.8	53.8
A-max 16	140/142 MEnc 13		407	52.9	54.9	56.9

Planetary Gearhead GP 16 A Ø16 mm, 0.1–0.3 Nm



M 1:1

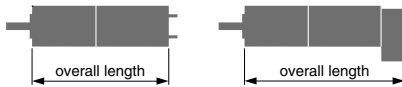
Technical Data

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

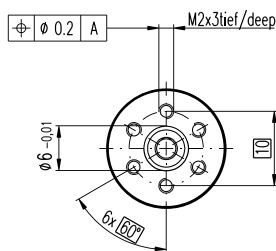
	110321	110322	110323	118186	110324	134782	110325	134785
Gearhead Data								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	2	2	2
Part Numbers	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
Part Numbers		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		135005697/54925	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	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 ²	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	120			37.9	41.5	45.1	45.1	48.7	48.7	52.3	52.3
RE 16, 2 W	120	MR	416/417	43.6	47.2	50.8	50.8	54.4	54.4	58.0	58.0
RE 16, 3.2 W	121/122			56.0	59.6	63.2	63.2	66.8	66.8	70.4	70.4
RE 16, 3.2 W	122	MR	416/417	61.0	64.6	68.2	68.2	71.8	71.8	75.4	75.4
RE 16, 3.2 W	122	MEnc 13	407	62.1	65.7	69.3	69.3	72.9	72.9	76.5	76.5
RE 16, 4.5 W	123/124			59.0	62.6	66.2	66.2	69.8	69.8	73.4	73.4
RE 16, 4.5 W	124	MR	416/417	64.0	67.6	71.2	71.2	74.8	74.8	78.4	78.4
RE 16, 4.5 W	124	MEnc 13	407	65.2	68.8	72.4	72.4	76.0	76.0	79.6	79.6
A-max 16	139-142			41.0	44.6	48.2	48.2	51.8	51.8	55.4	55.4
A-max 16	140/142	MR	416/417	46.0	49.6	53.2	53.2	56.8	56.8	60.4	60.4
A-max 16	140/142	MEnc 13	407	49.1	52.7	56.3	56.3	59.9	59.9	63.5	63.5
EC-max 16, 5 W	219			39.6	43.2	46.8	46.8	50.4	50.4	54.0	54.0
EC-max 16, 5 W	219	MR	418	46.9	50.5	54.1	54.1	57.7	57.7	61.3	61.3
EC-max 16, 2-wire	220			49.1	52.7	56.3	56.3	59.9	59.9	63.5	63.5

Option Ball Bearing



Part Numbers

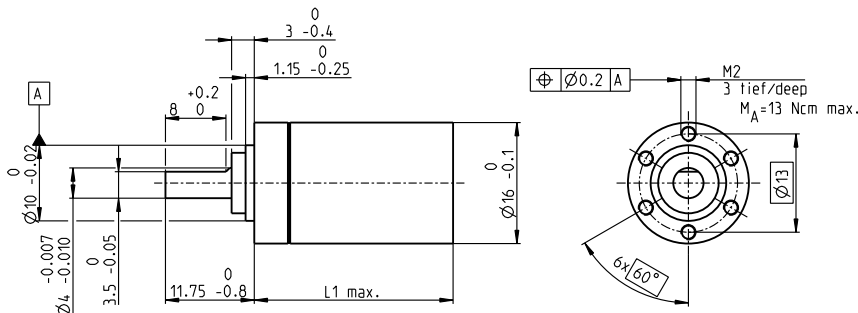
4.4 : 1	138333	455 : 1	138343
5.4 : 1	138334	561 : 1	138344
19 : 1	138335	690 : 1	138345
24 : 1	138336	850 : 1	138346
29 : 1	138337	1621 : 1	138347
84 : 1	138338	1996 : 1	138348
104 : 1	138339	2458 : 1	138349
128 : 1	138340	3027 : 1	138350
157 : 1	138341	3728 : 1	138351
370 : 1	138342	4592 : 1	138352

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

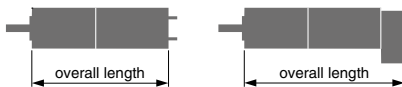
- Stock program
- Standard program
- Special program (on request)

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	$\frac{57}{13}$	$\frac{3249}{169}$	$\frac{185193}{2197}$	$\frac{19683}{125}$	$\frac{10556001}{28561}$	$\frac{1121931}{1625}$	$\frac{601692057}{371293}$	$\frac{63950067}{21125}$
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	1.5	2	2
Part Numbers	416500	416499	416385		416115	415807	415893	415476
1 Reduction	5.4:1	24:1	104:1		455:1	850:1	1996:1	3728:1
2 Absolute reduction	$\frac{27}{5}$	$\frac{1539}{65}$	$\frac{87723}{845}$		$\frac{500021}{10985}$	$\frac{531441}{625}$	$\frac{285012027}{142805}$	$\frac{30292137}{6125}$
3 Max. motor shaft diameter	mm 1.5	1.5	2		2	1.5	2	1.5
Part Numbers		416428	402672		416097		415786	409316
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Absolute reduction		$\frac{729}{25}$	$\frac{41553}{325}$		$\frac{2368521}{4225}$		$\frac{135005697}{54925}$	$\frac{14348907}{3125}$
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 ²	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

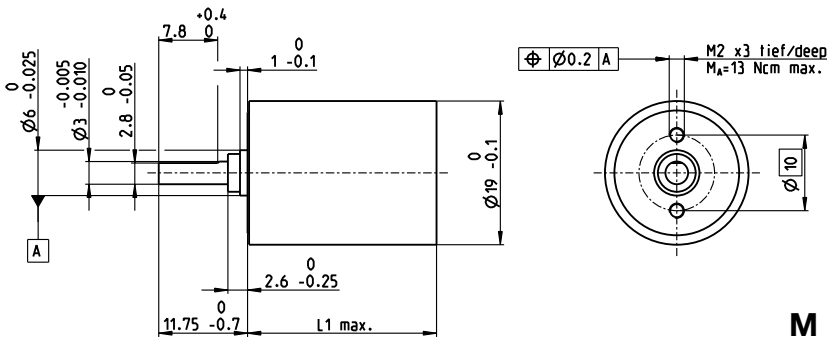


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts
RE 16, 2 W	120			40.5 45.6 49.2 49.2 52.8 52.8 56.3 56.3
RE 16, 2 W	120	MR	416/417	46.2 51.3 54.9 54.9 58.5 58.5 62.0 62.0
RE 16, 3.2 W	121/122			58.6 63.7 67.3 67.3 70.9 70.9 74.4 74.4
RE 16, 3.2 W	122	MR	416/417	63.6 68.7 72.3 72.3 75.9 75.9 79.4 79.4
RE 16, 3.2 W	122	MEnc 13	407	64.7 69.8 73.4 73.4 77.0 77.0 80.5 80.5
RE 16, 4.5 W	123/124			61.6 66.7 70.3 70.3 73.9 73.9 77.4 77.4
RE 16, 4.5 W	124	MR	416/417	66.6 71.7 75.3 75.3 78.9 78.9 82.4 82.4
RE 16, 4.5 W	124	MEnc 13	407	67.8 72.9 76.5 76.5 80.1 80.1 83.6 83.6
A-max 16	139-142			43.6 48.7 52.3 52.3 55.9 55.9 59.4 59.4
A-max 16	140/142	MR	416/417	48.6 53.7 57.3 57.3 60.9 60.9 64.4 64.4
A-max 16	140/142	MEnc 13	407	51.7 56.8 60.4 60.4 64.0 64.0 67.5 67.5
EC-max 16, 5 W	219			42.2 47.3 50.9 50.9 54.5 54.5 58.0 58.0
EC-max 16, 5 W	219	MR	418	49.5 54.6 58.2 58.2 61.8 61.8 65.3 65.3
EC-max 16, 8 W	221			54.2 59.3 62.9 62.9 66.5 66.5 70.0 70.0
EC-max 16, 8 W	221	MR	418	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

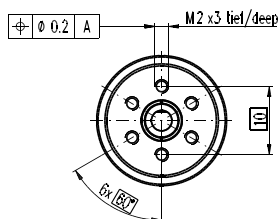
	149039	149041	149044	149047	149048	149051	149053	149056
Gearhead Data								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	2	2	2
Part Numbers	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
Part Numbers		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 ²	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 19	143/144			44.9	48.5	52.1	52.1	55.7	55.7	59.3	59.3
A-max 19, 1.5 W	144	MR	416/417	50.0	53.6	57.2	57.2	60.8	60.8	64.4	64.4
A-max 19, 1.5 W	144	Enc 22	426	59.3	62.9	66.5	66.5	70.1	70.1	73.7	73.7
A-max 19, 1.5 W	144	MEnc 13	407	52.4	56.0	59.6	59.6	63.2	63.2	66.8	66.8
A-max 19, 2.5 W	145/146			47.5	51.1	54.7	54.7	58.3	58.3	61.9	61.9
A-max 19, 2.5 W	146	MR	416/417	51.8	55.4	59.0	59.0	62.6	62.6	66.2	66.2
A-max 19, 2.5 W	146	Enc 22	426	61.9	65.5	69.1	69.1	72.7	72.7	76.3	76.3
A-max 19, 2.5 W	146	MEnc 13	407	55.0	58.6	62.2	62.2	65.8	65.8	69.4	69.4

Option Ball Bearing



Part Numbers

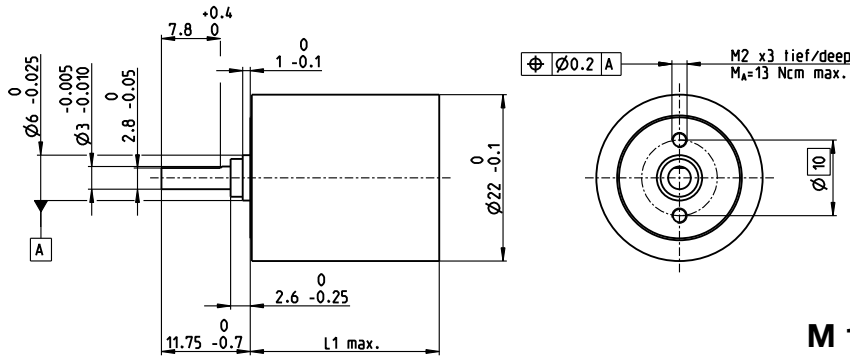
4.4 : 1	227632	455 : 1	227642
5.4 : 1	227633	561 : 1	227643
19 : 1	227634	690 : 1	227644
24 : 1	227635	850 : 1	227645
29 : 1	227636	1621 : 1	227646
84 : 1	227637	1996 : 1	227647
104 : 1	227638	2458 : 1	227648
128 : 1	227639	3027 : 1	227649
157 : 1	227640	3728 : 1	227650
370 : 1	227641	4592 : 1	227651

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

maxon gear



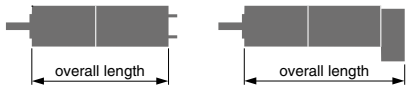
M 1:1

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

- Stock program
- Standard program
- Special program (on request)

Part Numbers

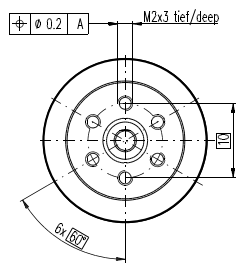
Gearhead Data	110355	110356	110357	118653	110358	134772	110359	134775
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	2	2	2
Part Numbers	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
Part Numbers		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		135005697/54925	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 ²	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	147-150			47.9	51.5	55.1	55.1	58.7	58.7	62.3	62.3								
A-max 22	148/150 MR		416/417	2.9	56.5	60.1	60.1	63.7	63.7	67.3	67.3								
A-max 22	148/150 Enc 22		426	62.3	65.9	69.5	69.5	73.1	73.1	76.7	76.7								
A-max 22	148/150 MEnc 13		407	55.0	58.6	62.2	62.2	65.8	65.8	69.4	69.4								

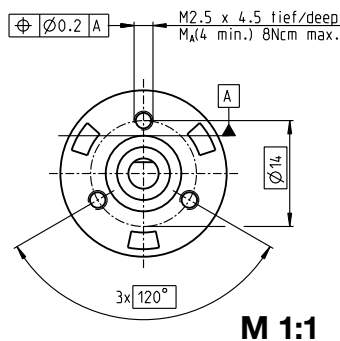
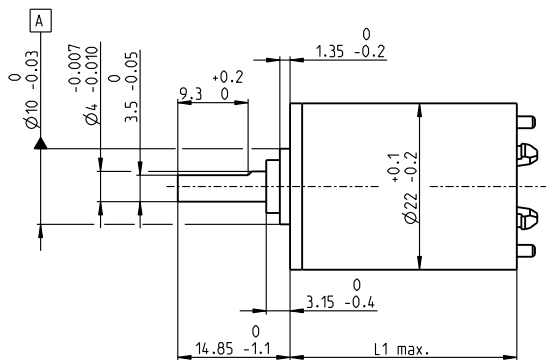
Option Ball Bearing



Part Numbers				Technical Data	
4.4:1	144137	455:1	144147	Planetary Gearhead	straight teeth
5.4:1	144138	561:1	144148	Housing	steel
19:1	144139	690:1	144149	Output shaft	stainless steel, hardened
24:1	144140	850:1	144150	Bearing at output	preloaded ball bearings
29:1	144141	1621:1	144151	Radial play, 6 mm from flange	max. 0.08 mm
84:1	144142	1996:1	144152	Axial play at axial load	< 4 N 0 mm > 4 N max. 0.05 mm
104:1	144143	2458:1	144153	Max. axial load (dynamic)	8 N
128:1	144144	3027:1	144154	Max. force for press fits	25 N
157:1	144145	3728:1	144155	Direction of rotation, drive to output	=
370:1	144146	4592:1	144156	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

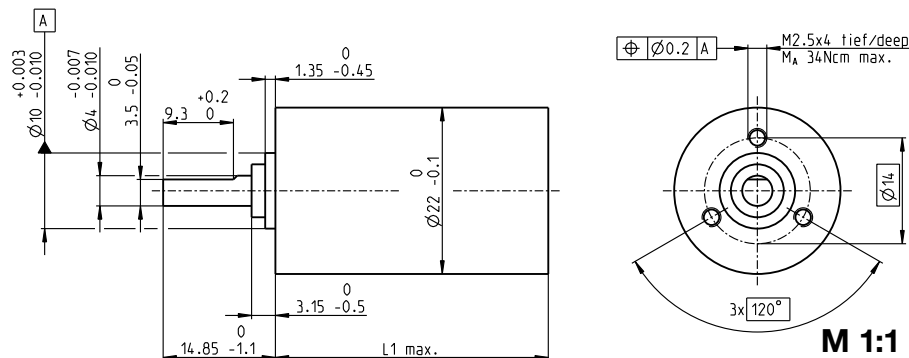
	232763	232766	232772	232778	232782	232788	232794	232796	232803	232809	232815
Gearhead Data											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	59049/100	759375/1024	158340015/114244	285012027/142805	1594323/500
3 Max. motor shaft diameter	mm 4	4	4	3.2	4	3.2	4	4	3.2	3.2	4
Part Numbers	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
Part Numbers	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	2.5	4	2.5	3.2	4	4	4	2.5
Part Numbers		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	
Part Numbers		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	
Part Numbers		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	4	4		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
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
7 Max. efficiency	%	84	70	59	59	49	49	49	42	42	42
8 Weight	g	28	35	43	43	51	51	51	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
10 Mass inertia	gcm ²	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	22.7	29.5	36.3	36.3	43.1	43.1	43.1	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	147-150			54.7	61.5	68.3	68.3	75.1	75.1	81.9	81.9	81.9	81.9
A-max 22	148/150 MR		416/417	59.7	66.5	73.3	73.3	80.1	80.1	80.1	86.9	86.9	86.9
A-max 22	148/150 Enc 22		426	69.1	75.9	82.7	82.7	89.5	89.5	89.5	96.3	96.3	96.3
A-max 22	148/150 MEnc 13		407	61.8	68.6	75.4	75.4	82.2	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
Gearhead Data											
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
Part Numbers	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
Part Numbers	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	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	4	2.5	3.2	4	4	4	2.5
Part Numbers		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	
Part Numbers		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	15000633/8788	3365793/300	
3 Max. motor shaft diameter	mm	3.2	3.2		3.2	3.2		3.2	3.2	3.2	
Part Numbers		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 ²	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

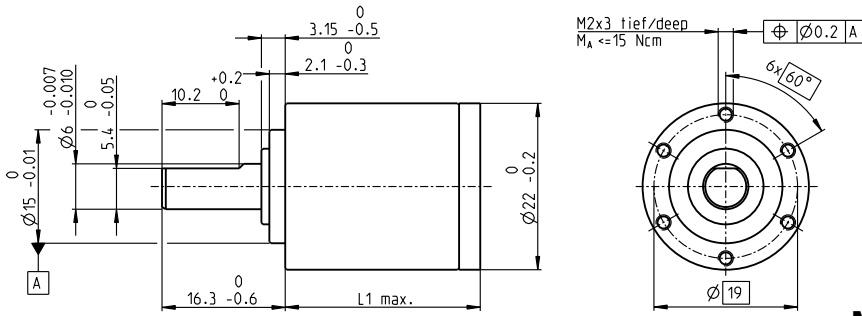
*for EC 32fl. L1 is + 7.1 mm

maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
A-max 19	143/144			51.6	58.4	65.2	65.2	72.0	72.0	72.0	78.8	78.8	78.8	78.8	
A-max 19, 1.5 W	144	MR	416/417	56.7	63.5	70.3	70.3	77.1	77.1	77.1	83.9	83.9	83.9	83.9	
A-max 19, 1.5 W	144	Enc 22	426	66.0	72.8	79.6	79.6	86.4	86.4	86.4	93.2	93.2	93.2	93.2	
A-max 19, 1.5 W	144	MEnc 13	407	59.1	65.9	72.7	72.7	79.5	79.5	79.5	86.3	86.3	86.3	86.3	
A-max 19, 2.5 W	145/146			54.2	61.0	67.8	67.8	74.6	74.6	74.6	81.4	81.4	81.4	81.4	
A-max 19, 2.5 W	146	MR	416/417	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7	85.7	85.7	85.7	
A-max 19, 2.5 W	146	Enc 22	426	68.6	75.4	82.2	82.2	89.0	89.0	89.0	95.8	95.8	95.8	95.8	
A-max 19, 2.5 W	146	MEnc 13	407	61.7	68.5	75.3	75.3	82.1	82.1	82.1	88.9	88.9	88.9	88.9	
A-max 22	147-150			54.6	61.4	68.2	68.2	75.0	75.0	75.0	81.8	81.8	81.8	81.8	
A-max 22	148/150	MR	416/417	59.6	66.4	73.2	73.2	80.0	80.0	80.0	86.8	86.8	86.8	86.8	
A-max 22	148/150	Enc 22	426	69.0	75.8	82.6	82.6	89.4	89.4	89.4	96.2	96.2	96.2	96.2	
A-max 22	148/150	MEnc 13	407	61.7	68.5	75.3	75.3	82.1	82.1	82.1	88.9	88.9	88.9	88.9	
EC 20 flat, 3 W, A	257			33.1	39.9	46.7	46.7	53.5	53.5	53.5	60.3	60.3	60.3	60.3	
EC 20 flat, 3 W, B	257			32.5	39.3	46.1	46.1	52.9	52.9	52.9	59.7	59.7	59.7	59.7	
EC 20 flat, 5 W	258			36.7	43.5	50.3	50.3	57.1	57.1	57.1	63.9	63.9	63.9	63.9	
EC 20 flat, IE, IP 00	259			39.7	46.5	53.3	53.3	60.1	60.1	60.1	66.9	66.9	66.9	66.9	
EC 20 flat, IE, IP 40	259			40.8	47.6	54.4	54.4	61.2	61.2	61.2	68.0	68.0	68.0	68.0	
EC 20 flat, IE, IP 00	260			43.7	50.5	57.3	57.3	64.1	64.1	64.1	70.9	70.9	70.9	70.9	
EC 20 flat, IE, IP 40	260			44.8	51.6	58.4	58.4	65.2	65.2	65.2	72.0	72.0	72.0	72.0	
EC 32 flat, 6 W	261			39.8	46.6	53.4	53.4	60.2	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

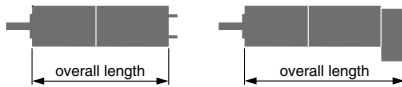
- Stock program
- Standard program
- Special program (on request)

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 ²	0.5	0.38	0.25
11 Gearhead length L1	mm	25.8	25.8	25.8

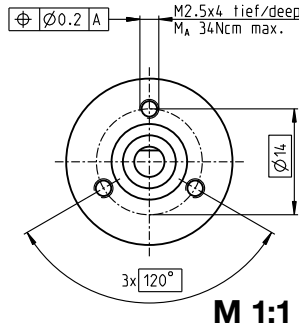
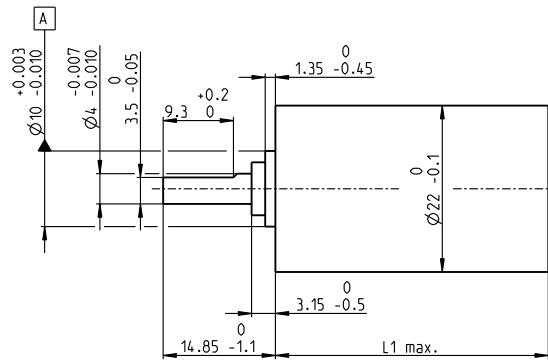


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 25, 20 W	126			68.9	68.9	68.9
RE 25, 20 W	126	MR	419	79.9	79.9	79.9
RE 25, 20 W	126	HED_ 5540	430/433	89.7	89.7	89.7
RE 25, 20 W	126	DCT22	438	91.2	91.2	91.2
RE 25, 20 W	126	AB 28	480	103	103	103
RE 25, 20 W	126	HED_ 5540/AB 28	430/480	120.2	120.2	120.2
EC-max 22, 25 W	223			74.4	74.4	74.4
EC-max 22, 25 W	223	MR	418	84	84	84
EC-max 22, 25 W	223	AB 20	478	110	110	110

Planetary Gearhead GP 22 C $\varnothing 22$ 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

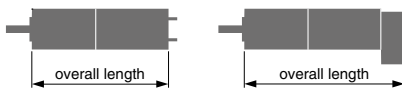
maxon gear

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	143971	143974	143980	143986	143990	143996	144002	144004	144011	144017	144023
Gearhead Data											
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	8723/845	50625/256	10556001/28561	59049/100	759375/1024	158340015/14244	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
Part Numbers	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
Part Numbers	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
Part Numbers		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	
Part Numbers		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	
Part Numbers		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 ²	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

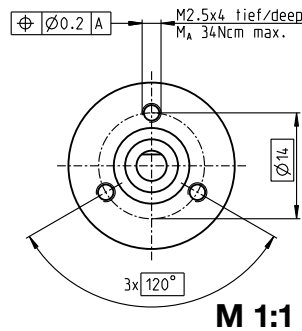
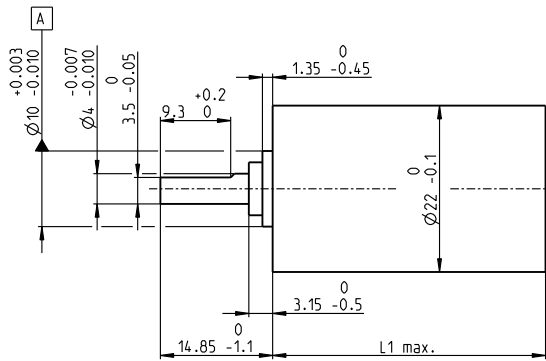


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
A-max 19	143/144			51.6	58.4	65.2	65.2	72.0	72.0	78.8	78.8	78.8
A-max 19, 1.5 W	144	MR	416/417	56.7	63.5	70.3	70.3	77.1	77.1	83.9	83.9	83.9
A-max 19, 1.5 W	144	Enc 22	426	66.0	72.8	79.6	79.6	86.4	86.4	93.2	93.2	93.2
A-max 19, 1.5 W	144	MEnc 13	407	59.1	65.9	72.7	72.7	79.5	79.5	86.3	86.3	86.3
A-max 19, 2.5 W	145/146			54.2	61.0	67.8	67.8	74.6	74.6	81.4	81.4	81.4
A-max 19, 2.5 W	146	MR	416/417	58.5	65.3	72.1	72.1	78.9	78.9	85.7	85.7	85.7
A-max 19, 2.5 W	146	Enc 22	426	68.6	75.4	82.2	82.2	89.0	89.0	95.8	95.8	95.8
A-max 19, 2.5 W	146	MEnc 13	407	61.7	68.5	75.3	75.3	82.1	82.1	88.9	88.9	88.9
A-max 22	147-150			54.6	61.4	68.2	68.2	75.0	75.0	81.8	81.8	81.8
A-max 22	148/150	MR	416/417	59.6	66.4	73.2	73.2	80.0	80.0	86.8	86.8	86.8
A-max 22	148/150	Enc 22	426	69.0	75.8	82.6	82.6	89.4	89.4	96.2	96.2	96.2
A-max 22	148/150	MEnc 13	407	61.7	68.5	75.3	75.3	82.1	82.1	88.9	88.9	88.9

Planetary Gearhead GP 22 C Ø22 mm, 0.5–2.0 Nm

Ceramic Version



Technical Data

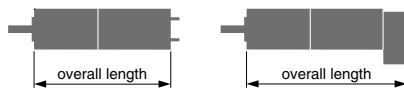
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	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

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	143971	143974	143980	143986	143990	143996	144002	144004	144011	144017	144023
Gearhead Data											
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
Part Numbers	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
Part Numbers	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
Part Numbers	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		4	3.2	3.2	
Part Numbers	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	
Part Numbers	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	
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 ² 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

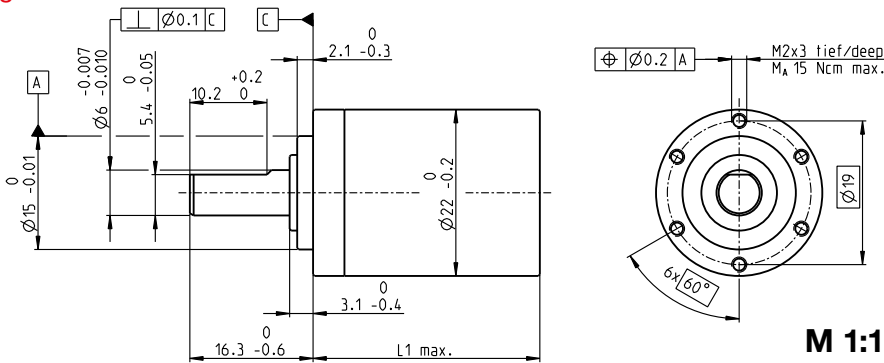


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm]	= Motor length + gearhead length + (sensor/brake) + assembly parts										
EC-max 16, 8 W	221			58.7	65.5	72.3	72.3	79.1	79.1	85.9	85.9	85.9	85.9	85.9	85.9
EC-max 16, 8 W	221	MR	418	66.0	72.8	79.6	79.6	86.4	86.4	86.4	93.2	93.2	93.2	93.2	93.2
EC-max 22, 12 W	222			57.5	64.3	71.1	71.1	77.9	77.9	77.9	84.7	84.7	84.7	84.7	84.7
EC-max 22, 12 W	222	MR	418	67.2	74.0	80.8	80.8	87.6	87.6	87.6	94.4	94.4	94.4	94.4	94.4
EC-max 22, 12 W	222	AB 20	478	93.1	99.9	106.7	106.7	113.5	113.5	113.5	120.3	120.3	120.3	120.3	120.3
EC 20 flat, 3 W, A	257			33.1	39.9	46.7	46.7	53.5	53.5	53.5	60.3	60.3	60.3	60.3	60.3
EC 20 flat, 3 W, B	257			32.5	39.3	46.1	46.1	52.9	52.9	52.9	59.7	59.7	59.7	59.7	59.7
EC 20 flat, 5 W	258			36.7	43.5	50.3	50.3	57.1	57.1	57.1	63.9	63.9	63.9	63.9	63.9
EC 20 flat, IE, IP 00	259			39.7	46.5	53.3	53.3	60.1	60.1	60.1	66.9	66.9	66.9	66.9	66.9
EC 20 flat, IE, IP 40	259			40.8	47.6	54.4	54.4	61.2	61.2	61.2	68.0	68.0	68.0	68.0	68.0
EC 20 flat, IE, IP 00	260			43.7	50.5	57.3	57.3	64.1	64.1	64.1	70.9	70.9	70.9	70.9	70.9
EC 20 flat, IE, IP 40	260			44.8	51.6	58.4	58.4	65.2	65.2	65.2	72.0	72.0	72.0	72.0	72.0
EC 32 flat, 6 W	261			39.8	46.6	53.4	53.4	60.2	60.2	60.2	67.0	67.0	67.0	67.0	67.0

Planetary Gearhead GP 22 HP $\varnothing 22$ mm, 2.0–3.4 Nm

High Power



Technical Data

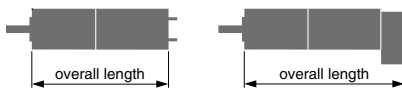
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	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
Gearhead Data (provisional)										
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	$\frac{15}{4}$	$\frac{225}{16}$	$\frac{81}{4}$	$\frac{3375}{64}$	$\frac{1215}{16}$	$\frac{8723}{845}$	$\frac{50625}{256}$	$\frac{2777895}{8788}$	$\frac{6561}{16}$	$\frac{59049}{100}$
3 Max. motor shaft diameter	mm 4	4	4	4	4	3.2	4	3.2	4	4
Part Numbers	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	$\frac{57}{13}$	$\frac{855}{62}$	$\frac{1539}{65}$	$\frac{12825}{208}$	$\frac{185193}{2197}$	$\frac{2187}{20}$	$\frac{192375}{632}$	$\frac{69255}{208}$	$\frac{5000211}{10985}$	$\frac{1121931}{1625}$
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
Part Numbers	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	$\frac{27}{5}$	$\frac{3249}{169}$	$\frac{729}{25}$	$\frac{48735}{676}$	$\frac{4617}{62}$	$\frac{41553}{325}$	$\frac{731025}{2704}$	$\frac{10556001}{28561}$	$\frac{124659}{260}$	$\frac{531441}{625}$
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
Part Numbers						370786	370796	370801	370806	
1 Reduction						157:1	285:1	389:1	561:1	
2 Absolute reduction						$\frac{19683}{125}$	$\frac{18225}{64}$	$\frac{263169}{676}$	$\frac{2368521}{4225}$	
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 ² 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

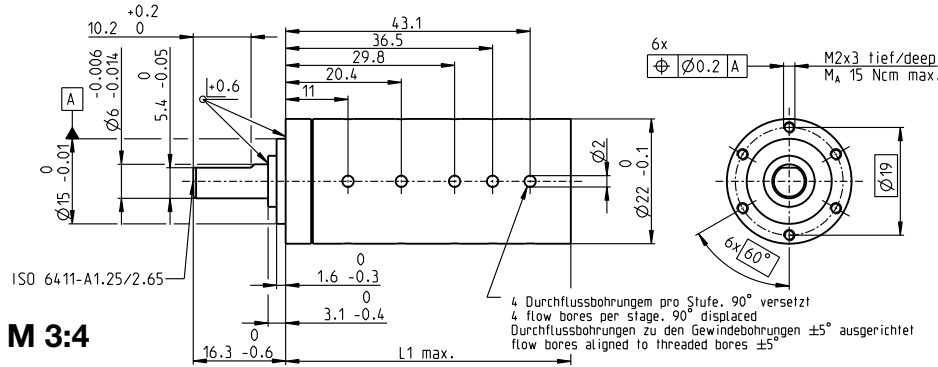


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
EC-max 22, 12 W	222			57.4	64.4	64.4	71.1	71.1	71.1	77.8	77.8	77.8
EC-max 22, 12 W	222	MR	418	67.1	74.1	74.1	80.8	80.8	80.8	87.5	87.5	87.5
EC-max 22, 12 W	222	AB 20	478	93.0	100.0	100.0	106.7	106.7	106.7	113.4	113.4	113.4
EC-max 22, 25 W	223			73.9	80.9	80.9	87.6	87.6	87.6	94.3	94.3	94.3
EC-max 22, 25 W	223	MR	418	83.6	90.6	90.6	97.3	97.3	97.3	104.0	104.0	104.0
EC-max 22, 25 W	223	AB 20	478	109.5	116.5	116.5	123.2	123.2	123.2	129.9	129.9	129.9
EC-4pole 22, 90 W	231			74.0	81.0	81.0	87.7	87.7	87.7	94.4	94.4	94.4
EC-4pole 22, 90 W	231	16 EASY/Abs.	409/411	86.2	93.2	93.2	99.9	99.9	99.9	106.6	106.6	106.6
EC-4pole 22, 90 W	231	AEDL/HEDL	427/433	95.5	102.5	102.5	109.2	109.2	109.2	115.9	115.9	115.9
EC-4pole 22, 120 W	232			91.4	98.4	98.4	105.1	105.1	105.1	111.8	111.8	111.8
EC-4pole 22, 120 W	232	16 EASY/Abs.	409/411	103.6	110.6	110.6	117.3	117.3	117.3	124.0	124.0	124.0
EC-4pole 22, 120 W	232	AEDL/HEDL	427/433	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



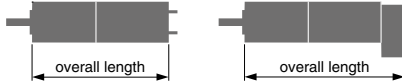
M 3:4

- 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	15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	2368521/4225	759375/1024	158340015/114244	373977/208	63950067/21125
3 Max. motor shaft diameter	mm 4	4	4	3.2	4	3.2	3.2	4	3.2	3.2	3.2
Part Numbers	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	57/13	855/52	12825/208	2187/20	192375/832	263169/676	59049/100	2885625/3328	3947535/2704	285012027/142805	1594323/500
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
Part Numbers	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	3249/169	48735/676	41559/325	731025/2704	6561/16	1121931/1625	10965375/10816	98415/64	7105563/3380	30292137/8125	
3 Max. motor shaft diameter	mm 3.2	3.2	3.2	4	3.2	4	3.2	4.0	3.2	3.2	
Part Numbers	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	81/4	1215/16		18225/64	5000211/10985		273375/256	601692057/371293	177147/80		
3 Max. motor shaft diameter	mm 4	4		4	3.2		4	3.2	4		
Part Numbers	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	1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	15000633/8788	135005697/54925		
3 Max. motor shaft diameter	mm 3.2	3.2		3.2	3.2		3.2	3.2	3.2		
Part Numbers		416697		416708			416746		416759		
1 Reduction		89:1		333:1			1249:1		2589:1		
2 Absolute reduction		4617/52		6925/208			1038825/832		3365793/1300		
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 ¹⁾	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 ² 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

¹⁾ 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	211			110.5 119.5 128.0 128.0 135.0 135.0 135.0 141.5 141.5 141.5 141.5
EC 22, 240 W, B	211			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

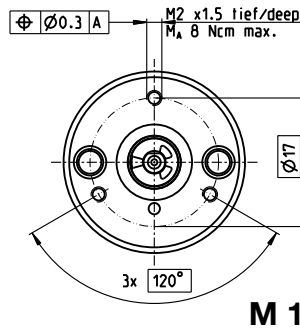
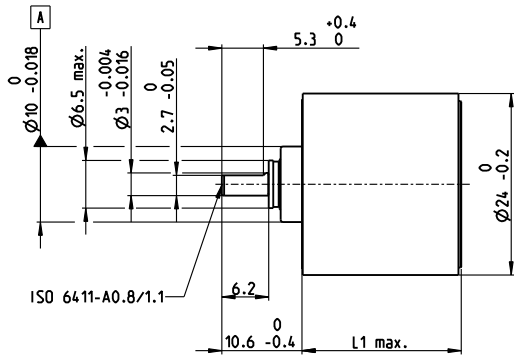
Oil & Gas Industry

- 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



M 1:1

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)

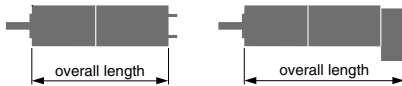
Part Numbers

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 ² 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

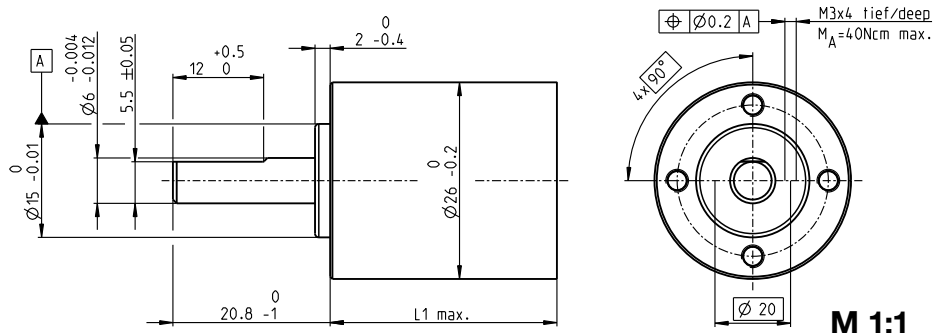
*L1 for A-max 22 L1 is=2.8 mm



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
A-max 19	143/144			45.5	49.2	49.2	49.2	49.2	53.0	53.0
A-max 19, 1.5 W	144	MR	416/417	50.6	54.3	54.3	54.3	54.3	58.1	58.1
A-max 19, 1.5 W	144	Enc 22	426	59.9	63.6	63.6	63.6	63.6	67.4	67.4
A-max 19, 1.5 W	144	MEnc 13	407	53.0	56.7	56.7	56.7	56.7	60.5	60.5
A-max 19, 2.5 W	145/146			48.1	51.8	51.8	51.8	51.8	55.6	55.6
A-max 19, 2.5 W	146	MR	416/417	52.4	56.1	56.1	56.1	56.1	59.9	59.9
A-max 19, 2.5 W	146	Enc 22	426	62.5	66.2	66.2	66.2	66.2	70.0	70.0
A-max 19, 2.5 W	146	MEnc 13	407	55.6	59.3	59.3	59.3	59.3	63.1	63.1
A-max 22	147-150			45.7	49.4	49.4	49.4	49.4	53.2	53.2
A-max 22	148/150	MR	416/417	50.7	54.4	54.4	54.4	54.4	58.2	58.2
A-max 22	148/150	Enc 22	426	60.1	63.8	63.8	63.8	63.8	67.6	67.6
A-max 22	148/150	MEnc 13	407	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



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

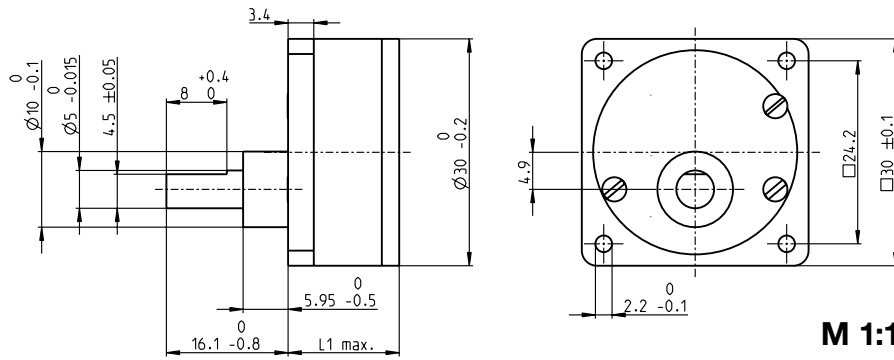
	406757	406762	406764	406767	406128	406769	406770	406771	406092
Gearhead Data									
1 Reduction	5.2:1	19:1	27:1	35:1	71:1	100:1	139:1	181:1	236:1
2 Absolute reduction	57/11	3591/187	3249/121	1539/44	226233/3179	204687/2057	185193/1331	87723/484	41553/176
3 Max. motor shaft diameter	mm 3	3	3	3	3	3	3	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 ² 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	125/127			78.0	87.5	87.5	87.5	94.1	94.1	94.1	94.1	94.1	94.1	94.1
RE 25	125/127	MR	419	89.0	98.5	98.5	98.5	105.1	105.1	105.1	105.1	105.1	105.1	105.1
RE 25	125/127	Enc 22	426	92.1	101.6	101.6	101.6	108.2	108.2	108.2	108.2	108.2	108.2	108.2
RE 25	125/127	HED_ 5540	429/431	98.8	108.3	108.3	108.3	114.9	114.9	114.9	114.9	114.9	114.9	114.9
RE 25	125/127	DCT22	438	100.3	109.8	109.8	109.8	116.4	116.4	116.4	116.4	116.4	116.4	116.4
RE 25, 20 W	126			66.5	76.0	76.0	76.0	82.6	82.6	82.6	82.6	82.6	82.6	82.6
RE 25, 20 W	126	MR	419	77.5	87.0	87.0	87.0	93.6	93.6	93.6	93.6	93.6	93.6	93.6
RE 25, 20 W	126	HED_ 5540	430	87.3	96.8	96.8	96.8	103.4	103.4	103.4	103.4	103.4	103.4	103.4
RE 25, 20 W	126	DCT 22	438	88.8	98.3	98.3	98.3	104.9	104.9	104.9	104.9	104.9	104.9	104.9
RE 25, 20 W	126	AB 28	480	100.6	110.1	110.1	110.1	116.7	116.7	116.7	116.7	116.7	116.7	116.7
RE 25, 20 W	126	HED_5540/AB 28	430/480	117.8	127.3	127.3	127.3	133.9	133.9	133.9	133.9	133.9	133.9	133.9
RE 25, 20 W	127	AB 28	480	112.1	121.6	121.6	121.6	128.2	128.2	128.2	128.2	128.2	128.2	128.2
RE 25, 20 W	127	HED_ 5540/AB 28	431/480	129.3	138.8	138.8	138.8	145.4	145.4	145.4	145.4	145.4	145.4	145.4
A-max 26	151-158			68.2	77.7	77.7	77.7	84.3	84.3	84.3	84.3	84.3	84.3	84.3
A-max 26	151-158	MEnc 13	408	75.3	84.8	84.8	84.8	91.4	91.4	91.4	91.4	91.4	91.4	91.4
A-max 26	151-158	MR	419	77.0	86.5	86.5	86.5	93.1	93.1	93.1	93.1	93.1	93.1	93.1
A-max 26	151-158	Enc 22	426	82.6	92.1	92.1	92.1	98.7	98.7	98.7	98.7	98.7	98.7	98.7
A-max 26	151-158	HED_ 5540	430/432	86.6	96.1	96.1	96.1	102.7	102.7	102.7	102.7	102.7	102.7	102.7

Spur Gearhead GS 30 A Ø30 mm, 0.07–0.2 Nm



Technical Data

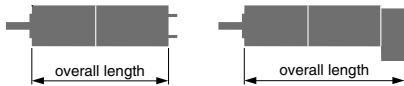
Spur Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.1 mm
Axial play	0.03–0.2 mm
Max. axial load (dynamic)	15 N
Max. force for press fits	400 N
Max. continuous input speed	5000 rpm
Recommended temperature 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 ² 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	

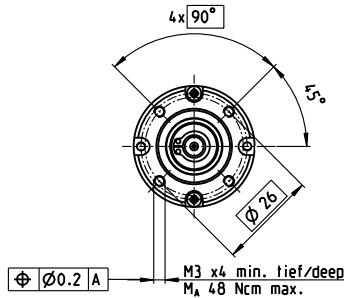
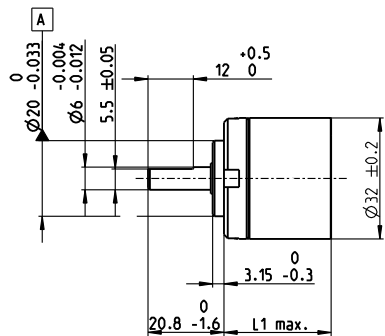


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 26	151-158			67.8	67.8	70.3	70.3	75.3	75.3
A-max 26	151-158	MEnc 13	408	74.9	74.9	77.4	77.4	82.4	82.4
A-max 26	151-158	MR	419	76.6	76.6	79.1	79.1	84.1	84.1
A-max 26	151-158	Enc 22	426	82.2	82.2	84.7	84.7	89.7	89.7
A-max 26	151-158	HED_ 5540	430/432	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

Gearhead Data	358975	351942	358331	357988	358335	358385	358512	358513	358515	358516
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	⁶³ / ₁₇	⁵⁷ / ₁₁	³⁵⁹¹ / ₁₈₇	³²⁴⁹ / ₁₂₁	¹⁵³⁹ / ₄₄	²²⁶²³³ / ₃₁₇₉	²⁰⁴⁶⁸⁷ / ₂₀₅₇	¹⁸⁵¹⁹³ / ₁₃₃₁	⁸⁷⁷²³ / ₄₈₄	⁴¹⁵⁵³ / ₁₇₆
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 ² 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

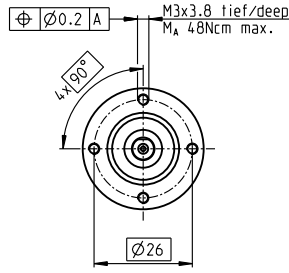
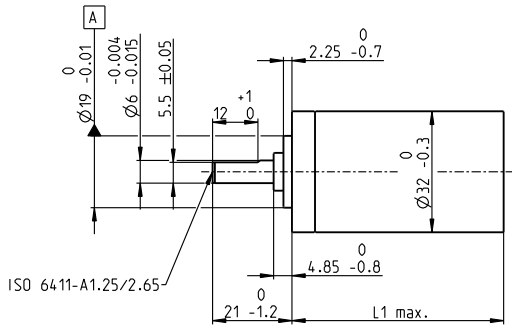
*for EC 32 L1 is + 6.4 mm, for RE 30 L1 is + 1.0 mm



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
RE 25	125/127			88.1	88.1	98.2	98.2	98.2	107.7	107.7	107.7	107.7	107.7	
RE 25	125/127	MR	419	99.1	99.1	109.2	109.2	109.2	118.7	118.7	118.7	118.7	118.7	
RE 25	125/127	Enc 22	426	102.2	102.2	112.3	112.3	112.3	121.8	121.8	121.8	121.8	121.8	
RE 25	125/127	HED_ 5540	429/431	108.9	108.9	119.0	119.0	119.0	128.5	128.5	128.5	128.5	128.5	
RE 25	125/127	DCT 22	438	110.4	110.4	120.5	120.5	120.5	130.0	130.0	130.0	130.0	130.0	
RE 25, 20 W	126			76.6	76.6	86.7	86.7	86.7	96.2	96.2	96.2	96.2	96.2	
RE 25, 20 W	126	MR	419	87.6	87.6	97.7	97.7	97.7	107.2	107.2	107.2	107.2	107.2	
RE 25, 20 W	126	HED_ 5540	430/431	97.4	97.4	107.5	107.5	107.5	117.0	117.0	117.0	117.0	117.0	
RE 25, 20 W	126	DCT 22	438	98.9	98.9	109.0	109.0	109.0	118.5	118.5	118.5	118.5	118.5	
RE 25, 20 W	126	AB 28	480	110.7	110.7	120.8	120.8	120.8	130.3	130.3	130.3	130.3	130.3	
RE 25, 20 W	126	HED_ 5540/AB 28	430/480	127.9	127.9	138.0	138.0	138.0	147.5	147.5	147.5	147.5	147.5	
RE 25, 20 W	127	AB 28	480	122.2	122.2	132.3	132.3	132.3	141.8	141.8	141.8	141.8	141.8	
RE 25, 20 W	127	HED_ 5540/AB 28	429/480	139.4	139.4	149.5	149.5	149.5	159.0	159.0	159.0	159.0	159.0	
RE 30, 60 W	129			102.6	102.6	112.7	112.7	112.7	122.2	122.2	122.2	122.2	122.2	
RE 30, 60 W	129	MR	420	114.0	114.0	124.1	124.1	124.1	133.6	133.6	133.6	133.6	133.6	
RE 30, 60 W	129	HED_ 5540	429/431	123.4	123.4	133.5	133.5	133.5	143.0	143.0	143.0	143.0	143.0	
RE 35, 90 W	130			104.6	104.6	114.7	114.7	114.7	124.2	124.2	124.2	124.2	124.2	
RE 35, 90 W	130	MR	420	116.0	116.0	126.1	126.1	126.1	135.6	135.6	135.6	135.6	135.6	
RE 35, 90 W	130	HED_ 5540	429/431	125.3	125.3	135.4	135.4	135.4	144.9	144.9	144.9	144.9	144.9	
RE 35, 90 W	130	DCT 22	438	122.7	122.7	132.8	132.8	132.8	142.3	142.3	142.3	142.3	142.3	
RE 35, 90 W	130	AB 28	480	140.7	140.7	150.8	150.8	150.8	160.3	160.3	160.3	160.3	160.3	
RE 35, 90 W	130	HEDS 5540/AB 28	429/480	157.9	157.9	168.0	168.0	168.0	177.5	177.5	177.5	177.5	177.5	
A-max 26	151-158			78.3	78.3	88.4	88.4	88.4	97.9	97.9	97.9	97.9	97.9	
A-max 26	151-158	MEnc 13	408	85.4	85.4	95.5	95.5	95.5	105.0	105.0	105.0	105.0	105.0	
A-max 26	151-158	MR	419	87.1	87.1	97.2	97.2	97.2	106.7	106.7	106.7	106.7	106.7	
A-max 26	151-158	Enc 22	426	92.7	92.7	102.8	102.8	102.8	112.3	112.3	112.3	112.3	112.3	
A-max 26	151-158	HED_ 5540	430/432	96.7	96.7	106.8	106.8	106.8	116.3	116.3	116.3	116.3	116.3	
A-max 32	159/161			96.5	96.5	106.6	106.6	106.6	116.1	116.1	116.1	116.1	116.1	
A-max 32	160/162			95.1	95.1	105.2	105.2	105.2	114.7	114.7	114.7	114.7	114.7	
A-max 32	160/162	MR	420	106.3	106.3	116.4	116.4	116.4	125.9	125.9	125.9	125.9	125.9	
A-max 32	160/162	HED_ 5540	430/431	115.9	115.9	126.0	126.0	126.0	135.5	135.5	135.5	135.5	135.5	
EC 32, 80 W	212			100.2	100.2	110.3	110.3	110.3	119.8	119.8	119.8	119.8	119.8	
EC 32, 80 W	212	HED_ 5540	430/433	118.6	118.6	128.7	128.7	128.7	138.2	138.2	138.2	138.2	138.2	
EC 32, 80 W	212	Res 26	439	120.3	120.3	130.4	130.4	130.4	139.9	139.9	139.9	139.9	139.9	
MCD EPOS, 60 W	475			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	475			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 Ø32 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

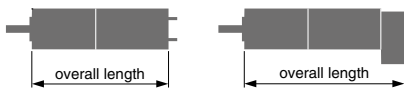
Option: Low-noise version

maxon gear

- Stock program
- Standard program
- Special program (on request)

Part Numbers

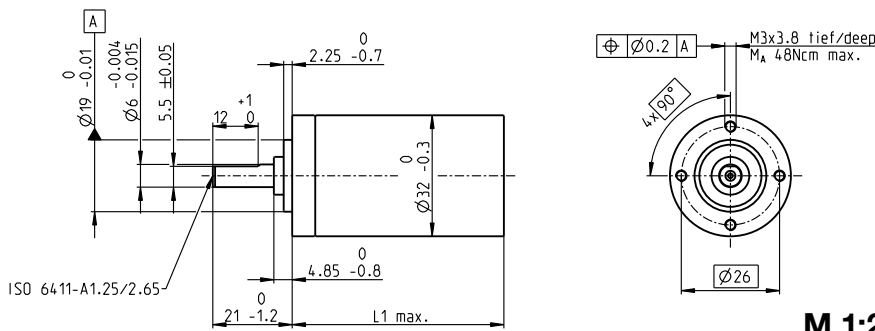
	166155	166158	166163	166164	166169	166174	166179	166184	166187	166192	166197	166202
Gearhead Data												
1 Reduction	3.7:1	14:1	33:1	51:1	111:1	246:1	492:1	762:1	1181:1	1972:1	2829:1	4380:1
2 Absolute reduction	26/7	676/49	529/16	17576/343	13824/125	421824/1715	85112/175	19044/25	10123776/8575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter	mm 6	6	3	6	4	4	3	3	4	4	3	3
Part Numbers	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	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
Part Numbers	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	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
Part Numbers		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	
Part Numbers		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	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 ²	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	125/127			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	125/127	MR	419	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	125/127	Enc 22	426	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	125/127	HED_5540	429/431	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	125/127	DCT 22	438	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	126			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	126	MR	419	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	126	HED_5540	430/433	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	126	DCT22	438	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	126	AB 28	480	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	126	HED_5540/AB 28	430/480	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	127	AB 28	480	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	127	HED_5540/AB 28	429/480	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	151-158			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	152-158	MEnc 13	408	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	152-158	MR	419	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	152-158	Enc 22	426	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	152-158	HED_5540	430/432	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



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

	Part Numbers											
	166155	166158	166163	166164	166169	166174	166179	166184	166187	166192	166197	166202
Stock program												
Standard program												
Special program (on request)												
Gearhead Data												
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
Part Numbers	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
Part Numbers	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
Part Numbers		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	3	4	3		3	4	3	
Part Numbers		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
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	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 ²	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

*for EC 32 flat L1 is + 2.0 mm

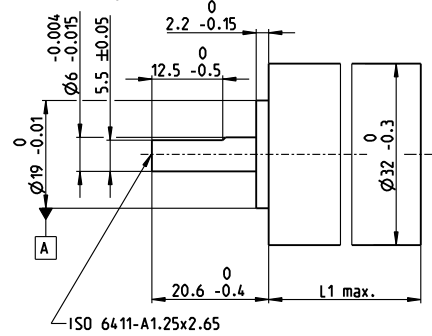


maxon Modular System													
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
RE 30, 15 W	128			94.6	104.5	104.5	111.2	111.2	117.9	117.9	124.6	124.6	124.6
RE 30, 15 W	128	MR	420	106.0	115.9	115.9	122.6	122.6	129.3	129.3	136.0	136.0	136.0
RE 30, 15 W	128	HED_5540	429/431	115.4	125.3	125.3	132.0	132.0	138.7	138.7	145.4	145.4	145.4
RE 30, 60 W	129			94.6	104.5	104.5	111.2	111.2	117.9	117.9	124.6	124.6	124.6
RE 30, 60 W	129	MR	420	106.0	115.9	115.9	122.6	122.6	129.3	129.3	136.0	136.0	136.0
RE 30, 60 W	129	HED_5540	429/431	115.4	125.3	125.3	132.0	132.0	138.7	138.7	145.4	145.4	145.4
RE 35, 90 W	130			97.6	107.5	107.5	114.2	114.2	120.9	120.9	127.6	127.6	127.6
RE 35, 90 W	130	MR	420	109.0	118.9	118.9	125.6	125.6	132.3	132.3	139.0	139.0	139.0
RE 35, 90 W	130	HED_5540	429/431	118.3	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3
RE 35, 90 W	130	DCT 22	438	115.7	125.6	125.6	132.3	132.3	139.0	139.0	145.7	145.7	145.7
RE 35, 90 W	130	AB 28	480	133.7	143.6	143.6	150.3	150.3	157.0	157.0	163.7	163.7	163.7
RE 35, 90 W	130	HEDS 5540/AB 28	429/480	150.9	160.8	160.8	167.5	167.5	174.2	174.2	180.9	180.9	180.9
A-max 32	159/161			89.5	99.4	99.4	106.1	106.1	112.8	112.8	119.5	119.5	119.5
A-max 32	160/162			88.1	98.0	98.0	104.7	104.7	111.4	111.4	118.1	118.1	118.1
A-max 32	160/162	MR	420	99.3	109.2	109.2	115.9	115.9	122.6	122.6	129.3	129.3	129.3
A-max 32	160/162	HED_5540	430/432	108.9	118.8	118.8	125.5	125.5	132.2	132.2	138.9	138.9	138.9
EC 32, 80 W	212			86.6	96.5	96.5	103.2	103.2	109.9	109.9	116.6	116.6	116.6
EC 32, 80 W	212	HED_5540	430/433	105.0	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0
EC 32, 80 W	212	Res 26	439	106.7	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7
EC 32 flat, 15 W	262			44.5	54.4	54.4	61.1	61.1	67.8	67.8	74.5	74.5	74.5
EC 32 flat, IE, IP 00	263			54.6	64.5	64.5	71.2	71.2	77.9	77.9	84.6	84.6	84.6
EC 32 flat, IE, IP 40	263			56.3	66.2	66.2	72.9	72.9	79.6	79.6	86.3	86.3	86.3

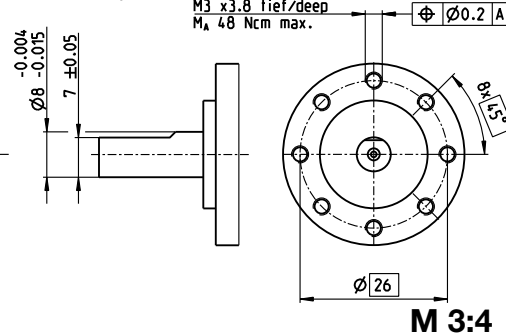
Planetary Gearhead GP 32 AR $\varnothing 32$ mm, 0.75 Nm

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			
	425901	425899	425898
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 ² 1.6	0.9	0.6
11 Gearhead length L1	mm 26.2	26.2	26.2

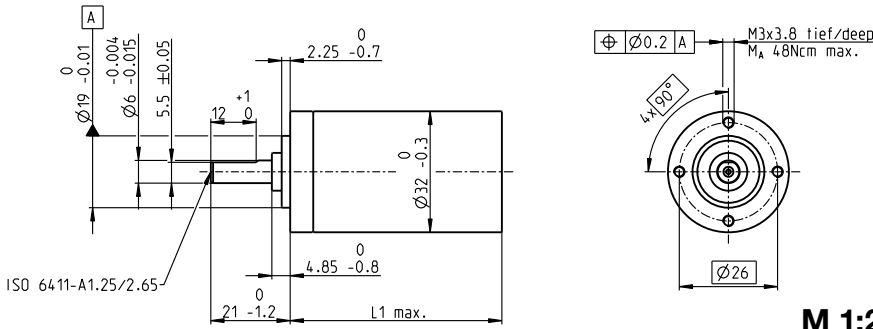


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 30, 60 W	129			94.3	94.3	94.3
RE 30, 60 W	129	MR	420	105.7	105.7	105.7
RE 30, 60 W	129	HED_5540	429/433	115.1	115.1	115.1
RE 35, 90 W	130			97.3	97.3	97.3
RE 35, 90 W	130	MR	420	108.7	108.7	108.7
RE 35, 90 W	130	HED_5540	429/433	118.0	118.0	118.0
RE 35, 90 W	130	DCT22	438	115.4	115.4	115.4
RE 35, 90 W	130	AB 28	480	133.4	133.4	133.4
RE 35, 90 W	130	HED_5540/AB 28	429/480	150.5	150.5	150.5
EC 32, 80 W	212			86.3	86.3	86.3
EC 32, 80 W	212	HED_5540	430/432	104.7	104.7	104.7
EC 32, 80 W	212	Res 26	439	106.4	106.4	106.4

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

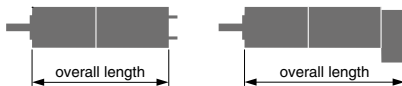
M 1:2

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
Gearhead Data												
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
Part Numbers	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	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
Part Numbers	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	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
Part Numbers		166936		166942	166947	166952	166957		166965	166970	166975	
1 Reduction		23:1		86:1	159:1	411:1	636:1		1694:1	2548:1	3566:1	
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	
Part Numbers		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		¹³⁸ / ₅		³⁵⁸⁹ / 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	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 ²	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

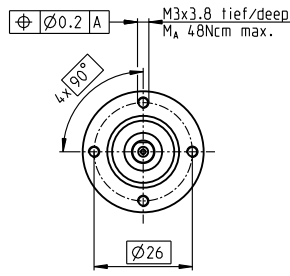
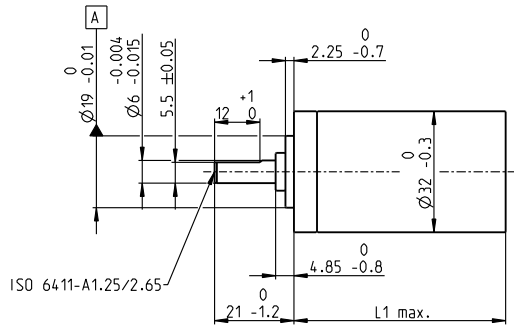


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
RE 25, 10 W	125			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	125	MR	419	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	125	Enc 22	426	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	125	HED_5540	429/431	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	125	DCT 22	438	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	126			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	126	MR	419	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	126	HED_5540	430/433	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	126	DCT22	438	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	126	AB 28	480	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	126	HED_5540/AB 28	430/480	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	127	AB 28	480	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	127	HED_5540/AB 28	480	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	129			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	129	MR	420	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	129	HED_5540	429/431	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	130			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	130	MR	420	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	130	HED_5540	429/431	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	130	DCT 22	438	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	130	AB 28	480	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	130	HEDS 5540/AB 28	429/480	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	152-158	MEnc 13	408	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	152-158	MR	419	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	152-158	Enc 22	426	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	152-158	HED_5540	430/432	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	159/161			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	160/162			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	160/162	MR	420	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	160/162	HED_5540	430/432	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 $\varnothing 32$ 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

