Program 2015/16

High Precision Drives and Systems.

www.maxonmotor.com

maxon motor

driven by precision

View the entire range of products online.

shop.maxonmotor.com

New products

maxon motor

60_DCX 12 S Ø12 mm, precious metal brushes, 1.6 Watt		NEW
61_DCX 12 L Ø12 mm, precious metal brushes, 2.5 Watt		NEW
62_DCX 14 L Ø14 mm, precious metal brushes, 3 Watt		NEW
63_DCX 14 L Ø14 mm, graphite brushes, 6 Watt		NEW
66_DCX 16 L Ø16 mm, precious metal brushes, 5 Watt		NEW
67_DCX 16 L Ø16 mm, graphite brushes, 10 Watt		NEW
71_DCX 22 L Ø22 mm, graphite brushes, 20 Watt		NEW
72_DCX 26 L Ø26 mm, precious metal brushes, 18 Watt		NEW
73_DCX 26 L Ø26 mm, graphite brushes, 40 Watt		NEW
78_DC-max 16 S Ø16 mm, precious metal brushes, 2 Watt		NEW
79_DC-max 16 S Ø16 mm, graphite brushes, 3 Watt		NEW
80_DC-max 22 S Ø22 mm, precious metal brushes, 5 Watt		NEW
81_DC-max 22 S Ø22 mm, graphite brushes, 8 Watt		NEW
190_EC 4 Ø4 mm, brushless, 0.5 Watt		NEW
191_EC 4 Ø4 mm, brushless, 1.0 Watt		NEW
236_EC-4pole 30 Ø30 mm, brushless, 150 Watt	sterilizable	NEW
244_EC-i 40 Ø40 mm, brushless, 50 Watt High Torque		NEW
246_EC-i 40 Ø40 mm, brushless, 70 Watt High Torque		NEW
247_EC-i 40 Ø40 mm, brushless, 100 Watt High Torque		NEW

maxon gear

85_GPX 12 Ø12 mm, planetary gearhead 0.08–0.17 Nm		NEW
86_GPX 14 Ø14 mm, planetary gearhead 0.13–0.5 Nm		NEW
88_GPX 16 Ø16 mm, planetary gearhead 0.16–0.6 Nm		NEW
90_GPX 19 Ø19 mm, planetary gearhead 0.65 Nm		NEW
93_GPX 26 Ø26 mm, planetary gearhead 0.75–3.0 Nm		NEW
95_GPX 32 Ø32 mm, planetary gearhead 1.0–6.6 Nm		NEW
97_GPX 37 Ø37 mm, planetary gearhead 1.9–12.0 Nm		NEW
272_GP 4 C Ø4 mm, 0.002–0.015 Nm		NEW

maxon spindle drive

325_GP 6 S Ø6 mm, metric spindle		NEW

maxon sensor

104_ENX 16 EASY Absolute Encoder		NEW
346_Encoder 16 EASY Absolute, 4096 step		NEW
347_Encoder 6–8 MAG 64–256 CPT, 3 channels		NEW
357_Encoder 6–8 OPT 128 CPT, 3 channels		NEW

maxon motor control

378_ESCON Module 24/2		NEW

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.

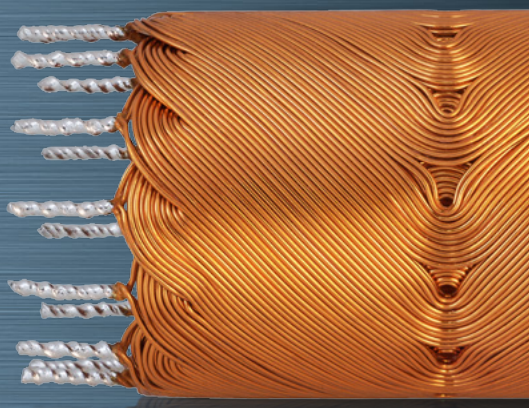
Born in Switzerland. Grown into the World.

maxon – a strong global brand.

maxon motor, with headquarters in Sachseln/Switzerland, has more than 2172 employees worldwide and, in addition to production sites in Switzerland, Germany, Hungary and Korea, has sales companies in more than 30 countries. The production sites are state-of-the-art with around 1136 employees in Central Switzerland, 396 in Sexau, Germany, 281 in Veszprém, Hungary, and 14 in Korea. We produce all important components of our drive systems on machines and production lines that we have largely developed ourselves. This guarantees not only economical manufacturing of large series, but also highest flexibility for handling special requirements or smaller quantities.

Driven by precision.

maxon motor is the worldwide leading provider of high-precision drives and systems up to 500 W. We develop and produce brushless and brushed DC motors with the unique ironless maxon winding. Flat motors with iron cores supplement the modular product range. The modular system also includes: planetary, spur and special gearheads, spindle drives, as well as encoders and control electronics. High-tech CIM and MIM components are manufactured in a special competence center. maxon motor stands for the highest level of quality, innovation, competitive pricing, and a worldwide distribution network. But what matters most is the quality of the customer-specific solution that we create with you and for you.



We are striving to get even closer to the 100%.

Dear Valued Customers

You expect much from our drive systems – a challenge that we gladly accept. Therefore we are constantly investing our entire know-how into making the products of maxon motor even better. A maxon DC motor already achieves an efficiency of more than 90%. We are giving our all to get even closer to the 100%.

This does not only apply to our products, but also to our service: We take pride in developing a large share of our drive solutions hand-in-hand with you, our customers. We continuously strive to make it even easier for you to select your custom drive. With this in mind, this year we have added additional products to the range of configurable maxon X drives. Configure your drive online now at xdrives.maxonmotor.com

Eugen Elmiger
CEO

Communication

Television- and aerial view cameras
Professional cameras
Digital recording systems
Projectors
Theater and concert lighting
Advertising displays
Bar code readers
Antenna adjustment systems

Robotics

Humanoid robots
Inspection robots
Microrobotic systems
Teleoperations robots
Educational robots
Household robots
Space robots

Security technology

Surveillance cameras
Access and lock systems
Card readers
Mobile inspection systems
Automated gates
Scanning systems
Respirators

Automotive

Gasoline and fuel injection pumps
Air conditioning
Adjustable shock absorbers
Power steering
Electronic tachographs
Distance measurement systems
Fuel cell vehicles

Aerospace

Brake flap adjustment
Seat and display adjustment
Flight recorders
Solar sail adjustment
Radar systems
Luggage hatch equipment
Autopilots

Consumer Applications

Motorized golf caddies
Gambling machines
Vacuum cleaner robots
Model airplanes and trains
Bicycles
Coffee machines
High-end modeling

If maxon is inside, the best is inside.

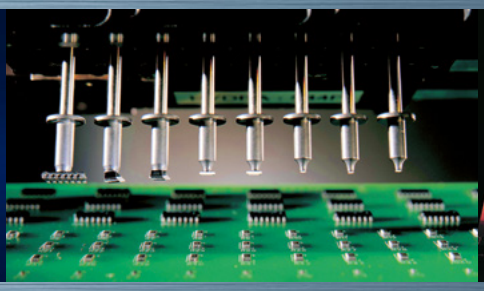
maxon drives set the world in motion.

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
Apnea devices
Prostheses
Ophthalmosurgical devices
Power tools
Radiation equipment
Surgical robots

Industrial Automation



PCB mounting systems
Lithography systems
Electric discharge machines
Welding equipment
Packing machines
Printing equipment
Weaving machines

Instrumentation & Inspection

Laser leveling systems
Microscopes
Calipers
Particle measuring equipment
Calibration systems
Precision scales
Weather and climate analyzers
Astrophysics

maxon motor

driven by precision

Custom drive systems.

Optimal complete solution thanks to a diverse product portfolio and experienced customer service.

In addition to the extensive standard range of products that form the maxon modular system, maxon also develops special drive solutions together with the customer. This includes modifying existing products, engineering add-on components, and completing new developments of drive units.

Great choice, easy ordering.

maxon's product range of motors and combinations is unique around the world. Its modular system and numerous winding options are crucial for this range of variations. We have divided our products into program groups to help guarantee our customers the shortest delivery times.

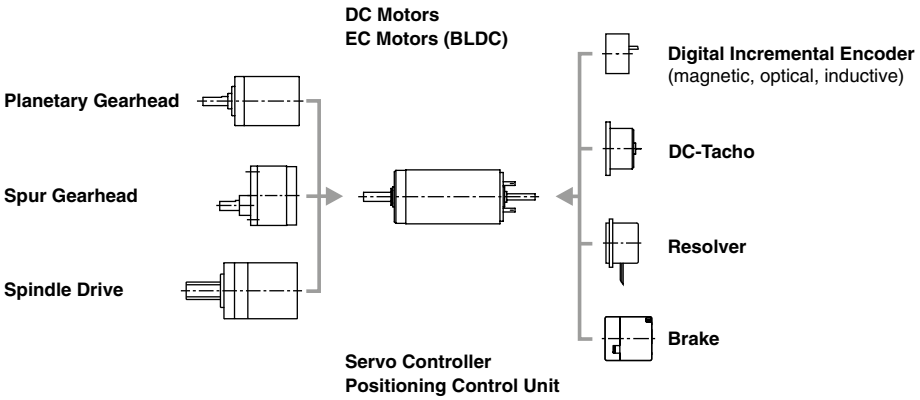
Stock program
The market-oriented selection from our extensive product portfolio offers you short delivery times.

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.

The maxon modular system.

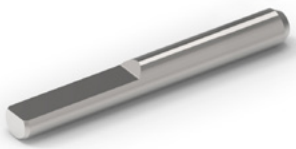
maxon's motors, gearheads, encoders, brakes and controllers are all perfectly compatible and offer an almost unending number of possible combinations. The maxon modular system always gives you the ideal combination for the required application. The maxon modular system shows you all standard combinations and helps you to select the appropriate components for your drive. Up to 49 units can also be ordered directly from our online catalog.
www.maxonmotor.com



Adapted to the application.

Simple and uncomplicated – we can modify the shaft and flange, bearings and the electric connections. We are also able to meet special requirements, such as a hollow shaft, special lubrication or special windings. Our new maxon X drives can also be configured and ordered online. Automatic processes guarantee fast delivery directly from the series production facilities.
xdrives.maxonmotor.com

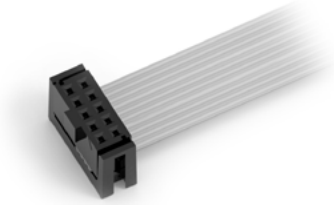
Shaft
Length
Diameter
Surface
Cross bore



Winding
Nominal voltage
Temperature range

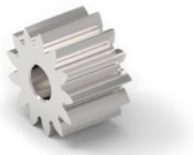
Bearings
Ball bearing
Sleeve bearing
Lubrication

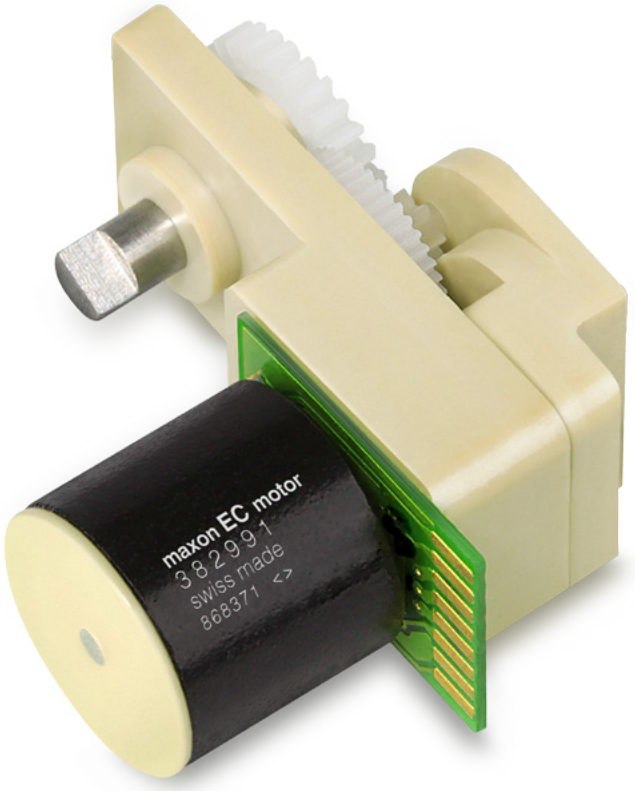
Electrical connection
Terminals or cables
Cable length
Connection alignment
Connector



Flange
Centering collar
Bolt circle
Thread

Output component
Pinion
Pulley





Designed based on the requirements.

maxon special design.

Custom-made to meet requirements, such as shock or temperature resistance, or a special configuration. Our project process, with clearly defined milestones, ensure transparency and result in drive solutions that fit.

Knowledge
maxon motor develops customized gearhead and drive solutions that reflect the market as closely as possible – from simple gearhead solutions to complex mechatronic drive units. The tried-and-tested expertise gained from the maxon standard products is also consistently applied to the special solutions.

Experience
Thorough application knowledge from many reference projects helps maxon motor come up with the right answers. We develop intelligent drive solutions at the highest level by working closely with customers.

Service
We are driven by your needs and requirements. You not only have access to our worldwide distribution and service network, but also to qualified personnel who have a personal interest in seeing you reach your goals.

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.

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 Ø10 mm.

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 Ø13 mm.

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.

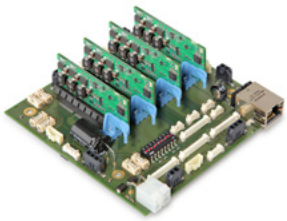
Efficient
Electrical hand tools in the fields of medical and dental technology require minimal heat development and low noise. These requirements put high demands on the drive solutions. Efficiency >90 %.

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.

Worm gear
Multi-stage gearhead with output shaft in worm design. Lightweight, reliable and cost-optimized unit with Ø15 mm motor.

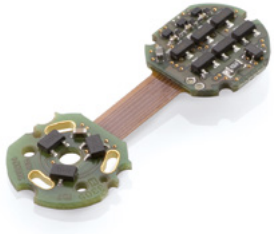
Linear drive
A compact reversing gear with threaded spindle mounted free of axial play transmits the movement to the desired location.

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.



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.

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



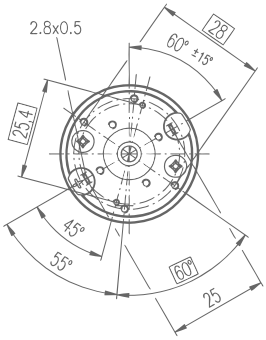
Integrated controller
In addition to fitting into very small spaces and meeting high safety requirements, this folding printed circuit board also withstands high temperatures.
For Ø22 mm motor.

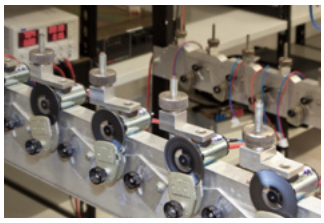
maxon resources.

Close proximity to the processes, thanks to in-house production.

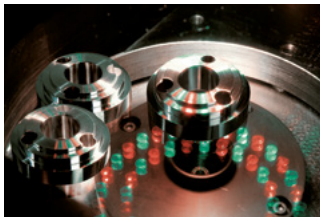
It is only possible to manufacture high-precision components and subassemblies that are perfectly matched to each other if the production processes have been completely mastered. The high production quality reflects maxon motor's many years of experience. maxon motor also leads the way when it comes to new production processes.

Development / project management





Test laboratory



Winding technology

Quality management

Series production: Plastic

Automatic assembly

CIM/MIM

Machining

Microtechnology

Notes on the catalog.

Disclaimer

maxon motor ag does not accept liability for the correctness of this documentation. maxon motor ag is not liable for direct or indirect damage resulting from using this documentation. This exclusion of liability does not apply in the event of willful intent, negligence or liability under the applicable product liability act.

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, RE-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 (Ø10 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.

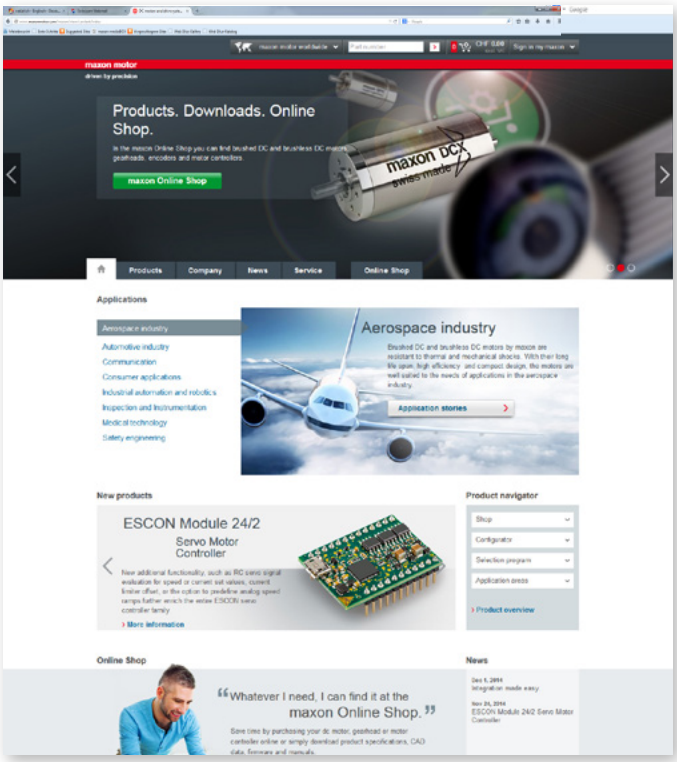
Overview of the maxon certifications.

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

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.



maxon online shop

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.

maxon selection program

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 configurator

online configurator

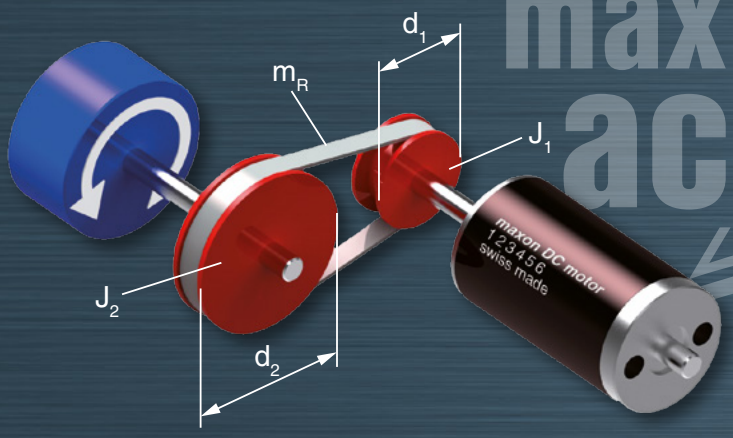
Configure and combine motors (DCX), gearheads (GPX) and encoders (ENX) according to your individual requirements. Fast, easy and online. We guide you step-by-step through the various functionalities in the configurator.

“driven” – the maxon motor magazine.

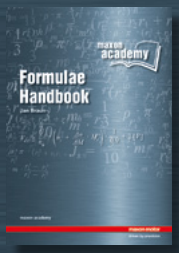
Exciting applications from the field of drive technology, interviews with experts or tips for the correct drive selection. In “driven”, maxon motor’s magazine, a wide range of topics are covered. The magazine appears twice a year in a tablet PC and print issue.

Download

The maxon motor magazine “driven” is available for free as a download from the Apple App Store, from Google Play, and from the Windows App Store. For more information please visit magazine.maxonmotor.com

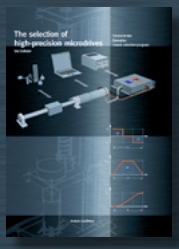


$$M_{in,\alpha} = \left(J_{in} + J_1 + \frac{J_2}{\eta} \cdot \frac{d_1^2}{d_2^2} + \frac{J_X}{\eta} \cdot \frac{d_1^2}{d_X^2} + \frac{m_L + m_B}{\eta} \cdot \frac{d_1^2}{4} \right) \cdot \frac{\pi}{30} \cdot \frac{\Delta n_{in}}{\Delta t_a}$$



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)

Magnetism.

Principles, definitions and theory on magnetism, magnetic circuits and magnetisation procedures. In-depth handling of drive technology-related magnetic forces. Explanations on magnetic field sensors and natural magnetic fields.
(Author: Dr. Otto Stemme, 182 pages, ISBN 978-3-9520143-5-6)

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.

maxon motor

driven by precision

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 characteristics related to individual motors. Should you need any additional information, simply call us!

Selection Guide

Encoder, DC tacho, resolver.

maxon sensor

sensor

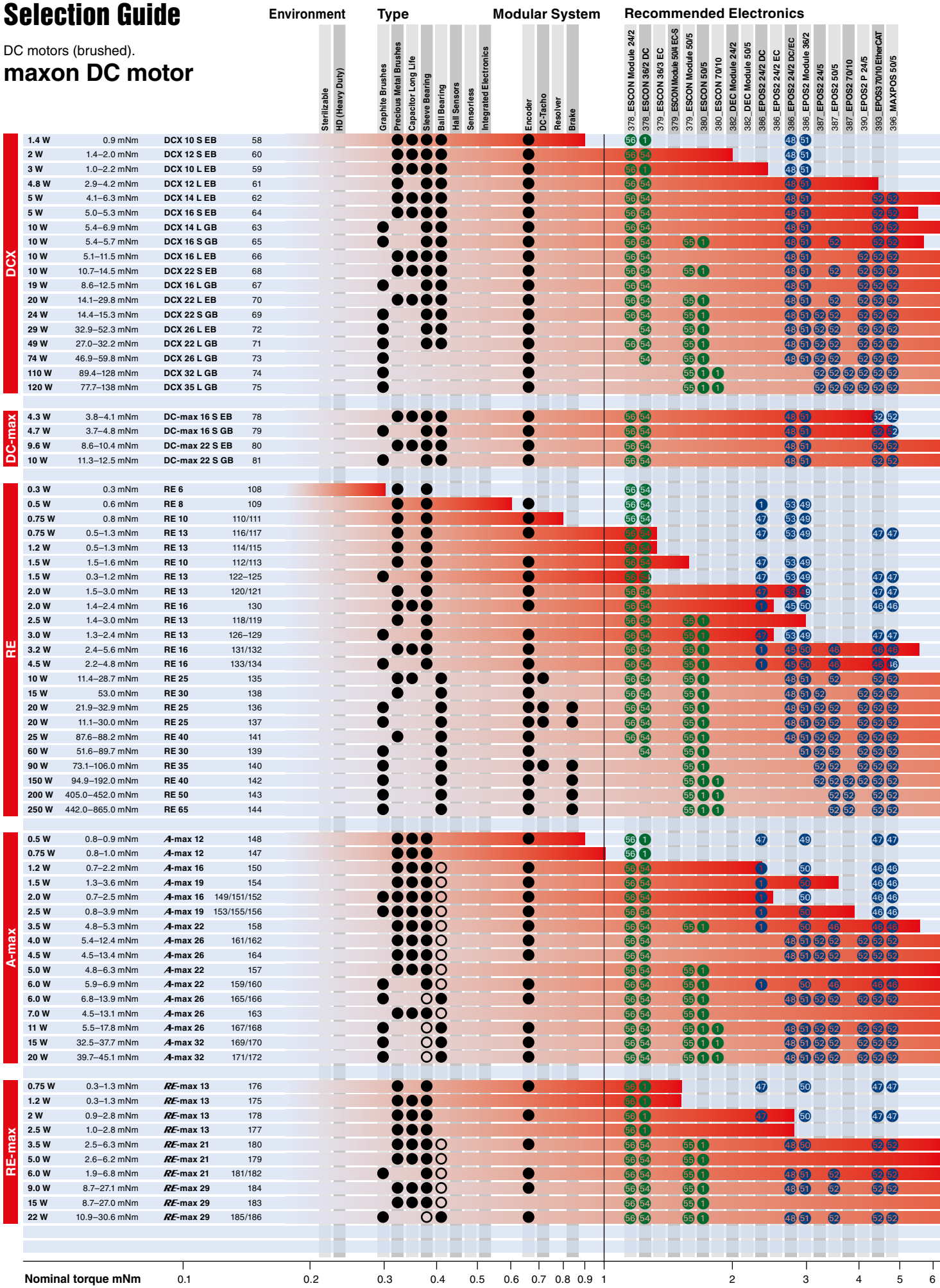
			Recommended Electronics																		
			378_ESCON Module 24/2	378_ESCON 36/2 DC	379_ESCON 36/3 EC	379_ESCON Module 50/4 EC-S	379_ESCON Module 50/5	380_ESCON 50/5	380_ESCON 70/10	382_DEC Module 24/2	382_DEC Module 50/5	386_EPOS2 24/2 DC	386_EPOS2 24/2 EC	386_EPOS2 24/2 DC/EC	386_EPOS2 Module 36/2	387_EPOS2 24/5	387_EPOS2 50/5	387_EPOS2 70/10	390_EPOS2 P 24/5	393_EPOS3 70/10 EtherCAT	396_MAXPOS 50/5
ENX 10 EASY	1024 CPT, 3 channel	102	40	1								71		71	72				71		
ENX 10 QUAD	1 CPT, 2 channel	102																			
ENX 16 EASY	1024 CPT, 3 channel	103	56	1			55	1	1					1	73	1	1		1	1	1
ENX 16 EASY Absolute	4096 steps	104															83			83	84
Encoder MILE	256–2048 CPT, 2 channel, LD	342					75	70					70		68	70	70		70	70	70
Encoder MILE	512–4096 CPT, 2 channel, LD	343					55	1	1							1	1	1	1	1	1
Encoder MILE	800–3200 CPT, 2 channel, LD	344					75	70	70							70	70	70	70	70	70
Encoder 16 EASY	128–1024 CPT, 3 channel, LD	345					55	1							73	1	1		1	1	1
Encoder 16 EASY Absolute SSI	4096 steps	346															83			83	84
Encoder 16 EASY Absolute BiSS-C	4096 steps	346																			84
Encoder 6–8 MAG	64–256 CPT, 3 channel	347	80					85		82				86	87						
Encoder MR, type S	16 CPT, 2 channel	348	57	66			76	66													
Encoder MR, type S	64–256 CPT, 2 channel, LD	349		47								47		47	59					47	47
Encoder MR, type S	100 CPT, 2 channel, LD	349		68								68		68	78						
Encoder MR, type S	64–256 CPT, 2 channel	350	57	66			76	66													
Encoder MR, type M	32 CPT, 2/3 channel	351/352	57	66			76	66													
Encoder MR, type M	128–512 CPT, 2/3 channel, LD	353	44	65			63	29				1		65	62					65	65
Encoder MR, type M	128–512 CPT, 2/3 channel, LD	354	56	1			55	1	1				1	1	73	1	1	1	1	1	1
Encoder MR, type ML	128–1000 CPT, 3 channel, LD	355	56	1			55	1	1					1	73	1	1	1	1	1	1
Encoder MR, type L	256–1024 CPT, 3 channel, LD	356	56	1			55	1	1					1	73	1	1	1	1	1	1
Encoder 6–8 OPT	128 CPT, 3 channel	357																			
Encoder Opt 8	50 CPT, 2 channel	358																			
Encoder SCH16F	2000–3600 CPT, 3 channel, LD	359	56	1			55	1	1					1	73	1	1	1	1	1	1
Encoder 2RMHF	3000–5000 CPT, 3 channel, LD	360					55	1	1						73	1	1	1	1	1	1
Encoder HEDS 5540	500 CPT, 3 channel	362–363	79	61			79	61	61												
Encoder HEDL 5540	500 CPT, 3 channel	364–367	56	1			55	1	1					1	1	1	1	1	1	1	1
Encoder HEDL 9140	500 CPT, 3 channel	368–369					55	60	60							60	60	60	60	1	60
Encoder MEnc 10	12 CPT, 2 channel	370																			
Encoder MEnc 13	16 CPT, 2 channel	371–372	57	66			76	66													
DC tacho DCT 22	0.52 V	373	56	67			55	1	1												

Information on connecting sensors with controllers, page 26.

Selection Guide

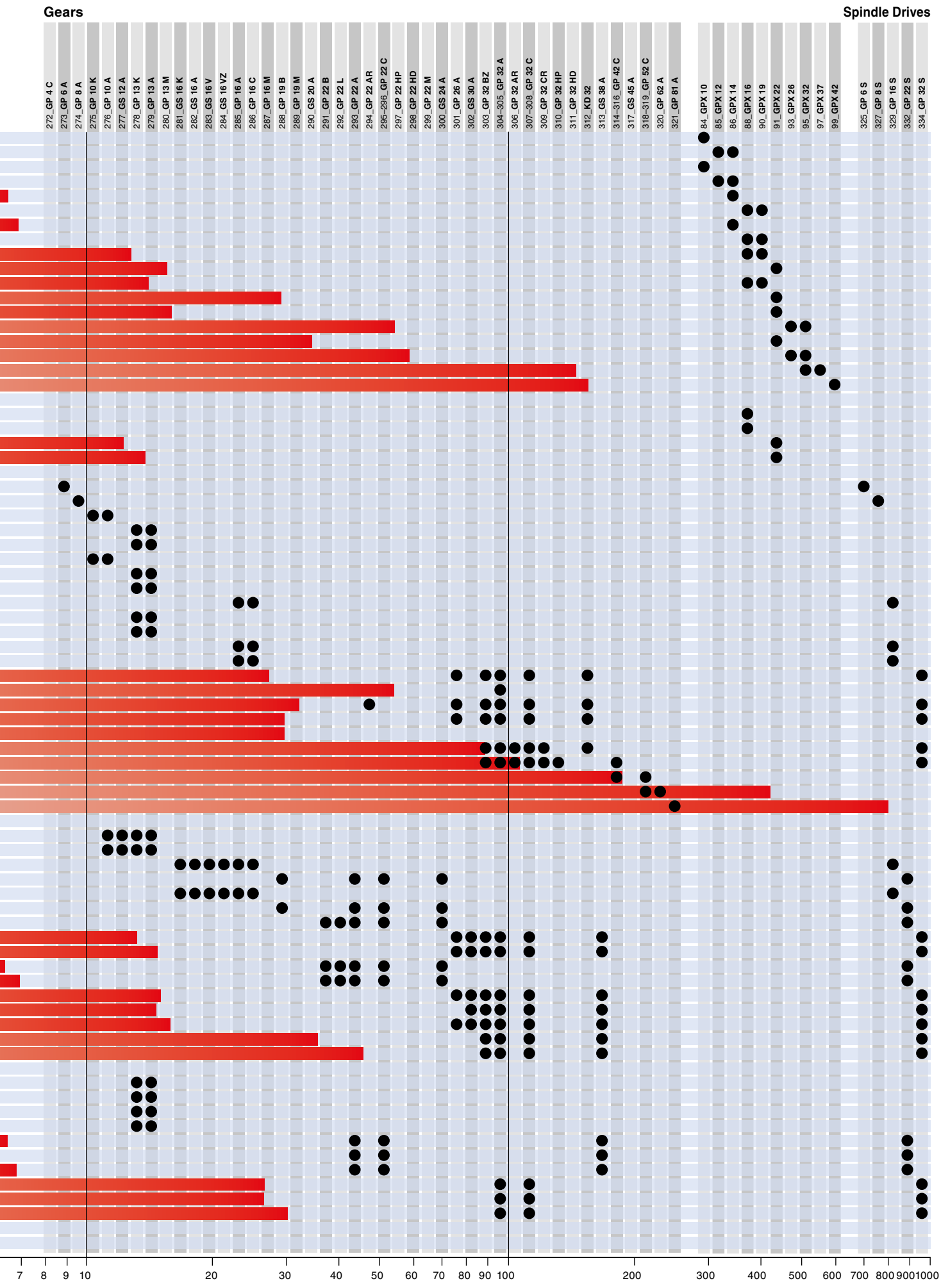
DC motors (brushed).

maxon DC motor



DCX	1.4 W	0.9 mNm	DCX 10 S EB	58
	2 W	1.4–2.0 mNm	DCX 12 S EB	60
	3 W	1.0–2.2 mNm	DCX 10 L EB	59
	4.8 W	2.9–4.2 mNm	DCX 12 L EB	61
	5 W	4.1–6.3 mNm	DCX 14 L EB	62
	5 W	5.0–5.3 mNm	DCX 16 S EB	64
	10 W	5.4–6.9 mNm	DCX 14 L GB	63
	10 W	5.4–5.7 mNm	DCX 16 S GB	65
	10 W	5.1–11.5 mNm	DCX 16 L EB	66
	10 W	10.7–14.5 mNm	DCX 22 S EB	68
	19 W	8.6–12.5 mNm	DCX 16 L GB	67
	20 W	14.1–29.8 mNm	DCX 22 L EB	70
	24 W	14.4–15.3 mNm	DCX 22 S GB	69
	29 W	32.9–52.3 mNm	DCX 26 L EB	72
	49 W	27.0–32.2 mNm	DCX 22 L GB	71
	74 W	46.9–59.8 mNm	DCX 26 L GB	73
	110 W	89.4–128 mNm	DCX 32 L GB	74
	120 W	77.7–138 mNm	DCX 35 L GB	75
DC-max	4.3 W	3.8–4.1 mNm	DC-max 16 S EB	78
	4.7 W	3.7–4.8 mNm	DC-max 16 S GB	79
	9.6 W	8.6–10.4 mNm	DC-max 22 S EB	80
	10 W	11.3–12.5 mNm	DC-max 22 S GB	81
RE	0.3 W	0.3 mNm	RE 6	108
	0.5 W	0.6 mNm	RE 8	109
	0.75 W	0.8 mNm	RE 10	110/111
	0.75 W	0.5–1.3 mNm	RE 13	116/117
	1.2 W	0.5–1.3 mNm	RE 13	114/115
	1.5 W	1.5–1.6 mNm	RE 10	112/113
	1.5 W	0.3–1.2 mNm	RE 13	122–125
	2.0 W	1.5–3.0 mNm	RE 13	120/121
	2.0 W	1.4–2.4 mNm	RE 16	130
	2.5 W	1.4–3.0 mNm	RE 13	118/119
	3.0 W	1.3–2.4 mNm	RE 13	126–129
	3.2 W	2.4–5.6 mNm	RE 16	131/132
	4.5 W	2.2–4.8 mNm	RE 16	133/134
	10 W	11.4–28.7 mNm	RE 25	135
	15 W	53.0 mNm	RE 30	138
	20 W	21.9–32.9 mNm	RE 25	136
	20 W	11.1–30.0 mNm	RE 25	137
	25 W	87.6–88.2 mNm	RE 40	141
	60 W	51.6–89.7 mNm	RE 30	139
	90 W	73.1–106.0 mNm	RE 35	140
	150 W	94.9–192.0 mNm	RE 40	142
	200 W	405.0–452.0 mNm	RE 50	143
	250 W	442.0–865.0 mNm	RE 65	144
A-max	0.5 W	0.8–0.9 mNm	*A*-max 12	148
	0.75 W	0.8–1.0 mNm	*A*-max 12	147
	1.2 W	0.7–2.2 mNm	*A*-max 16	150
	1.5 W	1.3–3.6 mNm	*A*-max 19	154
	2.0 W	0.7–2.5 mNm	*A*-max 16	149/151/152
	2.5 W	0.8–3.9 mNm	*A*-max 19	153/155/156
	3.5 W	4.8–5.3 mNm	*A*-max 22	158
	4.0 W	5.4–12.4 mNm	*A*-max 26	161/162
	4.5 W	4.5–13.4 mNm	*A*-max 26	164
	5.0 W	4.8–6.3 mNm	*A*-max 22	157
	6.0 W	5.9–6.9 mNm	*A*-max 22	159/160
	6.0 W	6.8–13.9 mNm	*A*-max 26	165/166
	7.0 W	4.5–13.1 mNm	*A*-max 26	163
	11 W	5.5–17.8 mNm	*A*-max 26	167/168
	15 W	32.5–37.7 mNm	*A*-max 32	169/170
	20 W	39.7–45.1 mNm	*A*-max 32	171/172
RE-max	0.75 W	0.3–1.3 mNm	*RE*-max 13	176
	1.2 W	0.3–1.3 mNm	*RE*-max 13	175
	2 W	0.9–2.8 mNm	*RE*-max 13	178
	2.5 W	1.0–2.8 mNm	*RE*-max 13	177
	3.5 W	2.5–6.3 mNm	*RE*-max 21	180
	5.0 W	2.6–6.2 mNm	*RE*-max 21	179
	6.0 W	1.9–6.8 mNm	*RE*-max 21	181/182
	9.0 W	8.7–27.1 mNm	*RE*-max 29	184
	15 W	8.7–27.0 mNm	*RE*-max 29	183
	22 W	10.9–30.6 mNm	*RE*-max 29	185/186

● For motors with / without sensors
● At least 2 channel encoder with line driver is required



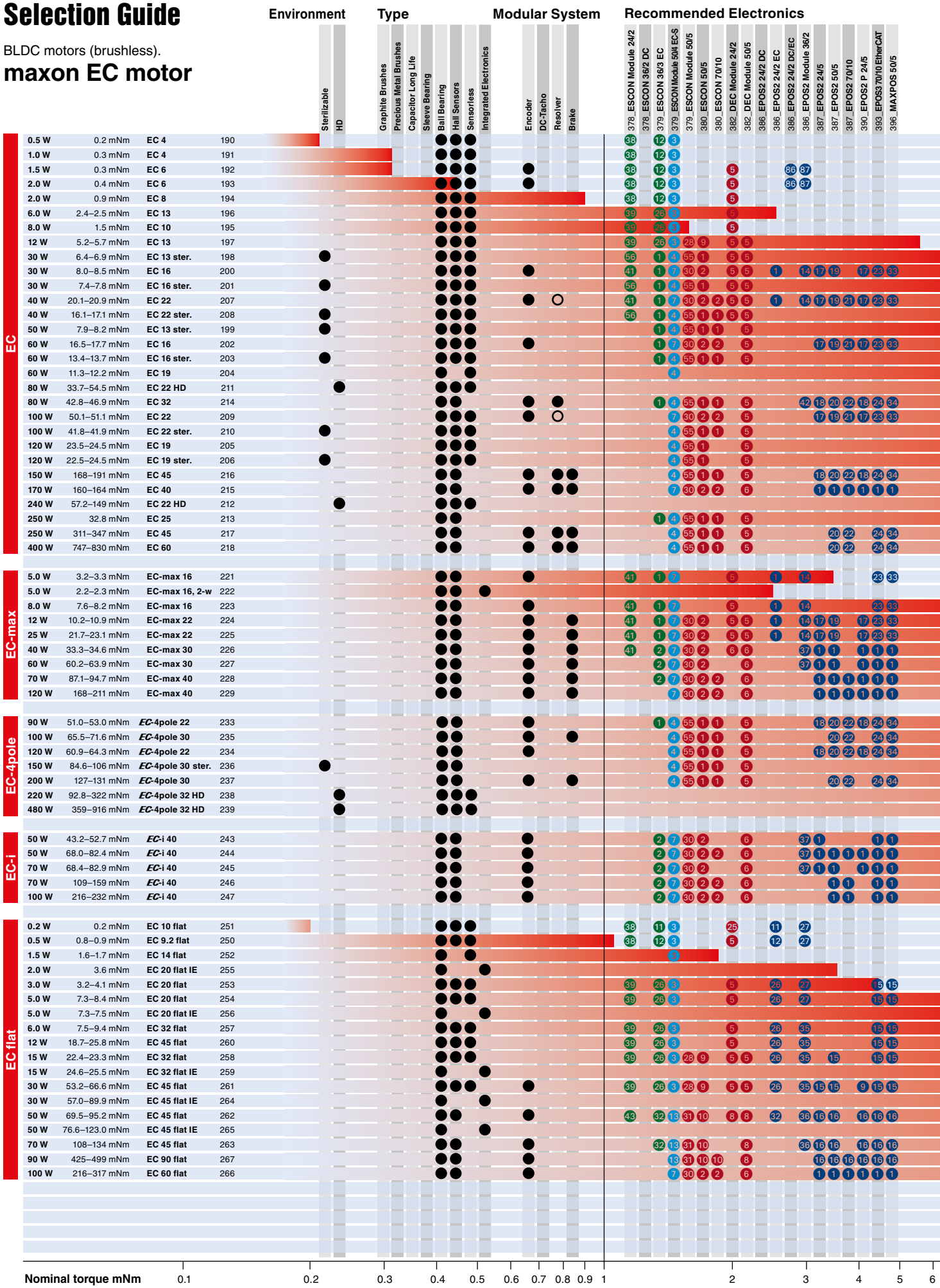
Information on connecting motors with controllers, page 26

○ Option/On request

Selection Guide

BLDC motors (brushless).

maxon EC motor

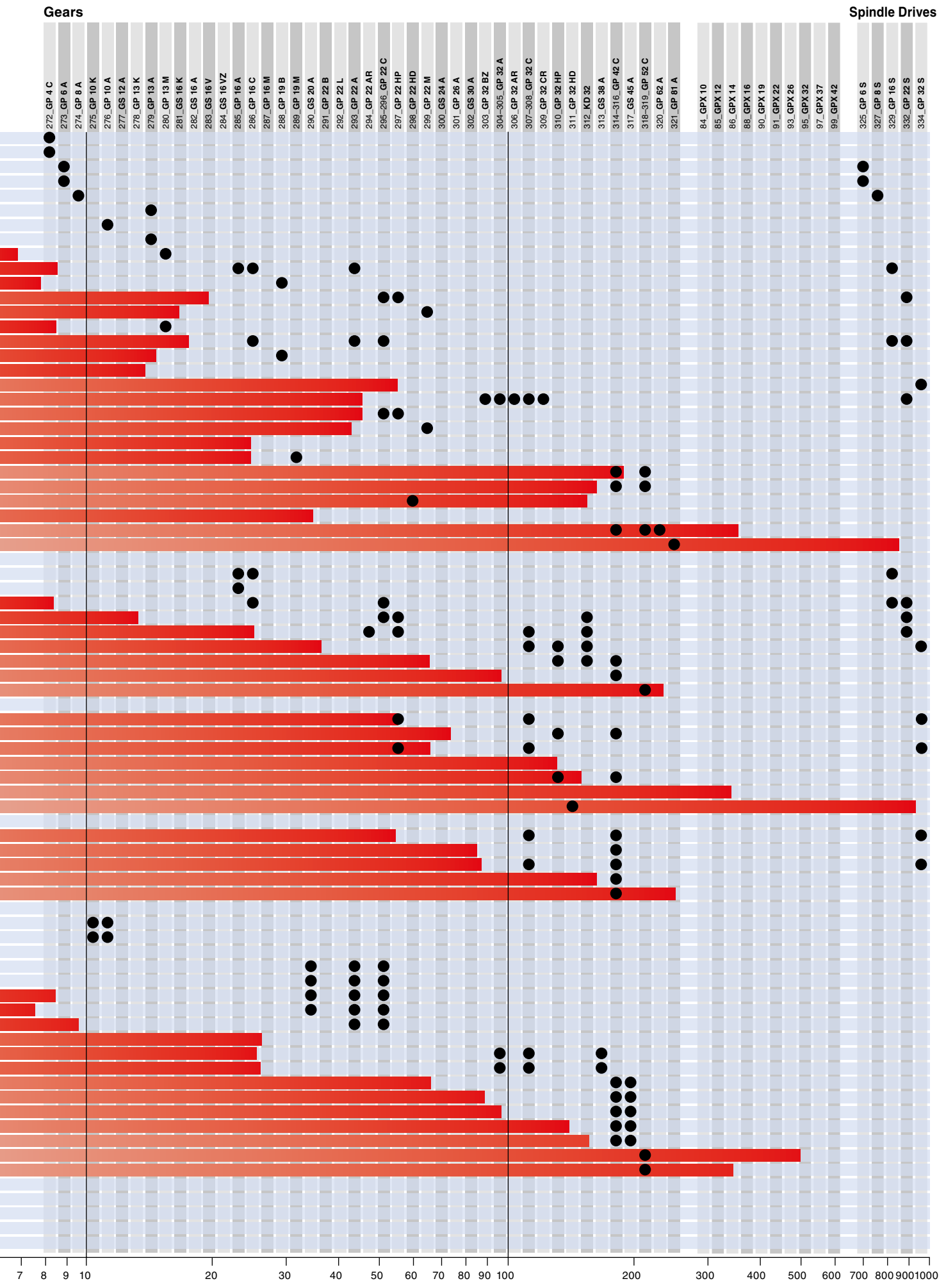


For motors without Hall sensors

For motors with Hall sensors

For motors with Hall sensors, with or without encoders

At least 2 channel encoder with line driver or Hall sensors in required



Information on connecting motors with controllers, page 26

○ on request

Accessories overview

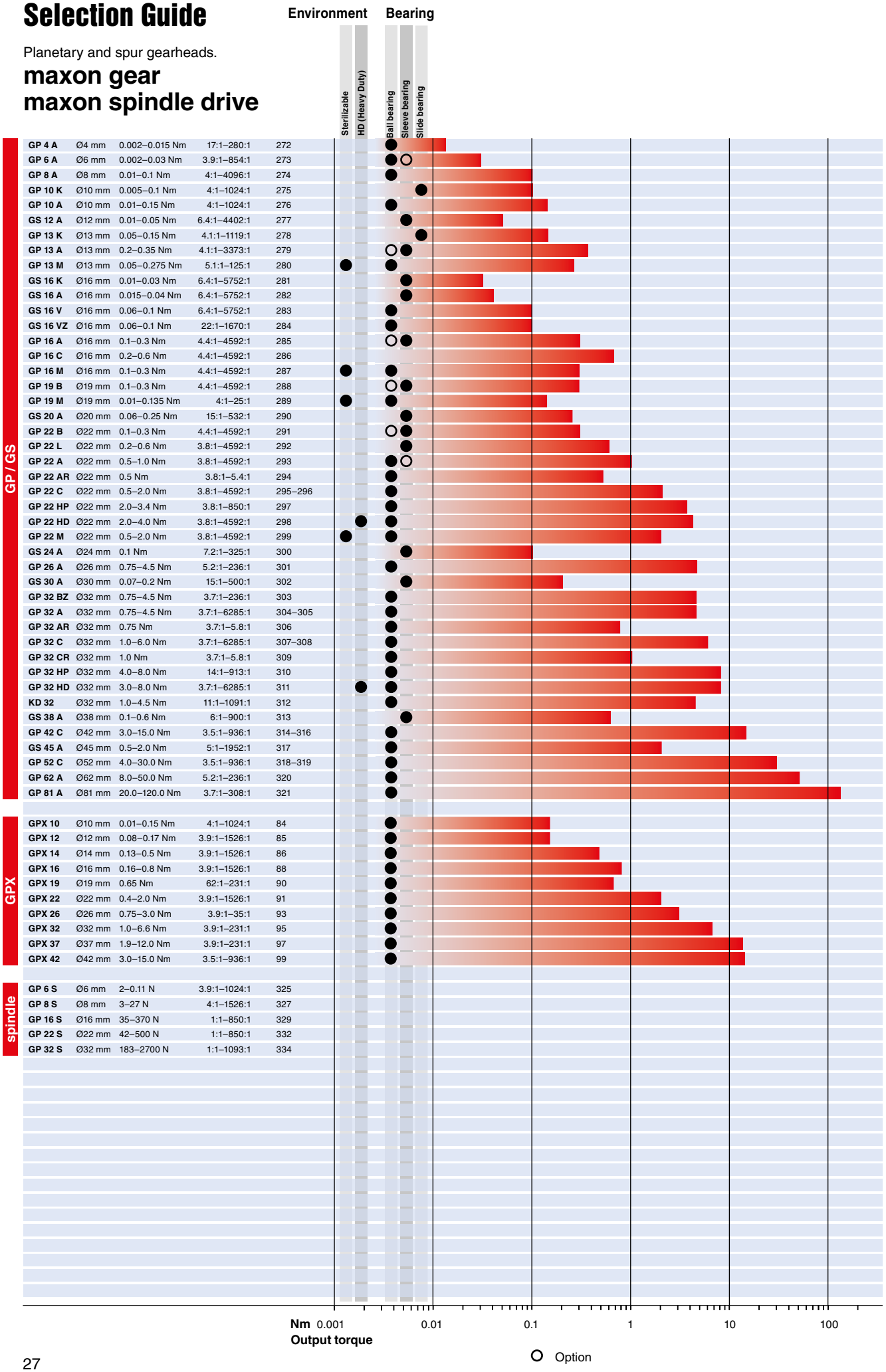
The following table contains information on connecting maxon motors with maxon controllers. All listed adapters, plugs, evaluation boards, etc. must be ordered separately. The numbers refer to the Selection Guide pages 27–25.

1	Can be connected directly. No accessories required.
2	Can be connected directly. Plug must be removed.
3	ESCON Module Motherboard Sensorless 450237 and adapter 220310 required.
4	ESCON Module Motherboard Sensorless 450237 required.
5	Evaluation board 370652 required.
6	Evaluation board 370652 required. Plug must be removed.
7	ESCON Module Motherboard Sensorless 450237 required. Plug must be removed.
8	Evaluation board 370652 and extension cable 339380 required.
9	Adapter 220300 required.
10	Extension cable 339380 required.
11	Adapter 418721 required.
12	Adapter 418723 required.
13	ESCON Module Motherboard Sensorless 450237 and extension cable 339380 required.
14	Evaluation board 361435 and plug set 384915 required. Plug must be removed.
15	Adapter 220300, extension cable 275878 and extension cable 275851 required.
16	Extension cable 354045 required.
17	Plug set 384915 required. Plug must be removed.
18	Plug set 384915 required.
19	Plug set 351061 required. Plug must be removed.
20	Plug set 351061 required.
21	Plug set 381405 required. Plug must be removed.
22	Plug set 381405 required.
23	Plug set 423544 required. Plug must be removed.
24	Plug set 423544 required.
25	Evaluation board 370652 and adapter 425931 required.
26	Adapter 418719 required.
27	Eva Board 361435, adapter 425931, extension cable 275878, and extension cable 275851 required.
28	ESCON Module Motherboard 438779 and adapter 220300 required.
29	Adapter 459875 required.
30	ESCON Module Motherboard 438779 required. Plug must be removed.
31	ESCON Module Motherboard 438779 and extension cable 339380 required.
32	Extension cable 442086 required.
33	Plug set 451746 required. Plug must be removed.
34	Plug set 451746 required.
35	Eva Board 361435, adapter 220300, extension cable 275878, and extension cable 275851 required.
36	Eva Board 361435, extension cable 354045 required.
37	Eva Board 361435
38	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 425931 required.
39	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 220300 required.
40	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 405120 required.
41	ESCON Module 24/2 Motherboard 486400 required; connector needs to be removed.
42	Eva Board 361435 and connector set 384915 required.
43	ESCON Module 24/2 Motherboard 485400 and extension cable 339380 required.
44	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 459875 required.
45	Can be connected directly. Attach solder bridge to printed circuit board.
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 to printed circuit board.
54	Extension cable 403962 required.
55	ESCON Module Motherboard 438779 required.
56	ESCON Module 24/2 Motherboard 486400 required.
57	ESCON Module 24/2 Motherboard 486400 and adapter 223774 required. Connector needs to be removed.
58	Eva Board 361435 and adapter 354046 required.
59	Eva Board 361435 and extension cable 327086 required.
60	Adapter 223774 required.
61	Adapter 223774 and extension cable 3409.506 (6 poles plug must be removed) required.
62	Eva Board 361435 required. Can be connected directly. Attach jumpers to printed circuit board.
63	ESCON Module Motherboard 438779 and adapter 459875 required.
64	Adapter 473103 and extension cable 354046 required. Plug must be removed.
65	Can be connected directly. Attach solder bridges / jumpers to printed circuit board.
66	Adapter 223774 required. Plug must be removed.
67	Extension cable 403964 required.
68	Adapter 425931 and extension cable 354046 required. Connector needs to be removed.
69	Eva Board 361435, adapter 473103, and extension cable 354046 required. Plug must be removed.
70	Extension cable 354046 required.
71	Adapter 405120 required.
72	Eva Board 361435 and adapter 405120 required.
73	Eva Board 361435 required.
75	ESCON Module Motherboard 438779 and extension cable 354046 required.
76	ESCON Module Motherboard 438779 and adapter 223774 required. Plug must be removed.
77	ESCON Module Motherboard 438779 and adapter 327086 required.
78	Eva Board 361435, adapter 425931, and extension cable 354046 required. Connector needs to be removed.
79	ESCON Module Motherboard 438779, adapter 223774, and extension cable 3409.506 (6-pin plug must be removed) are required.
80	ESCON Module 24/2 Motherboard Sensorless 486400 and adapter 498157 required.
81	Eva Board 361435, Adapter 498157 and extension cable 275852 and cable 275878 required.
82	DEC Module Eva Board 370652 and adapter 498157 required.
83	Adapter 488167 and cable 300586 required.
84	Adapter 488167 and cable 451290 required.
85	Adapter 498157 required.
86	Adapter 498157 and cable 302948 required.
87	Eva Board 361435, Adapter 498157 and extension cable 275851 and cable 275878 required.

Selection Guide

Planetary and spur gearheads.

maxon gear
maxon spindle drive



GP / GS	GP 4 A	Ø4 mm	0.002–0.015 Nm	17:1–280:1	272
	GP 6 A	Ø6 mm	0.002–0.03 Nm	3.9:1–854:1	273
	GP 8 A	Ø8 mm	0.01–0.1 Nm	4:1–4096:1	274
	GP 10 K	Ø10 mm	0.005–0.1 Nm	4:1–1024:1	275
	GP 10 A	Ø10 mm	0.01–0.15 Nm	4:1–1024:1	276
	GS 12 A	Ø12 mm	0.01–0.05 Nm	6.4:1–4402:1	277
	GP 13 K	Ø13 mm	0.05–0.15 Nm	4.1:1–1119:1	278
	GP 13 A	Ø13 mm	0.2–0.35 Nm	4.1:1–3373:1	279
	GP 13 M	Ø13 mm	0.05–0.275 Nm	5.1:1–125:1	280
	GS 16 K	Ø16 mm	0.01–0.03 Nm	6.4:1–5752:1	281
	GS 16 A	Ø16 mm	0.015–0.04 Nm	6.4:1–5752:1	282
	GS 16 V	Ø16 mm	0.06–0.1 Nm	6.4:1–5752:1	283
	GS 16 VZ	Ø16 mm	0.06–0.1 Nm	22:1–1670:1	284
	GP 16 A	Ø16 mm	0.1–0.3 Nm	4.4:1–4592:1	285
	GP 16 C	Ø16 mm	0.2–0.6 Nm	4.4:1–4592:1	286
	GP 16 M	Ø16 mm	0.1–0.3 Nm	4.4:1–4592:1	287
	GP 19 B	Ø19 mm	0.1–0.3 Nm	4.4:1–4592:1	288
	GP 19 M	Ø19 mm	0.01–0.135 Nm	4:1–25:1	289
	GS 20 A	Ø20 mm	0.06–0.25 Nm	15:1–532:1	290
	GP 22 B	Ø22 mm	0.1–0.3 Nm	4.4:1–4592:1	291
	GP 22 L	Ø22 mm	0.2–0.6 Nm	3.8:1–4592:1	292
	GP 22 A	Ø22 mm	0.5–1.0 Nm	3.8:1–4592:1	293
	GP 22 AR	Ø22 mm	0.5 Nm	3.8:1–5.4:1	294
	GP 22 C	Ø22 mm	0.5–2.0 Nm	3.8:1–4592:1	295–296
	GP 22 HP	Ø22 mm	2.0–3.4 Nm	3.8:1–850:1	297
	GP 22 HD	Ø22 mm	2.0–4.0 Nm	3.8:1–4592:1	298
	GP 22 M	Ø22 mm	0.5–2.0 Nm	3.8:1–4592:1	299
	GS 24 A	Ø24 mm	0.1 Nm	7.2:1–325:1	300
	GP 26 A	Ø26 mm	0.75–4.5 Nm	5.2:1–236:1	301
	GS 30 A	Ø30 mm	0.07–0.2 Nm	15:1–500:1	302
	GP 32 BZ	Ø32 mm	0.75–4.5 Nm	3.7:1–236:1	303
	GP 32 A	Ø32 mm	0.75–4.5 Nm	3.7:1–6285:1	304–305
	GP 32 AR	Ø32 mm	0.75 Nm	3.7:1–5.8:1	306
	GP 32 C	Ø32 mm	1.0–6.0 Nm	3.7:1–6285:1	307–308
	GP 32 CR	Ø32 mm	1.0 Nm	3.7:1–5.8:1	309
	GP 32 HP	Ø32 mm	4.0–8.0 Nm	14:1–913:1	310
	GP 32 HD	Ø32 mm	3.0–8.0 Nm	3.7:1–6285:1	311
	KD 32	Ø32 mm	1.0–4.5 Nm	11:1–1091:1	312
	GS 38 A	Ø38 mm	0.1–0.6 Nm	6:1–900:1	313
	GP 42 C	Ø42 mm	3.0–15.0 Nm	3.5:1–936:1	314–316
	GS 45 A	Ø45 mm	0.5–2.0 Nm	5:1–1952:1	317
	GP 52 C	Ø52 mm	4.0–30.0 Nm	3.5:1–936:1	318–319
	GP 62 A	Ø62 mm	8.0–50.0 Nm	5.2:1–236:1	320
	GP 81 A	Ø81 mm	20.0–120.0 Nm	3.7:1–308:1	321
GPX	GPX 10	Ø10 mm	0.01–0.15 Nm	4:1–1024:1	84
	GPX 12	Ø12 mm	0.08–0.17 Nm	3.9:1–1526:1	85
	GPX 14	Ø14 mm	0.13–0.5 Nm	3.9:1–1526:1	86
	GPX 16	Ø16 mm	0.16–0.8 Nm	3.9:1–1526:1	88
	GPX 19	Ø19 mm	0.65 Nm	62:1–231:1	90
	GPX 22	Ø22 mm	0.4–2.0 Nm	3.9:1–1526:1	91
	GPX 26	Ø26 mm	0.75–3.0 Nm	3.9:1–35:1	93
	GPX 32	Ø32 mm	1.0–6.6 Nm	3.9:1–231:1	95
	GPX 37	Ø37 mm	1.9–12.0 Nm	3.9:1–231:1	97
	GPX 42	Ø42 mm	3.0–15.0 Nm	3.5:1–936:1	99
spindle	GP 6 S	Ø6 mm	2–0.11 N	3.9:1–1024:1	325
	GP 8 S	Ø8 mm	3–27 N	4:1–1526:1	327
	GP 16 S	Ø16 mm	35–370 N	1:1–850:1	329
	GP 22 S	Ø22 mm	42–500 N	1:1–850:1	332
	GP 32 S	Ø32 mm	183–2700 N	1:1–1093:1	334

Contents

maxon X drives

Can be configured online

maxon DC motor

DC motors with moving coil rotor

maxon EC motor

Brushless DC servomotors

maxon gear

maxon spindle drive

maxon sensor

maxon motor control

maxon compact drive

maxon accessories

maxon ceramic

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
– Torsionally rigid shaft
– Automated manufacturing process

Characteristics of the **maxon *RE*-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

Turning speed

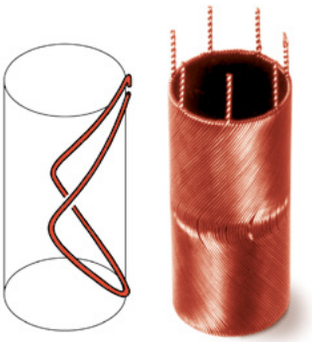
The optimal operating speeds are between 4000 rpm and 9000 rpm depending on the motor size. Speeds of more than 20000 rpm have been attained with some special versions.

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**
– ***RE*-max**



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

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.

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

Effects of wire gauge and number of windings are:

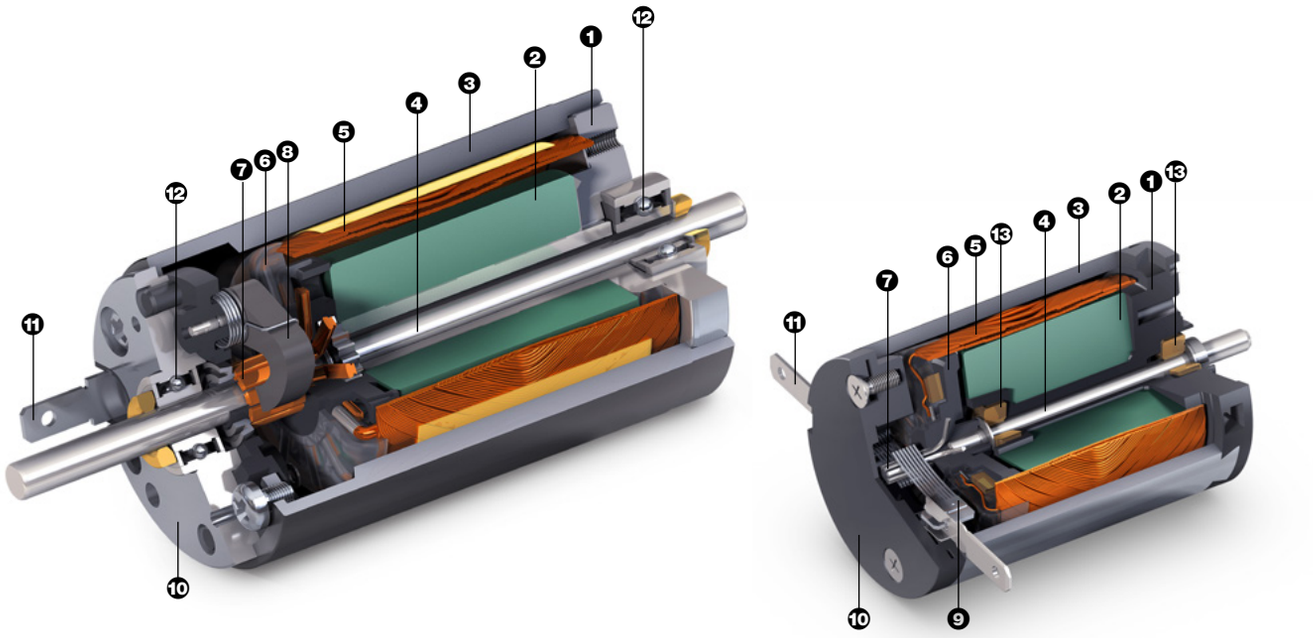
Low terminal resistance
– Low resistance winding
– Thick wire, few turns
– High starting currents
– High specific speed (rpm per volt)

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

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.

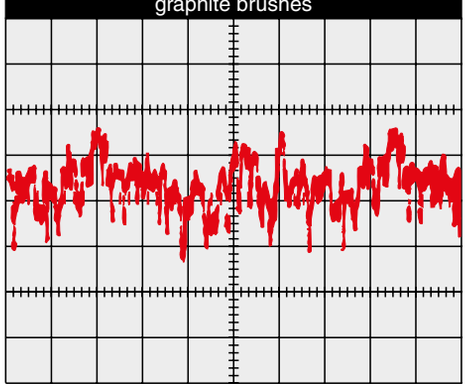
Precious metal brushes are typically used:
– In small motors
– In continuous operation
– With small current loads
– With battery operation
– In DC tachometers

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 electronical circuits. The motors need practically no interference suppression.

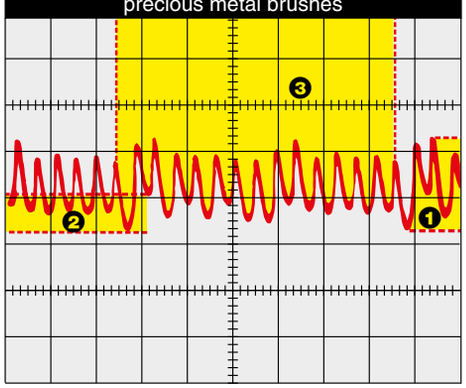
CLL concept
With precious metal commutation, the wear on commutators and brushes is caused mainly by sparks. The CLL concept suppresses spark generation to a large extent, thus greatly extending service life.
When driven with a pulsed power stage (PWM) higher no load currents occur and an unwanted motor heating can result.

For further explanations, please see page 107 or “The selection of high-precision microdrives” by Dr. Urs Kafader.

Commutation pattern with graphite brushes



Commutation pattern with precious metal brushes



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
❶ Ripple, actual peak-to-peak ripple
❷ Modulation, attributable mainly to asymmetry in the magnetic field and in the winding.
❸ 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 Neodymium permanent magnet with 1 or 2 pole pairs

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

Program

- **EC**
- ***EC*-max**
- ***EC*-4pole**

- **with Hall sensors**
- **sensorless**
- **with integrated electronics**
- **sterilizable**
- **Heavy Duty**

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

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.

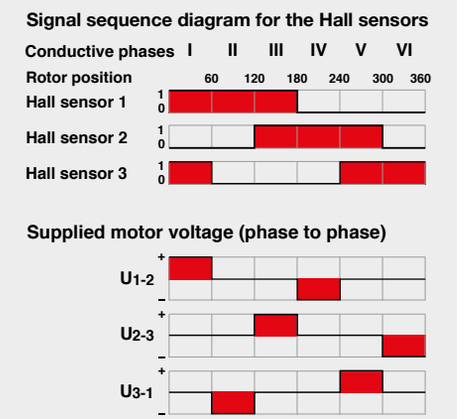
Possible applications
- Highly dynamic servo drives
- Start/stop operation
- Positioning tasks

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° 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.

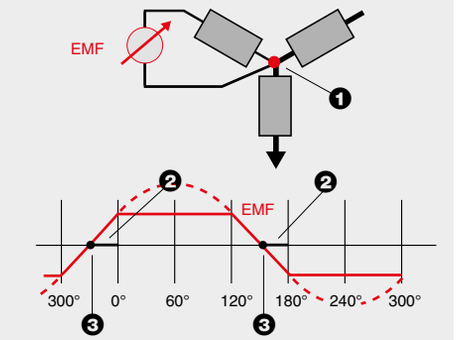
Properties of sensorless commutation
- Torque ripple of 14% (block commutation)
- No defined start-up
- Not suitable for low speeds
- Not suitable for dynamic applications

Possible applications
- Continuous operation at higher speeds
- Fans

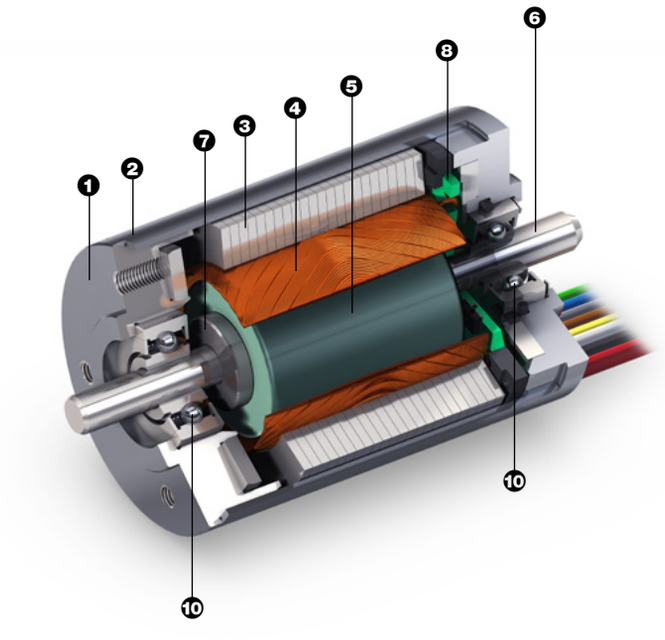
Block commutation

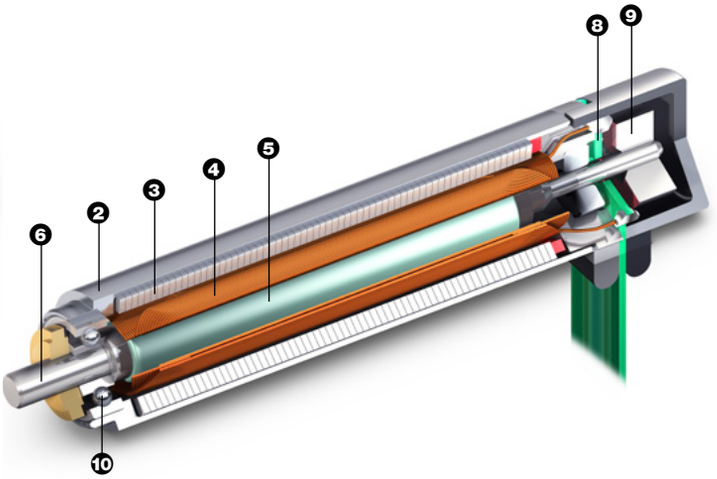


Sensorless commutation



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.





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.

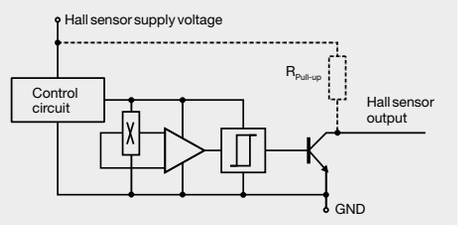
Properties of sinusoidal commutation
- More expensive electronics
- No torque ripple
- Very smooth running, even at very low speeds
- Approx. 5% more continuous torque compared to block commutation

Possible applications
- Highly dynamic servo drives
- Positioning tasks

Hall sensor circuit

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.

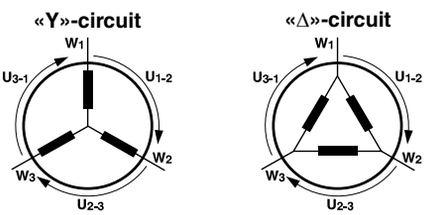
Wiring diagram for Hall sensors



The power consumption of a Hall sensor is typically 4 mA (for output of Hall sensor = “Hl”).

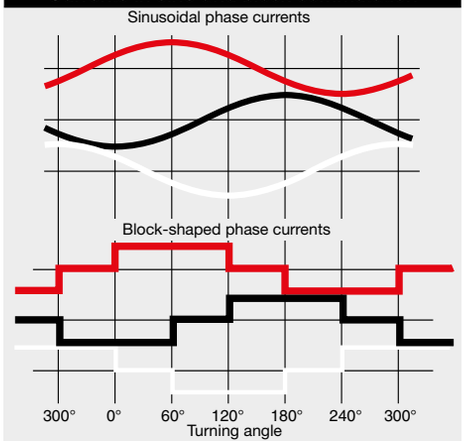
Winding arrangement

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.

Currents in sine and block commutation



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

For further explanations, please see page 189 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
- Flat design for when space is limited
- 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 Neodymium 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

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**
  - **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.

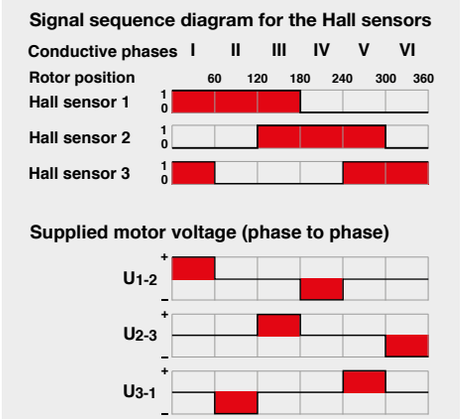
Possible applications
- Highly dynamic servo drives
- Start/stop operation
- Positioning tasks

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° 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.

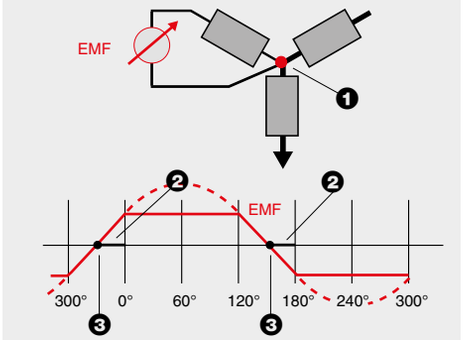
Properties of sensorless commutation
- No defined start-up
- Not suitable for low speeds
- Not suitable for dynamic applications

Possible applications
- Continuous operation at higher speeds
- Fans, pumps

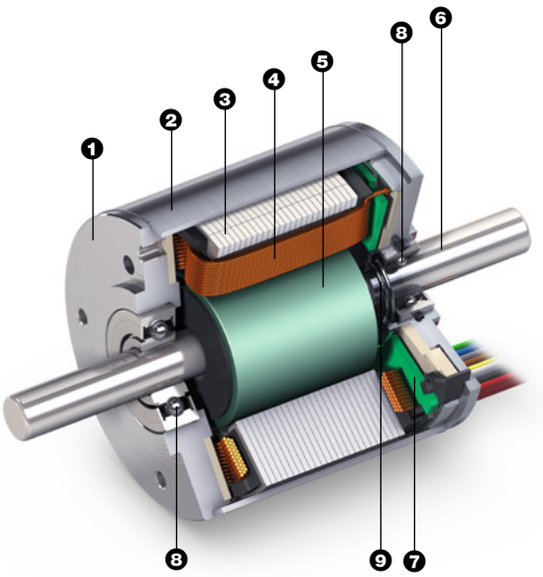
Block commutation

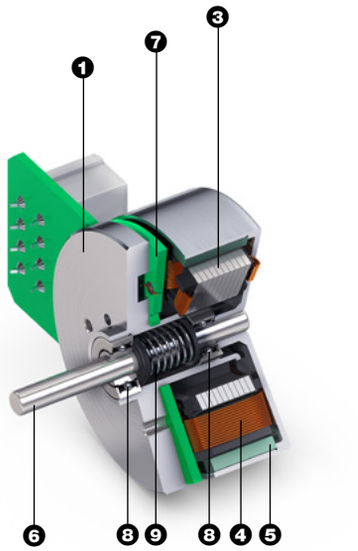


Sensorless commutation



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.





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.

Integrated electronics

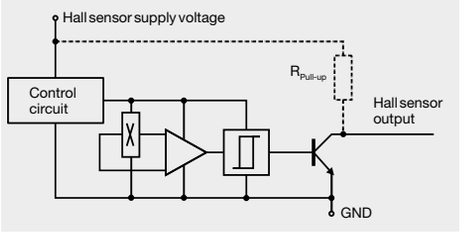
For motors with integrated electronics, the electronic commutation (mostly block commutation with Hall sensors) is built in. A speed controller and other functionalities can also be implemented.

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

Hall sensor circuit

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.

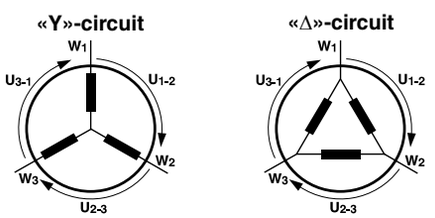
Wiring diagram for Hall sensors



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

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).

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

For further explanations, please see page 189 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

Program

- **Planetary gearhead**
- **Spur gearhead**
- **Koaxdrive**
- **Spindle 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

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.

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 $M_{N,G}$.

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

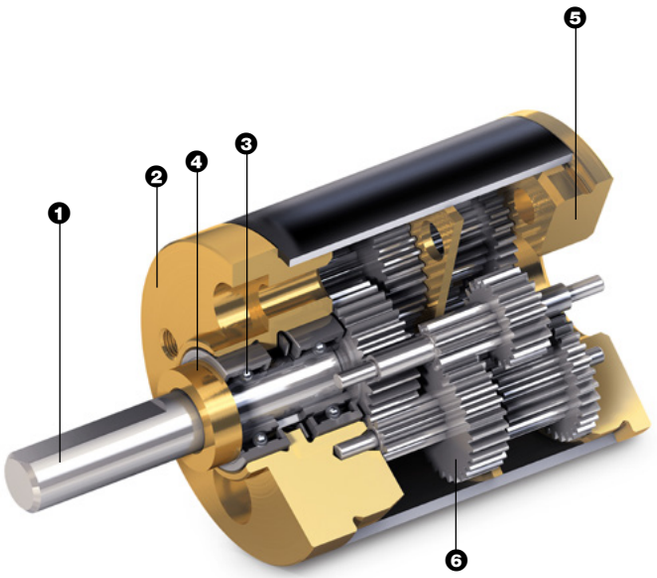
For short-term loading, the short-term torque of the gearhead must also be considered.
Where possible, the input speed of the gear $n_{max,G}$ should not be exceeded. This limits the maximum possible reduction i_{max} at a given operating speed. The following applies to the selection of the reduction i

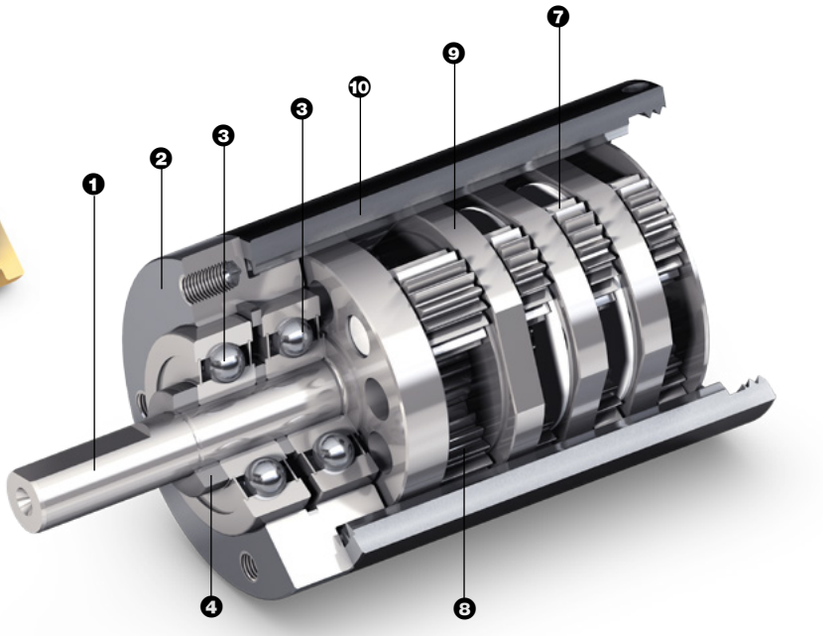
$$i \leq i_{max} = \frac{n_{max,G}}{n_L}$$

If the gear is selected, the data conversed 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 - Ø12–45 mm
- Low noise level
- High efficiency





Planetary gearhead

Planetary gears are particularly suitable for the transfer of high torques. Large gearheads are normally fitted with ball bearings at gearhead output.
– For transferring high torques up to 180 Nm
– Reduction ratios of 4:1 to 6285:1
– External diameter 6–81 mm
– High performance in a small space
– High reduction ratio in a small space
– Concentric gear input and output

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

Ceramic versions
By using ceramic components in gearheads, the wear characteristics of critical components can be significantly improved. The result when compared to purely metal gearheads is:
– Longer service life
– Higher continuous torques
– Higher intermittent torques
– Higher input speeds

High power gearhead
Especially high output torques in the output stage of planetary gearheads can be achieved through the following measures
– Use of ceramic components
– 4 instead of 3 planet gears in the output stage
– Additional motor-side support of the output stage
– Reinforcement of the output bearings

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

Reduced backlash gearhead
The reduction in backlash is achieved through a patented 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

Sensors

maxon offers a series of sensors. Their characteristics are:

Digital incremental encoder
– Relative position signal suitable for positioning tasks
– Rotation direction recognition
– Speed information from number of pulses per time unit
– Standard solution for many applications

DC tachometer
– Analog speed signal
– Rotation direction recognition
– Not suitable for positioning tasks

Resolver
– Analog rotor position signal
– Analog speed signal
– Extensive evaluation electronics required in the control system
– For special solutions in conjunction with sinusoidal commutation in EC motors

Program

– **Digital MILE encoder**
– **Digital EASY encoder**
– **Digital MR encoder**
– **Digital Hall effect encoder**
– **Digital optical encoder**
– **Analog DC Tacho**
– **Analog Resolver**

❶ End cap
❷ Electrical connections motor and encoder
❸ PCB
❹ MR sensor
❺ Graduated disk
❻ Magnetic multi-pole wheel
❼ Encoder housing
❽ Solid measure
❾ Flange
❿ Sensor with housing
⓫ Encoder fork coupler

Digital Incremental Encoder

Encoder signals
For further processing in the controller, the encoders deliver square-wave signals whose pulses can be counted for exact positioning or speed measurement. Channels A and B pick up phase shifted signals, which are compared with one another to determine the rotation direction. All maxon positioning systems evaluate the rising and falling signal edges. With regard to encoder number of pulses, this results in a four times higher positioning precision. This is what is referred to as quadcounts.
A "home" pulse (index channel I) can be used as a reference point for precise determination of rotation angle.
The line driver produces complementary signals $\overline{A}$, $\overline{B}$, $\overline{I}$ which help to eliminate interference on long signal lines. In addition, this electronic driver installed in the encoder improves signal quality by steeper signal edges.

Magnetic principles

On the magnetic Encoder a small multipole permanent magnet sits on the motor shaft. The changes in the magnetic flow are recorded by sensors and supplied to the electronics as processed channel A and B. Magnetic encoders require a minimum of space.

MR encoder
– Sensor with magnetoresistive principle
– High counts per turn possible, thanks to interpolator
– Different number of pulses can be selected
– with/without index
– with/without line driver

MEnc
– Digital Hall sensors
– 2 channels A and B
– No line driver possible
– Low number of pulses

EASY encoder
– Integrated circuit with Hall sensor and interpolator
– Counts per turn programmable from 1 to 1024
– With index channel and RS422 line driver

QUAD encoder
– Digital Hall sensors
– 4 statuses per turn
– Line driver not possible

Optical principle

In the optical principle of the fork light barrier (example: HEDL, HEDS, SCH16F, 2RMHF, Enc22) an LED sends light through a finely resolved impulse disc, which is mounted on the motor shaft. The receiver (photo transistor) changes light/dark signals into corresponding electrical impulses that are amplified and processed in the electronics.

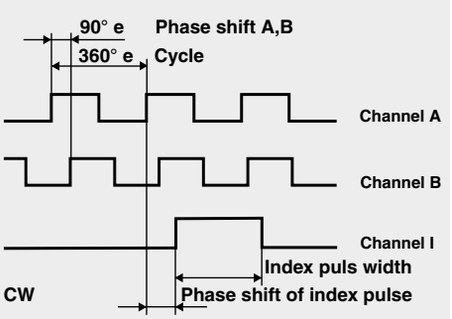
Characteristics
– High number of pulses
– Index channel and line driver possible
– Very high accuracy

Inductive principle

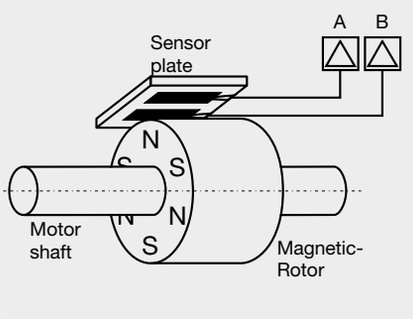
With inductive MILE encoders, a high-frequency alternating field is transformatively transmitted and thus angle dependant modulated, using a structured copper disk.

Characteristics
– Very robust against magnetic and electrical fields as well as contamination
– High speeds possible
– High precision
– Line driver available (some according to RS422)

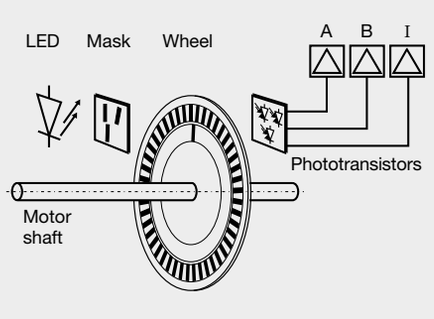
Representation of the output signal of a digital encoder

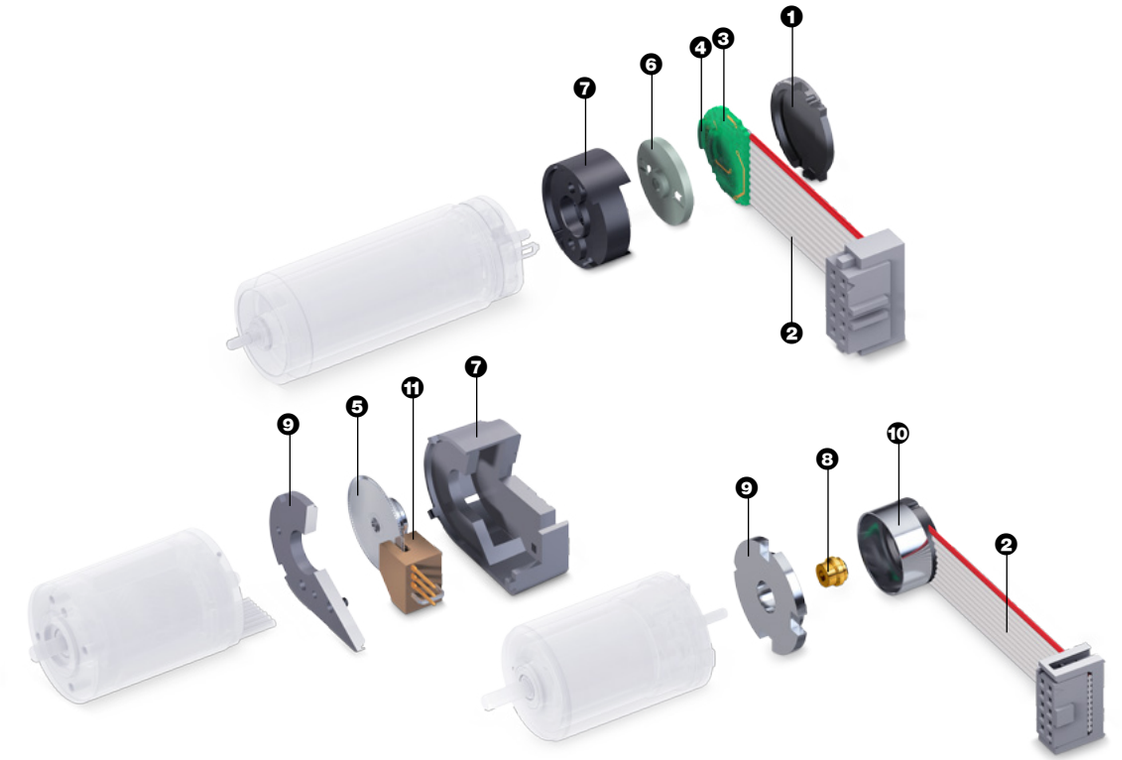


Schematic design of a magnetic encoder



Schematic design of an opto-electronic encoder





Tips on encoder selection

Principal features of the maxon incremental encoder are:
- The number of pulses per revolution (increments)
- The accuracy
- Use of an index channel
- The use of a line driver
- The maximum supported speed
- The suitability for special ambient conditions (dust, oil, magnetic fields, ionizing radiation)

Encoders and maxon controllers
- As a standard the maxon controllers are preset for encoders with 500 pulses per revolution.
- The input frequency of the controller electronics can limit the maximum possible counts per turn of the encoder.
- The higher the number of pulses and the higher the accuracy the better a smooth, jerk-free operation can be achieved even at low speeds.
- maxon controllers can be set for low or high speed operation and for encoders with a low or high number of pulses.

The following applies especially to positioning systems:
- The higher the number of pulses, the more precise the position that can be reached. At 500 pulses (2000 quadcounts) an angle resolution of 0.18° is achieved, which is usually much better than the precision of the mechanical drive components (e.g. due to gear play or elasticity of drive belts).
- Only encoders with an integrated line driver (RS422) should be used in positioning controls. This prevents electromagnetic interference signals from causing signal loss and accumulated positioning errors.
- Positioning applications often require the index channel of the encoder for precise reference point detection.

DC Tacho

In principle every maxon DC motor can be used as a DC tacho. For motor-tacho combinations, we offer a DC tachometer, whereby the tacho rotor is mounted directly on the motor shaft.

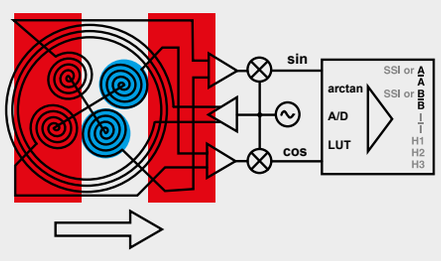
Characteristics
- The output DC voltage is proportional to the speed thanks to the precious metal brushes
- AlNiCo magnet for high signal stability with temperature fluctuations
- No additional tacho bearings or friction
- No couplings, high mechanical resonance frequency

Resolver

The resolver is mounted on the motor's through shaft and adjusted according to the magnetic field of the motor rotor. The resolver has a rotating primary coil (rotor) and two secondary coils (stator) offset by 90°. An alternating current connected to the primary coil is transferred to the two secondary coils. The amplitudes of the secondary voltages are sin φ and cos φ, where φ is the rotation angle.

Characteristics
- Robust, for industrial use
- Long service life
- No mechanical wear
- Output signal can be transmitted over long distances without problems
- No sensitive electronics
- Special signal evaluation required
- Only one sensor for position and speed information
- EC motors with resolver are supplied without Hall sensors

Schematic design of the inductive MILE encoder



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

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

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
Type of control
– 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

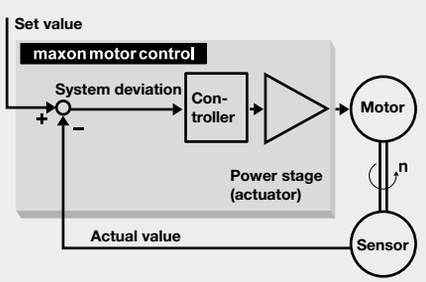
The motor is equipped with a digital encoder that provides a certain number of pulses per revolution. The turning direction is detected with the square pulses of channels A and B offset by 90 electric degrees.
- Digital encoders are often found in positioning controls, in order to derive and measure the travel or angle.
- Digital encoders are not subject to mechanical wear.
- In conjunction with digital controllers there are no drift effects.
- If Hall sensor signals of an EC motor are used for control, this corresponds to an encoder with low resolution.

IxR compensation

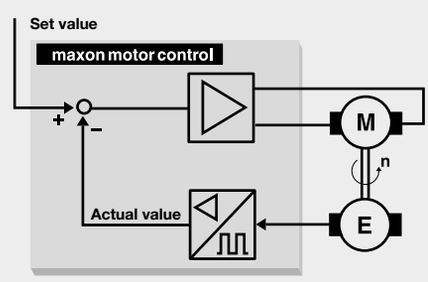
The motor is provided with a voltage that is proportional to the applied speed set value. The speed would drop with increasing motor load. The compensation circuitry increases the output voltage with increasing motor current. The compensation must be adjusted to the terminal resistance of the motor which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

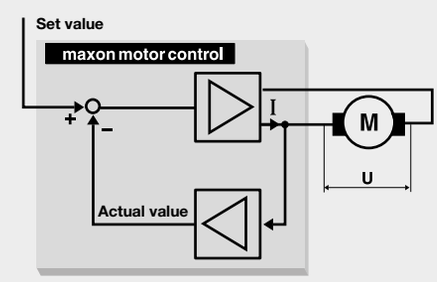
Principle of a control circuit



Principle: Encoder control



Principle: IxR compensation



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.

– Classical solution of a very precise control
– Limited service life of the DC tacho generator
– Not suitable for positioning tasks
– Only for analog controllers
– Analog feedback signal
– Ideal for stringent demands on speed dynamics

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
– Controlled motor operation and braking operation in both rotation directions
– A must for positioning tasks

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

Timed 4-Q power stages

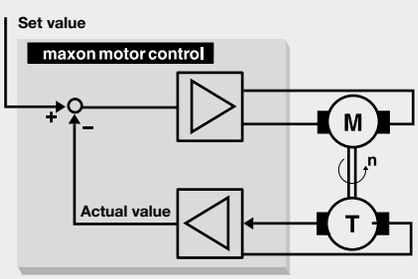
To control the power stage transistors, the maxon controllers use a 3-level pulse width modulation (PWM). The voltage present at the motor switches between the supply voltage and 0 V at short intervals (50 kHz and more). If the Off interval gets larger at the cost of the On interval, the decisive average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

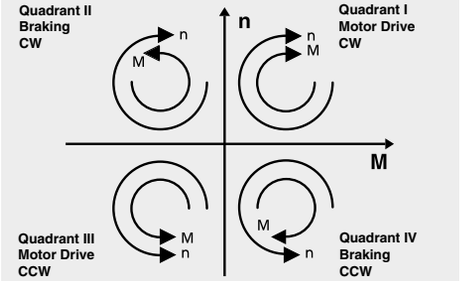
The 4-quadrant operation allows controlled and dynamic motor operation and brake operation in two directions of rotation (all 4 quadrants). 4-quadrant operation is a prerequisite for positioning tasks.

For further explanations, please see page 375.

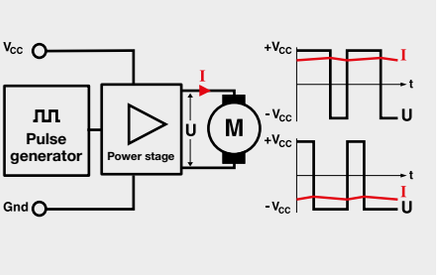
Principle: DC tachometer control



Operation quadrants



Principle: Pulsed power amplifier



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).

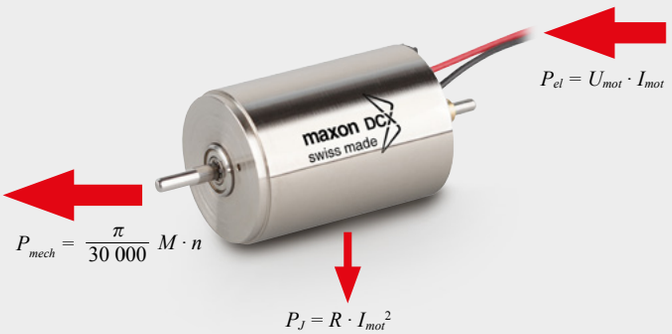
Independent of the voltage, the speed-torque line is described most practically by the slope or gradient of the curve (line 14 of the motor data).

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

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 48).

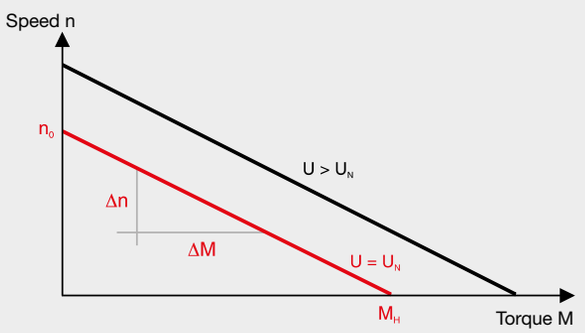
The following applies in particular:
– All torques in mNm
– All currents in A (even no load currents)
– Speeds (rpm) instead of angular velocity (rad/s)



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

$$M_H = k_M \cdot I_A$$

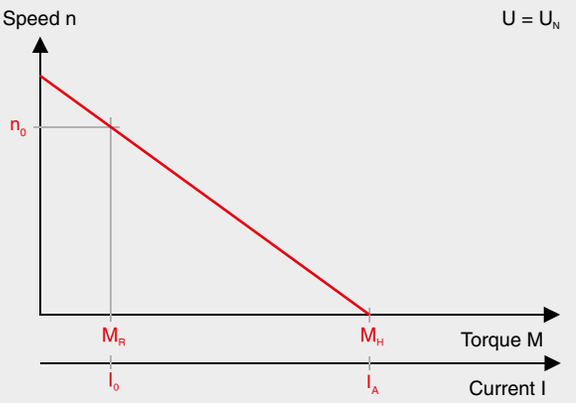
Efficiency curve
The efficiency η describes the relationship of mechanical power delivered to electrical power consumed.

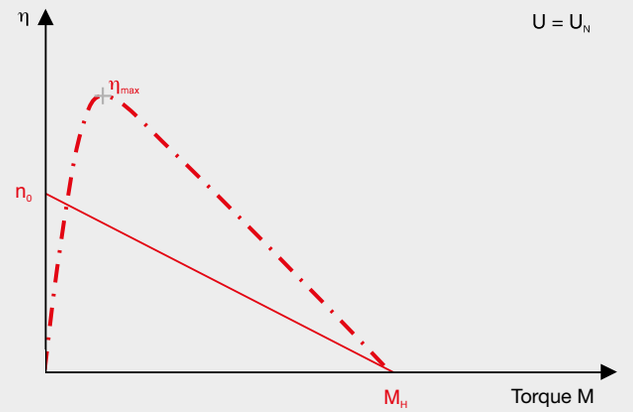
$$\eta = \frac{\pi}{30\,000} \cdot \frac{n \cdot (M - M_R)}{U_{mot} \cdot I_{mot}}$$

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.



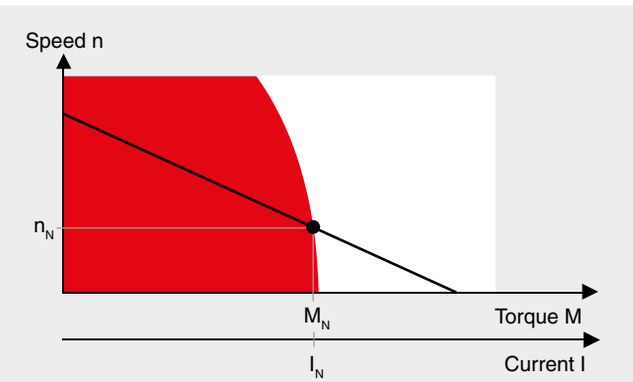


Rated operating point

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.

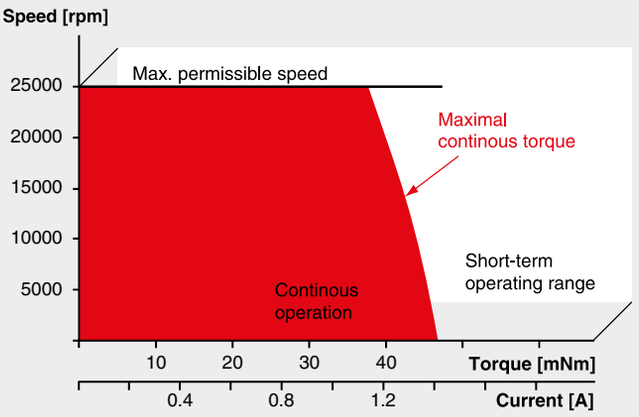
Short-term operating range
The motor may only be loaded with the maximum continuous current for thermal reasons. However, temporary higher currents (torques) are allowed. As long as the winding temperature is below the critical value, the winding will not be damaged. Phases with increased currents are 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 time is heavily dependent on the motor current and the rotor’s starting temperature.

Maximum continuous current, maximum continuous torque
The Jule 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.

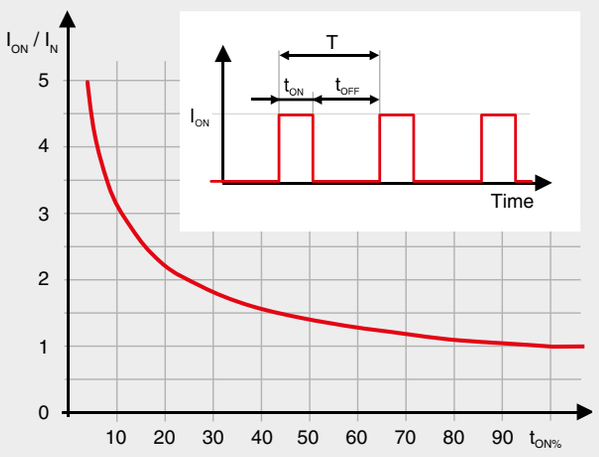
The maximum permissible speed
for DC motors is primarily limited by the commutation system. The commutator and brushes wear more rapidly at very high speeds.
The reasons are:
– Increased mechanical wear because of the large traveled path of the commutator
– Increased electro-erosion because of brush 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
The motor current causes the winding to heat up due to the winding’s resistance. To prevent the motor from overheating, this heat must dissipate to the environment via the stator. The coreless winding is the thermally critical point. The maximum rotor temperature must not be exceeded, even temporarily. With graphite brush motors and EC motors which tend to have higher current loads, the maximum rotor temperature is 125°C (in individual cases up to 155°C). Motors with precious metal commutators only allow lower current loads, so that the rotor temperatures must not exceed 85°C. Favourable mounting conditions, such as good air circulation or cooling plates, can significantly lower temperatures.



Operating range diagram



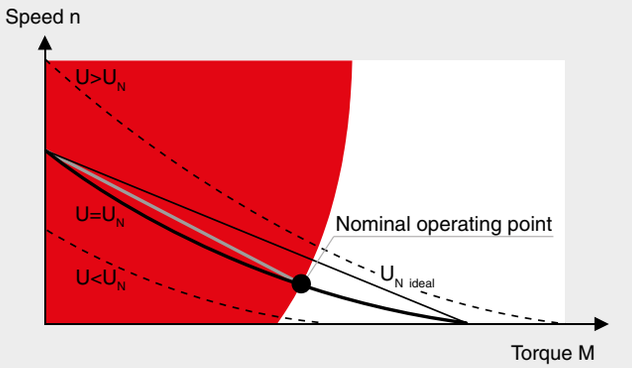
ON	Motor in operation
OFF	Motor stationary
I_{ON}	Max. peak current
I_N	Max. permissible continuous current (line 6)
t_{ON}	ON time *[s]*, should not exeed τ_w (line 19)
T	Cycle time $t_{ON} + t_{OFF}$ *[s]*
$t_{ON\%}$	Duty cycle as percentage of cycle time. The motor may be overloaded by the relationship I_{ON} / I_N at X % of the total cycle time.

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

maxon flat motor

Multipole EC motors, such as maxon flat motors, require a greater number of commutation steps for a motor revolution (6 x number of pole pairs). Due to the wound stator teeth they have a higher terminal inductance than motors with an ironless winding. As a result at higher speed, the current cannot develop fully during the correspondingly short commutation intervals. Therefore, the apparent torque produced is lower. Current is also fed back into the controller's power stage.
As a result, motor behaviour deviates from the ideal linear speed-torque gradient. The apparent speed-torque gradient depends on voltage and speed: The gradient is steeper at higher 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 approximately.

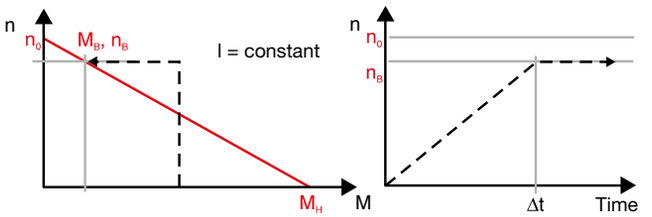
$$\frac{\Delta n}{\Delta M} \approx \frac{n_0 - n_N}{M_N}$$



Acceleration

In accordance with the electrical boundary conditions (power supply, control, battery), a distinction is principally 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:

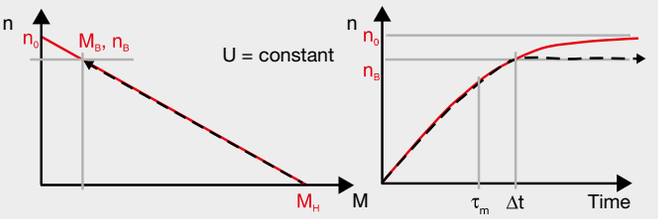
$$\alpha = 10^4 \cdot \frac{k_M \cdot I_{mot}}{J_R + J_L} = 10^4 \cdot \frac{M}{J_R + J_L}$$

– 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)

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:

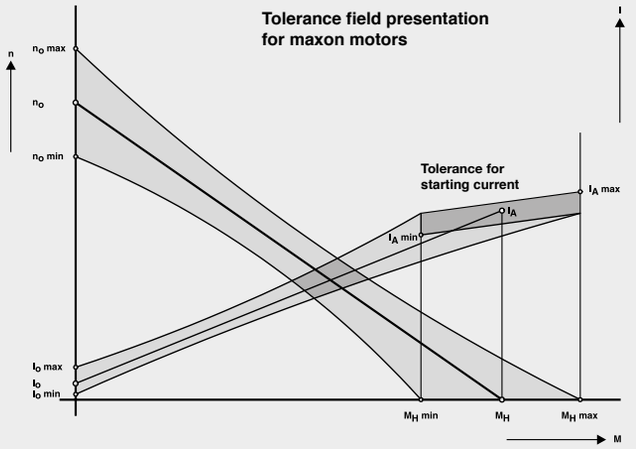
$$\alpha_{max} = 10^4 \cdot \frac{M_H}{J_R + J_L}$$

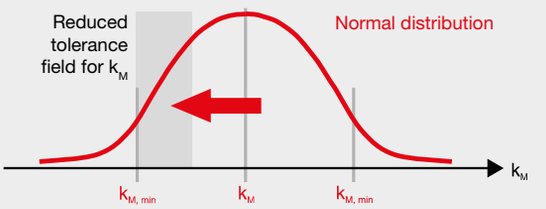
– Run-up time (in ms) at constant voltage up to the operating point (M_L, n_L):

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

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 ($\alpha_{Cu} = 0.0039$):

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

Example: a winding temperature of 75°C causes the winding resist- ance 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 kn 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.

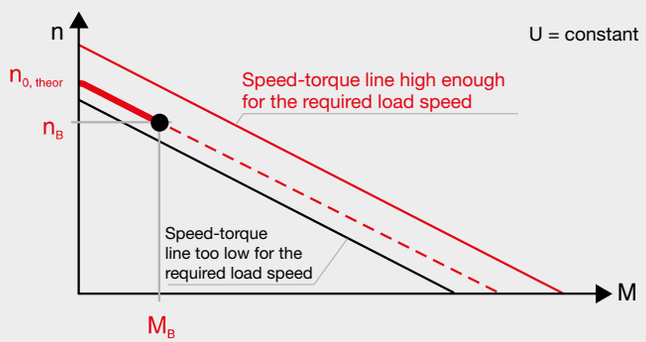
The motor current I_{mot} is calculated using the torque constant k_M of the selected winding and the load torque M_L.

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

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?
– What 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?

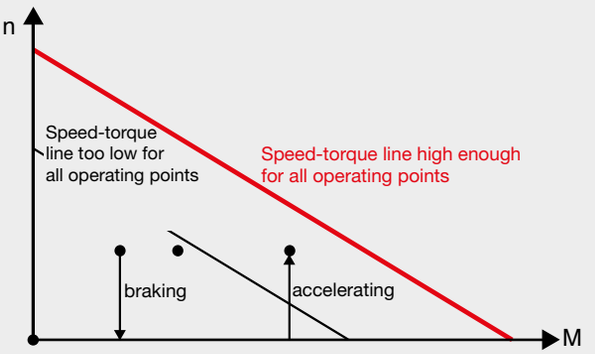


Regulated servo drives

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):

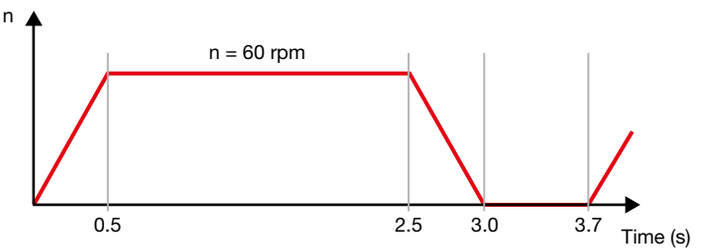
$$k_n \cdot U_{max} = n_0 > n_L + \frac{\Delta n}{\Delta M} M_L$$

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

A drive should move cyclically according to the following speed diagram.



The inertia of the load to be accelerated J_L is 140 000 gcm². The constant coefficient is approximately 300 mNm. The 4-quadrant operation allows controlled and dynamic motor operation and brake operation in two directions of rotation (all 4 quadrants). The power supply unit delivers max. 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):

$$M_\alpha = J_L \cdot \frac{\pi}{30} \frac{\Delta n}{\Delta t} = 0.014 \cdot \frac{\pi}{30} \cdot \frac{60}{0.5} = 0.176 \text{ Nm} = 176 \text{ mNm}$$

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

– Acceleration phase	(duration 0.5 s)	476 mNm
– Constant speed	(duration 2 s)	300 mNm
– Braking (friction brakes with 300 mNm)	(duration 0.5 s)	124 mNm
– Standstill	(duration 0.7 s)	0 mNm

Peak torque occurs during acceleration.
The RMS determined torque of the entire operating cycle is

$$M_{RMS} = \sqrt{\frac{t_1 \cdot M^2_1 + t_2 \cdot M^2_2 + t_3 \cdot M^2_3 + t_4 \cdot M^2_4}{t_{tot}}}$$

$$= \sqrt{\frac{0.5 \cdot 476^2 + 2 \cdot 300^2 + 0.5 \cdot 124^2 + 0.7 \cdot 0}{3.7}} \approx 285 \text{ mNm}$$

The maximum speed (60 rpm) occurs at the end of the acceleration phase at maximum torque (463 mNm). Thus, the peak mechanical power is:

$$P_{max} = M_{max} \cdot \frac{\pi}{30} n_{max} = 0.476 \cdot \frac{\pi}{30} \cdot 60 \approx 3 \text{ W}$$

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*	kgm²	gcm²
J_L	Moment of inertia of the load	kgm²	gcm²
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_H	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/s²	
$\Delta n/\Delta M$	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
A gear is required with a maximum continuous torque of at least 0.28 Nm and an intermittent torque of at least 0.47 Nm. This requirement is fulfilled, for example, by a planetary gear with 22 mm diameter (metal version GP 22 A).
The recommended input speed of 6000 rpm allows a maximum reduction of:

$$i_{max} = \frac{n_{max,\,G}}{n_B} = \frac{6000}{60} = 100{:}1$$

We select the three-stage gear with the next smallst reduction of 84 : 1 (stock program). Efficiency is max. 59%.

Motor type selection
Speed and torque are calculated to the motor shaft

$$n_{mot} = i \cdot n_L = 84 \cdot 60 = 5040 \text{ rpm}$$

$$M_{mot,\,RMS} = \frac{M_{RMS}}{i \cdot \eta} = \frac{285}{84 \cdot 0.59} \approx 5.8 \text{ mNm}$$

$$M_{mot,\,max} = \frac{M_{max}}{i \cdot \eta} = \frac{476}{84 \cdot 0.59} \approx 9.6 \text{ mNm}$$

The possible motors, which match the selected gears in accordance with the maxon modular system, are summarized *in the table opposite.* The table contains only DC motors with graphite commutation, which are better suited for start-stop operation, as well as brushless EC motors.

Selection falls on an A-max 22, 6 W, which demonstrates a sufficiently high continuous torque. The motor should have a torque reserve so that it can even function with a somewhat unfavorable gear efficiency. The additional torque requirement during acceleration can easily be delivered by the motor. The temporary peak torque is not even twice as high as the continuous torque of the motor.

Selection of the winding
The motor type A-max 22, 6 W has an average speed-torque gradient of some 450 rpm/mNm. However, it should be noted that the two lowest resistance windings have a somewhat steeper gradient. The desired no load speed is calculated as follows:

$$n_{0,\,theor} = n_{mot} + \frac{\Delta n}{\Delta M} \cdot M_{max} = 5040 + 450 \cdot 9.6 = 9360 \text{ min}^{-1}$$

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 V supplied by the control (ESCON 36/2), which defines the minimum target speed constant $k_{n,\,theor}$ of the motor.

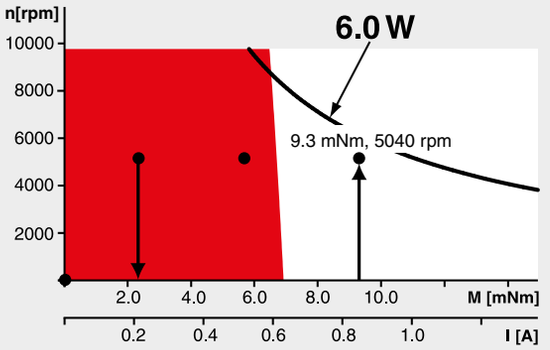
$$k_{n,\,theor} = \frac{n_{0,\,theor}}{U_{mot}} = \frac{9360}{24} = 390 \frac{\text{min}^{-1}}{V}$$

According to the calculations, the selection of the motor is 110163, which with its speed constant of 558 rpm/V has a speed control reserve of over 20%. This means that unfavorable tolerances are not a problem. 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 controller. This motor also has a second shaft end for mounting an encoder.
The torque constant of this winding is 17.1 mNm/A. Therefore the maximum torque corresponds to a peak current of:

$$I_{max} = \frac{M_{max}}{k_M} + I_0 = \frac{9.6}{17.1} + 0.029 = 0.6\,A$$

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.



Motor	M_N	Suitability
A-max 22, 6 W	≈ 6.9 mNm	good
A-max 19, 2.5 W	≈ 3.8 mNm	too weak
RE-max 21, 6 W	≈ 6.8 mNm	good
EC 16, 30 W	≈ 8.5 mNm	good
EC 16, 60 W	≈ 17 mNm	too strong
EC 20 flat, 3 W	≈ 3-4 mNm	too weak
EC 20 flat, 5 W	≈ 7.5 mNm	good
EC 20 flat, 5 W, iE.	≈ 7.5 mNm	good, possible alternative with integrated speed controller, no ESCON control necessary

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

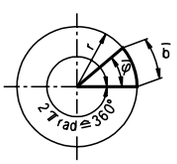
... gravitational acceleration:
g = 9.80665 m s^{-2}
= 386.08858 in s^{-2}

... 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 $kgm^2 s^{-3}$
1 J = 1 Nm = 1 Ws

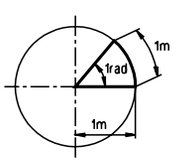
Decimal multiples and fractions of units

Prefix	Abbre-viation	Multiply	Prefix	Abbre-viation	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}

Arc definition



$\varphi = \frac{b}{r}$



$1\,rad = \frac{1m}{1m} \triangleq 57.2958°$

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	$2\pi/60000$
mW	7.06	0.117	112.9	1.356 · 10^3	1 · 10^3	1	9.807 · 10^3	$2\pi/60$
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 m^2]

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]

B \ A	oz	lb	gr (grain)	kg	g
kg	28.35 ·10^{-3}	0.454	64.79·10^{-6}	1	1 · 10^{-3}
g	28.35	0.454 · 10^3	64.79·10^{-3}	1 · 10^3	1
oz	1	16	2.28 · 10^{-3}	35.27	35.27 · 10^3
lb	$1/16$	1	$1/7000$	2.205	2.205 · 10^3
gr (grain)	437.5	7000	1	15.43 · 10^3	15.43 · 10^6

Force — F [N]

B \ A	oz	lbf	N	kp	p
N	0.278	4.448	1	9.807	9.807·10^{-3}
kp	0.028	0.454	0.102	1	1 · 10^{-3}
oz	1	16	3.600	35.27	35.27·10^{-3}
lbf	$1/16$	1	0.225	2.205	2.205·10^{-3}
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}]

B \ A	s^{-1} = Hz	**rpm**	rad s^{-1}
rad s^{-1}	2π	$\pi/30$	1
rpm	$1/60$	1	$30/\pi$

Angular Acceleration — α [s^{-2}]

B \ A	min^{-2}	s^{-2}	rad s^{-2}	min^{-1} s^{-1}
s^{-2}	$1/3600$	1	$1/2\pi$	$1/60$
rad s^{-2}	$\pi/1800$	2π	1	$\pi/30$

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

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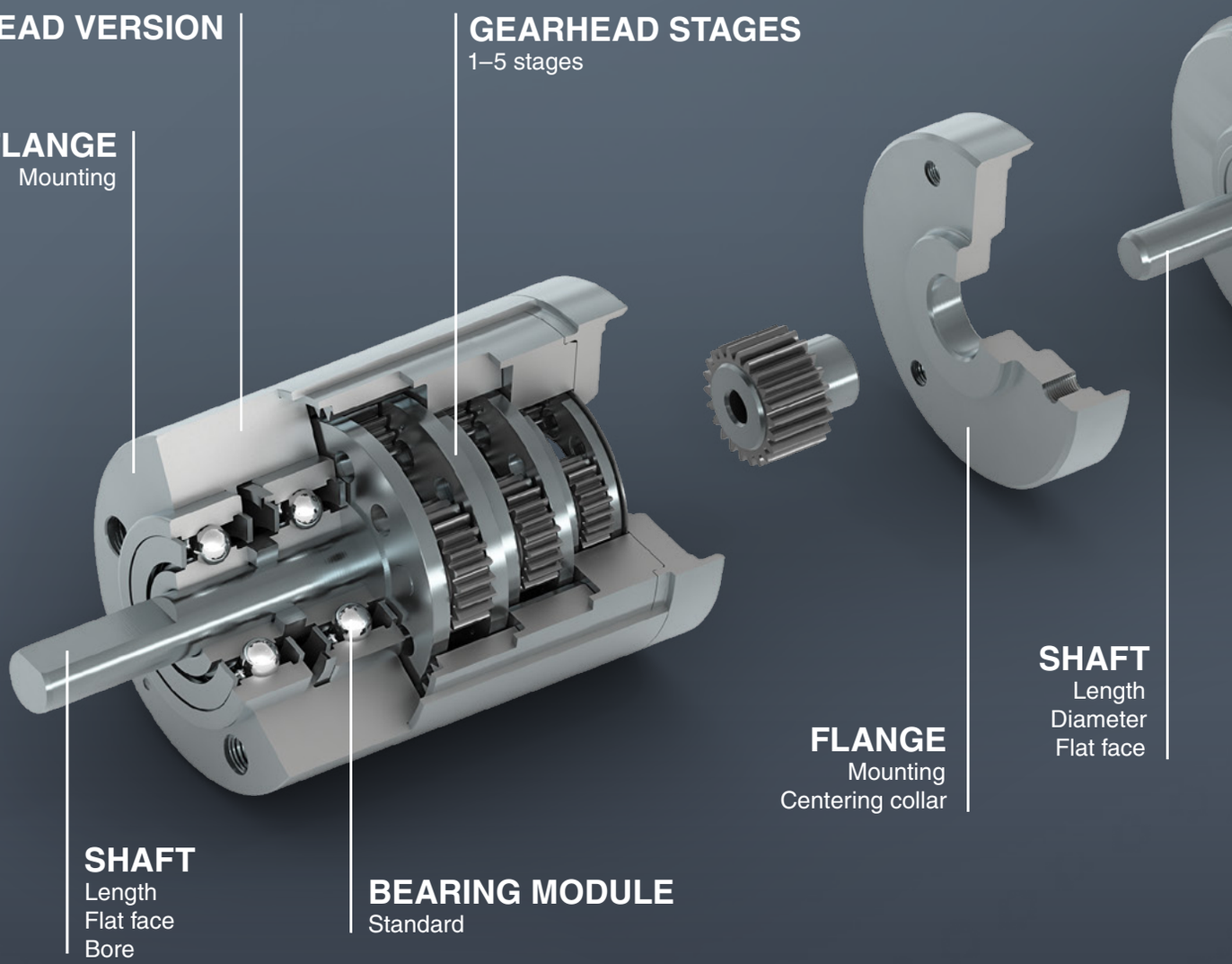


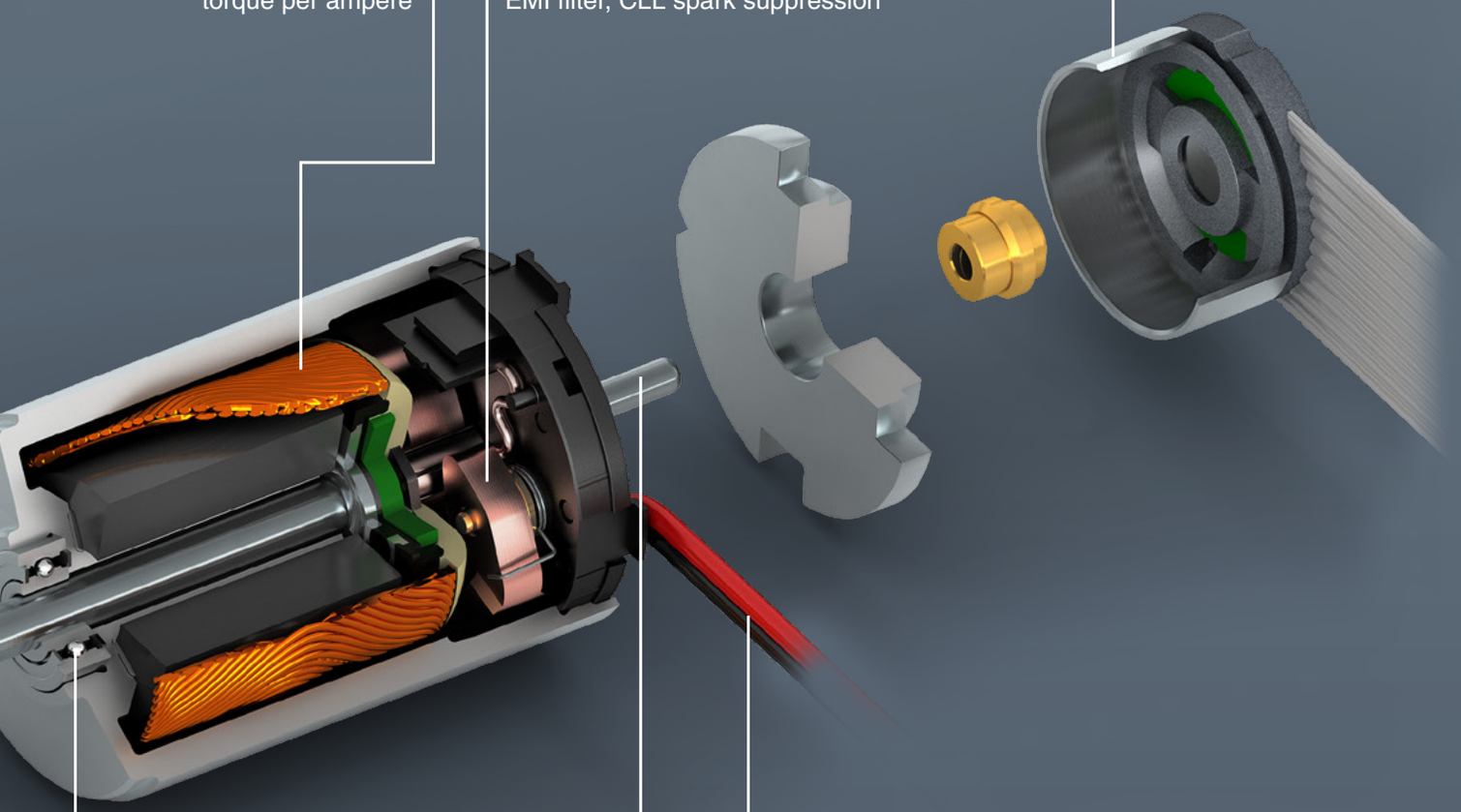
WINDING
Low nominal voltage
Low resistance
High current
High speed constant:
speed per volt

High nominal voltage
High resistance
Low current
High torque constant:
torque per ampere

COMMUTATION
Graphite brushes
High current and current peaks
Start/stop and reverse operation
Large motors (from approx. 5 W)
EMI filter

Precious metal brushes
Low current and voltage
Continuous operation
Cost-effective
EMI filter, CLL spark suppression

ENCODER
Counts per turn
Cable outlet angle with
strain relief
Cable length



CONNECTIONS
Terminals
Cable
Connector

SHAFT
Length

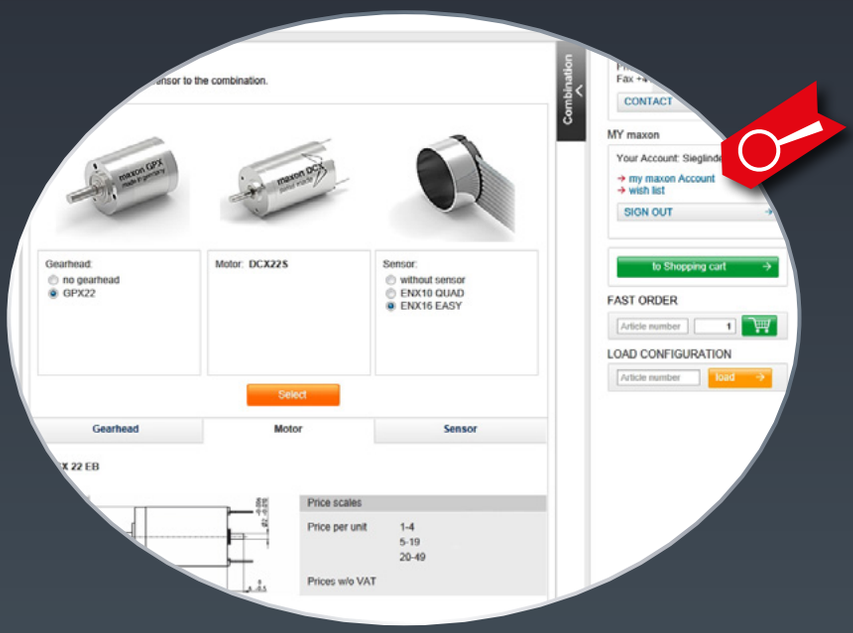
BEARING
Ball bearing
All operating modes
Higher radial and axial load

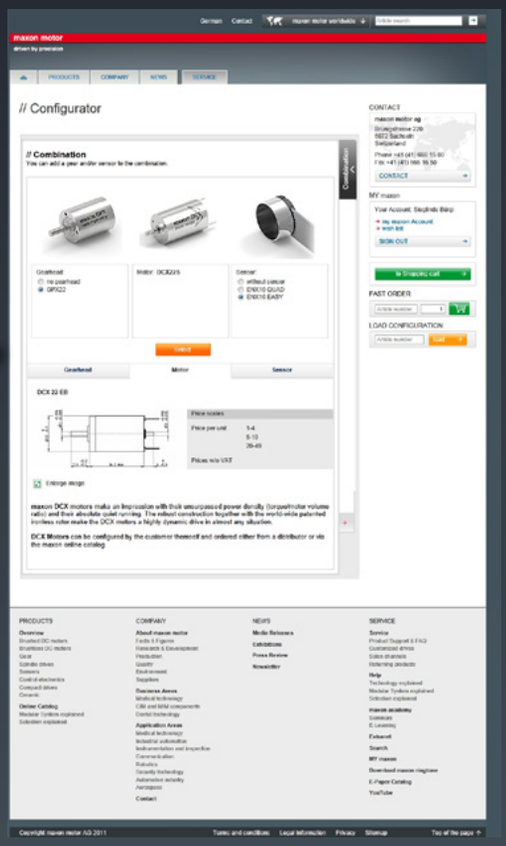
Sleeve bearing
For continuous operation at high speeds
Cost-effective

xdrives.maxonmotor.com

COMBINE ONLINE

The motor can be combined with a predefined selection of additional X-drive components such as gearheads and encoders.



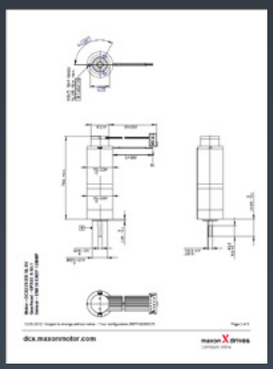


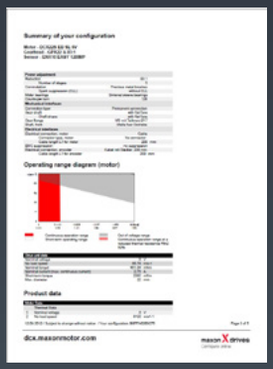
CONFIGURE ONLINE

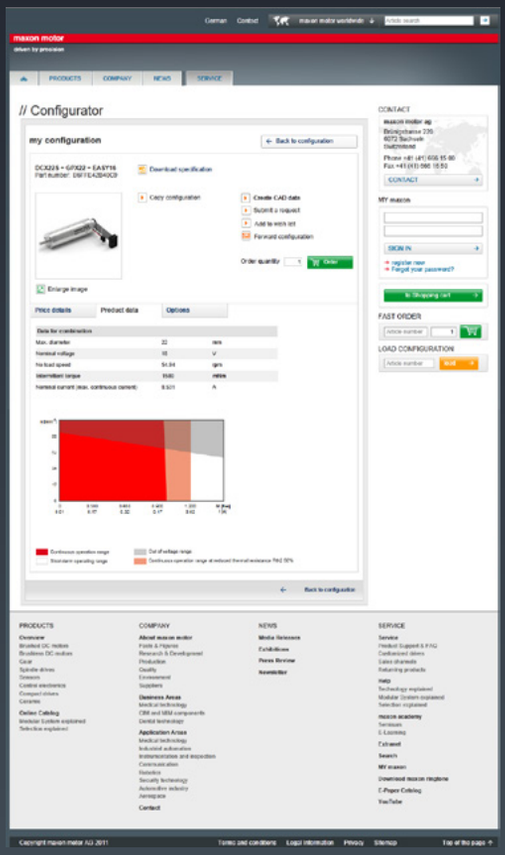
The selected basic product can be configured using the available options. The result is your own unique version with corresponding article number.

ORDER ONLINE

After all configurations have been completed, full specifications and documentation for the configured products are generated. 2D and 3D dimensional drawings can be downloaded. A complete, ready-to-print specification document describes your drive. Up to 49 units can be ordered directly online.







FAST PROCESSING – WORLDWIDE NETWORK

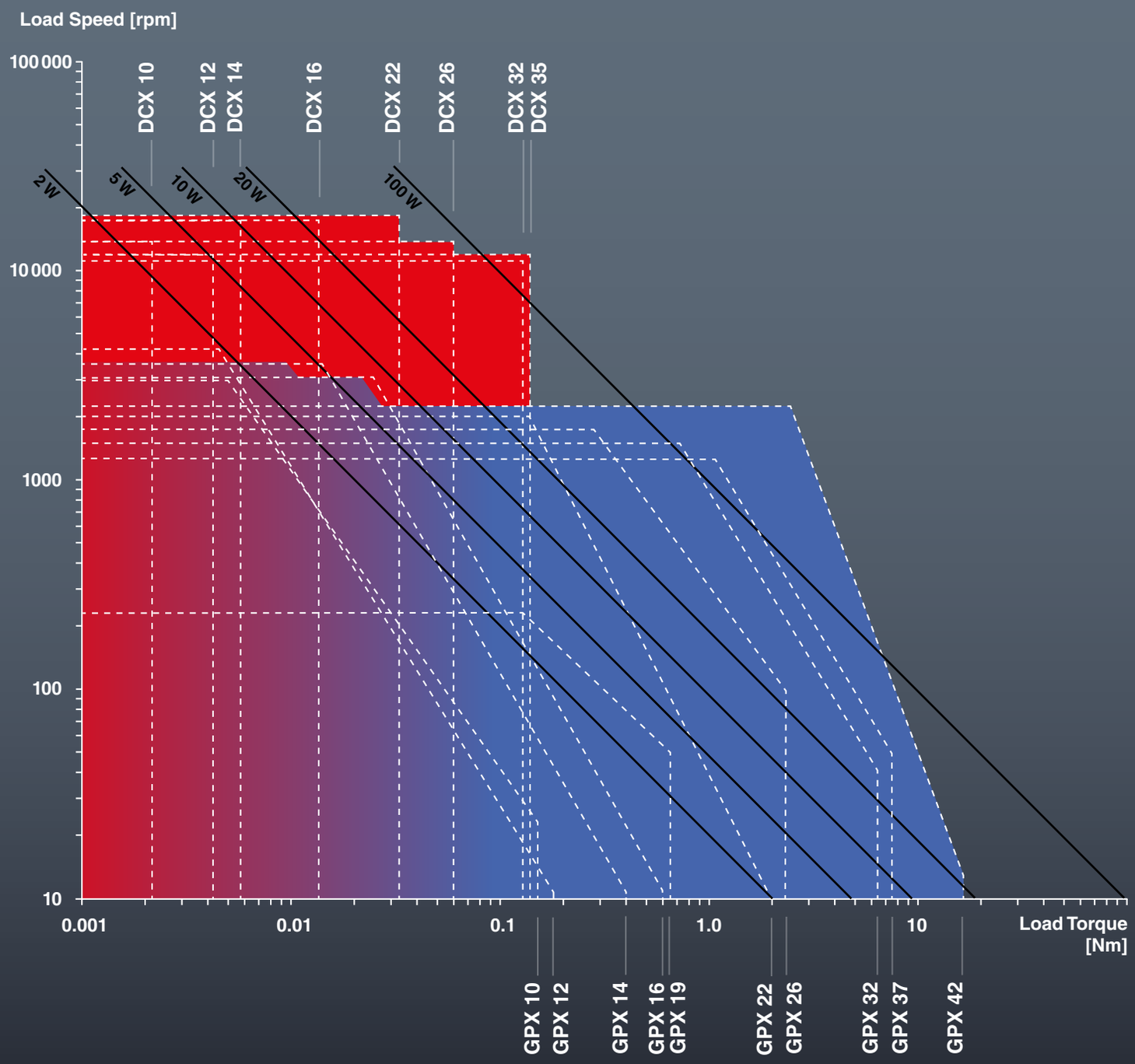
Configure and order your drive online. xdrives.maxonmotor.com

HEADQUARTERS

maxon motor ag
Brünigstrasse 220
P.O. Box 263
6072 Sachseln
Switzerland

+41 (41) 666 15 00
contact.maxonmotor.com

maxon DCX SELECTION



maxon DCX

maxon DCX MOTOR

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 worldwide patented ironless rotor make the DCX motors a highly dynamic drive in almost any situation.

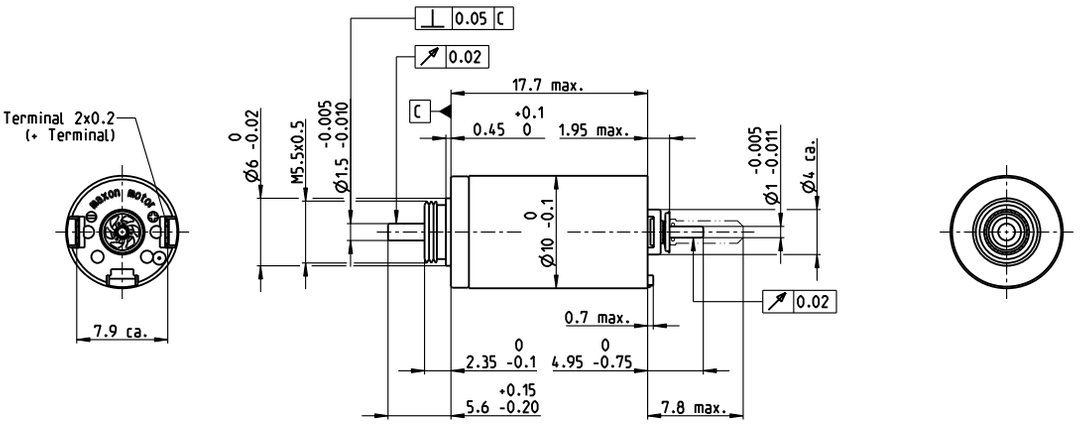
DCX maxon motors can be configured and ordered online. xdrives.maxonmotor.com

maxon motor

driven by precision

DCX 10 S Precious Metal Brushes
DC motor Ø10 mm

1/1.4 W 0.9 mNm 14300 rpm



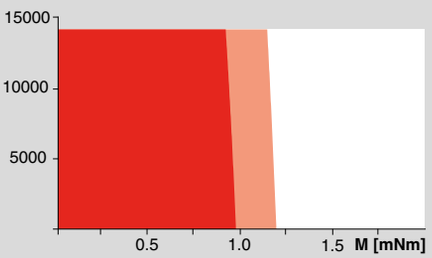
M 3:2

	Motor Data							
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	12700	13100	12700	12700	12700	12700
3_	No load current	mA	84.8	44.2	28.3	21.2	14.1	10.6
4_	Nominal speed	rpm	4330	4700	4300	4130	3970	3930
5_	Nominal torque (max. continuous torque)	mNm	0.911	0.938	0.936	0.918	0.902	0.898
6_	Nominal current (max. continuous current)	A	0.924	0.489	0.316	0.233	0.152	0.114
7_	Stall torque	mNm	1.43	1.51	1.46	1.41	1.36	1.35
8_	Stall current	A	1.36	0.737	0.462	0.334	0.215	0.16
9_	Max. efficiency	%	57	58	58	57	56	56
10_	Terminal resistance	Ω	1.11	4.07	9.75	17.9	41.8	75.0
11_	Terminal inductance	mH	0.019	0.073	0.173	0.307	0.692	1.23
12_	Torque constant	mNm/A	1.05	2.05	3.16	4.22	6.33	8.44
13_	Speed constant	rpm/V	9050	4660	3020	2260	1510	1130
14_	Speed/torque gradient	rpm/mNm	9480	9240	9290	9620	9970	10100
15_	Mechanical time constant	ms	7.61	7.41	7.39	7.39	7.44	7.43
16_	Rotor inertia	gcm²	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	°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	6.3
32_	Typical noise level	dBA	35

Operating Range

n [rpm] Winding 4.5 V



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

maxon Modular System

maxon gear	maxon sensor	maxon motor control
84_GPX 10	102_ENX 10 EASY	378_ESCON Module 24/2
	102_ENX 10 QUAD	378_ESCON 36/2 DC
		386_EPOS2 24/2 (DC/EC)
		386_EPOS2 Module 36/2

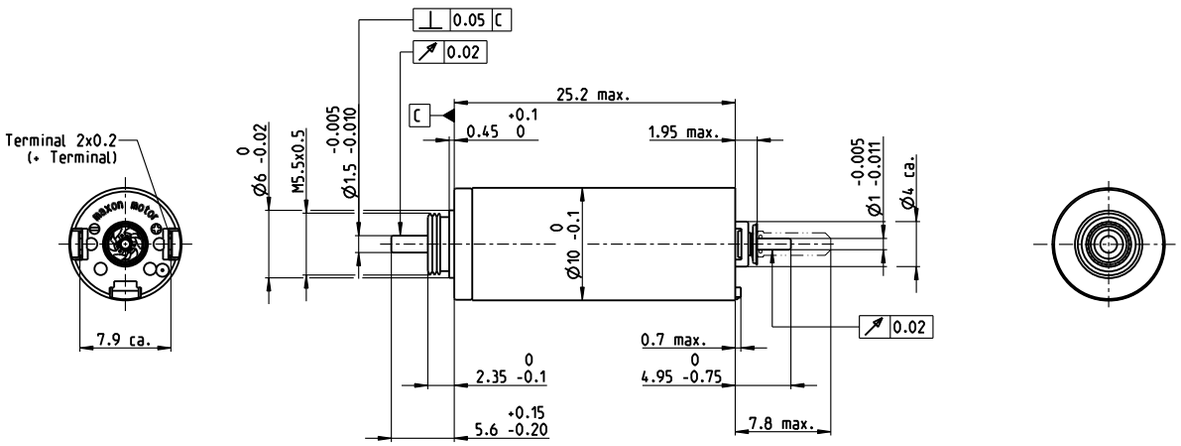
Configuration

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

xdrives.maxonmotor.com

DCX 10 L Precious Metal Brushes
DC motor Ø10 mm

1.5/3 W 2.2 mNm 14300 rpm



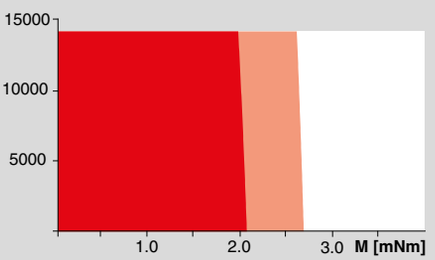
M 3:2

	Motor Data							
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	11500	12100	11900	12100	11900	11200
3_	No load current	mA	83.4	45.1	29.3	22.5	14.6	10
4_	Nominal speed	rpm	8960	6830	7050	6600	6750	5950
5_	Nominal torque (max. continuous torque)	mNm	1.04	2.04	2.2	1.93	2.06	2.03
6_	Nominal current (max. continuous current)	A	0.924	0.914	0.644	0.435	0.303	0.211
7_	Stall torque	mNm	4.75	4.73	5.42	4.32	4.81	4.38
8_	Stall current	A	3.9	2.04	1.53	0.933	0.681	0.438
9_	Max. efficiency	%	72	73	75	72	74	73
10_	Terminal resistance	Ω	0.385	1.47	2.93	6.43	13.2	27.4
11_	Terminal inductance	mH	0.006	0.021	0.050	0.086	0.199	0.399
12_	Torque constant	mNm/A	1.22	2.32	3.54	4.63	7.07	10.0
13_	Speed constant	rpm/V	7830	4120	2700	2060	1350	955
14_	Speed/torque gradient	rpm/mNm	2470	2610	2240	2860	2530	2620
15_	Mechanical time constant	ms	3.95	3.61	3.54	3.56	3.53	3.56
16_	Rotor inertia	gcm²	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	°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

Operating Range

n [rpm] Winding 4.5 V



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

maxon Modular System

maxon gear	maxon sensor	maxon motor control
84_GPX 10	102_ENX 10 EASY	378_ESCON Module 24/2
	102_ENX 10 QUAD	378_ESCON 36/2 DC
		386_EPOS2 24/2 (DC/EC)
		386_EPOS2 Module 36/2

Configuration

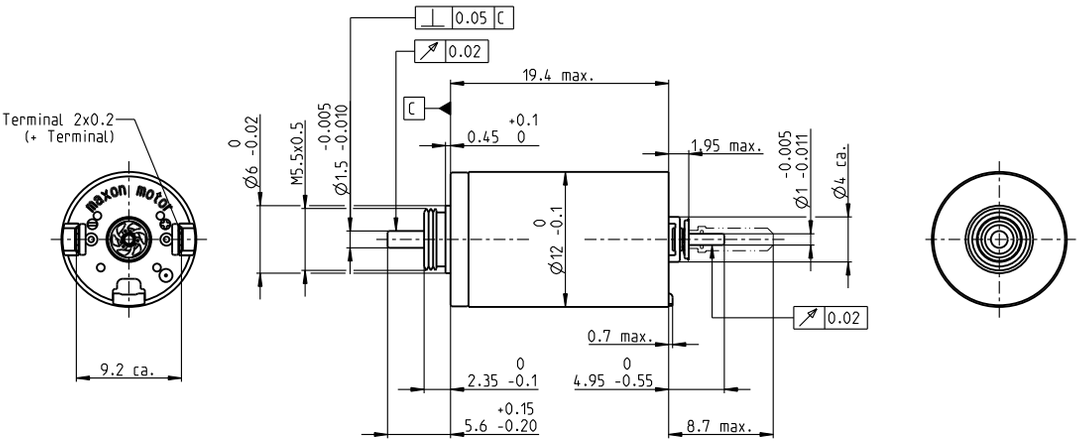
Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

xdrives.maxonmotor.com

DCX 12 S Precious Metal Brushes
DC motor Ø12 mm

NEW

1.6/2 W 2.0 mNm 14300 rpm



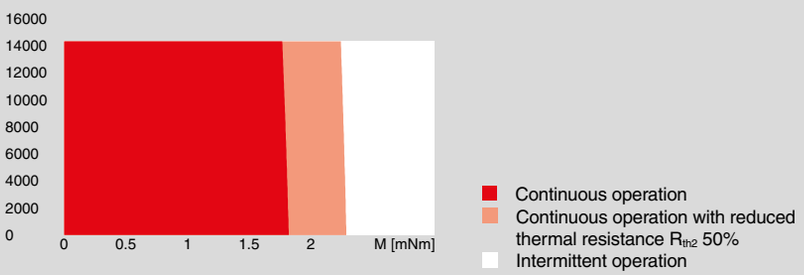
M 3:2

	Motor Data							
1_	Nominal voltage	V	1.5	3	4.5	6	9	12
2_	No load speed	rpm	8870	9130	9040	9130	9050	9060
3_	No load current	mA	42.2	21.9	14.4	11	7.21	5.42
4_	Nominal speed	rpm	4590	3730	3600	3840	3680	3600
5_	Nominal torque (max. continuous torque)	mNm	1.41	1.96	1.94	1.99	1.96	1.92
6_	Nominal current (max. continuous current)	A	0.924	0.655	0.427	0.332	0.216	0.159
7_	Stall torque	mNm	2.96	3.36	3.26	3.48	3.35	3.23
8_	Stall current	A	1.87	1.09	0.701	0.566	0.36	0.261
9_	Max. efficiency	%	72	74	74	75	74	74
10_	Terminal resistance	Ω	0.801	2.74	6.42	10.6	25	46
11_	Terminal inductance	mH	0.0162	0.0615	0.141	0.246	0.564	0.998
12_	Torque constant	mNm/A	1.58	3.08	4.65	6.15	9.31	12.4
13_	Speed constant	rpm/V	6050	3110	2050	1550	1030	771
14_	Speed/torque gradient	rpm/mNm	3070	2770	2830	2680	2760	2870
15_	Mechanical time constant	ms	8.64	8.29	8.24	8.22	8.25	8.25
16_	Rotor inertia	gcm²	0.269	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	7.67
20_	Thermal time constant motor	s	146
21_	Ambient temperature	°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	40

Operating Range

n [rpm] Winding 4.5 V



maxon Modular System

maxon gear	Stages	maxon sensor	maxon motor control
85_GPX 12	1–2	102_ENX 10 EASY	378_ESCON Module 24/2
86_GPX 14	3–4	102_ENX 10 QUAD	378_ESCON 36/2 DC
			386_EPOS2 24/2 (DC/EC)
			386_EPOS2 Module 36/2

Configuration

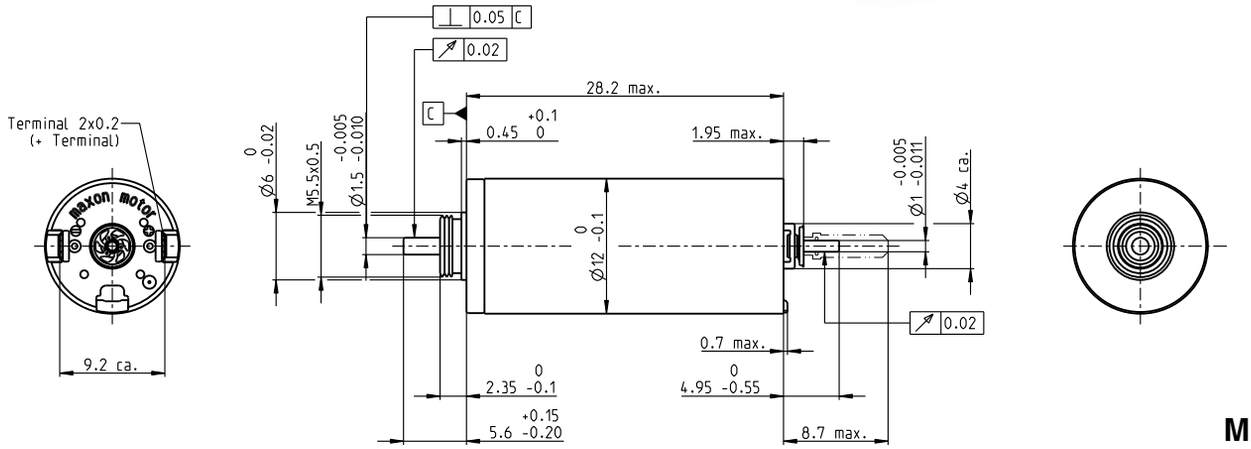
Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

xdrives.maxonmotor.com

DCX 12 L Precious Metal Brushes
DC motor Ø12 mm

NEW

2.5/4.8 W 4.2 mNm 12000 rpm



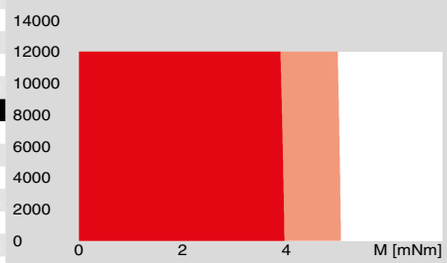
M 3:2

	Motor Data							
1_	Nominal voltage	V	3	4.5	6	9	12	18
2_	No load speed	rpm	8680	8690	8690	8700	8690	8690
3_	No load current	mA	33.9	22.6	17.0	11.3	8.49	5.66
4_	Nominal speed	rpm	6140	5510	5470	5680	5490	5470
5_	Nominal torque (max. continuous torque)	mNm	2.92	3.99	3.93	4.18	3.94	3.92
6_	Nominal current (max. continuous current)	A	0.924	0.834	0.616	0.436	0.308	0.204
7_	Stall torque	mNm	10.0	11.0	10.7	12.1	10.8	10.6
8_	Stall current	A	3.08	2.24	1.63	1.23	0.824	0.543
9_	Max. efficiency	%	80	81	81	82	81	81
10_	Terminal resistance	Ω	0.975	2.01	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	3.26	4.90	6.53	9.79	13.1	19.6
13_	Speed constant	rpm/V	2930	1950	1460	975	731	488
14_	Speed/torque gradient	rpm/mNm	874	801	824	726	816	825
15_	Mechanical time constant	ms	4.43	4.47	4.28	4.25	4.26	4.27
16_	Rotor inertia	gcm²	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	°C	-30…+85
22_	Max. winding temperature	°C	100
	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]
	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

Operating Range

n [rpm] Winding 4.5 V



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

maxon Modular System

maxon gear	Stages	maxon sensor	maxon motor control
85_GPX 12	1–2	102_ENX 10 EASY	378_ESCON Module 24/2
86_GPX 14	3–4	102_ENX 10 QUAD	378_ESCON 36/2 DC
			386_EPOS2 24/2 (DC/EC)
			386_EPOS2 Module 36/2

Configuration

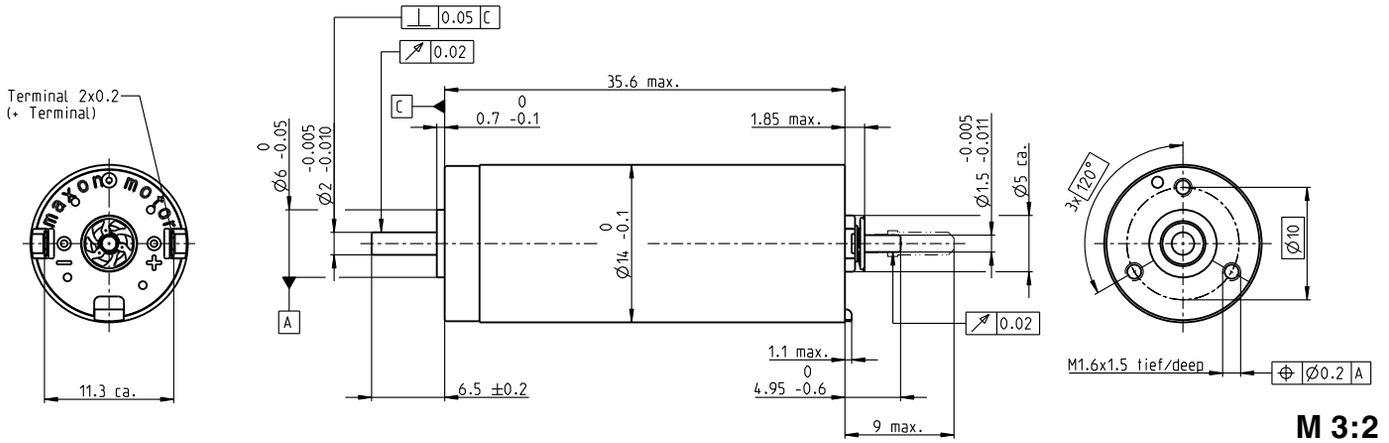
Bearing: Sleeve bearings/ball bearings preloaded
Commutation: Precious metal brushes with or without CLL
Flange front/back: Standard flange/Flange with thread holes/no flange
Shaft front/back: Length
Electric connection: Terminals or cable/cable length/connector type

xdrives.maxonmotor.com

DCX 14 L Precious Metal Brushes
DC motor Ø14 mm

NEW

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	7730	7730	7740	7740	7720	7730
3_	No load current	mA	76.3	50.9	38.2	25.5	19.1	12.7	9.55
4_	Nominal speed	rpm	5770	5170	5150	5210	5220	5060	5160
5_	Nominal torque (max. continuous torque)	mNm	4.11	6.25	6.19	6.33	6.34	5.96	6.2
6_	Nominal current (max. continuous current)	A	1.2	1.19	0.884	0.602	0.452	0.284	0.221
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	%	75.6	77.3	77.2	77.7	77.7	76.5	77.3
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	gcm²	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	°C	-30…+85
22_	Max. winding temperature	°C	100

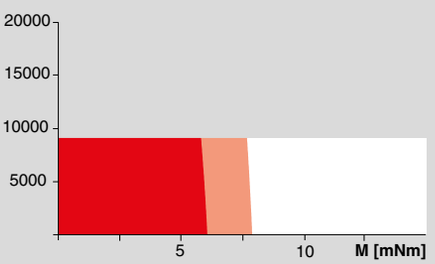
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0…0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

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

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

Operating Range

n [rpm] Winding 9 V



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

maxon Modular System

maxon gear	Stages	maxon sensor	maxon motor control
86_GPX 14	1–2	102_ENX 10 EASY	378_ESCON Module 24/2
88_GPX 16	3–4	102_ENX 10 QUAD	378_ESCON 36/2 DC
			386_EPOS2 24/2 (DC/EC)
			386_EPOS2 Module 36/2
			393_EPOS3 70/10 EtherCAT
			396_MAXPOS 50/5

Configuration

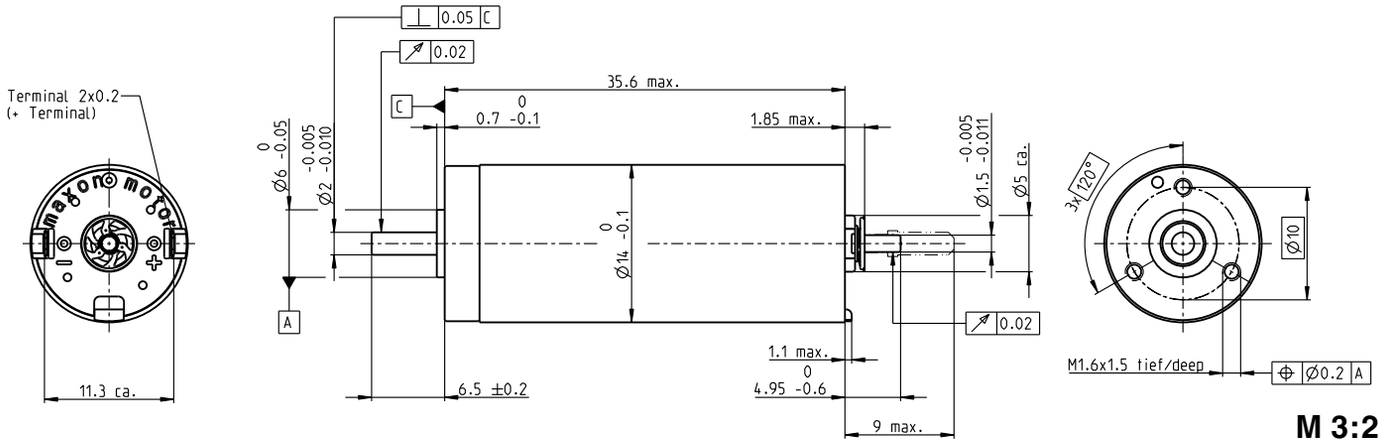
Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector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

xdrives.maxonmotor.com

DCX 14 L Graphite Brushes
DC motor Ø14 mm

NEW

6/10 W 6.9 mNm 17000 rpm



M 3:2

	Motor Data							
1_	Nominal voltage	V	4.5	6	9	12	18	24
2_	No load speed	rpm	11400	10200	11600	10300	11600	10300
3_	No load current	mA	74.3	47.8	37.4	24	18.7	12
4_	Nominal speed	rpm	7510	6890	8420	7340	8740	7300
5_	Nominal torque (max. continuous torque)	mNm	5.4	6.27	6.43	6.83	6.88	6.61
6_	Nominal current (max. continuous current)	A	1.54	1.19	0.914	0.645	0.489	0.313
7_	Stall torque	mNm	17.8	20.9	25	24.5	28.4	22.9
8_	Stall current	A	4.88	3.81	3.43	2.24	1.94	1.04
9_	Max. efficiency	%	71.2	75.4	78.2	79.3	80.8	79.6
10_	Terminal resistance	Ω	0.921	1.57	2.63	5.36	9.26	23
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	661	501	470	427	415	458
15_	Mechanical time constant	ms	5.75	4.95	4.56	4.32	4.22	4.18
16_	Rotor inertia	gcm²	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	°C	-40…+100
22_	Max. winding temperature	°C	125

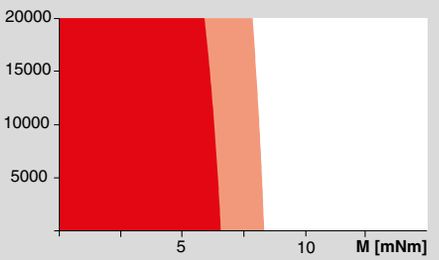
	Mechanical data ball bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0…0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

	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]

	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

Operating Range

n [rpm] Winding 12 V



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

maxon Modular System

maxon gear	Stages	maxon sensor	maxon motor control
86_GPX 14	1–2	102_ENX 10 EASY	378_ESCON Module 24/2
88_GPX 16	3–4	102_ENX 10 QUAD	378_ESCON 36/2 DC
			386_EPOS2 24/2 (DC/EC)
			386_EPOS2 Module 36/2
			393_EPOS3 70/10 EtherCAT
			396_MAXPOS 50/5

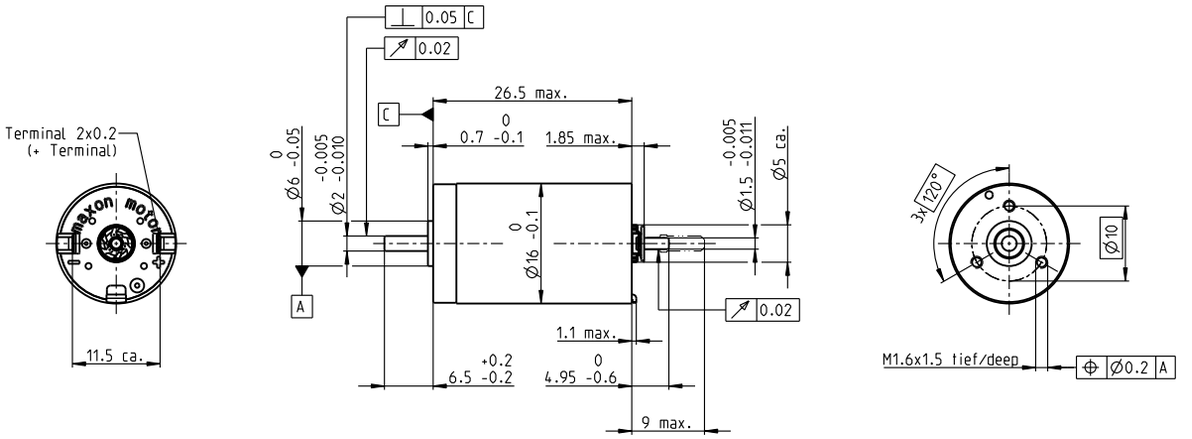
Configuration

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

3/5 W 5.3 mNm 8680 rpm



M 1:1

	Motor Data							
1_	Nominal voltage	V	3	4.5	6	9	12	24
2_	No load speed	rpm	6290	6290	6580	6290	6230	6220
3_	No load current	mA	56.0	37.3	29.6	18.7	13.8	6.91
4_	Nominal speed	rpm	3350	3300	3770	3280	3330	3210
5_	Nominal torque (max. continuous torque)	mNm	5.10	5.01	5.30	4.96	5.15	4.95
6_	Nominal current (max. continuous current)	A	1.20	0.782	0.648	0.388	0.298	0.143
7_	Stall torque	mNm	11.1	10.7	12.6	10.6	11.2	10.4
8_	Stall current	A	2.49	1.61	1.48	0.791	0.624	0.289
9_	Max. efficiency	%	73	72	74	72	73	72
10_	Terminal resistance	Ω	1.20	2.80	4.06	11.4	19.2	83.1
11_	Terminal inductance	mH	0.036	0.080	0.131	0.320	0.581	2.32
12_	Torque constant	mNm/A	4.45	6.67	8.53	13.3	18.0	36.0
13_	Speed constant	rpm/V	2150	1430	1120	715	531	265
14_	Speed/torque gradient	rpm/mNm	580	600	533	610	568	613
15_	Mechanical time constant	ms	6.09	6.09	6.05	6.13	6.11	6.17
16_	Rotor inertia	gcm²	1.00	0.97	1.08	0.959	1.03	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	°C	-30…+85
22_	Max. winding temperature	°C	100

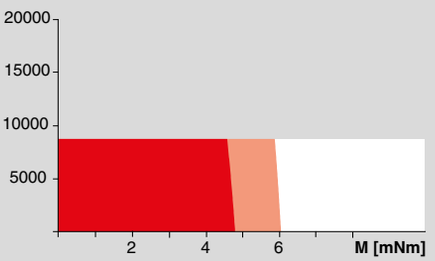
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0…0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

	Mechanical data sleeve bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0…0.2
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [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

Operating Range

n [rpm] Winding 12 V



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

maxon Modular System

maxon gear	Stages
88_GPX 16	1–2
90_GPX 19	3

maxon sensor
102_ENX 10 EASY
102_ENX 10 QUAD
103_ENX 16 EASY
104_ENX 16 EASY Absolute

maxon motor control
378_ESCON Module 24/2
378_ESCON 36/2 DC
386_EPOS2 24/2 (DC/EC)
386_EPOS2 Module 36/2
393_EPOS3 70/10 EtherCAT
396_MAXPOS 50/5

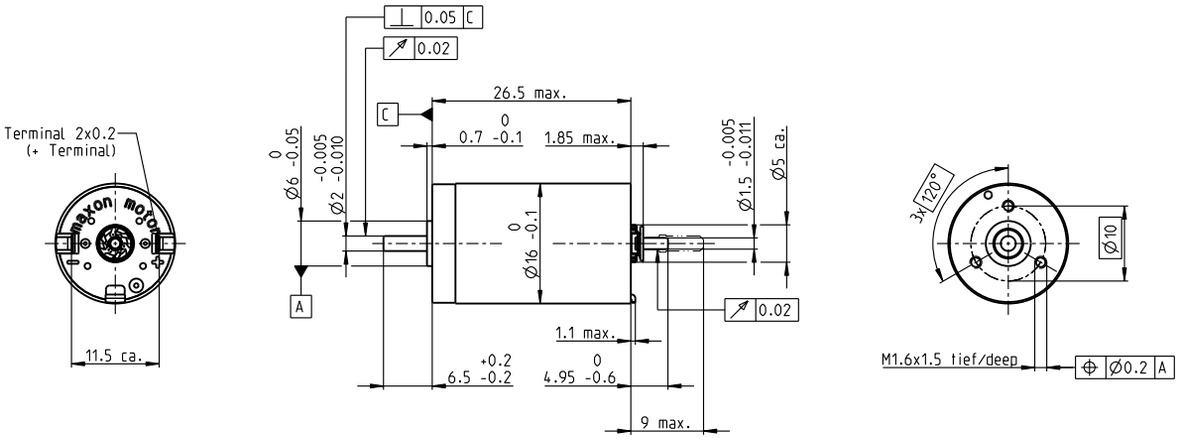
Configuration

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 Graphite Brushes
DC motor Ø16 mm

5/10 W 5.7 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	13300	12700	12700	12600
3_	No load current	mA	67.2	44.8	35.5	22.4	16.8	8.28
4_	Nominal speed	rpm	9470	9440	10200	9430	9540	9290
5_	Nominal torque (max. continuous torque)	mNm	5.47	5.39	5.71	5.36	5.53	5.35
6_	Nominal current (max. continuous current)	A	1.29	0.849	0.703	0.422	0.326	0.156
7_	Stall torque	mNm	22.0	21.3	25.1	21.1	22.4	20.8
8_	Stall current	A	4.94	3.20	2.94	1.58	1.26	0.577
9_	Max. efficiency	%	78	78	79	78	79	78
10_	Terminal resistance	Ω	1.22	2.82	4.08	11.4	19.1	83.2
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	586	603	536	611	574	614
15_	Mechanical time constant	ms	6.16	6.13	6.07	6.14	6.12	6.17
16_	Rotor inertia	gcm²	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	°C	-40…+100
22_	Max. winding temperature	°C	125

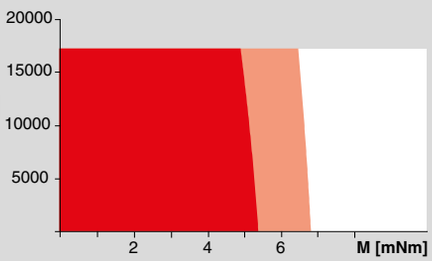
	Mechanical data ball bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0…0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

	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]

	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

Operating Range

n [rpm] Winding 12 V



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

maxon Modular System

maxon gear	Stages
88_GPX 16	1–2
90_GPX 19	3

maxon sensor
102_ENX 10 EASY
102_ENX 10 QUAD
103_ENX 16 EASY
104_ENX 16 EASY Absolute

maxon motor control
378_ESCON Module 24/2
378_ESCON 36/2 DC
379_ESCON Module 50/5
379_ESCON 50/5
386_EPOS2 24/2 (DC/EC)
386_EPOS2 Module 36/2
387_EPOS2 50/5
393_EPOS3 70/10 EtherCAT
396_MAXPOS 50/5

Configuration

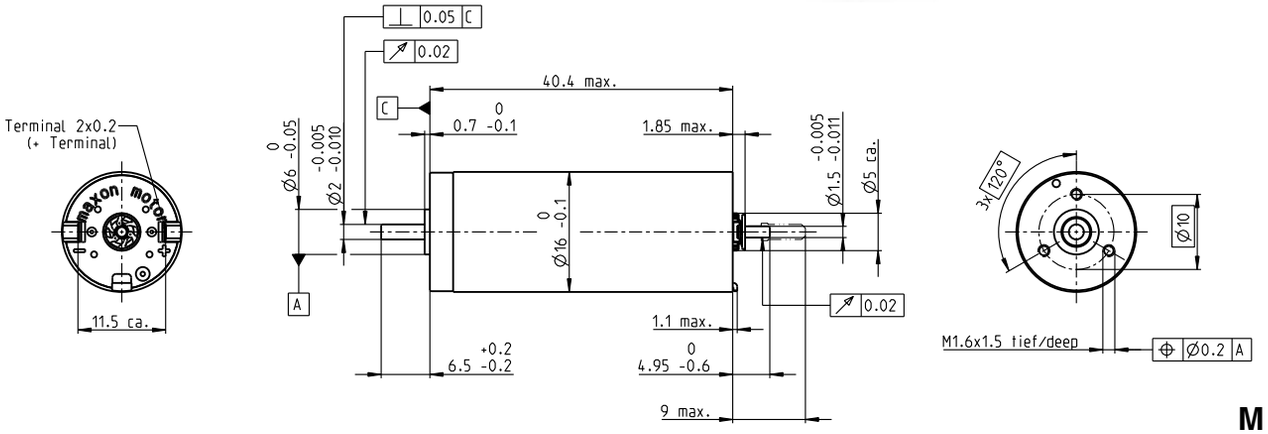
Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector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

xdrives.maxonmotor.com

DCX 16 L Precious Metal Brushes
DC motor Ø16 mm

5/10 W 11.5 mNm 8680 rpm

NEW



M 1:1

	Motor Data							
1_	Nominal voltage	V	3	6	9	12	18	24
2_	No load speed	rpm	6390	6620	6400	6400	6400	6560
3_	No load current	mA	66.8	34.9	22.3	16.7	11.1	8.62
4_	Nominal speed	rpm	5450	4920	4630	4500	4520	4640
5_	Nominal torque (max. continuous torque)	mNm	5.05	10.0	11.5	10.8	10.9	10.6
6_	Nominal current (max. continuous current)	A	1.20	1.20	0.887	0.622	0.419	0.315
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	%	82	83	84	83	83	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	gcm²	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	°C	-30…+85
22_	Max. winding temperature	°C	100

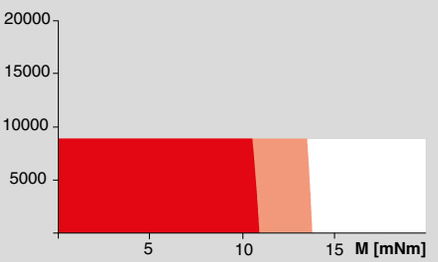
	Mechanical data ball bearings		
23_	Max. speed	rpm	8680
24_	Axial play	mm	0…0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

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

	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	42
32_	Typical noise level	dBA	44

Operating Range

n [rpm] Winding 9 V



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

maxon Modular System

maxon gear	Stages
88_GPX 16	1–2
90_GPX 19	3

maxon sensor
102_ENX 10 EASY
102_ENX 10 QUAD
103_ENX 16 EASY
104_ENX 16 EASY Absolute

maxon motor control
378_ESCON Module 24/2
378_ESCON 36/2 DC
386_EPOS2 24/2 (DC/EC)
386_EPOS2 Module 36/2
390_EPOS2 P 24/5
393_EPOS3 70/10 EtherCAT
396_MAXPOS 50/5

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

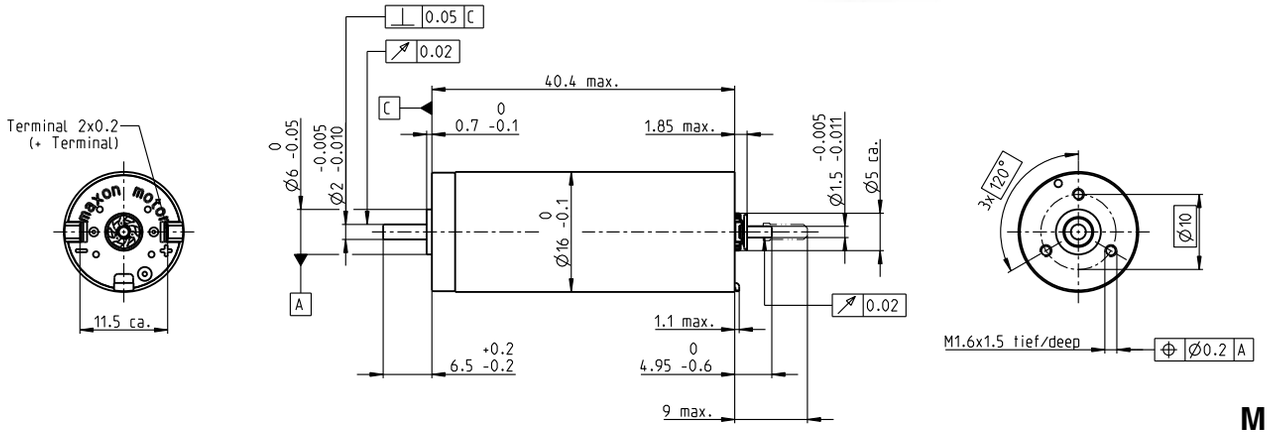
xdrives.maxonmotor.com

DCX 16 L Graphite Brushes
DC motor Ø16 mm

10/19 W 12.5 mNm 17000 rpm

NEW

maxon X drives



M 1:1

	Motor Data							
1_	Nominal voltage	V	6	9	12	18	24	36
2_	No load speed	rpm	12800	13100	13300	12800	12800	12800
3_	No load current	mA	79.3	54.8	41.8	26.5	19.8	13.2
4_	Nominal speed	rpm	11100	11100	11200	10900	10800	10800
5_	Nominal torque (max. continuous torque)	mNm	8.56	11.9	11.9	12.5	11.7	11.8
6_	Nominal current (max. continuous current)	A	2.00	1.88	1.42	0.964	0.678	0.457
7_	Stall torque	mNm	67.7	77.9	78.0	83.3	73.1	74.5
8_	Stall current	A	15.2	12.0	9.09	6.25	4.11	2.80
9_	Max. efficiency	%	86	87	87	88	87	87
10_	Terminal resistance	Ω	0.394	0.753	1.32	2.88	5.84	12.9
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	190	169	171	155	176	173
15_	Mechanical time constant	ms	4.35	4.26	4.23	4.20	4.20	4.22
16_	Rotor inertia	gcm²	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	°C	-40…+100
22_	Max. winding temperature	°C	125

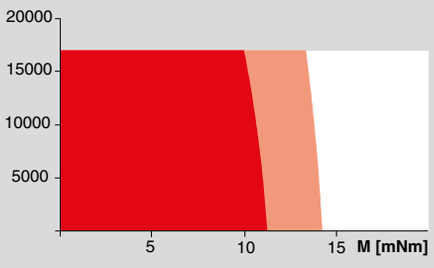
	Mechanical data ball bearings		
23_	Max. speed	rpm	17000
24_	Axial play	mm	0…0.1
	Preload	N	0.8
25_	Radial play	mm	0.015
26_	Max. axial load (dynamic)	N	0.8
27_	Max. force for press fits (static)	N	18
	(static, shaft supported)	N	300
28_	Max. radial load [mm from flange]	N	10 [5]

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

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

Operating Range

n [rpm] Winding 12 V



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

maxon Modular System

maxon gear	Stages
88_GPX 16	1–2
90_GPX 19	3

maxon sensor
102_ENX 10 EASY
102_ENX 10 QUAD
103_ENX 16 EASY
104_ENX 16 EASY Absolute

maxon motor control
378_ESCON Module 24/2
378_ESCON 36/2 DC
386_EPOS2 24/2 (DC/EC)
386_EPOS2 Module 36/2
390_EPOS2 P 24/5
393_EPOS3 70/10 EtherCAT
396_MAXPOS 50/5

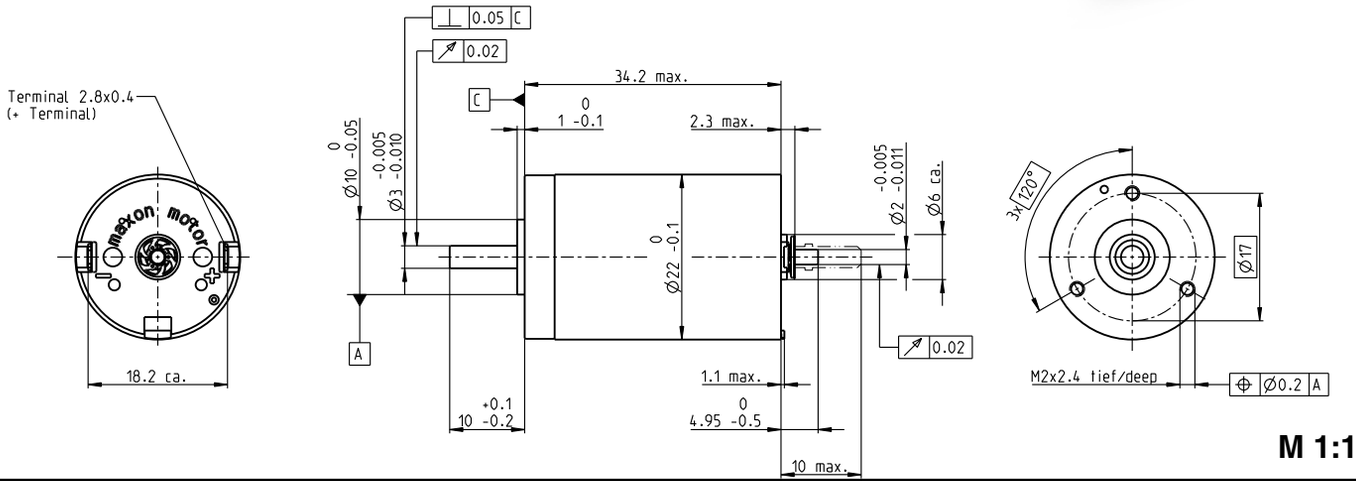
Configuration

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 22 S Precious Metal Brushes
DC motor Ø22 mm

6/10 W 14.5 mNm 7160 rpm



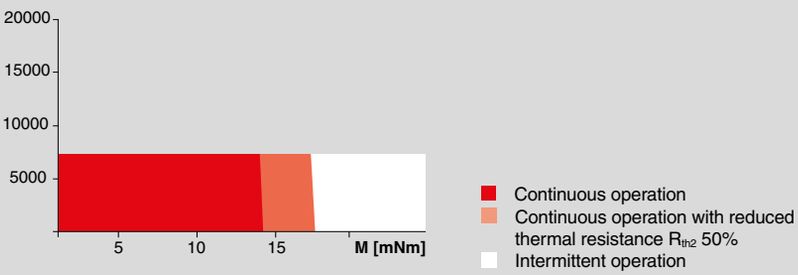
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	12	18	24	36	48
2_	No load speed	rpm	6200	8270	6110	6340	6550	5890
3_	No load current	mA	39.2	30.5	12.8	10.1	7.09	4.55
4_	Nominal speed	rpm	4960	6710	4560	4700	4940	4240
5_	Nominal torque (max. continuous torque)	mNm	10.7	14.0	14.5	13.6	13.8	13.6
6_	Nominal current (max. continuous current)	A	1.20	1.05	0.531	0.388	0.272	0.180
7_	Stall torque	mNm	53.7	74.7	57.5	52.7	56.5	48.6
8_	Stall current	A	5.85	5.42	2.06	1.47	1.08	0.63
9_	Max. efficiency	%	84	86	85	84	85	84
10_	Terminal resistance	Ω	1.02	2.21	8.75	16.3	33.3	76.2
11_	Terminal inductance	mH	0.058	0.130	0.535	0.881	1.86	4.08
12_	Torque constant	mNm/A	9.18	13.8	28.0	35.9	52.2	77.2
13_	Speed constant	rpm/V	1040	693	342	266	183	124
14_	Speed/torque gradient	rpm/mNm	116	111	107	121	117	122
15_	Mechanical time constant	ms	6.14	6.09	6.09	5.93	6.15	6.19
16_	Rotor inertia	gcm²	5.05	5.22	5.44	4.67	5.03	4.84

	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	°C	-30…85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0…0.1
	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	7160
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
	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	48

Operating Range

n [rpm] Winding 18 V



maxon Modular System

maxon gear	maxon sensor	maxon motor control
91_GPX 22	102_ENX 10 QUAD	378_ESCON Module 24/2
92_GPX 22	103_ENX 16 EASY	378_ESCON 36/2 DC
	104_ENX 16 EASY Absolute	379_ESCON 50/5
	359_ENC SCH16F	379_ESCON Module 50/5
	367_ENC 30 HEDL 5540	386_EPOS2 24/2 (DC/EC)
		386_EPOS2 Module 36/2
		387_EPOS2 50/5
		390_EPOS2 P 24/5
		393_EPOS3 70/10 EtherCAT
		396_MAXPOS 50/5

Configuration

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

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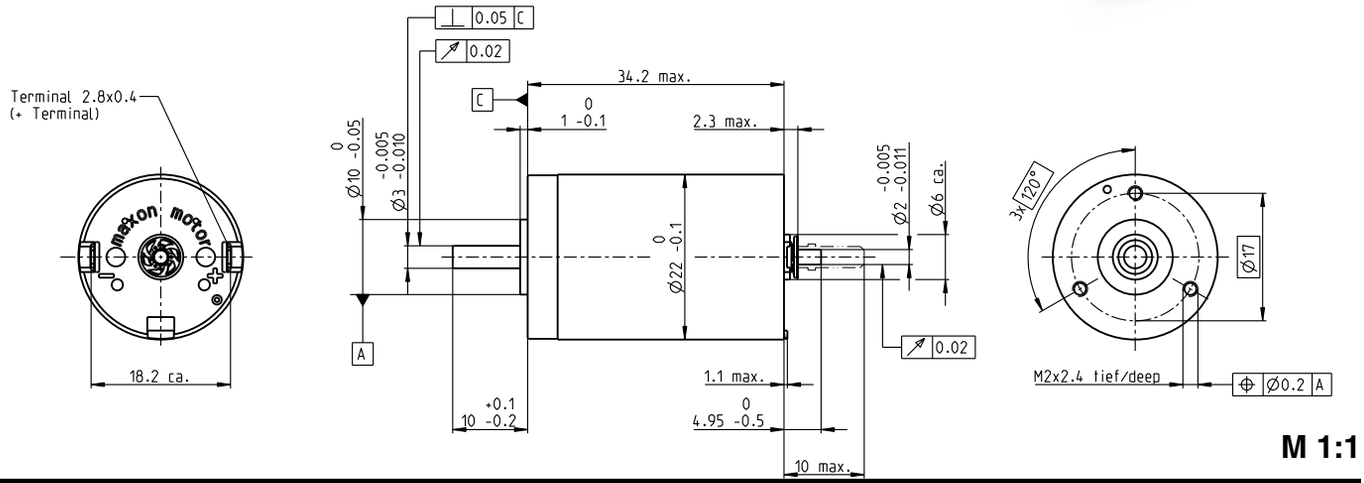
DCX 22 S Graphite Brushes
DC motor Ø22 mm

14/24 W 15.3 mNm 18000 rpm



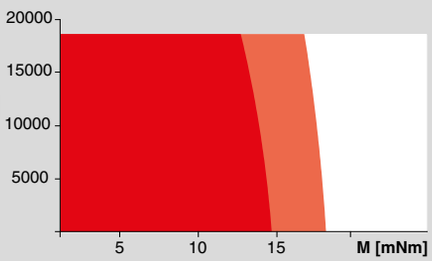
M 1:1

	Motor Data							
1_	Nominal voltage	V	6	12	18	24	36	48
2_	No load speed	rpm	11400	12400	12400	12400	12200	12700
3_	No load current	mA	126	71.7	47.8	35.9	23.4	18.5
4_	Nominal speed	rpm	9700	10700	10800	10800	10500	10900
5_	Nominal torque (max. continuous torque)	mNm	14.4	14.6	14.9	15.3	14.8	14.0
6_	Nominal current (max. continuous current)	A	3.00	1.65	1.12	0.869	0.552	0.406
7_	Stall torque	mNm	101	108	112	120	113	104
8_	Stall current	A	20.2	11.8	8.15	6.51	4.03	2.90
9_	Max. efficiency	%	85	85	85	86	85	84
10_	Terminal resistance	Ω	0.297	1.02	2.21	3.69	8.94	16.6
11_	Terminal inductance	mH	0.017	0.058	0.130	0.231	0.535	0.881
12_	Torque constant	mNm/A	5.01	9.18	13.8	18.4	28.0	35.9
13_	Speed constant	rpm/V	1910	1040	693	520	342	266
14_	Speed/torque gradient	rpm/mNm	113	116	111	104	109	123
15_	Mechanical time constant	ms	6.23	6.12	6.08	6.07	6.22	6.01
16_	Rotor inertia	gcm²	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	°C	-40…+100
22_	Max. winding temperature	°C	125
	Mechanical data ball bearings		
23_	Max. speed	rpm	18000
24_	Axial play	mm	0…0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]
	Mechanical data sleeve bearings		
23_	Max. speed	rpm	18000
24_	Axial play	mm	0…0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	66
32_	Typical noise level	dBA	41

Operating Range

n [rpm] Winding 18 V



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

maxon Modular System

maxon gear	maxon sensor	maxon motor control
91_GPX 22	102_ENX 10 QUAD	378_ESCON Module 24/2
92_GPX 22	103_ENX 16 EASY	378_ESCON 36/2 DC
	104_ENX 16 EASY Absolute	379_ESCON 50/5
	359_ENC SCH16F	379_ESCON Module 50/5
	367_ENC 30 HEDL 5540	386_EPOS2 24/2 (DC/EC)
		386_EPOS2 Module 36/2
		387_EPOS2 24/5
		387_EPOS2 50/5
		390_EPOS2 P 24/5
		393_EPOS3 70/10 EtherCAT
		396_MAXPOS 50/5

Configuration

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

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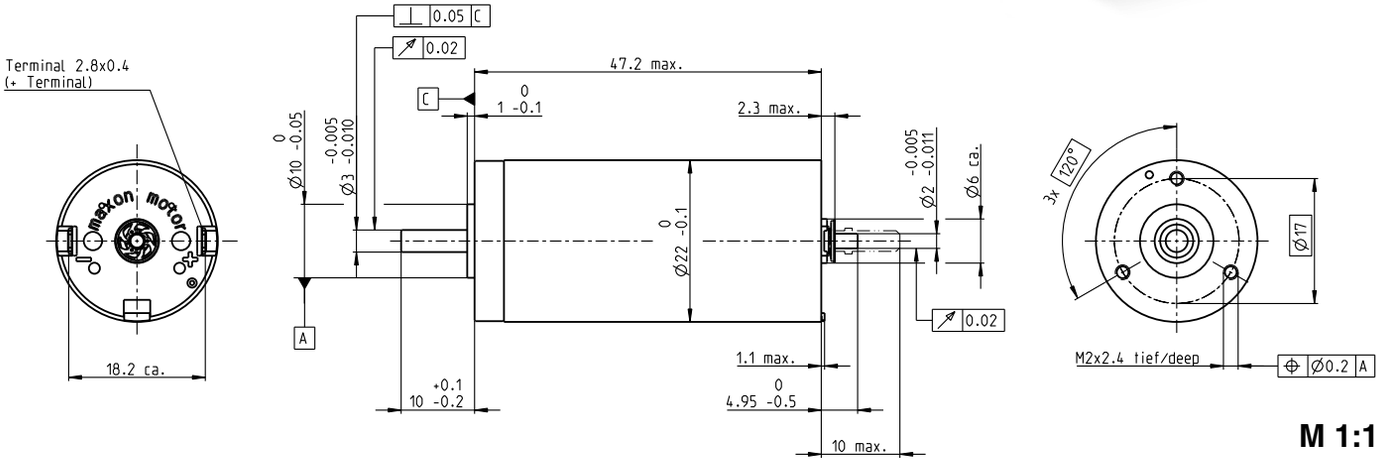
DCX 22 L Precious Metal Brushes
DC motor Ø22 mm

11/20 W 29.8 mNm 7160 rpm



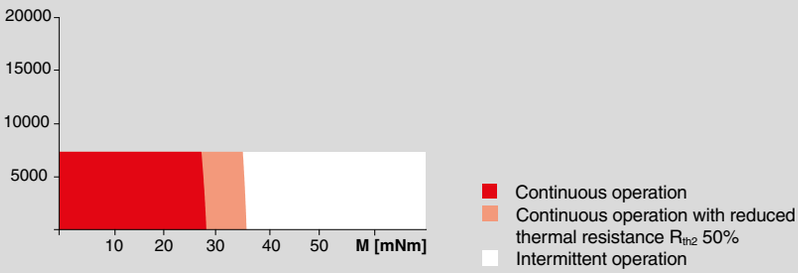
M 1:1

	Motor Data								
1_	Nominal voltage	V	6	9	12	18	24	36	48
2_	No load speed	rpm	5870	5870	4980	5740	5060	6020	5220
3_	No load current	mA	51.1	34.1	20.0	16.4	10.2	8.83	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	gcm²	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	°C	-30…+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	7160
24_	Axial play	mm	0…0.1
	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	7160
24_	Axial play	mm	0…0.2
	Preload	N	0
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	0.1
27_	Max. force for press fits (static)	N	80
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	3 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		9
31_	Weight of motor	g	95
32_	Typical noise level	dBA	52

Operating Range

n [rpm] Winding 18 V



maxon Modular System

maxon gear	maxon sensor	maxon motor control
91_GPX 22	102_ENX 10 QUAD	378_ESCON Module 24/2
92_GPX 22	103_ENX 16 EASY	378_ESCON 36/2 DC
	104_ENX 16 EASY Absolute	379_ESCON 50/5
	359_ENC SCH16F	379_ESCON Module 50/5
	367_ENC 30 HEDL 5540	386_EPOS2 24/2 (DC/EC)
		386_EPOS2 Module 36/2
		387_EPOS2 50/5
		390_EPOS2 P 24/5
		393_EPOS3 70/10 EtherCAT
		396_MAXPOS 50/5

Configuration

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

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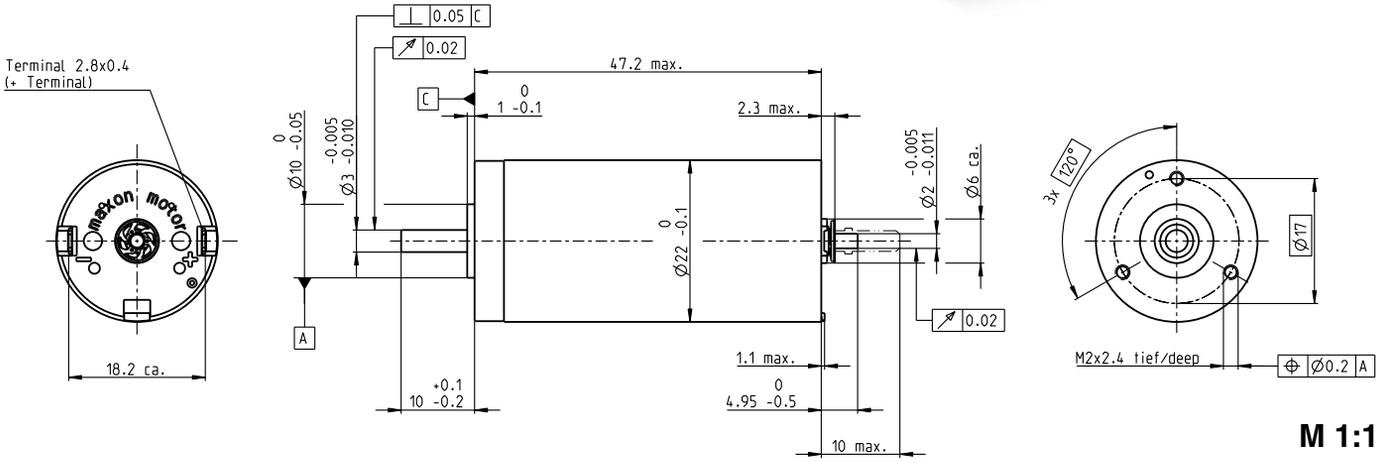
DCX 22 L Graphite Brushes
DC motor Ø22 mm

20/49 W 32.2 mNm 18000 rpm

NEW

maxon X drives



M 1:1

	Motor Data							
1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	12300	11700	11800	9970	11400	10100
3_	No load current	mA	118	81.8	54.6	31.8	26.3	16.2
4_	Nominal speed	rpm	11400	10700	10800	8920	10400	9020
5_	Nominal torque (max. continuous torque)	mNm	27.0	30.5	32.2	31.5	30.0	30.3
6_	Nominal current (max. continuous current)	A	4.00	3.21	2.26	1.40	1.03	0.687
7_	Stall torque	mNm	371	348	386	301	346	294
8_	Stall current	A	53.4	35.8	26.5	13.1	11.6	6.50
9_	Max. efficiency	%	90	91	91	90	90	90
10_	Terminal resistance	Ω	0.168	0.335	0.680	1.83	3.11	7.39
11_	Terminal inductance	mH	0.018	0.035	0.078	0.192	0.326	0.746
12_	Torque constant	mNm/A	6.95	9.73	14.6	22.9	29.9	45.2
13_	Speed constant	rpm/V	1370	981	654	416	320	211
14_	Speed/torque gradient	rpm/mNm	33.3	33.8	30.5	33.2	33.3	34.6
15_	Mechanical time constant	ms	3.27	3.21	3.13	3.13	3.23	3.20
16_	Rotor inertia	gcm²	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	°C	-40…+100
22_	Max. winding temperature	°C	125

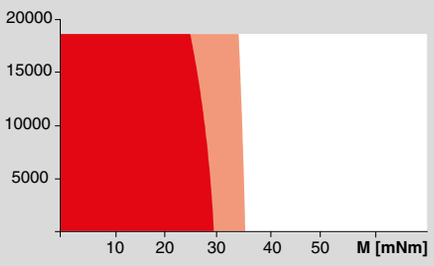
	Mechanical data ball bearings		
23_	Max. speed	rpm	18000
24_	Axial play	mm	0…0.1
	Preload	N	2.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	2.5
27_	Max. force for press fits (static)	N	30
	(static, shaft supported)	N	440
28_	Max. radial load [mm from flange]	N	16 [5]

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

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

Operating Range

n [rpm] Winding 18 V



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

maxon Modular System

maxon gear	maxon sensor	maxon motor control
91_GPX 22	102_ENX 10 QUAD	378_ESCON Module 24/2
92_GPX 22	103_ENX 16 EASY	378_ESCON 36/2 DC
	104_ENX 16 EASY Absolute	379_ESCON 50/5
	359_ENC SCH16F	379_ESCON Module 50/5
	367_ENC 30 HEDL 5540	386_EPOS2 24/2 (DC/EC)
		386_EPOS2 Module 36/2
		387_EPOS2 24/5
		387_EPOS2 50/5
		390_EPOS2 P 24/5
		393_EPOS3 70/10 EtherCAT
		396_MAXPOS 50/5

Configuration

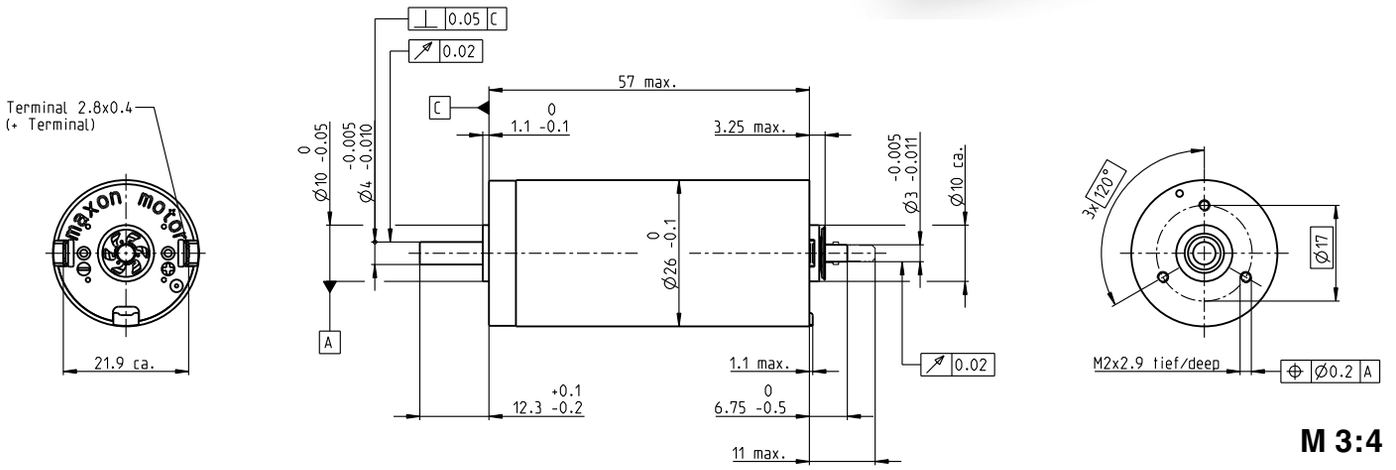
Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with or without CLL/graphite brushes/EMI filter
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable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

xdrives.maxonmotor.com

DCX 26 L Precious Metal Brushes
DC motor Ø26 mm

NEW

18/29 W 52.3 mNm 5900 rpm



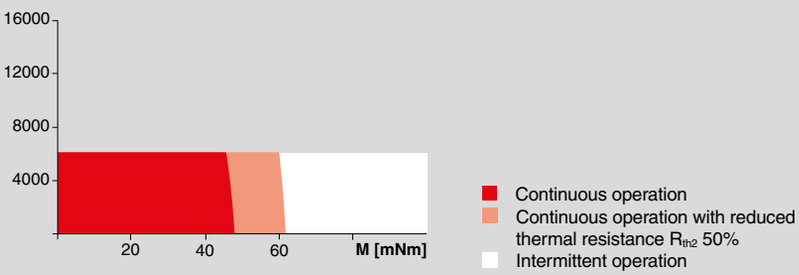
M 3:4

	Motor Data							
1_	Nominal voltage	V	9	12	18	24	36	48
2_	No load speed	rpm	5530	5330	5530	5330	5430	5320
3_	No load current	mA	80.5	56.8	40.2	28.4	19.5	14.2
4_	Nominal speed	rpm	5060	4690	4770	4600	4680	4570
5_	Nominal torque (max. continuous torque)	mNm	32.9	46.1	49.8	52.3	50.8	50.3
6_	Nominal current (max. continuous current)	A	2.20	2.20	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	31.0	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	15.0
15_	Mechanical time constant	ms	3.23	3.13	3.11	3.09	3.10	3.11
16_	Rotor inertia	gcm²	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	°C	-30…+85
22_	Max. winding temperature	°C	100
	Mechanical data ball bearings		
23_	Max. speed	rpm	5900
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	5900
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]
	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

Operating Range

n [rpm] Winding 18 V



maxon Modular System

maxon gear	Stages
93_GPX 26	1–2
95_GPX 32	3

maxon sensor
- 102_ENX 10 QUAD
- 103_ENX 16 EASY
- 104_ENX 16 EASY Absolute
- 367_ENC 30 HEDL 5540

maxon motor control
- 378_ESCON 36/2 DC
- 379_ESCON 50/5
- 379_ESCON Module 50/5
- 386_EPOS2 24/2 (DC/EC)
- 386_EPOS2 Module 36/2
- 387_EPOS2 24/5
- 387_EPOS2 50/5
- 390_EPOS2 P 24/5
- 393_EPOS3 70/10 EtherCAT
- 396_MAXPOS 50/5

Configuration

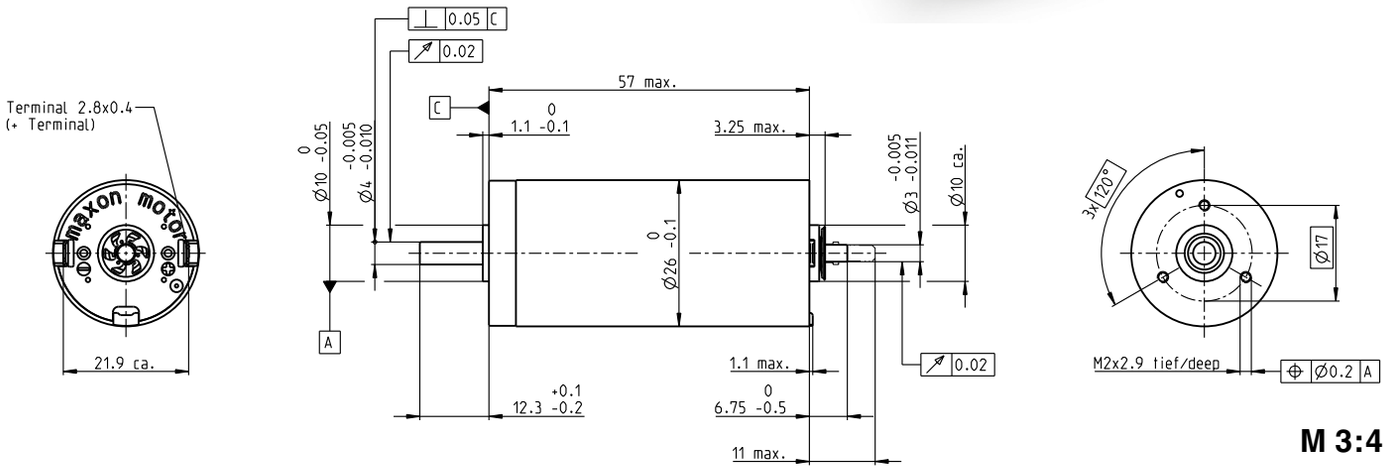
Bearing: Ball bearings preloaded/sleeve bearings
Commutation: Precious metal brushes with CLL/graphite brushes
Flange front/back: Standard flange/configurable flange/no flange
Shaft front/back: Length/diameter/flat face
Electric connection: Terminals or cable/alignment of connection/cable length/connector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

xdrives.maxonmotor.com

DCX 26 L Graphite Brushes
DC motor Ø26 mm

NEW

40/74 W 59.8 mNm 14 400 rpm



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	93.0	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	54.0	59.1	59.8
6_	Nominal current (max. continuous current)	A	4.50	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	%	87	89	90	90	91	91
10_	Terminal resistance	Ω	0.242	0.427	0.740	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	31.0	42.9	52.4
13_	Speed constant	rpm/V	890	616	445	308	223	182
14_	Speed/torque gradient	rpm/mNm	20.1	17.0	15.4	17.4	15.3	14.6
15_	Mechanical time constant	ms	4.50	3.79	3.45	3.53	3.40	3.16
16_	Rotor inertia	gcm²	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	°C	-40…+100
22_	Max. winding temperature	°C	125

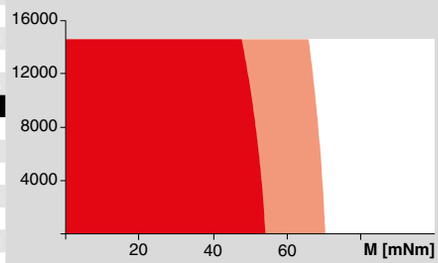
	Mechanical data ball bearings		
23_	Max. speed	rpm	14400
24_	Axial play	mm	0…0.1
	Preload	N	5.5
25_	Radial play	mm	0.02
26_	Max. axial load (dynamic)	N	5.5
27_	Max. force for press fits (static)	N	40
	(static, shaft supported)	N	500
28_	Max. radial load [mm from flange]	N	20.5 [5]

	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]

	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

Operating Range

n [rpm] Winding 18 V



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

maxon Modular System

maxon gear	Stages
93_GPX 26	1–2
95_GPX 32	3

maxon sensor
102_ENX 10 QUAD
103_ENX 16 EASY
104_ENX 16 EASY Absolute
367_ENC 30 HEDL 5540

maxon motor control
378_ESCON 36/2 DC
379_ESCON 50/5
379_ESCON Module 50/5
386_EPOS2 24/2 (DC/EC)
386_EPOS2 Module 36/2
387_EPOS2 24/5
387_EPOS2 50/5
390_EPOS2 P 24/5
393_EPOS3 70/10 EtherCAT
396_MAXPOS 50/5

Configuration

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

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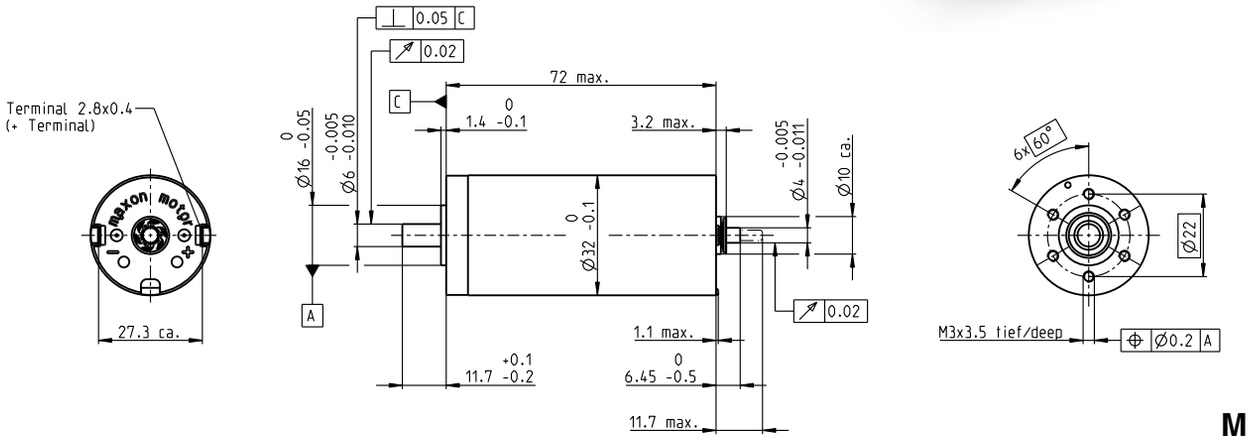
DCX 32 L Graphite Brushes
DC motor Ø32 mm

70/110 W 128 mNm 11 300 rpm



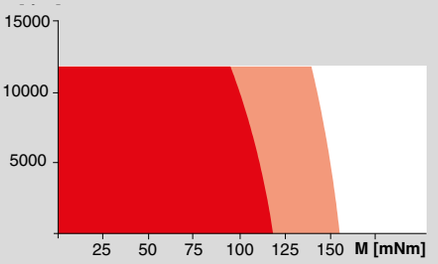
M 1:2

	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	gcm²	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
	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)	N	22.6
	(static, shaft supported)	N	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_	31 Weight of motor	g	325
32_	Typical noise level	dBA	47

Operating Range

n [rpm] Winding 36 V



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

maxon Modular System

maxon gear	Stages
95_GPX 32	1–2
96_GPX 32	1–2
97_GPX 37	3
98_GPX 37	3

maxon sensor
102_ENX 10 QUAD
103_ENX 16 EASY
104_ENX 16 EASY Absolute
360_ENC 2RMHF
367_ENC 30 HEDL 5540

maxon motor control
379_ESCON 50/5
379_ESCON Module 50/5
379_ESCON 70/10
387_EPOS2 24/5
387_EPOS2 50/5
387_EPOS2 70/10
390_EPOS2 P 24/5
393_EPOS3 70/10 EtherCAT
396_MAXPOS 50/5

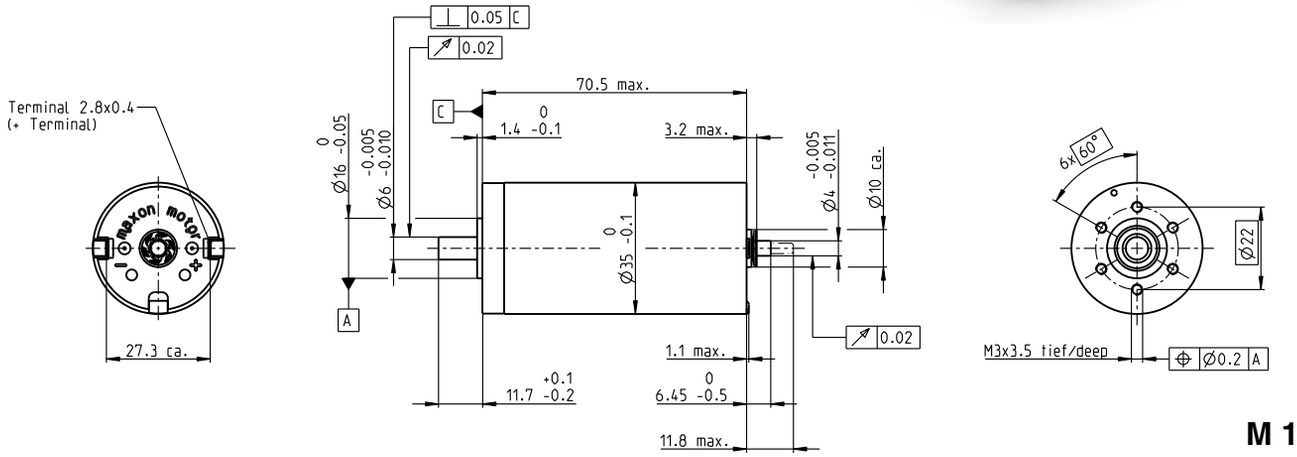
Configuration

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

DCX 35 L Graphite Brushes
DC motor Ø35 mm

80/120 W 138 mNm 12300 rpm



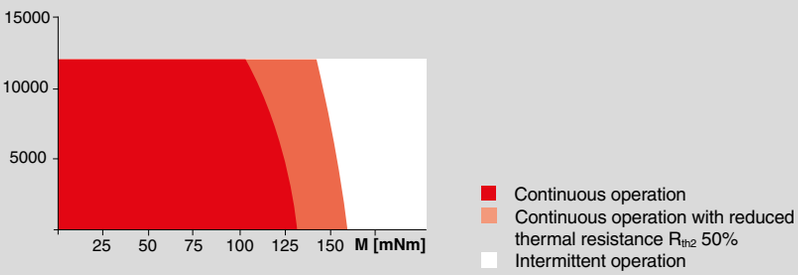
M 1:2

	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	gcm²	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
	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)	N	22.6
	(static, shaft supported)	N	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_	31 Weight of motor	g	385
32_	Typical noise level	dBA	48

Operating Range

n [rpm] Winding 36 V



maxon Modular System

maxon gear	Stages
97_GPX 37	1–2
98_GPX 37	1–2
99_GPX 42	1–4

maxon sensor
102_ENX 10 QUAD
103_ENX 16 EASY
104_ENX 16 EASY Absolute
360_ENC 2RMHF
367_ENC 30 HEDL 5540

maxon motor control
379_ESCON 50/5
379_ESCON Module 50/5
379_ESCON 70/10
387_EPOS2 24/5
387_EPOS2 50/5
387_EPOS2 70/10
390_EPOS2 P 24/5
393_EPOS3 70/10 EtherCAT
396_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

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maxon *DC*-max

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.

– Best price-performance ratio
– Maximum power/minimum volume
– Latest winding technology
– Neodymium magnets

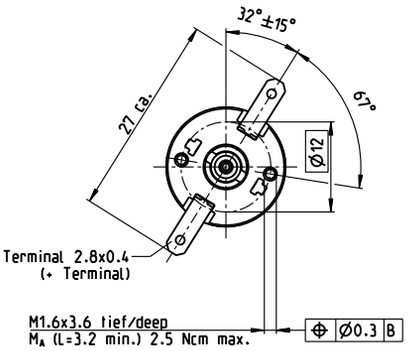
maxon motor

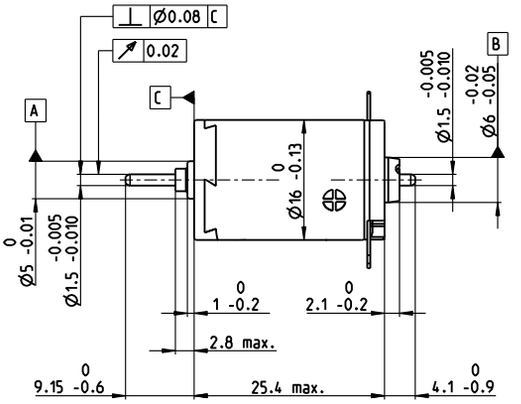
driven by precision

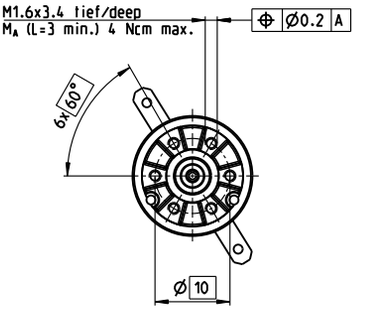
DC-max 16 S Precious Metal Brushes
DC motor Ø16 mm

NEW

2/4.3 W 4.1 mNm 11 000 rpm







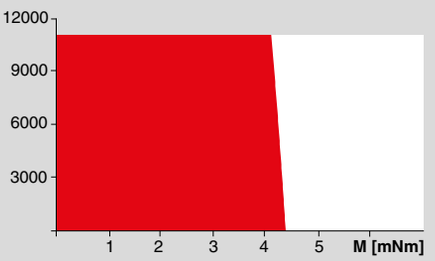
M 1:1

	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	gcm²	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
	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)	N	30
	(static, shaft supported)	N	200
28_	Max. radial load [mm from flange]	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)	N	35
	(static, shaft supported)	N	200
28_	Max. radial load [mm from flange]	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

Operating Range

n [rpm] Winding 12 V



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

maxon Modular System

maxon gear	Stages	maxon sensor	maxon motor control
88_GPX 16	1–2	102_ENX 10 QUAD	378_ESCON Module 24/2
		102_ENX 10 EASY	378_ESCON 36/2 DC
			386_EPOS2 24/2 (DC/EC)
			386_EPOS2 Module 36/2
			393_EPOS3 70/10 EtherCAT
			396_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

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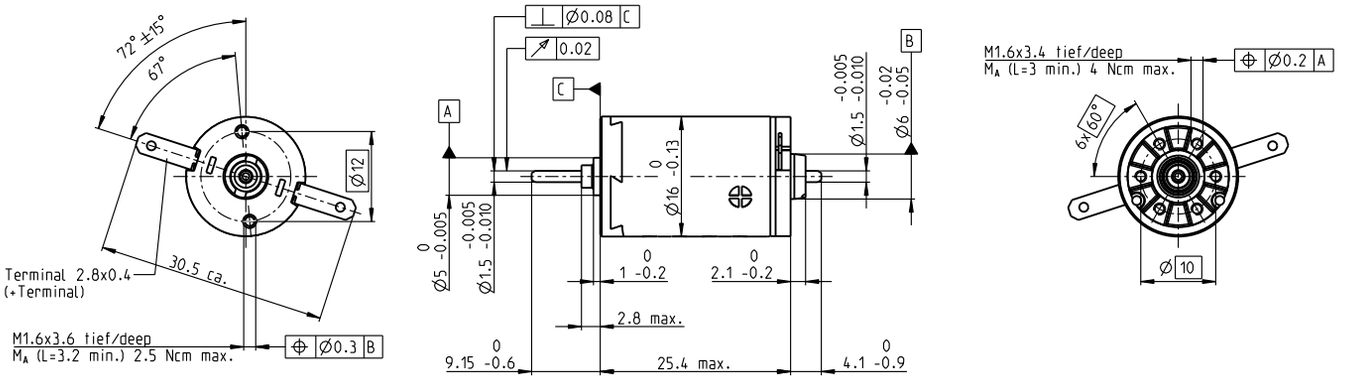
DC-max 16 S Graphite Brushes
DC motor Ø16 mm

3/4.7 W 4.8 mNm 11 000 rpm

NEW



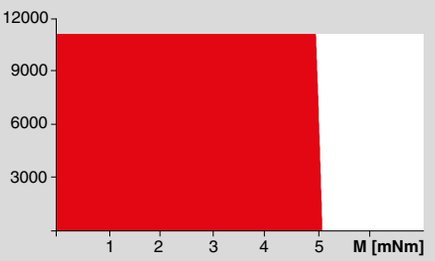
M 1:1

	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	gcm²	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
	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)	N	30
	(static, shaft supported)	N	200
28_	Max. radial load [mm from flange]	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)	N	35
	(static, shaft supported)	N	200
28_	Max. radial load [mm from flange]	N	1.4 [5]
	Other specifications		
29_	Number of pole pairs		1
30_	Number of commutator segments		7
31_	Weight of motor	g	23.1

Operating Range

n [rpm] Winding 24 V



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

maxon Modular System

maxon gear	Stages	maxon sensor	maxon motor control
88_GPX 16	1–2	102_ENX 10 QUAD	378_ESCON Module 24/2
		102_ENX 10 EASY	378_ESCON 36/2 DC
			386_EPOS2 24/2 (DC/EC)
			386_EPOS2 Module 36/2
			393_EPOS3 70/10 EtherCAT
			396_MAXPOS 50/5

Configuration

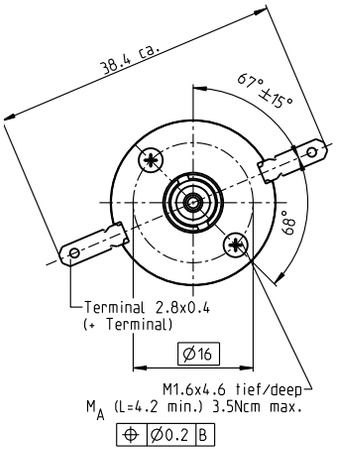
Bearing: Sleeve bearings/ball bearings
Commutation: Precious metal brushes with CLL/Graphite Brushes
Shaft front/back: Length
Electric connection: Terminals/cable

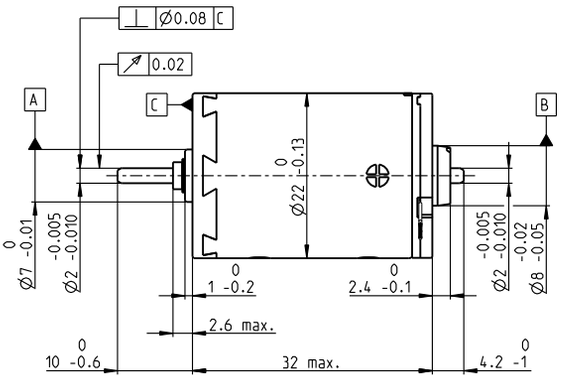
xdrives.maxonmotor.com

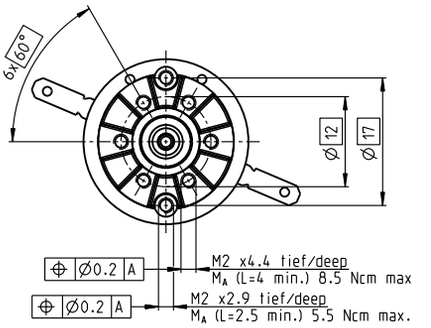
DC-max 22 S Precious Metal Brushes
DC motor Ø22 mm

5/9.6 W 10.4 mNm 9000 rpm

NEW







M 1:1

	Motor Data				
1_	Nominal voltage	V	6	12	24
2_	No load speed	rpm	5500	5900	5100
3_	No load current	mA	13.6	7.49	3.07
4_	Nominal speed	rpm	4280	4240	3440
5_	Nominal torque (max. continuous torque)	mNm	8.60	10.4	10.4
6_	Nominal current (max. continuous current)	A	0.840	0.543	0.236
7_	Stall torque	mNm	39.0	36.9	32.3
8_	Stall current	A	3.75	1.91	0.721
9_	Max. efficiency	%	88	88	88
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	gcm²	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

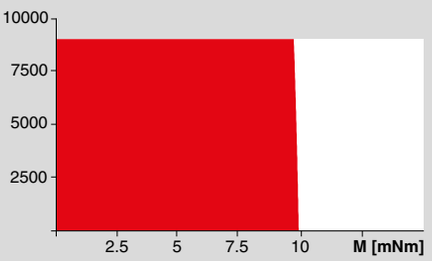
	Mechanical data ball bearings		
23_	Max. speed	rpm	9000
24_	Axial play	mm	0.05…0.15
	Preload	N	0
25_	Radial play	mm	0.025
26_	Max. axial load (dynamic)	N	3.3
27_	Max. force for press fits (static)	N	45
	(static, shaft supported)	N	420
28_	Max. radial load [mm from flange]	N	12.3 [5]

	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)	N	80
	(static, shaft supported)	N	420
28_	Max. radial load [mm from flange]	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

Operating Range

n [rpm] Winding 12 V



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

maxon Modular System

maxon gear	Stages	maxon sensor	maxon motor control
91_GPX 22	1–2	102_ENX 10 QUAD	378_ESCON Module 24/2
		102_ENX 10 EASY	378_ESCON 36/2 DC
			386_EPOS2 24/2 (DC/EC)
			386_EPOS2 Module 36/2
			393_EPOS3 70/10 EtherCAT
			396_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

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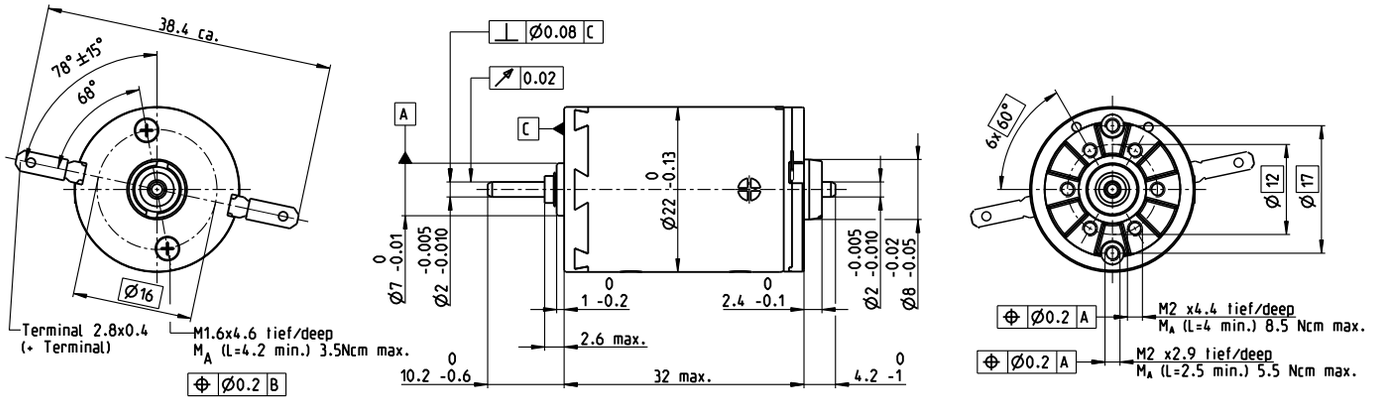
DC-max 22 S Graphite Brushes
DC motor Ø22 mm

8/10 W 12.5 mNm 9000 rpm

NEW

maxon X drives



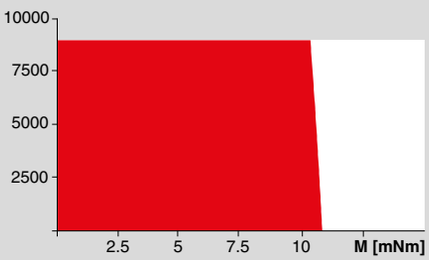
M 1:1

	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	4980	5260	5350
5_	Nominal torque (max. continuous torque)	mNm	11.3	12.5	11.8
6_	Nominal current (max. continuous current)	A	1.49	0.818	0.397
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	gcm²	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
	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)	N	45
	(static, shaft supported)	N	420
28_	Max. radial load [mm from flange]	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)	N	80
	(static, shaft supported)	N	420
28_	Max. radial load [mm from flange]	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

Operating Range

n [rpm] Winding 12 V



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

maxon Modular System

maxon gear	Stages	maxon sensor	maxon motor control
91_GPX 22	1–2	102_ENX 10 QUAD	378_ESCON Module 24/2
		102_ENX 10 EASY	378_ESCON 36/2 DC
			386_EPOS2 24/2 (DC/EC)
			386_EPOS2 Module 36/2
			393_EPOS3 70/10 EtherCAT
			396_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

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maxon GPX

maxon GPX GEAR

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.

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maxon motor

driven by precision

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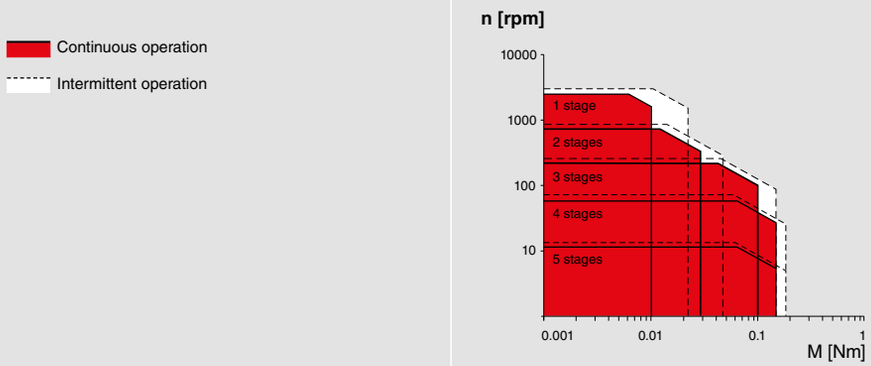
GPX 10 Planetary Gearhead Ø10 mm

Configurable

Key Data		Standard Version
Max. transmittable power	W	1.6
Max. continuous torque	Nm	0.15
Max. continuous input speed	rpm	12000
Ambient temperature	°C	-15 ... +80
Bearing at output		Ball bearing

Operating Range (output shaft) — **Standard Version**

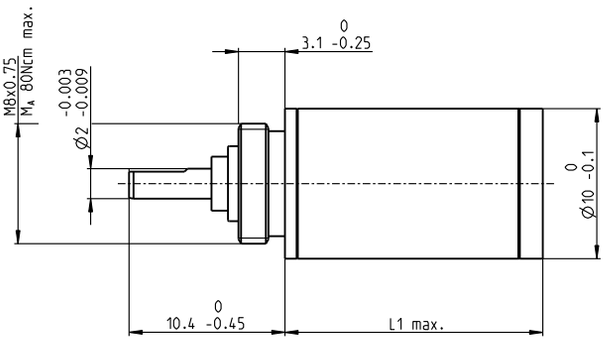


Specifications		Standard Version				
Number of stages		1	2	3	4	5
Max. transmittable power (continuous)	W	1.6	1.2	1.0	0.40	0.10
Max. transmittable power (intermittent)	W	2.0	1.5	1.3	0.50	0.13
Max. continuous torque	Nm	0.01	0.03	0.10	0.15	0.15
Max. intermittent torque	Nm	0.02	0.05	0.15	0.20	0.20
Max. continuous input speed	rpm	12000	12000	12000	12000	12000
Max. intermittent input speed	rpm	15000	15000	15000	15000	15000
Max. efficiency	%	90	81	73	65	59
Average backlash no load	°	1.5	1.8	2.0	2.2	2.5
Max. axial load (dynamic)	N	5	5	5	5	5
Max. radial load, 5 mm from flange	N	5	10	15	20	25
Gearhead length 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		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
maxon DC motor	
DCX 10 S	58
DCX 10 L	59

Dimensions Standard Version — **M 2:1**



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NEW

GPX 12 Planetary Gearhead Ø12 mm

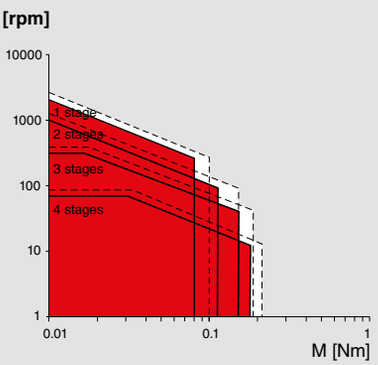
Configurable

Key Data		Standard Version
Max. transmittable power	W	2.0
Max. continuous torque	Nm	0.17
Max. continuous input speed	rpm	16000
Ambient temperature	°C	-40 ... +100
Bearing at output		Ball bearing

Operating Range (output shaft) — **Standard Version**

Continuous operation

Intermittent operation

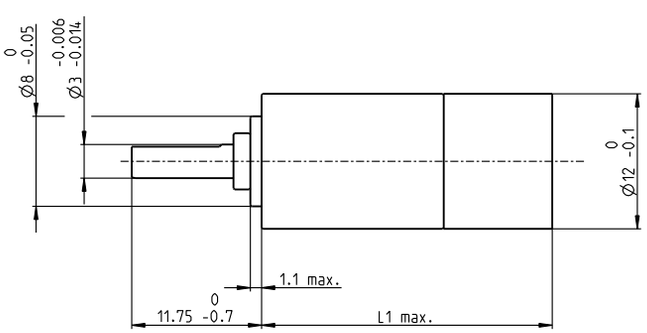


Specifications		Standard Version			
Number of stages		1	2	3	4
Max. transmittable power (continuous)	W	2.0	1.0	0.50	0.25
Max. transmittable power (intermittent)	W	2.5	1.25	0.65	0.30
Max. continuous torque	Nm	0.08	0.11	0.14	0.17
Max. intermittent torque	Nm	0.10	0.14	0.18	0.21
Max. continuous input speed	rpm	16000	16000	16000	16000
Max. intermittent input speed	rpm	20000	20000	20000	20000
Max. efficiency	%	90	80	75	65
Average backlash no load	°	1.4	1.6	2.0	2.4
Max. axial load (dynamic)	N	10	10	10	10
Max. radial load, 5 mm from flange	N	10	15	20	25
Gearhead length L1	mm	15.6	20.4	25.2	30.1
Weight	g	11	14	17	19

Configuration		Standard Version			
Number of stages		1	2	3	4
Reduction	X:1	3.9, 5.3	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard			
Flange		Standard flange/configurable flange			
Shaft		Length/flat face			

maxon Modular System	Page
maxon DC motor	
DCX 12 S	58
DCX 12 L	59

Dimensions Standard Version — **M 3:2**



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NEW

GPX 14 Planetary Gearhead Ø14 mm

Configurable

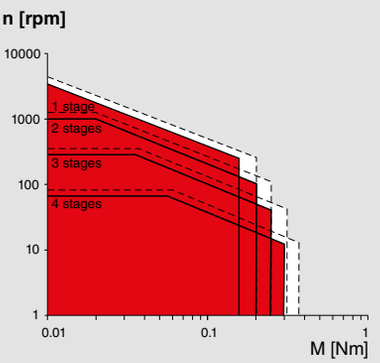
Key Data		Standard Version	Ceramic Version
Max. transmittable power	W	4	4.8
Max. continuous torque	Nm	0.3	0.4
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 … +100	-40 … +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

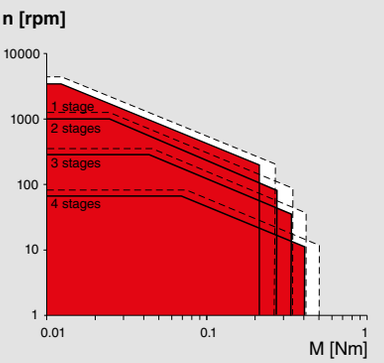
Continuous operation

Intermittent operation

Standard Version



Ceramic Version



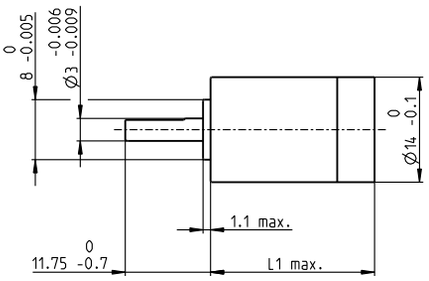
Specifications		Standard Version				Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable continuous power	W	4.0	2.0	1.0	0.4	4.8	2.4	1.2	0.5
Max. transmittable intermittent power	W	5.0	2.5	1.25	0.5	6.0	3.0	1.50	0.6
Max. continuous torque	Nm	0.16	0.20	0.25	0.30	0.21	0.27	0.33	0.40
Max. 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	°	1.4	1.6	2	2.4	1.4	1.6	2	2.4
Max. axial load (dynamic)	N	10	10	10	10	10	10	10	10
Max. radial load, 5 mm from flange	N	10	15	20	25	10	15	20	25
Gearhead length L1	mm	15.7	20.8	25.5	30.3	15.7	20.8	25.5	30.3
Weight	g	14	19	22	25	14	19	22	25

Configuration		Standard Version				Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526	3.9, 5.3, 6.6	16, 21, 26, 28, 35	62, 83, 103, 111, 138, 150, 172, 186, 231	243, 326, 406, 439, 546, 590, 679, 734, 794, 913, 987, 1135, 1227, 1526
Version		Standard/ceramic version/noise reduced/reduced backlash							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face							

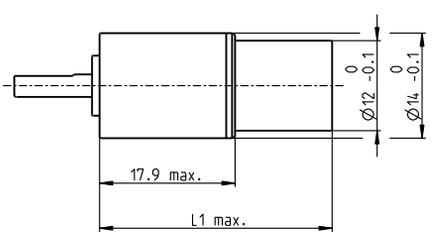
maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 12 S	3–4	60
DCX 12 L	3–4	61
DCX 14 L	1–2	62–63

Dimensions M 1:1

1–2 stages



3–4 stages



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NEW

GPX 14 Planetary Gearhead Ø14 mm

Configurable

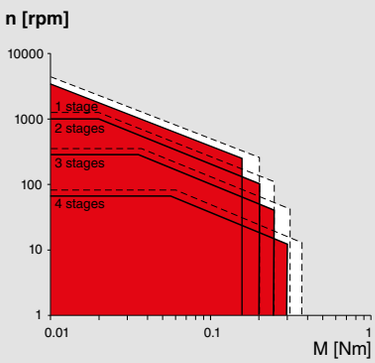
Key Data		Noise Reduced	Backlash Reduced
Max. transmittable power	W	3.2	3
Max. continuous torque	Nm	0.24	0.3
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 … +85	-40 … +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

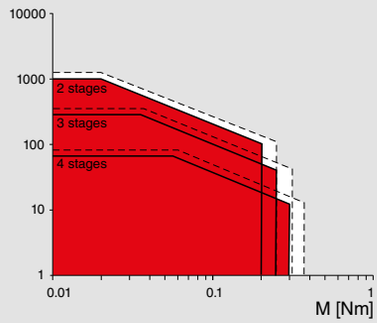
Continuous operation

Intermittent operation

Noise Reduced



Backlash Reduced



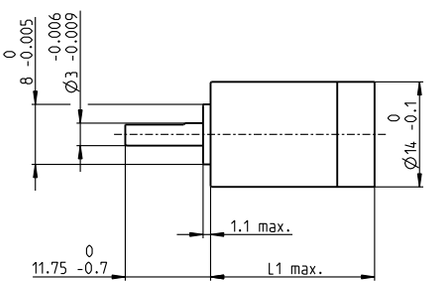
Specifications		Noise Reduced				Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Max. transmittable continuous power	W	3.2	1.6	0.8	0.3	2.0	1.0	0.4
Max. transmittable intermittent power	W	4.0	2.0	1.0	0.4	2.5	1.25	0.5
Max. continuous torque	Nm	0.13	0.16	0.20	0.24	0.20	0.25	0.30
Max. intermittent torque	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	°	1.4	1.6	2.0	2.4	1.2	1.4	1.6
Max. axial load (dynamic)	N	10	10	10	10	10	10	10
Max. radial load, 5 mm from flange	N	10	15	20	25	15	20	25
Gearhead length L1	mm	15.7	20.8	25.5	30.3	20.8	25.5	30.3
Weight	g	14	19	22	25	19	22	25

Configuration		Noise Reduced				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	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, 1'135, 1'227, 1'526
Version		Standard/ceramic version/noise reduced/backlash reduced						
Flange		Standard flange/configurable flange						
Shaft		Length/flat face						

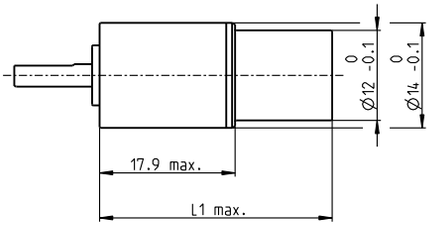
maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 12 S	3–4	60
DCX 12 L	3–4	61
DCX 14 L	1–2	62–63

Dimensions M 1:1

1–2 stages



3–4 stages



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NEW

GPX 16 Planetary Gearhead Ø16 mm

Configurable

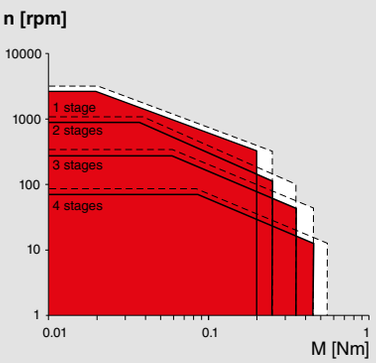
Key Data		Standard Version	Ceramic Version
Max. transmittable power	W	6.5	7.8
Max. continuous torque	Nm	0.45	0.6
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 … +100	-40 … +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

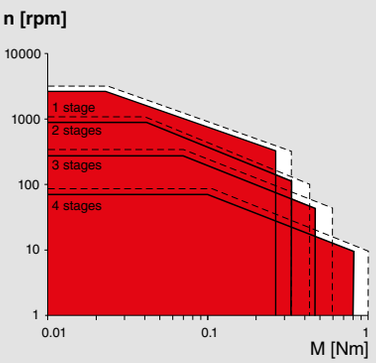
Continuous operation

Intermittent operation

Standard Version



Ceramic Version



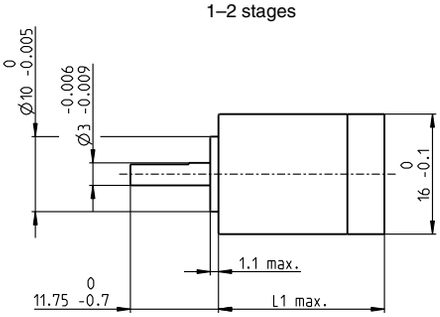
Specifications		Standard Version				Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable continuous power	W	6.5	3.2	1.6	0.60	7.8	3.8	1.9	0.7
Max. transmittable intermittent power	W	8.0	4.0	2.0	0.75	10.0	5.0	2.5	1.0
Max. continuous torque	Nm	0.20	0.25	0.35	0.45	0.27	0.33	0.47	0.60
Max. 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	°	1.4	1.6	2.0	2.4	1.4	1.6	2.0	2.4
Max. axial load (dynamic)	N	12	12	12	12	12	12	12	12
Max. radial load, 5 mm from flange	N	20	40	60	80	20	40	60	80
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		Standard Version				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/reduced backlash							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face							

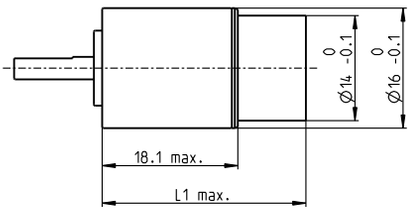
maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 14 L	3–4	62–63
DCX 16 S	1–2	64–65
DCX 16 L	1–2	66–67
DC-max 16 S	1–2	78–79

Dimensions M 1:1

1–2 stages



3–4 stages



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NEW

GPX 16 Planetary Gearhead Ø16 mm

Configurable

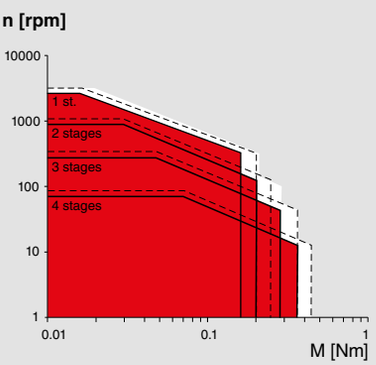
Key Data		Noise Reduced	Backlash Reduced
Max. transmittable power	W	5.2	3.2
Max. continuous torque	Nm	0.36	0.5
Max. continuous input speed	rpm	16000	16000
Ambient temperature	°C	-40 … +85	-40 … +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

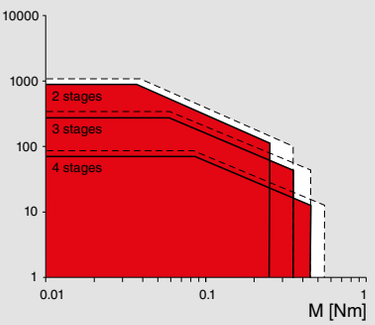
Continuous operation

Intermittent operation

Noise Reduced



Backlash Reduced



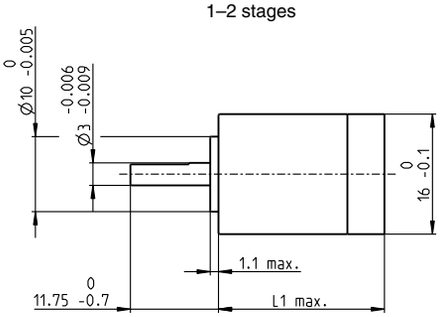
Specifications		Noise Reduced				Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Max. transmittable continuous power	W	5.2	2.6	1.3	0.5	3.2	1.6	0.6
Max. transmittable intermittent power	W	6.5	3.3	1.6	0.6	4.0	2.0	0.8
Max. continuous torque	Nm	0.16	0.20	0.28	0.36	0.25	0.35	0.45
Max. intermittent torque	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	°	1.4	1.6	2.0	2.4	1.3	1.6	1.9
Max. axial load (dynamic)	N	12	12	12	12	12	12	12
Max. radial load, 5 mm from flange	N	20	40	60	80	40	60	80
Gearhead length L1	mm	15.8	20.7	25.7	30.6	20.7	25.7	30.6
Weight	g	20	25	27	31	25	27	31

Configuration		Noise Reduced				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						
Flange		Standard flange/configurable flange						
Shaft		Length/flat face						

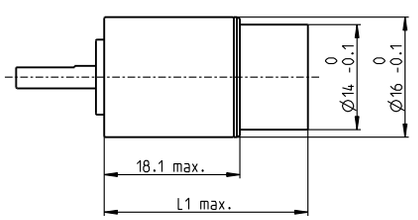
maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 14 L	3–4	62–63
DCX 16 S	1–2	64–65
DCX 16 L	1–2	66–67
DC-max 16 S	1–2	78–79

Dimensions M 1:1

1–2 stages



3–4 stages



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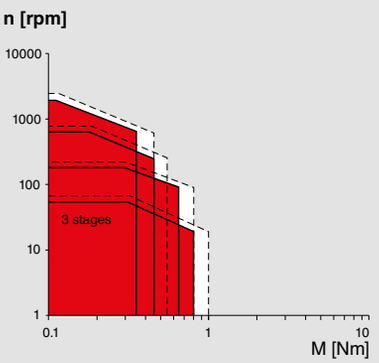
NEW

GPX 19 Planetary Gearhead Ø19 mm

Configurable

Key Data		Standard Version
Max. transmittable power	W	3.2
Max. continuous torque	Nm	0.65
Max. continuous input speed	rpm	14000
Ambient temperature	°C	-40 … +100
Bearing at output		Ball bearing

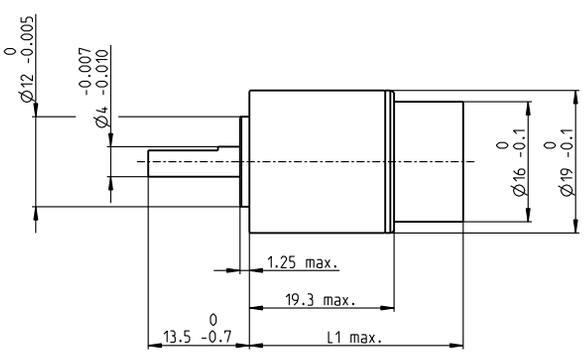
Operating Range (output shaft)	Standard Version
Continuous operation Intermittent operation	

Specifications		Standard Version
Number of stages		3
Max. transmittable continuous power	W	3.2
Max. transmittable intermittent power	W	4.1
Max. continuous torque	Nm	0.65
Max. intermittent torque	Nm	0.80
Max. continuous input speed	rpm	14000
Max. intermittent input speed	rpm	17500
Max. efficiency	%	75
Average backlash no load	°	1.4
Max. axial load (dynamic)	N	80
Max. radial load, 5 mm from flange	N	50
Gearhead length L1	mm	27.1
Weight	g	48

Configuration		Standard Version
Number of stages		3
Reduction	X:1	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard
Flange		Standard flange/configurable flange
Shaft		Length/flat face/cross hole

maxon Modular System	Page
maxon DC motor	
DCX 16 S	64–65
DCX 16 L	66–67
DC-max 16 S	78–79

Dimensions M 1:1



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GPX 22 Planetary Gearhead Ø22 mm

Configurable

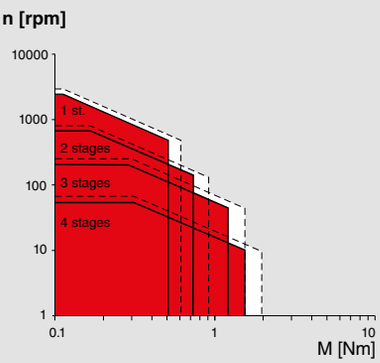
Key Data		Standard Version	Ceramic Version
Max. transmittable power	W	24	30
Max. continuous torque	Nm	1.5	2.3
Max. continuous input speed	rpm	12000	12000
Ambient temperature	°C	-40 ... +100	-40 ... +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

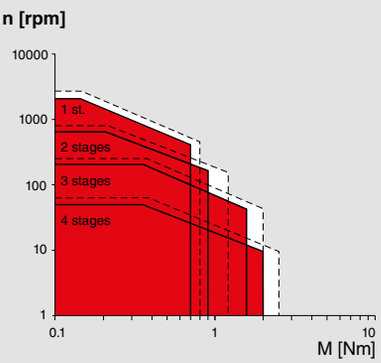
Continuous operation

Intermittent operation

Standard Version



Ceramic Version

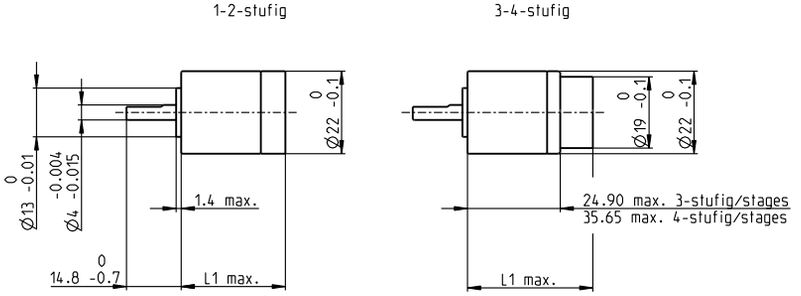


Specifications		Standard Version				Ceramic Version			
Number of stages		1	2	3	4	1	2	3	4
Max. transmittable power (continuous)	W	24.0	12.0	6.0	1.6	30.0	15.0	7.0	2.0
Max. transmittable power (intermittent)	W	30.0	15.0	7.5	2.0	38.0	19.0	9.0	2.5
Max. continuous torque	Nm	0.50	0.70	1.20	1.50	0.70	0.90	1.60	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	°	1.4	1.6	1.75	1.9	1.4	1.6	1.75	1.9
Max. axial load (dynamic)	N	100	100	100	100	100	100	100	100
Max. radial load, 10 mm from flange	N	35	55	70	70	35	55	70	70
Gearhead length L1	mm	18.5	25.0	29.6	33.9	18.5	25.0	29.6	33.9
Weight	g	42	52	57	63	42	52	57	63

Configuration		Standard Version				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/reduced backlash							
Flange		Standard flange/configurable flange							
Shaft		Length/flat face/cross hole							

maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 22 S	1–4	68–69
DCX 22 L	1–4	70–71
DC-max 22 S	1–2	80–81

Dimensions M 1:1



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GPX 22 Planetary Gearhead Ø22 mm

Configurable

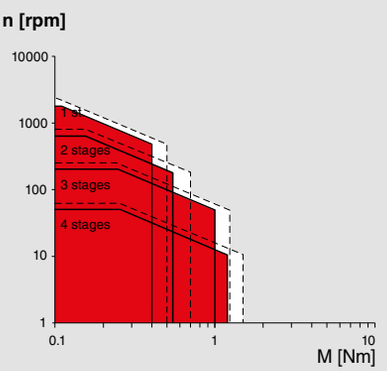
Key Data		Noise Reduced	Backlash Reduced
Max. transmittable power	W	20	12
Max. continuous torque	Nm	1.2	1.5
Max. continuous input speed	rpm	12000	12000
Ambient temperature	°C	-40 ... +85	-40 ... +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

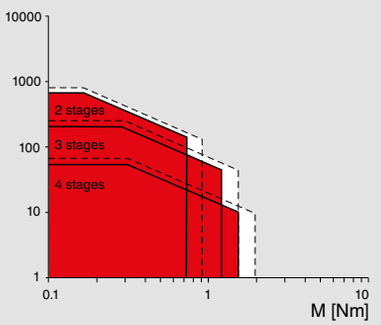
Continuous operation

Intermittent operation

Noise Reduced



Backlash Reduced

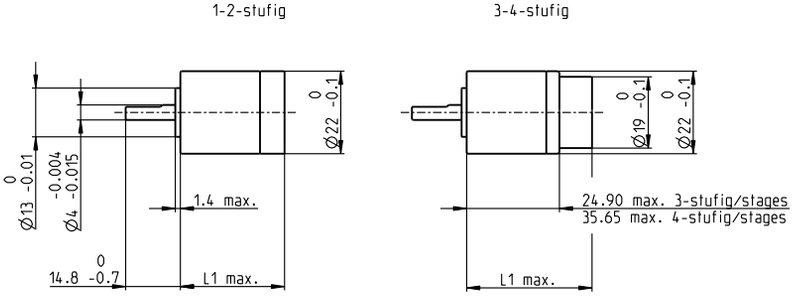


Specifications		Noise Reduced				Backlash Reduced		
Number of stages		1	2	3	4	2	3	4
Max. transmittable power (continuous)	W	20.0	10.0	5.0	1.3	12.0	6.0	1.6
Max. transmittable power (intermittent)	W	25.0	13.0	6.3	1.6	15.0	7.5	2.0
Max. continuous torque	Nm	0.40	0.55	1.00	1.20	0.70	1.20	1.50
Max. intermittent 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	°	1.4	1.6	1.75	1.9	1.1	1.2	1.4
Max. axial load (dynamic)	N	100	100	100	100	100	100	100
Max. radial load, 10 mm from flange	N	35	55	70	70	55	70	70
Gearhead length L1	mm	18.5	25.0	29.6	33.9	25.0	29.6	33.9
Weight	g	42	52	57	63	52	57	63

Configuration		Noise Reduced				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						
Flange		Standard flange/configurable flange						
Shaft		Length/flat face/cross hole						

maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 22 S	1–4	68–69
DCX 22 L	1–4	70–71
DC-max 22 S	1–2	80–81

Dimensions **M 1:1**



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NEW

GPX 26 Planetary Gearhead Ø26 mm

Configurable

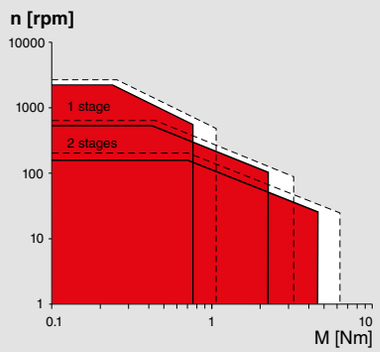
Key Data		Standard Version	Ceramic Version
Max. transmittable power	W	48	55
Max. continuous torque	Nm	2.25	3.0
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 … +100	-40 … +100
Bearing at output		Ball bearing	Ball bearing

Operating Range (output shaft)

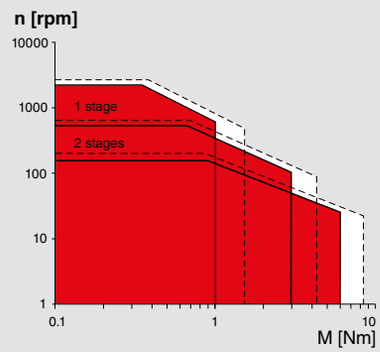
Continuous operation

Intermittent operation

Standard Version



Ceramic Version

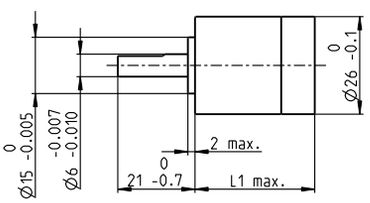


Specifications		Standard Version		Ceramic Version	
Number of stages		1	2	1	2
Max. transmittable continuous power	W	48	24	55	30
Max. transmittable intermittent power	W	60	30	70	35
Max. continuous torque	Nm	0.75	2.25	1.00	3.00
Max. intermittent torque	Nm	1.10	3.20	1.50	4.25
Max. continuous input speed	rpm	7000	8000	7000	8000
Max. intermittent input speed	rpm	8750	10000	8750	10000
Max. efficiency	%	90	78	90	78
Average backlash no load	°	1.2	1.3	1.2	1.30
Max. axial load (dynamic)	N	120	120	120	120
Max. radial load, 10 mm from flange	N	70	110	70	110
Gearhead length L1	mm	21.3	30.2	21.3	30.2
Weight	g	75	95	75	95

Configuration		Standard Version		Ceramic Version	
Number of stages		1	2	1	2
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	3.9, 5.3, 6.6	16, 21, 26, 28, 35
Version		Standard/ceramic version/noise reduced/reduced backlash			
Flange		Standard flange/configurable flange			
Shaft		Length/flat face/cross hole			

maxon Modular System	Page
maxon DC motor	
DCX 26 L	72–73

Dimensions Standard Version M 1:2



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NEW

GPX 26 Planetary Gearhead Ø26 mm

Configurable

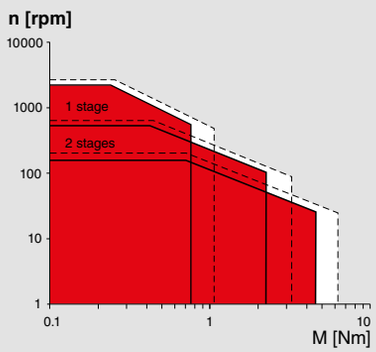
Key Data		Noise Reduced	Backlash Reduced
Max. transmittable power	W	38	24
Max. continuous torque	Nm	1.8	2.3
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 … +85	-40 … +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

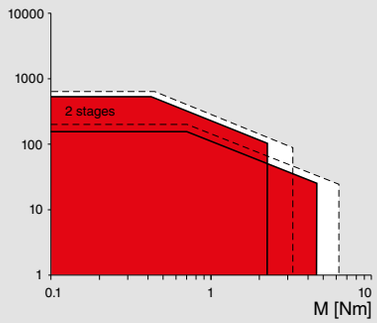
Continuous operation

Intermittent operation

Noise Reduced



Backlash Reduced

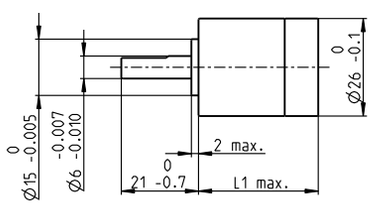


Specifications		Noise Reduced		Backlash Reduced
Number of stages		1	2	2
Max. transmittable continuous power	W	38	19	24
Max. transmittable intermittent power	W	48	24	30
Max. continuous torque	Nm	0.60	1.80	2.25
Max. intermittent torque	Nm	0.75	2.25	3.20
Max. continuous input speed	rpm	7000	8000	8000
Max. intermittent input speed	rpm	8750	10000	10000
Max. efficiency	%	90	78	78
Average backlash no load	°	1.2	1.3	0.7
Max. axial load (dynamic)	N	120	120	120
Max. radial load, 10 mm from flange	N	70	110	110
Gearhead length L1	mm	21.3	30.2	30.2
Weight	g	75	95	95

Configuration		Noise Reduced		Backlash Reduced
Number of stages		1	2	2
Reduction	X:1	3.9, 5.3, 6.6	16, 21, 26, 28, 35	16, 21, 26, 28, 35
Version		Standard/ceramic version/noise reduced/backlash reduced		
Flange		Standard flange/configurable flange		
Shaft		Length/flat face/cross hole		

maxon Modular System	Page
maxon DC motor	
DCX 26 L	72–73

Dimensions Standard Version M 1:2



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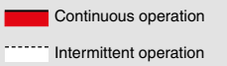
NEW

GPX 32 Planetary Gearhead Ø32 mm

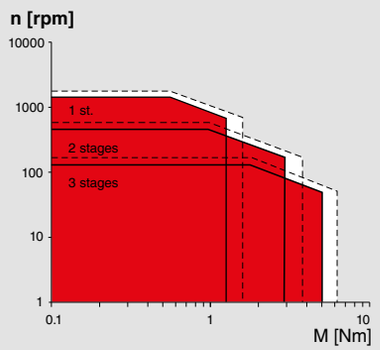
Configurable

Key Data		Standard Version	Ceramic Version
Max. transmittable power	W	100	100
Max. continuous torque	Nm	5.0	6.6
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 … +100	-40 … +100
Bearing at output		Ball bearing	Ball bearing

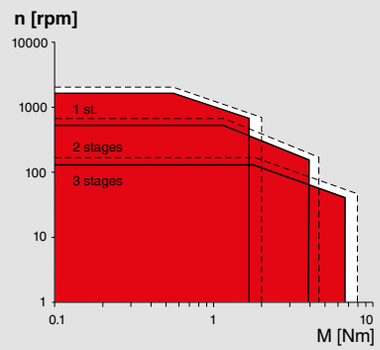
Operating Range (output shaft)



Standard Version



Ceramic Version



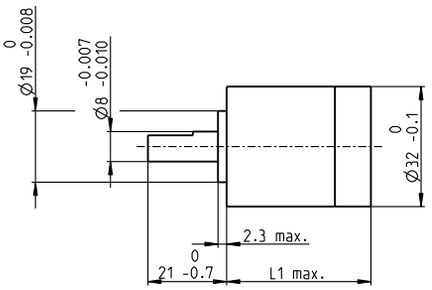
Specifications		Standard Version			Ceramic Version		
Number of stages		1	2	3	1	2	3
Max. transmittable continuous power	W	100	50	25	120	60	30
Max. transmittable intermittent power	W	125	62	31	150	75	37
Max. continuous torque	Nm	1.25	2.90	5.00	1.60	3.80	6.60
Max. intermittent torque	Nm	1.60	3.60	6.25	2.00	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	°	1.4	1.5	1.7	1.4	1.5	1.7
Max. axial load (dynamic)	N	120	120	120	120	120	120
Max. radial load, 10 mm from flange	N	90	140	200	90	140	200
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		Standard Version			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					

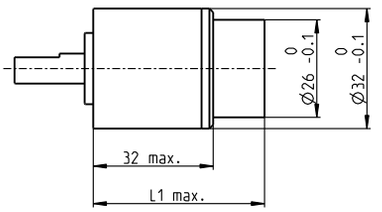
maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 26 L	3	72–73
DCX 32 L	1–2	74

Dimensions M 1:2

1–2 stages



3 stages



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NEW

GPX 32 Planetary Gearhead Ø32 mm

Configurable

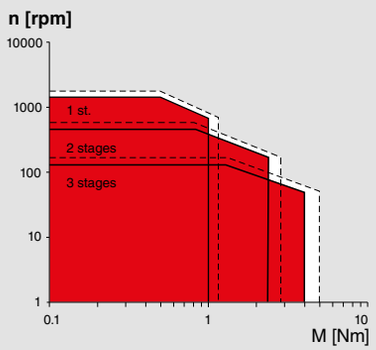
Key Data		Noise Reduced	Backlash Reduced
Max. transmittable power	W	80	50
Max. continuous torque	Nm	4.0	5.0
Max. continuous input speed	rpm	8000	8000
Ambient temperature	°C	-40 … +100	-40 … +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

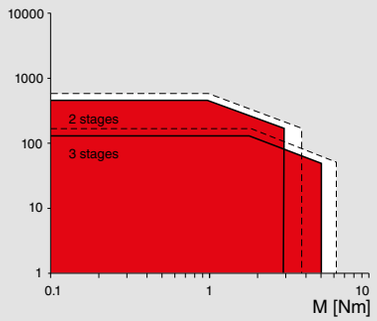
Continuous operation

Intermittent operation

Noise Reduced



Backlash Reduced



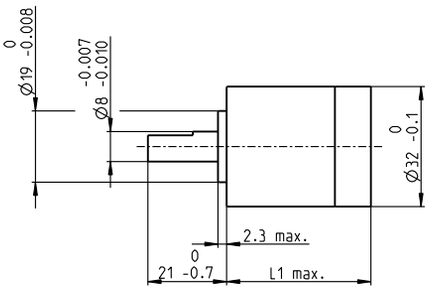
Specifications		Noise Reduced			Backlash Reduced	
Number of stages		1	2	3	2	3
Max. transmittable continuous power	W	80	40	20	50	25
Max. transmittable intermittent power	W	100	50	25	62	31
Max. continuous torque	Nm	1.00	2.30	4.00	2.90	5.00
Max. intermittent torque	Nm	1.30	2.90	5.00	3.60	6.25
Max. continuous 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	°	1.4	1.5	1.7	0.8	1.0
Max. axial load (dynamic)	N	120	120	120	120	120
Max. radial load, 10 mm from flange	N	90	140	200	140	200
Gearhead length L1	mm	26.7	36.3	43.9	36.3	43.9
Weight	g	140	185	230	185	230

Configuration		Noise Reduced			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				
Flange		Standard flange/configurable flange				
Shaft		Length/flat face/cross hole				

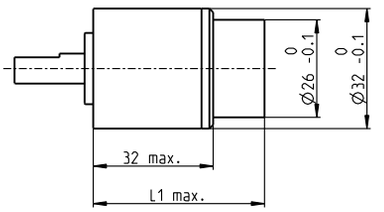
maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 26 L	3	72–73
DCX 32 L	1–2	74

Dimensions M 1:2

1–2 stages



3 stages



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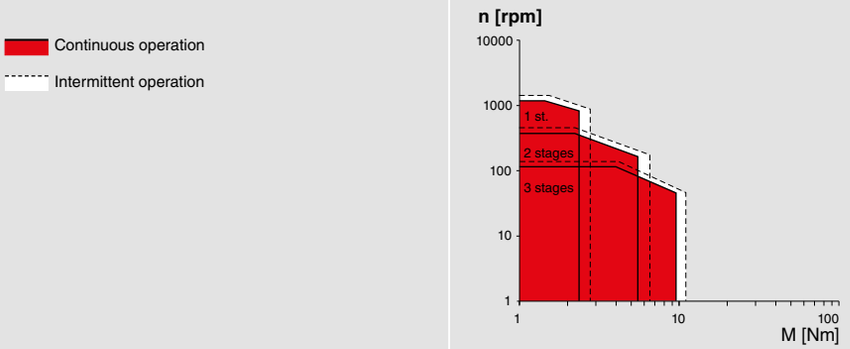
NEW

GPX 37 Planetary Gearhead Ø37 mm

Configurable

Key Data		Standard Version
Max. transmittable power	W	185
Max. continuous torque	Nm	9.3
Max. continuous input speed	rpm	7000
Ambient temperature	°C	-40 … +100
Bearing at output		Ball bearing

Operating Range (output shaft) — **Standard Version**

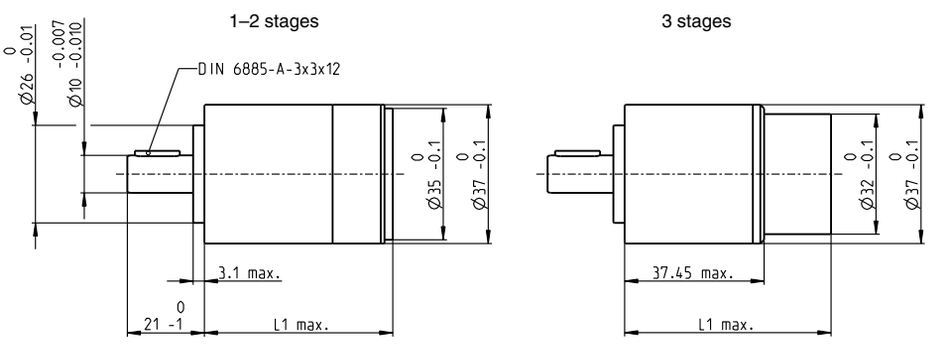


Specifications		Standard Version		
Number of stages		1	2	3
Max. transmittable continuous power	W	185	90	45
Max. transmittable intermittent power	W	230	115	60
Max. continuous torque	Nm	2.30	5.40	9.30
Max. intermittent torque	Nm	2.90	6.80	11.60
Max. continuous input speed	rpm	5000	6000	7000
Max. intermittent input speed	rpm	6250	7500	8750
Max. efficiency	%	90	80	75
Average backlash no load	°	1.4	1.5	1.7
Max. axial load (dynamic)	N	120	120	120
Max. radial load, 10 mm from flange	N	100	200	320
Gearhead length L1	mm	34.0	42.0	52.9
Weight	g	230	310	410

Configuration		Standard Version		
Number of stages		1	2	3
Reduction	X:1	3.9	16, 26	62, 83, 103, 111, 138, 150, 172, 186, 231
Version		Standard/noise reduced/reduced backlash		
Flange		Standard flange/configurable flange		
Shaft		Length/flat face/feather key		

maxon Modular System		Page
maxon DC motor	Number of stages	
DCX 32 L	3	74
DCX 35 L	1–2	75

Dimensions — **M 1:2**



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NEW

GPX 37 Planetary Gearhead Ø37 mm

Configurable

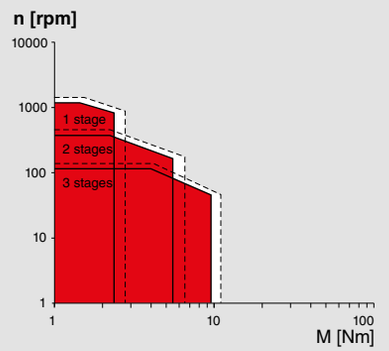
Key Data		Noise Reduced	Backlash Reduced
Max. transmittable power	W	150	90
Max. continuous torque	Nm	7.4	9.3
Max. continuous input speed	rpm	7000	7000
Ambient temperature	°C	-40 … +85	-40 … +100
Bearing at output		Ball bearing	Ball bearing
Typical noise level	dBA	-5 dBA compared to standard configuration	

Operating Range (output shaft)

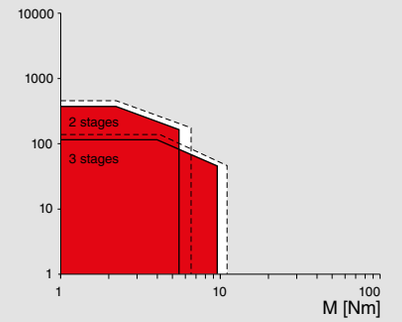
Continuous operation

Intermittent operation

Noise Reduced



Backlash Reduced

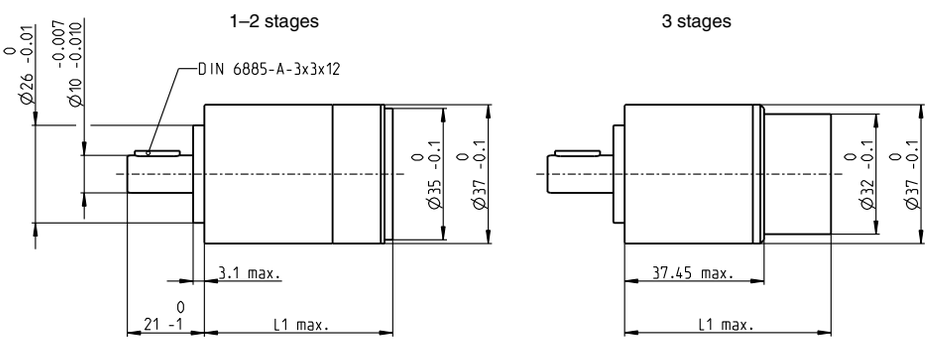


Specifications		Noise Reduced			Backlash Reduced	
Number of stages		1	2	3	2	3
Max. transmittable continuous power	W	150	75	37	90	45
Max. transmittable intermittent power	W	185	90	45	115	60
Max. continuous torque	Nm	1.85	4.30	7.40	5.40	9.30
Max. intermittent torque	Nm	2.30	5.40	9.20	6.80	11.60
Max. continuous input speed	rpm	5000	6000	7000	6000	7000
Max. intermittent input speed	rpm	6250	7500	8750	7500	8750
Max. efficiency	%	90	80	75	80	75
Average backlash no load	°	1.4	1.5	1.7	0.8	1.0
Max. axial load (dynamic)	N	120	120	120	120	120
Max. radial load, 10 mm from flange	N	100	200	320	200	320
Gearhead length L1	mm	34.0	42.0	52.9	42.0	52.9
Weight	g	230	310	410	310	410

Configuration		Noise Reduced			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
maxon DC motor	Number of stages	
DCX 32 L	3	74
DCX 35 L	1–2	75

Dimensions M 1:2



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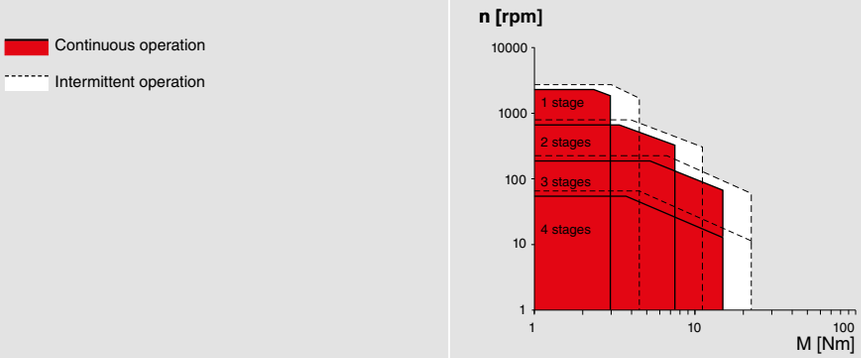
GPX 42 Planetary Gearhead Ø42 mm

Configurable

Key Data		Standard 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

Operating Range (output shaft) — **Standard Version**

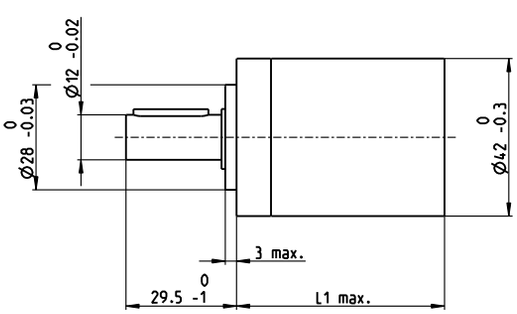


Specifications		Standard Version			
Number of stages		1	2	3	4
Max. transmittable power (continuous)	W	580	240	100	20
Max. transmittable power (intermittent)	W	725	300	125	25
Max. continuous torque	Nm	3.0	7.5	15.0	15.0
Max. intermittent torque	Nm	4.5	11.3	22.5	22.5
Max. continuous input speed	rpm	8000	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		Standard Version			
Number of stages		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
Version		Standard			
Flange		Standard flange/configurable flange			
Shaft		Length/feather key			

maxon Modular System	Page
maxon DC motor	
DCX 35 L	75

Dimensions Standard Version — **M 1:2**

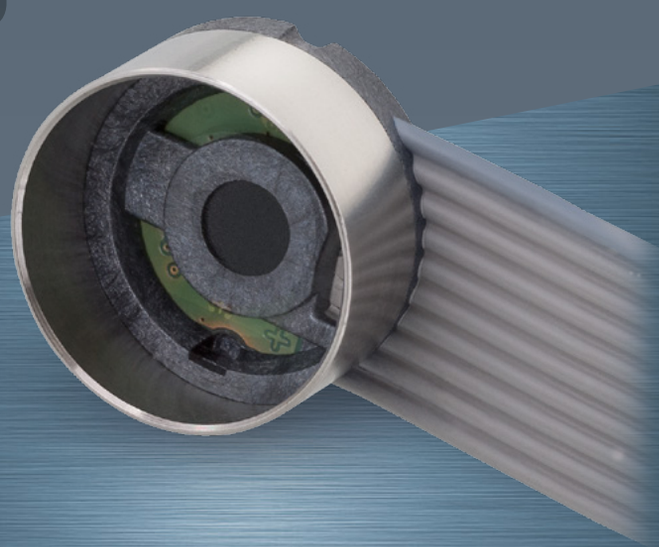


maxon ENX

maxon ENX ENCODER

maxon ENX encoders make an impression with their robust design and high signal quality. The 3-channel encoder with differential signals guarantees interference-free function even under the highest loads. The resolution can be factory-set. EASY is an incremental encoder based on the Hall effect. With the QUAD you get a 1-count encoder for rotation direction and speed recognition.

maxon ENX encoders can be configured and ordered online. xdrives.maxonmotor.com



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ENX 10 Encoder Ø10 mm

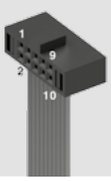
Configurable

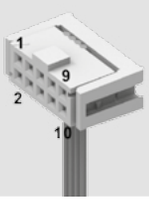
Key Data		EASY	QUAD
Number of channels		3	2
Max. counts per turn		1024	1
Encoder length L max.	mm	8.5	9
Ambient temperature	°C	-40 ... +100	-40 ... +100
Weight	g	<5	<5

Selection criteria	EASY	QUAD
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	QUAD
Supply voltage Vcc	V	5 ±0.5	5 ±0.5
Max. operating frequency	kHz	500	2
Max. Speed	rpm	30000	30000
Connector		10-pin 1.27 mm multipoint connector e.g. Samtec FTSH series Pin 1: Do not connect[1] Pin 2: V_{CC} Pin 3: GND Pin 4: Do not connect[1] Pin 5: Channel $\overline{A}$ Pin 6: Channel A Pin 7: Channel $\overline{B}$ Pin 8: Channel B Pin 9: Channel $\overline{I}$ Pin 10: Channel I	10-pin 2.54 mm multipoint connector[3] (IEC/EN 60603-1-DIN41651) 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

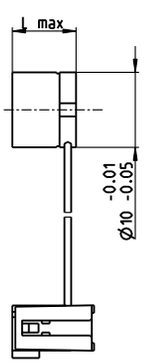




Configuration		EASY	QUAD
Counts per turn[2]		1 ... 1024	1
Cable length	mm	50, 100, 150, 200, 300, 500, 1000	50, 100, 150, 200, 300, 500, 1000
Alignment of cable outlet in relation to motor flange	°	15	15

maxon Modular System		Page
maxon DC motor		
DCX 10 S	EASY, QUAD	58
DCX 10 L	EASY, QUAD	59
DCX 12 S	EASY, QUAD	60
DCX 12 L	EASY, QUAD	61
DCX 14 L	EASY, QUAD	62–63
DCX 16 S	EASY, QUAD	64–65
DCX 16 L	EASY, QUAD	66–67
DCX 22 S	QUAD	68–69
DCX 22 L	QUAD	70–71
DCX 26 L	QUAD	72–73
DCX 32 L	QUAD	74
DCX 35 L	QUAD	75
DC-max 16 S	EASY, QUAD	78–79
DC-max 22 S	EASY, QUAD	80–81

Dimensions Standard Configuration M 1:1



Notes

[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.

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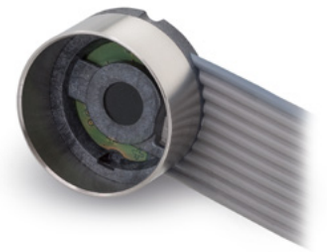
ENX 16 Encoder Ø16 mm

Configurable

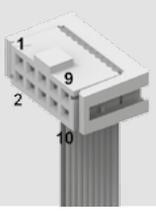


Key Data		EASY
Number of channels		3
Max. counts per turn		1024
Encoder length L max.	mm	8.5
Ambient temperature	°C	-40 ... +100
Weight	g	7

Selection criteria	EASY
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

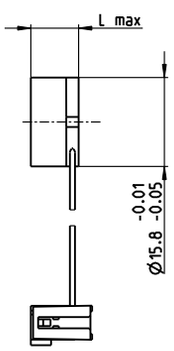
Specifications		EASY
Supply voltage Vcc	V	5 ±0.5
Max. operating frequency	kHz	500
Max. Speed	rpm	30000
Connector		10-pin 2.54 mm multipoint connector (IEC/EN 60603-1-DIN41651) Pin 1: N.C. Pin 2: V_{CC} Pin 3: GND Pin 4: N.C. Pin 5: Channel $\overline{A}$ Pin 6: Channel A Pin 7: Channel $\overline{B}$ Pin 8: Channel B Pin 9: Channel $\overline{I}$ Pin 10: Channel I



Configuration		EASY
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
maxon DC motor	
DCX 16 S	64–65
DCX 16 L	66–67
DCX 22 S	68–69
DCX 22 L	70–71
DCX 26 L	72–73
DCX 32 L	74
DCX 35 L	75

Dimensions Standard Version **M 3:4**



Notes

[1] maxon controllers require a resolution of at least 16 counts per turn.

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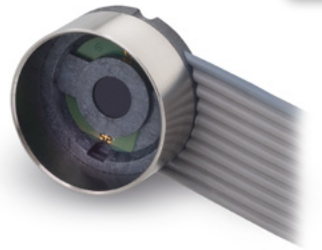
NEW

ENX 16 EASY Absolute Encoder Ø16 mm

Configurable

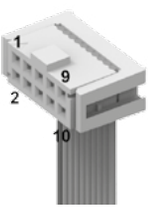


Key Data		EASY Absolute
Steps per turn		4096
Resolution (bit single turn)		12
Encoder length L max.	mm	8.5
Ambient temperature	°C	-40 ... +100
Weight	g	7

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

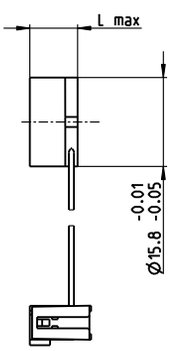
Specifications		EASY Absolute
Supply voltage Vcc	V	5 ±0.5
Max. Speed	rpm	30000
Connector		10-pin 2.54 mm multipoint connector (IEC/EN 60603-1-DIN41651) Pin 1: Data Pin 2: V_{CC} Pin 3: GND Pin 4: CLK Pin 5: Do not connect ($\overline{A}$) Pin 6: Do not connect (A) Pin 7: Do not connect ($\overline{B}$) Pin 8: Do not connect (B) Pin 9: Do not connect ($\overline{I}$) Pin 10: Do not connect (I)



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
maxon DC motor	
DCX 16 S	64–65
DCX 16 L	66–67
DCX 22 S	68–69
DCX 22 L	70–71
DCX 26 L	72–73
DCX 32 L	74
DCX 35 L	75

Dimensions Standard Version M 3:4



Notes

Adapter EASY Absolute (Part number 488167) required for all maxon controllers.

maxon DC motor

maxon DC motor

maxon DC 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.

With our Standard Specification we offer you a means to judge maxon motors in the most important respects. To our knowledge it covers normal applications. The Standard Specification is part of our “General Conditions of Sale”.

For information on standards and directives, refer to page 14 and 15.

The Standard Specification No. 100 for maxon DC motor

1. **Principles**
The **standard specification** describes tests carried out on the **finished motor and during the production process.** In order to guarantee our high quality standard, we check materials, parts and subassemblies through the manufacturing process and the complete motor. The obtained measurements are recorded and can be made available to customers if required. Random sampling plans are according to ISO 2859, MIL STD 105E and DIN/ISO 3951 (inspection by attributes, sequential sampling, variables inspection) as well as internal manufacturing controls. This specification always applies unless a different one has been agreed between the customer and maxon.

2. **Data**

2.1 **Electrical data** apply at 22° to 25°C. Data control within one minute running time.

Measurement voltage	+/- 0.5 % for voltages ≥ 3V and ± 0.015 V for voltages ≤ 3V
No load speed	± 10%
No load current	≤ maximum specified value
Direction of rotation	cw = clockwise
Motor position	horizontal

Notes: Measurement voltage may vary from the nominal voltage listed in the catalog. The no load current specified in the catalog is a typical value and not the maximum one. By connecting the red wires or if voltage is applied to the ‘+’ Terminal, shaft rotation is cw (clockwise) as seen from the mounting end. For ccw running, the specified tolerance data may only be marginally exceeded.
Terminal resistance: Winding resistance is verified in the manufacturing process through spot checks on a representative basis. Terminal resistance is determined at product certification. It should be noted that terminal resistance depends on the rotor’s rotational position. As transfer resistance depends on current density in graphite brushes, measuring resistance with an ohmmeter if the current is low does not give reasonable results. Too low a reading is produced with precious metal brush motors if the brushes bridge two commutator segments, thereby short-circuiting one coil segment.
Inductance is determined at product certification. Test frequency is 1 kHz. The motor’s terminal inductance depends on frequency.
Commutation: An oscilloscope is used to check the neutral setting and test for electrical faults, such as interrupted winding or short-circuit between turns. Commutation displays for precious metal brushes and graphite brushes are not directly comparable. Precious metal brushes display a clear commutation picture which remains interference free up to the motor’s recommended maximum speed, but with graphite brushes, this is only expected up to around one third of that. In addition, it should be noted that the contact resistance of graphite brushes and the torque constant may change during the run-in period due to increased brush seating. As a result, no load current and speed may drift marginally. The same effect may also be observed if motors are being operated under no load condition over a longer period.