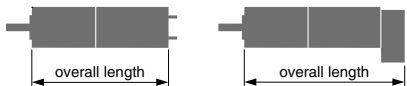
Option: Low-noise version

maxon gear

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	166930	166933	166938	166939	166944	166949	166954	166959	166962	166967	166972	166977
Gearhead Data												
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
Part Numbers	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	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	3	3	3	3	3	3
Part Numbers	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	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
Part Numbers		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		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	
Part Numbers		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		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 ²	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

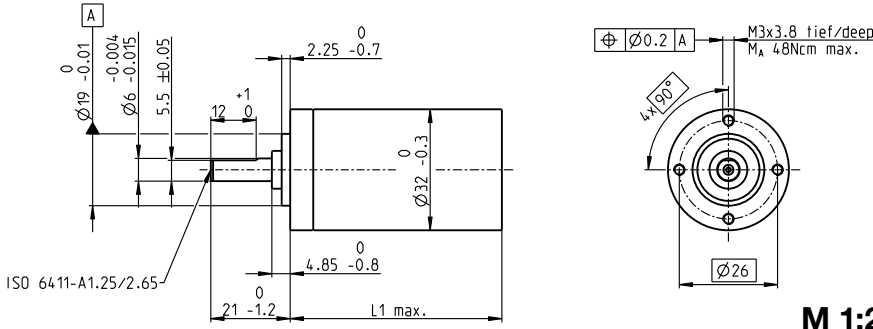


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC 32, 80 W	212			86.6	96.5	96.5	103.2	103.2	109.9	109.9	116.6	116.6	116.6
EC 32, 80 W	212	HED_5540	430/433	105.0	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0
EC 32, 80 W	212	Res 26	439	106.7	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7
EC-max 22, 25 W	223			75.1	85.0	85.0	91.7	91.7	98.4	98.4	105.1	105.1	105.1
EC-max 22, 25 W	223	MR	418	84.8	94.7	94.7	101.4	101.4	108.1	108.1	114.8	114.8	114.8
EC-max 22, 25 W	223	AB 20	478	110.7	120.5	120.5	127.2	127.2	133.9	133.9	140.6	140.6	140.6
EC-max 30, 40 W	224			68.9	78.8	78.8	85.5	85.5	92.2	92.2	98.9	98.9	98.9
EC-max 30, 40 W	224	MR	419	81.1	91.0	91.0	97.7	97.7	104.4	104.4	111.1	111.1	111.1
EC-max 30, 40 W	224	HEDL 5540	432	89.5	99.4	99.4	106.1	106.1	112.8	112.8	119.5	119.5	119.5
EC-max 30, 40 W	224	AB 20	478	104.5	114.4	114.4	121.1	121.1	127.8	127.8	134.5	134.5	134.5
EC-max 30, 40 W	224	HEDL 5540/AB 20	433/478	125.1	135.0	135.0	141.7	141.7	148.4	148.4	155.1	155.1	155.1
EC-max 30, 60 W	225			90.9	100.8	100.8	107.4	107.4	114.7	114.7	120.8	120.8	120.8
EC-max 30, 60 W	225	MR	419	103.1	113.0	113.0	119.7	119.7	126.4	126.4	133.1	133.1	133.1
EC-max 30, 60 W	225	HEDL 5540	433	111.5	121.4	121.4	128.0	128.0	134.7	134.7	141.4	141.4	141.4
EC-max 30, 60 W	225	AB 20	478	126.5	136.4	136.4	143.0	143.0	149.7	149.7	156.4	156.4	156.4
EC-max 30, 60 W	225	HEDL 5540/AB 20	433/478	147.9	157.2	157.2	163.8	163.8	170.5	170.5	177.2	177.2	177.2
EC-4pole 22, 90 W	231			75.2	85.1	85.1	91.8	91.8	98.5	98.5	105.2	105.2	105.2
EC-4pole 22, 90 W	231	16 EASY/Abs.	409/411	87.4	97.3	97.3	104.0	104.0	110.7	110.7	117.4	117.4	117.4
EC-4pole 22, 90 W	231	AEDL/HEDL	427/433	96.7	106.6	106.6	113.3	113.3	120.0	120.0	126.7	126.7	126.7
EC-4pole 22, 120 W	232			92.6	102.5	102.5	109.2	109.2	115.9	115.9	122.6	122.6	122.6
EC-4pole 22, 120 W	232	16 EASY/Abs.	409/411	104.8	114.7	114.7	121.4	121.4	128.1	128.1	134.8	134.8	134.8
EC-4pole 22, 120 W	232	AEDL/HEDL	427/433	114.1	124.0	124.0	130.7	130.7	137.4	137.4	144.1	144.1	144.1
EC 32 flat, 15 W	262			44.5	54.4	54.4	61.1	61.1	67.8	67.8	74.5	74.5	74.5
EC 32 flat IE, IP 00	263			54.6	64.5	64.5	71.2	71.2	77.9	77.9	84.6	84.6	84.6
EC 32 flat IE, IP 40	263			56.3	66.2	66.2	72.9	72.9	79.6	79.6	86.3	86.3	86.3
EC-i 30, 20 W	241			68.6	78.5	78.5	85.2	85.2	91.9	91.9	98.6	98.6	98.6
EC-i 30, 30 W	242			68.8	78.7	78.7	85.4	85.4	92.1	92.1	98.8	98.8	98.8
EC-i 30, 30 W	242	16 EASY/Abs.	409-411	80.5	90.4	90.4	97.1	97.1	103.8	103.8	110.5	110.5	110.5
EC-i 30, 30 W	242	16 RIO	423/424	79.0	88.9	88.9	95.6	95.6	102.3	102.3	109.0	109.0	109.0
EC-i 30, 30 W	242	AEDL 5810	427/428	89.5	99.4	99.4	106.1	106.1	112.8	112.8	119.5	119.5	119.5
EC-i 30, 30 W	242	HEDL 5540	431-435	89.5	99.4	99.4	106.1	106.1	112.8	112.8	119.5	119.5	119.5

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
Gearhead Data												
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	¹⁷⁵⁶ / 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
Part Numbers	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	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
Part Numbers	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	²³ / ₄	²⁹⁹ / ₁₄		³⁸⁸⁷ / ₄₉	³³¹² / ₂₅	³⁸⁹³⁷⁶ / ₁₂₂₅	²⁰⁶³¹ / ₃₅	²⁷⁹⁸⁴ / 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
Part Numbers		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		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	
Part Numbers		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		¹³⁸ / ₅		³⁵⁸⁸ / ₃₅	¹²¹⁶⁷ / ₆₄	⁸⁹⁴⁰¹ / ₁₉₆	¹⁵⁸¹⁷ / ₂₂₄		²²³⁸⁸¹² / 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	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 ² 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	56.5	56.5	56.5	56.5



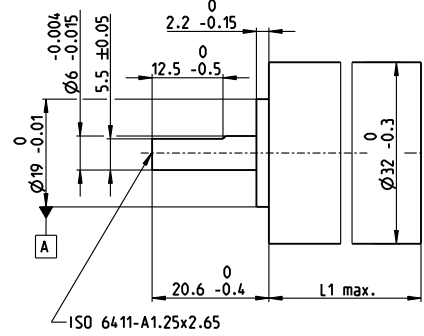
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
EC-i 30, 45 W	243			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	243	16 EASY/Abs.	409/412	80.5	90.4	90.4	97.1	97.1	103.8	103.8	103.8	110.5	110.5	110.5	110.5
EC-i 30, 45 W	243	16 RIO	423/424	79.0	88.9	88.9	95.6	95.6	102.3	102.3	102.3	109.0	109.0	109.0	109.0
EC-i 30, 45 W	243	AEDL 5810	427/428	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-i 30, 45 W	243	HEDL 5540	431-435	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-i 30, 50 W	244			90.8	100.7	100.7	107.4	107.4	114.1	114.1	114.1	120.8	120.8	120.8	120.8
EC-i 30, 50 W	244	16 EASY/Abs.	409/412	102.5	112.4	112.4	119.1	119.1	125.8	125.8	125.8	132.5	132.5	132.5	132.5
EC-i 30, 50 W	244	16 RIO	423/424	101.0	110.9	110.9	117.6	117.6	124.3	124.3	124.3	131.0	131.0	131.0	131.0
EC-i 30, 50 W	244	AEDL 5810	427/428	111.5	121.4	121.4	128.1	128.1	134.8	134.8	134.8	141.5	141.5	141.5	141.5
EC-i 30, 50 W	244	HEDL 5540	431-435	111.5	121.4	121.4	128.1	128.1	134.8	134.8	134.8	141.5	141.5	141.5	141.5
EC-i 30, 75 W	245			90.8	100.7	100.7	107.4	107.4	114.1	114.1	114.1	120.8	120.8	120.8	120.8
EC-i 30, 75 W	245	16 EASY/Abs.	409/412	102.5	112.4	112.4	119.1	119.1	125.8	125.8	125.8	132.5	132.5	132.5	132.5
EC-i 30, 75 W	245	16 RIO	423/424	101.0	110.9	110.9	117.6	117.6	124.3	124.3	124.3	131.0	131.0	131.0	131.0
EC-i 30, 75 W	245	AEDL 5810	427/428	111.5	121.4	121.4	128.1	128.1	134.8	134.8	134.8	141.5	141.5	141.5	141.5
EC-i 30, 75 W	245	HEDL 5540	431-435	111.5	121.4	121.4	128.1	128.1	134.8	134.8	134.8	141.5	141.5	141.5	141.5
EC-i 40, 50 W	246			58.3	68.2	68.2	74.9	74.9	81.6	81.6	81.6	88.3	88.3	88.3	88.3
EC-i 40, 50 W	246	16 EASY/Abs.	409/411	70.0	79.9	79.9	86.6	86.6	93.3	93.3	93.3	100.0	100.0	100.0	100.0
EC-i 40, 50 W	246	16 RIO	423/424	72.8	82.7	82.7	89.4	89.4	96.1	96.1	96.1	102.8	102.8	102.8	102.8
EC-i 40, 50 W	246	2RMHF	425	88.5	98.4	98.4	105.1	105.1	111.8	111.8	111.8	118.5	118.5	118.5	118.5
EC-i 40, 50 W	246	AEDL 5810	427/428	81.3	91.2	91.2	97.9	97.9	104.6	104.6	104.6	111.3	111.3	111.3	111.3
EC-i 40, 50 W	246	HEDL 5540	431-435	81.3	91.2	91.2	97.9	97.9	104.6	104.6	104.6	111.3	111.3	111.3	111.3
EC-i 40, 70 W	248			68.3	78.2	78.2	84.9	84.9	91.6	91.6	91.6	98.3	98.3	98.3	98.3
EC-i 40, 70 W	248	16 EASY/Abs.	409/411	80.0	89.9	89.9	96.6	96.6	103.3	103.3	103.3	110.0	110.0	110.0	110.0
EC-i 40, 70 W	248	16 RIO	423/424	82.8	92.7	92.7	99.4	99.4	106.1	106.1	106.1	112.8	112.8	112.8	112.8
EC-i 40, 70 W	248	2RMHF	425	98.5	108.4	108.4	115.1	115.1	121.8	121.8	121.8	128.5	128.5	128.5	128.5
EC-i 40, 70 W	248	AEDL 5810	427/428	91.3	101.2	101.2	107.9	107.9	114.6	114.6	114.6	121.3	121.3	121.3	121.3
EC-i 40, 70 W	248	HEDL 5540	431-435	91.3	101.2	101.2	107.9	107.9	114.6	114.6	114.6	121.3	121.3	121.3	121.3
MCD EPOS, 60 W	475			150.2	160.1	160.1	166.8	166.8	173.5	173.5	173.5	180.2	180.2	180.2	180.2
MCD EPOS P, 60 W	475			150.2	160.1	160.1	166.8	166.8	173.5	173.5	173.5	180.2	180.2	180.2	180.2

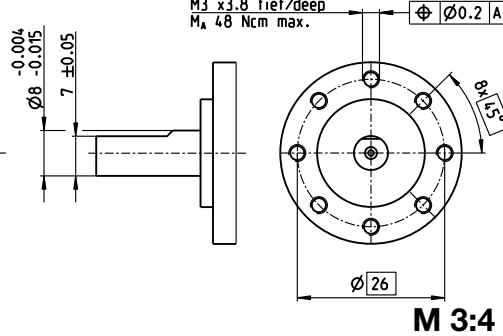
Planetary Gearhead GP 32 CR Ø32 mm, 1.0 Nm

for high radial loads, ceramic version

Ø6 mm output shaft



Ø8 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

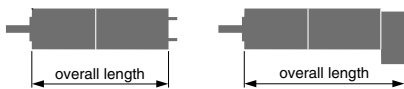
- Stock program
- Standard program
- Special program (on request)

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
Part Numbers			
	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 ² 1.6	0.9	0.6
11 Gearhead length L1	mm 26.2	26.2	26.2

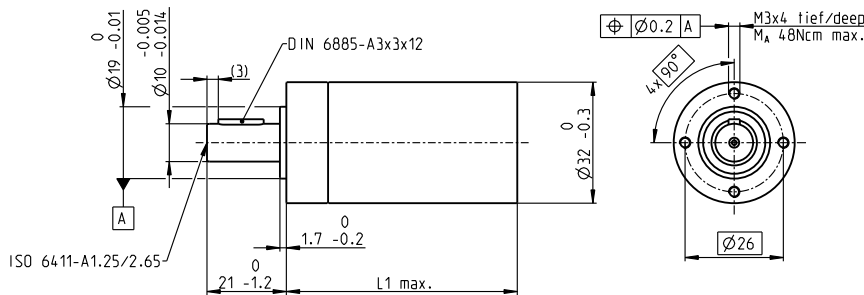


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 30, 60 W	129			94.3	94.3	94.3
RE 30, 60 W	129	MR	420	105.7	105.7	105.7
RE 30, 60 W	129	HED_5540	429/431	115.1	115.1	115.1
RE 35, 90 W	130			97.3	97.3	97.3
RE 35, 90 W	130	MR	420	108.7	108.7	108.7
RE 35, 90 W	130	HED_5540	429/431	118.0	118.0	118.0
RE 35, 90 W	130	DCT22	438	115.4	115.4	115.4
RE 35, 90 W	130	AB 28	480	133.4	133.4	133.4
RE 35, 90 W	130	HED_5540/AB 28	429/480	150.5	150.5	150.5
EC 32, 80 W	212			86.3	86.3	86.3
EC 32, 80 W	212	HED_5540	430/433	104.7	104.7	104.7
EC 32, 80 W	212	Res 26	439	106.4	106.4	106.4

Planetary Gearhead GP 32 HP $\varnothing 32$ mm, 4.0–8.0 Nm

High Power



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

M 1:2

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	320247	326663	326664	326668	326672	324947	324952
Gearhead Data							
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
Part Numbers	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
Part Numbers	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
Part Numbers	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	
Part Numbers	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 ² 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

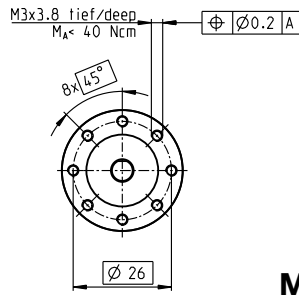
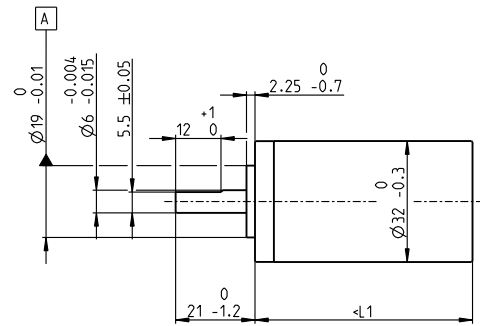


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
RE 35, 90 W	130			119.4	119.4	126.1	126.1	132.8	132.8	132.8
RE 35, 90 W	130	MR	420	130.8	130.8	137.5	137.5	144.2	144.2	144.0
RE 35, 90 W	130	HEDL 5540	429/431	140.1	140.1	146.8	146.8	153.5	153.5	153.5
RE 35, 90 W	130	DCT 22	438	137.5	137.5	144.2	144.2	150.9	150.9	150.9
RE 35, 90 W	130	AB 28	480	155.5	155.5	162.2	162.2	168.9	168.9	168.9
RE 35, 90 W	130	HEDS 5540/AB 28	429/480	172.7	172.7	179.4	179.4	186.1	186.1	186.1
EC-max 30, 40 W	224			90.2	90.2	96.9	96.9	103.6	103.6	103.6
EC-max 30, 40 W	224	MR	419	102.4	102.4	109.1	109.1	115.8	115.8	115.8
EC-max 30, 40 W	224	HEDL 5540	433	110.8	110.8	117.5	117.5	124.2	124.2	124.2
EC-max 30, 40 W	224	AB 20	478	125.8	125.8	132.5	132.5	139.2	139.2	139.2
EC-max 30, 40 W	224	HEDL 5540/AB 20	433/478	146.4	146.4	153.1	153.1	159.8	159.8	159.8
EC-max 30, 60 W	225			112.2	112.2	118.9	118.9	125.6	125.6	125.6
EC-max 30, 60 W	225	MR	419	124.4	124.4	131.1	131.1	137.8	137.8	137.8
EC-max 30, 60 W	225	HEDL 5540	433	132.8	132.8	139.5	139.5	146.2	146.2	146.2
EC-max 30, 60 W	225	AB 20	478	147.8	147.8	154.5	154.5	161.2	161.2	161.2
EC-max 30, 60 W	225	HEDL 5540/AB 20	433/478	168.4	168.4	175.1	175.1	181.8	181.8	181.8
EC-4pole 30, 100 W	233			95.2	95.2	101.9	101.9	108.6	108.6	108.6
EC-4pole 30, 100 W	233	16 EASY/Abs.	409/411	109.1	109.1	115.8	115.8	122.5	122.5	122.5
EC-4pole 30, 100 W	233	AEDL/HEDL	427/433	115.8	115.8	122.5	122.5	129.2	129.2	129.2
EC-4pole 30, 100 W	233	AB 20	478	131.4	131.4	138.1	138.1	144.8	144.8	144.8
EC-4pole 30, 100 W	233	AEDL/HEDL/AB 20	427/478	152.2	152.2	158.9	158.9	165.6	165.6	165.6
EC-4pole 30, 200 W	235			112.2	112.2	118.9	118.9	125.6	125.6	125.6
EC-4pole 30, 200 W	235	16 EASY/Abs.	409/411	126.1	126.1	132.8	132.8	139.5	139.5	139.5
EC-4pole 30, 200 W	235	HEDL 5540	433	132.8	132.8	139.5	139.5	146.2	146.2	146.2
EC-4pole 30, 200 W	235	AB 20	478	148.4	148.4	155.1	155.1	161.8	161.8	161.8
EC-4pole 30, 200 W	235	HEDL 5540/AB 20	433/478	169.2	169.2	175.9	175.9	182.6	182.6	182.6
MCD EPOS, 60 W	475			168.2	168.2	174.9	174.9	181.6	181.6	181.6
MCD EPOS P, 60 W	475			168.2	168.2	174.9	174.9	181.6	181.6	181.6

Koaxdrive KD 32 Ø32 mm, 1.0–4.5 Nm

Low Noise



M 1:2

Technical Data

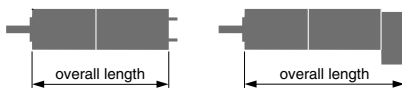
Planetary Gearhead	special toothing
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
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

- Stock program
- Standard program
- Special program (on request)

Part Numbers

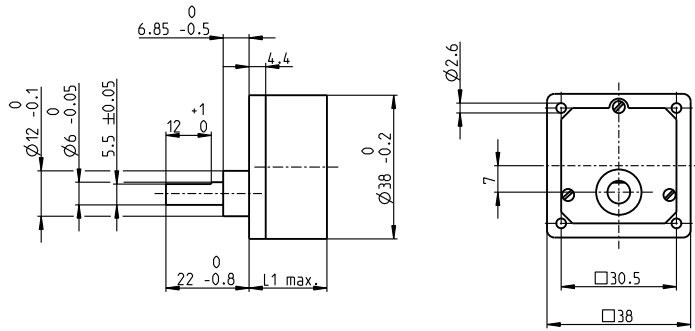
	354722	354725	354962	354730	354731	354734	354737	354963	354742
Gearhead Data									
1 Reduction	11:1	41:1	82:1	158:1	152:1	253:1	392:1	705:1	1091:1
2 Absolute reduction	1 ¹ / ₁	286 ⁶ / ₇	408 ⁵ / ₅	792 ⁵ / ₅	7436 ⁴⁹ / ₄₉	6336 ²⁵ / ₂₅	9792 ²⁵ / ₂₅	9867 ¹⁴ / ₁₄	17457 ¹⁶ / ₁₆
7 Max. efficiency	% 78	70	65	61	63	63	59	55	55
10 Mass inertia	gcm ² 0.65	0.60	0.60	0.35	0.60	0.60	0.35	0.35	0.22
Part Numbers	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	1 ⁷ / ₁	264 ⁵ / ₅	391 ⁴ / ₄	759 ⁴ / ₄	6864 ³⁵ / ₃₅	1518 ⁵ / ₅	22308 ⁴⁹ / ₄₉	19008 ²⁵ / ₂₅	
7 Max. efficiency	% 72	70	65	65	63	63	55	55	
10 Mass inertia	gcm ² 0.38	0.60	0.35	0.35	0.60	0.60	0.22	0.22	
Part Numbers	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 / ₁	442 ⁷ / ₇	858 ⁷ / ₇		11492 ⁴⁹ / ₄₉	5819 ¹⁶ / ₁₆	20592 ³⁵ / ₃₅	4554 ⁵ / ₅	
7 Max. efficiency	% 68	70	61		63	63	59	55	
10 Mass inertia	gcm ² 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	125/127			95.3	112.5	112.5	112.5	122.2	122.2	122.2	122.2
RE 25	125/127	MR	419	106.3	123.5	123.5	123.5	133.2	133.2	133.2	133.2
RE 25	125/127	Enc 22	426	109.4	126.6	126.6	126.6	136.3	136.3	136.3	136.3
RE 25	125/127	HED_5540	429/431	116.1	133.3	133.3	133.3	143.0	143.0	143.0	143.0
RE 25	125/127	DCT 22	438	117.6	134.8	134.8	134.8	144.5	144.5	144.5	144.5
RE 25, 20 W	126			83.8	101.0	101.0	101.0	110.7	110.7	110.7	110.7
RE 25, 20 W	126	MR	419	94.8	112.0	112.0	112.0	121.7	121.7	121.7	121.7
RE 25, 20 W	126	HED_5540	430/431	104.6	121.8	121.8	121.8	131.5	131.5	131.5	131.5
RE 25, 20 W	126	DCT 22	438	106.1	123.3	123.3	123.3	133.0	133.0	133.0	133.0
RE 25, 20 W	126	AB 28	480	117.9	135.1	135.1	135.1	144.8	144.8	144.8	144.8
RE 25, 20 W	126	HED_5540/AB 28	430/480	135.1	152.3	152.3	152.3	162.0	162.0	162.0	162.0
RE 30, 60 W	129			108.8	126.0	126.0	126.0	135.7	135.7	135.7	135.7
RE 30, 60 W	129	MR	420	120.2	137.4	137.4	137.4	147.1	147.1	147.1	147.1
RE 30, 60 W	129	HEDL 5540	431	129.6	146.8	146.8	146.8	156.5	156.5	156.5	156.5
EC-max 22, 12 W	222			72.8	90.0	90.0	90.0	99.7	99.7	99.7	99.7
EC-max 22, 12 W	222	MR	418	82.4	99.6	99.6	99.6	109.3	109.3	109.3	109.3
EC-max 22, 12 W	222	AB 20	478	108.4	125.6	125.6	125.6	135.3	135.3	135.3	135.3
EC-max 22, 25 W	223			89.3	106.5	106.5	106.5	116.2	116.2	116.2	116.2
EC-max 22, 25 W	223	MR	418	98.9	116.1	116.1	116.1	125.8	125.8	125.8	125.8
EC-max 22, 25 W	223	AB 20	478	125.0	142.2	142.2	142.2	151.9	151.9	151.9	151.9
EC-max 30, 40 W	224			82.8	100.0	100.0	100.0	109.7	109.7	109.7	109.7
EC-max 30, 40 W	224	MR	419	95.0	112.2	112.2	112.2	121.9	121.9	121.9	121.9
EC-max 30, 40 W	224	HEDL 5540	433	103.4	120.6	120.6	120.6	130.3	130.3	130.3	130.3
EC-max 30, 40 W	224	AB 20	478	118.4	135.6	135.6	135.6	145.3	145.3	145.3	145.3
EC-max 30, 40 W	224	HEDL 5540/AB 20	433/478	139.2	156.2	156.2	156.2	165.8	165.8	165.8	165.8
EC-max 30, 60 W	225			104.8	122.0	122.0	122.0	131.7	131.7	131.7	131.7
EC-max 30, 60 W	225	MR	419	117.0	134.2	134.2	134.2	143.9	143.9	143.9	143.9
EC-max 30, 60 W	225	HEDL 5540	433	125.4	142.6	142.6	142.6	152.3	152.3	152.3	152.3
EC-max 30, 60 W	225	AB 20	478	140.4	157.6	157.6	157.6	167.3	167.3	167.3	167.3
EC-max 30, 60 W	225	HEDL 5540/AB 20	433/478	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

maxon gear

- Stock program
- Standard program
- Special program (on request)

Part Numbers

Gearhead Data	Part Numbers									
	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 ² 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

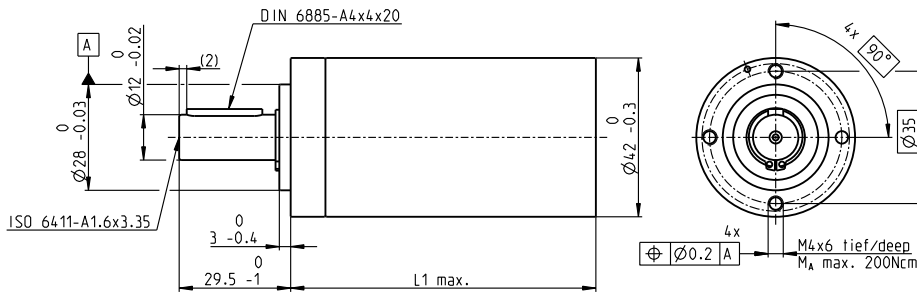


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
A-max 26	151-158			65.4	65.4	67.9	67.9	70.4	70.4	72.9	75.4	75.4
A-max 26	152-158	MEnc 13	408	72.5	72.5	75.0	75.0	77.5	77.5	80.0	82.5	82.5
A-max 26	152-158	MR	419	74.2	74.2	76.7	76.7	79.2	79.2	81.7	84.2	84.2
A-max 26	152-158	Enc 22	426	79.8	79.8	82.3	82.3	84.8	84.8	87.3	89.8	89.8
A-max 26	152-158	HED_ 5540	430/432	83.8	83.8	86.3	86.3	88.8	88.8	91.3	93.8	93.8
A-max 32	159/161			83.6	83.6	86.1	86.1	88.6	88.6	91.1	93.6	93.6
A-max 32	160/162			82.2	82.2	84.7	84.7	87.2	87.2	89.7	92.2	92.2
A-max 32	160/162	MR	420	93.4	93.4	95.9	95.9	98.4	98.4	100.9	103.4	103.4
A-max 32	160/162	HED_ 5540	430/432	103.0	103.0	105.5	105.5	108.0	108.0	110.5	113.0	113.0
EC 32 flat, 15 W	262			38.6	38.6	41.1	41.1	43.6	43.6	46.1	48.6	48.6
EC 32 flat, IE, IP 00	263			48.7	48.7	51.2	51.2	53.7	53.7	56.2	58.7	58.7
EC 32 flat, IE, IP 40	263			50.4	50.4	52.9	52.9	55.4	55.4	57.9	60.4	60.4

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

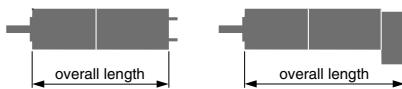
maxon gear

- Stock program
- Standard program
- Special program (on request)

Part Numbers

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	7/2	49/4	26	343/8	2197/27	156	2401/16	15379/54	441	756
10 Mass inertia	gcm ² 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	13/3	91/6	36/1	637/12	91	216/1	4459/24	637/2	4394/9	936
10 Mass inertia	gcm ² 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	6/1	169/9		1183/18	338/3		8281/36	28561/81	546	1296/1
10 Mass inertia	gcm ² 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		147/2	126		1029/4	1183/3	676	
10 Mass inertia	gcm ²	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	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
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

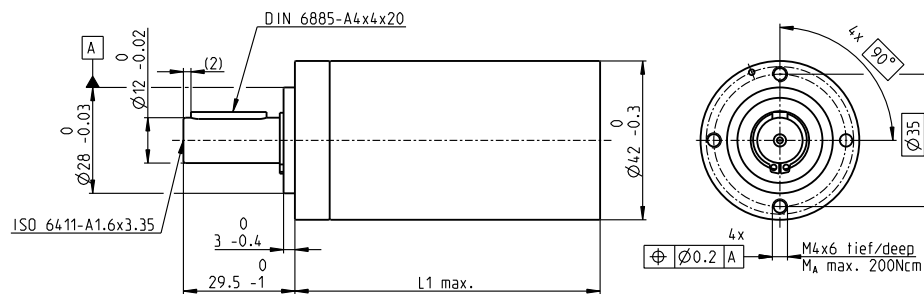


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC-max 30, 60 W	225					105.1	119.6	119.6	134.1	134.1	134.1	148.6	148.6	148.6	148.6
EC-max 30, 60 W	225	MR	419			117.3	131.8	131.8	146.3	146.3	146.3	160.8	160.8	160.8	160.8
EC-max 30, 60 W	225	HEDL 5540	433			125.7	140.2	140.2	154.7	154.7	154.7	169.2	169.2	169.2	169.2
EC-max 30, 60 W	225			AB 20	478	141.2	155.1	155.1	169.5	169.5	169.5	184.2	184.2	184.2	184.2
EC-max 30, 60 W	225	HEDL 5540	433	AB 20	478	161.4	175.9	175.9	190.4	190.4	190.4	204.9	204.9	204.9	204.9
EC-max 40, 70 W	226					99.1	113.6	113.6	128.1	128.1	128.1	142.6	142.6	142.6	142.6
EC-max 40, 70 W	226	MR	420			115.0	129.5	129.5	144.0	144.0	144.0	158.5	158.5	158.5	158.5
EC-max 40, 70 W	226	HEDL 5540	433			122.5	137.0	137.0	151.5	151.5	151.5	166.0	166.0	166.0	166.0
EC-max 40, 70 W	226			AB 28	479	133.5	148.0	148.0	162.5	162.5	162.5	177.0	177.0	177.0	177.0
EC-max 40, 70 W	226	HEDL 5540	433	AB 28	479	151.8	166.3	166.3	180.8	180.8	180.8	195.3	195.3	195.3	195.3
EC-4pole 30, 100 W	233					88.1	102.6	102.6	117.1	117.1	117.1	131.6	131.6	131.6	131.6
EC-4pole 30, 100 W	233	16 EASY/Abs.	409			102.0	116.5	116.5	131.0	131.0	131.0	145.5	145.5	145.5	145.5
EC-4pole 30, 100 W	233	AEDL/HEDL	427/433			108.7	123.2	123.2	137.7	137.7	137.7	152.2	152.2	152.2	152.2
EC-4pole 30, 100 W	233			AB 20	478	124.3	138.8	138.8	153.3	153.3	153.3	167.8	167.8	167.8	167.8
EC-4pole 30, 100 W	233	AEDL/HEDL	427/433	AB 20	478	145.1	159.6	159.6	174.1	174.1	174.1	188.6	188.6	188.6	188.6
EC-4pole 30, 200 W	235					105.1	119.6	119.6	134.1	134.1	134.1	148.6	148.6	148.6	148.6
EC-4pole 30, 200 W	235	16 EASY/Abs.	409			119.0	133.5	133.5	148.0	148.0	148.0	162.5	162.5	162.5	162.5
EC-4pole 30, 200 W	235	AEDL/HEDL	427/433			125.7	140.2	140.2	154.7	154.7	154.7	169.2	169.2	169.2	169.2
EC-4pole 30, 200 W	235			AB 20	478	141.3	155.8	155.8	170.3	170.3	170.3	184.8	184.8	184.8	184.8
EC-4pole 30, 200 W	235	AEDL/HEDL	427/433	AB 20	478	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	246/247					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	246/247	16 EASY/Abs.	409/411			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	246/247	16 RIO	423			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	246/247	2RMHF	425			97.3	111.8	111.8	126.3	126.3	126.3	140.8	140.8	140.8	140.8
EC-i 40, 50 W	246/247	AEDL/HEDL	427/433			90.1	104.6	104.6	119.1	119.1	119.1	133.6	133.6	133.6	133.6

Planetary Gearhead GP 42 C $\varnothing 42$ 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

M 1:2

- 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		7/2	49/4	26	343/8	2197/27	156	2401/16	15379/54	441	756
10 Mass inertia	gcm ²	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		13/3	91/6	36/1	637/12	91	216/1	4459/24	637/2	4394/9	936
10 Mass inertia	gcm ²	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		6/1	169/9		1183/18	338/3		8281/36	28561/81	546	1296/1
10 Mass inertia	gcm ²	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		147/2	126		1029/4	1183/3	676	
10 Mass inertia	gcm ²		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-i 40
**for EC 45 flat L1 is -3.6 mm

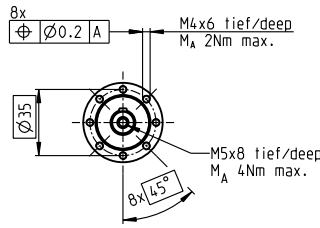
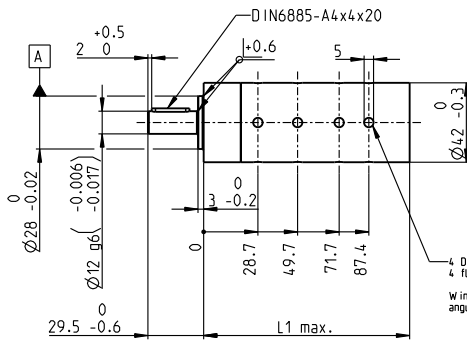


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC-i 40, 70 W	248/249					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	248/249	16 EASY/Abs.	409/411			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	248/249	16 RIO	423			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	248/249	2RMHF	425			107.3	121.8	121.8	136.3	136.3	136.3	150.8	150.8	150.8	150.8
EC-i 40, 70 W	248/249	AEDL/HEDL	427/433			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	250					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	250	16 EASY/Abs.	409/411			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	250	16 RIO	423			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	250	2RMHF	425			127.3	141.8	141.8	156.3	156.3	156.3	170.8	170.8	170.8	170.8
EC-i 40, 100 W	250	AEDL/HEDL	427/433			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	265					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	265	MILE	402			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	266					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	266	MILE	402			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	267					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	267	MILE	402			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	268					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	268					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	269					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	269					79.9	94.4	94.4	108.9	108.9	108.9	123.4	123.4	123.4	123.4
MCD EPOS, 60 W	475					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	475					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



M 1:4

4 Durchflussbohrungen pro Stufe, 90° versetzt
4 flow bores per stage, 90° displaced
Winkel der Durchflussbohrungen zu den Gewindebohrungen undefiniert
angular position of the flow bores aligned to threaded bores undefined

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

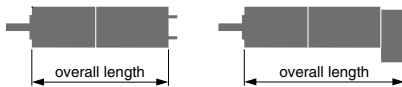
maxon gear

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	454742	454744	454745	476936	454280	476945	476949
Gearhead Data (provisional)							
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 ² 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
Part Numbers	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 ² 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
Part Numbers		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 ²	19.1	28.1	21.2	36.6	28.9	28.1
3 Max. motor shaft diameter	mm	8	8	8	10	8	8
Part Numbers			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 ²		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
5 Max. continuous torque	Nm	10	20	40	40	50	50
6 Max. intermittent torque at gear output	Nm	15	30	60	60	75	75
15 Max. overload torque ¹⁾	Nm	20	40	80	80	100	100
7 Max. efficiency	%	95	87	78	78	65	65
8 Weight	g	430	600	710	710	780	780
9 Average backlash no load	°	0.6	0.8	0.8	1.0	1.0	1.0
11 Gearhead length L1	mm	57.7	79.9	102.2	102.2	116.9	116.9
13 Max. transmittable power (continuous)	W	2000	880	300	300	62	62
14 Max. transmittable power (intermittent)	W	3000	1320	450	450	93	93

¹⁾ Reduced lift time expectancy

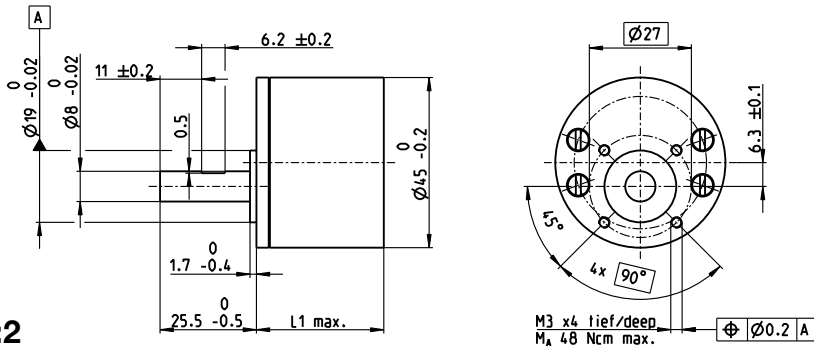


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm]	= Motor length + gearhead length + (sensor/brake) + assembly parts			
EC 32 HD oil, A	237			221.3	243.5	265.8	280.5	280.5
EC 32 HD oil, B	237			201.3	223.5	245.8	260.5	260.5

Application	Important Notice
General	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	
Oil & Gas Industry	
- oil, gas and geothermal wells	

Spur Gearhead GS 45 A $\varnothing 45$ mm, 0.5–2.0 Nm



M 1:2

Technical Data

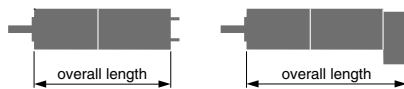
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.15 mm
Axial play	0.02–0.2 mm
Max. axial load (dynamic)	60 N
Max. force for press fits	60 N
Max. continuous input speed	6000 rpm
Recommended temperature range	-15...+80°C
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

- Stock program
- Standard program
- Special program (on request)

Part Numbers

	301177	301175	301181	301186	301191
Gearhead Data					
1 Reduction	5:1	18:1	61:1	212:1	732:1
2 Absolute reduction	$\frac{51}{10}$	$\frac{459}{26}$	$\frac{20655}{338}$	$\frac{125862}{595}$	$\frac{492790}{673}$
10 Mass inertia	3.7	1.6	1.0	0.8	0.8
3 Max. motor shaft diameter	3	3	3	3	3
Part Numbers	301178	301173	301182	301187	301192
1 Reduction	7:1	26:1	89:1	310:1	1072:1
2 Absolute reduction	$\frac{209}{28}$	$\frac{9405}{364}$	$\frac{66632}{745}$	$\frac{183281}{592}$	$\frac{307572}{287}$
10 Mass inertia	3.1	1.4	1.0	0.8	0.8
3 Max. motor shaft diameter	3	3	3	3	3
Part Numbers	301179	266595	301184	301188	301193
1 Reduction	9:1	32:1	111:1	385:1	1334:1
2 Absolute reduction	$\frac{2295}{247}$	$\frac{8523}{265}$	$\frac{334}{3}$	$\frac{173808}{451}$	$\frac{198769}{149}$
10 Mass inertia	2.1	1.4	0.6	0.5	0.4
3 Max. motor shaft diameter	3	3	3	3	3
Part Numbers	301180	301171	301185	301189	301194
1 Reduction	14:1	47:1	163:1	564:1	1952:1
2 Absolute reduction	$\frac{2475}{182}$	$\frac{6221}{132}$	$\frac{141157}{861}$	$\frac{161880}{287}$	$\frac{1929023}{988}$
10 Mass inertia	2.2	0.9	0.5	0.5	0.4
3 Max. motor shaft diameter	3	3	3	3	3
4 Number of stages	2	3	4	5	6
5 Max. continuous torque	0.5	2.0	2.0	2.0	2.0
6 Max. intermittent torque at gear output	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	224	224	255	287	313
9 Average backlash no load	1.6	2.0	2.4	2.8	3.2
11 Gearhead length L1*	23.5	23.5	26.9	30.4	33.8

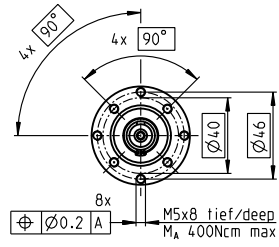
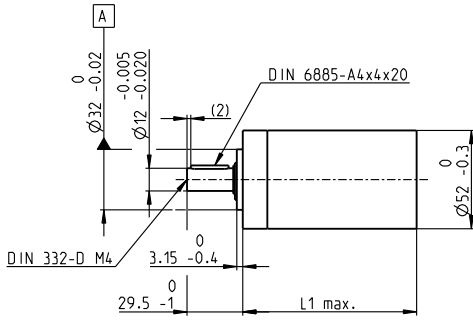
*for EC 45 flat, IE, L1 is max. + 4.0 mm



maxon Modular System				
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts
EC 45 flat, 30 W	265			40.0 40.0 43.4 46.9 50.3
EC 45 flat, 30 W	265	MILE	402	43.0 43.0 46.4 49.9 53.3
EC 45 flat, 50 W	266			44.9 44.9 48.3 51.8 55.2
EC 45 flat, 50 W	266	MILE	402	46.2 46.2 49.6 53.1 56.5
EC 45 flat, 70 W	267			50.3 50.3 53.7 57.2 60.6
EC 45 flat, 70 W	267	MILE	402	52.0 52.0 55.4 58.9 62.3
EC 45 flat, IE, IP 00	268			59.2 59.2 62.6 66.1 69.5
EC 45 flat, IE, IP 40	268			61.4 61.4 64.8 68.3 71.7
EC 45 flat, IE, IP 00	269			64.2 64.2 67.6 71.1 74.5
EC 45 flat, IE, IP 40	269			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

Gearhead Data

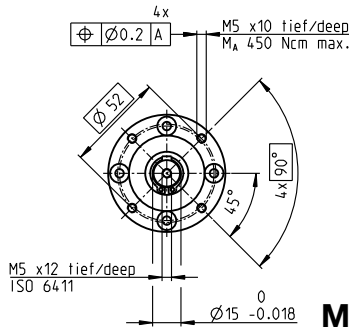
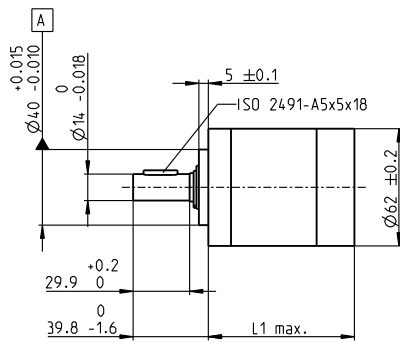
	223080	223083	223089	223094	223097	223104	223109
1 Reduction	3.5:1	12:1	43:1	91:1	150:1	319:1	546:1
2 Absolute reduction	7/2	49/4	343/8	91	2401/16	637/2	546
10 Mass inertia	gcm ² 20.7	17.6	17.3	16.7	17.3	16.8	16.4
3 Max. motor shaft diameter	mm 10	10	10	10	10	10	10
Part Numbers							
1 Reduction	4.3:1	15:1	53:1	113:1	186:1	353:1	676:1
2 Absolute reduction	13/3	91/6	637/12	338/3	4459/24	28561/81	676
10 Mass inertia	gcm ² 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
Part Numbers							
1 Reduction	19:1	66:1	126:1	230:1	394:1	756:1	
2 Absolute reduction	169/9	1183/18	126	8281/36	1183/3	756	
10 Mass inertia	gcm ² 9.5	16.7	16.4	16.8	16.7	16.4	
3 Max. motor shaft diameter	mm 8	10	10	10	10	10	
Part Numbers							
1 Reduction	21:1	74:1	156:1	257:1	441:1	936:1	
2 Absolute reduction	21	147/2	156	1029/4	441	936	
10 Mass inertia	gcm ² 16.5	17.2	9.1	17.3	16.5	9.1	
3 Max. motor shaft diameter	mm 10	10	8	10	10	8	
Part Numbers							
1 Reduction	26:1	81:1		285:1	488:1		
2 Absolute reduction	26	2197/27		15379/54	4394/9		
10 Mass inertia	gcm ² 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	3	4	4	4
5 Max. continuous torque	Nm 4	15	30	30	30	30	30
6 Max. intermittent torque at gear output	Nm 6	22.5	45	45	45	45	45
7 Max. efficiency	% 91	83	75	75	68	68	68
8 Weight	g 460	620	770	770	920	920	920
9 Average backlash no load	° 0.6	0.8	1.0	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	92.0



maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
RE 40, 150 W	132					120.1	136.1	149.6	149.6	163.1	163.1	163.1
RE 40, 150 W	132	MR	420			131.5	147.5	161.0	161.0	174.5	174.5	174.5
RE 40, 150 W	132	HED_5540	429/432			140.8	156.8	170.3	170.3	183.8	183.8	183.8
RE 40, 150 W	132	HEDL 9140	436			174.1	190.1	203.6	203.6	217.1	217.1	217.1
RE 40, 150 W	132			AB 28	480	156.2	172.2	185.7	185.7	199.2	199.2	199.2
RE 40, 150 W	132			AB 28	481	164.2	180.2	193.7	193.7	207.2	207.2	207.2
RE 40, 150 W	132	HED_5540	429/432	AB 28	480	173.4	189.4	202.9	202.9	216.4	216.4	216.4
RE 40, 150 W	132	HEDL 9140	436	AB 28	481	184.6	200.6	214.1	214.1	227.6	227.6	227.6
RE 50, 200 W	133					157.1	173.1	186.6	186.6	200.1	200.1	200.1
RE 50, 200 W	133	HED_5540	430/432			177.8	193.8	207.3	207.3	220.8	220.8	220.8
RE 50, 200 W	133	HEDL 9140	437			219.5	235.5	249.0	249.0	262.5	262.5	262.5
RE 50, 200 W	133			AB 44	484	219.5	235.5	249.0	249.0	262.5	262.5	262.5
RE 50, 200 W	133	HEDL 9140	437	AB 44	484	232.5	248.5	262.0	262.0	275.5	275.5	275.5
EC 40, 170 W	213					129.1	145.1	158.6	158.6	172.1	172.1	172.1
EC 40, 170 W	213	HED_5540	430/432			152.5	168.5	182.0	182.0	195.5	195.5	195.5
EC 40, 170 W	213	Res 26	439			156.3	172.3	185.8	185.8	199.3	199.3	199.3
EC 40, 170 W	213			AB 32	482	171.8	187.8	201.3	201.3	214.8	214.8	214.8
EC 40, 170 W	213	HED_5540	430/432	AB 32	482	190.2	206.2	219.7	219.7	233.2	233.2	233.2

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

M 1:4

- Stock program
- Standard program
- Special program (on request)

Part Numbers

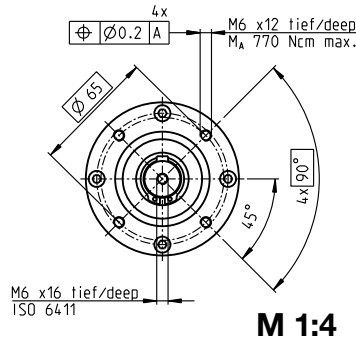
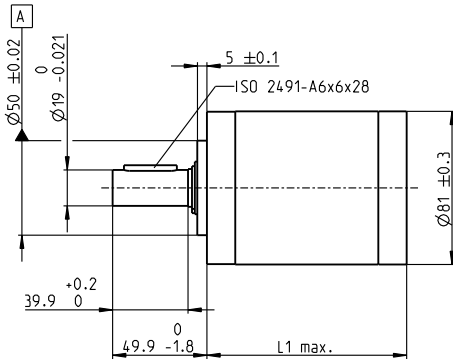
Gearhead Data	Part Numbers									
	110499	110501	110502	110503	110504	110505	110506	110507	110508	
1 Reduction	5.2:1	19:1	27:1	35:1	71:1	100:1	139:1	181:1	236:1	
2 Absolute reduction	57/11	3591/187	3249/121	1539/44	226223/3179	204687/2057	185193/1331	87723/484	41553/176	
3 Max. motor shaft diameter	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 ² 109	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	133				180.6	196.4	196.4	196.4	212.3	212.3	212.3	212.3	212.3
RE 50, 200 W	133	HEDS 5540	430		201.3	217.1	217.1	217.1	233.0	233.0	233.0	233.0	233.0
RE 50, 200 W	133	HEDL 5540	432		201.3	217.1	217.1	217.1	233.0	233.0	233.0	233.0	233.0
RE 50, 200 W	133	HEDL 9140	437		243.0	258.8	258.8	258.8	274.7	274.7	274.7	274.7	278.7
RE 50, 200 W	133			AB 44	484	243.0	258.8	258.8	258.8	274.7	274.7	274.7	278.7
RE 50, 200 W	133	HEDL 9140	437	AB 44	484	256.0	271.8	271.8	271.8	287.7	287.7	287.7	287.7
EC 45, 250 W	215				216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3	248.3
EC 45, 250 W	215	HEDL 9140	436		232.2	248.0	248.0	248.0	263.9	263.9	263.9	263.9	263.9
EC 45, 250 W	215	Res 26	439		216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3	248.3
EC 45, 250 W	215			AB 28	481	224.0	239.8	239.8	239.8	255.7	255.7	255.7	255.7
EC 45, 250 W	215	HEDL 9140	436	AB 28	481	241.0	256.8	256.8	256.8	272.7	272.7	272.7	272.7

Planetary Gearhead GP 81 A Ø81 mm, 20.0–120.0 Nm



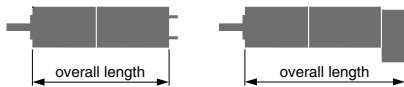
Technical Data

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 ²	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	134					223.5	245.2	245.2	266.8	266.8	266.8
RE 65, 250 W	134	HEDS 5540	430			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	134	HEDL 5540	432			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	134	HEDL 9140	437			279.6	301.3	301.3	322.9	322.9	322.9
RE 65, 250 W	134			AB 44	484	279.6	301.3	301.3	322.9	322.9	322.9
RE 65, 250 W	134	HEDL 9140	437	AB 44	484	297.6	319.3	319.3	340.9	340.9	340.9
EC 60, 400 W	216					269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	216	HEDL 9140	436			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	216	Res 26	439			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	216			AB 41	483	283.0	304.7	304.7	326.3	326.3	326.3
EC 60, 400 W	216	HEDL 9140	436	AB 41	483	307.0	328.7	328.7	350.3	350.3	350.3



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

maxon screw drive

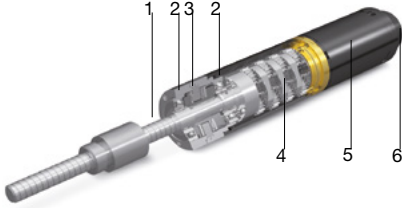
Compact, easy to configure linear actuators as part of a complete system with integrated thrust bearing for high axial loads. Versions available with metric lead screw, trapezoidal lead screw or ball screw.

Standard Specification No. 102	61
Important considerations	364
GP 6 S Ø6 mm, metric lead screw	365
GP 6 S Ø6 mm, metric lead screw, ceramic	366
GP 8 S Ø8 mm, metric lead screw	367
GP 8 S Ø8 mm, metric lead screw, ceramic	368
GP 16 S Ø16 mm, ball screw	369
GP 16 S Ø16 mm, metric lead screw	370
GP 16 S Ø16 mm, metric lead screw, ceramic	371
GP 22 S Ø22 mm, ball screw	372
GP 22 S Ø22 mm, metric lead screw	373
GP 32 S Ø32 mm, ball screw	374
GP 32 S Ø32 mm, metric lead screw	376
GP 32 S Ø32 mm, trapezoidal lead screw	378
Options	380–382

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

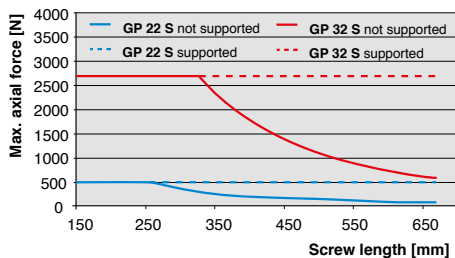
Trapezoidal lead screw:

- 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 η_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 η 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 380.

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:

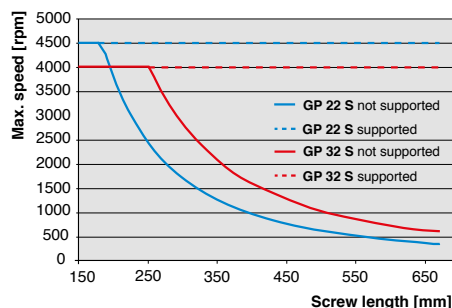
$$n_{mot} = \frac{v_L \cdot 60 \cdot i}{p}$$

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

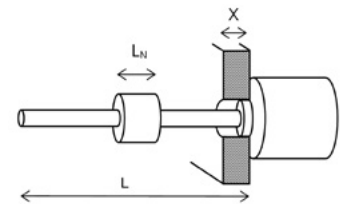
In this value, following factors are taken into consideration:

- 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.

$$\text{Stroke} = L - (L_N + X + \text{stroke reserve} + \text{opt. SPIN02})$$



Mounting and safety instructions

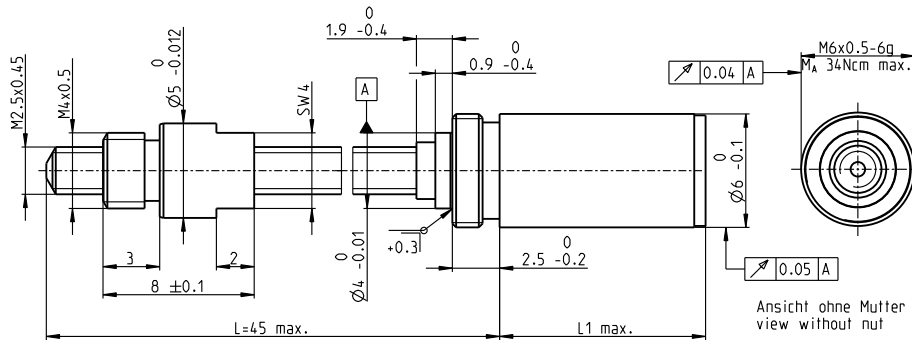
Using a ball screw with a flange nut, the mounting through a hole is only possible with the optional rectangular mounting flange.