2.2 **Mechanical data** per outline drawing: Standardmeasuring instruments (for electrical length measuring DIN 32876, micrometer per DIN 863, dial indicator DIN 878, calliper per DIN 862, bore calliper DIN 2245, thread calliper per DIN 2280 and others) are used.

2.3 **Rotor imbalance:** Rotors are balanced according to standard data or customer requirements during manufacturing.

2.4 **Noise:** Tests are carried out for anomalies within a lot, on a subjective basis. Depending on speed, the motions in the motor cause noise and vibration of varying degrees, frequency and intensity. The noise level experienced with a single sample unit should not be interpreted as indicative of the noise or vibration level to be expected of future deliveries.

2.5 **Service life:** Durability tests are carried out under uniform internal criteria as part of product certification. A motor’s service life essentially depends on the operating and ambient conditions. Consequently, the many possible variations do not allow us to make a general statement on service life.

2.6 **Environmental influences**
Protection against corrosion: Our products are tested during product certification on the basis of DIN EN 60068-2-30.
Coating of components: Surface treatment and coating procedures used by maxon are selected on the basis of their merits to resist corrosion. These treatments are evaluated at product certification according to their applicable standard.

3. Parameters that differ from or are additional to the data sheet can be specified and will be then a central part of our systematic testing as the customer’s specification. Test/inspection certificates are issued by prior agreement.

January 2010 edition / subject to change

Explanation of the pages 108–186

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 relation of the depth of the screw connection to the thread diameter must be at least 2:1. 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 n_0 [rpm] ±10%
This is the speed at which the motor turns at nominal voltage and without load. It is approximately proportional to the applied voltage.

3 No load current I_0 [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 torque produced by the motor when at standstill. 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 cannot often 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 $\Delta n / \Delta M$ [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 τ_m [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} [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.

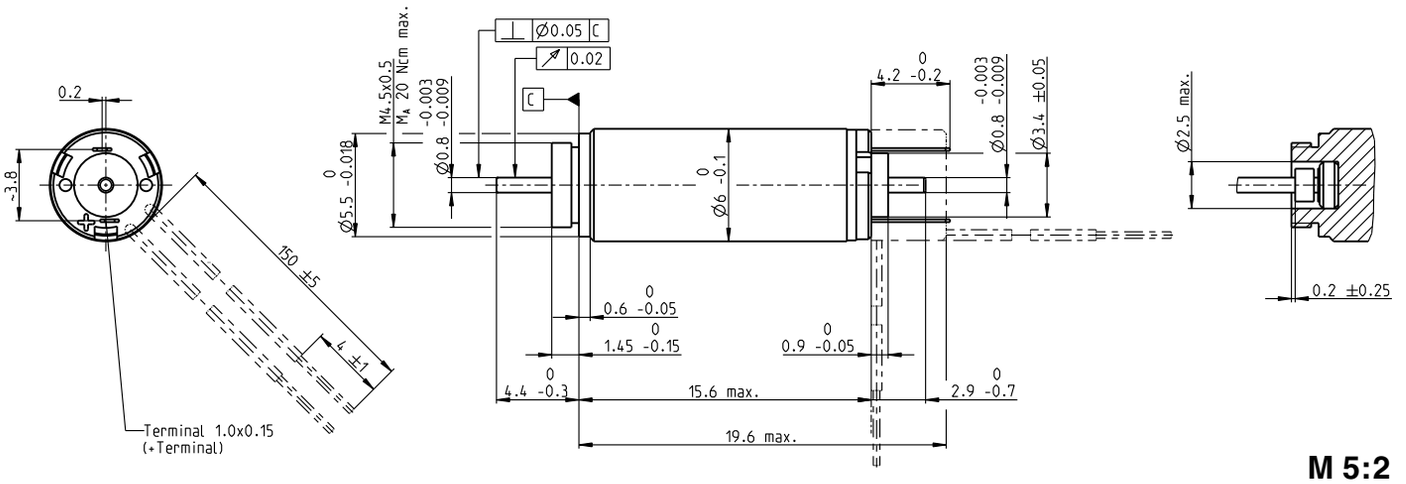
29 Number of pole pairs
Number of north poles of the permanent magnet. The phase streams and commutation signals pass through per revolution p cycles. Servo-controllers require the correct details of the number of pole pairs.

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.

RE 6 ∅6 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

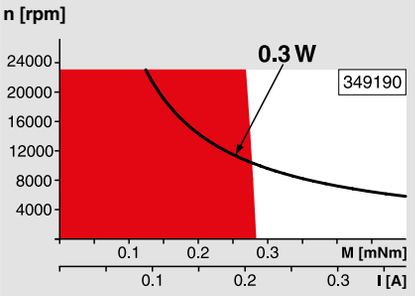
Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	1.5	3	4.5	6
2	No load speed	rpm	18500	18600	18600	18600
3	No load current	mA	42.6	21.3	14.2	10.7
4	Nominal speed	rpm	4680	5670	5400	5340
5	Nominal torque (max. continuous torque)	mNm	0.302	0.324	0.318	0.316
6	Nominal current (max. continuous 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	gcm²	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	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	2.3 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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).

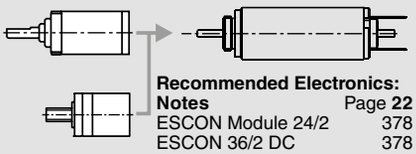
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅6 mm
0.002 - 0.03 Nm
Page 273

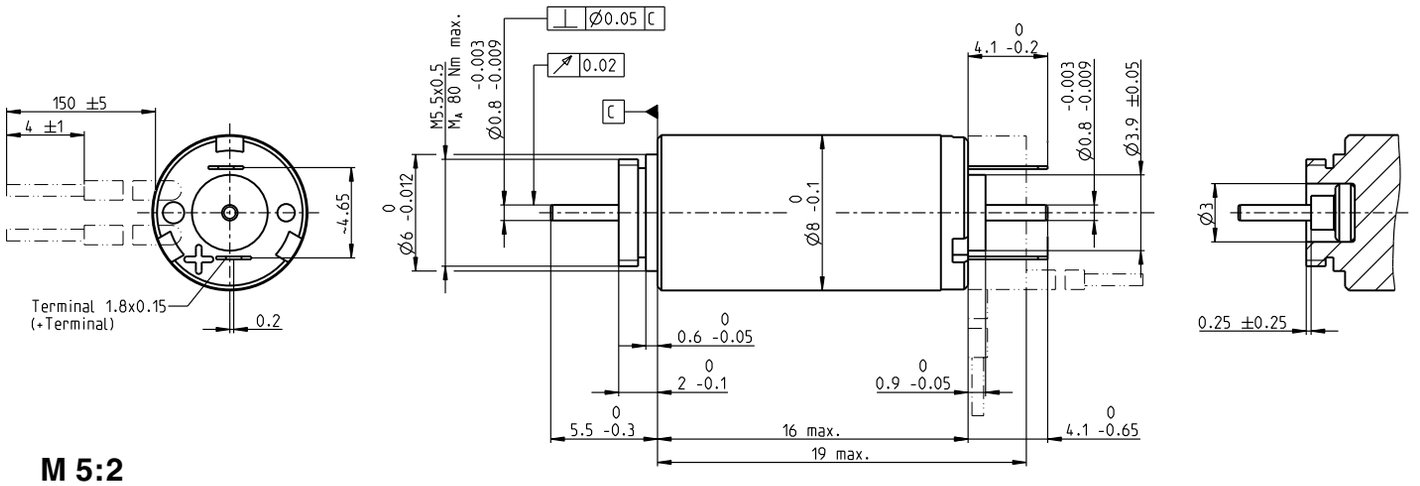
Spindle Drive
∅6 mm
Page 325–326



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 8 ∅8 mm, Precious Metal Brushes, 0.5 Watt



M 5:2

Stock program
Standard program
Special program (on request)

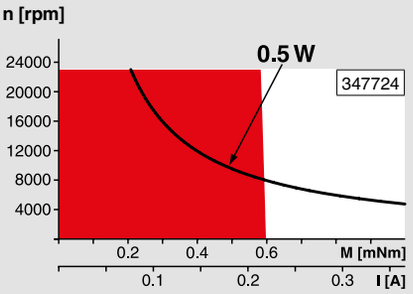
		Part Numbers							
B with cables		462207	463219	**463220**	463221	463222	**463223**		
A with terminals		347723	347724	**347725**	347728	347726	**347727**		
Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	2.4	4.2	6	7.2	9	12	
2	No load speed	rpm	13900	14200	13300	14300	14400	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	gcm²	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 107.

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 20–25

Planetary Gearhead
∅8 mm
0.01 - 0.1 Nm
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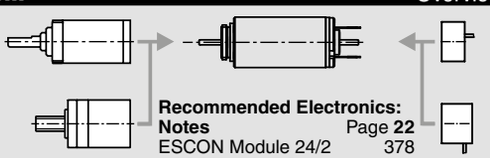
Spindle Drive
∅8 mm
Page 327–328



Recommended Electronics:

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ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386

for type A:
Encoder MR
100 CPT, 2 channels
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for type A:
Encoder 8 OPT
50 CPT, 2 channels
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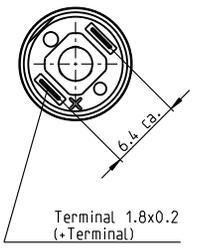
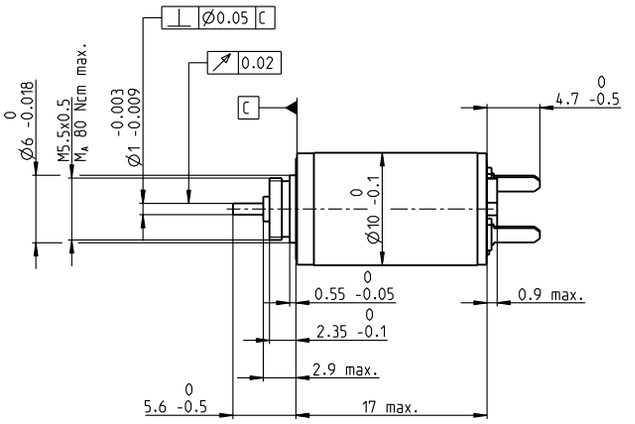
RE 10 ∅10 mm, Precious Metal Brushes, 0.75 Watt





M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

	Motor Data		118382	118383	118384	118385	**118386**	118387	118388	118389	118390	**118391**
	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	gcm²	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)

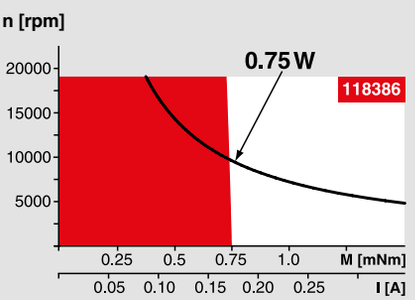
23	Max. speed	19000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 4 mm from flange	0.4 N

Other specifications

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

Values listed in the table are nominal.
Explanation of the figures on page 107.

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).

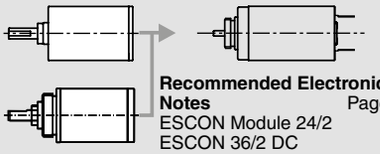
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
Page 275

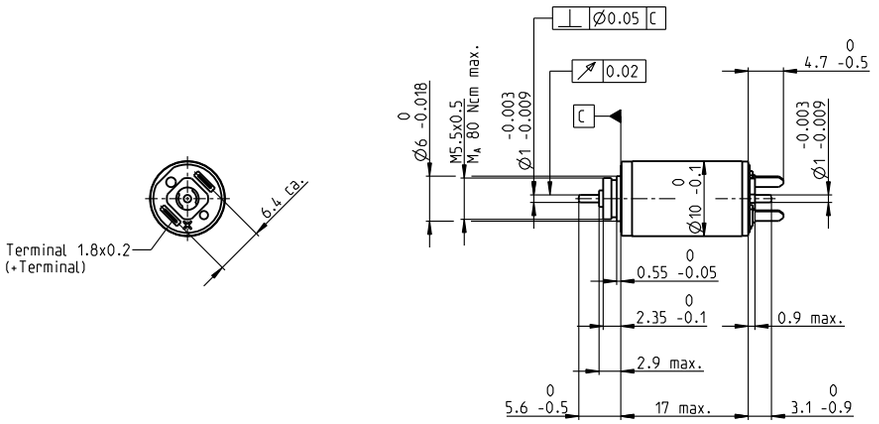
Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 276



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 10 ∅10 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 gcm²	0.066	0.0711	0.0704	0.0706	0.0706	0.0726	0.0706	0.0666	0.0666	0.0654

Specifications

Thermal data

17	Thermal resistance housing-ambient	45.5 K/W
18	Thermal resistance winding-housing	19.5 K/W
19	Thermal time constant winding	3.16 s
20	Thermal time constant motor	108 s
21	Ambient temperature	-20…+65°C
22	Max. winding temperature	+85°C

Mechanical data (sleeve bearings)

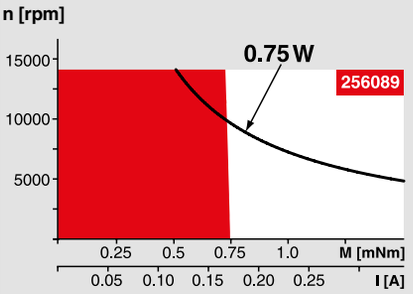
23	Max. speed	14000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.15 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 4 mm from flange	0.4 N

Other specifications

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

Values listed in the table are nominal.
Explanation of the figures on page 107.

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 20–25

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
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Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
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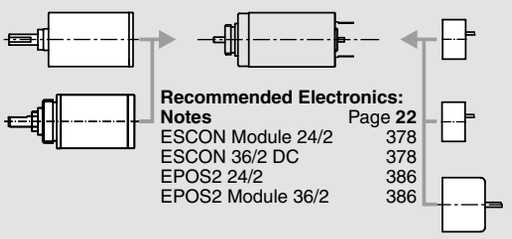

Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386

Encoder MR
16 CPT,
2 channels
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Encoder MR
64 - 256 CPT,
2 channels
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Encoder MEnc
∅10 mm
12 CPT, 2 channels
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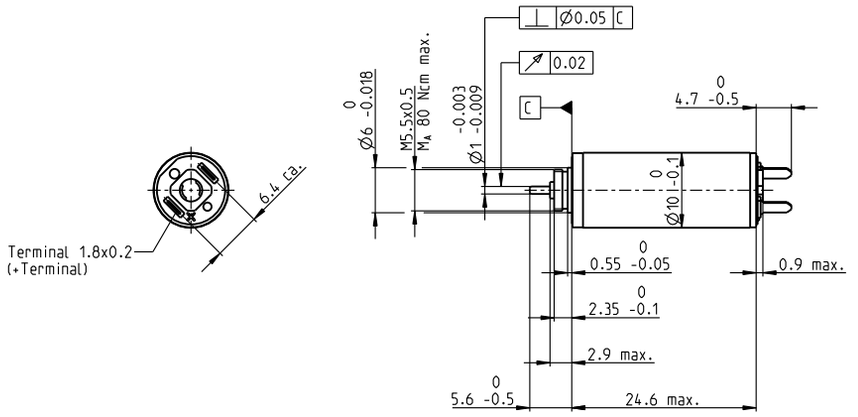
RE 10 ∅10 mm, Precious Metal Brushes, 1.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

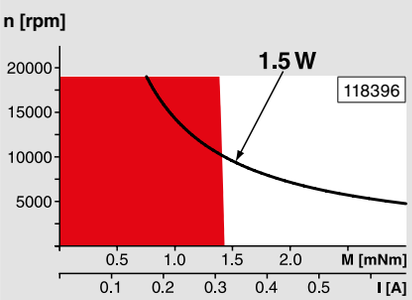
		118392	118393	118394	118395	118396	118397	118398	118399	118400
Motor Data										
	Values at nominal voltage									
1	Nominal voltage	V	3	3	4.5	4.5	6	6	9	9	12
2	No load speed	rpm	13000	10700	12800	10600	12400	9880	12200	11100	12500
3	No load current	mA	23.9	18.5	15.5	12.1	11.1	8.33	7.27	6.42	5.67
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	gcm²	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
	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 107.

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 20–25

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
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Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
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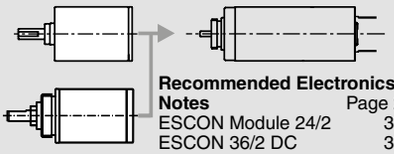
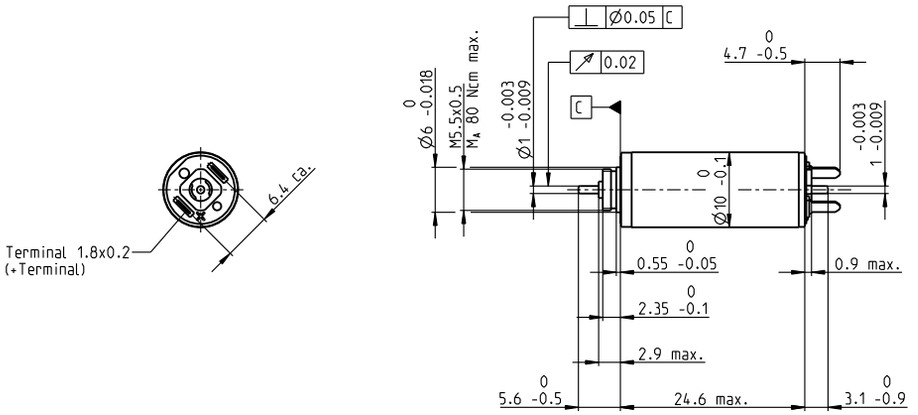


Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 10 ∅10 mm, Precious Metal Brushes, 1.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

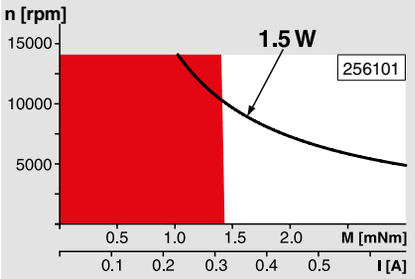
			256096	256097	256099	256100	256101	256102	256103	256104	256105
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	2.4	2.4	4.5	4.5	6	7.2	9	10	12
2	No load speed	rpm	10400	8560	12800	10600	12400	11900	12200	12300	12500
3	No load current	mA	21.7	17	15.1	11.8	10.8	8.55	7.06	6.45	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	gcm²	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 107.

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 20–25

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
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Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
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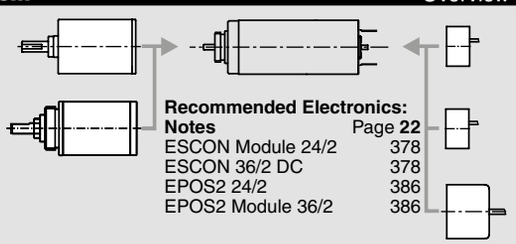

Recommended Electronics:

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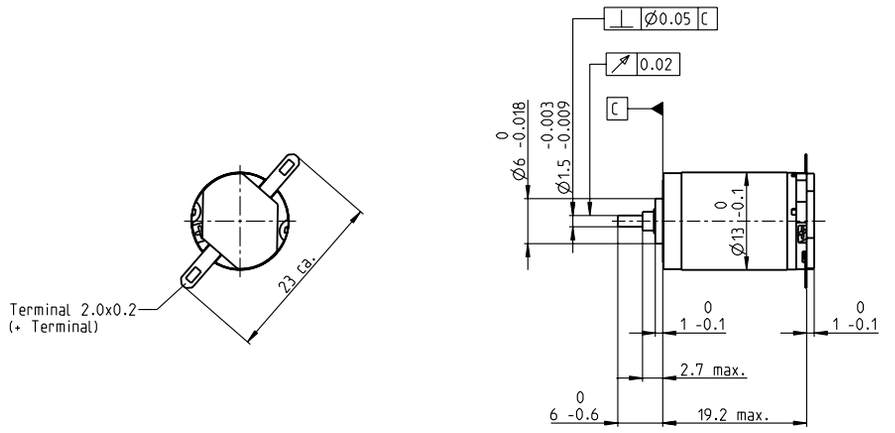
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386

Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349

Encoder MEnc
∅10 mm
12 CPT, 2 channels
Page 370

RE 13 ∅13 mm, Precious Metal Brushes, 1.2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

		118401	118402	118403	118404	118405	118406	118407	118408	118409	118410	118411	118412	118413	118414	118415
Motor Data																
	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	gcm²	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)

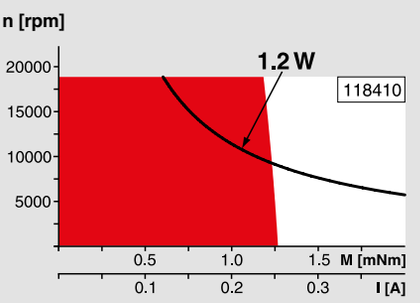
23	Max. speed	19000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	12 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

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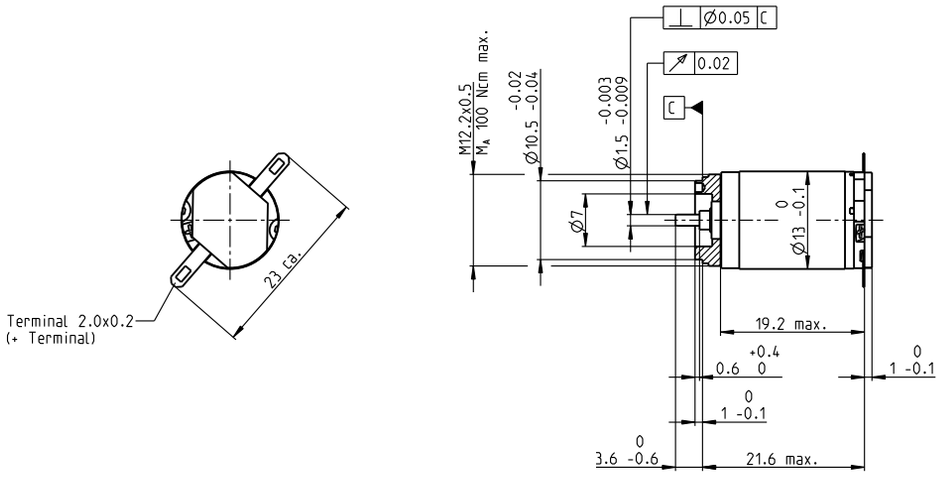
Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 13 ∅13 mm, Precious Metal Brushes, 1.2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

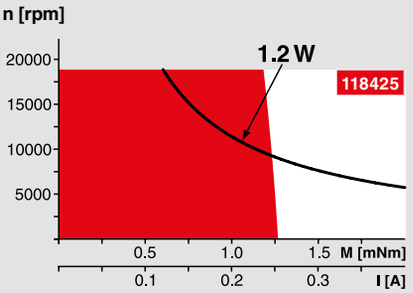
		118416	118417	118418	118419	118420	118421	118422	118423	118424	**118425**	118426	118427	**118428**	118429	118430
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	1	1.2	1.5	1.8	2.4	3	3.6	4.2	5	6	8	9	10	12	15
2	No load speed	rpm	11600	11300	11100	11000	11300	11600	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	gcm²	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 107.

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 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
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Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
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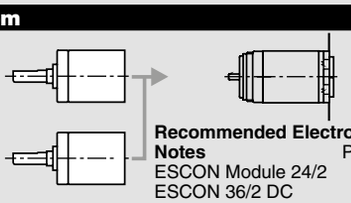
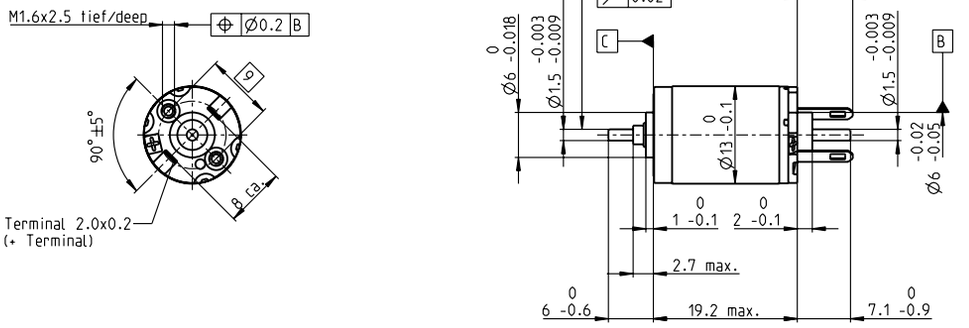


Recommended Electronics:

Notes	Page
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 13 ∅13 mm, Precious Metal Brushes, 0.75 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

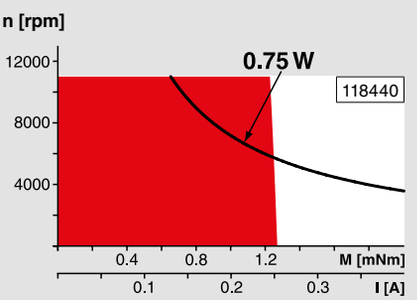
		118431	118432	118433	118434	118435	118436	118437	118438	118439	118440	118441	118442	118443	118444	118445
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	0.6	0.72	0.9	1.2	1.5	1.8	1.8	2.4	3	3.6	4.8	6	6	7.2	10
2	No load speed	rpm	6900	6710	6590	7250	6990	6850	5950	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	gcm²	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)	15 N
	(static, shaft supported)	170 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 107.

Operating Range



Comments

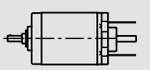
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Recommended Electronics:

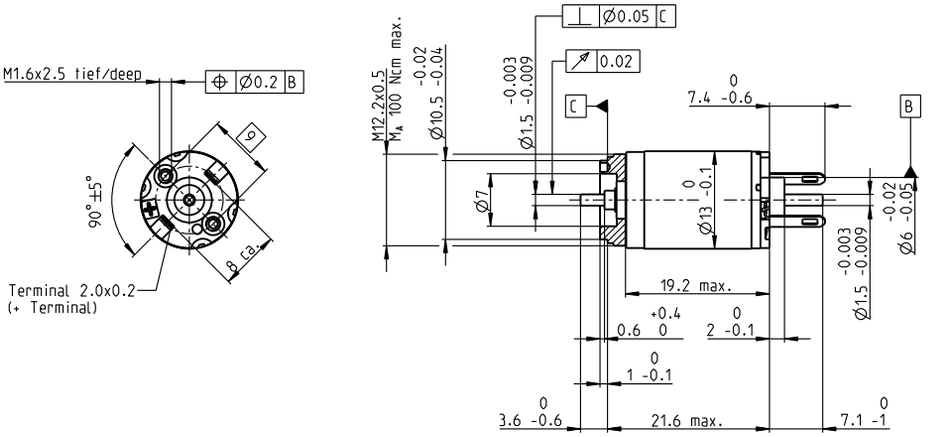
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349/350

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

RE 13 ∅13 mm, Precious Metal Brushes, 0.75 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

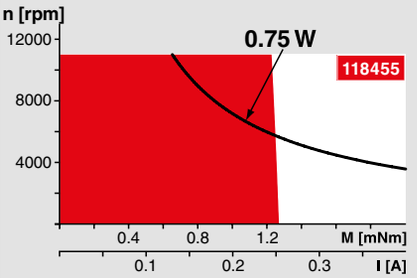
		118446	118447	118448	118449	118450	118451	118452	118453	118454	118455	118456	118457	118458	118459	118460
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	0.6	0.7	0.9	1.2	1.5	1.8	1.8	2.4	3	3.6	4.8	6	6	7.2	10
2	No load speed	rpm	6900	6520	6590	7250	6990	6850	5950	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	1.3	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	1.4	1.51	1.63	1.59	1.66	1.54	1.66	1.66	1.61	1.7	1.68	1.54	1.59	1.65
8	Stall current	A	2.14	1.43	1.21	1.08	0.812	0.69	0.557	0.489	0.404	0.318	0.269	0.214	0.184	0.161	0.127
9	Max. efficiency	%	64	61	62	63	63	63	63	64	64	63	64	64	62	63	63
	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	gcm²	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)	15 N
	(static, shaft supported)	170 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 107.

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

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Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
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Recommended Electronics:

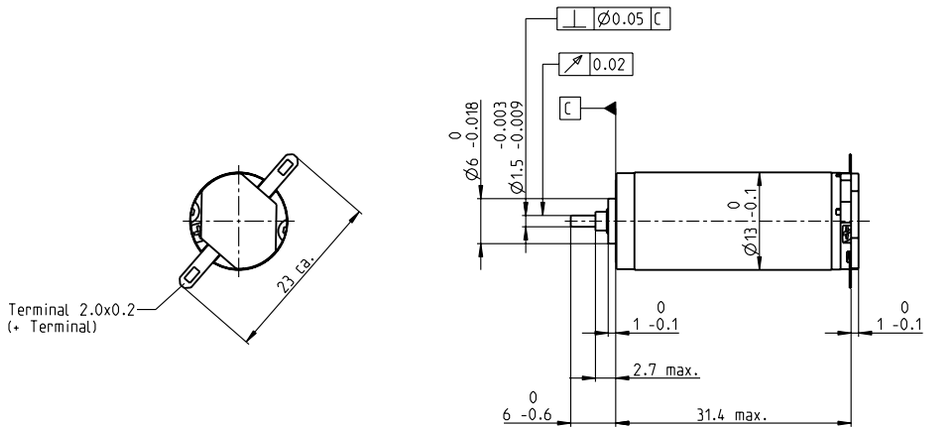
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349/350

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

RE 13 ∅13 mm, Precious Metal Brushes, 2.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

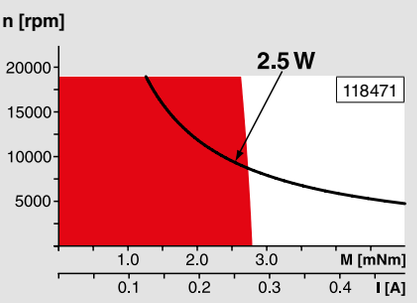
		118461	118462	118463	118464	118465	118466	118467	118468	118469	118470	118471	118472	118473	118474	118475
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	2.4	3	3	3.6	4.8	4.8	6	7.2	8	10	12	15	15	18	24
2	No load speed	rpm	10600	12200	10700	10800	11400	10100	11400	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	gcm²	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

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

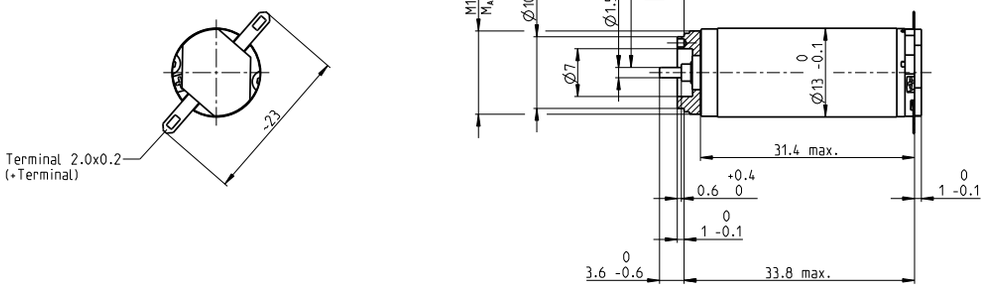
maxon Modular System

Overview on page 20–25

Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 13 ∅13 mm, Precious Metal Brushes, 2.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

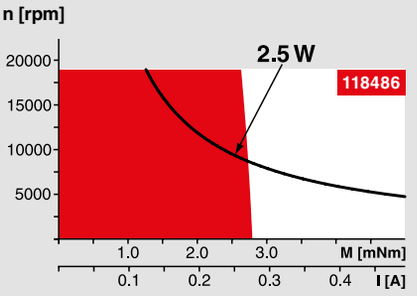
			118476	118477	118478	118479	118480	118481	118482	118483	118484	118485	118486	118487	118488	118489	118490
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	2.4	3	3	3.6	4.8	4.8	6	7.2	8	10	12	15	15	18	24
2	No load speed	rpm	10600	12200	10700	10800	11400	10100	11400	11400	10900	11400	11000	11100	10300	10600	11500
3	No load current	mA	51.5	50.8	42	35.5	28.8	24.4	23	19.2	16.1	13.8	11	8.87	7.98	6.9	5.82
4	Nominal speed	rpm	9160	10500	8490	8050	7890	6430	7660	7730	7320	7790	7390	7470	6620	6920	7800
5	Nominal torque (max. continuous torque)	mNm	1.44	1.56	1.8	2.16	2.76	2.87	2.81	2.86	2.98	2.9	2.89	2.9	2.88	2.9	2.84
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.664	0.586	0.497	0.443	0.363	0.291	0.235	0.217	0.187	0.149
7	Stall torque	mNm	9.95	10.2	8.34	8.25	8.81	7.78	8.51	8.84	9.1	9.15	8.77	8.9	8.13	8.44	8.87
8	Stall current	A	4.63	4.42	3.15	2.63	2.22	1.74	1.72	1.48	1.31	1.11	0.856	0.699	0.592	0.526	0.451
9	Max. efficiency	%	80	80	79	78	79	78	79	79	79	79	79	79	78	79	79
	Characteristics																
10	Terminal resistance	Ω	0.519	0.679	0.951	1.37	2.16	2.75	3.5	4.85	6.11	9.03	14	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1070	1210	1300	1330	1310	1320	1360	1310	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.65	7.55	7.45	7.37	7.28	7.27	7.28	7.23	7.16	7.2	7.21	7.21	7.21	7.22	7.27
16	Rotor inertia	gcm²	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

Values listed in the table are nominal.
Explanation of the figures on page 107.

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).

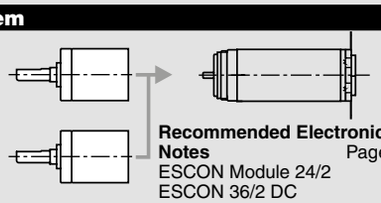
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

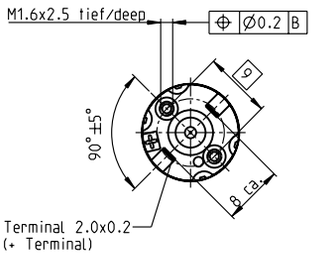
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279

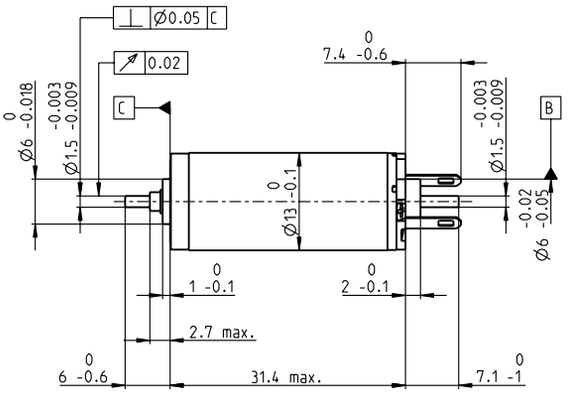


Recommended Electronics:

Notes	Page
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 13 ∅13 mm, Precious Metal Brushes, 2 Watt





M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

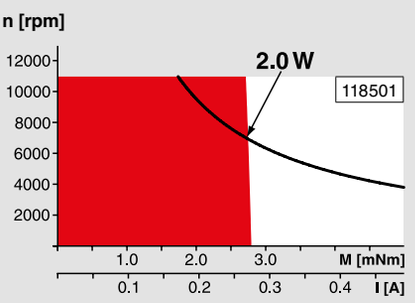
		118491	118492	118493	118494	118495	118496	118497	118498	118499	118500	118501	118502	118503	118504	118505
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	1.5	1.5	1.8	2.4	3	3	3.6	4.2	4.8	6	7.2	9	10	12	15
2	No load speed	rpm	6570	6090	6380	7170	7100	6300	6800	6620	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	gcm²	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)	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 107.

Operating Range



Comments

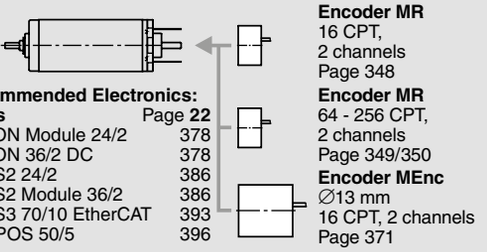
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Recommended Electronics:

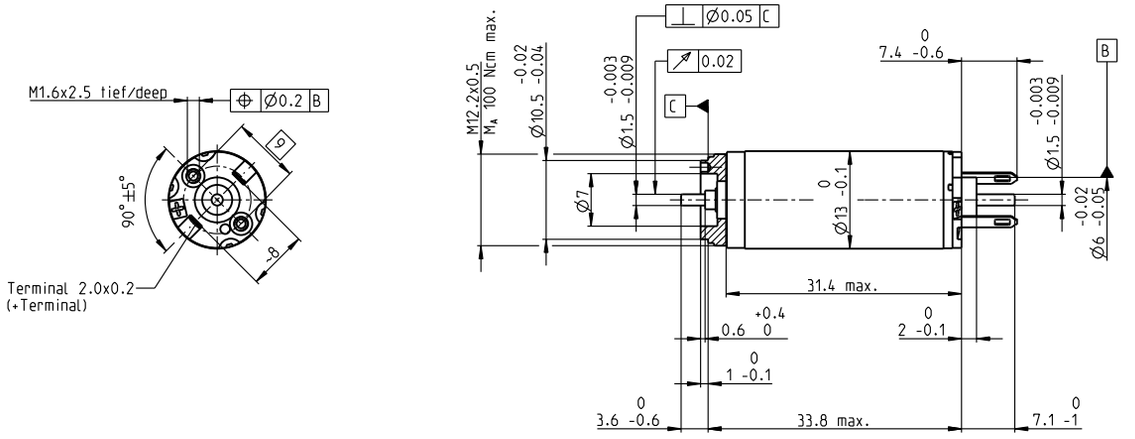
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349/350

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

RE 13 ∅13 mm, Precious Metal Brushes, 2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

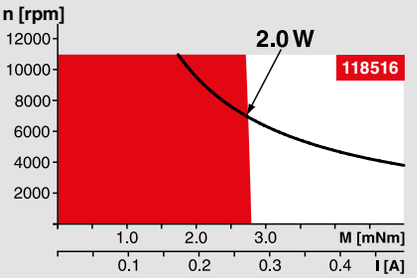
		118506	118507	118508	118509	118510	118511	118512	118513	118514	118515	118516	118517	118518	118519	118520
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	1.5	1.5	1.8	2.4	3	3	3.6	4.2	4.8	6	7.2	9	10	12	15
2	No load speed	rpm	6570	6090	6380	7170	7100	6300	6800	6620	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	0.486	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	gcm²	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	24 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

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Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279

Recommended Electronics:

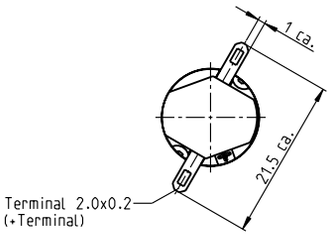
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

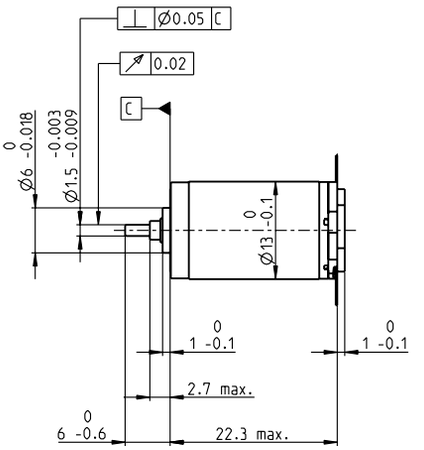
Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349/350

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

RE 13 ∅13 mm, Graphite Brushes, 1.5 Watt





M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

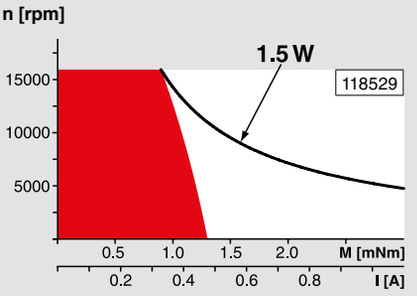
			118521	118522	118523	118524	118525	118526	118527	118528	118529	118530	118531	118532	118533	118534	118535
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	1.2	1.5	2.4	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2	No load speed	rpm	13300	13300	13700	13200	13000	13300	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	gcm²	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

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

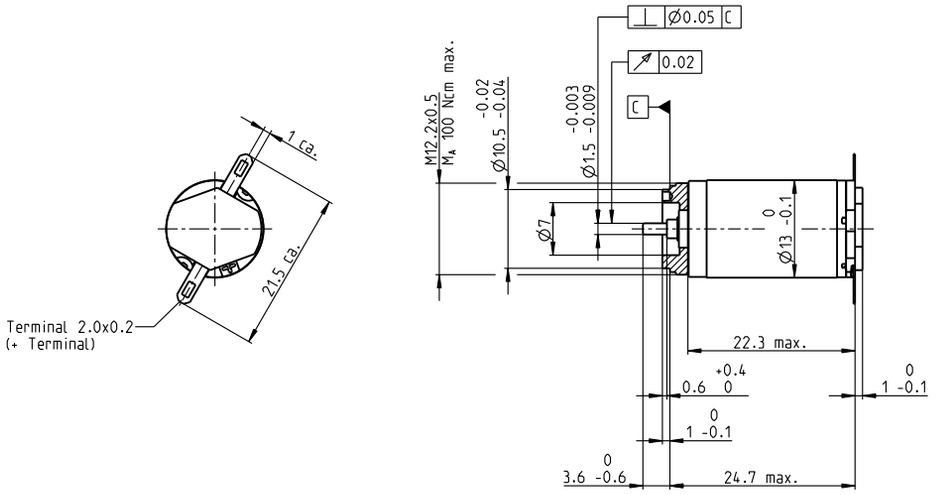
maxon Modular System

Overview on page 20–25

Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 13 ∅13 mm, Graphite Brushes, 1.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

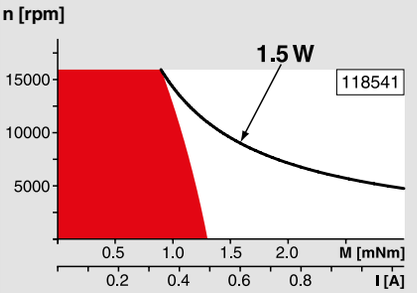
			118536	118537	118538	118539	118540	118541	118542	118543	118544	118545	118546	118547	118548	118549	118550
Motor Data																	
	Values at nominal voltage																
1	Nominal voltage	V	1.2	1.5	2.4	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2	No load speed	rpm	13300	13300	13700	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3	No load current	mA	482	394	259	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4	Nominal speed	rpm	12600	11800	10600	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5	Nominal torque (max. continuous torque)	mNm	0.194	0.329	0.719	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7	Stall torque	mNm	4.07	3.25	3.33	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8	Stall current	A	5.2	3.4	2.26	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9	Max. efficiency	%	49	44	45	44	45	46	45	45	44	44	45	43	44	46	44
	Characteristics																
10	Terminal resistance	Ω	0.231	0.441	1.06	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11	Terminal inductance	mH	0.006	0.009	0.022	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm/A	0.782	0.956	1.48	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13	Speed constant	rpm/V	12200	9990	6470	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14	Speed / torque gradient	rpm/mNm	3600	4610	4660	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15	Mechanical time constant	ms	13.5	14	14.1	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16	Rotor inertia	gcm²	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
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	17 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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).

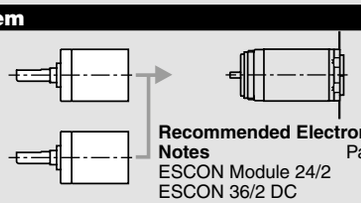
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

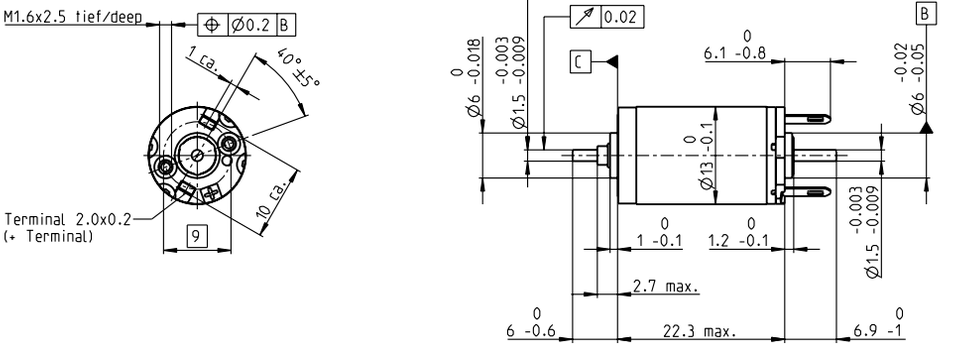
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279



Recommended Electronics:

Notes	Page
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE 13 ∅13 mm, Graphite Brushes, 1.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

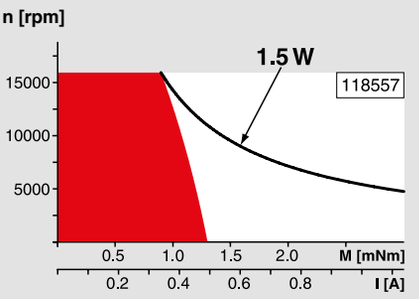
			118555	118556	118557	118558	118559	118560	118561	118562	118563	118564	118565	118566
Motor Data														
	Values at nominal voltage													
1	Nominal voltage	V	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2	No load speed	rpm	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3	No 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	gcm²	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
	(static, shaft supported)	140 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 107.

Operating Range



Comments

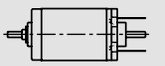
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
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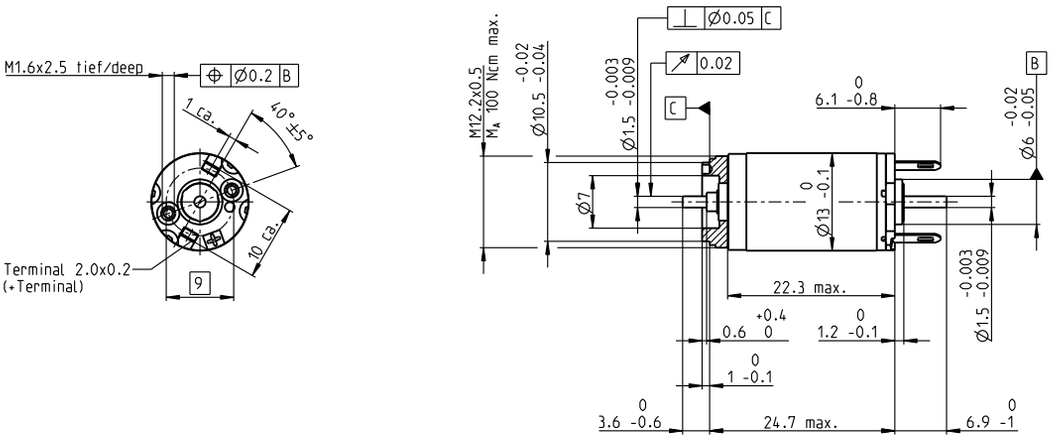
Encoder MR
64 - 256 CPT,
2 channels
Page 349/350

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

RE 13 ∅13 mm, Graphite Brushes, 1.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	118570	118571	118572	118573	118574	118575	118576	118577	118578	118579	118580	118581
Motor Data												
Values at nominal voltage												
1 Nominal voltage V	3	3.6	4.2	4.8	6	7.2	9	12	12	15	18	20
2 No load speed rpm	13200	13000	13300	12300	12700	12300	12300	13300	12300	13100	14000	13300
3 No load current mA	197	159	140	111	92.5	73.7	59.2	49.2	44.7	38.9	35.1	29.7
4 Nominal speed rpm	8520	7790	8260	7130	7480	7010	7000	8040	6940	7870	8890	8020
5 Nominal torque (max. continuous torque) mNm	1.06	1.23	1.27	1.28	1.25	1.26	1.25	1.21	1.22	1.21	1.2	1.19
6 Nominal current (max. continuous current) A	0.72	0.659	0.588	0.481	0.39	0.316	0.252	0.199	0.186	0.157	0.139	0.119
7 Stall torque mNm	3.19	3.3	3.56	3.26	3.25	3.16	3.12	3.28	3.01	3.23	3.51	3.22
8 Stall current A	1.67	1.41	1.32	0.989	0.814	0.639	0.506	0.429	0.368	0.335	0.321	0.254
9 Max. efficiency %	44	45	46	45	45	44	44	45	43	44	46	44
Characteristics												
10 Terminal resistance Ω	1.8	2.56	3.18	4.85	7.37	11.3	17.8	28	32.6	44.8	56.1	78.8
11 Terminal inductance mH	0.036	0.054	0.072	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12 Torque constant mNm/A	1.91	2.35	2.69	3.3	4	4.95	6.17	7.64	8.17	9.64	10.9	12.7
13 Speed constant rpm/V	5000	4070	3550	2890	2390	1930	1550	1250	1170	990	872	753
14 Speed / torque gradient rpm/mNm	4700	4440	4190	4250	4410	4390	4460	4570	4660	4600	4470	4680
15 Mechanical time constant ms	14.2	14.1	14	14	14.1	14.2	14.2	14.3	14.3	14.3	14.2	14.4
16 Rotor inertia gcm²	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)

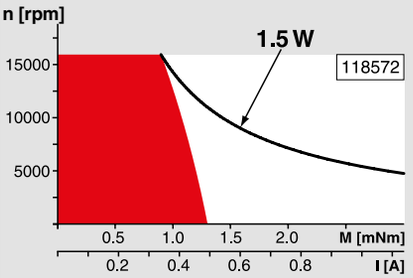
23	Max. speed	16000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
	(static, shaft supported)	140 N
28	Max. radial load, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	18 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
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Recommended Electronics:

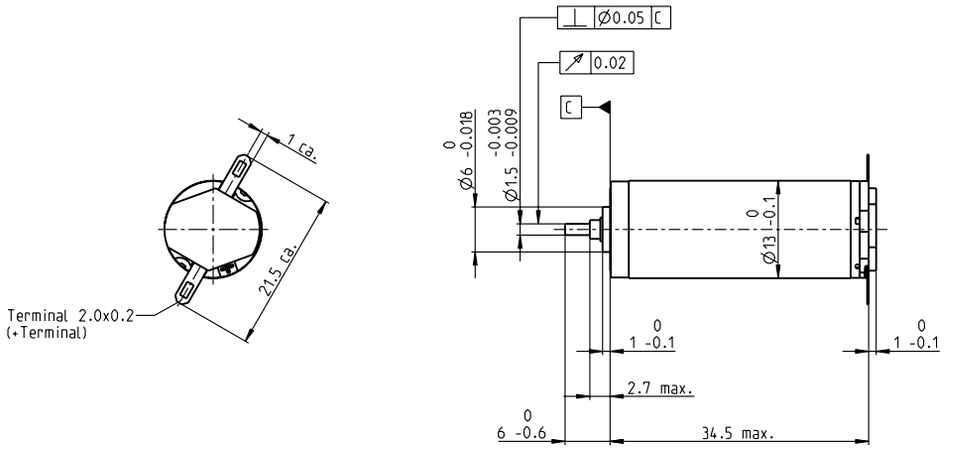
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349/350

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

RE 13 ∅13 mm, Graphite Brushes, 3 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

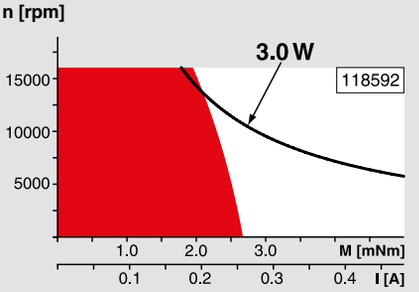
		118582	118583	118584	118585	118586	118587	118588	118589	118590	118591	118592	118593	118594	118595	118596
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	13800	13200	13300	13400	13000	14100	13800	14000
3	No load current	mA	168	164	136	121	95.5	81	75.3	64	53.9	45.4	36.8	29.2	28	23.8	19.5
4	Nominal speed	rpm	9520	10800	8780	10100	10300	8660	9790	10600	10100	10200	10400	9910	11100	10800	11000
5	Nominal torque (max. continuous torque)	mNm	1.22	1.32	1.58	1.92	2.05	2.17	2.12	2.17	2.32	2.3	2.31	2.36	2.29	2.33	2.28
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.602	0.558	0.495	0.422	0.383	0.319	0.259	0.212	0.192	0.167	0.134
7	Stall torque	mNm	7.44	8.13	7.11	8.58	9.25	8.35	9.03	10.1	10.5	10.4	10.5	10.4	11.1	11	10.9
8	Stall current	A	3.46	3.51	2.69	2.73	2.33	1.87	1.82	1.69	1.52	1.25	1.03	0.814	0.809	0.688	0.556
9	Max. efficiency	%	50	53	53	57	60	60	61	63	64	65	65	66	66	66	66
	Characteristics																
10	Terminal resistance	Ω	0.867	1.02	1.34	1.76	2.57	3.21	3.96	5.32	6.6	9.56	14.6	22.1	26	34.9	54
11	Terminal inductance	mH	0.021	0.025	0.032	0.046	0.073	0.092	0.114	0.164	0.223	0.316	0.486	0.75	0.871	1.19	1.79
12	Torque constant	mNm/A	2.15	2.31	2.65	3.14	3.97	4.46	4.96	5.95	6.94	8.27	10.2	12.7	13.7	16	19.7
13	Speed constant	rpm/V	4440	4130	3610	3040	2410	2140	1930	1600	1380	1160	932	750	696	595	485
14	Speed / torque gradient	rpm/mNm	1790	1830	1830	1700	1560	1540	1540	1430	1310	1340	1330	1300	1320	1300	1330
15	Mechanical time constant	ms	12.8	11.4	10.5	9.44	8.68	8.46	8.23	7.93	7.74	7.62	7.51	7.42	7.39	7.37	7.38
16	Rotor inertia	gcm²	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

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

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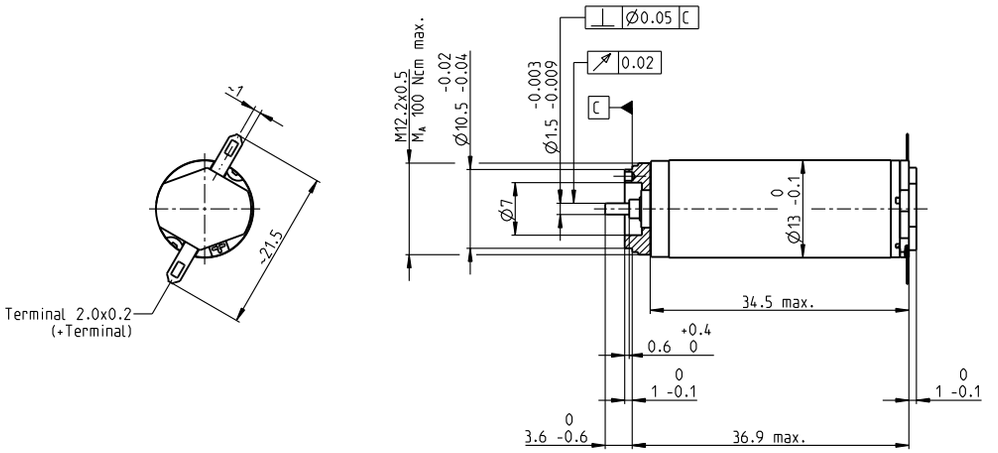
Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

RE 13 ∅13 mm, Graphite Brushes, 3 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

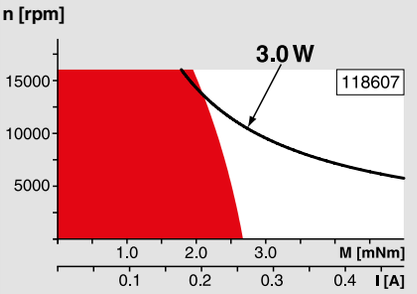
		118597	118598	118599	118600	118601	118602	118603	118604	118605	118606	118607	118608	118609	118610	118611
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	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	gcm²	0.681	0.596	0.548	0.53	0.53	0.526	0.512	0.528	0.565	0.545	0.541	0.544	0.536	0.543	0.529

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	33 K/W
18	Thermal resistance winding-housing	7.0 K/W
19	Thermal time constant winding	4.88 s
20	Thermal time constant motor	259 s
21	Ambient temperature	-20…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.4 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	27 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
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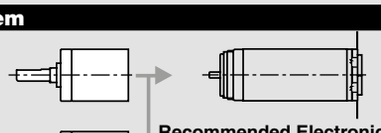
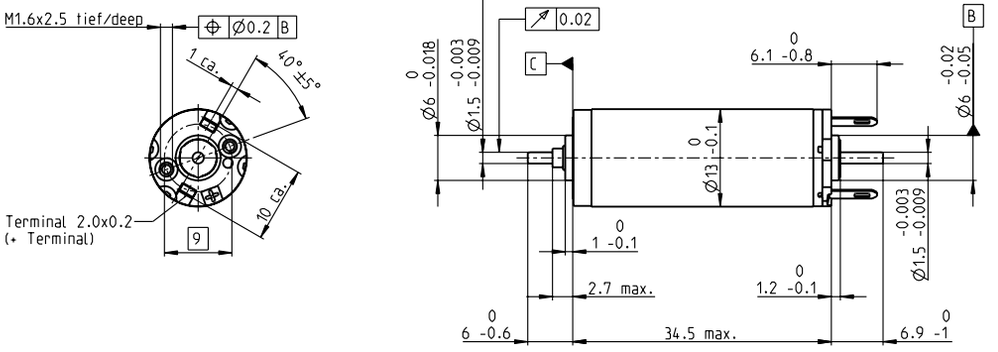
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

RE 13 ∅13 mm, Graphite Brushes, 3 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

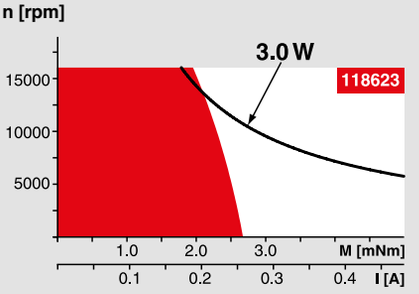
		118613	118614	118615	118616	118617	118618	118619	118620	118621	118622	118623	118624	118625	118626	118627
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	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	gcm²	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
	(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	24 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Operating Range



Comments

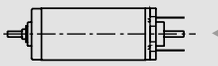
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
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Encoder MR
64 - 256 CPT,
2 channels
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Encoder MEnc
∅13 mm
16 CPT, 2 channels
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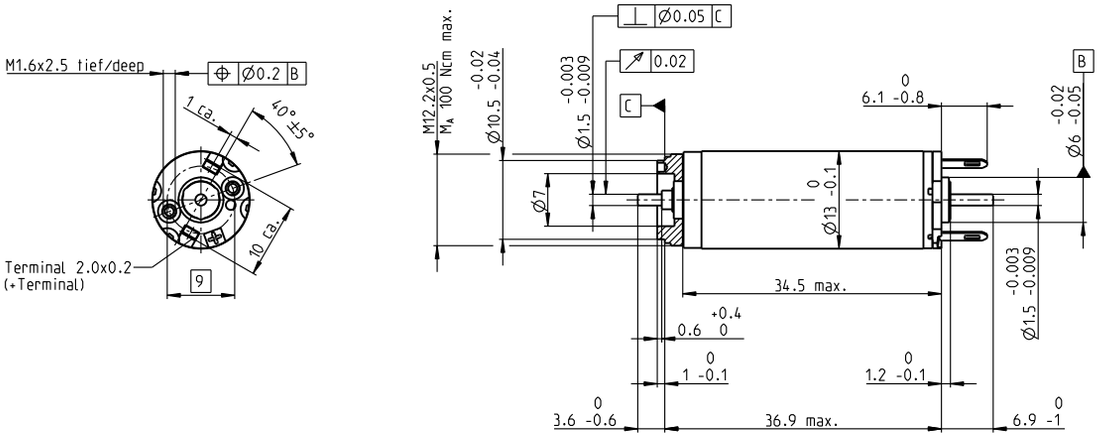
RE 13 ∅13 mm, Graphite Brushes, 3 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

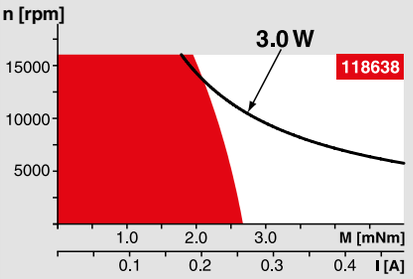
		118628	118629	118630	118631	118632	118633	118634	118635	118636	118637	118638	118639	118640	118641	118642
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	3	3.6	3.6	4.8	6	6	7.2	9	10	12	15	18	21	24	30
2	No load speed	rpm	12000	13600	11900	13600	13600	12100	13100	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	gcm²	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
	(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	27 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Operating Range



Comments

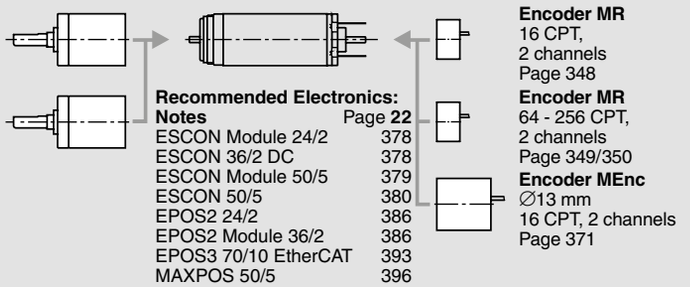
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279

Recommended Electronics:

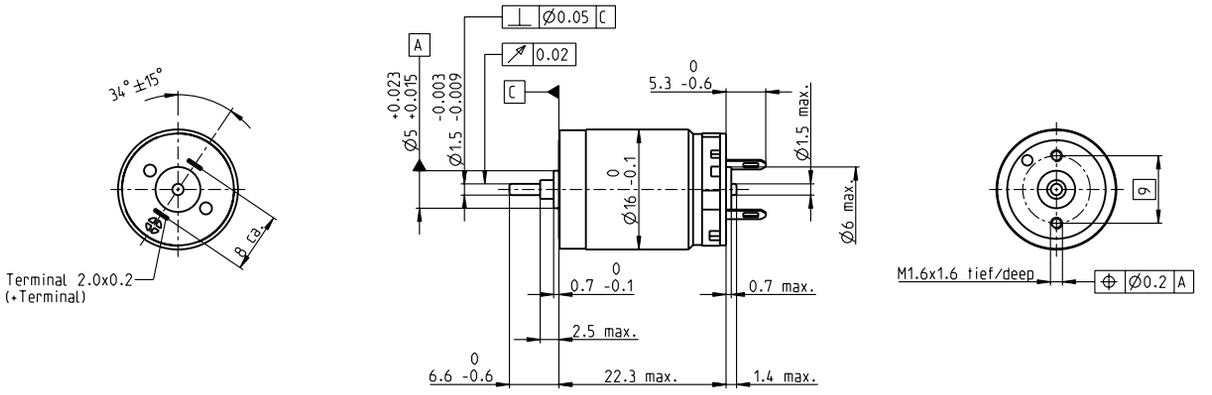
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349/350

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

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



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	320173	320174	320175	320176	320177	320178	320179
Motor Data							
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 gcm²	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

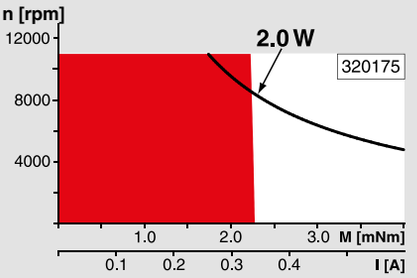
Other specifications

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 107.

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

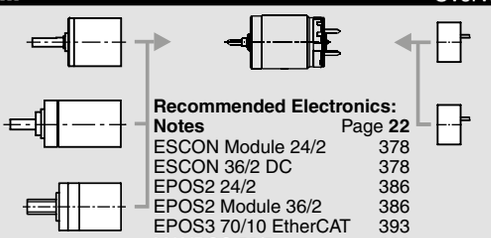
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 285

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 286

Spindle Drive
∅16 mm
Page 329–331



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
32 CPT,
2 / 3 channels
Page 351

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
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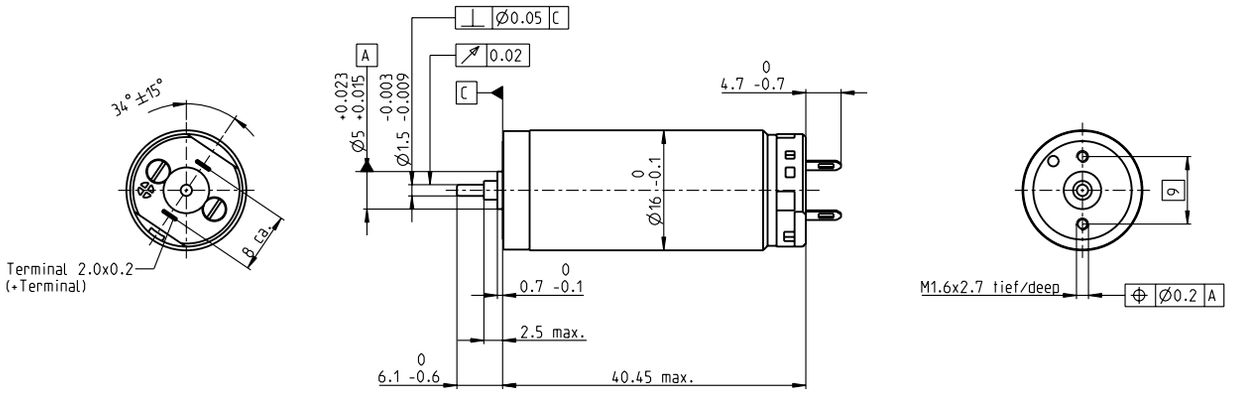
RE 16 ∅16 mm, Precious Metal Brushes CLL, 3.2 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

		118678	118679	118680	118681	118682	118683	118684	118685	118686	118687	118688	118689	118690	118691	118692
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	1.8	2.4	3	3.2	4.5	4.8	7.2	9	12	12	15	18	24	30	48
2	No load speed	rpm	4990	6360	6890	6270	6740	5700	6890	6740	7130	5990	6010	5900	7250	6460	5500
3	No load current	mA	23.5	25.4	23	18.6	14.8	10.8	9.57	7.4	6.05	4.63	3.72	3.02	3.11	2.08	1.02
4	Nominal speed	rpm	4320	5510	5820	4930	5050	3630	4810	4630	5030	3830	3840	3730	5070	4220	3180
5	Nominal torque (max. continuous torque)	mNm	2.39	2.5	2.89	3.41	4.48	5.61	5.54	5.48	5.48	5.38	5.36	5.33	5.29	5.18	5.01
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.711	0.566	0.438	0.348	0.287	0.229	0.187	0.171	0.119	0.0614
7	Stall torque	mNm	15.5	16.9	17.3	15.2	17.4	15.2	18.1	17.4	18.6	14.9	14.9	14.5	17.6	15	11.9
8	Stall current	A	4.53	4.71	4.19	3.13	2.74	1.9	1.82	1.37	1.16	0.784	0.628	0.5	0.561	0.341	0.144
9	Max. efficiency	%	86	86	86	85	86	86	86	86	86	86	85	85	86	85	84
	Characteristics																
10	Terminal resistance	Ω	0.397	0.51	0.715	1.02	1.64	2.53	3.95	6.56	10.3	15.3	23.9	36	42.8	88	333
11	Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.284	0.452	0.639	0.993	1.48	1.75	3.44	12.1
12	Torque constant	mNm/A	3.43	3.58	4.13	4.84	6.34	7.99	9.92	12.7	16	19	23.7	28.9	31.4	44.1	82.7
13	Speed constant	rpm/V	2790	2660	2310	1970	1510	1190	962	753	597	502	403	330	304	217	115
14	Speed / torque gradient	rpm/mNm	323	379	400	415	391	378	383	389	386	404	406	410	414	432	465
15	Mechanical time constant	ms	5.84	5.71	5.56	5.46	5.36	5.31	5.29	5.29	5.27	5.29	5.3	5.31	5.31	5.36	5.42
16	Rotor inertia	gcm²	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

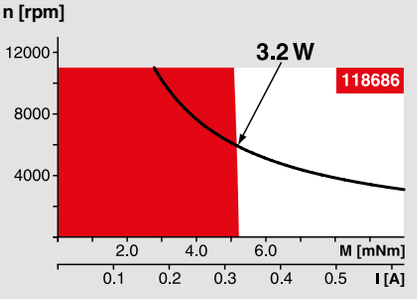
Specifications

	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)	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 107.

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 20–25

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
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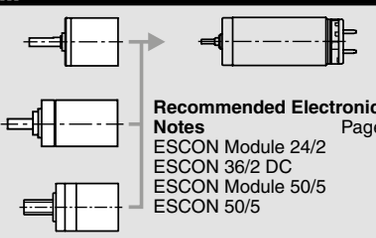
Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 286

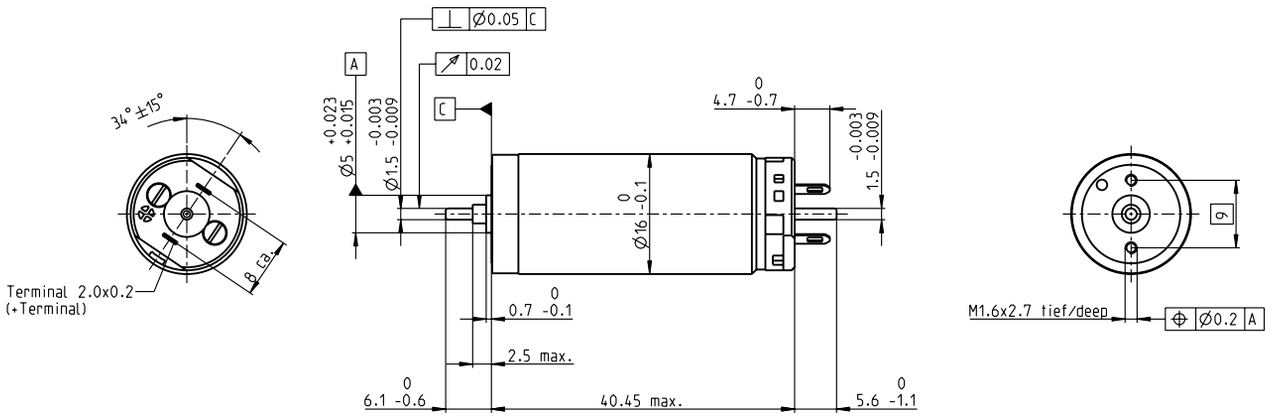
Spindle Drive
∅16 mm
Page 329–331



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

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



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

		118693	118694	118695	118696	118697	118698	118699	118700	118701	118702	118703	118704	118705	118706	118707
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	1.8	2.4	3	3.2	4.5	4.8	7.2	9	12	12	15	18	24	30	48
2	No load speed	rpm	4990	6360	6890	6270	6740	5700	6890	6740	7130	5990	6010	5900	7250	6460	5500
3	No load current	mA	23.5	25.4	23	18.6	14.8	10.8	9.57	7.4	6.05	4.63	3.72	3.02	3.11	2.08	1.02
4	Nominal speed	rpm	4320	5510	5820	4930	5050	3630	4810	4630	5030	3830	3840	3730	5070	4220	3180
5	Nominal torque (max. continuous torque)	mNm	2.39	2.5	2.89	3.41	4.48	5.61	5.54	5.48	5.48	5.38	5.36	5.33	5.29	5.18	5.01
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.72	0.72	0.711	0.566	0.438	0.348	0.287	0.229	0.187	0.171	0.119	0.0614
7	Stall torque	mNm	15.5	16.9	17.3	15.2	17.4	15.2	18.1	17.4	18.6	14.9	14.9	14.5	17.6	15	11.9
8	Stall current	A	4.53	4.71	4.19	3.13	2.74	1.9	1.82	1.37	1.16	0.784	0.628	0.5	0.561	0.341	0.144
9	Max. efficiency	%	86	86	86	85	86	86	86	86	86	86	85	85	86	85	84
	Characteristics																
10	Terminal resistance	Ω	0.397	0.51	0.715	1.02	1.64	2.53	3.95	6.56	10.3	15.3	23.9	36	42.8	88	333
11	Terminal inductance	mH	0.021	0.023	0.03	0.042	0.071	0.113	0.174	0.284	0.452	0.639	0.993	1.48	1.75	3.44	12.1
12	Torque constant	mNm/A	3.43	3.58	4.13	4.84	6.34	7.99	9.92	12.7	16	19	23.7	28.9	31.4	44.1	82.7
13	Speed constant	rpm/V	2790	2660	2310	1970	1510	1190	962	753	597	502	403	330	304	217	115
14	Speed / torque gradient	rpm/mNm	323	379	400	415	391	378	383	389	386	404	406	410	414	432	465
15	Mechanical time constant	ms	5.84	5.71	5.56	5.46	5.36	5.31	5.29	5.29	5.27	5.29	5.3	5.31	5.31	5.36	5.42
16	Rotor inertia	gcm²	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)	15 N
	(static, shaft supported)	70 N
28	Max. radial load, 5 mm from flange	1.5 N

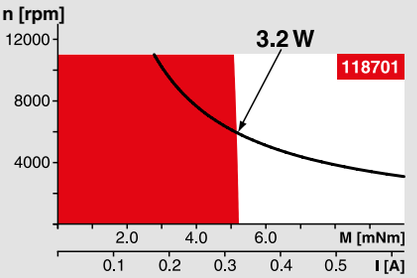
Other specifications

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 107.

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

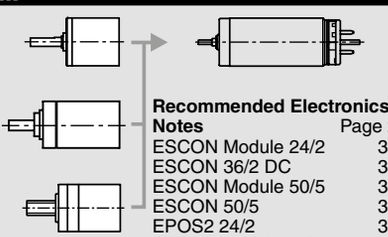
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 285

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 286

Spindle Drive
∅16 mm
Page 329–331



Recommended Electronics:

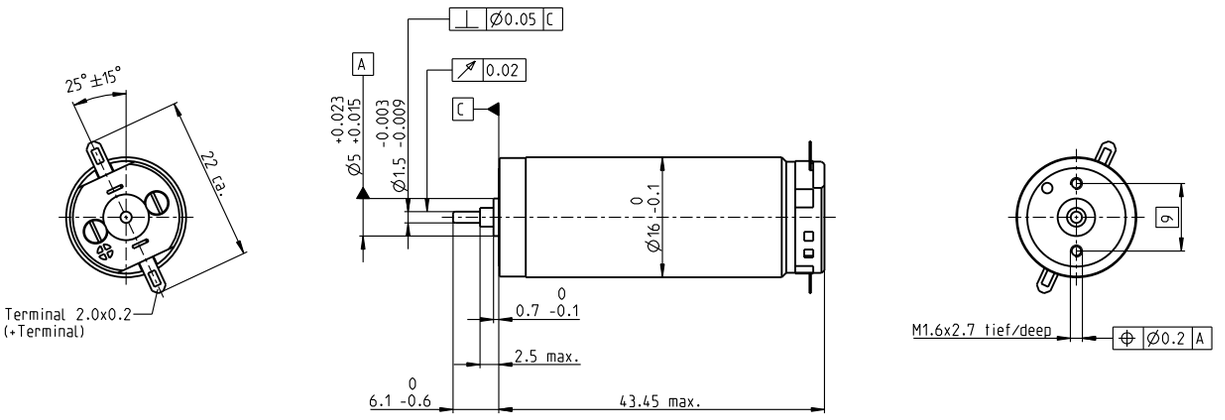
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 50/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
32 CPT,
2 / 3 channels
Page 351

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 353

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

RE 16 ∅16 mm, Graphite Brushes, 4.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

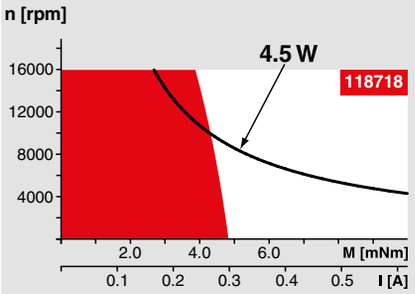
		118710	118711	118712	118713	118714	118715	118716	118717	118718	118719	118720	118721	118722	118723	118724
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	4.8	4.8	6	7.2	9	12	15	18	24	30	36	45	48	48	48
2	No load speed	rpm	12700	12100	13200	13600	13100	13900	14000	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	gcm²	1.73	1.44	1.33	1.26	1.31	1.34	1.32	1.3	1.3	1.25	1.25	1.24	1.23	1.18	1.11

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	30 K/W
18	Thermal resistance winding-housing	8.5 K/W
19	Thermal time constant winding	10.6 s
20	Thermal time constant motor	504 s
21	Ambient temperature	-20…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static)	15 N
28	Max. radial load, 5 mm from flange	1.5 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	40 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

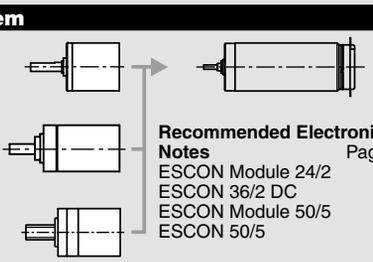
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 285

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 286

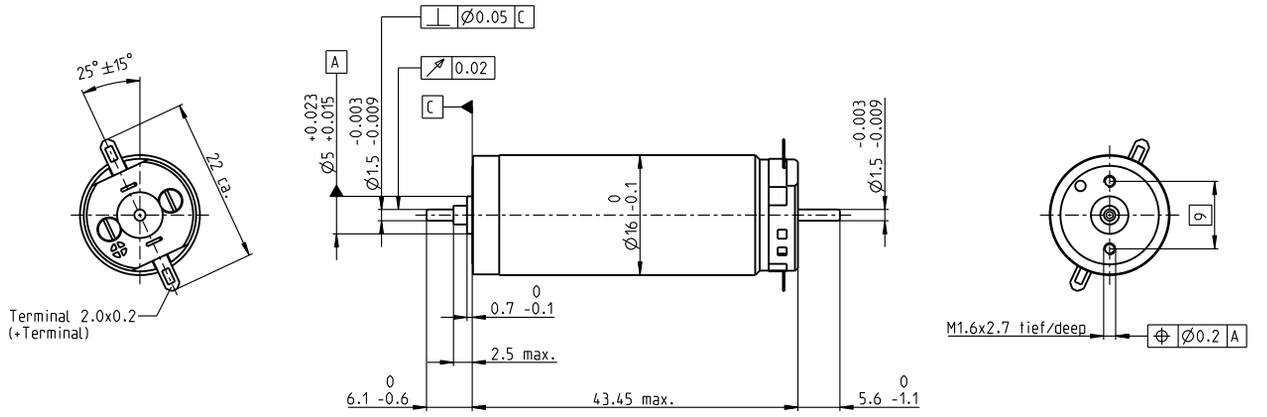
Spindle Drive
∅16 mm
Page 329–331



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

RE 16 ∅16 mm, Graphite Brushes, 4.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

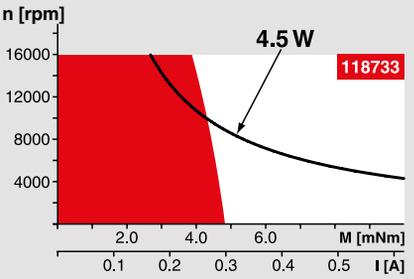
		118725	118726	118727	118728	118729	118730	118731	118732	118733	118734	118735	118736	118737	118738	118739
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	4.8	4.8	6	7.2	9	12	15	18	24	30	36	45	48	48	48
2	No load speed	rpm	12700	12100	13200	13600	13100	13900	14000	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	gcm²	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)	15 N
	(static, shaft supported)	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 107.

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

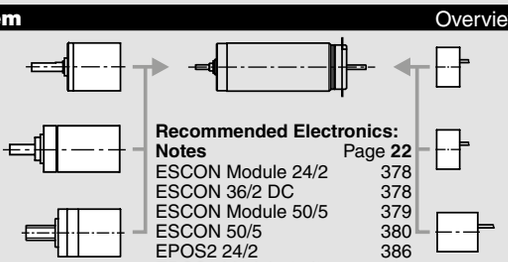
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 285

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 286

Spindle Drive
∅16 mm
Page 329–331



Recommended Electronics:

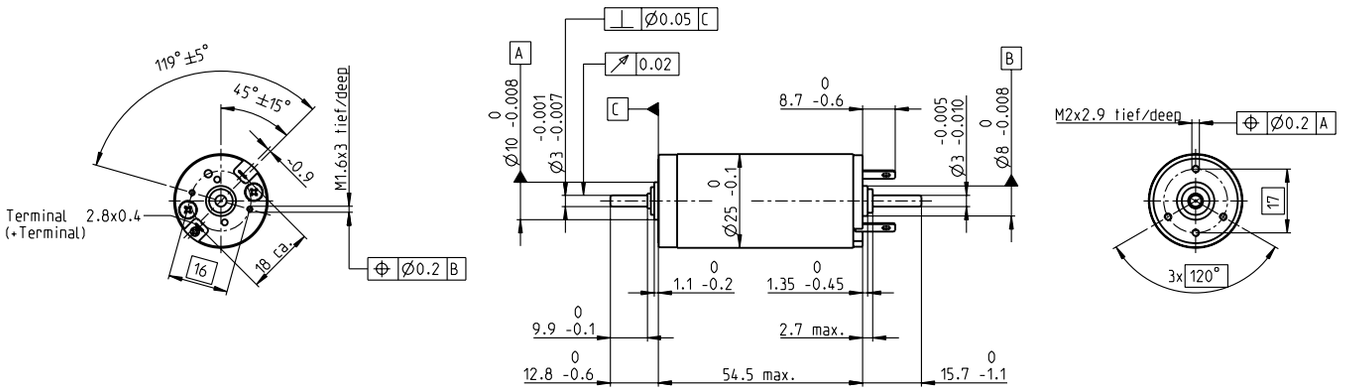
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 50/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
32 CPT,
2 / 3 channels
Page 351

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 353

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

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



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	118740	118741	118742	118743	118744	118745	118746	118747	118748
Motor Data									
Values at nominal voltage									
1 Nominal voltage V	4.5	8	9	12	15	18	24	32	48
2 No load speed rpm	5360	5320	5230	4850	4980	4790	5190	5510	5070
3 No load current mA	79.7	44.4	38.7	26.3	21.8	9.88	14.4	11.7	6.96
4 Nominal speed rpm	4980	4520	4220	3800	3920	3710	4130	4450	4000
5 Nominal torque (max. continuous torque) mNm	11.4	20.9	23.9	28.6	28.2	28.7	28	27.9	27.9
6 Nominal current (max. continuous current) A	1.5	1.5	1.5	1.24	1.01	0.811	0.652	0.516	0.317
7 Stall torque mNm	131	132	119	129	131	126	136	144	132
8 Stall current A	16.5	9.23	7.31	5.5	4.57	3.52	3.1	2.61	1.47
9 Max. efficiency %	87	87	86	87	87	90	87	87	87
Characteristics									
10 Terminal resistance Ω	0.273	0.867	1.23	2.18	3.28	5.11	7.73	12.3	32.6
11 Terminal inductance mH	0.0275	0.0882	0.115	0.238	0.353	0.551	0.832	1.31	3.48
12 Torque constant mNm/A	7.99	14.3	16.3	23.5	28.6	35.8	43.9	55.2	89.9
13 Speed constant rpm/V	1200	668	584	406	334	267	217	173	106
14 Speed / torque gradient rpm/mNm	40.9	40.5	44	37.7	38.3	38.2	38.3	38.5	38.6
15 Mechanical time constant ms	4.99	4.4	4.37	4.25	4.23	4.22	4.22	4.22	4.23
16 Rotor inertia gcm²	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)	64 N
	(static, shaft supported)	800 N
28	Max. radial load, 5 mm from flange	16 N

Other specifications

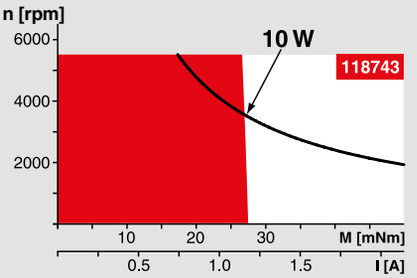
29	Number of pole pairs	1
30	Number of commutator segments	11
31	Weight of motor	130 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

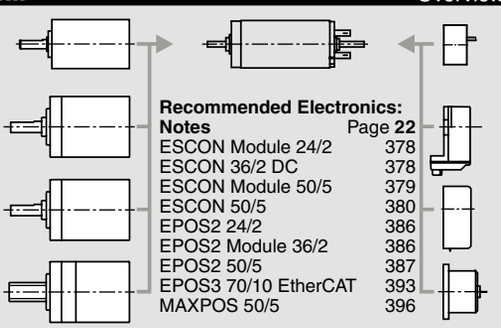
Overview on page 20–25

Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 312

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 50/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

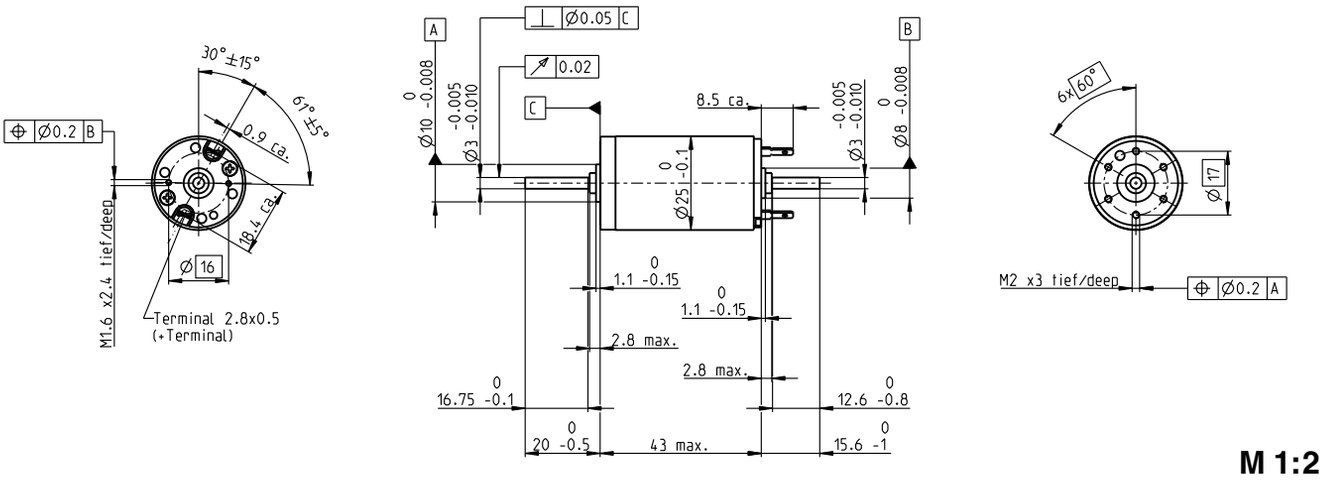
Encoder MR
128 - 1000 CPT,
3 channels
Page 355

Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder HED_ 5540
500 CPT,
3 channels
Page 362/364

DC-Tacho DCT
∅22 mm
0.52 V
Page 373

RE 25 ∅25 mm, Graphite Brushes, 20 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

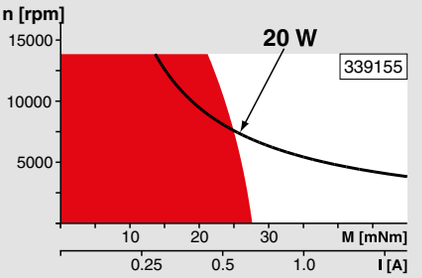
		302534	339149	339150	339151	339152	339153	339154	339155	339156	339157	339158
Motor Data												
	Values at nominal voltage											
1	Nominal voltage	V	7.2	9	12	18	24	30	36	48	48	48	48
2	No load speed	rpm	10500	9710	9620	10400	10900	9210	10100	9540	8450	6720	4650
3	No load current	mA	133	93.2	68.1	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	gcm²	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)	60 N
	(static, shaft supported)	1000 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 107.

Operating Range



Comments

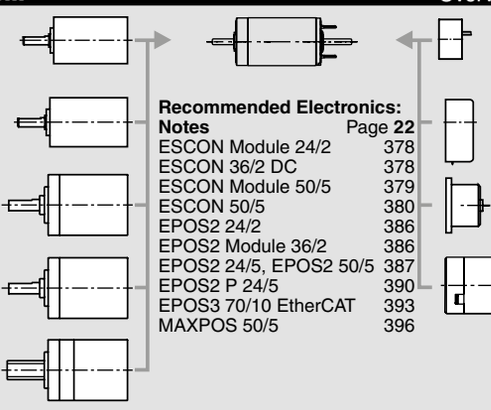
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅22 mm
0.5 Nm
Page 294

Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 312

Spindle Drive
∅32 mm
Page 334–336

Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

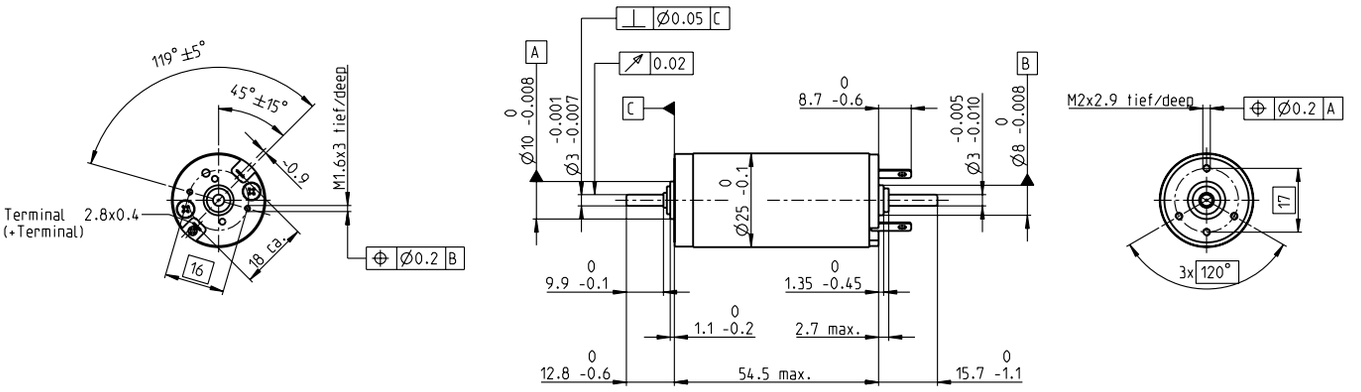
Encoder MR
128 - 1000 CPT,
3 channels
Page 355

Encoder HED_ 5540
500 CPT,
3 channels
Page 363/364

DC-Tacho DCT
∅22 mm
0.52 V
Page 373

Brake AB 28
24 VDC
0.4 Nm
Page 408

RE 25 ∅25 mm, Graphite Brushes, 20 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

according to dimensional drawing	118749	118750	118751	118752	118753	118754	118755	118756	118757
shaft length 15.7 shortened to 4 mm	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	gcm²	11.7	10.4	9.49	10.8	10.6	10.6	10.5	10.5	10.5

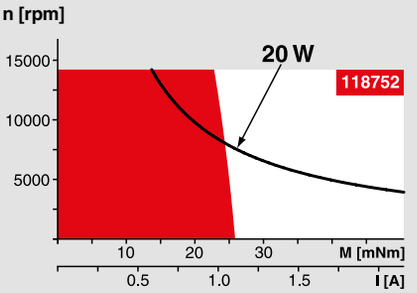
Specifications

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)	64 N
	(static, shaft supported)	800 N
28	Max. radial load, 5 mm from flange	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 107.

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

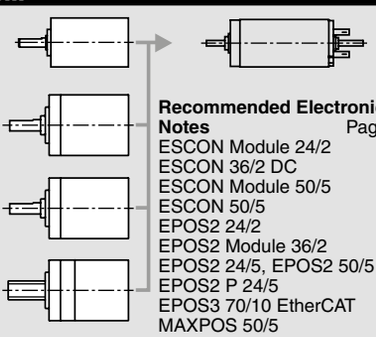
Overview on page 20–25

Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

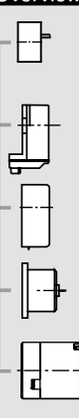
Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 312

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396



Encoder MR
128 - 1000 CPT,
3 channels
Page 355

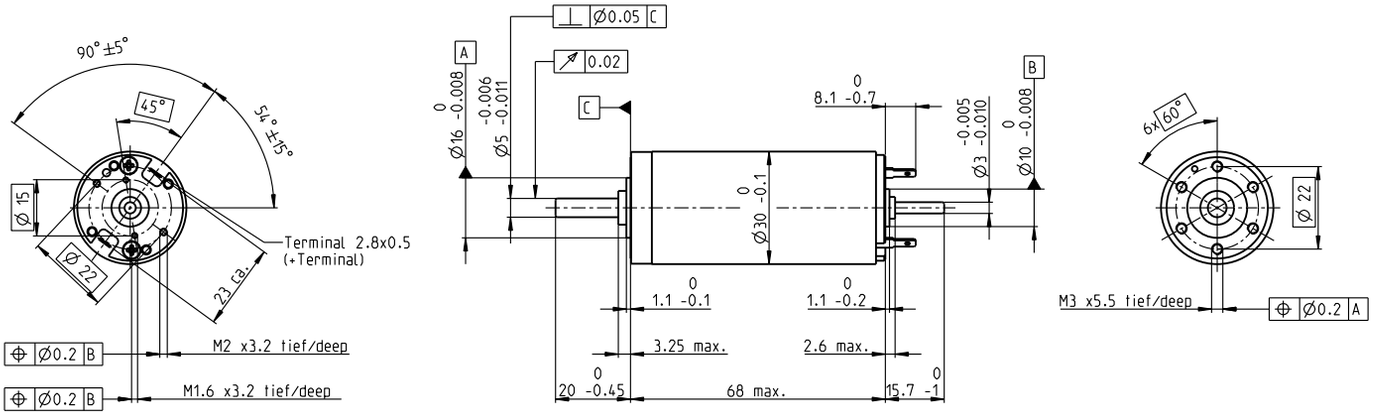
Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder HED_ 5540
500 CPT,
3 channels
Page 362/364

DC-Tacho DCT
∅22 mm
0.52 V
Page 373

Brake AB 28
24 VDC
0.4 Nm
Page 408

RE 30 ∅30 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 gcm²	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)	110 N
(static, shaft supported)	1200 N
28 Max. radial load, 5 mm from flange	28 N

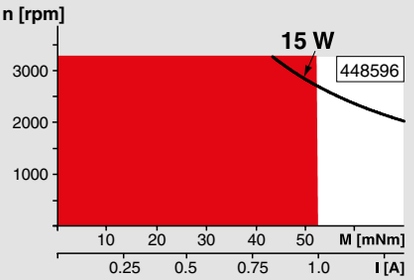
Other specifications

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

Values listed in the table are nominal.
Explanation of the figures on page 107.

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.

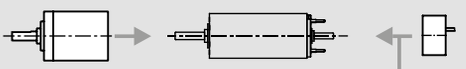
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 4.5 Nm
Page 305



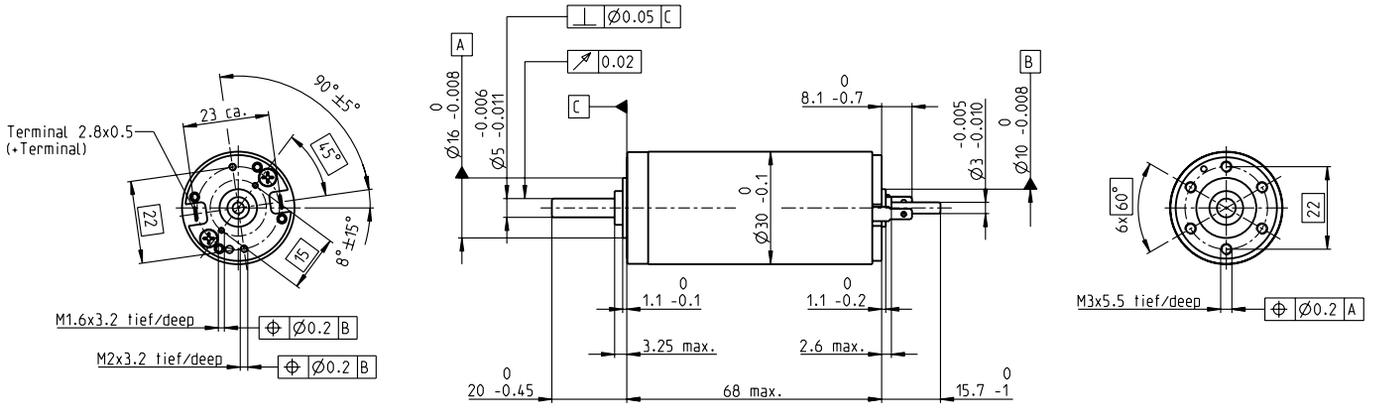
Encoder MR
256 - 1024 CPT,
3 channels
Page 356

Encoder HED_ 5540
500 CPT,
3 channels
Page 362/364

Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

RE 30 ∅30 mm, Graphite Brushes, 60 Watt



M 1:2

Stock program
Standard program
Special program (on request)

			Part Numbers						
	according to dimensional drawing		310005	310006	**310007**	310008	**310009**		
	shaft length 15.7 shortened to 8.7 mm		268193	268213	268214	268215	268216		
Motor Data									
	Values at nominal voltage								
1	Nominal voltage	V	12	18	24	36	48		
2	No load speed	rpm	8170	8590	8810	8590	8490		
3	No load current	mA	301	213	165	106	78.6		
4	Nominal speed	rpm	7630	7910	8050	7840	7760		
5	Nominal torque (max. continuous torque)	mNm	51.6	75.5	85.6	86.6	89.7		
6	Nominal current (max. continuous current)	A	4	4	3.47	2.28	1.74		
7	Stall torque	mNm	853	1000	1020	1000	1050		
8	Stall current	A	61.1	50.3	39.3	25.2	19.6		
9	Max. efficiency	%	85	87	87	87	88		
	Characteristics								
10	Terminal resistance	Ω	0.196	0.358	0.611	1.43	2.45		
11	Terminal inductance	mH	0.034	0.07	0.119	0.281	0.513		
12	Torque constant	mNm/A	13.9	19.9	25.9	39.8	53.8		
13	Speed constant	rpm/V	685	479	369	240	178		
14	Speed / torque gradient	rpm/mNm	9.64	8.61	8.7	8.61	8.09		
15	Mechanical time constant	ms	3.4	3.24	3.05	2.98	2.94		
16	Rotor inertia	gcm²	33.7	35.9	33.5	33.1	34.7		

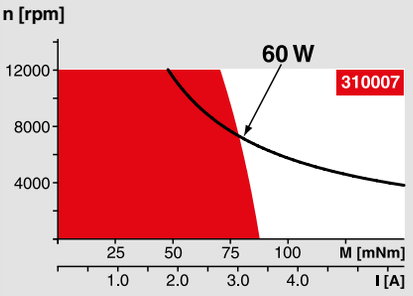
Specifications

	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)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	260 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

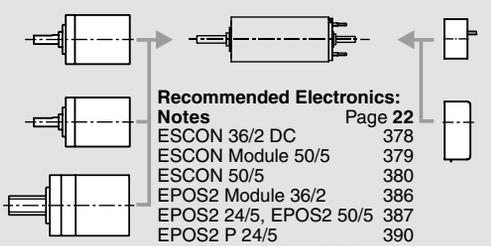
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303–309

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 312

Spindle Drive
∅32 mm
Page 334–336



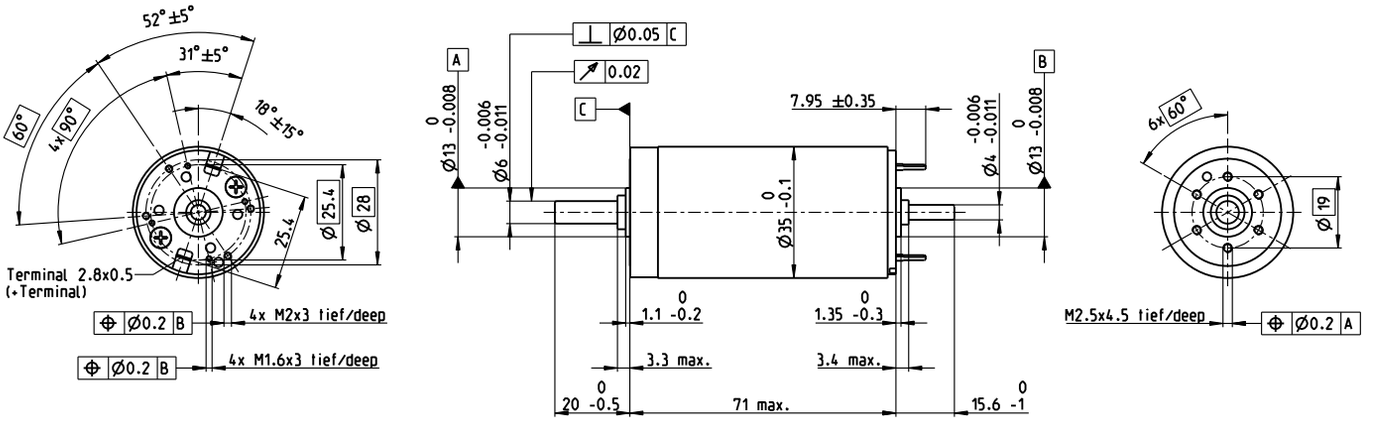
Recommended Electronics:

Notes	Page 22
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
256 - 1024 CPT,
3 channels
Page 356

Encoder HED_ 5540
500 CPT,
3 channels
Page 362/364

RE 35 ∅35 mm, Graphite Brushes, 90 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

according to dimensional drawing	273752	323890	273753	273754	273755	273756	273757	273758	273759	273760	273761	273762	273763	
shaft length 15.6 shortened to 4 mm	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
2 No load speed	rpm	7180	7740	7270	7560	7300	6670	5980	4760	3820	3140	2580	2110	1630
3 No load current	mA	247	169	124	92.9	77.5	68.8	59.8	44.8	34.2	27.2	21.6	17.2	13
4 Nominal speed	rpm	6500	7000	6490	6820	6530	5890	5180	3940	2990	2290	1720	1230	736
5 Nominal torque (max. continuous torque)	mNm	73.1	101	97.2	101	99.4	101	101	104	106	106	106	105	105
6 Nominal current (max. continuous current)	A	4	3.62	2.62	2.02	1.67	1.55	1.39	1.14	0.928	0.761	0.626	0.507	0.393
7 Stall torque	mNm	929	1200	973	1080	980	890	776	620	498	398	322	255	196
8 Stall current	A	47.8	41.1	25	20.7	15.8	13.1	10.2	6.5	4.2	2.76	1.84	1.19	0.708
9 Max. efficiency	%	83	86	85	86	86	85	85	84	82	81	79	77	74
Characteristics														
10 Terminal resistance	Ω	0.314	0.583	1.2	2.03	3.05	3.67	4.69	7.38	11.4	17.4	26	40.2	67.8
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	7.93	6.55	7.57	7.05	7.52	7.57	7.79	7.77	7.76	8.01	8.13	8.4	8.49
15 Mechanical time constant	ms	5.65	5.44	5.4	5.35	5.34	5.35	5.35	5.36	5.36	5.37	5.38	5.39	5.41
16 Rotor inertia	gcm²	68.1	79.2	68.1	72.5	67.9	67.4	65.6	65.9	65.9	64	63.2	61.2	60.8

Specifications

Thermal data

17	Thermal resistance housing-ambient	6.2 K/W
18	Thermal resistance winding-housing	2.0 K/W
19	Thermal time constant winding	30.2 s
20	Thermal time constant motor	644 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)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N

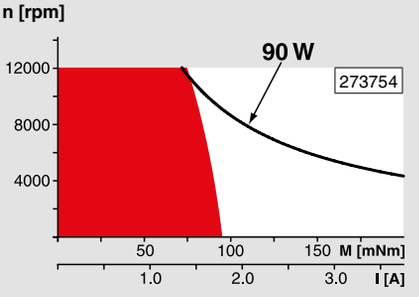
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	340 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Hollow shaft as special design
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

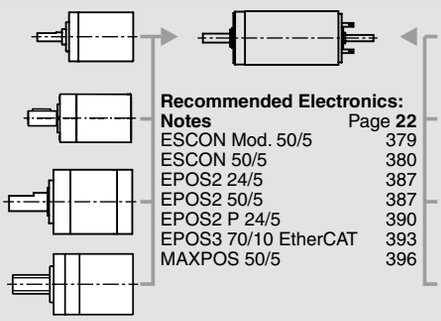
Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303–309

Planetary Gearhead
∅32 mm
4.0 - 8.0 Nm
Page 310

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 314

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Mod. 50/5	379
ESCON 50/5	380
EPOS2 24/5	387
EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
256 - 1024 CPT,
3 channels
Page 356

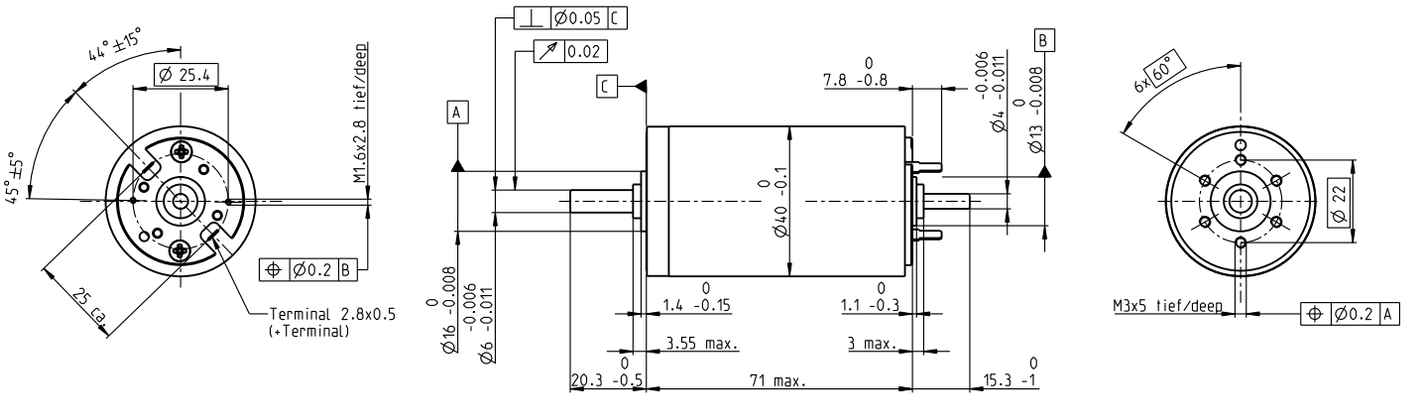
Encoder HED_ 5540
500 CPT,
3 channels
Page 362/364

DC-Tacho DCT
∅22 mm
0.52 V
Page 373

Brake AB 28
24 VDC
0.4 Nm
Page 408

End cap
Page 413

RE 40 ∅40 mm, Precious Metal Brushes, 25 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	448588	448589	448590	448591	448592
Motor Data (provisional)					
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	2610	2600	2480	2640	2410
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 gcm²	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)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N

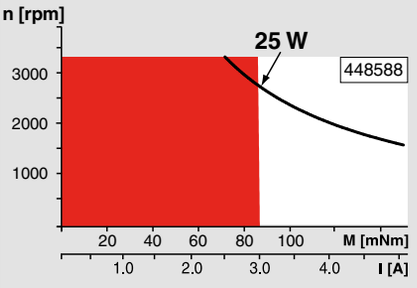
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	480 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Preloaded ball bearings

Operating Range



Comments

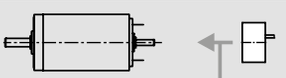
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



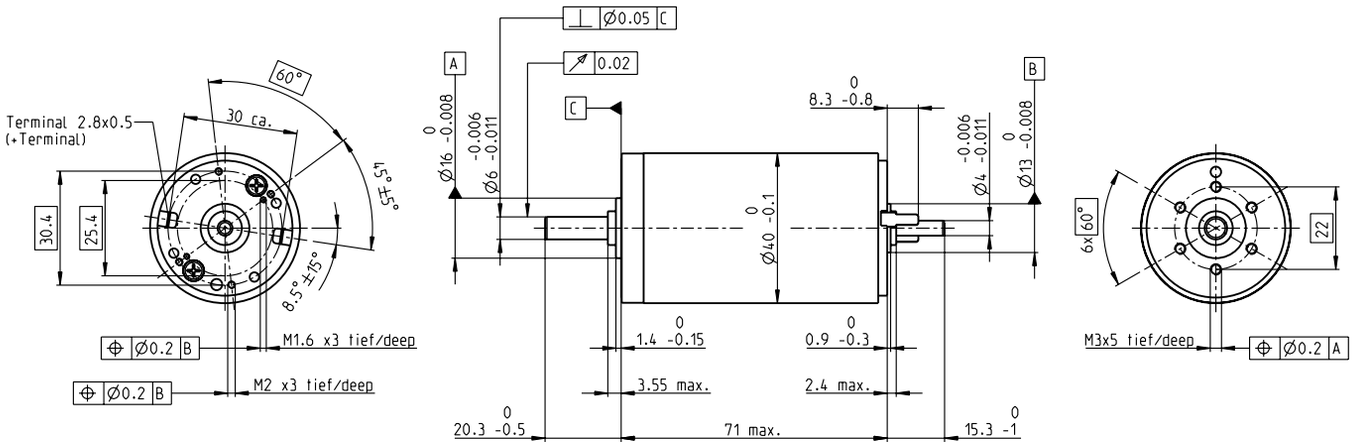
Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
256 - 1024 CPT,
3 channels
Page 356

Encoder HED_ 5540
500 CPT,
3 channels
Page 362/365

RE 40 ∅40 mm, Graphite Brushes, 150 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

	148866	148867	148877	218008	218009	218010	218011	218012	218013	218014
Motor Data										
Values at nominal voltage										
1 Nominal voltage V	12	24	48	48	48	48	48	48	48	48
2 No load speed rpm	6920	7580	7590	6420	5560	3330	2690	2130	1720	1420
3 No load current mA	241	137	68.6	53.7	43.7	21.9	16.6	12.5	9.66	7.76
4 Nominal speed rpm	6370	6930	7000	5810	4920	2700	2050	1500	1080	774
5 Nominal torque (max. continuous torque) mNm	94.9	170	187	183	177	187	187	189	189	188
6 Nominal current (max. continuous current) A	6	5.77	3.17	2.62	2.2	1.38	1.12	0.898	0.721	0.593
7 Stall torque mNm	1680	2280	2560	1990	1580	995	796	641	512	415
8 Stall current A	102	75.7	42.4	28	19.2	7.26	4.68	3	1.92	1.29
9 Max. efficiency %	88	91	92	91	91	89	88	88	86	85
Characteristics										
10 Terminal resistance Ω	0.117	0.316	1.13	1.72	2.24	6.61	10.2	16	24.9	37.1
11 Terminal inductance mH	0.025	0.082	0.329	0.46	0.612	1.7	2.62	4.14	6.4	9.31
12 Torque constant mNm/A	16.4	30.2	60.3	71.3	82.2	137	170	214	266	321
13 Speed constant rpm/V	581	317	158	134	116	69.7	56.2	44.7	35.9	29.8
14 Speed / torque gradient rpm/mNm	4.15	3.33	3.04	3.23	3.53	3.36	3.39	3.35	3.37	3.44
15 Mechanical time constant ms	6.03	4.67	4.28	4.2	4.19	4.16	4.15	4.15	4.15	4.16
16 Rotor inertia gcm²	140	139	139	130	118	123	122	124	123	120

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	736 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)	110 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	28 N

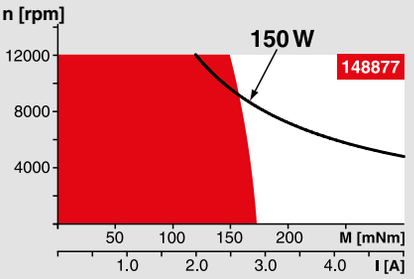
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	480 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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).

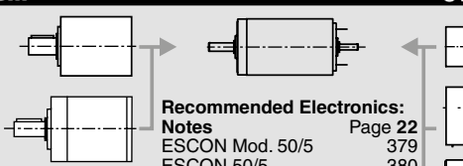
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 314

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 318



Recommended Electronics:

Notes	Page 22
ESCON Mod. 50/5	379
ESCON 50/5	380
ESCON 70/10	380
EPOS2 24/5	387
EPOS2 50/5	387
EPOS2 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
256 - 1024 CPT,
3 channels
Page 356

Encoder HED_ 5540
500 CPT,
3 channels
Page 362/365

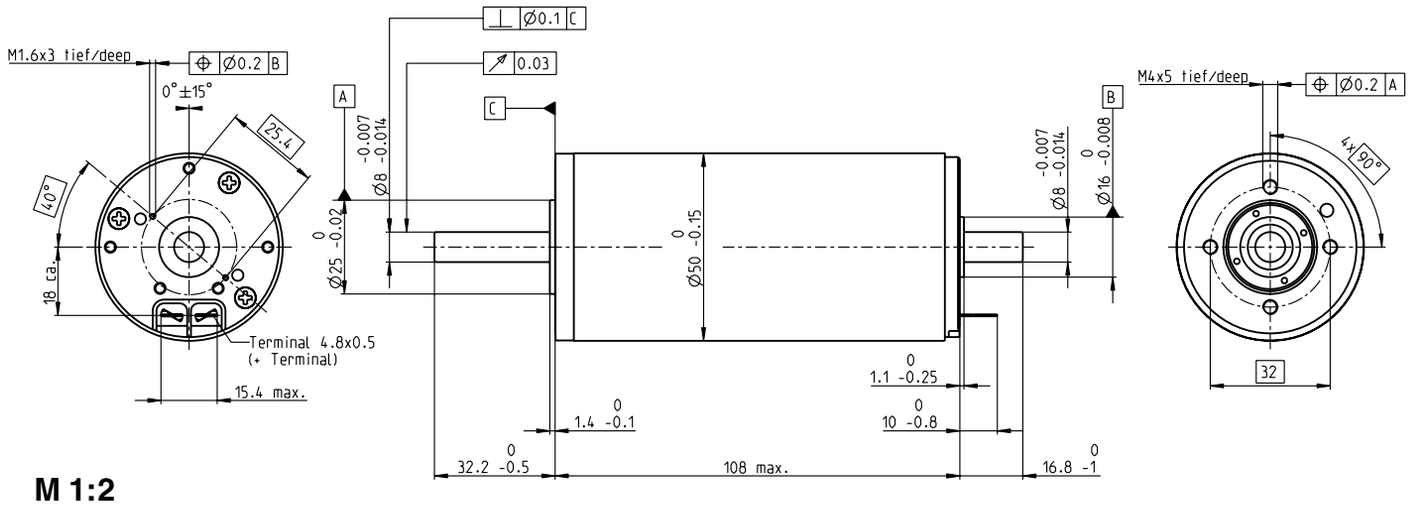
Brake AB 28
24 VDC
0.4 Nm
Page 408

Industrial Version
Encoder HEDL 9140
Page 368

Brake AB 28
Page 409

End cap
Page 413

RE 50 ∅50 mm, Graphite Brushes, 200 Watt



M 1:2

Stock program
Standard program
Special program (on request)

			Part Numbers			
			370354	370355	370356	370357
	Industrial Version IP54*		389089	389090	389091	389092
Motor Data						
	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	gcm²	536	560	542	560

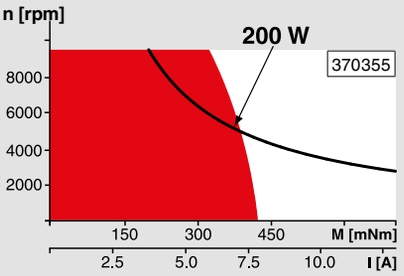
Specifications

	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)		150 N
	(static, shaft supported)		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 107.

* 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 20–25

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 318

Planetary Gearhead
∅62 mm
8 - 50 Nm
Page 320

Recommended Electronics:

Notes	Page 22
ESCON Mod. 50/5	379
ESCON 50/5	380
ESCON 70/10	380
EPOS2 50/5	387
EPOS2 70/10	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder HEDS 5540
500 CPT,
3 channels
Page 363

Encoder HEDL 5540
500 CPT,
3 channels
Page 365

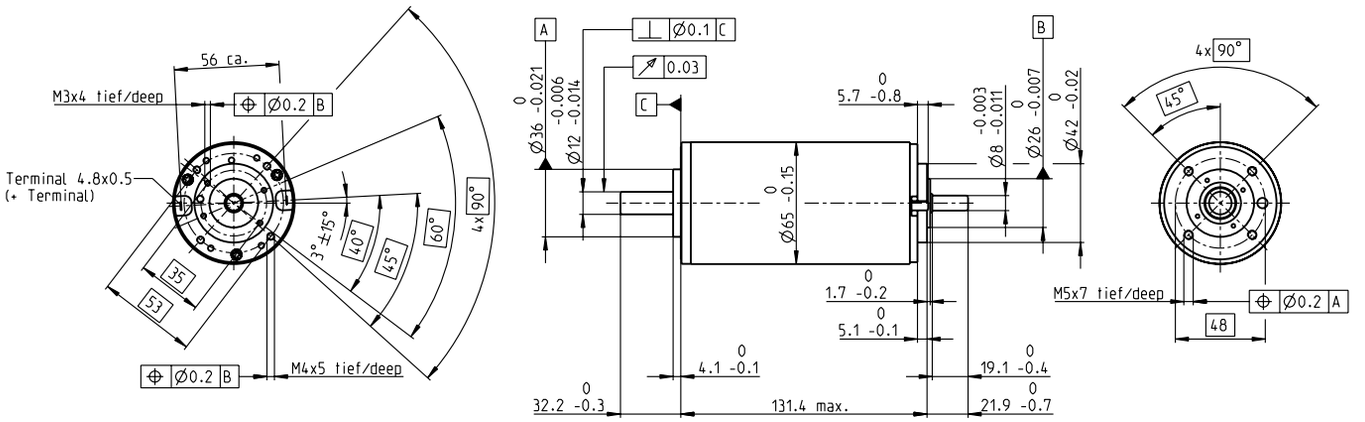
Industrial Version IP54*

Encoder HEDL 9140
Page 369

Brake AB 44
Page 412

End cap
Page 413

RE 65 ∅65 mm, Graphite Brushes, 250 Watt



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers

	353294	**353295**	353296	**353297**	353298	353299	353300	353301
Industrial Version IP54*	388984	388985	388986	388987	388988	388989	388990	388991

Motor Data

	Values at nominal voltage										
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										
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/Nm	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	gcm²	1380	1290	1380	1340	1320	1310	1280	1340	

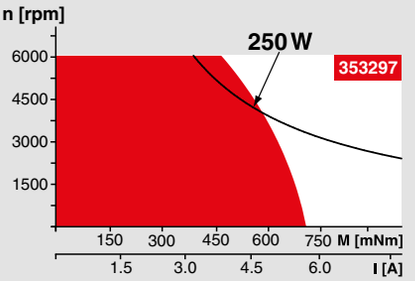
Specifications

	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
26	Max. axial load (dynamic)		70 N
27	Max. force for press fits (static)		420 N
	(static, shaft supported)		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 107.

* 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.

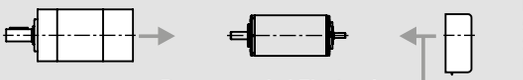
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅81 mm
20 - 120 Nm
Page 321



Recommended Electronics:

Notes	Page **22**
ESCON Mod. 50/5	379
ESCON 50/5	380
ESCON 70/10	380
EPOS2 50/5	387
EPOS2 70/10	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder HEDS 5540
500 CPT,
3 channels
Page 363
Encoder HEDL 5540
500 CPT,
3 channels
Page 365
Industrial Version IP54*
Encoder HEDL 9140
Page 369
Brake AB 44
Page 412
End cap
Page 413

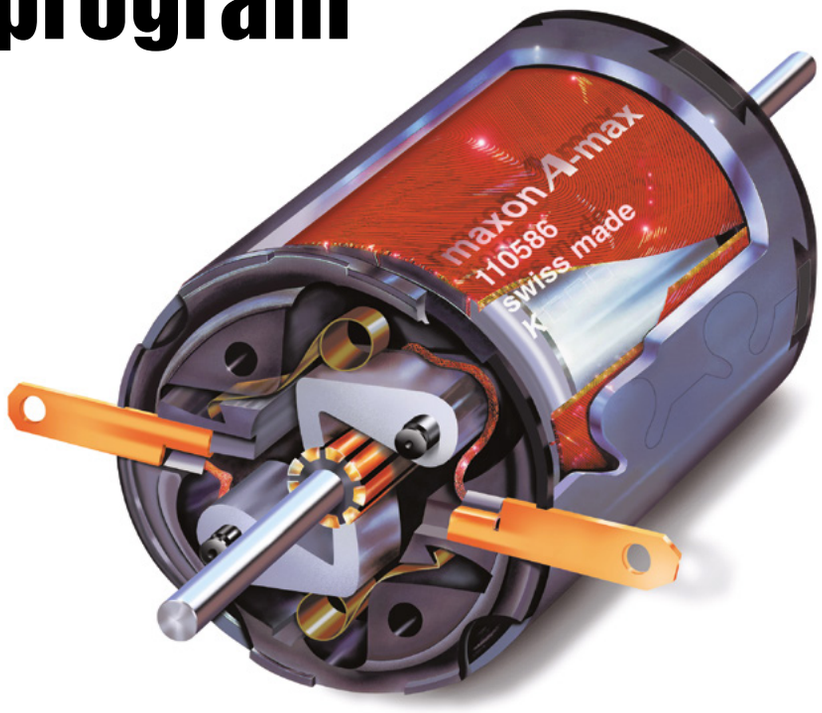
maxon A-max

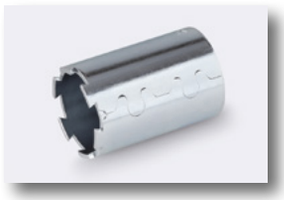
maxon A-max

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

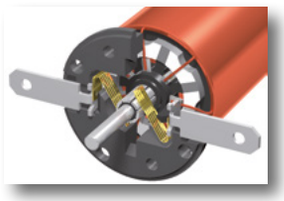
maxon A-max program

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.



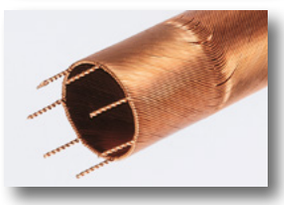
Power leads or AMP-compatible terminals. Save strain relieve on power leads.

Elimination of a C-Clip groove results in higher torsional stability and greater cross-sectional strength.

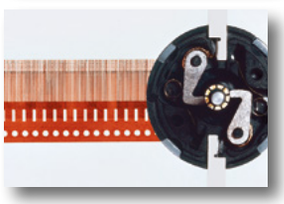
Reduced-diameter commutator, employing more segments, provides longer life.

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 polyphtalamide plastic (PPA), impact-resistant, heat-resistant up to 125°C and noise absorbing.

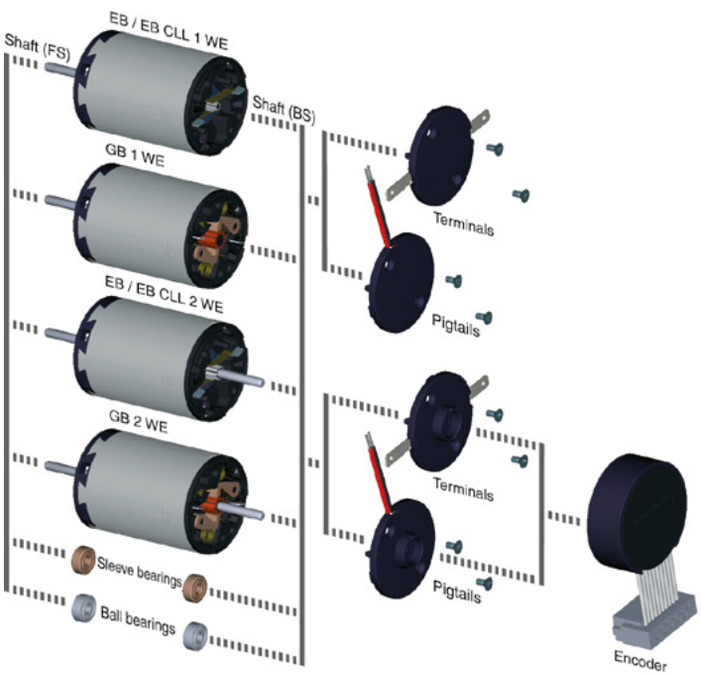


Proven winding technology provides a high-performance relationship between the coil and magnet system.



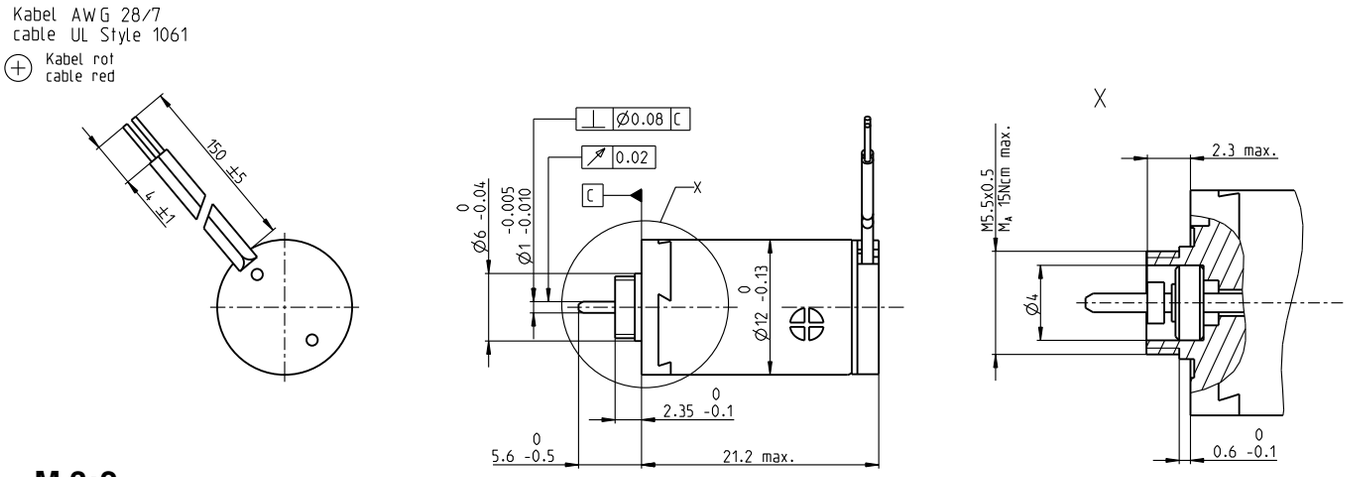
Graphite brushes for the most demanding tasks. 4-, 5- or 7-fingered precious metal brushes for fine rotary motions.

Modular construction of the A-max program



X = Standard X = Option	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
Precious Metal Brushes (EB)				x	x	x	x	x	x	x	x		
Precious Metal Brushes (EB) and CLL		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
Ball Bearings		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
Shaft flange side (FS)	min.	4.5	4.5	4.5	4.5	5.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0
	max.	10.0	10.0	15.0	15.0	27.4	27.4	25.0	25.0	27.0	27.0	27.0	27.0
Shaft brush side (BS)	min.		2.6		2.6		2.6		2.6		2.6		3.0
	max.		9.4		10.0		16.6		16.0		16.0		19.3

A-max 12 ∅12 mm, Precious Metal Brushes CLL, 0.75 Watt



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 gcm²	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	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

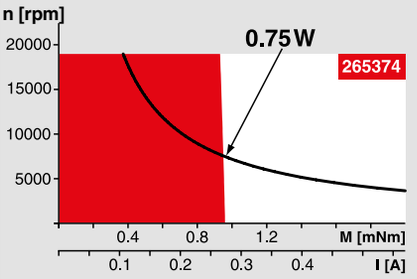
Other specifications

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 107.

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

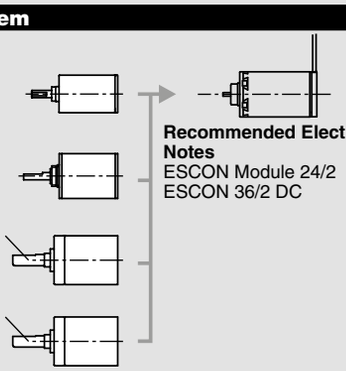
Overview on page 20–25

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 276

Spur Gearhead
∅12 mm
0.01 - 0.03 Nm
Page 277

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

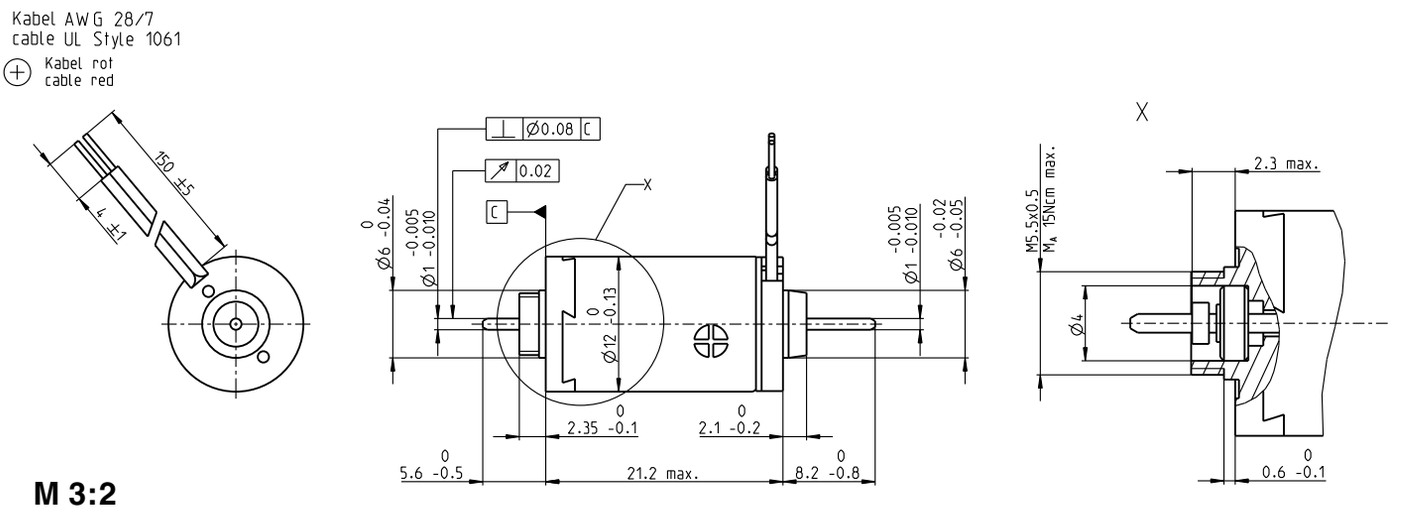
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378

A-max 12 ∅12 mm, Precious Metal Brushes CLL, 0.5 Watt



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						
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							
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	gcm²	0.218	0.246	0.241	0.238	0.235	0.183

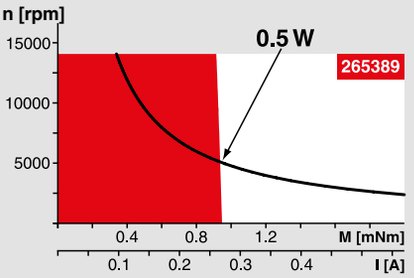
Specifications

	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)	15 N
	(static, shaft supported)	70 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	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 107.

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

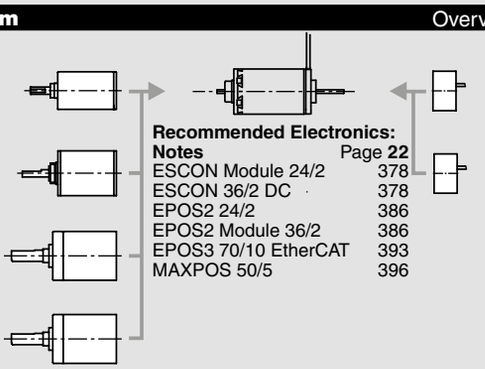
Overview on page 20–25

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 276

Spur Gearhead
∅12 mm
0.01 - 0.03 Nm
Page 277

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279



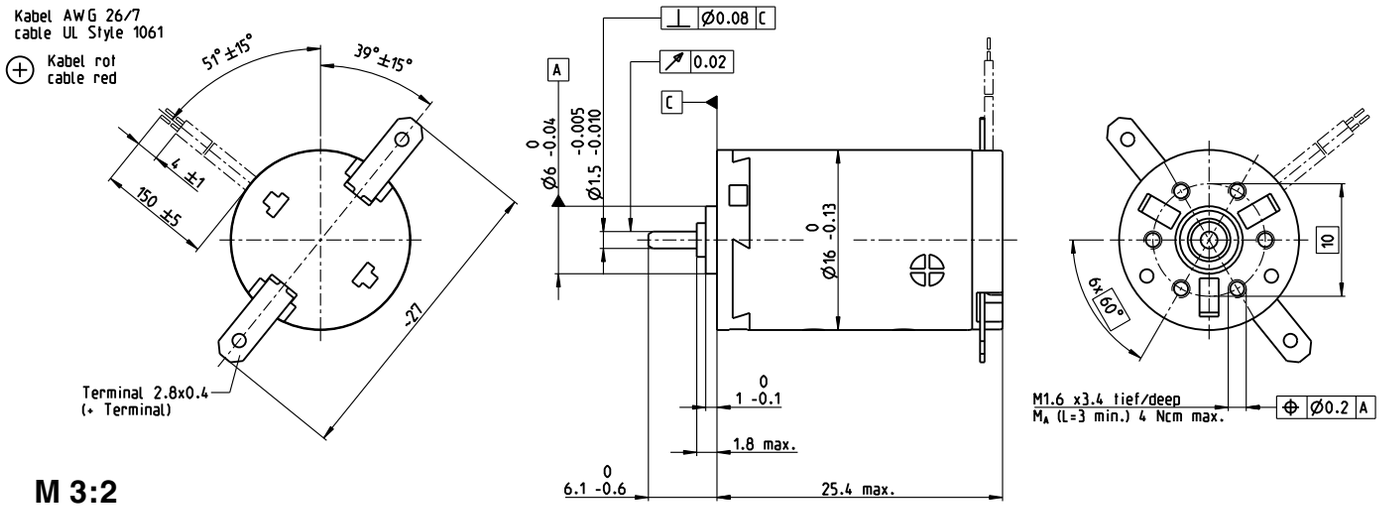
Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349

A-max 16 ∅16 mm, Precious Metal Brushes CLL, 2 Watt



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	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	gcm²	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793

Specifications

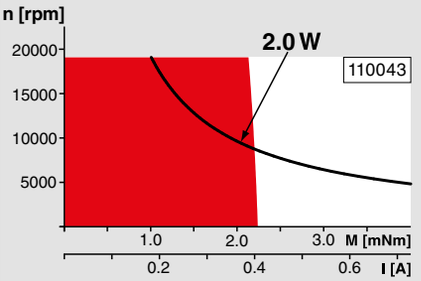
	Thermal data	
17	Thermal resistance housing-ambient	29.8 K/W
18	Thermal resistance winding-housing	5.5 K/W
19	Thermal time constant winding	3.55 s
20	Thermal time constant motor	165 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	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 107.