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) ¹	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 ¹	mm/s 15	10	2.6	0.7	0.2
21 Max. feed force (continuous) ¹	N 2	3	4	6	10
22 Max. feed force (intermittent) ¹	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 ¹	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 ¹	mm 0.106	0.107	0.107	0.107	0.108
10 Mass inertia gearhead incl. screw ¹	gcm ² 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

¹ based on screw length 45 mm



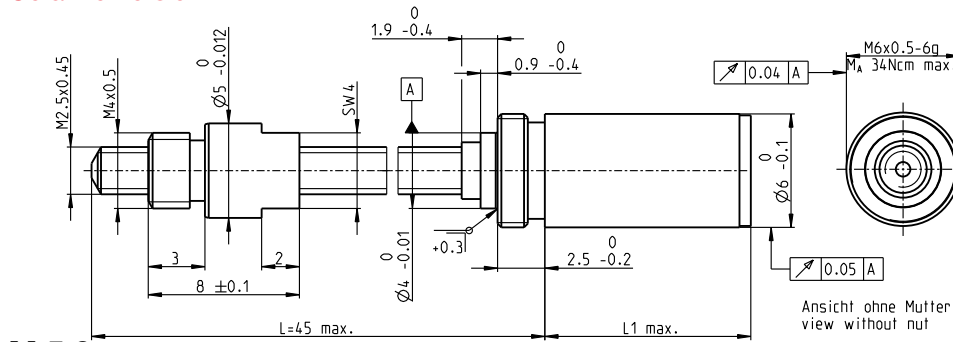
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 6, 0.3 W, A	98			22.6	25.1	27.7	30.2	32.8
RE 6, 0.3 W, B	98			26.6	29.1	31.7	34.2	36.8
EC 6, 1.5 W	204			28.3	30.8	33.4	35.9	38.5
EC 6, 1.5 W	204	Enc 6 MAG	405	30.4	32.9	35.5	38.0	40.6
EC 6, 1.5 W	204	Enc 6 OPT	421	30.4	32.9	35.5	38.0	40.6
EC 6, 2 W	205			28.3	30.8	33.4	35.9	38.5
EC 6, 2 W	205	Enc 6 MAG	405	30.4	32.9	35.5	38.0	40.6
EC 6, 2 W	205	Enc 6 OPT	421	30.4	32.9	35.5	38.0	40.6

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) ¹	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	²⁷ / ₇	⁷²⁹ / ₄₉	¹⁹⁶⁸³ / ₃₄₃	⁵³¹⁴⁴¹ / ₂₄₀₁	¹⁴³⁸⁹⁰⁷ / ₁₆₈₀₇
20 Max. feed velocity ¹	mm/s 25	10	2.6	0.7	0.2
21 Max. feed force (continuous) ¹	N 2	3	5	7	11
22 Max. feed force (intermittent) ¹	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 ¹	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 ¹	mm 0.081	0.082	0.082	0.082	0.083
10 Mass inertia gearhead incl. screw ¹	gcm ² 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

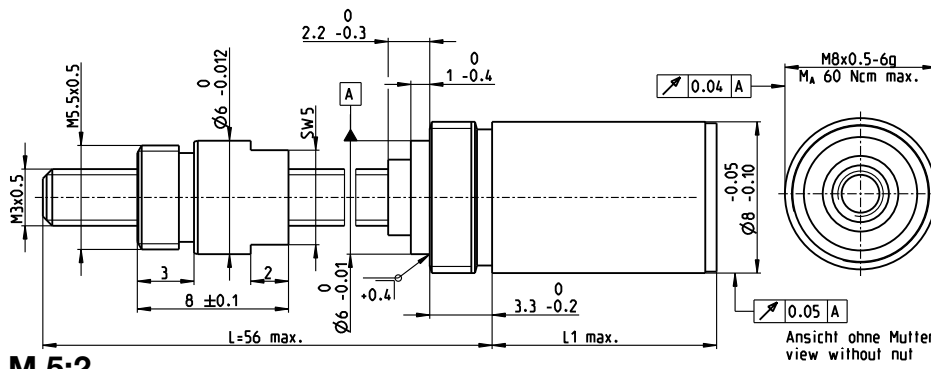
¹ based on screw length 45 mm



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	98			22.6	25.1	27.7	30.2	32.8
RE 6, 0.3 W, B	98			26.6	29.1	31.7	34.2	36.8
EC 6, 1.5 W	204			28.3	30.8	33.4	35.9	38.5
EC 6, 1.5 W	204	Enc 6 MAG	405	30.4	32.9	35.5	38.0	40.6
EC 6, 1.5 W	204	Enc 6 OPT	421	30.4	32.9	35.5	38.0	40.6
EC 6, 2 W	205			28.3	30.8	33.4	35.9	38.5
EC 6, 2 W	205	Enc 6 MAG	405	30.4	32.9	35.5	38.0	40.6
EC 6, 2 W	205	Enc 6 OPT	421	30.4	32.9	35.5	38.0	40.6

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) ¹	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

	473643	473644	473645	473646	473647
Screw Drive Data					
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 ¹	mm/s	15	6.3	1.6	0.4
21 Max. feed force (continuous) ¹	N	3	6	9	14
22 Max. feed force (intermittent) ¹	N	8	18	27	27
4 Number of stages	1	2	3	4	5
7 Max. efficiency gearhead incl. screw	%	27	24	22	19
8 Weight ¹	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 ¹	mm	0.112	0.112	0.112	0.112
10 Mass inertia gearhead incl. screw ¹	gcm ²	0.005	0.004	0.004	0.004
11 Gearhead length L1	mm	7.0	9.6	12.2	14.8

¹ based on screw length 56 mm

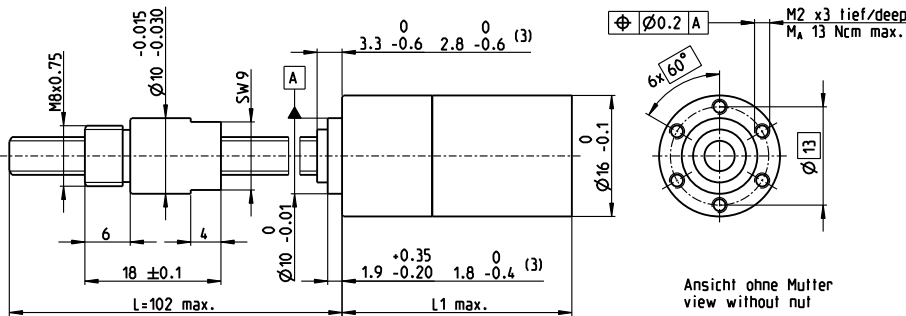


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 8, 0.5 W, A	99			23.7	26.3	28.9	31.5	34.1
RE 8, 0.5 W, B	99			26.7	29.3	31.9	34.5	37.1
RE 8, 0.5 W, A	99	MR	413/414	30.3	32.9	35.5	38.1	40.7
RE 8, 0.5 W, A	99	Enc 8 OPT	422	31.9	34.5	37.1	39.7	42.3
EC 8, 2 W	206			30.1	32.7	35.3	37.9	40.5

maxon screw drive

Screw Drive GP 16 S Ø16 mm, Ball Screw



M 1:1

Technical Data

Screw	Ø5 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 ²	12 000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) ¹	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 ¹	mm/s	150	90.9	21.1	4.8	
21 Max. feed force (continuous) ¹	N	54	64	104	171	
22 Max. feed force (intermittent) ¹	N	149	176	287	403	
Part Numbers		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 ¹	mm/s	74.1	16.7	3.8	0.9	
21 Max. feed force (continuous) ¹	N	69	113	184	300	
22 Max. feed force (intermittent) ¹	N	189	311	403	403	
Part Numbers			424744	424747	424750	
1 Reduction			29:1	128:1	561:1	
2 Absolute reduction			729/25	41553/325	2368521/4225	
20 Max. feed velocity ¹	mm/s		13.8	3.1	0.7	
21 Max. feed force (continuous) ¹	N		120	197	322	
22 Max. feed force (intermittent) ¹	N		331	403	403	
Part Numbers				424748	424751	
1 Reduction				157:1	690:1	
2 Absolute reduction				19683/125	1121931/1625	
20 Max. feed velocity ¹	mm/s			2.5	0.6	
21 Max. feed force (continuous) ¹	N			211	345	
22 Max. feed force (intermittent) ¹	N			403	403	
Part Numbers					424752	
1 Reduction					850:1	
2 Absolute reduction					531441/625	
20 Max. feed velocity ¹	mm/s				0.5	
21 Max. feed force (continuous) ¹	N				370	
22 Max. feed force (intermittent) ¹	N				403	
4 Number of stages		0	1	2	3	4
7 Max. efficiency gearhead incl. screw	%	93	87	79	71	63
8 Weight ¹	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 ¹	mm	0.039	0.041	0.042	0.044	0.046
10 Mass inertia gearhead incl. screw ¹	gcm ²	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

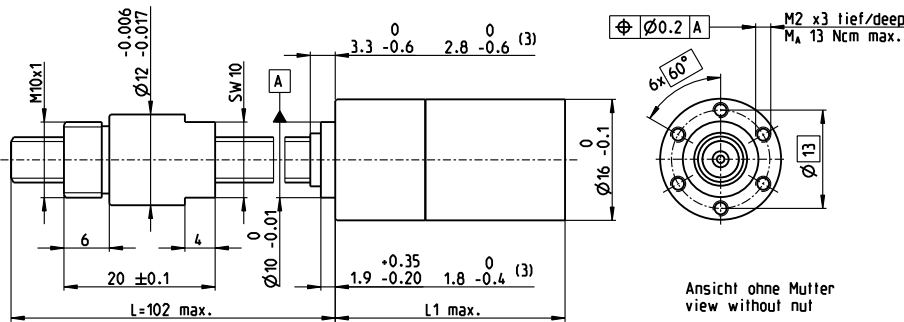
¹ based on screw length 102 mm (standard length) ² for reduction 1:1 = 4500 rpm ³ for reduction 1:1



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 16, 2 W	120			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	120	MR	416/417	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	121/122			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	122	MR	416/417	64.7	67.8	72.9	76.5	80.1
RE 16, 3.2 W	122	MEnc 13	407	65.8	68.9	74.0	77.6	81.2
RE 16, 4.5 W	123/124			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	124	MR	416/417	67.7	70.8	75.9	79.5	83.1
RE 16, 4.5 W	124	MEnc 13	407	68.9	72.0	77.1	80.7	84.3
A-max 16	139-142			-	47.8	52.9	56.5	60.1
A-max 16	140/142	MR	416/417	-	52.8	57.9	61.5	65.1
A-max 16	140/142	MEnc 13	407	-	55.9	61.0	64.6	68.2
EC-max 16, 5 W	219			-	46.4	51.5	55.1	58.7
EC-max 16, 5 W	219	MR	403	-	53.7	58.8	62.4	66.0
EC-max 16, 8 W	221			-	58.4	63.5	67.1	70.7
EC-max 16, 8 W	221	MR	403	-	65.7	70.8	74.4	78.0

Screw Drive GP 16 S Ø16 mm, Metric Lead Screw



M 1:1

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 ²	12 000 rpm			
Recommended temperature range	-15...+80°C			
Max. axial load (static) ¹	500 N			
Number of stages	0	1	2	3
Max. radial load, 6 mm from flange	20 N	40 N	60 N	80 N

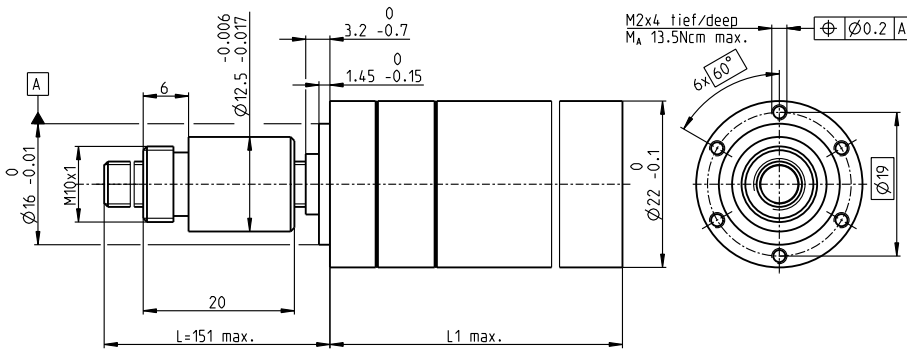
		Part Numbers				
		424231	424232	424233	424234	424235
Screw Drive Data (provisional)						
1	Reduction	1:1	4.4:1	19:1	84:1	370:1
2	Absolute reduction	1/1	57/13	3249/169	185193/2197	10556001/28561
20	Max. feed velocity ¹	mm/s	50.0	45.5	10.5	2.4
21	Max. feed force (continuous) ¹	N	35	37	60	98
22	Max. feed force (intermittent) ¹	N	134	138	224	315
Part Numbers			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 ¹	mm/s		37.0	8.3	1.9
21	Max. feed force (continuous) ¹	N		39	64	105
22	Max. feed force (intermittent) ¹	N		148	243	315
Part Numbers				424799	424803	424807
1	Reduction			29:1	128:1	561:1
2	Absolute reduction			729/25	41553/325	2368521/4225
20	Max. feed velocity ¹	mm/s		6.9	1.6	0.4
21	Max. feed force (continuous) ¹	N		69	112	184
22	Max. feed force (intermittent) ¹	N		258	315	315
Part Numbers					424804	424808
1	Reduction				157:1	690:1
2	Absolute reduction				19683/125	1121931/1625
20	Max. feed velocity ¹	mm/s			1.3	0.3
21	Max. feed force (continuous) ¹	N			120	197
22	Max. feed force (intermittent) ¹	N			315	315
Part Numbers						424809
1	Reduction					850:1
2	Absolute reduction					531441/625
20	Max. feed velocity ¹	mm/s				0.2
21	Max. feed force (continuous) ¹	N				211
22	Max. feed force (intermittent) ¹	N				315
4	Number of stages	0	1	2	3	4
7	Max. efficiency gearhead incl. screw	%	28	27	24	22
8	Weight ¹	g	55	61	64	68
9	Average backlash no load	°	1.0	1.4	1.6	2.0
23	Mechanical positioning accuracy ¹	mm	0.166	0.167	0.167	0.169
10	Mass inertia gearhead incl. screw ¹	gcm ²	0.23	0.11	0.05	0.05
11	Gearhead length L1	mm	19.2	22.3	27.4	31.0

¹ based on screw length 102 mm (standard length) ² for reduction 1:1 = 3000 rpm ³ 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	120			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	120	MR	416/417	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	121/122			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	122	MR	416/417	64.7	67.8	72.9	76.5	80.1
RE 16, 3.2 W	122	MEnc 13	407	65.8	68.9	74.0	77.6	81.2
RE 16, 4.5 W	123/124			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	124	MR	416/417	67.7	70.8	75.9	79.5	83.1
RE 16, 4.5 W	124	MEnc 13	407	68.9	72.0	77.1	80.7	84.3
A-max 16	139-142			-	47.8	52.9	56.5	60.1
A-max 16	140/142	MR	416/417	-	52.8	57.9	61.5	65.1
A-max 16	140/142	MEnc 13	407	-	55.9	61.0	64.6	68.2
EC-max 16, 5 W	219			-	46.4	51.5	55.1	58.7
EC-max 16, 5 W	219	MR	403	-	53.7	58.8	62.4	66.0
EC-max 16, 8 W	221			-	58.4	63.5	67.1	70.7
EC-max 16, 8 W	221	MR	403	-	65.7	70.8	74.4	78.0

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 ²	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) ¹	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

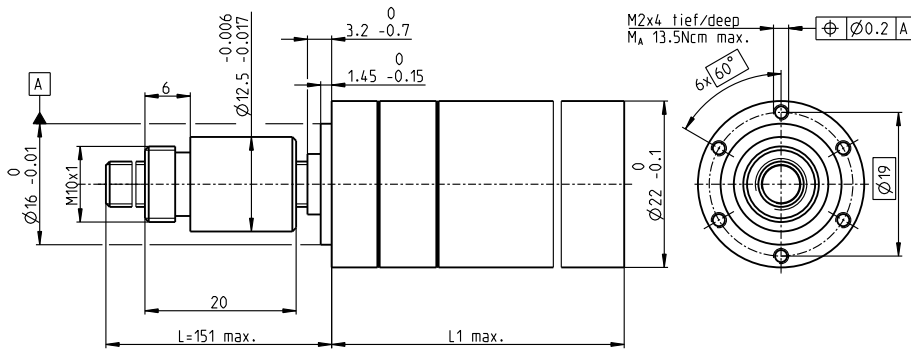
Screw Drive Data	363863	363864	363867	363871	363872	363877	363882	363887	363892
1 Reduction	1:1	3.8:1	14:1	29:1	53:1	89:1	198:1	333:1	479:1
2 Absolute reduction	1/1	15/4	225/16	729/25	3375/64	4617/52	50625/256	69255/208	124659/260
20 Max. feed velocity ¹	mm/s	150	70	19	9.2	5.0	3.0	0.8	0.6
21 Max. feed force (continuous) ¹	N	77	100	154	196	240	285	372	443
22 Max. feed force (intermittent) ¹	N	183	236	365	465	500	500	500	500
Part Numbers		363865	364041		363873	363878	363883	363888	363893
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 ¹	mm/s	61	17		4.3	2.6	1.2	0.7	0.5
21 Max. feed force (continuous) ¹	N	105	161		253	300	392	458	500
22 Max. feed force (intermittent) ¹	N	248	381		500	500	500	500	500
Part Numbers		363866	363868		363874	363879	363884	363889	363894
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 ¹	mm/s	49	14		3.7	2.4	1.0	0.7	0.5
21 Max. feed force (continuous) ¹	N	112	170		266	305	413	466	500
22 Max. feed force (intermittent) ¹	N	266	404		500	500	500	500	500
Part Numbers			363869		363875	363880	363885	363890	363895
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	1121931/1825
20 Max. feed velocity ¹	mm/s		13		3.5	2.1	0.9	0.7	0.4
21 Max. feed force (continuous) ¹	N		173		270	322	420	474	500
22 Max. feed force (intermittent) ¹	N		411		500	500	500	500	500
Part Numbers			363870		363876	363881	363886	363891	363896
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 ¹	mm/s		11		3.2	1.7	0.8	0.6	0.3
21 Max. feed force (continuous) ¹	N		184		280	345	435	491	500
22 Max. feed force (intermittent) ¹	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 ¹	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 ¹	mm	0.039	0.039	0.040	0.040	0.042	0.042	0.044	0.044
10 Mass inertia gearhead incl. screw ¹	gcm ²	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

¹ based on screw length 151 mm (standard length) ² 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, 1.5 W	144	MR	416/417	-	69.3	76.1	76.1	82.9	82.9	89.7
A-max 19, 1.5 W	144	Enc 22	426	-	78.6	85.4	85.4	92.2	92.2	99.0
A-max 19, 1.5 W	144	MEnc 13	407	-	71.7	78.5	78.5	85.3	85.3	92.1
A-max 19, 2.5 W	145/146			-	66.8	73.6	73.6	80.4	80.4	87.2
A-max 19, 2.5 W	146	MR	416/417	-	71.1	77.9	77.9	84.7	84.7	91.5
A-max 19, 2.5 W	146	Enc 22	426	-	81.2	88.0	88.0	94.8	94.8	101.6
A-max 19, 2.5 W	146	MEnc 13	407	-	74.3	81.1	81.1	87.9	87.9	94.7
A-max 22	147-150			-	67.2	74.0	74.0	80.8	80.8	87.6
A-max 22	148/150	MR	416/417	-	72.2	79.0	79.0	85.8	85.8	92.6
A-max 22	148/150	Enc 22	426	-	81.6	88.4	88.4	95.2	95.2	102.0
A-max 22	148/150	MEnc 13	407	-	74.3	81.1	81.1	87.9	87.9	94.7
EC-max 16, 8 W	221			-	71.4	78.2	78.2	85.0	85.0	91.8
EC-max 16, 8 W	221	MR	403	-	78.7	85.5	85.5	92.3	92.3	99.1
EC-max 22, 12 W	222			-	70.1	76.9	76.9	83.7	83.7	90.5
EC-max 22, 12 W	222	MR	403	-	79.8	86.6	86.6	93.4	93.4	100.2
EC-max 22, 12 W	222	AB 20	478	-	105.7	112.5	112.5	119.3	119.3	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 ²	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) ¹	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	1/4	15/4	225/16	729/25	3375/64	4617/52	50625/256	6925/208	124659/260
20 Max. feed velocity ¹	mm/s	101	35	9.5	4.6	2.5	0.7	0.4	0.3
21 Max. feed force (continuous) ¹	N	42	60	92	118	144	223	266	300
22 Max. feed force (intermittent) ¹	N	118	167	259	330	350	350	350	350
Part Numbers		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	885/52		12825/208	87723/645	192375/632	10556001/28561	2368521/4225
20 Max. feed velocity ¹	mm/s	30	8.3		2.2	1.3	0.6	0.4	0.2
21 Max. feed force (continuous) ¹	N	63	97		152	180	235	275	316
22 Max. feed force (intermittent) ¹	N	176	270		350	350	350	350	350
Part Numbers		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 ¹	mm/s	25	7.0		1.9	1.2	0.5	0.3	0.2
21 Max. feed force (continuous) ¹	N	67	102		159	183	248	280	321
22 Max. feed force (intermittent) ¹	N	188	286		350	350	350	350	350
Part Numbers			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 ¹	mm/s		6.7		1.8	1.0	0.5	0.3	0.2
21 Max. feed force (continuous) ¹	N		104		162	193	252	285	339
22 Max. feed force (intermittent) ¹	N		291		350	350	350	350	350
Part Numbers			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	5000211/10985	531441/625
20 Max. feed velocity ¹	mm/s		5.6		1.6	0.8	0.4	0.3	0.2
21 Max. feed force (continuous) ¹	N		111		168	207	261	295	350
22 Max. feed force (intermittent) ¹	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 ¹	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 ¹	mm	0.034	0.034	0.034	0.034	0.034	0.037	0.037	0.037
10 Mass inertia gearhead incl. screw ¹	gcm ²	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

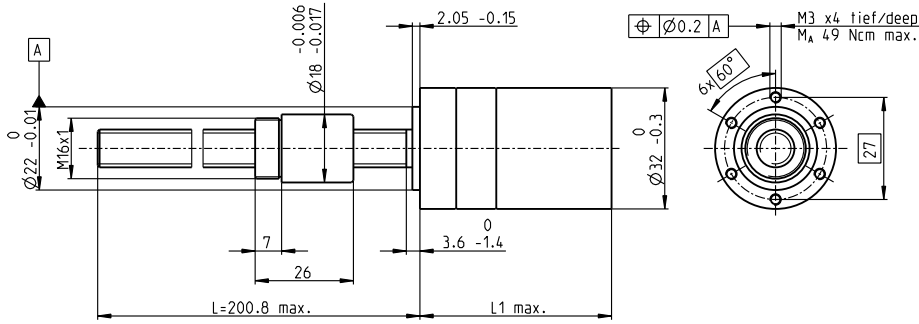
¹ based on screw length 151 mm (standard length) ² for reduction 1:1 = 6088 rpm



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 19, 1.5 W	144	MR	416/417	-	69.3	76.1	76.1	82.9	82.9	89.7	89.7
A-max 19, 1.5 W	144	Enc 22	426	-	78.6	85.4	85.4	92.2	92.2	99.0	99.0
A-max 19, 1.5 W	144	MEnc 13	407	-	71.7	78.5	78.5	85.3	85.3	92.1	92.1
A-max 19, 2.5 W	145/146			-	66.8	73.6	73.6	80.4	80.4	87.2	87.2
A-max 19, 2.5 W	146	MR	416/417	-	71.1	77.9	77.9	84.7	84.7	91.5	91.5
A-max 19, 2.5 W	146	Enc 22	426	-	81.2	88.0	88.0	94.8	94.8	101.6	101.6
A-max 19, 2.5 W	146	MEnc 13	407	-	74.3	81.1	81.1	87.9	87.9	94.7	94.7
A-max 22	147-150			-	67.2	74.0	74.0	80.8	80.8	87.6	87.6
A-max 22	148/150	MR	416/417	-	72.2	79.0	79.0	85.8	85.8	92.6	92.6
A-max 22	148/150	Enc 22	426	-	81.6	88.4	88.4	95.2	95.2	102.0	102.0
A-max 22	148/150	MEnc 13	407	-	74.3	81.1	81.1	87.9	87.9	94.7	94.7
EC-max 16, 8 W	221			-	71.4	78.2	78.2	85.0	85.0	91.8	91.8
EC-max 16, 8 W	221	MR	403	-	78.7	85.5	85.5	92.3	92.3	99.1	99.1
EC-max 22, 12 W	222			-	70.1	76.9	76.9	83.7	83.7	90.5	90.5
EC-max 22, 12 W	222	MR	403	-	79.8	86.6	86.6	93.4	93.4	100.2	100.2
EC-max 22, 12 W	222	AB 20	478	-	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 ²	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) ¹	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 ¹	mm/s	133	72	19	8.1	5.2	2.4	1.1	0.5
21 Max. feed force (continuous) ¹	N	386	474	739	983	1137	1473	1921	2420
22 Max. feed force (intermittent) ¹	N	1023	1255	1956	2604	2700	2700	2700	2700
Part Numbers		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 ¹	mm/s	56	15		4.0	2.2	0.9	0.5	0.3
21 Max. feed force (continuous) ¹	N	517	803		1239	1524	2041	2482	2700
22 Max. feed force (intermittent) ¹	N	1369	2127		2700	2700	2700	2700	2700
Part Numbers		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		24/5	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256
20 Max. feed velocity ¹	mm/s	46	13		3.4	2.0	0.8	0.5	0.2
21 Max. feed force (continuous) ¹	N	551	846		1315	1561	2092	2569	2700
22 Max. feed force (intermittent) ¹	N	1458	2239		2700	2700	2700	2700	2700
Part Numbers			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 ¹	mm/s		12		3.1	1.7	0.6	0.4	
21 Max. feed force (continuous) ¹	N		872		1353	1661	2279	2636	
22 Max. feed force (intermittent) ¹	N		2308		2700	2700	2700	2700	
Part Numbers			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 ¹	mm/s		9.5		2.6	1.4	0.6	0.4	
21 Max. feed force (continuous) ¹	N		931		1437	1762	2359	2700	
22 Max. feed force (intermittent) ¹	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 ¹	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 ¹	mm	0.037	0.037	0.037	0.037	0.039	0.039	0.039	0.039
10 Mass inertia gearhead incl. screw ¹	gcm ²	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

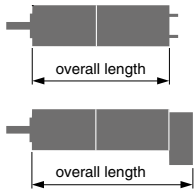
¹ based on screw length 200.8 mm (standard length) ² for reduction 1:1 = 4000 rpm

maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	125/127			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7	125.7
RE 25	125/127 MR		419	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7
RE 25	125/127 Enc 22		426	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8	139.8
RE 25	125/127 HED_5540		429/431	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5	146.5
RE 25	125/127 DCT 22		438	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0	148.0
RE 25, 20 W	126			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2	114.2
RE 25, 20 W	126	MR	419	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2	125.2
RE 25, 20 W	126	HED_5540	429/431	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0
RE 25, 20 W	126	DCT 22	438	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5	136.5
RE 25, 20 W	126	AB 28	480	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3
RE 25, 20 W	126	HED_5540/AB 28	429/480	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5	165.5
RE 25, 20 W	127	AB 28	480	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8	159.8
RE 25, 20 W	127	HED_5540/AB 28	429/480	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0	177.0
RE 30, 60 W	129			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2	139.2
RE 30, 60 W	129	MR	420	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6	150.6
RE 30, 60 W	129	HED_5540	429/431	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 376 and 378.

Screw Drive GP 32 S Ø32 mm, Ball Screw



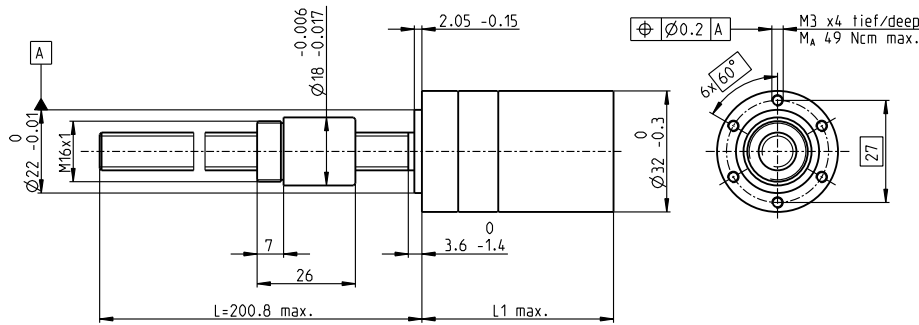
Part Numbers

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 Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 35, 90 W	130			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2	142.2
RE 35, 90 W	130	MR	420	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6	153.6
RE 35, 90 W	130	HED_5540	429/431	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9	162.9
RE 35, 90 W	130	DCT 22	438	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3	160.3
RE 35, 90 W	130	AB 28	480	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3	178.3
RE 35, 90 W	130	HEDS 5540/AB 28	429/480	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5	195.5
A-max 26	151-158			-	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
A-max 26	152-158	MEnc 13	429/431	-	102.9	109.6	109.6	116.3	116.3	123.0	123.0	123.0
A-max 26	152-158	MR	438	-	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
A-max 26	152-158	Enc 22	480	-	110.2	116.9	116.9	123.6	123.6	130.3	130.3	130.3
A-max 26	152-158	HED_5540	429/480	-	114.2	120.9	120.9	127.6	127.6	134.3	134.3	134.3
A-max 32	159-161			-	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
A-max 32	160-162			-	112.6	119.3	119.3	126.0	126.0	132.7	132.7	132.7
A-max 32	160-162	MR	420	-	123.8	130.5	130.5	137.2	137.2	143.9	143.9	143.9
A-max 32	160-162	HED_5540	429/431	-	133.4	140.1	140.1	146.8	146.8	153.5	153.5	153.5
EC 32, 80 W	212			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2	131.2
EC 32, 80 W	212	HED_5540	429/431	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6	149.6
EC 32, 80 W	212	Res 26	439	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3	151.3
EC-max 22, 25 W	223			-	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7
EC-max 22, 25 W	223	MR	420	-	109.3	116.0	116.0	122.7	122.7	129.4	129.4	129.4
EC-max 22, 25 W	223	AB 20	478	-	135.4	142.1	142.1	148.8	148.8	155.5	155.5	155.5
EC-max 30, 40 W	224			-	93.1	99.8	99.8	106.5	106.5	113.2	113.2	113.2
EC-max 30, 40 W	224	MR	420	-	105.3	112.0	112.0	118.7	118.7	125.4	125.4	125.4
EC-max 30, 40 W	224	HEDL 5540	432	-	113.7	120.4	120.4	127.1	127.1	133.8	133.8	133.8
EC-max 30, 40 W	224	AB 20	478	-	128.9	135.6	135.6	142.3	142.3	148.3	148.3	148.3
EC-max 30, 40 W	224	HEDL 5540/AB 20	432/478	-	149.5	156.2	156.2	162.9	162.9	169.6	169.6	169.6
EC-4pole 22, 90 W	231			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8	119.8
EC-4pole 22, 90 W	231	16 EASY/Abs.	409/411	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0	132.0
EC-4pole 22, 90 W	231	AEDL/HEDL	427/433	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3	141.3
EC-4pole 22,120 W	232			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2	137.2
EC-4pole 22,120 W	232	16 EASY/Abs.	409/411	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4	149.4
EC-4pole 22,120 W	232	AEDL/HEDL	427/433	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7	158.7
EC-i 30, 30 W	242			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 30 W	242	16 EASY/Abs.	409/411	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 30 W	242	16 RIO	423	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 30 W	242	AEDL 5810	427	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 30 W	242	HEDL 5540	432	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	243			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 45 W	243	16 EASY/Abs.	409/411	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 45 W	243	16 RIO	423	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 45 W	243	AEDL 5810	427	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	243	HEDL 5540	432	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 50 W	244			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 50 W	244	16 EASY/Abs.	409/411	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 50 W	244	16 RIO	423	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 50 W	244	AEDL 5810	427	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 50 W	244	HEDL 5540	432	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	245			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 75 W	245	16 EASY/Abs.	409/411	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 75 W	245	16 RIO	423	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 75 W	245	AEDL 5810	427	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	245	HEDL 5540	432	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 40, 50 W	246			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8
EC-i 40, 50 W	246	16 EASY/Abs.	409/411	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5	114.5
EC-i 40, 50 W	246	16 RIO	423	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3	117.3
EC-i 40, 50 W	246	2RMHF	425	112.9	112.9	119.6	119.6	126.3	126.3	133.0	133.0	133.0
EC-i 40, 50 W	246	AEDL 5810	427	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 50 W	246	HEDL 5540	432	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 70 W	248			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8
EC-i 40, 70 W	248	16 EASY/Abs.	409/411	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5	124.5
EC-i 40, 70 W	248	16 RIO	423	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3	127.3
EC-i 40, 70 W	248	2RMHF	425	122.9	122.9	129.6	129.6	136.3	136.3	143.0	143.0	143.0
EC-i 40, 70 W	248	AEDL 5810	427	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8
EC-i 40, 70 W	248	HEDL 5540	432	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8
MCD EPOS, 60 W	475			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2	191.2
MCD EPOS P 60 W	475			171.1	171.1	177.8	177.8	184.5	184.5	191.2	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 ²	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) ¹	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

	363900	363901	363904	363909	363910	363915	363920	363925	363930
Screw Drive Data									
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 ¹	mm/s	100	36	9.5	4.0	2.6	1.2	0.5	0.2
21 Max. feed force (continuous) ¹	N	183	257	400	533	616	798	1040	1311
22 Max. feed force (intermittent) ¹	N	455	638	995	1324	1350	1350	1350	1350
Part Numbers									
1 Reduction		363902	363905		363911	363916	363921	363926	363931
2 Absolute reduction		4.8:1	18:1		66:1	123:1	295:1	531:1	913:1
20 Max. feed velocity ¹	mm/s		28	7.4		2.0	1.1	0.5	0.1
21 Max. feed force (continuous) ¹	N		280	435		671	826	1105	1345
22 Max. feed force (intermittent) ¹	N		696	1082		1350	1350	1350	1350
Part Numbers									
1 Reduction		363903	363906		363912	363917	363922	363927	363932
2 Absolute reduction		5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1
20 Max. feed velocity ¹	mm/s		23	6.3		1.7	1.0	0.4	0.1
21 Max. feed force (continuous) ¹	N		298	458		712	845	1133	1350
22 Max. feed force (intermittent) ¹	N		742	1139		1350	1350	1350	1350
Part Numbers									
1 Reduction		363907		363913	363918	363923	363928		
2 Absolute reduction		23:1		86:1	159:1	411:1	636:1		
20 Max. feed velocity ¹	mm/s		5.8		1.6	0.8	0.3		
21 Max. feed force (continuous) ¹	N		472		733	899	1234		
22 Max. feed force (intermittent) ¹	N		1174		1350	1350	1350		
Part Numbers									
1 Reduction		363908		363914	363919	363924	363929		
2 Absolute reduction		28:1		103:1	190:1	456:1	706:1		
20 Max. feed velocity ¹	mm/s		4.8		1.3	0.7	0.2		
21 Max. feed force (continuous) ¹	N		504		778	955	1278		
22 Max. feed force (intermittent) ¹	N		1253		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 ¹	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 ¹	mm	0.033	0.033	0.033	0.033	0.034	0.034	0.034	0.034
10 Mass inertia gearhead incl. screw ¹	gcm ²	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

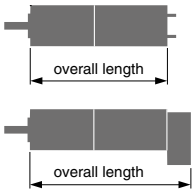
¹ based on screw length 200.8 mm (standard length) ² for reduction 1:1 = 5984 rpm



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 25	125/127			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7
RE 25	125/127 MR		419	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7
RE 25	125/127 Enc 22		426	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8
RE 25	125/127 HED_5540		429/431	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5
RE 25	125/127 DCT 22		438	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0
RE 25, 20 W	126			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2
RE 25, 20 W	126	MR	419	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2
RE 25, 20 W	126	HED_5540	429/431	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0
RE 25, 20 W	126	DCT 22	438	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5
RE 25, 20 W	126	AB 28	480	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3
RE 25, 20 W	126	HED_5540/AB 28	429/480	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5
RE 25, 20 W	127	AB 28	480	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8
RE 25, 20 W	127	HED_5540/AB 28	429/480	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0
RE 30, 60 W	129			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2
RE 30, 60 W	129	MR	420	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6
RE 30, 60 W	129	HED_5540	429/431	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



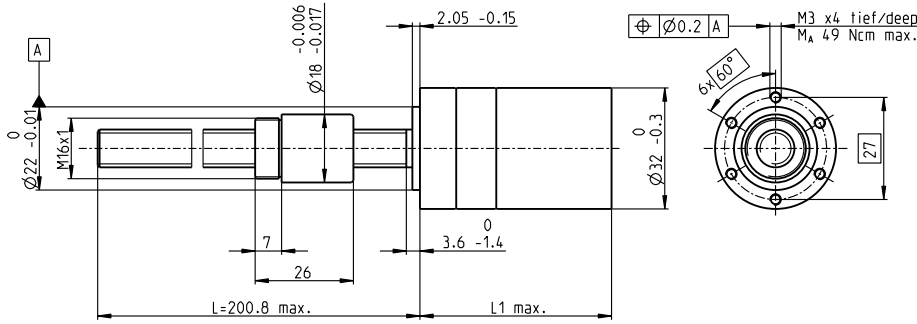
Part Numbers

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	130			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2	142.2
RE 35, 90 W	130	MR	420	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6	153.6
RE 35, 90 W	130	HED_5540	429/431	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9	162.9
RE 35, 90 W	130	DCT 22	438	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3	160.3
RE 35, 90 W	130	AB 28	480	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3	178.3
RE 35, 90 W	130	HEDS 5540/AB 28	429/480	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5	195.5
A-max 26	151-158			-	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
A-max 26	152-158	MEnc 13	429/431	-	102.9	109.6	109.6	116.3	116.3	123.0	123.0	123.0
A-max 26	152-158	MR 404	438	-	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
A-max 26	152-158	Enc 22	480	-	110.2	116.9	116.9	123.6	123.6	130.3	130.3	130.3
A-max 26	152-158	HED_5540	429/480	-	114.2	120.9	120.9	127.6	127.6	134.3	134.3	134.3
A-max 32	159-161			-	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
A-max 32	160-162			-	112.6	119.3	119.3	126.0	126.0	132.7	132.7	132.7
A-max 32	160-162	MR	420	-	123.8	130.5	130.5	137.2	137.2	143.9	143.9	143.9
A-max 32	160-162	HED_5540	429/431	-	133.4	140.1	140.1	146.8	146.8	153.5	153.5	153.5
EC 32, 80 W	212			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2	131.2
EC 32, 80 W	212	HED_5540	429/431	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6	149.6
EC 32, 80 W	212	Res 26	439	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3	151.3
EC-max 22, 25 W	223			-	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7
EC-max 22, 25 W	223	MR	420	-	109.3	116.0	116.0	122.7	122.7	129.4	129.4	129.4
EC-max 22, 25 W	223	AB 20	478	-	135.4	142.1	142.1	148.8	148.8	155.5	155.5	155.5
EC-max 30, 40 W	224			-	93.1	99.8	99.8	106.5	106.5	113.2	113.2	113.2
EC-max 30, 40 W	224	MR	420	-	105.3	112.0	112.0	118.7	118.7	125.4	125.4	125.4
EC-max 30, 40 W	224	HEDL 5540	432	-	113.7	120.4	120.4	127.1	127.1	133.8	133.8	133.8
EC-max 30, 40 W	224	AB 20	478	-	128.9	135.6	135.6	142.3	142.3	148.3	148.3	148.3
EC-max 30, 40 W	224	HEDL 5540/AB 20	432/478	-	149.5	156.2	156.2	162.9	162.9	169.6	169.6	169.6
EC-4pole 22, 90 W	231			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8	119.8
EC-4pole 22, 90 W	231	16 EASY/Abs.	409/411	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0	132.0
EC-4pole 22, 90 W	231	AEDL/HEDL	427/433	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3	141.3
EC-4pole 22,120 W	232			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2	137.2
EC-4pole 22,120 W	232	16 EASY/Abs.	409/411	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4	149.4
EC-4pole 22,120 W	232	AEDL/HEDL	427/433	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7	158.7
EC-i 30, 30 W	242			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 30 W	242	16 EASY/Abs.	409/411	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 30 W	242	16 RIO	423	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 30 W	242	AEDL 5810	427	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 30 W	242	HEDL 5540	432	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	243			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 45 W	243	16 EASY/Abs.	409/411	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 45 W	243	16 RIO	423	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 45 W	243	AEDL 5810	427	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	243	HEDL 5540	432	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 50 W	244			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 50 W	244	16 EASY/Abs.	409/411	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 50 W	244	16 RIO	423	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 50 W	244	AEDL 5810	427	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 50 W	244	HEDL 5540	432	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	245			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 75 W	245	16 EASY/Abs.	409/411	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 75 W	245	16 RIO	423	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 75 W	245	AEDL 5810	427	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	245	HEDL 5540	432	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 40, 50 W	246			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8
EC-i 40, 50 W	246	16 EASY/Abs.	409/411	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5	114.5
EC-i 40, 50 W	246	16 RIO	423	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3	117.3
EC-i 40, 50 W	246	2RMHF	425	112.9	112.9	119.6	119.6	126.3	126.3	133.0	133.0	133.0
EC-i 40, 50 W	246	AEDL 5810	427	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 50 W	246	HEDL 5540	432	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 70 W	248			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8
EC-i 40, 70 W	248	16 EASY/Abs.	409/411	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5	124.5
EC-i 40, 70 W	248	16 RIO	423	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3	127.3
EC-i 40, 70 W	248	2RMHF	425	122.9	122.9	129.6	129.6	136.3	136.3	143.0	143.0	143.0
EC-i 40, 70 W	248	AEDL 5810	427	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8
EC-i 40, 70 W	248	HEDL 5540	432	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8
MCD EPOS, 60 W	475			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2	191.2
MCD EPOS P 60 W	475			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2	191.2

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 ²	8000 rpm
Recommended temperature range	-15...+80°C
Max. axial load (static) ¹	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 ¹	mm/s	186	72	19	8.1	5.2	2.4	1.1	0.5
21 Max. feed force (continuous) ¹	N	216	296	462	614	710	921	1200	1530
22 Max. feed force (intermittent) ¹	N	528	723	1127	1500	1530	1530	1530	1530
Part Numbers		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 ¹	mm/s	56	15		4.0	2.2	0.9	0.5	0.3
21 Max. feed force (continuous) ¹	N	323	502		774	953	1275	1530	1530
22 Max. feed force (intermittent) ¹	N	789	1226		1530	1530	1530	1530	1530
Part Numbers		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 ¹	mm/s	46	13		3.4	2.0	0.8	0.5	0.2
21 Max. feed force (continuous) ¹	N	344	529		822	975	1308	1530	1530
22 Max. feed force (intermittent) ¹	N	840	1291		1530	1530	1530	1530	1530
Part Numbers			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 ¹	mm/s		12		3.1	1.7	0.6	0.4	
21 Max. feed force (continuous) ¹	N		545		846	1038	1424	1530	
22 Max. feed force (intermittent) ¹	N		1330		1530	1530	1530	1530	
Part Numbers			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 ¹	mm/s		9.5		1.3	0.7	0.3	0.2	
21 Max. feed force (continuous) ¹	N		582		898	1101	1475	1530	
22 Max. feed force (intermittent) ¹	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 ¹	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 ¹	mm	0.035	0.035	0.035	0.035	0.037	0.037	0.037	0.037
10 Mass inertia gearhead incl. screw ¹	gcm ²	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

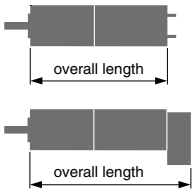
¹ based on screw length 200.8 mm (standard length) ² for reduction 1:1 = 5569 rpm



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 25	125/127			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7
RE 25	125/127 MR		419	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7
RE 25	125/127 Enc 22		426	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8
RE 25	125/127 HED_5540		429/431	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5
RE 25	125/127 DCT 22		438	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0
RE 25, 20 W	126			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2
RE 25, 20 W	126	MR	419	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2
RE 25, 20 W	126	HED_5540	429/431	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0
RE 25, 20 W	126	DCT 22	438	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5
RE 25, 20 W	126	AB 28	480	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3
RE 25, 20 W	126	HED_5540/AB 28	429/480	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5
RE 25, 20 W	127	AB 28	480	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8
RE 25, 20 W	127	HED_5540/AB 28	429/480	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0
RE 30, 60 W	129			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2
RE 30, 60 W	129	MR	420	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6
RE 30, 60 W	129	HED_5540	429/431	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	130			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2	142.2
RE 35, 90 W	130	MR	420	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6	153.6
RE 35, 90 W	130	HED_5540	429/431	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9	162.9
RE 35, 90 W	130	DCT 22	438	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3	160.3
RE 35, 90 W	130	AB 28	480	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3	178.3
RE 35, 90 W	130	HEDS 5540/AB 28	429/480	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5	195.5
A-max 26	151-158			-	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
A-max 26	152-158	MEnc 13	429/431	-	102.9	109.6	109.6	116.3	116.3	123.0	123.0	123.0
A-max 26	152-158	MR 404	438	-	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
A-max 26	152-158	Enc 22	480	-	110.2	116.9	116.9	123.6	123.6	130.3	130.3	130.3
A-max 26	152-158	HED_5540	429/480	-	114.2	120.9	120.9	127.6	127.6	134.3	134.3	134.3
A-max 32	159-161			-	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
A-max 32	160-162			-	112.6	119.3	119.3	126.0	126.0	132.7	132.7	132.7
A-max 32	160-162	MR	420	-	123.8	130.5	130.5	137.2	137.2	143.9	143.9	143.9
A-max 32	160-162	HED_5540	429/431	-	133.4	140.1	140.1	146.8	146.8	153.5	153.5	153.5
EC 32, 80 W	212			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2	131.2
EC 32, 80 W	212	HED_5540	429/431	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6	149.6
EC 32, 80 W	212	Res 26	439	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3	151.3
EC-max 22, 25 W	223			-	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7
EC-max 22, 25 W	223	MR	420	-	109.3	116.0	116.0	122.7	122.7	129.4	129.4	129.4
EC-max 22, 25 W	223	AB 20	478	-	135.4	142.1	142.1	148.8	148.8	155.5	155.5	155.5
EC-max 30, 40 W	224			-	93.1	99.8	99.8	106.5	106.5	113.2	113.2	113.2
EC-max 30, 40 W	224	MR	420	-	105.3	112.0	112.0	118.7	118.7	125.4	125.4	125.4
EC-max 30, 40 W	224	HEDL 5540	432	-	113.7	120.4	120.4	127.1	127.1	133.8	133.8	133.8
EC-max 30, 40 W	224	AB 20	478	-	128.9	135.6	135.6	142.3	142.3	148.3	148.3	148.3
EC-max 30, 40 W	224	HEDL 5540/AB 20	432/478	-	149.5	156.2	156.2	162.9	162.9	169.6	169.6	169.6
EC-4pole 22, 90 W	231			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8	119.8
EC-4pole 22, 90 W	231	16 EASY/Abs.	409/411	111.9	111.9	118.6	118.6	125.3	125.3	132.0	132.0	132.0
EC-4pole 22, 90 W	231	AEDL/HEDL	427/433	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3	141.3
EC-4pole 22,120 W	232			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2	137.2
EC-4pole 22,120 W	232	16 EASY/Abs.	409/411	129.3	129.3	136.0	136.0	142.7	142.7	149.4	149.4	149.4
EC-4pole 22,120 W	232	AEDL/HEDL	427/433	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7	158.7
EC-i 30, 30 W	242			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 30 W	242	16 EASY/Abs.	409/411	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 30 W	242	16 RIO	423	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 30 W	242	AEDL 5810	427	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 30 W	242	HEDL 5540	432	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	243			93.3	93.3	100.0	100.0	106.7	106.7	113.4	113.4	113.4
EC-i 30, 45 W	243	16 EASY/Abs.	409/411	105.0	105.0	111.7	111.7	118.4	118.4	125.1	125.1	125.1
EC-i 30, 45 W	243	16 RIO	423	103.5	103.5	110.2	110.2	116.9	116.9	123.6	123.6	123.6
EC-i 30, 45 W	243	AEDL 5810	427	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 45 W	243	HEDL 5540	432	114.0	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
EC-i 30, 50 W	244			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 50 W	244	16 EASY/Abs.	409/411	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 50 W	244	16 RIO	423	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 50 W	244	AEDL 5810	427	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 50 W	244	HEDL 5540	432	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	245			115.3	115.3	122.0	122.0	128.7	128.7	135.4	135.4	135.4
EC-i 30, 75 W	245	16 EASY/Abs.	409/411	127.0	127.0	133.7	133.7	140.4	140.4	147.1	147.1	147.1
EC-i 30, 75 W	245	16 RIO	423	125.5	125.5	132.2	132.2	138.9	138.9	145.6	145.6	145.6
EC-i 30, 75 W	245	AEDL 5810	427	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 30, 75 W	245	HEDL 5540	432	136.0	136.0	142.7	142.7	149.4	149.4	156.1	156.1	156.1
EC-i 40, 50 W	246			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8
EC-i 40, 50 W	246	16 EASY/Abs.	409/411	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5	114.5
EC-i 40, 50 W	246	16 RIO	423	97.2	97.2	103.9	103.9	110.6	110.6	117.3	117.3	117.3
EC-i 40, 50 W	246	2RMHF	425	112.9	112.9	119.6	119.6	126.3	126.3	133.0	133.0	133.0
EC-i 40, 50 W	246	AEDL 5810	427	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 50 W	246	HEDL 5540	432	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 70 W	248			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8
EC-i 40, 70 W	248	16 EASY/Abs.	409/411	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5	124.5
EC-i 40, 70 W	248	16 RIO	423	107.2	107.2	113.9	113.9	120.6	120.6	127.3	127.3	127.3
EC-i 40, 70 W	248	2RMHF	425	122.9	122.9	129.6	129.6	136.3	136.3	143.0	143.0	143.0
EC-i 40, 70 W	248	AEDL 5810	427	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8
EC-i 40, 70 W	248	HEDL 5540	432	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8
MCD EPOS, 60 W	475			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2	191.2
MCD EPOS P 60 W	475			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

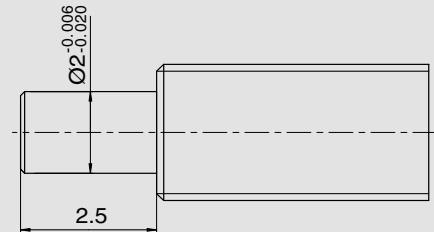
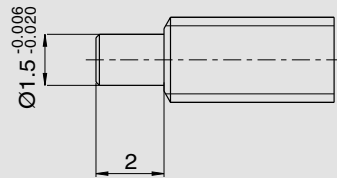
Without specification, the screw is supplied in the standard length 45 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.

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

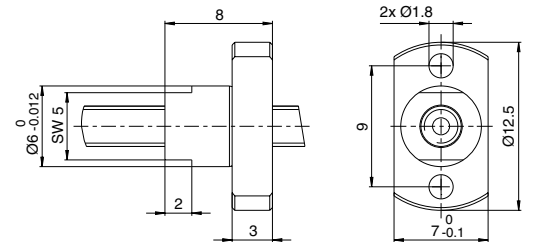
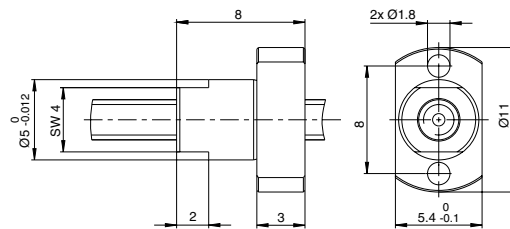
In order to support the end of the screw by an additional bearing, it can be delivered according to the illustration.

Customer specific screw ends on request.



Flange nut
Order reference SPIN04

Flange nut instead of the standard thread nut.



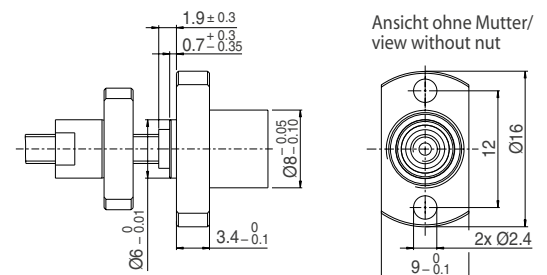
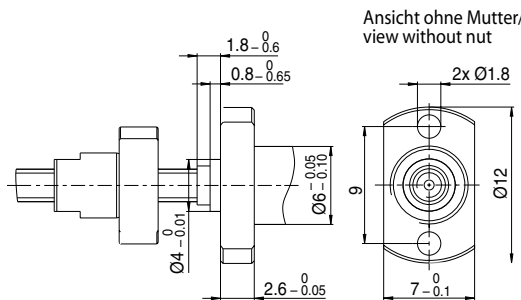
Low backlash ball screw nut
Order reference SPIN05

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

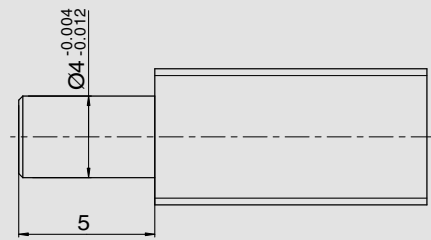
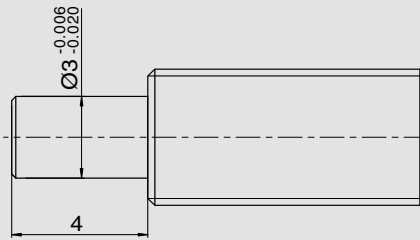
Without specification, the screw is supplied in the standard length 102 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.

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.

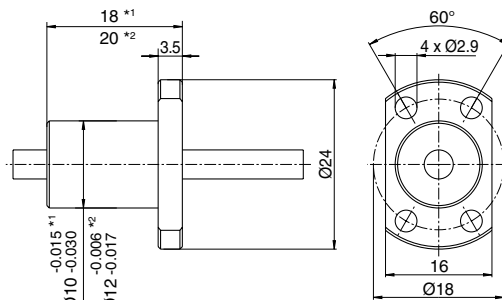
Customer specific screw ends on request.



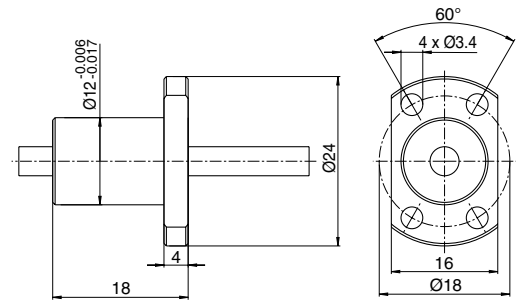
Flange nut
Order reference SPIN04

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.

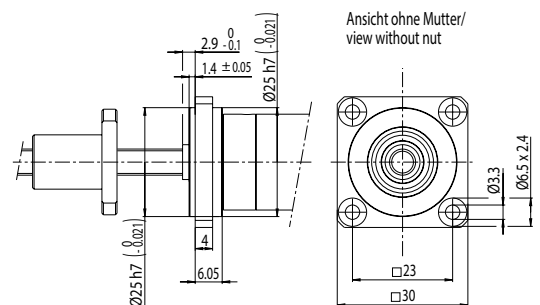
Axial play is almost eliminated through increased preloading of the ball screw nut. Although, the increased load can lead to greater wear.

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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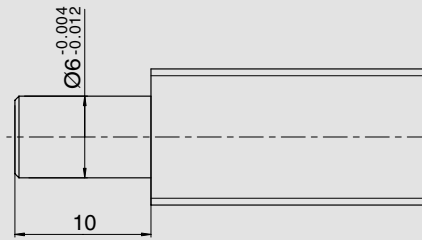
Special length
Order reference SPIN01

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.

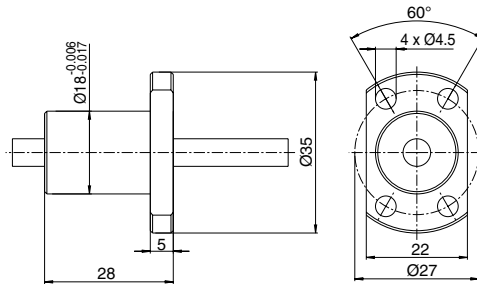
Customer specific screw ends on request.



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.



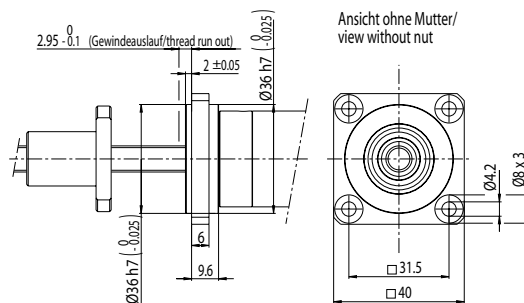
Low backlash ball screw nut
Order reference SPIN05

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	61
Inductive encoder	
Encoder MILE 256–2048 CPT, 2 channel	402
Encoder MILE 512–4096 CPT, 2 channel	403
Encoder MILE 512–6400 CPT, 2 channel	404
Magnetic encoders (ENX can be configured online)	
ENX 6 MAG 64–256 CPT,	386
ENX 8 MAG 64–256 CPT,	387
ENX 8 EASY INT 1–1024 CPT, 3 channel	388
ENX 8 EASY INT Absolute 4096 steps per turn	389
ENX 10 EASY/QUAD 1–1024 CPT, 2/3 channel	390
ENX 13 EASY INT 1–1024 CPT, 4096 steps per turn	391
ENX 16 EASY 1024 CPT, 3 channel	392
ENX 16 EASY Absolute 4096 steps per turn	393
ENX 16 EASY INT 1–1024 CPT, 4096 steps per turn	394
ENX 19 EASY INT 1–1024 CPT, 4096 steps per turn NEW	395
ENX 22 EASY INT 1–1024 CPT, 4096 steps per turn NEW	396
Encoder 6 MAG 64–256 CPT, 3 channel	405
Encoder MEnc 10 12 CPT, 2 channel	406
Encoder MEnc 13 16 CPT, 2 channel	407–408
Encoder 16 EASY 128–1024 CPT, 3 channel	409–410
Encoder 16 EASY Absolute 4096 steps per turn	411–412
Encoder MR 16–1024 CPT, 2/3 channel	413–420

Optical Encoder (ENX can be configured online)	
ENX 6 OPT 128 CPT, 3 channel	397
ENX 8 OPT 128 CPT, 3 channel	398
ENX 16 RIO 512–65536 CPT, 3 channel	399
Encoder 6 OPT 128 CPT, 3 channel	421
Encoder 8 OPT 50 CPT, 2 channel	422
Encoder 16 RIO 512–65536 CPT, 3 channel	423–424
Encoder 2RMHF 3000–5000 CPT, 3 channel	425
Encoder Enc 22 100 CPT, 2 channel	426
Encoder AEDL 5810 1024–5000 CPT, 3 channel	427–428
Encoder HEDS 5540 500 CPT, 3 channel	429–430
Encoder HEDL 5540 500 CPT, 3 channel	431–435
Encoder HEDL 9140 500 CPT, 3 channel	436–437
DC Tacho/Resolver	
DC-Tacho DCT 22 0.52 V	438
Resolver Res 26 10 V	439

DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

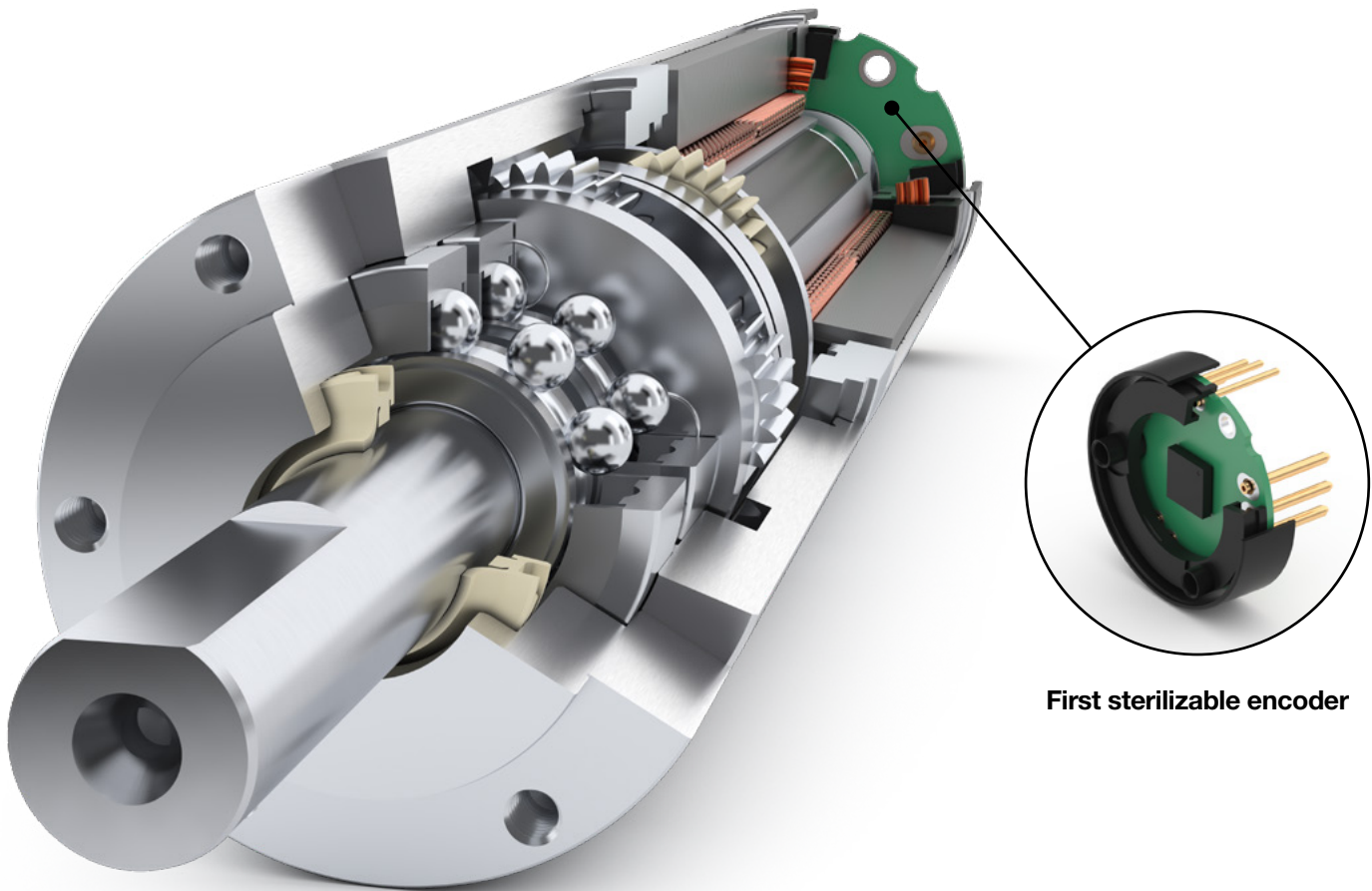
Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information



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



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

Standard Specification No. 103	61
ENX Program (can be configured online)	386–399
Inductive encoders	402–404
Magnetic encoders	405–420
Optical encoders	421–437
DC Tacho/Resolver	438–439

ENX 6 MAG

Encoder Ø6 mm, 64...256 CPT

NEW



Key Data		ENX 6 MAG Incremental
Number of channels		3
Max. counts per turn		256
Encoder length L	mm	6.1
Ambient temperature	°C	-40...125
Weight	g	1

Selection criteria		ENX 6 MAG 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 MAG Incremental
Supply voltage Vcc	V	3.0...3.6
Typical current draw	mA	10
Max. operating frequency	kHz	107
Max. Speed	min ⁻¹	100000
Connection		FPC, 12 pole, pitch 0.5 mm
		Pin 1 Motor+
		Pin 2 Motor-
		Pin 3 Not connected
		Pin 4 GND
		Pin 5 V _{CC}
		Pin 6 Channel A
		Pin 7 Channel B
		Pin 8 Channel I
		Pin 9-11 Do not connect ¹
		Pin 12 Not connected
		Output signal: CMOS compatible
		Output current per channel: +4 mA

Configuration		ENX 6 MAG Incremental
Counts per turn ¹		64, 128, 256

maxon Modular System	Page	Dimensions Standard Version	Notes
maxon DC motor			
DCX 6 M	66		<p>¹ Applying voltage to these pins may destroy the encoder.</p> <p>Compatible connector: Molex 52745-1297, Tyco 1-1734839-2 Adapter 498157 required for all maxon controllers</p> <p>Please note: max. continuous current 0.5 A</p>

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ENX 8 MAG

Encoder Ø8 mm, 64...256 CPT

NEW



maxon ENX

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

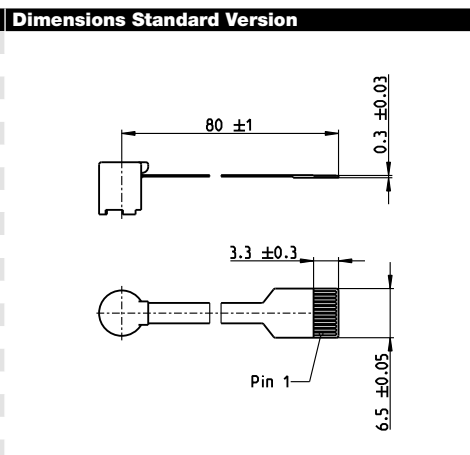
Selection criteria	ENX 8 MAG Incremental	ENX 8 MAG Incremental, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	▲	▲
Cost effective	■	■

■ 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 ⁻¹ 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 _{CC} Pin 6 Channel A Pin 7 Channel B Pin 8 Channel I Pin 9-11 Do not connect ¹ 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 _{CC} 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 ¹	64, 128, 256	64, 128, 256

maxon Modular System	Page
maxon DC motor	
DCX 8 M	67
maxon EC motor	
ECX 8 SPEED	166-167



Notes

¹ Applying voltage to these pins may destroy the encoder.

Compatible connector:
Molex 52745-1297, Tyco 1-1734839-2
Adapter 498157 required for all maxon controllers

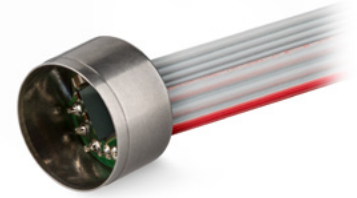
Please note: max. continuous current 0.5 A

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ENX 8 EASY INT

Encoder Ø8 mm, 1...1024 CPT

Integrated into motor

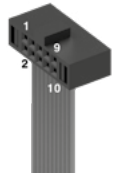
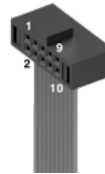


Key Data	EASY Incremental Differential	EASY Incremental, Commutation Signal
Number of channels	3	3
Max. counts per turn	1024	1024
Encoder length L	mm 0 (integrated into motor)	0 (integrated into motor)
Ambient temperature ²	°C -20...100 (-40...100)	-20...100 (-40...100)
Weight	g <4	<4

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 ³	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Do not connect (BiSS-C Data ⁴) Pin 2 V _{CC} 4.5...5.5 Pin 3 GND Pin 4 Do not connect (BiSS-C CLK ⁴) 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	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Do not connect (BiSS-C Data) Pin 2 V _{CC} 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

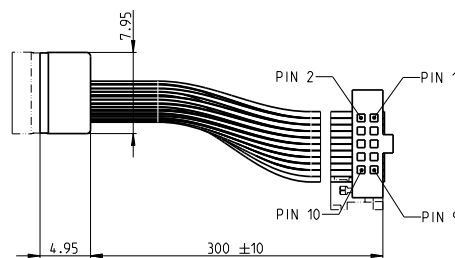


Adapter Micromotor (Art.-Nr. 498157) required for all maxon controllers.

Configuration	EASY Incremental Differential	EASY Incremental, Commutation Signal
Counts per turn ¹	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 ²	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 8 SPEED	166-167			

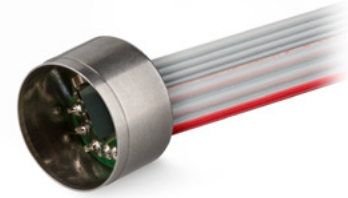


¹ maxon controllers require a resolution of at least 16 counts per turn and commutation signals.
² For PVC-cable (-20...100°C)
 For PO- and FEP cable (-40...100°C)
³ H1, index and angle zero are aligned with angle commutation zero (see p. 40).
⁴ Applying voltage to these pins may destroy the encoder.

ENX 8 EASY INT Absolute

Encoder Ø8 mm, 4096 steps, Single Turn

Integrated into motor



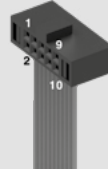
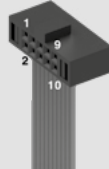
maxon ENX

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 ¹	°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

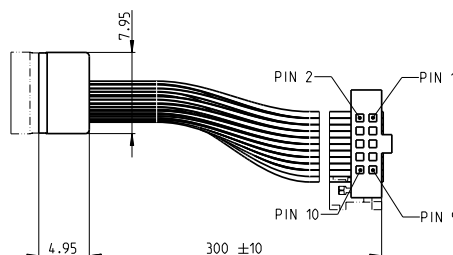
Specifications	EASY Absolute	EASY Absolute, Commutation Signal
Supply voltage V _{cc}	V 5 ±0.5	5 ±0.5
Typical current draw	mA 17	17
Max. operating frequency	kHz 80000	80000
Connector ²	10-pin 1.27 mm multipoint connector e.g. Samtec FFSD series Pin 1 Data Pin 2 V _{cc} 4.5...5.5 Pin 3 GND Pin 4 CLK Pin 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 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 _{cc} 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 ¹	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
maxon EC motor				
ECX 8 SPEED	166-167			

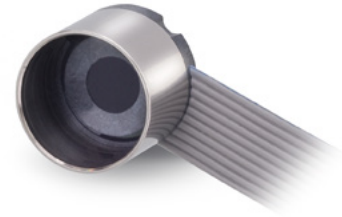
¹ For PVC-cable (-20...100°C)
 For PO- and FEP cable (-40...100°C)
² H1, index and angle zero are aligned with angle commutation zero (see p. 40).



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ENX 10 EASY/QUAD

Encoder Ø10 mm, 1...1024 CPT

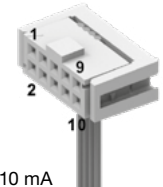
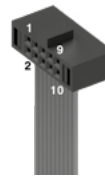


Key Data	EASY Incremental Differential	QUAD Incremental
Number of channels	3	2
Max. counts per turn	1024	1
Encoder length L ⁴	mm 8.5	9.0
Ambient temperature	°C -40 ... +100	-40 ... +100
Weight	g <5	<5

Selection criteria	EASY Incremental Differential	QUAD Incremental
Speed and rotation direction detection	■	■
Speed and position control	■	▲
Compact and robust design	■	■
High resolution	■	●
Cost effective	■	■

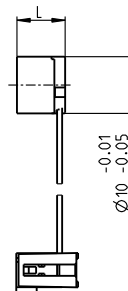
■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	EASY Incremental Differential	QUAD Incremental
Supply voltage V _{cc}	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 ³ (IEC/EN 60603-13 / DIN41651)
	Pin 1 Do not connect ¹ (BiSS-C Data) Pin 2 V _{cc} Pin 3 GND Pin 4 Do not connect ¹ (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 _{cc} 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 ²	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
maxon DC motor				
DCX 10 S	EASY, QUAD	68		¹ Applying voltage to these pins can destroy the encoder. ² maxon controllers require a resolution of at least 16 counts per turn. ³ Option: 6-pol 2.54 mm pin header. ⁴ 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. ENX 10 EASY available with single wires, without line driver, for ambient temperatures -55°C ... +125°C.
DCX 10 L	EASY, QUAD	69		
DCX 12 S	EASY, QUAD	70		
DCX 12 L	EASY, QUAD	71		
DCX 14 L	EASY, QUAD	72–73		
DCX 16 S	EASY, QUAD	74–75		
DCX 16 L	EASY, QUAD	76–77		
DCX 19 S	EASY, QUAD	78–79		
DCX 22 S	EASY, QUAD	80–81		
DCX 22 L	EASY, QUAD	82–83		
DCX 26 L	EASY, QUAD	84–85		
DCX 32 L	EASY, QUAD	86		
DCX 35 L	EASY, QUAD	87		
DC-max 16 S	EASY, QUAD	90–91		
DC-max 22 S	EASY, QUAD	92–93		
DC-max 26 S	QUAD	94–95		



ENX 13 EASY INT

Encoder Ø13 mm, 1...1024 CPT/4096 steps, Single Turn

Sterilizable, integrated into motor

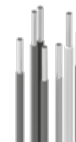
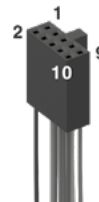


Key Data	EASY Incremental Differential	EASY Absolute
Number of channels	3	
Max. counts per turn	1024	
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L	mm 0 (integrated into motor)	0 (integrated into motor)
Ambient temperature	°C -40...100	-40...100
Weight	g <5	<5

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 ³	EASY Absolute																														
Supply voltage V _{cc}	V 5 ± 0.5	5 ± 0.5																														
Typical current draw	mA 22	22																														
Max. operating frequency	kHz 4000																															
Max. Speed	rpm 200000	200000																														
Connector ²	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_{cc}</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 _{cc}	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>cable AWG 28</td> <td>Data</td> </tr> <tr> <td>green</td> <td>V_{cc}</td> </tr> <tr> <td>black</td> <td>GND</td> </tr> <tr> <td>brown</td> <td>CLK</td> </tr> <tr> <td>yellow</td> <td></td> </tr> </table>	cable AWG 28	Data	green	V _{cc}	black	GND	brown	CLK	yellow	
Pin 1	Do not connect																															
Pin 2 (black)	V _{cc}																															
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																															
cable AWG 28	Data																															
green	V _{cc}																															
black	GND																															
brown	CLK																															
yellow																																
	Output signal: EIA-Standard RS 422 Output current per channel: ± 20 mA	Output signal: CMOS compatible Output current per channel: + 20 mA																														

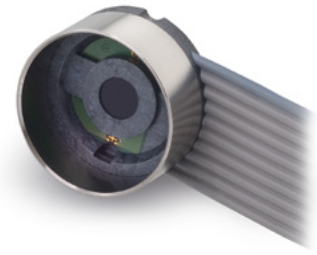


Configuration	EASY Incremental Differential	EASY Absolute
Counts per turn ¹	1...1024	
Signalprotokoll		BiSS-C, SSI
Cable length	mm 200, 500	200, 500
Electric connection		cable length/pin connection/connector

maxon Modular System	Page	Sterilization information	Notes
maxon EC motor			
ECX 13 SPEED M	170-171	<div style="border: 1px solid black; padding: 2px; display: inline-block;">135°C</div> Typically 1000 autoclave cycles	¹ maxon controllers require a resolution of at least 16 counts per turn and commutation signals.
ECX 13 SPEED L	174-175		
		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 16 EASY

Encoder Ø16 mm, 1...1024 CPT

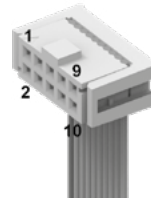


Key Data		EASY Incremental Differential	
Number of channels		3	
Max. counts per turn		1024	
Encoder length L ²	mm	8.5	
Ambient temperature	°C	-40 ... +100	
Weight	g	7	

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 _{cc}	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 _{cc}	
		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	



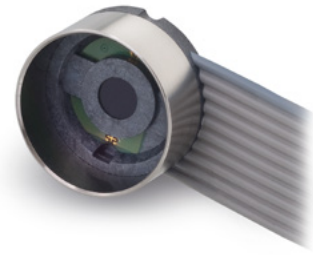
Configuration		EASY Incremental Differential	
Counts per turn ¹		1 ... 1024	
Cable length	mm	50, 100, 150, 200, 300, 500, 1000	
Alignment of cable outlet in relation to motor flange	°	15	

maxon Modular System	Page	Dimensions Standard Version	M 3:4	Notes
maxon DC motor				
DCX 16 S	74-75			¹ maxon controllers require a resolution of at least 16 counts per turn. ² For attachment to DCX motors: plus 2-4 mm thick intermediate plate. Option: ENX 16 EASY available with single wires, for ambient temperatures -55°C ... +125°C.
DCX 16 L	76-77			
DCX 19 S	78-79			
DCX 22 S	80-81			
DCX 22 L	82-83			
DCX 26 L	84-85			
DCX 32 L	86			
DCX 35 L	87			
DC-max 26 S	94-95			
Also available in combination with BLDC motors (see page 409-411)				

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ENX 16 Absolute

Encoder Ø16 mm, 4096 steps, Single Turn

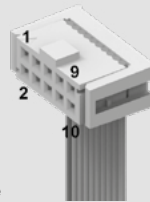


Key Data	EASY Absolute
Steps per turn	4096
Resolution (bit single turn)	12
Encoder length L ¹	mm 8.5
Ambient temperature	°C -40 ... +100
Weight	g 7

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 _{cc}	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 _{cc} 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



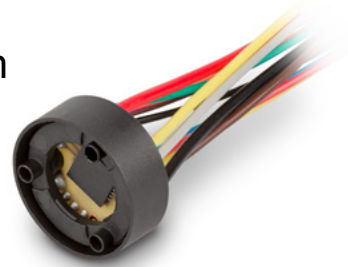
Configuration	EASY Absolute
Signal protocol	BiSS-C, SSI
Cable length	mm 50, 100, 150, 200, 300, 500, 1000
Alignment of cable outlet in relation to motor flange	° 15

maxon Modular System	Page	Dimensions Standard Version	M 3:4	Notes
maxon DC motor				
DCX 16 S	74–75			Adapter EASY Absolute (Part number 488167) required for all maxon controllers. ¹ For attachment to DCX motors: added 2-4 mm thick intermediate plate. Option: ENX 16 EASY available with single wires, with line driver, -55°C ... +125°C.
DCX 16 L	76–77			
DCX 19 S	78–79			
DCX 22 S	80–81			
DCX 22 L	82–83			
DCX 26 L	84–85			
DCX 32 L	86			
DCX 35 L	87			
DC-max 26 S	94–95			

ENX 16 EASY INT

Encoder Ø16 mm, 1...1024 CPT / 4096 steps, Single Turn

Sterilizable, integrated into motor

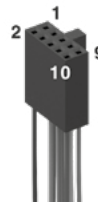


Key Data	EASY Incremental Differential	EASY Absolute
Number of channels	3	
Max. counts per turn	1024	
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L	mm -1 (integrated into motor)	-1 (integrated into motor)
Ambient temperature	°C -40...100	-40...100
Weight	g <5	<5

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 ³	EASY Absolute
Supply voltage V _{cc}	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 ²	10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651) cable AWG 28	without connector
	Pin 1 Do not connect	cable AWG 28
	Pin 2 (black) V _{cc}	green Data
	Pin 3 (brown) GND	black V _{cc}
	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 ¹	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 16 SPEED M	176-179	Typically 1000 autoclave cycles	¹ maxon controllers require a resolution of at least 16 counts per turn and commutation signals. ² H1, index and angle zero are aligned with angle commutation zero (see p. 40).
ECX 16 SPEED L	181-184		
		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.	

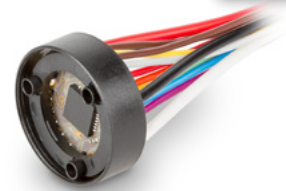
xdrives.maxonmotor.com

ENX 19 EASY INT

Encoder Ø19 mm, 1...1024 CPT / 4096 steps, Single Turn

Sterilizable, integrated into motor

NEW



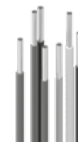
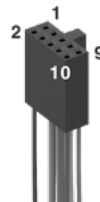
maxon ENX

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 ³	EASY Absolute
Supply voltage V _{cc}	V 5 ± 0.5	5 ± 0.5
Typical current draw	mA 22	22
Max. operating frequency	kHz 4000	
Max. Speed	rpm 200000	200000
Connector ²	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 _{cc}	green Data
	Pin 3 (brown) GND	black V _{cc}
	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 ¹	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 19 SPEED M	185–188	 Typically 1000 autoclave cycles	¹ maxon controllers require a resolution of at least 16 counts per turn and commutation signals.
ECX 19 SPEED L	189–192		
		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.	

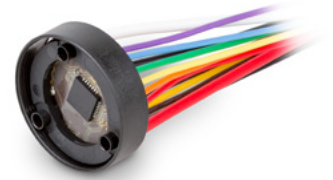
xdrives.maxonmotor.com

ENX 22 EASY INT

Encoder Ø22 mm, 1...1024 CPT / 4096 steps, Single Turn

Sterilizable, integrated into motor

NEW

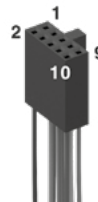


Key Data	EASY Incremental Differential	EASY Absolute
Number of channels	3	
Max. counts per turn	1024	
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L	mm -1.5 (integrated into motor)	-1.5 (integrated into motor)
Ambient temperature	°C -40...100	-40...100
Weight	g <5	<5


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 ³	EASY Absolute
Supply voltage V _{cc}	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 ²	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 _{cc}	green Data
	Pin 3 (brown) GND	black V _{cc}
	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 ¹	1...1024	
Signalprotokoll		BiSS-C, SSI
Cable length	mm 200, 500	200, 500
Electric connection		cable length/pin connection/connector

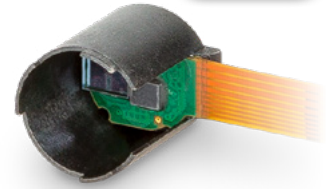
maxon Modular System	Page	Sterilization information	Notes
maxon EC motor			
ECX 22 SPEED M	193–196	 Typically 1000 autoclave cycles Sterilization with steam Temperature +134 ± 4°C Compression pressure up to 2.3 bar Rel. humidity 100% Cycle length 18 minutes	¹ maxon controllers require a resolution of at least 16 counts per turn and commutation signals. ² H1, index and angle zero are aligned with angle commutation zero (see p. 40).
ECX 22 SPEED L	197–200		
		The connector is not sterilizable and needs to be removed first.	

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ENX 6 OPT

Encoder Ø6 mm, 128 CPT

NEW



maxon ENX

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 ⁻¹	60000
Connection	FPC, 12 pole, pitch 0.5 mm	
	Pin 1	Motor+
	Pin 2	Motor-
	Pin 3	Not connected
	Pin 4	GND
	Pin 5	V _{cc}
	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 ¹		128

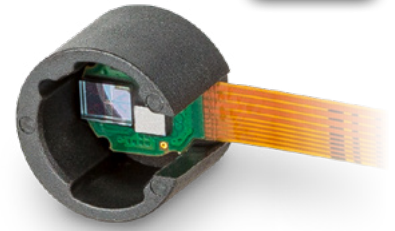
maxon Modular System	Seite	Dimensions Standard Version	Notes
maxon DC motor			
DCX 6 M	66		<p>¹ Applying voltage to these pins may destroy the encoder.</p> <p>Compatible connector: Molex 52745-1297, Tyco 1-1734839-2 Adapter 498157 required for all maxon controllers</p> <p>Please note: max. continuous current 0.5 A</p>

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ENX 8 OPT

Encoder Ø8 mm, 128 CPT

NEW



Key Data	ENX 8 OPT Incremental	ENX 8 OPT Incremental, Commutation Signal
Number of channels	3	3
Max. counts per turn	128	128
Encoder length L	mm 5.8	5.8
Ambient temperature	°C -20...85	-20...85
Weight	g 1	1

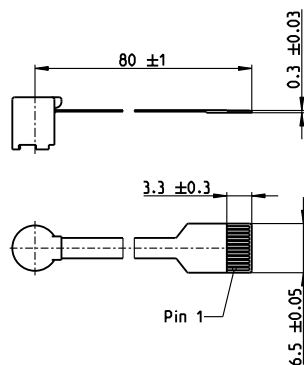
Selection criteria	ENX 8 OPT Incremental	ENX 8 OPT Incremental, Commutation Signal
Speed and rotation direction detection	■	■
Speed and position control	■	■
Compact and robust design	■	■
High resolution	▲	▲
Cost effective	■	■

■ suitable ▲ suitable to a limited extent ● not suitable

Specifications	ENX 8 OPT Incremental	ENX 8 OPT Incremental, Commutation Signal
Supply voltage V _{cc}	V 3.0...6.0	3.0...6.0
Typical current draw	mA 4	4
Max. operating frequency	kHz 1000	1000
Max. Speed	min ⁻¹ 60000	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 _{cc} 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	FPC, 12 pole, pitch 0.5 mm Pin 1 W1 Pin 2 W2 Pin 3 W3 Pin 4 GND Pin 5 V _{cc} 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 + 5 mA

Configuration	ENX 8 OPT Incremental	ENX 8 OPT Incremental, Commutation Signal
Counts per turn ¹	128	128

maxon Modular System	Seite	Dimensions Standard Version	Notes
maxon DC motor			
DCX 8 M	67		
maxon EC motor			
ECX 8 SPEED M	166-167		



¹ Applying voltage to these pins may destroy the encoder.

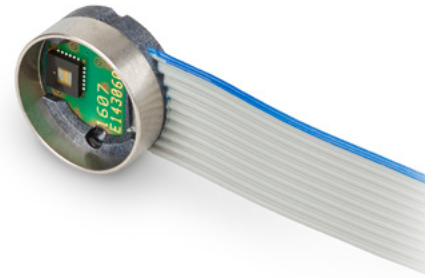
Compatible connector:
Molex 52745-1297, Tyco 1-1734839-2
Adapter 498157 required for all maxon controllers

Please note: max. continuous current 0.5 A

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ENX 16 RIO

Encoder Ø16 mm, 512 ... 65536 CPT

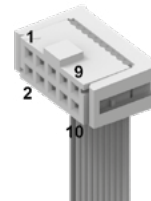


Key Data		RIO Incremental, optical	
Number of channels		3	
Max. counts per turn		65536	
Encoder length L ¹	mm	7.0	
Ambient temperature	°C	-40 ... +100	
Weight	g	15	

Selection criteria		RIO Incremental, optical	
Speed and rotation direction detection		■	
Speed and position control		■	
Compact and robust design		■	
High resolution		■	
Cost effective		■	

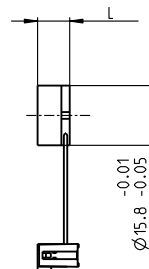
■ suitable ▲ suitable to a limited extent ● not suitable

Specifications		RIO Incremental, optical	
Supply voltage V _{cc}	V	5 ± 10%	
Typical current draw	mA	50	
Max. operating frequency	kHz	3125	
Max. Speed	min ⁻¹	40000	
Connection		10-pin 2.54 mm multipoint connector (IEC/EN 60603-13 / DIN41651)	
		Pin 1 Do not connect	
		Pin 2 V _{cc}	
		Pin 3 GND	
		Pin 4 Do not connect	
		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	



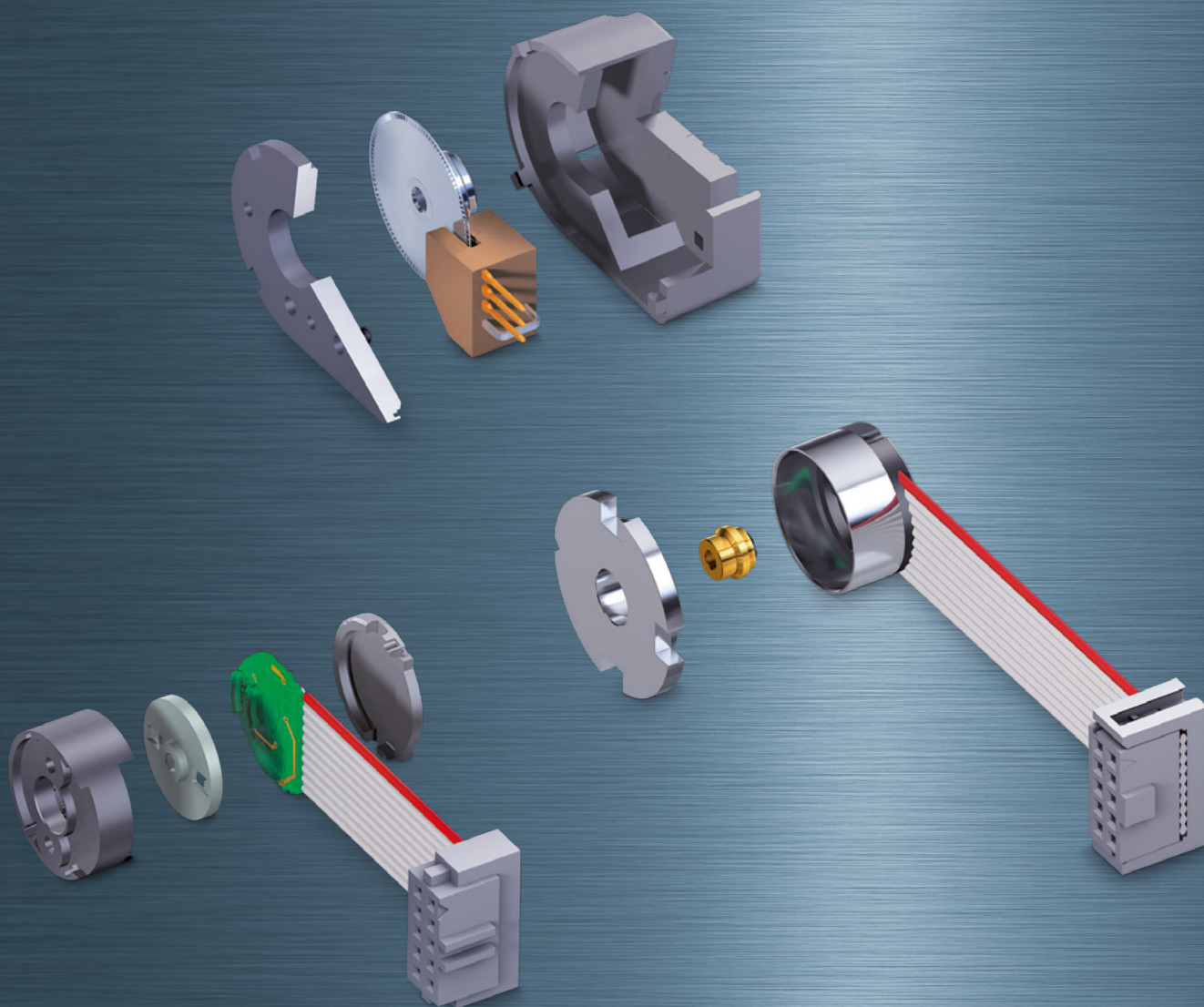
Configuration		RIO Incremental, optical	
Counts per turn		512... 65536 (in steps of 256)	
Cable length	mm	50, 100, 150, 200, 300, 500, 1000	
Alignment of cable outlet in relation to motor flange	°	15	

maxon Modular System	Seite	Dimensions Standard Version	Notes
maxon DC motor			
DCX 16 S	74–75		¹ Applying voltage to these pins may destroy the encoder.
DCX 16 L	76–77		
DCX 19 S	78–79		
DCX 22 S	80–81		
DCX 22 L	82–83		
DCX 26 L	84–85		
DCX 32 L	86		
DCX 35 L	87		



Also available in combination with BLDC motors (see page 423–425)

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DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

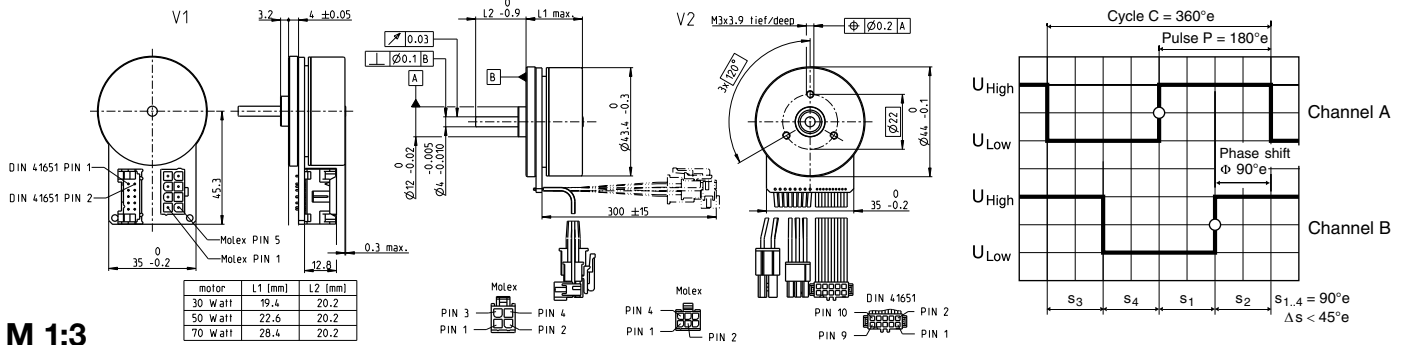
maxon sensor

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.

Standard Specification No. 103	61
ENX Program (can be configured online)	386–399
Inductive encoders	402–404
Magnetic encoders	405–420
Optical encoders	421–437
DC Tacho/Resolver	438–439

Encoder MILE 256–2048 CPT, 2 Channels, with Line Driver

Integrated into motor



M 1:3

motor	L1 [mm]	L2 [mm]
30 Watt	19.4	20.2
50 Watt	22.6	20.2
70 Watt	28.4	20.2

- 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	265					19.4	19.4	19.4	19.4
EC 45 flat, 30 W, A	265	GP 42, 3 - 15 Nm	356			●	●	●	●
EC 45 flat, 30 W, A	265	GS 45, 0.5 - 2.0 Nm	358			●	●	●	●
EC 45 flat, 50 W, A	266					22.6	22.6	22.6	22.6
EC 45 flat, 50 W, A	266	GP 42, 3 - 15 Nm	356			●	●	●	●
EC 45 flat, 50 W, A	266	GS 45, 0.5 - 2.0 Nm	358			●	●	●	●
EC 45 flat, 70 W, A	267					28.4	28.4	28.4	28.4
EC 45 flat, 70 W, A	267	GP 42, 3 - 15 Nm	356			●	●	●	●
EC 45 flat, 70 W, A	267	GS 45, 0.5 - 2.0 Nm	358			●	●	●	●

Technical Data

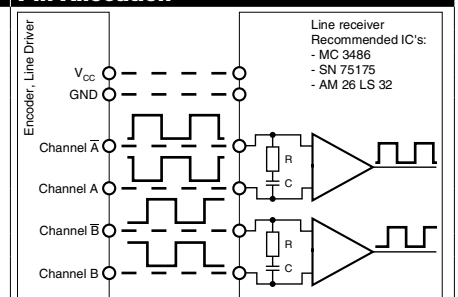
Supply voltage V_{CC}	$5 B \pm 10\%$
Typical current draw	12 mA
Output signal	CMOS compatible
State length $s_n 90^\circ e$ (1000 rpm)	$45 \dots 135^\circ e$
Signal rise time (typically, at $C_L = 25 \text{ pF}$, $R_L = 1 \text{ k}\Omega$, $25^\circ C$)	100 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$, $R_L = 1 \text{ k}\Omega$, $25^\circ C$)	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. 43	

Pin Allocation

Connection V1	Connection V2
Motor + Sensors	Sensors (AWG24)
Pin 1 Hall sensor 1*	Pin1 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 NTC
Pin 7 Motor winding 1	Motor (AWG 16)
Pin 8 Motor winding 2	Pin 1 Motor winding 1
	Pin 2 Motor winding 2
	Pin 3 Motor winding 3
	Pin 4 Not connected
Encoder	Encoder (AWG 28)
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
Pin type:	
39-28-1083 Molex	43025-600 Molex
DIN 41651/EN 60603-13	39-01-2040 Molex
	DIN 41651/EN 60603-13

*Internal pull-up (10 kΩ) on V_{Hall}

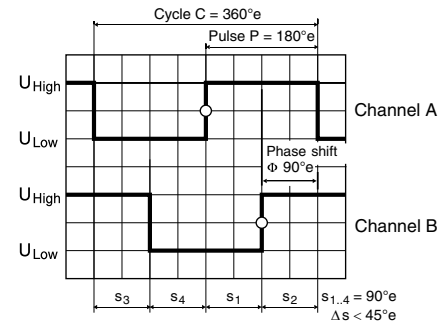
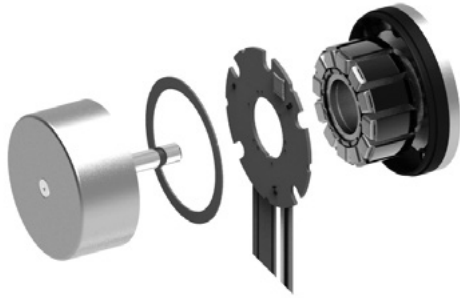
Pin Allocation



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



Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

421985	421986	421987	421988
--------	--------	--------	--------

Type	421985	421986	421987	421988
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



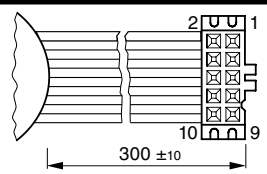
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead			
EC 60 flat, IP00	270					39.0	39.0	39.0	39.0
EC 60 flat, IP00	270	GP 52, 4 - 30 Nm	360			●	●	●	●
EC 60 flat, IP54	270					43.0	43.0	43.0	43.0
EC 60 flat, IP54	270	GP 52, 4 - 30 Nm	360			●	●	●	●

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 $C_L = 25 \text{ pF}$, $R_L = 1 \text{ k}\Omega$, 25°C)	100 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$, $R_L = 1 \text{ k}\Omega$, 25°C)	100 ns
Operating temperature range	$-40 \dots +100^\circ\text{C}$
Moment of inertia of code wheel	$\leq 13 \text{ gcm}^2$
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. 43	

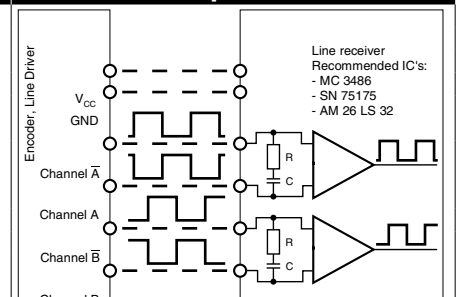
Pin Allocation



DIN Connector 41651/EN 60603-13 flat ribbon cable AWG 28

- 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 Do not connect
- 10 Do not connect

Connection example

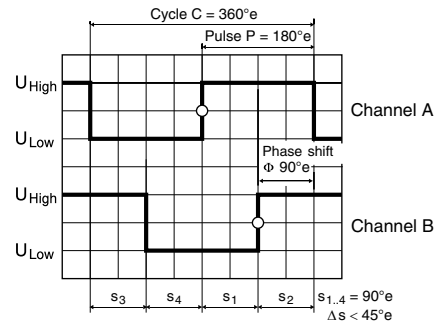
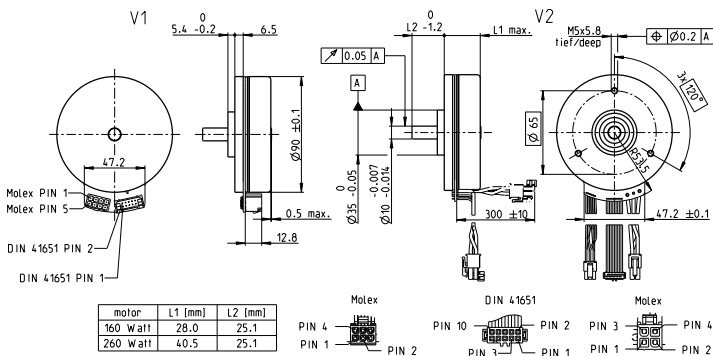


Opt. terminal resistance $R = \text{typical } 120 \Omega$
Capacitor $C \geq 0.1 \text{ nF}$ per m line length

Additional information can be found under 'Downloads' in the maxon online shop.

Encoder MILE 512-6400 CPT, 2 Channels, with Line Driver

Integrated into motor



M 1:6

Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

V1 with connector
V2 with cable and connector

621796	621789	621795	621790	621794	621791	621793	621792
607517	607510	607516	607511	607515	607512	607514	607513

Type	Counts per turn	Number of channels	Max. operating frequency (kHz)	Max. speed (rpm)
Stock program	512	2	1000	5000
Standard program	800	2	1000	5000
Special program (on request)	1024	2	1000	5000
	1600	2	1000	5000
	2048	2	1000	5000
	3200	2	1000	5000
	4096	2	1000	5000
	6400	2	1000	5000



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead					
EC 90 flat, 160 W	271					28.0	28.0	28.0	28.0	28.0	28.0
EC 90 flat, 260 W	272					40.5	40.5	40.5	40.5	40.5	40.5

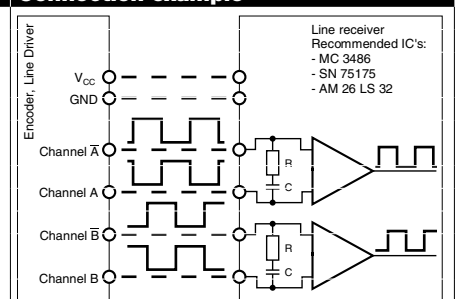
Technical Data

Supply voltage V _{CC}	5 V ± 10%
Typical current draw	15 mA
Output signal driver used:	CMOS compatible
State length s _n (500 rpm)	90°e ± <45°e
Signal rise and fall times (typically, at C _L = 25 pF, R _L = 1 kΩ, 25°C)	100 ns
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 65 gcm ²
Output current per channel	max. 4 mA
Open collector output of the Hall sensors with integrated pull-up resistor	10 kΩ ± 20%
Wiring diagram for Hall sensors see p. 43	

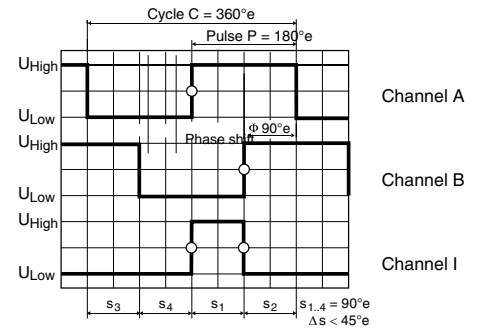
Pin Allocation

Connection V1	Connection V2
Motor + Sensors	Sensors (AWG24)
Pin 1 Hall sensor 1*	Pin1 Hall sensor 1*
Pin 2 Hall sensor 2*	Pin 2 Hall sensor 2*
Pin 3 V _{Hall} 3.5...18 VDC	Pin 3 Hall sensor 3*
Pin 4 Motor winding 3	Pin 4 GND
Pin 5 Hall sensor 3*	Pin 5 V _{Hall} 3.5...18 VDC
Pin 6 GND	Pin 6 NTC**
Pin 7 Motor winding 1	Motor (AWG 16)
Pin 8 Motor winding 2	Pin 1 Motor winding 1
	Pin 2 Motor winding 2
	Pin 3 Motor winding 3
	Pin 4 Not connected
Encoder	Encoder (AWG 28)
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
Pin type:	
46015-0806 Molex	43025-0600 Molex
DIN 41651/EN 60603-13	39-01-2040 Molex
	DIN 41651/EN 60603-13

Connection example



Encoder 6 MAG 64–256 CPT, 3 Channels



Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers						
502804	502805	502806	547012	547013	547014	547014

Type (provisional)	502804	502805	502806	547012	547013	547014
Counts per turn	64	128	256	64	128	256
Number of channels	3	3	3	3	3	3
Max. operating frequency (kHz)	64	64	64	64	64	64
Max. speed (rpm)	100 000	50 000	25 000	100 000	50 000	25 000

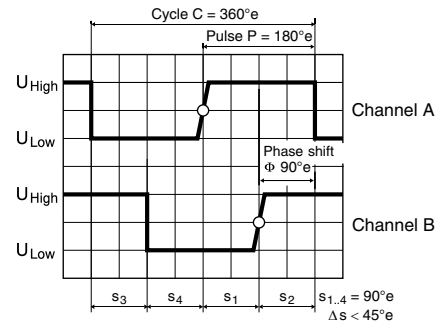
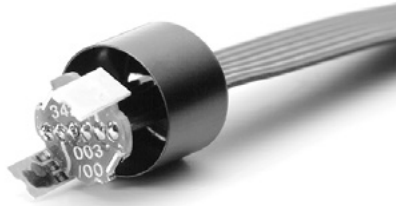
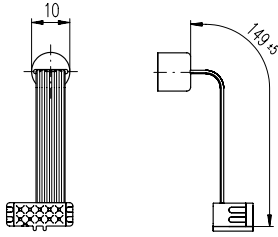


maxon Modular System									
+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead				
EC 6, 1.5 W, B	204			6 (8*)	23.4	23.4	23.4		
EC 6, 1.5 W, B	204	GP 6, 0.002 - 0.03 Nm	317	6 (8*)	●	●	●		
EC 6, 1.5 W, B	204	GP 6 S	365-366	6 (8*)	●	●	●		
EC 6, 2.0 W, B	205			6 (8*)	23.4	23.4	23.4		
EC 6, 2.0 W, B	205	GP 6, 0.002 - 0.03 Nm	317	6 (8*)	●	●	●		
EC 6, 2.0 W, B	205	GP 6 S	365-366	6 (8*)	●	●	●		
EC 6, 1.5 W, A	204			6 (8*)				23.4	23.4
EC 6, 1.5 W, A	204	GP 6, 0.002 - 0.03 Nm	317	6 (8*)				●	●
EC 6, 1.5 W, A	204	GP 6 S	365-366	6 (8*)				●	●
EC 6, 2.0 W, A	205			6 (8*)				23.4	23.4
EC 6, 2.0 W, A	205	GP 6, 0.002 - 0.03 Nm	317	6 (8*)				●	●
EC 6, 2.0 W, A	205	GP 6 S	365-366	6 (8*)				●	●

*Max diameter of the end cap (incl. extension).

Technical Data	Pin Allocation	Connection example
Supply voltage V_{CC} 3 - 3.6 V Typical current draw 10 mA Output signal $V_{CC} = 3.3$ VDC TTL compatible Phase shift Φ $90^\circ e \pm 45^\circ e$ Index pulse width $90^\circ e \pm 45^\circ e$ Operating temperature range $-40 \dots +125^\circ C$ Moment of inertia of code wheel ≤ 0.001 gcm ² Output current per channel ≤ 4 mA	<p> B sensorless 1 W1 2 W2 3 W3 4 GND 5 V_{CC} 6 Channel A 7 Channel B 8 Channel I 9 Do not connect 10 Do not connect 11 Do not connect 12 Do not connect </p> <p> A Hall sensor W1 W2 W3 GND V_{CC} Channel A Channel B Channel I H1 H2 H3 Do not connect </p> <p>Compatible connector: Molex 52745-1297, Tyco 1-1734839-2 Adapter: 498157 Please note: max. continuous current 0.5 A</p>	

Encoder MEnc 10 12 CPT, 2 Channels



Direction of rotation cw (definition cw p. 60)

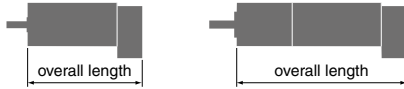
- Stock program
- Standard program
- Special program (on request)

Part Numbers

138061

Type

Counts per turn ¹	12
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	100 000



maxon Modular System

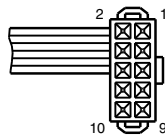
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 10, 0.75 W	101			25.1
RE 10, 0.75 W	101	GP 10, 0.005 - 0.1 Nm	319	●
RE 10, 0.75 W	101	GP 10, 0.01 - 0.15 Nm	320	●
RE 10, 1.5 W	103			32.7
RE 10, 1.5 W	103	GP 10, 0.005 - 0.1 Nm	319	●
RE 10, 1.5 W	103	GP 10, 0.01 - 0.15 Nm	320	●

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 ϕ	$90^\circ e \pm 45^\circ e$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.03 gcm ²
Operating temperature range	-20...+80 °C
Open collector output with integrated pull-up resistance	10 kΩ ± 20%

¹ maxon controllers require a resolution of at least 16 pulses.

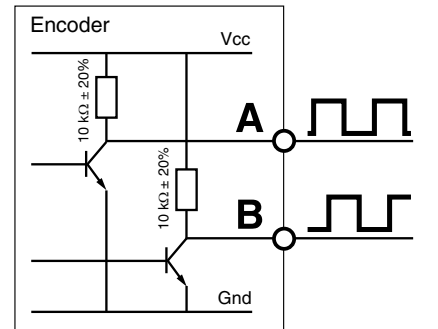
Pin Allocation



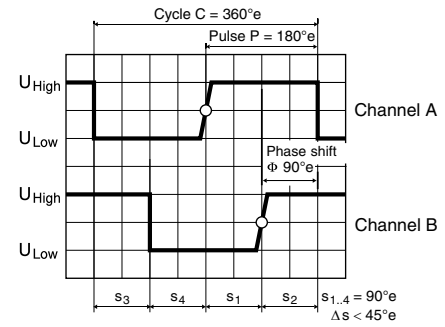
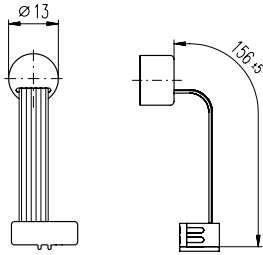
- 1 Motor +
- 2 V_{CC}
- 3 Channel A
- 4 Channel B
- 5 GND
- 6 Motor -

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



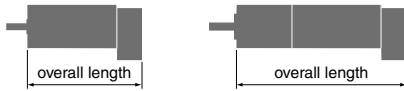
Direction of rotation cw (definition cw p. 60)

- 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



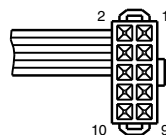
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 13, 0.75 W	106/107			27.0/29.4
RE 13, 0.75 W	107	GP 13, 0.05 - 0.15 Nm	322	●
RE 13, 0.75 W	107	GP 13, 0.2 - 0.35 Nm	323	●
RE 13, 2 W	110/111			39.2/41.6
RE 13, 2 W	111	GP 13, 0.05 - 0.15 Nm	322	●
RE 13, 2 W	111	GP 13, 0.2 - 0.35 Nm	323	●
RE 13, 1.5 W	114/115			30.3/32.7
RE 13, 1.5 W	115	GP 13, 0.05 - 0.15 Nm	322	●
RE 13, 1.5 W	115	GP 13, 0.2 - 0.35 Nm	323	●
RE 13, 3 W	118/119			42.5/44.9
RE 13, 3 W	119	GP 13, 0.05 - 0.15 Nm	322	●
RE 13, 3 W	119	GP 13, 0.2 - 0.35 Nm	323	●
RE 16, 3.2 W	122			46.5
RE 16, 3.2 W	122	GP 16, 0.1 - 0.6 Nm	328/329	●
RE 16, 3.2 W	122	GP 16 S	369/370	●
RE 16, 4.5 W	124			49.7
RE 16, 4.5 W	124	GP 16, 0.1 - 0.6 Nm	328/329	●
RE 16, 4.5 W	124	GP 16 S	369/370	●
A-max 16	140/142			33.5
A-max 16	140/142	GS 16, 0.01 - 0.03 Nm	324/325	●
A-max 16	140/142	GS 16, 0.06 - 0.1 Nm	326/327	●
A-max 16	140/142	GP 16, 0.1 - 0.3 Nm	328	●
A-max 16	140/142	GP 16 S	369/370	●
A-max 19	144/146			36.4/39.0
A-max 19	144/146	GP 19, 0.1 - 0.3 Nm	330	●
A-max 19	144/146	GP 22, 0.5 - 2.0 Nm	333/335	●
A-max 19	144/146	GS 24, 0.1 Nm	339	●
A-max 19	144/146	GP 22 S	372/373	●

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 Φ	$90^\circ \pm 45^\circ$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm ²
Operating temperature range	-20...+80 °C
Open collector output with integrated pull-up resistance	10 k Ω \pm 20%

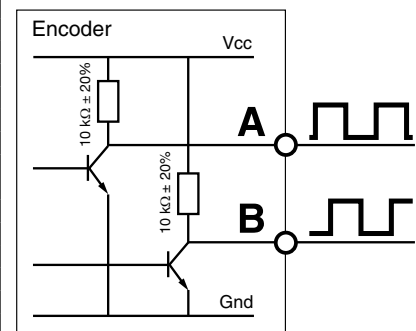
Pin Allocation



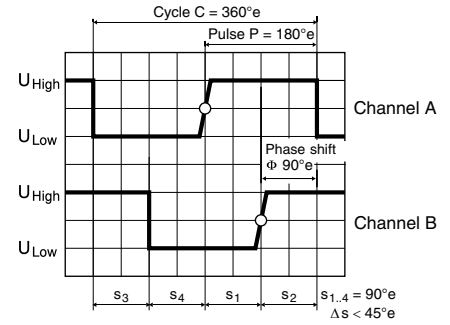
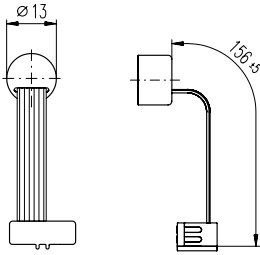
- 1 Motor +
- 2 V_{CC}
- 3 Channel A
- 4 Channel B
- 5 GND
- 6 Motor -

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. 60)

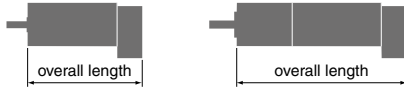
- Stock program
- Standard program
- Special program (on request)

Part Numbers

110778

Type

Counts per turn	16
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	75000



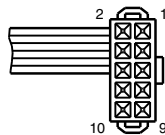
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
A-max 22	148/150			39.0
A-max 22	148/150	GP 22, 0.1 - 0.6 Nm	331/332	●
A-max 22	148/150	GP 22, 0.5 - 2.0 Nm	333/335	●
A-max 22	148/150	GS 24, 0.1 Nm	339	●
A-max 22	148/150	GP 22 S	372/373	●
A-max 26	152-158			51.8
A-max 26	152-158	GP 26, 0.75 - 4.5 Nm	340	●
A-max 26	152-158	GS 30, 0.07 - 0.2 Nm	341	●
A-max 26	152-158	GP 32, 0.75 - 4.5 Nm	342	●
A-max 26	152-158	GP 32, 0.75 - 6.0 Nm	343	●
A-max 26	152-158	GS 38, 0.1 - 0.6 Nm	353	●
A-max 26	152-158	GP 32 S	374-378	●

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 Φ	$90^\circ e \pm 45^\circ e$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm ²
Operating temperature range	-20...+80 °C
Open collector output with integrated pull-up resistance	10 k $\Omega \pm 20\%$

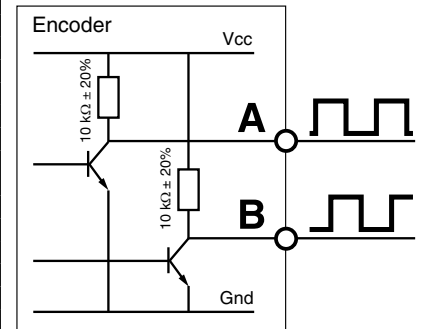
Pin Allocation



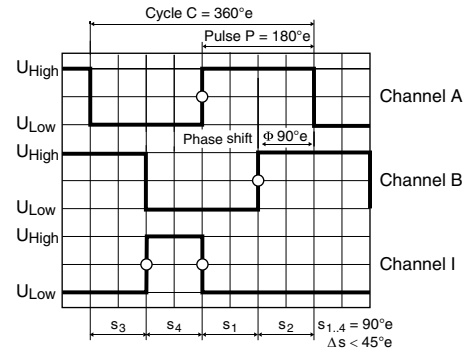
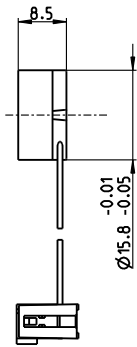
- 1 Motor +
- 2 V_{CC}
- 3 Channel A
- 4 Channel B
- 5 GND
- 6 Motor -

Pin type
DIN 41651/EN 60603-13
(Type 3M 89110-0101 HA)
flat band cable AWG 28

Connection example



Encoder 16 EASY 128–1024 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 60)

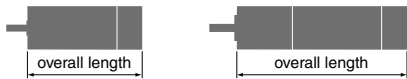
- Stock program
- Standard program
- Special program (on request)

Part Numbers

499356	499357	499358	499359	499360	499361
--------	--------	--------	--------	--------	--------

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 Φ (°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	231					60.8	60.8	60.8	60.8	60.8	60.8
EC-4pole 22, 90 W	231	GP 22/GP 32	337/347			●	●	●	●	●	●
EC-4pole 22, 90 W	231	GP 32 S	374-379			●	●	●	●	●	●
EC-4pole 22, 120 W	232					78.2	78.2	78.2	78.2	78.2	78.2
EC-4pole 22, 120 W	232	GP 22/GP 32	337/347			●	●	●	●	●	●
EC-4pole 22, 120 W	232	GP 32 S	374-379			●	●	●	●	●	●
EC-4pole 30, 100 W	233					60.9	60.9	60.9	60.9	60.9	60.9
EC-4pole 30, 100 W	233	GP 32, 4.0 - 8.0 Nm	350			●	●	●	●	●	●
EC-4pole 30, 100 W	233	GP 42, 3.0 - 15.0 Nm	355			●	●	●	●	●	●
EC-4pole 30, 200 W	235					77.9	77.9	77.9	77.9	77.9	77.9
EC-4pole 30, 200 W	235	GP 32, 4.0 - 8.0 Nm	350			●	●	●	●	●	●
EC-4pole 30, 200 W	235	GP 42, 3.0 - 15.0 Nm	355			●	●	●	●	●	●
EC-i 30, 30 W	242					53.7	53.7	53.7	53.7	53.7	53.7
EC-i 30, 30 W	242	GP 32, 1.0 - 6.0 Nm	347			●	●	●	●	●	●
EC-i 30, 30 W	242	GP 32 S	374-379			●	●	●	●	●	●
EC-i 30, 45 W	243					53.7	53.7	53.7	53.7	53.7	53.7
EC-i 30, 45 W	243	GP 32, 1.0 - 6.0 Nm	348			●	●	●	●	●	●
EC-i 30, 45 W	243	GP 32 S	374-379			●	●	●	●	●	●
EC-i 30, 50 W	244					75.7	75.7	75.7	75.7	75.7	75.7
EC-i 30, 50 W	244	GP 32, 1.0 - 6.0 Nm	348			●	●	●	●	●	●
EC-i 30, 50 W	244	GP 32 S	374-379			●	●	●	●	●	●
EC-i 30, 75 W	245					75.7	75.7	75.7	75.7	75.7	75.7
EC-i 30, 75 W	245	GP 32, 1.0 - 6.0 Nm	348			●	●	●	●	●	●
EC-i 30, 75 W	245	GP 32 S	374-379			●	●	●	●	●	●

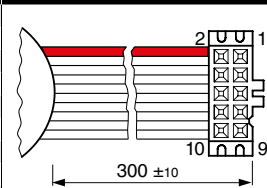
Technical Data

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 ²
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. 40.

Additional information can be found in the maxon online shop under downloads.
The index signal I is synchronized with channel A or B.

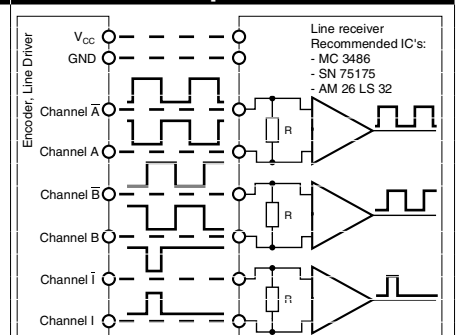
Pin Allocation



- 1 N.C.
 - 2 V_{CC}
 - 3 GND
 - 4 N.C.
 - 5 Channel Ā
 - 6 Channel A
 - 7 Channel B̄
 - 8 Channel B
 - 9 Channel I (Index)
 - 10 Channel I (Index)
- DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

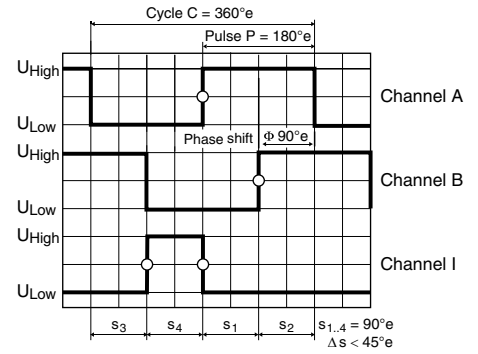
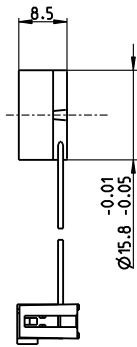
Option: also available in a single-strand version (Ambient temperature -55°C ... +125°C).

Connection example



Opt. terminal resistance R = typical 120 Ω

Encoder 16 EASY 128–1024 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

499356	499357	499358	499359	499360	499361
--------	--------	--------	--------	--------	--------

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 Φ (°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 40, 50 W	246/247					37.7	37.7	37.7	37.7	37.7	37.7
EC-i 40, 50 W	246	GP 32, 1.0 - 6.0 Nm	348			●	●	●	●	●	●
EC-i 40, 50 W	246	GP 32 S	374-379			●	●	●	●	●	●
EC-i 40, 50 W	246/247	GP 42, 3.0 - 15.0 Nm	355			●	●	●	●	●	●
EC-i 40, 70 W	248/249					47.7	47.7	47.7	47.7	47.7	47.7
EC-i 40, 70 W	248	GP 32, 1.0 - 6.0 Nm	348			●	●	●	●	●	●
EC-i 40, 70 W	248	GP 32 S	374-379			●	●	●	●	●	●
EC-i 40, 70 W	248/249	GP 42, 3.0 - 15.0 Nm	356			●	●	●	●	●	●
EC-i 40, 100 W	250					67.7	67.7	67.7	67.7	67.7	67.7
EC-i 40, 100 W	250	GP 42, 3.0 - 15.0 Nm	356			●	●	●	●	●	●
EC-i 52, 180 W	251					93.7	93.7	93.7	93.7	93.7	93.7
EC-i 52, 180 W	251	GP 52, 4.0 - 30.0 Nm	360			●	●	●	●	●	●

Technical Data

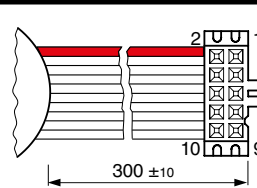
Supply voltage V_{CC}	5 V ± 10%
Typical current draw	22 mA
Output signal	EIA Standard RS 422
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.09 gcm ²
Output current per channel	± 20 mA
Hysteresis	0.17 °m
Min. state duration s	125 ns
Signal rise and fall times (typically, 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. 40.

Additional information can be found in the maxon online shop under downloads.

The index signal I is synchronized with channel A or B.

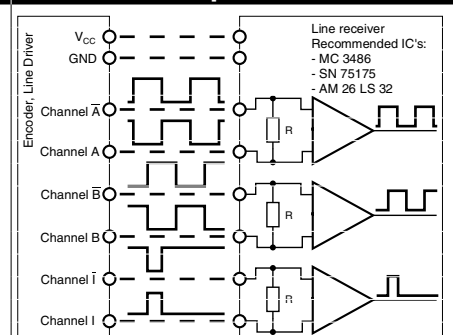
Pin Allocation



- 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)
- DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

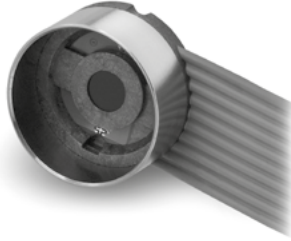
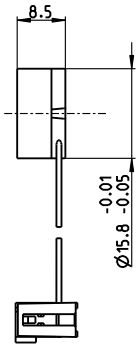
Option: also available in a single-strand version (Ambient temperature -55°C ... +125°C).

Connection example

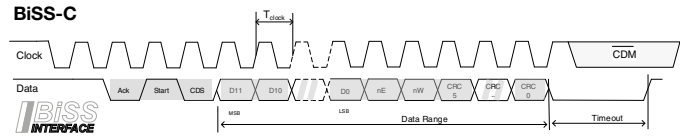


Opt. terminal resistance R = typical 120 Ω

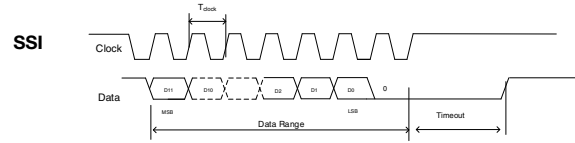
Encoder 16 EASY Absolute 4096 steps, Single Turn



BiSS-C



SSI



Angle values increase when direction of rotation is cw (definition of 'cw' on p. 60)

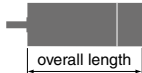
Part numbers

488783	488782
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- Stock program
- Standard program
- Special program (on request)

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
Timeout (µs)	2	16



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-4pole 22, 90 W	231					60.8 / 60.8
EC-4pole 22, 90 W	231	GP 22, 2.0 - 3.4 Nm	337			● / ●
EC-4pole 22, 90 W	231	GP 32, 1.0 - 6.0 Nm	347			● / ●
EC-4pole 22, 90 W	231	GP 32 S	374-379			● / ●
EC-4pole 22, 120 W	232					78.2 / 78.2
EC-4pole 22, 120 W	232	GP 22, 2.0 - 3.4 Nm	337			● / ●
EC-4pole 22, 120 W	232	GP 32, 1.0 - 6.0 Nm	347			● / ●
EC-4pole 22, 120 W	232	GP 32 S	374-379			● / ●
EC-4pole 30, 100 W	233					60.9 / 60.9
EC-4pole 30, 100 W	233	GP 32, 4.0 - 8.0 Nm	350			● / ●
EC-4pole 30, 100 W	233	GP 42, 3.0 - 15.0 Nm	355			● / ●
EC-4pole 30, 200 W	235					77.9 / 77.9
EC-4pole 30, 200 W	235	GP 32, 4.0 - 8.0 Nm	350			● / ●
EC-4pole 30, 200 W	235	GP 42, 3.0 - 15.0 Nm	355			● / ●
EC-i 30, 30 W	242					53.7 / 53.7
EC-i 30, 30 W	242	GP 32, 1.0 - 6.0 Nm	347			● / ●
EC-i 30, 30 W	242	GP 32 S	374-379			● / ●
EC-i 30, 45 W	243					53.7 / 53.7
EC-i 30, 45 W	243	GP 32, 1.0 - 6.0 Nm	348			● / ●
EC-i 30, 45 W	243	GP 32 S	374-379			● / ●
EC-i 30, 50 W	244					75.7 / 75.7
EC-i 30, 50 W	244	GP 32, 1.0 - 6.0 Nm	348			● / ●
EC-i 30, 50 W	244	GP 32 S	374-379			● / ●
EC-i 30, 75 W	245					75.7 / 75.7
EC-i 30, 75 W	245	GP 32, 1.0 - 6.0 Nm	348			● / ●
EC-i 30, 75 W	245	GP 32 S	374-379			● / ●

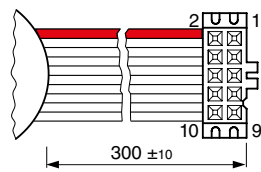
Technical data

Supply voltage V_{CC}	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 ²
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. 40.

Additional information can be found under 'Downloads' in the maxon online shop.

Pin assignment

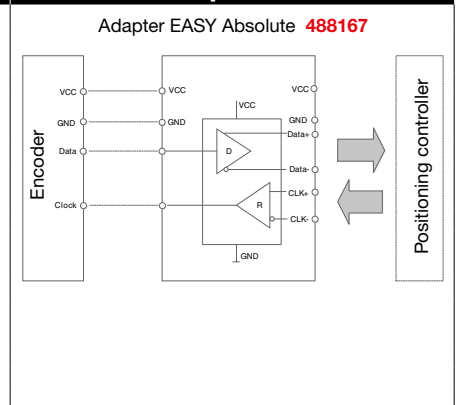


- 1 Data
 - 2 V_{CC}
 - 3 GND
 - 4 CLK
 - 5 Do not connect (A)
 - 6 Do not connect (A)
 - 7 Do not connect (B)
 - 8 Do not connect (B)
 - 9 Do not connect (I)
 - 10 Do not connect (I)
- DIN Connector 41651/
EN 60603-13
flat ribbon cable AWG 28

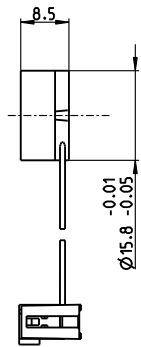
Option: Encoder with single wires, line driver RS422, -55°C ... +125°C.