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

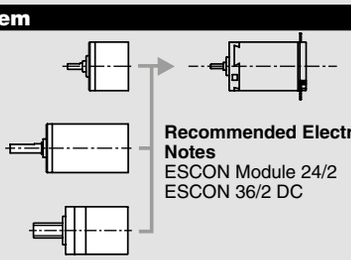
maxon Modular System

Overview on page 20–25

Spur Gearhead
∅16 mm
0.01 - 0.1 Nm
Page 281–284

Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 285/286

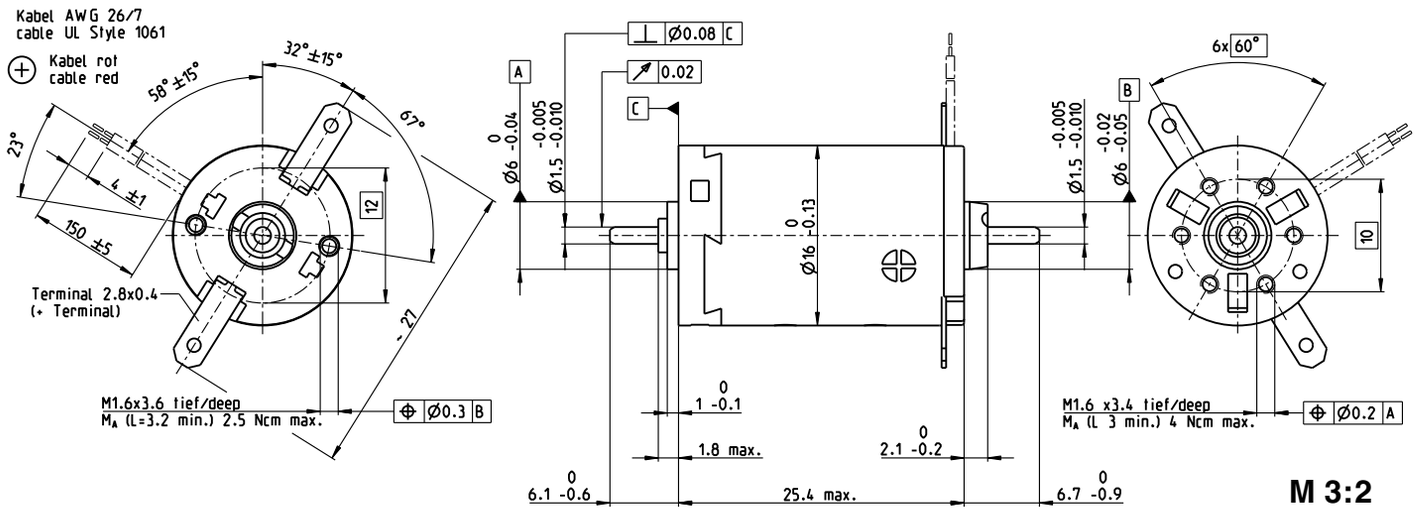
Spindle Drive
∅16 mm
Page 329–331



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

A-max 16 ∅16 mm, Precious Metal Brushes CLL, 1.2 Watt



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	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	gcm²	1.06	0.818	0.866	0.857	0.847	0.857	0.85	0.836	0.814	0.791

Specifications

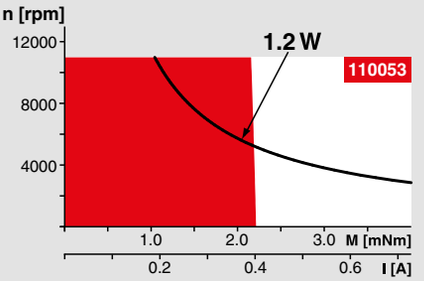
	Thermal data	
17	Thermal resistance housing-ambient	29.8 K/W
18	Thermal resistance winding-housing	5.5 K/W
19	Thermal time constant winding	3.55 s
20	Thermal time constant motor	165 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	11000 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
	(static, shaft supported)	280 N
28	Max. radial load, 5 mm from flange	1.4 N
	Mechanical data (ball bearings)	
23	Max. speed	11000 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
	(static, shaft supported)	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

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

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 20–25

Spur Gearhead
∅16 mm
0.01 - 0.1 Nm
Page 281–284

Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 285/286

Spindle Drive
∅16 mm
Page 329–331

Recommended Electronics:

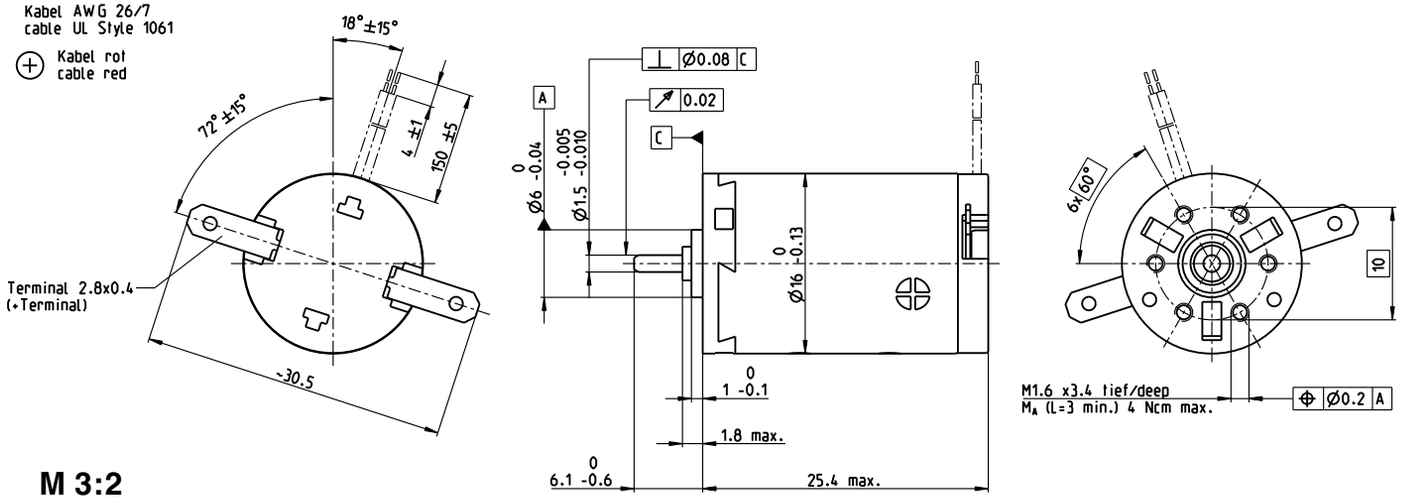
Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
32 CPT,
2 / 3 channels
Page 351

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 353

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

maxon A-max 16 ∅16 mm, Graphite Brushes, 2 Watt



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	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	gcm²	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793

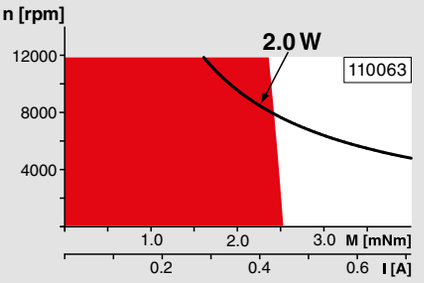
Specifications

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

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

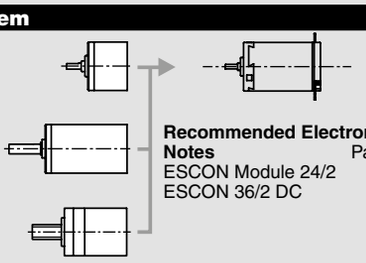
maxon Modular System

Overview on page 20–25

Spur Gearhead
∅16 mm
0.01 - 0.1 Nm
Page 281–284

Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 285/286

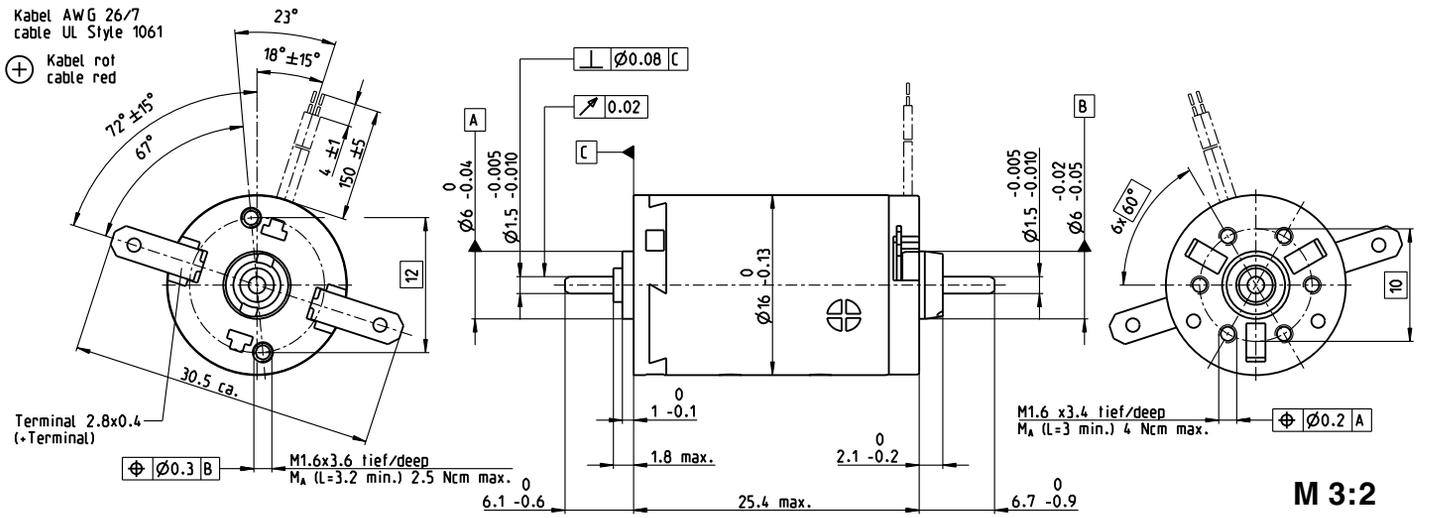
Spindle Drive
∅16 mm
Page 329–331



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

A-max 16 ∅16 mm, Graphite Brushes, 2 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

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

Motor Data

	Values at nominal voltage										
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	gcm²	1.06	0.82	0.868	0.859	0.849	0.859	0.852	0.838	0.816	0.793

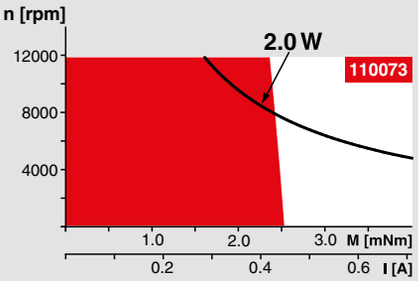
Specifications

	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
	(static, shaft supported)	280 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
	(static, shaft supported)	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 107.

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 20–25

Spur Gearhead
∅16 mm
0.01 - 0.1 Nm
Page 281–284

Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 285/286

Spindle Drive
∅16 mm
Page 329–331

Recommended Electronics:

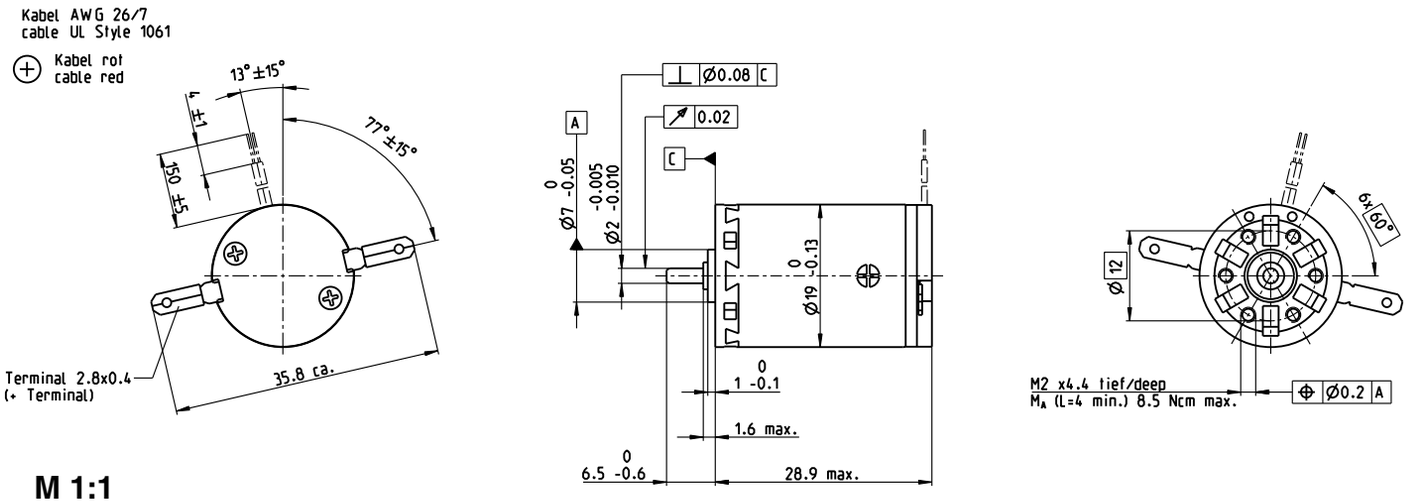
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
32 CPT,
2 / 3 channels
Page 351

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 353

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

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



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110081	110082	110083	**110084**	110085	110086	**110087**	110088	110089
with cables	139828	202411	352922	202412	352923	233453	238388	267427	235373

Motor Data

	Values at nominal voltage									
1	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	gcm²	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

Specifications

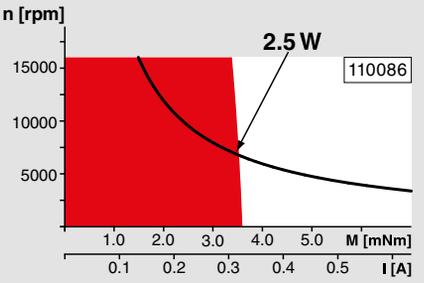
	Thermal data	
17	Thermal resistance housing-ambient	21.3 K/W
18	Thermal resistance winding-housing	10.5 K/W
19	Thermal time constant winding	11 s
20	Thermal time constant motor	201 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16000 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 107.

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

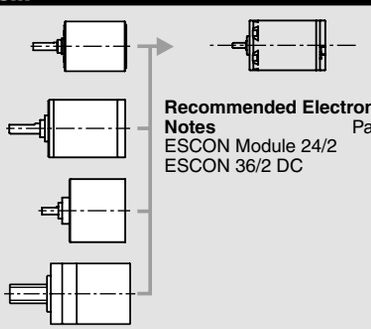
Overview on page 20–25

Planetary Gearhead
∅19 mm
0.1 - 0.3 Nm
Page 288

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/295

Spur Gearhead
∅24 mm
0.1 Nm
Page 300

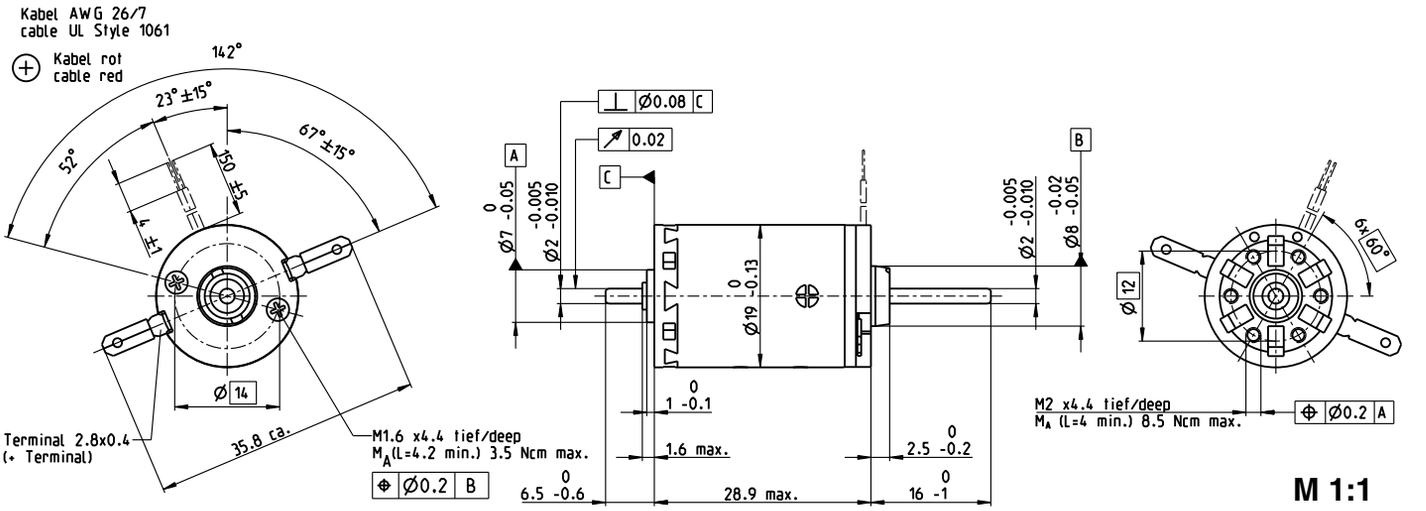
Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

A-max 19 ∅19 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	gcm²	2.54	2.08	2.18	2.15	2.17	2.09	2.09	2.06	1.99

Specifications

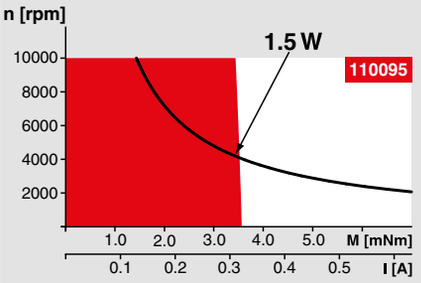
	Thermal data	
17	Thermal resistance housing-ambient	21.3 K/W
18	Thermal resistance winding-housing	10.5 K/W
19	Thermal time constant winding	11 s
20	Thermal time constant motor	201 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	10000 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)	80 N
	(static, shaft supported)	440 N
28	Max. radial load, 5 mm from flange	2.7 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)	45 N
	(static, shaft supported)	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 107.

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

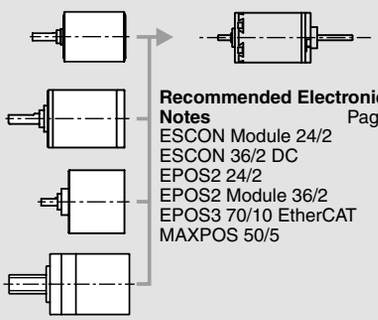
Overview on page 20–25

Planetary Gearhead
∅19 mm
0.1 - 0.3 Nm
Page 288

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/295

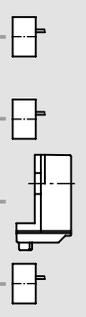
Spur Gearhead
∅24 mm
0.1 Nm
Page 300

Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396



Encoder MR
32 CPT,
2 / 3 channels
Page 351

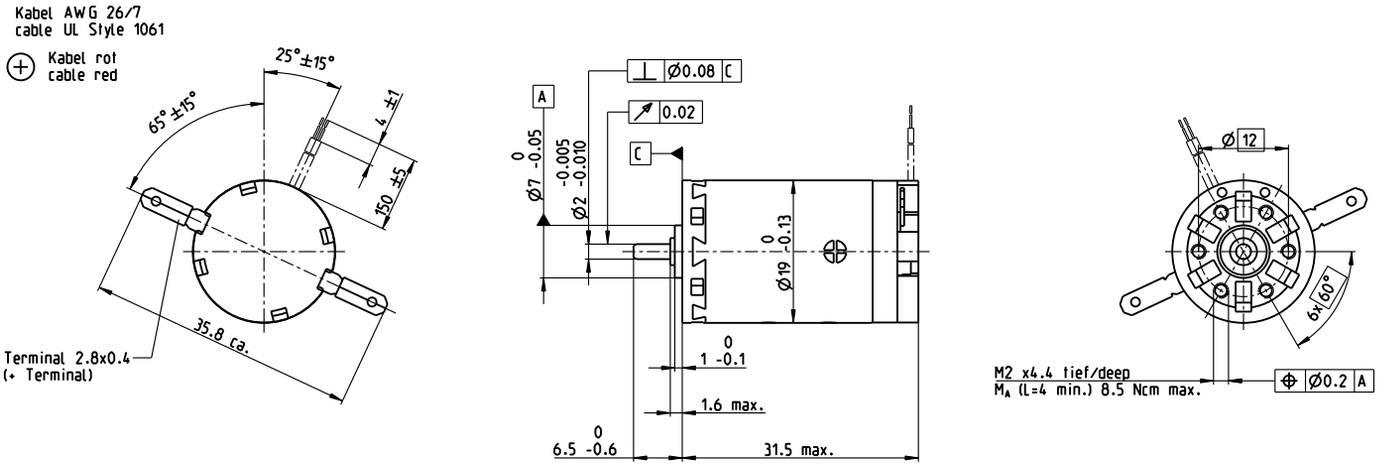
Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 353

Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

maxon A-max

A-max 19 ∅19 mm, Graphite Brushes, 2.5 Watt



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									
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	gcm²	2.57	2.1	2.21	2.17	2.2	2.12	2.12	2.09	2.02

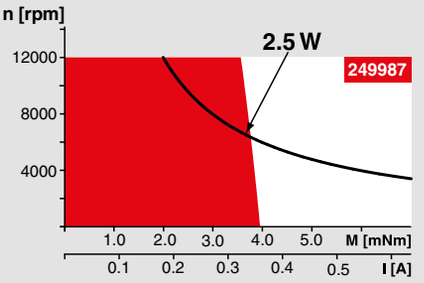
Specifications

	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 107.

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

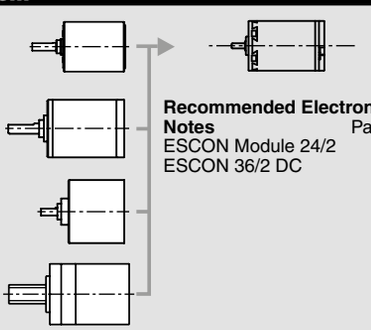
Overview on page 20–25

Planetary Gearhead
∅19 mm
0.1 - 0.3 Nm
Page 288

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/295

Spur Gearhead
∅24 mm
0.1 Nm
Page 300

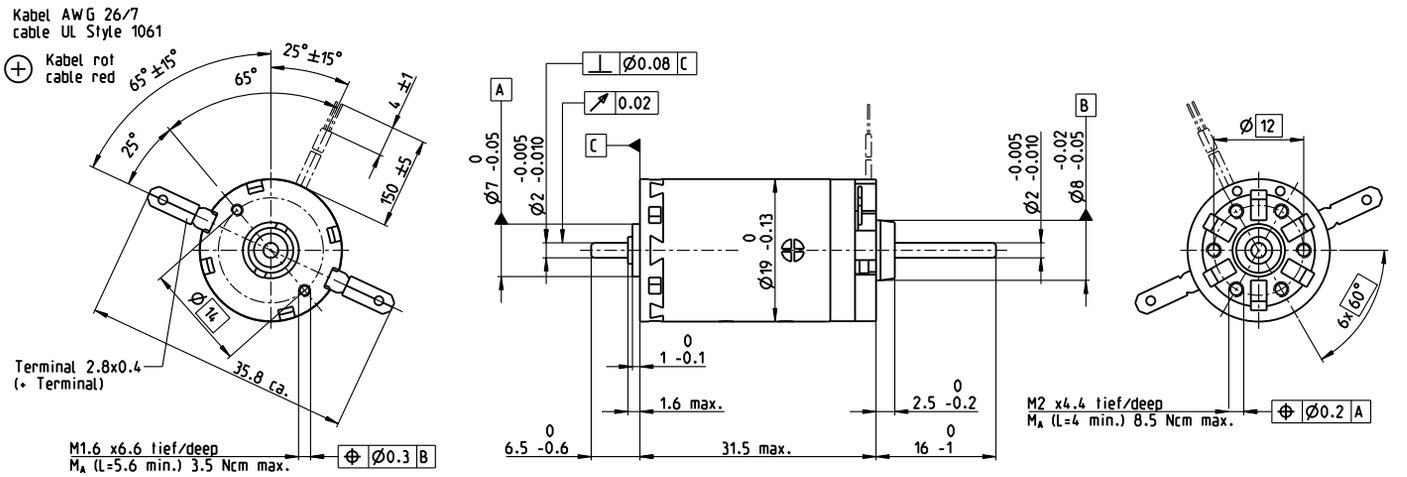
Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

A-max 19 ∅19 mm, Graphite Brushes, 2.5 Watt



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									
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	gcm²	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

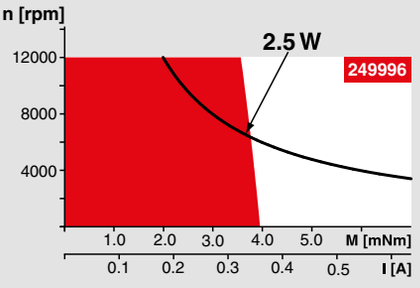
Specifications

	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)	80 N
	(static, shaft supported)	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)	45 N
	(static, shaft supported)	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 107.

Option
Ball bearings in place of sleeve bearings

Operating Range



Comments

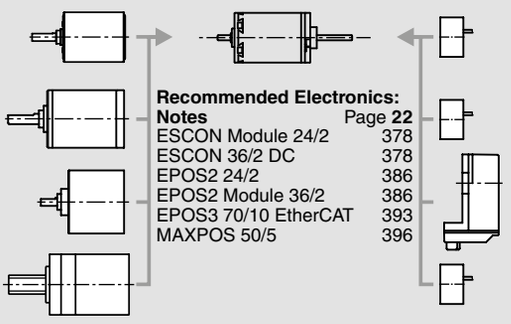
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅19 mm
0.1 - 0.3 Nm
Page 288

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/295

Spur Gearhead
∅24 mm
0.1 Nm
Page 300

Spindle Drive
∅22 mm
Page 332/333

Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

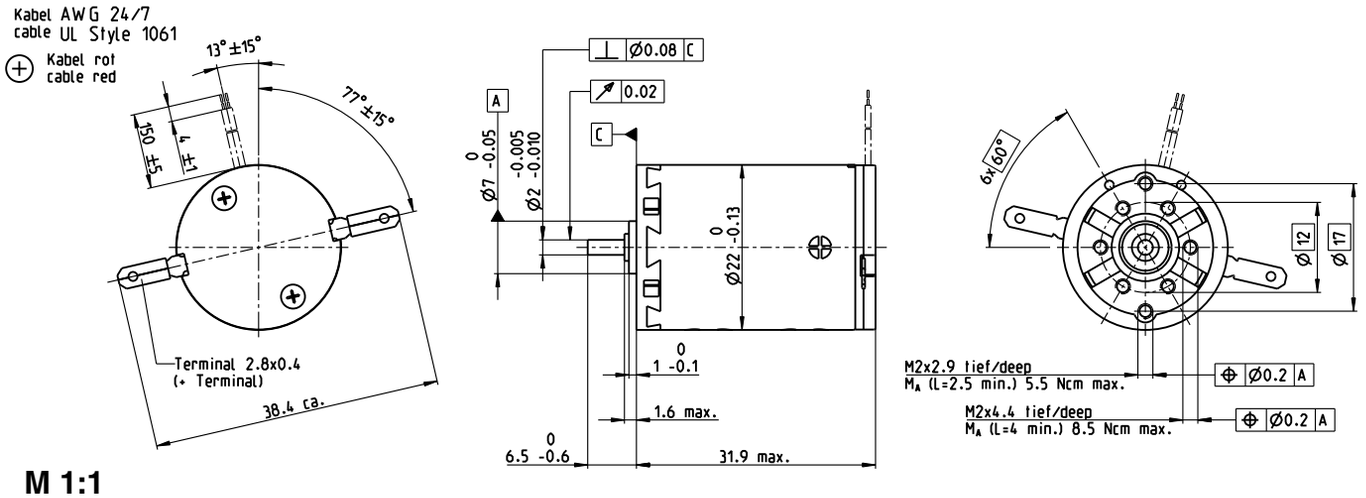
Encoder MR
32 CPT,
2 / 3 channels
Page 351

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 353

Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 371

A-max 22 ∅22 mm, Precious Metal Brushes CLL, 5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110117	110119	110120	**110121**	110122	110123	110124	**110125**	110126	110127	**110128**	110129
with cables	139838	218799	238798	202413	258367	137255	134267	134666	267423	137476	310003	342390

Motor Data

	Values at nominal voltage													
1	Nominal voltage	V	6	9	9	12	12	15	18	24	30	36	48	48
2	No load speed	rpm	9630	9970	8760	10400	9400	10300	9970	10700	10800	9800	9280	8370
3	No load current	mA	29.5	20.8	16.8	16.8	14.2	13.1	10.4	8.81	7.18	5.06	3.47	2.93
4	Nominal speed	rpm	7390	7300	6100	7770	6700	7530	7220	7970	8070	7000	6420	5520
5	Nominal torque (max. continuous torque)	mNm	4.81	6.22	6.3	6.24	6.18	6.1	6.05	6.02	5.98	5.94	5.83	5.9
6	Nominal current (max. continuous current)	A	0.84	0.745	0.661	0.586	0.523	0.451	0.362	0.291	0.234	0.175	0.122	0.111
7	Stall torque	mNm	20.1	22.9	20.5	24.3	21.4	22.9	22	23.5	23.5	20.8	19	17.4
8	Stall current	A	3.42	2.68	2.11	2.23	1.77	1.65	1.28	1.11	0.894	0.599	0.387	0.32
9	Max. efficiency	%	83	84	83	84	83	83	83	83	83	83	82	82
	Characteristics													
10	Terminal resistance	Ω	1.76	3.36	4.27	5.39	6.78	9.07	14	21.6	33.5	60.1	124	150
11	Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.584	0.89	1.37	2.1	3.68	7.29	8.95
12	Torque constant	mNm/A	5.9	8.55	9.73	10.9	12.1	13.9	17.1	21.2	26.2	34.8	48.9	54.3
13	Speed constant	rpm/V	1620	1120	981	875	790	689	558	450	364	274	195	176
14	Speed / torque gradient	rpm/mNm	482	438	430	432	443	451	458	459	465	474	494	486
15	Mechanical time constant	ms	20.5	19.8	19.7	19.7	19.8	20.2	20.1	20.2	20.3	20.3	20.5	20.4
16	Rotor inertia	gcm²	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

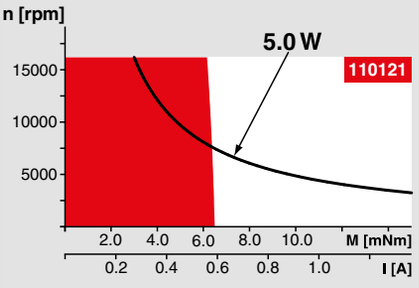
	Thermal data	
17	Thermal resistance housing-ambient	20 K/W
18	Thermal resistance winding-housing	6.0 K/W
19	Thermal time constant winding	10.2 s
20	Thermal time constant motor	313 s
21	Ambient temperatureC	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	16000 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 107.

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

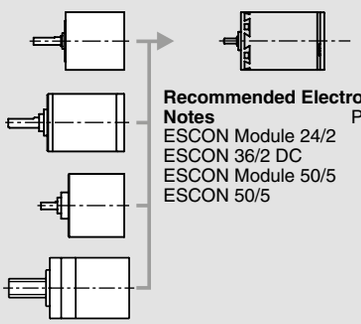
Overview on page 20–25

Planetary Gearhead
∅22 mm
0.1 - 0.6 Nm
Page 291/292

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/295

Spur Gearhead
∅24 mm
0.1 Nm
Page 300

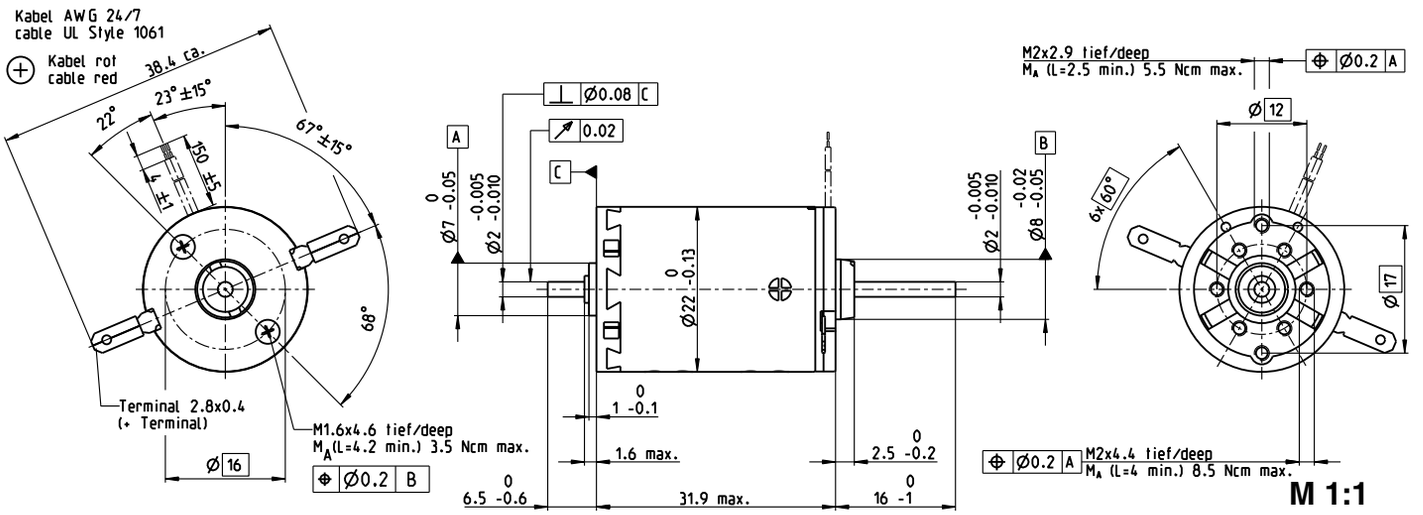
Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

A-max 22 ∅22 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													
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													
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	gcm²	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

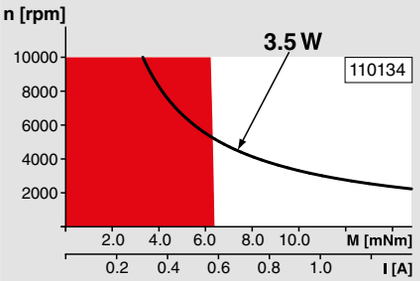
	Thermal data	
17	Thermal resistance housing-ambient	20 K/W
18	Thermal resistance winding-housing	6.0 K/W
19	Thermal time constant winding	10.2 s
20	Thermal time constant motor	313 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	10000 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)	80 N
	(static, shaft supported)	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)	45 N
	(static, shaft supported)	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

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

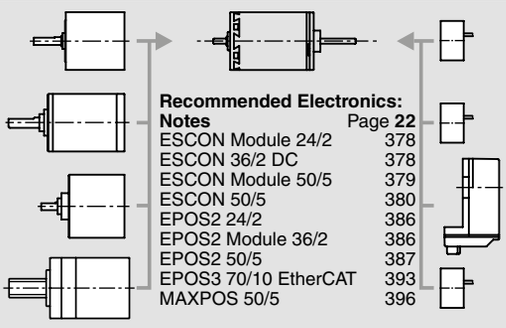
Overview on page 20–25

Planetary Gearhead
∅22 mm
0.1 - 0.6 Nm
Page 291/292

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/295

Spur Gearhead
∅24 mm
0.1 Nm
Page 300

Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 50/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

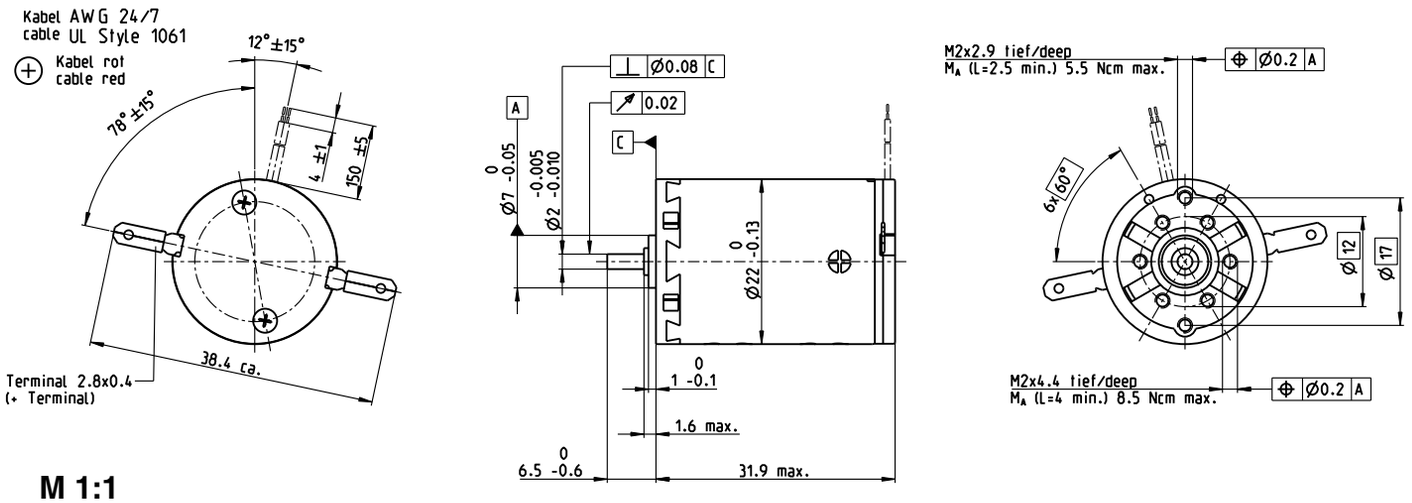
Encoder MR
32 CPT,
2 / 3 channels
Page 351

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 353

Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 372

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



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												
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	gcm²	4	4.25	4.3	4.29	4.19	4.2	4.13	4.13	4.09	4.02	3.9	3.94

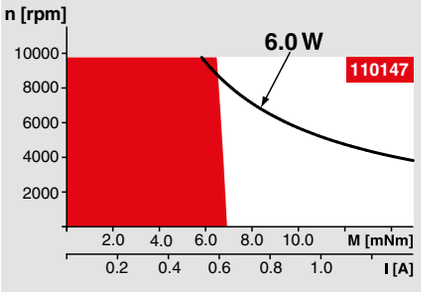
Specifications

	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 107.

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

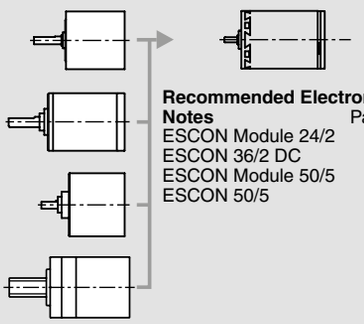
Overview on page 20–25

Planetary Gearhead
∅22 mm
0.1 - 0.6 Nm
Page 291/292

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/295

Spur Gearhead
∅24 mm
0.1 Nm
Page 300

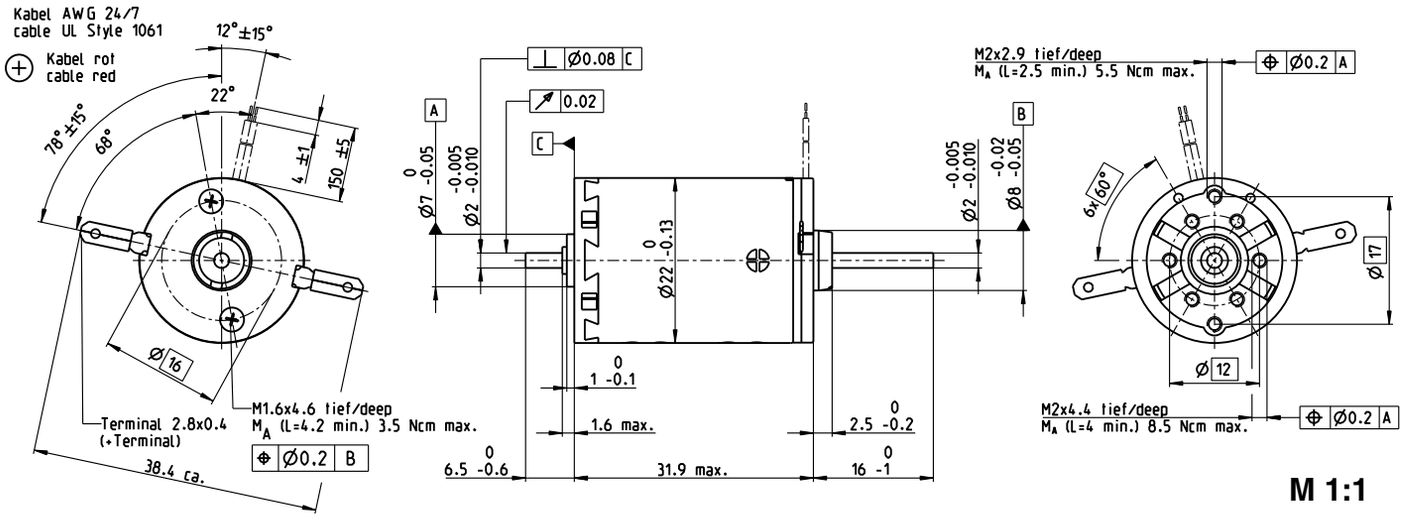
Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

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



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												
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	gcm²	4.07	4.32	4.37	4.36	4.26	4.27	4.2	4.2	4.16	4.09	3.97	4.01

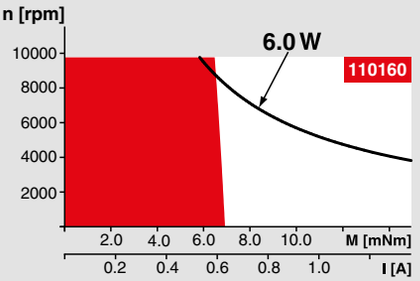
Specifications

	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)	80 N
	(static, shaft supported)	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)	45 N
	(static, shaft supported)	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 107.

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

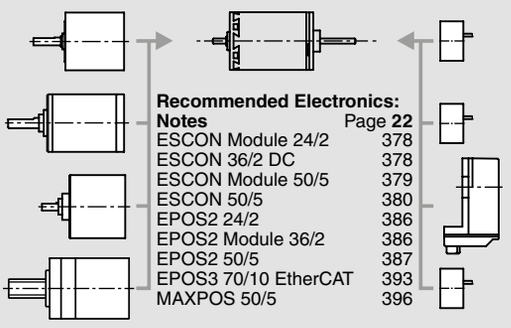
Overview on page 20–25

Planetary Gearhead
∅22 mm
0.1 - 0.6 Nm
Page 291/292

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/295

Spur Gearhead
∅24 mm
0.1 Nm
Page 300

Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 50/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

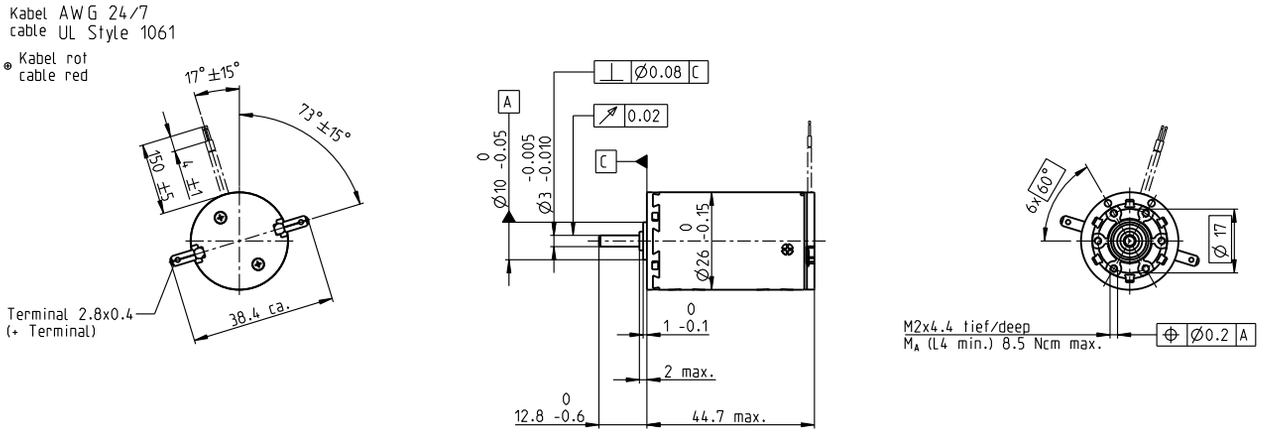
Encoder MR
32 CPT,
2 / 3 channels
Page 351

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 353

Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 372

A-max 26 ∅26 mm, Precious Metal Brushes CLL, 4 Watt



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													
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													
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	gcm²	12.3	10.9	13.6	13.2	13.1	13	11.8	11.2	12.5	12.5	12.2	11.8

Specifications

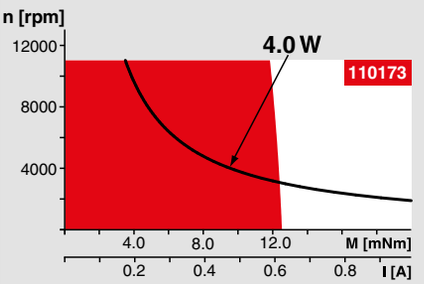
Thermal data		
17	Thermal resistance housing-ambient	13.2 K/W
18	Thermal resistance winding-housing	3.2 K/W
19	Thermal time constant winding	12.5 s
20	Thermal time constant motor	423 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. speed	11 000 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	11 000 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 107.

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 20–25

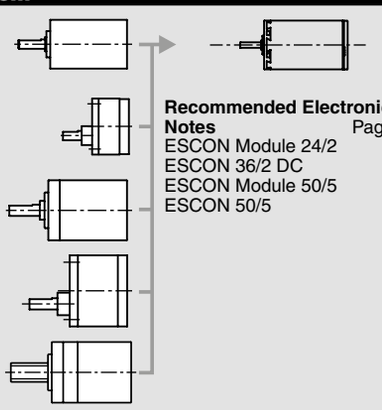
Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 302

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

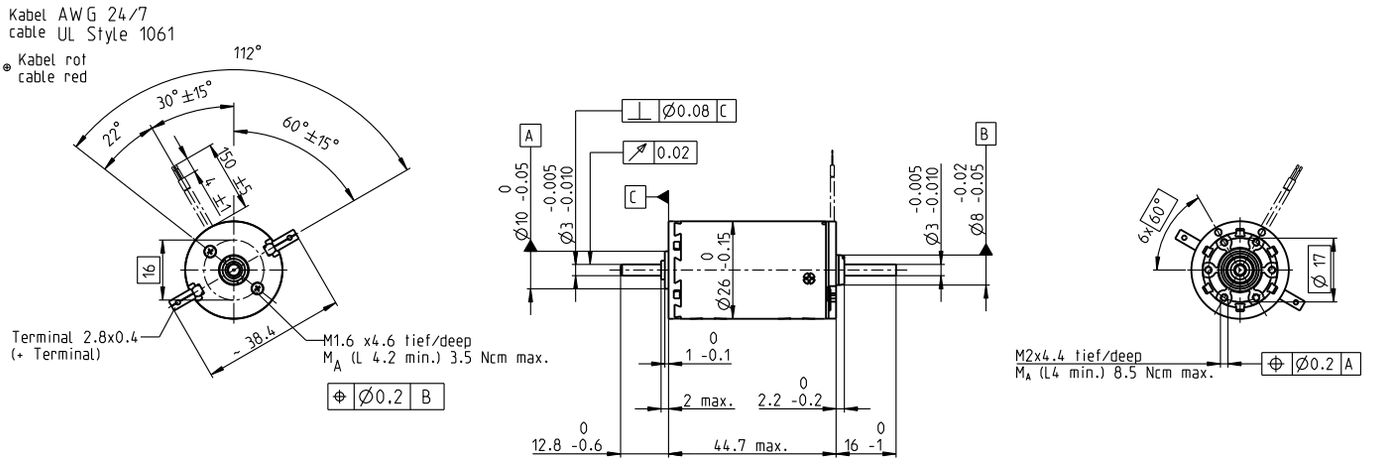
Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

A-max 26 ∅26 mm, Precious Metal Brushes CLL, 4 Watt



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													
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													
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	gcm²	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)	80 N
	(static, shaft supported)	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)	75 N
	(static, shaft supported)	1200 N
28	Max. radial load, 5 mm from flange	20.5 N

Other specifications

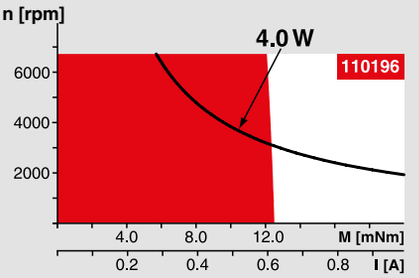
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	100 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

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 20–25

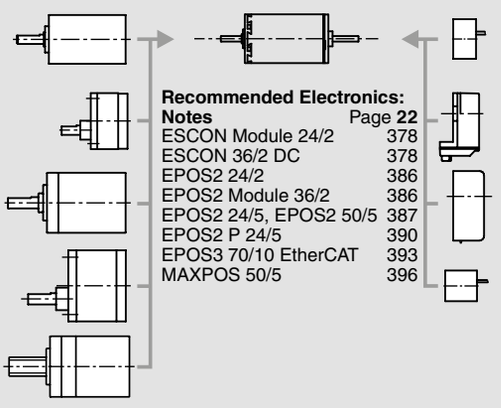
Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 302

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
128 - 1000 CPT,
3 channels
Page 355

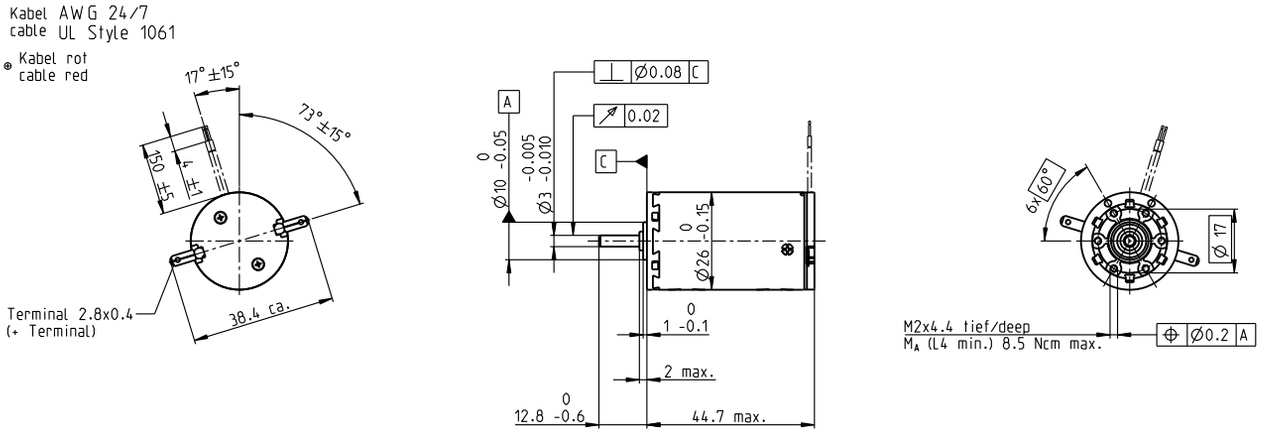
Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder HED_ 5540
500 CPT,
3 channels
Page 363/365

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 372

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

High Power



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												
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	gcm²	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

Specifications

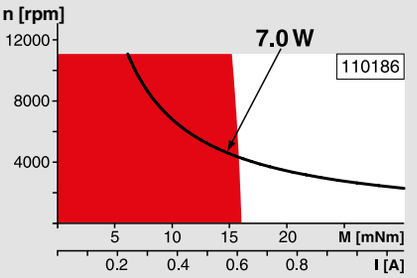
	Thermal data	
17	Thermal resistance housing-ambient	13.2 K/W
18	Thermal resistance winding-housing	3.2 K/W
19	Thermal time constant winding	13.8 s
20	Thermal time constant motor	473 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	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 107.

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 20–25

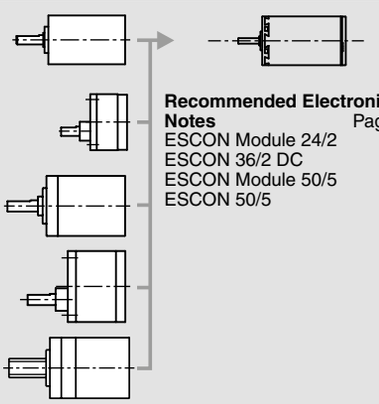
Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 302

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336

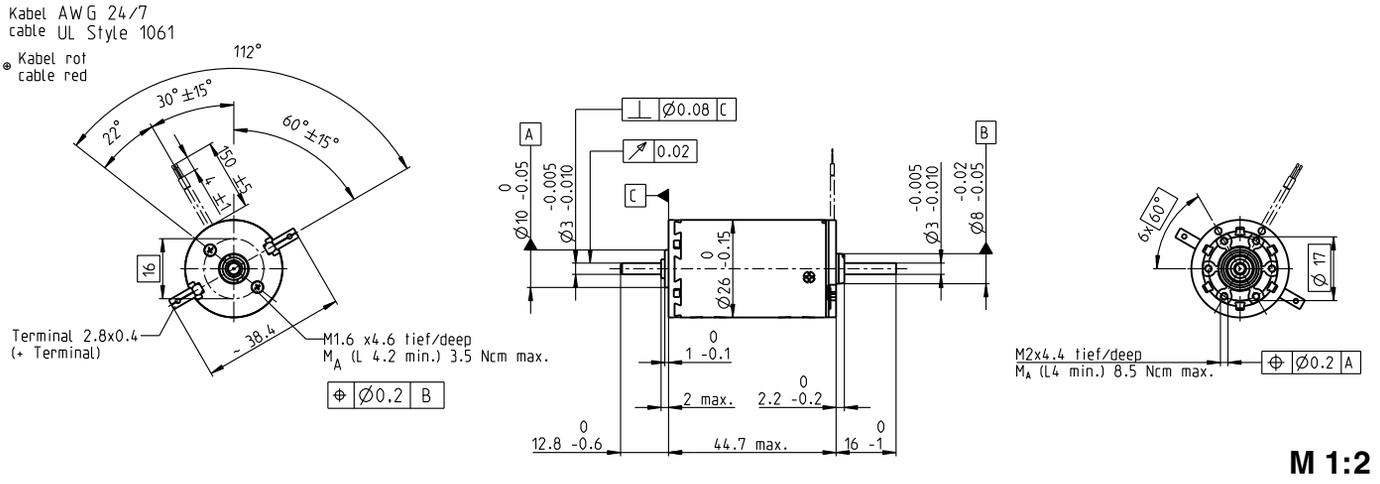


Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

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

High Power



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	gcm²	14.4	12.9	13.6	13.2	13.3	13.1	12.6	12.6	12.5	12.2	12.1

Specifications

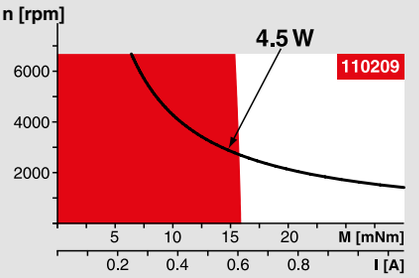
	Thermal data	
17	Thermal resistance housing-ambient	13.2 K/W
18	Thermal resistance winding-housing	3.2 K/W
19	Thermal time constant winding	12.5 s
20	Thermal time constant motor	473 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	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)	80 N
	(static, shaft supported)	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)	75 N
	(static, shaft supported)	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	119 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

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 20–25

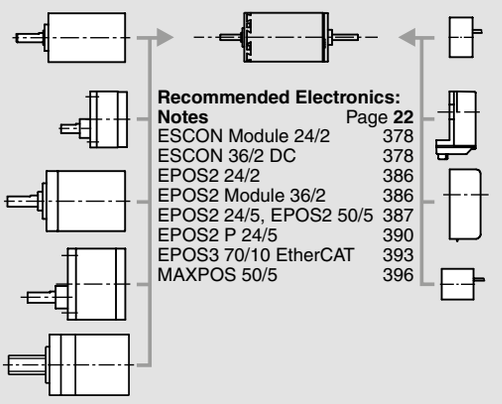
Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 302

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

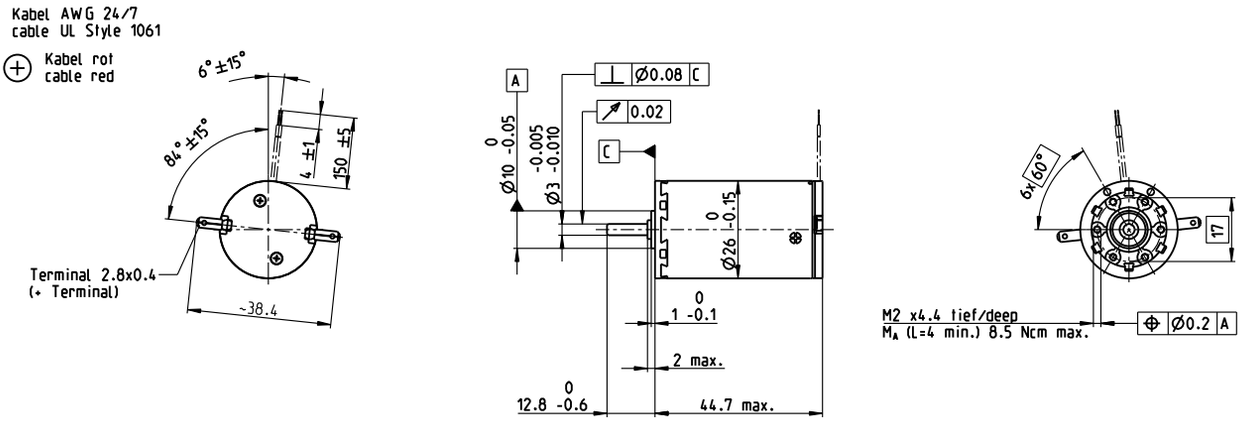
Encoder MR
128 - 1000 CPT,
3 channels
Page 355

Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder HED_ 5540
500 CPT,
3 channels
Page 363/365

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 372

A-max 26 ∅26 mm, Graphite Brushes, 6 Watt



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	gcm²	12.3	10.9	13.6	13.2	13.1	13	11.8	11.2	12.5	12.5	12.2	11.8

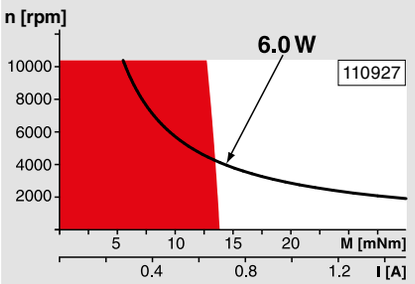
Specifications

	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
	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	98 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Sleeve bearings in place of ball bearings

Operating Range



Comments

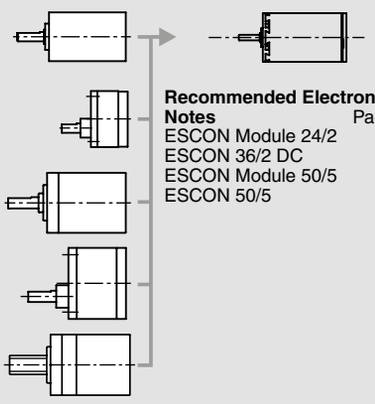
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 302

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

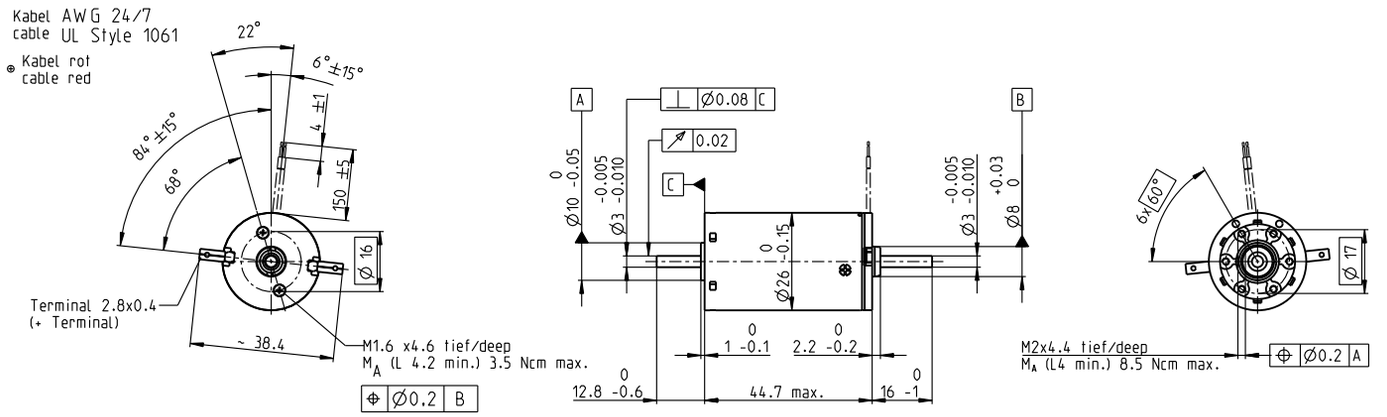
Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336

Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

A-max 26 ∅26 mm, Graphite Brushes, 6 Watt



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													
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	gcm²	12.3	10.9	13.6	13.2	13.1	13	11.8	11.2	12.5	12.5	12.2	11.8	

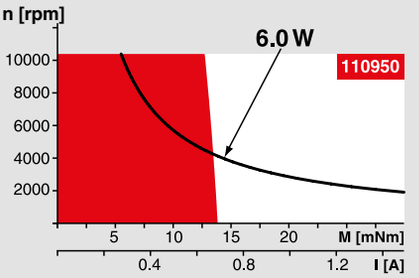
Specifications

	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)	75 N
	(static, shaft supported)	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)	80 N
	(static, shaft supported)	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	100 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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 20–25

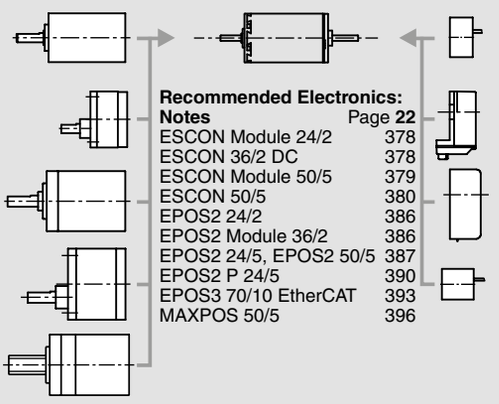
Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 302

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
128 - 1000 CPT,
3 channels
Page 355

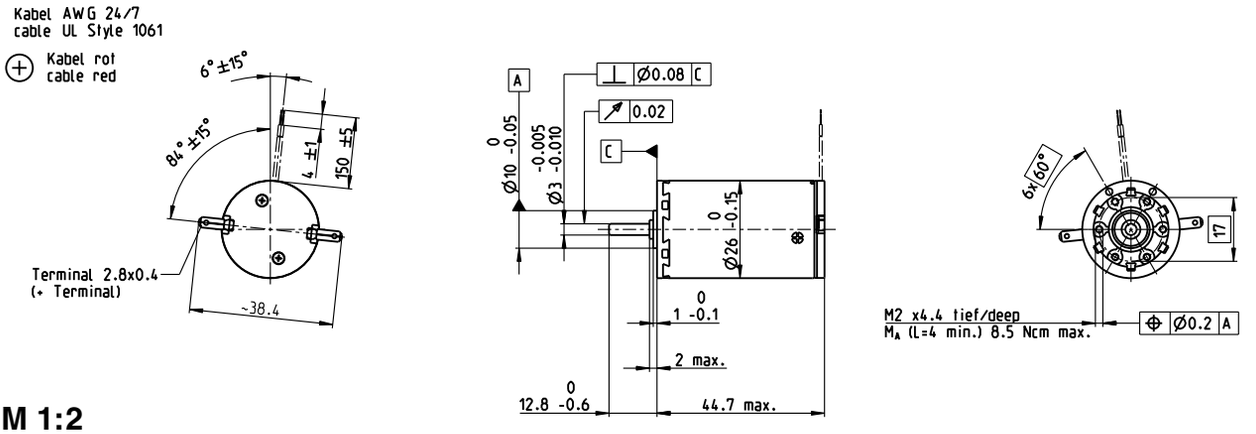
Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder HED_ 5540
500 CPT,
3 channels
Page 363/365

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 372

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

High Power



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with terminals	110935	110936	**110937**	110938	110939	**110940**	110941	110942	110943	110944	110945	
with cables	139852	353166	353167	353168	353169	206344	353171	314214	202893	353174	353175	

Motor Data													
	Values at nominal voltage												
1	Nominal voltage	V	6	7.2	12	15	18	24	30	36	42	48	48
2	No load speed	rpm	9740	10400	8190	8450	8040	8890	7050	7280	7880	7470	6010
3	No load current	mA	143	130	57	47.5	37.1	31.7	18.9	16.4	15.5	12.7	9.66
4	Nominal speed	rpm	9210	9700	6720	6620	6080	6910	5000	5230	5840	5390	3900
5	Nominal torque (max. continuous torque)	mNm	5.48	6.26	14.2	17.4	18.7	18.4	18.2	18.2	18.1	17.8	17.9
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	0.919	0.749	0.47	0.404	0.373	0.305	0.247
7	Stall torque	mNm	102	96.4	80.2	80.5	77.1	83.3	63	65.2	70.3	64.5	51.4
8	Stall current	A	17.4	14.7	5.79	4.8	3.64	3.26	1.57	1.4	1.4	1.06	0.684
9	Max. efficiency	%	83	82	81	81	81	82	80	80	80	80	78
	Characteristics												
10	Terminal resistance	Ω	0.345	0.49	2.07	3.13	4.94	7.36	19.1	25.8	30.1	45.1	70.2
11	Terminal inductance	mH	0.04	0.051	0.227	0.333	0.529	0.77	1.9	2.58	2.99	4.34	6.68
12	Torque constant	mNm/A	5.84	6.57	13.9	16.8	21.2	25.5	40.1	46.7	50.3	60.6	75.2
13	Speed constant	rpm/V	1640	1450	689	569	451	374	238	205	190	158	127
14	Speed / torque gradient	rpm/mNm	96.6	109	103	106	105	108	113	113	113	117	119
15	Mechanical time constant	ms	14.6	14.7	14.6	14.7	14.7	14.7	14.9	14.9	14.9	15	15
16	Rotor inertia	gcm²	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

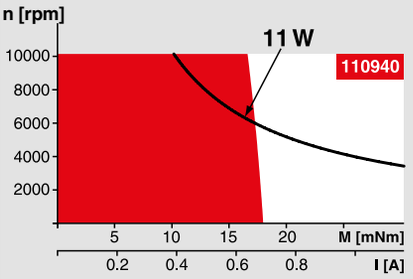
Specifications

	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 107.

Option
Sleeve bearings in place of ball bearings

Operating Range



Comments

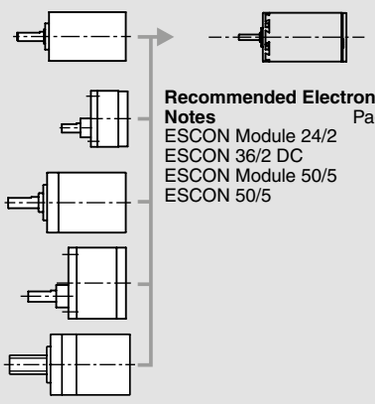
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 302

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

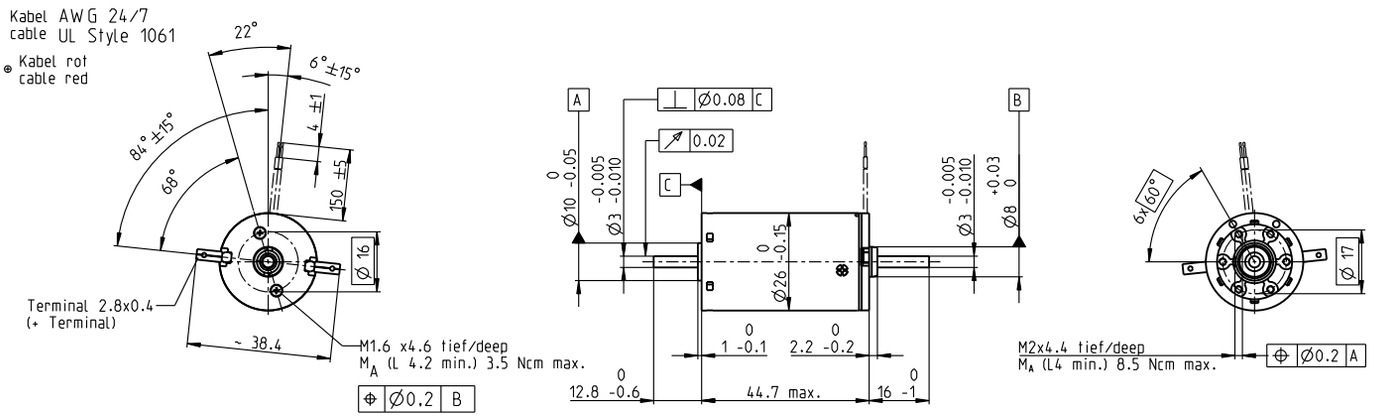
Spindle Drive
∅32 mm
Page 334–336

Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

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

High Power



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												
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	gcm²	14.4	12.9	13.6	13.2	13.3	13.1	12.5	12.6	12.5	12.2	12.1

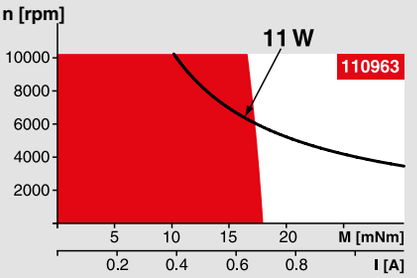
Specifications

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
	(static, shaft supported)	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)	80 N
	(static, shaft supported)	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 107.

Option
Sleeve bearings in place of ball bearings

Operating Range



Comments

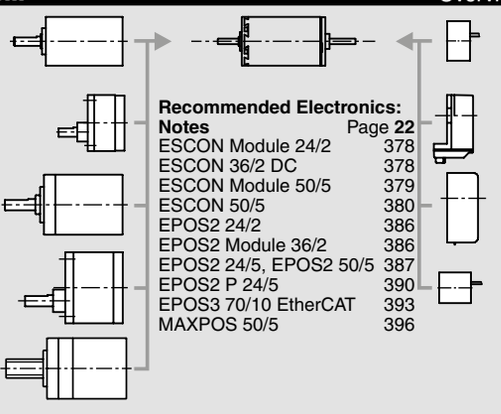
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅26 mm
0.75 - 4.5 Nm
Page 301

Spur Gearhead
∅30 mm
0.07 - 0.2 Nm
Page 302

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303/304/307

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336

Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

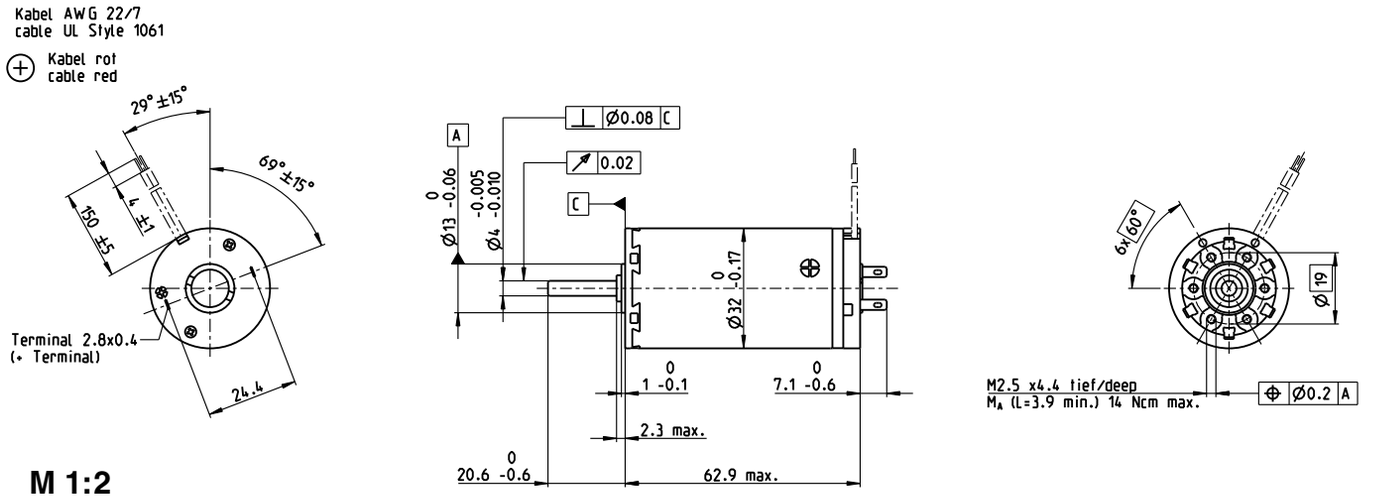
Encoder MR
128 - 1000 CPT,
3 channels
Page 355

Encoder Enc
22 mm
100 CPT, 2 channels
Page 361

Encoder HED_ 5540
500 CPT,
3 channels
Page 363/365

Encoder MEnc
∅13 mm
16 CPT, 2 channels
Page 372

A-max 32 ∅32 mm, Graphite Brushes, 15 Watt



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								
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	gcm²	44.2	39.2	43.5	46.2	44.2	44.6	43.8	42.6

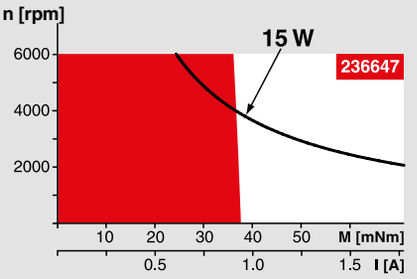
Specifications

	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 107.

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

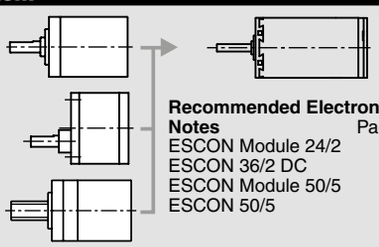
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303–308

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

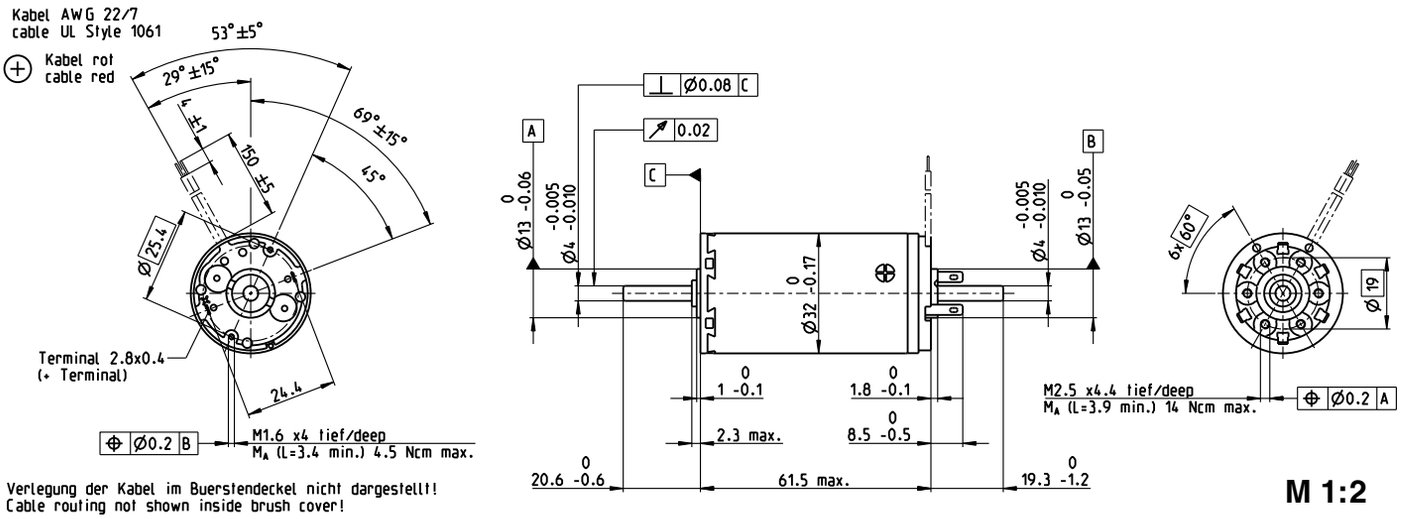
Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

A-max 32 ∅32 mm, Graphite Brushes, 15 Watt



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								
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	gcm²	44.2	39.2	43.5	46.2	44.2	44.6	43.8	42.6

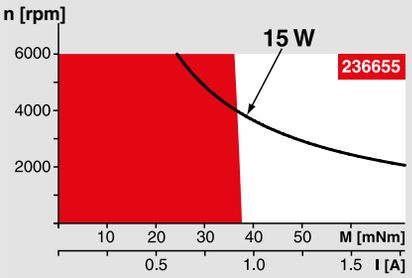
Specifications

	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
	(static, shaft supported)	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)	110 N
	(static, shaft supported)	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	210 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

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

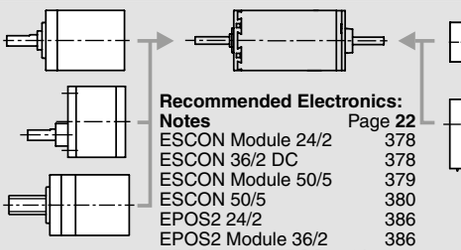
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303–308

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

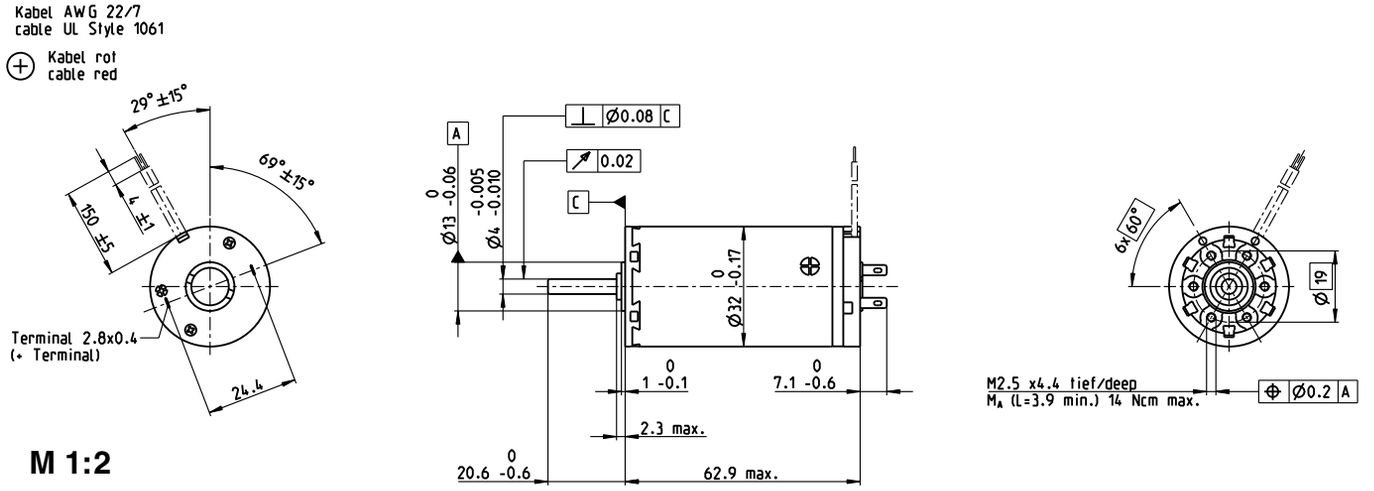
Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
256 - 1024 CPT,
3 channels
Page 356

Encoder HED_ 5540
500 CPT,
3 channels
Page 363/365

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

High Power



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								
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	gcm²	44.2	40.8	41.7	45.3	44.2	44.6	43.8

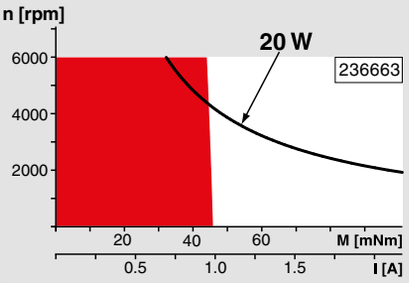
Specifications

	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 107.

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

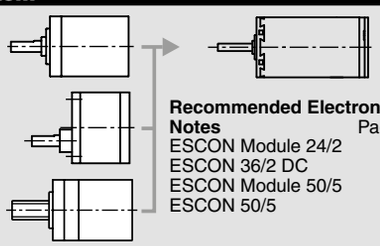
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303–308

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336

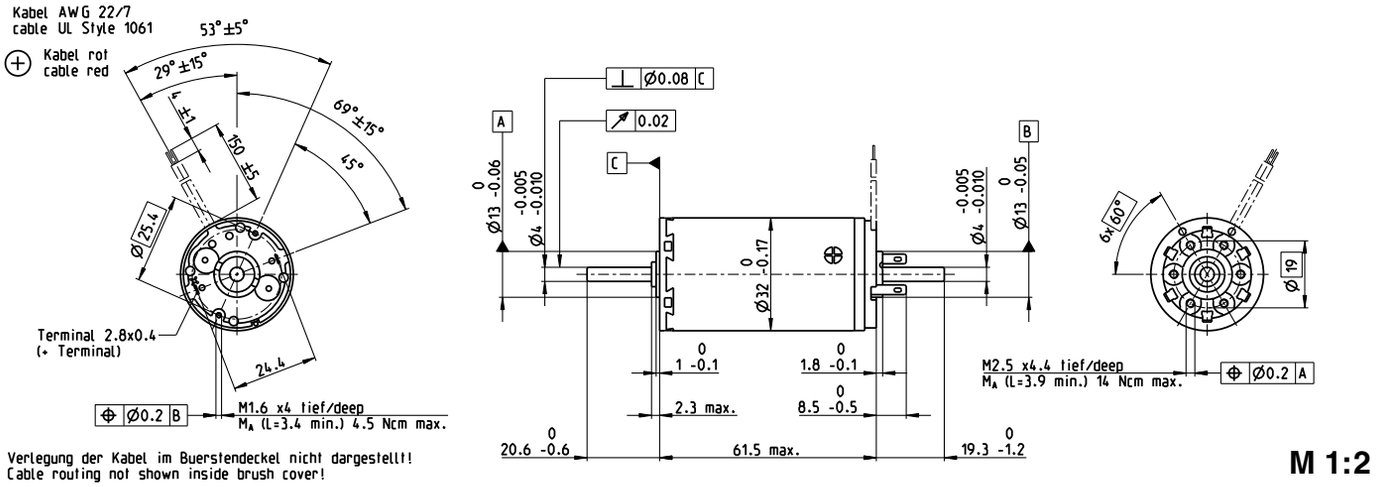


Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

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

High Power



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								
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	gcm²	44.2	40.8	41.7	45.3	44.2	44.6	43.8

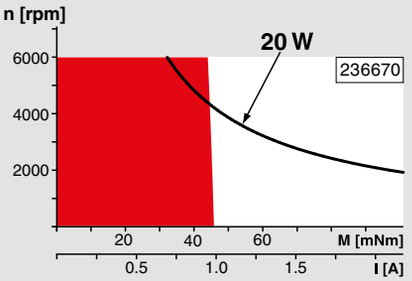
Specifications

	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
	(static, shaft supported)	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)	110 N
	(static, shaft supported)	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 107.

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

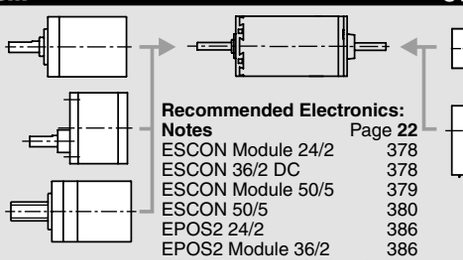
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 303–308

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
256 - 1024 CPT,
3 channels
Page 356

Encoder HED_ 5540
500 CPT,
3 channels
Page 363/365

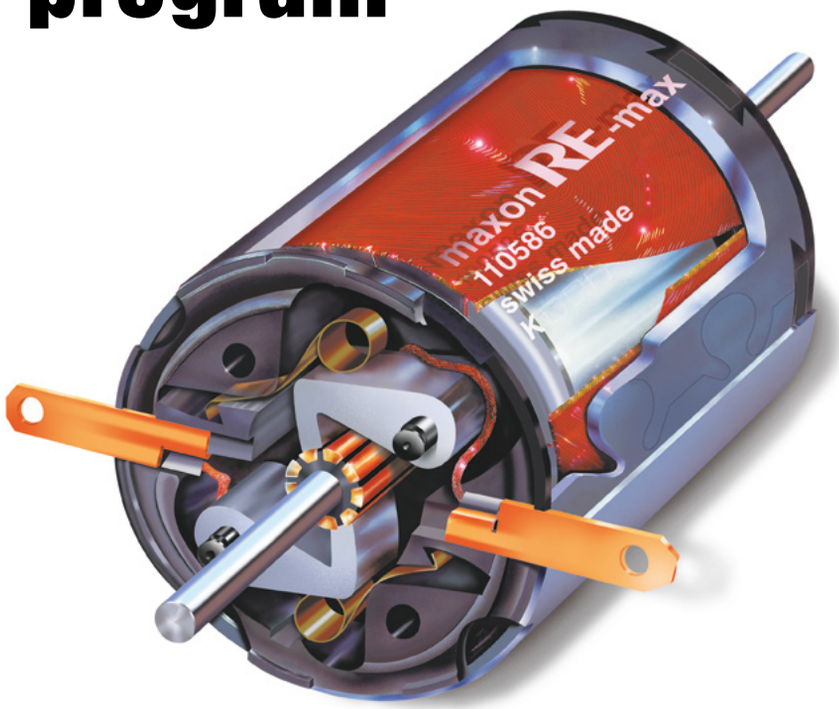
maxon RE-max

maxon RE-max

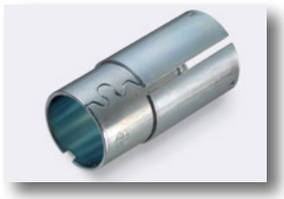
– High-performance at low cost
– Equipped with NdFeB magnets
– High and consistent quality thanks to mastery and monitoring of the processes
– Same part platform – compatible with the A-max
– Automated manufacturing process
– Open for customer-oriented modifications

maxon RE-max program

The high-power range DC motor, with top performance and convincing quality.



Same design as the innovative and award-winning A-max range. Consistent implementation of the same part platform.



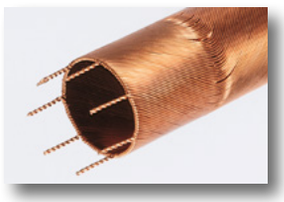
Motor housing made of steel laminate, minimizing waste. The strong field of the neodymium magnets is absorbed by an additional sleeve.

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.

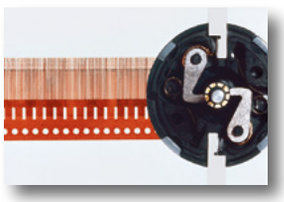
Elimination of a C-Clip groove results in higher torsional stability and greater cross-sectional strength.

Reduced-diameter commutator, employing more segments. The newly developed CLL concept (Capacitor Long Life) significantly increases the service life of the RE-max motors.

High and consistent quality thanks to process monitoring and production on the most modern assembly lines.

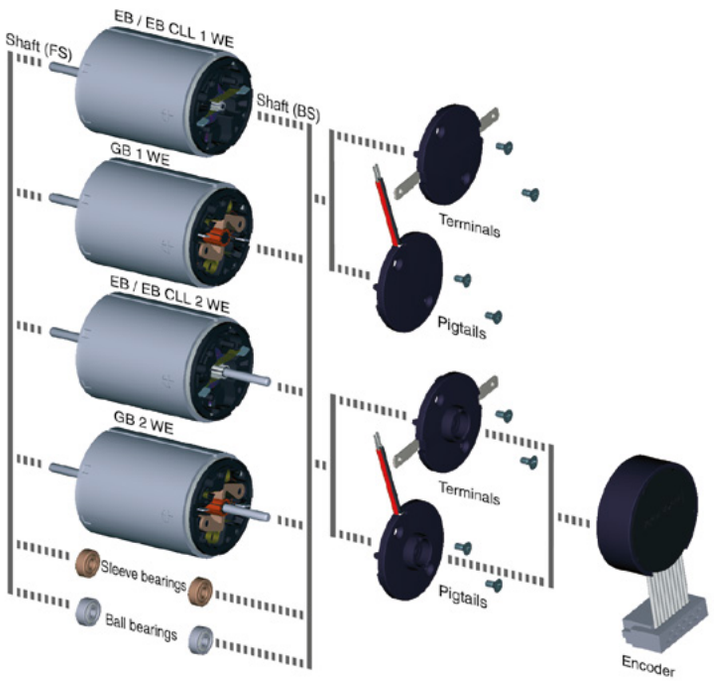


The “heart” of our motors is the ironless winding System maxon®. This means – physically dependent – advantages like an efficiency of up to 90%, the best regulating dynamics and small dimensions.



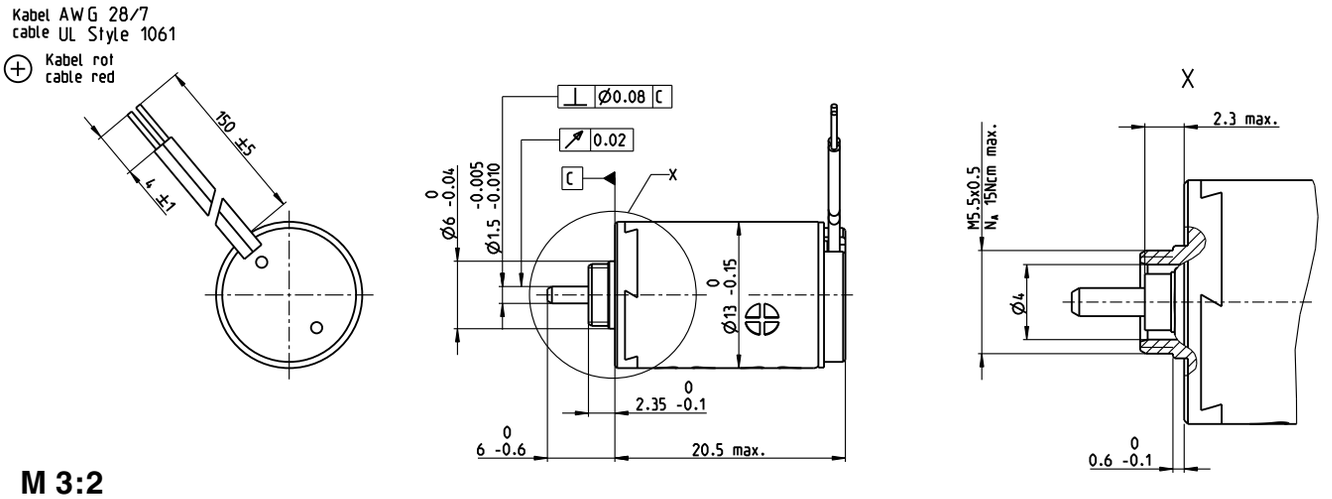
Graphite brushes for hard use with the highest peak loads. Precious metal brushes for fine rotational movements.

Modular construction of the RE-max program



X = Standard X = Option	WE = Shaft end	RE-max 13 1 WE	RE-max 13 2 WE	RE-max 21 1 WE	RE-max 21 2 WE	RE-max 29 1 WE	RE-max 29 2 WE
Precious Metal Brushes (EB)		X	X	X	X	X	X
Precious Metal Brushes (EB) and CLL		X	X	X	X	X	X
Graphite Brushes (GB)				X	X	X	X
Sleeve Bearings		X	X	X	X	X	X
Ball Bearings				X	X	X	X
Terminals				X	X	X	X
Pigtails		X	X	X	X	X	X
Shaft flange side (FS)	min.	4.5	4.5	5.0	5.0	6.0	6.0
	max.	15.0	15.0	27.4	27.4	27.0	27.0
Shaft brush side (BS)	min.		2.6		2.6		2.6
	max.		10.0		16.6		16.0

RE-max 13 ∅13 mm, Precious Metal Brushes CLL, 1.2 Watt



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

		201352	203881	203882	203883	203884	203885	203886	203887	203888	203889	203890	203891	203892	203893	203894
Motor Data																
	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	11700	11400	11200	11100	11400	11700	12200	11600	11400	11100	11800	10700	11200	11300	10800
3	No load current	mA	68	55	42.8	35.1	27.5	22.7	20.3	16.1	13.2	10.4	8.69	6.65	6.36	5.43	4.02
4	Nominal speed	rpm	10200	9350	8720	7950	7350	6920	7070	6300	6020	5670	6440	5250	5630	5860	5240
5	Nominal torque (max. continuous torque)	mNm	0.334	0.422	0.552	0.682	0.898	1.11	1.28	1.31	1.29	1.3	1.28	1.27	1.26	1.27	1.26
6	Nominal current (max. continuous current)	A	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.4	0.325	0.263	0.209	0.167	0.155	0.132	0.0997
7	Stall torque	mNm	2.36	2.14	2.33	2.32	2.47	2.7	3.02	2.87	2.74	2.68	2.83	2.51	2.56	2.64	2.47
8	Stall current	A	2.94	2.18	1.87	1.53	1.26	1.12	1.09	0.846	0.668	0.527	0.447	0.321	0.306	0.267	0.19
9	Max. efficiency	%	73	72	73	73	73	74	75	75	75	75	75	74	74	74	74
	Characteristics																
10	Terminal resistance	Ω	0.34	0.55	0.802	1.17	1.91	2.67	3.29	4.96	7.48	11.4	17.9	28.1	32.7	44.9	78.9
11	Terminal inductance	mH	0.0056	0.0083	0.0135	0.0199	0.0333	0.0501	0.0661	0.0993	0.145	0.223	0.346	0.532	0.607	0.847	1.47
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	6.33	7.84	8.38	9.89	13
13	Speed constant	rpm/V	11900	9740	7650	6300	4870	3970	3460	2820	2330	1880	1510	1220	1140	965	734
14	Speed / torque gradient	rpm/mNm	5050	5470	4920	4880	4740	4400	4110	4130	4250	4210	4270	4360	4450	4380	4450
15	Mechanical time constant	ms	19	16.7	15.4	14.8	14.3	14	13.7	13.6	13.6	13.6	13.6	13.7	13.7	13.6	13.7
16	Rotor inertia	gcm²	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

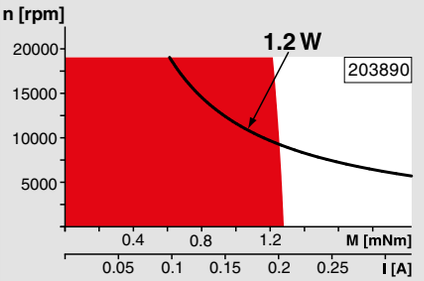
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	47.5 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.11 s
20	Thermal time constant motor	186 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)	35 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

CLL = Capacitor Long Life
Alignment of the electronic connections not specified

Values listed in the table are nominal.
Explanation of the figures on page 107.

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).

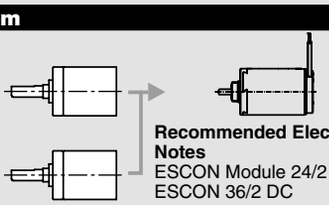
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

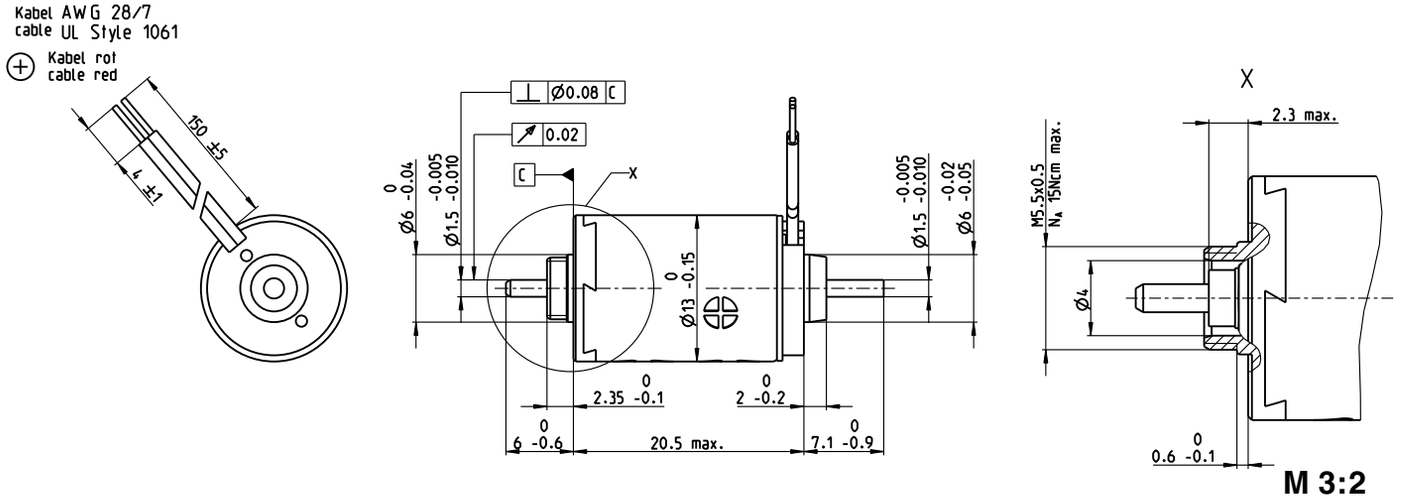
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE-max 13 ∅13 mm, Precious Metal Brushes, 0.75 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

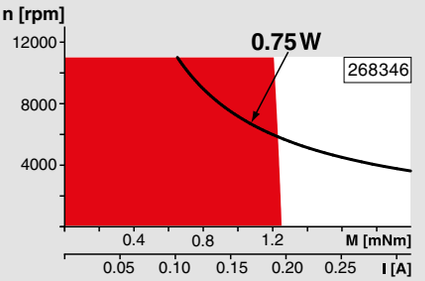
		268336	268337	268338	268339	268340	268341	268342	268343	268344	268345	268346	268347	268348	268349	268350
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	0.6	0.72	0.9	1.2	1.5	1.8	1.8	2.4	3	3.6	4.8	6	6	7.2	10
2	No load speed	rpm	6870	6700	6600	7260	7010	6870	5980	6510	6720	6510	6970	7030	6560	6680	7050
3	No load current	mA	79	64	50	42.8	32.6	26.3	21.8	18.3	15.3	12.2	10.1	8.16	7.43	6.34	4.92
4	Nominal speed	rpm	5490	4680	4130	4160	2960	2150	849	1340	1350	1140	1580	1580	1050	1250	1550
5	Nominal torque (max. continuous torque)	mNm	0.327	0.415	0.545	0.674	0.892	1.11	1.28	1.28	1.29	1.3	1.29	1.27	1.26	1.26	1.26
6	Nominal current (max. continuous current)	A	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.392	0.326	0.264	0.21	0.168	0.156	0.132	0.1
7	Stall torque	mNm	1.41	1.28	1.4	1.55	1.54	1.62	1.51	1.64	1.64	1.61	1.7	1.68	1.54	1.59	1.65
8	Stall current	A	1.76	1.31	1.12	1.02	0.786	0.674	0.547	0.484	0.401	0.316	0.268	0.214	0.184	0.16	0.127
9	Max. efficiency	%	63	62	63	64	64	65	65	66	65	65	66	66	64	65	65
	Characteristics																
10	Terminal resistance	Ω	0.34	0.55	0.802	1.17	1.91	2.67	3.29	4.96	7.48	11.4	17.9	28.1	32.7	44.9	78.9
11	Terminal inductance	mH	0.006	0.008	0.014	0.02	0.033	0.05	0.066	0.099	0.145	0.223	0.346	0.532	0.606	0.847	1.47
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	6.33	7.84	8.38	9.89	13
13	Speed constant	rpm/V	11900	9740	7650	6300	4870	3970	3460	2820	2330	1880	1510	1220	1140	965	734
14	Speed / torque gradient	rpm/mNm	5050	5470	4920	4880	4740	4400	4110	4130	4250	4210	4270	4360	4450	4380	4450
15	Mechanical time constant	ms	19.2	17	15.7	15.1	14.6	14.2	13.9	13.9	13.9	13.8	13.8	13.9	13.9	13.9	13.9
16	Rotor inertia	gcm²	0.363	0.296	0.304	0.295	0.293	0.308	0.323	0.32	0.311	0.313	0.309	0.305	0.298	0.302	0.299

Specifications

	Thermal data	
17	Thermal resistance housing-ambient	47.5 K/W
18	Thermal resistance winding-housing	14 K/W
19	Thermal time constant winding	5.11 s
20	Thermal time constant motor	186 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)	35 N
	(static, shaft supported)	240 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
	Alignment of the electronic connections not specified	

Values listed in the table are nominal.
Explanation of the figures on page 107.

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).

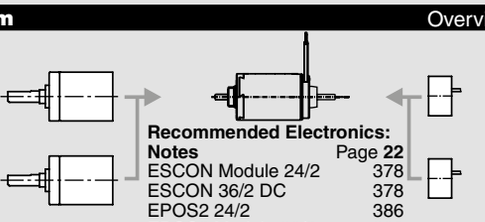
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279



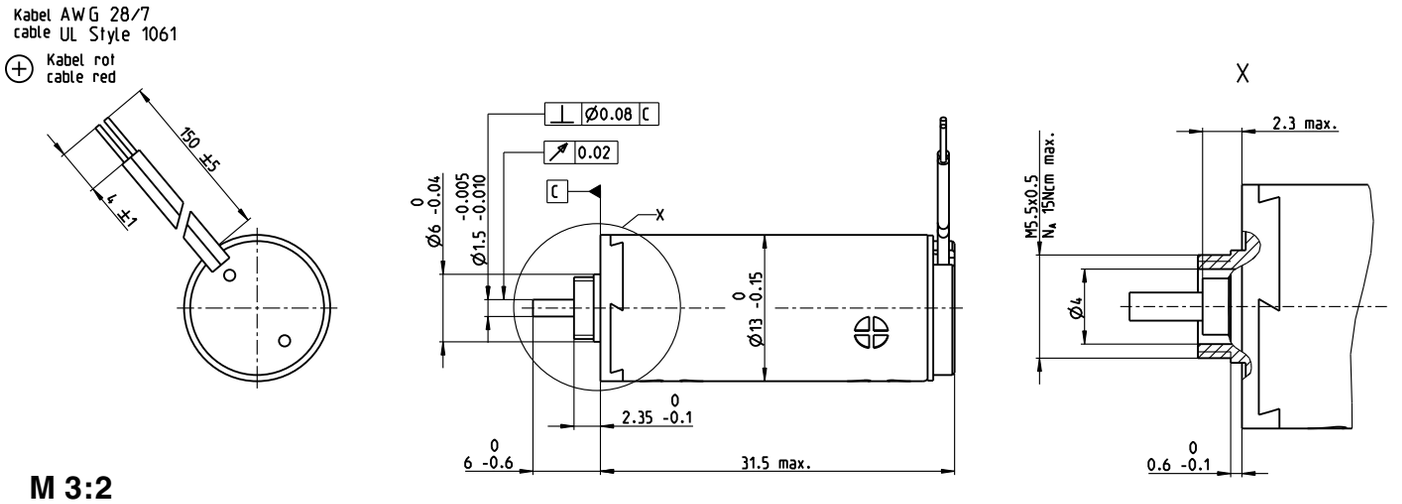
Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
Page 348

Encoder MR
64 - 256 CPT,
2 channels
Page 349/350

RE-max 13 ∅13 mm, Precious Metal Brushes CLL, 2.5 Watt



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

		201353	203937	203938	203939	203940	203941	203942	203943	203944	203945	203946	203947	203948	203949	203950
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	12300	10800	10900	11500	10200	11500	11500	10900	11500	11100	11200	10400	10600	11600
3	No load current	mA	30.6	31.5	25.1	21.3	17.5	14.3	14	11.7	9.67	8.4	6.62	5.35	4.72	4.11	3.55
4	Nominal speed	rpm	9550	11000	9180	8940	9050	7440	8320	7990	7580	8060	7670	7750	6910	7210	8080
5	Nominal torque (max. continuous torque)	mNm	0.969	1.04	1.21	1.45	1.84	2.09	2.32	2.67	2.78	2.72	2.71	2.72	2.7	2.72	2.66
6	Nominal current (max. continuous current)	A	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.458	0.408	0.336	0.27	0.218	0.201	0.173	0.138
7	Stall torque	mNm	8.91	9.4	7.84	7.9	8.56	7.61	8.35	8.72	9	9.08	8.73	8.86	8.1	8.42	8.85
8	Stall current	A	4.15	4.06	2.97	2.52	2.16	1.71	1.69	1.47	1.3	1.1	0.852	0.697	0.591	0.526	0.45
9	Max. efficiency	%	84	84	83	83	83	83	83	83	84	84	84	84	83	84	84
	Characteristics																
10	Terminal resistance	Ω	0.578	0.738	1.01	1.43	2.22	2.81	3.56	4.91	6.16	9.09	14.1	21.5	25.4	34.3	53.3
11	Terminal inductance	mH	0.016	0.018	0.024	0.033	0.053	0.068	0.083	0.12	0.163	0.232	0.356	0.549	0.638	0.872	1.31
12	Torque constant	mNm/A	2.15	2.31	2.64	3.14	3.96	4.46	4.95	5.94	6.94	8.26	10.2	12.7	13.7	16	19.6
13	Speed constant	rpm/V	4450	4130	3610	3040	2410	2140	1930	1610	1380	1160	933	751	697	596	486
14	Speed / torque gradient	rpm/mNm	1200	1320	1380	1390	1350	1350	1380	1330	1220	1270	1280	1270	1290	1270	1320
15	Mechanical time constant	ms	8.55	8.23	7.94	7.71	7.5	7.44	7.42	7.33	7.25	7.26	7.26	7.24	7.25	7.25	7.3
16	Rotor inertia	gcm²	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	37 K/W
18	Thermal resistance winding-housing	10 K/W
19	Thermal time constant winding	6.97 s
20	Thermal time constant motor	277 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)	35 N
28	Max. radial load, 5 mm from flange	1.4 N

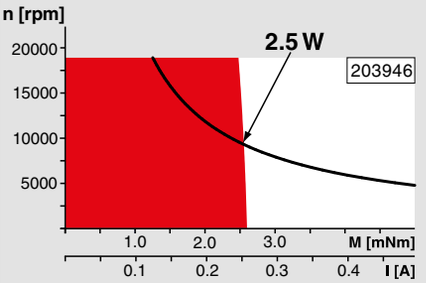
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	24 g

CLL = Capacitor Long Life
Alignment of the electronic connections not specified

Values listed in the table are nominal.
Explanation of the figures on page 107.

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).

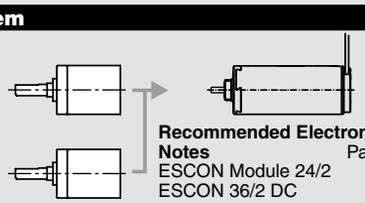
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
Page 278

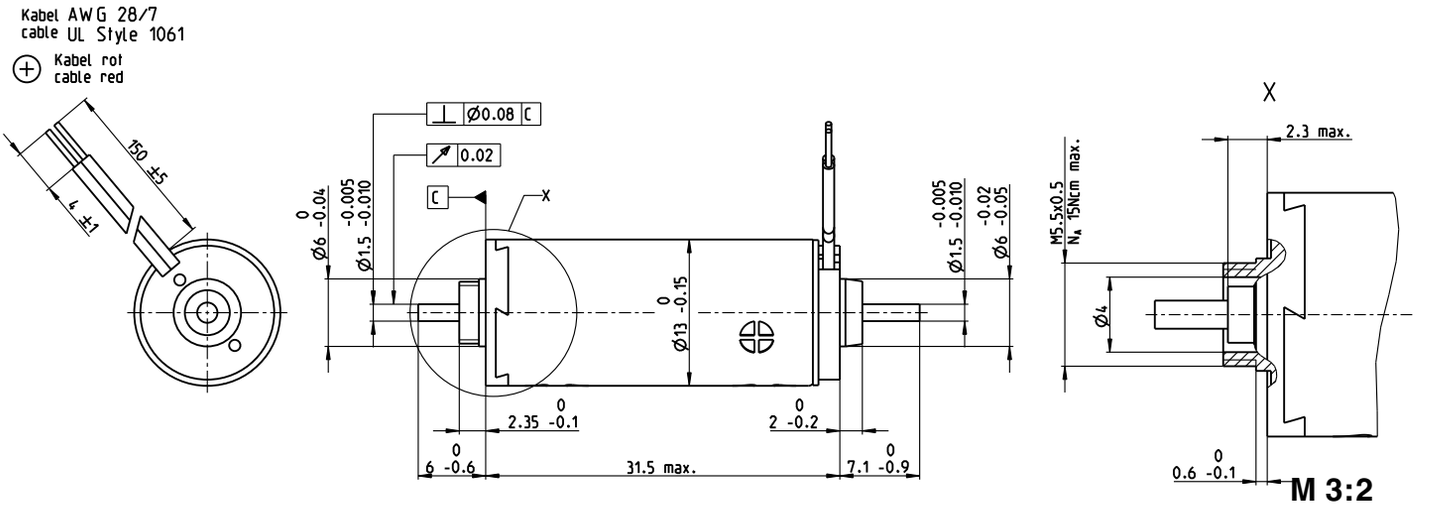
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279



Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378

RE-max 13 ∅13 mm, Precious Metal Brushes CLL, 2 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

		268351	268353	268355	268356	268357	268358	268359	268360	268361	268362	268363	268364	268365	268366	268367
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	6080	6380	7180	7100	6300	6810	6620	6500	6820	6600	6640	6840	7030	7160
3	No load current	mA	43.8	39.8	35.3	30.8	24.3	20.9	19.2	15.9	13.5	11.5	9.2	7.42	6.95	5.99	4.91
4	Nominal speed	rpm	5550	4830	4840	5290	4720	3590	3690	3150	3160	3420	3180	3230	3420	3630	3700
5	Nominal torque (max. continuous torque)	mNm	0.941	1.02	1.18	1.42	1.82	2.06	2.3	2.66	2.76	2.7	2.69	2.7	2.68	2.69	2.64
6	Nominal current (max. continuous current)	A	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.46	0.41	0.337	0.271	0.219	0.201	0.173	0.139
7	Stall torque	mNm	5.57	4.7	4.71	5.26	5.35	4.76	5.01	5.09	5.4	5.45	5.24	5.32	5.4	5.61	5.53
8	Stall current	A	2.59	2.03	1.78	1.68	1.35	1.07	1.01	0.856	0.779	0.66	0.511	0.418	0.394	0.35	0.281
9	Max. efficiency	%	76	74	74	75	75	74	75	75	76	76	75	75	76	76	76
	Characteristics																
10	Terminal resistance	Ω	0.578	0.738	1.01	1.43	2.22	2.81	3.56	4.91	6.16	9.09	14.1	21.5	25.4	34.3	53.3
11	Terminal inductance	mH	0.0157	0.0182	0.0237	0.0334	0.0534	0.0675	0.0834	0.12	0.163	0.232	0.356	0.549	0.638	0.872	1.31
12	Torque constant	mNm/A	2.15	2.31	2.64	3.14	3.96	4.46	4.95	5.94	6.94	8.26	10.2	12.7	13.7	16	19.6
13	Speed constant	rpm/V	4450	4130	3610	3040	2410	2140	1930	1610	1380	1160	933	751	697	596	486
14	Speed / torque gradient	rpm/mNm	1200	1320	1380	1390	1350	1350	1380	1330	1220	1270	1280	1270	1290	1270	1320
15	Mechanical time constant	ms	8.61	8.3	8.01	7.78	7.57	7.51	7.49	7.4	7.31	7.33	7.33	7.31	7.31	7.32	7.37
16	Rotor inertia	gcm²	0.686	0.601	0.553	0.535	0.535	0.531	0.517	0.533	0.57	0.55	0.546	0.549	0.541	0.548	0.534

Specifications

Thermal data

17	Thermal resistance housing-ambient	37 K/W
18	Thermal resistance winding-housing	10 K/W
19	Thermal time constant winding	6.97 s
20	Thermal time constant motor	277 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)	35 N
	(static, shaft supported)	140 N
28	Max. radial load, 5 mm from flange	1.4 N

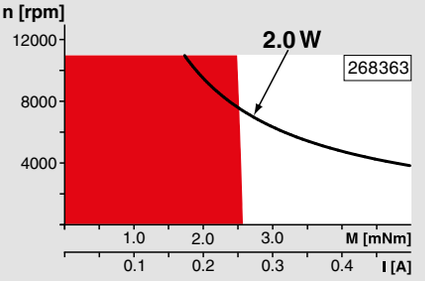
Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	24 g

CLL = Capacitor Long Life
Alignment of the electronic connections not specified

Values listed in the table are nominal.
Explanation of the figures on page 107.

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 20–25

Planetary Gearhead
∅13 mm
0.05 - 0.15 Nm
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Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
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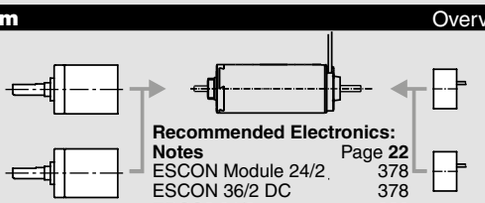

Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
16 CPT,
2 channels
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Encoder MR
64 - 256 CPT,
2 channels
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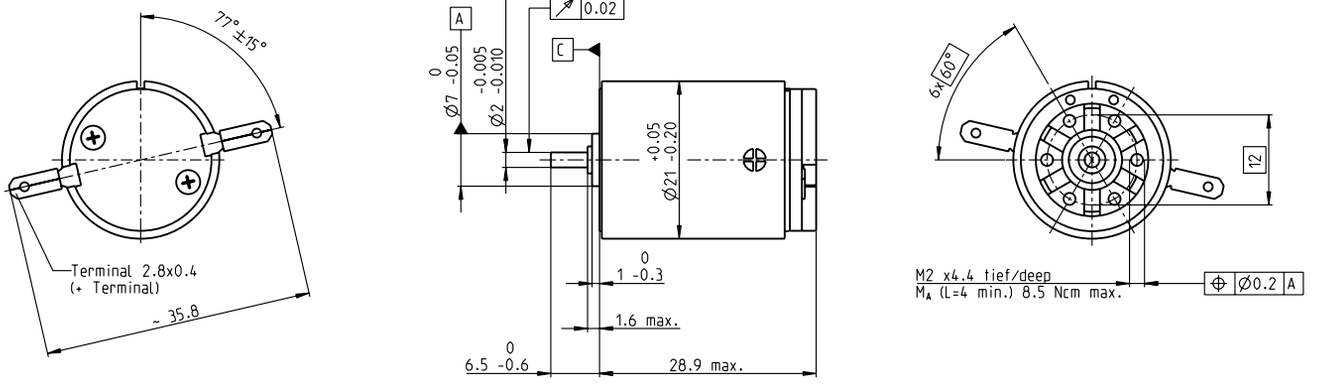
RE-max 21 ∅21 mm, Precious Metal Brushes CLL, 5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	221009	221010	221011	**221012**	221013	221015	221016	221017	221019
Motor Data									
Values at nominal voltage									
1 Nominal voltage	V	3	6	9	12	18	21	24	36	48
2 No load speed	rpm	8420	9440	9880	8160	9660	9450	8620	9750	9290
3 No load current	mA	176	101	70.7	42.5	34.5	28.8	22.7	17.4	12.4
4 Nominal speed	rpm	7870	8090	8280	6500	8050	7800	6950	8070	7580
5 Nominal torque (max. continuous torque)	mNm	2.23	4.41	5.59	5.66	5.56	5.45	5.51	5.28	5.26
6 Nominal current (max. continuous current)	A	0.84	0.84	0.722	0.452	0.352	0.29	0.234	0.17	0.121
7 Stall torque	mNm	29.7	30	34.3	28.1	33.7	31.6	28.8	31.1	29.1
8 Stall current	A	8.87	5.03	4.01	2.04	1.93	1.52	1.11	0.9	0.602
9 Max. efficiency	%	74	74	75	73	75	74	74	74	74
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	0.013	0.041	0.085	0.22	0.354	0.503	0.786	1.39	2.71
12 Torque constant	mNm/A	3.35	5.95	8.55	13.8	17.5	20.8	26	34.6	48.3
13 Speed constant	rpm/V	2850	1600	1120	694	546	459	367	276	198
14 Speed / torque gradient	rpm/mNm	288	322	293	297	292	305	305	319	326
15 Mechanical time constant	ms	7.67	6.98	6.69	6.65	6.62	6.66	6.68	6.88	6.77
16 Rotor inertia	gcm²	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	28 K/W
18	Thermal resistance winding-housing	8.0 K/W
19	Thermal time constant winding	10.5 s
20	Thermal time constant motor	502 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	0.025 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

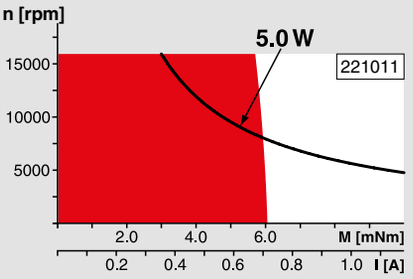
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	42 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Ball bearings in place of sleeve bearings
Pigtails in place of terminals
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

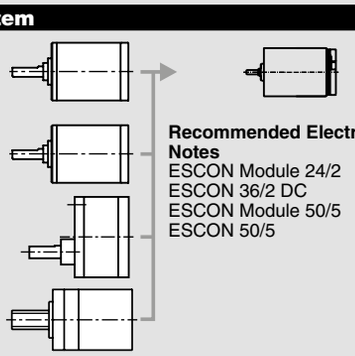
Overview on page 20–25

Planetary Gearhead
∅22 mm
0.5 - 1.0 Nm
Page 293

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 295

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

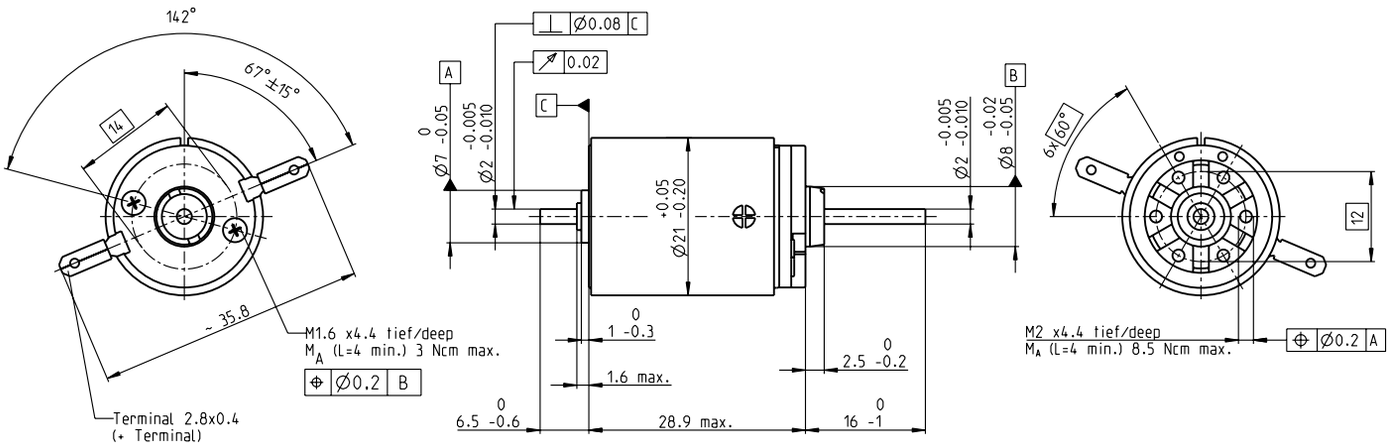
Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

RE-max 21 ∅21 mm, Precious Metal Brushes CLL, 3.5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			221020	221023	221024	221025	221026	221028	221030	221031	221032
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	2	3.6	5	8.4	10	12	15	21	30
2	No load speed	rpm	5890	5950	5760	6010	5630	5670	5670	5970	6100
3	No load current	mA	54.5	30.8	21.1	13.4	10.2	8.61	6.88	5.31	3.84
4	Nominal speed	rpm	5220	4410	3830	4060	3690	3680	3680	3940	4050
5	Nominal torque (max. continuous torque)	mNm	2.54	4.65	6.25	6.16	6.21	6.07	6.06	5.91	5.85
6	Nominal current (max. continuous current)	A	0.84	0.84	0.778	0.477	0.378	0.311	0.248	0.182	0.129
7	Stall torque	mNm	19	17.3	18.3	18.9	18	17.3	17.3	17.4	17.5
8	Stall current	A	5.91	3.02	2.23	1.43	1.07	0.867	0.692	0.525	0.376
9	Max. efficiency	%	82	81	82	82	82	81	81	81	81
	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	0.013	0.041	0.0846	0.219	0.353	0.502	0.784	1.38	2.7
12	Torque constant	mNm/A	3.22	5.72	8.22	13.2	16.8	20	25	33.2	46.5
13	Speed constant	rpm/V	2970	1670	1160	722	569	477	382	287	206
14	Speed / torque gradient	rpm/mNm	312	348	317	321	316	330	331	346	353
15	Mechanical time constant	ms	8.32	7.57	7.25	7.22	7.18	7.23	7.25	7.46	7.35
16	Rotor inertia	gcm²	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	28 K/W
18	Thermal resistance winding-housing	8.0 K/W
19	Thermal time constant winding	8.83 s
20	Thermal time constant motor	502 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)	80 N
	(static, shaft supported)	480 N
28	Max. radial load, 5 mm from flange	2.7 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)	45 N
	(static, shaft supported)	480 N
28	Max. radial load, 5 mm from flange	11.9 N

Other specifications

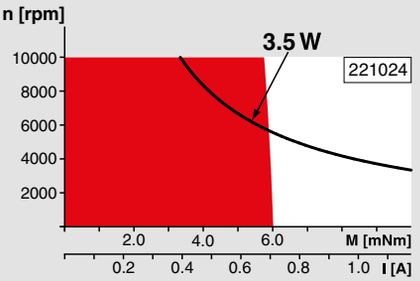
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	43 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Ball bearings in place of sleeve bearings
Pigtails in place of terminals
Without CLL

Operating Range



Comments

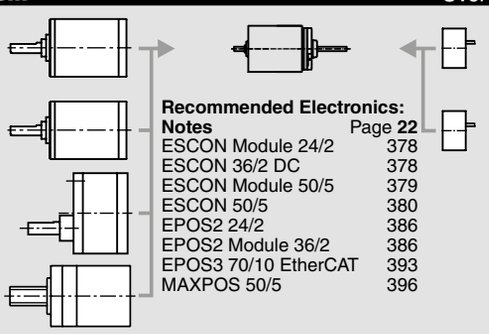
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅22 mm
0.5 - 1.0 Nm
Page 293

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 295

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅22 mm
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Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
32 CPT,
2 / 3 channels
Page 352

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
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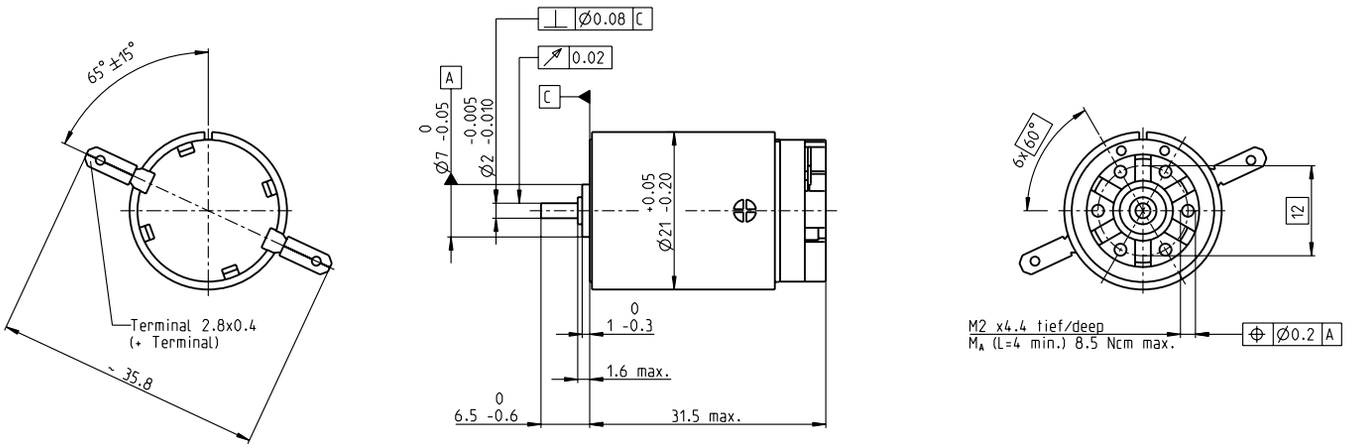
RE-max 21 ∅21 mm, Graphite Brushes, 6 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			250000	250001	250002	250003	250004	250005	250006	250007	250008
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	4	6	9	15	18	21	24	36	48
2	No load speed	rpm	11200	9440	9880	10200	9680	9470	8650	9780	9320
3	No load current	mA	150	81	56.9	35.7	27.7	23.2	18.2	14	9.95
4	Nominal speed	rpm	10700	8230	8230	8140	7580	7320	6480	7580	7090
5	Nominal torque (max. continuous torque)	mNm	1.91	3.81	5.69	7.13	7.23	7.09	7.14	6.9	6.86
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.552	0.44	0.362	0.292	0.213	0.151
7	Stall torque	mNm	45.4	30.9	34.8	35.2	33.7	31.6	28.8	31.1	29.1
8	Stall current	A	13.6	5.19	4.07	2.56	1.93	1.52	1.11	0.9	0.602
9	Max. efficiency	%	79	76	78	78	78	77	76	77	76
	Characteristics										
10	Terminal resistance	Ω	0.295	1.16	2.21	5.86	9.32	13.8	21.7	40	79.7
11	Terminal inductance	mH	0.013	0.041	0.085	0.22	0.354	0.503	0.786	1.39	2.71
12	Torque constant	mNm/A	3.35	5.95	8.55	13.8	17.5	20.8	26	34.6	48.3
13	Speed constant	rpm/V	2850	1600	1120	694	546	459	367	276	198
14	Speed / torque gradient	rpm/mNm	252	312	289	295	291	305	305	319	326
15	Mechanical time constant	ms	6.77	6.87	6.68	6.72	6.7	6.76	6.78	6.98	6.88
16	Rotor inertia	gcm²	2.57	2.1	2.21	2.17	2.2	2.12	2.12	2.09	2.02

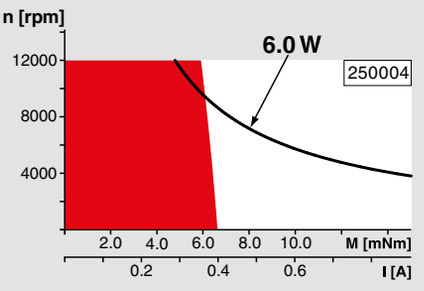
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	28 K/W
18	Thermal resistance winding-housing	8.0 K/W
19	Thermal time constant winding	8.75 s
20	Thermal time constant motor	501 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	42 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Ball bearings in place of sleeve bearings
Pigtails in place of terminals

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

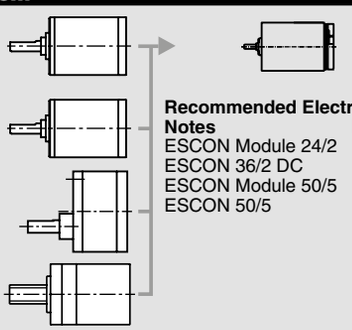
Overview on page 20–25

Planetary Gearhead
∅22 mm
0.5 - 1.0 Nm
Page 293

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 295

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

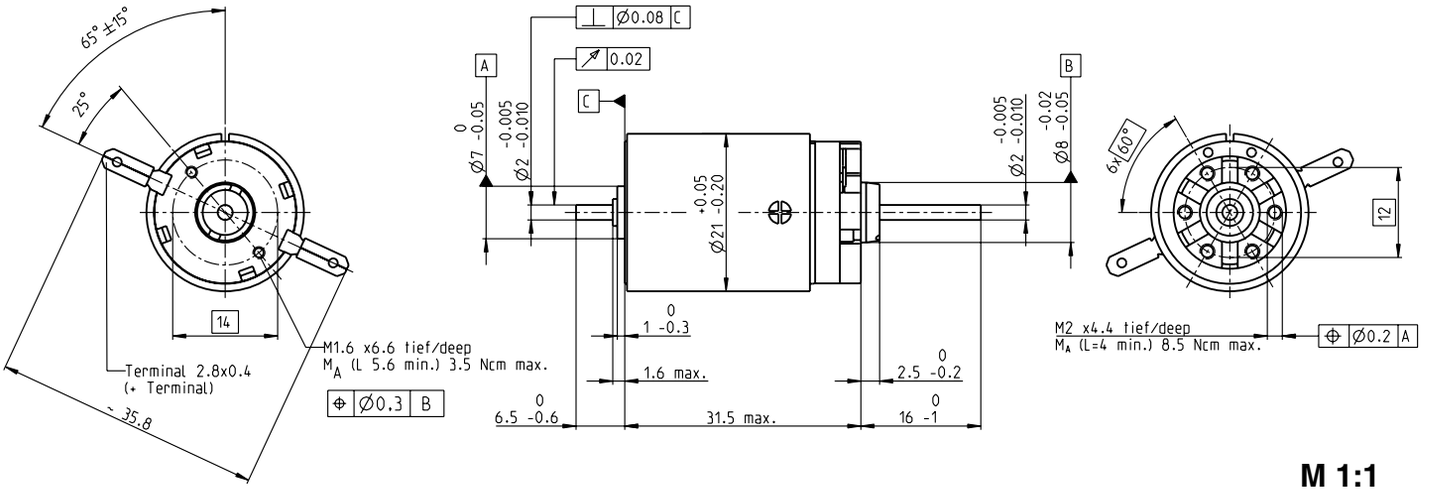
Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

RE-max 21 ∅21 mm, Graphite Brushes, 6 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

			250020	250021	250022	250023	250024	250025	250026	250027	250028
Motor Data											
	Values at nominal voltage										
1	Nominal voltage	V	4	6	9	15	18	21	24	36	48
2	No load speed	rpm	11200	9440	9880	10200	9680	9470	8650	9780	9320
3	No load current	mA	150	81	56.9	35.7	27.7	23.2	18.2	14	9.95
4	Nominal speed	rpm	10700	8230	8230	8140	7580	7320	6480	7580	7090
5	Nominal torque (max. continuous torque)	mNm	1.91	3.81	5.69	7.13	7.23	7.09	7.14	6.9	6.86
6	Nominal current (max. continuous current)	A	0.72	0.72	0.72	0.552	0.44	0.362	0.292	0.213	0.151
7	Stall torque	mNm	45.4	30.9	34.8	35.2	33.7	31.6	28.8	31.1	29.1
8	Stall current	A	13.6	5.19	4.07	2.56	1.93	1.52	1.11	0.9	0.602
9	Max. efficiency	%	79	76	78	78	78	77	76	77	76
	Characteristics										
10	Terminal resistance	Ω	0.295	1.16	2.21	5.86	9.32	13.8	21.7	40	79.7
11	Terminal inductance	mH	0.013	0.041	0.085	0.22	0.354	0.503	0.786	1.39	2.71
12	Torque constant	mNm/A	3.35	5.95	8.55	13.8	17.5	20.8	26	34.6	48.3
13	Speed constant	rpm/V	2850	1600	1120	694	546	459	367	276	198
14	Speed / torque gradient	rpm/mNm	252	312	289	295	291	305	305	319	326
15	Mechanical time constant	ms	6.69	6.77	6.59	6.62	6.6	6.66	6.68	6.88	6.77
16	Rotor inertia	gcm²	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

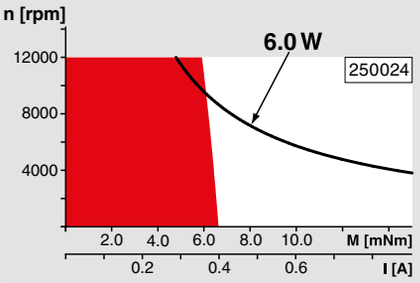
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	28 K/W
18	Thermal resistance winding-housing	8.0 K/W
19	Thermal time constant winding	8.75 s
20	Thermal time constant motor	502 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
	(static, shaft supported)	420 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
	(static, shaft supported)	420 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	42 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Ball bearings in place of sleeve bearings
Pigtails in place of terminals

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

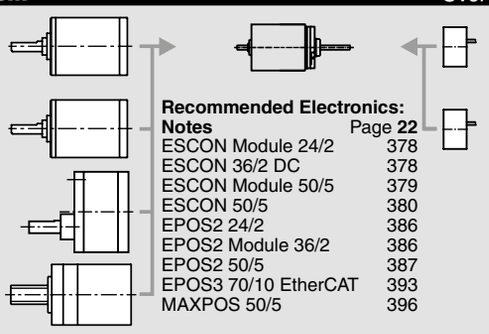
Overview on page 20–25

Planetary Gearhead
∅22 mm
0.5 - 1.0 Nm
Page 293

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 295

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313

Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

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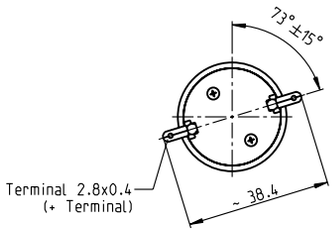
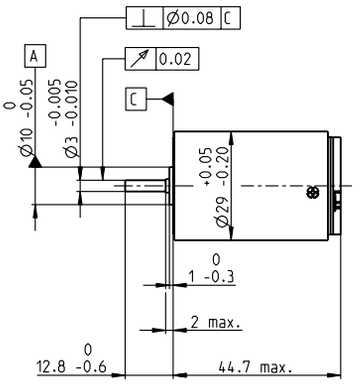
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 50/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

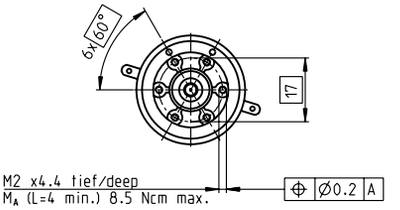
Encoder MR
32 CPT,
2 / 3 channels
Page 352

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 354

RE-max 29 ∅29 mm, Precious Metal Brushes CLL, 15 Watt







M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

		226748	226749	226751	226752	226753	226754	226755	226756	226757	226759	226760	226761	226762	226763	226764
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	7.2	9	12	18	18	24	30	36	42	48	48	48	48	48	48
2	No load speed	rpm	6320	7020	6010	6650	5490	5810	6010	6480	6550	6120	5260	4880	4050	3260	2720
3	No load current	mA	43	41.7	23.6	18.9	13.4	11.1	9.45	9.01	7.87	6.1	4.65	4.07	2.95	2.04	1.5
4	Nominal speed	rpm	6080	6710	5430	6020	4700	4990	5190	5650	5680	5280	4410	4020	3180	2380	1820
5	Nominal torque (max. continuous torque)	mNm	8.67	9.78	15.6	21.2	25.9	27	26.6	26.5	25	25.9	26.2	26.2	25.9	25.8	25.6
6	Nominal current (max. continuous current)	A	0.84	0.84	0.84	0.84	0.84	0.695	0.569	0.508	0.417	0.353	0.305	0.283	0.232	0.186	0.153
7	Stall torque	mNm	200	205	156	219	177	190	193	206	188	187	161	149	120	95.7	77.5
8	Stall current	A	18.4	16.8	8.22	8.49	5.68	4.81	4.05	3.9	3.07	2.51	1.86	1.59	1.06	0.683	0.461
9	Max. efficiency	%	91	91	90	91	91	91	91	91	90	91	90	90	90	90	89
	Characteristics																
10	Terminal resistance	Ω	0.39	0.536	1.46	2.12	3.17	4.99	7.41	9.24	13.7	19.2	25.8	30.1	45.1	70.2	104
11	Terminal inductance	mH	0.0353	0.0447	0.108	0.199	0.292	0.464	0.676	0.839	1.12	1.67	2.26	2.63	3.81	5.86	8.46
12	Torque constant	mNm/A	10.9	12.2	19	25.8	31.2	39.4	47.5	53	61.1	74.7	86.9	93.7	113	140	168
13	Speed constant	rpm/V	879	781	502	370	306	242	201	180	156	128	110	102	84.6	68.2	56.8
14	Speed / torque gradient	rpm/mNm	31.6	34.3	38.6	30.4	31	30.7	31.3	31.4	34.9	32.8	32.7	32.8	33.9	34.2	35.2
15	Mechanical time constant	ms	4.77	4.63	4.42	4.32	4.29	4.28	4.28	4.27	4.31	4.3	4.3	4.29	4.32	4.33	4.34
16	Rotor inertia	gcm²	14.4	12.9	10.9	13.6	13.2	13.3	13.1	13	11.8	12.5	12.6	12.5	12.2	12.1	11.8

Specifications

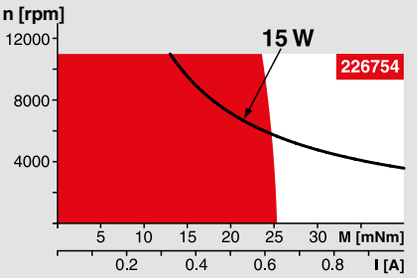
	Thermal data	
17	Thermal resistance housing-ambient	15.8 K/W
18	Thermal resistance winding-housing	4.0 K/W
19	Thermal time constant winding	15.4 s
20	Thermal time constant motor	928 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	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	159 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Ball bearings in place of sleeve bearings
Pigtails in place of terminals
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

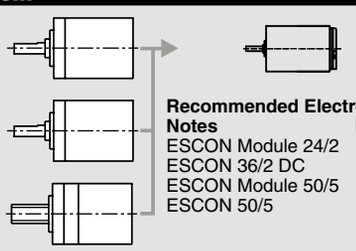
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 4.5 Nm
Page 304

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

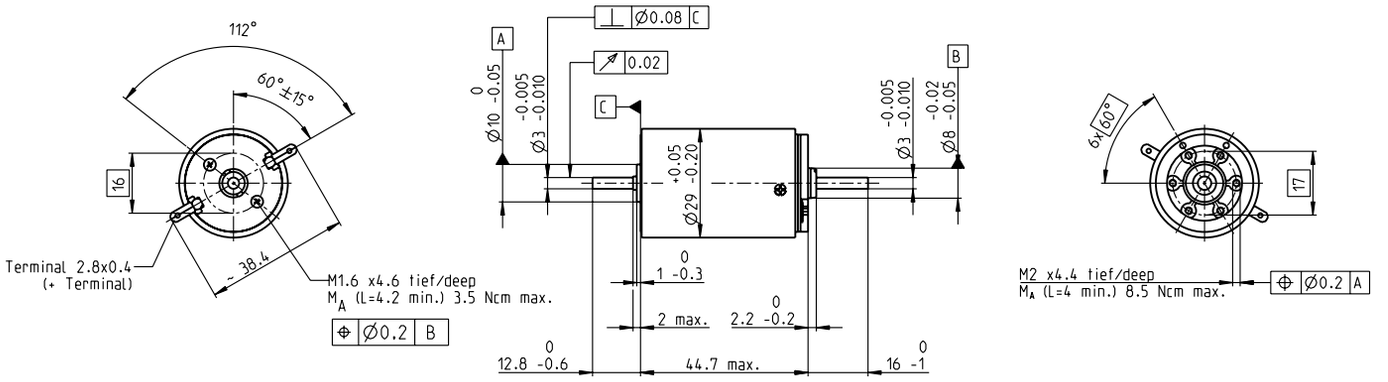
Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

RE-max 29 ∅29 mm, Precious Metal Brushes CLL, 9 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

		226765	226767	226770	226771	226772	226773	226774	226775	226776	226778	226779	226780	226781	226782	226783
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	4.5	6	9	12	15	18	24	24	30	36	36	42	48	48	48
2	No load speed	rpm	3940	4670	4500	4430	4570	4350	4810	4310	4670	4590	3940	4270	4050	3260	2710
3	No load current	mA	39.5	38.7	24.4	17.8	15	11.5	10.1	8.52	7.75	6.27	4.93	4.79	3.86	2.76	2.1
4	Nominal speed	rpm	3700	4370	3930	3800	3780	3530	3980	3480	3800	3740	3090	3410	3180	2380	1820
5	Nominal torque (max. continuous torque)	mNm	8.71	9.81	15.5	21.3	25.8	27.1	26.7	26.7	25.2	26	26.2	26.1	25.7	25.7	25.4
6	Nominal current (max. continuous current)	A	0.84	0.84	0.84	0.84	0.84	0.697	0.57	0.511	0.419	0.354	0.306	0.283	0.231	0.186	0.153
7	Stall torque	mNm	125	137	117	146	148	142	154	138	134	140	121	131	120	95.7	77.5
8	Stall current	A	11.5	11.2	6.16	5.66	4.73	3.61	3.24	2.6	2.2	1.88	1.39	1.39	1.06	0.683	0.461
9	Max. efficiency	%	89	89	88	89	89	89	89	89	89	89	89	89	88	88	87
	Characteristics																
10	Terminal resistance	Ω	0.39	0.536	1.46	2.12	3.17	4.99	7.41	9.24	13.7	19.2	25.8	30.1	45.1	70.2	104
11	Terminal inductance	mH	0.035	0.045	0.108	0.199	0.292	0.465	0.677	0.841	1.12	1.67	2.26	2.63	3.81	5.87	8.48
12	Torque constant	mNm/A	10.9	12.2	19	25.8	31.2	39.4	47.5	53	61.1	74.7	86.9	93.7	113	140	168
13	Speed constant	rpm/V	879	781	502	370	306	242	201	180	156	128	110	102	84.6	68.2	56.8
14	Speed / torque gradient	rpm/mNm	31.6	34.3	38.6	30.4	31	30.7	31.3	31.5	34.9	32.8	32.7	32.8	33.9	34.2	35.2
15	Mechanical time constant	ms	4.78	4.63	4.43	4.32	4.3	4.29	4.29	4.28	4.32	4.31	4.31	4.3	4.33	4.34	4.35
16	Rotor inertia	gcm²	14.4	12.9	11	13.6	13.2	13.3	13.1	13	11.8	12.6	12.6	12.5	12.2	12.1	11.8

Specifications

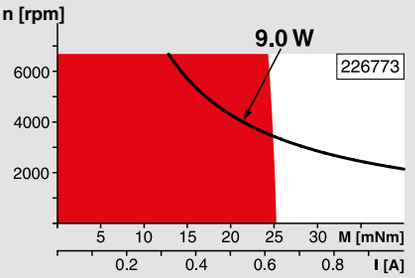
	Thermal data	
17	Thermal resistance housing-ambient	15.8 K/W
18	Thermal resistance winding-housing	4.0 K/W
19	Thermal time constant winding	15.9 s
20	Thermal time constant motor	928 s
21	Ambient temperature	-30…+65°C
22	Max. winding temperature	+85°C
	Mechanical data (sleeve bearings)	
23	Max. speed	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)	80 N
	(static, shaft supported)	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)	75 N
	(static, shaft supported)	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	161 g

CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Ball bearings in place of sleeve bearings
Pigtails in place of terminals
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

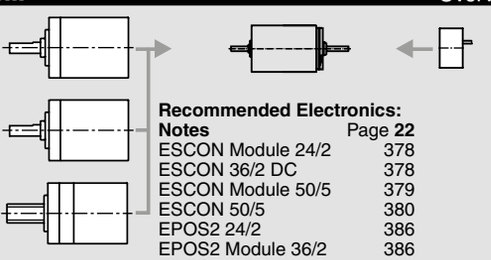
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 4.5 Nm
Page 304

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

Spindle Drive
∅32 mm
Page 334–336



Encoder MR
128 - 1000 CPT,
3 channels
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Recommended Electronics:

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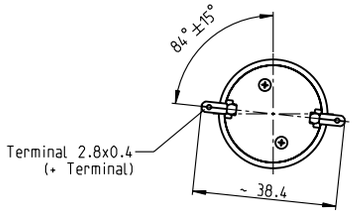
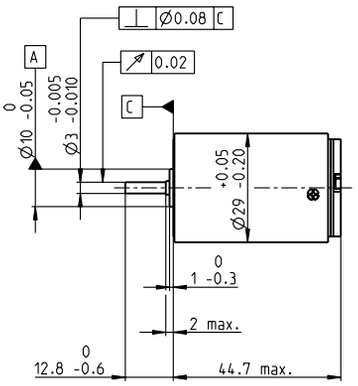
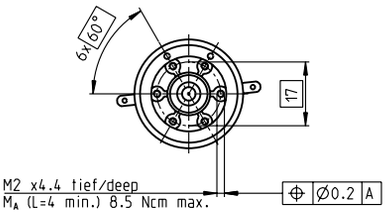
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 50/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

RE-max 29 ∅29 mm, Graphite Brushes, 22 Watt







M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

		226784	226785	226787	226788	226789	226790	226791	226792	226793	226795	226796	226797	226798	226799	226800
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	9	12	18	24	30	36	42	48	48	42	48	48	48	48	48
2	No load speed	rpm	7890	9350	9010	8860	9140	8700	8410	8630	7470	5350	5250	4870	4040	3250	2700
3	No load current	mA	78.2	73.7	46.8	34.2	28.6	22.3	18.3	16.5	13.7	10.2	8.7	7.93	6.33	4.9	3.96
4	Nominal speed	rpm	7580	8960	8270	8050	8200	7760	7450	7670	6450	4330	4240	3850	3000	2200	1630
5	Nominal torque (max. continuous torque)	mNm	10.9	12.3	19.7	27	30.8	31.1	30.8	30.7	29.4	31	31.1	31.2	30.9	30.9	30.6
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	1.01	0.811	0.666	0.595	0.495	0.425	0.366	0.34	0.28	0.225	0.186
7	Stall torque	mNm	284	299	242	299	300	287	271	277	215	164	162	150	120	95.7	77.5
8	Stall current	A	26.1	24.5	12.7	11.6	9.6	7.29	5.71	5.22	3.52	2.2	1.86	1.6	1.06	0.684	0.461
9	Max. efficiency	%	89	89	88	90	90	89	89	89	88	87	87	86	85	84	82
	Characteristics																
10	Terminal resistance	Ω	0.345	0.49	1.41	2.07	3.13	4.94	7.36	9.19	13.6	19.1	25.8	30.1	45.1	70.2	104
11	Terminal inductance	mH	0.035	0.045	0.108	0.199	0.292	0.465	0.677	0.841	1.12	1.67	2.26	2.63	3.81	5.87	8.48
12	Torque constant	mNm/A	10.9	12.2	19	25.8	31.2	39.4	47.5	53	61.1	74.7	86.9	93.7	113	140	168
13	Speed constant	rpm/V	879	781	502	370	306	242	201	180	156	128	110	102	84.6	68.2	56.8
14	Speed / torque gradient	rpm/mNm	27.9	31.4	37.4	29.8	30.6	30.4	31.1	31.3	34.8	32.7	32.6	32.7	33.8	34.2	35.1
15	Mechanical time constant	ms	4.21	4.24	4.28	4.23	4.24	4.24	4.26	4.26	4.3	4.3	4.3	4.29	4.32	4.34	4.35
16	Rotor inertia	gcm²	14.4	12.9	11	13.6	13.2	13.3	13.1	13	11.8	12.5	12.6	12.5	12.2	12.1	11.8

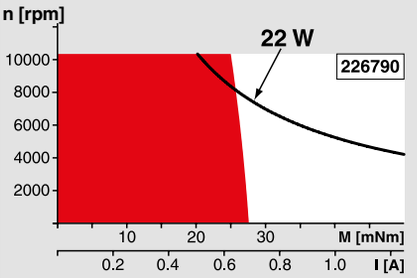
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	15.8 K/W
18	Thermal resistance winding-housing	4.0 K/W
19	Thermal time constant winding	15.9 s
20	Thermal time constant motor	927 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)	5.0 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	12.3 N
	Other specifications	
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	150 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Sleeve bearings in place of ball bearings
Pigtails in place of terminals

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

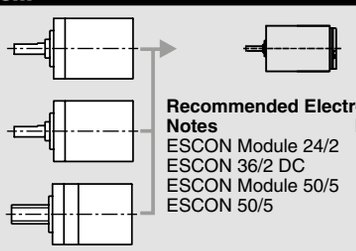
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 4.5 Nm
Page 304

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

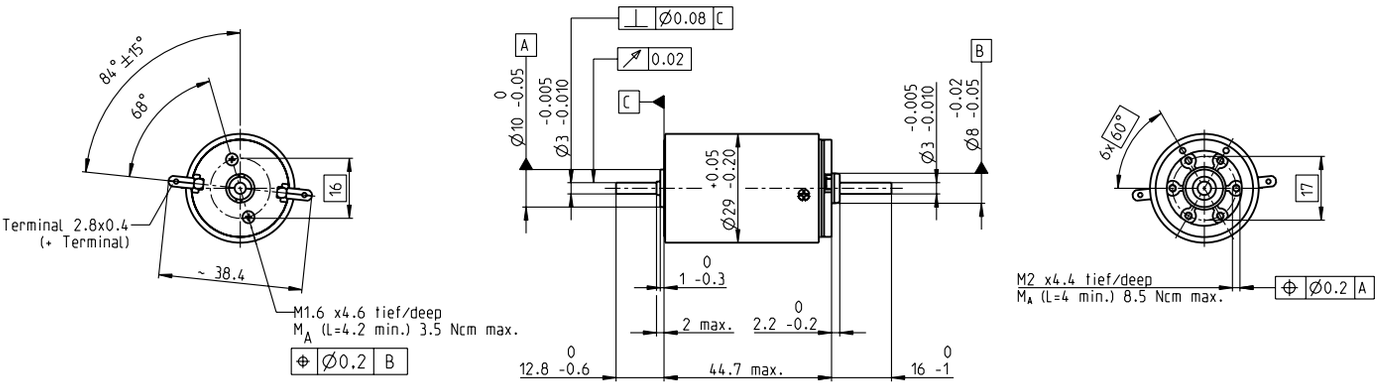
Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page 22
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380

RE-max 29 ∅29 mm, Graphite Brushes, 22 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

		226801	226802	226805	226806	226807	226808	226809	226810	226811	226815	226816	226817	226818	226819	226820
Motor Data																
	Values at nominal voltage															
1	Nominal voltage	V	9	12	18	24	30	36	42	48	48	48	48	48	48	48	48
2	No load speed	rpm	7890	9350	9010	8860	9140	8700	8410	8630	7470	6110	5250	4870	4040	3250	2700
3	No load current	mA	78.2	73.7	46.8	34.2	28.6	22.3	18.3	16.5	13.7	10.5	8.7	7.93	6.33	4.9	3.96
4	Nominal speed	rpm	7580	8960	8270	8050	8200	7760	7450	7670	6450	5100	4240	3850	3000	2200	1630
5	Nominal torque (max. continuous torque)	mNm	10.9	12.3	19.7	27	30.8	31.1	30.8	30.7	29.4	30.8	31.1	31.2	30.9	30.9	30.6
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	1.01	0.811	0.666	0.595	0.495	0.423	0.366	0.34	0.28	0.225	0.186
7	Stall torque	mNm	284	299	242	299	300	287	271	277	215	188	162	150	120	95.7	77.5
8	Stall current	A	26.1	24.5	12.7	11.6	9.6	7.29	5.71	5.22	3.52	2.51	1.86	1.6	1.06	0.684	0.461
9	Max. efficiency	%	89	89	88	90	90	89	89	89	88	88	87	86	85	84	82
	Characteristics																
10	Terminal resistance	Ω	0.345	0.49	1.41	2.07	3.13	4.94	7.36	9.19	13.6	19.1	25.8	30.1	45.1	70.2	104
11	Terminal inductance	mH	0.034	0.044	0.106	0.195	0.285	0.453	0.66	0.82	1.09	1.63	2.21	2.57	3.72	5.73	8.27
12	Torque constant	mNm/A	10.9	12.2	19	25.8	31.2	39.4	47.5	53	61.1	74.7	86.9	93.7	113	140	168
13	Speed constant	rpm/V	879	781	502	370	306	242	201	180	156	128	110	102	84.6	68.2	56.8
14	Speed / torque gradient	rpm/mNm	27.9	31.4	37.4	29.8	30.6	30.4	31.1	31.3	34.8	32.7	32.6	32.7	33.8	34.2	35.1
15	Mechanical time constant	ms	4.21	4.24	4.29	4.23	4.24	4.25	4.26	4.26	4.3	4.3	4.3	4.3	4.32	4.34	4.35
16	Rotor inertia	gcm²	14.4	12.9	11	13.6	13.2	13.3	13.1	13	11.8	12.5	12.6	12.5	12.2	12.1	11.8

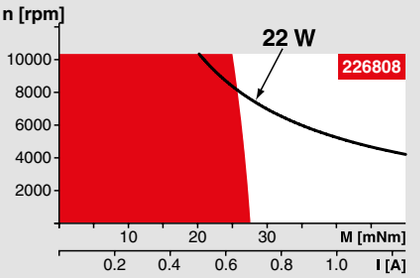
Specifications

	Thermal data	
17	Thermal resistance housing-ambient	15.8 K/W
18	Thermal resistance winding-housing	4.0 K/W
19	Thermal time constant winding	15.9 s
20	Thermal time constant motor	927 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)	5.0 N
27	Max. force for press fits (static)	75 N
	(static, shaft supported)	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	0.025 mm
26	Max. axial load (dynamic)	1.7 N
27	Max. force for press fits (static)	80 N
	(static, shaft supported)	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	160 g

Values listed in the table are nominal.
Explanation of the figures on page 107.