Adapter EASY Absolute **488167** (required for all maxon controllers).

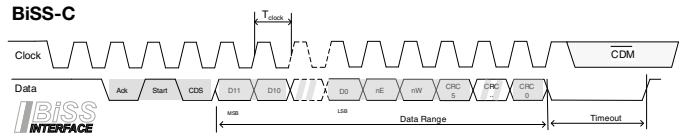
Connection example



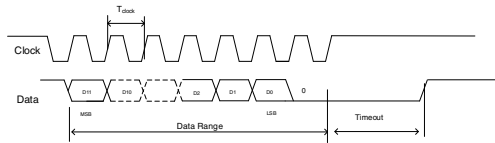
Encoder 16 EASY Absolute 4096 steps, Single Turn



BiSS-C



SSI



Angle values increase when direction of rotation is cw (definition of 'cw' on p. 60)

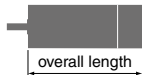
- Stock program
- Standard program
- Special program (on request)

Part numbers

488783	488782
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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
Timeout (µs)	2	16



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-i 40, 50 W	246/247					37.7 / ●
EC-i 40, 50 W	246	GP 32, 1.0 - 6.0 Nm	348			● / ●
EC-i 40, 50 W	246	GP 32 S	374-379			● / ●
EC-i 40, 50 W	246/247	GP 42, 3.0 - 15.0 Nm	355			● / ●
EC-i 40, 70 W	248/249					47.7 / ●
EC-i 40, 70 W	248	GP 32, 1.0 - 6.0 Nm	348			● / ●
EC-i 40, 70 W	248	GP 32 S	374-379			● / ●
EC-i 40, 70 W	248/249	GP 42, 3.0 - 15.0 Nm	355			● / ●
EC-i 40, 100 W	250					67.7 / ●
EC-i 40, 100 W	250	GP 42, 3.0 - 15.0 Nm	355			● / ●
EC-i 52, 180 W	251					93.7 / ●
EC-i 52, 180 W	251	GP 52, 4.0 - 30.0 Nm	360			● / ●

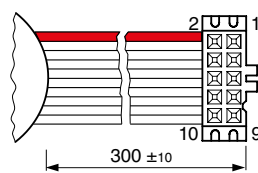
Technical data

Supply voltage V _{CC}	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 ²
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. 40.

Additional information can be found under 'Downloads' in the maxon online shop.

Pin assignment



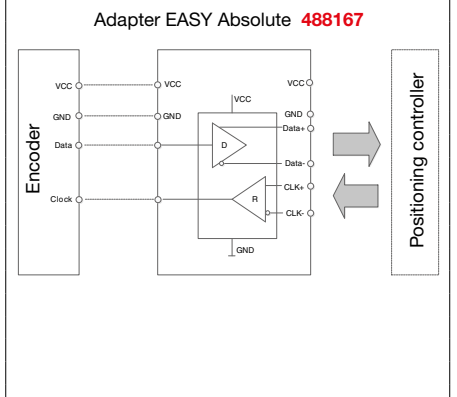
- 1 Data
- 2 V_{CC}
- 3 GND
- 4 CLK
- 5 Do not connect (A)
- 6 Do not connect (A)
- 7 Do not connect (B)
- 8 Do not connect (B)
- 9 Do not connect (I)
- 10 Do not connect (I)

DIN Connector 41651/
EN 60603-13
flat ribbon cable AWG 28

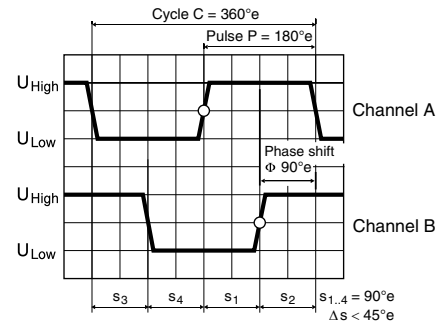
Option: Encoder with single wires, line driver RS422, -55°C ... +125°C.

Adapter EASY Absolute **488167** (required for all maxon controllers).

Connection example



Encoder MR Type S, 16 CPT, 2 Channels



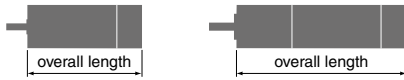
Direction of rotation cw (definition cw p. 60)

- 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



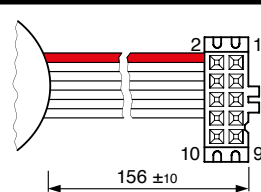
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead
RE 10, 0.75 W	101			10	22.8
RE 10, 0.75 W	101	GP 10, 0.005 - 0.15 Nm	319/320	10	●
RE 10, 1.5 W	103			10	30.4
RE 10, 1.5 W	103	GP 10, 0.005 - 0.15 Nm	319/320	10	●
RE 13, 0.75 W	107			13	26.3
RE 13, 0.75 W	107			13	28.7
RE 13, 0.75 W	107	GP 13, 0.05 - 0.15 Nm	322	13	●
RE 13, 0.75 W	107	GP 13, 0.2 - 0.35 Nm	323	13	●
RE 13, 2 W	110			13	38.5
RE 13, 2 W	111			13	40.9
RE 13, 2 W	111	GP 13, 0.05 - 0.15 Nm	322	13	●
RE 13, 2 W	111	GP 13, 0.2 - 0.35 Nm	323	13	●
RE 13, 1.5 W	114			13	28.4
RE 13, 1.5 W	115			13	30.8
RE 13, 1.5 W	115	GP 13, 0.05 - 0.15 Nm	322	13	●
RE 13, 1.5 W	115	GP 13, 0.2 - 0.35 Nm	323	13	●
RE 13, 3 W	118			13	40.6
RE 13, 3 W	119			13	43.0
RE 13, 3 W	119	GP 13, 0.05 - 0.15 Nm	322	13	●
RE 13, 3 W	119	GP 13, 0.2 - 0.35 Nm	323	13	●
A-max 12, 0.5 W	138			12	25.3
A-max 12, 0.5 W	138	GP 10, 0.01 - 0.15 Nm	320	12	●
A-max 12, 0.5 W	138	GS 12, 0.01 - 0.03 Nm	321	12	●
A-max 12, 0.5 W	138	GP 13, 0.05 - 0.15 Nm	322	12	●
A-max 12, 0.5 W	138	GP 13, 0.2 - 0.35 Nm	323	12	●

Technical Data

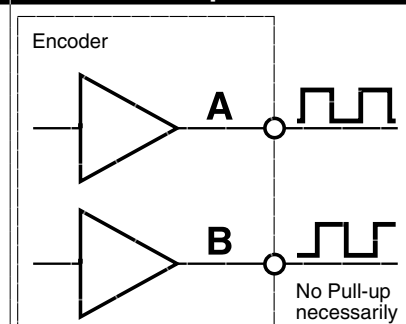
Supply voltage V_{CC}	2.7 - 5.5 V
Typical current draw	7 mA
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift Φ	$90^\circ \pm 45^\circ$
Operating temperature range	$-40 \dots +85^\circ\text{C}$
Moment of inertia of code wheel	$\leq 0.005 \text{ gcm}^2$
Output current per channel	max. 5 mA

Pin Allocation

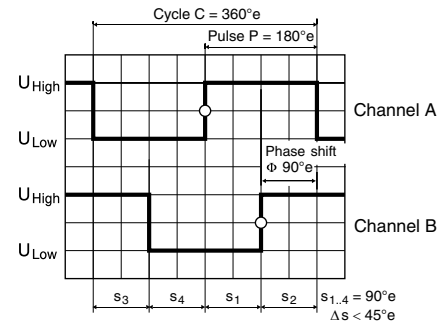


- 1 Motor +
 - 2 V_{CC}
 - 3 Channel A
 - 4 Channel B
 - 5 GND
 - 6 Motor -
- DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

Connection example



Encoder MR Type S, 64–256 CPT, 2 Channels, with Line Driver



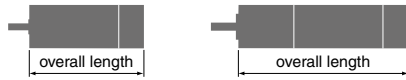
Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

323049	323050	334910	323051	323052	323053	323054
--------	--------	--------	--------	--------	--------	--------

Type	323049	323050	334910	323051	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

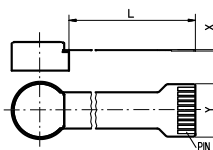
+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead
RE 8, 0.5 W, A	99			8	22.6
RE 8, 0.5 W, A	99	GP 8, 0.01 - 0.1 Nm	318	8	●
RE 8, 0.5 W, A	99	GP 8 S	367-368	8	●
RE 10, 0.75 W	101			10	22.8
RE 10, 0.75 W	101	GP 10, 0.005 - 0.15 Nm	319/320	10	●
RE 10, 1.5 W	103			10	30.4
RE 10, 1.5 W	103	GP 10, 0.005 - 0.15 Nm	319/320	10	●
RE 13, 0.75 W	107			13	26.3
RE 13, 0.75 W	107			13	28.7
RE 13, 0.75 W	107	GP 13, 0.05 - 0.15 Nm	322	13	●
RE 13, 0.75 W	107	GP 13, 0.2 - 0.35 Nm	323	13	●
RE 13, 2 W	110			13	38.5
RE 13, 2 W	111			13	40.9
RE 13, 2 W	111	GP 13, 0.05 - 0.15 Nm	322	13	●
RE 13, 2 W	111	GP 13, 0.2 - 0.35 Nm	323	13	●
RE 13, 1.5 W	114			13	28.4
RE 13, 1.5 W	115			13	30.8
RE 13, 1.5 W	115	GP 13, 0.05 - 0.15 Nm	322	13	●
RE 13, 1.5 W	115	GP 13, 0.2 - 0.35 Nm	323	13	●
RE 13, 3 W	118			13	40.6
RE 13, 3 W	119			13	43.0
RE 13, 3 W	119	GP 13, 0.05 - 0.15 Nm	322	13	●
RE 13, 3 W	119	GP 13, 0.2 - 0.35 Nm	323	13	●
A-max 12, 0.5 W	138			12	25.3
A-max 12, 0.5 W	138	GP 10, 0.01 - 0.15 Nm	320	12	●
A-max 12, 0.5 W	138	GS 12, 0.01 - 0.03 Nm	321	12	●
A-max 12, 0.5 W	138	GP 13, 0.05 - 0.15 Nm	322	12	●
A-max 12, 0.5 W	138	GP 13, 0.2 - 0.35 Nm	323	12	●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	11 mA
Output signal	TTL compatible
Phase shift ϕ	90°e ± 45°e
Operating temperature range	-25...+85°C
Moment of inertia of code wheel	≤ 0.005 gcm ²
Output current per channel	max. 5 mA

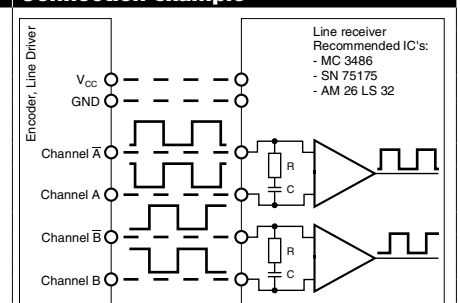
Pin Allocation

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

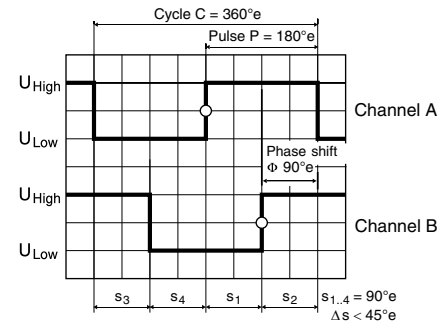


Part Numbers 334910
 Pin 1–8 / X = 0.3 ± 0.03 / Y = 4.5 ± 0.07 / L = 84 ± 3
 Compatible connector:
 Molex 52745-0833

Connection example



Encoder MR Type S, 64–256 CPT, 2 Channels

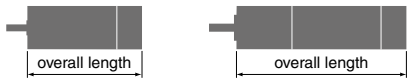


Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

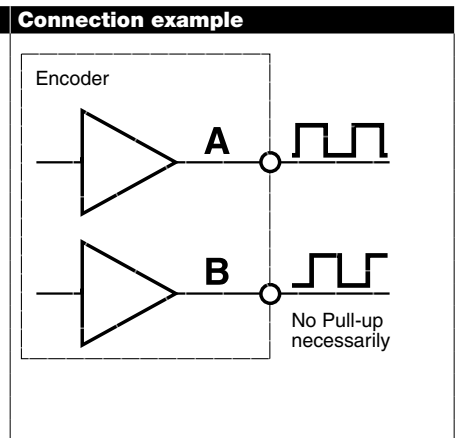
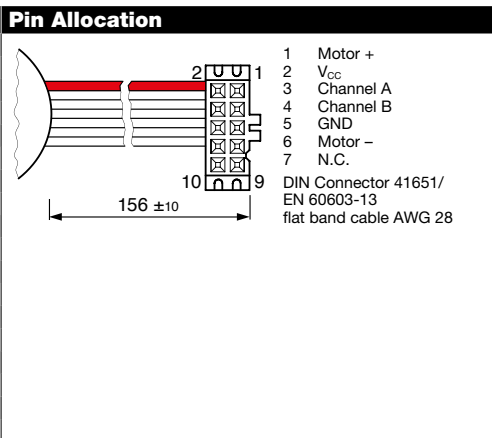
Part Numbers		
241057	241060	241062

Type			
Counts per turn	64	128	256
Number of channels	2	2	2
Max. operating frequency (kHz)	80	160	320
Max. speed (rpm)	75 000	75 000	75 000

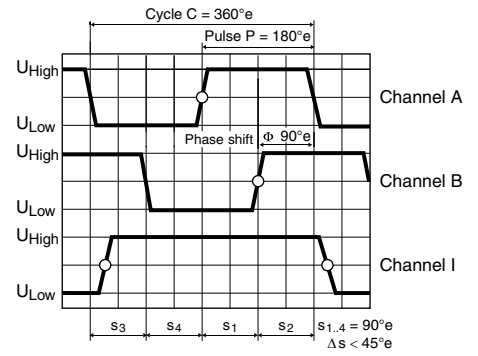


maxon Modular System							
+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead		
RE 13, 0.75 W	107			13	26.3	26.3	26.3
RE 13, 0.75 W	107			13	28.7	28.7	28.7
RE 13, 0.75 W	107	GP 13, 0.05 - 0.15 Nm	322	13	●	●	●
RE 13, 0.75 W	107	GP 13, 0.2 - 0.35 Nm	323	13	●	●	●
RE 13, 2 W	110			13	38.5	38.5	38.5
RE 13, 2 W	111			13	40.9	40.9	40.9
RE 13, 2 W	111	GP 13, 0.05 - 0.15 Nm	322	13	●	●	●
RE 13, 2 W	111	GP 13, 0.2 - 0.35 Nm	323	13	●	●	●
RE 13, 1.5 W	114			13	28.4	28.4	28.4
RE 13, 1.5 W	115			13	30.8	30.8	30.8
RE 13, 1.5 W	115	GP 13, 0.05 - 0.15 Nm	322	13	●	●	●
RE 13, 1.5 W	115	GP 13, 0.2 - 0.35 Nm	323	13	●	●	●
RE 13, 3 W	118			13	40.6	40.6	40.6
RE 13, 3 W	119			13	43.0	43.0	43.0
RE 13, 3 W	119	GP 13, 0.05 - 0.15 Nm	322	13	●	●	●
RE 13, 3 W	119	GP 13, 0.2 - 0.35 Nm	323	13	●	●	●

Technical Data	
Supply voltage V_{CC}	5 V ± 5%
Typical current draw	11 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.005 gcm ²
Output current per channel	max. 5 mA



Encoder MR Type M, 32 CPT, 2/3 Channels



Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

201935	201938
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Type

Counts per turn	32	32
Number of channels	2	3
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	15 000	15 000



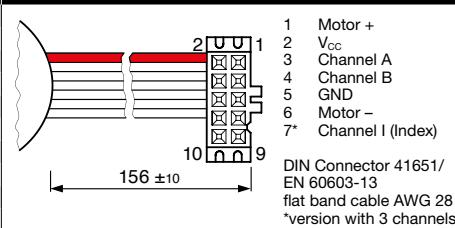
maxon Modular System

+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead	
RE 16, 2 W	120			16	28.0	28.0
RE 16, 2 W	120	GP 16, 0.1 - 0.6 Nm	328/329	16	●	●
RE 16, 2 W	120	GP 16 S	369/370	16	●	●
RE 16, 3.2 W	122			16	45.4	45.4
RE 16, 3.2 W	122	GP 16, 0.1 - 0.6 Nm	328/329	16	●	●
RE 16, 3.2 W	122	GP 16 S	369/370	16	●	●
RE 16, 4.5 W	124			16	48.4	48.4
RE 16, 4.5 W	124	GP 16, 0.1 - 0.6 Nm	328/329	16	●	●
RE 16, 4.5 W	124	GP 16 S	369/370	16	●	●
A-max 16	140/142			16	30.4	30.4
A-max 16	140/142	GS 16, 0.01 - 0.1 Nm	324-327	16	●	●
A-max 16	140/142	GP 16, 0.1 - 0.3 Nm	328	16	●	●
A-max 16	140/142	GP 16 S	369/370	16	●	●
A-max 19, 1.5 W	144			19	34.0	34.0
A-max 19, 1.5 W	144	GP 19, 0.1 - 0.3 Nm	330	19	●	●
A-max 19, 1.5 W	144	GP 22, 0.5 - 2.0 Nm	335	19	●	●
A-max 19, 1.5 W	144	GS 24, 0.1 Nm	339	19	●	●
A-max 19, 1.5 W	144	GP 22 S	372/373	19	●	●
A-max 19, 2.5 W	146			19	35.8	35.8
A-max 19, 2.5 W	146	GP 19, 0.1 - 0.3 Nm	330	19	●	●
A-max 19, 2.5 W	146	GP 22, 0.5 - 2.0 Nm	335	19	●	●
A-max 19, 2.5 W	146	GS 24, 0.1 Nm	339	19	●	●
A-max 19, 2.5 W	146	GP 22 S	372/373	19	●	●
A-max 22	148/150			22	36.9	36.9
A-max 22	148/150	GP 22, 0.1 - 0.6 Nm	331/332	22	●	●
A-max 22	148/150	GP 22, 0.5 - 2.0 Nm	331-335	22	●	●
A-max 22	148/150	GS 24, 0.1 Nm	339	22	●	●
A-max 22	148/150	GP 22 S	372/373	22	●	●

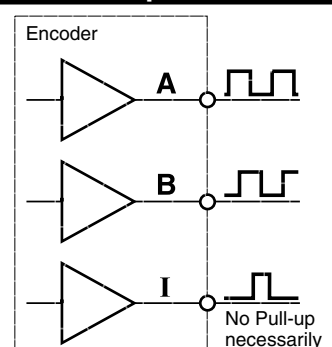
Technical Data

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 Φ	$90^\circ e \pm 45^\circ e$
Operating temperature range	$-40 \dots +85^\circ C$
Moment of inertia of code wheel	≤ 0.09 gcm ²
Output current per channel	max. 5 mA

Pin Allocation

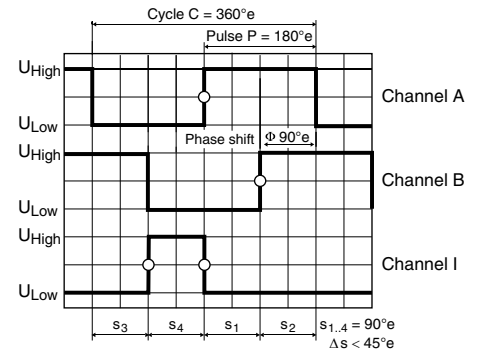


Connection example



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

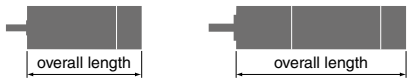


Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

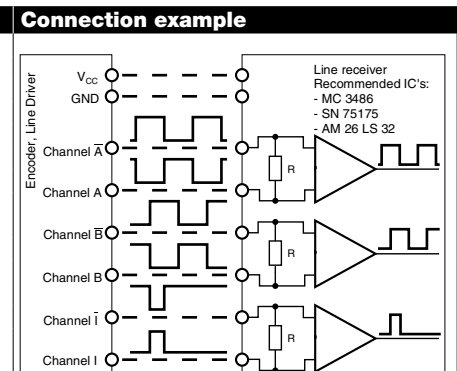
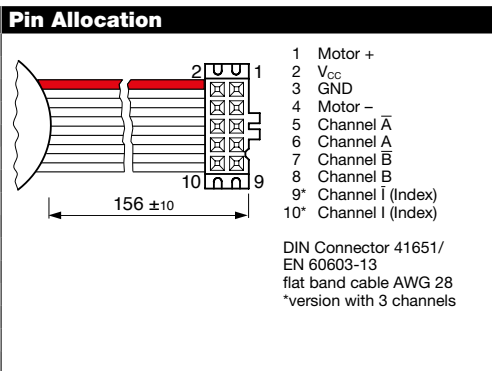
Part Numbers						
228179	228177	228181	228182	201937	201940	

Type						
Counts per turn		128	128	256	256	512
Number of channels		2	3	2	3	2
Max. operating frequency (kHz)		80	80	160	160	320
Max. speed (rpm)		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					
RE 16, 2 W	120			16	28.0	28.0	28.0	28.0	28.0	28.0
RE 16, 2 W	120	GP 16, 0.1 - 0.6 Nm	328/329	16	●	●	●	●	●	●
RE 16, 2 W	120	GP 16 S	369/370	16	●	●	●	●	●	●
RE 16, 3.2 W	122			16	45.4	45.4	45.4	45.4	45.4	45.4
RE 16, 3.2 W	122	GP 16, 0.1 - 0.6 Nm	328/329	16	●	●	●	●	●	●
RE 16, 3.2 W	122	GP 16 S	369/370	16	●	●	●	●	●	●
RE 16, 4.5 W	124			16	48.4	48.4	48.4	48.4	48.4	48.4
RE 16, 4.5 W	124	GP 16, 0.1 - 0.6 Nm	328/329	16	●	●	●	●	●	●
RE 16, 4.5 W	124	GP 16 S	369/370	16	●	●	●	●	●	●
A-max 16	140/142			16	30.4	30.4	30.4	30.4	30.4	30.4
A-max 16	140/142	GS 16, 0.01 - 0.1 Nm	324-327	16	●	●	●	●	●	●
A-max 16	140/142	GP 16, 0.1 - 0.6 Nm	328/329	16	●	●	●	●	●	●
A-max 16	140/142	GP 16 S	369/370	16	●	●	●	●	●	●
A-max 19, 1.5 W	144			19	34.0	34.0	34.0	34.0	34.0	34.0
A-max 19, 1.5 W	144	GP 19, 0.1 - 0.3 Nm	330	19	●	●	●	●	●	●
A-max 19, 1.5 W	144	GP 22, 0.5 - 2.0 Nm	333/335	19	●	●	●	●	●	●
A-max 19, 1.5 W	144	GS 24, 0.1 Nm	339	19	●	●	●	●	●	●
A-max 19, 1.5 W	144	GP 22 S	372/373	19	●	●	●	●	●	●
A-max 19, 2.5 W	146			19	35.8	35.8	35.8	35.8	35.8	35.8
A-max 19, 2.5 W	146	GP 19, 0.1 - 0.3 Nm	330	19	●	●	●	●	●	●
A-max 19, 2.5 W	146	GP 22, 0.5 - 2.0 Nm	333/335	19	●	●	●	●	●	●
A-max 19, 2.5 W	146	GS 24, 0.1 Nm	339	19	●	●	●	●	●	●
A-max 19, 2.5 W	146	GP 22 S	372/373	19	●	●	●	●	●	●
A-max 22	148/150			22	36.9	36.9	36.9	36.9	36.9	36.9
A-max 22	148/150	GP 22, 0.1 - 0.6 Nm	331/332	22	●	●	●	●	●	●
A-max 22	148/150	GP 22, 0.5 - 2.0 Nm	333/335	22	●	●	●	●	●	●
A-max 22	148/150	GS 24, 0.1 Nm	339	22	●	●	●	●	●	●
A-max 22	148/150	GP 22 S	372/373	22	●	●	●	●	●	●

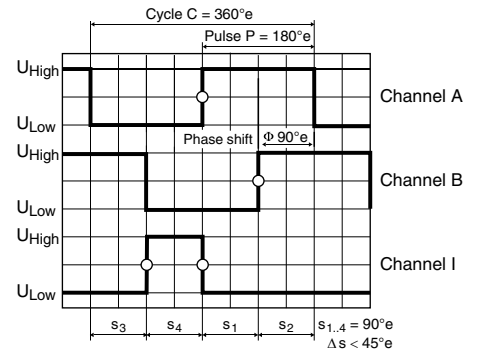
Technical Data	
Supply voltage V_{CC}	5 V ± 5%
Typical current draw 2 channel	11 mA
Typical current draw 3 channel	14 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 0.09 gcm ²
Output current 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. 60)

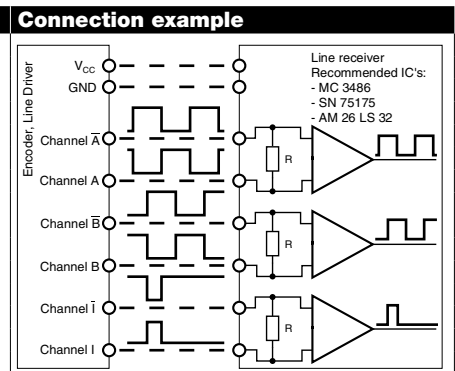
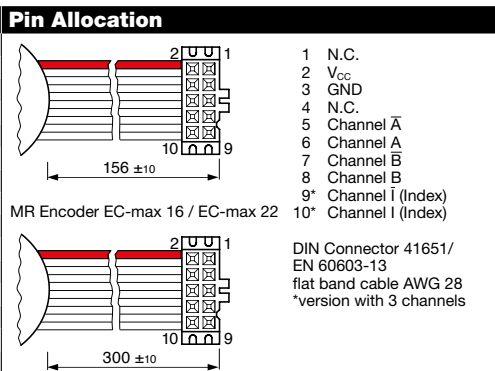
- Stock program
- Standard program
- Special program (on request)

Part Numbers						
228179	228177	228181	228182	201937	201940	

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	∅ Enc [mm]	Overall length [mm] / ● see Gearhead					
EC-max 16, 5 W	219			16	31.3	31.3	31.3	31.3	31.3	31.3
EC-max 16, 5 W	219	GP 16, 0.1 - 0.6 Nm	328/329	16	●	●	●	●	●	●
EC-max 16, 5 W	219	GP 16 S	369/370	16	●	●	●	●	●	●
EC-max 16, 8 W	221			16	43.3	43.3	43.3	43.3	43.3	43.3
EC-max 16, 8 W	221	GP 16, 0.2 - 0.6 Nm	329	16	●	●	●	●	●	●
EC-max 16, 8 W	221	GP 22, 0.5 - 2.0 Nm	336	16	●	●	●	●	●	●
EC-max 16, 8 W	221	GP 16 S/GP 22 S	369/373	16	●	●	●	●	●	●
EC-max 22, 12 W	222			16	41.7	41.7	41.7	41.7	41.7	41.7
EC-max 22, 12 W	222	GP 22, 0.5 - 2.0 Nm	336/337	16	●	●	●	●	●	●
EC-max 22, 12 W	222	KD 32, 1.0 - 4.5 Nm	352	16	●	●	●	●	●	●
EC-max 22, 12 W	222	GP 22 S	372/373	16	●	●	●	●	●	●
EC-max 22, 25 W	223			16	58.2	58.2	58.2	58.2	58.2	58.2
EC-max 22, 25 W	223	GP 22/GP 32	337/347	16	●	●	●	●	●	●
EC-max 22, 25 W	223	GP 32 S	374-379	16	●	●	●	●	●	●

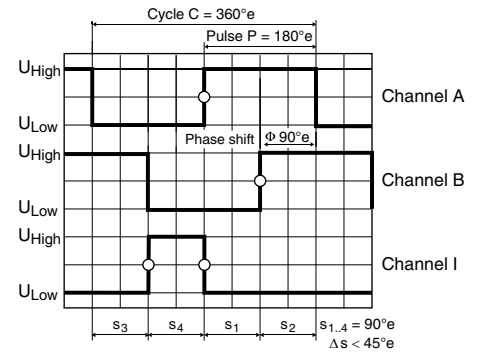
Technical Data	
Supply voltage V_{CC}	$5 V \pm 5\%$
Typical current draw 2 channel	11 mA
Typical current draw 3 channel	14 mA
Output signal	TTL compatible
Phase shift Φ	$90^\circ e \pm 45^\circ e$
Index pulse width	$90^\circ e \pm 45^\circ e$
Operating temperature range	$-25 \dots +85^\circ C$
Moment of inertia of code wheel	$\leq 0.09 \text{ gcm}^2$
Output current per channel	max. 5 mA



The index signal I is synchronized with channel A or B.

Opt. terminal resistance $R > 1 \text{ k}\Omega$

Encoder MR Type ML, 128–1000 CPT, 3 Channels, with Line Driver



Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

225771	225773	225778	225805	225780
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Type	225771	225773	225778	225805	225780
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



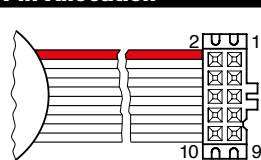
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead				
RE 25	125/127			25	65.5	65.5	65.5	65.5	65.5
RE 25	125/127	GP 26, 0.75 - 4.5 Nm	340	25	●	●	●	●	●
RE 25	125/127	GP 32, 0.75 - 6.0 Nm	342-347	25	●	●	●	●	●
RE 25	125/127	KD 32, 1.0 - 4.5 Nm	352	25	●	●	●	●	●
RE 25	125/127	GP 32 S	374-379	25	●	●	●	●	●
RE 25, 20 W	126			25	54.0	54.0	54.0	54.0	54.0
RE 25, 20 W	126	GP 22, 0.5 Nm	333	25	●	●	●	●	●
RE 25, 20 W	126	GP 26, 0.75 - 4.5 Nm	340	25	●	●	●	●	●
RE 25, 20 W	126	GP 32, 0.75 - 6.0 Nm	342-347	25	●	●	●	●	●
RE 25, 20 W	126	KD 32, 1.0 - 4.5 Nm	352	25	●	●	●	●	●
RE 25, 20 W	126	GP 32 S	374-379	25	●	●	●	●	●
A-max 26	152-158			25	53.5	53.5	53.5	53.5	53.5
A-max 26	152-158	GP 26, 0.75 - 4.5 Nm	340	25	●	●	●	●	●
A-max 26	152-158	GS 30, 0.07 - 0.2 Nm	341	25	●	●	●	●	●
A-max 26	152-158	GP 32, 0.75 - 6.0 Nm	342-347	25	●	●	●	●	●
A-max 26	152-158	GS 38, 0.1 - 0.6 Nm	353	25	●	●	●	●	●
A-max 26	152-158	GP 32 S	374-379	25	●	●	●	●	●
EC-max 30, 40 W	224			25			54.2		54.2
EC-max 30, 40 W	224	GP 32, 1 - 8.0 Nm	347/350	25	●	●	●	●	●
EC-max 30, 40 W	224	KD 32, 1.0 - 4.5 Nm	352	25	●	●	●	●	●
EC-max 30, 40 W	224	GP 32 S	374-379	25	●	●	●	●	●
EC-max 30, 60 W	225			25			76.2		76.2
EC-max 30, 60 W	225	GP 32, 1 - 8.0 Nm	347/350	25	●	●	●	●	●
EC-max 30, 60 W	225	KD 32, 1.0 - 4.5 Nm	352	25	●	●	●	●	●
EC-max 30, 60 W	225	GP 42, 3 - 15 Nm	355	25	●	●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	14 mA
Output signal	TTL compatible
Phase shift Φ	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 ²
Output current per channel	max. 5 mA

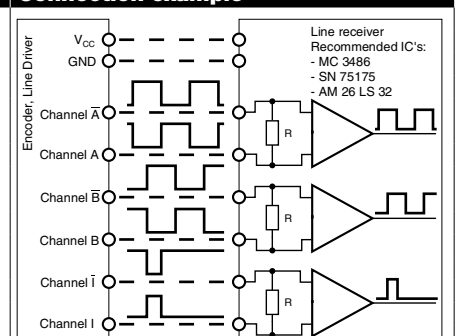
Pin Allocation



RE/A-max L = 506
EC-max L = 500

- 1 N.C.
 - 2 V_{CC}
 - 3 GND
 - 4 N.C.
 - 5 Channel A
 - 6 Channel A
 - 7 Channel B
 - 8 Channel B
 - 9 Channel I (Index)
 - 10 Channel I (Index)
- DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

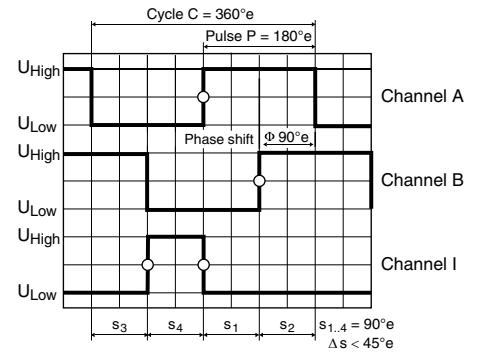
Connection example



Opt. terminal resistance $R > 1\text{ k}\Omega$

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. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

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

Type

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



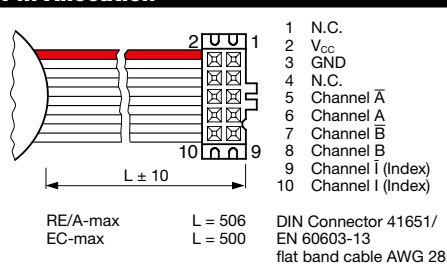
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Ø Enc [mm]	Overall length [mm] / ● see Gearhead					
RE 30, 15 W	128			32	79.4	79.4	79.4	79.4	79.4	79.4
RE 30, 15 W	128	GP 32, 0.75 - 4.5 Nm	344	32	●	●	●	●	●	●
RE 30, 60 W	129			32	79.4	79.4	79.4	79.4	79.4	79.4
RE 30, 60 W	129	GP 32, 0.75 - 4.5 Nm	342	32	●	●	●	●	●	●
RE 30, 60 W	129	GP 32, 0.75 - 6.0 Nm	344-349	32	●	●	●	●	●	●
RE 30, 60 W	129	GP 32 S	374-379	32	●	●	●	●	●	●
RE 35, 90 W	130			32	82.4	82.4	82.4	82.4	82.4	82.4
RE 35, 90 W	130	GP 32, 0.75 - 4.5 Nm	342	32	●	●	●	●	●	●
RE 35, 90 W	130	GP 32, 0.75 - 6.0 Nm	344-349	32	●	●	●	●	●	●
RE 35, 90 W	130	GP 32, 4.0 - 8.0 Nm	350	32	●	●	●	●	●	●
RE 35, 90 W	130	GP 42, 3 - 15 Nm	354	32	●	●	●	●	●	●
RE 35, 90 W	130	GP 32 S	374-379	32	●	●	●	●	●	●
RE 40, 25 W	131			32	82.4	82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	132			32	82.4	82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	132	GP 42, 3 - 15 Nm	354	32	●	●	●	●	●	●
RE 40, 150 W	132	GP 52, 4 - 30 Nm	359	32	●	●	●	●	●	●
A-max 32	160/162			32	72.7	72.7	72.7	72.7	72.7	72.7
A-max 32	160/162	GP 32, 0.75 - 6.0 Nm	344-347	32	●	●	●	●	●	●
A-max 32	160/162	GS 38, 0.1 - 0.6 Nm	353	32	●	●	●	●	●	●
A-max 32	160/162	GP 32 S	374-379	32	●	●	●	●	●	●
EC-max 40, 70 W	226			31.8	73.9	73.9	73.9	73.9	73.9	73.9
EC-max 40, 70 W	226	GP 42, 3 - 15 Nm	355	31.8	●	●	●	●	●	●
EC-max 40, 120 W	227			31.8	103.9	103.9	103.9	103.9	103.9	103.9
EC-max 40, 120 W	227	GP 52, 4 - 30 Nm	360	31.8	●	●	●	●	●	●

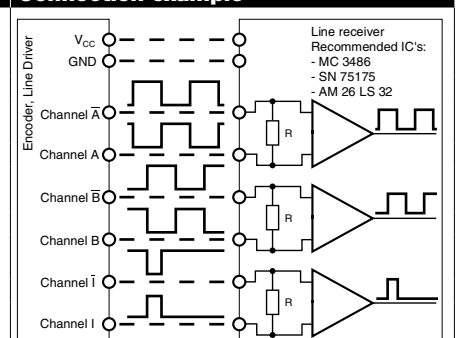
Technical Data

Supply voltage V_{CC}	5 V ± 5%
Typical current draw	14 mA
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25...+85 °C
Moment of inertia of code wheel	≤ 1.7 gcm ²
Output current per channel	max. 5 mA

Pin Allocation



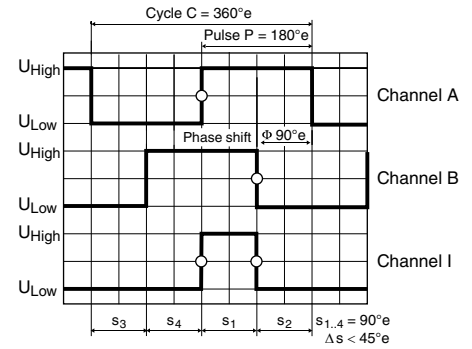
Connection example



Opt. terminal resistance R > 1 kΩ

The index signal I is synchronized with channel A or B.

Encoder 6 OPT 128 CPT, 3 Channels



Direction of rotation cw (definition cw p. 60)

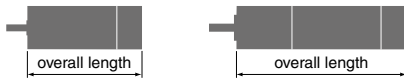
- Stock program
- Standard program
- Special program (on request)

Part Numbers

502807

Type (provisional)

Counts per turn	128
Number of channels	3
Max. operating frequency (kHz)	1000
Max. speed (rpm)	60000



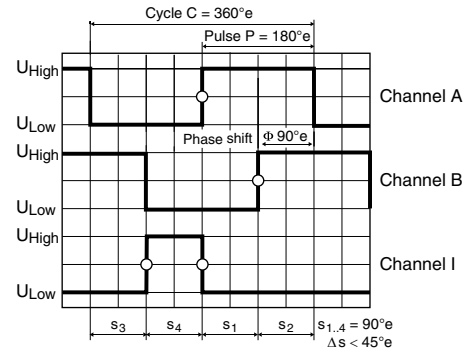
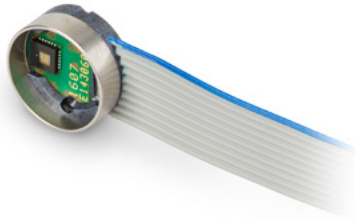
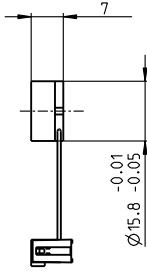
maxon Modular System

+ Motor	Page	+ Gearhead	Page	∅ Enc [mm]	Overall length [mm] / ● see Gearhead
EC 6, 1.5 W	204			6 (8*)	23.4
EC 6, 1.5 W	204	GP 6, 0.002 - 0.03 Nm	317	6 (8*)	●
EC 6, 1.5 W	204	GP 6 S	365-366	6 (8*)	●
EC 6, 2.0 W	205			6 (8*)	23.4
EC 6, 2.0 W	205	GP 6, 0.002 - 0.03 Nm	317	6 (8*)	●
EC 6, 2.0 W	205	GP 6 S	365-366	6 (8*)	●

*Max diameter of the end cap (incl. extension).

Technical Data	Pin Allocation	Connection example
Supply voltage V_{CC} 3 - 6 V Typical current draw 4 mA Phase shift ϕ $90^\circ e \pm 45^\circ e$ Index pulse width $90^\circ e \pm 45^\circ e$ Operating temperature range -20...+85 °C Moment of inertia of code wheel $\leq 0.001 \text{ gcm}^2$ Output current per channel $\leq 5 \text{ mA}$	<ul style="list-style-type: none"> 1 EC 2 W1 3 W2 4 W3 5 GND 6 V_{CC} 7 Chanal A 8 Chanal B 9 Chanal I 10 not connected 11 not connected 12 do not connect <p>Compatible connector: Molex 52745-1297, Tyco 1-1734839-2 Adapter: 498157</p> <p>Please note: max. continuous current 0.5 A</p>	

Encoder 16 RIO 512-65 536 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 60)

- 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 Φ (°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



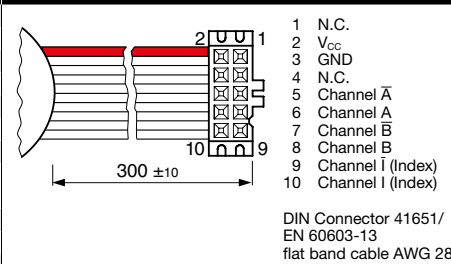
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
EC-4pole 22, 90 W	231					59.3	59.3	59.3	59.3	59.3
EC-4pole 22, 90 W	231	GP 22, 2.0 - 3.4 Nm	337			●	●	●	●	●
EC-4pole 22, 90 W	231	GP 32, 1.0 - 6.0 Nm	347			●	●	●	●	●
EC-4pole 22, 90 W	231	GP 32 S	374-379			●	●	●	●	●
EC-4pole 22, 120 W	232					76.7	76.7	76.7	76.7	76.7
EC-4pole 22, 120 W	232	GP 22, 2.0 - 3.4 Nm	337			●	●	●	●	●
EC-4pole 22, 120 W	232	GP 32, 1.0 - 6.0 Nm	347			●	●	●	●	●
EC-4pole 22, 120 W	232	GP 32 S	374-379			●	●	●	●	●
EC-4pole 30, 100 W	233					59.4	59.4	59.4	59.4	59.4
EC-4pole 30, 100 W	233	GP 32, 4.0 - 8.0 Nm	350			●	●	●	●	●
EC-4pole 30, 100 W	233	GP 42, 3.0 - 15.0 Nm	355			●	●	●	●	●
EC-4pole 30, 200 W	235					76.4	76.4	76.4	76.4	76.4
EC-4pole 30, 200 W	235	GP 32, 4.0 - 8.0 Nm	350			●	●	●	●	●
EC-4pole 30, 200 W	235	GP 42, 3.0 - 15.0 Nm	355			●	●	●	●	●
EC-i 30, 30 W	242					52.2	52.2	52.2	52.2	52.2
EC-i 30, 30 W	242	GP 32, 1.0 - 6.0 Nm	347			●	●	●	●	●
EC-i 30, 30 W	242	GP 32 S	374-379			●	●	●	●	●
EC-i 30, 45 W	243					52.2	52.2	52.2	52.2	52.2
EC-i 30, 45 W	243	GP 32, 1.0 - 6.0 Nm	347			●	●	●	●	●
EC-i 30, 45 W	243	GP 32 S	374-379			●	●	●	●	●
EC-i 30, 50 W	244					74.2	74.2	74.2	74.2	74.2
EC-i 30, 50 W	244	GP 32, 1.0 - 6.0 Nm	347			●	●	●	●	●
EC-i 30, 50 W	244	GP 32 S	374-379			●	●	●	●	●
EC-i 30, 75 W	245					74.2	74.2	74.2	74.2	74.2
EC-i 30, 75 W	245	GP 32, 1.0 - 6.0 Nm	347			●	●	●	●	●
EC-i 30, 75 W	245	GP 32 S	374-379			●	●	●	●	●

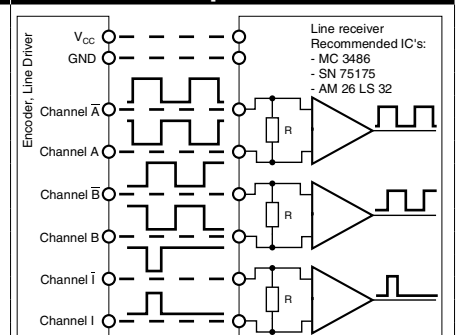
Technical Data

Supply voltage V_{CC}	$5 V \pm 10\%$
Typical current draw	50 mA
Output signal	EIA Standard RS 422
Operating temperature range	$-40...+100^\circ C$
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



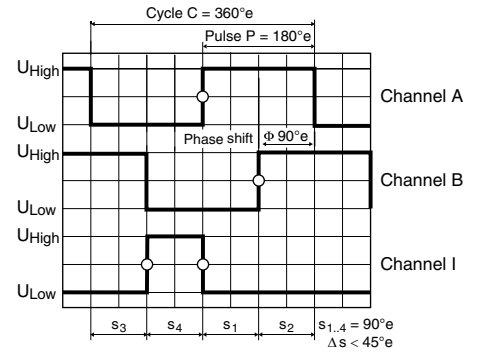
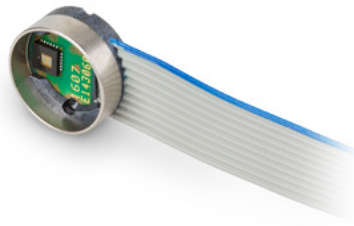
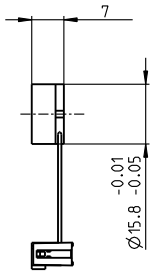
Connection example



Opt. terminal resistance R = typical 120 Ω

The index signal I is synchronized with channel A or B.

Encoder 16 RIO 512-65 536 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

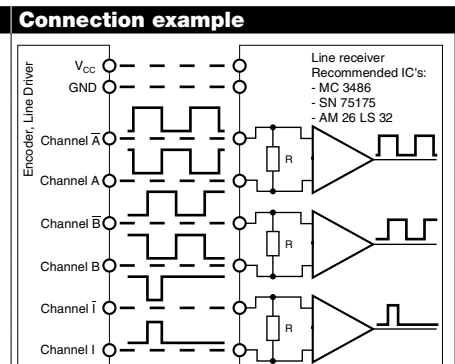
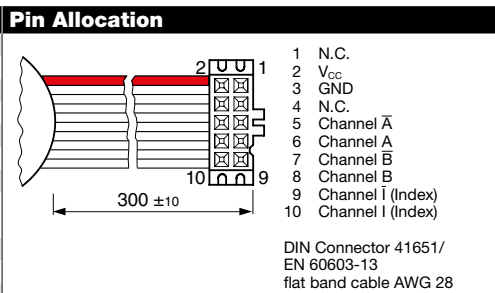
Part Numbers				
575826	575827	575828	575829	575830

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 Φ (°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-i 40, 50 W	246/247					40.5	40.5	40.5	40.5	40.5
EC-i 40, 50 W	246	GP 32, 1.0 - 6.0 Nm	348			●	●	●	●	●
EC-i 40, 50 W	246	GP 32 S	374-379			●	●	●	●	●
EC-i 40, 50 W	246/247	GP 42, 3.0 - 15.0 Nm	355			●	●	●	●	●
EC-i 40, 70 W	248/249					50.5	50.5	50.5	50.5	50.5
EC-i 40, 70 W	248	GP 32, 1.0 - 6.0 Nm	348			●	●	●	●	●
EC-i 40, 70 W	248	GP 32 S	374-379			●	●	●	●	●
EC-i 40, 70 W	248/249	GP 42, 3.0 - 15.0 Nm	355			●	●	●	●	●
EC-i 40, 100 W	250					70.5	70.5	70.5	70.5	70.5
EC-i 40, 100 W	250	GP 42, 3.0 - 15.0 Nm	355			●	●	●	●	●
EC-i 52, 180 W	251					96.5	96.5	96.5	96.5	96.5
EC-i 52, 180 W	251	GP 52, 4.0 - 30.0 Nm	360			●	●	●	●	●

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

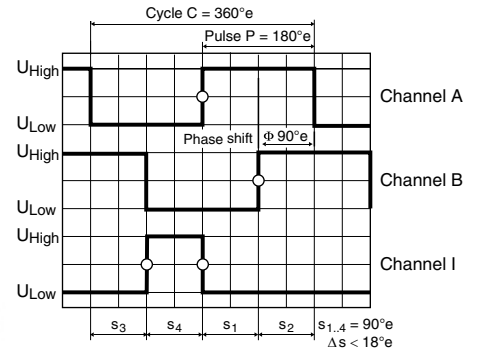
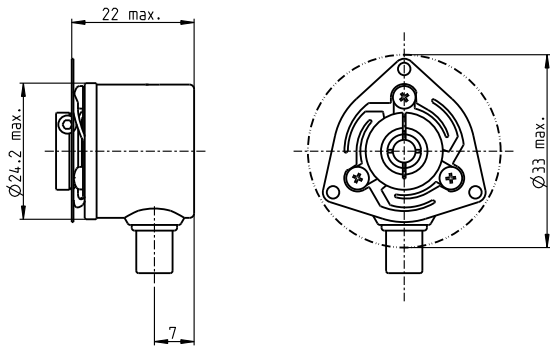


The index signal I is synchronized with channel A or B.

Opt. terminal resistance R = typical 120 Ω

Encoder 2RMHF 3000–5000 CPT, 3 Channels, with Line Driver RS 422

maxon sensor

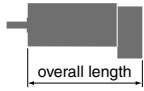


Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

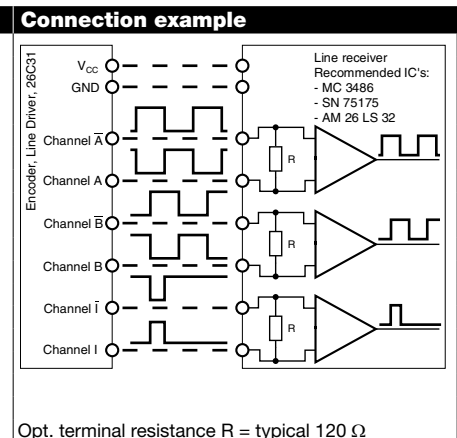
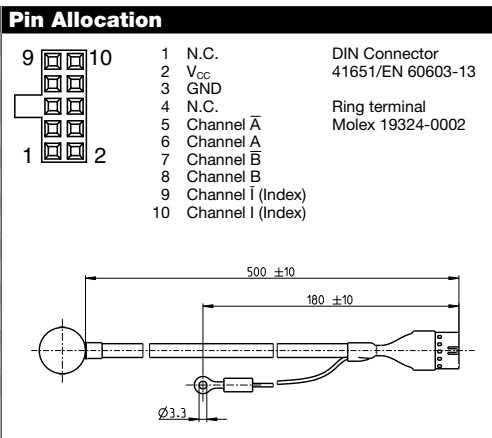
Part Numbers					
461214	461216	461213	461215	X drives	

Type (provisional)	461214	461216	461213	461215	X drives
Counts per turn	3000	3000	5000	5000	3000–5000
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	200	200	200	200	200
Max. speed (rpm)	4000	4000	2400	2400	4000–2400
Shaft diameter (mm)	4	6	4	6	4



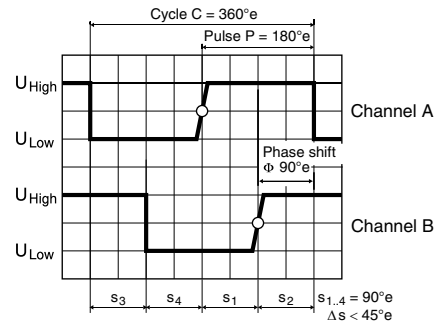
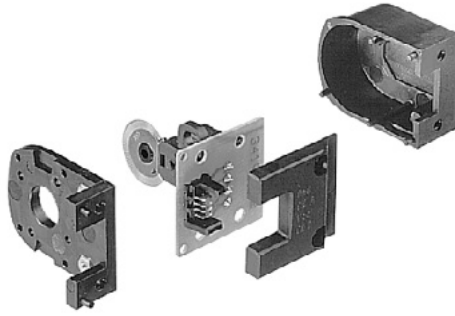
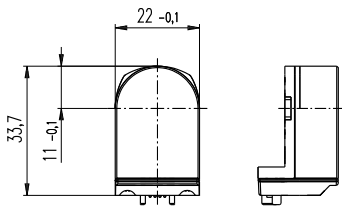
maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
DCX 32 L	86					online
DCX 35 L	87					online
EC-4pole 30, 100 W 233						75.2 / 75.2
EC-4pole 30, 200 W 235						92.2 / 92.2
EC-i 40, 50 W	246/247					56.2 / 56.2
EC-i 40, 70 W	248/249					66.2 / 66.2
EC-i 40, 100 W	250					86.2 / 86.2

Technical Data	
Supply voltage V _{CC}	4.5 - 5.5 V
Typical current draw	30 mA
Output signal driver used:	EIA Standard RS 422 26C31
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	1.0 gcm ²
Output current per channel	± 30 mA
Phase shift ϕ	90°e ± 18°e
Index pulse width	90°e ± 18°e
Max. startup torque at 25 °C	< 5 mNm



The index signal I is synchronized with channel A or B.

Encoder Enc 22 100 CPT, 2 Channels



Direction of rotation cw (definition cw p. 60)

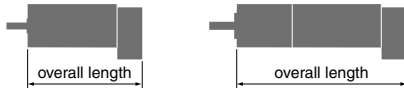
- Stock program
- Standard program
- Special program (on request)

Part Numbers

	103935	110520	110521
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Type

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



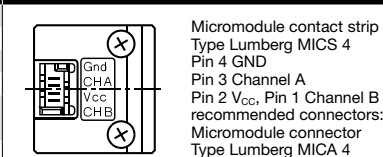
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 25	125/127			68.6
RE 25	125/127	GP 26, 0.75 - 4.5 Nm	340	●
RE 25	125/127	GP 32, 0.75 - 4.5 Nm	342	●
RE 25	125/127	GP 32, 0.75 - 4.5 Nm	343	●
RE 25	125/127	GP 32, 1.0 - 6.0 Nm	346	●
RE 25	125/127	GP 32 S	374-379	●
A-max 19, 1.5 W	144			43.3
A-max 19, 1.5 W	144	GP 19, 0.1 - 0.3 Nm	330	●
A-max 19, 1.5 W	144	GP 22, 0.1 - 2.0 Nm	333/335	●
A-max 19, 1.5 W	144	GS 24, 0.1 Nm	339	●
A-max 19, 1.5 W	146	GP 22 S	372/373	●
A-max 19, 2.5 W	146			45.9
A-max 19, 2.5 W	146	GP 19, 0.1 - 0.3 Nm	330	●
A-max 19, 2.5 W	146	GP 22, 0.1 - 2.0 Nm	333/335	●
A-max 19, 2.5 W	146	GS 24, 0.1 Nm	339	●
A-max 19, 2.5 W	146	GP 22 S	372/373	●
A-max 22	148/150			46.3
A-max 22	148/150	GP 22, 0.1 - 0.3 Nm	331	●
A-max 22	148/150	GP 22, 0.2 - 0.6 Nm	332	●
A-max 22	148/150	GP 22, 0.1 - 2.0 Nm	331-335	●
A-max 22	148/150	GS 24, 0.1 Nm	339	●
A-max 22	148/150	GP 22 S	372/373	●
A-max 26	152-158			59.1
A-max 26	152-158	GP 26, 0.75 - 4.5 Nm	340	●
A-max 26	152-158	GS 30, 0.07 - 0.2 Nm	341	●
A-max 26	152-158	GP 32, 0.75 - 4.5 Nm	342	●
A-max 26	152-158	GP 32, 0.75 - 4.5 Nm	343	●
A-max 26	152-158	GP 32, 1.0 - 6.0 Nm	347	●
A-max 26	152-158	GS 38, 0.1 - 0.6 Nm	353	●
A-max 26	152-158	GP 32 S	374-379	●

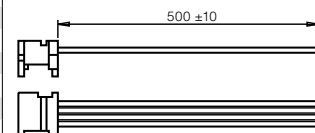
Technical Data

Supply voltage V_{CC}	5 V \pm 10%
Typical current draw	18 mA
Output signal	TTL compatible
Phase shift Φ	90°e \pm 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 11$ k Ω , 25°C)	200 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 11$ k Ω , 25°C)	50 ns
Operating temperature range	-20...+85°C
Moment of inertia of code wheel	≤ 0.05 gcm ²
Output current per channel	min. -1 mA, max. 5 mA

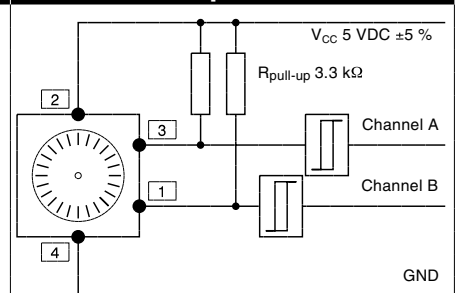
Pin Allocation



Order number for connector with cable: 3419.506

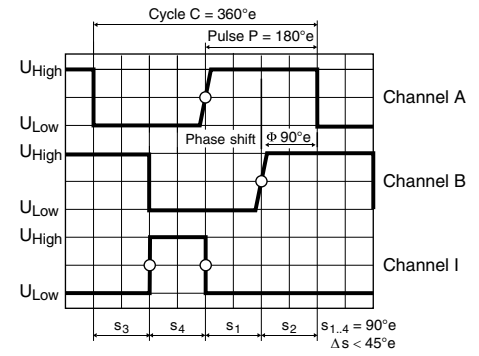
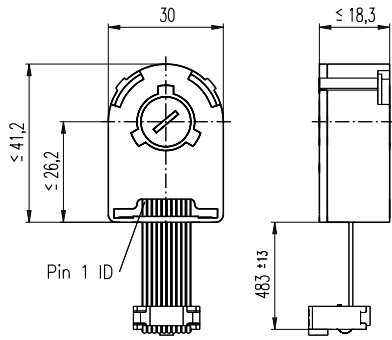


Connection example



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. 60)

- 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 Φ (°e)	90 ± 25	90 ± 45	90 ± 25	90 ± 45	90 ± 45	90 ± 45	90 ± 25	90 ± 45



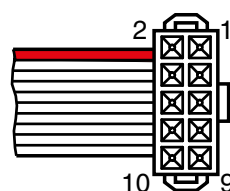
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
EC-4pole 22, 90 W 231						70.1	70.1
EC-4pole 22, 90 W 231		GP 22/GP 32	337/347			●	●
EC-4pole 22, 90 W 231		GP 32 S	374-379			●	●
EC-4pole 22, 120 W 232						87.5	87.5
EC-4pole 22, 120 W 232		GP 22/GP 32	337/347			●	●
EC-4pole 22, 120 W 232		GP 32 S	374-379			●	●
EC-4pole 30, 100 W 233						67.6	67.6
EC-4pole 30, 100 W 233		GP 32, 4.0 - 8.0 Nm	350			●	●
EC-4pole 30, 100 W 233		GP 42, 3.0 - 15.0 Nm	355			●	●
EC-4pole 30, 100 W 233				AB 20	478	104.0	104.0
EC-4pole 30, 100 W 233		GP 32, 4.0 - 8.0 Nm	350	AB 20	478	●	●
EC-4pole 30, 100 W 233		GP 42, 3.0 - 15.0 Nm	355	AB 20	478	●	●
EC-4pole 30, 200 W 235						84.6	84.6
EC-4pole 30, 200 W 235		GP 32, 4.0 - 8.0 Nm	350			●	●
EC-4pole 30, 200 W 235		GP 42, 3.0 - 15.0 Nm	355			●	●
EC-4pole 30, 200 W 235				AB 20	478	121.0	121.0
EC-4pole 30, 200 W 235		GP 32, 4.0 - 8.0 Nm	350	AB 20	478	●	●
EC-4pole 30, 200 W 235		GP 42, 3.0 - 15.0 Nm	355	AB 20	478	●	●
EC-i 30, 30 W 242						62.7	62.7
EC-i 30, 30 W 242		GP 32, 1.0 - 6.0 Nm	347			●	●
EC-i 30, 30 W 242		GP 32 S	374-379			●	●
EC-i 30, 45 W 243						62.7	62.7
EC-i 30, 45 W 243		GP 32, 1.0 - 6.0 Nm	348			●	●
EC-i 30, 45 W 243		GP 32 S	374-379			●	●
EC-i 30, 50 W 244						84.7	84.7
EC-i 30, 50 W 244		GP 32, 1.0 - 6.0 Nm	348			●	●
EC-i 30, 50 W 244		GP 32 S	374-379			●	●
EC-i 30, 75 W 245						84.7	84.7
EC-i 30, 75 W 245		GP 32, 1.0 - 6.0 Nm	348			●	●
EC-i 30, 75 W 245		GP 32 S	374-379			●	●

Technical Data

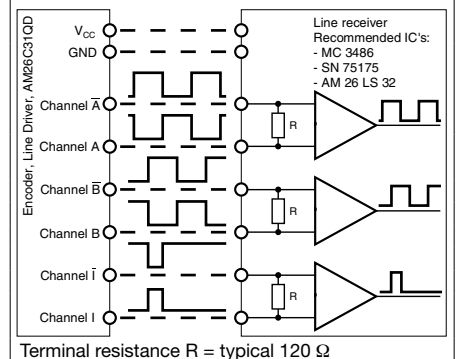
Supply voltage V_{CC}	5 V ± 10%
Typical current draw	30 mA
Output signal driver used:	EIA Standard RS 422 AM26C31QD
Signal rise time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Signal fall time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Output current per channel	± 20 mA

Pin Allocation

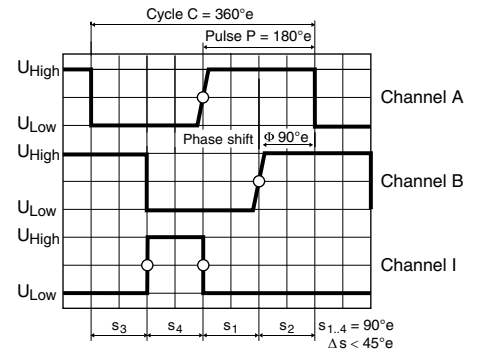
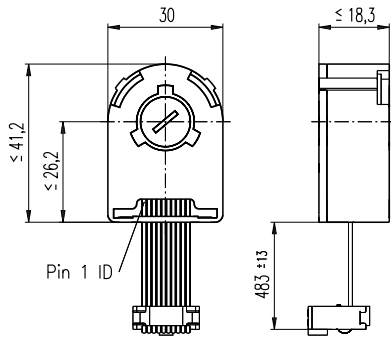


- 1 N.C.
 - 2 V_{CC}
 - 3 GND
 - 4 N.C.
 - 5 Channel \bar{A}
 - 6 Channel A
 - 7 Channel \bar{B}
 - 8 Channel B
 - 9 Channel \bar{I} (Index)
 - 10 Channel I (Index)
- Pin type DIN 41651/ EN 60603-13
flat band cable AWG 28

Connection example



Encoder AEDL 5810 1024–5000 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 60)

- 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 Φ (°e)	90 ± 25	90 ± 45	90 ± 25	90 ± 45	90 ± 45	90 ± 45	90 ± 25	90 ± 45

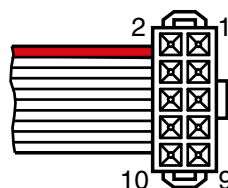
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-i 40, 50 W	246-247					49.0
EC-i 40, 50 W	246	GP 32, 1.0 - 6.0 Nm	348			●
EC-i 40, 50 W	246	GP 32 S	374-379			●
EC-i 40, 50 W	246-247	GP 42, 3.0 - 15.0 Nm	355			●
EC-i 40, 70 W	248/249					59.0
EC-i 40, 70 W	248	GP 32, 1.0 - 6.0 Nm	348			●
EC-i 40, 70 W	248	GP 32 S	374-379			●
EC-i 40, 70 W	248/249	GP 42, 3.0 - 15.0 Nm	356			●
EC-i 40, 100 W	250					79.0
EC-i 40, 100 W	250	GP 42, 3.0 - 15.0 Nm	355			●
EC-i 52, 180 W	251					100.7
EC-i 52, 180 W	251	GP 52, 4.0 - 30.0 Nm	360			●
DCX 22 S	80-81					online
DCX 22 L	82-83					online
DCX 26 L	84-85					online
DCX 32 L	86					online
DCX 35 L	87					online

Technical Data

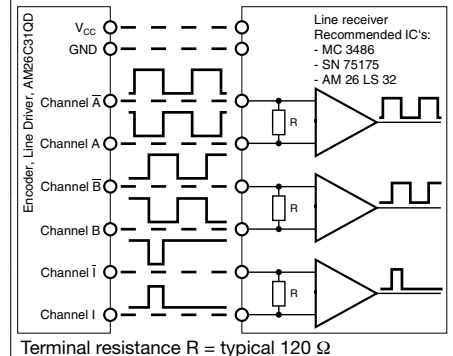
Supply voltage V_{CC}	5 V ± 10%
Typical current draw	30 mA
Output signal driver used:	EIA Standard RS 422 AM26C31QD
Signal rise time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Signal fall time (typically, at $C_L = 100$ pF, 25 °C)	10 ns
Index pulse width	90°e
Operating temperature range	-40...+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Output current per channel	± 20 mA

Pin Allocation



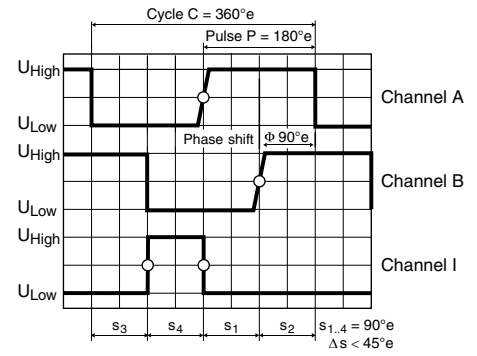
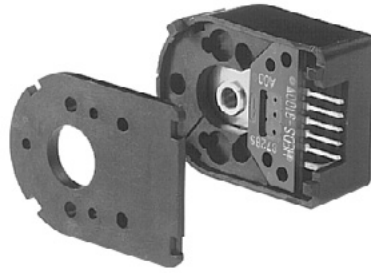
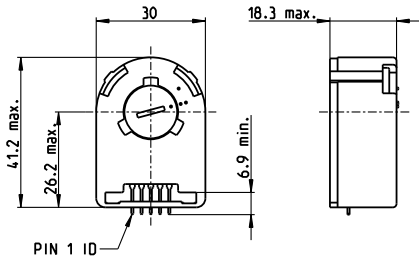
- 1 N.C.
 - 2 V_{CC}
 - 3 GND
 - 4 N.C.
 - 5 Channel \bar{A}
 - 6 Channel A
 - 7 Channel \bar{B}
 - 8 Channel B
 - 9 Channel \bar{I} (Index)
 - 10 Channel I (Index)
- Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

Connection example



The index signal I is synchronized with channel A or B.

Encoder HEDS 5540 500 CPT, 3 Channels



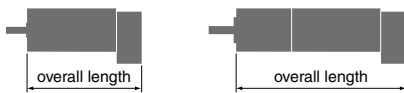
Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

110511	110513	110515	X drives
--------	--------	--------	----------

Type	110511	110513	110515	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	2-4



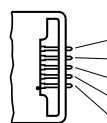
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25	125/127					75.3
RE 25	125/127	GP 26, 0.75 - 4.5 Nm	340			●
RE 25	125/127	GP 32, 0.75 - 6.0 Nm	342-346			●
RE 25	125/127	KD 32, 1.0 - 4.5 Nm	352			●
RE 25	125/127	GP 32 S	374-379			●
RE 25, 20 W	127			AB 28	480	105.8
RE 25, 20 W	127	GP 26, 0.75 - 4.5 Nm	340	AB 28	480	●
RE 25, 20 W	127	GP 32, 0.75 - 6.0 Nm	342-346	AB 28	480	●
RE 25, 20 W	127	KD 32, 1.0 - 4.5 Nm	352	AB 28	480	●
RE 25, 20 W	127	GP 32 S	374-379	AB 28	480	●
RE 30, 15 W	128					88.8
RE 30, 15 W	128	GP 32, 0.75 - 4.5 Nm	344			●
RE 30, 60 W	129					88.8
RE 30, 60 W	129	GP 32, 0.75 - 6.0 Nm	342-349			●
RE 30, 60 W	129	KD 32, 1.0 - 4.5 Nm	352			●
RE 30, 60 W	129	GP 32 S	374-379			●
RE 35, 90 W	130					91.7
RE 35, 90 W	130	GP 32, 0.75 - 8.0 Nm	342-350			●
RE 35, 90 W	130	GP 42, 3.0 - 15 Nm	354			●
RE 35, 90 W	130	GP 32 S	374-379			●
RE 35, 90 W	130			AB 28	480	124.3
RE 35, 90 W	130	GP 32, 0.75 - 8.0 Nm	342-350	AB 28	480	●
RE 35, 90 W	130	GP 42, 3.0 - 15 Nm	354	AB 28	480	●
RE 35, 90 W	130	GP 32 S	374-379	AB 28	480	●
RE 40, 25 W	131					91.7
RE 40, 150 W	132					●
RE 40, 150 W	132	GP 42, 3.0 - 15 Nm	354			●
RE 40, 150 W	132	GP 52, 4.0 - 30 Nm	359			●
RE 40, 150 W	132			AB 28	480	124.3
RE 40, 150 W	132	GP 42, 3.0 - 15 Nm	354	AB 28	480	●
RE 40, 150 W	132	GP 52, 4.0 - 30 Nm	359	AB 28	480	●
DCX 22 S	80-81					online
DCX 22 L	82-83					online
DCX 26 L	84-85					online
DCX 32 L	86					online
DCX 35 L	87					online

Technical Data

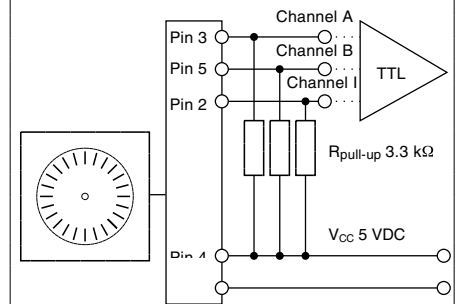
Supply voltage V_{CC}	5 V \pm 10%
Typical current draw	55 mA
Output signal	TTL compatible
Phase shift ϕ	90° \pm 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , 25°C)	40 ns
Index pulse width (nominal)	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	min. -1 mA, max. 5 mA

Pin Allocation



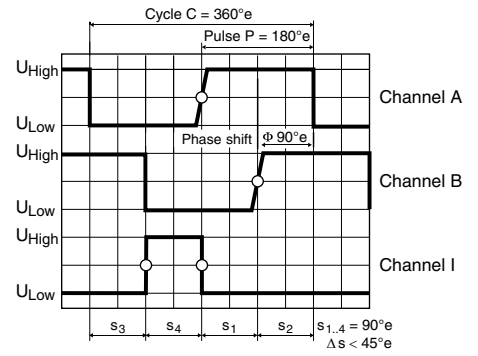
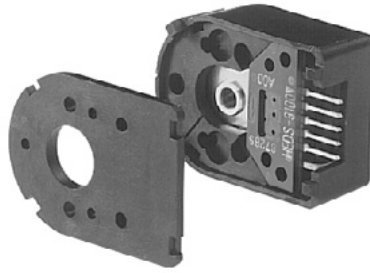
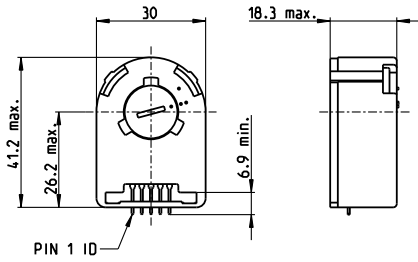
Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	V_{CC}	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

Connection example



The index signal I is synchronized with channel A or B.

Encoder HEDS 5540 500 CPT, 3 Channels



Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

Part Numbers

110511	110513	110515	110517
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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	8

maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25, 20 W	126					63.8
RE 25, 20 W	126	GP 26, 0.75 - 4.5 Nm	340			●
RE 25, 20 W	126	GP 32, 0.75 - 4.5 Nm	342			●
RE 25, 20 W	126	GP 32, 0.75 - 6.0 Nm	343/346			●
RE 25, 20 W	126	KD 32, 1.0 - 4.5 Nm	352			●
RE 25, 20 W	126	GP 32 S	374-378			●
RE 25, 20 W	126			AB 28	480	94.3
RE 25, 20 W	126	GP 22, 0.5 Nm	333			●
RE 25, 20 W	126	GP 26, 0.75 - 4.5 Nm	340	AB 28	480	●
RE 25, 20 W	126	GP 32, 0.75 - 4.5 Nm	342	AB 28	480	●
RE 25, 20 W	126	GP 32, 0.75 - 6.0 Nm	343/346	AB 28	480	●
RE 25, 20 W	126	KD 32, 1.0 - 4.5 Nm	352	AB 28	480	●
RE 25, 20 W	126	GP 32 S	374-378	AB 28	480	●
RE 50, 200 W	133					128.7
RE 50, 200 W	133	GP 52, 4 - 30 Nm	360			●
RE 50, 200 W	133	GP 62, 8 - 50 Nm	361			●
RE 65, 250 W	134					157.3
RE 65, 250 W	134	GP 81, 20 - 120 Nm	362			●
A-max 26	152-158					63.1
A-max 26	152-158	GP 26, 0.75 - 4.5 Nm	340			●
A-max 26	152-158	GS 30, 0.07 - 0.2 Nm	341			●
A-max 26	152-158	GP 32, 0.75 - 4.5 Nm	342			●
A-max 26	152-158	GP 32, 0.75 - 6.0 Nm	343/347			●
A-max 26	152-158	GS 38, 0.1 - 0.6 Nm	353			●
A-max 26	152-158	GP 32 S	374-378			●
A-max 32	160/162					82.3
A-max 32	160/162	GP 32, 0.75 - 6.0 Nm	342-347			●
A-max 32	160/162	GS 38, 0.1 - 0.6 Nm	353			●
A-max 32	160/162	GP 32 S	374-378			●
EC 32, 80 W	212					78.4
EC 32, 80 W	212	GP 32, 0.75 - 6.0 Nm	342-349			●
EC 32, 80 W	212	GP 32 S	374-378			●
EC 40, 170 W	213					103.4
EC 40, 170 W	213	GP 42, 3.0 - 15 Nm	354			●
EC 40, 170 W	213	GP 52, 4.0 - 30 Nm	359			●

Technical Data

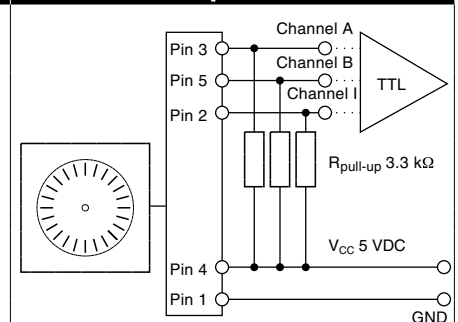
Supply voltage V_{CC}	$5V \pm 10\%$
Typical current draw	55 mA
Output signal	TTL compatible
Phase shift Φ	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25\text{ pF}$, $R_L = 2.7\text{ k}\Omega$, 25°C)	180 ns
Signal fall time (typically, at $C_L = 25\text{ pF}$, $R_L = 2.7\text{ k}\Omega$, 25°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 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

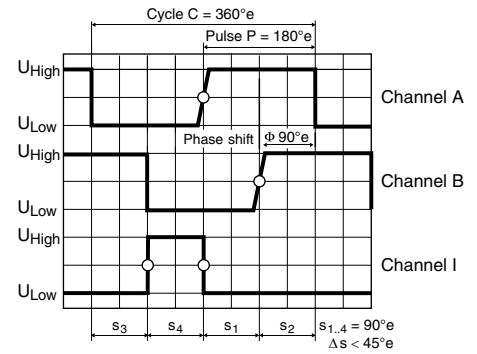
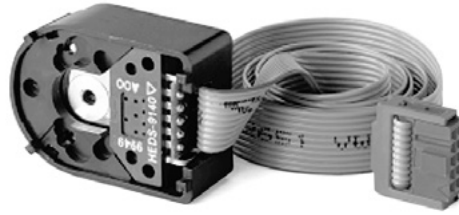
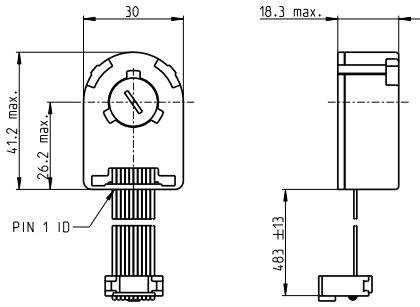
Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	V_{CC}	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

Connection example



Ambient temperature range $\theta_U = 25^\circ\text{C}$

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



Direction of rotation cw (definition cw p. 60)

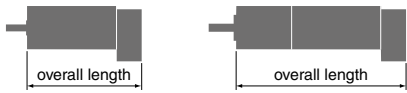
- Stock program
- Standard program
- Special program (on request)

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



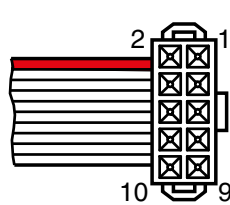
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 25	125/127					75.3
RE 25	125/127	GP 26/GP 32	340/342			●
RE 25	125/127	KD 32, 1.0 - 4.5 Nm	352			●
RE 25	125/127	GP 32, 0.75 - 6.0 Nm	343/346			●
RE 25	125/127	GP 32 S	374-378			●
RE 25, 20 W	126					63.8
RE 25, 20 W	126	GP 26/GP 32	340/342			●
RE 25, 20 W	126	KD 32, 1.0 - 4.5 Nm	352			●
RE 25, 20 W	126	GP 32, 0.75 - 6.0 Nm	343/346			●
RE 25, 20 W	126	GP 32 S	374-378			●
RE 25, 20 W	126			AB 28	480	94.3
RE 25, 20 W	126	GP 26/GP 32	340/342	AB 28	480	●
RE 25, 20 W	126	KD 32, 1.0 - 4.5 Nm	352	AB 28	480	●
RE 25, 20 W	126	GP 32, 0.75 - 6.0 Nm	343/346	AB 28	480	●
RE 25, 20 W	126	GP 32 S	374-378	AB 28	480	●
RE 25, 20 W	127			AB 28	480	105.8
RE 25, 20 W	127	GP 26/GP 32	340/342	AB 28	480	●
RE 25, 20 W	127	KD 32, 1.0 - 4.5 Nm	352	AB 28	480	●
RE 25, 20 W	127	GP 32, 0.75 - 6.0 Nm	343/346	AB 28	480	●
RE 25, 20 W	127	GP 32 S	374-378	AB 28	480	●
RE 30, 15 W	128					88.8
RE 30, 15 W	128	GP 32, 0.75 - 4.5 Nm	344			●
RE 30, 60 W	129					88.8
RE 30, 60 W	129	GP 32, 0.75 - 6.0 Nm	342-349			●
RE 30, 60 W	129	KD 32, 1.0 - 4.5 Nm	352			●
RE 30, 60 W	129	GP 32 S	374-378			●
RE 35, 90 W	130					91.7
RE 35, 90 W	130	GP 32, 0.75 - 8.0 Nm	342-350			●
RE 35, 90 W	130	GP 42, 3.0 - 15.0 Nm	354			●
RE 35, 90 W	130	GP 32 S	374-378			●
RE 35, 90 W	130			AB 28	480	124.3
RE 35, 90 W	130	GP 32, 0.75 - 8.0 Nm	342-350	AB 28	480	●
RE 35, 90 W	130	GP 42, 3.0 - 15.0 Nm	354	AB 28	480	●
RE 35, 90 W	130	GP 32 S	374-378	AB 28	480	●

Technical Data

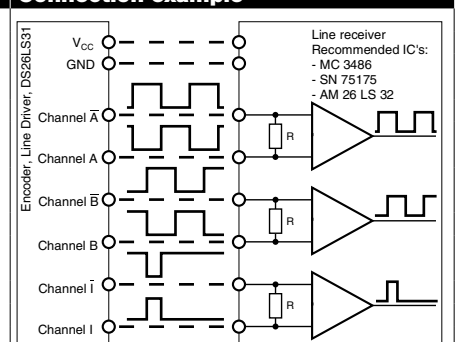
Supply voltage V_{CC}	$5V \pm 10\%$
Typical current draw	55 mA
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift ϕ	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , $25^\circ C$)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , $25^\circ C$)	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +100^\circ C$
Moment of inertia of code wheel	≤ 0.6 gcm 2
Max. angular acceleration	250 000 rad s $^{-2}$
Output current per channel	± 20 mA

Pin Allocation



- 1 N.C.
 - 2 V_{CC}
 - 3 GND
 - 4 N.C.
 - 5 Channel A
 - 6 Channel A
 - 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

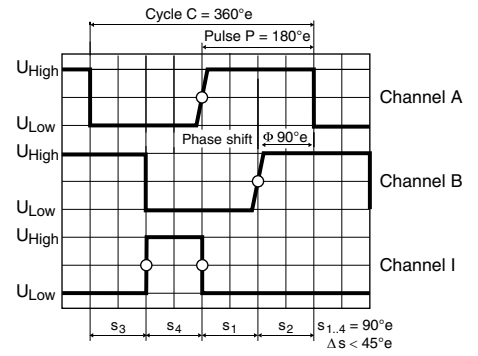
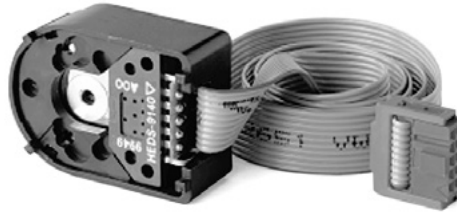
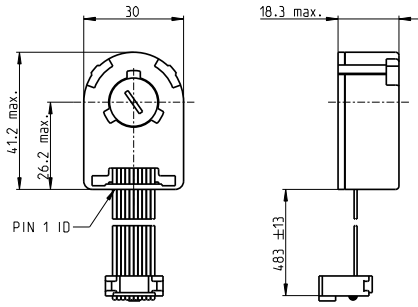
Connection example



Terminal resistance $R =$ typical 120 Ω

The index signal I is synchronized with channel A or B.

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422

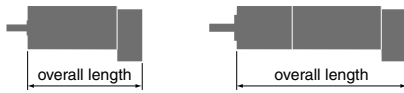


Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

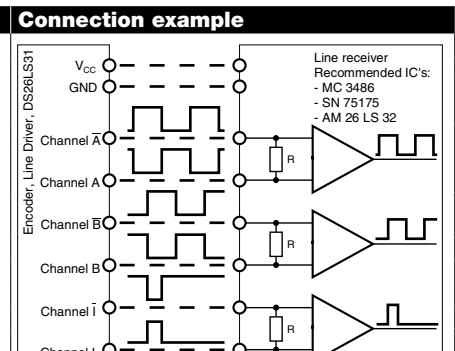
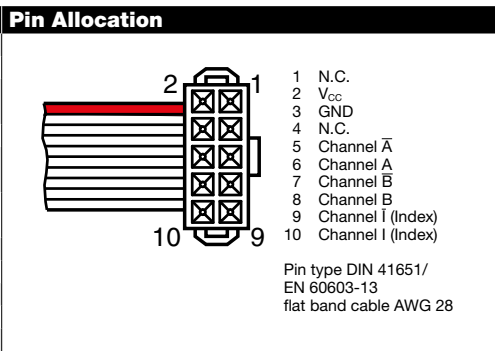
Part Numbers

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	131					91.7
RE 40, 150 W	132					91.7
RE 40, 150 W	132	GP 42, 3.0 - 15.0 Nm	354			●
RE 40, 150 W	132	GP 52, 4.0 - 30.0 Nm	359			●
RE 40, 150 W	132			AB 28	480	124.3
RE 40, 150 W	132	GP 42, 3.0 - 15.0 Nm	354	AB 28	480	●
RE 40, 150 W	132	GP 52, 4.0 - 30.0 Nm	359	AB 28	480	●
RE 50, 200 W	133					128.7
RE 50, 200 W	133	GP 52, 4.0 - 30.0 Nm	360			●
RE 50, 200 W	133	GP 62, 8.0 - 50.0 Nm	361			●
RE 65, 250 W	134					157.3
RE 65, 250 W	134	GP 81, 20.0 - 120.0 Nm	362			●
A-max 26	152-158					63.1
A-max 26	152-158	GP 26, 0.75 - 4.5 Nm	340			●
A-max 26	152-158	GS 30/GP 32	341/344			●
A-max 26	152-158	GP 32, 0.75 - 6.0 Nm	343/347			●
A-max 26	152-158	GS 38, 0.1 - 0.6 Nm	353			●
A-max 26	152-158	GP 32 S	374-378			●
A-max 32	160/162					82.3
A-max 32	160/162	GP 32, 0.75 - 6.0 Nm	342-347			●
A-max 32	160/162	GS 38, 0.1 - 0.6 Nm	353			●
A-max 32	160/162	GP 32 S	374-378			●
EC 32, 80 W	212					78.4
EC 32, 80 W	212	GP 32, 0.75 - 6.0 Nm	342-349			●
EC 32, 80 W	212	GP 32 S	374-378			●
EC 40, 170 W	213					103.4
EC 40, 170 W	213	GP 42, 3.0 - 15.0 Nm	354			●
EC 40, 170 W	213	GP 52, 4.0 - 30.0 Nm	359			●

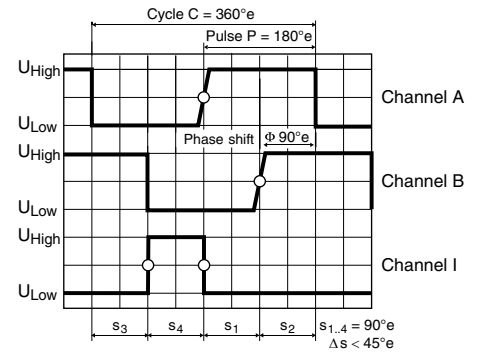
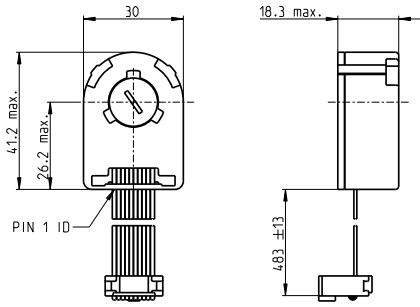
Technical Data	
Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , 25°C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	± 20 mA



The index signal I is synchronized with channel A or B.

Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422

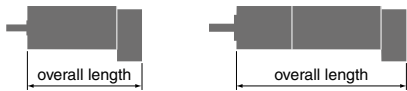


Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

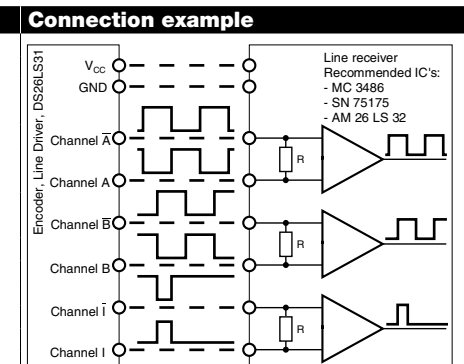
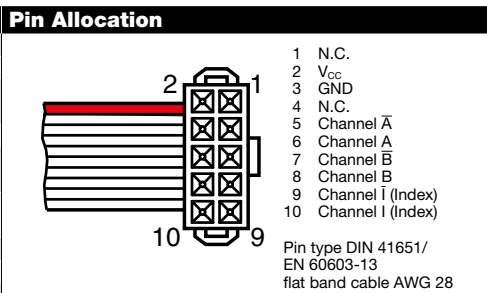
Part Numbers				
110512	110514	110516	110518	X drives

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	224					62.6
EC-max 30, 40 W	224	GP 32, 1.0 - 8.0 Nm	347/350			●
EC-max 30, 40 W	224	KD 32, 1.0 - 4.5 Nm	352			●
EC-max 30, 40 W	224	GP 32 S	374-378			●
EC-max 30, 40 W	224			AB 20	478	98.4
EC-max 30, 40 W	224	GP 32, 1.0 - 8.0 Nm	347/350	AB 20	478	●
EC-max 30, 40 W	224	KD 32, 1.0 - 4.5 Nm	352	AB 20	478	●
EC-max 30, 40 W	224	GP 32 S	374-378	AB 20	478	●
EC-max 30, 60 W	225					84.6
EC-max 30, 60 W	225	GP 32, 1.0 - 8.0 Nm	347/350			●
EC-max 30, 60 W	225	KD 32, 1.0 - 4.5 Nm	352			●
EC-max 30, 60 W	225	GP 42, 3.0 - 15.0 Nm	355			●
EC-max 30, 60 W	225			AB 20	478	120.4
EC-max 30, 60 W	225	GP 32, 1.0 - 8.0 Nm	347/350	AB 20	478	●
EC-max 30, 60 W	225	KD 32, 1.0 - 4.5 Nm	352	AB 20	478	●
EC-max 30, 60 W	225	GP 42, 3.0 - 15.0 Nm	355	AB 20	478	●
EC-max 40, 70 W	226					81.4
EC-max 40, 70 W	226	GP 42, 3.0 - 15.0 Nm	355			●
EC-max 40, 70 W	226			AB 28	479	110.7
EC-max 40, 70 W	226	GP 42, 3.0 - 15.0 Nm	355	AB 28	479	●
EC-max 40, 120 W	227					111.4
EC-max 40, 120 W	227	GP 52, 4.0 - 30.0 Nm	360			●
EC-max 40, 120 W	227			AB 28	479	140.7
EC-max 40, 120 W	227	GP 52, 4.0 - 30.0 Nm	360	AB 28	479	●
EC-4pole 22, 90 W	231					70.1
EC-4pole 22, 90 W	231	GP 22/GP 32	337/347			●
EC-4pole 22, 90 W	231	GP 32 S	374-378			●
EC-4pole 22, 120 W	232					87.5
EC-4pole 22, 120 W	232	GP 22/GP 32	337/347			●
EC-4pole 22, 120 W	232	GP 32 S	374-378			●

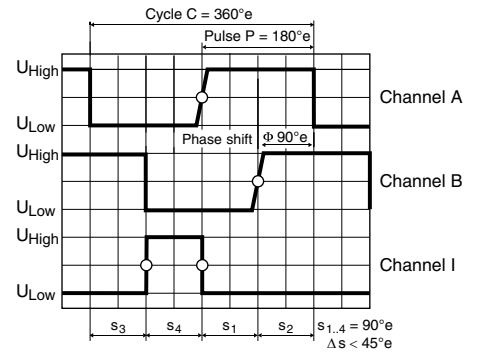
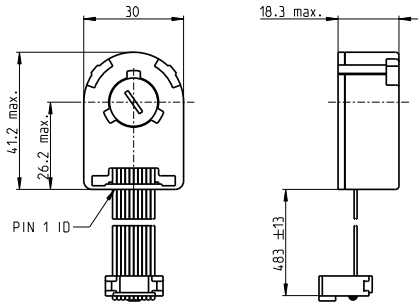
Technical Data	
Supply voltage V_{CC}	5 V ± 10%
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , 25°C)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , 25°C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100°C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	± 20 mA



The index signal I is synchronized with channel A or B.

Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



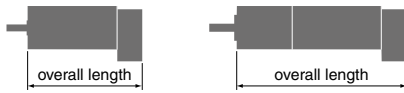
Direction of rotation cw (definition cw p. 60)

- 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)	12 000	12 000	12 000	12 000	12 000
Shaft diameter (mm)	3	4	6	8	2-4



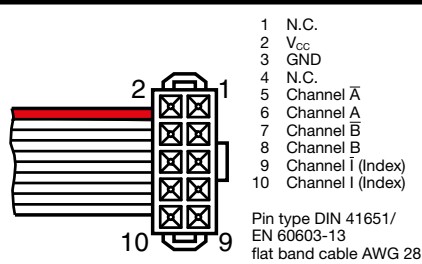
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-4pole 30, 100 W 233						67.6
EC-4pole 30, 100 W 233		GP 32, 4.0 - 8.0 Nm	350			●
EC-4pole 30, 100 W 233		GP 42, 3 - 15 Nm	355			●
EC-4pole 30, 100 W 233				AB 20	478	104.0
EC-4pole 30, 100 W 233		GP 32, 4.0 - 8.0 Nm	350	AB 20	478	●
EC-4pole 30, 100 W 233		GP 42, 3 - 15 Nm	355	AB 20	478	●
EC-4pole 30, 200 W 235						84.6
EC-4pole 30, 200 W 235		GP 32, 4.0 - 8.0 Nm	350			●
EC-4pole 30, 200 W 235		GP 42, 3 - 15 Nm	355			●
EC-4pole 30, 200 W 235				AB 20	478	121.0
EC-4pole 30, 200 W 235		GP 32, 4.0 - 8.0 Nm	350	AB 20	478	●
EC-4pole 30, 200 W 235		GP 42, 3 - 15 Nm	355	AB 20	478	●
EC-i 30, 30 W	242					62.7
EC-i 30, 30 W	242	GP 32, 1.0 - 6.0 Nm	347			●
EC-i 30, 30 W	242	GP 32 S	374-379			●
EC-i 30, 45 W	243					62.7
EC-i 30, 45 W	243	GP 32, 1.0 - 6.0 Nm	348			●
EC-i 30, 45 W	243	GP 32 S	374-379			●
EC-i 30, 50 W	244					62.7
EC-i 30, 50 W	244	GP 32, 1.0 - 6.0 Nm	348			●
EC-i 30, 50 W	244	GP 32 S	374-379			●
EC-i 30, 75 W	245					62.7
EC-i 30, 75 W	245	GP 32, 1.0 - 6.0 Nm	348			●
EC-i 30, 75 W	245	GP 32 S	374-379			●

Technical Data

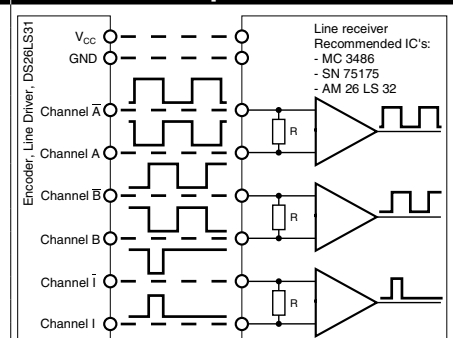
Supply voltage V_{CC}	$5 V \pm 10\%$
Typical current draw	55 mA
Output signal	EIA Standard RS 422
driver used:	DS26LS31
Phase shift ϕ	$90^\circ e \pm 45^\circ e$
Signal rise time	
(typically, at $C_L = 25 \text{ pF}$, $R_L = 2.7 \text{ k}\Omega$, 25°C)	180 ns
Signal fall time	
(typically, at $C_L = 25 \text{ pF}$, $R_L = 2.7 \text{ k}\Omega$, 25°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



- 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

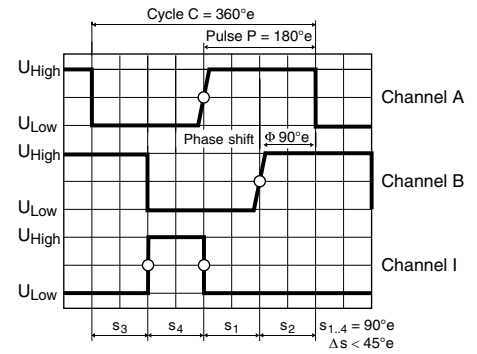
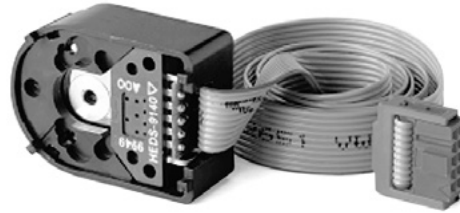
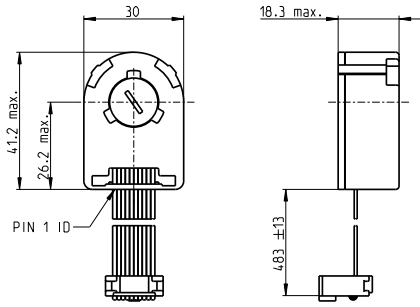
Connection example



Terminal resistance R = typical 120 Ω

The index signal I is synchronized with channel A or B.

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422

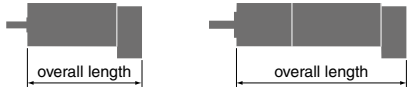


Direction of rotation cw (definition cw p. 60)

- Stock program
- Standard program
- Special program (on request)

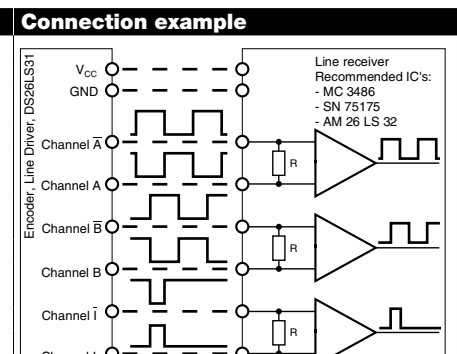
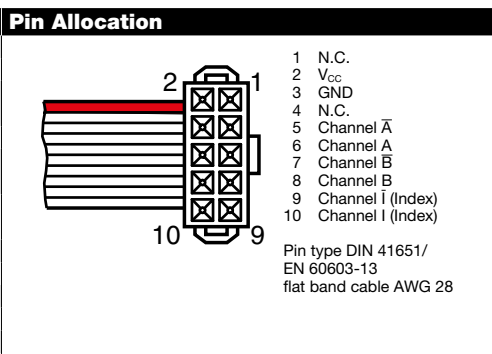
Part Numbers					
110512	110514	110516	110518	X drives	

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



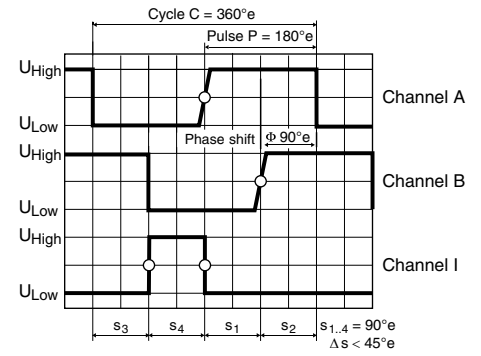
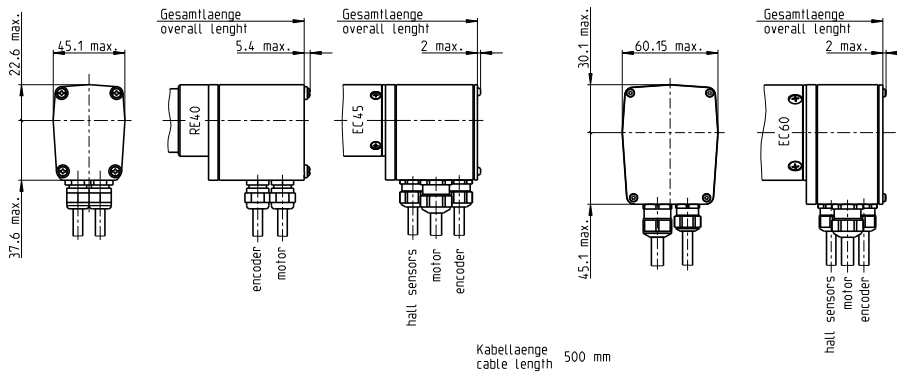
maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC-i 40, 50 W	246-247					49.0
EC-i 40, 50 W	246	GP 32, 1.0 - 6.0 Nm	347			●
EC-i 40, 50 W	246-247	GP 42, 3.0 - 15.0 Nm	355			●
EC-i 40, 50 W	246	GP 32 S	374-378			●
EC-i 40, 70 W	248/249					59.0
EC-i 40, 70 W	248	GP 32, 1.0 - 6.0 Nm	347			●
EC-i 40, 70 W	248/249	GP 42, 3.0 - 15.0 Nm	355			●
EC-i 40, 70 W	248	GP 32 S	374-378			●
EC-i 40, 100 W	250					79.0
EC-i 40, 100 W	250	GP 42, 3.0 - 15.0 Nm	355			●
EC-i 52, 180 W	251					102.8
EC-i 52, 180 W	251	GP 52, 4.0 - 30.0 Nm	359			●
DCX 22 S	80-81					online
DCX 22 L	82-83					online
DCX 26 L	84-85					online
DCX 32 L	86					online
DCX 35 L	87					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 Φ	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , $25^\circ C$)	180 ns
Signal fall time (typically, at $C_L = 25$ pF, $R_L = 2.7$ k Ω , $25^\circ C$)	40 ns
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +100^\circ C$
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	± 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. 60)

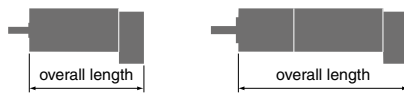
- Stock program
- Standard program
- Special program (on request)

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	132					125.1
RE 40, 150 W	132	GP 42, 3 - 15 Nm	354			●
RE 40, 150 W	132	GP 52, 4 - 30 Nm	359			●
RE 40, 150 W	132			AB 28	481	135.6
RE 40, 150 W	132	GP 42, 3 - 15 Nm	354	AB 28	481	●
RE 40, 150 W	132	GP 52, 4 - 30 Nm	359	AB 28	481	●
EC 45, 150 W	214					126.8
EC 45, 150 W	214	GP 42, 3 - 15 Nm	354			●
EC 45, 150 W	214	GP 52, 4 - 30 Nm	359			●
EC 45, 150 W	214			AB 28	481	135.6
EC 45, 150 W	214	GP 42, 3 - 15 Nm	354	AB 28	481	●
EC 45, 150 W	214	GP 52, 4 - 30 Nm	359	AB 28	481	●
EC 45, 250 W	215					159.6
EC 45, 250 W	215	GP 42, 3 - 15 Nm	355			●
EC 45, 250 W	215	GP 52, 4 - 30 Nm	359			●
EC 45, 250 W	215	GP 62, 8 - 50 Nm	361			●
EC 45, 250 W	215			AB 28	481	168.4
EC 45, 250 W	215	GP 42, 3 - 15 Nm	355	AB 28	481	●
EC 45, 250 W	215	GP 52, 4 - 30 Nm	359	AB 28	481	●
EC 45, 250 W	215	GP 62, 8 - 50 Nm	361	AB 28	481	●
EC 60, 400 W	216					177.3
EC 60, 400 W	216	GP 81, 20 - 120 Nm	362			●
EC 60, 400 W	216			AB 41	483	214.9
EC 60, 400 W	216	GP 81, 20 - 120 Nm	362	AB 41	483	●

Technical Data

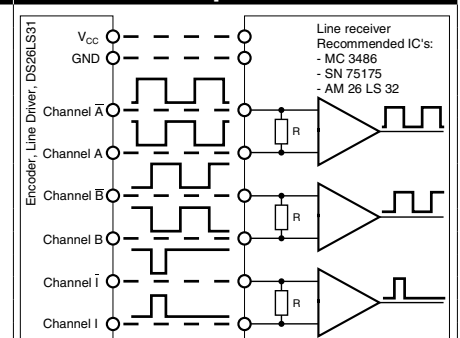
Supply voltage V_{CC}	$5 V \pm 10\%$
Typical current draw	55 mA
Output signal driver used:	EIA Standard RS 422 DS26LS31
Phase shift ϕ	$90^\circ e \pm 45^\circ e$
Signal rise time (typically, at $C_L = 25 \text{ pF}$, $R_L = 11 \text{ k}\Omega$, 25°C)	180 ns
Signal fall time (typically, at $C_L = 25 \text{ pF}$, $R_L = 11 \text{ k}\Omega$, 25°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 $8 \times 0.25 \text{ mm}^2$

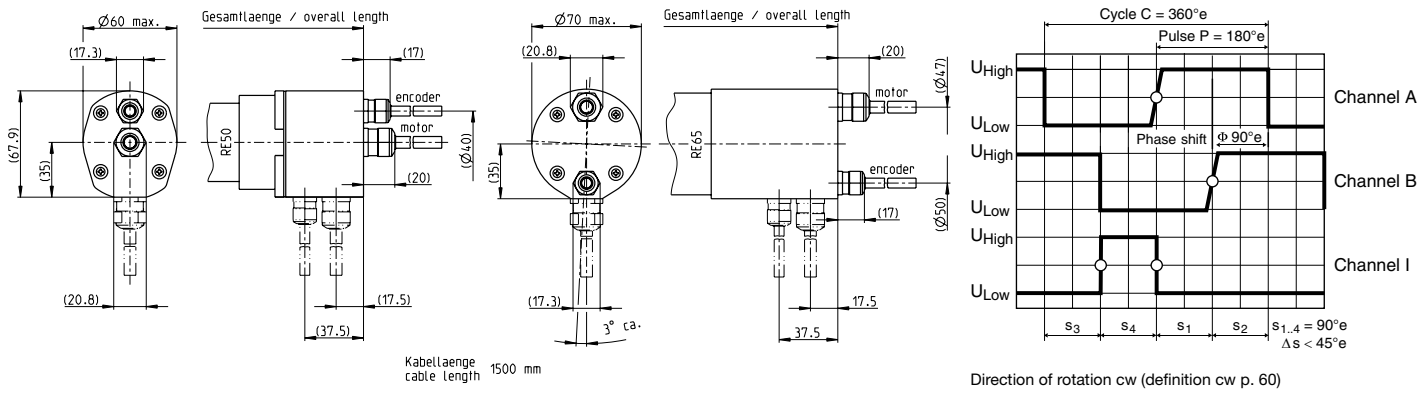
Connection example



Terminal resistance $R = \text{typical } 120 \Omega$

The index signal I is synchronized with channel A or B.

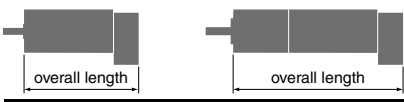
Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422



- Stock program
- Standard program
- Special program (on request)

Part Numbers	
cable outlet axial	386051 386001
cable outlet radial	386053 386002

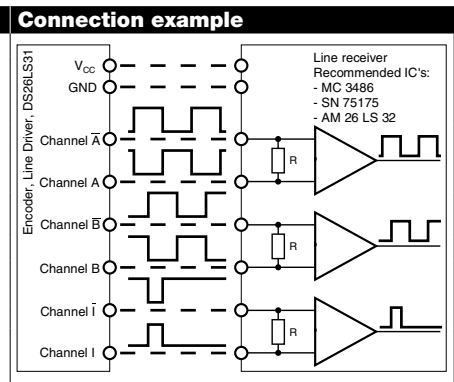
Type		
Counts per turn	500	500
Number of channels	3	3
Max. operating frequency (kHz)	100	100
Max. speed (rpm)	12000	12000



maxon Modular System						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 50, 200 W	133					170.4
RE 50, 200 W	133	GP 52, 4 - 30 Nm	360			●
RE 50, 200 W	133	GP 62, 8 - 50 Nm	361			●
RE 50, 200 W	133			AB 44	484	183.4
RE 50, 200 W	133	GP 52, 4 - 30 Nm	360	AB 44	484	●
RE 50, 200 W	133	GP 62, 8 - 50 Nm	361	AB 44	484	●
RE 65, 250 W	134					187.5
RE 65, 250 W	134	GP 81, 20 - 120 Nm	362			●
RE 65, 250 W	134			AB 44	484	205.5
RE 65, 250 W	134	GP 81, 20 - 120 Nm	362	AB 44	484	●

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 Φ	$90^\circ e \pm 45^\circ e$
Signal rise time	180 ns
(typically, at $C_L = 25$ pF, $R_L = 11$ k Ω , 25 °C)	
Signal fall time	40 ns
(typically, at $C_L = 25$ pF, $R_L = 11$ k Ω , 25 °C)	
Index pulse width	$90^\circ e$
Operating temperature range	$-40 \dots +85^\circ C$
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	± 20 mA
Protection to	IP54

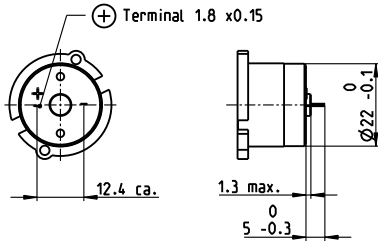
Pin Allocation	
Encoder	
Cable white	= V_{CC} 5 VDC
Cable brown	= GND
Cable green	= Channel \bar{A}
Cable yellow	= Channel A
Cable grey	= Channel \bar{B}
Cable pink	= Channel B
Cable blue	= Channel \bar{I} (Index)
Cable red	= Channel I (Index)
Cable size 8×0.25 mm ²	
Motor	
Cable white	= Motor +
Cable brown	= Motor -
Cable size 2×1.0 mm ²	



The index signal I is synchronized with channel A or B.

Terminal resistance R = typical 120 Ω

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.

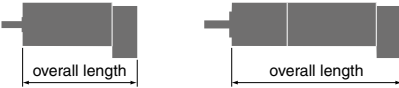
- Stock program
- Standard program
- Special program (on request)

Part Numbers

118909	118910
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Type

Shaft diameter (mm)	3	4
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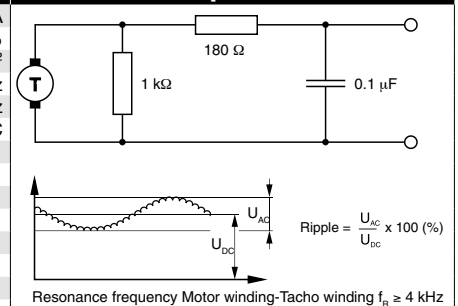
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 25	125/127			76.8
RE 25	125/127	GP 26, 0.75 - 4.5 Nm	340	●
RE 25	125/127	GP 32, 0.75 - 4.5 Nm	342/343	●
RE 25	125/127	GP 32, 1.0 - 6.0 Nm	346	●
RE 25	125/127	GP 32, 1.0 - 4.5 Nm	352	●
RE 25	125/127	GP 32 S	374-378	●
RE 25, 20 W	126			65.3
RE 25, 20 W	126	GP 22, 0.5 - 1.0 Nm	333	●
RE 25, 20 W	126	GP 26, 0.75 - 4.5 Nm	340	●
RE 25, 20 W	126	GP 32, 0.75 - 4.5 Nm	342/343	●
RE 25, 20 W	126	GP 32, 0.75 - 6.0 Nm	346	●
RE 25, 20 W	126	GP 32, 1.0 - 4.5 Nm	352	●
RE 25, 20 W	126	GP 32 S	374-378	●
RE 35, 90 W	130			89.1
RE 35, 90 W	130	GP 32, 0.75 - 6.0 Nm	342-349	●
RE 35, 90 W	130	GP 32, 4.0 - 8.0 Nm	350	●
RE 35, 90 W	130	GP 42, 3.0 - 15 Nm	354	●
RE 35, 90 W	130	GP 32 S	374-378	●

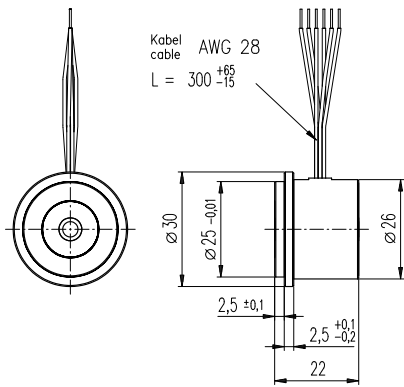
Technical Data

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 ²
Ripple frequency per turn	14	Resonance frequency with motors on p. 125-127	> 2 kHz
Linear voltage tolerance, 500 to 5000 rpm	± 0.2 %	with motors on p. 130	> 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		

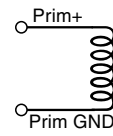
Connection example



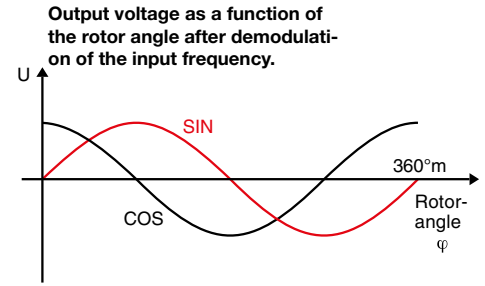
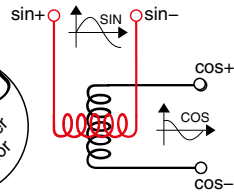
Resolver Res 26 10 Volt



Primary



Secondary

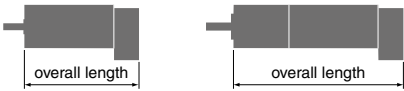


- Stock program
- Standard program
- Special program (on request)

Part Numbers

166488	133405	268912	199287
--------	--------	--------	--------

Type	166488	133405	268912	199287
Shaft diameter (mm)	4	6	6	6
Max. speed (rpm)	10000	10000	10000	10000



maxon Modular System

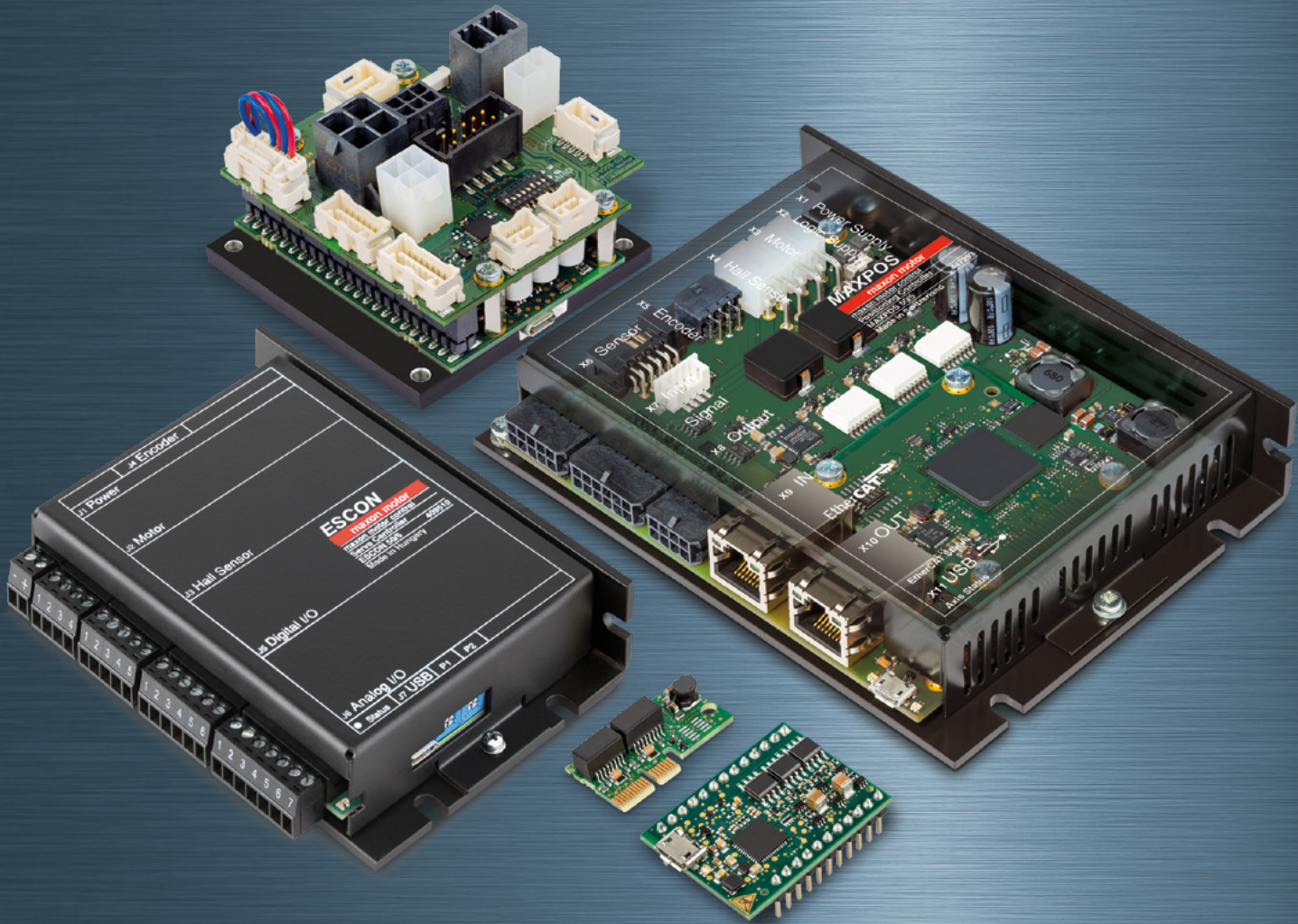
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
EC 32, 80 W	212			80.1
EC 32, 80 W	212	GP 32, 0.75 - 6.0 Nm	342-349	●
EC 32, 80 W	212	GP 32 S	374-378	●
EC 40, 170 W	213			107.2
EC 40, 170 W	213	GP 42, 3.0 - 15 Nm	354	●
EC 40, 170 W	213	GP 52, 4.0 - 30 Nm	359	●
EC 45, 150 W	214			111.2
EC 45, 150 W	214	GP 42, 3.0 - 15 Nm	354	●
EC 45, 150 W	214	GP 52, 4.0 - 30 Nm	359	●
EC 45, 250 W	215			144.0
EC 45, 250 W	215	GP 42, 3.0 - 15 Nm	354	●
EC 45, 250 W	215	GP 52, 4.0 - 30 Nm	359	●
EC 45, 250 W	215	GP 62, 8.0 - 50 Nm	361	●
EC 60, 400 W	216			177.3
EC 60, 400 W	216	GP 81, 20 - 120 Nm	362	●

Technical Data

Input voltage	10 V peak, 10 kHz
Transmission ratio	0.5
Electrical error	± 10 minutes
Rotor inertia	6 gcm ²
Weight	40 g
Operating temperature range	-55 ... +155°C

Pin Allocation

	EC 32/EC 40	EC 45/EC 60
Prim +	red/white	white
Prim GND	yellow/white	brown
cos +	red	green
sin +	yellow	yellow
cos -	schwarz	grey
sin -	blue	pink



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
controlCompact
Drive

Accessories

Ceramic

Contact
information

maxon motor 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 motors, the positioning controllers constitute complete solutions for highly demanding motion control applications.

ESCON servo controllers	NEW 442-447
1-Q-EC servoamplifier	448-449
Positioning control units EPOS4	NEW 450-456
Positioning control units EPOS2	457-461
Positioning control unit EPOS2 P	462-464
Positioning control unit MAXPOS	466-468
Summary maxon motor control	469
Summary accessories	470-471

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).

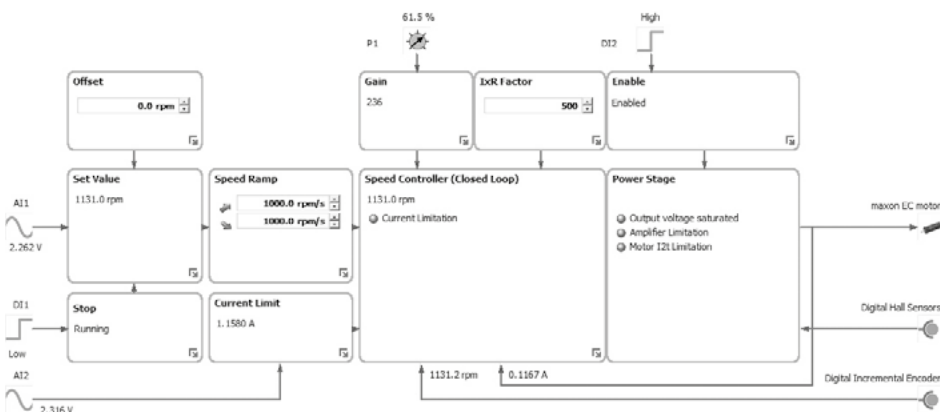
To the numerous **inputs and outputs**, various functionalities can be assigned to.

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)

404404	ESCON 36/2 DC Connector Set	—	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
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



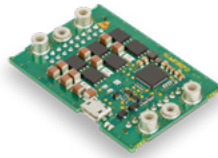
	ESCON Module 24/2	ESCON 36/2 DC
DC motors up to (continuous / maximum)	48 W / 144 W	72 W / 144 W
EC motors up to (continuous / maximum)	48 W / 144 W	–
Sensors		
	Digital Incremental Encoder (2 channel with or without Line Driver)	Digital Incremental Encoder (2 channel with or without Line Driver)
	DC Tacho	DC Tacho
	Without sensor (DC motors)	Without sensor (DC motors)
	Digital Hall Sensors (EC motors)	–
Operating mode		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
Electrical data		
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 μ H / 2 A
Inputs/Outputs		
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
Environmental conditions		
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%
Mechanical data		
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
Part numbers		
	466023 ESCON Module 24/2	403112 ESCON 36/2 DC
	Order accessories separately, from page 470	Order accessories separately, from page 470

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
Sensors		
–	–	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)
Operating mode		
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)
Electrical data		
10 - 36 VDC	10 - 50 VDC	10 - 50 VDC
0.98 x V _{CC}	0.96 x V _{CC}	0.98 x V _{CC}
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	–	–
Inputs/Outputs		
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
Environmental conditions		
-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%
Mechanical data		
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)
Part numbers		
414533 ESCON 36/3 EC	446925 ESCON Module 50/4 EC-S	438725 ESCON Module 50/5
Order accessories separately, from page 470	Order accessories separately, from page 470	Order accessories separately, from page 470

ESCON Feature Comparison Chart



NEW



NEW

	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
Sensors		
	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)
Operating mode		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
Electrical data		
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	-	-
Inputs/Outputs		
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
Environmental conditions		
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%
Mechanical data		
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)
Part numbers		
	532872 ESCON Module 50/8	586137 ESCON Module 50/8 HE
	Order accessories separately, from page 470	Order accessories separately, from page 470

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
Sensors		
	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)
Operating mode		
	Current controller (torque control), Speed controller (closed and open loop)	Current controller (torque control), Speed controller (closed and open loop)
Electrical data		
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 μ H / 5 A	3 x 15 μ H / 10 A
Inputs/Outputs		
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
Environmental conditions		
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%
Mechanical data		
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
Part numbers		
	409510 ESCON 50/5	422969 ESCON 70/10
	Order accessories separately, from page 470	Order accessories separately, from page 470

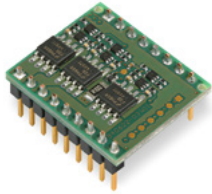
1-Q-EC Amplifier Summary

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 449.

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

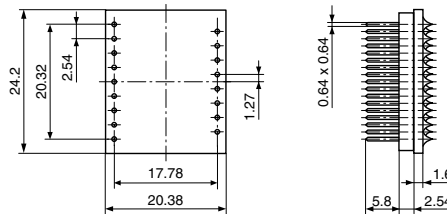
The power amplifier is protected against thermal overload and the control inputs against overvoltage.