Option
Sleeve bearings in place of ball bearings
Pigtails in place of terminals

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

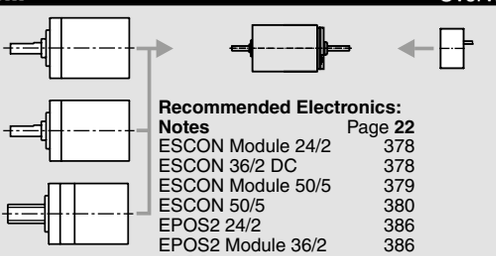
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 4.5 Nm
Page 304

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

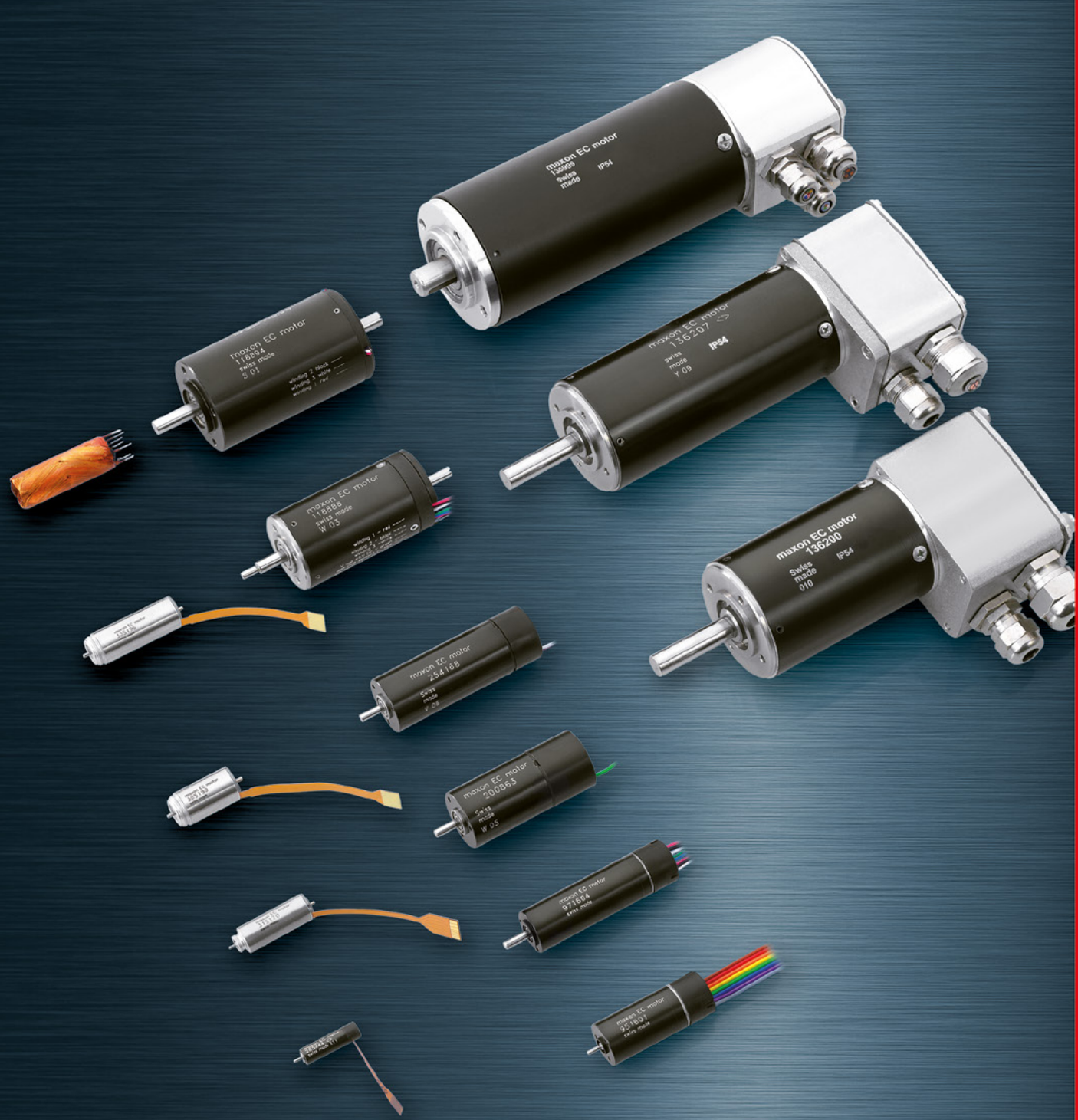
Spindle Drive
∅32 mm
Page 334–336



Encoder MR
128 - 1000 CPT,
3 channels
Page 355

Recommended Electronics:

Notes	Page **22**
ESCON Module 24/2	378
ESCON 36/2 DC	378
ESCON Module 50/5	379
ESCON 50/5	380
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 50/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396



maxon EC motor

maxon EC (BLDC) 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.

maxon Standard Specification

With our Standard Specification we offer you a means to judge maxon motors in the most important respects. To our knowledge it covers normal applications. The Standard Specification is part of our «General Conditions of Sale».

For information on standards and directives, refer to page 14 and 15.

The Standard Specification No. 101 for maxon EC motor

1. **Principles**
The **standard specification** defines checks and tests performed on the **complete motor and during the production process.** In order to guarantee our high quality standard, we check compliance to specified measurements and characteristics of materials, parts and subassemblies through the manufacturing process and the complete motor. The obtained measurements are recorded and can be made available to customers if required. Random sampling plans are according to ISO 2859, MIL STD 105E and DIN/ISO 3951 (inspection by attributes, sequential sampling, variables inspection) as well as internal manufacturing controls. This standard specification always applies unless a different one has been agreed between the customer and maxon.

2. **Data**

2.1 **Electrical data** apply at 22° to 25°C and use of a 1 quadrant controller with block commutation: Data control within one minute running time.

Measurement voltage	+/- 0.5 % for voltages ≥ 3 V and ± 0.015 V for voltages ≤ 3 V
No load speed	± 10%
No load current	≤ maximum specified value
Direction of rotation	CW/CCW
Motor position	horizontal or vertical

Notes: Measurement voltage may vary from the nominal voltage listed in the catalog. The no load current specified in the catalog is a typical value and not the maximum one. When connecting the motor according to the catalog (or labelling), the shaft turns CW as seen from the mounting end.
Terminal resistance is verified through random sampling.
Inductance is determined at product certification. Test frequency is 1 kHz. Terminal inductance depends on frequency. The specified electromechanical parameters are sufficiently guaranteed with these measurements.

2.2 **Mechanical data** per outline drawing: Standard measuring instruments (for electrical length measuring DIN 32876, micrometer per DIN 863, dial indicator DIN 878, caliper per DIN 862, bore caliper DIN 2245, thread caliper per DIN 2280 and others) are used.

2.3 **Rotor imbalance:** Rotors for EC motors with air-flux winding are balanced according to our standard guidelines during manufacturing. For EC motors with wound stator teeth, the rotors are mounted in gauges but not balanced as standard. Only a subjective assessment is possible on the complete motor which is done during random sampling.

2.4 **Electric strength:** Each motor is completely assembled and then tested for ground faults, at 250 or 500 V DC depending on the diameter.

2.5 **Noise:** Tests are carried out for anomalies within a lot on a subjective basis. Depending on speed, the motions in the motor cause noise and vibration of varying degrees, frequency and intensity. The noise level experienced with a single sample unit should not be interpreted as indicative of the noise or vibration level to be expected of future deliveries.

2.6 **Service life:** Durability tests are carried out under uniform internal criteria as part of product certification. The service life of an EC motor essentially depends on the service life of the bearings. This is determined by type of operation, bearing load and ambient conditions. Consequently, the many possible variations do not allow us to make a general statement on service life.

2.7 **Environmental influences**
Protection against corrosion: Our products are tested during product certification on the basis of DIN EN 60068-2-30.
Coating of components: Surface treatment and coating procedures used by maxon are selected on the basis of their merits to resist corrosion. These treatments are evaluated at product certification according to their applicable standard.

3. Parameters that differ from or are additional to the data sheet can be set and are a central part of our systematic testing as the customer's specification. Test/inspection certificates are issued by prior agreement.

January 2010 edition/subject to change

Explanation of the pages 192–267

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 32 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] ±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] ±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 torque produced by the motor when at standstill. 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 cannot often 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 phase to phase R [Ω]
is determined through the resistance at 25°C between two connections.

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
Δ_n/Δ_M [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 ± 20%).
With flat motors, the real gradient depends on speed: at higher speeds, it is steeper, but flatter at lower 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 45).

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.

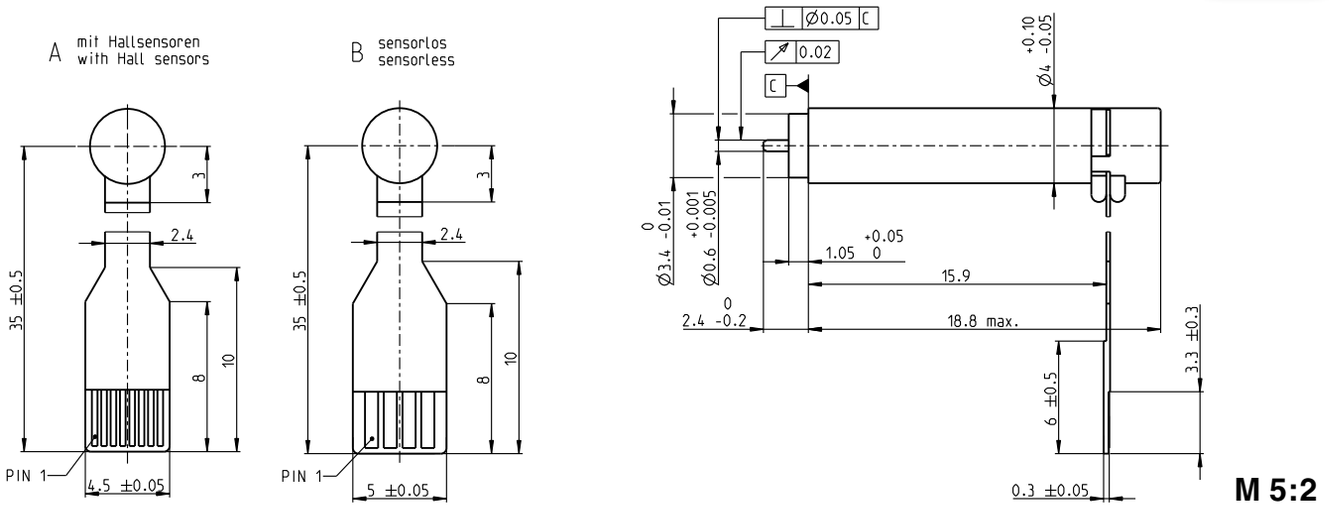
38 Scaling Set speed value input k_c [rpm/V]
Set speed value n_c is based on the product $n_c = k_c \cdot U_c$.

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.

EC 4 ∅4 mm, brushless, 0.5 Watt

NEW



M 5:2

Stock program
Standard program
Special program (on request)

	Part Numbers	
A with Hall sensors	431555	431558
B sensorless	423518	423525

Motor Data (provisional)									
	Values at nominal voltage								
1	Nominal voltage	V	3	6					
2	No load speed	rpm	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	gcm²	0.00111	0.00111					

Specifications

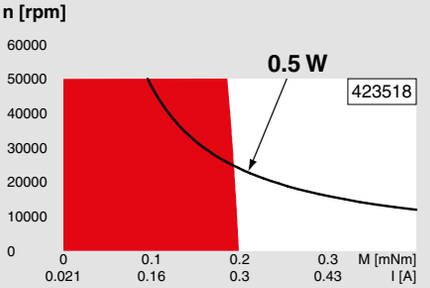
	Thermal data	
17	Thermal resistance housing-ambient	129 K/W
18	Thermal resistance winding-housing	2.78 K/W
19	Thermal time constant winding	0.13 s
20	Thermal time constant motor	78.0 s
21	Ambient temperature	-20...+80°C
22	Max. winding temperature	+125°C
	Mechanical data	
23	Max. speed	50000 rpm
24	Axial 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} 4.5...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	52745-0896	52207-0485
MOLEX		52089-0419
TYCO		84953-4

Pin for design with Hall sensors:
FPC, 8 pole, pitch 0.5 mm, top contact style
Wiring diagram for Hall sensors see page 33

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.

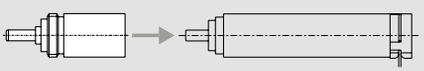
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅4 mm
0.002 - 0.015 Nm
Page 272

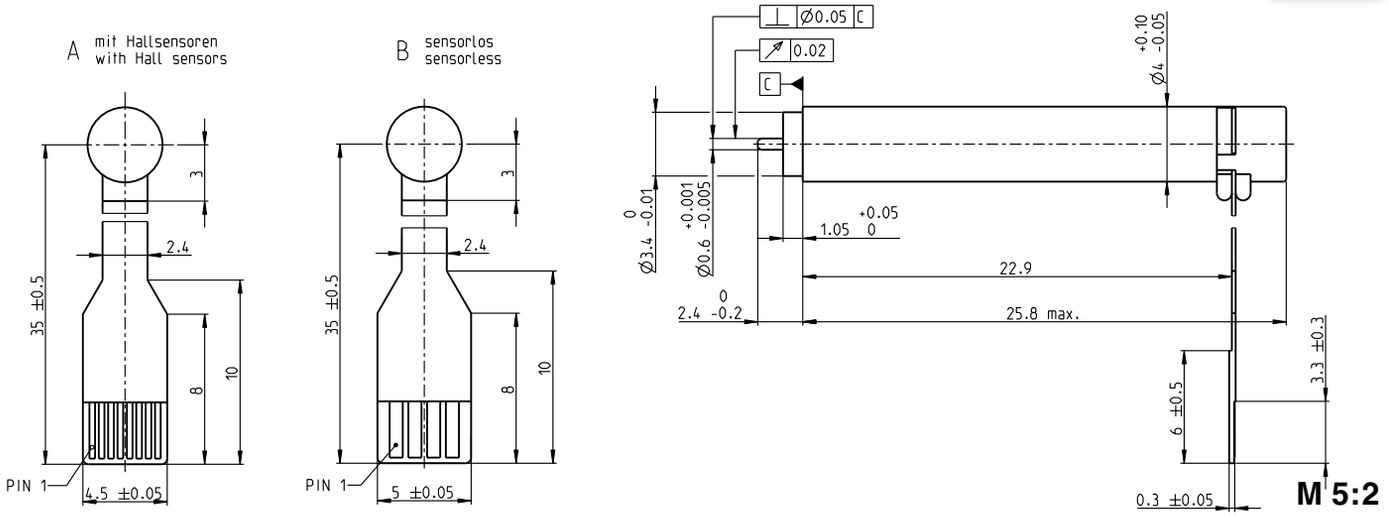


Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379

EC 4 ∅4 mm, brushless, 1.0 Watt

NEW



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	gcm²	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	50 000 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

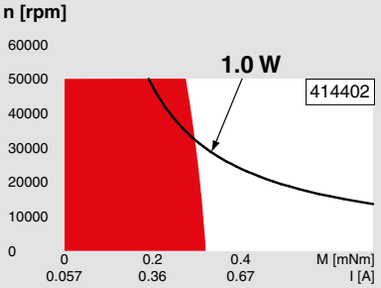
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	1.8 g

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} 4.5...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	52745-0896	52207-0485
MOLEX		52089-0419
TYCO		84953-4

Pin for design with Hall sensors:
FPC, 8 pole, pitch 0.5 mm, top contact style
Wiring diagram for Hall sensors see page 33

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.

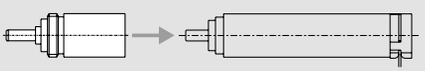
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

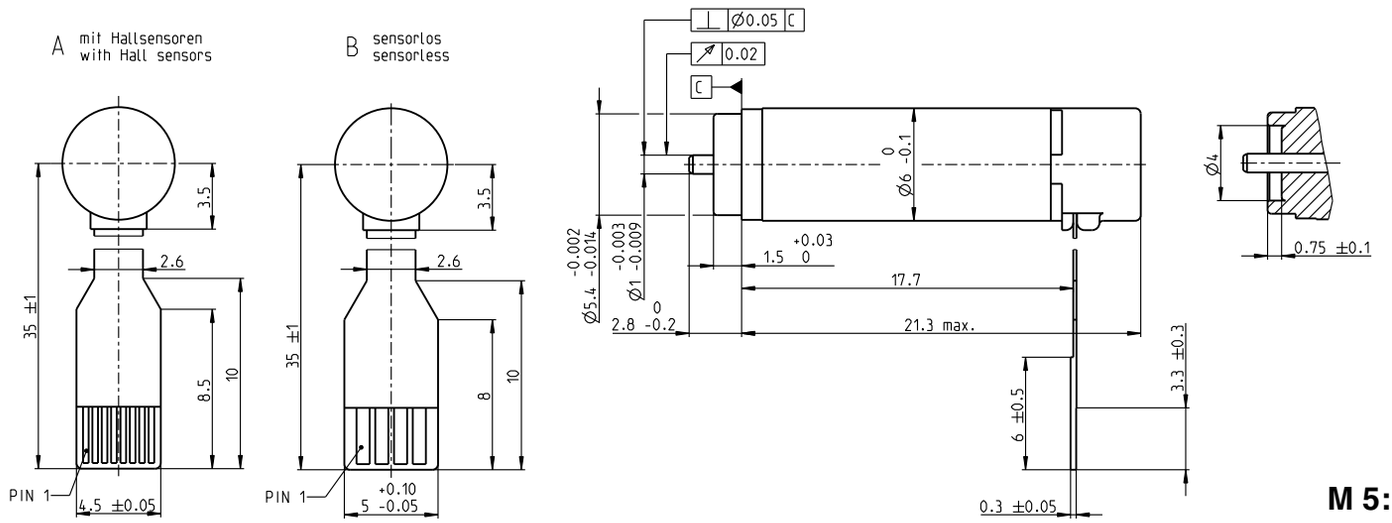
Planetary Gearhead
∅4 mm
0.002 - 0.015 Nm
Page 272



Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379

EC 6 ∅6 mm, brushless, 1.5 Watt



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									
1	Nominal voltage	V	6	12						
2	No load speed	rpm	44100	33500						
3	No load current	mA	46.9	15.5						
4	Nominal speed	rpm	25500	13900						
5	Nominal torque (max. continuous torque)	mNm	0.339	0.33						
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	%	57	53						
	Characteristics									
10	Terminal resistance phase to phase	Ω	8.72	63.8						
11	Terminal inductance phase to phase	mH	0.065	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	gcm²	0.00703	0.00703						

Specifications

Thermal data

17	Thermal resistance housing-ambient	67.1 K/W
18	Thermal resistance winding-housing	16.1 K/W
19	Thermal time constant winding	1.69 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		100 000 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

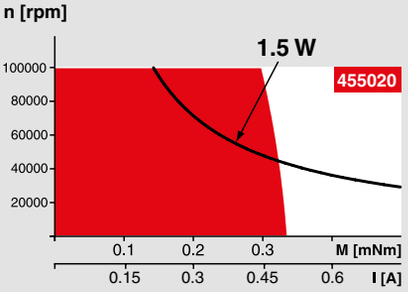
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	3 g

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	52207-0433
Molex		52089-0419
Tyco		84953-4
FCI	SFV8R-2STE1LF	

Pin for design with Hall sensors:
FPC, 8 pole, pitch 0.5 mm, top contact style
Wiring diagram for Hall sensors see page 33

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).

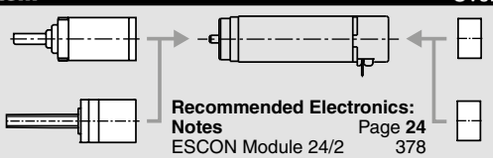
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅6 mm
0.002 - 0.03 Nm
Page 273

Spindle Drive
∅6 mm
Page 325–326



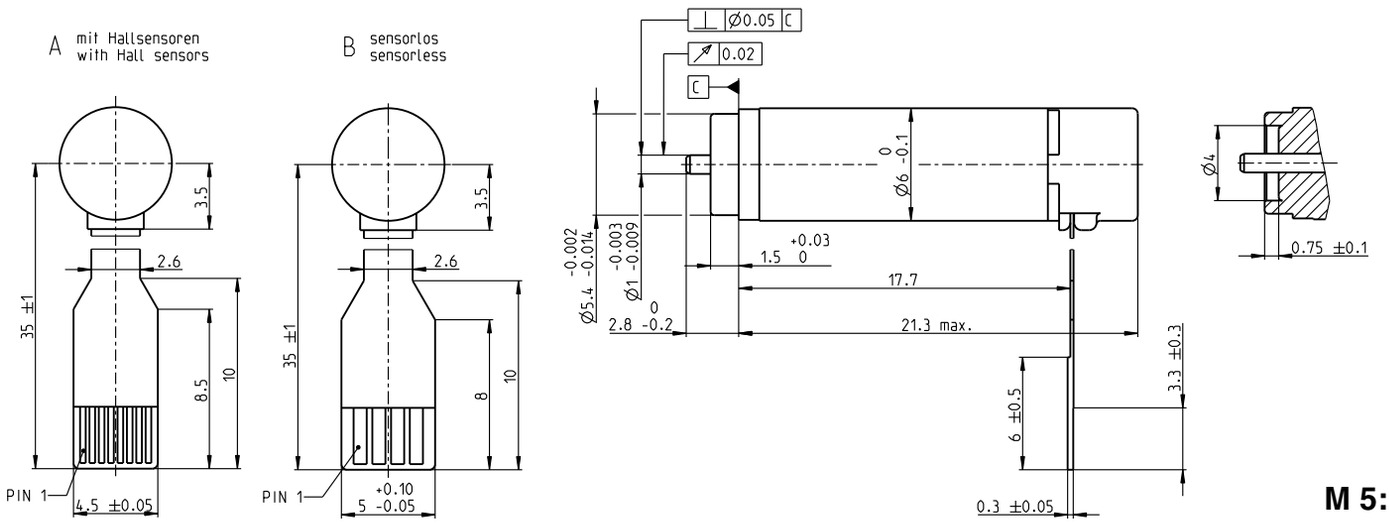
Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2 EC	386
EPOS2 Module 36/2	386

for type B:
Encoder 6–8 MAG
64–256 CPT,
Page 347

for type B:
Encoder 6–8 OPT
128 CPT,
Page 357

EC 6 ∅6 mm, brushless, 2 Watt



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	73200	61900	62700					
3	No load current	mA	209	78.3	39.8					
4	Nominal speed	rpm	52600	45100	47000					
5	Nominal torque (max. continuous torque)	mNm	0.394	0.398	0.41					
6	Nominal current (max. continuous current)	A	1.23	0.512	0.266					
7	Stall torque	mNm	1.45	1.52	1.7					
8	Stall current	A	3.92	1.72	0.97					
9	Max. efficiency	%	61	64	65					
	Characteristics									
10	Terminal resistance phase to phase	Ω	0.766	3.49	12.4					
11	Terminal inductance phase to phase	mH	0.005	0.03	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	gcm²	0.00703	0.00703	0.00703					

Specifications

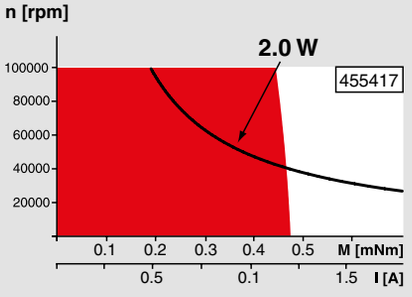
	Thermal data		
17	Thermal resistance housing-ambient		65.8 K/W
18	Thermal resistance winding-housing		13.2 K/W
19	Thermal time constant winding		1.34 s
20	Thermal time constant motor		70.4 s
21	Ambient temperature		-20...+100°C
22	Max. winding temperature		+125°C
	Mechanical data (preloaded ball bearings)		
23	Max. speed		100 000 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		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	52207-0433
Molex		52089-0419
Tyco		84953-4
FCI	SFV8R-2STE1LF	

Pin for design with Hall sensors:
FPC, 8 pole, pitch 0.5 mm, top contact style
Wiring diagram for Hall sensors see page 33

Operating Range



Comments

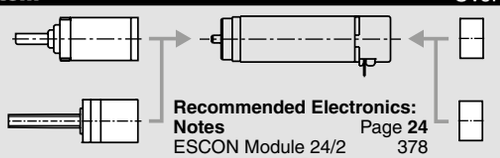
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅6 mm
0.002 - 0.03 Nm
Page 273

Spindle Drive
∅6 mm
Page 325–326

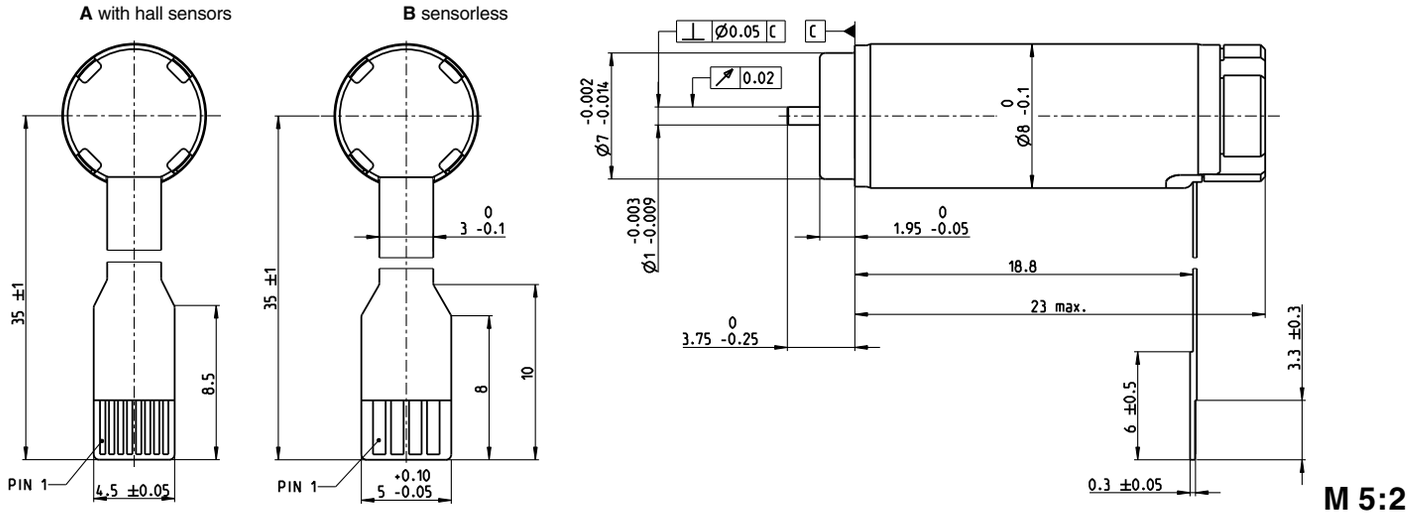
Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2 EC	386
EPOS2 Module 36/2	386

for type B:
Encoder 6–8 MAG
64–256 CPT,
Page 347

for type B:
Encoder 6–8 OPT
128 CPT,
Page 357

EC 8 ∅8 mm, brushless, 2 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	**468334**	468335	468336
B sensorless	468337	468338	468339

Motor Data

	Values at nominal voltage									
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	gcm²	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
		> 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

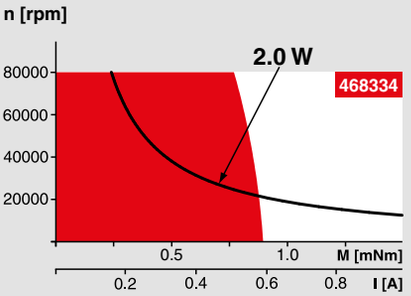
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	6 g

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	52207-0433
Molex		52089-0419
Tyco		84953-4

Pin for design with Hall sensors:
FPC, 8 pole, pitch 0.5 mm, top contact style
Wiring diagram for Hall sensors see page 33

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).

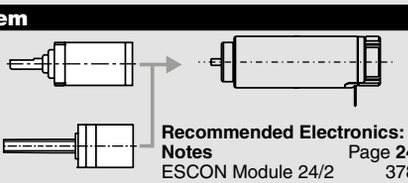
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅8 mm
0.01 - 0.1 Nm
Page 274

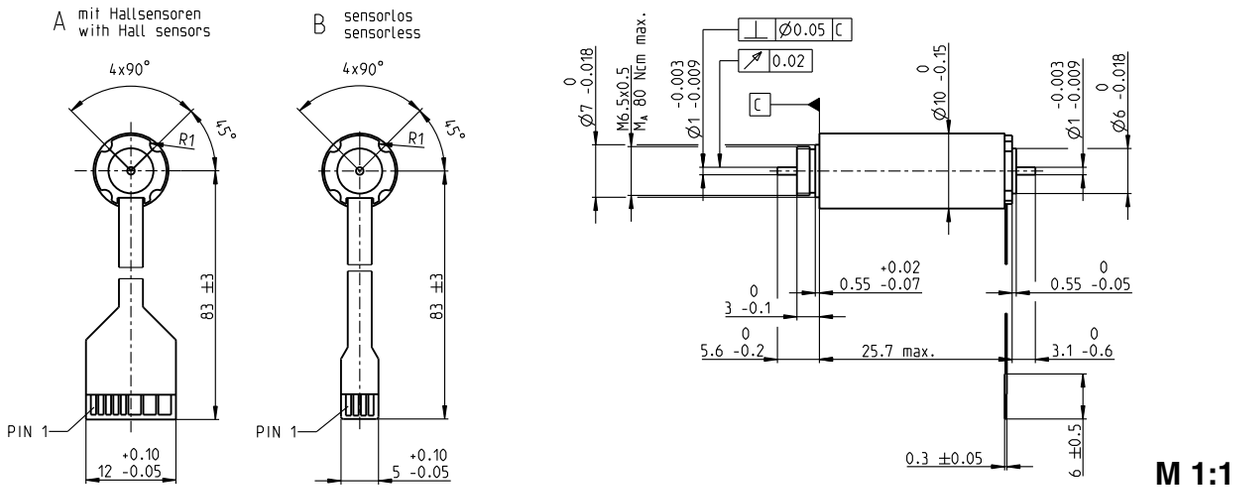
Spindle Drive
∅8 mm
Page 327–328



Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382

EC 10 ∅10 mm, brushless, 8 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	315170	315171	315172	**315173**
B sensorless	315174	315175	315176	315177

Motor Data

	Values at nominal voltage					
1	Nominal voltage	V	6	9	12	18
2	No load speed	rpm	49200	52500	53200	57100
3	No load current	mA	160	118	90.4	67.3
4	Nominal speed	rpm	41700	45600	46600	50900
5	Nominal torque (max. continuous torque)	mNm	1.74	1.63	1.62	1.61
6	Nominal current (max. continuous current)	A	1.66	1.11	0.843	0.6
7	Stall torque	mNm	12	13	13.7	15.6
8	Stall current	A	10.4	8.05	6.46	5.27
9	Max. efficiency	%	77	78	78	79
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.575	1.12	1.86	3.42
11	Terminal inductance phase to phase	mH	0.00998	0.0198	0.0342	0.0671
12	Torque constant	mNm/A	1.15	1.61	2.12	2.97
13	Speed constant	rpm/V	8340	5920	4500	3220
14	Speed/torque gradient	rpm/mNm	4180	4110	3940	3700
15	Mechanical time constant	ms	3.03	2.97	2.85	2.68
16	Rotor inertia	gcm²	0.0691	0.0691	0.0691	0.0691

Specifications

Thermal data

17	Thermal resistance housing-ambient		39.8 K/W
18	Thermal resistance winding-housing		5.1 K/W
19	Thermal time constant winding		1.51 s
20	Thermal time constant motor		221 s
21	Ambient temperature		-40…+100°C
22	Max. winding temperature		+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		65 000 rpm
24	Axial play at axial load	< 0.2 N	0 mm
		> 0.2 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		0.16 N
27	Max. force for press fits (static)		12 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		2 N

Other specifications

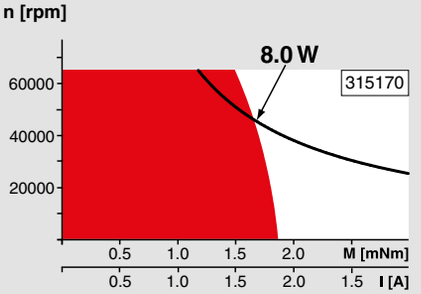
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	13 g

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. 399	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 33

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.

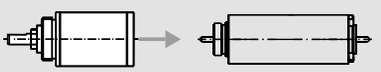
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 276

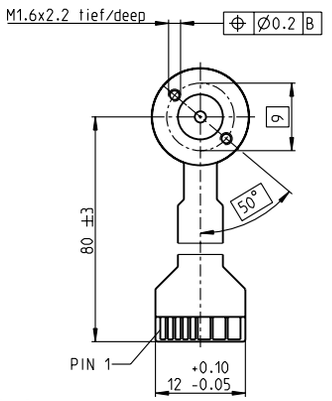


Recommended Electronics:

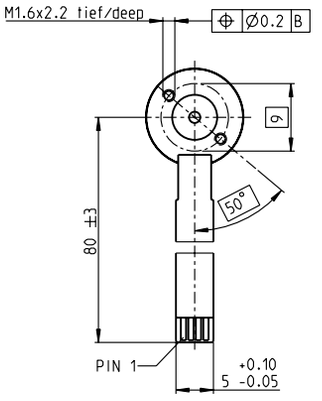
Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382

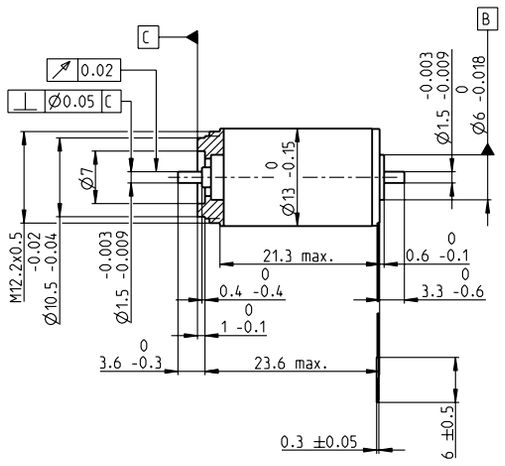
EC 13 ∅13 mm, brushless, 6 Watt

A with Hall sensors



B sensorless





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								
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	gcm²	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		50 000 rpm
24	Axial play at axial load	< 1.5 N	0 mm
		> 1.5 N	max. 0.05 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1 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

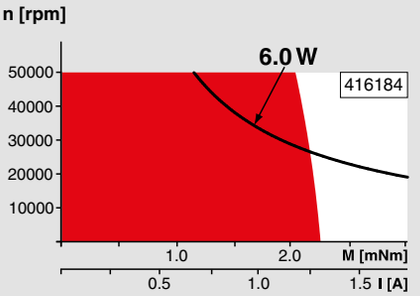
Values listed in the table are nominal.

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. 399	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 33

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 20–25

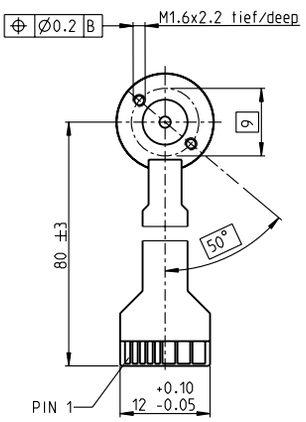
Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279

Recommended Electronics:

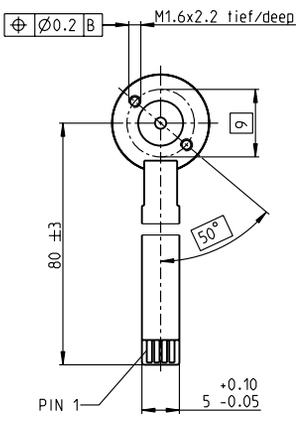
Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382

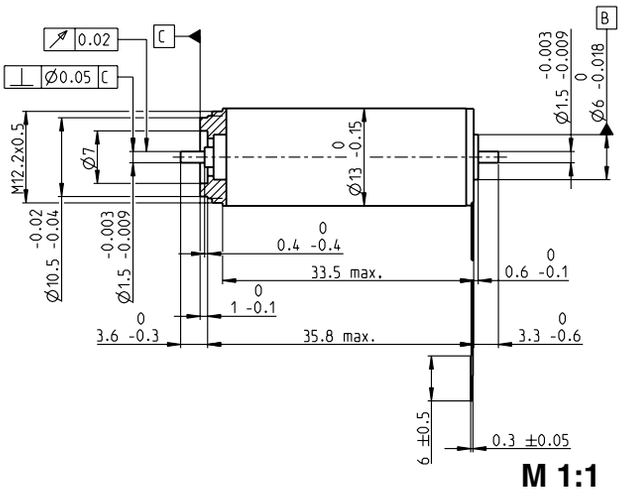
EC 13 ∅13 mm, brushless, 12 Watt

A with Hall sensors



B sensorless





M 1:1

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	gcm²	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		50 000 rpm
24	Axial play at axial load	< 1.5 N	0 mm
		> 1.5 N	max. 0.05 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		0.8 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

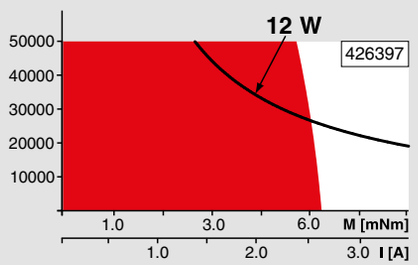
Connection	**with Hall sensors**	**sensorless**
Pin 1	V_{Hall} 4.5…24 VDC	Motor winding 1
Pin 2	Hall sensor 3	Motor winding 2
Pin 3	Hall sensor 1	Motor winding 3
Pin 4	Hall sensor 2	N.C.
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

Adapter	**Part number**	**Part number**
see p. 399	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 33

Operating Range

n [rpm]



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.

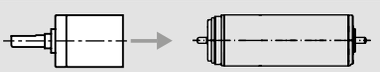
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅13 mm
0.2 - 0.35 Nm
Page 279

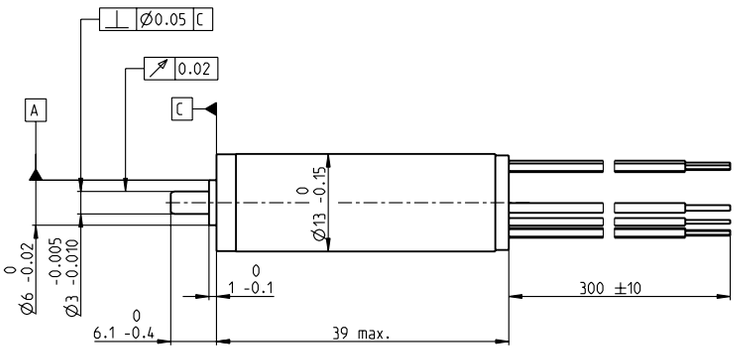


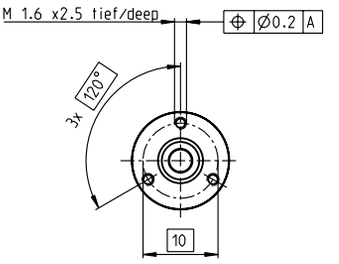
Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2	382
DEC Module 50/5	382

EC 13 ∅13 mm, brushless, 30 Watt

sterilizable





M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	**448825**	**448826**	448827
B sensorless	448831	448832	448833

Motor Data (provisional)									
Values at nominal voltage									
1 Nominal voltage	V	12	24	48					
2 No load speed	rpm	65300	65300	76000					
3 No load current	mA	171	85.5	53.9					
4 Nominal speed	rpm	59100	59400	70200					
5 Nominal torque (max. continuous torque)	mNm	5	4.99	4.47					
6 Nominal current (max. continuous current)	A	2.99	1.49	0.788					
7 Stall torque	mNm	60.2	64.3	68.2					
8 Stall current	A	34.5	18.4	11.4					
9 Max. efficiency	%	87	87	87					
Characteristics									
10 Terminal resistance phase to phase	Ω	0.348	1.3	4.22					
11 Terminal inductance phase to phase	mH	0.018	0.072	0.213					
12 Torque constant	mNm/A	1.75	3.49	6					
13 Speed constant	rpm/V	5470	2740	1590					
14 Speed/torque gradient	rpm/mNm	1090	1020	1120					
15 Mechanical time constant	ms	1.63	1.53	1.68					
16 Rotor inertia	gcm²	0.143	0.143	0.143					

Specifications

Thermal data

17	Thermal resistance housing-ambient	20.7 K/W
18	Thermal resistance winding-housing	2.58 K/W
19	Thermal time constant winding	1.87 s
20	Thermal time constant motor	391 s
21	Ambient temperature	-40…+135°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		90 000 rpm
24	Axial play at axial load	< 7 N	0 mm
		> 7 N	max. 0.1 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		6 N
27	Max. force for press fits (static)		10 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	37.8 g

Alignment of the electronic connections not specified.

Values listed in the table are nominal.

Connection A and B, motor (cable AWG 22)

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

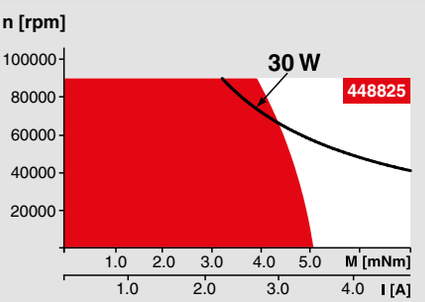
Connection A, sensors (cable AWG 26)

green	V_{Hall} 3.8...24 VDC
blue	GND
red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3

Option: Inch-version size 5 available as standard version.

Wiring diagram for Hall sensors see page 33

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

Application

135°C

Sterilizable Devices

- Saws
- Surgical Reamers
- Arthroscopic Shavers
- Surgical Staplers
- Dental Tools

Sterilization information

Sensorless: typically 2000 autoclave cycles
Hall sensor: typically 1000 autoclave cycles

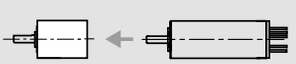
Sterilization with steam

Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

maxon modular system

Overview on page 20–25

Planetary Gearhead
sterilizable
∅13 mm
0.05 - 0.275 Nm
Page 280



Recommended Electronics:

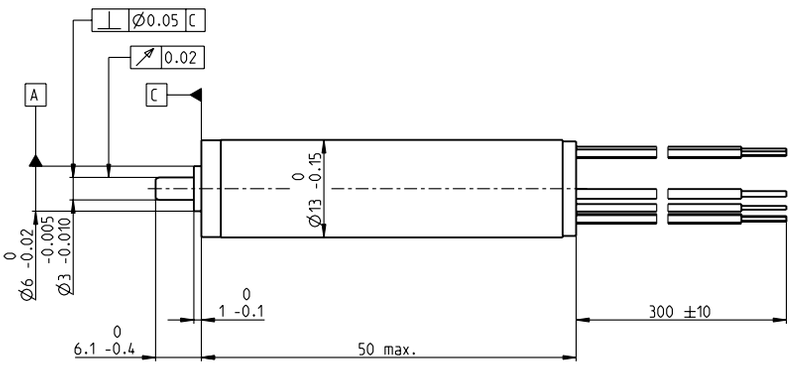
Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2, 50/5	382

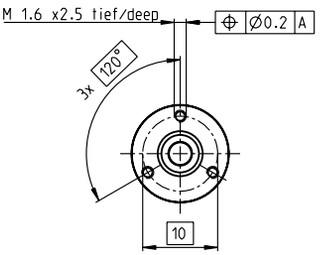
Choke may be required

November 2015 edition / subject to change

EC 13 ∅13 mm, brushless, 50 Watt

sterilizable





M 1:1

Stock program
Standard program
Special program (on request)

	Part Numbers								
A with Hall sensors	**448828**	**448829**	448830						
B sensorless	448834	448835	448836						
Motor Data (provisional)									
Values at nominal voltage									
1 Nominal voltage	V	12	24	48					
2 No load speed	rpm	73400	73400	73500					
3 No load current	mA	270	135	67.6					
4 Nominal speed	rpm	68000	68800	69000					
5 Nominal torque (max. continuous torque)	mNm	7.6	7.88	7.88					
6 Nominal current (max. continuous current)	A	5.1	2.64	1.32					
7 Stall torque	mNm	116	146	152					
8 Stall current	A	74.8	46.8	24.5					
9 Max. efficiency	%	89	90	90					
Characteristics									
10 Terminal resistance phase to phase	Ω	0.16	0.513	1.96					
11 Terminal inductance phase to phase	mH	0.00653	0.0261	0.104					
12 Torque constant	mNm/A	1.55	3.11	6.22					
13 Speed constant	rpm/V	6140	3070	1540					
14 Speed/torque gradient	rpm/mNm	633	506	484					
15 Mechanical time constant	ms	2.39	1.91	1.83					
16 Rotor inertia	gcm²	0.36	0.36	0.36					

Specifications

Thermal data

17	Thermal resistance housing-ambient	17.9 K/W
18	Thermal resistance winding-housing	0.703 K/W
19	Thermal time constant winding	0.774 s
20	Thermal time constant motor	394 s
21	Ambient temperature	-40…+135°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		90000 rpm
24	Axial play at axial load	< 7 N	0 mm
		> 7 N	max. 0.85 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		6 N
27	Max. force for press fits (static)		7 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	44 g

Alignment of the electronic connections not specified.

Values listed in the table are nominal.

Connection A and B, motor (cable AWG 22)

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

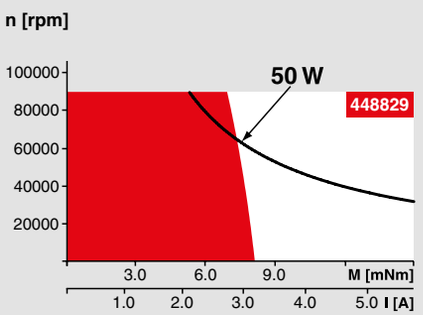
Connection A, sensors (cable AWG 26)

green	V_{Hall} 3.8...24 VDC
blue	GND
red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3

Option: Inch-version size 5 available as standard version.

Wiring diagram for Hall sensors see page 33

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

Application

135°C

Sterilizable Devices

- Saws
- Surgical Reamers
- Arthroscopic Shavers
- Surgical Staplers
- Dental Tools

Sterilization information

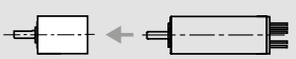
Sensorless: typically 2000 autoclave cycles
Hall sensor: typically 1000 autoclave cycles

Sterilization with steam	
Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

maxon Modular System

Overview on page 20–25

Planetary Gearhead
sterilizable
∅13 mm
0.05 - 0.275 Nm
Page 280

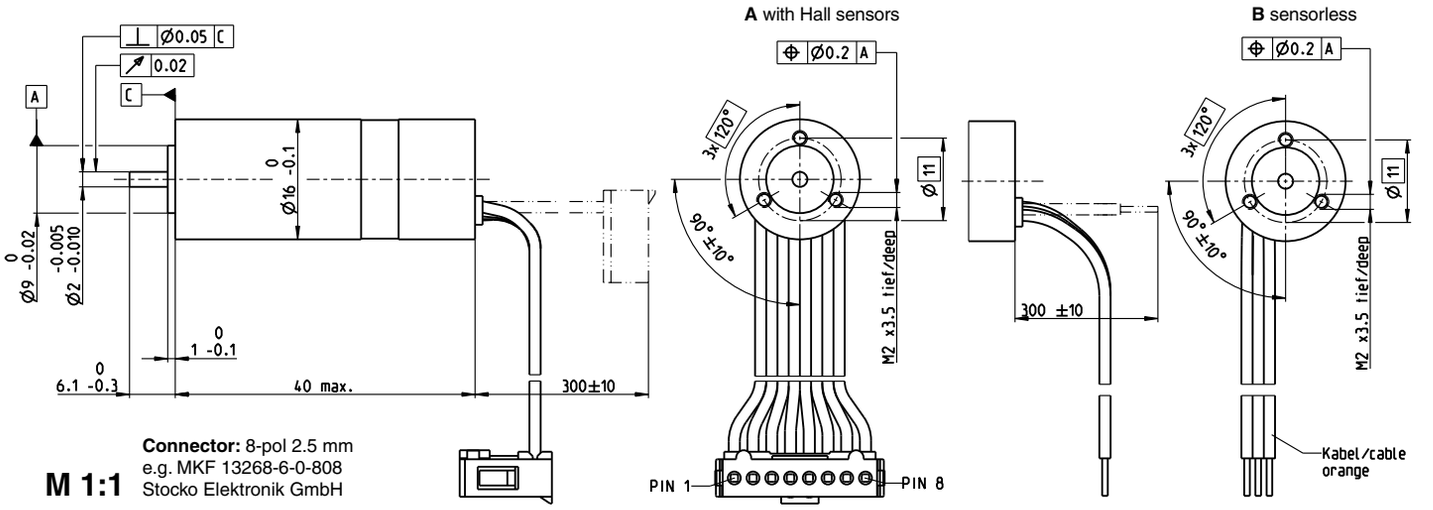


Recommended Electronics:

Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382

Choke may be required

EC 16 ∅16 mm, brushless, 30 Watt



Connector: 8-pol 2.5 mm
e.g. MKF 13268-6-0-808
Stocko Elektronik GmbH

M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	400160	405812	**400161**	405813	400162			
B sensorless	404079	405817	**404080**	405818	404081			

Motor Data

	Values at nominal voltage								
1	Nominal voltage	V	12	18	24	36	48		
2	No load speed	rpm	44500	42200	42800	45800	39600		
3	No load current	mA	397	241	185	139	80.8		
4	Nominal speed	rpm	39300	37400	38100	41100	34800		
5	Nominal torque (max. continuous torque)	mNm	7.85	8.01	8.09	7.56	7.87		
6	Nominal current (max. continuous current)	A	3.41	2.18	1.68	1.14	0.754		
7	Stall torque	mNm	75.5	78	82.7	82.3	72.5		
8	Stall current	A	29.8	19.4	15.6	11.1	6.35		
9	Max. efficiency	%	79	80	80	80	79		
	Characteristics								
10	Terminal resistance phase to phase	Ω	0.403	0.928	1.53	3.24	7.56		
11	Terminal inductance phase to phase	mH	0.0235	0.059	0.102	0.2	0.477		
12	Torque constant	mNm/A	2.54	4.02	5.29	7.4	11.4		
13	Speed constant	rpm/V	3760	2380	1810	1290	836		
14	Speed/torque gradient	rpm/mNm	598	549	524	565	554		
15	Mechanical time constant	ms	4.54	4.17	3.98	4.29	4.21		
16	Rotor inertia	gcm²	0.725	0.725	0.725	0.725	0.725		

Specifications

Thermal data

17	Thermal resistance housing-ambient		16.3 K/W
18	Thermal resistance winding-housing		1.68 K/W
19	Thermal time constant winding		1.97 s
20	Thermal time constant motor		240 s
21	Ambient temperature		-20…+100°C
22	Max. winding temperature		+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		70000 rpm
24	Axial play at axial load	< 3.5 N	0 mm
		> 3.5 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3 N
27	Max. force for press fits (static)		35 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		10 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	34 g

Values listed in the table are nominal.

Connection A

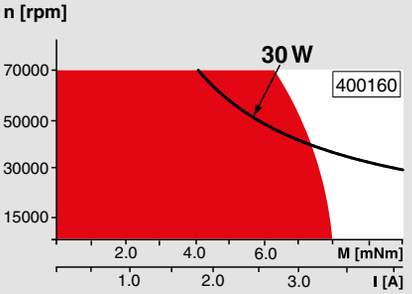
brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V_{Hall} 3…24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 33

Connection B (Cable AWG 24)

brown	Motor winding 1
red	Motor winding 2
orange	Motor winding 3

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

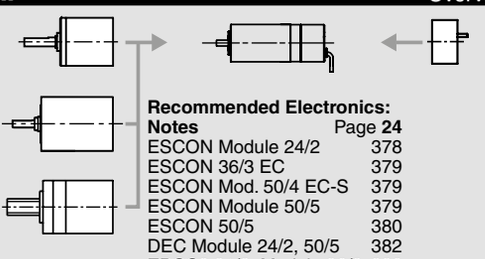
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅16 mm
0.1 - 0.6 Nm
Page 285/286

Planetary Gearhead
∅22 mm
0.5 - 1.0 Nm
Page 293

Spindle Drive
∅16 mm
Page 329–331



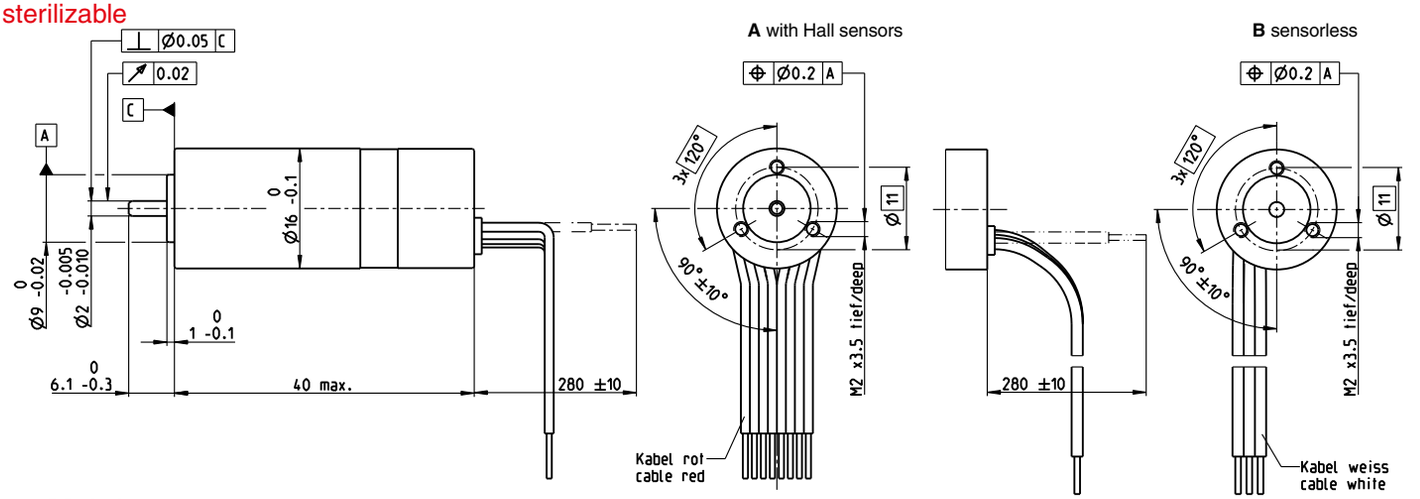
for type A:
Encoder MR
128/256/512 CPT,
Page 354

Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2, 50/5	382
EPOS2 24/2, Module 36/2	386
EPOS2 24/5, EPOS2 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC 16 ∅16 mm, brushless, 30 Watt

sterilizable



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	405146	405147
B sensorless	405149	405150

Motor Data

	Values at nominal voltage								
1	Nominal voltage	V	12	24					
2	No load speed	rpm	47800	45900					
3	No load current	mA	323	153					
4	Nominal speed	rpm	42100	40800					
5	Nominal torque (max. continuous torque)	mNm	7.66	7.85					
6	Nominal current (max. continuous current)	A	3.51	1.72					
7	Stall torque	mNm	70.6	77.3					
8	Stall current	A	29.8	15.6					
9	Max. efficiency	%	81	81					
	Characteristics								
10	Terminal resistance phase to phase	Ω	0.403	1.53					
11	Terminal inductance phase to phase	mH	0.0168	0.0729					
12	Torque constant	mNm/A	2.37	4.94					
13	Speed constant	rpm/V	4030	1930					
14	Speed/torque gradient	rpm/mNm	685	601					
15	Mechanical time constant	ms	5.2	4.56					
16	Rotor inertia	gcm²	0.725	0.725					

Specifications

Thermal data

17	Thermal resistance housing-ambient		16.3 K/W
18	Thermal resistance winding-housing		1.68 K/W
19	Thermal time constant winding		1.97 s
20	Thermal time constant motor		240 s
21	Ambient temperature		-40…+135°C
22	Max. winding temperature		155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		70000 rpm
24	Axial play at axial load	< 3.5 N	0 mm
		> 3.5 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3 N
27	Max. force for press fits (static)		43 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		10 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	34 g

Values listed in the table are nominal.

Connection A and B, motor (Cable AWG 22)

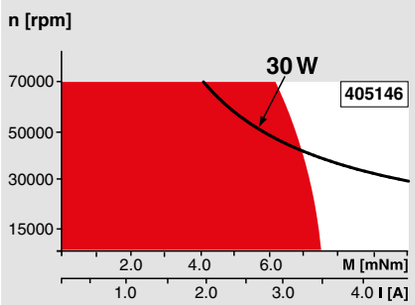
red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

green	V_{Hall} 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. 33

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

Application

135°C
Sterilizable Devices

- Orthopedic Drills & Saws
- Surgical Reamers
- Arthroscopic Shavers
- Surgical Staplers
- Dental Tools

Sterilization information

Sensorless: typically 1000 autoclave cycles
Hall sensor: typically 500 autoclave cycles

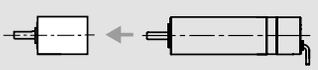
Sterilization with steam

Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

maxon modular system

Overview on page 20–25

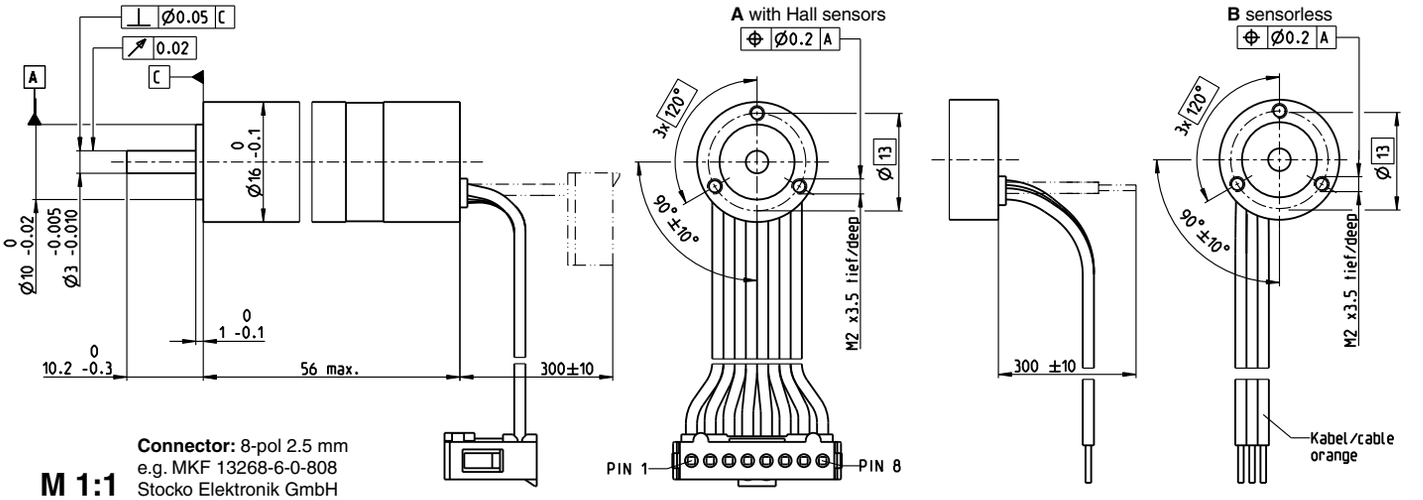
Planetary Gearhead
sterilizable
∅16 mm
0.1 - 0.3 Nm
Page 287



Recommended Electronics:

<GT>**Notes**	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2	382
DEC Module 50/5	382

EC 16 ∅16 mm, brushless, 60 Watt



M 1:1

Connector: 8-pol 2.5 mm
e.g. MKF 13268-6-0-808
Stocko Elektronik GmbH

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	394216	396916	**395588**	396928	405794				
B sensorless	397162	397294	**397292**	397295	405795				

Motor Data

	Values at nominal voltage									
1	Nominal voltage	V	12	18	24	32	48			
2	No load speed	rpm	37100	43400	43400	43400	41700			
3	No load current	mA	327	272	204	153	96.2			
4	Nominal speed	rpm	32500	39200	39400	39500	37900			
5	Nominal torque (max. continuous torque)	mNm	17.2	16.9	17	17	17.1			
6	Nominal current (max. continuous current)	A	5.82	4.48	3.39	2.54	1.63			
7	Stall torque	mNm	157	205	221	230	224			
8	Stall current	A	51.4	52	42.2	32.8	20.5			
9	Max. efficiency	%	85	86	87	87	87			
	Characteristics									
10	Terminal resistance phase to phase	Ω	0.233	0.346	0.569	0.976	2.34			
11	Terminal inductance phase to phase	mH	0.02	0.033	0.059	0.104	0.254			
12	Torque constant	mNm/A	3.06	3.94	5.25	7	10.9			
13	Speed constant	rpm/V	3120	2420	1820	1360	873			
14	Speed/torque gradient	rpm/mNm	238	213	197	190	187			
15	Mechanical time constant	ms	2.66	2.39	2.21	2.13	2.09			
16	Rotor inertia	gcm²	1.07	1.07	1.07	1.07	1.07			

Specifications

Thermal data

17	Thermal resistance housing-ambient		10.3 K/W
18	Thermal resistance winding-housing		1.2 K/W
19	Thermal time constant winding		2.53 s
20	Thermal time constant motor		299 s
21	Ambient temperature		-20…+100°C
22	Max. winding temperature		155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		70000 rpm
24	Axial play at axial load	< 3.5 N	0 mm
		> 3.5 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3 N
27	Max. force for press fits (static)		35 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		10 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	58 g

Values listed in the table are nominal.

Connection A

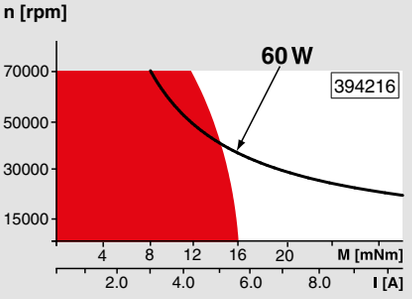
brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	VHall 3…24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
gray	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 33

Connection B (Cable AWG 24)

brown	Motor winding 1
red	Motor winding 2
orange	Motor winding 3

Operating Range



Comments

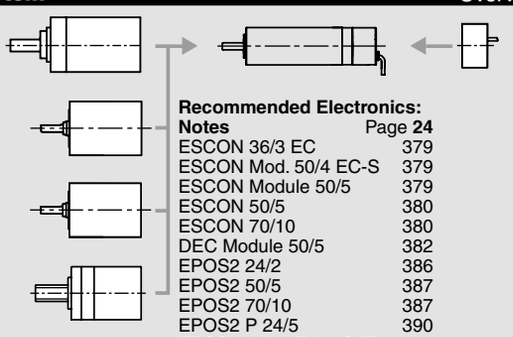
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 286

Planetary Gearhead
∅22 mm
0.5 - 1.0 Nm
Page 293

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 296

Spindle Drive
∅16/22 mm
Page 329–333<GT>

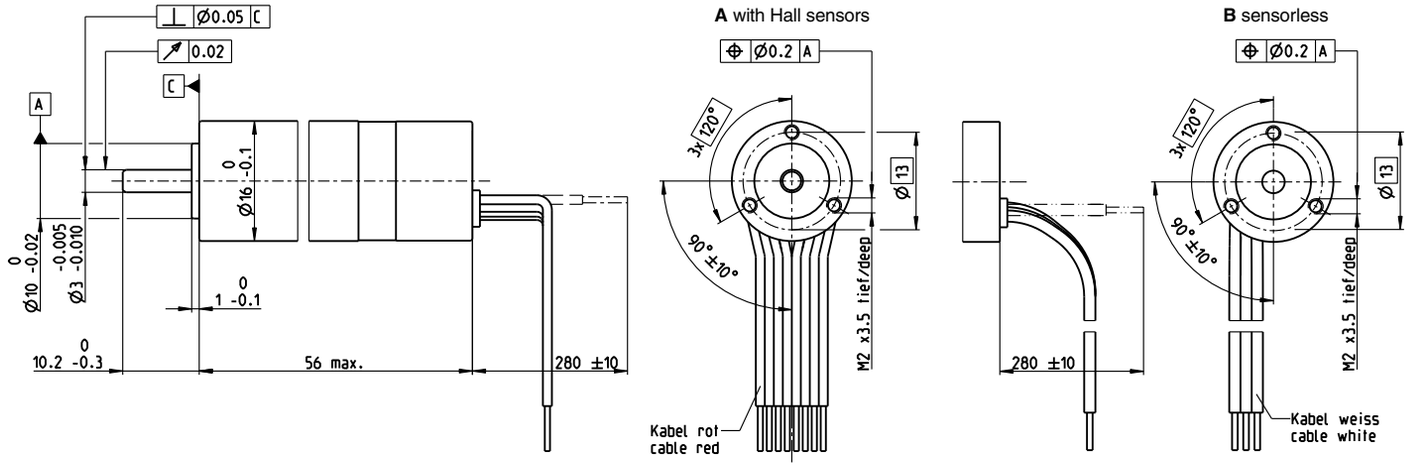
for type A:
Encoder MR
128/256/512 CPT,
Page 354

Recommended Electronics:

Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/2	386
EPOS2 50/5	387
EPOS2 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC 16 ∅16 mm, brushless, 60 Watt

sterilizable



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	399264	399263
B sensorless	399696	399678

Motor Data

	Values at nominal voltage								
1	Nominal voltage	V	12	24					
2	No load speed	rpm	47700	55200					
3	No load current	mA	406	247					
4	Nominal speed	rpm	42500	50700					
5	Nominal torque (max. continuous torque)	mNm	14.7	14.2					
6	Nominal current (max. continuous current)	A	6.48	3.63					
7	Stall torque	mNm	147	202					
8	Stall current	A	61.8	48.9					
9	Max. efficiency	%	85	86					
	Characteristics								
10	Terminal resistance phase to phase	Ω	0.194	0.491					
11	Terminal inductance phase to phase	mH	0.00968	0.0291					
12	Torque constant	mNm/A	2.38	4.13					
13	Speed constant	rpm/V	4000	2310					
14	Speed/torque gradient	rpm/mNm	326	275					
15	Mechanical time constant	ms	3.66	3.08					
16	Rotor inertia	gcm²	1.07	1.07					

Specifications

Thermal data

17	Thermal resistance housing-ambient	10.3 K/W
18	Thermal resistance winding-housing	1.2 K/W
19	Thermal time constant winding	2.18 s
20	Thermal time constant motor	299 s
21	Ambient temperature	-40…+135°C
22	Max. winding temperature	155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		70000 rpm
24	Axial play at axial load	< 3.5 N	0 mm
		> 3.5 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3 N
27	Max. force for press fits (static)		43 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		10 N

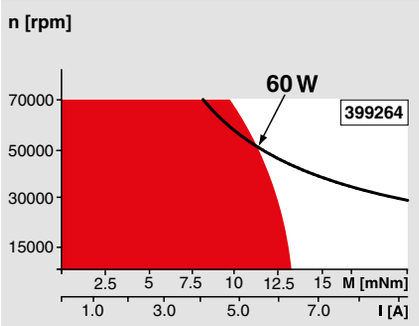
Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	58 g

Values listed in the table are nominal.

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)
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. 33

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

Application

135°C
Sterilizable Devices

- Orthopedic Drills & Saws
- Surgical Reamers
- Arthroscopic Shavers
- Surgical Staplers
- Dental Tools

Sterilization information

Sensorless: typically 1000 autoclave cycles
Hall sensor: typically 500 autoclave cycles

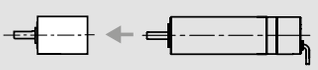
Sterilization with steam

Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

maxon modular system

Overview on page 20–25

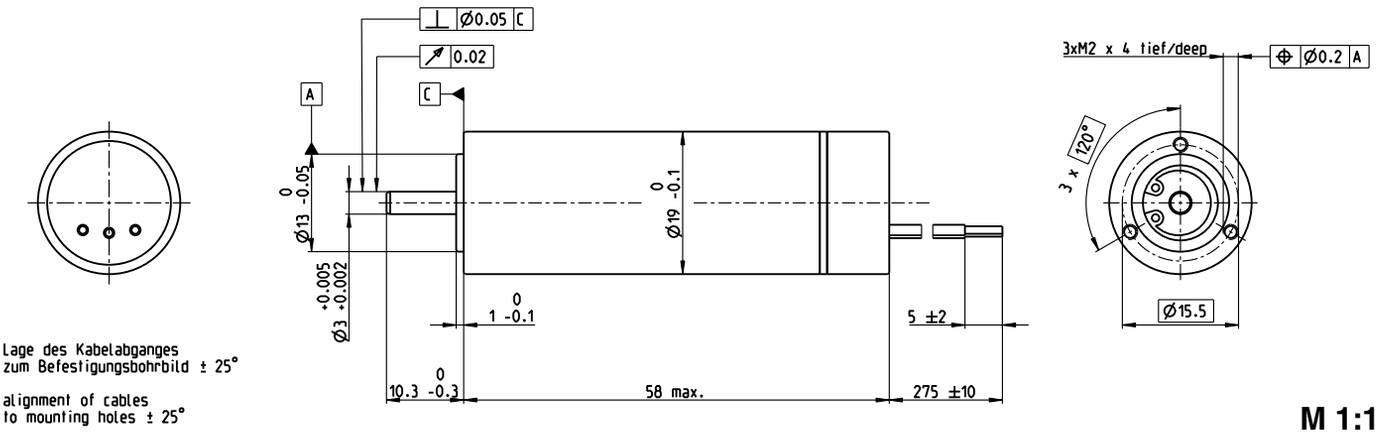
Planetary Gearhead
sterilizable
∅16 mm
0.1 - 0.3 Nm
Page 287



Recommended Electronics:

Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382

EC 19 ∅19 mm, brushless, 60 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	sensorless	475529	475530	474510	477254
Motor Data (provisional)					
	Values at nominal voltage				
1	Nominal voltage	V	18	24	30	36
2	No load speed	rpm	67000	69500	65200	67100
3	No load current	mA	406	324	232	203
4	Nominal speed	rpm	64200	67000	62600	64500
5	Nominal torque (max. continuous torque)	mNm	8.71	8.3	9.15	8.28
6	Nominal current (max. continuous current)	A	3.77	2.82	2.29	1.8
7	Stall torque	mNm	279	318	312	295
8	Stall current	A	109	97	71.3	57.8
9	Max. efficiency	%	88	89	89	89
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.165	0.247	0.421	0.623
11	Terminal inductance phase to phase	mH	0.018	0.03	0.053	0.073
12	Torque constant	mNm/A	2.55	3.28	4.37	5.1
13	Speed constant	rpm/V	3740	2910	2180	1870
14	Speed/torque gradient	rpm/mNm	242	220	210	229
15	Mechanical time constant	ms	4.15	3.77	3.61	3.93
16	Rotor inertia	gcm²	1.64	1.64	1.64	1.64

Specifications

Thermal data

17	Thermal resistance housing-ambient	14.0 K/W
18	Thermal resistance winding-housing	0.808 K/W
19	Thermal time constant winding	2.67 s
20	Thermal time constant motor	557 s
21	Ambient temperature	-20…+100°C
22	Max. winding temperature	120°C

Mechanical data (preloaded ball bearings)

23	Max. speed		80000 rpm
24	Axial play at axial load	< 3 N	0 mm
		> 3 N	max. 0.1 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3.1 N
27	Max. force for press fits (static)		21 N
	(static, shaft supported)		1400 N
28	Max. radial load, 5 mm from flange		12 N

Other specifications

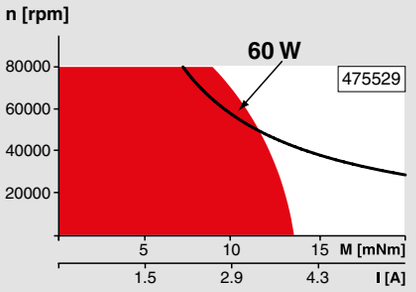
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	98 g

Values listed in the table are nominal.

Connection motor (Cable AWG 22)

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

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

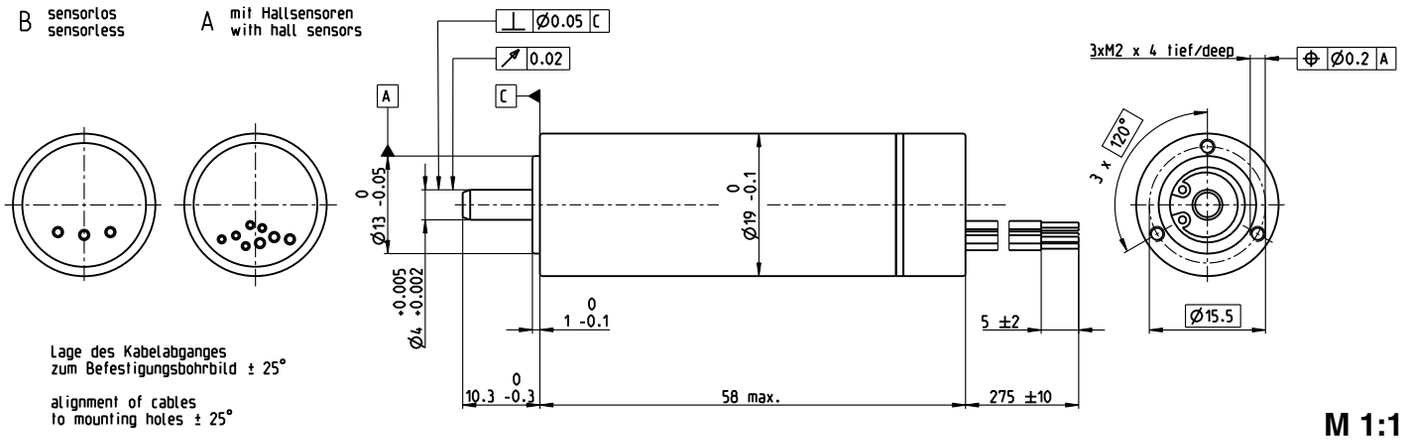
Overview on page 20–25

Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/4 EC-S	379

EC 19 ∅19 mm, brushless, 120 Watt

High Power



M 1:1

Stock program
Standard program
Special program (on request)

	Part Numbers								
A with Hall sensors	475523	475524	**467392**						
B sensorless	475527	475528	474494						

Motor Data (provisional)									
Values at nominal voltage									
1 Nominal voltage	V	24	30	36					
2 No load speed	rpm	62200	60400	54400					
3 No load current	mA	272	208	147					
4 Nominal speed	rpm	59100	57600	51700					
5 Nominal torque (max. continuous torque)	mNm	19.8	20.3	20.8					
6 Nominal current (max. continuous current)	A	5.59	4.45	3.4					
7 Stall torque	mNm	536	574	540					
8 Stall current	A	146	121	85.6					
9 Max. efficiency	%	92	92	92					
Characteristics									
10 Terminal resistance phase to phase	Ω	0.165	0.247	0.421					
11 Terminal inductance phase to phase	mH	0.018	0.03	0.053					
12 Torque constant	mNm/A	3.68	4.73	6.31					
13 Speed constant	rpm/V	2600	2020	1510					
14 Speed/torque gradient	rpm/mNm	116	106	101					
15 Mechanical time constant	ms	2.2	2	1.91					
16 Rotor inertia	gcm²	1.81	1.81	1.81					

Specifications

Thermal data

17	Thermal resistance housing-ambient	14.0 K/W
18	Thermal resistance winding-housing	0.808 K/W
19	Thermal time constant winding	2.67 s
20	Thermal time constant motor	572 s
21	Ambient temperature	-20…+100°C
22	Max. winding temperature	155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		100 000 rpm
24	Axial play at axial load	< 3 N	0 mm
		> 3 N	max. 0.1 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3.1 N
27	Max. force for press fits (static)		21 N
	(static, shaft supported)		1400 N
28	Max. radial load, 5 mm from flange		12 N

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 A and B, motor (Cable AWG 22)

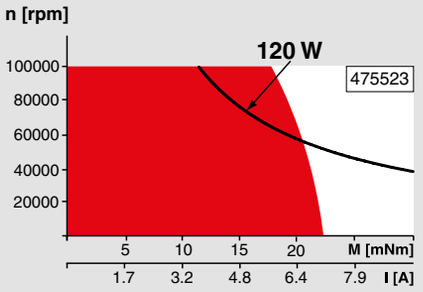
red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

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. 33

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

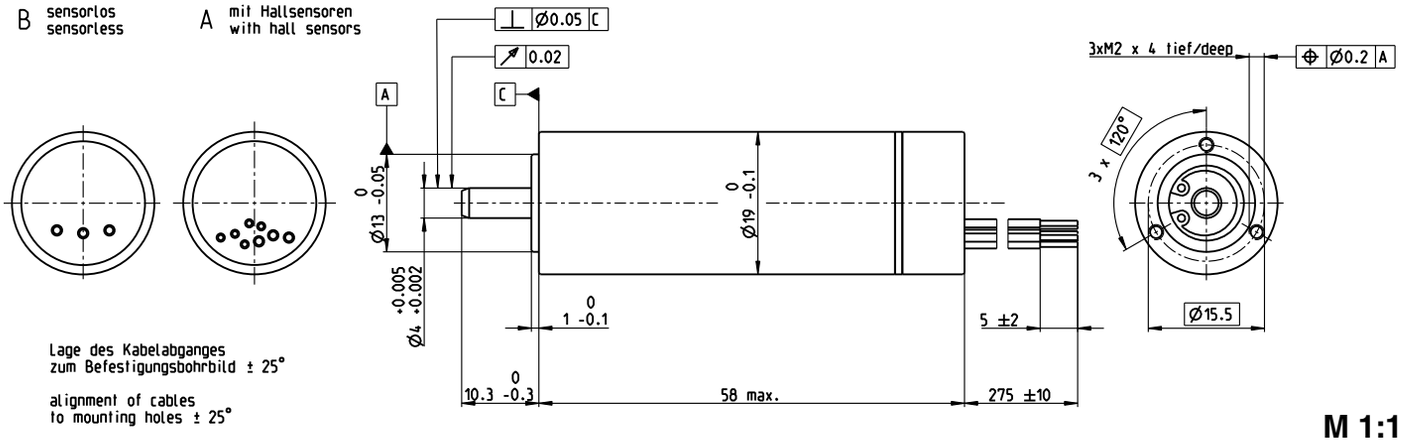
Overview on page 20–25

Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 50/5	382

EC 19 ∅19 mm, brushless, 120 Watt

High Power, sterilizable



M 1:1

Stock program
Standard program
Special program (on request)

	Part Numbers								
A with Hall sensors	475521	475522	**467168**						
B sensorless	475525	475526	474493						

Motor Data (provisional)									
Values at nominal voltage									
1 Nominal voltage	V	24	30	36					
2 No load speed	rpm	62200	60400	54400					
3 No load current	mA	272	208	147					
4 Nominal speed	rpm	59100	57600	51700					
5 Nominal torque (max. continuous torque)	mNm	19.8	20.3	20.8					
6 Nominal current (max. continuous current)	A	5.59	4.45	3.4					
7 Stall torque	mNm	536	574	540					
8 Stall current	A	146	121	85.6					
9 Max. efficiency	%	92	92	92					
Characteristics									
10 Terminal resistance phase to phase	Ω	0.165	0.247	0.421					
11 Terminal inductance phase to phase	mH	0.018	0.03	0.053					
12 Torque constant	mNm/A	3.68	4.73	6.31					
13 Speed constant	rpm/V	2600	2020	1510					
14 Speed/torque gradient	rpm/mNm	116	106	101					
15 Mechanical time constant	ms	2.2	2	1.91					
16 Rotor inertia	gcm²	1.81	1.81	1.81					

Specifications

Thermal data

17	Thermal resistance housing-ambient	14.0 K/W
18	Thermal resistance winding-housing	0.808 K/W
19	Thermal time constant winding	2.46 s
20	Thermal time constant motor	572 s
21	Ambient temperature	-40…+135°C
22	Max. winding temperature	155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		100000 rpm
24	Axial play at axial load	< 3 N	0 mm
		> 3 N	max. 0.1 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		3.1 N
27	Max. force for press fits (static)		21 N
	(static, shaft supported)		1400 N
28	Max. radial load, 5 mm from flange		12 N

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 A and B, motor (Cable AWG 22)

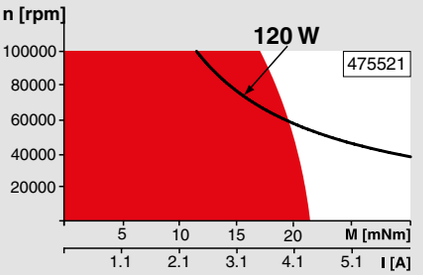
red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection A, sensors (Cable AWG 26)

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. 33

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

Application

135°C

Sterilizable Devices

- Orthopedic Drills & Saws
- Surgical Reamers
- Arthroscopic Shavers
- Surgical Staplers
- Dental Tools

Sterilization information

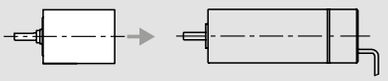
Sensorless: typically 2000 autoclave cycles
Hall sensor: typically 1000 autoclave cycles

Sterilization with steam	
Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

maxon modular system

Overview on page 20–25

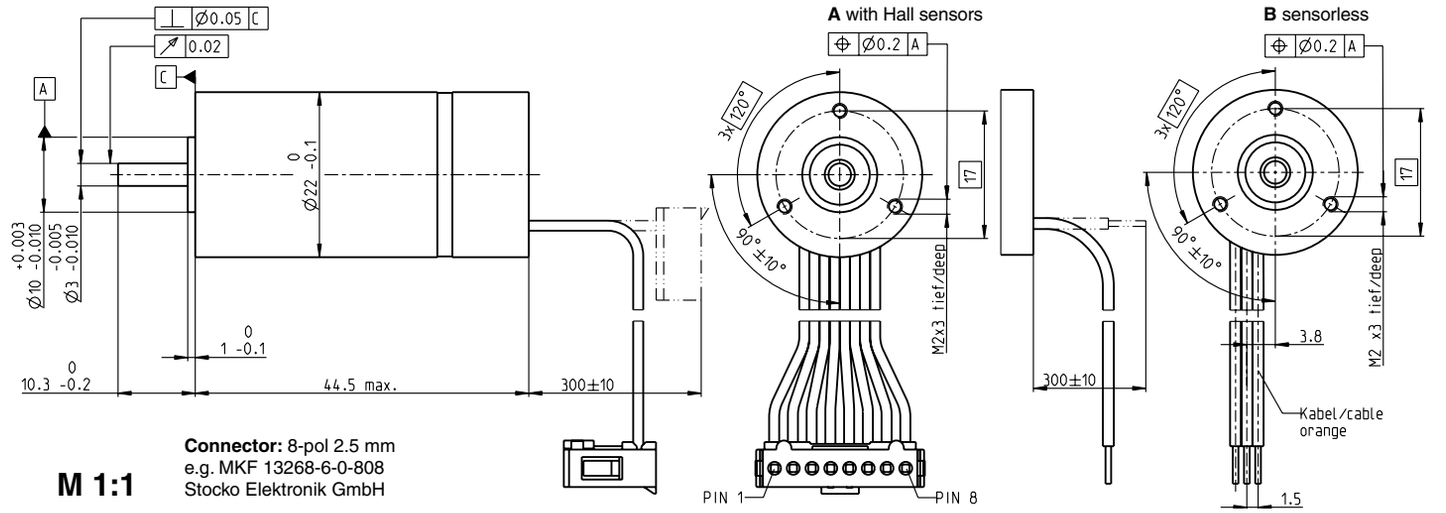
Planetary Gearhead
sterilizable
∅19 mm
0.01 - 0.315 Nm
Page 289



Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 50/5	382

EC 22 ∅22 mm, brushless, 40 Watt



M 1:1

Connector: 8-pol 2.5 mm
e.g. MKF 13268-6-0-808
Stocko Elektronik GmbH

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	386657	**386658**	386659	386660
B sensorless	386661	**386662**	386663	386664

Motor Data

	Values at nominal voltage					
1	Nominal voltage	V	12	24	36	48
2	No load speed	rpm	30400	35200	31600	34200
3	No load current	mA	238	144	83.3	69.3
4	Nominal speed	rpm	26600	31800	28300	30900
5	Nominal torque (max. continuous torque)	mNm	20.9	20.7	20.4	20.1
6	Nominal current (max. continuous current)	A	5.75	3.29	1.95	1.56
7	Stall torque	mNm	184	243	221	237
8	Stall current	A	49.1	37.4	20.4	17.7
9	Max. efficiency	%	87	88	88	88
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.244	0.641	1.76	2.71
11	Terminal inductance phase to phase	mH	0.0182	0.0546	0.152	0.231
12	Torque constant	mNm/A	3.75	6.49	10.8	13.3
13	Speed constant	rpm/V	2550	1470	882	716
14	Speed/torque gradient	rpm/mNm	166	145	144	145
15	Mechanical time constant	ms	4.16	3.64	3.6	3.64
16	Rotor inertia	gcm²	2.39	2.39	2.39	2.39

Specifications

Thermal data

17	Thermal resistance housing-ambient		10 K/W
18	Thermal resistance winding-housing		2 K/W
19	Thermal time constant winding		4.85 s
20	Thermal time constant motor		278 s
21	Ambient temperature		-20…+100°C
22	Max. winding temperature		+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		60 000 rpm
24	Axial play at axial load	< 4.5 N	0 mm
		> 4.5 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4 N
27	Max. force for press fits (static)		45 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		16 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	85 g

Values listed in the table are nominal.

Connection A

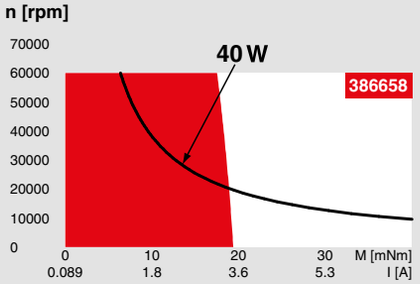
brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	VHall 3…24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 33

Connection B (Cable AWG 24)

brown	Motor winding 1
red	Motor winding 2
orange	Motor winding 3

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 20–25

Planetary Gearhead
∅22 mm
0.5 - 3.4 Nm
Page 296/297

Spindle Drive
∅22 mm
Page 332/333

Recommended Electronics:

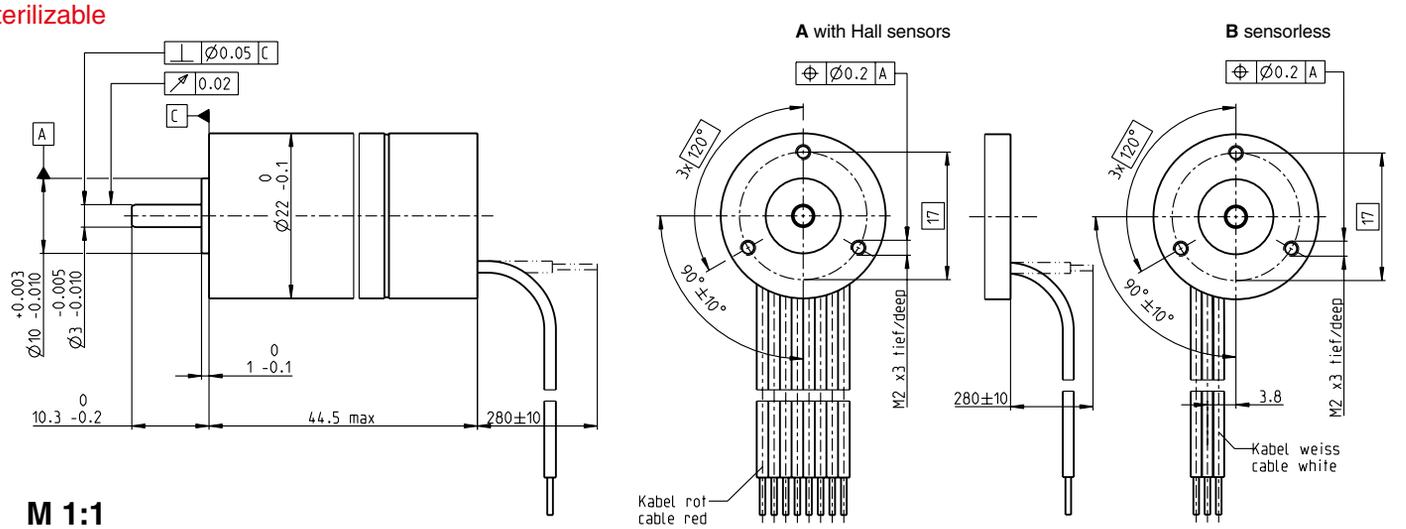
Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5, 70/10	380
DEC Module 24/2, 50/5	382
EPOS2 24/2, Module 36/2	386
EPOS2 24/5, 50/5, 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

for type A:
Encoder MR
128/256/512 CPT,
Page 354

for type B:
Resolver
on request

EC 22 ∅22 mm, brushless, 40 Watt

sterilizable



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	386665	386666	386667	386668
B sensorless	386669	386670	386671	386672

Motor Data

	Values at nominal voltage					
1	Nominal voltage	V	12	24	36	48
2	No load speed	rpm	36100	41700	41800	44900
3	No load current	mA	327	198	132	110
4	Nominal speed	rpm	31700	37800	37900	41000
5	Nominal torque (max. continuous torque)	mNm	17.1	16.8	16.7	16.1
6	Nominal current (max. continuous current)	A	5.67	3.23	2.14	1.68
7	Stall torque	mNm	155	204	210	219
8	Stall current	A	49.1	37.4	25.7	21.5
9	Max. efficiency	%	85	86	86	86
	Characteristics					
10	Terminal resistance phase to phase	Ω	0.244	0.641	1.4	2.23
11	Terminal inductance phase to phase	mH	0.0182	0.0546	0.123	0.189
12	Torque constant	mNm/A	3.15	5.46	8.18	10.1
13	Speed constant	rpm/V	3030	1750	1170	941
14	Speed/torque gradient	rpm/mNm	235	206	200	206
15	Mechanical time constant	ms	5.2	4.54	4.41	4.56
16	Rotor inertia	gcm²	2.11	2.11	2.11	2.11

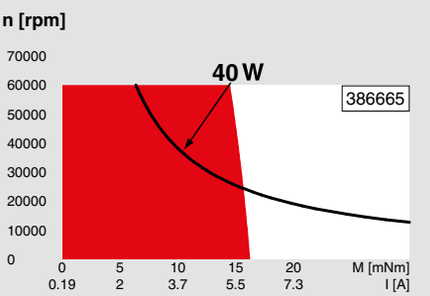
Specifications

	Thermal data		
17	Thermal resistance housing-ambient		10 K/W
18	Thermal resistance winding-housing		2 K/W
19	Thermal time constant winding		4.85 s
20	Thermal time constant motor		278 s
21	Ambient temperature		-40…+135°C
22	Max. winding temperature		155°C
	Mechanical data (preloaded ball bearings)		
23	Max. speed		60000 rpm
24	Axial play at axial load	< 4.5 N	0 mm
		> 4.5 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4 N
27	Max. force for press fits (static)		53 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		16 N
	Other specifications		
29	Number of pole pairs		1
30	Number of phases		3
31	Weight of motor		85 g

Values listed in the table are nominal.

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)
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. 33

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

Application

135°C
Sterilizable Devices

Orthopedic Drills & Saws
Surgical Reamers
Arthroscopic Shavers
Surgical Staplers
Dental Tools

Sterilization information

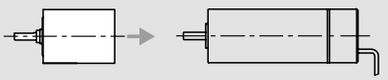
Sensorless: typically 1000 autoclave cycles
Hall sensor: typically 500 autoclave cycles

Sterilization with steam	
Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

maxon modular system

Overview on page 20–25

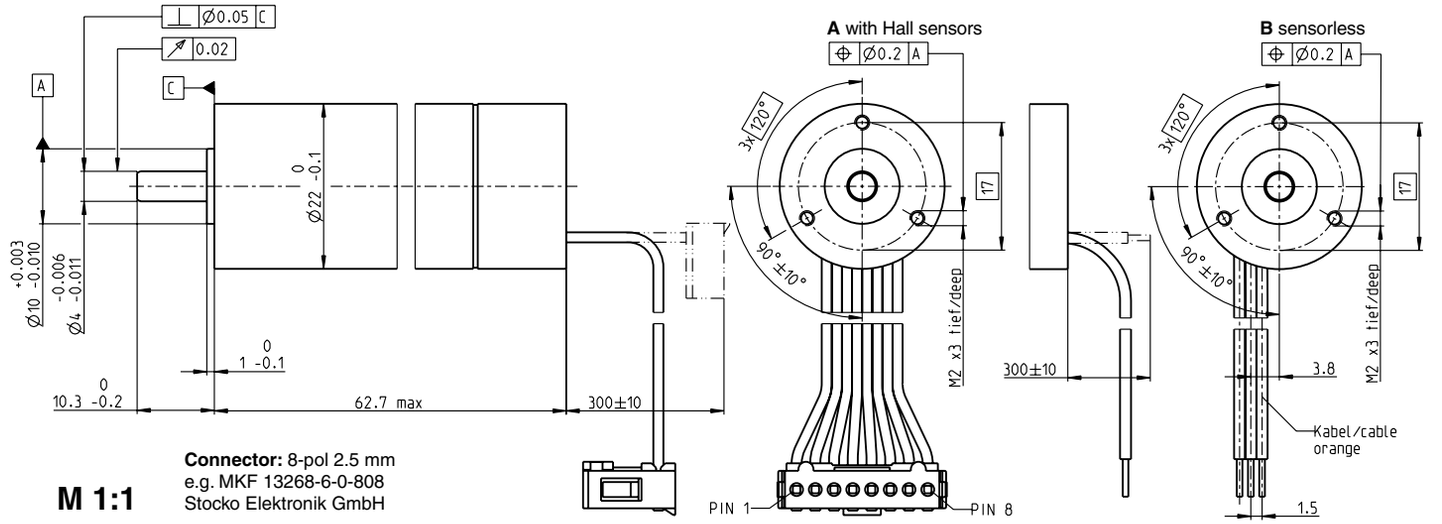
Planetary Gearhead
sterilizable
∅22 mm
0.5 - 2.0 Nm
Page 299



Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 24/2, 50/5	382

EC 22 ∅22 mm, brushless, 100 Watt



M 1:1

Connector: 8-pol 2.5 mm
e.g. MKF 13268-6-0-808
Stocko Elektronik GmbH

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	386673	**386674**	386675
B sensorless	386676	**386677**	386678

Motor Data

			386673	**386674**	386675
	Values at nominal voltage				
1	Nominal voltage	V	18	24	48
2	No load speed	rpm	31000	29500	32200
3	No load current	mA	242	168	95.9
4	Nominal speed	rpm	28100	27000	29900
5	Nominal torque (max. continuous torque)	mNm	51.5	50.5	50.1
6	Nominal current (max. continuous current)	A	9.42	6.59	3.57
7	Stall torque	mNm	644	691	857
8	Stall current	A	116	89.1	60.2
9	Max. efficiency	%	91	92	92
	Characteristics				
10	Terminal resistance phase to phase	Ω	0.155	0.269	0.797
11	Terminal inductance phase to phase	mH	0.0178	0.035	0.118
12	Torque constant	mNm/A	5.53	7.75	14.2
13	Speed constant	rpm/V	1730	1230	672
14	Speed/torque gradient	rpm/mNm	48.3	42.8	37.6
15	Mechanical time constant	ms	2.07	1.83	1.61
16	Rotor inertia	gcm²	4.09	4.09	4.09

Specifications

Thermal data

17	Thermal resistance housing-ambient	7 K/W
18	Thermal resistance winding-housing	1 K/W
19	Thermal time constant winding	4.92 s
20	Thermal time constant motor	355 s
21	Ambient temperature	-20…+100°C
22	Max. winding temperature	155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		60 000 rpm
24	Axial play at axial load	< 4.5 N	0 mm
		> 4.5 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4 N
27	Max. force for press fits (static)		40 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		16 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	128 g

Values listed in the table are nominal.

Connection A

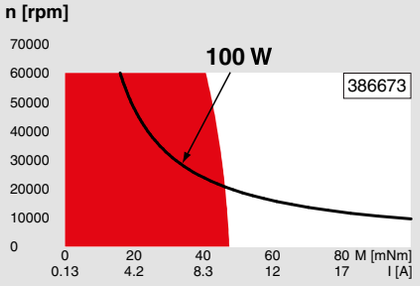
brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	VHall 3…24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
gray	Hall sensor 3	Pin 8

Wiring diagram for Hall sensors see p. 33

Connection B (Cable AWG 24)

brown	Motor winding 1
red	Motor winding 2
orange	Motor winding 3

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).

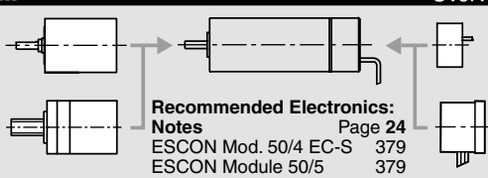
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅22 mm
0.5 - 3.4 Nm
Page 296/297

Spindle Drive
∅22 mm
Page 332/333



Recommended Electronics:

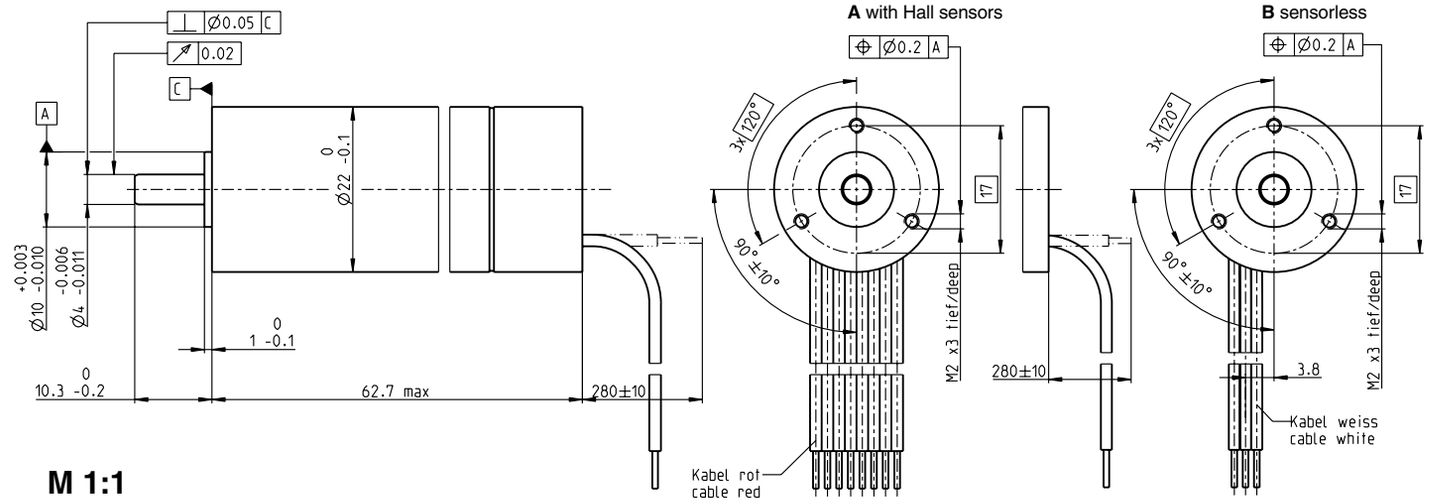
Notes	Page **24**
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5, 70/10	380
DEC Module 50/5	382
EPOS2 24/5, 50/5, 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

for type A:
Encoder MR
128/256/512 CPT,
Page 354

for type B:
Resolver
on request

EC 22 ∅22 mm, brushless, 100 Watt

sterilizable



Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	386679	386680							
B sensorless	386681	386682							

Motor Data

	Values at nominal voltage									
1	Nominal voltage	V	24	42						
2	No load speed	rpm	32400	32700						
3	No load current	mA	195	113						
4	Nominal speed	rpm	29400	30000						
5	Nominal torque (max. continuous torque)	mNm	41.9	41.8						
6	Nominal current (max. continuous current)	A	6.03	3.48						
7	Stall torque	mNm	546	612						
8	Stall current	A	77.4	50.1						
9	Max. efficiency	%	90	91						
	Characteristics									
10	Terminal resistance phase to phase	Ω	0.31	0.839						
11	Terminal inductance phase to phase	mH	0.044	0.131						
12	Torque constant	mNm/A	7.06	12.2						
13	Speed constant	rpm/V	1350	781						
14	Speed/torque gradient	rpm/mNm	59.4	53.6						
15	Mechanical time constant	ms	2.55	2.29						
16	Rotor inertia	gcm²	4.09	4.09						

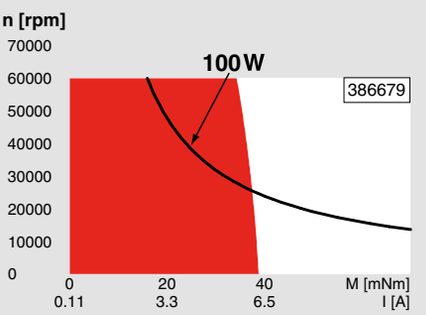
Specifications

	Thermal data		
17	Thermal resistance housing-ambient		7 K/W
18	Thermal resistance winding-housing		1 K/W
19	Thermal time constant winding		5.01 s
20	Thermal time constant motor		355 s
21	Ambient temperature		-40…+135°C
22	Max. winding temperature		155°C
	Mechanical data (preloaded ball bearings)		
23	Max. speed		60000 rpm
24	Axial play at axial load	< 4.5 N	0 mm
		> 4.5 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		4 N
27	Max. force for press fits (static)		45 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		16 N
	Other specifications		
29	Number of pole pairs		1
30	Number of phases		3
31	Weight of motor		128 g

Values listed in the table are nominal.

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)
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. 33

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

Application

135°C
Sterilizable Devices

Orthopedic Drills & Saws
Surgical Reamers
Arthroscopic Shavers
Surgical Staplers
Dental Tools

Sterilization information

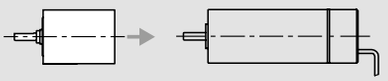
Sensorless: typically 1000 autoclave cycles
Hall sensor: typically 500 autoclave cycles

Sterilization with steam	
Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

maxon modular system

Overview on page 20–25

Planetary Gearhead
sterilizable
∅22 mm
0.5 - 2.0 Nm
Page 299

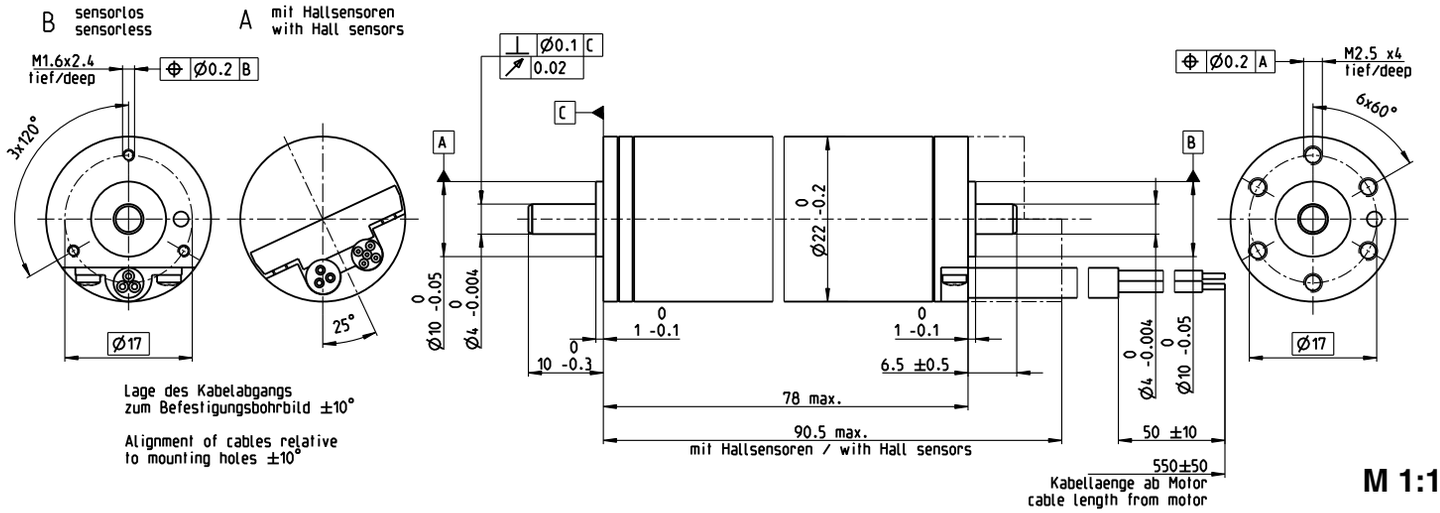


Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382

EC 22 ∅22 mm, brushless, 80 Watt

Heavy Duty – for applications in air



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	426448
B sensorless	426449

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	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	gcm²	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)		98 N
	(static, shaft supported)		250 N
28	Max. radial load, 5 mm from flange		16 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor (sensorless)	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)

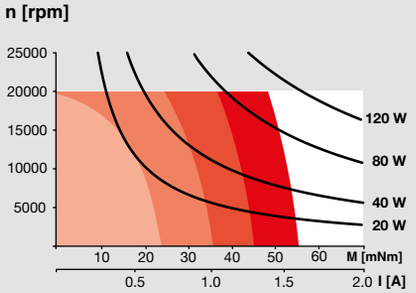
green	V_{Hall} 4.5…24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

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. 33

Operating Range



Comments

TA = 25°C
TA = 100°C
TA = 150°C
TA = 200°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 (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

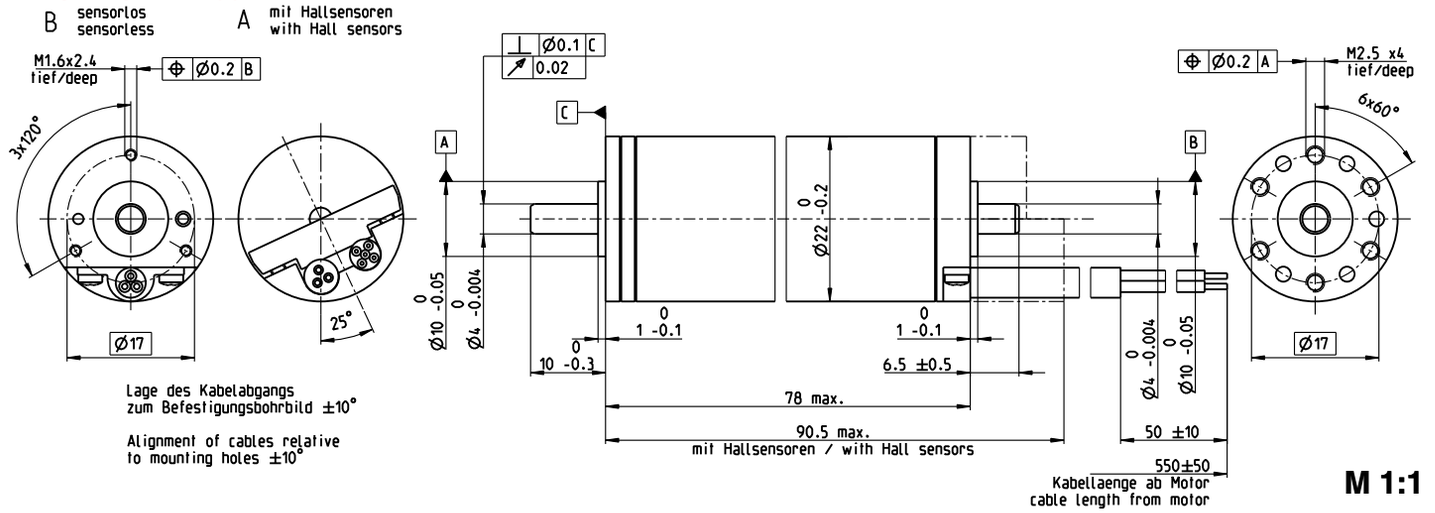
Industry
– pumps and valves for liquid metal cooling systems/turbine fuel and steam control
– valve adjustment for gas and steam power plants

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 22 ∅22 mm, brushless, 240 Watt

Heavy Duty – for applications in oil



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall Sensors	426450
B sensorless	426451

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	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	gcm²	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)	98 N
	(static, shaft supported)	250 N
28	Max. radial load, 5 mm from flange	16 N
	Other specifications	
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor (sensorless)	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)

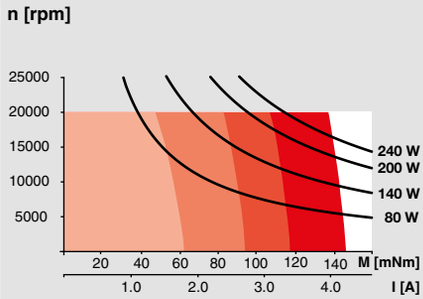
green	VHall 4.5…24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

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. 33

Operating Range



Comments

TA = 25°C
TA = 100°C
TA = 150°C
TA = 200°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

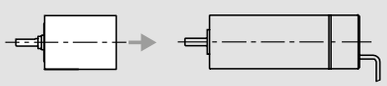
This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

Reference medium: Shell Tellus oil T15
Operation in oil of different viscosity will affect the motor data.

maxon modular system

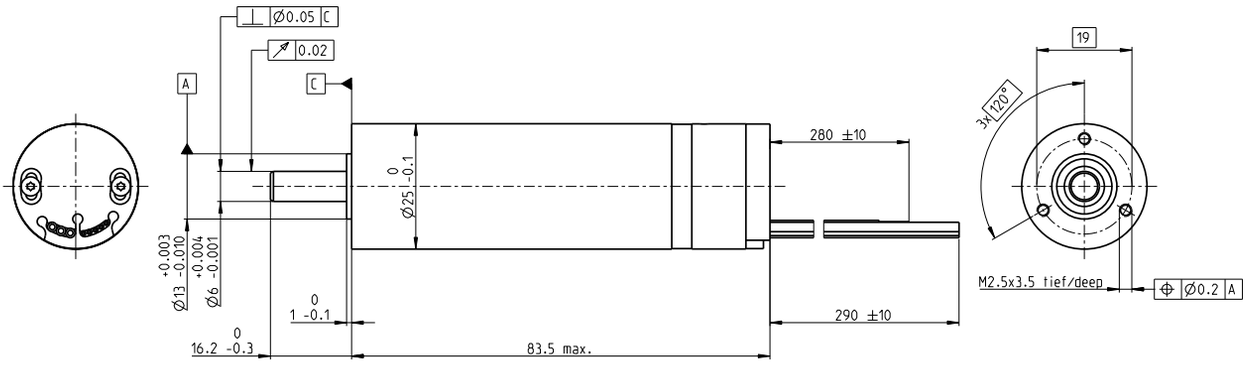
Overview on page 20–25

Planetary Gearhead
∅22 mm
2.0 - 4.0 Nm
Page 298



EC 25 ∅25 mm, brushless, 250 Watt

High Speed



M 3:2

Stock program
Standard program
Special program (on request)

Part Numbers

			351144
Motor Data			
	Values at nominal voltage		
1	Nominal voltage	V	36
2	No load speed	rpm	64100
3	No load current	mA	242
4	Nominal speed	rpm	62200
5	Nominal torque (max. continuous torque)	mNm	35.1
6	Nominal current (max. continuous current)	A	6.74
7	Stall torque	mNm	1580
8	Stall current	A	294
9	Max. efficiency	%	94
	Characteristics		
10	Terminal resistance phase to phase	Ω	0.122
11	Terminal inductance phase to phase	mH	0.014
12	Torque constant	mNm/A	5.36
13	Speed constant	rpm/V	1780
14	Speed/torque gradient	rpm/mNm	40.6
15	Mechanical time constant	ms	2.32
16	Rotor inertia	gcm²	5.45

Specifications

Thermal data

17	Thermal resistance housing-ambient	6.54 K/W
18	Thermal resistance winding-housing	0.1 K/W
19	Thermal time constant winding	0.509 s
20	Thermal time constant motor	332 s
21	Ambient temperature	-20…+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		70 000 rpm
24	Axial play at axial load	< 9 N	0 mm
		> 9 N	max. 0.14 mm
25	Radial play		0.025 mm
26	Max. axial load (dynamic)		7 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		20 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	240 g

Values listed in the table are nominal.

Connection motor (Cable AWG 18)

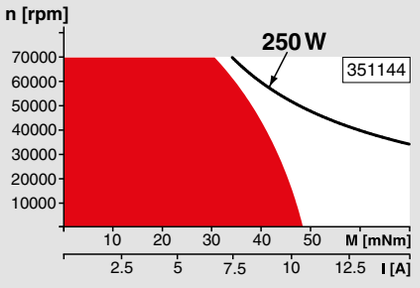
red	Motor winding 1
black	Motor winding 2
white	Motor winding 3

Connection sensors (Cable AWG 26)

green	V_{Hall} 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. 33

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

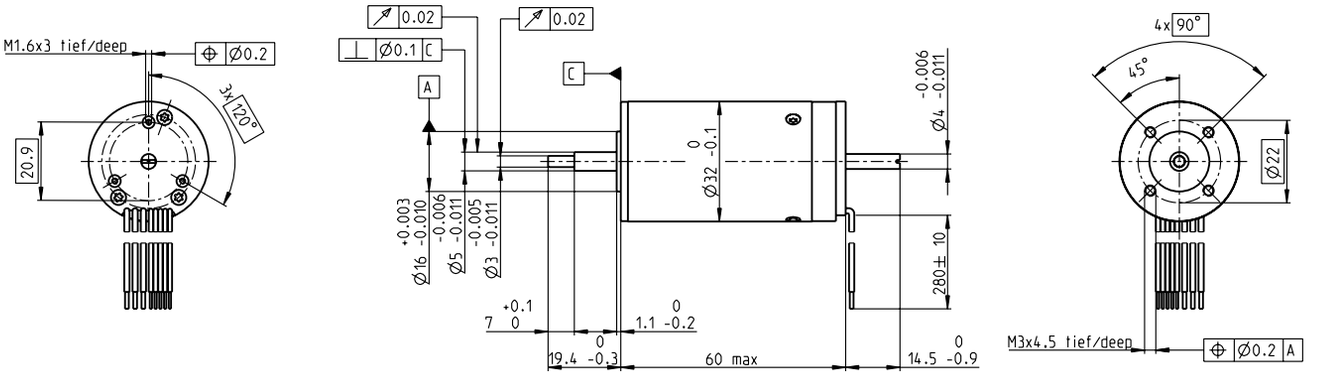
maxon Modular System

Overview on page 20–25

Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382

EC 32 ∅32 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							
	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	gcm²	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)		98 N
	(static, shaft supported)		1200 N
28	Max. radial load, 5 mm from flange		28 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	270 g

Values listed in the table are nominal.

Connection motor (Cable AWG 22)

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

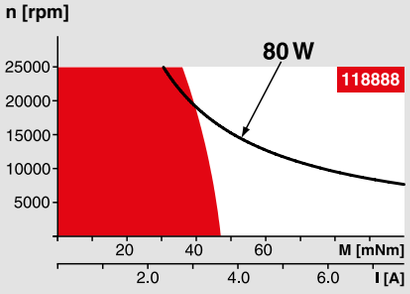
Connection sensors (Cable AWG 26)[1]

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. 33

[1] Not lead through in combination with resolver.

Operating Range



Comments

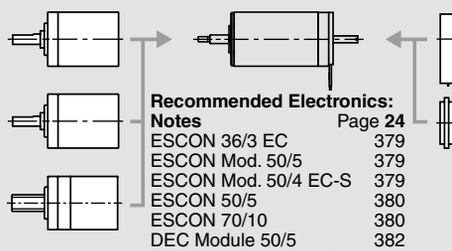
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅32 mm
0.75 - 4.5 Nm
Page 303

Planetary Gearhead
∅32 mm
0.75 - 6.0 Nm
Page 305–309

Spindle Drive
∅32 mm
Page 334–336

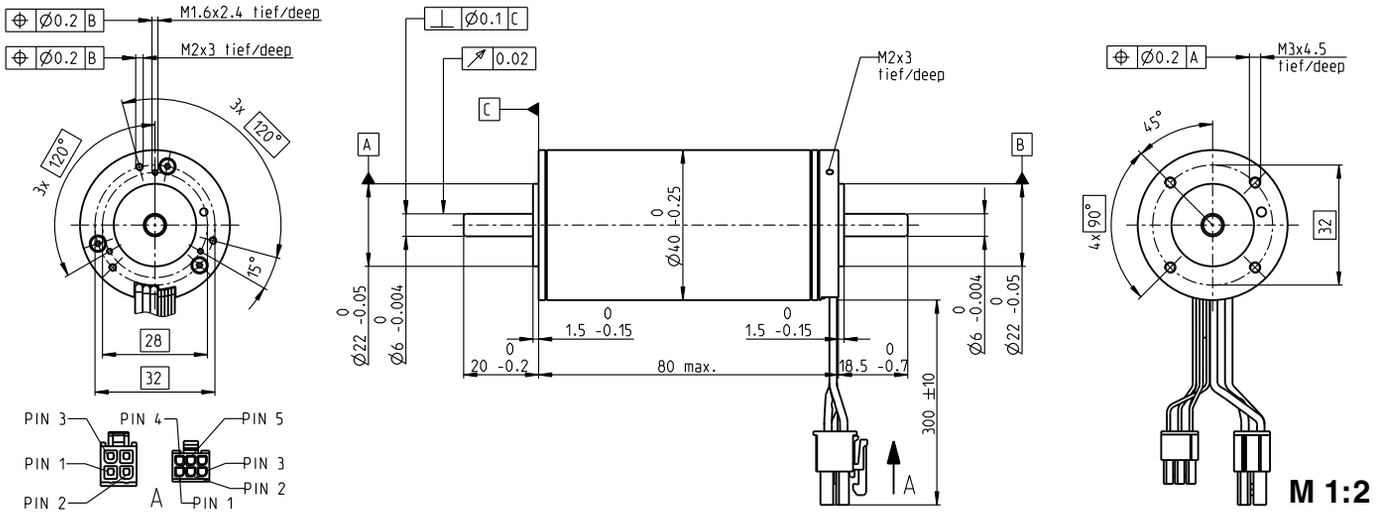
Recommended Electronics:

Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5, 50/5, 70/10	387
EPOS2 P 24/5	390
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder HED_5540
500 CPT,
3 channels
Page 363/366

Resolver Res 26
∅26 mm
10 V
Page 374

EC 40 ∅40 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 gcm²	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)		106 N
	(static, shaft supported)		5500 N
28	Max. radial load, 5 mm from flange		75 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	580 g

Values listed in the table are nominal.

Connection motor (Cable AWG 16)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	Part number
Molex	39-01-2040

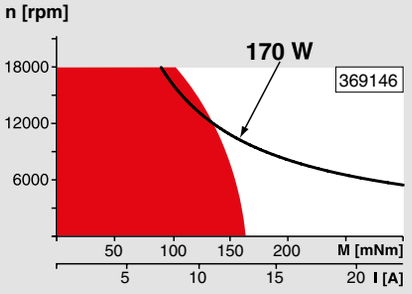
Connection sensors (Cable AWG 26)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 3…24 VDC	Pin 5
	N.C.	Pin 6

Connector	Part number
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 33

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 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 314

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 318

Recommended Electronics:

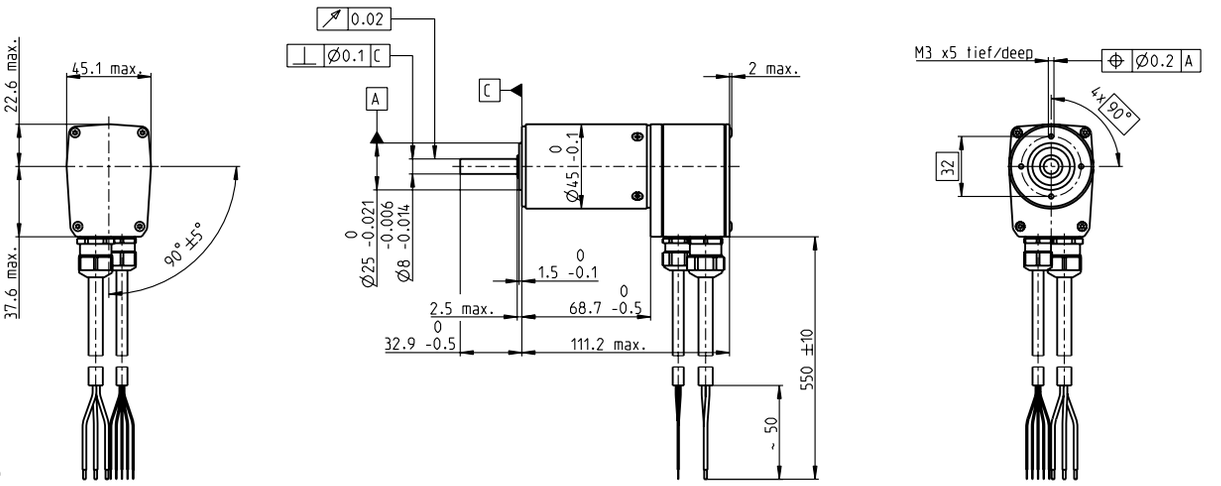
Notes	Page 24
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5, 50/5, 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder HED_5540
500 CPT,
3 channels
Page 363/366

Resolver Res 26
∅26 mm
10 V
Page 374

Brake AB 32
24 VDC
0.4 Nm
Page 410

EC 45 ∅45 mm, brushless, 150 Watt



M 1:4

Stock program
Standard program
Special program (on request)

Part Numbers

		136202	136196	136203	136197	136204	136198	136205	136200	136206	136201
Motor Data											
	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	gcm²	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
		> 20 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		16 N
27	Max. force for press fits (static)		182 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		140 N

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

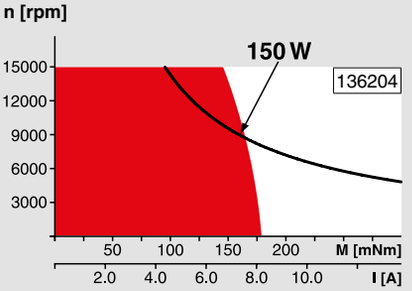
Wiring diagram for Hall sensors see p. 33

[1)] Not lead through in combination with resolver.

Option

Temperature monitoring, PTC resistance Micropille 110°C, R 25°C < 0.5 kΩ, R 105°C = 1.2…1.5 kΩ, R 115°C = 7…13 kΩ, R 120°C = 18…35 kΩ

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).

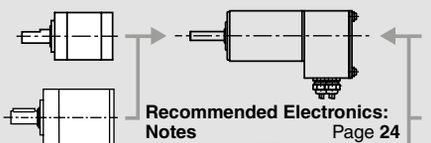
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 314

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 319



Recommended Electronics:

Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5, 50/5, 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

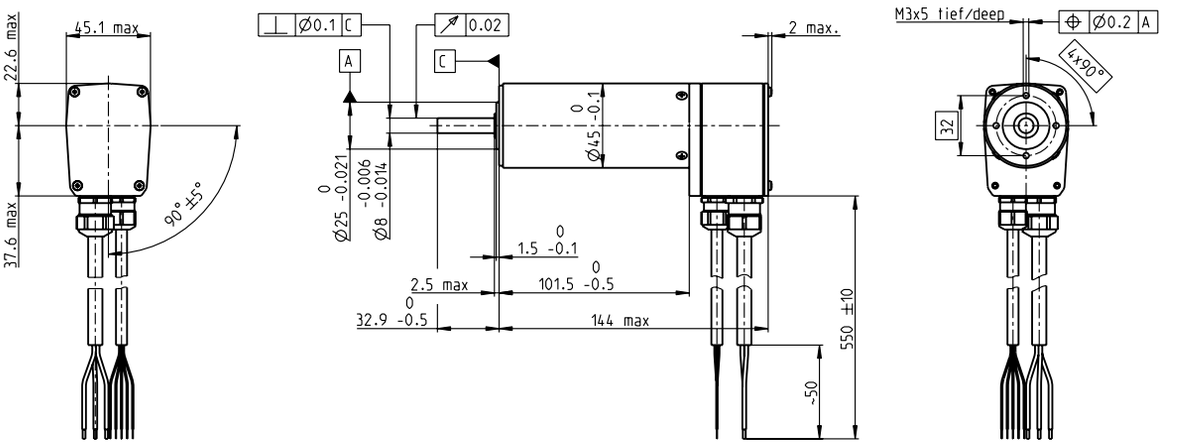
Encoder HEDL 9140
500 CPT,
3 channels
Page 368

Resolver Res 26
∅26 mm
10 V
Page 374

Brake AB 28
24 VDC
0.4 Nm
Page 409

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

EC 45 ∅45 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							
	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	gcm²	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
		> 20 N	max. 0.15 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		16 N
27	Max. force for press fits (static)		182 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		180 N

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

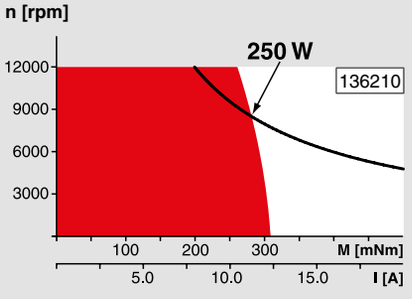
Wiring diagram for Hall sensors see p. 33

[1)] Not lead through in combination with resolver.