DEC Module 24/2

Connections

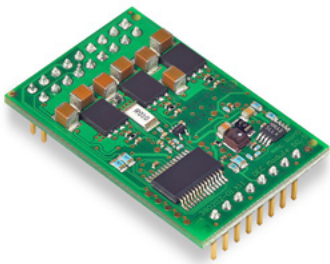
Male header 8 + 9 = 17 poles
Pitch 2.54 mm

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 449.

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

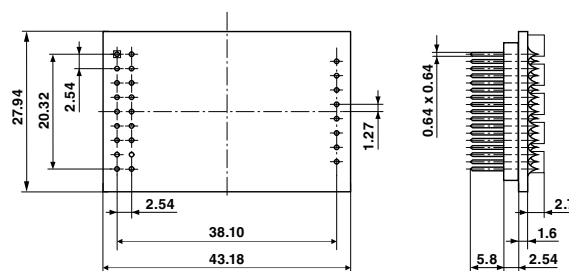
The power amplifier is protected against thermal overload and the control inputs against overvoltage.

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.

	DEC Module 24/2	DEC Module 50/5
EC motors up to (continuous / maximum)	48 W / 72 W	250 W / 500 W
Sensors	Digital Hall Sensors	Digital Hall Sensors
Operating mode	Speed controller (closed and open loop)	Speed controller (closed and open loop)
Electrical data		
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
Input		
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
Output		
Monitor		“Monitor n”, digital, (5 V)
Status reading “Ready”	“Ready”, digital, (5 V)	“Ready”, digital, (5 V)
Voltage outputs		
Hall sensors supply voltage V_{CC} Hall	+5 VDC, max. 35 mA	+5 VDC, max. 35 mA
Possible adjustments	Input “Mode 0” and “Mode 1”	Input “Mode 0” and “Mode 1”
Protective functions		
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
Ambient temperature and humidity range		
Operation	-10...+45°C	-10...+45°C
Storage	-40...+85°C	-40...+85°C
No condensation	20...80%	20...80%
Mechanical data		
Weight	Approx. 4 g	Approx. 9 g
Dimensions (L x W x H)	24.2 x 20.38 x 12.7 mm (see page 448)	43.18 x 27.94 x 12.7 mm (see page 448)
Mounting	mountable on socket terminal strips pitch 2.54 mm	mountable on socket terminal strips pitch 2.54 mm
Connections	See page 448	See page 448
Part numbers	367661 DEC Module 24/2 1-Q-EC Amplifier	380200 DEC Module 50/5 1-Q-EC Amplifier

Accessories		
	370652 DEC Module Eva-Board	370652 DEC Module Eva-Board

EPOS4 Positioning Controllers Overview



CANopen slave with EtherCAT option

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).

Interpolated Position Mode (PVT)

Thanks to Interpolated Position Mode, the EPOS4 is able to synchronously run a path specified by interpolating points. With a suitable

Operating modes/Control

- Cyclic Synchronous Position (CSP)
- Cyclic Synchronous Velocity (CSV)
- Cyclic Synchronous Torque (CST)
- Profile Position, Profile Velocity and Homing Mode
- Interpolated Position Mode (PVT)¹
- Speed and Acceleration Feed Forward
- Sinusoidal or Block Commutation for EC motors
- Alternative set value input via step/direction, master encoder or analog commands¹
- Dual-loop Position and Speed Control¹

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 e.g. for set value
- Free analog outputs, configurable e.g. for current monitor

Available software

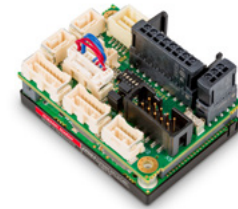
- EPOS Studio
- Windows DLL (32-/64-bit) with programming examples
- Linux shared object library (X86 32-/64-bit, ARMv7/v8 32-bit for Raspberry Pi and BeagleBone) with programming examples
- IEC 61131-3 libraries
- Firmware

Available documentation

- Feature Chart
- Hardware Reference
- Firmware Specification
- Communication Guide
- Application Notes

¹ in preparation

EPOS4 Positioning Controllers Data



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

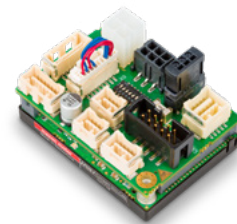
Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.

Controller version	CANopen Slave with EtherCAT option	CANopen Slave
Electrical data		
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 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ 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 μ H / 1.5 A
Inputs		
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
Outputs		
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
Interfaces		
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 EtherCAT Card Available	-
Indicator		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
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%
Mechanical data		
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 28.3 mm
Mounting	Socket header 1.27 mm or M2.5 screws	M2.5 screws
Part numbers		
	536630 EPOS4 Module 24/1.5	546714 EPOS4 Compact 24/1.5 CAN
Accessories		
	309687 DSR 50/5 Shunt regulator	309687 DSR 50/5 Shunt regulator
	Order accessories separately, see page 470	Order accessories separately, see page 470

EPOS4 Positioning Controllers Data



NEW



maxon motor control

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.

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.

Controller version		
CANopen Slave with EtherCAT option	CANopen Slave with EtherCAT option	CANopen Slave
Electrical data		
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
0.9 x V _{CC}	0.9 x V _{CC}	0.9 x V _{CC}
15 A (<3 s)	15 A (<3 s)	15 A (<3 s)
5 A	5 A	5 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)
15 µH / 5 A	–	9.4 µH / 5 A
Inputs		
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 (logic level)	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 DIP switch 1...5	configurable with external wiring	configurable with DIP switch 1...5
Outputs		
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
Interfaces		
RxD; TxD (max. 115 200 bit/s)	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)	high; low (max. 1 Mbit/s)
Data+; Data- (Full Speed)	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
Optional EtherCAT Card Available	Optional EtherCAT Card Available	–
Indicator		
Green LED, red LED	Green LED, red LED	Green LED, red LED
Environmental conditions		
-30...+50 °C	-30...+45 °C	-30...+25 °C
+50...+80 °C; Derating: -0.167 A/°C	+45...+75 °C; Derating: -0.167 A/°C	+25...+70 °C; Derating: -0.111 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%
Mechanical data		
approx. 206 g	approx. 17 g	approx. 58 g
105.0 x 83.0 x 38.7 mm	53.8 x 38.8 x 11.1 mm	55.0 x 40.0 x 26.9 mm
Flange for M4-screws	Socket header 1.27 mm or M2.5 screws	M2.5 screws
Part numbers		
546047 EPOS4 50/5	534130 EPOS4 Module 50/5	541718 EPOS4 Compact 50/5 CAN
Accessories		
309687 DSR 50/5 Shunt regulator	309687 DSR 50/5 Shunt regulator	309687 DSR 50/5 Shunt regulator
Order accessories separately, see page 470	Order accessories separately, see page 470	Order accessories separately, see page 470

EPOS4 Positioning Controllers Data



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.

Controller version	CANopen Slave with EtherCAT option	CANopen Slave
Electrical data		
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 (<5 s)	30 A (<5 s)
Continuous output current I_{cont}	8 A	8 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Max. speed (1 pole pair)	50000 rpm (sinusoidal), 100000 rpm (block)	50000 rpm (sinusoidal), 100000 rpm (block)
Built-in motor choke per phase	-	2.2 μ H / 15 A
Inputs		
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
Outputs		
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
Interfaces		
RS232	RxD; TxD (max. 115200 bit/s)	RxD; TxD (max. 115200 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 EtherCAT Card Available	-
Indicator		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperature - Operation	-30...+45 °C	-30...+45 °C
Temperature - Extended Range	+45...+77 °C; Derating: -0.250 A/°C	+45...+77 °C; Derating: -0.250 A/°C
Temperature - Storage	-40...+85 °C	-40...+85 °C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 23 g	approx. 86 g
Dimensions (L x W x H)	59.5 x 46.0 x 14.1 mm	59.5 x 58.5 x 33.0 mm
Mounting	Socket header 2.54 mm or M2.5 screws	M2.5 screws
Part numbers	504384 EPOS4 Module 50/8	520885 EPOS4 Compact 50/8 CAN
Accessories	235811 DSR 70/30 Shunt regulator	235811 DSR 70/30 Shunt regulator
	Order accessories separately, see page 470	Order accessories separately, see page 470

EPOS4 Positioning Controllers Data

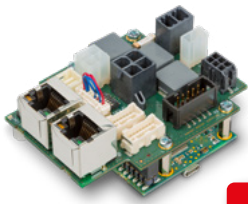
(optional)
EtherCAT

CANopen

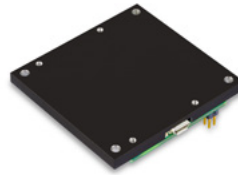
USB

RS232

GUI



NEW



maxon motor control

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.

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		
EtherCAT Slave	CANopen Slave with EtherCAT option	CANopen Slave
Electrical data		
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
0.9 x V _{CC}	0.9 x V _{CC}	0.9 x V _{CC}
30 A (<60 s)	30 A (<60 s)	30 A (<60 s)
8 A	15 A	15 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
Inputs		
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 (logic level)	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 DIP switch 1...5	configurable with external wiring	configurable with DIP switch 1...5
Outputs		
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
Interfaces		
–	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 EtherCAT Card Available	–
Indicator		
Green LED, red LED	Green LED, red LED	Green LED, red LED
Environmental conditions		
-30...+45 °C	-30...+25 °C	-30...+25 °C
+45...+77 °C; Derating: -0.250 A/°C	+25...+77 °C; Derating: -0.288 A/°C	+25...+77 °C; Derating: -0.288 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%
Mechanical data		
approx. 100 g	approx. 70 g	approx. 126 g
59.5 x 79.5 x 35.0 mm	59.5 x 62.0 x 16.4 mm	59.5 x 65.5 x 35.1 mm
M2.5 screws	Socket header 2.54 mm or M3 screws	M3 screws
Part numbers		
605298 EPOS4 Compact 50/8 EtherCAT	504383 EPOS4 Module 50/15	520886 EPOS4 Compact 50/15 CAN
Accessories		
235811 DSR 70/30 Shunt regulator	235811 DSR 70/30 Shunt regulator	235811 DSR 70/30 Shunt regulator
Order accessories separately, see page 470	Order accessories separately, see page 470	Order accessories separately, see page 470

EPOS4 Positioning Controllers Data

(optional) EtherCAT

CANopen

USB

RS232

GUI



NEW

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.



NEW

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.

Controller version	EtherCAT Slave	CANopen Slave with EtherCAT option
Electrical data		
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 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Max. speed (1 pole pair)	50000 rpm (sinusoidal), 100000 rpm (block)	50000 rpm (sinusoidal), 100000 rpm (block)
Built-in motor choke per phase	2.2 μ H / 15 A	15 μ H / 15 A
Inputs		
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
Outputs		
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
Interfaces		
RS232	-	RxD; TxD (max. 115200 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 EtherCAT Card Available
Indicator		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
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%
Mechanical data		
Weight	approx. 140 g	approx. 372 g
Dimensions (L x W x H)	59.5 x 79.5 x 37.1 mm	125.0 x 94.5 x 38.7 mm
Mounting	M3 screws	Flange for M4-screws
Part numbers	605299 EPOS4 Compact 50/15 EtherCAT	594385 EPOS4 70/15
Accessories	235811 DSR 70/30 Shunt regulator	235811 DSR 70/30 Shunt regulator
	Order accessories separately, see page 470	Order accessories separately, see page 470

EPOS2 Positioning Controllers Summary

Online commanded



EPOS2 24/2

- Several device variations allows the operation of various maxon DC and EC micromotors up to 48 watts
- Point to point control (1 axis)
- Interpolated Position Mode (PVT)
- Combination of several drives via CAN Bus
- CANopen
- 6 digital inputs
- 2 digital outputs
- 2 analog inputs
- Miniaturized design

Details pages 458–460

Slave version (online commanded) using CAN Master (EPOS2 P, PC, PLC, SoftPLC, etc.) or PC via USB or RS232 interface

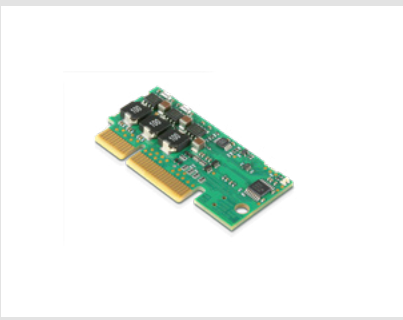
Typical applications:

- Small apparatus/appliances
- System automation tasks
- Drive technology

Part Numbers

EPOS2 24/2 **380264, 390003**
 390438, 530239

Online commanded



EPOS2 Module 36/2

- DC and EC motors up to 72 W
- Point to point control unit (1 axis)
- Interpolated Position Mode (PVT)
- Combination of several drives via CAN Bus
- CANopen
- 6 digital inputs
- 3 digital outputs
- 2 analog inputs
- Miniaturized open electronics board (OEM)

Details pages 458–460

Slave version (online commanding) using CAN Master (EPOS2 P, PC, PLC, SoftPLC, μ -Processor, etc.) or PC via USB ¹⁾ or RS232 interface ¹⁾ requires external transceiver

Typical applications:

- Small apparatus/appliances
- System automation tasks
- OEM customers

Part Number

EPOS2 Module 36/2 **360665**

Online commanded



EPOS2 24/5

- DC and EC motors up to 120 W
- Point to point control unit (1 axis)
- Interpolated Position Mode (PVT)
- Combination of several drives via CAN Bus
- CANopen
- 6 digital inputs
- 4 digital outputs
- 2 analog inputs
- Compact design

Details pages 458–461

Slave version (online commanding) using CAN Master (EPOS2 P, PC, PLC, SoftPLC, etc.) or PC via USB or RS232 interface

Typical applications:

- Tool building
- Production equipment
- System automation tasks

Part Number

EPOS2 24/5 **367676**

Online commanded



EPOS2 50/5

- DC and EC motors up to 250 W
- Point to point control unit (1 axis)
- Interpolated Position Mode (PVT)
- Combination of several drives via CAN Bus
- CANopen
- 11 digital inputs
- 5 digital outputs
- 2 analog inputs
- 1 analog output
- Compact design

Details pages 458–461

Slave version (online commanding) using CAN Master (EPOS2 P, PC, PLC, SoftPLC, etc.) or PC via USB or RS232 interface

Typical applications:

- Tool building
- Production equipment
- System automation tasks

Part Number

EPOS2 50/5 **347717**

Online commanded



EPOS2 70/10

- DC and EC motors up to 700 W
- Point to point control unit (1 axis)
- Interpolated Position Mode (PVT)
- Combination of several drives via CAN Bus
- CANopen
- 10 digital inputs
- 5 digital outputs
- 2 analog inputs
- Robust design

Details pages 458–461

Slave version (online commanding) using CAN Master (EPOS2 P, PC, PLC, SoftPLC, etc.) or PC via USB or RS232 interface

Typical applications:

- Production equipment
- System automation tasks
- Plant construction

Part Number

EPOS2 70/10 **375711**

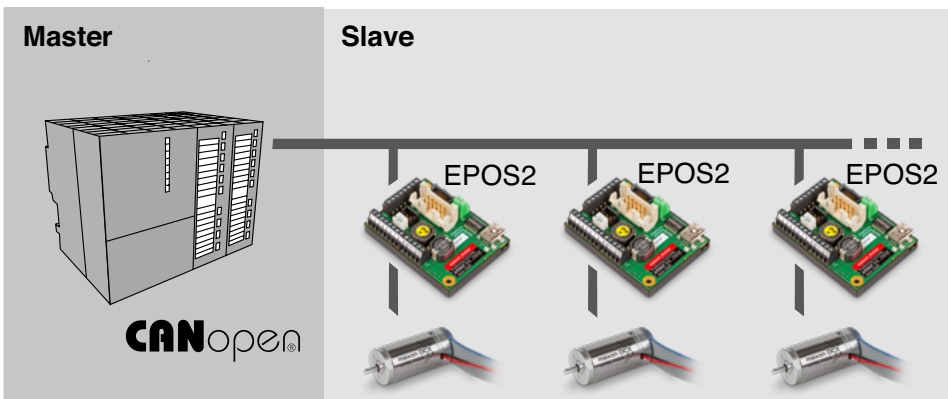
EPOS2 Positioning Controllers



CANopen Slave (online commanded)

Single motion and I/O commands from the process control are transmitted to the positioning control unit by a superior system (Master). For that purpose product specific commands are available.

EPOS2 is a modular constructed digital positioning controller. It is suitable for DC and EC motors with incremental encoder with a power range from 1 to 700 watts continuous power. A number of operating modes provides flexible application in a wide range of drive systems in automation technology and mechatronics.



Point to point

The “CANopen 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).

Interpolated Position Mode (PVT)

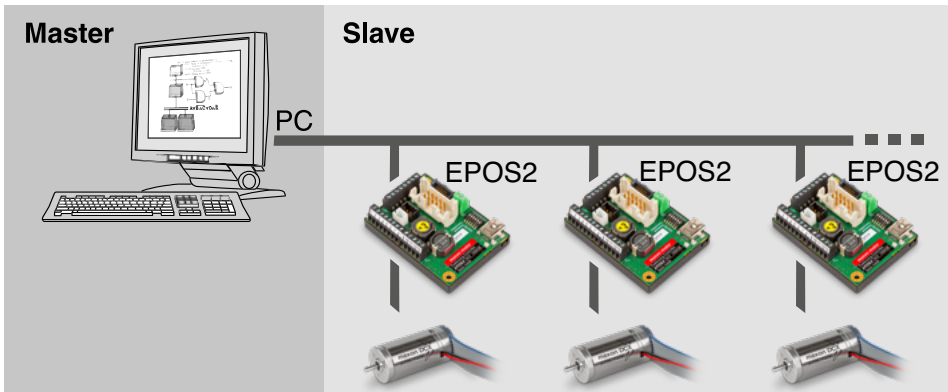
Thanks to Interpolated Position Mode, the EPOS2 is able to synchronously run a path specified by interpolating points. With a suitable master, coordinated multi-axis movements as well as any profile in a 1-axis system can be carried out. (PVT = Position and Velocity versus Time)

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. EPOS2 supports feed forward acceleration and speed control.

Speed control

In “CANopen Profile Velocity Mode”, the motor axis is moved with a set speed. The motor axis retains speed until a new speed is set.



Torque control

In “Current Mode”, a controlled torque can be produced on the motor shaft. The sinusoidal commutation used produces minimum torque ripple.

Homing

The “CANopen Homing Mode” is for referencing to a special mechanical position. There is a wide variety of methods for referencing.

Electronic gearhead

In “Master Encoder Mode”, the motor follows a reference input produced by an external encoder. A gearing factor can also be defined using software parameters. Two motors can be very easily synchronized using this method.

Step/Direction

In “Step/Direction Mode” the motor axis follows a digital signal step-by-step. This mode can replace stepper motors. It can also be used to control the EPOS2 by a PLC without CAN interface.

Analog Commands

In the position, speed and current mode it is possible to give commands via an external analog set value. This function offers further possibilities to operate the EPOS2 without serial on-line commanding.

Capture inputs (Position Marker)

Digital inputs can be configured so that the actual position value is saved when a positive and/or negative edge of an input appears.

Trigger output (Position Compare)

Digital outputs can be configured so that a digital signal is emitted at a set position value.

Dual-loop position and speed control

With an additional sensor the load can be controlled directly and with high precision; the motor control is subordinated. The mechanical backlash and the elasticity can be compensated.

Wide range of sensors can be handled: digital incremental encoder, SSI absolute encoder, analog incremental encoder (sin/cos). (Only in use with EPOS2 50/5 and EPOS2 70/10.)

Control of holding brakes

The control of the holding brake can be implemented in the device state management. The delay times can be individually configured for switching on and off.

Additional information for technical data of page 460/461

Standardized, extendable

CANopen standard CiA 301, 402 and 305. Can easily be integrated into existing CANopen systems. Networks with other CANopen modules. Alternatively controllable by serial interface (USB and RS232).

Flexible, modular

The same technology for DC and EC motors. Configurable inputs and outputs for limit switches, reference switches, 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.

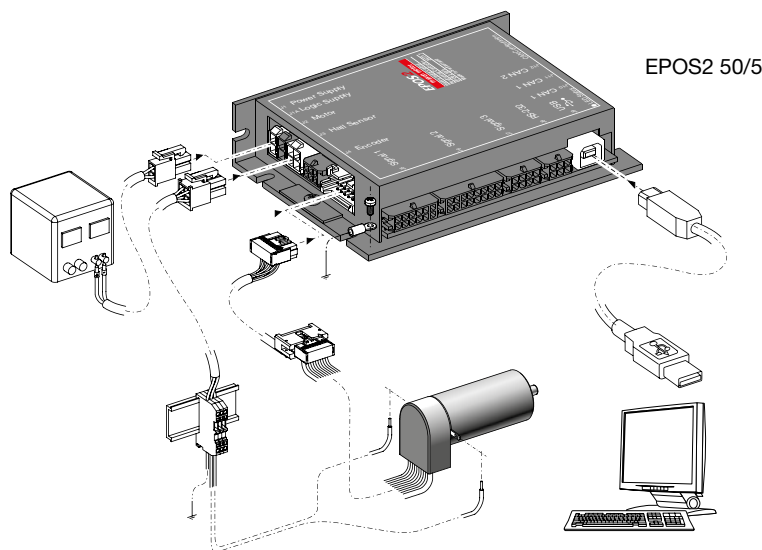
Easy programming

IEC 61131-3 libraries for CAN master units from industry leading manufacturers (Beckhoff, Siemens/Helmholz, VIPA) as well as 32/64-bit Windows DLLs for PC master units (IXXAT, Vector, National Instruments and Kvaser) are available. Programming examples for MS Visual C#, MS Visual C++, MS Visual Basic, Borland C++, Borland Delphi, National Instruments LabVIEW and National Instruments LabWindows/CVI are available at no charge.

Also available: The 32/64-bit Linux Shared Object Library with programming examples for Eclipse C++/QT as well as ARMv7 support for a wide variety of platforms (Raspberry Pi, BeagleBone). In addition, the maxon library for NI SoftMotion makes integration of EPOS2 in the National Instruments Compact Rio system easy.

Operating modes

Digital position, speed and current/torque control. Sinusoidal commutation for smooth operation of EC motors.



Operating modes

CANopen Profile Position-, Profile Velocity- and Homing Mode

Position, Velocity and Current Mode
Alternative set value setting via Step/Direction, Master Encoder or external analog commanding

Path generating with trapezoidal or sinusoidal profiles

Feed forward for velocity and acceleration

Interpolated Position Mode (PVT)

Sinusoidal or block commutation for EC motors

Dual loop position and speed controller

Communication

Communication via CANopen and/or USB 2.0/3.0 and/or RS232

Gateway function USB-to-CAN and RS232-to-CAN

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

Windows DLL/Linux Shared Object Library

IEC 61131-3 Libraries

Firmware

Available documentation

Feature Chart

Getting Started

Cable Starting Set

Hardware Reference

Firmware Specification

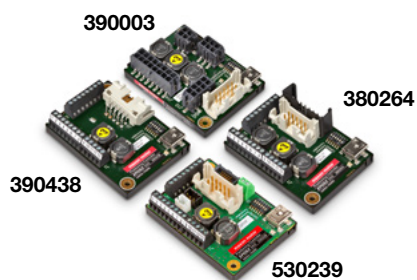
Communication Guide

Application Notes

Cable

A comprehensive range of cables is available as an option. Details can be found on page 470.

EPOS2 Positioning Controllers Data



EPOS2 24/2

Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder up to 48/96 watts.

EPOS2 Module 36/2

The EPOS2 is an OEM positioning controller plug-in module for brushed DC motors with encoder or brushless EC motors with Hall sensors and encoder up to 72/144 watts.

Controller versions	CANopen Slave	CANopen Slave
Electrical data		
Operating voltage V_{CC}	9 - 24 VDC	11 - 36 VDC (optional 0 - 36 VDC)
Logic supply voltage V_C (optional)		11 - 36 VDC (optional 5.0 VDC)
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current I_{max} (<1 s)	4 A	4 A
Continuous output current I_{cont}	2 A	2 A
Switching frequency of power stage	100 kHz	50 kHz
Sample rate of PI - current controller	10 kHz	10 kHz
Sample rate of PI - speed controller	1 kHz	1 kHz
Sample rate of PID - positioning control	1 kHz	1 kHz
Max. speed (1 pole pair)	25000 rpm (sinusoidal); 100000 rpm (block)	25000 rpm (sinusoidal); 100000 rpm (block)
Built-in motor choke per phase	47 μ H / 2 A	10 μ H / 2 A
Input		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A', B, B', I, I' (max. 5 MHz)	A, A', B, B', I, I' (max. 5 MHz)
Digital inputs	6 (TTL level)	6 (TTL level)
Analog inputs	2 (12-bit resolution, 0...+5 V)	2 (11-bit resolution, 0...+5 V)
CAN-ID (CAN node identification)	configurable with DIP switch 1...4	set by external wiring
Output		
Digital outputs	2	3
Analog outputs		
Encoder voltage output	+5 VDC, max. 100 mA	+5 VDC, max. 100 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 10 mA	
Interface		
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)	external USB transceiver required
Indicator		
LED green = READY, red = ERROR	green LED, red LED	green LED, red LED
Environmental conditions		
Temperature – Operation	-10...+55°C	-10...+45°C
Temperature – Extended range	+55...+74°C; Derating: -0.105 A/°C	+45...+75°C; Derating: -0.067 A/°C
Temperature – Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	Approx. 30 g	Approx. 10 g
Dimensions (L x W x H)	55 x 40 x 19.6 mm	54.5 x 28.2 x 9 mm
Mounting	Flange for M2.5-screws	PCB edge connector with locking mechanism
Part numbers		
	390438 EPOS2 24/2 for DC motors	360665 EPOS2 Module 36/2
	380264 EPOS2 24/2 for EC motors	
	390003 EPOS2 24/2 for DC/EC motors	
	530239 EPOS2 24/2 for DC(X) motors	
Accessories		
	309687 DSR 50/5 Shunt regulator	363407 EPOS2 Module Starter-Kit
	Order accessories separately, see page 470	Order accessories separately, see page 470

**EPOS2 24/5**

Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder to 120/240 watts.

**EPOS2 50/5**

Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder to 250/500 watts.

**EPOS2 70/10**

Matched with DC brush motors with encoder or brushless EC motors with Hall sensors or encoder to 700/1750 watts.

Controller versions		
CANopen Slave	CANopen Slave	CANopen Slave
Electrical data		
11 - 24 VDC	11 - 50 VDC	11 - 70 VDC
11 - 24 VDC	11 - 50 VDC	11 - 70 VDC
0.9 x V _{CC}	0.9 x V _{CC}	0.9 x V _{CC}
10 A	10 A	25 A
5 A	5 A	10 A
50 kHz	50 kHz	50 kHz
10 kHz	10 kHz	10 kHz
1 kHz	1 kHz	1 kHz
1 kHz	1 kHz	1 kHz
25 000 rpm (sinusoidal); 100 000 rpm (block)	25 000 rpm (sinusoidal); 100 000 rpm (block)	25 000 rpm (sinusoidal); 100 000 rpm (block)
15 μH / 5 A	22 μH / 5 A	25 μH / 10 A
Input		
H1, H2, H3	H1, H2, H3	H1, H2, H3
A, A\, B, B\, I, I\ (max. 5 MHz)	A, A\, B, B\, I, I\ (max. 5 MHz)	A, A\, B, B\, I, I\ (max. 5 MHz)
6 (TTL and PLC level)	11 (7 optically isolated, 4 differential)	10 (7 optically isolated, 3 differential)
2 (12-bit resolution, 0...+5 V)	2 (differential, 12-bit resolution, ±10 V)	2 (differential, 12-bit resolution, 0...+5 V)
configurable with DIP switch 1...7	configurable with DIP switch 1...7	configurable with DIP switch 1...7
Output		
4	5 (4 optically isolated, 1 differential)	5 (4 optically isolated, 1 differential)
	1 (12-bit, 0...10 V, max. 1 mA)	
+5 VDC, max 100 mA	+5 VDC, max. 100 mA	+5 VDC, max. 100 mA
+5 VDC, max. 30 mA	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
V _{CC} , max. 1300 mA	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA; +5 VDC (R _i = 1 kΩ)
Interface		
RxD; TxD (max. 115 200 bit/s)	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)	high; low (max. 1 Mbit/s)
Data+; Data- (max. 12 Mbit/s)	Data+; Data- (max. 12 Mbit/s)	Data+; Data- (max. 12 Mbit/s)
Indicator		
green LED, red LED	green LED, red LED	green LED, red LED
Environmental conditions		
-10...+55°C	-10...+45°C	-10...+45°C
+55...+83°C; Derating: -0.179 A/°C	+45...+80°C; Derating: -0.143 A/°C	+45...+85°C; Derating: -0.250 A/°C
-40...+85°C	-40...+85°C	-40...+85°C
5...90%	5...90%	5...90%
Mechanical data		
Approx. 170 g	Approx. 240 g	Approx. 330 g
105 x 83 x 24 mm	120 x 93.5 x 27 mm	150 x 93 x 27 mm
Flange for M3-screws	Flange for M3-screws	Flange for M3-screws
Part numbers		
367676 EPOS2 24/5	347717 EPOS2 50/5	375711 EPOS2 70/10
Accessories		
309687 DSR 50/5 Shunt regulator	309687 DSR 50/5 Shunt regulator	235811 DSR 70/30 Shunt regulator
Order accessories separately, see page 470	Order accessories separately, see page 470	Order accessories separately, see page 470

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 464

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

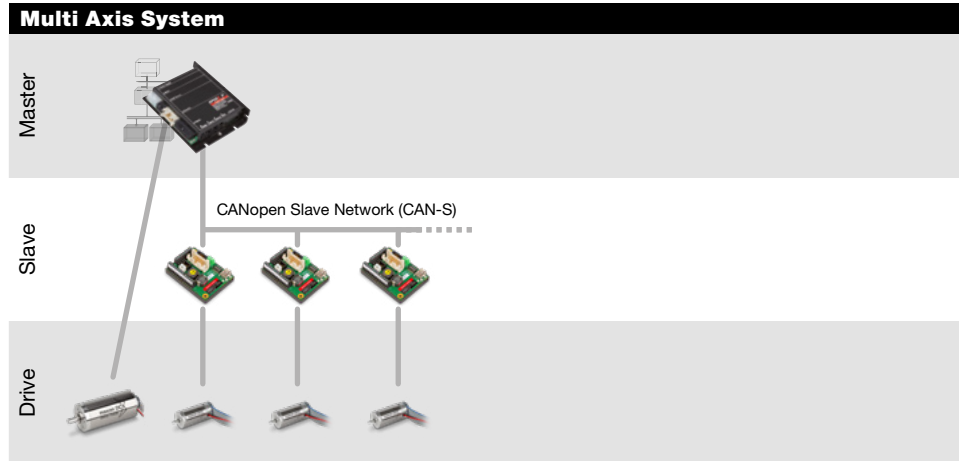
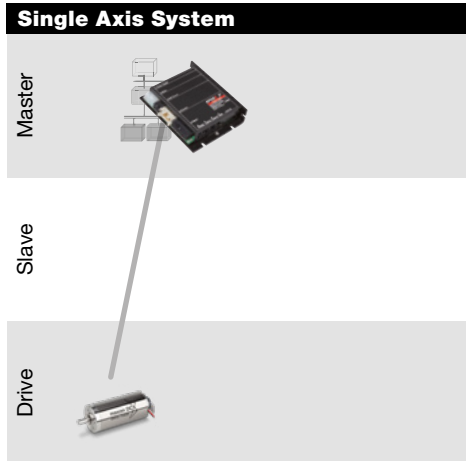
Part Number
EPOS2 P 24/5 **378308**

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.

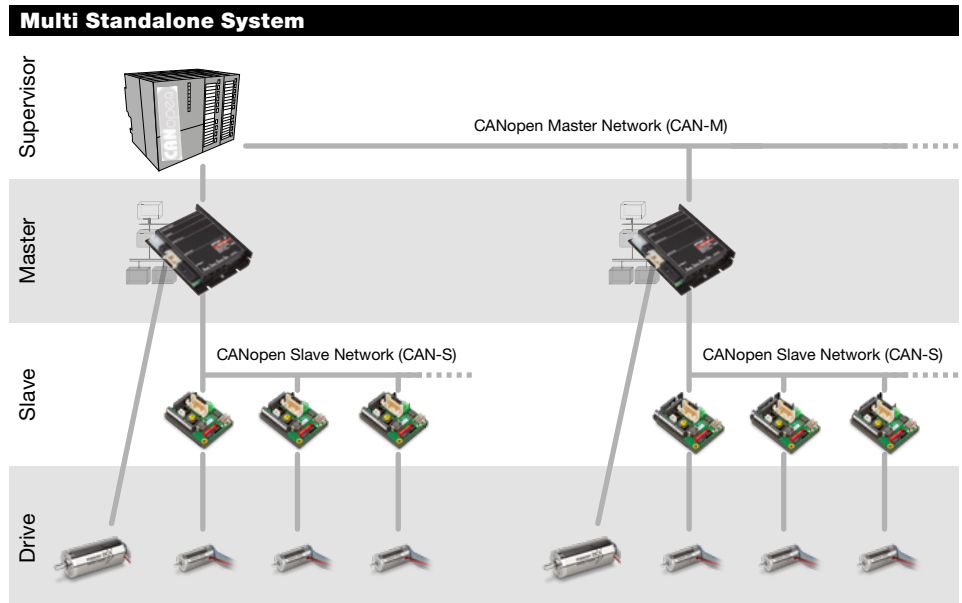
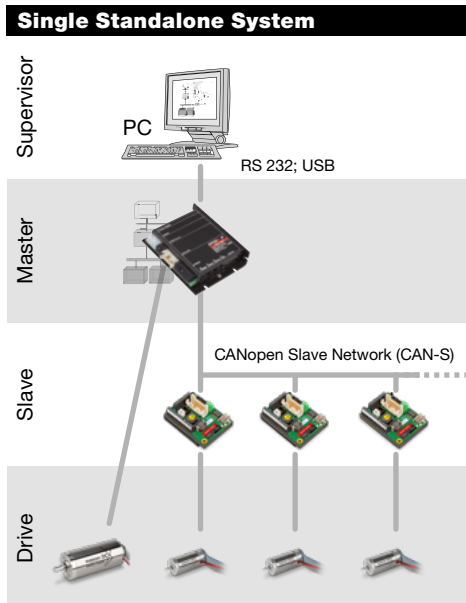
Standalone drive systems
With self-compiled programs, the standalone version of EPOS2 can autonomously control single and multiple axis systems dispensing with the need for a superior intelligent control unit.

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.

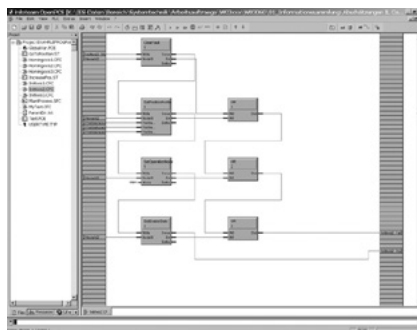
Technical data page 464

Performance features

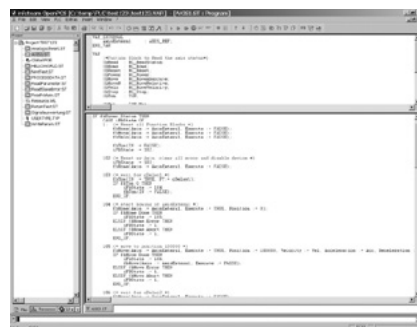
- 32 bit host processor, 60 MHz
- 1 MB memory, with 768 KB free user program memory
- typically 2.5 ms / 5000 lines IL
- 4 KB non-volatile memory
- Digital motion control signal processor

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



FBD Editor



ST Editor



SFC Editor

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

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 μ 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
-------------------------	------------------------------

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 470

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

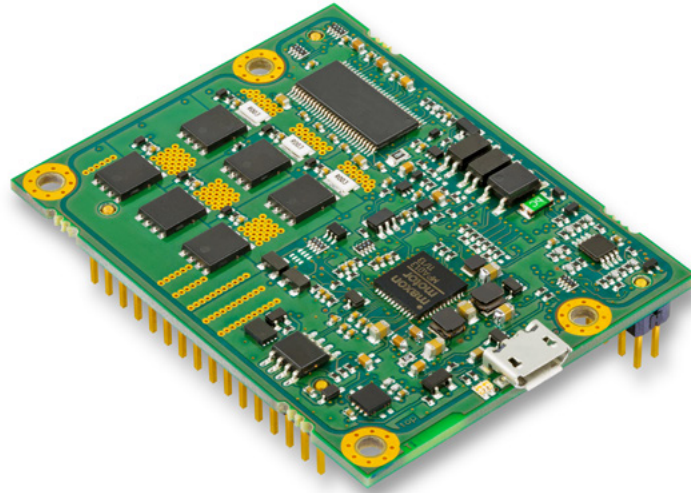
EPOS Studio
 programming according to IEC 61131-3
 IEC 61131-3 standard libraries
 motion control library
 maxon utility function block library
 CANopen function block library
 maxon utility library
 Application Examples
 Best Practice Examples
 Firmware

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 470.



maxon EPOS4: **E**asy to use **P**ositioning **S**ystem. **1500 W on just 28 cm²**

The new maxon EPOS4 positioning controllers have a lot to offer:

Maximum power density for DC and BLDC motors
From 36 W continuous power to 2100 W peak power.

Uncompromising control performance
Field-oriented control (FOC) and observer control.




Versatile systems compatibility
EtherCAT, CANopen, USB and RS232.

Easy to use
EPOS Studio with auto-tuning and software libraries.

epos.maxonmotor.com

MAXPOS Positioning Controller Summary

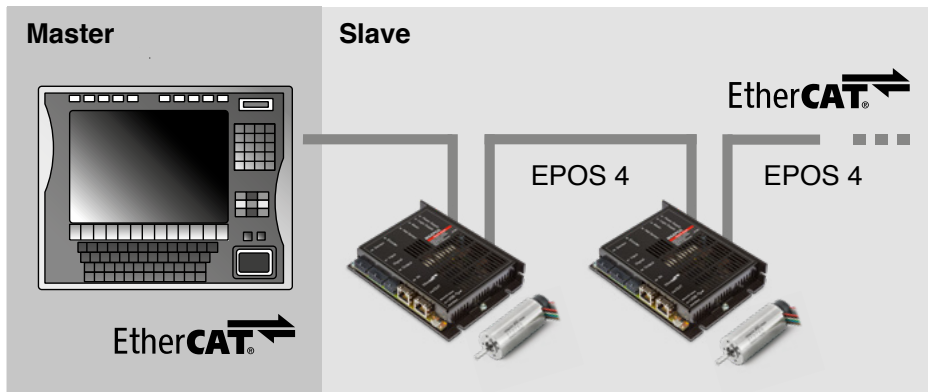


-  **PRECISION**
-  **DYNAMIC**
-  **SYNCHRONIZATION**

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.

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.

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

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.

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.

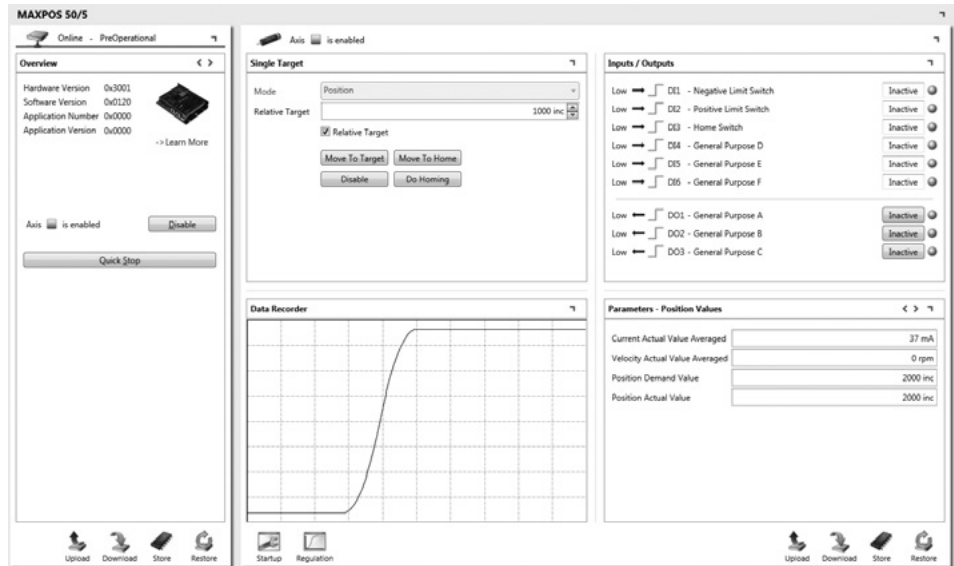
EtherCAT Master: Integration made easy

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.

Additional information for technical data of page 468



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 470.

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.

Controller versions	
	EtherCAT Slave
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 μ s)
Sample rate of PI - speed controller	10 kHz (100 μ s)
Sample rate of PID - positioning control	10 kHz (100 μ s)
Max. speed (DC)	limited by max. speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	200 000 rpm (sinusoidal)
Built-in motor choke per phase	22 μ 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	
	447293 MAXPOS 50/5
Accessories	
	309687 DSR 50/5 Shunt regulator
	Order accessories separately, see page 470

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	444	
	403112	ESCON 36/2 DC, for DC motors, speed control (open loop/closed loop), current control, 2/4 A, 10–36 VDC	444	
	414533	ESCON 36/3 EC, for EC motors, speed control (open loop/closed loop), current control, 2.7/9 A, 10–36 VDC	445	
	446925	ESCON Module 50/4 EC-S, for sensorless EC motors, speed control (open loop/closed loop), 4/12 A, 10–50 VDC	445	
	409510	ESCON 50/5, for DC/EC motors, speed control (open loop/closed loop), current control, 5/15 A, 10–50 VDC	447	
	438725	ESCON Module 50/5, for DC/EC motors, speed control (open loop/closed loop), current control, 5/15 A, 10–50 VDC	445	
	NEW	532872	ESCON Module 50/8, for DC/EC motors, speed control (open loop/closed loop), current control, 8/15 A, 10–50 VDC	
	NEW	586137	ESCON Module 50/8 HE, for DC/EC motors, speed control (open loop/closed loop), current control, 8/15 A, 10–50 VDC	
		422969	ESCON 70/10, for DC/EC motors, speed control (open loop/closed loop), current control, 10/30 A, 10–70 VDC	447

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
	NRND	228597	DES 70/10, digital 4-Q-EC Servoamplifier 70 V/10 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	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	
		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	
	NEW	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	
	NEW	605299	EPOS4 Compact 50/15 EtherCAT, digital positioning controller, 15 A, 10–50 VDC	
	NEW	594385	EPOS4 70/15, digital positioning controller, 15 A, 10–70 VDC	
	EPOS2		380264	EPOS2 24/2 for EC motors, digital positioning controller, 2 A, 9–24 VDC
			390003	EPOS2 24/2 for DC/EC motors, digital positioning controller, 2 A, 9–24 VDC
			390438	EPOS2 24/2 for DC motors, digital positioning controller, 2 A, 9–24 VDC
		530239	EPOS2 24/2 for DC(X) motors, digital positioning controller, 2 A, 9–24 VDC	
		360665	EPOS2 Module 36/2 OEM positioning controller plug-in module, 2 A, 11–36 VDC	
		392159	EPOS2 Module 24/3 OEM positioning controller plug-in module, 3 A, 11–24 VDC	
		367676	EPOS2 24/5, digital positioning controller, 5 A, 11–24 VDC	
		347717	EPOS2 50/5, digital positioning controller, 5 A, 11–50 VDC	
		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)
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Front panel

NRND	167850	Front panel 3HE / 5TE to ADS_E 50/5 (166143)
NRND	168910	Front panel 3HE / 7TE to ADS_E 50/10 (168049)

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
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
520851	Motor Cable High Current (length 3 m) to 520884, 520886, 594385, 604594, 605299
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
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
275932	Signal Cable 16core (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
300586	Signal Cable 6x2core (length 3 m) to 347717, 375711
350390	Signal Cable 4x2core (length 3 m) to 347717
378173	Signal Cable 3x2core (length 3 m) 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
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
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
350392	USB Type A - B Cable (length 3 m) to 347717, 361435
370513	USB Type A - mini B Cable (length 3 m) to 367676, 375711, 378308, 390438, 380264, 390003
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
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, 536997, 541718, 546047, 546714, 594385
319471	CAN-Y Cable to 390003, 378308
422827	Ethernet Cable (length 2 m) to 447293, 546047, 594385, 604594, 605298, 605299
451290	Sensor Cable 5x2core (length 3 m) to 447293
520852	Sensor Cable 5x2core (length 3 m) to 520884, 520885, 520886, 534133, 536997, 541718, 546047, 546714, 594385, 604594, 605298, 605299
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
303807	EPOS2 24/2 Connector Set to 390003
351061	EPOS2 50/5 Connector Set to 347717
384915	EPOS2 24/5 Connector Set to 367676, 378308
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
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 EC 6 (1.5 W/2 W) EC 8, EC 9.2 flat
498157	Adapter Micromotor for use with motors EC 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 EC 6 (1.5 W/2 W) EC 8, EC 9.2 flat with 380264 and 414533
418721	Adapter GREEN FPC8poles, for use with motors EC 6 (1.2 W), EC 10 flat with 380264 and 414533

Thermal pad

NEW	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

DEC	370652	DEC Module Evaluation Board, with switch, LED, potentiometer etc., for use with 367661 and 380200	
ESCON	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	
NEW	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	
EPOS2	363407	EPOS2 Module 36/2 Starter Kit, consisting of 361435, 360665, 275829, 275851, 275878, 275934, 275932, 350392	
	361435	EPOS2 Module Evaluation Board, 1-axis (with switch, LED, potentiometer and connector) for use with 360665	
	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	
EPOS2 P	327460	EPOS2 P 24/5 Starter Kit, consisting of EPOS2 P 24/5, EC motor with encoder, power supply, I/O board, cables	
EPOS4	NEW	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
	536997	EPOS4 CB 50/5 CAN, connector board including STO Idle Connector, compatible with 534130	
	534133	EPOS4 CB 24/1.5 CAN, connector board including STO Idle Connector, compatible with 536630	

Expansion boards

EPOS4	NEW	581245	EPOS4 EtherCAT Card for use with 536630, 546047, 534130, 504384, 504383, 594385
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Software

ESCON	409286	ESCON USB Stick including ESCON Setup, for use with 466023, 403112, 414533, 446925, 409510, 438725, 422969, 532872, 586137
MAXPOS	459639	MAXPOS USB Stick including MAXPOS Setup, for use with 447293



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

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

474-475
476

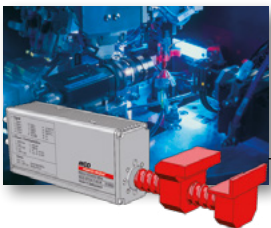
MCD EPOS Intelligent compact drive

CANopen



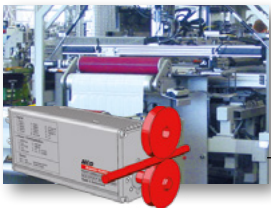
Driving

A reliable drive solution is the key to production machinery with many years of maintenance-free operation in a variety of applications.



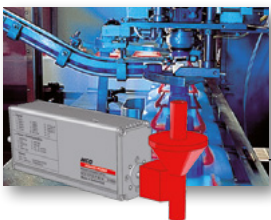
Setting-up

The rapid set-up of processing machinery which offers both precision and long-term accuracy is the key to efficient production.



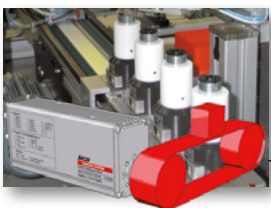
Guiding

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.

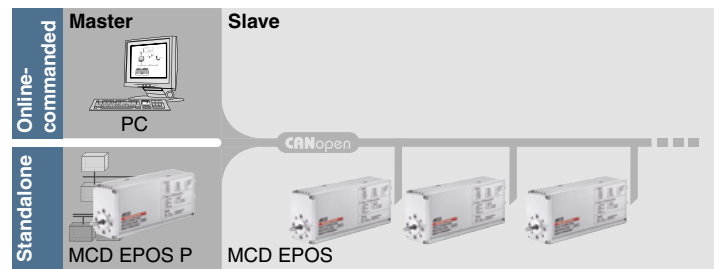


Maintenance-free positioning drive with tried and trusted components

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

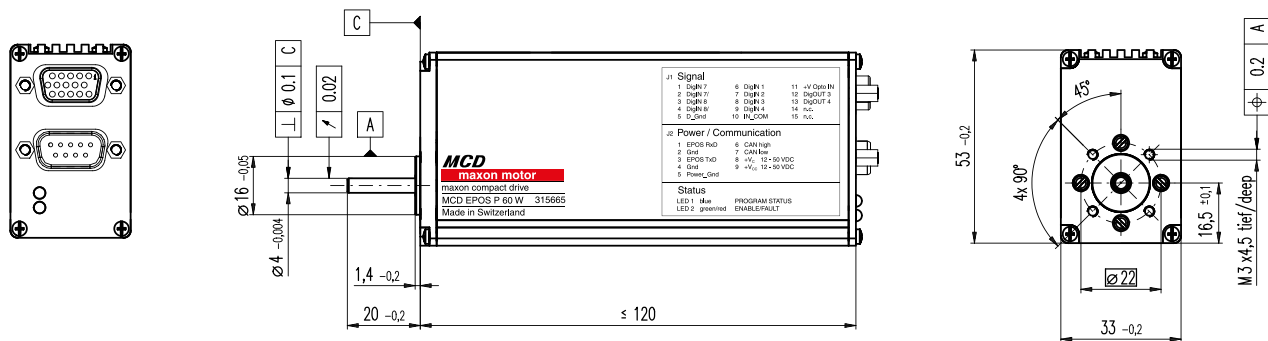
Substantial cost-savings have been made thanks to the careful selection and optimization of components. The resulting drive is available at an unsurpassed price which is well below the cost of the individual parts. Simplified mounting results in further cost-savings.

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

maxon compact drive

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 ²	
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 _C 12-50 VDC
3 EPOS TxD	6 CAN high	9 +V _{CC} 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 _{CC}	+12...+50 VDC
Logic supply voltage +V _C (optional)	+12...+50 VDC
Max. output voltage	0.9 x V _{CC}
Max. output current I _{max}	9 A
Continuous output current I _{cont}	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 _L <350 mA)
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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 Ø32 mm, 1.0-8.0 Nm, P. 342/347/350/374-378	
Planetary Gearhead Ø42 mm, 3.0 - 15.0 Nm, p. 355	

Part Numbers

326343	MCD EPOS 60 W
315665	MCD EPOS P 60 W

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

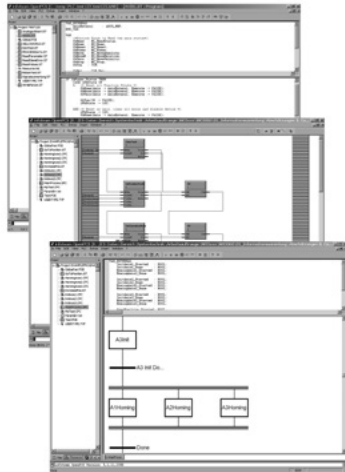
- Step-by-step movement of the motor axis

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

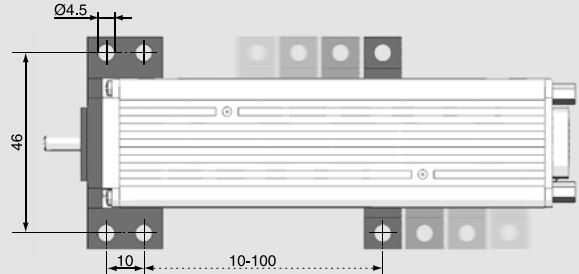
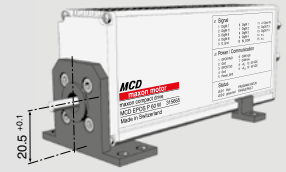
The complexity and development costs of drive systems are substantially reduced. The Motion Firmware Library was implemented according to the widely-used Motion Control Standard. Standardized function blocks make implementation easy.

- 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

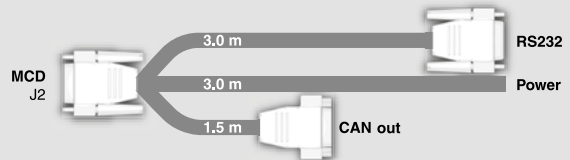
Signal cable



Part Number
326923

MCD EPOS Signal Cable

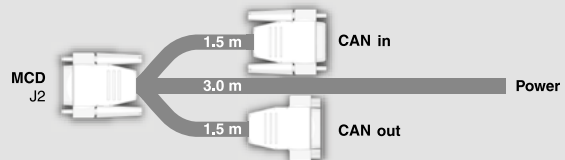
Power/RS232-CAN cable



Part Number
325939

MCD EPOS Power/RS232-CAN Cable

Power/CAN-CAN cable



Part Number
325235

MCD EPOS Power/CAN-CAN Cable

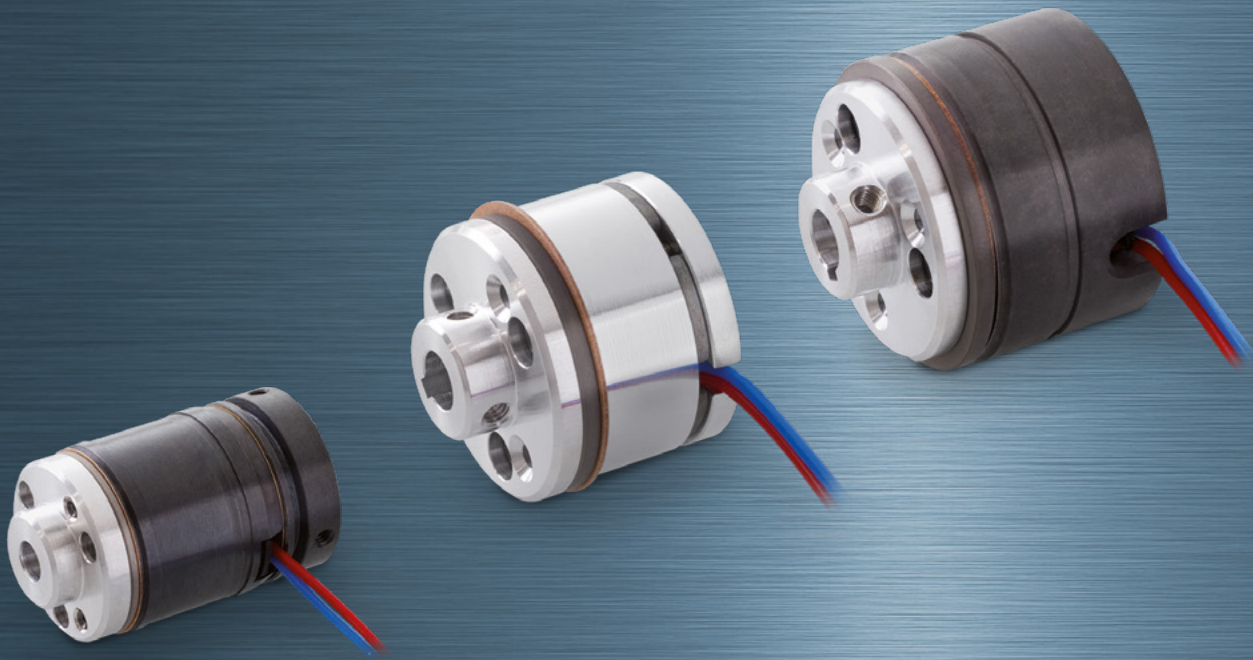
CAN Termination plug

Is required as line termination for the CAN-Network.



Part Number
326925

MCD EPOS CAN Termination Plug



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
controlCompact
Drive

Accessories

Ceramic

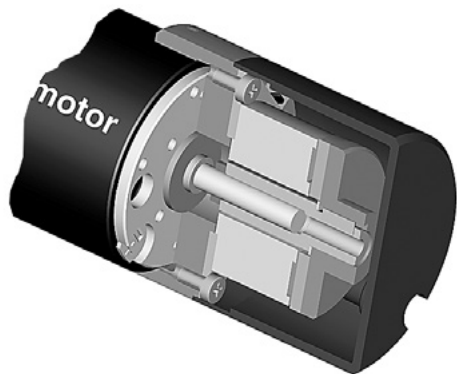
Contact
information

maxon accessories

Useful parts complete maxon's full range of drive technology products. Brakes may only be assembled with motors in the delivery plant.

Brake AB 20	24 VDC, 0.1 Nm	478
Brake AB 28	24 VDC, 0.4 Nm	479-481
Brake AB 32	24 VDC, 0.4 Nm	482
Brake AB 41	24 VDC, 2.0 Nm	483
Brake AB 44	24 VDC, 2.5 Nm	484
End caps		485
ECX 13	Connection cable	486
ECX 16	Connection cable	487
ECX 19	Connection cable	488
ECX 22	Connection cable	489

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.