Option

Temperature monitoring, PTC resistance Micropille 110°C, R 25°C < 0.5 kΩ, R 105°C = 1.2…1.5 kΩ, R 115°C = 7…13 kΩ, R 120°C = 18…35 kΩ

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

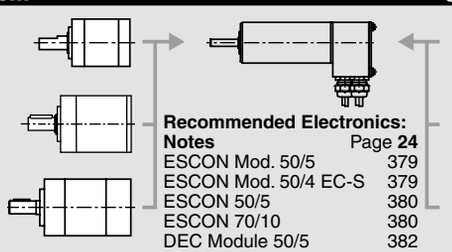
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 314

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 319

Planetary Gearhead
∅62 mm
8 - 50 Nm
Page 320



Recommended Electronics:

Notes	Page 24
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 50/5, 70/10	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

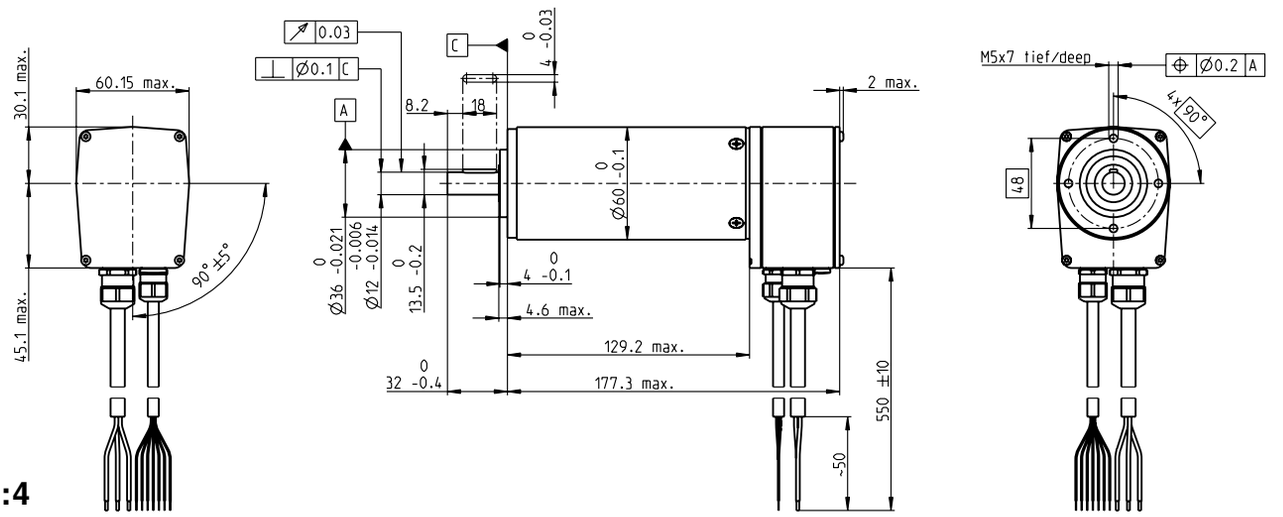
Encoder HEDL 9140
500 CPT,
3 channels
Page 368

Resolver Res 26
∅26 mm
10 V
Page 374

Brake AB 28
24 VDC
0.4 Nm
Page 409

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

EC 60 ∅60 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	48
2 No load speed rpm	5380	3100
3 No load current mA	449	194
4 Nominal speed rpm	4940	2670
5 Nominal torque (max. continuous torque) mNm	810	859
6 Nominal current (max. continuous current) A	9.84	5.94
7 Stall torque mNm	11800	6820
8 Stall current A	139	46.4
9 Max. efficiency %	89	88
Characteristics		
10 Terminal resistance phase to phase Ω	0.345	1.03
11 Terminal inductance phase to phase mH	0.273	0.82
12 Torque constant mNm/A	84.9	147
13 Speed constant rpm/V	113	65
14 Speed/torque gradient rpm/mNm	0.457	0.457
15 Mechanical time constant ms	3.98	3.98
16 Rotor inertia gcm²	831	831

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.3 K/W
18	Thermal resistance winding-housing	0.5 K/W
19	Thermal time constant winding	33.9 s
20	Thermal time constant motor	1200 s
21	Ambient temperature	-20…+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		7000 rpm
24	Axial play at axial load	< 30 N	0 mm
		> 30 N	max. 0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		24 N
27	Max. force for press fits (static)		390 N
	(static, shaft supported)		6000 N
28	Max. radial load, 5 mm from flange		240 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	2400 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

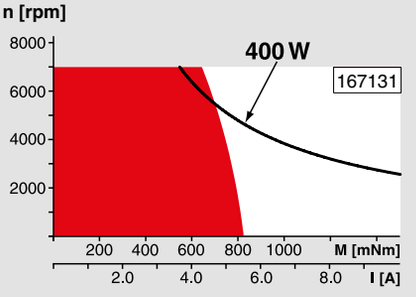
Connection sensors (Cable AWG 24)[1)]

white	Hall sensor 3
brown	Hall sensor 2
green	Hall sensor 1
yellow	GND
grey	V_{Hall} 4.5 … 24 VDC
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 < 0.5 kΩ, R 105°C = 1.2…1.5 kΩ, R 115°C = 7…13 kΩ, R 120°C = 18…35 kΩ
Wiring diagram for Hall sensors see p. 33

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 20–25

Planetary Gearhead
∅81 mm
20 - 120 Nm
Page 321

Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 50/5, 70/10	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder HEDL 9140
500 CPT,
3 channels
Page 368

Resolver Res
∅26 mm
10 V
Page 374

Brake AB 41
24 VDC
2.0 Nm
Page 411

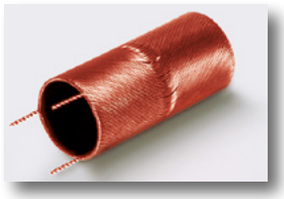
*Protection level only when installed with flange-side seal.

maxon EC-max

maxon EC-max

The maxon EC-max program picks up the ideology of the successful A-max and RE-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.

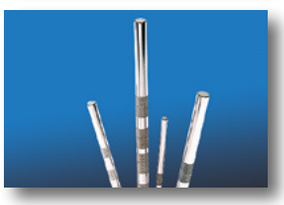
maxon EC-max program



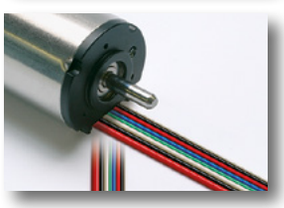
The «heart» is the ironless winding, System maxon®. This means physically dependent – advantages like no detent, high efficiency and excellent regulating dynamics.

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.

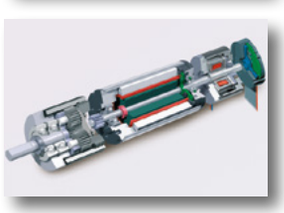


Shaft with no groove guarantees torsional stability and smooth running.

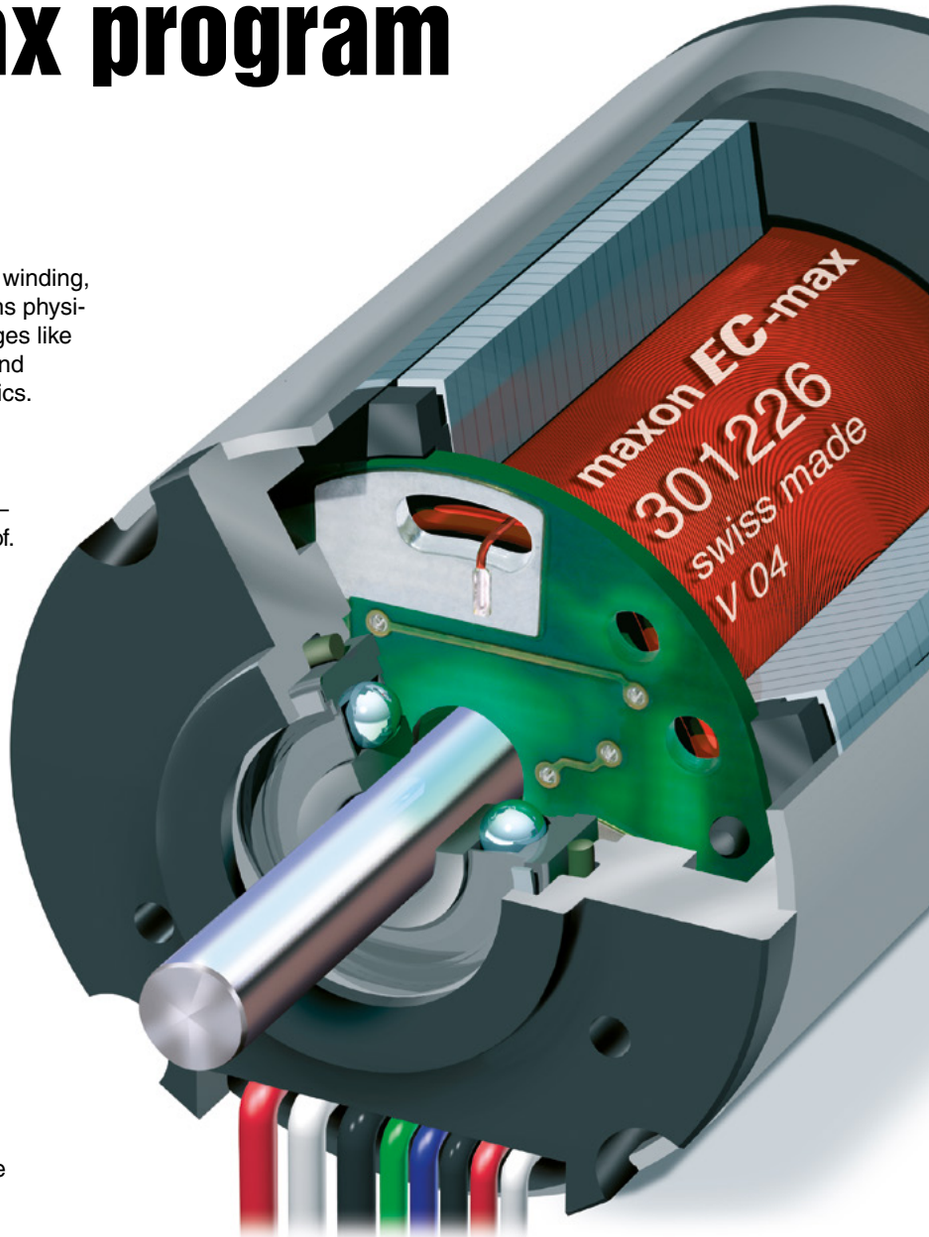


Non-tension cables can be directed both radially and axially from the motor. Wide range of plug options.

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

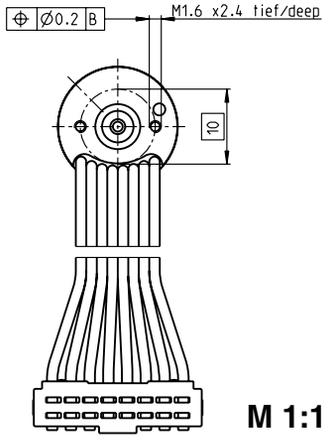


Modular construction with gears, sensors and brakes.

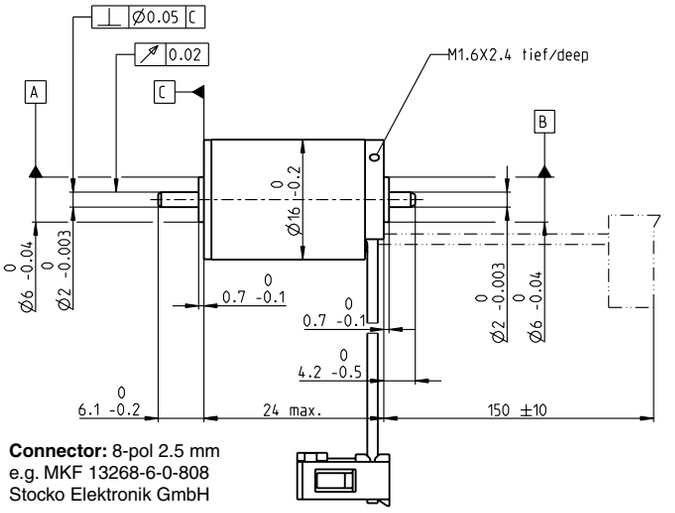


The modular EC-motor program with an impressive price-performance ratio

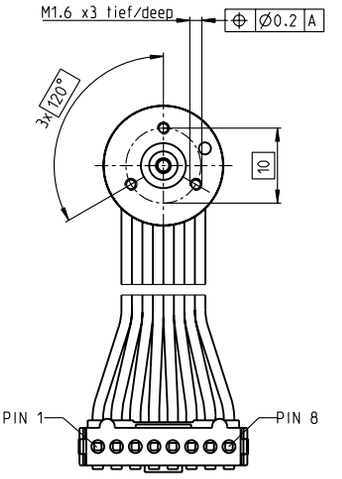
EC-max 16 ∅16 mm, brushless, 5 Watt



M 1:1



Connector: 8-pol 2.5 mm
e.g. MKF 13268-6-0-808
Stocko Elektronik GmbH



Stock program
Standard program
Special program (on request)

Part Numbers

	283825	283826	283827	283828
Motor Data				
Values at nominal voltage				
1 Nominal voltage	4.5 V	6 V	9 V	12 V
2 No load speed	12800 rpm	13500 rpm	12600 rpm	13500 rpm
3 No load current	148 mA	120 mA	72.4 mA	60.2 mA
4 Nominal speed	5170 rpm	5690 rpm	4920 rpm	5840 rpm
5 Nominal torque (max. continuous torque)	3.33 mNm	3.2 mNm	3.29 mNm	3.23 mNm
6 Nominal current (max. continuous current)	1.18 A	0.903 A	0.574 A	0.456 A
7 Stall torque	5.82 mNm	5.79 mNm	5.64 mNm	5.95 mNm
8 Stall current	1.89 A	1.49 A	0.901 A	0.762 A
9 Max. efficiency	53 %	53 %	53 %	53 %
Characteristics				
10 Terminal resistance phase to phase	2.38 Ω	4.04 Ω	9.99 Ω	15.7 Ω
11 Terminal inductance phase to phase	0.0396 mH	0.0634 mH	0.163 mH	0.254 mH
12 Torque constant	3.08 mNm/A	3.9 mNm/A	6.26 mNm/A	7.8 mNm/A
13 Speed constant	3100 rpm/V	2450 rpm/V	1530 rpm/V	1220 rpm/V
14 Speed/torque gradient	2390 rpm/mNm	2540 rpm/mNm	2440 rpm/mNm	2470 rpm/mNm
15 Mechanical time constant	10.7 ms	11.4 ms	10.9 ms	11.1 ms
16 Rotor inertia	0.428 gcm²	0.428 gcm²	0.428 gcm²	0.428 gcm²

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)		18 N
	(static, shaft supported)		600 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	36 g

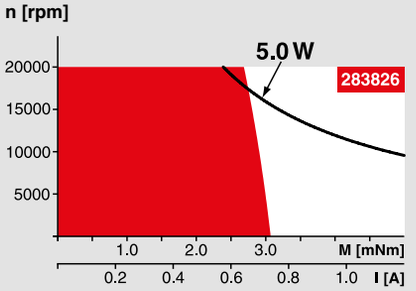
Values listed in the table are nominal.

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. 33

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

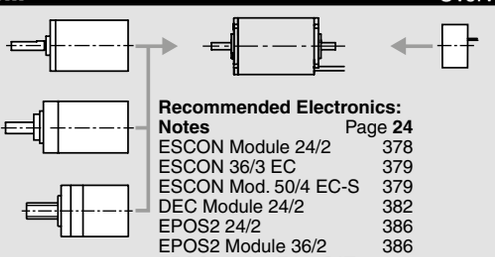
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 285

Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 286

Spindle Drive
∅16 mm
Page 329–331

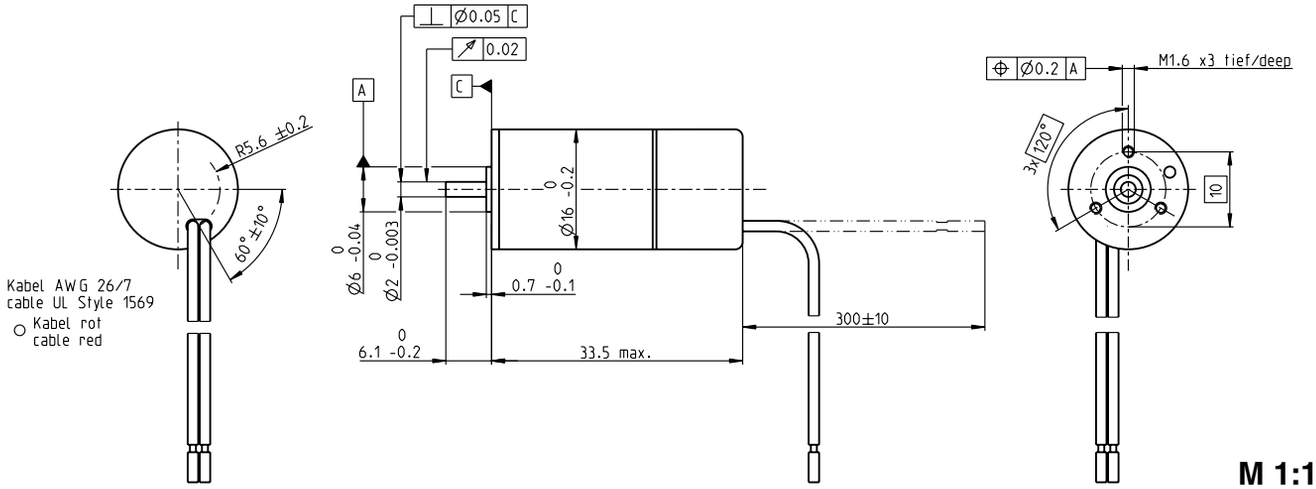


Encoder MR
128/256/512 CPT,
2/3 channels
Page 354

Recommended Electronics:

Notes	Page 24
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC-max 16 2-wire ∅16 mm, brushless, 5 Watt



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	320816	320817	320818	320819
Motor Data				
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

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

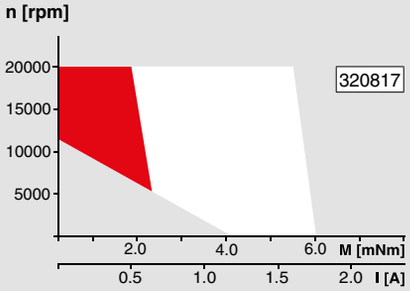
Protective functions

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)

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.

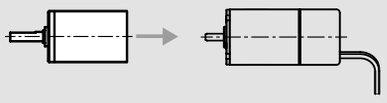
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

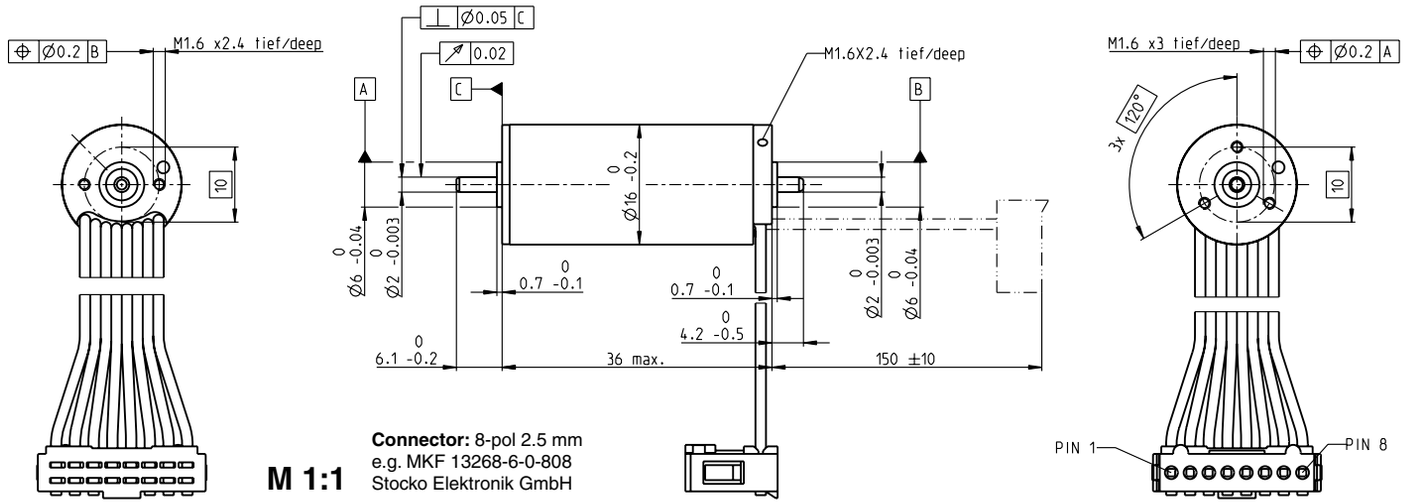
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅16 mm
0.1 - 0.3 Nm
Page 285



EC-max 16 ∅16 mm, brushless, 8 Watt



M 1:1

Connector: 8-pol 2.5 mm
e.g. MKF 13268-6-0-808
Stocko Elektronik GmbH

Stock program
Standard program
Special program (on request)

Part Numbers

		283831	283832	283833	283834	283835
Motor Data						
	Values at nominal voltage					
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	gcm²	0.85	0.85	0.85	0.85	0.85

Specifications

Thermal data

17	Thermal resistance housing-ambient	17.7 K/W
18	Thermal resistance winding-housing	1.41 K/W
19	Thermal time constant winding	0.9 s
20	Thermal time constant motor	427 s
21	Ambient temperature	-40…+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		20000 rpm
24	Axial play at axial load	< 1.5 N	0 mm
		> 1.5 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1 N
27	Max. force for press fits (static)		18 N
	(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

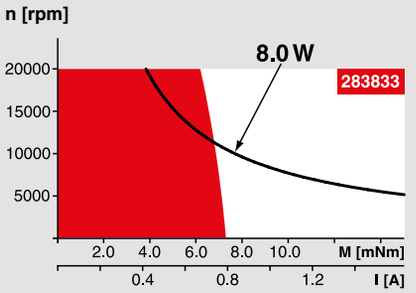
Values listed in the table are nominal.

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. 33

Operating Range



Comments

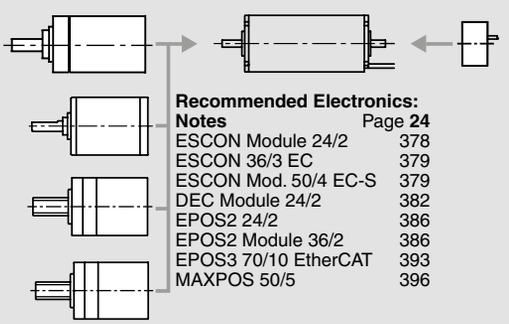
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

Assigned power rating

maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅16 mm
0.2 - 0.6 Nm
Page 286

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 296

Spindle Drive
∅16 mm
Page 329–331

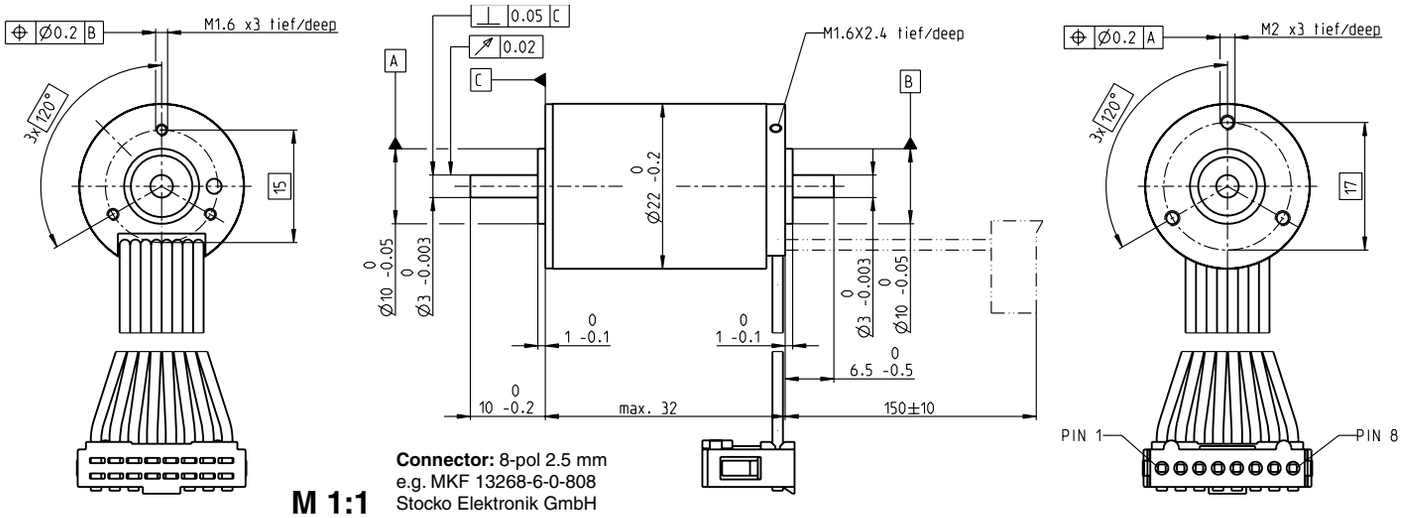
Spindle Drive
∅22 mm
Page 332/333

Encoder MR
128/256/512 CPT,
2/3 channels
Page 354

Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC-max 22 ∅22 mm, brushless, 12 Watt



M 1:1

Connector: 8-pol 2.5 mm
e.g. MKF 13268-6-0-808
Stocko Elektronik GmbH

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	gcm²	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

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	83 g

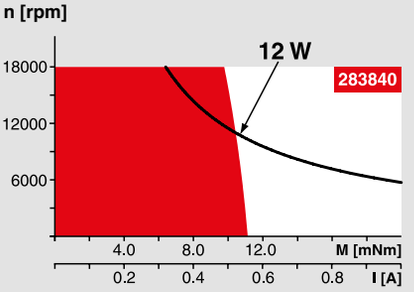
Values listed in the table are nominal.

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. 33

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.

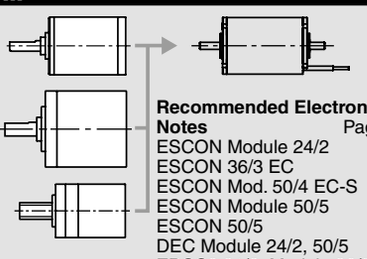
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅22 mm
0.5 - 3.4 Nm
Page 296/297
Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 312
Spindle Drive
∅22 mm
Page 332/333



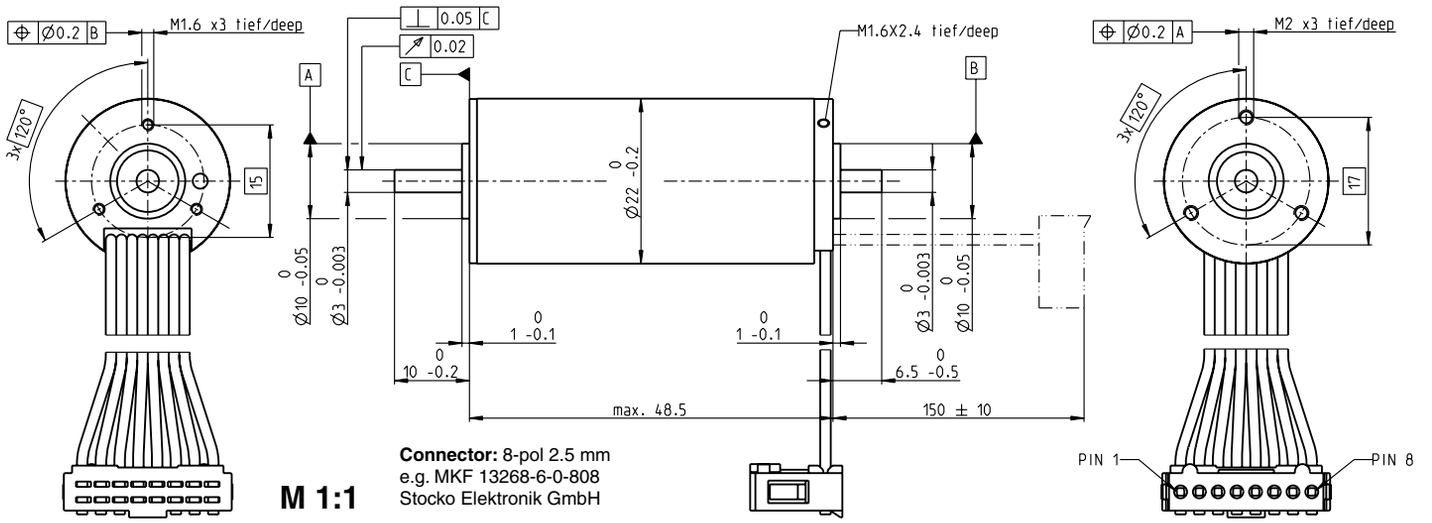
Recommended Electronics:

Notes	Page 24
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2, 50/5	382
EPOS2 24/2, Module 36/2	386
EPOS2 24/5, 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
128/256/512 CPT,
2/3 channels
Page 354

Brake AB 20
24 VDC
0.1 Nm
Page 406

EC-max 22 ∅22 mm, brushless, 25 Watt



Connector: 8-pol 2.5 mm
e.g. MKF 13268-6-0-808
Stocko Elektronik GmbH

Stock program
Standard program
Special program (on request)

Part Numbers

	283856	283857	283858	283859	283860
Motor Data					
Values at nominal voltage					
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 gcm²	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
26	Max. axial load (dynamic)		3.5 N
27	Max. force for press fits (static)		60 N
	(static, shaft supported)		1000 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	110 g

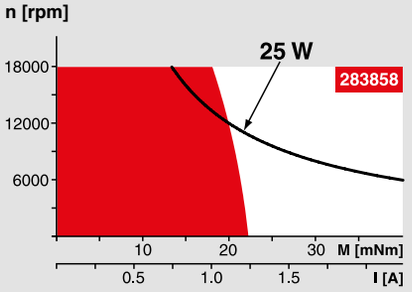
Values listed in the table are nominal.

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. 33

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

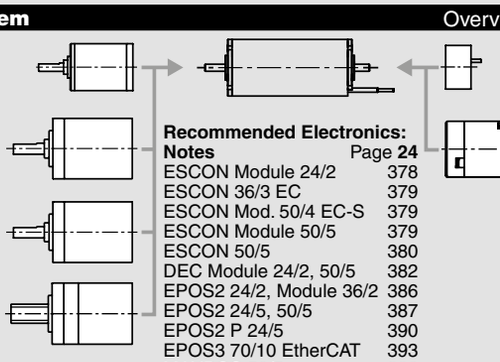
Overview on page 20–25

Planetary Gearhead
∅22 mm
0.5 - 3.4 Nm
Seite 294/297

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 312

Spindle Drive
∅32 mm
Page 334–336



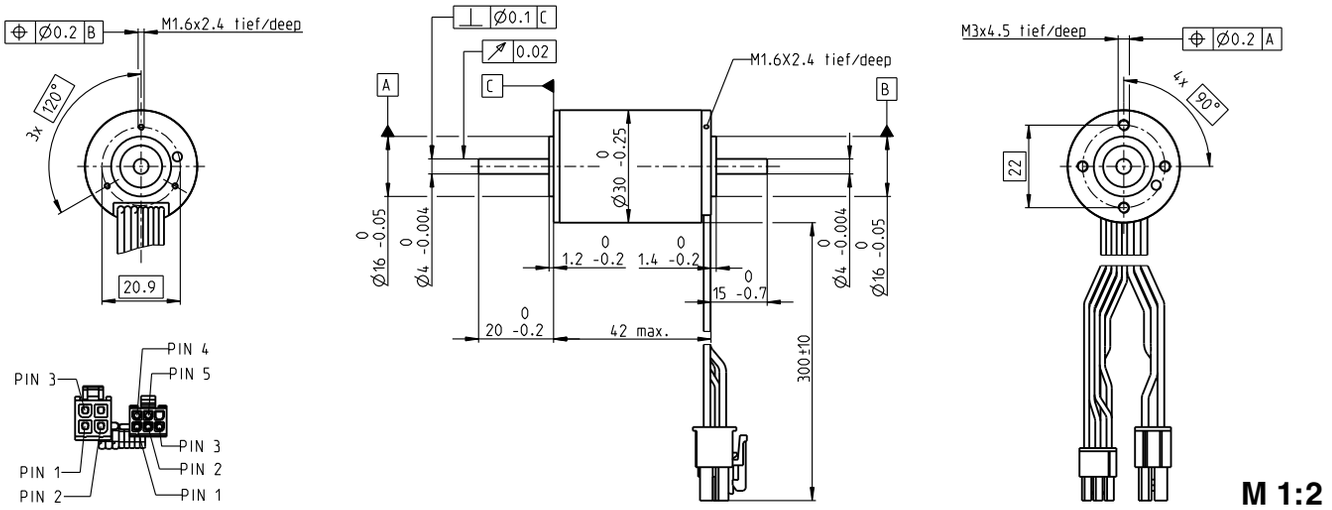
Recommended Electronics:

Notes	Page 24
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2, 50/5	382
EPOS2 24/2, Module 36/2	386
EPOS2 24/5, 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
128/256/512 CPT,
2/3 channels
Page 354

Brake AB 20
24 VDC
0.1 Nm
Page 406

EC-max 30 ∅30 mm, brushless, 40 Watt



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 gcm²	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.	Pin 4

Connector	Part number
Molex	39-01-2040

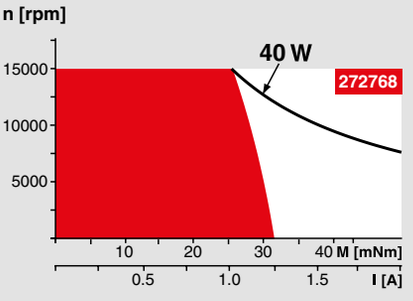
Connection sensors (Cable AWG 26)

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.	Pin 6

Connector	Part number
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 33

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

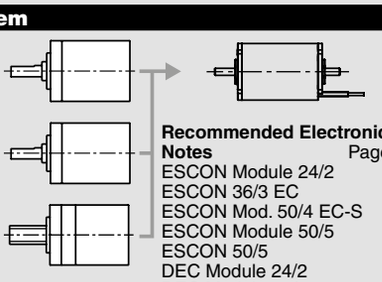
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
1.0 - 8.0 Nm
Page 308/310

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 312

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

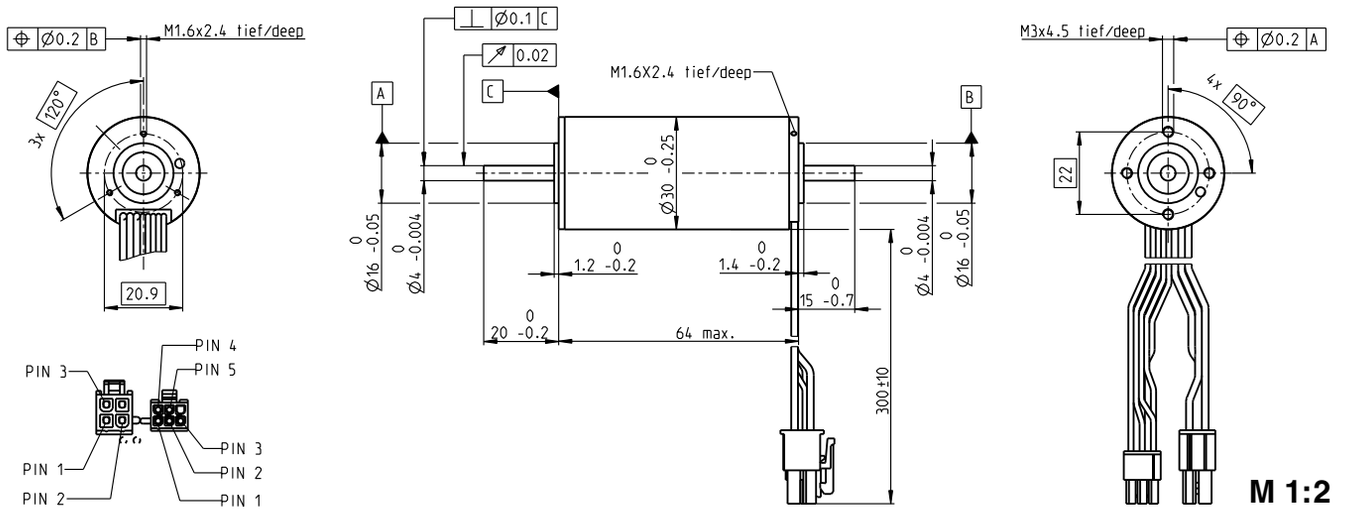
Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2	382
DEC Module 50/5	382
EPOS2 Module 36/2	386
EPOS2 24/5, 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
500/1000 CPT,
3 channels
Page 355

Encoder HEDL 5540
500 CPT,
3 channels
Page 366

Brake AB 20
24 VDC
0.1 Nm
Page 406

EC-max 30 ∅30 mm, brushless, 60 Watt



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	gcm²	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	**Part number**
Molex	39-01-2040

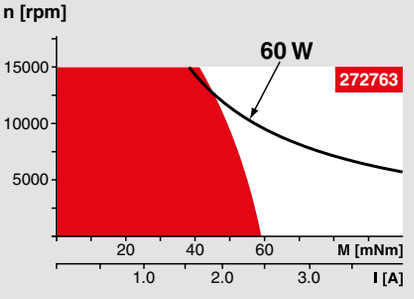
Connection sensors (Cable AWG 26)

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.	Pin 6

Connector	**Part number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 33

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 20–25

Planetary Gearhead
∅32 mm
1.0 - 8.0 Nm
Page 308/310

Koaxdrive
∅32 mm
1.0 - 4.5 Nm
Page 312

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315

Recommended Electronics:

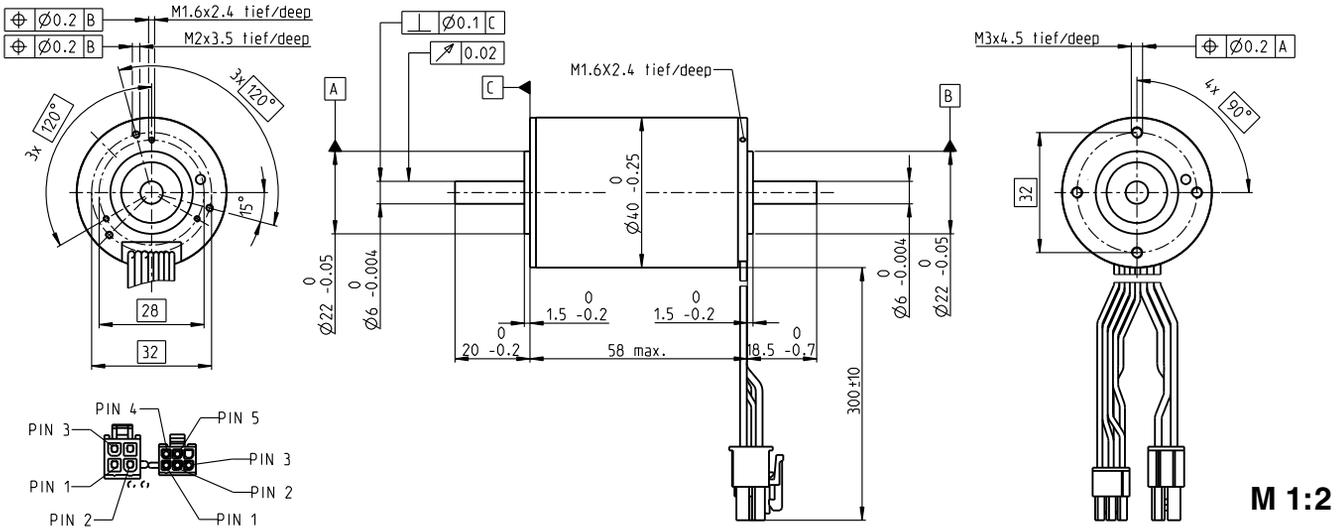
Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 50/5	382
EPOS2 Module 36/2	386
EPOS2 24/5, 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
500/1000 CPT,
3 channels
Page 355

Encoder HEDL 5540
500 CPT,
3 channels
Page 366

Brake AB 20
24 VDC
0.1 Nm
Page 406

EC-max 40 ∅40 mm, brushless, 70 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	283866	283867	283868	283869
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 gcm²	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)		211 N
	(static, shaft supported)		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.	Pin 4

Connector	**Part number**
Molex	39-01-2040

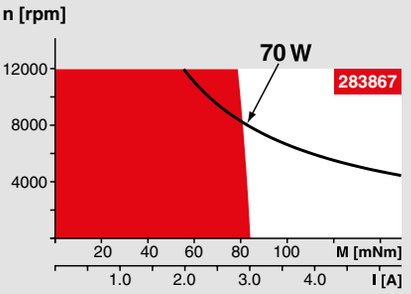
Connection (Cable AWG 26)

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	**Part number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 33

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.

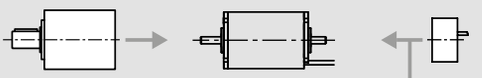
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315



Recommended Electronics:

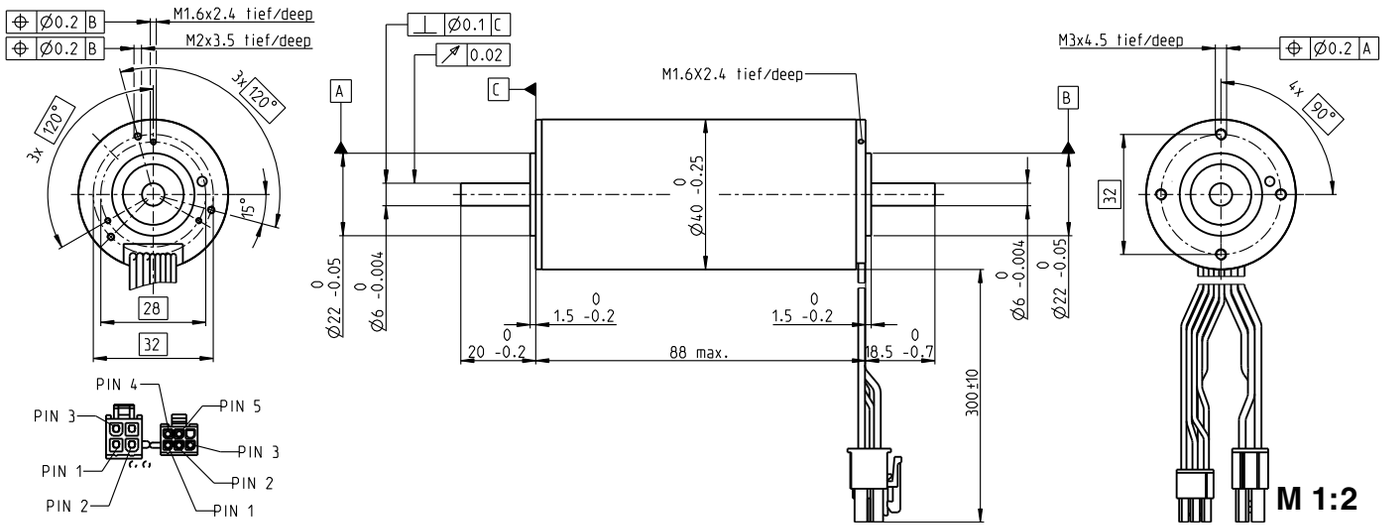
Notes	**Page 24**
ESCON 36/3 EC	379
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5	387
EPOS2 50/5	387
EPOS2 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
256 - 1024 CPT,
3 channels
Page 356

Encoder HEDL 5540
500 CPT,
3 channels
Page 366

Brake AB 28
24 VDC
0.4 Nm
Page 407

EC-max 40 ∅40 mm, brushless, 120 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	283870	283871	283872	283873
Motor Data				
Values at nominal voltage				
1 Nominal voltage V	48	48	48	48
2 No load speed rpm	10100	7240	4720	3610
3 No load current mA	310	188	104	72.8
4 Nominal speed rpm	9250	6280	3770	2670
5 Nominal torque (max. continuous torque) mNm	170	185	203	211
6 Nominal current (max. continuous current) A	4.06	3.1	2.19	1.74
7 Stall torque mNm	2090	1490	1050	838
8 Stall current A	46.7	23.7	10.9	6.68
9 Max. efficiency %	85	83	82	80
Characteristics				
10 Terminal resistance phase to phase Ω	1.03	2.02	4.4	7.19
11 Terminal inductance phase to phase mH	0.204	0.4	0.937	1.6
12 Torque constant mNm/A	44.8	62.8	96.1	126
13 Speed constant rpm/V	213	152	99.4	76.1
14 Speed/torque gradient rpm/mNm	4.89	4.9	4.55	4.35
15 Mechanical time constant ms	5.17	5.19	4.81	4.61
16 Rotor inertia gcm²	101	101	101	101

Specifications

Thermal data

17	Thermal resistance housing-ambient	3.45 K/W
18	Thermal resistance winding-housing	0.29 K/W
19	Thermal time constant winding	3.96 s
20	Thermal time constant motor	1240 s
21	Ambient temperature	-40…+100°C
22	Max. winding temperature	+155°C

Mechanical data (preloaded ball bearings)

23	Max. speed		12000 rpm
24	Axial play at axial load	< 10 N	0 mm
		> 10 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		8 N
27	Max. force for press fits (static)		211 N
	(static, shaft supported)		4000 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	720 g

Values listed in the table are nominal.

Connection motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector	**Part number**
Molex	39-01-2040

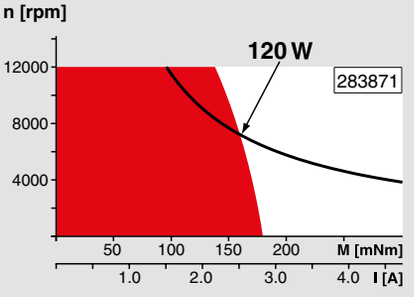
Connection sensors (Cable AWG 26)

yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V_{Hall} 3…24 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 33

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.

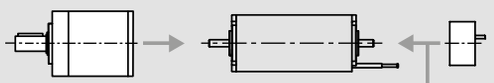
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 319



Recommended Electronics:

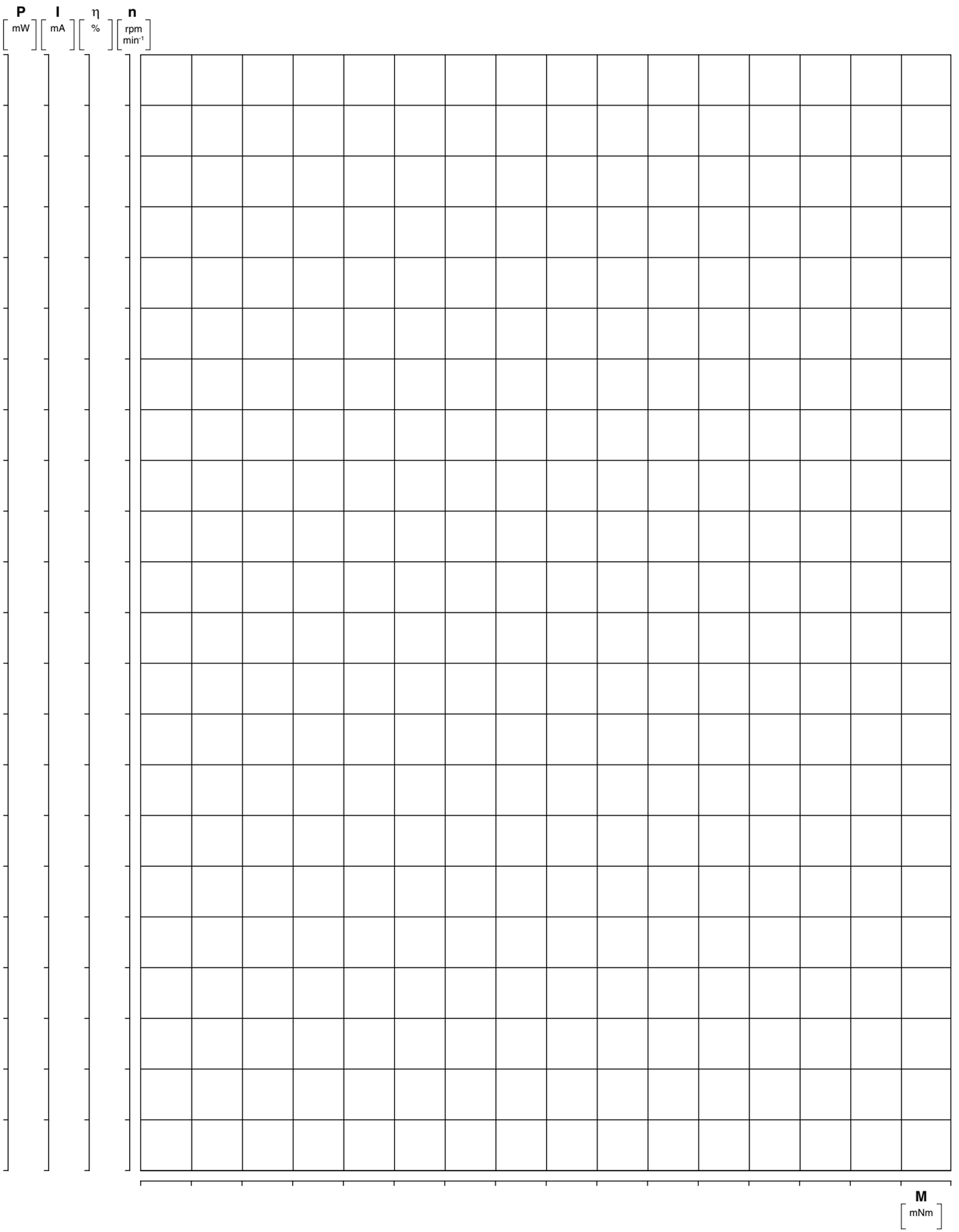
Notes	Page **24**
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5, 50/5, 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
256 - 1024 CPT,
3 channels
Page 356

Encoder HEDL 5540
500 CPT,
3 channels
Page 366

Brake AB 28
24 VDC
0.4 Nm
Page 407

For your personal notes

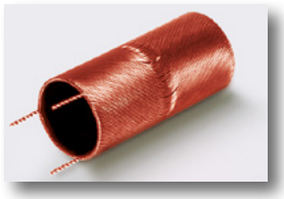


maxon EC-4pole

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.

maxon EC-4pole program

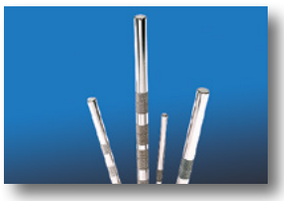


The «heart» is the ironless winding, System maxon®. This means physically dependent – advantages like no detent, high efficiency and excellent regulating dynamics.

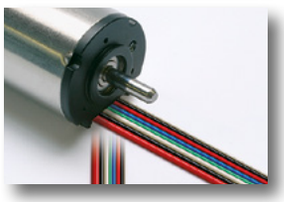
The motor housing, a simple tube made of stainless steel – non magnetic, rigid, rustproof.

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.



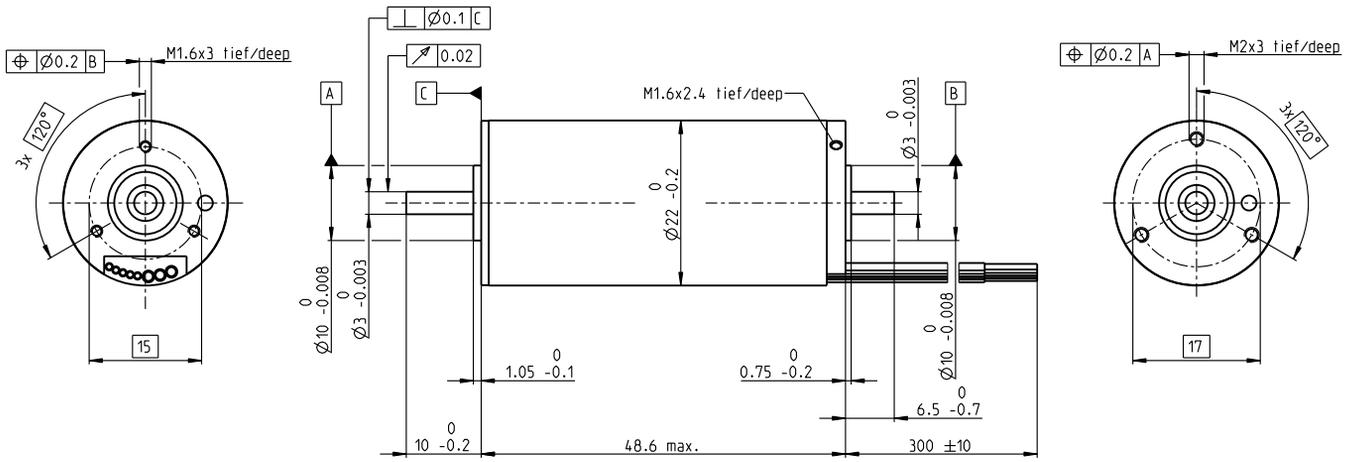
Non-tension cables can be directed both radially and axially from the motor. Wide range of plug options.

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 ∅22 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					
1	Nominal voltage	V	18	24	36	48	48
2	No load speed	rpm	16300	16300	16300	16300	6900
3	No load current	mA	221	166	110	82.8	21.1
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	gcm²	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)		53 N
	(static, shaft supported)		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	120 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

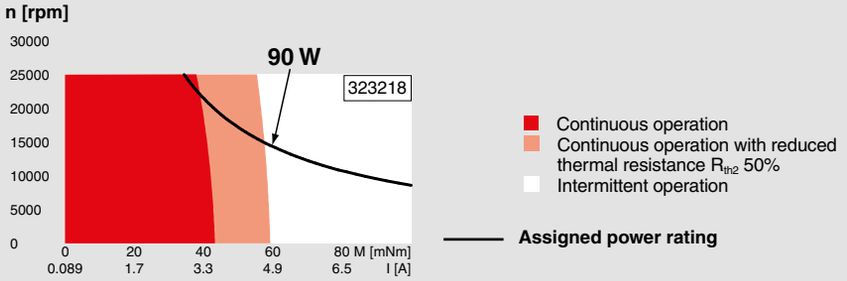
Connection sensors (Cable AWG 26)

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. 33

Operating Range

Comments



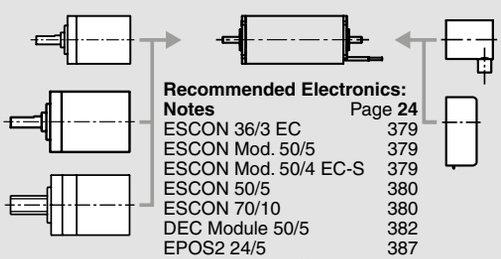
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅22 mm
2.0 - 3.4 Nm
Page 297

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

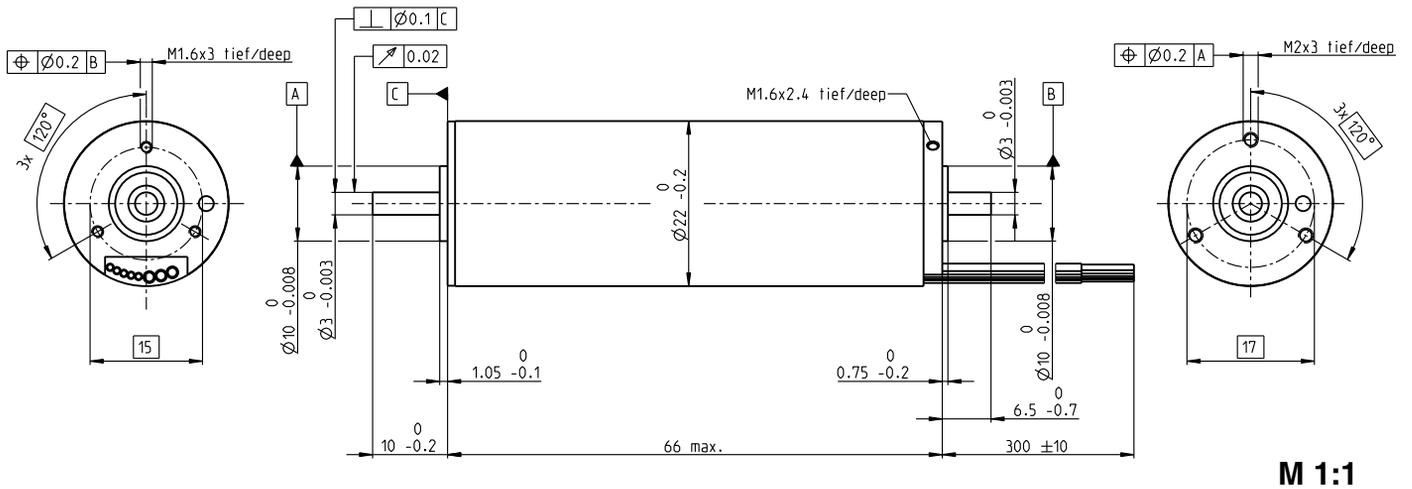
Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5	387
EPOS2 50/5, 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder SCH16F
2000 - 3600 CPT,
3 channels
Page 359

Encoder HEDL 5540
500 CPT,
3 channels
Page 367

EC-4pole 22 ∅22 mm, brushless, 120 Watt

High Power



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	311535	311536	311537	311538
Motor Data				
Values at nominal voltage				
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	gcm²	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		preloaded
26	Max. axial load (dynamic)		4 N
27	Max. force for press fits (static)		53 N
	(static, shaft supported)		600 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	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

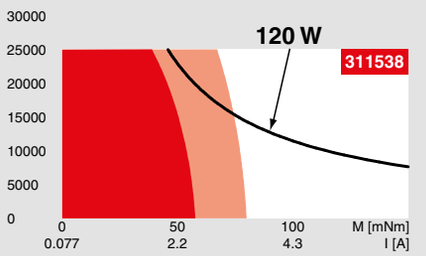
Connection sensors (Cable AWG 26)

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. 33

Operating Range

Comments



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

Assigned power rating

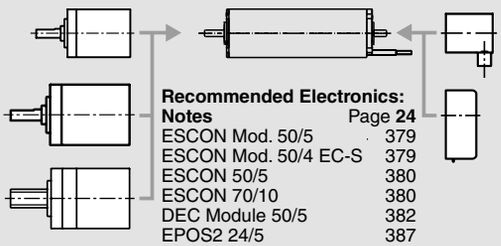
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅22 mm
2.0 - 3.4 Nm
Page 297

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

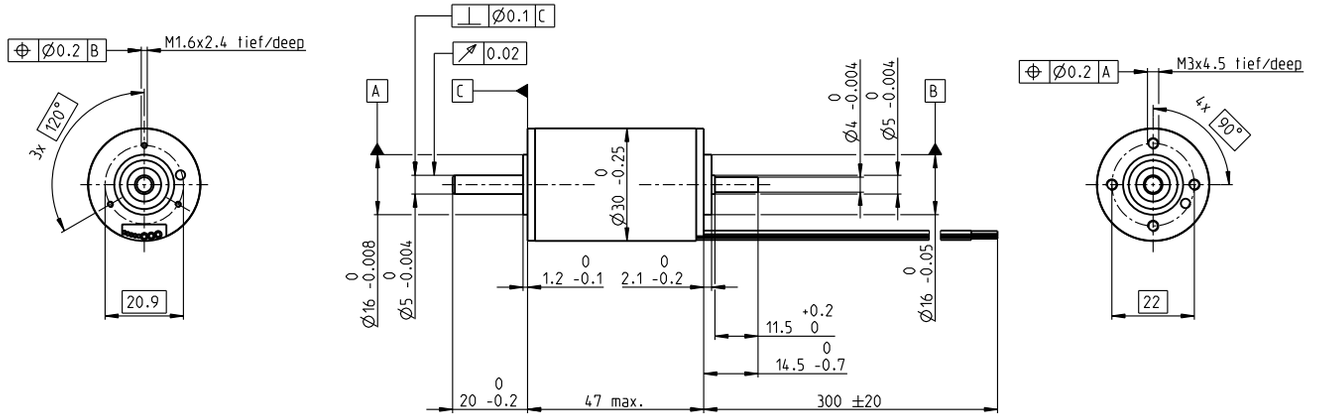
Notes	Page 24
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5	387
EPOS2 50/5	387
EPOS2 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder SCH16F
2000 - 3600 CPT,
3 channels
Page 359

Encoder HEDL 5540
500 CPT,
3 channels
Page 367

EC-4pole 30 ∅30 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	17800	17800	17800	17800
3	No load current	mA	719	539	360	270
4	Nominal speed	rpm	16700	16800	16900	16900
5	Nominal torque (max. continuous torque)	mNm	64.9	61.9	67	66.1
6	Nominal current (max. continuous current)	A	7.38	5.3	3.8	2.82
7	Stall torque	mNm	1280	1240	1480	1470
8	Stall current	A	133	96.9	77.2	57.4
9	Max. efficiency	%	86	86	87	87
	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	9.58	12.8	19.2	25.5
13	Speed constant	rpm/V	997	748	499	374
14	Speed/torque gradient	rpm/mNm	14.1	14.5	12.1	12.2
15	Mechanical time constant	ms	2.7	2.78	2.33	2.35
16	Rotor inertia	gcm²	18.3	18.3	18.3	18.3

Specifications

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
25	Radial play		preloaded
26	Max. axial load (dynamic)		5.5 N
27	Max. force for press fits (static)		73 N
	(static, shaft supported)		2000 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	210 g

Values listed in the table are nominal.

Connection motor (Cable AWG 18)

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

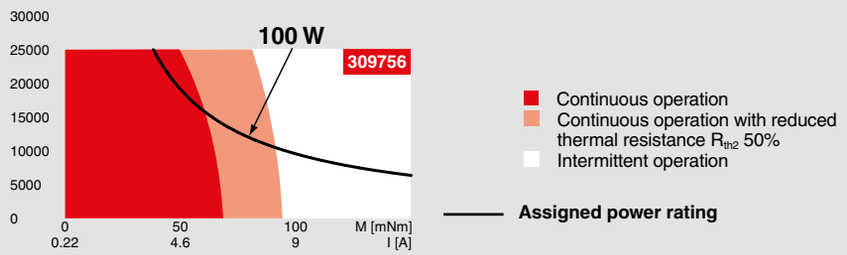
Connection sensors (Cable AWG 26)

black/grey	Hall sensor 2
blue	GND
green	V_{Hall} 3…24 VDC
red/grey	Hall sensor 1
white/grey	Hall sensor 3

Wiring diagram for Hall sensors see p. 33

Operating Range

Comments

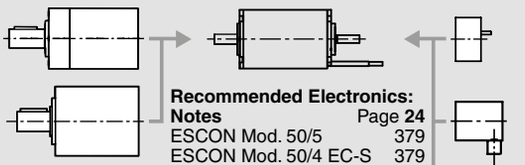


maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
8 Nm
Page 310

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315



Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 50/5	387
EPOS2 70/10	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
128 - 1000 CPT,
3 channels
Page 355

Encoder 2RMHF
3000 - 5000 CPT,
3 channels
Page 360

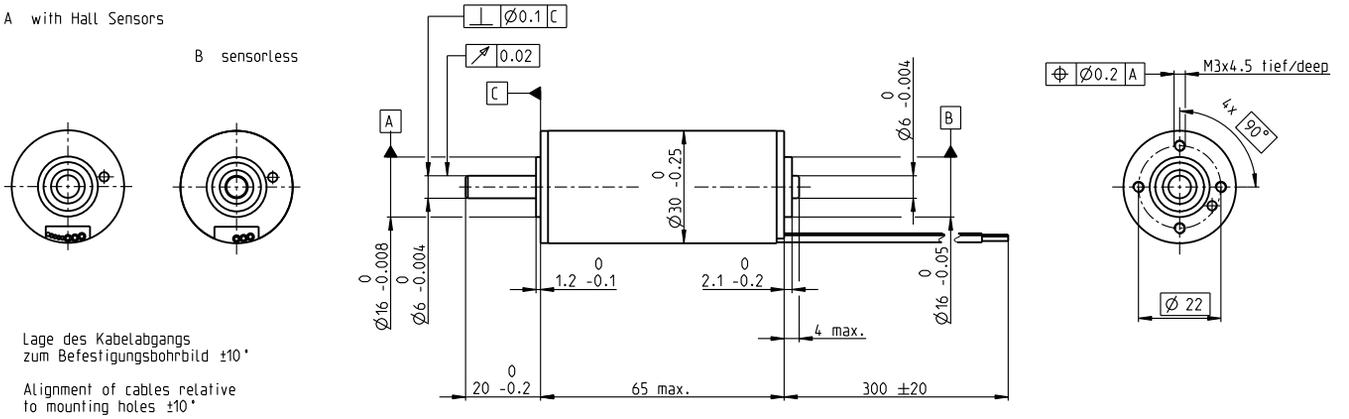
Encoder HEDL 5540
500 CPT,
3 channels
Page 367

Brake AB 20
24 VDC
0.1 Nm
Page 406

EC-4pole 30 ∅30 mm, brushless, 150 Watt

sterilizable

NEW



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	gcm²	35.2	35.2						

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	-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	< 6 N	0 mm
		> 6 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		5.5 N
27	Max. force for press fits (static)		73 N
	(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)

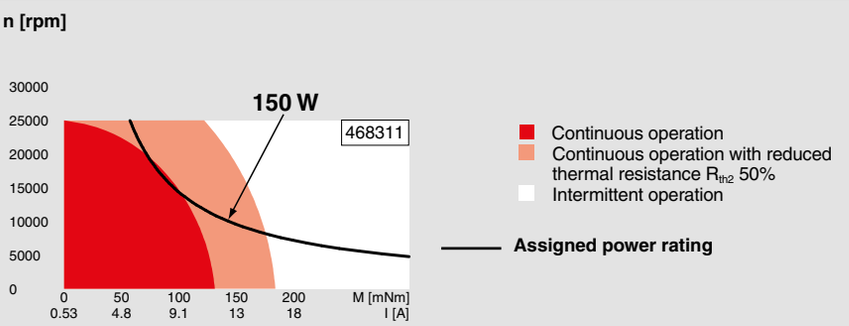
green	VHall 3…24 VDC
blue	GND
red/grey	Hall sensor 1
black/grey	Hall sensor 2
white/grey	Hall sensor 3

Wiring diagram for Hall sensors see p. 33

Option
Hollow shaft with bore diameter up to 4.1 mm

Operating Range

Comments



Application

Sterilizable Devices

- Orthopedic Drills
- Orthopedic Saws
- Surgical Reamers

Sterilization information

Sensorless: typically 2000 autoclave cycles
Hall sensor: typically 1000 autoclave cycles

Sterilization with steam

Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

maxon Modular System

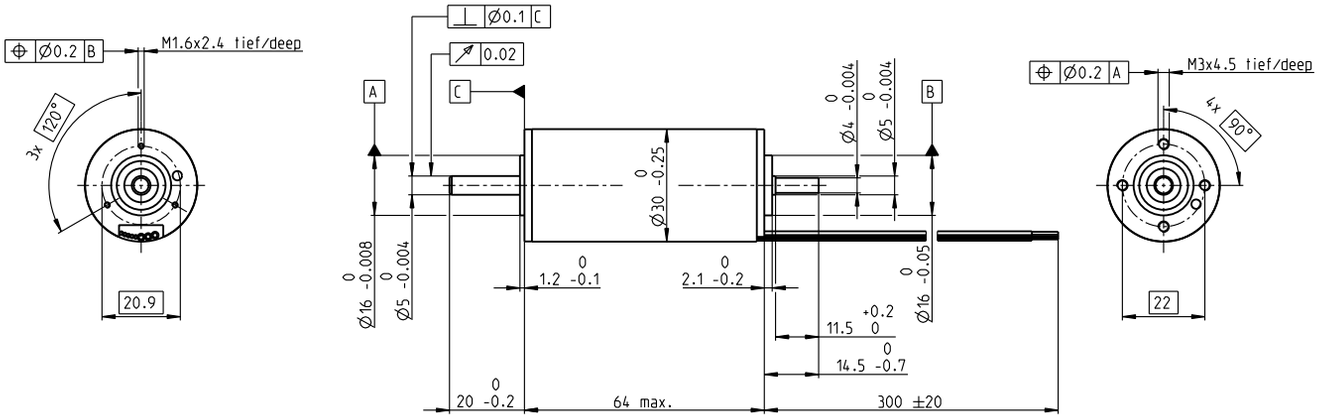
Overview on page 20–25

Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382

EC-4pole 30 ∅30 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			
1 Nominal voltage V	24	36	48
2 No load speed rpm	16700	16700	16500
3 No load current mA	728	485	356
4 Nominal speed rpm	16100	16200	16000
5 Nominal torque (max. continuous torque) mNm	94.6	94.2	92.9
6 Nominal current (max. continuous current) A	7.58	5.03	3.68
7 Stall torque mNm	3220	3510	3430
8 Stall current A	236	171	124
9 Max. efficiency %	89	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	13.6	20.5	27.6
13 Speed constant rpm/V	700	466	346
14 Speed/torque gradient rpm/mNm	5.21	4.78	4.83
15 Mechanical time constant ms	1.82	1.67	1.69
16 Rotor inertia gcm²	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)		73 N
	(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	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

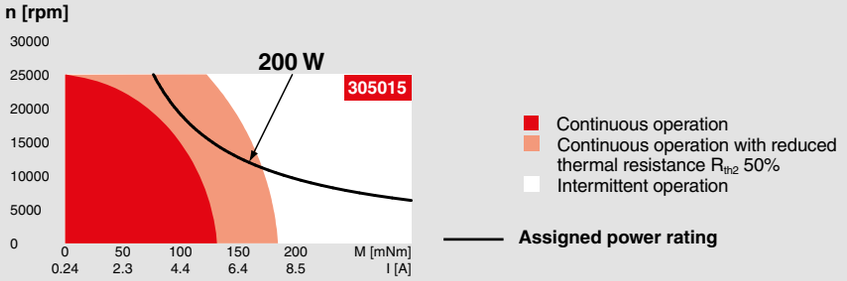
Connection sensors (Cable AWG 26)

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. 33

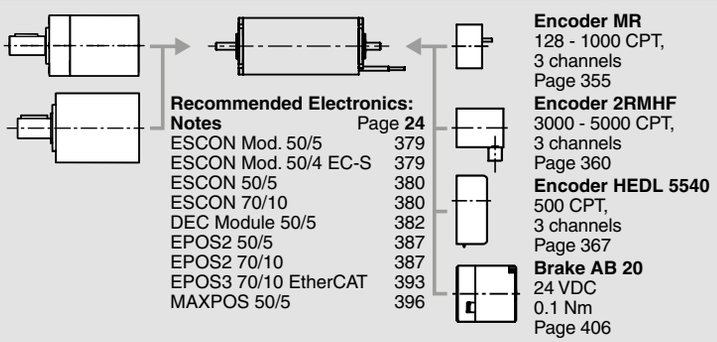
Operating Range

Comments



maxon Modular System

Overview on page 20–25



Planetary Gearhead
∅32 mm
8 Nm
Page 310

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315

Recommended Electronics:

Notes	Page 24
ESCON Mod. 50/5	379
ESCON Mod. 50/4 EC-S	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 50/5	387
EPOS2 70/10	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder MR
128 - 1000 CPT,
3 channels
Page 355

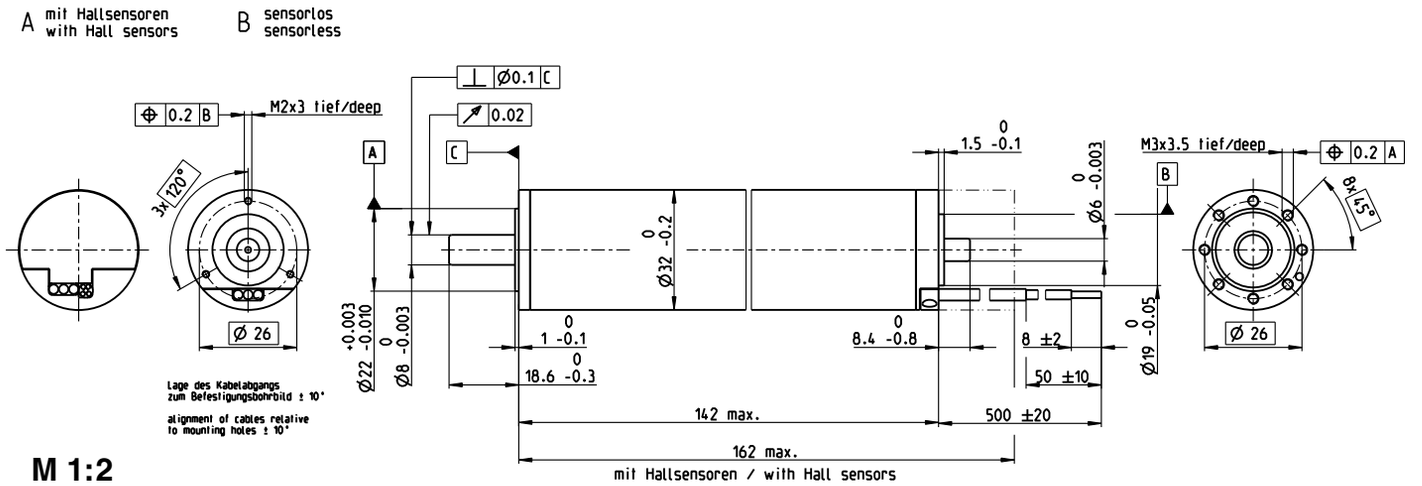
Encoder 2RMHF
3000 - 5000 CPT,
3 channels
Page 360

Encoder HEDL 5540
500 CPT,
3 channels
Page 367

Brake AB 20
24 VDC
0.1 Nm
Page 406

EC-4pole 32 ∅32 mm, brushless, 220 Watt

Heavy Duty – for applications in air



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	gcm²	128	128	128	128

[1] Values for operation in thermal equilibrium.

Specifications

Thermal data

17	Thermal resistance housing-ambient	3.69 K/W
18	Thermal resistance winding-housing	0.734 K/W
19	Thermal time constant winding	23.5 s
20	Thermal time constant motor	1350 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 (sensorless)	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)

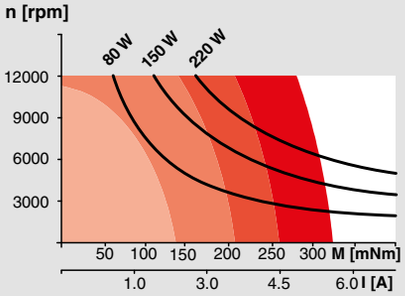
green	V_{Hall} 4.5…24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

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. 33

Operating Range



Comments

TA = 25°C
TA = 100°C
TA = 150°C
TA = 200°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 (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

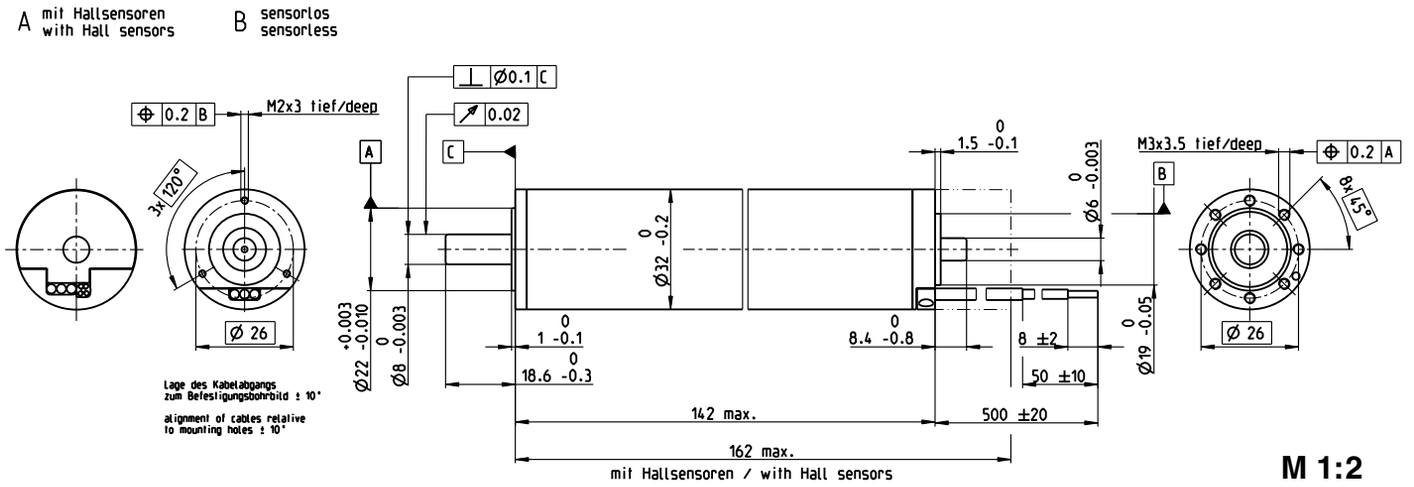
Industry
– pumps and valves for liquid metal cooling systems/turbine fuel and steam control
– valve adjustment for gas and steam power plants

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 ∅32 mm, brushless, 480 Watt

Heavy Duty – for applications in oil



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	4350	4420	4700	5340
5 Nominal torque (max. continuous torque)[1]	mNm	961	762	596	379
6 Nominal current (max. continuous current)	A	13.5	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	gcm²	140	140	140	140

[1] Values for operation in thermal equilibrium.

Specifications

Thermal data		
17	Thermal resistance housing-ambient	0.284 K/W
18	Thermal resistance winding-housing	0.305 K/W
19	Thermal time constant winding	9.78 s
20	Thermal time constant motor	104 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 (sensorless)	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)

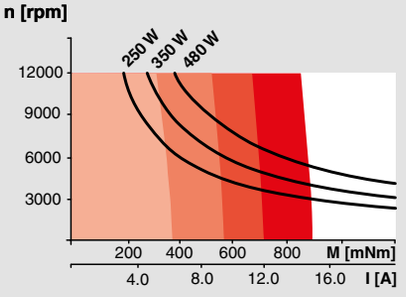
green	V_{Hall} 4.5…24 V
blue	GND
red	Hall sensor 1
black	Hall sensor 2
white	Hall sensor 3

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. 33

Operating Range



Comments

TA = 25°C
TA = 100°C
TA = 150°C
TA = 200°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

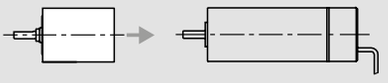
This motor contains leaded solder. It therefore does not fulfill the requirements for the permitted maximum concentration of hazardous substances in accordance with the EC directive 2011/65/EC (RoHS) for all applications. The motor may therefore only be used for devices that are not subject to this directive.

Reference medium: Shell Tellus oil T15
Operation in oil of different viscosity will affect the motor data.

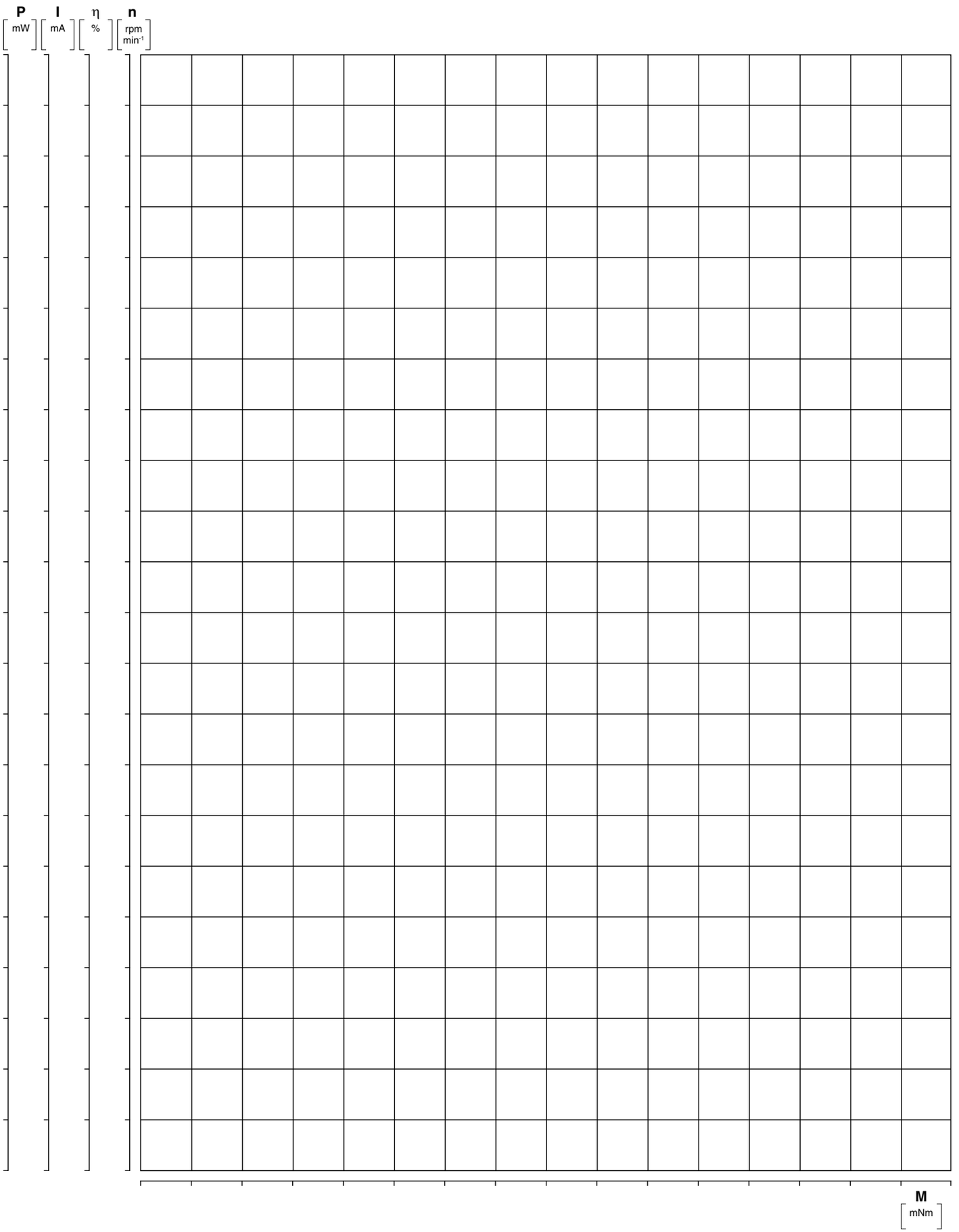
maxon Modular System

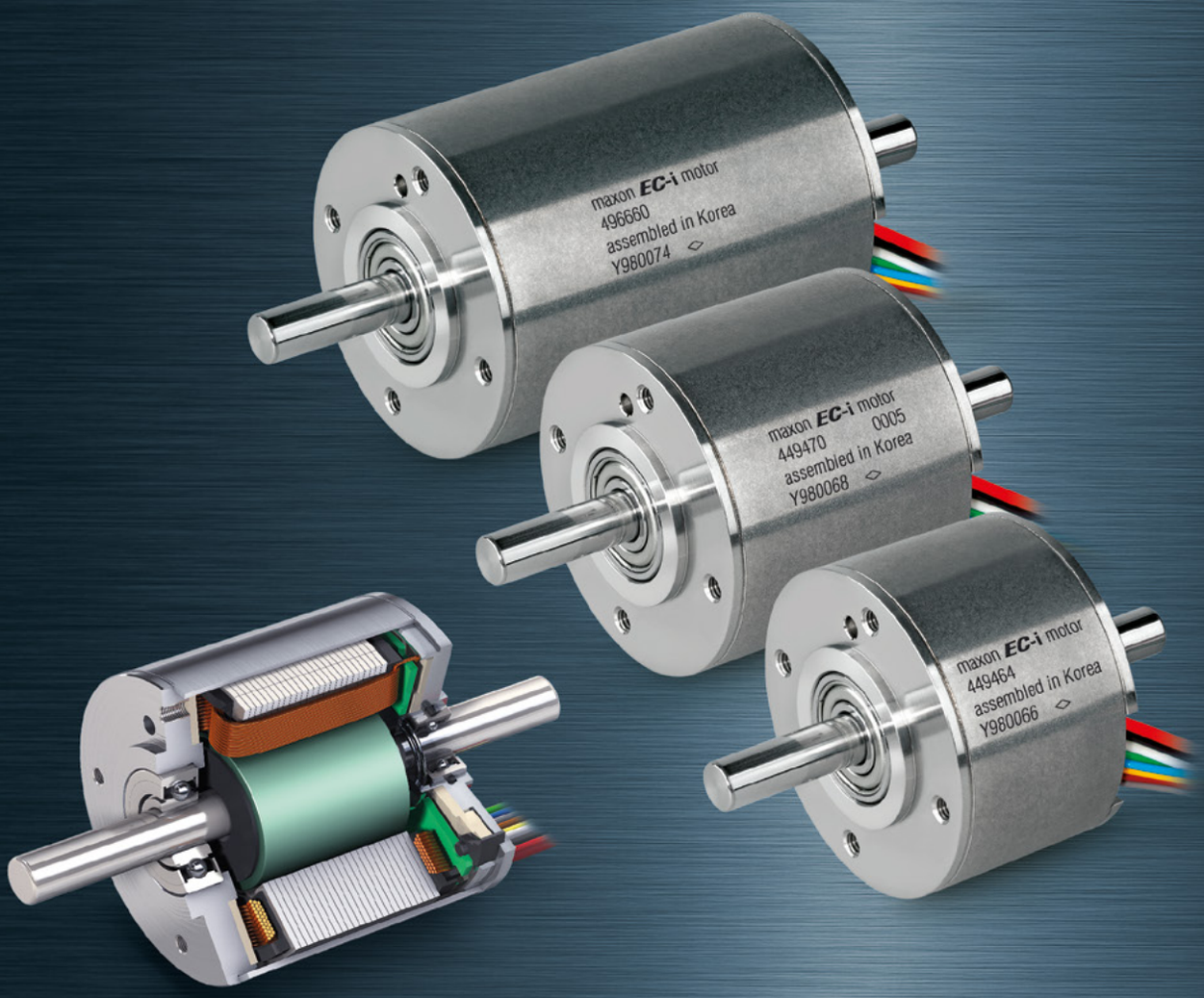
Overview on page 20–25

Planetary Gearhead
∅32 mm
3.0 - 8.0 Nm
Page 311



For your personal notes





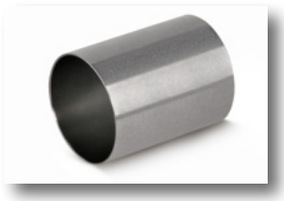
maxon EC-i

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.

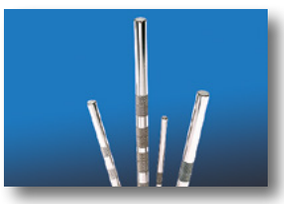
Summary

maxon EC-i program

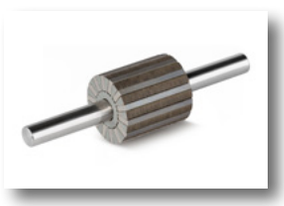
The stator with an iron winding is designed for high power at a low cogging torque.



The steel housing and flange ensure good heat dissipation and mechanical stability.



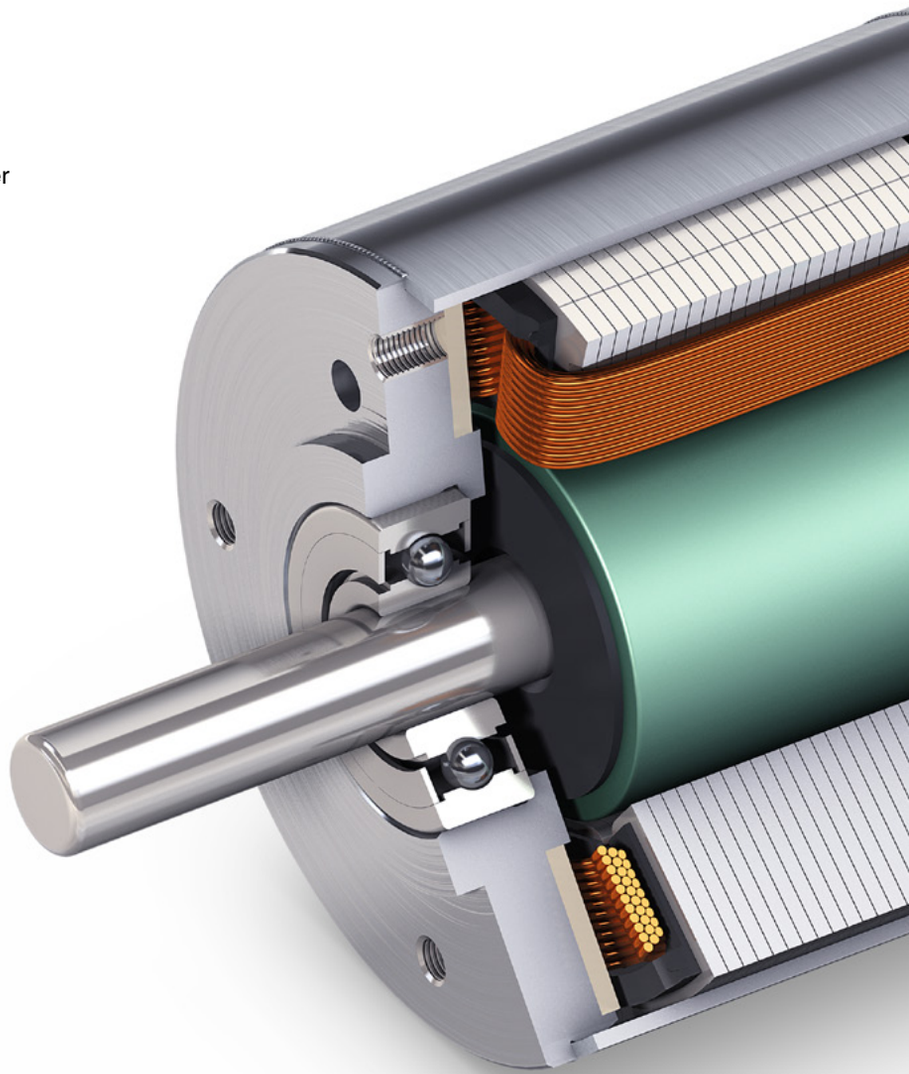
Shaft with no groove guarantees torsional stability and smooth running.



The modular rotor delivers good dynamics and large torques.

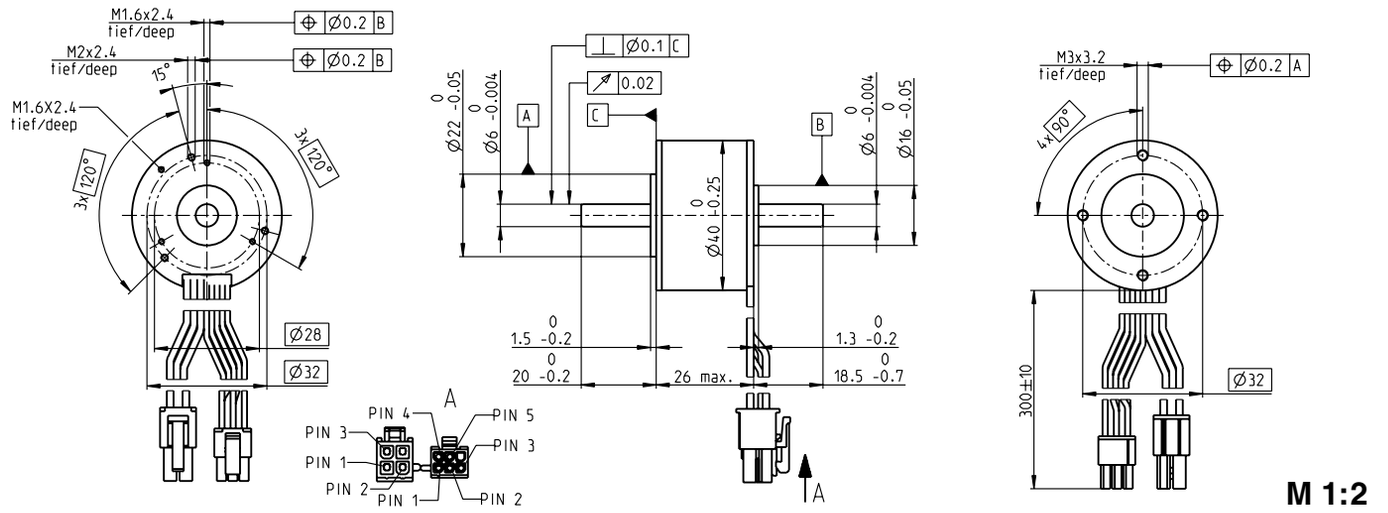
"assembled in Korea": High quality due to process-monitored manufacturing on state-of-the-art assembly lines.

Modular construction with gears, sensors and brakes.



Dynamic, high torque, and unbeatable value.

EC-i 40 ∅40 mm, brushless, 50 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	with Hall sensors	449463	449464

Motor Data (provisional)

	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	9560	10200
5	Nominal torque (max. continuous torque)	mNm	43.2	52.7
6	Nominal current (max. continuous current)	A	4.53	2.79
7	Stall torque	mNm	432	773
8	Stall current	A	48.3	45.8
9	Max. efficiency	%	81	85
	Characteristics			
10	Terminal resistance phase to phase	Ω	0.248	0.524
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	29.6	17.5
15	Mechanical time constant	ms	3.26	1.93
16	Rotor inertia	gcm²	10.5	10.5

Specifications

Thermal data

17	Thermal resistance housing-ambient		9.66 K/W
18	Thermal resistance winding-housing		2.57 K/W
19	Thermal time constant winding		11.9 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)		7 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		6500 N
28	Max. radial load, 5 mm from flange		15 N

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 (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

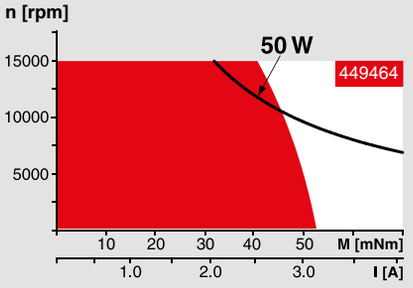
Connection (Cable AWG 26)

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. 35

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

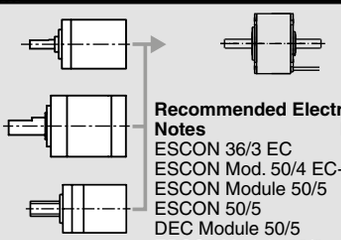
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 50/5	382
EPOS2 Module 36/2	386
EPOS2 24/5	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder 16 EASY
128 - 1024 CPT,
3 channels
Page 345

Encoder 16 EASY Absolute
4096 steps
Page 346

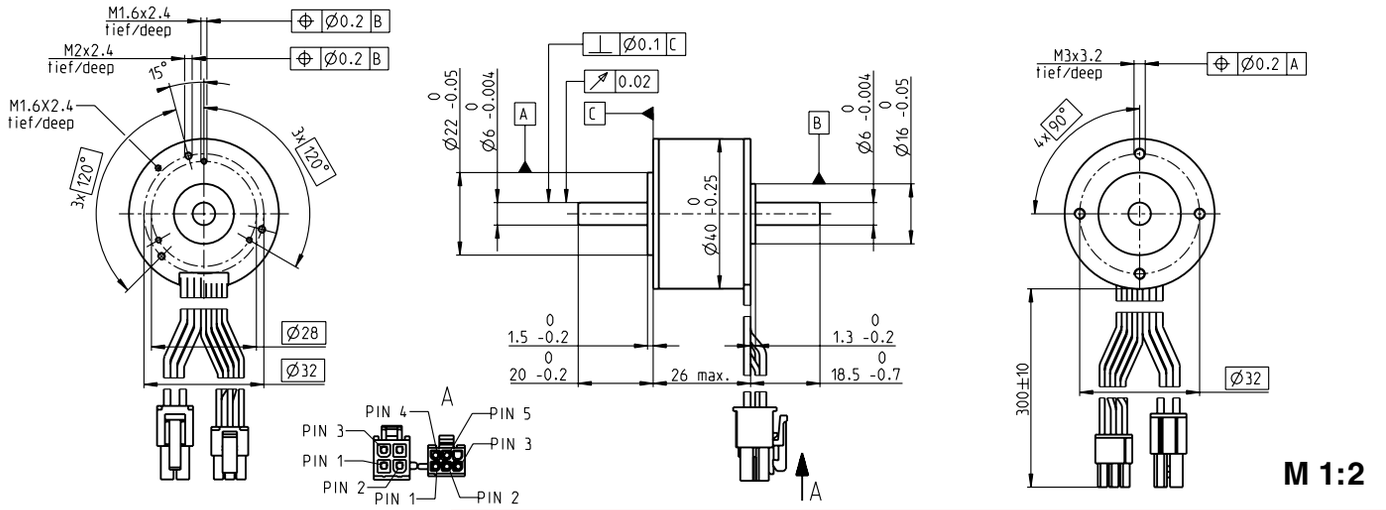
Encoder 2RMHF
3000 - 5000 CTP,
3 channels
Page 360

Encoder HEDL 5540
500 CPT,
3 channels
Page 367

EC-i 40 ∅40 mm, brushless, 50 Watt

NEW

High Torque



Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	496650	496651	496652	496653
Motor Data (provisional)				
Values at nominal voltage				
1 Nominal voltage	V	9	18	36	48
2 No load speed	rpm	7790	7790	7350	7570
3 No load current	mA	577	289	131	103
4 Nominal speed	rpm	6430	6520	6070	6300
5 Nominal torque (max. continuous torque)	mNm	69.8	69.4	84	78.7
6 Nominal current (max. continuous current)	A	6.25	3.11	1.71	1.25
7 Stall torque	mNm	863	995	1320	1240
8 Stall current	A	79.6	45.9	28.6	20.9
9 Max. efficiency	%	84	85	87	87
Characteristics				
10 Terminal resistance phase to phase	Ω	0.113	0.392	1.26	2.3
11 Terminal inductance phase to phase	mH	0.0639	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	9.19	7.97	5.65	6.18
15 Mechanical time constant	ms	1.23	1.07	0.757	0.828
16 Rotor inertia	gcm²	12.8	12.8	12.8	12.8

Specifications

Thermal data

17	Thermal resistance housing-ambient	9.91 K/W
18	Thermal resistance winding-housing	3.77 K/W
19	Thermal time constant winding	22.4 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)

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)		87 N
	(static, shaft supported)		6500 N
28	Max. radial load, 5 mm from flange		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 (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

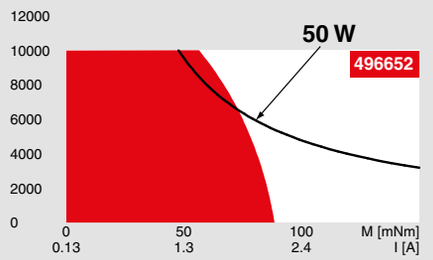
Connection (Cable AWG 26)

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. 35

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 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315

Recommended Electronics:

Notes	Page **24**
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 Module 36/2	386
EPOS2 24/5	387
EPOS2 50/5	387
EPOS2 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

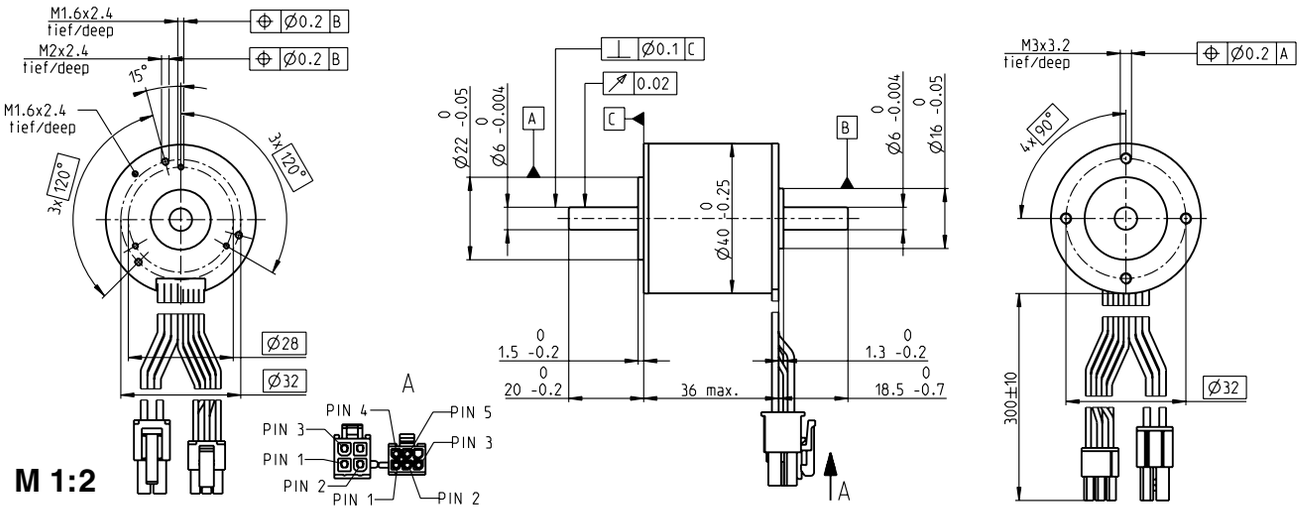
Encoder 16 EASY
128 - 1024 CPT,
3 channels
Page 345

Encoder 16 EASY Absolute
4096 steps
Page 346

Encoder 2RMHF
3000 - 5000 CTP,
3 channels
Page 360

Encoder HEDL 5540
500 CPT,
3 channels
Page 367

EC-i 40 ∅40 mm, brushless, 70 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	449469	449470

Motor Data (provisional)

	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	8180	8730
5	Nominal torque (max. continuous torque)	mNm	68.4	82.9
6	Nominal current (max. continuous current)	A	3.92	2.42
7	Stall torque	mNm	820	1410
8	Stall current	A	49.1	44.6
9	Max. efficiency	%	84	87
	Characteristics			
10	Terminal resistance phase to phase	Ω	0.367	0.807
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	12.6	7.75
15	Mechanical time constant	ms	3.18	1.96
16	Rotor inertia	gcm²	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	19.3 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)		7 N
27	Max. force for press fits (static)		87 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		15 N

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 (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

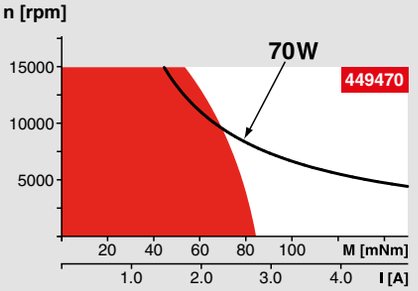
Connection (Cable AWG 26)

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. 35

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

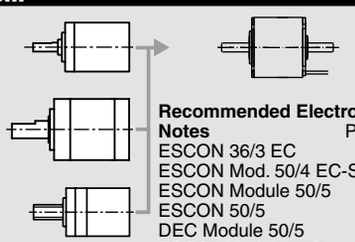
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
1.0 - 6.0 Nm
Page 308

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315

Spindle Drive
∅32 mm
Page 334–336



Recommended Electronics:

Notes	**Page 24**
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 50/5	382
EPOS2 Module 36/2	386
EPOS2 24/5, 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder 16 EASY
128 - 1024 CPT,
3 channels
Page 345

Encoder 16 EASY Absolute
4096 steps
Page 346

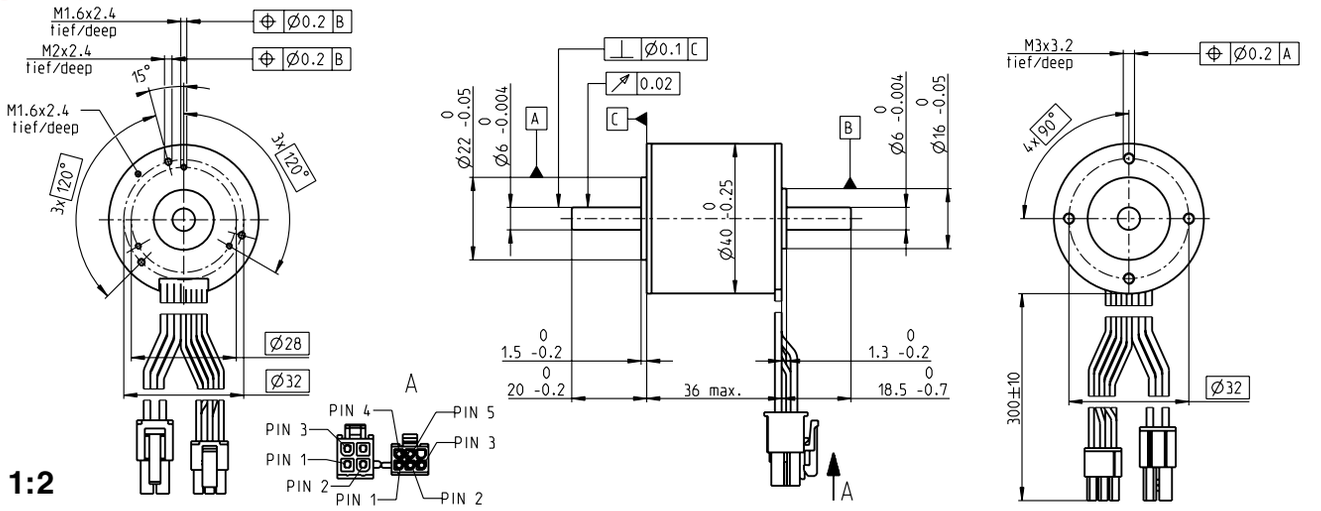
Encoder 2RMHF
3000 - 5000 CTP,
3 channels
Page 360

Encoder HEDL 5540
500 CPT,
3 channels
Page 367

EC-i 40 ∅40 mm, brushless, 70 Watt

NEW

High Torque



M 1:2

Stock program
Standard program
Special program (on request)

with Hall sensors	496654	496655	496656
Motor Data (provisional)			
Values at nominal voltage			
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	6900	6440	4090
5 Nominal torque (max. continuous torque) mNm	111	137	160
6 Nominal current (max. continuous current) A	5.13	2.87	1.64
7 Stall torque mNm	2290	3190	2190
8 Stall current A	106	69.3	23.8
9 Max. efficiency %	88	90	88
Characteristics			
10 Terminal resistance phase to phase Ω	0.17	0.519	2.02
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	3.47	2.34	2.27
15 Mechanical time constant ms	0.835	0.563	0.547
16 Rotor inertia gcm²	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	21.8 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)		87 N
	(static, shaft supported)		5000 N
28	Max. radial load, 5 mm from flange		26.1 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 (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

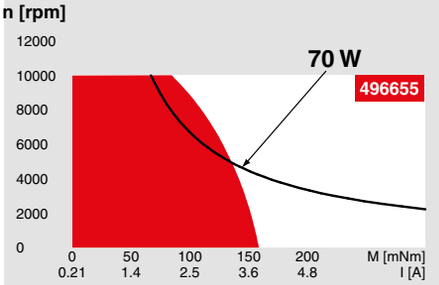
Connection (Cable AWG 26)

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. 35

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 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315

Recommended Electronics:

Notes	**Page 24**
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5	387
EPOS2 50/5	387
EPOS2 70/10	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder 16 EASY
128 - 1024 CPT,
3 channels
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Encoder 16 EASY Absolute
4096 steps
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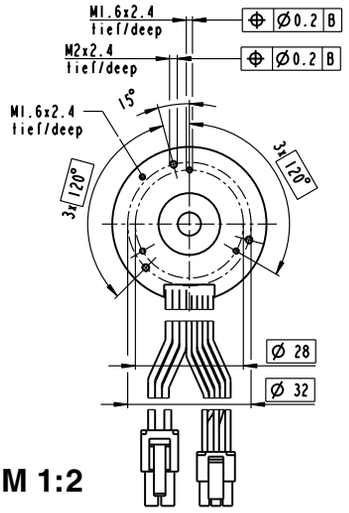
Encoder 2RMHF
3000 - 5000 CTP,
3 channels
Page 360

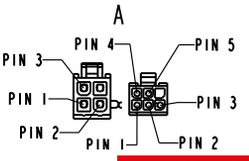
Encoder HEDL 5540
500 CPT,
3 channels
Page 367

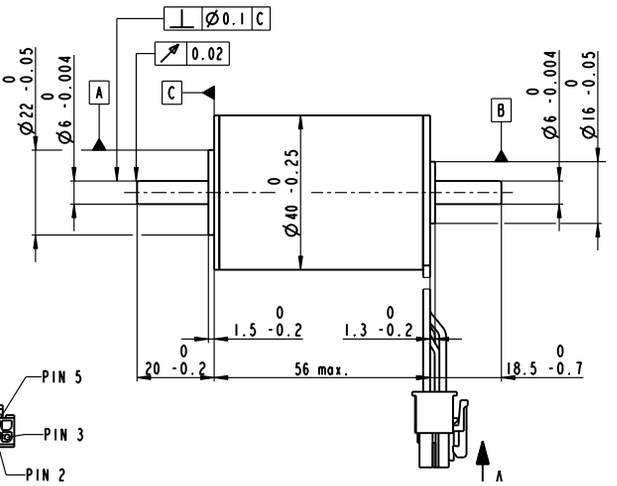
EC-i 40 ∅40 mm, brushless, 100 Watt

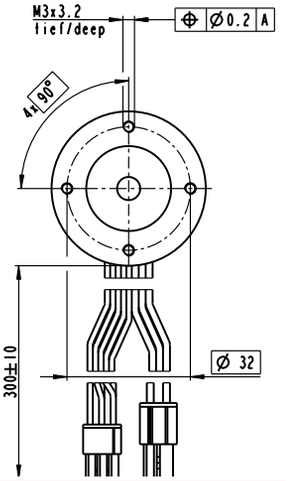
NEW

High Torque









M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	496660	496661	488607

Motor Data (provisional)

	Values at nominal voltage				
1	Nominal voltage	V	18	36	48
2	No load speed	rpm	4550	4550	5000
3	No load current	mA	352	176	150
4	Nominal speed	rpm	3930	3950	4380
5	Nominal torque (max. continuous torque)	mNm	218	217	234
6	Nominal current (max. continuous current)	A	5.7	2.84	2.5
7	Stall torque	mNm	3260	3520	4800
8	Stall current	A	87	46.9	52.8
9	Max. efficiency	%	88	88	90
	Characteristics				
10	Terminal resistance phase to phase	Ω	0.207	0.767	0.909
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	1.41	1.31	1.05
15	Mechanical time constant	ms	0.648	0.601	0.483
16	Rotor inertia	gcm²	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		23.1 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)		87 N
	(static, shaft supported)		3000 N
28	Max. radial load, 5 mm from flange		29.9 N
	Other specifications		
29	Number of pole pairs		7
30	Number of phases		3
31	Weight of motor		390 g

Values listed in the table are nominal.

Connection (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

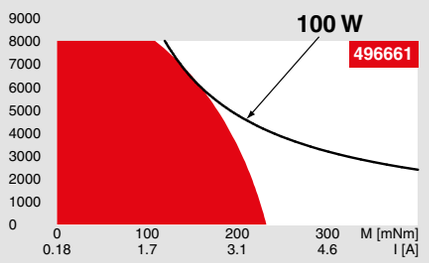
Connection (Cable AWG 26)

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. 35

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 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 315

Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5	387
EPOS2 50/5	387
EPOS2 70/10	387
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Encoder 16 EASY
128 - 1024 CPT,
3 channels
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Encoder 16 EASY Absolute
4096 steps
Page 346

Encoder 2RMHF
3000 - 5000 CTP,
3 channels
Page 360

Encoder HEDL 5540
500 CPT,
3 channels
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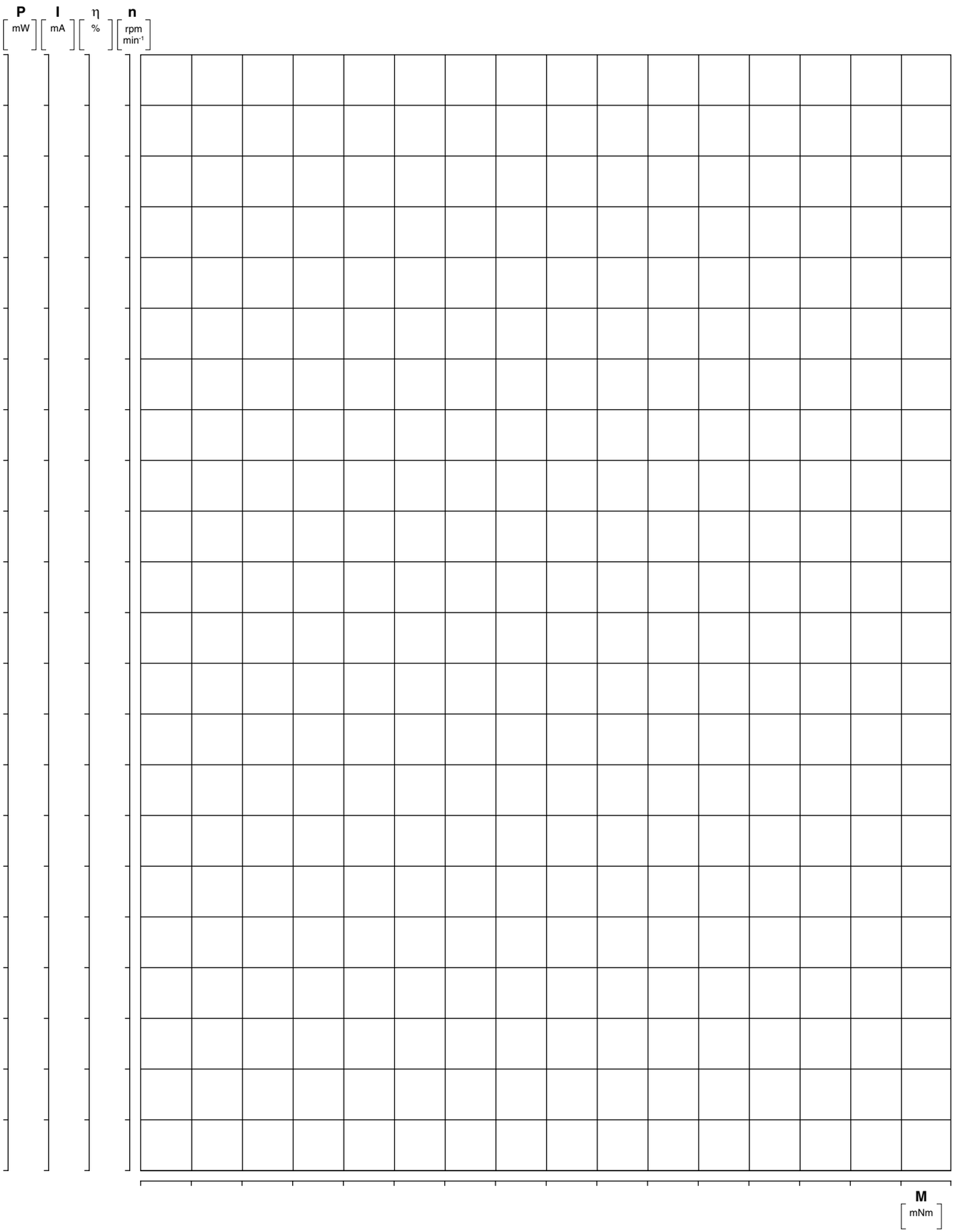
For your personal notes



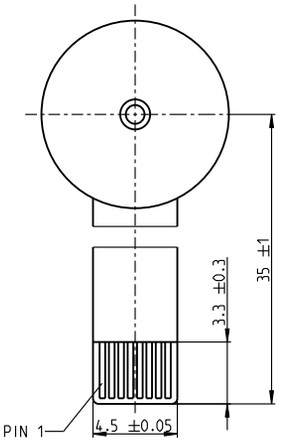
maxon flat motor

maxon flat motor

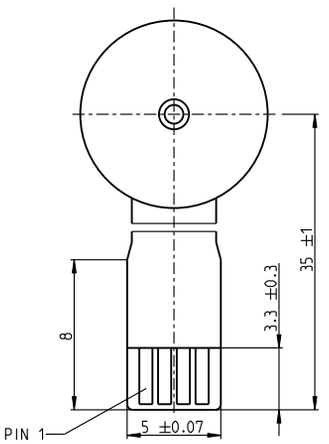
Thanks to their flat design, the brushless DC motors with iron-core winding are exactly the right drive for many applications. The well-conceived, simple engineering allows mainly automated production which results in a favorable price.

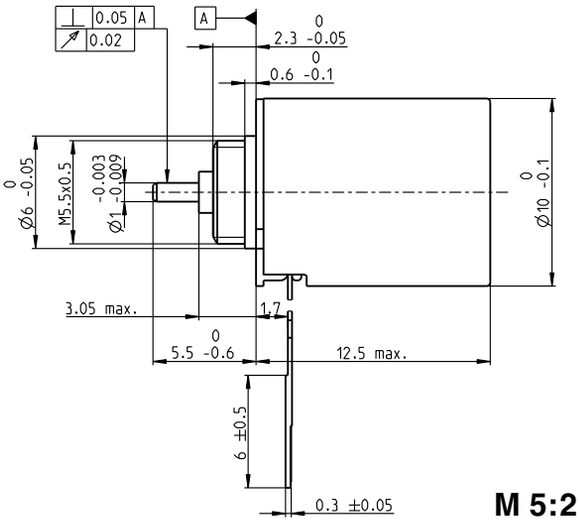
EC 9.2 flat ∅10 mm, brushless, 0.5 Watt

A with Hall sensors



B sensorless





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									
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	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	gcm²	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)		15 N
	(static, shaft supported)		70 N
28	Max. radial load, 4 mm from flange		0.4 N
	Other specifications		
29	Number of pole pairs		4
30	Number of phases		3
31	Weight of motor		3 g

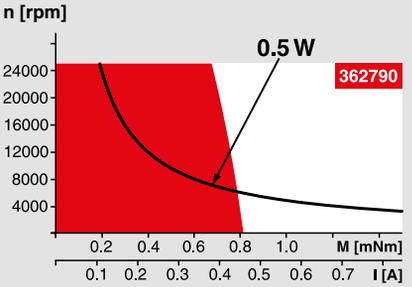
Values listed in the table are nominal.

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. 35

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).

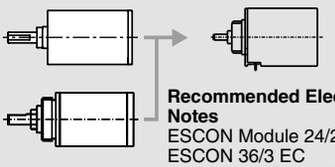
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
Page 275

Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 276

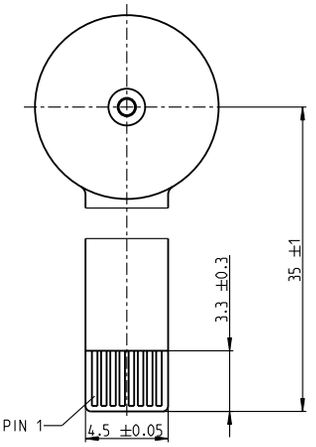


Recommended Electronics:

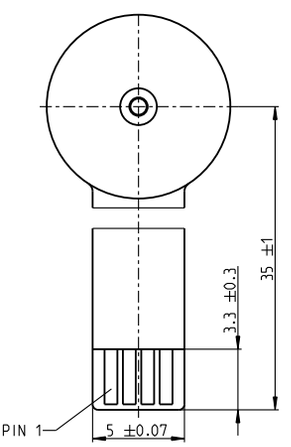
Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2	386
EPOS2 Module 36/2	386

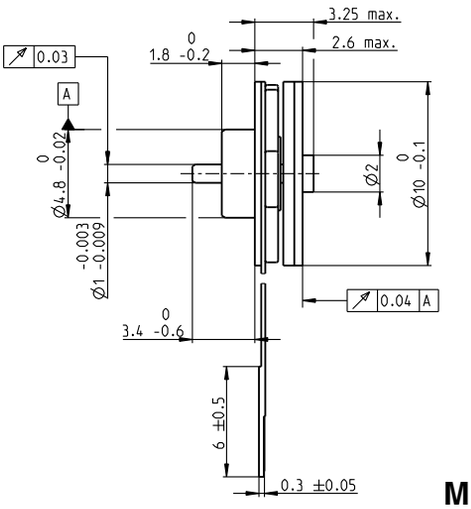
EC 10 flat ∅10 mm, brushless, 0.2 Watt

A with Hall sensors



B sensorless





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	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	gcm²	0.08						

Specifications

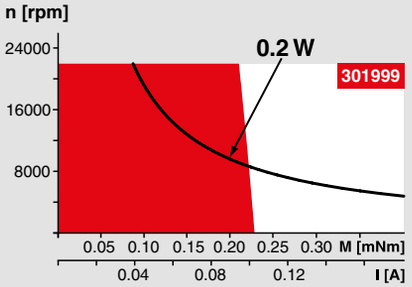
	Thermal data		
17	Thermal resistance housing-ambient		50 K/W
18	Thermal resistance winding-housing		50 K/W
19	Thermal time constant winding		2.22 s
20	Thermal time constant motor		20.5 s
21	Ambient temperature		-40…+85°C
22	Max. winding temperature		+100°C
	Mechanical data (preloaded ball bearings)		
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
26	Max. axial load (dynamic)		1 N
27	Max. force for press fits (static)		6 N
	(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. 35

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).

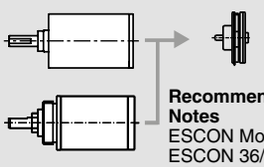
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅10 mm
0.005 - 0.1 Nm
Page 275

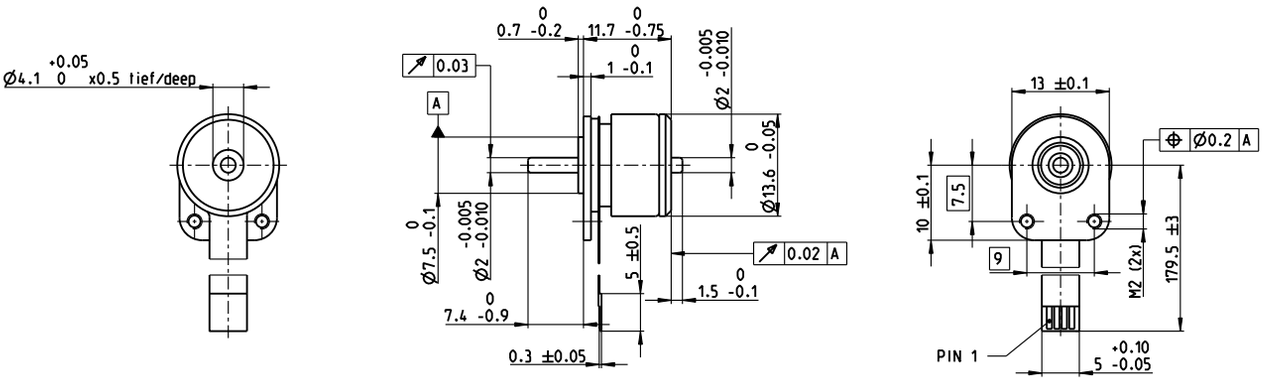
Planetary Gearhead
∅10 mm
0.01 - 0.15 Nm
Page 276



Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2	386
EPOS2 Module 36/2	386

EC 14 flat ∅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	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	gcm²	1.1	1.1	1.1	1.1

Specifications

Thermal data

17	Thermal resistance housing-ambient	11.6 K/W
18	Thermal resistance winding-housing	11.3 K/W
19	Thermal time constant winding	1.37 s
20	Thermal time constant motor	49.2 s
21	Ambient temperature	-40…+100°C
22	Max. winding temperature	+125°C

Mechanical data (preloaded ball bearings)

23	Max. speed		22000 rpm
24	Axial play at axial load	< 1.5 N	0 mm
		> 1.5 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		1.3 N
27	Max. force for press fits (static)		18 N
	(static, shaft supported)		200 N
28	Max. radial load, 5 mm from flange		3.4 N

Other specifications

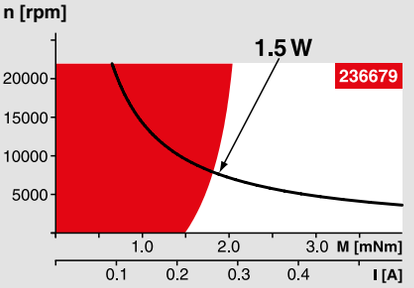
29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	8 g

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. 399	220310
Connector	**Part number**
Tyco	84953-4
Molex	52207-0433
Molex	52089-0419

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

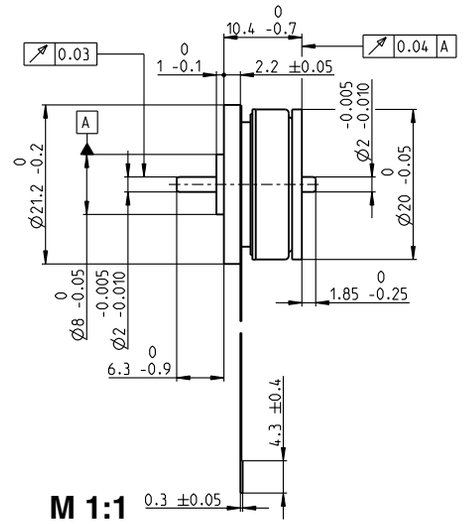
maxon Modular System

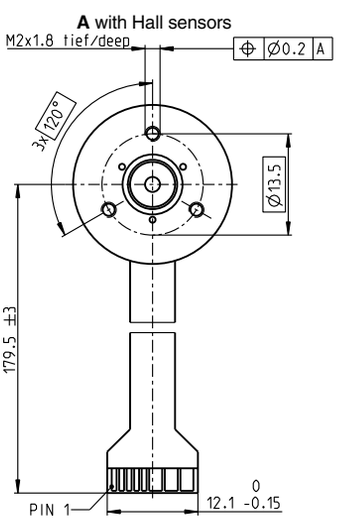
Overview on page 20–25

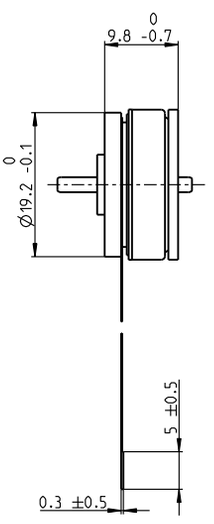
Recommended Electronics:

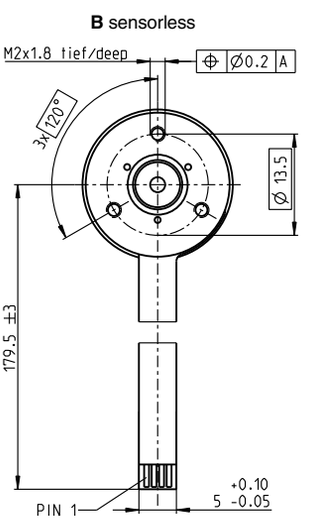
Notes	Page **24**
ESCON Mod. 50/4 EC-S	379

EC 20 flat ∅20 mm, brushless, 3 Watt









Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	351098	351099	351100	351101
B sensorless	339255	**241916**	339257	339258

Motor Data

	Values at nominal voltage								
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	mNm	5.29	8.04	5.67	7.12			
8	Stall current	A	0.9	0.957	0.503	0.309			
9	Max. efficiency	%	59	66	61	65			
	Characteristics								
10	Terminal resistance phase to phase	Ω	6.67	9.4	23.9	77.7			
11	Terminal inductance phase to phase	mH	0.639	1.3	2.35	9.8			
12	Torque constant	mNm/A	5.88	8.4	11.3	23			
13	Speed constant	rpm/V	1620	1140	847	414			
14	Speed/torque gradient	rpm/mNm	1840	1270	1790	1400			
15	Mechanical time constant	ms	74.1	51.2	72.1	56.2			
16	Rotor inertia	gcm²	3.84	3.84	3.84	3.84			

Specifications

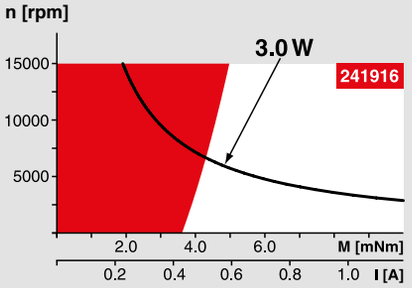
	Thermal data		
17	Thermal resistance housing-ambient		19.2 K/W
18	Thermal resistance winding-housing		8.41 K/W
19	Thermal time constant winding		3.69 s
20	Thermal time constant motor		31.8 s
21	Ambient temperature		-40…+100°C
22	Max. winding temperature		+125°C
	Mechanical data (preloaded ball bearings)		
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)		18 N
	(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. 399	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. 35

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 20–25

Spur Gearhead
∅20.3 mm
0.06 - 0.25 Nm
Page 290

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
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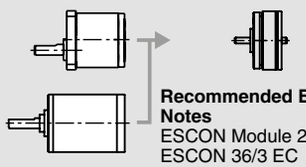
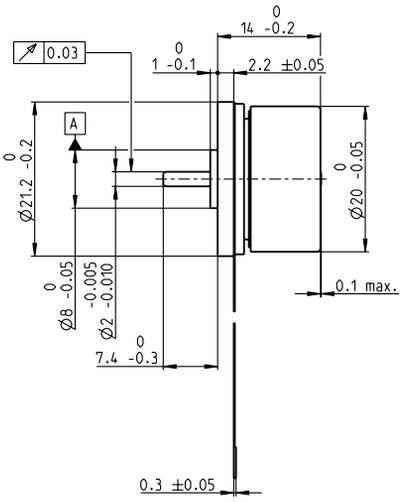
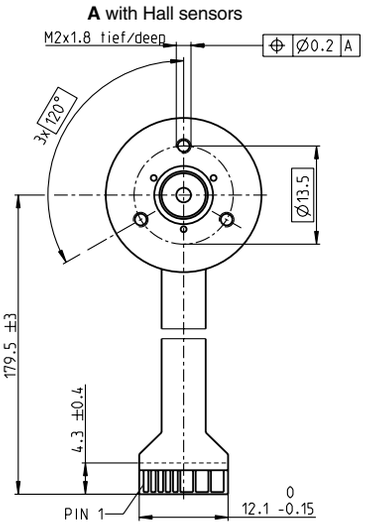


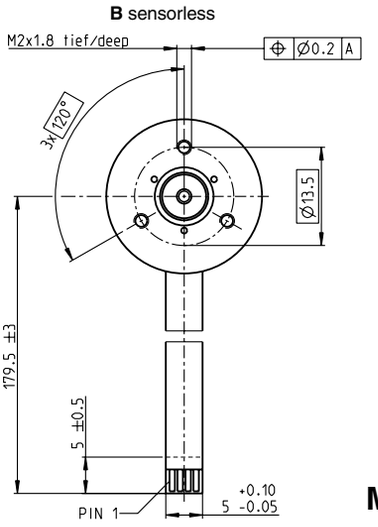
Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC 20 flat ∅20 mm, brushless, 5 Watt







M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	351005	351006	351007	351008
B sensorless	351054	351055	351056	351057

Motor Data (provisional)

	Values at nominal voltage					
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	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	gcm²	5.1	5.1	5.1	5.1

Specifications

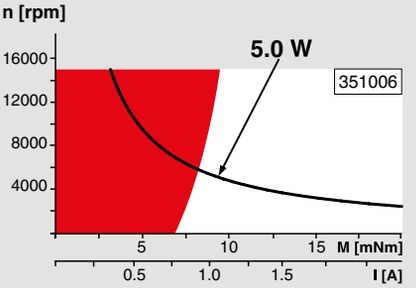
	Thermal data		
17	Thermal resistance housing-ambient		16.5 K/W
18	Thermal resistance winding-housing		2.66 K/W
19	Thermal time constant winding		1.77 s
20	Thermal time constant motor		27.5 s
21	Ambient temperature		-40…+100°C
22	Max. winding temperature		+125°C
	Mechanical data (preloaded ball bearings)		
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)		26 N
	(static, shaft supported)		200 N
28	Max. radial load, 5 mm from flange		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. 399	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. 35

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).

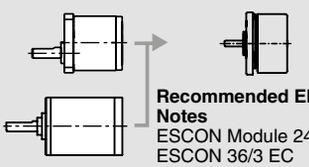
Assigned power rating

maxon Modular System

Overview on page 20–25

Spur Gearhead
∅20.3 mm
0.06 - 0.25 Nm
Page 290

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/296

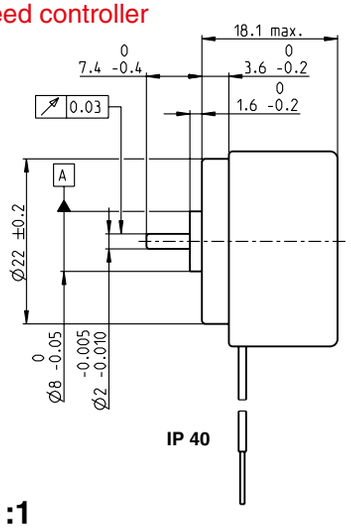


Recommended Electronics:

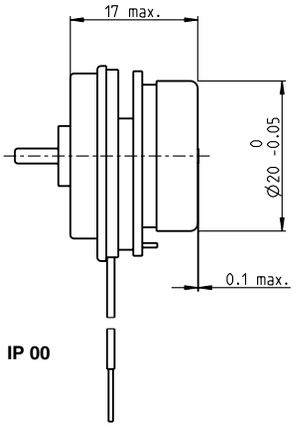
Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC 20 flat brushless, 2 Watt, with integrated electronics

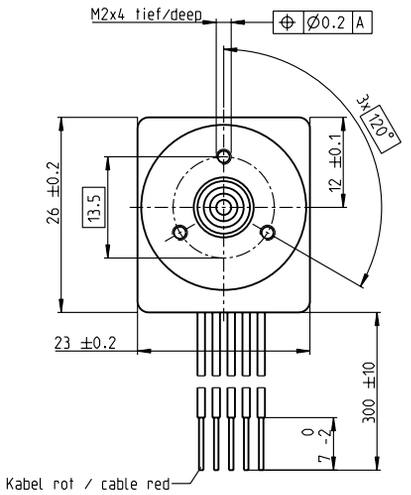
1-Q-speed controller



IP 40



IP 00



M 1:1

Stock program
Standard program
Special program (on request)

Part Numbers

	2 wire version		5 wire version	
			Enable	Direction
IP 40 (with cover)	350795	350796	350794	370413
IP 00 (without cover)	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 gcm²
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)		26 N
	(static, shaft supported)		200 N
28	Max. radial load, 5 mm from flange		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)

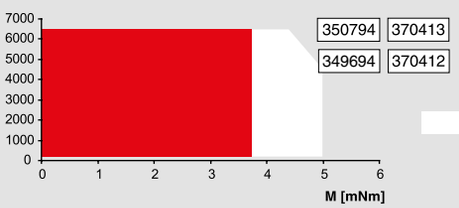
red	$+V_{CC}$ 10…28 VDC
black	GND

Connection 5 wire version (Cable AWG 28)

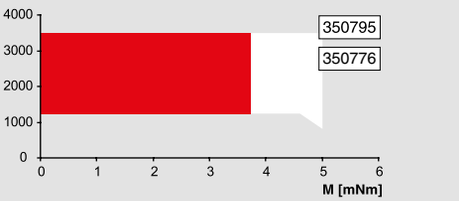
red	$+V_{CC}$ 10…28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

Operating Range

n [rpm]



n [rpm]

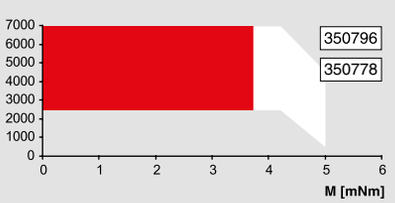


Comments

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.

n [rpm]

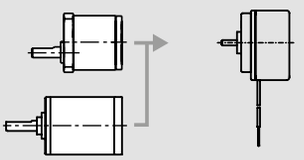


maxon Modular System

Overview on page 20–25

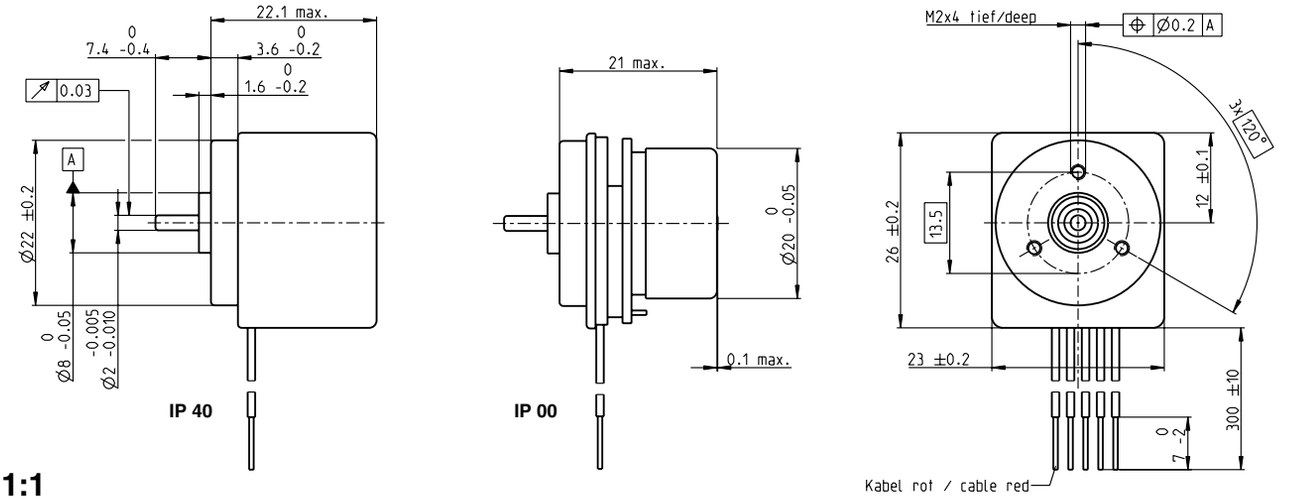
Spur Gearhead
∅20.3 mm
0.06 - 0.25 Nm
Page 290

Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
Page 293/296



EC 20 flat brushless, 5 Watt, with integrated electronics

1-Q-speed controller



M 1:1

Stock program
Standard program
Special program (on request)

	Part Numbers			
			5 wire version	
	2 wire version		Enable	Direction
IP 40 (with cover)	350834	350835	350806	370416
IP 00 (without cover)	350804	350805	349731	370415

Motor Data						
	Values at nominal voltage					
1	Nominal voltage	V	24	24	24	24
2	No load speed	rpm	3000	6000	6000	6000
3	No load current	mA	18.6	32.9	32.9	32.9
4	Nominal speed	rpm	3000	6000	6000	6000
5	Nominal torque (max. continuous torque)	mNm	7.45	7.31	7.31	7.31
6	Nominal current (max. continuous current)	A	0.263	0.377	0.377	0.377
33	Max. torque	mNm	13.2	13.2	13.2	13.2
34	Max. current	A	0.73	0.73	0.73	0.73
9	Max. efficiency	%	44	54	54	54
	Characteristics					
35	Type of control		Speed	Speed	Speed	Speed
36	Supply voltage $+V_{CC}$	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
26	Max. axial load (dynamic)		1.8 N
27	Max. force for press fits (static)		26 N
	(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

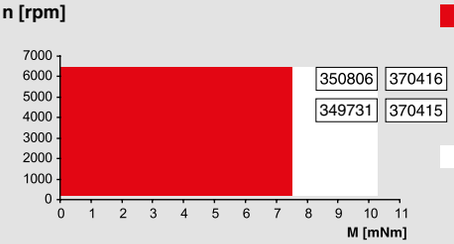
Connection 2 wire version (Cable AWG 28)

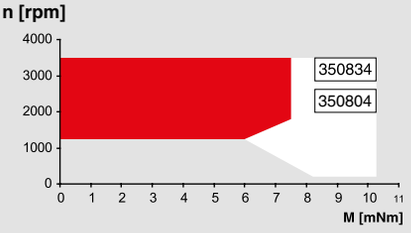
red	$+V_{CC}$ 10…28 VDC
black	GND

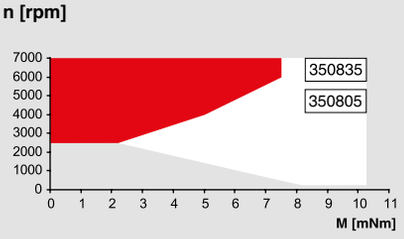
Connection 5 wire version (Cable AWG 28)

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.