- 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-max 22, 12 W	222					22	67.8
EC-max 22, 12 W	222	GP 22, 0.5 - 3.4 Nm	336/337			22	•
EC-max 22, 12 W	222	KD 32	352			22	•
EC-max 22, 12 W	222	GP 22 S	372/373			22	•
EC-max 22, 25 W	223					22	84.2
EC-max 22, 25 W	223	GP 22, 0.5 - 3.4 Nm	337			22	•
EC-max 22, 25 W	223	GP 32, 1 - 6 Nm	347			22	•
EC-max 22, 25 W	223	KD 32	352			22	•
EC-max 22, 25 W	223	GP 32 S	374-378			22	•
EC-max 30, 40 W	224					30	77.6
EC-max 30, 40 W	224	GP 32, 1.0 - 8.0 Nm	347/350			30	•
EC-max 30, 40 W	224	KD 32, 1.0 - 4.5 Nm	352			30	•
EC-max 30, 40 W	224	GP 32 S	374-378			30	•
EC-max 30, 40 W	224			HEDL 5540	432	30	98.4
EC-max 30, 40 W	224	GP 32, 1.0 - 8.0 Nm	347/350	HEDL 5540	432	30	•
EC-max 30, 40 W	224	KD 32, 1.0 - 4.5 Nm	352	HEDL 5540	432	30	•
EC-max 30, 40 W	224	GP 32 S	374-378	HEDL 5540	432	30	•
EC-max 30, 60 W	225					30	99.6
EC-max 30, 60 W	225	GP 32, 1.0 - 8.0 Nm	347/350			30	•
EC-max 30, 60 W	225	KD 32, 1.0 - 4.5 Nm	352			30	•
EC-max 30, 60 W	225	GP 42, 3 - 15 Nm	355			30	•
EC-max 30, 60 W	225			HEDL 5540	432	30	120.4
EC-max 30, 60 W	225	GP 32, 1.0 - 8.0 Nm	347/350	HEDL 5540	432	30	•
EC-max 30, 60 W	225	KD 32, 1.0 - 4.5 Nm	352	HEDL 5540	433	30	•
EC-max 30, 60 W	225	GP 42, 3 - 15 Nm	355	HEDL 5540	432	30	•
EC-4pole 30, 100 W	233					30	83.2
EC-4pole 30, 100 W	233	GP 32, 0.4 - 8.0 Nm	350			30	•
EC-4pole 30, 100 W	233	GP 42, 3 - 15 Nm	355			30	•
EC-4pole 30, 100 W	233			HEDL 5540	433	30	104
EC-4pole 30, 100 W	233	GP 32, 0.4 - 8.0 Nm	350	HEDL 5540	433	30	•
EC-4pole 30, 100 W	233	GP 42, 3 - 15 Nm	355	HEDL 5540	433	30	•
EC-4pole 30, 200 W	235					30	100.2
EC-4pole 30, 200 W	235	GP 32, 0.4 - 8.0 Nm	350			30	•
EC-4pole 30, 200 W	235	GP 42, 3 - 15 Nm	355			30	•
EC-4pole 30, 200 W	235			HEDL 5540	433	30	121
EC-4pole 30, 200 W	235	GP 32, 0.4 - 8.0 Nm	350	HEDL 5540	433	30	•
EC-4pole 30, 200 W	235	GP 42, 3 - 15 Nm	355	HEDL 5540	433	30	•

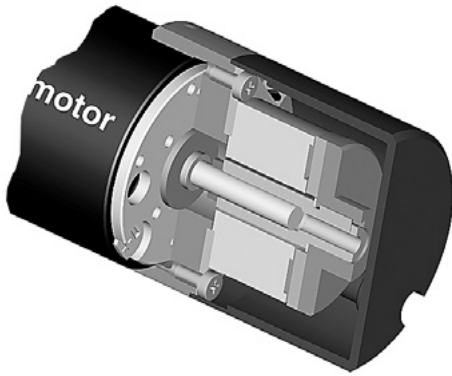
Technical Data

Max. permissible static torque at 20°C	0.1 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	1.8 gcm ²	Resistance	R ₂₀ = 227 Ω ±6%
Max. speed	49000 rpm	Duty cycle	100%
Weight	29 g	Reaction time	≤ 12 ms
Ambient temperature range	-40...+100°C	- Coupling	≤ 6 ms
		- Opening	

Pin Allocation

Cable (AWG 26)	Designation
red	U _{Brake} + 24 VDC
blue	U _{Brake} GND
Min. cable length	350 mm

Brake AB 28 24 VDC, 0.4 Nm



Important Information

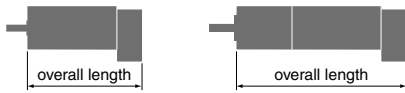
- Permanent magnet — single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

- Stock program
- Standard program
- Special program (on request)

Part Numbers

301215

Type

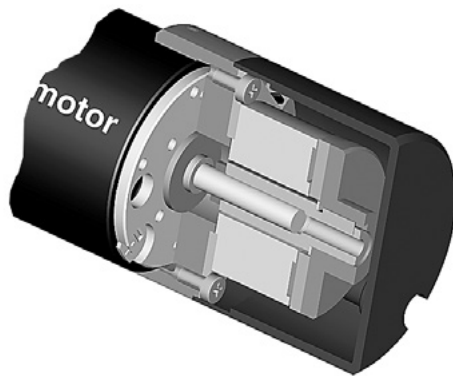


maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	∅ AB [mm]	Overall length [mm] / • see Gearhead
EC-max 40, 70 W	226					40	92.4
EC-max 40, 70 W	226	GP 42, 3 - 15 Nm	355			40	•
EC-max 40, 70 W	226			HEDL 5540	432	40	110.7
EC-max 40, 70 W	226	GP 42, 3 - 15 Nm	355	HEDL 5540	432	40	•
EC-max 40, 120 W	227					40	122.4
EC-max 40, 120 W	227	GP 52, 4 - 30 Nm	360			40	•
EC-max 40, 120 W	227			HEDL 5540	432	40	140.7
EC-max 40, 120 W	227	GP 52, 4 - 30 Nm	360	HEDL 5540	432	40	•

Technical Data				Pin Allocation	
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%	Cable (AWG 26)	Designation
Mass inertia	10 gcm ²	Resistance	R ₂₀ = 92.5 Ω ±6%	red	U _{Brake} + 24 VDC
Max. speed	16000 rpm	Duty cycle	100%	blue	U _{Brake} GND
Weight	0.05 kg	Reaction time	≤ 13 ms	Min. cable length 350 mm	
Ambient temperature range	-5...+85°C	- Coupling	≤ 27 ms		
		- Opening			

Brake AB 28 24 VDC, 0.4 Nm



Important Information

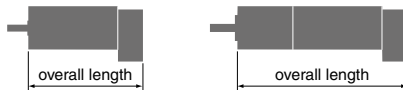
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

- 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	126					40	77.1
RE 25, 20 W	126	GP 22, 0.5 -1.0 Nm	333			40	•
RE 25, 20 W	126	GP 26, 0.75 - 4.5 Nm	340			40	•
RE 25, 20 W	126	GP 32, 0.75 - 4.5 Nm	342			40	•
RE 25, 20 W	126	GP 32, 0.75 - 4.5 Nm	343			40	•
RE 25, 20 W	126	GP 32, 1.0 - 6.0 Nm	346/352			40	•
RE 25, 20 W	126	GP 32 S	374-378			40	•
RE 25, 20 W	126			HED_ 5540	430/433	40	94.3
RE 25, 20 W	126	GP 22, 0.5 - 1.0 Nm	333	HED_ 5540	430/433	40	•
RE 25, 20 W	126	GP 26, 0.75 - 4.5 Nm	340	HED_ 5540	430/433	40	•
RE 25, 20 W	126	GP 32, 0.75 - 4.5 Nm	342	HED_ 5540	430/433	40	•
RE 25, 20 W	126	GP 32, 0.75 - 4.5 Nm	343	HED_ 5540	430/433	40	•
RE 25, 20 W	126	GP 32, 1.0 - 6.0 Nm	346/352	HED_ 5540	430/433	40	•
RE 25, 20 W	126	GP 32 S	374-378	HED_ 5540	430/433	40	•
RE 25, 20 W	127					40	88.6
RE 25, 20 W	127	GP 26, 0.75 - 4.5 Nm	340			40	•
RE 25, 20 W	127	GP 32, 0.75 - 4.5 Nm	342			40	•
RE 25, 20 W	127	GP 32, 0.75 - 4.5 Nm	343			40	•
RE 25, 20 W	127	GP 32, 1.0 - 6.0 Nm	346/352			40	•
RE 25, 20 W	127	GP 32 S	374-378			40	•
RE 25, 20 W	127			HED_ 5540	429/431	40	105.8
RE 25, 20 W	127	GP 26, 0.75 - 4.5 Nm	340	HED_ 5540	429/431	40	•
RE 25, 20 W	127	GP 32, 0.4 - 2.0 Nm	342	HED_ 5540	429/431	40	•
RE 25, 20 W	127	GP 32, 0.75 - 4.5 Nm	343	HED_ 5540	429/431	40	•
RE 25, 20 W	127	GP 32, 1.0 - 6.0 Nm	346/352	HED_ 5540	429/431	40	•
RE 25, 20 W	127	GP 32 S	374-378	HED_ 5540	429/431	40	•
RE 35, 90 W	130					40	107.1
RE 35, 90 W	130	GP 32, 0.75 - 6.0 Nm	342-349			40	•
RE 35, 90 W	130	GP 32, 4.0 - 8.0 Nm	350			40	•
RE 35, 90 W	130	GP 42, 3 - 15 Nm	354			40	•
RE 35, 90 W	130			HED_ 5540	429/431	40	124.3
RE 35, 90 W	130	GP 32, 0.75 - 6.0 Nm	342-349	HED_ 5540	429/431	40	•
RE 35, 90 W	130	GP 32, 4.0 - 8.0 Nm	350	HED_ 5540	429/431	40	•
RE 35, 90 W	130	GP 42, 3 - 15 Nm	354	HED_ 5540	429/431	40	•
RE 35, 90 W	130	GP 32 S	374-378			40	•
RE 35, 90 W	130	GP 32 S	374-378	HED_ 5540	429/431	40	•
RE 40, 150 W	132					45	107.1
RE 40, 150 W	132	GP 42, 3 - 15 Nm	354			45	•
RE 40, 150 W	132	GP 52, 4 - 30 Nm	359			45	•
RE 40, 150 W	132			HED_ 5540	429/431	45	124.3
RE 40, 150 W	132	GP 42, 3 - 15 Nm	354	HED_ 5540	429/431	45	•
RE 40, 150 W	132	GP 52, 4 - 30 Nm	359	HED_ 5540	429/431	45	•

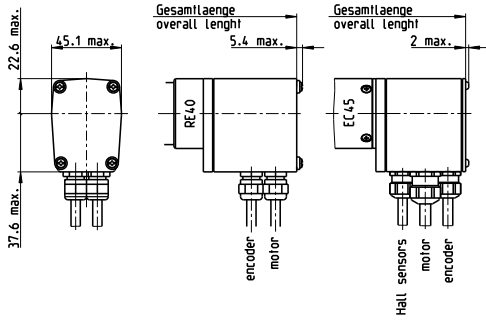
Technical Data

Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	10 gcm ²	Resistance	R ₂₀ = 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 _{Brake} + 24 VDC
blue	U _{Brake} GND
red	Motor+
black	Motor-
Min. cable length	350 mm

Brake AB 28 24 VDC, 0.4 Nm



Important Information

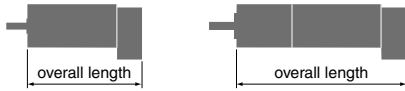
- Permanent magnet — single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

- 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	132					115.1
RE 40, 150 W	132	GP 42, 3 - 15 Nm	354			•
RE 40, 150 W	132	GP 52, 4 - 30 Nm	359			•
RE 40, 150 W	132			HEDL 9140	436	135.6
RE 40, 150 W	132	GP 42, 3 - 15 Nm	354	HEDL 9140	436	•
RE 40, 150 W	132	GP 52, 4 - 30 Nm	359	HEDL 9140	436	•
EC 45, 150 W	214					118.6
EC 45, 150 W	214	GP 42, 3 - 15 Nm	354			•
EC 45, 150 W	214	GP 52, 4 - 30 Nm	359			•
EC 45, 150 W	214			HEDL 9140	436	135.6
EC 45, 150 W	214	GP 42, 3 - 15 Nm	354	HEDL 9140	436	•
EC 45, 150 W	214	GP 52, 4 - 30 Nm	359	HEDL 9140	436	•
EC 45, 250 W	215					151.4
EC 45, 250 W	215	GP 42, 3 - 15 Nm	355			•
EC 45, 250 W	215	GP 52, 4 - 30 Nm	359			•
EC 45, 250 W	215	GP 62, 8 - 50 Nm	361			•
EC 45, 250 W	215			HEDL 9140	436	168.4
EC 45, 250 W	215	GP 42, 3 - 15 Nm	355	HEDL 9140	436	•
EC 45, 250 W	215	GP 52, 4 - 30 Nm	359	HEDL 9140	436	•
EC 45, 250 W	215	GP 62, 8 - 50 Nm	361	HEDL 9140	436	•

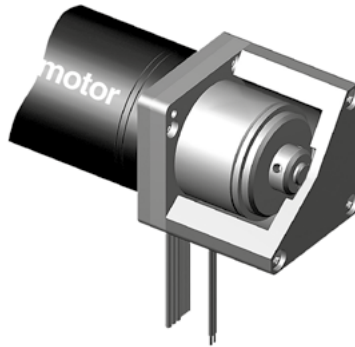
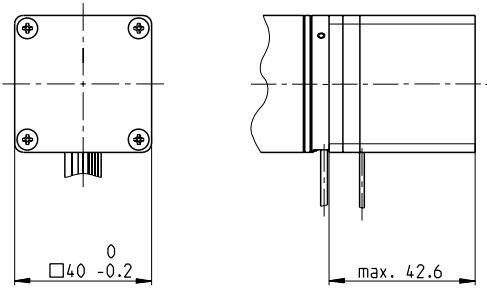
Technical Data

Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	10 gcm ²	Resistance	R ₂₀ = 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

	from motor clamp	Designation
	RE 40	
Cable green	(AWG 20)	U _{Brake} + 24 VDC
Cable yellow	(AWG 20)	U _{Brake} GND
	EC 45	
Cable No 4	(AWG 18)	U _{Brake} + 24 VDC
Cable No 5	(AWG 18)	U _{Brake} GND
	Min. cable length	500 mm

Brake AB 32 24 VDC, 0.4 Nm



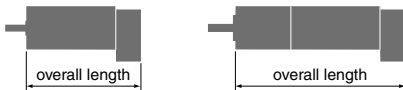
Important Information

- 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

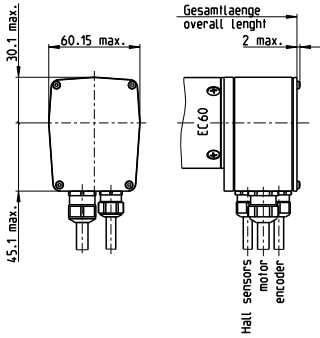


maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
EC 40, 170 W	213					122.7
EC 40, 170 W	213	GP 42, 3 - 15 Nm	354			•
EC 40, 170 W	213	GP 52, 4 - 30 Nm	359			•
EC 40, 170 W	213			HED_ 5540	430/432	141.1
EC 40, 170 W	213	GP 42, 3 - 15 Nm	354	HED_ 5540	430/432	•
EC 40, 170 W	213	GP 52, 4 - 30 Nm	359	HED_ 5540	430/432	•

Technical Data				Pin Allocation	
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%	Cable (AWG 24)	Designation
Mass inertia	19 gcm ²	Resistance	R ₂₀ = 100 Ω ±7%	red	U _{Brake} + 24 VDC
Max. speed	10 000 rpm	Duty cycle	100%	blue	U _{Brake} 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

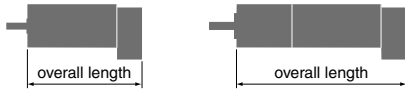
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

Part Numbers

228998

- Stock program
- Standard program
- Special program (on request)

Type



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
EC 60, 400 W	216					190.9
EC 60, 400 W	216	GP 81, 20 - 120 Nm	362			•
EC 60, 400 W	216			HEDL 9140	436	214.9
EC 60, 400 W	216	GP 81, 20 - 120 Nm	362	HEDL 9140	436	•

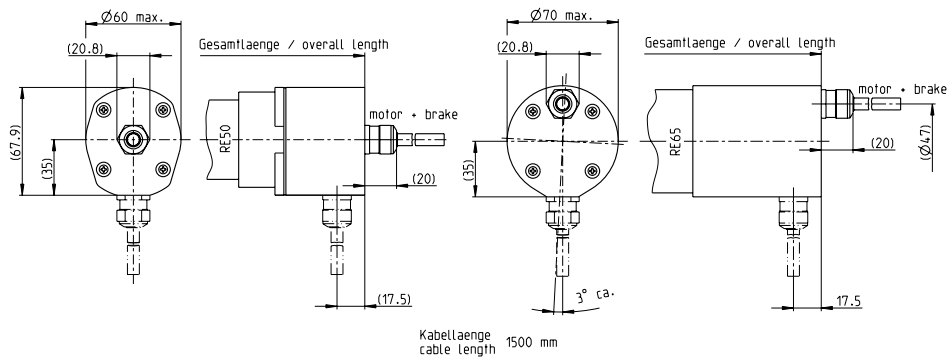
Technical Data

Max. permissible static torque at 20°C	2.0 Nm	Nominal voltage, smoothed	24 VDC -10 ... +6%
Mass inertia	45 gcm ²	Resistance	R ₂₀ = 72 Ω ±7%
Max. speed	10000 rpm	Duty cycle	100%
Weight	0.18 kg	Reaction time	≤ 2 ms
Ambient temperature range	-5...+85°C	- Coupling	≤ 25 ms
		- Opening	≤ 25 ms

Pin Allocation

from motor clamp Designation		
Cable red	No 4 (AWG 16)	U _{Brake} + 24 VDC
Cable black	No 5 (AWG 16)	U _{Brake} GND
Min. cable length	500 mm	

Brake AB 44 24 VDC, 2.5 Nm



Important Information

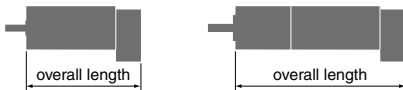
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been 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	133					170.4
RE 50, 200 W	133	GP 52, 4 - 30 Nm	360			•
RE 50, 200 W	133	GP 62, 8 - 50 Nm	361			•
RE 50, 200 W	133			HEDL 9140	437	183.4
RE 50, 200 W	133	GP 52, 4 - 30 Nm	360	HEDL 9140	437	•
RE 50, 200 W	133	GP 62, 8 - 50 Nm	361	HEDL 9140	437	•
RE 65, 250 W	134					187.5
RE 65, 250 W	134	GP 81, 20 - 120 Nm	362			•
RE 65, 250 W	134			HEDL 9140	437	205.5
RE 65, 250 W	134	GP 81, 20 - 120 Nm	362	HEDL 9140	437	•

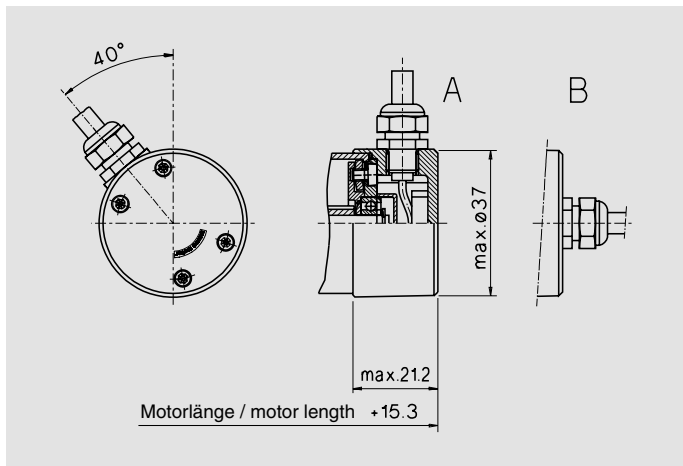
Technical Data

Max. permissible static torque at 20°C	2.5 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	90 gcm ²	Resistance	R ₂₀ = 64 Ω ±7%
Max. speed	10 000 rpm	Duty cycle	100%
Weight	0.19 kg	Reaction time	≤ 20 ms
Ambient temperature range	-40...+100°C	- Coupling	≤ 35 ms
		- Opening	

Pin Allocation

Cable (AWG 18)	Designation
white	Motor+
brown	Motor-
green	U _{Brake} + 24 VDC
yellow	U _{Brake} GND
Min. cable length	1490 mm

End Caps



End cap for maxon DC motor RE 35 mm

Details for motor see page 130

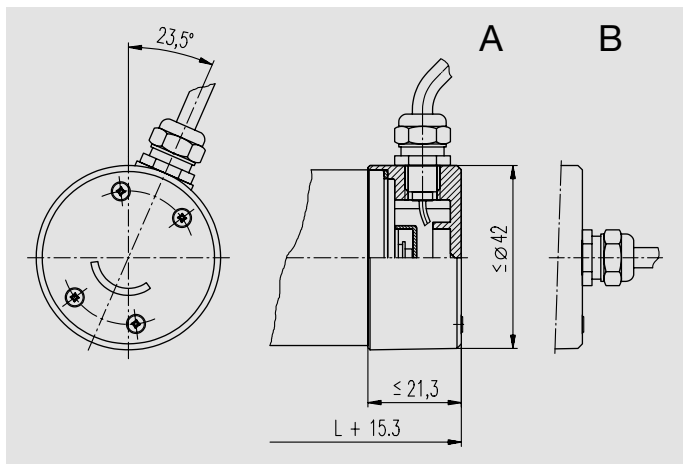
- Plastic housing
- Protection to IP54
- With 500 mm cable, AWG 20 (2 × 0.5 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	- Pol

Part Numbers

137235	A	End cap with radial cable outlet (500 mm)
137234	B	End cap with axial cable outlet (500 mm)



End cap for maxon DC motor RE 40 mm

Details for motor see page 132

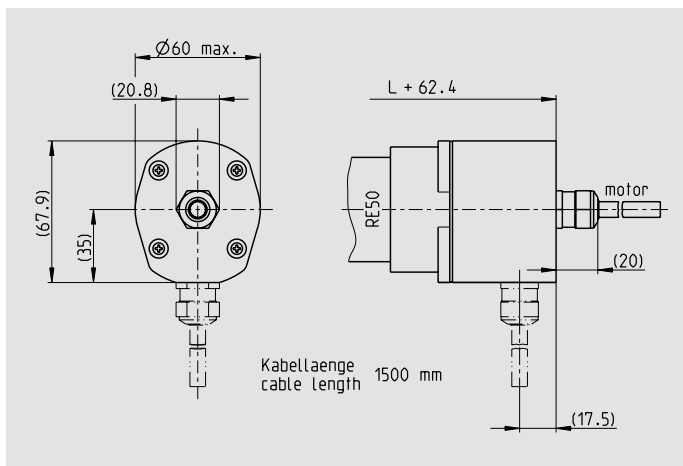
- Plastic housing
- Protection to IP54
- With 500 mm cable, AWG 20 (2 × 0.5 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	- Pol

Part Numbers

232341	A	End cap with radial cable outlet (500 mm)
232343	B	End cap with axial cable outlet (500 mm)



End cap for maxon DC motor RE 50 mm

Details for motor see page 133

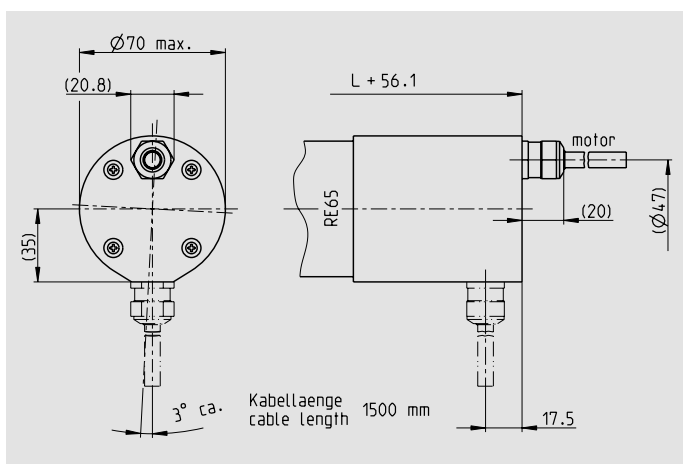
- Aluminium housing
- Protection to IP54
- With 1500 mm cable, AWG 18 (2 × 1.0 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor.

Pin Allocation

Cable No.	Color	Motor
1	white	+ Pol
2	brown	- Pol

Part Numbers

386056	A	End cap with radial cable outlet (1500 mm)
386055	B	End cap with axial cable outlet (1500 mm)



End cap for maxon DC motor RE 65 mm

Details for motor see page 134

- Aluminium housing
- Protection to IP54
- With 1500 mm cable, AWG 18 (2 × 1.0 mm²) 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

386004	A	End cap with radial cable outlet (1500 mm)
386003	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.

Characteristics:

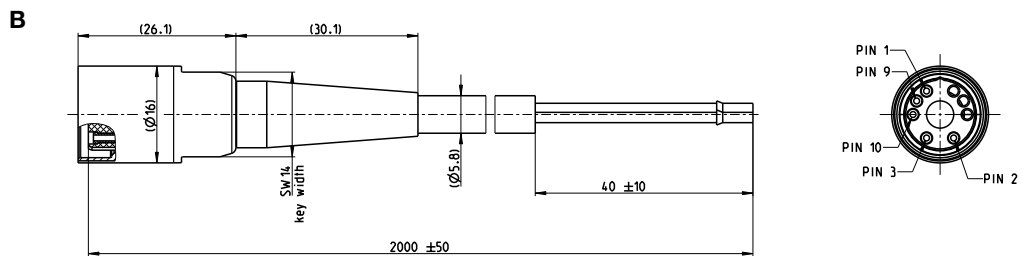
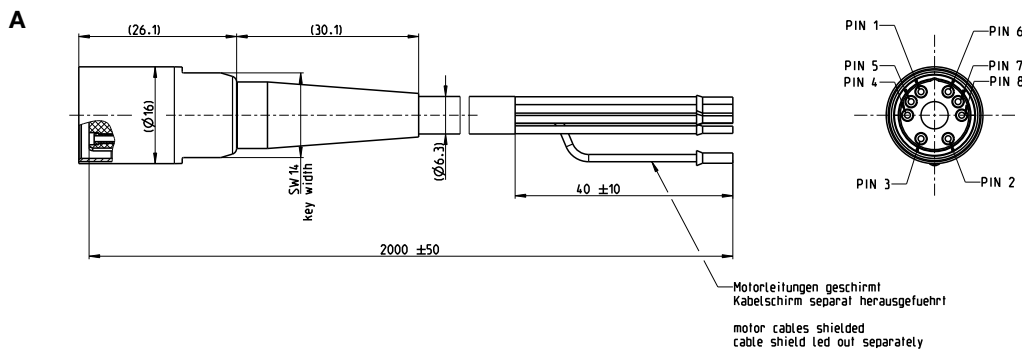
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

Part number

585750
592191
595698

Cable version

ECX 13 connecting cable, type **A**
ECX 13 connecting cable, type **B**
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

NEW

maxon accessories

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 176–179 / 181–184 and online at www.maxonmotor.com.

Characteristics:

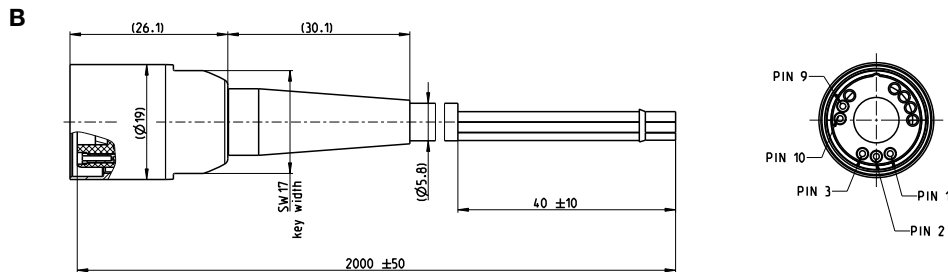
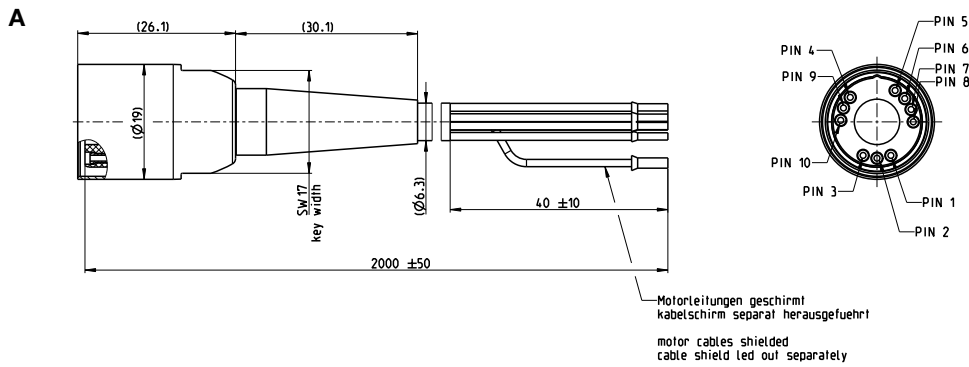
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

Part number

584532
592194
595697

Cable version

ECX 16 connecting cable, type **A**
ECX 16 connecting cable, type **B**
ECX 16 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	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 185–192 and online at www.maxonmotor.com.

Characteristics:

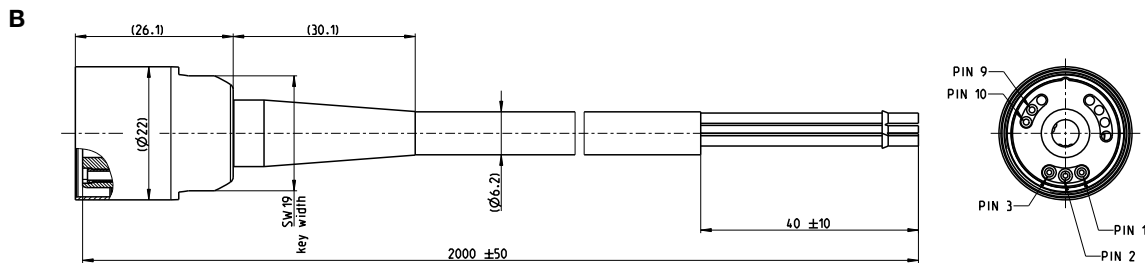
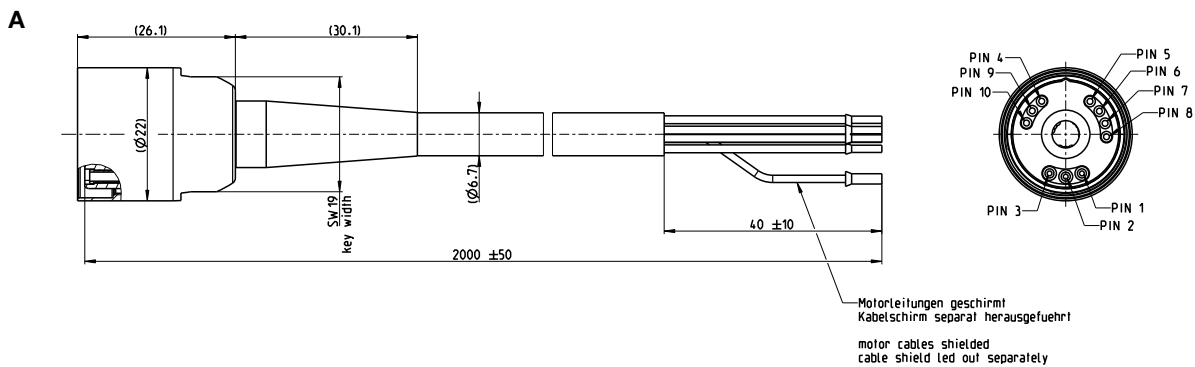
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

Part number

589852
589892
551012

Cable version

ECX 19 connecting cable, type **A**
ECX 19 connecting cable, type **B**
ECX 19 connector set (without cable)



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

NEW

maxon accessories

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 193–200 und online auf www.maxonmotor.com.

Characteristics:

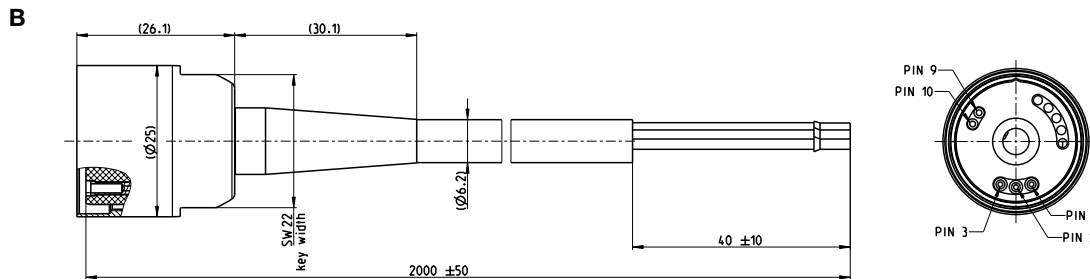
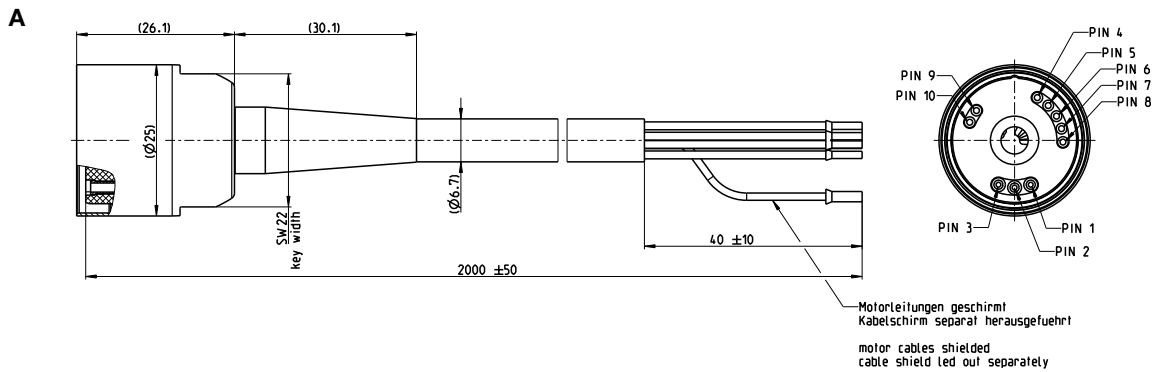
- Steel housing
- Withstands 1000 sterilization cycles in the autoclave
- Silicone outer shell
- PTFE cable insulation
- Electrical conductors with cable end sleeves
- A motor cables shielded. The shielding is fitted with heat shrink tubing and cable end sleeve.

Part number

574625
592061
595696

Cable version

ECX 22 connecting cable, type **A**
ECX 22 connecting cable, type **B**
ECX 22 connector set (without cable)



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



DC Motor

EC Motor
(BLDC Motor)

Gearhead

Screw
drive

Sensor

Motor
control

Compact
Drive

Accessories

Ceramic

Contact
information

maxon ceramic

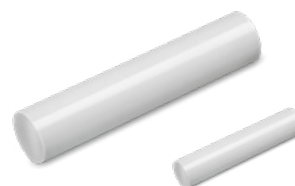
High performance industrial ceramic is used primarily for applications where customary materials would fail. maxon ceramic products include: precision screws, axles and shafts, customer-specific components for microtechnology, and scratch-resistant housing components.

Innovative high-tech ceramic components	492-494
Material properties	495-497
Standard screws	498
System-specific nuts	499-500
Standard axles	501

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.





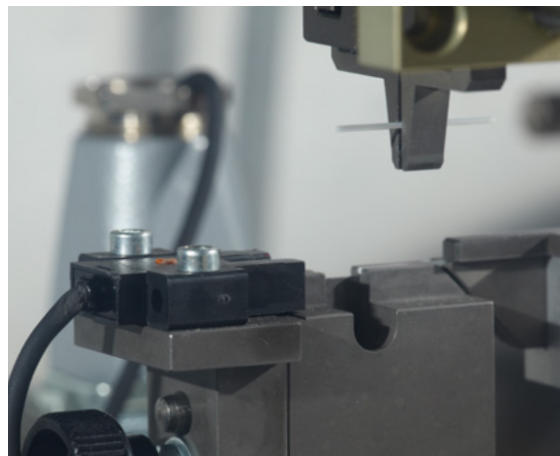
Experience and innovation.

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.

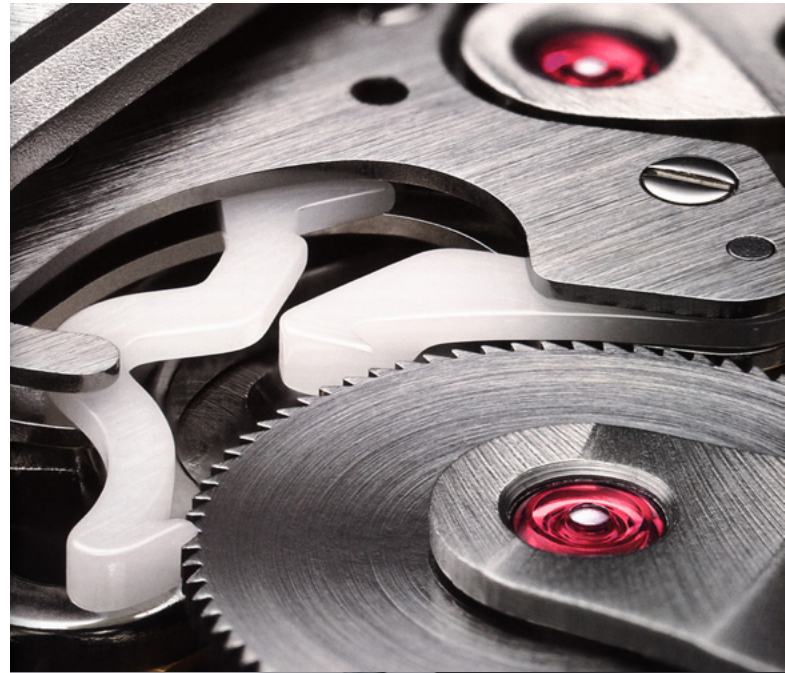
For additional information, contact your local maxon representative found at:
contact.maxonmotor.com



Complex shapes for microtechnology.

Ceramic pawls in automatic watches.

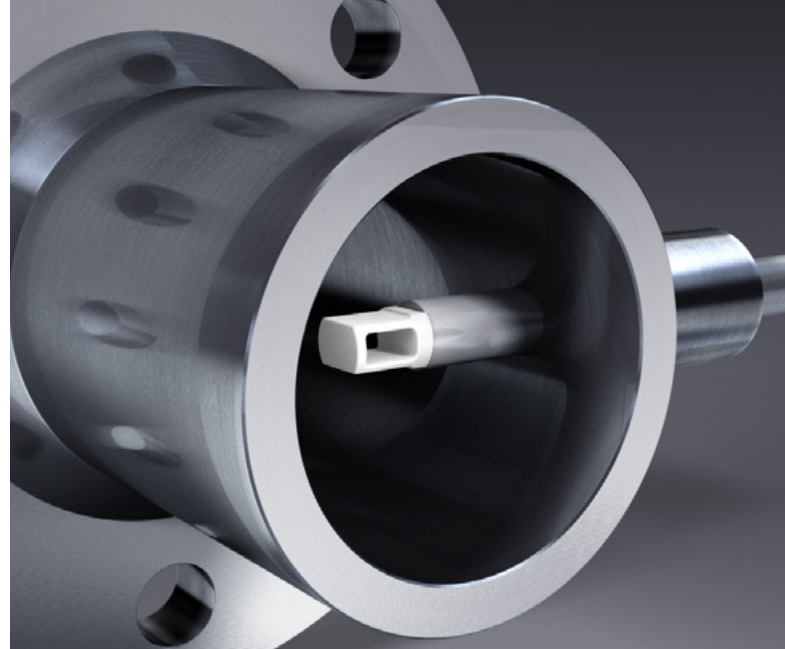
In clockwork, the tiny mechanical parts have to be machined with utmost precision for the clockwork to run reliably. With ceramic components, the meshing parts maintain precision over life spans never achieved before.



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/mm², bending strength of >800 N/mm², expansion co-efficient of 10 x 10⁻⁶ 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 ²
Elasticity modulus	2 x 10 ⁵ N/mm ²
Density	≥6.03 g/cm ³
Hardness	1350 HV
Heat expansion coefficient	10 x 10 ⁻⁶ 1/K
Thermal conductivity	2 W/mK
Dielectric constant	22 []
Electrical resistance	10 ⁸ Ωm



Precision screws made of ceramic.

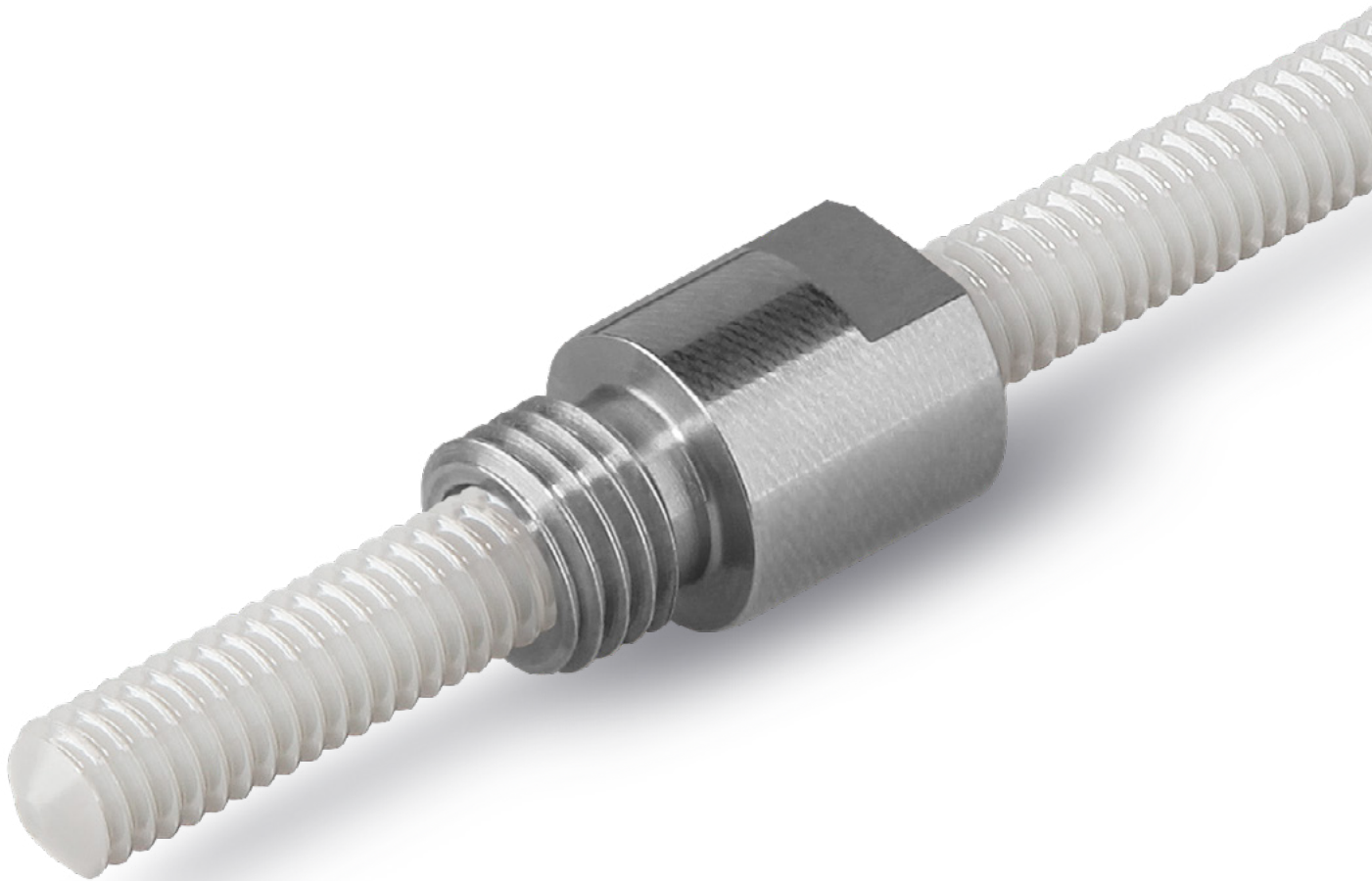
The maxon cgs screw – smooth-running and wear-proof.

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.



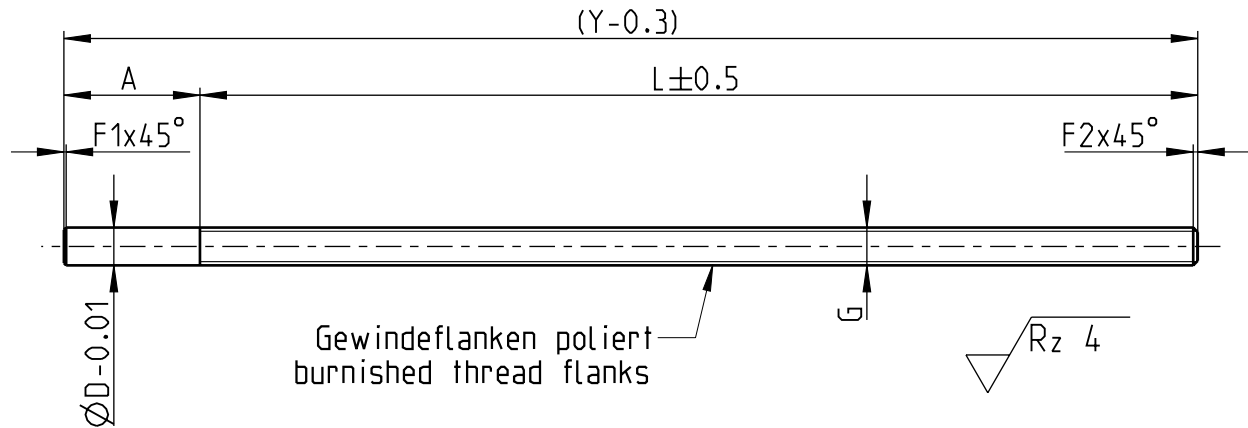


Ceramic as screw material makes it possible to use the screws in:

- 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



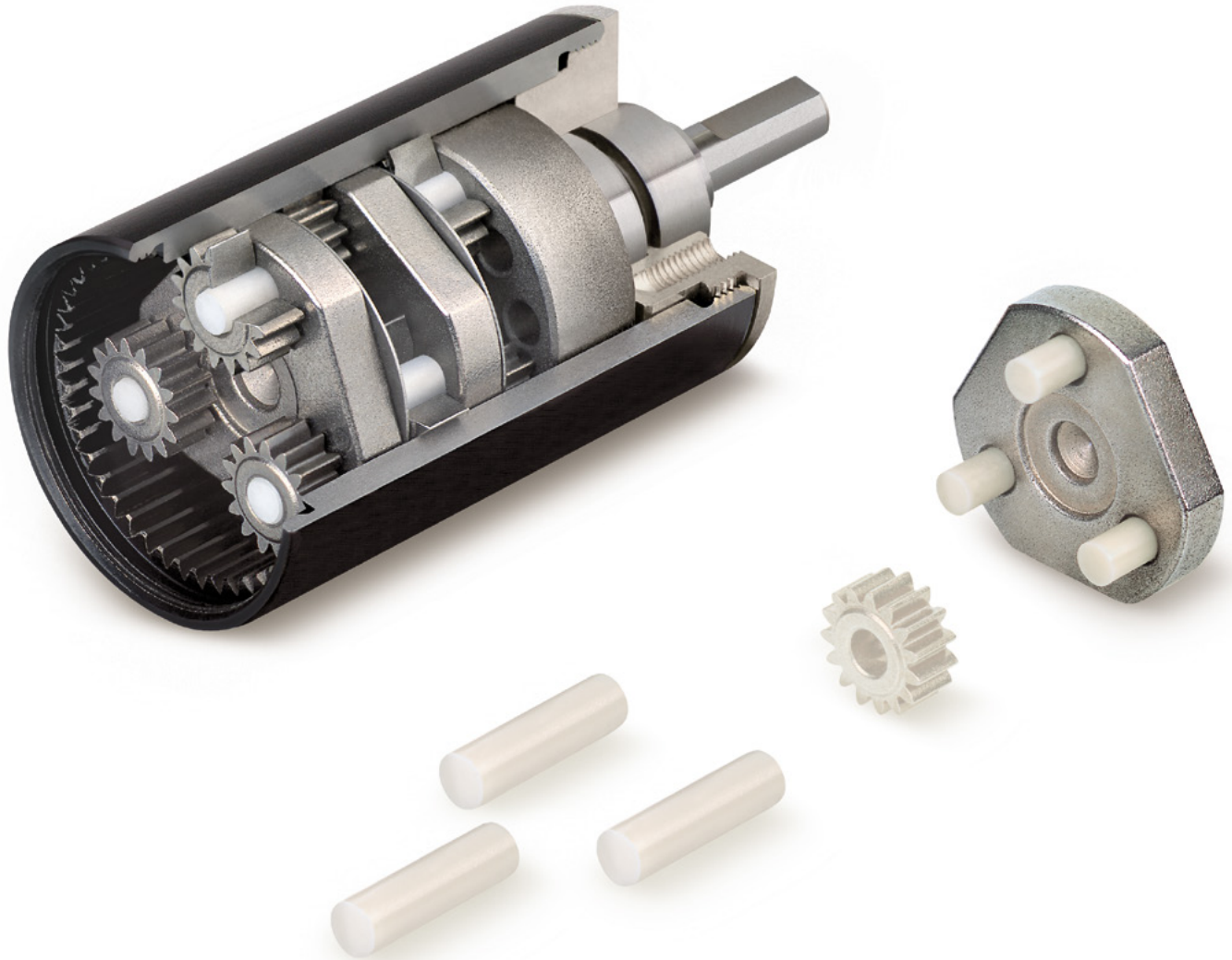
System-specific nuts.

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.

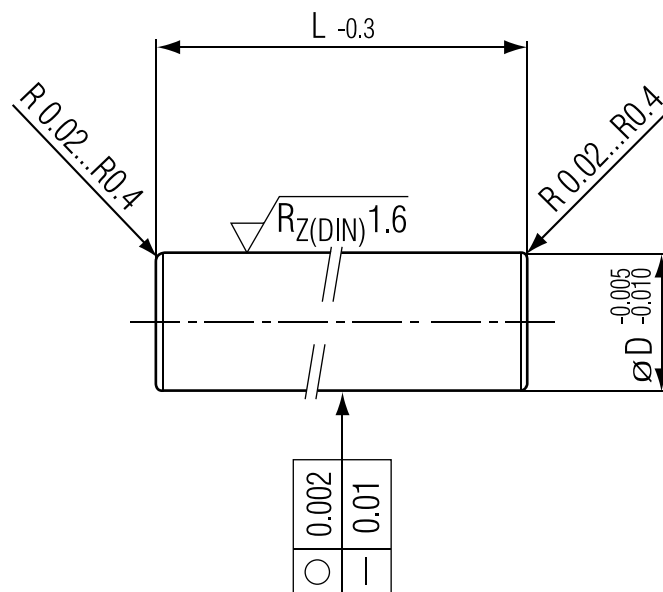


How can the life span of planetary gearheads be increased?

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 ⁴⁾	348501 ⁴⁾	348502 ⁵⁾	348503 ⁶⁾	
1.0	255891	255892	255893	255894	255895	255896	255898 ⁴⁾	348498 ⁴⁾	348499 ⁵⁾	348500 ⁶⁾	
1.5	255883	255884	255885	255886	255887	255888	255889 ⁴⁾	255890 ⁴⁾	255792 ⁵⁾	255793 ⁶⁾	
2.0	255872	255873	348693	255875	255876	255877	255879	255880	255881	255882	
2.5	255864	143825 ³⁾⁷⁾	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 ¹⁾³⁾⁷⁾	137962 ¹⁾³⁾⁷⁾	255849	255850	255851	255853	255854	255791	255787 ⁵⁾
5.0	255833	255834	255835	255836	255837	255838	255839	255840	255841	255842	255843 ⁵⁾
5.5	255818	255819	255820	255786	205063 ²⁾³⁾⁷⁾	255825	255826	255827	255828	255830	255831 ⁵⁾
6.0	255806	255807	255808	255809	255810	255811	255812	255813	255814	255815	255816 ⁵⁾
8.0	255794	255795	255796	255797	255798	255799	255800	255801	255802	255803	255804 ⁵⁾

¹⁾ Diameter tolerance deviation: -0.008/-0.013

²⁾ Diameter tolerance deviation: -0.013/-0.018

³⁾ Rounded edges R 0.3 ± 0.1

⁴⁾ Straightness tolerance deviation: 0.02 mm

⁵⁾ Straightness tolerance deviation: 0.03 mm

⁶⁾ Straightness tolerance deviation: 0.04 mm

⁷⁾ Roundness tolerance deviation: 0.003 mm



Born in Switzerland. Grown into the world.

maxon motor ag headquarters

maxon motor ag
Brünigstrasse 220
P.O. Box 263
6072 Sachseln
Switzerland
Phone: +41 (0) 41 666 15 00
Fax: +41 (0) 41 666 16 50
E-mail: info@maxonmotor.com
www.maxonmotor.com

maxon Divisions

maxon ceramic
maxon motor GmbH
Untere Ziel 1
79350 Sexau
Germany
Phone: +49 (0) 7641 9114 0
Fax: +49 (0) 7641 9114 14
E-mail: ceramic@maxonmotor.com
www.maxonceramic.de

maxon medical
Brünigstrasse 220
P.O. Box 263
6072 Sachseln
Switzerland
Phone: +41 (0) 41 666 15 00
Fax: +41 (0) 41 666 19 75
E-mail: maxonmedical@maxonmotor.com
www.maxonmedical.com

mars maxon bikedrive

maxon advanced robotics & systems
Industriestrasse 24
6074 Giswil
Switzerland
Phone: +41 (0) 41 662 95 00
www.maxonbikedrive.com

maxon Manufacturing Companies

maxon motor GmbH
Untere Ziel 1
79350 Sexau
Germany
Phone: +49 (0) 7641 9114 0
Fax: +49 (0) 7641 9114 14

maxon motor hungary kft
Tartu u. 4.
8200 Veszprém
Hungary
Phone: +36 14088000
Fax: +36 88 806 009
E-mail: mmh-info@maxonmotor.com

maxon motor manufacturing Co., Ltd.
26, Yongwon 3-gil
Seongnam-myeon, Dongnam-gu
Cheonan, Korea 31246
Phone: +82 (41) 908 3330
Fax: +82 (41) 908 8880
E-mail: info.kr@maxonmotor.com
www.maxonmotor.co.kr

mdp
21 Porte du Grand Lyon
01700 Neyron
France
Phone: +33/472 - 018 300
Fax: +33/472 - 018 309
E-mail: contact@mdp.fr
www.mdp.fr

maxon motor benelux B.V.
Josink Kolkweg 38
7545 PR Enschede
Netherlands
Phone: +31 53 - 7440744
E-mail: info@maxonmotor.nl
www.maxonmotor.nl

maxon Sales Companies and Sales Agents

Europe

Belgium / Luxembourg

maxon motor benelux B.V.
Mechelen Campus
Schaliënhoedreef 20 C
2800 Mechelen
Belgium
Phone: +32/15 - 20 00 10
E-mail: info@maxonmotor.be
www.maxonmotor.be

Denmark

DJ Stork Drives ApS
Naverland 2, 10.
2600 Glostrup
Denmark
Phone: +45 8988 2416
Mobile: +45 5353 5051
E-mail: ulrik.eriksen@storkdrives.dk
www.storkdrives.dk

Germany (Head Office)

maxon motor gmbh
Truderinger Strasse 210
81825 München
Germany
Phone: +49/89 - 42 04 93 -0
E-mail: info@maxonmotor.de
www.maxonmotor.de

Finland

DJ Stork Drives OY
Mäenalantie 773
24260 Salo
Finland
Phone: +358 45 11 06 433
E-mail: jyrki.leinonen@storkdrives.fi
www.storkdrives.fi

France

mdp
21 porte du Grand Lyon
01700 Neyron
France
Phone: +33/472 - 018 300
Fax: +33/472 - 018 309
E-mail: contact@mdp.fr
www.mdp.fr

Great Britain

maxon motor uk Ltd.
Maxon House
Hogwood Lane, Finchampstead
Berkshire, RG40 4QW
Great Britain
Phone: +44 (0) 1189 733337
Fax: +44 (0) 1189 737472
E-mail: salesuk@maxonmotor.com
www.maxonmotor.co.uk

Italy

maxon motor italia S.r.l.
Società Unipersonale
Via Sirtori 35
20017 Rho MI
Italy
Phone: +39 02 93580588
Fax: +39 02 93580473
E-mail: info.it@maxonmotor.com
www.maxonmotor.it

Netherlands

maxon motor benelux B.V.
Josink Kolkweg 38
7545 PR Enschede
Netherlands
Phone: +31 53 - 7440744
E-mail: info@maxonmotor.nl
www.maxonmotor.nl

Norway

DJ Stork Drives AS
Garverivegen 6
2740 Roa
Norway
Phone: +47/6199 3001
Mobile: +47/9400 2990
E-mail: arve.stensrud@storkdrives.no
www.storkdrives.no

Austria

Hungary, Slovenia, Romania, Croatia, Serbia,
Bulgaria
Kwapil & Co GmbH
Kammelmweg 9
1210 Wien
Austria
Phone: +43/1 - 278 85 85
Fax: +43/1 - 278 85 86
E-mail: verkauf@kwapil.com
www.kwapil.com

Sweden

DJ Stork Drives AB
Box 1158
Solna Strandväg 116
171 54 Solna
Sweden
Phone: +46/8 - 635 60 00
Fax: +46/8 - 635 60 01
E-mail: info@storkdrives.se
www.storkdrives.se

Spain (Madrid)

maxon motor ibérica s.a.
C/ Polo Norte nº 9
28850 Torrejón de Ardoz
Spain
Phone: +34/91 - 656 49 73
Fax: +34/91 - 656 48 72
E-mail: info@maxonmotor.es
www.maxonmotor.es

Spain (Barcelona)

maxon motor ibérica s.a.
Via Massagué 26 4º 1ª
08201 Sabadell
Spain
Phone: +34/93 - 715 69 52
Fax: +34/93 - 725 73 59
E-mail: jordi.more@maxonmotor.com
www.maxonmotor.es

Spain (La Rioja)

maxon motor ibérica s.a.
C/ General Vara del Rey, 9 5º K
26002 Logroño
Spain
Phone: +34/941 23 65 91
Fax: +34/941 23 65 13
E-mail: juan.ruiz@maxonmotor.com
www.maxonmotor.es

Switzerland

maxon motor ag
P.O. Box 263
6072 Sachseln
Switzerland
Phone: +41 (0) 41 662 95 95
Fax: +41 (0) 41 666 16 16
E-mail: sales-swiss@maxonmotor.com
www.maxonmotor.ch

Czech Republic, Slovakia, Poland

Kwapil & Co. Gesellschaft m.b.H.
Hlavní 1054/131
624 00 Brno
Czech Republic
Phone: +420 541 211 538
E-mail: sales@kwapil.com
www.kwapil.cz

maxon Sales Agents

Russia

AVI Solutions LLC
Prospect Medikov 5-B
197022 St. Petersburg
Russia
Phone: +7-812- 702 1001
Fax: +7-812- 702 1148
E-mail: sales@avi-solutions.com
www.avi-solutions.com

Turkey

Ensatek Mühendislik Otomsyon Sanayi Ticaret
Limited Şirketi
Cevizli Mah. Mustafa Kemal Cad.
Hukukçular Towers Sit. B Blok Apt. No: 66/B
Kat : 13 D : 88 34865 Kartal/İstanbul
Turkey
Phone: +90 216 970 13 31
Fax: +90 850 220 04 51
E-mail: ensatek@ensatek.com.tr
www.ensatek.com.tr

A world map with various colored dots (white, red, and grey) indicating the locations of Maxon sales companies and agents across different continents.

maxon Sales Companies and Sales Agents

America

USA (East Coast)

Valid until November 30, 2018:
maxon precision motors, inc.
101 Waldron Road
Fall River, MA 02720
USA

As of December 1st, 2018:
maxon precision motors, inc.
125 Dever Drive
Taunton, MA 02780
USA

Phone: +1/508 - 677 0520
Fax: +1/508 - 677 0530
E-mail: info@maxonmotorusa.com
www.maxonmotorusa.com

USA (West Coast)

maxon precision motors, inc.
1065 East Hillsdale Blvd, Suite 210
Foster City, CA 94404
USA

Phone: +1/650-524-8822
Fax: +1/650-372-9395
E-mail: info@maxonmotorusa.com
www.maxonmotorusa.com

maxon Sales Agents

Brazil

Treffer Ltda.
Av. Protásio de Oliveira Penna 366 / 101
Cep 30575-360 Bairro Buritis
Belo Horizonte – MG
Brazil
Phone: +55 31 3378 6222
Fax: +55 31 3378 6222
E-mail: motores@treffer.com.br
www.treffer.com.br

Canada

Electromate Inc.
6221 Highway 7
Unit #15
Vaughan, Ontario L4H 0K8
Canada
Phone: +1/877 737 8698
Fax: +1/877 737 8699
E-mail: sales@electromate.com
www.electromate.com

Australia

Australia

maxon motor australia Pty Ltd
Unit 1, 12-14 Beaumont Road
Mount Kuring-Gai
NSW 2080
Australia
Phone: +61 2 9457 7477
Fax: +61 2 9457 8366
E-mail: info.au@maxonmotor.com
www.maxonmotor.com.au

Africa

maxon Sales Agent

South Africa

DNH TRADESERVE CC
P.O. Box 31151
1684 Kyalami
South Africa
Phone: +27 11 468 2722
Fax-Mail: +27 86 509 6714
E-mail: info@dnhtrade.co.za
www.dnhtrade.co.za

Asia

China

maxon motor (Suzhou) Co., Ltd.
5F, Block 1, No. 1128, East Jiangxing Road,
Wujiang Economic Developing Zone,
215200 Suzhou, Jiangsu Province
China
Phone: +86/512-8207 9287
Fax: +86/512-8207 9761
E-mail: info@maxonmotor.com.cn
www.maxonmotor.com.cn

India

maxon precision motor India Pvt. Ltd.
Niran Arade, No. 563/564,
New BEL Road, RMV 2nd Stage
Bangalore – 560 094
India
Phone: +91 80417 34132
Fax: +91 80416 12703
E-mail: info.in@maxonmotor.com
www.maxonmotor.in

Japan

maxon japan corporation
5-1-15 Shinjuku
Shinjuku-Ku
Tokyo 160-0022
Japan
Phone: +81/3 - 3350 42 61
Fax: +81/3 - 3350 42 30
E-mail: info@maxonjapan.co.jp
www.maxonjapan.co.jp

Korea

maxon motor Korea Co., Ltd.
27, Banpo-daero 14-gil, Seocho-gu,
Seoul, South Korea 06652
Phone: +82 2 3486 3441
Fax: +82 2 3486 8836
E-mail: info.kr@maxonmotor.com
www.maxonmotor.co.kr

Taiwan

maxon motor Taiwan Co. Ltd.
6F.-7 No. 16, Lane 609, Sec. 5
Chongxin Rd., Sanchong Dist.,
New Taipei City 241
Taiwan (R.O.C.)
Phone: +886-2-2999-3558
Fax: +886-2-2999-7268
E-mail: info.tw@maxonmotor.com
www.maxonmotor.com.tw

maxon Sales Agents

Hong Kong

Servo Dynamics (H.K.) Ltd.
Rm. 1504, 15/F, Yuen Long Trading Centre,
33 Wang Yip Street West,
N.T., Hong Kong.
Phone: +852/2409 9986
Fax: +852/2409 7872
E-mail: sales@servodynamics.com.hk

Israel

Electrondart Ltd.
9 Ben Zion Gellis St.
Segula Industrial Area
Petach-Tikva 4927909
Israel
Phone: +972 (3) 931 4447
Fax: +972 (3) 930 2867
E-mail: sales@e-dart.co.il
www.electrondart.com

Malaysia

Servo Engineering Sdn. Bhd.
No. 15 G, Ground Floor, Highway Center,
Jalan 51/205,
46050 Petaling Jaya,
Selangor Darul Ehsan
Malaysia
Phone: +603-7782 3540
Fax: +603-7784 1013
E-mail: sales-rfq@servo.my
www.servo.my

Singapore

Servo Dynamics Pte. Ltd.
No. 10 Kaki Bukit Road 1
#01-30 KB Industrial Building
416175 Singapore
Phone: +65/6844 0288
Fax: +65/6844 0070
E-mail: servodynamics@servo.com.sg
www.servo.com.sg

Thailand

Servo Dynamics (Thailand) Co. LTD
52/210 Moo 2, Soi Wadnamdaeng, Srinakarin Rd.
10540 Bangkaew Banglee Samutprakarn
Thailand
Phone: +66 2 753 56 25
Fax: +66 2 753 56 50
E-mail: info@servoline.com
www.servoline.com

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