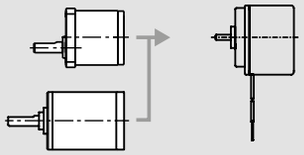
Overload range
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

maxon Modular System

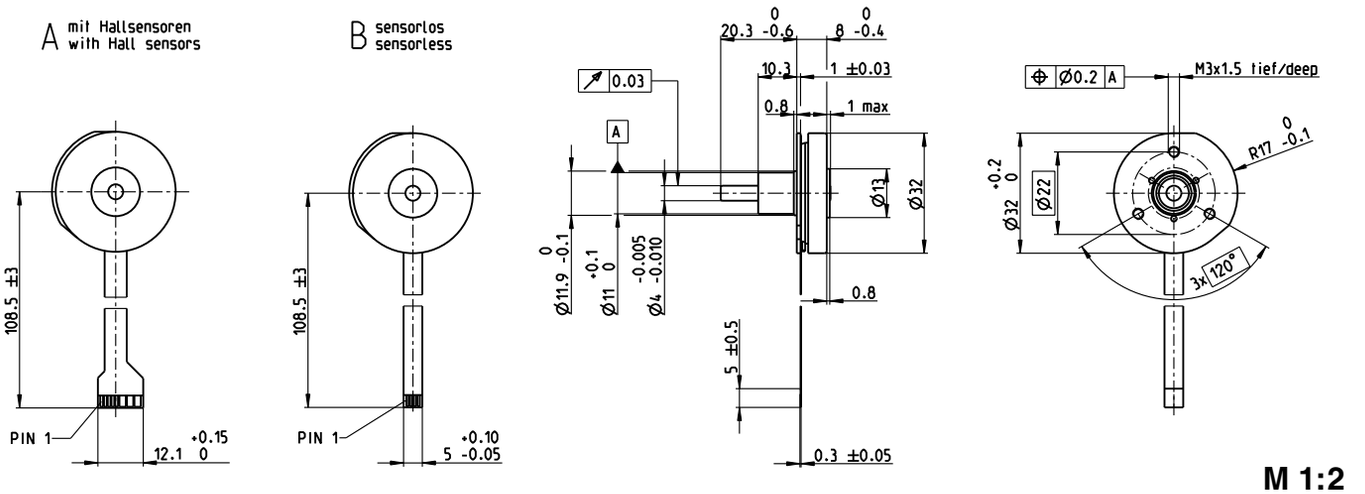
Overview on page 20–25

Spur Gearhead
Ø20.3 mm
0.06 - 0.25 Nm
Page 290

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 293/296



EC 32 flat ∅32 mm, brushless, 6 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	339259	**200187**	339260	339261
B sensorless	339263	**200138**	339264	339265

Motor Data

	Values at nominal voltage								
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	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								
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	gcm²	13.9	13.9	13.9	13.9			

Specifications

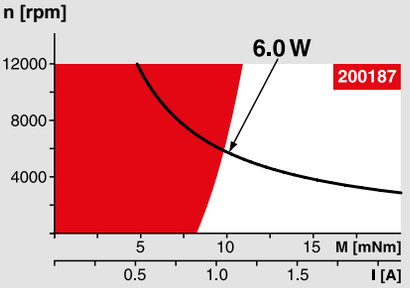
	Thermal data		
17	Thermal resistance housing-ambient		8.25 K/W
18	Thermal resistance winding-housing		6.21 K/W
19	Thermal time constant winding		3.48 s
20	Thermal time constant motor		22.1 s
21	Ambient temperature		-40…+100°C
22	Max. winding temperature		+125°C
	Mechanical data (preloaded ball bearings)		
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)		45 N
	(static, shaft supported)		1000 N
28	Max. radial load, 15 mm from flange		10.5 N
	Other specifications		
29	Number of pole pairs		4
30	Number of phases		3
31	Weight of motor		32 g

Values listed in the table are nominal.

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. 398	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. 35

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 20–25

Planetary Gearhead
∅22 mm
0.5 - 1.0 Nm
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Planetary Gearhead
∅22 mm
0.5 - 2.0 Nm
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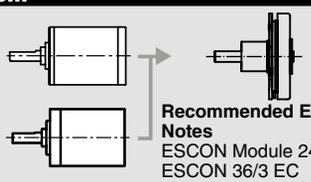
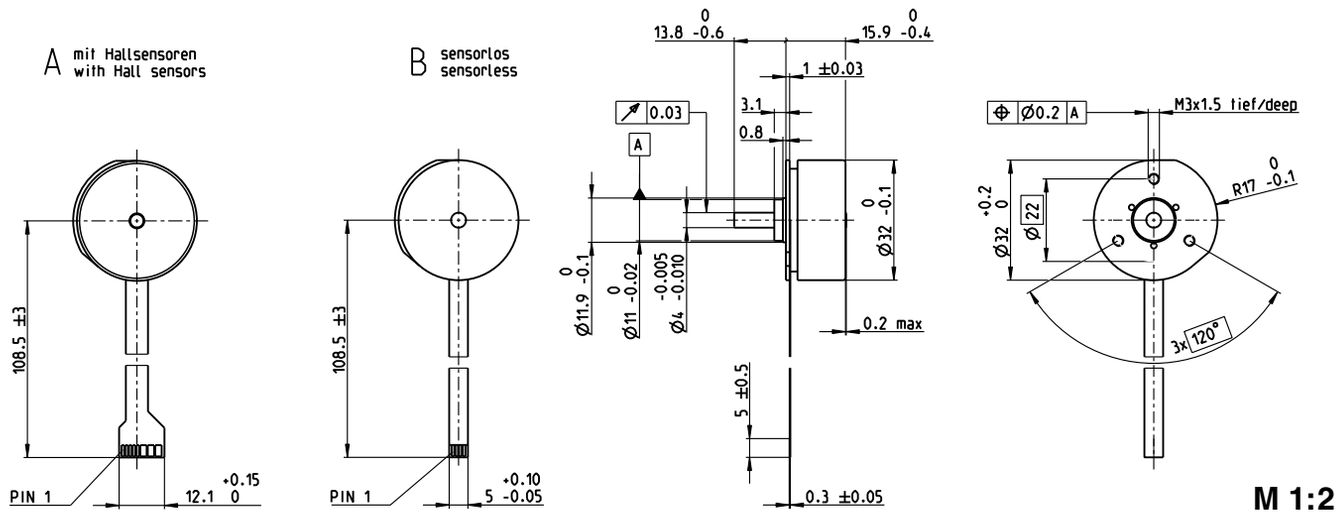


Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC 32 flat ∅32 mm, brushless, 15 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	339267	339268	**267121**	339269
B sensorless	339271	339272	**226006**	339273

Motor Data

	Values at nominal voltage					
1	Nominal voltage	V	9	12	24	48
2	No load speed	rpm	3720	4610	4530	4780
3	No load current	mA	74.7	75.7	36.9	19.9
4	Nominal speed	rpm	2090	2810	2760	2940
5	Nominal torque (max. continuous torque)	mNm	24.6	25.1	25.5	24.7
6	Nominal current (max. continuous current)	A	1.06	1	0.5	0.257
7	Stall torque	mNm	70	84.1	85.8	84.1
8	Stall current	A	3.13	3.49	1.75	0.906
9	Max. efficiency	%	72	73	74	73
	Characteristics					
10	Terminal resistance phase to phase	Ω	2.87	3.43	13.7	53
11	Terminal inductance phase to phase	mH	1.61	1.87	7.73	27.8
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	54.9	56.6	54.5	58.7
15	Mechanical time constant	ms	20.1	20.7	20	21.5
16	Rotor inertia	gcm²	35	35	35	35

Specifications

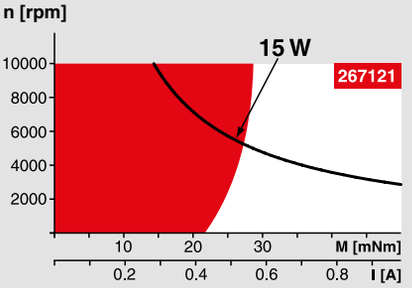
	Thermal data		
17	Thermal resistance housing-ambient		10.8 K/W
18	Thermal resistance winding-housing		4.99 K/W
19	Thermal time constant winding		8.78 s
20	Thermal time constant motor		120 s
21	Ambient temperature		-40…+100°C
22	Max. winding temperature		+125°C
	Mechanical data (preloaded ball bearings)		
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)		45 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		14 N
	Other specifications		
29	Number of pole pairs		4
30	Number of phases		3
31	Weight of motor		46 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. 398	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. 35

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 20–25

Planetary Gearhead
∅32 mm
0.75 - 6 Nm
Page 305–308

Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
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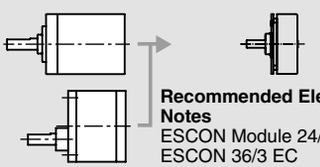
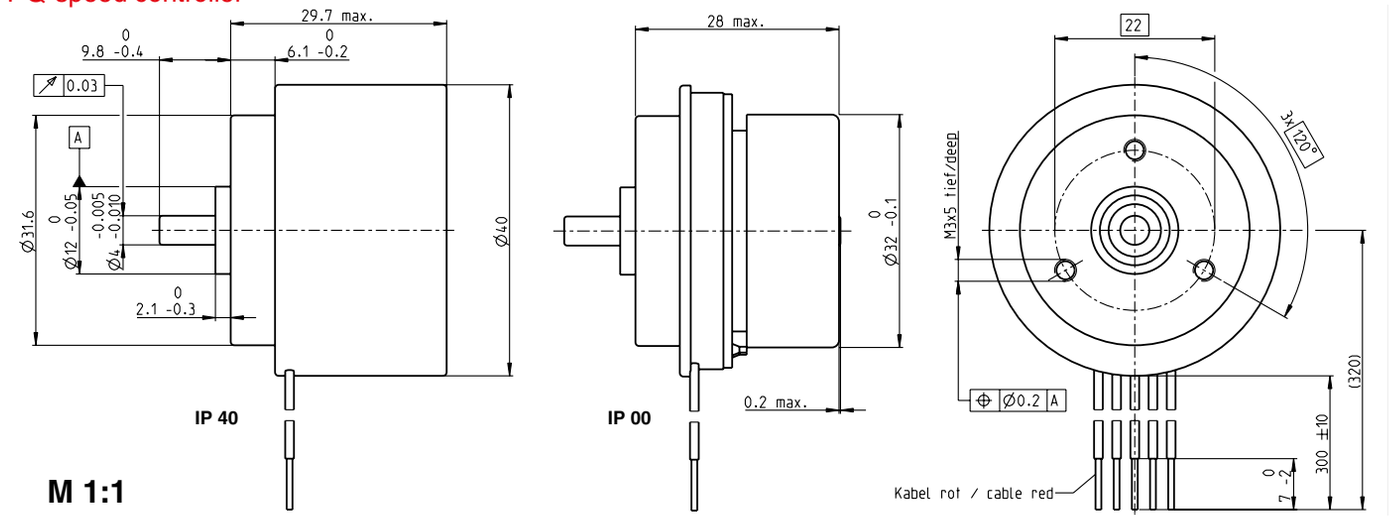


Recommended Electronics:

Notes	Page **24**
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2	382
DEC Module 50/5	382
EPOS2 24/2, 50/5	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC 32 flat brushless, 15 Watt, with integrated electronics

1-Q-speed controller



Stock program
Standard program
Special program (on request)

Part Numbers

	2 wire version		5 wire version	
			Enable	Direction
IP 40 (with cover)	353400	353401	353399	370418
IP 00 (without cover)	353324	353325	349801	370417

Motor Data

	Values at nominal voltage					
1	Nominal voltage	V	24	24	24	24
2	No load speed	rpm	3000	6000	6000	6000
3	No load current	mA	44.8	84.6	84.6	84.6
4	Nominal speed	rpm	3000	6000	6000	6000
5	Nominal torque (max. continuous torque)	mNm	18.8	18.6	18.6	18.6
6	Nominal current (max. continuous current)	A	0.44	0.741	0.741	0.741
33	Max. torque	mNm	35.8	35.8	35.8	35.8
34	Max. current	A	1.6	1.6	1.6	1.6
9	Max. efficiency	%	58	66	66	66
	Characteristics					
35	Type of control		Speed	Speed	Speed	Speed
36	Supply voltage $+V_{CC}$	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	< 5.0 N	0 mm
		> 5.0 N	0.14 mm
25	Radial play		preloaded
26	Max. axial load (dynamic)		6.8 N
27	Max. force for press fits (static)		95 N
	(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)

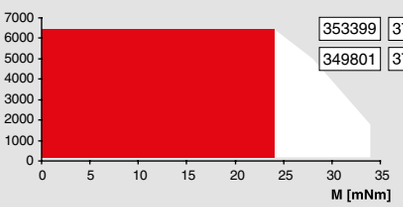
red	$+V_{CC}$ 10…28 VDC
black	GND

Connection 5 wire version (Cable AWG 24)

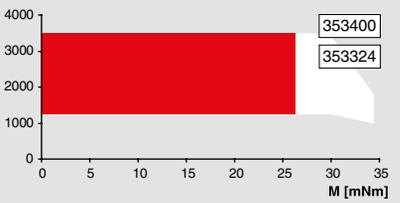
red	$+V_{CC}$ 10…28 VDC
black	GND
white	Speed set value input
green	Monitor n (6 pulses per revolution)
grey	Disable (Type Enable) or sense of direction (Type Direction)

Operating Range

n [rpm]



n [rpm]

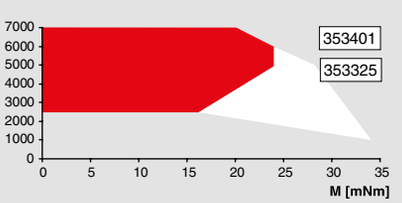


Comments

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.

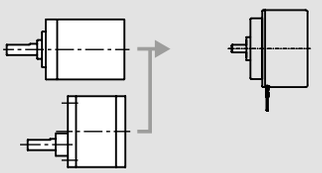
n [rpm]



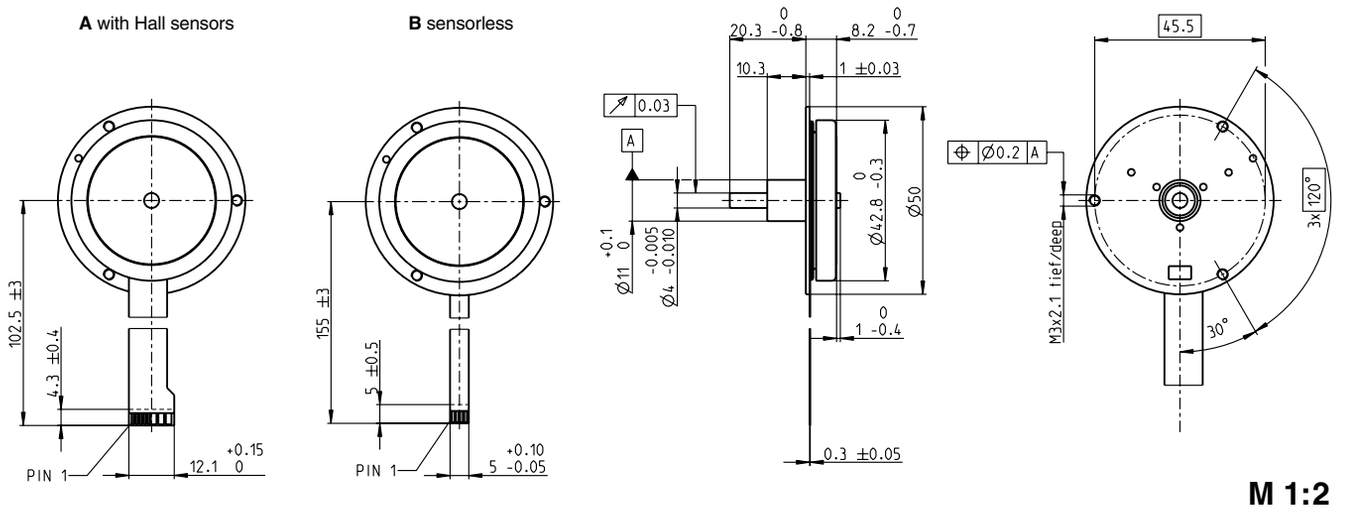
maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅32 mm
0.75 - 6 Nm
Page 305/308
Spur Gearhead
∅38 mm
0.1 - 0.6 Nm
Page 313



EC 45 flat ∅42.8 mm, brushless, 12 Watt



M 1:2

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	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	gcm²	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)		45 N
	(static, shaft supported)		1000 N
28	Max. radial load, 15 mm from flange		12.5 N

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.

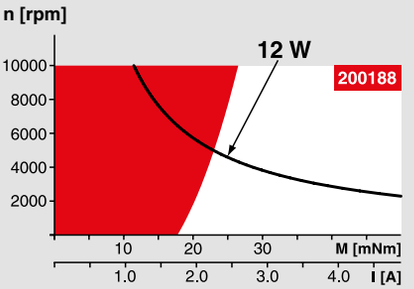
Connection	with Hall sensors	sensorless
Pin 1	V_{Hall} 4.5…18 VDC	Motor winding 1
Pin 2	Hall sensor 3*	Motor winding 2
Pin 3	Hall sensor 1*	Motor winding 3
Pin 4	Hall sensor 2*	⅄ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

*Internal pull-up (7…13 kΩ) on pin 1
Wiring diagram for Hall sensors see p. 35

Adapter	Part number	Part number
see p. 399	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

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 20–25

Recommended Electronics:

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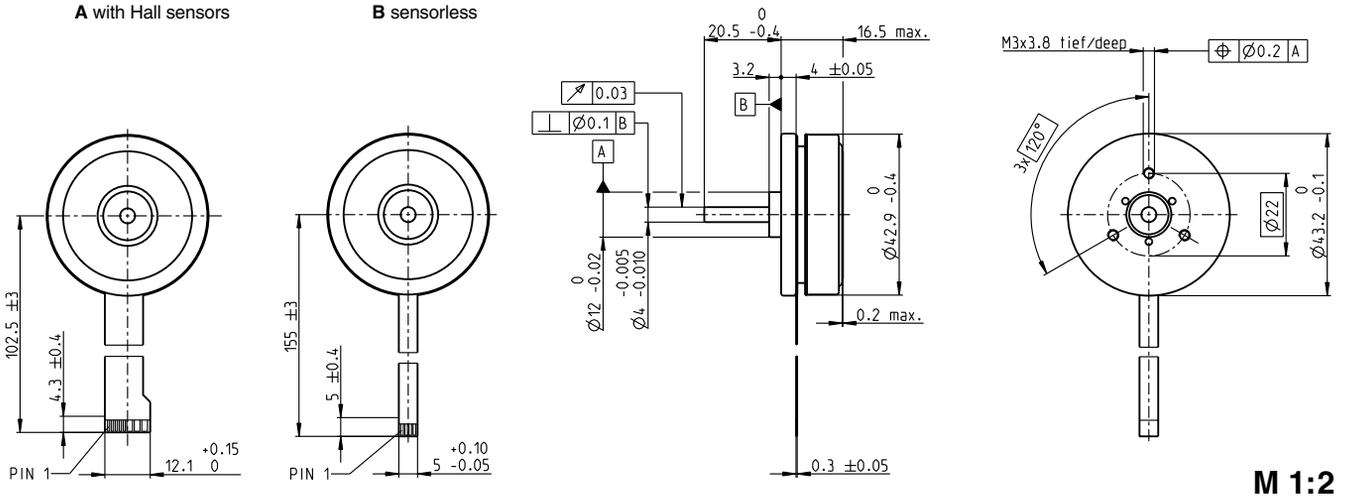
ESCON Module 24/2	378
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
DEC Module 24/2	382
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC 45 flat ∅42.9 mm, brushless, 30 Watt



M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

A with Hall sensors	200142		339281		339282			
B sensorless		200189		339283		339284		

Motor Data									
	Values at nominal voltage								
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	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	gcm²	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)		53 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		18 N
	Other specifications		
29	Number of pole pairs		8
30	Number of phases		3
31	Weight of motor		75 g

Values listed in the table are nominal.

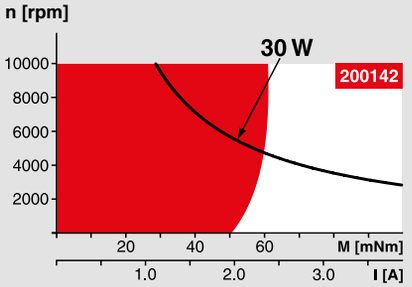
Connection	**with Hall sensors**	**sensorless**
Pin 1	V_{Hall} 4.5…18 VDC	Motor winding 1
Pin 2	Hall sensor 3*	Motor winding 2
Pin 3	Hall sensor 1*	Motor winding 3
Pin 4	Hall sensor 2*	⅄ neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

*Internal pull-up (7…13 kΩ) on pin 1
Wiring diagram for Hall sensors see p. 35

Adapter	**Part number**	**Part number**
see p. 398	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

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 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 316

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 317

Encoder MILE
256 - 2048 CPT,
2 channels
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Recommended Electronics:

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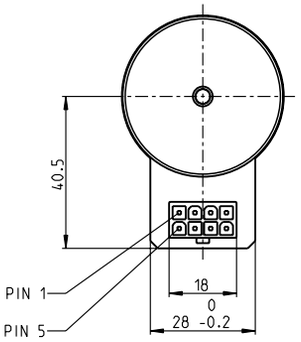
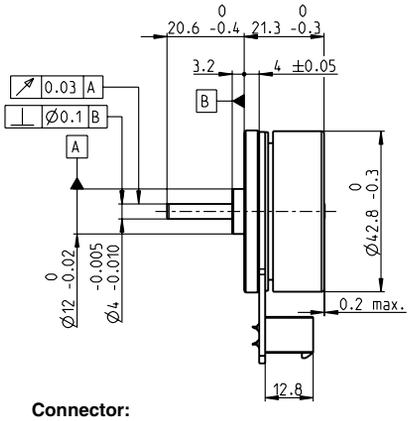
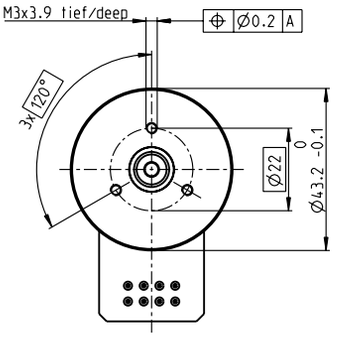
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2	382
DEC Module 50/5	382
EPOS2 24/2, Module 36/2	386
EPOS2 24/5, 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Option
With Cable and Connector
(Motor length +1.3 mm,
Ambient temperature -20…+100°C)

EC 45 flat ∅42.8 mm, brushless, 50 Watt







Connector:
39-28-1083 Molex

M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	339285	251601	339286	339287
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	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 gcm²	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)		53 N
	(static, shaft supported)		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

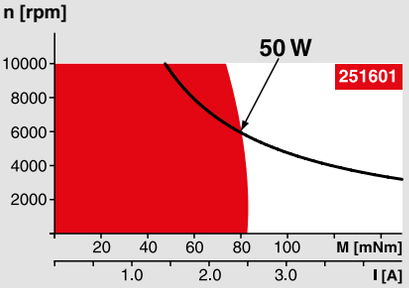
Pin 1	Hall sensor 1*
Pin 2	Hall sensor 2*
Pin 3	V_{Hall} 4.5…18 VDC
Pin 4	Motor winding 3
Pin 5	Hall sensor 3*
Pin 6	GND
Pin 7	Motor winding 1
Pin 8	Motor winding 2

*Internal pull-up (7…13 kΩ) on pin 3
Wiring diagram for Hall sensors see p. 35

Cable

Connection cable Universal, L = 500 mm	**339380**
Connection cable to EPOS, L = 500 mm	**354045**

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).

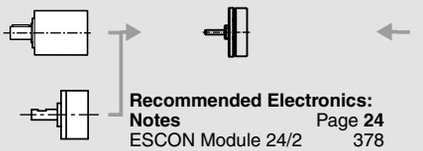
Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 316

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 317



Encoder MILE
256 - 2048 CPT,
2 channels
Page 342

Recommended Electronics:

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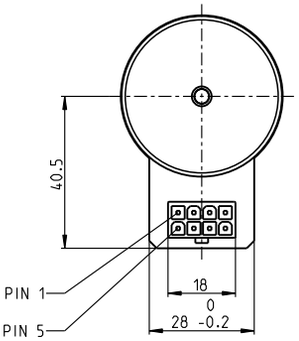
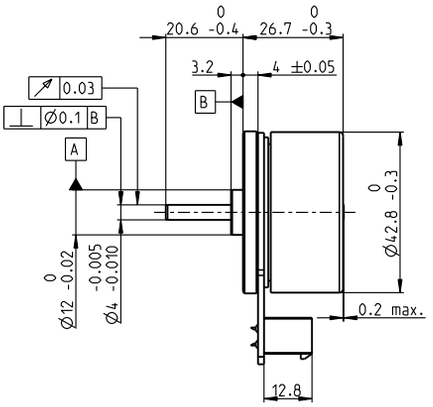
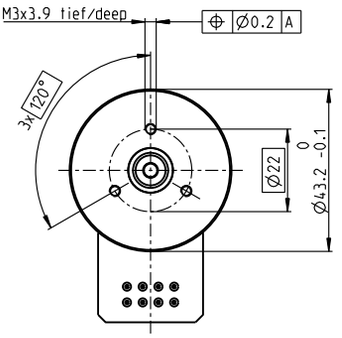
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 24/2	382
DEC Module 50/5	382
EPOS2 24/2	386
EPOS2 Module 36/2	386
EPOS2 24/5, 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

Option
With Cable and Connector
(Ambient temperature -20…+100°C)

EC 45 flat ∅42.8 mm, brushless, 70 Watt







Connector:
39-28-1083 Molex

M 1:2

Stock program
Standard program
Special program (on request)

Part Numbers

with Hall sensors	397172	402685	402686	402687
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 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 gcm²	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)		50 N
	(static, shaft supported)		1000 N
28	Max. radial load, 5 mm from flange		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

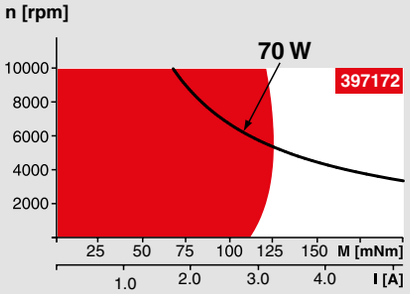
Pin 1	Hall sensor 1*
Pin 2	Hall sensor 2*
Pin 3	V_{Hall} 4.5 ... 18 VDC
Pin 4	Motor winding 3
Pin 5	Hall sensor 3*
Pin 6	GND
Pin 7	Motor winding 1
Pin 8	Motor winding 2

*Internal pull-up (7 … 13 kΩ) on pin 3
Wiring diagram for Hall sensors see p. 35

Cable

Connection cable Universal, L = 500 mm	**339380**
Connection cable to EPOS, L = 500 mm	**354045**

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 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 316

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
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Encoder MILE
256 - 2048 CPT,
2 channels
Page 342

Recommended Electronics:

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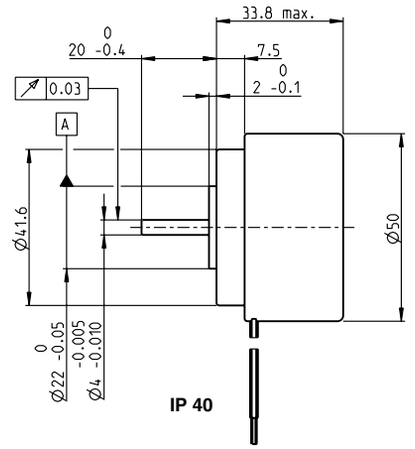
ESCON 36/3 EC	379
ESCON Mod. 50/4 EC-S	379
ESCON Module 50/5	379
ESCON 50/5	380
DEC Module 50/5	382
EPOS2 Module 36/2	386
EPOS2 24/5, 50/5	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

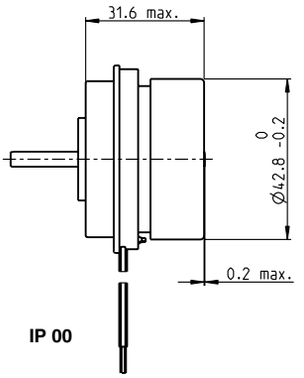
Option
With Cable and Connector
(Ambient temperature -20 ... +100°C)

EC 45 flat brushless, 30 Watt, with integrated electronics

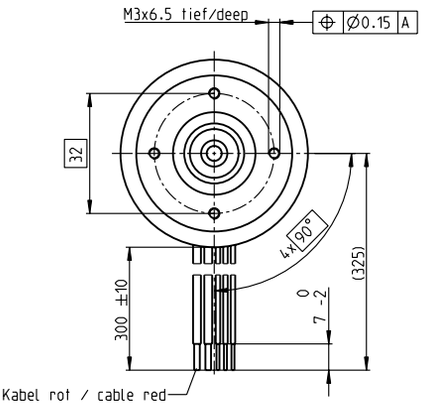
1-Q-speed controller



IP 40



IP 00



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)	353518		353519		350909		370425	
IP 00 (without cover)		353516		353517		352886		370424
Motor Data (provisional)								
Values at nominal voltage								
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								
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
26	Max. axial load (dynamic)		6.8 N
27	Max. force for press fits (static)		95 N
	(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

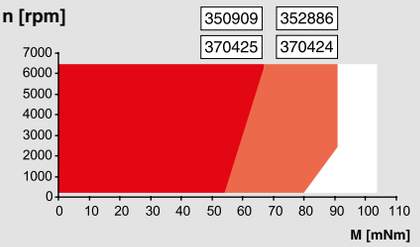
Connection 2 wire version (Cable AWG 18)

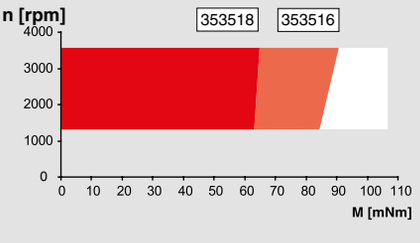
red	$+V_{CC}$ 10…28 VDC
black	GND

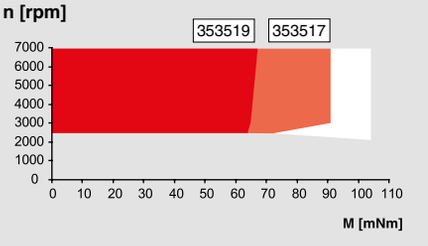
Connection 5 wire version (Cable AWG 18/24)

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 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
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Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
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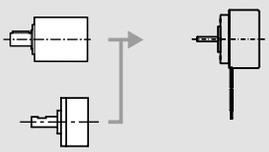
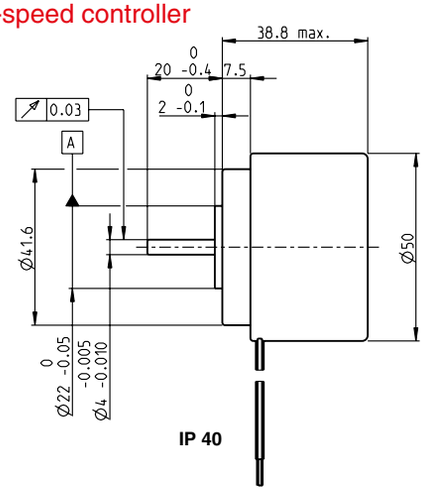
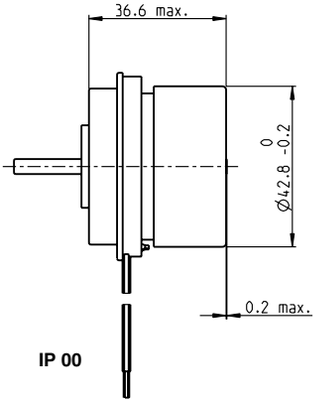
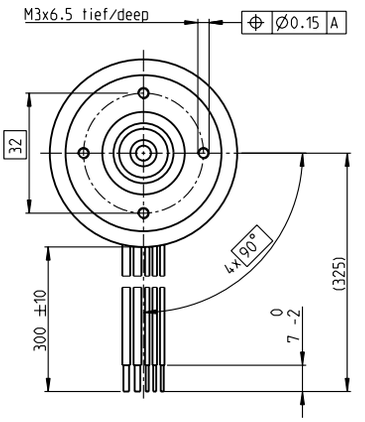


EC 45 flat brushless, 50 Watt, with integrated electronics

1-Q-speed controller







M 1:2

Stock program
Standard program
Special program (on request)

	Part Numbers					
	2 wire version		5 wire version Enable		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							
1	Nominal voltage	V	24	24	24	24	24	24
2	No load speed	rpm	3000	3000	4500	4500	4500	4500
3	No load current	mA	114	114	192	192	192	192
4	Nominal speed	rpm	3000	3000	4500	4500	4500	4500
5	Nominal torque (max. continuous torque)	mNm	89.9	130	82.8	131	82.8	131
6	Nominal current (max. continuous current)	A	1.61	2.41	2.15	3.45	2.15	3.45
33	Max. torque	mNm	150	150	149	149	149	149
34	Max. current	A	2.83	2.83	3.86	3.86	3.86	3.86
9	Max. efficiency	%	74	74	76	76	76	76
	Characteristics							
35	Type of control		Speed	Speed	Speed	Speed	Speed	Speed
36	Supply voltage $+V_{CC}$	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
26	Max. axial load (dynamic)		6.8 N
27	Max. force for press fits (static)		95 N
	(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

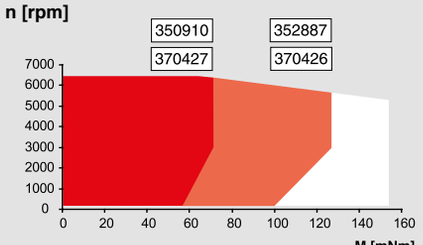
Connection 2 wire version (Cable AWG 18)

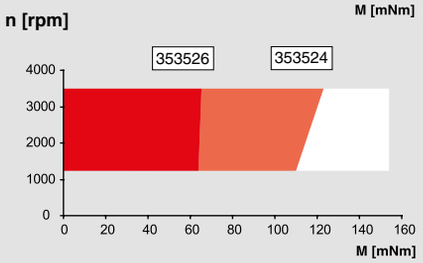
red	$+V_{CC}$ 10…28 VDC
black	GND

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.

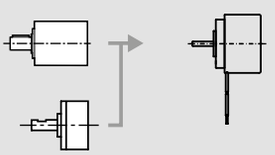
Overload range
The drive reaches these operating points. Speed may vary from the set value. The overload protection shuts down the drive in the event of sustained overload.

maxon Modular System

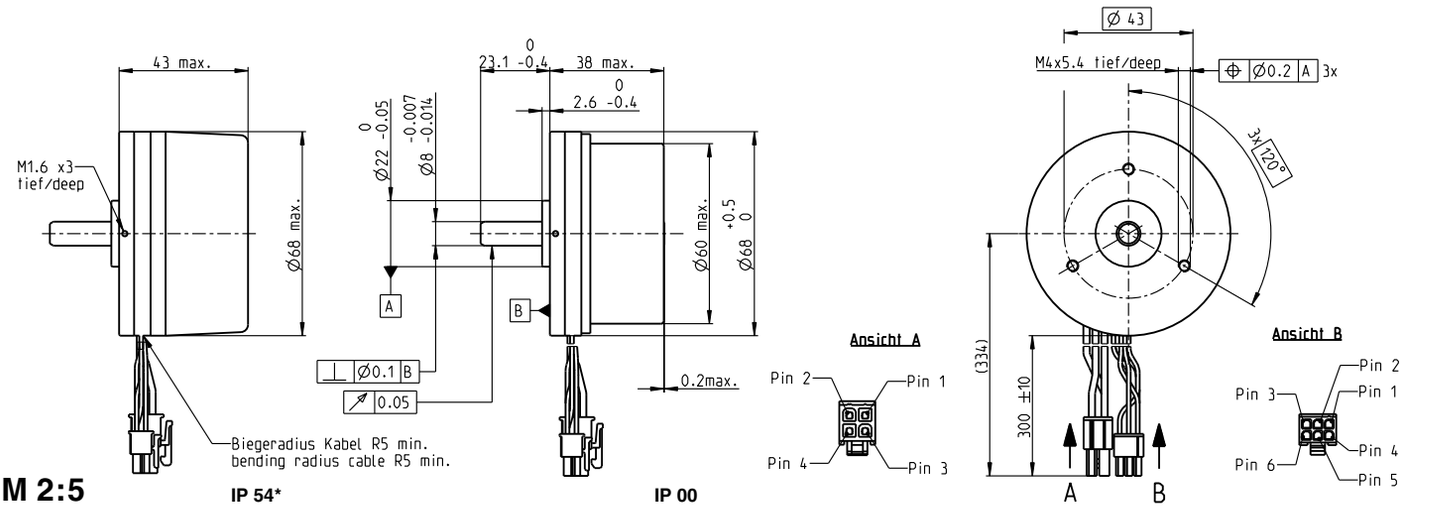
Overview on page 20–25

Planetary Gearhead
∅42 mm
3 - 15 Nm
Page 316

Spur Gearhead
∅45 mm
0.5 - 2.0 Nm
Page 317



EC 60 flat ∅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		**408057**		412821				
IP 00 (without cover)		412823		**411678**		412825			

Motor Data

	Values at nominal voltage								
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	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	gcm²	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)		170 N
	(static, shaft supported)		8000 N
28	Max. radial load, 5 mm from flange		112 N

Other specifications

29	Number of pole pairs	7
30	Number of phases	3
31	Weight of motor	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.	Pin 4

Connector	**Part number**
Molex	39-01-2040

Connection sensors (Cable AWG 28)

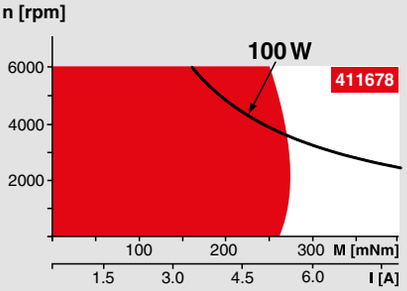
grey	Hall sensor 1	Pin 1
grey	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
grey	GND	Pin 4
blue	V_{Hall} 4.5…18 VDC	Pin 5
	N.C.	Pin 6

Connector	**Part number**
Molex	430-25-0600

Wiring diagram for Hall sensors see p. 35

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

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.

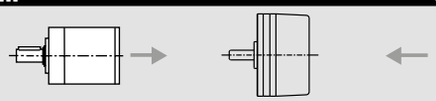
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 319

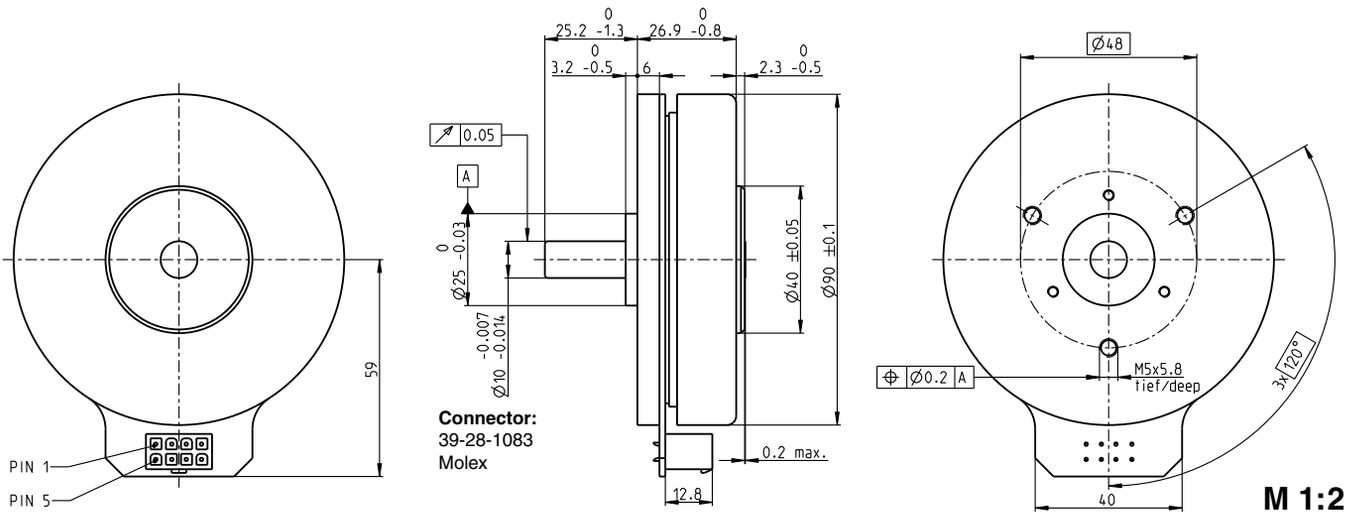


Encoder MILE
512 - 4096 CPT,
2 channels
Page 343

Recommended Electronics:

Notes	**Page 24**
ESCON Mod. 50/4 EC-S	379
ESCON Mod. 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5	387
EPOS2 50/5	387
EPOS2 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

EC 90 flat ∅90 mm, brushless, 90 Watt



Stock program
Standard program
Special program (on request)

Part Numbers

	with Hall sensors	323772	429271	244879
Motor Data				
	Values at nominal voltage			
1	Nominal voltage	V	24	36	48
2	No load speed	rpm	3190	3120	2080
3	No load current	mA	544	348	135
4	Nominal speed	rpm	2590	2510	1610
5	Nominal torque (max. continuous torque)	mNm	444	560	533
6	Nominal current (max. continuous current)	A	6.06	4.76	2.27
7	Stall torque	mNm	4940	7480	4570
8	Stall current	A	70	69	21.1
9	Max. efficiency	%	84	87	85
	Characteristics				
10	Terminal resistance phase to phase	Ω	0.343	0.522	2.28
11	Terminal inductance phase to phase	mH	0.264	0.625	2.5
12	Torque constant	mNm/A	70.5	109	217
13	Speed constant	rpm/V	135	88	44
14	Speed/torque gradient	rpm/mNm	0.659	0.423	0.462
15	Mechanical time constant	ms	21.1	13.6	14.8
16	Rotor inertia	gcm²	3060	3060	3060

Specifications

Thermal data

17	Thermal resistance housing-ambient	1.91 K/W
18	Thermal resistance winding-housing	2.6 K/W
19	Thermal time constant winding	46 s
20	Thermal time constant motor	283 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	< 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)		183 N
	(static, shaft supported)		8000 N
28	Max. radial load, 5 mm from flange		68 N

Other specifications

29	Number of pole pairs	12
30	Number of phases	3
31	Weight of motor	600 g

Values listed in the table are nominal.

Connection

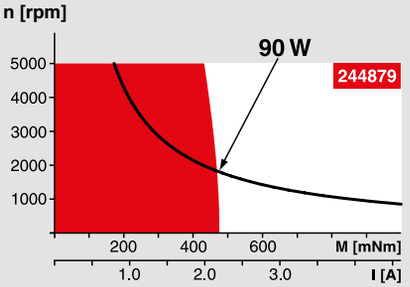
Pin 1	Hall sensor 1
Pin 2	Hall sensor 2
Pin 3	V_{Hall} 4.5…18 VDC
Pin 4	Motor winding 3
Pin 5	Hall sensor 3
Pin 6	GND
Pin 7	Motor winding 1
Pin 8	Motor winding 2

Wiring diagram for Hall sensors see p. 35

Cable

Connection cable Universal, L = 500 mm	**339380**
Connection cable to EPOS2, L = 500 mm	**354045**

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.

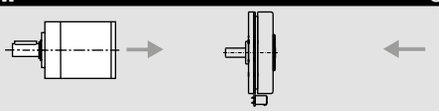
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

maxon Modular System

Overview on page 20–25

Planetary Gearhead
∅52 mm
4 - 30 Nm
Page 319

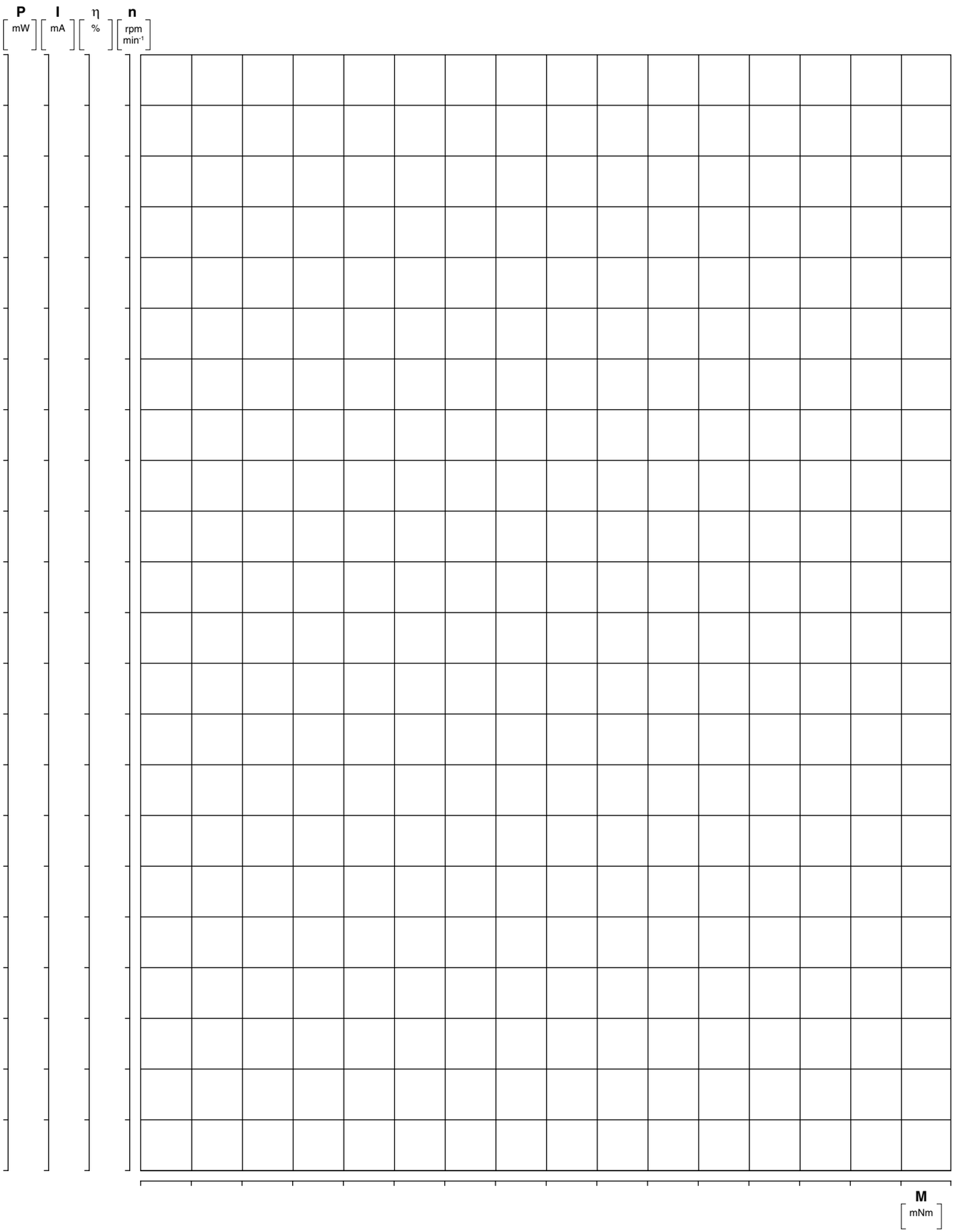


Encoder MILE
512 - 6400 CPT,
2 channels
Page 344

Recommended Electronics:

Notes	Page **24**
ESCON Mod. 50/4 EC-S	379
ESCON Mod. 50/5	379
ESCON 50/5	380
ESCON 70/10	380
DEC Module 50/5	382
EPOS2 24/5, 50/5, 70/10	387
EPOS2 P 24/5	390
EPOS3 70/10 EtherCAT	393
MAXPOS 50/5	396

For your personal notes



maxon gear

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.

With our Standard Specification we offer you a means to judge maxon gearheads in the most important respects. To our knowledge it covers normal applications. The Standard Specification is part of our “General Conditions of Sale”.

For information on standards and directives, refer to page 14 and 15.

The Standard Specification No. 102 for maxon gear

1. **Principles**
   The **Standard Specification** defines checks and tests performed on the complete gearhead and during the production process. In order to guarantee our high quality standard, we check compliance to specified measurements and characteristics of materials, parts and subassemblies through the manufacturing process and the complete gearhead. The obtained measurements are recorded and can be made available to customers if required. Random sampling plans are according to ISO 2859, and DIN/ISO 3951 (inspection by attributes, sequential sampling, variables inspection) as well as internal manufacturing controls. This Standard Specification always applies unless a different one has been agreed between the customer and maxon.

2. **Data**

2.1 **Mechanical data** per outline drawing: Standard measuring instruments (for electrical length measuring DIN 32876, micrometer per DIN 863, dial indicator DIN 878, caliper per DIN 862, bore caliper DIN 2245, thread caliper per DIN 2280 and others) are used.

2.2 **Noise:** Tests are carried out for anomalies within a lot on a subjective basis. Depending on speed the motions in the gearhead cause noise and vibration of varying degrees, frequency and intensity. The noise level experienced with a single sample unit should not be interpreted as indicative of the noise or vibration level to be expected of future deliveries.

2.3 **Service life:** Durability tests are carried out under uniform internal criteria as part of product certification. A gearhead’s service life essentially depends on the operating and ambient conditions. Consequently, the many possible variations do not allow us to make a general statement on service life. Minimum expected service life for the relevant maxon gears is based on standard conditions
- 25°C
- Normal storage conditions
- Horizontal position of the unit
- No axial and radial load on the output shaft

2.4 **Environmental influences**
Protection against corrosion: Our products are tested during product certification on the basis of DIN EN 60068-2-30.
Coating of components: Surface treatment and coating procedures used by maxon are selected on the basis of their merits to resist corrosion. These treatments are evaluated at product certification according to their applicable standard.

3. Parameters that differ from or are additional to the data sheet can be set and are a central part of our systematic testing as the customer’s specification. Test/inspection certificates are issued by prior agreement.

April 2010 edition/subject to change

Explanation of the pages 272–321

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).

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).

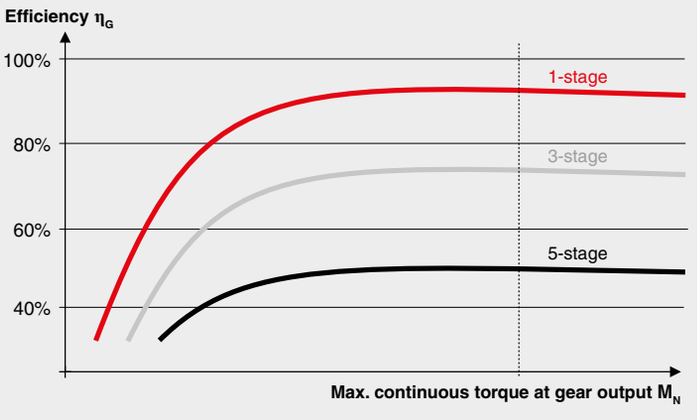
12 Direction of rotation
The Direction of rotation of our planetary gears is always the same as that of the motor shaft. With spur gears, it depends on the number of stages. With even numbers (i.e. 2, 4, 6, 8), the Direction of rotation is the same, but the opposite if the numbers are odd (exception: 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.

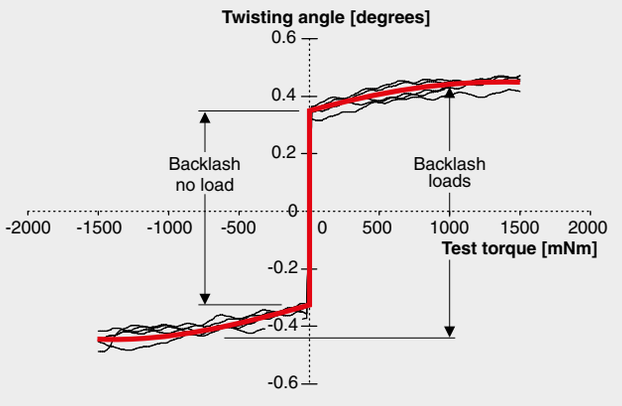
14 Max. transmittable power (intermittent) [W]
This value gives the maximum intermittent output available on the output shaft. This range may be used intermittently and repeatedly. It is defined as follows:
– during max. 1 second
– during max. 10% of the operating cycle
If these values are exceeded, 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)



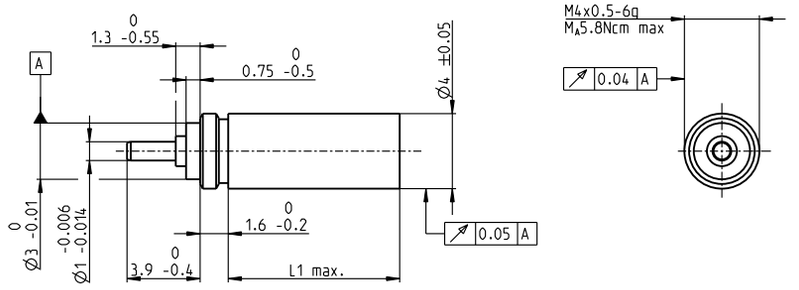
Gear play measurement



Planetary Gearhead GP 4 C ∅4 mm, 0.002–0.015 Nm

NEW

Ceramic Version



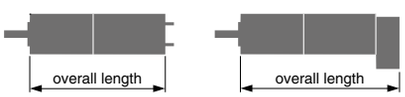
Technical Data

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	3 N	3 N

M 5:2

Stock program
Standard program
Special program (on request)

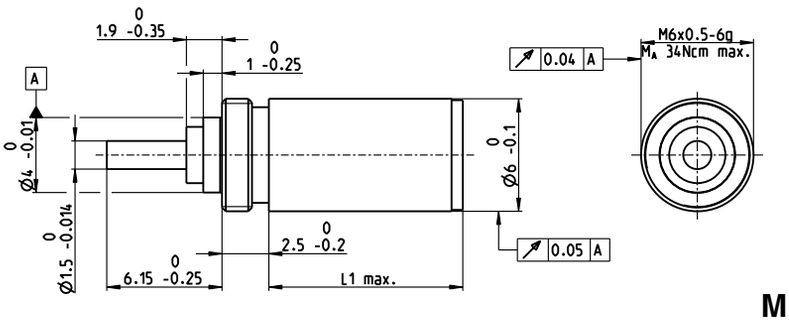
Part Numbers	484357	484358	484359
Gearhead Data (provisional)			
1 Reduction	17:1	68:1	280:1
2 Absolute reduction	$^{2025}/_{121}$	$^{91125}/_{1331}$	$^{4100625}/_{14641}$
3 Max. motor shaft diameter mm	0.6	0.6	0.6
4 Number of stages	2	3	4
5 Max. continuous torque Nm	0.002	0.006	0.015
6 Max. intermittent 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	190			24.9	26.6	28.3
EC 4, 0.5 W, B	190			24.9	26.6	28.3
EC 4, 1.0 W, A	191			31.9	33.6	35.3
EC 4, 1.0 W, B	191			31.9	33.6	35.3

Planetary Gearhead GP 6 A ∅6 mm, 0.002–0.03 Nm

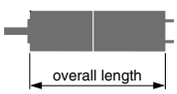


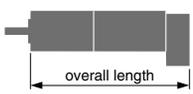
M 5:2

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

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	$^{27}/_{7}$	$^{729}/_{49}$	$^{19683}/_{343}$	$^{531441}/_{2401}$	$^{14348907}/_{16807}$
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

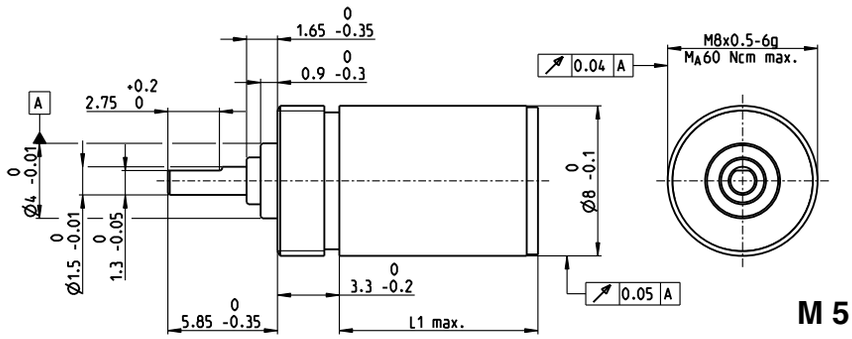




maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 6, 0.3 W, A	108			21.0	23.5	26.1	28.7	31.3
RE 6, 0.3 W, B	108			25.0	27.5	30.1	32.7	35.3
EC 6, 1.5 W	192			26.7	29.2	31.8	34.4	37.0
EC 6, 1.5 W	192	Enc 6-8 MAG	347	28.8	31.3	33.9	36.5	39.1
EC 6, 1.5 W	192	Enc 6-8 OPT	357	28.8	31.3	33.9	36.5	39.1
EC 6, 2 W	193			26.7	29.2	31.8	34.4	37.0
EC 6, 2 W	193	Enc 6-8 MAG	347	28.8	31.3	33.9	36.5	39.1
EC 6, 2 W	193	Enc 6-8 OPT	357	28.8	31.3	33.9	36.5	39.1

Planetary Gearhead GP 8 A ∅8 mm, 0.01–0.1 Nm



M 5:2

Technical Data

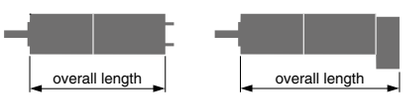
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.08 mm
Axial play	max. 0.08 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input speed	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
Gearhead Data								
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

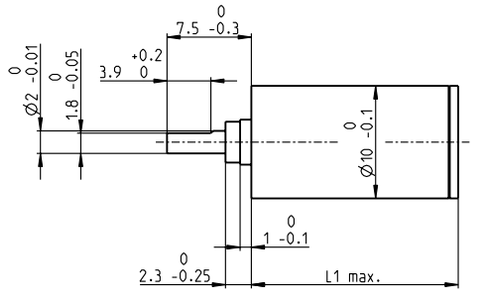


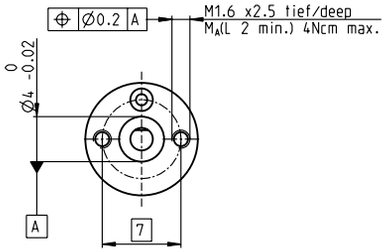
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 8, 0.5 W, A	109			22.2	24.8	25.0	27.4	27.8	30.0	30.6	32.6
RE 8, 0.5 W, B	109			25.2	27.8	28.0	30.4	30.8	33.0	33.6	35.6
RE 8, 0.5 W, A	109	MR	348/349	28.8	31.4	31.6	34.0	34.4	36.6	37.2	39.2
RE 8, 0.5 W, A	109	8 OPT	358	30.4	33.0	33.2	35.6	36.0	38.2	38.8	40.8
EC 8, 2 W	194			28.6	31.2	31.4	33.8	34.2	36.4	37.0	39.0

Planetary Gearhead GP 10 K ∅10 mm, 0.005–0.1 Nm

Plastic Version





M 3:2

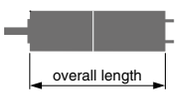
Technical Data

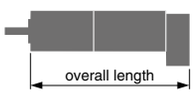
Planetary Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	10 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Max. radial load, 5 mm from flange	1 N

Stock program
Standard program
Special program (on request)

Part Numbers

		110308	110309	110310	110311	110312
Gearhead Data						
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	gcm²	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

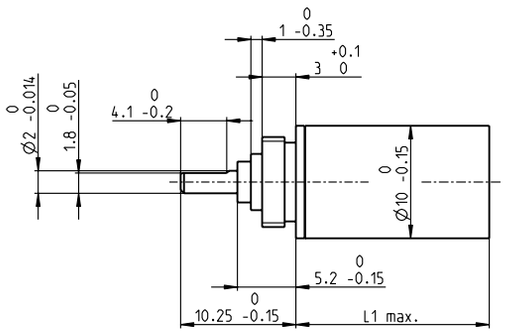


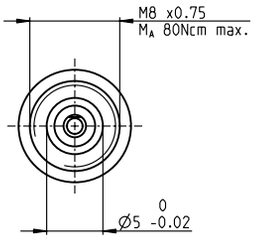


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 10, 0.75 W	110/111			27.3	31.4	35.5	39.6	43.7
RE 10, 0.75 W	111	MR	348/349	33.1	37.2	41.3	45.4	49.5
RE 10, 0.75 W	111	MEnc 10	370	35.4	39.5	43.6	47.7	51.8
RE 10, 1.5 W	112/113			34.9	39.0	43.1	47.2	51.3
RE 10, 1.5 W	113	MR	348/349	40.7	44.8	48.9	53.0	57.1
RE 10, 1.5 W	113	MEnc 10	370	43.0	47.1	51.2	55.3	59.4
EC 9.2 flat, 0.5 W	250			22.8	26.9	31.0	35.1	39.2
EC 10 flat, 0.2 W	251			13.6	17.7	21.8	25.9	30.0

Planetary Gearhead GP 10 A ∅10 mm, 0.01–0.15 Nm





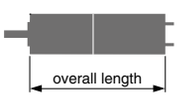
M 3:2

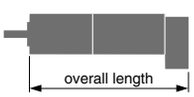
Technical Data

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					-15…+80°C
Extended range as option					-40…+100°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

Stock program
Standard program
Special program (on request)

Part Numbers	218415	218416	218417	218418	218419	332422	332423	332424	332425	332426
Gearhead Data										
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 gcm²	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

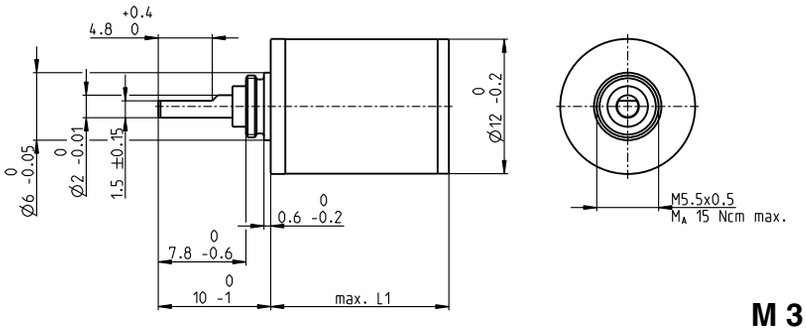




maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
RE 10, 0.75 W	110/111			27.5	31.2	34.3	37.5	40.6						
RE 10, 0.75 W	111	MR	348/349	33.3	37.0	40.1	43.3	46.4						
RE 10, 0.75 W	111	MEnc 10	370	35.6	39.3	42.4	45.6	48.7						
RE 10, 1.5 W	112/113			35.1	38.8	41.9	45.1	48.2						
RE 10, 1.5 W	113	MR	348/349	40.9	44.6	47.7	50.9	54.0						
RE 10, 1.5 W	113	MEnc 10	370	43.2	46.9	50.0	53.2	56.3						
A-max 12	147/148			31.7	35.4	38.5	41.7	44.8						
A-max 12, 0.5 W	148	MR	348/349	35.8	39.5	42.6	45.8	48.9						
EC 10, 8 W	195								36.2	39.9	43.0	46.2	49.3	
EC 9.2 flat, 0.5 W	250			23.0	26.7	29.8	33.0	36.1						
EC 10 flat, 0.2 W	251			13.8	17.5	20.6	23.8	26.9						

Spur Gearhead GS 12 A ∅12 mm, 0.01–0.03 Nm



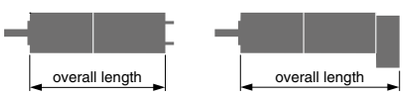
M 3:2

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	1.5 N

Stock program
Standard program
Special program (on request)

Part Numbers							
	310301	313872	313990	313991	310311	313993	310316
Gearhead Data							
1 Reduction	6.4:1	13:1	58:1	141:1	371:1	485:1	3101:1
2 Absolute reduction	403/63	21866/1694	724594/12474	20138716/142884	26782109/72171	624300196/1285956	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	899/99	12493/567	387283/5103	22462414/112266		372178963/413343	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		27869/891	863939/8019	12005773/45927		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	7
5 Max. continuous torque Nm	0.010	0.015	0.020	0.025	0.025	0.030	0.030
6 Max. intermittent torque at gear output Nm	0.030	0.035	0.040	0.045	0.045	0.050	0.050
12 Direction of rotation, drive to output	=	≠	=	≠	≠	=	≠
7 Max. efficiency %	81	73	66	59	59	53	48
8 Weight g	6.5	7.4	8.3	9.2	9.2	10.1	11
9 Average backlash no load °	1	1	1.2	1.2	1.2	1.2	1.5
10 Mass inertia gcm²	0.002	0.002	0.002	0.002	0.002	0.002	0.002
11 Gearhead length L1 mm	10	12	14	16	16	18	20

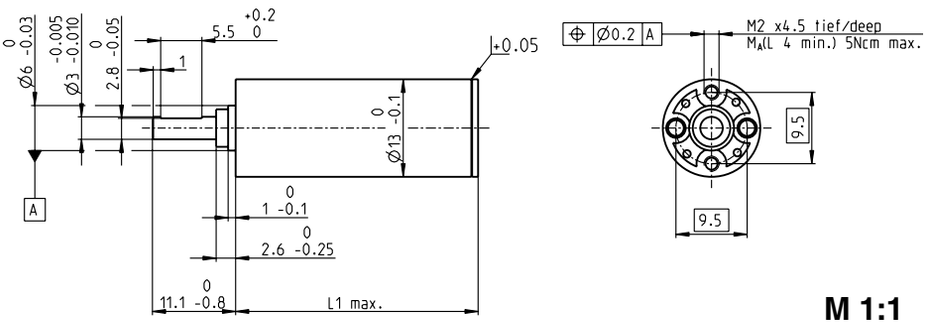


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
A-max 12	147/148			31.3	33.3	35.3	37.3	37.3	39.3	41.3
A-max 12, 0.5 W	148	MR	348/349	35.4	37.4	39.4	41.4	41.4	43.4	45.4

Planetary Gearhead GP 13 K ∅13 mm, 0.05–0.15 Nm

Plastic Version



M 1:1

Technical Data

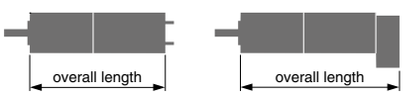
Planetary Gearhead	straight teeth
Housing, planetary wheels	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.12 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	5 N
Max. force for press fits	100 N
Direction of rotation, drive to 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

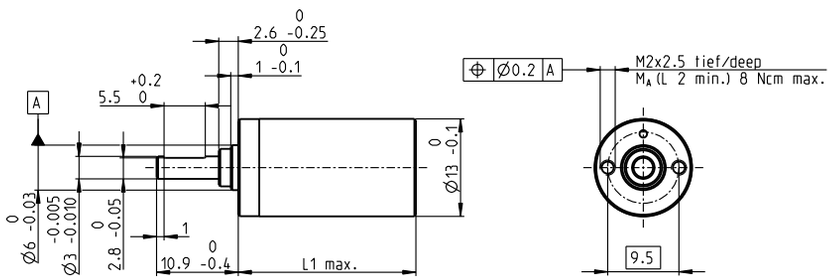
		137149	137150	137151	137152	137153
Gearhead Data						
1 Reduction		4.1:1	17:1	67:1	275:1	1119:1
2 Absolute reduction		$^{57}/_{14}$	$^{3249}/_{196}$	$^{185193}/_{2744}$	$^{10556001}/_{38416}$	$^{601692057}/_{537824}$
3 Max. motor shaft diameter	mm	1.5	1.5	1.5	1.5	1.5
4 Number of stages		1	2	3	4	5
5 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	gcm²	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	115/117			34.8	40.7	44.4	48.1	51.8
RE 13, 0.75 W	117	MR	348-350	41.9	47.8	51.5	55.2	58.9
RE 13, 0.75 W	117	MEnc 13	371	42.6	48.5	52.2	55.9	59.6
RE 13	119/121			47.0	52.9	56.6	60.3	64.0
RE 13, 2 W	121	MR	348-350	54.1	60.0	63.7	67.4	71.1
RE 13, 2 W	121	MEnc 13	371	54.8	60.7	64.4	68.1	71.8
RE 13, 1.5 W	123/125			37.9	43.8	47.5	51.2	54.9
RE 13, 1.5 W	125	MR	348-350	44.0	49.9	53.6	57.3	61.0
RE 13, 1.5 W	125	MEnc 13	371	45.9	51.8	55.5	59.2	62.9
RE 13, 3 W	127/129			50.1	56.0	59.7	63.4	67.1
RE 13, 3 W	129	MR	348-350	56.2	62.1	65.8	69.5	73.2
RE 13, 3 W	129	MEnc 13	371	58.1	64.0	67.7	71.4	75.1
A-max 12	147/148			36.8	42.7	46.4	50.1	53.8
A-max 12, 0.5 W	148	MR	348-350	40.7	46.6	50.3	54.0	57.7
RE-max 13	175/176			36.1	42.0	45.7	49.4	53.1
RE-max 13, 0.75 W	176	MR	348-350	40.8	46.7	50.4	54.1	57.8
RE-max 13	177/178			47.1	53.0	56.7	60.4	64.1
RE-max 13, 2 W	178	MR	348-350	51.8	57.7	61.4	65.1	68.8

Planetary Gearhead GP 13 A ∅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

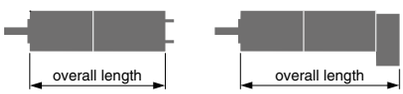
maxon gear

Stock program
Standard program
Special program (on request)

Part Numbers

		110313	110314	110315	110316	110317
Gearhead Data						
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	gcm²	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

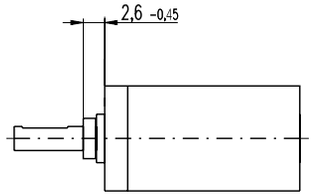
* for A-max 12 and RE-max 13 L1 is + 0.3 mm



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
RE 13	115/117			35.4	39.3	43.1	47.0	50.8
RE 13, 0.75 W	117	MR	348-350	42.5	46.4	50.2	54.1	57.9
RE 13, 0.75 W	117	MEnc 13	371	43.2	47.1	50.9	54.8	58.6
RE 13	119/121			47.6	51.5	55.3	59.2	63.0
RE 13, 2 W	121	MR	348-350	54.7	58.6	62.4	66.3	70.1
RE 13, 2 W	121	MEnc 13	371	55.4	59.3	63.1	67.0	70.8
RE 13, 1.5 W	123/125			38.5	42.4	46.2	50.1	53.9
RE 13, 1.5 W	125	MR	348-350	44.6	48.5	52.3	56.2	60.0
RE 13, 1.5 W	125	MEnc 13	371	46.5	50.4	54.2	58.1	61.9
RE 13, 3 W	127/129			50.7	54.6	58.4	62.3	66.1
RE 13, 3 W	129	MR	348-350	56.8	60.7	64.5	68.4	72.2
RE 13, 3 W	129	MEnc 13	371	58.7	62.6	66.4	70.3	74.1
A-max 12	147/148			37.6	41.5	45.3	49.2	53.0
A-max 12, 0.5 W	148	MR	348-350	41.7	45.6	49.4	53.3	57.1
RE-max 13	175/176			36.9	40.8	44.6	48.5	52.3
RE-max 13, 0.75 W	176	MR	348-350	41.6	45.5	49.3	53.2	57.0
RE-max 13	177/178			47.9	51.8	55.6	59.5	63.3
RE-max 13, 2 W	178	MR	348-350	52.6	56.5	60.3	64.2	68.0
EC 13, 6 W	196			37.4	41.3	45.1	49.0	52.8
EC 13, 12 W	197			49.6	53.5	57.3	61.2	65.0

Option Ball Bearing



Gearhead length: L1 + 0.2 mm

Part Numbers

4.1 : 1	144300	131 : 1	352393
5.1 : 1	352391	275 : 1	144303
17 : 1	144301	664 : 1	352394
26 : 1	352392	1119 : 1	144304
67 : 1	144302	3373 : 1	352395

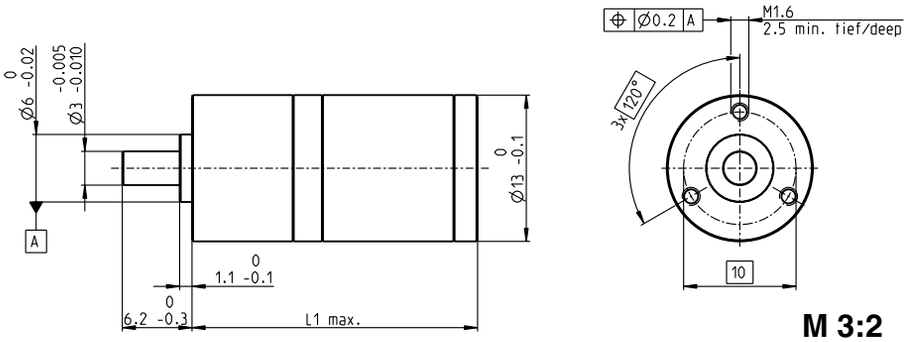
Technical Data

Planetary Gearhead					straight teeth
Output shaft					stainless steel, hardened
Bearing at output					preloaded ball bearings
Radial play, 6 mm from flange					max. 0.04 mm
Axial play at axial load	< 5 N				0 mm
	> 5 N				max. 0.04 mm
Max. axial load (dynamic)					8 N
Max. force for press fits					25 N
Direction of rotation, drive to output					=
Max. continuous input speed					8000 rpm
Recommended temperature range					-40…+100°C
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	10 N	15 N	20 N	20 N	20 N

Gearhead values according to sleeve bearing version

Planetary Gearhead GP 13 M Ø13 mm, 0.05–0.275 Nm

Sterilizable



Technical Data

Planetary Gearhead			straight teeth
Output shaft			stainless steel
Bearing at output			ball bearing
Radial play, 6 mm from flange			max. 0.2 mm
Axial play			max. 0.1 mm
Max. axial load (dynamic)			50 N
Max. force for press fits			80 N
Direction of rotation, drive to output			=
Max. continuous input speed			60 000 rpm
Recommended temperature range			-40…+100°C
with shaft seal			-10…+100°C
Number of stages	1	2	3
Max. radial load, 6 mm from flange	10 N	15 N	20 N

Option: Inch-version GP size 5 M as standard variant available.

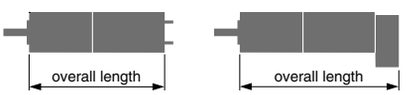
Stock program
Standard program
Special program (on request)

Part Numbers

with shaft seal	370275	370517	370611
without shaft seal	370617	370622	370623

Gearhead Data

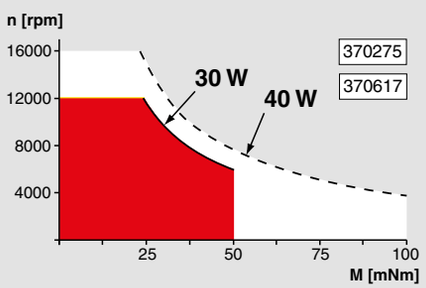
1	Reduction		5:1	25:1	125:1
2	Absolute reduction		5/1	25/1	125/1
3	Max. motor shaft diameter	mm	1.5	1.5	1.5
4	Number of stages		1	2	3
5	Max. continuous torque	Nm	0.05	0.225	0.275
6	Max. intermittent torque at gear output	Nm	0.1	0.25	0.3
7	Max. efficiency, sealed	%	85	80	70
8	Weight	g	16	20	23
9	Average backlash no load	°	1.2	1.4	1.6
10	Mass inertia	gcm²	0.017	0.016	0.016
11	Gearhead length L1	mm	25.4	31.3	37.2
13	Max. transmittable power (continuous)	W	30	20	15
14	Max. transmittable power (intermittent)	W	40	25	20



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
EC 13, 30 W, ster.	198			62.5	68.4	74.3
EC 13, 50 W, ster.	199			73.5	79.4	85.3

Operating Range (Output shaft)



Comments

Continuous operating
Valid in an ambient temperature of 25°C and taking account of stage-dependent limits (points 5 and 13). The recommended motor speed must not be exceeded.

Short term operation
Valid in an ambient temperature of 25°C and taking account of stage-dependent limits (points 6 and 14). This range may be used intermittently and repeatedly. It is defined as follows

– during max. 1 second
– during max. 10% of the operating cycle

——— max. transferable continuous performance

- - - - - max. transferable intermittent performance

Application

Sterilizable Devices

- Saws
- Surgical Reamers
- Arthroscopic Shavers
- Surgical Staplers
- Dental Tools

Sterilization information

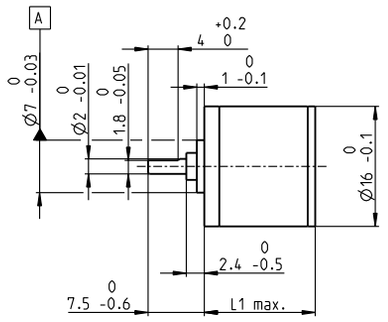
With shaft seal: typically 2000 autoclave cycles
Without shaft seal: typically 1000 autoclave cycles

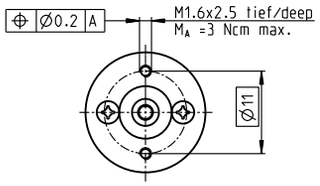
Sterilization with steam

Temperature	134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	18 minutes

Spur Gearhead GS 16 K ∅16 mm, 0.01–0.03 Nm

Plastic Version





M 1:1

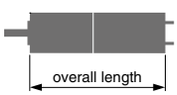
Technical Data

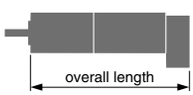
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.15 mm
Axial play	0.02–0.12 mm
Max. axial load (dynamic)	2 N
Max. force for press fits	15 N
Max. continuous input speed	8000 rpm
Recommended temperature range	-15...+80°C
Max. radial load, 6.5 mm from flange	1 N

maxon gear

Stock program
Standard program
Special program (on request)

Gearhead Data		Part Numbers					
		201463	201465	201467	201469	201471	201473
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		207405	207406	207407	207408	207409	207410
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		201464	201466	201468	201470	201472	201474
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	0.010	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	gcm²	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

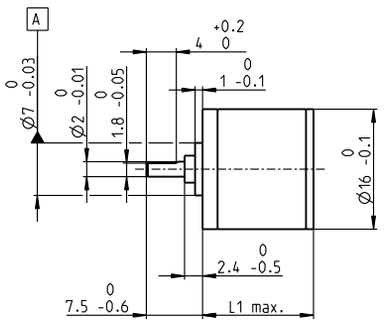


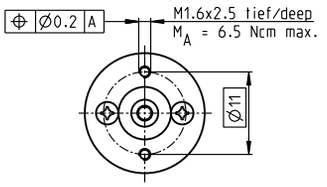


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	149-152			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	150/152	MR	351/353	42.3	43.3	45.3	47.3	49.3	51.3
A-max 16	150/152	MEnc 13	371	45.4	46.4	48.4	50.4	52.4	54.4

Spur Gearhead GS 16 A ∅16 mm, 0.015–0.04 Nm





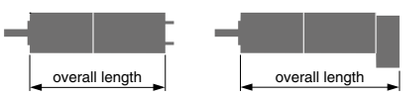
M 1:1

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	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

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

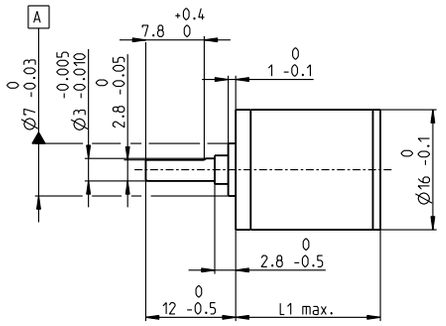


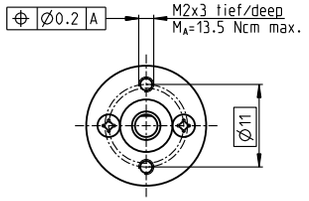
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	149-152			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	150/152	MR	351/353	42.3	43.3	45.3	47.3	49.3	51.3
A-max 16	150/152	MEnc 13	371	45.4	46.4	48.4	50.4	52.4	54.4

Spur Gearhead GS 16 V ∅16 mm, 0.06–0.1 Nm

Reinforced





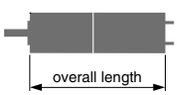
M 1:1

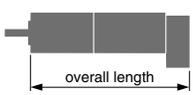
Technical Data

Spur Gearhead					straight teeth
Output shaft					stainless steel, hardened
Bearing at output					preloaded ball bearings
Radial play, 6.5 mm from flange					max. 0.02 mm
Axial play at axial load					< 5 N 0 mm
					> 5 N max. 0.05 mm
Max. axial load (dynamic)					5 N
Max. force for press fits					5 N
Max. continuous input speed					8000 rpm
Recommended temperature range					-15…+100°C
Extended range as option					-40…+100°C
Number of stages	1	2	3	4	5
Max. radial load, 6.5 mm from flange	10 N	15 N	20 N	22 N	22 N

Stock program
Standard program
Special program (on request)

Part Numbers	235066	235070	235073	235076	235079	235082
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	235068	235071	235074	235077	235080	235083
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	235069	235072	235075	235078	235081	235084
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	0.06	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



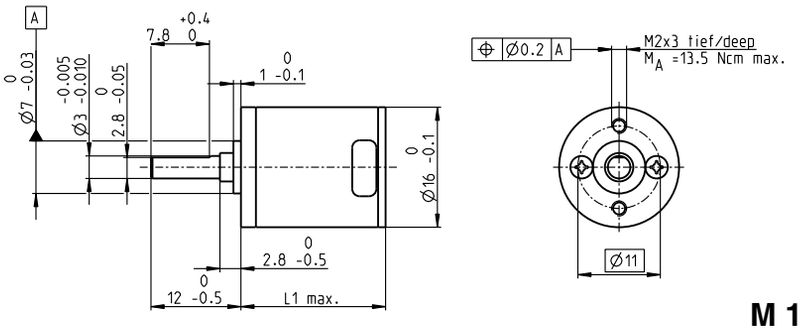


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 16	149-152			39.8	42.8	44.8	46.8	48.8	50.8
A-max 16	150/152	MR	351/353	44.8	47.8	49.8	51.8	53.8	55.8
A-max 16	150/152	MEnc 13	371	47.9	50.9	52.9	54.9	56.9	58.9

Spur Gearhead GS 16 VZ ∅16 mm, 0.06–0.1 Nm

Low Backlash



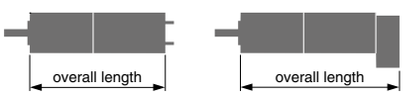
M 1:1

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

Stock program
Standard program
Special program (on request)

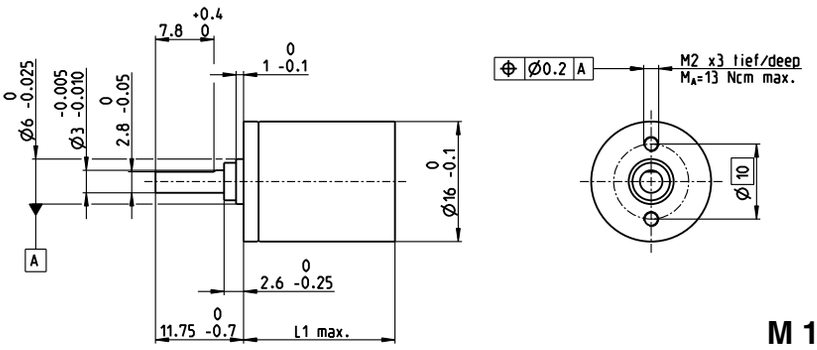
			Part Numbers		
			327789	327796	327800
Gearhead Data					
1	Reduction		76:1	261:1	900:1
2	Absolute reduction		$^{387283}/_{5103}$	$^{12005773}/_{45927}$	$^{372178963}/_{413343}$
3	Max. motor shaft diameter	mm	1.5	1.5	1.5
	Part Numbers		327788	327797	327801
1	Reduction		108:1	371:1	1278:1
2	Absolute reduction		$^{863939}/_{8019}$	$^{26782109}/_{72171}$	$^{830245379}/_{649539}$
3	Max. motor shaft diameter	mm	1.5	1.5	1.5
	Part Numbers		327790	327799	327802
1	Reduction		141:1	485:1	1670:1
2	Absolute reduction		$^{923521}/_{6561}$	$^{28629151}/_{59049}$	$^{887503681}/_{531441}$
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	gcm²	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	149-152			44.8	46.8	48.8
A-max 16	150/152	MR	351/353	49.8	51.8	53.8
A-max 16	150/152	MEnc 13	371	52.9	54.9	56.9

Planetary Gearhead GP 16 A ∅16 mm, 0.1–0.3 Nm



M 1:1

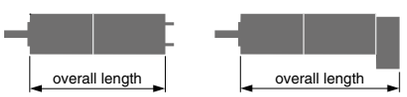
Technical Data

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

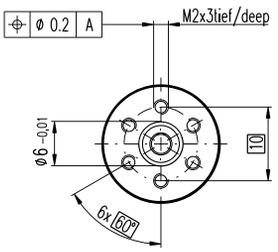
Gearhead Data		110321	110322	110323	118186	110324	134782	110325	134785
1	Reduction		4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2	Absolute reduction		57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3	Max. motor shaft diameter	mm	2	2	2	1.5	2	2	2	2
	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		5000211/10985	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
5	Max. continuous torque	Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30	0.30
6	Max. intermittent torque at gear output	Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450	0.450
7	Max. efficiency	%	90	81	73	73	65	65	59	59
8	Weight	g	20	23	27	27	31	31	35	35
9	Average backlash no load	°	1.4	1.6	2.0	2.0	2.4	2.4	3.0	3.0
10	Mass inertia	gcm²	0.07	0.05	0.05	0.04	0.05	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	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	130			37.9	41.5	45.1	45.1	48.7	48.7	52.3	52.3
RE 16, 2 W	130	MR	351/353	43.6	47.2	50.8	50.8	54.4	54.4	58.0	58.0
RE 16, 3.2 W	131/132			56.0	59.6	63.2	63.2	66.8	66.8	70.4	70.4
RE 16, 3.2 W	132	MR	351/353	61.0	64.6	68.2	68.2	71.8	71.8	75.4	75.4
RE 16, 3.2 W	132	MEnc 13	371	62.1	65.7	69.3	69.3	72.9	72.9	76.5	76.5
RE 16, 4.5 W	133/134			59.0	62.6	66.2	66.2	69.8	69.8	73.4	73.4
RE 16, 4.5 W	134	MR	351/353	64.0	67.6	71.2	71.2	74.8	74.8	78.4	78.4
RE 16, 4.5 W	134	MEnc 13	371	65.2	68.8	72.4	72.4	76.0	76.0	79.6	79.6
A-max 16	149-152			41.0	44.6	48.2	48.2	51.8	51.8	55.4	55.4
A-max 16	150/152	MR	351/353	46.0	49.6	53.2	53.2	56.8	56.8	60.4	60.4
A-max 16	150/152	MEnc 13	371	49.1	52.7	56.3	56.3	59.9	59.9	63.5	63.5
EC 16, 30 W	200			55.6	59.2	62.8	62.8	66.4	66.4	70.0	70.0
EC 16, 30 W	200	MR	354	66.3	69.9	73.5	73.5	77.1	77.1	80.7	80.7
EC-max 16, 5 W	221			39.6	43.2	46.8	46.8	50.4	50.4	54.0	54.0
EC-max 16, 5 W	221	MR	354	46.9	50.5	54.1	54.1	57.7	57.7	61.3	61.3
EC-max 16, 2-wire	222			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

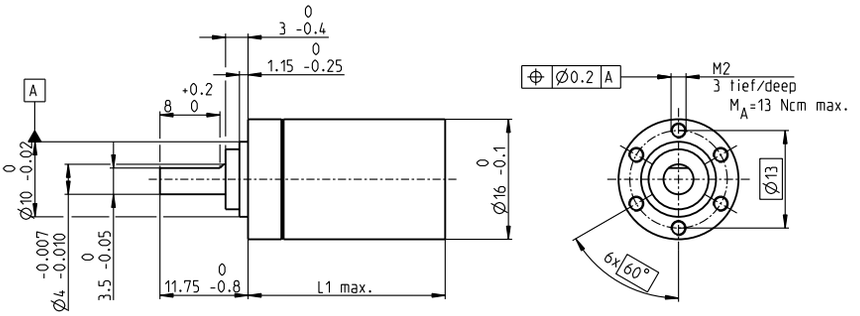
Technical Data

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					-15…+100°C
Extended range as option					-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 ∅16 mm, 0.2–0.6 Nm

Ceramic Version



M 1:1

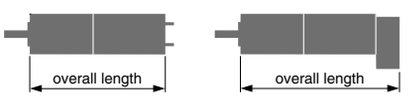
Technical Data

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	-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	20 N	40 N	60 N	80 N	80 N

Stock program
Standard program
Special program (on request)

Part Numbers	416328	407883	416391	401954	328699	416028	416188	414453
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	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	$^{27}/_{5}$	$^{1539}/_{65}$	$^{87723}/_{845}$		$^{5000211}/_{10985}$	$^{531441}/_{625}$	$^{285012027}/_{142805}$	$^{30292137}/_{8125}$
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		$^{729}/_{25}$	$^{41553}/_{325}$		$^{2368521}/_{4225}$		$^{135005697}/_{54925}$	$^{14348907}/_{3125}$
3 Max. motor shaft diameter mm		1.5	1.5		2		2	1.5
4 Number of stages	1	2	3	3	4	4	5	5
5 Max. continuous torque Nm	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.6
6 Max. intermittent torque at gear output Nm	0.3	0.45	0.6	0.6	0.75	0.75	0.9	0.9
7 Max. efficiency %	90	81	73	73	65	65	59	59
8 Weight g	22	25	29	29	33	33	37	37
9 Average backlash no load °	1.4	1.6	2	2	2.4	2.4	3	3
10 Mass inertia gcm^2	0.07	0.05	0.05	0.04	0.05	0.04	0.05	0.05
11 Gearhead length L1 mm	18.1	23.2	26.8	26.8	30.4	30.4	33.9	33.9

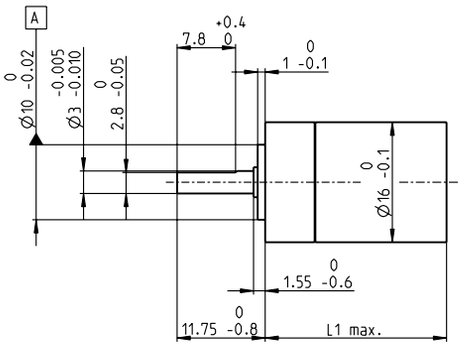


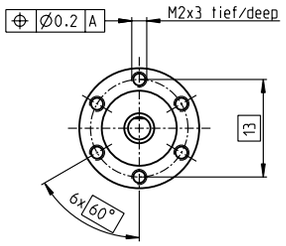
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
RE 16, 2 W	130			40.5	45.6	49.2	49.2	52.8	52.8	56.3	56.3
RE 16, 2 W	130	MR	351/353	46.2	51.3	54.9	54.9	58.5	58.5	62.0	62.0
RE 16, 3.2 W	131/132			58.6	63.7	67.3	67.3	70.9	70.9	74.4	74.4
RE 16, 3.2 W	132	MR	351/353	63.6	68.7	72.3	72.3	75.9	75.9	79.4	79.4
RE 16, 3.2 W	132	MEnc 13	371	64.7	69.8	73.4	73.4	77.0	77.0	80.5	80.5
RE 16, 4.5 W	133/134			61.6	66.7	70.3	70.3	73.9	73.9	77.4	77.4
RE 16, 4.5 W	134	MR	351/353	66.6	71.7	75.3	75.3	78.9	78.9	82.4	82.4
RE 16, 4.5 W	134	MEnc 13	371	67.8	72.9	76.5	76.5	80.1	80.1	83.6	83.6
A-max 16	149-152			43.6	48.7	52.3	52.3	55.9	55.9	59.4	59.4
A-max 16	150/152	MR	351/353	48.6	53.7	57.3	57.3	60.9	60.9	64.4	64.4
A-max 16	150/152	MEnc 13	371	51.7	56.8	60.4	60.4	64.0	64.0	67.5	67.5
EC 16, 30 W	200			58.2	63.3	66.9	66.9	70.5	70.5	74.0	74.0
EC 16, 30 W	200	MR	354	68.9	74.0	77.6	77.6	81.2	81.2	84.7	84.7
EC 16, 60 W	202			74.2	79.3	82.9	82.9	86.5	86.5	90.0	90.0
EC 16, 60 W	202	MR	354	84.9	90.0	93.6	93.6	97.2	97.2	100.7	100.7
EC-max 16, 5 W	221			42.2	47.3	50.9	50.9	54.5	54.5	58.0	58.0
EC-max 16, 5 W	221	MR	354	49.5	54.6	58.2	58.2	61.8	61.8	65.3	65.3
EC-max 16, 8 W	223			54.2	59.3	62.9	62.9	66.5	66.5	70.0	70.0
EC-max 16, 8 W	223	MR	354	61.5	66.6	70.2	70.2	73.8	73.8	77.3	77.3

Planetary Gearhead GP 16 M ∅16 mm, 0.1–0.3 Nm

Sterilizable





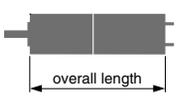
M 1:1

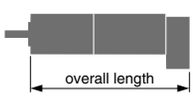
Technical Data

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)	50 N				
Max. force for press fits	100 N				
Direction of rotation, drive to output	=				
Max. continuous input speed	8000 rpm				
Recommended temperature range	0...+80°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

Stock program
Standard program
Special program (on request)

Part Numbers	312908	312910	312913	312916	312917	312920	312922	312925
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	312909	312911	312914		312918	312921	312923	312926
1 Reduction	5.4:1	24:1	104:1		455:1	850:1	1996:1	3728:1
2 Absolute reduction	$^{27}/_{5}$	1539/65	$^{87723}/_{845}$		$^{5000211}/_{10985}$	$^{531441}/_{625}$	$^{285012027}/_{142805}$	$^{30292137}/_{8125}$
3 Max. motor shaft diameter mm	1.5	2	2		2	1.5	2	2
Part Numbers		312912	312915		312919		312924	312927
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
5 Max. continuous torque Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30	0.30
6 Max. intermittent torque at gear output Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450	0.450
7 Max. efficiency %	90	81	73	73	65	65	59	59
8 Weight g	25	28	32	32	36	36	41	41
9 Average backlash no load °	1.4	1.6	2.0	2.0	2.4	2.4	3.0	3.0
10 Mass inertia gcm^2	0.07	0.05	0.05	0.04	0.05	0.05	0.05	0.05
11 Gearhead length L1 mm	20.6	24.2	27.8	27.8	31.4	31.4	35.0	35.0



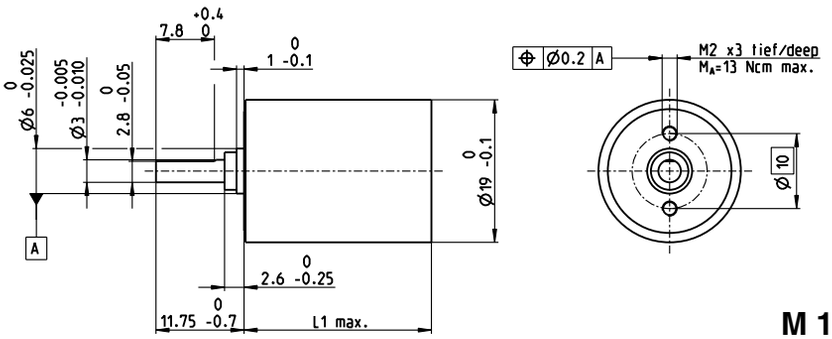


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
EC 16, 30 W, ster.	201			60.6	64.2	67.8	67.8	71.4	71.4	75.0	75.0
EC 16, 60 W, ster.	203			76.6	80.2	83.8	83.8	87.4	87.4	91.0	91.0

	Application	Sterilization information
	Sterilizable Devices	Without shaft seal: typically 1000 autoclave cycles
	Saws	Sterilization with steam
	Surgical Reamers	Temperature 134°C ± 4°C
	Arthroscopic Shavers	Compression pressure up to 2.3 bar
	Surgical Staplers	Rel. humidity 100%
	Dental Tools	Cycle length 18 minutes

Planetary Gearhead GP 19 B ∅19 mm, 0.1–0.3 Nm



M 1:1

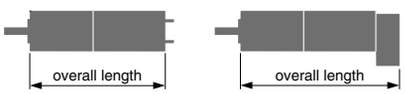
Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.08 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

Stock program
Standard program
Special program (on request)

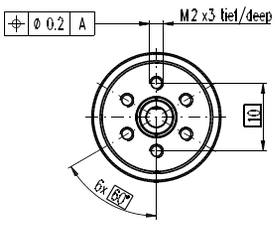
Part Numbers	149039	149041	149044	149047	149048	149051	149053	149056
Gearhead Data								
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Absolute reduction	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter mm	2	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		5000211/10985	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		135005697/54925	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
5 Max. continuous torque Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30	0.30
6 Max. intermittent torque at gear output Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450	0.450
7 Max. efficiency %	90	81	73	73	65	65	59	59
8 Weight g	26	31	36	36	41	41	46	46
9 Average backlash no load °	1.4	1.6	2.0	2.0	2.4	2.4	3.0	3.0
10 Mass inertia gcm²	0.07	0.05	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	30.3



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 19	153/154			44.9	48.5	52.1	52.1	55.7	55.7	59.3	59.3
A-max 19, 1.5 W	154	MR	351/353	50.0	53.6	57.2	57.2	60.8	60.8	64.4	64.4
A-max 19, 1.5 W	154	Enc 22	361	59.3	62.9	66.5	66.5	70.1	70.1	73.7	73.7
A-max 19, 1.5 W	154	MEnc 13	371	52.4	56.0	59.6	59.6	63.2	63.2	66.8	66.8
A-max 19, 2.5 W	155/156			47.5	51.1	54.7	54.7	58.3	58.3	61.9	61.9
A-max 19, 2.5 W	156	MR	351/353	51.8	55.4	59.0	59.0	62.6	62.6	66.2	66.2
A-max 19, 2.5 W	156	Enc 22	361	61.9	65.5	69.1	69.1	72.7	72.7	76.3	76.3
A-max 19, 2.5 W	156	MEnc 13	371	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

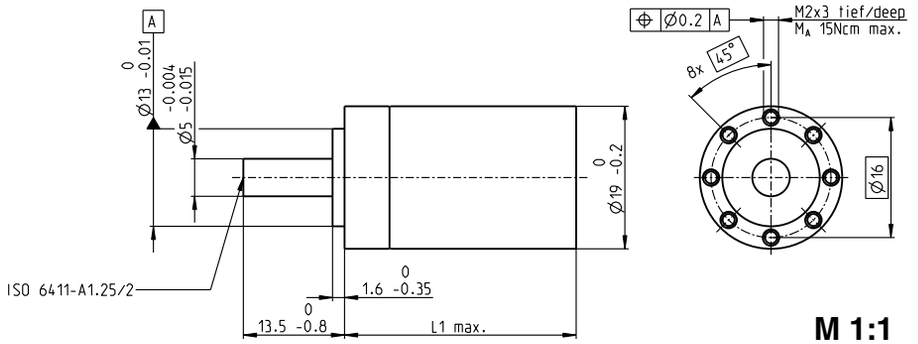
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6 mm from flange	max. 0.08 mm
Axial play at axial load	< 4 N 0 mm
	> 4 N max. 0.05 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	25 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-15…+100°C
Extended range as option	-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 19 M ∅19 mm, 0.1–0.315 Nm

Sterilizable



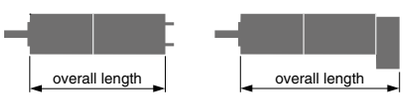
M 1:1

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.08 mm
Axial play	0.10 mm
Max. axial load (dynamic)	50 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	40000 rpm
Recommended temperature range	-10…+100°C
Number of stages	1 2
Max. radial load, 10 mm from flange	20 N 30 N

Stock program
Standard program
Special program (on request)

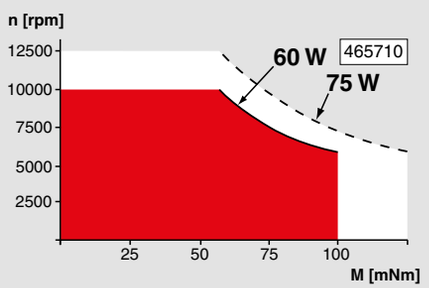
		with shaft seal	Part Numbers 465710	467808	467821	476914	467863
Gearhead Data							
1	Reduction		4:1	5:1	16:1	20:1	25:1
2	Absolute reduction		4/1	5/1	16/1	20/1	25/1
3	Max. motor shaft diameter	mm	3.8	2.7	3.8	2.7	2.7
4	Number of stages		1	1	2	2	2
5	Max. continuous torque	Nm	0.1	0.1	0.315	0.315	0.315
6	Max. intermittent torque at gear output	Nm	0.125	0.125	0.390	0.390	0.390
7	Max. efficiency	%	85	85	80	80	80
8	Weight	g	33	33	54	54	54
9	Average backlash no load	°	1.0	1.0	1.2	1.2	1.2
10	Mass inertia	gcm²	0.16	0.16	0.14	0.14	0.14
11	Gearhead length L1	mm	31.0	31.0	38.5	38.5	38.5
13	Max. transmittable power (continuous)	W	60	60	40	40	40
14	Max. transmittable power (intermittent)	W	75	75	50	50	50



maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
EC 19, 120 W, ster.	206			83.4	83.4	90.9	90.9	90.9

Operating Range (Output shaft)



Comments

Continuous operating
Valid in an ambient temperature of 25 °C and taking account of stage-dependent limits (points 5 and 13). The recommended motor speed must not be exceeded.

Short term operation
Valid in an ambient temperature of 25 °C and taking account of stage-dependent limits (points 6 and 14). This range may be used intermittently and repeatedly. It is defined as follows

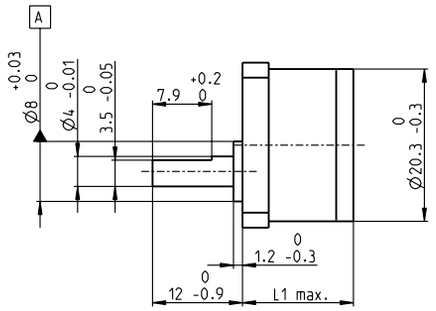
– during max. 1 second
– during max. 10% of the operating cycle

——— max. transferable continuous performance

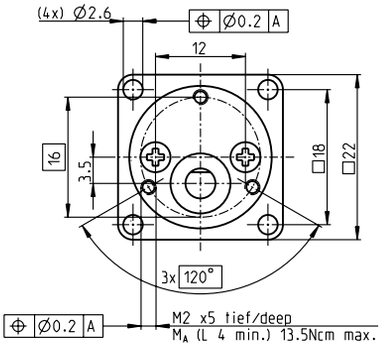
- - - - - max. transferable intermittent performance

Application	Sterilization information	
135°C **Sterilizable Devices**	With shaft seal: typically 2000 autoclave cycles	
Saws	Sterilization with steam	
Surgical Reamers	Temperature	134°C ± 4°C
Arthroscopic Shavers	Compression pressure up to	2.3 bar
Surgical Staplers	Rel. humidity	100 %
Dental Tools	Cycle length	18 minutes

Spur Gearhead GS 20 A ∅20.3 mm, 0.06–0.25 Nm



M 1:1



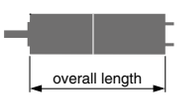
Technical Data

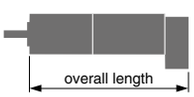
Spur Gearhead					straight teeth
Output shaft					stainless steel, hardened
Bearing at output					sleeve bearing
Radial play, 6 mm from flange					max. 0.1 mm
Axial play					max. 0.3 mm
Max. axial load (dynamic)					8 N
Max. force for press fits					20 N
Max. continuous input speed					8000 rpm
Recommended temperature range					-15…+80°C
Number of stages	2	3	4	5	6
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

			258042	258044	258045	258047	258049
Gearhead Data							
1	Reduction		15:1	36:1	88:1	216:1	532:1
2	Absolute reduction		$^{1696}/_{117}$	$^{54272}/_{1521}$	$^{1736704}/_{19773}$	$^{55574528}/_{257049}$	$^{1778384896}/_{3341637}$
3	Max. motor shaft diameter	mm	2	2	2	2	2
4	Number of stages		2	3	4	5	6
5	Max. continuous torque	Nm	0.06	0.08	0.15	0.20	0.25
6	Max. intermittent torque at gear output	Nm	0.07	0.09	0.18	0.25	0.30
12	Direction of rotation, drive to output		≠	=	≠	=	≠
7	Max. efficiency	%	91	83	75	69	62
8	Weight	g	11.8	13.0	14.3	15.6	16.8
9	Average backlash no load	°	1.6	2.0	2.4	2.8	3.2
10	Mass inertia	gcm²	0.016	0.015	0.015	0.015	0.015
11	Gearhead length L1	mm	23.6	25.8	28.1	30.3	32.6

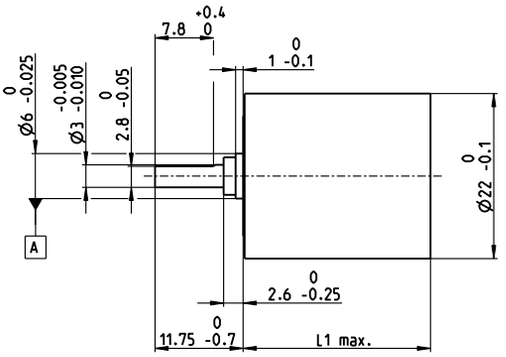


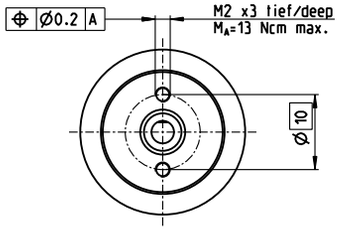


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts				
EC 20 flat, 3 W, A	253			34.1	36.3	38.6	40.8	43.1
EC 20 flat, 3 W, B	253			33.5	35.7	38.0	40.2	42.5
EC 20 flat, 5 W	254			37.7	39.9	42.2	44.4	46.7
EC 20 flat, IE, IP 00	255			40.7	42.9	45.2	47.4	49.7
EC 20 flat, IE, IP 40	255			41.8	44.0	46.3	48.5	50.8
EC 20 flat, IE, IP 00	256			44.7	46.9	49.2	51.4	53.7
EC 20 flat, IE, IP 40	256			45.8	48.0	50.3	52.5	54.8

Planetary Gearhead GP 22 B ∅22 mm, 0.1–0.3 Nm





M 1:1

Technical Data

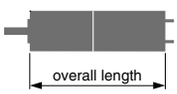
Planetary Gearhead	straight teeth
Housing	steel
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.06 mm
Axial play	0.02–0.10 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-30…+100°C
Extended range as option	-40…+100°C

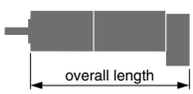
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	8 N	12 N	16 N	20 N	20 N

Stock program
Standard program
Special program (on request)

Part Numbers

	110355	110356	110357	118653	110358	134772	110359	134775
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	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	$^{27}/_{5}$	$^{1539}/_{65}$	$^{87723}/_{845}$		$^{5000211}/_{10985}$	$^{531441}/_{625}$	$^{285012027}/_{142805}$	$^{30292137}/_{8125}$
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
5 Max. continuous torque Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30	0.30
6 Max. intermittent torque at gear output Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450	0.450
7 Max. efficiency %	90	81	73	73	65	65	59	59
8 Weight g	39	48	57	57	65	65	73	73
9 Average backlash no load °	1.4	1.6	2.0	2.0	2.4	2.4	3.0	3.0
10 Mass inertia gcm²	0.07	0.05	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	30.3

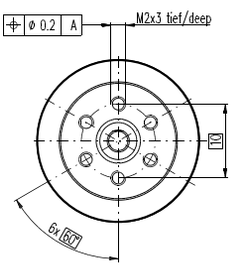




maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 22	157-160			47.9	51.5	55.1	55.1	58.7	58.7	62.3	62.3
A-max 22	158/160	MR	351/353	52.9	56.5	60.1	60.1	63.7	63.7	67.3	67.3
A-max 22	158/160	Enc 22	361	62.3	65.9	69.5	69.5	73.1	73.1	76.7	76.7
A-max 22	158/160	MEnc 13	371	55.0	58.6	62.2	62.2	65.8	65.8	69.4	69.4

Option Ball Bearing



Part Numbers

4.4 : 1	144137	455 : 1	144147
5.4 : 1	144138	561 : 1	144148
19 : 1	144139	690 : 1	144149
24 : 1	144140	850 : 1	144150
29 : 1	144141	1621 : 1	144151
84 : 1	144142	1996 : 1	144152
104 : 1	144143	2458 : 1	144153
128 : 1	144144	3027 : 1	144154
157 : 1	144145	3728 : 1	144155
370 : 1	144146	4592 : 1	144156

Technical Data

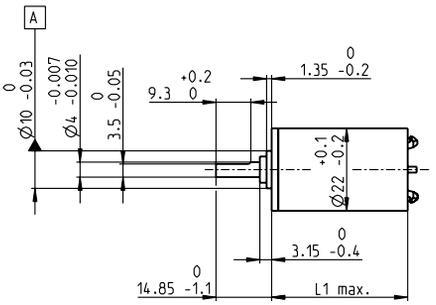
Planetary Gearhead	straight teeth
Housing	steel
Output shaft	stainless steel, hardened
Bearing at output	preloaded ball bearings
Radial play, 6 mm from flange	max. 0.08 mm
Axial play at axial load	< 4 N 0 mm
	> 4 N max. 0.05 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	25 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-15…+100°C
Extended range as option	-40…+100°C

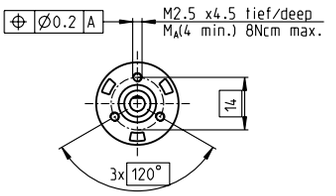
Number of stages	1	2	3	4	5
Max. radial load, 6 mm from flange	10 N	15 N	20 N	20 N	20 N

Gearhead values according to sleeve bearing version

Planetary Gearhead GP 22 L ∅22 mm, 0.2–0.6 Nm

Plastic Version



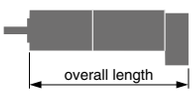


M 1:2

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)

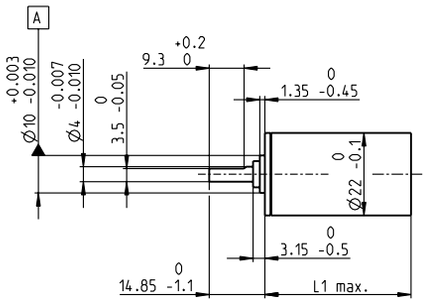
Part Numbers											
	232763	232766	232772	232778	232782	232788	232794	232796	232803	232809	232815
Gearhead Data											
1 Reduction	3.8:1	14:1	53:1	104:1	198:1	370:1	590:1	742:1	1386:1	1996:1	3189:1
2 Absolute reduction	$^{15}/_{4}$	$^{225}/_{16}$	$^{3375}/_{64}$	$^{87723}/_{845}$	$^{50625}/_{256}$	$^{10556001}/_{28561}$	$^{59049}/_{100}$	$^{759375}/_{1024}$	$^{158340015}/_{114244}$	$^{285012027}/_{142805}$	$^{1594323}/_{500}$
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	$^{27}/_{5}$	$^{3249}/_{169}$	$^{48735}/_{676}$	$^{41553}/_{325}$	$^{731025}/_{2704}$	$^{6561}/_{16}$	$^{531441}/_{625}$	$^{10965375}/_{10816}$	$^{98415}/_{64}$	$^{177147}/_{80}$	$^{14348907}/_{3125}$
3 Max. motor shaft diameter mm	2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	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		$^{81}/_{4}$	$^{1215}/_{16}$	$^{19683}/_{125}$	$^{18225}/_{64}$	$^{5000211}/_{10985}$		$^{273375}/_{256}$	$^{60169057}/_{371293}$	$^{135005697}/_{54925}$	
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	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6
6 Max. intermittent torque at gear output Nm	0.3	0.4	0.5	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8
7 Max. efficiency %	84	70	59	59	49	49	49	42	42	42	42
8 Weight g	28	35	43	43	51	51	51	59	59	59	59
9 Average backlash no load °	1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia gcm^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	22.7	29.5	36.3	36.3	43.1	43.1	43.1	49.9	49.9	49.9	49.9

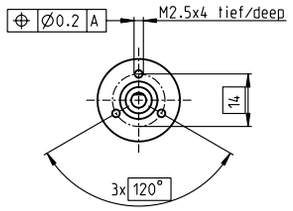


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
A-max 22	157-160			54.7	61.5	68.3	68.3	75.1	75.1	75.1	81.9	81.9	81.9	81.9
A-max 22	158/160	MR	351/353	59.7	66.5	73.3	73.3	80.1	80.1	80.1	86.9	86.9	86.9	86.9
A-max 22	158/160	Enc 22	361	69.1	75.9	82.7	82.7	89.5	89.5	89.5	96.3	96.3	96.3	96.3
A-max 22	158/160	MEnc 13	371	61.8	68.6	75.4	75.4	82.2	82.2	82.2	89.0	89.0	89.0	89.0

Planetary Gearhead GP 22 A ∅22 mm, 0.5–1.0 Nm





M 1:2

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	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter mm	2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	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	13500569/54925	
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	3365793/1300	
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		69255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.5	0.5	0.8	0.8	1.0	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	1.6
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 gcm²	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1* mm	22.6	29.4	36.2	36.2	43.0	43.0	43.0	49.8	49.8	49.8	49.8

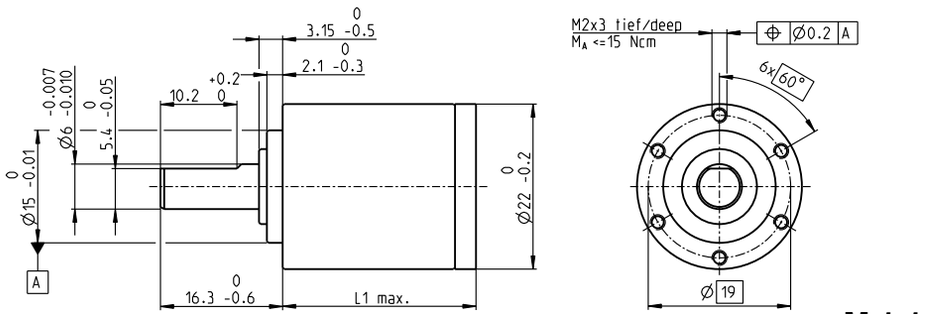
*for EC 32fl. L1 is + 7.1 mm

maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
A-max 19	153/154			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	154	MR	351/353	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	154	Enc 22	361	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	154	MEnc 13	371	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	155/156			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	156	MR	351/353	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	156	Enc 22	361	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	156	MEnc 13	371	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	157-160			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	158/160	MR	351/353	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	158/160	Enc 22	361	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	158/160	MEnc 13	371	61.7	68.5	75.3	75.3	82.1	82.1	82.1	88.9	88.9	88.9	88.9
RE-max 21	179/180			51.6	58.4	65.2	65.2	72.0	72.0	72.0	78.8	78.8	78.8	78.8
RE-max 21, 3.5 W	180	MR	352/354	56.7	63.5	70.3	70.3	77.1	77.1	77.1	83.9	83.9	83.9	83.9
RE-max 21, 6 W	181/182			54.2	61.0	67.8	67.8	74.6	74.6	74.6	81.4	81.4	81.4	81.4
RE-max 21, 6 W	182	MR	352/354	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7	85.7	85.7	85.7
EC 16, 30 W	200			65.5	72.3	79.1	79.1	85.9	85.9	85.9	92.7	92.7	92.7	92.7
EC 16, 30 W	200	MR	354	76.2	83	89.8	89.8	96.6	96.6	96.6	103.4	103.4	103.4	103.4
EC 16, 60 W	202			81.5	88.3	95.1	95.1	101.9	101.9	101.9	108.7	108.7	108.7	108.7
EC 16, 60 W	202	MR	354	92.2	99.0	105.8	105.8	112.6	112.6	112.6	119.4	119.4	119.4	119.4
EC 20 flat, 3 W, A	253			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	253			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	254			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	255			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	255			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	256			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	256			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	257			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 ∅22 mm, 0.50 Nm

for high radial loads



M 1:1

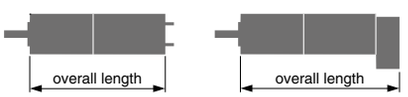
Technical Data

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

Stock program
Standard program
Special program (on request)

Part Numbers

	462695	438992	462696
Gearhead Data			
1 Reduction	3.8:1	4.4:1	5.4:1
2 Absolute reduction	15/4	57/13	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 gcm²	0.5	0.38	0.25
11 Gearhead length L1 mm	25.8	25.8	25.8

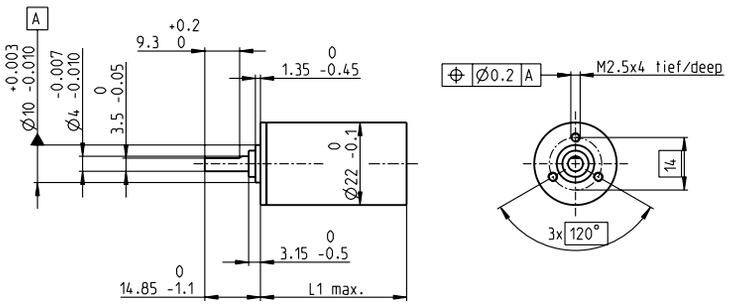


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 25, 20 W	136			68.9	68.9	68.9
RE 25, 20 W	136	MR	355	79.9	79.9	79.9
RE 25, 20 W	136	HED_ 5540	363/366	89.7	89.7	89.7
RE 25, 20 W	136	DCT22	373	91.2	91.2	91.2
RE 25, 20 W	136	AB 28	408	103	103	103
RE 25, 20 W	136	HED_ 5540/AB 28	363/408	120.2	120.2	120.2
EC-max 22, 25 W	225			74.4	74.4	74.4
EC-max 22, 25 W	225	MR	354	84	84	84
EC-max 22, 25 W	225	AB 20	406	110	110	110

Planetary Gearhead GP 22 C ∅22 mm, 0.5–2.0 Nm

Ceramic Version



M 1:2

Technical Data

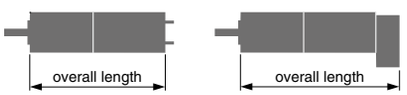
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	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	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	135005697/54925	
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	3365793/1300	
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		69255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.5	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 gcm²	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

*L1 is–2.8 mm for calculating the overall length

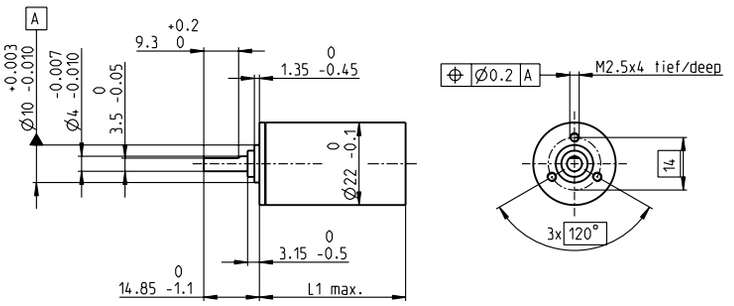


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
A-max 19	153/154			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	154	MR	351/353	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	154	Enc 22	361	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	154	MEnc 13	371	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	155/156			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	156	MR	351/353	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	156	Enc 22	361	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	156	MEnc 13	371	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	157-160			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	158/160	MR	351/353	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	158/160	Enc 22	361	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	158/160	MEnc 13	371	61.7	68.5	75.3	75.3	82.1	82.1	82.1	88.9	88.9	88.9	88.9
RE-max 21	179/180			51.6	58.4	65.2	65.2	72.0	72.0	72.0	78.8	78.8	78.8	78.8
RE-max 21, 3.5 W	180	MR	352/354	56.7	63.5	70.3	70.3	77.1	77.1	77.1	83.9	83.9	83.9	83.9
RE-max 21	181/182			54.2	61.0	67.8	67.8	74.6	74.6	74.6	81.4	81.4	81.4	81.4
RE-max 21, 6 W	182	MR	352/354	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7	85.7	85.7	85.7

Planetary Gearhead GP 22 C ∅22 mm, 0.5–2.0 Nm

Ceramic Version



M 1:2

Technical Data

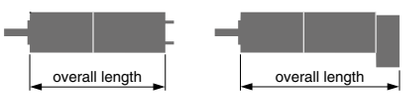
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	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	$^{27}/_{5}$	$^{3249}/_{169}$	$^{48735}/_{676}$	$^{41553}/_{325}$	$^{731025}/_{2704}$	$^{6561}/_{16}$	$^{531441}/_{625}$	$^{10965375}/_{10816}$	$^{98415}/_{64}$	$^{177147}/_{80}$	$^{14348907}/_{3125}$
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		$^{81}/_{4}$	$^{1215}/_{16}$	$^{19683}/_{125}$	$^{18225}/_{64}$	$^{5000211}/_{10985}$		$^{273375}/_{256}$	$^{60169057}/_{371293}$	$^{135005697}/_{54925}$	
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		$^{1539}/_{65}$	$^{185193}/_{2197}$		$^{2777895}/_{8788}$	$^{124659}/_{260}$		$^{41668425}/_{35152}$	$^{15000633}/_{8788}$	$^{3365793}/_{1300}$	
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		$^{729}/_{25}$	$^{4617}/_{52}$		$^{69255}/_{208}$	$^{2368521}/_{4225}$		$^{1038825}/_{832}$	$^{373977}/_{208}$	$^{63950067}/_{21125}$	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.5	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

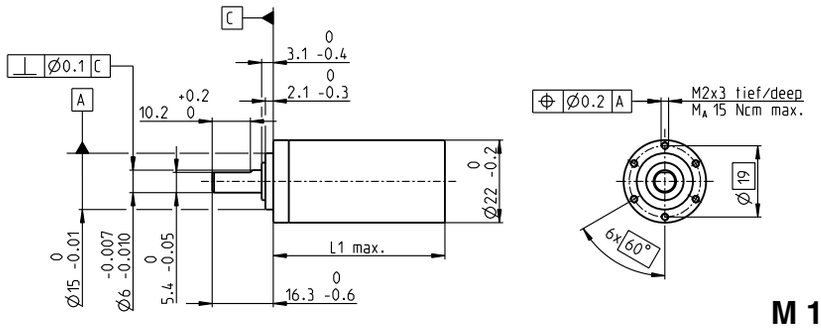


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
EC 16, 60 W	202			81.5	88.3	95.1	95.1	101.9	101.9	101.9	108.7	108.7	108.7	108.7
EC 16, 60 W	202	MR	354	92.2	99.0	105.8	105.8	112.6	112.6	112.6	119.4	119.4	119.4	119.4
EC 22, 40 W	207			70.0	76.8	83.6	83.6	90.4	90.4	90.4	97.2	97.2	97.2	97.2
EC 22, 40 W	207	MR	354	76.0	82.8	89.6	89.6	96.4	96.4	96.4	103.2	103.2	103.2	103.2
EC 22, 100 W	209			88.2	95.0	101.8	101.8	108.6	108.6	108.6	115.4	115.4	115.4	115.4
EC 22, 100 W	209	MR	354	94.2	101.0	107.8	107.8	114.6	114.6	114.6	121.4	121.4	121.4	121.4
EC-max 16, 8 W	223			58.7	65.5	72.3	72.3	79.1	79.1	79.1	85.9	85.9	85.9	85.9
EC-max 16, 8 W	223	MR	354	66.0	72.8	79.6	79.6	86.4	86.4	86.4	93.2	93.2	93.2	93.2
EC-max 22, 12 W	224			57.5	64.3	71.1	71.1	77.9	77.9	77.9	84.7	84.7	84.7	84.7
EC-max 22, 12 W	224	MR	354	67.2	74.0	80.8	80.8	87.6	87.6	87.6	94.4	94.4	94.4	94.4
EC-max 22, 12 W	224	AB 20	406	93.1	99.9	106.7	106.7	113.5	113.5	113.5	120.3	120.3	120.3	120.3
EC 20 flat, 3 W, A	253			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	253			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	254			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	255			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	255			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	256			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	256			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	257			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 HP ∅22 mm, 2.0–3.4 Nm

High Power



M 1:2

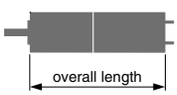
Technical Data

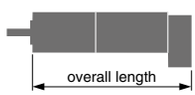
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	12000 rpm
Recommended temperature range	-30…+100°C
Extended range as option	-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

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	15/4	225/16	81/4	3375/64	1215/16	87723/845	50625/256	2777895/8788	6561/16	59049/100
3 Max. motor shaft diameter mm	4	4	4	4	4	3.2	4	3.2	4	4
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	57/13	855/52	1539/65	12825/208	185193/2197	2187/20	192375/832	69255/208	5000211/10985	1121931/1625
3 Max. motor shaft diameter mm	3.2	3.2	3.2	3.2	3.2	4	3.2	3.2	3.2	3.2
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	27/5	3249/169	729/25	48735/676	4617/52	41553/325	731025/2704	10556001/28561	124659/260	531441/625
3 Max. motor shaft diameter mm	2.5	3.2	2.5	3.2	3.2	3.2	3.2	3.2	3.2	2.5
Part Numbers						370786	370796	370801	370806	
1 Reduction						157:1	285:1	389:1	561:1	
2 Absolute reduction						19683/125	18225/64	263169/676	2368521/4225	
3 Max. motor shaft diameter mm						2.5	4	3.2	3.2	
4 Number of stages	1	2	2	3	3	3	4	4	4	4
5 Max. continuous torque Nm	2	2.4	2.4	3	3	3	3.4	3.4	3.4	3.4
6 Max. intermittent torque at gear output Nm	2.5	3	3	3.5	3.5	3.5	3.8	3.8	3.8	3.8
7 Max. efficiency %	84	70	70	59	59	59	49	49	49	49
8 Weight g	51	64	64	78	78	78	91	91	91	91
9 Average backlash no load °	1.0	1.2	1.2	1.6	1.6	1.6	2.0	2.0	2.0	2.0
10 Mass inertia gcm²	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



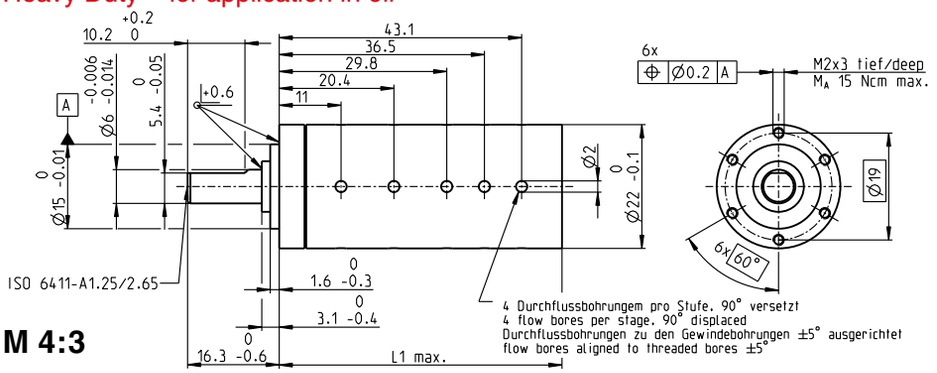


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC 22, 40 W	207			69.9	76.9	76.9	83.6	83.6	83.6	90.3	90.3	90.3	90.3
EC 22, 40 W	207	MR	354	75.9	82.9	82.9	89.6	89.6	89.6	96.3	96.3	96.3	96.3
EC 22, 100 W	209			88.1	95.1	95.1	101.8	101.8	101.8	108.5	108.5	108.5	108.5
EC 22, 100 W	209	MR	354	94.1	101.1	101.1	107.8	107.8	107.8	114.5	114.5	114.5	114.5
EC-max 22, 12 W	224			57.4	64.4	64.4	71.1	71.1	71.1	77.8	77.8	77.8	77.8
EC-max 22, 12 W	224	MR	354	67.0	74.0	74.0	80.7	80.7	80.7	87.4	87.4	87.4	87.4
EC-max 22, 12 W	224	AB 20	406	93.0	100.0	100.0	106.7	106.7	106.7	113.4	113.4	113.4	113.4
EC-max 22, 25 W	225			73.9	80.9	80.9	87.6	87.6	87.6	94.3	94.3	94.3	94.3
EC-max 22, 25 W	225	MR	354	83.5	90.5	90.5	97.2	97.2	97.2	103.9	103.9	103.9	103.9
EC-max 22, 25 W	225	AB 20	406	109.5	116.5	116.5	123.2	123.2	123.2	129.9	129.9	129.9	129.9
EC-4pole 22, 90 W	233			74.0	81.0	81.0	87.7	87.7	87.7	94.4	94.4	94.4	94.4
EC-4pole 22, 90 W	233	HEDL 5540	367	95.5	102.5	102.5	109.2	109.2	109.2	115.9	115.9	115.9	115.9
EC-4pole 22, 120 W	234			91.4	98.4	98.4	105.1	105.1	105.1	111.8	111.8	111.8	111.8
EC-4pole 22, 120 W	234	HEDL 5540	367	112.9	119.9	119.9	126.6	126.6	126.6	133.3	133.3	133.3	133.3

Planetary Gearhead GP 22 HD ∅22 mm, 2.0–4.0 Nm

Heavy Duty – for application in oil



M 4:3

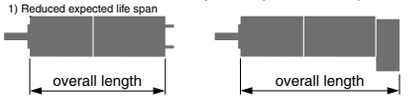
Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.1 mm
Max. axial load (dynamic)	100 N
Max. force for press fits	100 N
Direction of rotation, drive to output	=
Max. continuous input speed	11'000 rpm
Recommended temperature range	-55…+200°C
Extended range as option	-55…+260°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	55 N	85 N	100 N	110 N	110 N

Stock program
Standard program
Special program (on request)

Part Numbers	410657	410637	410558	416698	409667	416709	416738	416211	416747	416753	416760
Gearhead Data (provisional)											
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	41553/325	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	3.2	4	3.2	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	60169205/371293	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		69255/208			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 gcm²	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



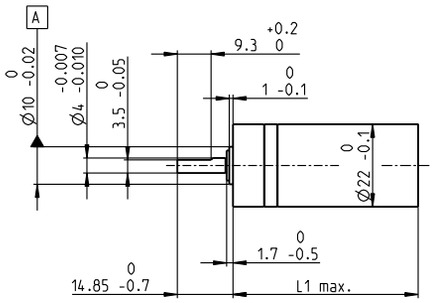
maxon Modular System

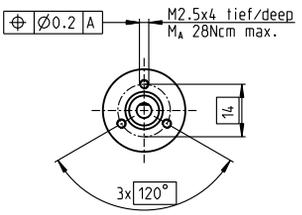
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
EC 22, 240 W, A	212			110.5	119.5	128.0	128.0	135.0	135.0	135.0	141.5	141.5	141.5	141.5
EC 22, 240 W, B	212			98.1	107.5	116.0	116.0	122.4	122.4	122.4	129.5	129.5	129.5	129.5

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	

Planetary Gearhead GP 22 M ∅22 mm, 0.5–2.0 Nm

Sterilizable





M 1:2

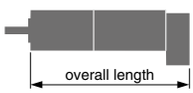
Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.12 mm
Axial play	max. 0.05 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	0…+80°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	20 N	30 N	40 N	40 N	40 N

Stock program
Standard program
Special program (on request)

Part Numbers	305129	305132	305138	305144	305148	305154	305160	305163	305169	305175	305181
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	305130	305133	305139	305145	305149	305155	305161	305164	305170	305176	305182
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	305131	305134	305140	305146	305150	305156	305162	305165	305171	305177	305183
1 Reduction	5.4:1	19:1	72:1	128:1	270:1	410:1	850:1	1014:1	1538:1	2214:1	4592:1
2 Absolute reduction	27/5	3249/169	48735/676	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter mm	2.5	3.2	3.2	3.2	3.2	4	2.5	3.2	4	4	2.5
Part Numbers		305135	305141	305147	305151	305157		305166	305172	305178	
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	135005697/54925	
3 Max. motor shaft diameter mm		4	4	2.5	4	3.2		4	3.2	3.2	
Part Numbers		305136	305142		305152	305158		305167	305173	305179	
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		305137	305143		305153	305159		305168	305174	305180	
1 Reduction		29:1	89:1		333:1	561:1		1249:1	1798:1	3027:1	
2 Absolute reduction		729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages	1	2	3	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm	0.5	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	64	77	90	90	103	103	103	116	116	116	116
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 gcm²	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	35.8	42.6	49.4	49.4	56.2	56.2	56.2	63.0	63.0	63.0	63.0

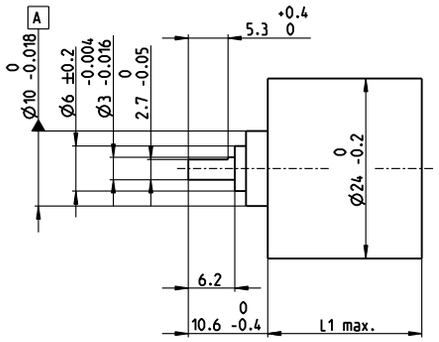


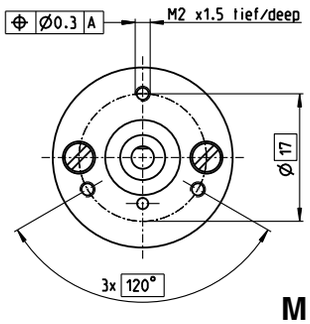
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts										
EC 22, 40 W, ster.	208			80.4	87.2	94.0	94.0	100.8	100.8	100.8	107.6	107.6	107.6	107.6
EC 22, 100 W, ster.	210			98.6	105.4	112.2	112.2	119.0	119.0	119.0	125.8	125.8	125.8	125.8

Application	Sterilization information
135°C Sterilizable Devices	Without shaft seal: typically 1000 autoclave cycles
Saws	Sterilization with steam
Surgical Reamers	Temperature 134°C ± 4°C
Arthroscopic Shavers	Compression pressure up to 2.3 bar
Surgical Staplers	Rel. humidity 100 %
Dental Tools	Cycle length 18 minutes

Spur Gearhead GS 24 A ∅24 mm, 0.1 Nm





M 1:1

Technical Data

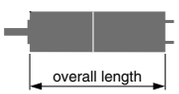
Spur Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 8 mm from flange	max. 0.038 mm
Axial play	0.03–0.30 mm
Max. axial load (dynamic)	8 N
Max. force for press fits	500 N
Max. continuous input speed	4000 rpm
Recommended temperature range	-15…+80°C
Max. radial load, 8 mm from flange	5 N

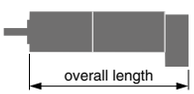
Stock program
Standard program
Special program (on request)

Part Numbers

		110480	110481	110482	110483	110484	110485	110486
Gearhead Data								
1	Reduction	7.2:1	20:1	32:1	64:1	131:1	199:1	325:1
2	Absolute reduction	93/13	753424/38025	923521/28561	837/13	212629/1625	887503681/4455516	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	gcm²	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

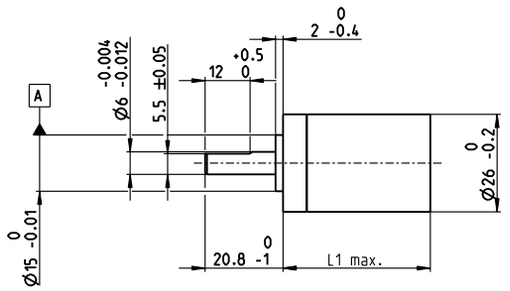


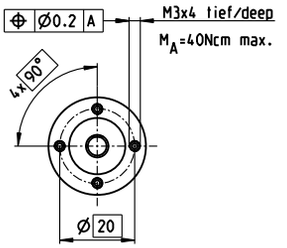


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
A-max 19	153/154			45.5	49.2	49.2	49.2	49.2	53.0	53.0
A-max 19, 1.5 W	154	MR	351/353	50.6	54.3	54.3	54.3	54.3	58.1	58.1
A-max 19, 1.5 W	154	Enc 22	361	59.9	63.6	63.6	63.6	63.6	67.4	67.4
A-max 19, 1.5 W	154	MEnc 13	371	53.0	56.7	56.7	56.7	56.7	60.5	60.5
A-max 19, 2.5 W	155/156			48.1	51.8	51.8	51.8	51.8	55.6	55.6
A-max 19, 2.5 W	156	MR	351/353	52.4	56.1	56.1	56.1	56.1	59.9	59.9
A-max 19, 2.5 W	156	Enc 22	361	62.5	66.2	66.2	66.2	66.2	70.0	70.0
A-max 19, 2.5 W	156	MEnc 13	371	55.6	59.3	59.3	59.3	59.3	63.1	63.1
A-max 22	157-160			45.7	49.4	49.4	49.4	49.4	53.2	53.2
A-max 22	158/160	MR	351/353	50.7	54.4	54.4	54.4	54.4	58.2	58.2
A-max 22	158/160	Enc 22	361	60.1	63.8	63.8	63.8	63.8	67.6	67.6
A-max 22	158/160	MEnc 13	371	52.8	56.5	56.5	56.5	56.5	60.3	60.3

Planetary Gearhead GP 26 A ∅26 mm, 0.75–4.5 Nm





M 1:2

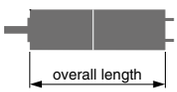
Technical Data

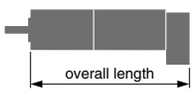
Planetary Gearhead			straight teeth
Output shaft			stainless steel, hardened
Bearing at output			preloaded ball bearings
Radial play, 5 mm from flange			max. 0.1 mm
Axial play at axial load	< 6 N		0 mm
	> 6 N		max. 0.4 mm
Max. axial load (dynamic)			120 N
Max. force for press fits			120 N
Direction of rotation, drive to output			=
Max. continuous input speed			8000 rpm
Recommended temperature range			-30…+100°C
Extended range as option			-40…+100°C
Number of stages	1	2	3
Max. radial load, 12 mm from flange	70 N	110 N	140 N

Stock program
Standard program
Special program (on request)

Part Numbers

	406757	406762	406764	406767	406128	406769	406770	406771	406092
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



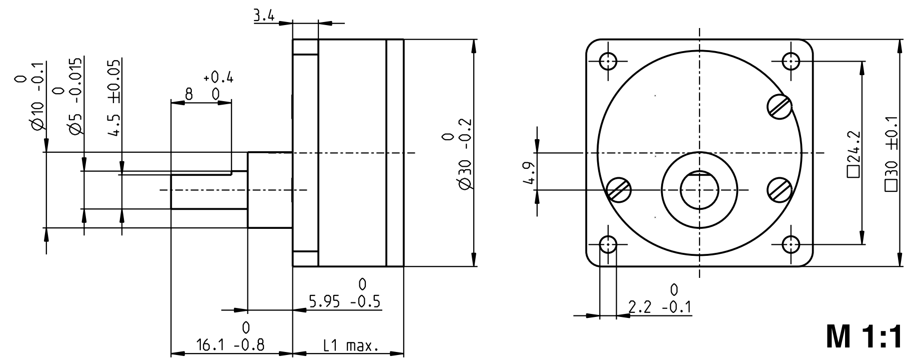


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	135/137			78.0	87.5	87.5	87.5	94.1	94.1	94.1	94.1	94.1
RE 25	135/137	MR	355	89.0	98.5	98.5	98.5	105.1	105.1	105.1	105.1	105.1
RE 25	135/137	Enc 22	361	92.1	101.6	101.6	101.6	108.2	108.2	108.2	108.2	108.2
RE 25	135/137	HED_ 5540	362/364	98.8	108.3	108.3	108.3	114.9	114.9	114.9	114.9	114.9
RE 25	135/137	DCT22	373	100.3	109.8	109.8	109.8	116.4	116.4	116.4	116.4	116.4
RE 25, 20 W	136			66.5	76.0	76.0	76.0	82.6	82.6	82.6	82.6	82.6
RE 25, 20 W	136	MR	355	77.5	87.0	87.0	87.0	93.6	93.6	93.6	93.6	93.6
RE 25, 20 W	136	HED_ 5540	363	87.3	96.8	96.8	96.8	103.4	103.4	103.4	103.4	103.4
RE 25, 20 W	136	DCT 22	373	88.8	98.3	98.3	98.3	104.9	104.9	104.9	104.9	104.9
RE 25, 20 W	136	AB 28	408	100.6	110.1	110.1	110.1	116.7	116.7	116.7	116.7	116.7
RE 25, 20 W	136	HED_5540/AB 28	363/408	117.8	127.3	127.3	127.3	133.9	133.9	133.9	133.9	133.9
RE 25, 20 W	137	AB 28	408	112.1	121.6	121.6	121.6	128.2	128.2	128.2	128.2	128.2
RE 25, 20 W	137	HED_ 5540/AB 28	364/408	129.3	138.8	138.8	138.8	145.4	145.4	145.4	145.4	145.4
A-max 26	161-168			68.2	77.7	77.7	77.7	84.3	84.3	84.3	84.3	84.3
A-max 26	161-168	MEnc 13	372	75.3	84.8	84.8	84.8	91.4	91.4	91.4	91.4	91.4
A-max 26	161-168	MR	355	77.0	86.5	86.5	86.5	93.1	93.1	93.1	93.1	93.1
A-max 26	161-168	Enc 22	361	82.6	92.1	92.1	92.1	98.7	98.7	98.7	98.7	98.7
A-max 26	161-168	HED_ 5540	363/365	86.6	96.1	96.1	96.1	102.7	102.7	102.7	102.7	102.7

Spur Gearhead GS 30 A ∅30 mm, 0.07–0.2 Nm

maxon gear



M 1:1

Technical Data

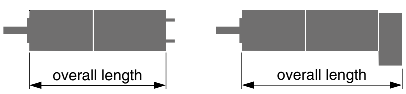
Spur Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.1 mm
Axial play	0.03–0.2 mm
Max. axial load (dynamic)	15 N
Max. force for press fits	400 N
Max. continuous input speed	5000 rpm
Recommended temperature 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			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	gcm²	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



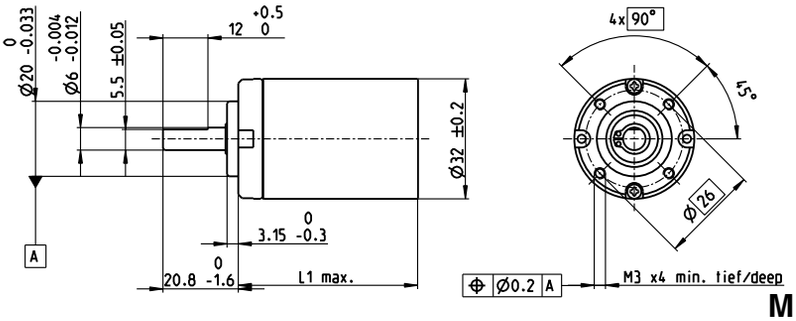
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts					
A-max 26	161-168			67.8	67.8	70.3	70.3	75.3	75.3
A-max 26	161-168	MEnc 13	372	74.9	74.9	77.4	77.4	82.4	82.4
A-max 26	161-168	MR	355	76.6	76.6	79.1	79.1	84.1	84.1
A-max 26	161-168	Enc 22	361	82.2	82.2	84.7	84.7	89.7	89.7
A-max 26	161-168	HED_ 5540	363/365	86.2	86.2	88.7	88.7	93.7	93.7

October 2015 edition / subject to change

Planetary Gearhead GP 32 BZ ∅32 mm, 0.75–4.5 Nm

Low Backlash



M 1:2

Technical Data

Planetary Gearhead	straight teeth		
Output shaft	stainless steel, hardened		
Bearing at output	ball bearing		
Radial play, 5 mm from flange	max. 0.1 mm		
Axial play	max. 0.7 mm		
Max. axial load (dynamic)	120 N		
Max. force for press fits	120 N		
Direction of rotation, drive to output	=		
Max. continuous input speed	4000 rpm		
Recommended temperature range	-40...+100°C		
Number of stages	1	2	3
Max. radial load, 12 mm from flange	70 N	110 N	130 N

Stock program
Standard program
Special program (on request)

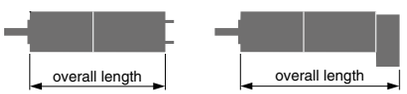
Part Numbers

	358975	351942	358331	357988	358335	358385	358512	358513	358515	358516

Gearhead Data

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	gcm²	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

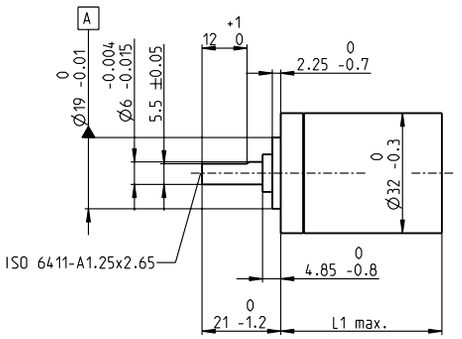
*for EC 32 L1 is + 6.4 mm, for RE 30 L1 is + 1.0 mm

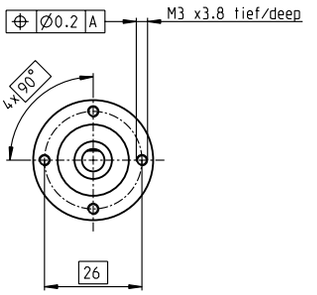


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
RE 25	135/137			88.1	88.1	98.2	98.2	98.2	107.7	107.7	107.7	107.7	107.7
RE 25	135/137	MR	355	99.1	99.1	109.2	109.2	109.2	118.7	118.7	118.7	118.7	118.7
RE 25	135/137	Enc 22	361	102.2	102.2	112.3	112.3	112.3	121.8	121.8	121.8	121.8	121.8
RE 25	135/137	HED_ 5540	362/364	108.9	108.9	119.0	119.0	119.0	128.5	128.5	128.5	128.5	128.5
RE 25	135/137	DCT 22	373	110.4	110.4	120.5	120.5	120.5	130.0	130.0	130.0	130.0	130.0
RE 25, 20 W	136			76.6	76.6	86.7	86.7	86.7	96.2	96.2	96.2	96.2	96.2
RE 25, 20 W	136	MR	355	87.6	87.6	97.7	97.7	97.7	107.2	107.2	107.2	107.2	107.2
RE 25, 20 W	136	HED_ 5540	363/364	97.4	97.4	107.5	107.5	107.5	117.0	117.0	117.0	117.0	117.0
RE 25, 20 W	136	DCT 22	373	98.9	98.9	109.0	109.0	109.0	118.5	118.5	118.5	118.5	118.5
RE 25, 20 W	136	AB 28	408	110.7	110.7	120.8	120.8	120.8	130.3	130.3	130.3	130.3	130.3
RE 25, 20 W	136	HED_ 5540/AB 28	363/408	127.9	127.9	138.0	138.0	138.0	147.5	147.5	147.5	147.5	147.5
RE 25, 20 W	137	AB 28	408	122.2	122.2	132.3	132.3	132.3	141.8	141.8	141.8	141.8	141.8
RE 25, 20 W	137	HED_ 5540/AB 28	362/408	139.4	139.4	149.5	149.5	149.5	159.0	159.0	159.0	159.0	159.0
RE 30, 60 W	139			102.6	102.6	112.7	112.7	112.7	122.2	122.2	122.2	122.2	122.2
RE 30, 60 W	139	MR	356	114.0	114.0	124.1	124.1	124.1	133.6	133.6	133.6	133.6	133.6
RE 30, 60 W	139	HED_ 5540	362/364	123.4	123.4	133.5	133.5	133.5	143.0	143.0	143.0	143.0	143.0
RE 35, 90 W	140			104.6	104.6	114.7	114.7	114.7	124.2	124.2	124.2	124.2	124.2
RE 35, 90 W	140	MR	356	116.0	116.0	126.1	126.1	126.1	135.6	135.6	135.6	135.6	135.6
RE 35, 90 W	140	HED_ 5540	362/364	125.3	125.3	135.4	135.4	135.4	144.9	144.9	144.9	144.9	144.9
RE 35, 90 W	140	DCT 22	373	122.7	122.7	132.8	132.8	132.8	142.3	142.3	142.3	142.3	142.3
RE 35, 90 W	140	AB 28	408	140.7	140.7	150.8	150.8	150.8	160.3	160.3	160.3	160.3	160.3
RE 35, 90 W	140	HEDS 5540/AB 28	362/408	157.9	157.9	168.0	168.0	168.0	177.5	177.5	177.5	177.5	177.5
A-max 26	161-168			78.3	78.3	88.4	88.4	88.4	97.9	97.9	97.9	97.9	97.9
A-max 26	162-168	MEnc 13	372	85.4	85.4	95.5	95.5	95.5	105.0	105.0	105.0	105.0	105.0
A-max 26	162-168	MR	355	87.1	87.1	97.2	97.2	97.2	106.7	106.7	106.7	106.7	106.7
A-max 26	162-168	Enc 22	361	92.7	92.7	102.8	102.8	102.8	112.3	112.3	112.3	112.3	112.3
A-max 26	162-168	HED_ 5540	363/365	96.7	96.7	106.8	106.8	106.8	116.3	116.3	116.3	116.3	116.3
A-max 32	169/171			96.5	96.5	106.6	106.6	106.6	116.1	116.1	116.1	116.1	116.1
A-max 32	170/172			95.1	95.1	105.2	105.2	105.2	114.7	114.7	114.7	114.7	114.7
A-max 32	170/172	MR	356	106.3	106.3	116.4	116.4	116.4	125.9	125.9	125.9	125.9	125.9
A-max 32	170/172	HED_ 5540	363/364	115.9	115.9	126.0	126.0	126.0	135.5	135.5	135.5	135.5	135.5
EC 32, 80 W	214			100.2	100.2	110.3	110.3	110.3	119.8	119.8	119.8	119.8	119.8
EC 32, 80 W	214	HED_ 5540	363/366	118.6	118.6	128.7	128.7	128.7	138.2	138.2	138.2	138.2	138.2
EC 32, 80 W	214	Res 26	374	120.3	120.3	130.4	130.4	130.4	139.9	139.9	139.9	139.9	139.9
MCD EPOS, 60 W	403			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	403			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 ∅32 mm, 0.75–4.5 Nm





M 1:2

Technical Data

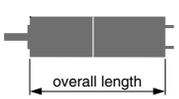
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-40...+100°C

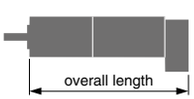
Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	90 N	140 N	200 N	220 N	220 N

Option: Low-noise version

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	$^{26}/_{7}$	$^{676}/_{49}$	$^{529}/_{16}$	$^{17576}/_{343}$	$^{13824}/_{125}$	$^{421824}/_{1715}$	$^{86112}/_{175}$	$^{19044}/_{25}$	$^{10123776}/_{8575}$	$^{8626176}/_{4375}$	$^{495144}/_{175}$	$^{109503}/_{25}$
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	$^{24}/_{5}$	$^{624}/_{35}$		$^{16224}/_{245}$	$^{6877}/_{56}$	$^{101062}/_{343}$	$^{331776}/_{625}$	$^{36501}/_{40}$	$^{2425488}/_{1715}$	$^{536406}/_{245}$	$^{1907712}/_{625}$	$^{839523}/_{160}$
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		$^{138}/_{5}$		$^{3588}/_{35}$	$^{12167}/_{64}$	$^{89401}/_{196}$	$^{158171}/_{224}$		$^{2238912}/_{1225}$	$^{2056223}/_{784}$	$^{3637933}/_{896}$	
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	4	5	5	5	5
5 Max. continuous torque Nm	0.75	2.25	2.25	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
6 Max. intermittent torque at gear output Nm	1.1	3.4	3.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	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	1.0
10 Mass inertia gcm²	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1 mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5

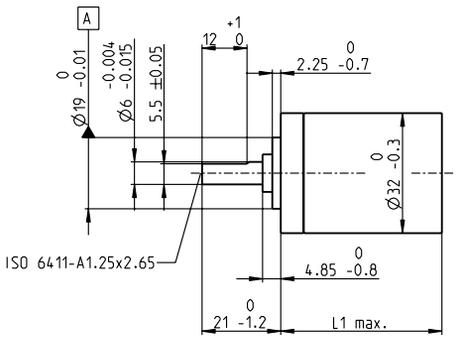


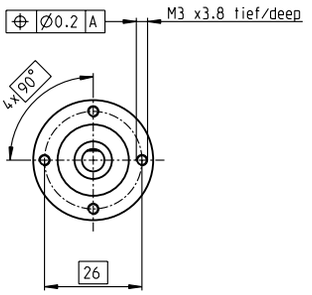


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
RE 25	135/137			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	135/137	MR	355	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	135/137	Enc 22	361	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	135/137	HED_ 5540	362/364	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	135/137	DCT 22	373	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	136			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	136	MR	355	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	136	HED_ 5540	363/366	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	136	DCT22	373	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	136	AB 28	408	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	136	HED_ 5540/AB 28	363/408	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	137	AB 28	408	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	137	HED_ 5540/AB 28	362/408	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	161-168			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	162-168	MEnc 13	372	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	162-168	MR	355	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	162-168	Enc 22	361	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	162-168	HED_ 5540	363/365	89.7	99.6	99.6	106.3	106.3	113.0	113.0	113.0	119.7	119.7	119.7	119.7
RE-max 29	183-186			71.3	81.2	81.2	87.9	87.9	94.6	94.6	94.6	101.3	101.3	101.3	101.3
RE-max 29	184/186	MR	355	80.1	90.0	90.0	96.7	96.7	103.4	103.4	103.4	110.1	110.1	110.1	110.1

Planetary Gearhead GP 32 A ∅32 mm, 0.75–4.5 Nm





M 1:2

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	6000 rpm
Recommended temperature range	-40…+100°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	90 N	140 N	200 N	220 N	220 N

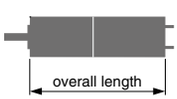
Option: Low-noise version

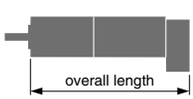
maxon gear

Stock program
Standard program
Special program (on request)

Part Numbers	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	$^{26}/_{7}$	$^{676}/_{49}$	$^{529}/_{16}$	$^{17576}/_{343}$	$^{13824}/_{125}$	$^{421824}/_{1715}$	$^{86112}/_{175}$	$^{19044}/_{25}$	$^{10123776}/_{8575}$	$^{8626176}/_{4375}$	$^{495144}/_{175}$	$^{109503}/_{25}$
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	$^{24}/_{5}$	$^{624}/_{35}$		$^{16224}/_{245}$	$^{6877}/_{56}$	$^{101062}/_{343}$	$^{331776}/_{625}$	$^{36501}/_{40}$	$^{2425488}/_{1715}$	$^{536406}/_{245}$	$^{1907712}/_{625}$	$^{839523}/_{160}$
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	$^{23}/_{4}$	$^{299}/_{14}$		$^{3887}/_{49}$	$^{3312}/_{25}$	$^{38976}/_{1225}$	$^{20631}/_{35}$	$^{279841}/_{256}$	$^{9345024}/_{6125}$	$^{2066688}/_{875}$	$^{474513}/_{140}$	$^{6436343}/_{1024}$
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		$^{138}/_{5}$		$^{3588}/_{35}$	$^{12167}/_{64}$	$^{89401}/_{196}$	$^{158171}/_{224}$		$^{2238912}/_{1225}$	$^{2056223}/_{784}$	$^{3637933}/_{896}$	
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	4	5	5	5	5
5 Max. continuous torque Nm	0.75	2.25	2.25	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
6 Max. intermittent torque at gear output Nm	1.1	3.4	3.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	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	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	0.7
11 Gearhead length L1* mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5

*for EC 32 flat L1 is + 2.0 mm





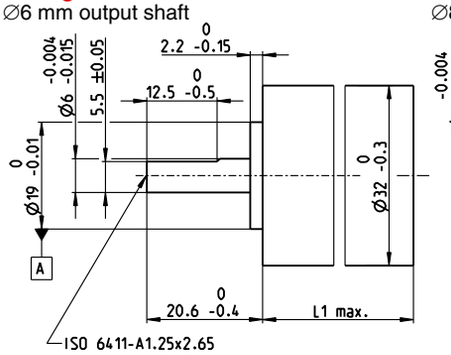
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts												
RE 30, 15 W	138			94.6	104.5	104.5	111.2	111.2	117.9	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 15 W	138	MR	356	106.0	115.9	115.9	122.6	122.6	129.3	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 15 W	138	HED_ 5540	362/364	115.4	125.3	125.3	132.0	132.0	138.7	138.7	138.7	145.4	145.4	145.4	145.4
RE 30, 60 W	139			94.6	104.5	104.5	111.2	111.2	117.9	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 60 W	139	MR	356	106.0	115.9	115.9	122.6	122.6	129.3	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 60 W	139	HED_ 5540	362/364	115.4	125.3	125.3	132.0	132.0	138.7	138.7	138.7	145.4	145.4	145.4	145.4
RE 35, 90 W	140			97.6	107.5	107.5	114.2	114.2	120.9	120.9	120.9	127.6	127.6	127.6	127.6
RE 35, 90 W	140	MR	356	109.0	118.9	118.9	125.6	125.6	132.3	132.3	132.3	139.0	139.0	139.0	139.0
RE 35, 90 W	140	HED_ 5540	362/364	118.3	128.2	128.2	134.9	134.9	141.6	141.6	141.6	148.3	148.3	148.3	148.3
RE 35, 90 W	140	DCT 22	373	115.7	125.6	125.6	132.3	132.3	139.0	139.0	139.0	145.7	145.7	145.7	145.7
RE 35, 90 W	140	AB 28	408	133.7	143.6	143.6	150.3	150.3	157.0	157.0	157.0	163.7	163.7	163.7	163.7
RE 35, 90 W	140	HEDS 5540/AB 28	362/408	150.9	160.8	160.8	167.5	167.5	174.2	174.2	174.2	180.9	180.9	180.9	180.9
A-max 32	169/171			89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
A-max 32	170/172			88.1	98.0	98.0	104.7	104.7	111.4	111.4	111.4	118.1	118.1	118.1	118.1
A-max 32	170/172	MR	356	99.3	109.2	109.2	115.9	115.9	122.6	122.6	122.6	129.3	129.3	129.3	129.3
A-max 32	170/172	HED_ 5540	363/365	108.9	118.8	118.8	125.5	125.5	132.2	132.2	132.2	138.9	138.9	138.9	138.9
EC 32, 80 W	214			86.6	96.5	96.5	103.2	103.2	109.9	109.9	109.9	116.6	116.6	116.6	116.6
EC 32, 80 W	214	HED_ 5540	363/366	105.0	114.9	114.9	121.6	121.6	128.3	128.3	128.3	135.0	135.0	135.0	135.0
EC 32, 80 W	214	Res 26	374	106.7	116.6	116.6	123.3	123.3	130.0	130.0	130.0	136.7	136.7	136.7	136.7
EC 32 flat, 15 W	258			44.5	54.4	54.4	61.1	61.1	67.8	67.8	67.8	74.5	74.5	74.5	74.5
EC 32 flat, IE, IP 00	259			54.6	64.5	64.5	71.2	71.2	77.9	77.9	77.9	84.6	84.6	84.6	84.6
EC 32 flat, IE, IP 40	259			56.3	66.2	66.2	72.9	72.9	79.6	79.6	79.6	86.3	86.3	86.3	86.3

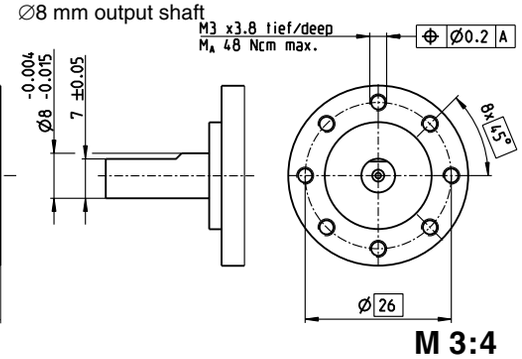
Planetary Gearhead GP 32 AR ∅32 mm, 0.75 Nm

for high radial loads

∅6 mm output shaft



∅8 mm output shaft



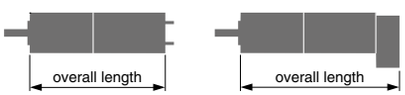
M 3:4

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
Gearhead Data			
1 Reduction	3.7:1	4.8:1	5.8:1
2 Absolute reduction	26/7	24/5	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	26/7	24/5	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 gcm²	1.6	0.9	0.6
11 Gearhead length L1 mm	26.2	26.2	26.2

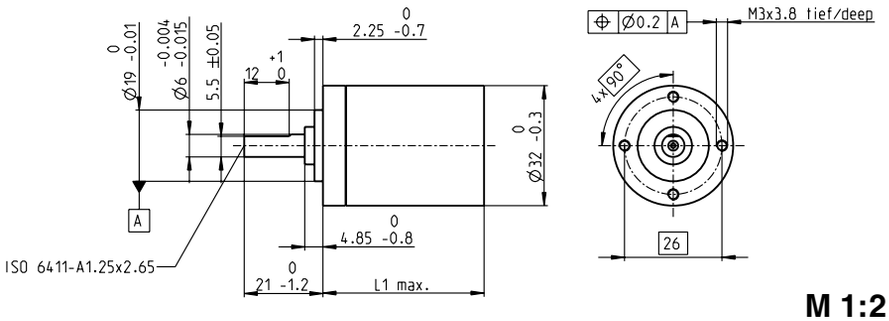


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 30, 60 W	139			94.3	94.3	94.3
RE 30, 60 W	139	MR	356	105.7	105.7	105.7
RE 30, 60 W	139	HED_5540	362/366	115.1	115.1	115.1
RE 35, 90 W	140			97.3	97.3	97.3
RE 35, 90 W	140	MR	356	108.7	108.7	108.7
RE 35, 90 W	140	HED_5540	362/366	118.0	118.0	118.0
RE 35, 90 W	140	DCT22	373	115.4	115.4	115.4
RE 35, 90 W	140	AB 28	408	133.4	133.4	133.4
RE 35, 90 W	140	HED_ 5540/AB 28	362/408	150.5	150.5	150.5
EC 32, 80 W	214			86.3	86.3	86.3
EC 32, 80 W	214	HED_5540	363/365	104.7	104.7	104.7
EC 32, 80 W	214	Res 26	374	106.4	106.4	106.4

Planetary Gearhead GP 32 C ∅32 mm, 1.0–6.0 Nm

Ceramic Version



M 1:2

Technical Data

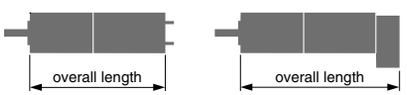
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40…+100°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	90 N	140 N	200 N	220 N	220 N

Option: Low-noise version

Stock program
Standard program
Special program (on request)

Part Numbers	166930	166933	166938	166939	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	$^{24}/_{5}$	$^{624}/_{35}$		$^{16224}/_{245}$	$^{6877}/_{56}$	$^{101062}/_{343}$	$^{331776}/_{625}$	$^{36501}/_{40}$	$^{2425488}/_{1715}$	$^{536406}/_{245}$	$^{1907712}/_{625}$	$^{839523}/_{160}$
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	$^{23}/_{4}$	$^{299}/_{14}$		$^{3887}/_{49}$	$^{3312}/_{25}$	$^{389376}/_{1225}$	$^{20631}/_{35}$	$^{279841}/_{256}$	$^{9345024}/_{6125}$	$^{2066688}/_{875}$	$^{474513}/_{140}$	$^{6436343}/_{1024}$
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	4	5	5	5	5
5 Max. continuous torque Nm	1	3	3	6	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	7.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	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	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	0.7
11 Gearhead length L1 mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5

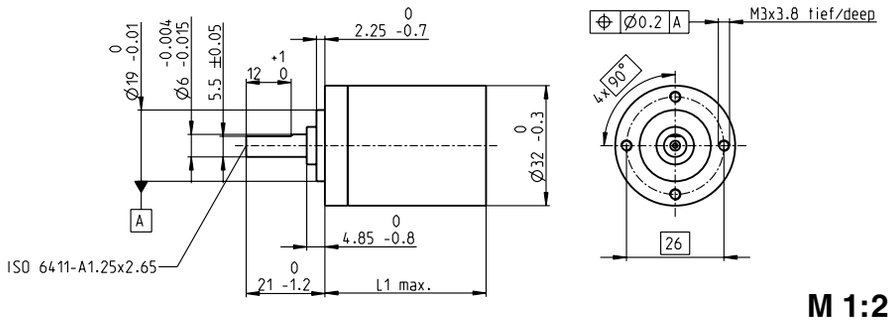


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
RE 25, 10 W	135/137			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, 10 W	135/137	MR	355	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, 10 W	135/137	Enc 22	361	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, 10 W	135/137	HED_ 5540	362/364	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, 10 W	135/137	DCT 22	373	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	136			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	136	MR	355	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	136	HED_ 5540	363/366	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	136	DCT22	373	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	136	AB 28	408	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	136	HED_ 5540/AB 28	363/408	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	137	AB 28	408	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	137	HED_5540/AB 28	408	132.4	142.3	142.3	149.0	149.0	155.7	155.7	155.7	162.4	162.4	162.4	162.4
RE 30, 60 W	139			94.6	104.5	104.5	111.2	111.2	117.9	117.9	117.9	124.6	124.6	124.6	124.6
RE 30, 60 W	139	MR	356	106.0	115.9	115.9	122.6	122.6	129.3	129.3	129.3	136.0	136.0	136.0	136.0
RE 30, 60 W	139	HED_ 5540	362/364	115.4	125.3	125.3	132.0	132.0	138.7	138.7	138.7	145.4	145.4	145.4	145.4
RE 35, 90 W	140			97.6	107.5	107.5	114.2	114.2	120.9	120.9	120.9	127.6	127.6	127.6	127.6
RE 35, 90 W	140	MR	356	109.0	118.9	118.9	125.6	125.6	132.3	132.3	132.3	139.0	139.0	139.0	139.0
RE 35, 90 W	140	HED_ 5540	362/364	118.3	128.2	128.2	134.9	134.9	141.6	141.6	141.6	148.3	148.3	148.3	148.3
RE 35, 90 W	140	DCT 22	374	115.7	125.6	125.6	132.3	132.3	139.0	139.0	139.0	145.7	145.7	145.7	145.7
RE 35, 90 W	140	AB 28	408	133.7	143.6	143.6	150.3	150.3	157.0	157.0	157.0	163.7	163.7	163.7	163.7
RE 35, 90 W	140	HEDS 5540/AB 28	362/408	150.9	160.8	160.8	167.5	167.5	174.2	174.2	174.2	180.9	180.9	180.9	180.9
A-max 26	161-168			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	162-168	MEnc 13	372	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	162-168	MR	355	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	162-168	Enc 22	361	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	162-168	HED_ 5540	363/365	89.7	99.6	99.6	106.3	106.3	113.0	113.0	113.0	119.7	119.7	119.7	119.7
A-max 32	169/171			89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
A-max 32	170/172			88.1	98.0	98.0	104.7	104.7	111.4	111.4	111.4	118.1	118.1	118.1	118.1
A-max 32	170/172	MR	356	99.3	109.2	109.2	115.9	115.9	122.6	122.6	122.6	129.3	129.3	129.3	129.3
A-max 32	170/172	HED_ 5540	363/365	108.9	118.8	118.8	125.5	125.5	132.2	132.2	132.2	138.9	138.9	138.9	138.9

Planetary Gearhead GP 32 C ∅32 mm, 1.0–6.0 Nm

Ceramic Version



M 1:2

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	90 N	140 N	200 N	220 N	220 N

Option: Low-noise version

Stock program
Standard program
Special program (on request)

Part Numbers	166930	166933	166938	166939	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	$^{24}/_{5}$	$^{624}/_{35}$		$^{16224}/_{245}$	$^{6877}/_{56}$	$^{101062}/_{343}$	$^{331776}/_{625}$	$^{36501}/_{40}$	$^{2425488}/_{1715}$	$^{536406}/_{245}$	$^{1907712}/_{625}$	$^{839523}/_{160}$
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	$^{23}/_{4}$	$^{299}/_{14}$		$^{3887}/_{49}$	$^{3312}/_{25}$	$^{389376}/_{1225}$	$^{20631}/_{35}$	$^{279841}/_{256}$	$^{9345024}/_{6125}$	$^{2066688}/_{875}$	$^{474513}/_{140}$	$^{6436343}/_{1024}$
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	4	5	5	5	5
5 Max. continuous torque Nm	1	3	3	6	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	7.5
7 Max. efficiency %	80	75	75	70	70	60	60	60	50	50	50	50
8 Weight g	118	162	162	194	194	226	226	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	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	0.7
11 Gearhead length L1 mm	26.5	36.4	36.4	43.1	43.1	49.8	49.8	49.8	56.5	56.5	56.5	56.5

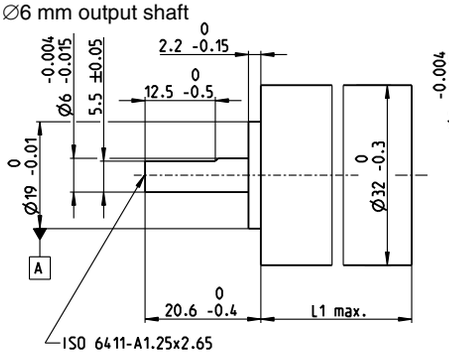
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts											
RE-max 29	183-186			71.3	81.2	81.2	87.9	87.9	94.6	94.6	94.6	101.3	101.3	101.3	101.3
RE-max 29	184/186	MR	355	80.1	90.0	90.0	96.7	96.7	103.4	103.4	103.4	110.1	110.1	110.1	110.1
EC 32, 80 W	214			86.6	96.5	96.5	103.2	103.2	109.9	109.9	109.9	116.6	116.6	116.6	116.6
EC 32, 80 W	214	HED_ 5540	363/366	105.0	114.9	114.9	121.6	121.6	128.3	128.3	128.3	135.0	135.0	135.0	135.0
EC 32, 80 W	214	Res 26	374	106.7	116.6	116.6	123.3	123.3	130.0	130.0	130.0	136.7	136.7	136.7	136.7
EC-max 22, 25 W	225			75.1	85.0	85.0	91.7	91.7	98.4	98.4	98.4	105.1	105.1	105.1	105.1
EC-max 22, 25 W	225	MR	354	84.8	94.7	94.7	101.4	101.4	108.1	108.1	108.1	114.8	114.8	114.8	114.8
EC-max 22, 25 W	225	AB 20	406	110.7	120.5	120.5	127.2	127.2	133.9	133.9	133.9	140.6	140.6	140.6	140.6
EC-max 30, 40 W	226			68.9	78.8	78.8	85.5	85.5	92.2	92.2	92.2	98.9	98.9	98.9	98.9
EC-max 30, 40 W	226	MR	355	81.1	91.0	91.0	97.7	97.7	104.4	104.4	104.4	111.1	111.1	111.1	111.1
EC-max 30, 40 W	226	HEDL 5540	365	89.5	99.4	99.4	106.1	106.1	112.8	112.8	112.8	119.5	119.5	119.5	119.5
EC-max 30, 40 W	226	AB 20	406	104.5	114.4	114.4	121.1	121.1	127.8	127.8	127.8	134.5	134.5	134.5	134.5
EC-max 30, 40 W	226	HEDL 5540/AB 20	366/406	125.1	135.0	135.0	141.7	141.7	148.4	148.4	148.4	155.1	155.1	155.1	155.1
EC-max 30, 60 W	227			90.9	100.8	100.8	107.4	107.4	114.7	114.7	114.7	120.8	120.8	120.8	120.8
EC-max 30, 60 W	227	MR	355	103.1	113.0	113.0	119.7	119.7	126.4	126.4	126.4	133.1	133.1	133.1	133.1
EC-max 30, 60 W	227	HEDL 5540	366	111.5	121.4	121.4	128.0	128.0	134.7	134.7	134.7	141.4	141.4	141.4	141.4
EC-max 30, 60 W	227	AB 20	406	126.5	136.4	136.4	143.0	143.0	149.7	149.7	149.7	156.4	156.4	156.4	156.4
EC-max 30, 60 W	227	HEDL 5540/AB 20	366/406	147.9	157.2	157.2	163.8	163.8	170.5	170.5	170.5	177.2	177.2	177.2	177.2
EC-4pole 22, 90 W	233			75.2	85.1	85.1	91.8	91.8	98.5	98.5	98.5	105.2	105.2	105.2	105.2
EC-4pole 22, 90 W	233	HEDL 5540	367	96.7	106.6	106.6	113.3	113.3	120.0	120.0	120.0	126.7	126.7	126.7	126.7
EC-4pole 22, 120 W	234			92.6	102.5	102.5	109.2	109.2	115.9	115.9	115.9	122.6	122.6	122.6	122.6
EC-4pole 22, 120 W	234	HEDL 5540	367	114.1	124.0	124.0	130.7	130.7	137.4	137.4	137.4	144.1	144.1	144.1	144.1
EC 32 flat, 15 W	258			44.5	54.4	54.4	61.1	61.1	67.8	67.8	67.8	74.5	74.5	74.5	74.5
EC 32 flat IE, IP 00	259			54.6	64.5	64.5	71.2	71.2	77.9	77.9	77.9	84.6	84.6	84.6	84.6
EC 32 flat IE, IP 40	259			56.3	66.2	66.2	72.9	72.9	79.6	79.6	79.6	86.3	86.3	86.3	86.3
EC-i 40, 50 W	243			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	243	16 EASY	345/346	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	243	HEDL 5540	367	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	245			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	245	16 EASY	345/346	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	245	HEDL 5540	366	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	403			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	403			150.2	160.1	160.1	166.8	166.8	173.5	173.5	173.5	180.2	180.2	180.2	180.2

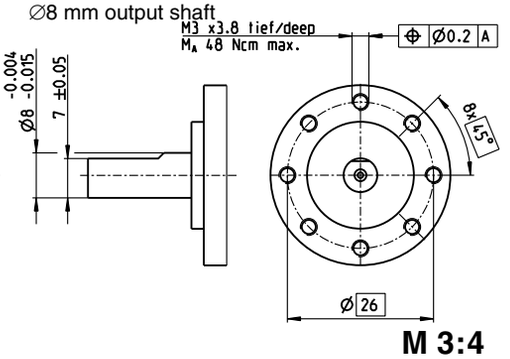
Planetary Gearhead GP 32 CR ∅32 mm, 1.0 Nm

for high radial loads, ceramic version

∅6 mm output shaft



∅8 mm output shaft



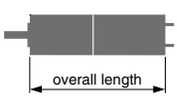
M 3:4

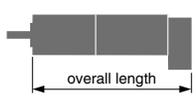
Technical Data

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
Gearhead Data			
1 Reduction	3.7:1	4.8:1	5.8:1
2 Absolute reduction	26/7	24/5	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	26/7	24/5	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 gcm²	1.6	0.9	0.6
11 Gearhead length L1 mm	26.2	26.2	26.2



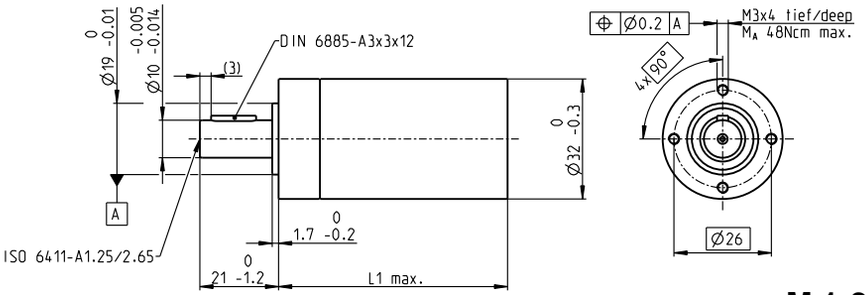


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts		
RE 30, 60 W	139			94.3	94.3	94.3
RE 30, 60 W	139	MR	356	105.7	105.7	105.7
RE 30, 60 W	139	HED_5540	362/364	115.1	115.1	115.1
RE 35, 90 W	140			97.3	97.3	97.3
RE 35, 90 W	140	MR	356	108.7	108.7	108.7
RE 35, 90 W	140	HED_5540	362/364	118.0	118.0	118.0
RE 35, 90 W	140	DCT22	373	115.4	115.4	115.4
RE 35, 90 W	140	AB 28	408	133.4	133.4	133.4
RE 35, 90 W	140	HED_ 5540/AB 28	362/408	150.5	150.5	150.5
EC 32, 80 W	214			86.3	86.3	86.3
EC 32, 80 W	214	HED_5540	363/366	104.7	104.7	104.7
EC 32, 80 W	214	Res 26	374	106.4	106.4	106.4

Planetary Gearhead GP 32 HP ∅32 mm, 4.0–8.0 Nm

High Power



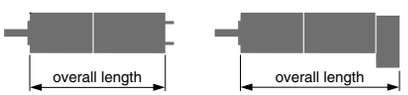
M 1:2

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-40...+100°C
Number of stages	2 3 4
Max. radial load, 10 mm from flange	200 N 250 N 300 N

Stock program
Standard program
Special program (on request)

Part Numbers	320247	326663	326664	326668	326672	324947	324952
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 gcm²	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

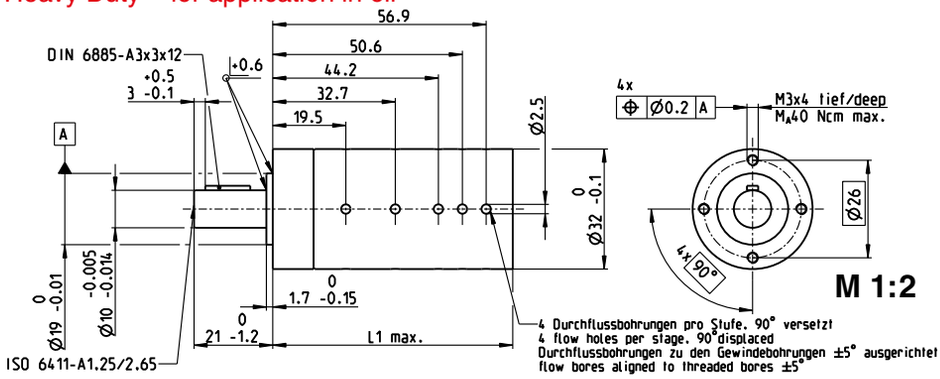


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
RE 35, 90 W	140			119.4	119.4	126.1	126.1	132.8	132.8	132.8
RE 35, 90 W	140	MR	356	130.8	130.8	137.5	137.5	144.2	144.2	144.0
RE 35, 90 W	140	HED_ 5540	362/364	140.1	140.1	146.8	146.8	153.5	153.5	153.5
RE 35, 90 W	140	DCT 22	373	137.5	137.5	144.2	144.2	150.9	150.9	150.9
RE 35, 90 W	140	AB 28	408	155.5	155.5	162.2	162.2	168.9	168.9	168.9
RE 35, 90 W	140	HEDS 5540/AB 28	362/408	172.7	172.7	179.4	179.4	186.1	186.1	186.1
EC-max 30, 40 W	226			90.2	90.2	96.9	96.9	103.6	103.6	103.6
EC-max 30, 40 W	226	MR	355	102.4	102.4	109.1	109.1	115.8	115.8	115.8
EC-max 30, 40 W	226	HEDL 5540	366	110.8	110.8	117.5	117.5	124.2	124.2	124.2
EC-max 30, 40 W	226	AB 20	406	125.8	125.8	132.5	132.5	139.2	139.2	139.2
EC-max 30, 40 W	226	HEDL 5540/AB 20	366/406	146.4	146.4	153.1	153.1	159.8	159.8	159.8
EC-max 30, 60 W	227			112.2	112.2	118.9	118.9	125.6	125.6	125.6
EC-max 30, 60 W	227	MR	355	124.4	124.4	131.1	131.1	137.8	137.8	137.8
EC-max 30, 60 W	227	HEDL 5540	366	132.8	132.8	139.5	139.5	146.2	146.2	146.2
EC-max 30, 60 W	227	AB 20	406	147.8	147.8	154.5	154.5	161.2	161.2	161.2
EC-max 30, 60 W	227	HEDL 5540/AB 20	406	168.4	168.4	175.1	175.1	181.8	181.8	181.8
EC-4pole 30, 100 W	235			95.2	95.2	101.9	101.9	108.6	108.6	108.6
EC-4pole 30, 100 W	235	MR	355	107.4	107.4	114.1	114.1	120.8	120.8	120.8
EC-4pole 30, 100 W	235	HEDL 5540	367	115.8	115.8	122.5	122.5	129.2	129.2	129.2
EC-4pole 30, 100 W	235	AB 20	406	131.4	131.4	138.1	138.1	144.8	144.8	144.8
EC-4pole 30, 100 W	235	HEDL 5540/AB 20	367/406	152.2	152.2	158.9	158.9	165.6	165.6	165.6
EC-4pole 30, 200 W	237			112.2	112.2	118.9	118.9	125.6	125.6	125.6
EC-4pole 30, 200 W	237	MR	355	124.4	124.4	131.1	131.1	137.8	137.8	137.8
EC-4pole 30, 200 W	237	HEDL 5540	367	132.8	132.8	139.5	139.5	146.2	146.2	146.2
EC-4pole 30, 200 W	237	AB 20	406	148.4	148.4	155.1	155.1	161.8	161.8	161.8
EC-4pole 30, 200 W	237	HEDL 5540/AB 20	367/406	169.2	169.2	175.9	175.9	182.6	182.6	182.6
MCD EPOS, 60 W	403			168.2	168.2	174.9	174.9	181.6	181.6	181.6
MCD EPOS P, 60 W	403			168.2	168.2	174.9	174.9	181.6	181.6	181.6

Planetary Gearhead GP 32 HD ∅32 mm, 3.0–8.0 Nm

Heavy Duty – for application in oil



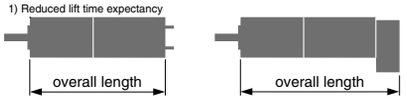
Technical Data	
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. axial load (dynamic)	120 N
Max. force for press fits	120 N
Direction of rotation, drive to output	=
Max. continuous input speed	8000 rpm
Recommended temperature range	-55…+200°C
Extended range as option	-55…+260°C

Number of stages	1	2	3	4	5
Max. radial load, 10 mm from flange	120 N	200 N	250 N	300 N	300 N

Stock program
Standard program
Special program (on request)

Part Numbers	416962	416930	416461	420735*	416984	420743	426072	426130	426135	426141
Gearhead Data (provisional)										
1 Reduction	3.7:1	14:1	51:1	123:1	190:1	492:1	707:1	1694:1	2548:1	4060:1
2 Absolute reduction	26/7	676/49	17576/343	6877/56	456976/2401	86112/175	11881376/16807	1162213/686	7962624/3125	3637933/896
3 Max. motor shaft diameter mm	6	6	6	3	6	6	6	6	4	6
Part Numbers	420518	420725	420730	420736	420738	420744	426125	426131	426136	426142
1 Reduction	4.8:1	18:1	66:1	132:1	246:1	531:1	914:1	1828:1	2623:1	4380:1
2 Absolute reduction	24/5	624/35	16224/245	3312/25	421824/1715	331776/625	10967424/12005	2238912/1225	2056223/784	109503/25
3 Max. motor shaft diameter mm	4	6	6	4	6	4	6	6	6	4
Part Numbers	420724*	420726	420731	420737*	420739	420745	426126	426132	426137	426143
1 Reduction	5.8:1	21:1	79:1	159:1	295:1	589:1	1094:1	1972:1	2829:1	5247:1
2 Absolute reduction	23/4	299/14	3887/49	1587/10	101062/343	20631/35	2627612/2401	8626176/4375	495144/175	839523/160
3 Max. motor shaft diameter mm	3	6	6	3	6	6	6	4	6	4
Part Numbers		420727	420732		420740	420746	426127	426133	426138	426144*
1 Reduction		23:1	86:1		318:1	636:1	1181:1	2189:1	3052:1	6285:1
2 Absolute reduction		576/25	14976/175		389376/1225	79488/125	10123776/8575	536406/245	1907712/625	6436343/1024
3 Max. motor shaft diameter mm		4	6		6	4	6	6	4	3
Part Numbers		420728	420733		420741	420748	426128	426134	426139	
1 Reduction		28:1	103:1		411:1	762:1	1414:1	2362:1	3389:1	
2 Absolute reduction		138/5	3588/35		359424/875	19044/25	2425488/1715	2066688/875	474513/140	
3 Max. motor shaft diameter mm		4	6		6	4	6	6	6	
Part Numbers		420729*	420734		420742		426129		426140	
1 Reduction		33:1	111:1		456:1		1526:1		3656:1	
2 Absolute reduction		529/16	13824/125		89401/196		9345024/6125		457056/125	
3 Max. motor shaft diameter mm		3	4		6		4		4	
4 Number of stages	1	2	3	3	4	4	5	5	5	5
5 Max. continuous torque Nm	3	4	8	8	8	8	8	8	8	8
6 Max. intermittent torque at gear output Nm	4.5	6	12	12	12	12	12	12	12	12
15 Max. overload torque[1] Nm	9	12	24	24	24	24	24	24	24	24
7 Max. efficiency %	95	87	78	78	65	65	53	53	53	53
8 Weight g	170	228	271	271	303	303	334	334	334	334
9 Average backlash no load °	0.7	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm²	1.59	1.59	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
11 Gearhead length L1 mm	29.0	41.4	51.2	51.2	57.7	57.7	64.2	64.2	64.2	64.2
13 Max. transmittable power (continuous) W	320	200	80	80	40	40	12	12	12	12
14 Max. transmittable power (intermittent) W	480	300	120	120	60	60	18	18	18	18

1) Reduced lift time expectancy



maxon Modular System

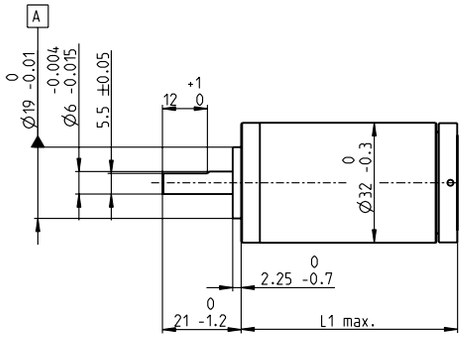
+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC 32 HD oil, A	239			194.0	206.5	216.5	216.5	223.0	223.0	229.5	229.5	229.5	229.5
EC 32 HD oil, B	239			174.0	186.5	196.5	196.5	203.0	203.0	209.5	209.5	209.5	209.5

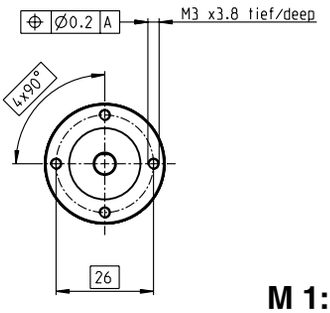
*Overall length + 2 mm

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	

Koaxdrive KD 32 ∅32 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

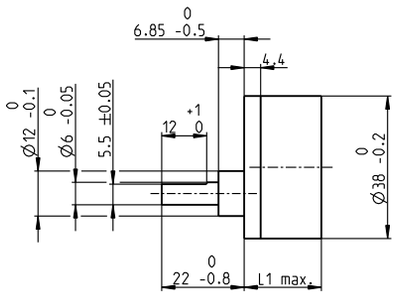
Stock program
Standard program
Special program (on request)

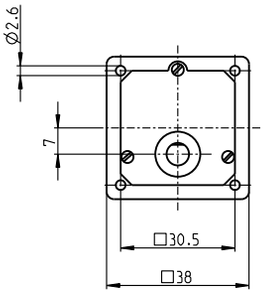
Part Numbers	354722	354725	354962	354730	354731	354734	354737	354963	354742
Gearhead Data									
1 Reduction	11:1	41:1	82:1	158:1	152:1	253:1	392:1	705:1	1091:1
2 Absolute reduction	$^{11}/_{1}$	$^{286}/_{7}$	$^{408}/_{5}$	$^{792}/_{5}$	$^{7436}/_{49}$	$^{6336}/_{25}$	$^{9792}/_{25}$	$^{9867}/_{14}$	$^{17457}/_{16}$
7 Max. efficiency %	78	70	65	61	63	63	59	55	55
10 Mass inertia gcm²	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	$^{17}/_{1}$	$^{264}/_{5}$	$^{391}/_{4}$	$^{759}/_{4}$	$^{6864}/_{35}$	$^{1518}/_{5}$	$^{22308}/_{49}$	$^{19008}/_{25}$	
7 Max. efficiency %	72	70	65	65	63	63	55	55	
10 Mass inertia gcm²	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	$^{33}/_{1}$	$^{442}/_{7}$	$^{858}/_{7}$		$^{11492}/_{49}$	$^{5819}/_{16}$	$^{20592}/_{35}$	$^{4554}/_{5}$	
7 Max. efficiency %	68	70	61		63	63	59	55	
10 Mass inertia gcm²	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	135/137			95.3	112.5	112.5	112.5	122.2	122.2	122.2	122.2	122.2
RE 25	135/137	MR	355	106.3	123.5	123.5	123.5	133.2	133.2	133.2	133.2	133.2
RE 25	135/137	Enc 22	361	109.4	126.6	126.6	126.6	136.3	136.3	136.3	136.3	136.3
RE 25	135/137	HED_5540	362/364	116.1	133.3	133.3	133.3	143.0	143.0	143.0	143.0	143.0
RE 25	135/137	DCT 22	373	117.6	134.8	134.8	134.8	144.5	144.5	144.5	144.5	144.5
RE 25, 20 W	136			83.8	101.0	101.0	101.0	110.7	110.7	110.7	110.7	110.7
RE 25, 20 W	136	MR	355	94.8	112.0	112.0	112.0	121.7	121.7	121.7	121.7	121.7
RE 25, 20 W	136	HED_5540	363/364	104.6	121.8	121.8	121.8	131.5	131.5	131.5	131.5	131.5
RE 25, 20 W	136	DCT 22	373	106.1	123.3	123.3	123.3	133.0	133.0	133.0	133.0	133.0
RE 25, 20 W	136	AB 28	408	117.9	135.1	135.1	135.1	144.8	144.8	144.8	144.8	144.8
RE 25, 20 W	136	HED_5540/AB 28	363/408	135.1	152.3	152.3	152.3	162.0	162.0	162.0	162.0	162.0
RE 30, 60 W	139			108.8	126.0	126.0	126.0	135.7	135.7	135.7	135.7	135.7
RE 30, 60 W	139	MR	356	120.2	137.4	137.4	137.4	147.1	147.1	147.1	147.1	147.1
RE 30, 60 W	139	HEDL 5540	364	129.6	146.8	146.8	146.8	156.5	156.5	156.5	156.5	156.5
EC-max 22, 12 W	224			72.8	90.0	90.0	90.0	99.7	99.7	99.7	99.7	99.7
EC-max 22, 12 W	224	MR	354	82.4	99.6	99.6	99.6	109.3	109.3	109.3	109.3	109.3
EC-max 22, 12 W	224	AB 20	406	108.4	125.6	125.6	125.6	135.3	135.3	135.3	135.3	135.3
EC-max 22, 25 W	225			89.3	106.5	106.5	106.5	116.2	116.2	116.2	116.2	116.2
EC-max 22, 25 W	225	MR	354	98.9	116.1	116.1	116.1	125.8	125.8	125.8	125.8	125.8
EC-max 22, 25 W	225	AB 20	406	125.0	142.2	142.2	142.2	151.9	151.9	151.9	151.9	151.9
EC-max 30, 40 W	226			82.8	100.0	100.0	100.0	109.7	109.7	109.7	109.7	109.7
EC-max 30, 40 W	226	MR	355	95.0	112.2	112.2	112.2	121.9	121.9	121.9	121.9	121.9
EC-max 30, 40 W	226	HEDL 5540	366	103.4	120.6	120.6	120.6	130.3	130.3	130.3	130.3	130.3
EC-max 30, 40 W	226	AB 20	406	118.4	135.6	135.6	135.6	145.3	145.3	145.3	145.3	145.3
EC-max 30, 40 W	226	HEDL 5540/AB 20	366/406	139.2	156.2	156.2	156.2	165.7	165.7	165.7	165.7	165.7
EC-max 30, 60 W	227			104.8	122.0	122.0	122.0	131.7	131.7	131.7	131.7	131.7
EC-max 30, 60 W	227	MR	355	117.0	134.2	134.2	134.2	143.9	143.9	143.9	143.9	143.9
EC-max 30, 60 W	227	HEDL 5540	366	125.4	142.6	142.6	142.6	152.3	152.3	152.3	152.3	152.3
EC-max 30, 60 W	227	AB 20	406	140.4	157.6	157.6	157.6	167.3	167.3	167.3	167.3	167.3
EC-max 30, 60 W	227	HEDL 5540/AB 20	366/406	161.2	178.2	178.2	178.2	187.7	187.7	187.7	187.7	187.7

Spur Gearhead GS 38 A ∅38 mm, 0.1–0.6 Nm





M 1:2

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

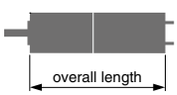
maxon gear

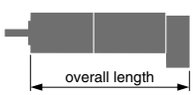
Stock program
Standard program
Special program (on request)

Part Numbers

		110451	110452	110453	110454	110455	110456	110457	110458	110459
Gearhead Data										
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	gcm²	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



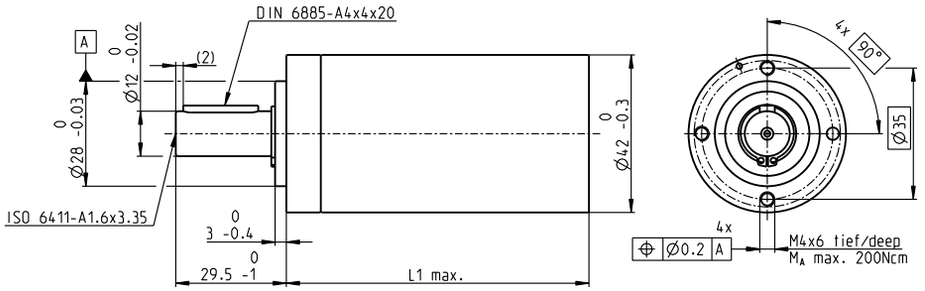


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
A-max 26	161-168			65.4	65.4	67.9	67.9	70.4	70.4	72.9	75.4	75.4
A-max 26	162-168	MEnc 13	372	72.5	72.5	75.0	75.0	77.5	77.5	80.0	82.5	82.5
A-max 26	162-168	MR	355	74.2	74.2	76.7	76.7	79.2	79.2	81.7	84.2	84.2
A-max 26	162-168	Enc 22	361	79.8	79.8	82.3	82.3	84.8	84.8	87.3	89.8	89.8
A-max 26	162-168	HED_ 5540	363/365	83.8	83.8	86.3	86.3	88.8	88.8	91.3	93.8	93.8
A-max 32	169/171			83.6	83.6	86.1	86.1	88.6	88.6	91.1	93.6	93.6
A-max 32	170/172			82.2	82.2	84.7	84.7	87.2	87.2	89.7	92.2	92.2
A-max 32	170/172	MR	356	93.4	93.4	95.9	95.9	98.4	98.4	100.9	103.4	103.4
A-max 32	170/172	HED_ 5540	363/365	103.0	103.0	105.5	105.5	108.0	108.0	110.5	113.0	113.0
RE-max 21	179/180			49.6	49.6	52.1	52.1	54.6	54.6	57.1	59.6	59.6
RE-max 21, 3.5 W	180	MR	352/354	54.7	54.7	57.2	57.2	59.7	59.7	62.2	64.7	64.7
RE-max 21	181/182			52.2	52.2	54.7	54.7	57.2	57.2	59.7	62.2	62.2
RE-max 21, 6 W	182	MR	352/354	56.5	56.5	59.0	59.0	61.5	61.5	64.0	66.5	66.5
EC 32 flat, 15 W	258			38.6	38.6	41.1	41.1	43.6	43.6	46.1	48.6	48.6
EC 32 flat, IE, IP 00	259			48.7	48.7	51.2	51.2	53.7	53.7	56.2	58.7	58.7
EC 32 flat, IE, IP 40	259			50.4	50.4	52.9	52.9	55.4	55.4	57.9	60.4	60.4

Planetary Gearhead GP 42 C ∅42 mm, 3–15 Nm

Ceramic Version



M 1:2

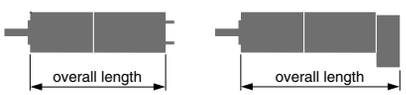
Technical Data

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

Stock program
Standard program
Special program (on request)

Part Numbers		203113	203115	**203119**	**203120**	203124	**203129**	203128	203133	203137	203141
Gearhead Data											
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	gcm²	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	gcm²	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	gcm²	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	gcm²		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 W and 250 W)

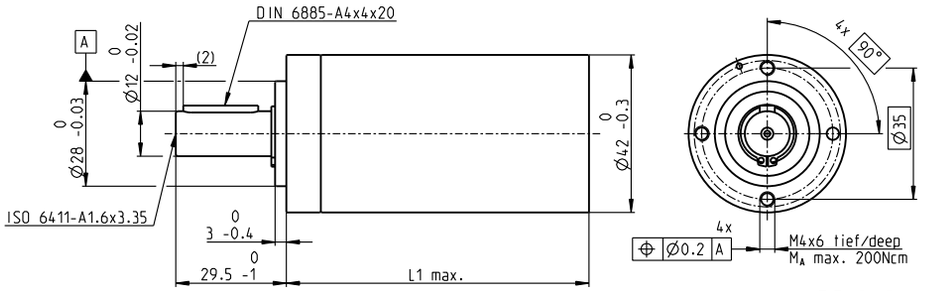


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
RE 35, 90 W	140					112.1	126.6	126.6	141.1	141.1	141.1	155.6	155.6	155.6	155.6
RE 35, 90 W	140	MR	356			123.5	138.0	138.0	152.5	152.5	152.5	167.0	167.0	167.0	167.0
RE 35, 90 W	140	HED_ 5540	362/364			132.8	147.3	147.3	161.8	161.8	161.8	176.3	176.3	176.3	176.3
RE 35, 90 W	140	DCT 22	373			130.2	144.7	144.7	159.2	159.2	159.2	173.7	173.7	173.7	173.7
RE 35, 90 W	140			AB 28	408	148.2	162.7	162.7	177.2	177.2	177.2	191.7	191.7	191.7	191.7
RE 35, 90 W	140	HED_ 5540	362/364	AB 28	408	165.4	179.9	179.9	194.4	194.4	194.4	208.9	208.9	208.9	208.9
RE 40, 150 W	142					112.1	126.6	126.6	141.1	141.1	141.1	155.6	155.6	155.6	155.6
RE 40, 150 W	142	MR	356			123.5	138.0	138.0	152.5	152.5	152.5	167.0	167.0	167.0	167.0
RE 40, 150 W	142	HED_ 5540	362/365			132.8	147.3	147.3	161.8	161.8	161.8	176.3	176.3	176.3	176.3
RE 40, 150 W	142	HEDL 9140	368			166.2	180.7	180.7	195.2	195.2	195.2	209.7	209.7	209.7	209.7
RE 40, 150 W	142			AB 28	408	148.2	162.7	162.7	177.2	177.2	177.2	191.7	191.7	191.7	191.7
RE 40, 150 W	142			AB 28	409	156.2	170.7	170.7	185.2	185.2	185.2	199.7	199.7	199.7	199.7
RE 40, 150 W	142	HED_ 5540	362/365	AB 28	408	165.4	179.9	179.9	194.4	194.4	194.4	208.9	208.9	208.9	208.9
RE 40, 150 W	142	HEDL 9140	368	AB 28	409	176.7	191.2	191.2	205.7	205.7	205.7	220.2	220.2	220.2	220.2
EC 40, 170 W	215					121.1	135.6	135.6	150.1	150.1	150.1	164.6	164.6	164.6	164.6
EC 40, 170 W	215	HED_ 5540	363/366			144.5	159.0	159.0	175.5	175.5	175.5	188.0	188.0	188.0	188.0
EC 40, 170 W	215	Res 26	374			148.3	162.8	162.8	177.3	177.3	177.3	191.8	191.8	191.8	191.8
EC 40, 170 W	215			AB 32	410	163.8	178.3	178.3	192.8	192.8	192.8	207.3	207.3	207.3	207.3
EC 40, 170 W	215	HED_ 5540	363/366	AB 32	410	182.2	196.7	196.7	211.2	211.2	211.2	225.7	225.7	225.7	225.7
EC 45, 150 W	216					152.3	166.8	166.8	181.3	181.3	181.3	195.8	195.8	195.8	195.8
EC 45, 150 W	216	HEDL 9140	368			167.9	182.4	182.4	196.9	196.9	196.9	211.4	211.4	211.4	211.4
EC 45, 150 W	216	Res 26	374			152.3	166.8	166.8	181.3	181.3	181.3	195.8	195.8	195.8	195.8
EC 45, 150 W	216			AB 28	409	159.7	174.2	174.2	188.7	188.7	188.7	203.2	203.2	203.2	203.2
EC 45, 150 W	216	HEDL 9140	368	AB 28	409	176.7	191.2	191.2	205.7	205.7	205.7	220.2	220.2	220.2	220.2
EC 45, 250 W	217					185.1	199.6	199.6	214.1	214.1	214.1	228.6	228.6	228.6	228.6
EC 45, 250 W	217	HEDL 9140	368			200.7	215.2	215.2	229.7	229.7	229.7	244.2	244.2	244.2	244.2
EC 45, 250 W	217	Res 26	374			185.1	199.6	199.6	214.1	214.1	214.1	228.6	228.6	228.6	228.6
EC 45, 250 W	217			AB 28	409	192.5	207.0	207.0	221.5	221.5	221.5	236.0	236.0	236.0	236.0
EC 45, 250 W	217	HEDL 9140	368	AB 28	409	209.5	224.0	224.0	238.5	238.5	238.5	253.0	253.0	253.0	253.0

Planetary Gearhead GP 42 C ∅42 mm, 3–15 Nm

Ceramic Version



M 1:2

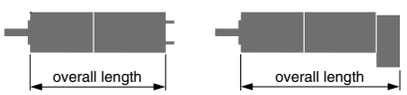
Technical Data

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

Stock program
Standard program
Special program (on request)

			Part Numbers									
			203113	203115	203119	203120	203124	203129	203128	203133	203137	203141
Gearhead Data												
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	gcm²	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	gcm²	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	gcm²	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	gcm²		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-i 40 (50 W and 70 W)

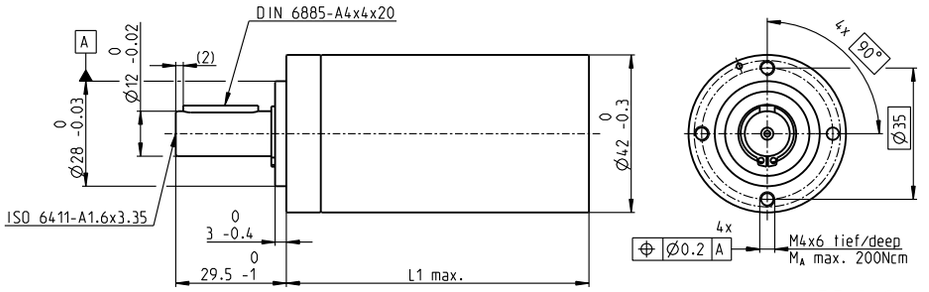


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC-max 30, 60 W	227					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	227	MR	355			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	227	HEDL 5540	366			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	227			AB 20	406	141.2	155.1	155.1	169.6	169.6	169.6	184.1	184.1	184.1	184.1
EC-max 30, 60 W	227	HEDL 5540	366	AB 20	406	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	228					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	228	MR	356			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	228	HEDL 5540	366			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	228			AB 28	407	133.4	147.9	147.9	162.4	162.4	162.4	176.9	176.9	176.9	176.9
EC-max 40, 70 W	228	HEDL 5540	366	AB 28	407	151.7	166.2	166.2	180.7	180.7	180.7	195.2	195.2	195.2	195.2
EC-4pole 30, 100 W	235					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	235	MR	355			100.3	114.8	114.8	129.3	129.3	129.3	143.8	143.8	143.8	143.8
EC-4pole 30, 100 W	235	HEDL 5540	367			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	235			AB 20	406	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	235	HEDL 5540	367	AB 20	406	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	237					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	237	MR	355			117.3	131.8	131.8	146.3	146.3	146.3	160.8	160.8	160.8	160.8
EC-4pole 30, 200 W	237	HEDL 5540	366			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	237			AB 20	406	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	237	HEDL 5540	366	AB 20	406	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	243/244					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	243/244	16 EASY	345			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	243/244	HEDL 5540	367			90.1	104.6	104.6	119.1	119.1	119.1	133.6	133.6	133.6	133.6
EC-i 40, 70 W	245/246					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	245/246	16 EASY	345			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	245/246	HEDL 5540	367			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	247					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	247	16 EASY	345			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	247	HEDL 5540	367			120.1	134.6	134.6	149.1	149.1	149.1	163.6	163.6	163.6	163.6

Planetary Gearhead GP 42 C ∅42 mm, 3–15 Nm

Ceramic Version



M 1:2

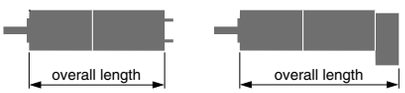
Technical Data

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

Stock program
Standard program
Special program (on request)

Part Numbers		203113	203115	**203119**	**203120**	203124	**203129**	203128	203133	203137	203141
Gearhead Data											
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	gcm²	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	gcm²	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	gcm²	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	gcm²		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

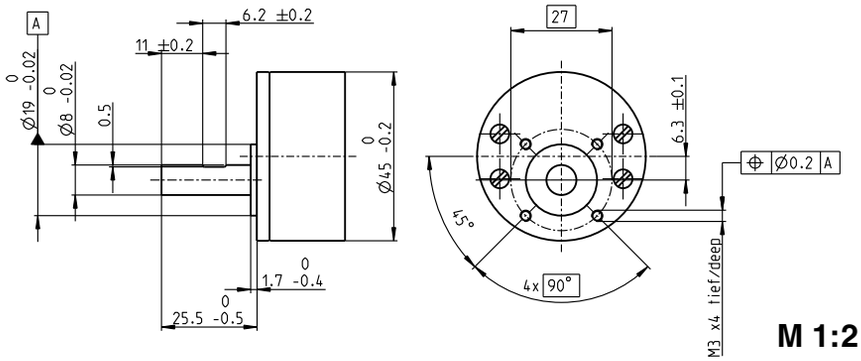
**for EC 45 flat L1 is -3.6 mm



maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts									
EC 45 flat, 30 W	261					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	261	MILE	342			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	262					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	262	MILE	342			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	263					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	263	MILE	342			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	264					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	264					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	265					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	265					79.9	94.4	94.4	108.9	108.9	108.9	123.4	123.4	123.4	123.4
MCD EPOS, 60 W	403					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	403					161.1	175.6	175.6	190.1	190.1	190.1	204.6	204.6	204.6	204.6

Spur Gearhead GS 45 A ∅45 mm, 0.5–2.0 Nm



M 1:2

Technical Data

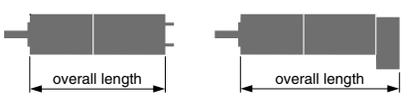
Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.15 mm
Axial play	0.02–0.2 mm
Max. axial load (dynamic)	60 N
Max. force for press fits	60 N
Max. continuous input speed	6000 rpm
Recommended temperature range	-15...+80°C

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	$^{51}/_{10}$	$^{459}/_{26}$	$^{20655}/_{338}$	$^{125862}/_{595}$	$^{492790}/_{673}$
10 Mass inertia gcm²	3.7	1.6	1.0	0.8	0.8
3 Max. motor shaft diameter mm	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	$^{209}/_{28}$	$^{9405}/_{364}$	$^{66632}/_{745}$	$^{183281}/_{592}$	$^{307572}/_{287}$
10 Mass inertia gcm²	3.1	1.4	1.0	0.8	0.8
3 Max. motor shaft diameter mm	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	$^{2295}/_{247}$	$^{8523}/_{265}$	$^{334}/_{3}$	$^{173808}/_{451}$	$^{198769}/_{149}$
10 Mass inertia gcm²	2.1	1.4	0.6	0.5	0.4
3 Max. motor shaft diameter mm	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	$^{2475}/_{182}$	$^{6221}/_{132}$	$^{141157}/_{861}$	$^{161880}/_{287}$	$^{1929023}/_{988}$
10 Mass inertia gcm²	2.2	0.9	0.5	0.5	0.4
3 Max. motor shaft diameter mm	3	3	3	3	3
4 Number of stages	2	3	4	5	6
5 Max. continuous torque Nm	0.5	2.0	2.0	2.0	2.0
6 Max. intermittent torque at gear output Nm	0.75	2.5	2.5	2.5	2.5
12 Direction of rotation, drive to output	=	≠	=	≠	=
7 Max. efficiency %	87	76	66	59	53
8 Weight g	224	224	255	287	313
9 Average backlash no load °	1.6	2.0	2.4	2.8	3.2
11 Gearhead length L1* mm	23.5	23.5	26.9	30.4	33.8

*for EC 45 flat, IE, L1 is max. + 4.0 mm

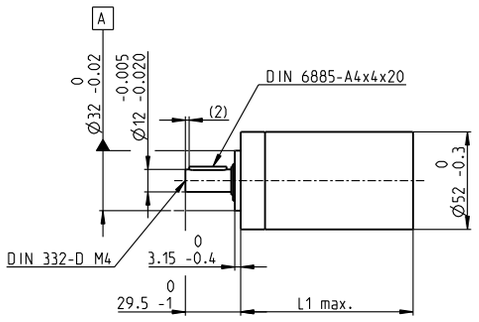


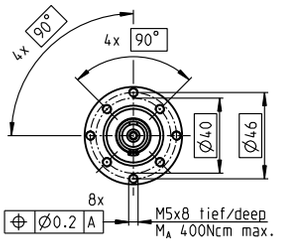
maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts				
EC 45 flat, 30 W	261			40.0	40.0	43.4	46.9	50.3
EC 45 flat, 30 W	261	MILE	342	43.0	43.0	46.4	49.9	53.3
EC 45 flat, 50 W	262			44.9	44.9	48.3	51.8	55.2
EC 45 flat, 50 W	262	MILE	342	46.2	46.2	49.6	53.1	56.5
EC 45 flat, 70 W	263			50.3	50.3	53.7	57.2	60.6
EC 45 flat, 70 W	263	MILE	342	52.0	52.0	55.4	58.9	62.3
EC 45 flat, IE, IP 00	264			59.2	59.2	62.6	66.1	69.5
EC 45 flat, IE, IP 40	264			61.4	61.4	64.8	68.3	71.7
EC 45 flat, IE, IP 00	265			64.2	64.2	67.6	71.1	74.5
EC 45 flat, IE, IP 40	265			66.4	66.4	69.8	73.3	76.7

Planetary Gearhead GP 52 C ∅52 mm, 4–30 Nm

Ceramic Version





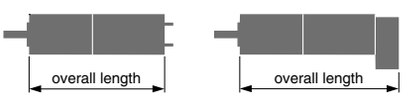
M 1:4

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

Stock program
Standard program
Special program (on request)

			Part Numbers						
			223080	223083	223089	223094	223097	223104	223109
Gearhead Data									
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	gcm²	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		223081	223084	223090	223095	223099	223105	223110
1	Reduction		4.3:1	15:1	53:1	113:1	186:1	353 :1	676:1
2	Absolute reduction		13/3	91/6	637/12	338/3	4459/24	28561/81	676
10	Mass inertia	gcm²	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			223085	223091	223096	223101	223106	223111
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	gcm²		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			223086	223092	223098	223102	223107	223112
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	gcm²		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			223087	223093		223103	223108	
1	Reduction			26:1	81:1		285:1	488:1	
2	Absolute reduction			26	2197/27		15379/54	4394/9	
10	Mass inertia	gcm²		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

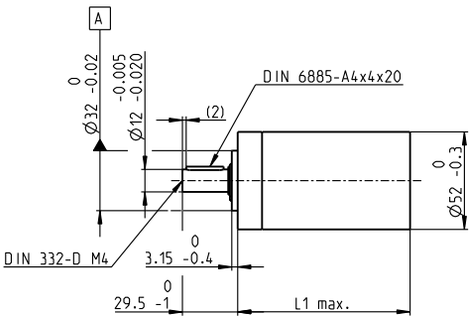


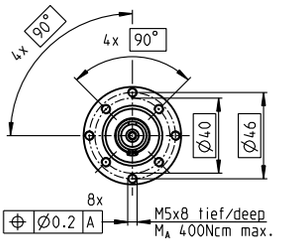
maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts						
RE 40, 150 W	142					120.1	136.1	149.6	149.6	163.1	163.1	163.1
RE 40, 150 W	142	MR	356			131.5	147.5	161.0	161.0	174.5	174.5	174.5
RE 40, 150 W	142	HED_ 5540	362/365			140.8	156.8	170.3	170.3	183.8	183.8	183.8
RE 40, 150 W	142	HEDL 9140	368			174.1	190.1	203.6	203.6	217.1	217.1	217.1
RE 40, 150 W	142			AB 28	408	156.2	172.2	185.7	185.7	199.2	199.2	199.2
RE 40, 150 W	142			AB 28	409	164.2	180.2	193.7	193.7	207.2	207.2	207.2
RE 40, 150 W	142	HED_ 5540	362/365	AB 28	408	173.4	189.4	202.9	202.9	216.4	216.4	216.4
RE 40, 150 W	142	HEDL 9140	368	AB 28	409	184.6	200.6	214.1	214.1	227.6	227.6	227.6
RE 50, 200 W	143					157.1	173.1	186.6	186.6	200.1	200.1	200.1
RE 50, 200 W	143	HED_5540	363/365			177.8	193.8	207.3	207.3	220.8	220.8	220.8
RE 50, 200 W	143	HEDL 9140	369			219.5	235.5	249.0	249.0	262.5	262.5	262.5
RE 50, 200 W	143			AB 44	412	219.5	235.5	249.0	249.0	262.5	262.5	262.5
RE 50, 200 W	143	HEDL 9140	369	AB 44	412	232.5	248.5	262.0	262.0	275.5	275.5	275.5
EC 40, 170 W	215					129.1	145.1	158.6	158.6	172.1	172.1	172.1
EC 40, 170 W	215	HED_5540	363/366			152.5	168.5	182.0	182.0	195.5	195.5	195.5
EC 40, 170 W	215	Res 26	374			156.3	172.3	185.8	185.8	199.3	199.3	199.3
EC 40, 170 W	215			AB 32	410	171.8	187.8	201.3	201.3	214.8	214.8	214.8
EC 40, 170 W	215	HED_5540	363/366	AB 32	410	190.2	206.2	219.7	219.7	233.2	233.2	233.2

Planetary Gearhead GP 52 C ∅52 mm, 4–30 Nm

Ceramic Version





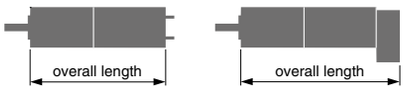
M 1:4

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

Stock program
Standard program
Special program (on request)

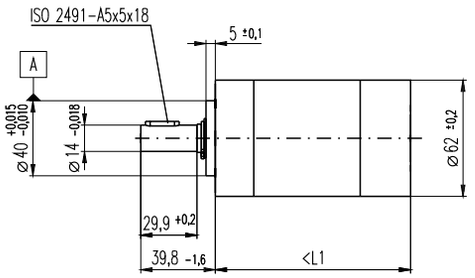
			Part Numbers						
			223080	223083	223089	223094	223097	223104	223109
Gearhead Data									
1	Reduction		3.5:1	12:1	43:1	91:1	150:1	319:1	546:1
2	Absolute reduction		7/2	49/4	343/8	91	2401/16	637/2	546
10	Mass inertia	gcm²	20.7	17.6	17.3	16.7	17.3	16.8	16.4
3	Max. motor shaft diameter	mm	10	10	10	10	10	10	10
	Part Numbers		**223081**	223084	223090	223095	223099	**223105**	223110
1	Reduction		4.3:1	15:1	53:1	113:1	186:1	353:1	676:1
2	Absolute reduction		13/3	91/6	637/12	338/3	4459/24	28561/81	676
10	Mass inertia	gcm²	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			**223085**	223091	223096	223101	223106	223111
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	gcm²		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			223086	223092	223098	223102	223107	223112
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	gcm²		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			223087	**223093**		223103	223108	
1	Reduction			26:1	81:1		285:1	488:1	
2	Absolute reduction			26	2197/27		15379/54	4394/9	
10	Mass inertia	gcm²		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

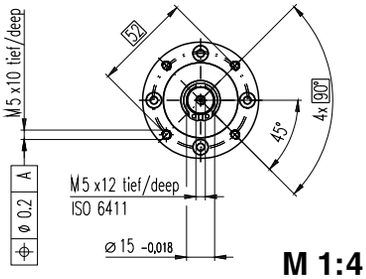


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts						
EC 45, 150 W	216					160.3	176.3	189.8	189.8	203.3	203.3	203.3
EC 45, 150 W	216	HEDL 9140	368			175.9	191.9	205.4	205.4	218.9	218.9	218.9
EC 45, 150 W	216	Res 26	374			160.3	176.3	189.8	189.8	203.3	203.3	203.3
EC 45, 150 W	216			AB 28	409	167.7	183.7	197.2	197.2	210.7	210.7	210.7
EC 45, 150 W	216	HEDL 9140	368	AB 28	409	184.7	200.7	214.2	214.2	227.7	227.7	227.7
EC 45, 250 W	217					193.1	209.1	222.6	222.6	236.1	236.1	236.1
EC 45, 250 W	217	HEDL 9140	368			208.7	224.7	238.2	238.2	251.7	251.7	251.7
EC 45, 250 W	217	Res 26	374			193.1	209.1	222.6	222.6	236.1	236.1	236.1
EC 45, 250 W	217			AB 28	409	200.5	216.5	230.0	230.0	243.5	243.5	243.5
EC 45, 250 W	217	HEDL 9140	368	AB 28	409	217.5	233.5	247.0	247.0	260.5	260.5	260.5
EC-max 40, 120 W	229					137.1	153.1	166.6	166.6	180.1	180.1	180.1
EC-max 40, 120 W	229	MR	356			153.0	169.0	182.5	182.5	196.0	196.0	196.0
EC-max 40, 120 W	229	HEDL 5540	366			160.5	176.5	190.0	190.0	203.5	203.5	203.5
EC-max 40, 120 W	229			AB 28	407	171.5	187.5	201.0	201.0	214.5	214.5	214.5
EC-max 40, 120 W	229	HEDL 5540	366	AB 28	407	189.8	205.8	219.3	219.3	232.8	232.8	232.8
EC 60 flat, IP 00	266					89.8	105.8	119.3	119.3	132.8	132.8	132.8
EC 60 flat, IP 54	266					94.8	110.8	124.3	124.3	137.8	137.8	137.8
EC 60 flat, IP 00	266	MILE	343			90.8	106.8	120.3	120.3	133.8	133.8	133.8
EC 60 flat, IP 54	266	MILE	343			94.8	110.8	124.3	124.3	137.8	137.8	137.8
EC 90 flat, 90 W	267					81.0	97.0	110.5	110.5	124.0	124.0	124.0
EC 90 flat, 90 W	267	MILE	344			81.0	97.0	110.5	110.5	124.0	124.0	124.0

Planetary Gearhead GP 62 A ∅62 mm, 8–50 Nm





M 1:4

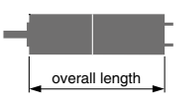
Technical Data

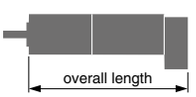
Planetary Gearhead			straight teeth
Output shaft			steel
Bearing at output			ball bearing
Radial play, 7 mm from flange			max. 0.08 mm
Axial play			max. 1 mm
Max. axial load (dynamic)			120 N
Max. force for press fits			1000 N
Direction of rotation, drive to output			=
Max. continuous input speed			3000 rpm
Recommended temperature range			-30…+140°C
Number of stages	1	2	3
Max. radial load, 24 mm from flange	240 N	360 N	570 N

Stock program
Standard program
Special program (on request)

Part Numbers

		110499	110501	110502	110503	110504	110505	110506	110507	110508
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		$^{57}/_{11}$	$^{3591}/_{187}$	$^{3249}/_{121}$	$^{1539}/_{44}$	$^{226223}/_{3179}$	$^{204687}/_{2057}$	$^{185193}/_{1331}$	$^{87723}/_{484}$	$^{41553}/_{176}$
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	gcm²	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

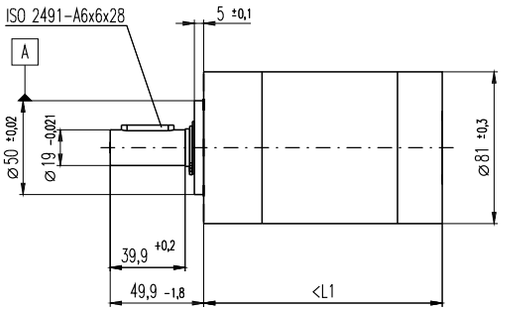


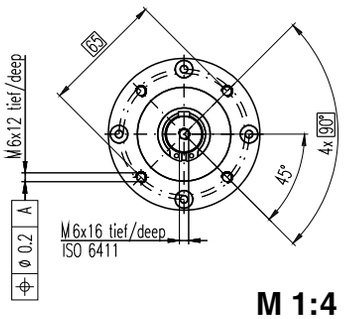


maxon Modular System

+ Motor	Page	+ Sensor	Page	Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 50, 200 W	143					180.6	196.4	196.4	196.4	212.3	212.3	212.3	212.3	212.3
RE 50, 200 W	143	HEDS 5540	363			201.3	217.1	217.1	217.1	233.0	233.0	233.0	233.0	233.0
RE 50, 200 W	143	HEDL 5540	365			201.3	217.1	217.1	217.1	233.0	233.0	233.0	233.0	233.0
RE 50, 200 W	143	HEDL 9140	369			243.0	258.8	258.8	258.8	2747	274.7	274.7	274.7	278.7
RE 50, 200 W	143			AB 44	412	243.0	258.8	258.8	258.8	2747	274.7	274.7	274.7	278.7
RE 50, 200 W	143	HEDL 9140	369	AB 44	412	256.0	271.8	271.8	271.8	287.7	287.7	287.7	287.7	287.7
EC 45, 250 W	217					216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3	248.3
EC 45, 250 W	217	HEDL 9140	368			232.2	248.0	248.0	248.0	263.9	263.9	263.9	263.9	263.9
EC 45, 250 W	217	Res 26	374			216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3	248.3
EC 45, 250 W	217			AB 28	409	224.0	239.8	239.8	239.8	255.7	255.7	255.7	255.7	255.7
EC 45, 250 W	217	HEDL 9140	368	AB 28	409	241.0	256.8	256.8	256.8	272.7	272.7	272.7	272.7	272.7

Planetary Gearhead GP 81 A ∅81 mm, 20–120 Nm



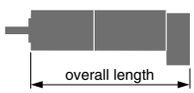


M 1:4

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)

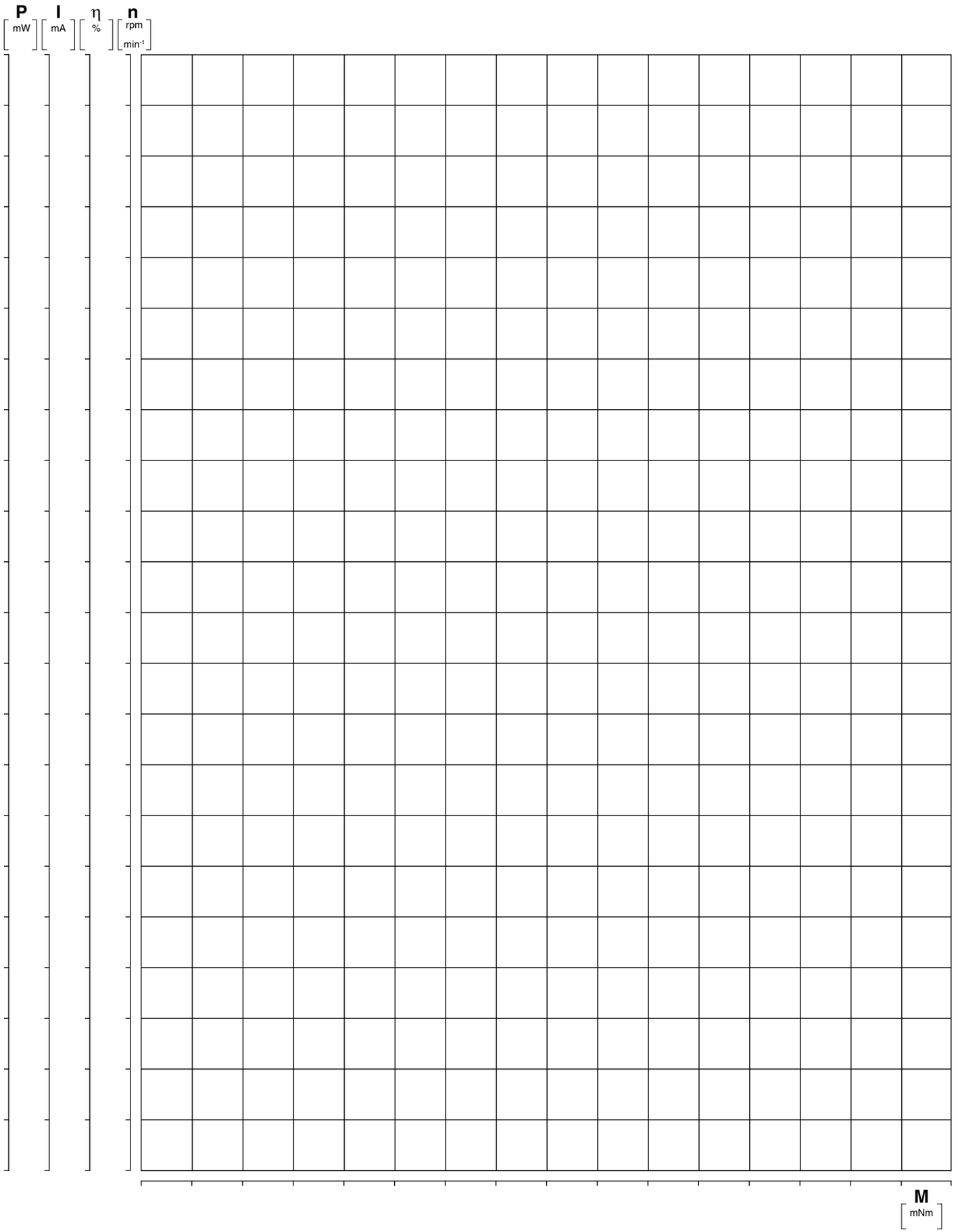
Part Numbers	110408	110409	110410	110411	110412	110413
Gearhead Data						
1 Reduction	3.7:1	14:1	25:1	51:1	93:1	308:1
2 Absolute reduction	$^{63}/_{17}$	$^{3969}/_{289}$	$^{1701}/_{68}$	$^{250047}/_{4913}$	$^{107163}/_{1156}$	$^{19683}/_{64}$
3 Max. motor shaft diameter mm	14	14	14	14	14	14
4 Number 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	144					223.5	245.2	245.2	266.8	266.8	266.8
RE 65, 250 W	144	HEDS 5540	363			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	144	HEDL 5540	365			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	144	HEDL 9140	369			279.6	301.3	301.3	322.9	322.9	322.9
RE 65, 250 W	144			AB 44	412	279.6	301.3	301.3	322.9	322.9	322.9
RE 65, 250 W	144	HEDL 9140	369	AB 44	412	297.6	319.3	319.3	340.9	340.9	340.9
EC 60, 400 W	218					269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	218	HEDL 9140	368			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	218	Res 26	374			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	218			AB 41	411	283.0	304.7	304.7	326.3	326.3	326.3
EC 60, 400 W	218	HEDL 9140	368	AB 41	411	307.0	328.7	328.7	350.3	350.3	350.3

For your personal notes



maxon spindle drive

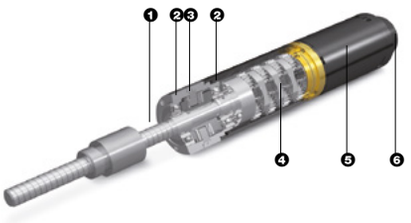
maxon spindle drive

Compact, easy to configure linear actuators as part of a complete system with integrated thrust bearing for high axial loads. Versions available with metric thread, trapezoidal thread or ball screw.

Spindle Drive Basics

Design

❶ Spindle, directly implemented in the gearhead
❷ Radial bearing
❸ Axial bearing
❹ Planetary gearhead 0–4 stages
❺ Motor
❻ Encoder



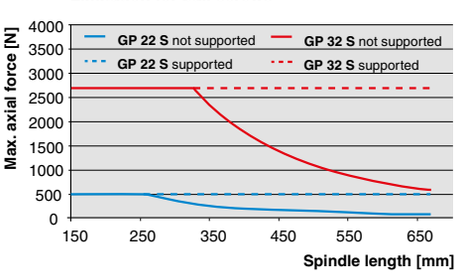
The particular type of spindle required must first be established before a spindle drive can be designed. Every type of spindle has different characteristics and a number of specific limits. These limits are taken into account in the technical data.

Ball screw:
– highly efficient
– not self-locking
– high load capacity
Metric spindle:
– self-locking
– low costs
Trapezoidal spindle:
– same as metric spindle
– higher load capacity than metric spindle

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 spindle. The maximum permissible feed force is displayed for standard spindles. For longer spindles, the permissible feed force can be limited by the critical compressive force of the spindle. In this case, supporting the end of the spindle may be necessary.

Limitation for ball screws



Torque

The required torque of the spindle M_a [mNm] is calculated with the feed force F_L [N] (load), the thread lead p [mm] and the efficiency of the spindle 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 spindle drive.

Technical Data

The "Technical Data" block contains generally applicable data on spindle, nut and gearhead. These are independent of the gearhead reduction ratio.

Length

The data sheets show the spindle 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 spindle alone (without gearhead). The values with gearhead are given in the "Gearhead data" main data field.

Nut

Standard spindle 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 337.

Bearing

The output stage and the spindle 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:

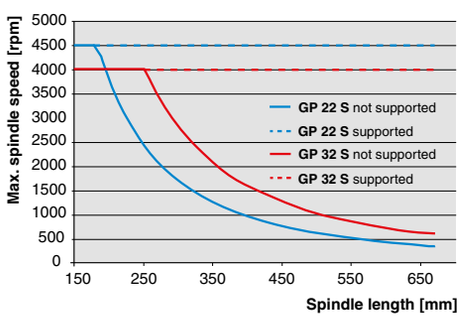
$$n_{mot} = \frac{v_L \cdot 60 \cdot i}{p}$$

Where i is the gearhead reduction ratio and p the spindle lead.

The spindle speed is limited by the resonance frequency of the spindle and for ball screws additionally by the ball return system.

In addition, the maximum permissible speed of the gearhead has to be considered.

Max. spindle speed at ball screws



Spindle Drive Data

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 spindle drive (gearhead and spindle).

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.

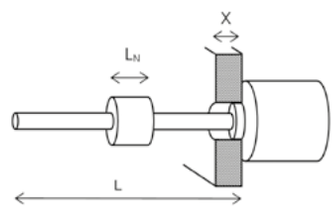
22 Max. feed force (intermittent)
Is the maximum permissible feed force which may be intermittently applied. "Intermittently" is defined as follows:
– during max. 1 second
– during max. 10% of operation
Exceeding these values results in a reduced service life.

23 Mechanical positioning accuracy
In this value, following factors are taken into consideration:
– backlash of the gearhead
– accuracy of the spindle
– axial play of the nut

Maximum stroke

The maximum possible stroke depends on the length of the spindle L [mm]. The length of the nut L_N [mm] and the thickness of its mounting plate X [mm] must be taken into consideration.

Stroke = L – (L_N + X + stroke reserve + opt. SPIN02)

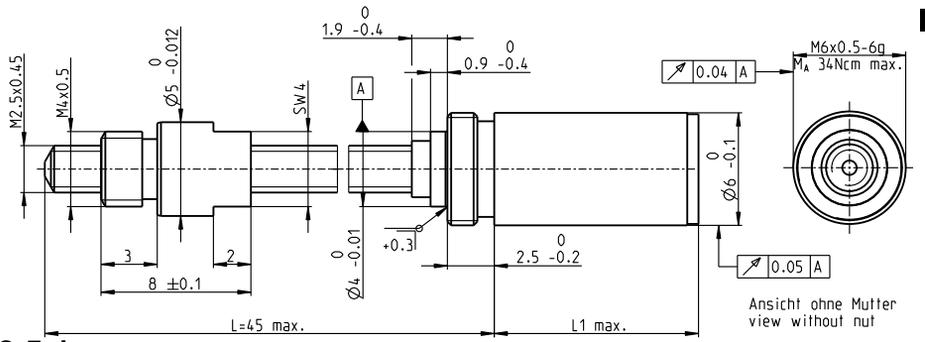


Mounting and safety instructions

Using a ball screw with a flange nut, the mounting through a hole is only possible with the optional rectangular mounting flange.
The ball screw nut may never be removed. As the balls are preloaded remounting would be impossible.
The spindle may never block during operation, as this could damage the spindle nut or gearhead.
Service life crucially depends on the precision with which the gear is fixed to the spindle 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 downloads.

Spindle Drive GP 6 S Ø6 mm, Metric spindle

NEW



M 2.5:1

Technical Data					
Spindle	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	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)

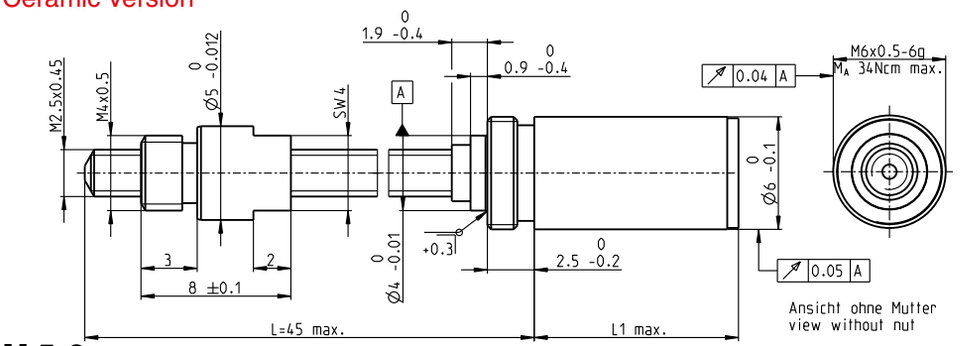
Part Numbers	428758	428757	428756	420663	428755
Spindle Drive Data					
1 Reduction	3.9 : 1	15 : 1	57 : 1	221 : 1	854 : 1
2 Absolute reduction	$^{27}/_{7}$	$^{729}/_{49}$	$^{19683}/_{343}$	$^{531441}/_{2401}$	$^{1438907}/_{16807}$
20 Max. feed velocity[1] mm/s	15	10	2.6	0.7	0.2
21 Max. feed force (continuous)[1] 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. spindle %	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. spindle[1] gcm²	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 spindle 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	108			22.6	25.1	27.7	30.2	32.8	
RE 6, 0.3 W, B	108			26.6	29.1	31.7	34.2	36.8	
EC 6, 1.5 W	192			28.3	30.8	33.4	35.9	38.5	
EC 6, 1.5 W	192	Enc 6-8 MAG	347	30.4	32.9	35.5	38.0	40.6	
EC 6, 1.5 W	192	Enc 6-8 OPT	357	30.4	32.9	35.5	38.0	40.6	
EC 6, 2 W	193			28.3	30.8	33.4	35.9	38.5	
EC 6, 2 W	193	Enc 6-8 MAG	347	30.4	32.9	35.5	38.0	40.6	
EC 6, 2 W	193	Enc 6-8 OPT	357	30.4	32.9	35.5	38.0	40.6	

Spindle Drive GP 6 S Ø6 mm, Metric spindle

Ceramic Version



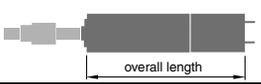
M 5:2

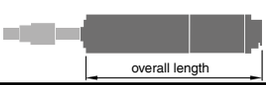
Technical Data					
Spindle	M2.5 x 0.45, ceramic				
Standard length	45 mm				
Special length (5 mm steps)	max. 80 mm				
Nut (standard)	thread nut				
Material	stainless steel				
Axial play	< 0.079 mm				
Planetary gearhead	straight teeth				
Bearing	ball bearing				
Radial play, 5 mm from flange	< 0.12 mm				
Axial play	preloaded				
Max. continuous input speed	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

Stock program
Standard program
Special program (on request)

Part Numbers	437380	437379	437378	437377	437375
Spindle Drive Data					
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. spindle %	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. spindle[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 spindle length 45 mm

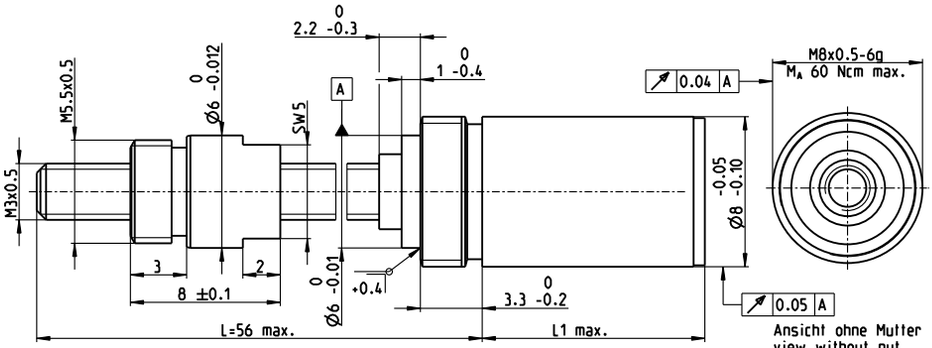




maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 6, 0.3 W, A	108			22.6	25.1	27.7	30.2	32.8
RE 6, 0.3 W, B	108			26.6	29.1	31.7	34.2	36.8
EC 6, 1.5 W	192			28.3	30.8	33.4	35.9	38.5
EC 6, 1.5 W	192	Enc 6-8 MAG	347	30.4	32.9	35.5	38.0	40.6
EC 6, 1.5 W	192	Enc 6-8 OPT	357	30.4	32.9	35.5	38.0	40.6
EC 6, 2 W	193			28.3	30.8	33.4	35.9	38.5
EC 6, 2 W	193	Enc 6-8 MAG	347	30.4	32.9	35.5	38.0	40.6
EC 6, 2 W	193	Enc 6-8 OPT	357	30.4	32.9	35.5	38.0	40.6

Spindle Drive GP 8 S Ø8 mm, Metric spindle



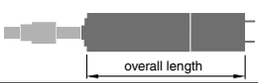
M 5:2

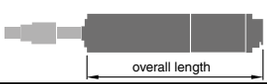
Technical Data					
Spindle	M3 x 0.5, stainless steel				
Standard length	56 mm				
Special length (5 mm steps)	max. 100 mm				
Nut (standard)	thread nut				
Material	bronze				
Axial play	< 0.1 mm				
Planetary gearhead	straight teeth				
Bearing	ball bearing				
Radial play, 5 mm from flange	< 0.08 mm				
Axial play	preloaded				
Max. continuous input speed	12000 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

Stock program
Standard program
Special program (on request)

Part Numbers	473643	473644	473645	473646	473647
Spindle 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	0.1
21 Max. feed force (continuous)[1] N	3	6	9	14	22
22 Max. feed force (intermittent)[1] N	8	18	27	27	27
4 Number of stages	1	2	3	4	5
7 Max. efficiency gearhead incl. spindle %	27	24	22	19	17
8 Weight[1] g	6.3	6.9	7.5	8.1	8.7
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
23 Mechanical positioning accuracy[1] mm	0.112	0.112	0.112	0.112	0.113
10 Mass inertia gearhead incl. spindle[1] gcm²	0.005	0.004	0.004	0.004	0.004
11 Gearhead length L1 mm	7.0	9.6	12.2	14.8	17.4

[1] based on spindle length 56 mm



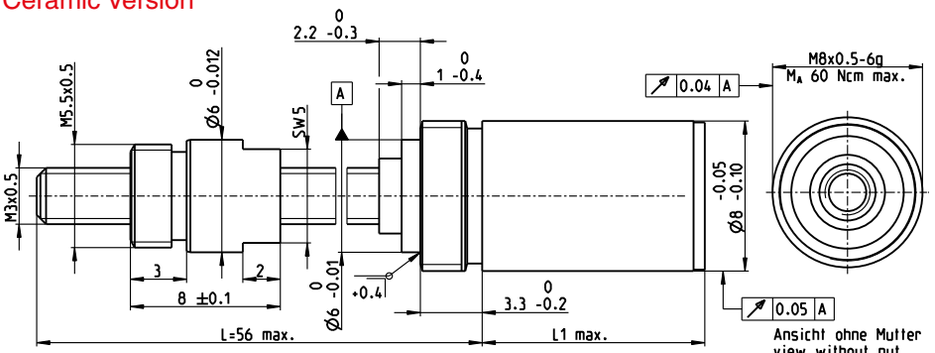


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 8, 0.5 W, A	109			23.7	26.3	28.9	31.5	34.1
RE 8, 0.5 W, B	109			26.7	29.3	31.9	34.5	37.1
RE 8, 0.5 W, A	109	MR	348/349	30.3	32.9	35.5	38.1	40.7
RE 8, 0.5 W, A	109	8 OPT	358	31.9	34.5	37.1	39.7	42.3
EC 8, 2 W	194			30.1	32.7	35.3	37.9	40.5

Spindle Drive GP 8 S Ø8 mm, Metric spindle

Ceramic Version



M 5:2

Technical Data						
Spindle						M3 x 0.5, ceramic
Standard length						56 mm
Special length (5 mm steps)						max. 100 mm
Nut (standard)						thread nut
Material						stainless steel
Axial play						< 0.09 mm
Planetary gearhead						straight teeth
Bearing						ball bearing
Radial play, 5 mm from flange						< 0.08 mm
Axial play						preloaded
Max. continuous input speed						12000 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	

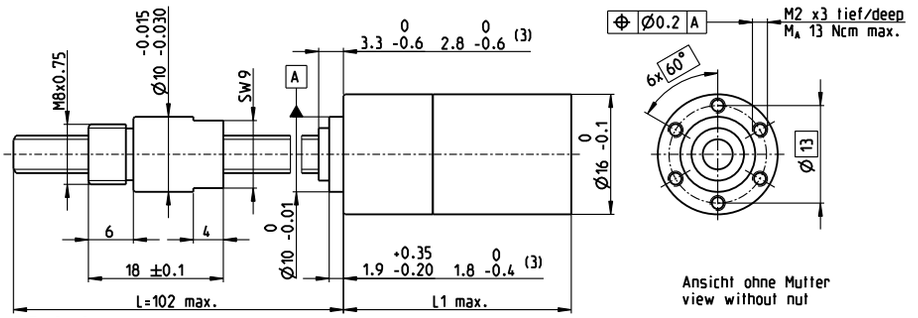
Stock program
Standard program
Special program (on request)

Part Numbers	473636	473637	473639	473640	473641
Spindle Drive Data (provisional)					
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	25	6.3	1.6	0.4	0.1
21 Max. feed force (continuous)[1] N	3	7	11	17	27
22 Max. feed force (intermittent)[1] N	14	22	32	32	32
4 Number of stages	1	2	3	4	5
7 Max. efficiency gearhead incl. spindle %	38	34	31	28	25
8 Weight[1] g	6.3	6.9	7.5	8.1	8.7
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
23 Mechanical positioning accuracy[1] mm	0.087	0.087	0.087	0.087	0.088
10 Mass inertia gearhead incl. spindle[1] gcm²	0.005	0.004	0.004	0.004	0.004
11 Gearhead length L1 mm	7.0	9.6	12.2	14.8	17.4

[1] based on spindle 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	109			23.7	26.3	28.9	31.5	34.1		
RE 8, 0.5 W, B	109			26.7	29.3	31.9	34.5	37.1		
RE 8, 0.5 W, A	109	MR	348/349	30.3	32.9	35.5	38.1	40.7		
RE 8, 0.5 W, A	109	8 OPT	358	31.9	34.5	37.1	39.7	42.3		
EC 8, 2 W	194			30.1	32.7	35.3	37.9	40.5		

Spindle Drive GP 16 S Ø16 mm, Ball Screw



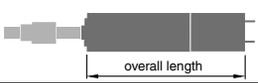
M 1:1

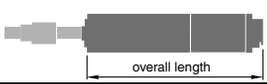
Technical Data					
Spindle	Ø5 x 2, stainless steel				
Standard length	102 mm				
Special length (5 mm steps)	max. 200 mm				
Nut (standard)	thread nut				
Material	X46Cr13, hardened				
Axial play	< 0.01 mm				
Planetary gearhead	straight teeth				
Bearing	ball bearing/axial bearing				
Radial play, 6 mm from flange	< 0.08 mm				
Axial play	preloaded				
Max. continuous input speed[2]	12000 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

Stock program
Standard program
Special program (on request)

			Part Numbers				
			424221	424222	424223	424219	424224
Spindle 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	150	90.9	21.1	4.8	1.1
21	Max. feed force (continuous)[1]	N	54	64	104	171	280
22	Max. feed force (intermittent)[1]	N	149	176	287	403	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	87723/845	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. spindle	%	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. spindle[1]	gcm²	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 spindle length 102 mm (standard length)
[2] for reduction 1:1 = 4500 rpm



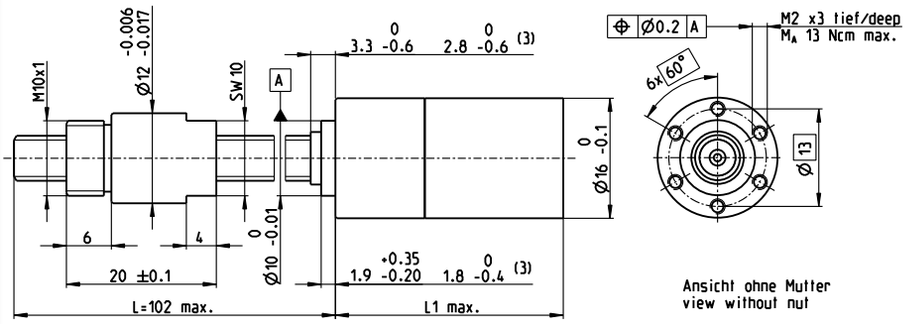


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor / brake) + assembly parts				
RE 16, 2 W	130			41.6	44.7	49.8	53.4	57.0
RE 16, 2 W	130	MR	351/353	47.3	50.4	55.5	59.1	62.7
RE 16, 3.2 W	131/132			59.7	62.8	67.9	71.5	75.1
RE 16, 3.2 W	132	MR	351/353	64.7	67.8	72.9	76.5	80.1
RE 16, 3.2 W	132	MEnc 13	371	65.8	68.9	74.0	77.6	81.2
RE 16, 4.5 W	133/134			62.7	65.8	70.9	74.5	78.1
RE 16, 4.5 W	134	MR	351/353	67.7	70.8	75.9	79.5	83.1
RE 16, 4.5 W	134	MEnc 13	371	68.9	72.0	77.1	80.7	84.3

Continuation of the modular system (irrespective of the spindle) on page 330 and 331.

Spindle Drive GP 16 S Ø16 mm, Metric spindle



M 1:1

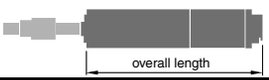
Technical Data

Spindle	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]	12000 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

Stock program
Standard program
Special program (on request)

			Part Numbers				
			424231	424232	424233	424234	424235
Spindle 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	0.5
21	Max. feed force (continuous)[1]	N	35	37	60	98	160
22	Max. feed force (intermittent)[1]	N	134	138	224	315	315
	Part Numbers			424797	424798	424800	424806
1	Reduction			5.4:1	24:1	104:1	455:1
2	Absolute reduction			27/5	1539/65	87723/845	5000211/10985
20	Max. feed velocity[1]	mm/s		37.0	8.3	1.9	0.4
21	Max. feed force (continuous)[1]	N		39	64	105	172
22	Max. feed force (intermittent)[1]	N		148	243	315	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. spindle	%	28	27	24	22	19
8	Weight[1]	g	55	61	64	68	72
9	Average backlash no load	°	1.0	1.4	1.6	2.0	2.4
23	Mechanical positioning accuracy[1]	mm	0.166	0.167	0.167	0.169	0.170
10	Mass inertia gearhead incl. spindle[1]	gcm²	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 spindle length 102 mm (standard length) [2] for reduction 1:1 = 3000 rpm



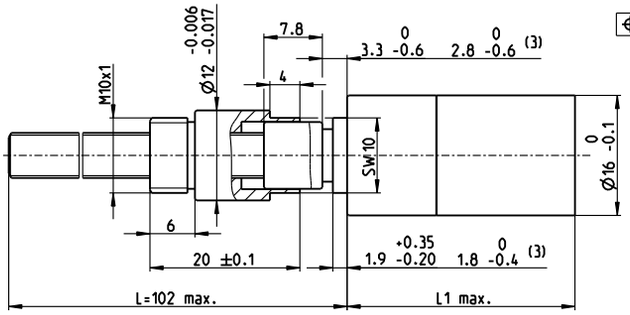
maxon Modular System

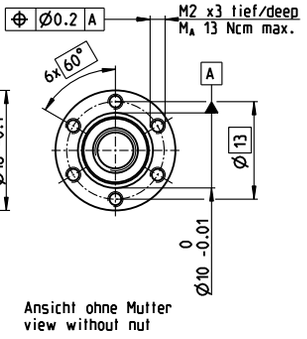
+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts			
A-max 16	149–152			–	47.8	52.9	56.5	60.1
A-max 16	150/152	MR	351/353	–	52.8	57.9	61.5	65.1
A-max 16	150/152	MEnc 13	371	–	55.9	61.0	64.6	68.2

Continuation of the modular system (irrespective of the spindle) on pages 329 and 331.

Spindle Drive GP 16 S Ø16 mm, Metric spindle

Ceramic Version





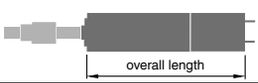
M 1:1

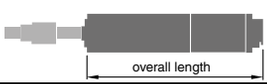
Technical Data						
Spindle						M6 x 1, ceramic
Standard length						102 mm
Special length (5 mm steps)						max. 200 mm
Nut (standard)						thread nut
Material						X8CrNiS18-9
Axial play						< 0.134 mm
Planetary gearhead						straight teeth
Bearing						ball bearing
Radial play, 6 mm from flange						< 0.08 mm
Axial play						preloaded
Max. continuous input speed[2]						12000 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	

Stock program
Standard program
Special program (on request)

			Part Numbers				
			424241	424242	424243	424244	424245
Spindle 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	0.5
21	Max. feed force (continuous)[1]	N	44	46	74	122	200
22	Max. feed force (intermittent)[1]	N	134	138	224	315	315
	Part Numbers			424811	424812	424814	424819
1	Reduction			5.4:1	24:1	104:1	455:1
2	Absolute reduction			27/5	1539/65	87723/845	5000211/10985
20	Max. feed velocity[1]	mm/s		37.0	8.3	1.9	0.4
21	Max. feed force (continuous)[1]	N		49	80	131	215
22	Max. feed force (intermittent)[1]	N		148	243	315	315
	Part Numbers				424813	424815	424820
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			86	141	230
22	Max. feed force (intermittent)[1]	N			258	315	315
	Part Numbers					424818	424821
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				150	246
22	Max. feed force (intermittent)[1]	N				315	315
	Part Numbers						424822
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					264
22	Max. feed force (intermittent)[1]	N					315
4	Number of stages		0	1	2	3	4
7	Max. efficiency gearhead incl. spindle	%	41	38	34	31	28
8	Weight[1]	g	55	61	64	68	72
9	Average backlash no load	°	1.0	1.4	1.6	2.0	2.4
23	Mechanical positioning accuracy[1]	mm	0.166	0.167	0.167	0.169	0.170
10	Mass inertia gearhead incl. spindle[1]	gcm²	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 spindle length 102 mm (standard length)
[2] for reduction 1:1 = 3000 rpm



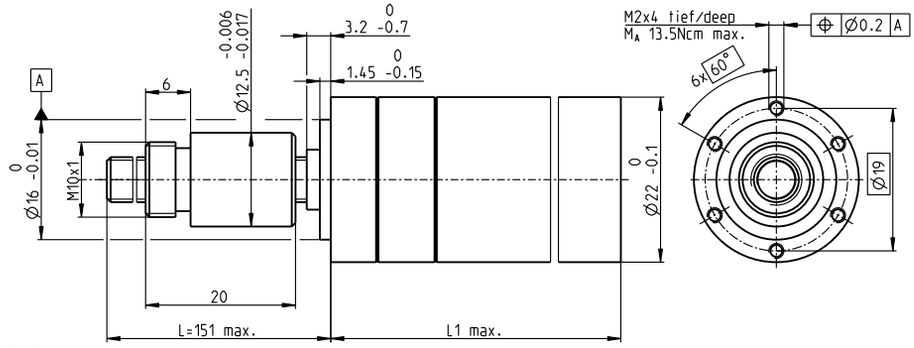


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts				
EC 16, 30 W	200			59.3	62.4	67.5	71.1	74.7
EC 16, 30 W	200	MR	354	70.0	73.1	78.2	81.8	85.4
EC 16, 60 W	202			75.3	78.4	83.5	87.1	90.7
EC 16, 60 W	202	MR	354	86.0	89.1	94.2	97.8	101.4
EC-max 16, 5 W	221			–	46.4	51.5	55.1	58.7
EC-max 16, 5 W	221	MR	354	–	53.7	58.8	62.4	66.0
EC-max 16, 8 W	223			–	58.4	63.5	67.1	70.7
EC-max 16, 8 W	223	MR	354	–	65.7	70.8	74.4	78.0

Continuation of the modular system (irrespective of the spindle) on pages 329 and 330.

Spindle Drive GP 22 S Ø22 mm, Ball Screw



M 1:1

Technical Data

Spindle	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	1	2	3	4
Max. radial load, 15 mm from flange	80 N	130 N	180 N	180 N

Stock program
Standard program
Special program (on request)

Part Numbers	363863	363864	363867	363871	363872	363877	363882	363887	363892
Spindle Drive Data									
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	1.3	0.8	0.6
21 Max. feed force (continuous)[1] N	77	100	154	196	240	285	372	443	500
22 Max. feed force (intermittent)[1] N	183	236	365	465	500	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	885/52		12825/208	87723/845	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	2187/20	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	1121931/1625
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	2	3	3	4	4	4
7 Max. efficiency gearhead incl. spindle %	96	81	67	67	57	57	47	47	47
8 Weight[1] g	103	103	115	115	128	128	141	141	141
9 Average backlash no load °	1.0	1.0	1.2	1.2	1.6	1.6	2.0	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	0.044
10 Mass inertia gearhead incl. spindle[1] gcm²	10	1.0	0.4	0.4	0.3	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	58.4

[1] based on spindle length 151 mm (standard length) [2] for reduction 1:1 = 4500 rpm

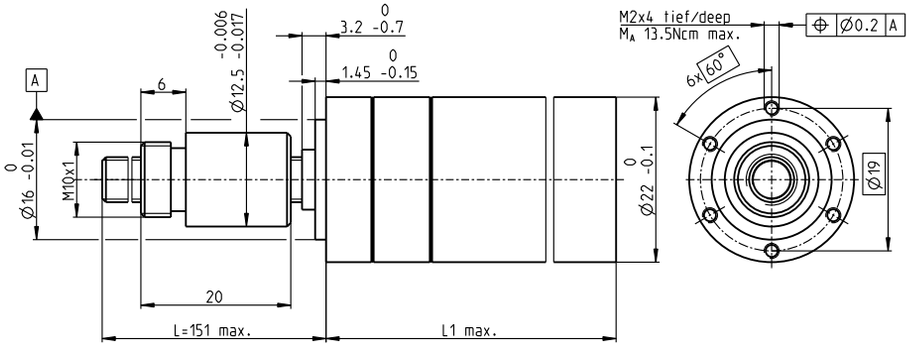
maxon Modular System

Overall length [mm] = Motor length + gearhead length + (sensor / brake) + assembly parts

+ Motor	Page	+ Sensor/Brake	Page								
A-max 19	153/154			–	64.2	71.0	71.0	77.8	77.8	84.6	84.6	84.6
A-max 19, 1.5 W	154	MR	351/353	–	69.3	76.1	76.1	82.9	82.9	89.7	89.7	89.7
A-max 19, 1.5 W	154	Enc 22	361	–	78.6	85.4	85.4	92.2	92.2	99.0	99.0	99.0
A-max 19, 1.5 W	154	MEnc 13	371	–	71.7	78.5	78.5	85.3	85.3	92.1	92.1	92.1
A-max 19, 2.5 W	155/156			–	66.8	73.6	73.6	80.4	80.4	87.2	87.2	87.2
A-max 19, 2.5 W	156	MR	351/353	–	71.1	77.9	77.9	84.7	84.7	91.5	91.5	91.5
A-max 19, 2.5 W	156	Enc 22	361	–	81.2	88.0	88.0	94.8	94.8	101.6	101.6	101.6
A-max 19, 2.5 W	156	MEnc 13	371	–	74.3	81.1	81.1	87.9	87.9	94.7	94.7	94.7
A-max 22	157-160			–	67.2	74.0	74.0	80.8	80.8	87.6	87.6	87.6
A-max 22	158/160	MR	351/353	–	72.2	79.0	79.0	85.8	85.8	92.6	92.6	92.6
A-max 22	158/160	Enc 22	361	–	81.6	88.4	88.4	95.2	95.2	102.0	102.0	102.0
A-max 22	158/160	MEnc 13	371	–	74.3	81.1	81.1	87.9	87.9	94.7	94.7	94.7
RE-max 21	179/180			–	64.2	71.0	71.0	77.8	77.8	84.6	84.6	84.6
RE-max 21, 3.5 W	180	MR	352/354	–	69.3	76.1	76.1	82.9	82.9	89.7	89.7	89.7
RE-max 21	181/182			–	66.8	73.6	73.6	80.4	80.4	87.2	87.2	87.2
RE-max 21, 6 W	182	MR	352/354	–	71.1	77.9	77.9	84.7	84.7	91.5	91.5	91.5

Continuation of the modular system (irrespective of the spindle) on page 333.

Spindle Drive GP 22 S Ø22 mm, Metric spindle



M 1:1

Technical Data

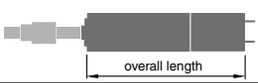
Spindle	M6 x 1, stainless steel
Standard length	151 mm
Special length (5 mm steps)	max. 300 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.008 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed[2]	8000 rpm
Recommended temperature range	-15…+80°C
Max. axial load (static)[1]	550 N

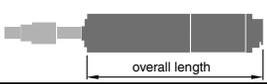
Number of stages	1	2	3	4
Max. radial load, 15 mm from flange	80 N	130 N	180 N	180 N

Stock program
Standard program
Special program (on request)

Part Numbers	363826	363827	363830	363834	363835	363840	363845	363850	363855
Spindle Drive Data									
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	101	35	9.5	4.6	2.5	1.5	0.7	0.4	0.3
21 Max. feed force (continuous)[1] N	42	60	92	118	144	171	223	266	300
22 Max. feed force (intermittent)[1] N	118	167	259	330	350	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	87723/845	192375/832	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	2777895/8788	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	2	3	3	4	4	4
7 Max. efficiency gearhead incl. spindle %	42	35	29	29	25	25	20	20	20
8 Weight[1] g	103	103	116	116	128	128	141	141	141
9 Average backlash no load °	1.0	1.0	1.2	1.2	1.6	1.6	2.0	2.0	2.0
23 Mechanical positioning accuracy[1] mm	0.034	0.034	0.034	0.034	0.034	0.034	0.037	0.037	0.037
10 Mass inertia gearhead incl. spindle[1] gcm²	10	1.0	0.4	0.4	0.3	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	58.4

[1] based on spindle length 151 mm (standard length) [2] for reduction 1:1 = 6088 rpm



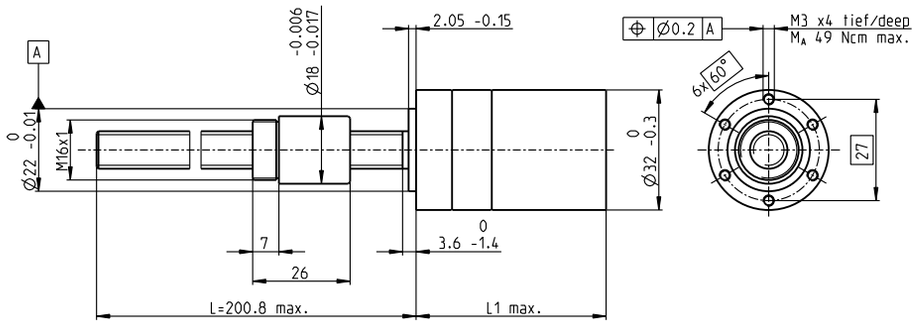


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	**Overall length [mm]** = Motor length + gearhead length + (sensor/brake) + assembly parts								
EC 16, 60 W	202			94.2	94.2	101.0	101.0	107.8	107.8	114.6	114.6	114.6
EC 16, 60 W	202	MR	354	104.9	104.9	111.7	111.7	118.5	118.5	125.3	125.3	125.3
EC 22, 40 W	207			82.7	82.7	89.5	89.5	96.3	96.3	103.1	103.1	103.1
EC 22, 40 W	207	MR	354	88.7	88.7	95.5	95.5	102.3	102.3	109.1	109.1	109.1
EC 22, 100 W	209			100.9	100.9	107.7	107.7	114.5	114.5	121.3	121.3	121.3
EC 22, 100 W	209	MR	354	106.9	106.9	113.7	113.7	120.5	120.5	127.3	127.3	127.3
EC-max 16, 8 W	223			–	71.4	78.2	78.2	85.0	85.0	91.8	91.8	91.8
EC-max 16, 8 W	223	MR	354	–	78.7	85.5	85.5	92.3	92.3	99.1	99.1	99.1
EC-max 22, 12 W	224			–	70.1	76.9	76.9	83.7	83.7	90.5	90.5	90.5
EC-max 22, 12 W	224	MR	354	–	79.8	86.6	86.6	93.4	93.4	100.2	100.2	100.2
EC-max 22, 12 W	224	AB 20	406	–	105.7	112.5	112.5	119.3	119.3	126.1	126.1	126.1

Continuation of the modular system (irrespective of the spindle) on page 332.

Spindle Drive GP 32 S Ø32 mm, Ball Screw



M 1:2

Technical Data

Spindle	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	1	2	3	4
Max. radial load, 15 mm from flange	200 N	350 N	400 N	400 N

Stock program
Standard program
Special program (on request)

Part Numbers	363970	363971	363974	363979	363980	363985	363990	363995	364000
Spindle 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	133	72	19	8.1	5.2	2.4	1.1	0.5	0.3
21 Max. feed force (continuous)[1] N	386	474	739	983	1137	1473	1921	2420	2700
22 Max. feed force (intermittent)[1] N	1023	1255	1956	2604	2700	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	6877/56	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		23/4	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	359424/875	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	4
7 Max. efficiency gearhead incl. spindle %	94	75	71	71	66	66	56	56	56
8 Weight[1] g	304	304	331	331	359	359	387	387	387
9 Average backlash no load °	0.7	0.7	0.8	0.8	1.0	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	0.039
10 Mass inertia gearhead incl. spindle[1] gcm²	42.3	4.2	0.9	0.9	0.7	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	71.1

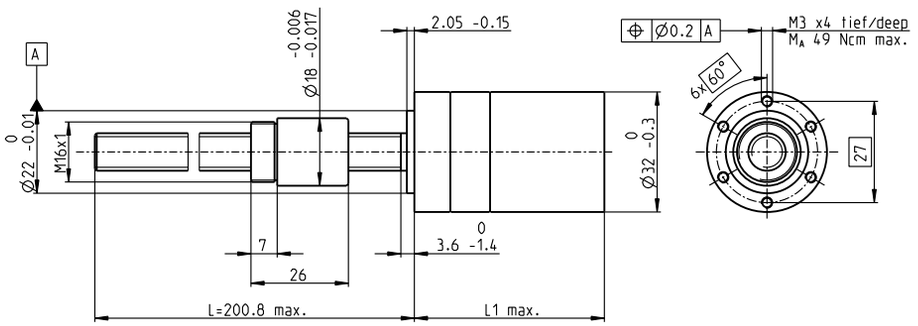
[1] based on spindle length 200.8 mm (standard length) [2] for reduction 1:1 = 4000 rpm

maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts								
RE 25	135/137			105.6	105.6	112.3	112.3	119.0	119.0	125.7	125.7	125.7
RE 25	135/137	MR	355	116.6	116.6	123.3	123.3	130.0	130.0	136.7	136.7	136.7
RE 25	135/137	Enc 22	361	119.7	119.7	126.4	126.4	133.1	133.1	139.8	139.8	139.8
RE 25	135/137	HED_5540	362/364	126.4	126.4	133.1	133.1	139.8	139.8	146.5	146.5	146.5
RE 25	135/137	DCT 22	373	127.9	127.9	134.6	134.6	141.3	141.3	148.0	148.0	148.0
RE 25, 20 W	136			94.1	94.1	100.8	100.8	107.5	107.5	114.2	114.2	114.2
RE 25, 20 W	136	MR	355	105.1	105.1	111.8	111.8	118.5	118.5	125.2	125.2	125.2
RE 25, 20 W	136	HED_5540	362/364	114.9	114.9	121.6	121.6	128.3	128.3	135.0	135.0	135.0
RE 25, 20 W	136	DCT 22	373	116.4	116.4	123.1	123.1	129.8	129.8	136.5	136.5	136.5
RE 25, 20 W	136	AB 28	408	128.2	128.2	134.9	134.9	141.6	141.6	148.3	148.3	148.3
RE 25, 20 W	136	HED_5540/AB 28	362/408	145.4	145.4	152.1	152.1	158.8	158.8	165.5	165.5	165.5
RE 25, 20 W	137	AB 28	408	139.7	139.7	146.4	146.4	153.1	153.1	159.8	159.8	159.8
RE 25, 20 W	137	HED_5540/AB 28	362/408	156.9	156.9	163.6	163.6	170.3	170.3	177.0	177.0	177.0
RE 30, 60 W	139			119.1	119.1	125.8	125.8	132.5	132.5	139.2	139.2	139.2
RE 30, 60 W	139	MR	356	130.5	130.5	137.2	137.2	143.9	143.9	150.6	150.6	150.6
RE 30, 60 W	139	HED_5540	362/364	139.9	139.9	146.6	146.6	153.3	153.3	160.0	160.0	160.0
RE 35, 90 W	140			122.1	122.1	128.8	128.8	135.5	135.5	142.2	142.2	142.2
RE 35, 90 W	140	MR	356	133.5	133.5	140.2	140.2	146.9	146.9	153.6	153.6	153.6
RE 35, 90 W	140	HED_5540	362/364	142.8	142.8	149.5	149.5	156.2	156.2	162.9	162.9	162.9
RE 35, 90 W	140	DCT 22	373	140.2	140.2	146.9	146.9	153.6	153.6	160.3	160.3	160.3
RE 35, 90 W	140	AB 28	408	158.2	158.2	164.9	164.9	171.6	171.6	178.3	178.3	178.3
RE 35, 90 W	140	HEDS 5540/AB 28	362/408	175.4	175.4	182.1	182.1	188.8	188.8	195.5	195.5	195.5

Continuation of the modular system (irrespective of the spindle) on pages 335 and 336.

Spindle Drive GP 32 S Ø32 mm, Metric spindle



M 1:2

Technical Data

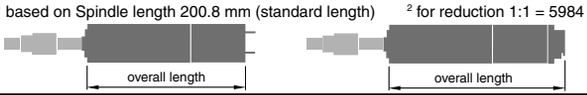
Spindle	M10 x 1, stainless steel
Standard length	200.8 mm
Special length (5 mm steps)	max. 600 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.008 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed[2]	8000 rpm
Recommended temperature range	-15…+80°C
Max. axial load (static)[1]	2700 N

Number of stages	1	2	3	4
Max. radial load, 15 mm from flange	200 N	350 N	400 N	400 N

Stock program
Standard program
Special program (on request)

Part Numbers	363900	363901	363904	363909	363910	363915	363920	363925	363930
Spindle 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	0.3	0.2
21 Max. feed force (continuous)[1] N	183	257	400	533	616	798	1040	1311	1350
22 Max. feed force (intermittent)[1] N	455	638	995	1324	1350	1350	1350	1350	1350
Part Numbers		363902	363905		363911	363916	363921	363926	363931
1 Reduction		4.8:1	18:1		66:1	123:1	295:1	531:1	913: 1
2 Absolute reduction		24/5	624/35		16224/245	6877/56	101062/343	331776/625	36501/40
20 Max. feed velocity[1] mm/s		28	7.4		2.0	1.1	0.5	0.3	0.1
21 Max. feed force (continuous)[1] N		280	435		671	826	1105	1345	1350
22 Max. feed force (intermittent)[1] N		696	1082		1350	1350	1350	1350	1350
Part Numbers		363903	363906		363912	363917	363922	363927	363932
1 Reduction		5.8:1	21:1		79:1	132:1	318:1	589:1	1093:1
2 Absolute reduction		23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256
20 Max. feed velocity[1] mm/s		23	6.3		1.7	1.0	0.4	0.2	0.1
21 Max. feed force (continuous)[1] N		298	458		712	845	1133	1350	1350
22 Max. feed force (intermittent)[1] N		742	1139		1350	1350	1350	1350	1350
Part Numbers			363907		363913	363918	363923	363928	
1 Reduction			23:1		86:1	159:1	411:1	636:1	
2 Absolute reduction			576/25		14976/175	1587/10	359424/875	79488/125	
20 Max. feed velocity[1] mm/s			5.8		1.6	0.8	0.3	0.2	
21 Max. feed force (continuous)[1] N			472		733	899	1234	1350	
22 Max. feed force (intermittent)[1] N			1174		1350	1350	1350	1350	
Part Numbers			363908		363914	363919	363924	363929	
1 Reduction			28:1		103:1	190:1	456:1	706:1	
2 Absolute reduction			138/5		3588/35	12167/64	89401/196	158171/224	
20 Max. feed velocity[1] mm/s			4.8		1.3	0.7	0.3	0.2	
21 Max. feed force (continuous)[1] N			504		778	955	1278	1350	
22 Max. feed force (intermittent)[1] N			1253		1350	1350	1350	1350	
4 Number of stages	0	1	2	2	3	3	4	4	4
7 Max. efficiency gearhead incl. spindle %	27	22	20	20	19	19	16	16	16
8 Weight[1] g	304	304	331	331	359	359	387	387	387
9 Average backlash no load °	0.7	0.7	0.8	0.8	1.0	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	0.034
10 Mass inertia gearhead incl. spindle[1] gcm²	43.3	3.0	0.9	0.9	0.7	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	71.1

[1] based on Spindle length 200.8 mm (standard length) [2] for reduction 1:1 = 5984 rpm

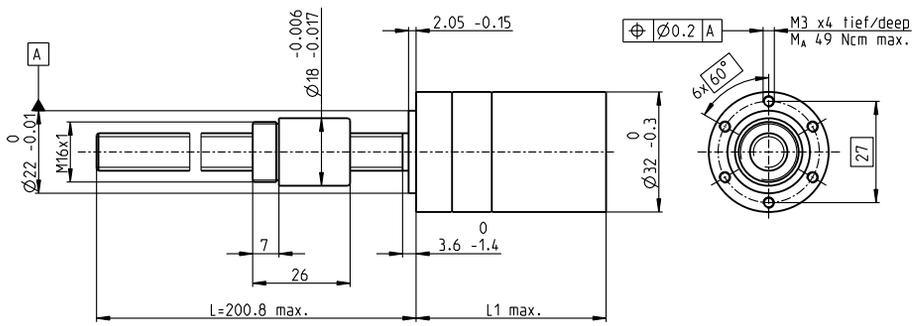


maxon Modular System

+ Motor	Page	+ Sensor/Brake	Page	Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts							
A-max 26	161-168			–	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
A-max 26	162-168	MEnc 13	371	–	102.9	109.6	109.6	116.3	116.3	123.0	123.0	123.0
A-max 26	162-168	MR	355	–	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
A-max 26	162-168	Enc 22	361	–	110.2	116.9	116.9	123.6	123.6	130.3	130.3	130.3
A-max 26	162-168	HED_5540	362/364	–	114.2	120.9	120.9	127.6	127.6	134.3	134.3	134.3
A-max 32	169/171			–	114.0	120.7	120.7	127.4	127.4	134.1	134.1	134.1
A-max 32	170/172			–	112.6	119.3	119.3	126.0	126.0	132.7	132.7	132.7
A-max 32	170/172	MR	356	–	123.8	130.5	130.5	137.2	137.2	143.9	143.9	143.9
A-max 32	170/172	HED_5540	362/364	–	133.4	140.1	140.1	146.8	146.8	153.5	153.5	153.5
RE-max 29	183-186			–	95.8	102.5	102.5	109.2	109.2	115.9	115.9	115.9
RE-max 29	184/186	MR	355	–	104.6	111.3	111.3	118.0	118.0	124.7	124.7	124.7
EC 32, 80 W	214			111.1	111.1	117.8	117.8	124.5	124.5	131.2	131.2	131.2
EC 32, 80 W	214	HED_ 5540	363/365	129.5	129.5	136.2	136.2	142.9	142.9	149.6	149.6	149.6
EC 32, 80 W	214	Res 26	374	131.2	131.2	137.9	137.9	144.6	144.6	151.3	151.3	151.3
MCD EPOS, 60 W	403			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2	191.2
MCD EPOS P 60 W	403			171.1	171.1	177.8	177.8	184.5	184.5	191.2	191.2	191.2

Continuation of the modular system (irrespective of the spindle) on pages 334 and 336.

Spindle Drive GP 32 S Ø32 mm, Trapezoidal spindle



M 1:2

Technical Data

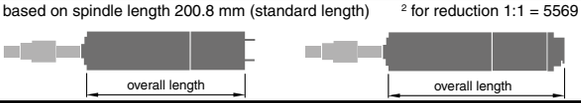
Spindle	TR10 x 2, stainless steel
Standard length	200.8 mm
Special length (5 mm steps)	max. 600 mm
Nut (standard)	thread nut
Material	bronze
Axial play	< 0.008 mm
Planetary gearhead	straight teeth
Bearing	ball bearing/thrust roller bearing
Radial play, 5 mm from flange	< 0.05 mm
Axial play	preloaded
Max. continuous input speed[2]	8000 rpm
Recommended temperature range	-15…+80°C
Max. axial load (static)[1]	2700 N

Number of stages	1	2	3	4
Max. radial load, 15 mm from flange	200 N	350 N	400 N	400 N

Stock program
Standard program
Special program (on request)

Part Numbers	363936	363937	363940	363945	363946	363951	363956	363961	363966
Spindle 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	186	72	19	8.1	5.2	2.4	1.1	0.5	0.3
21 Max. feed force (continuous)[1] N	216	296	462	614	710	921	1200	1512	1530
22 Max. feed force (intermittent)[1] N	528	723	1127	1500	1530	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	6877/56	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		23/4	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	359424/875	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	4
7 Max. efficiency gearhead incl. spindle %	47	38	35	35	33	33	28	28	28
8 Weight[1] g	304	304	331	331	359	359	387	387	387
9 Average backlash no load °	0.7	0.7	0.8	0.8	1.0	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	0.037
10 Mass inertia gearhead incl. spindle[1] gcm²	42.3	2.4	0.9	0.9	1.0	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	71.1

[1] based on spindle length 200.8 mm (standard length) [2] for reduction 1:1 = 5569 rpm



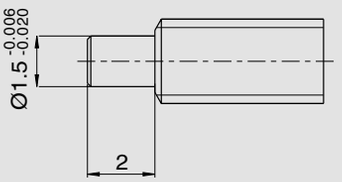
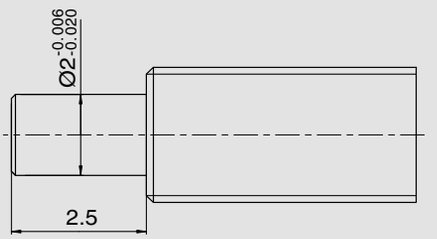
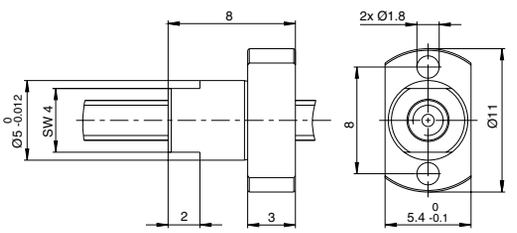
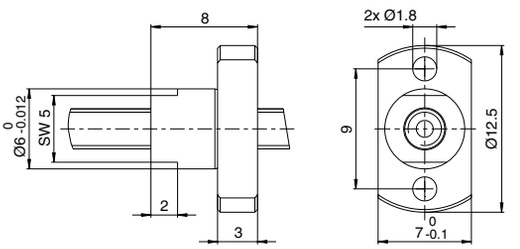
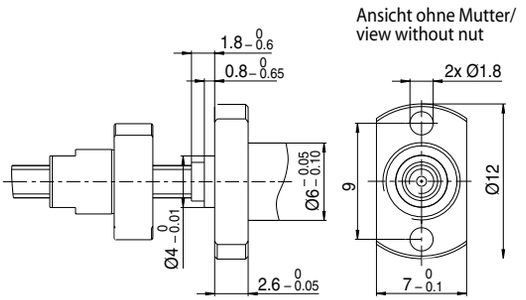
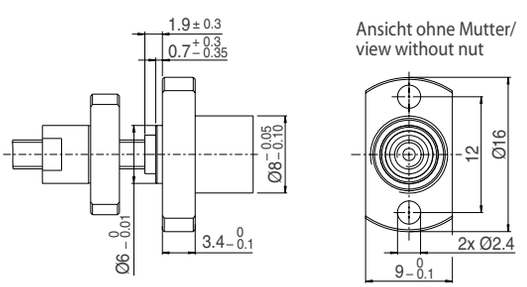
maxon Modular System

Overall length [mm] = Motor length + gearhead length + (sensor/brake) + assembly parts

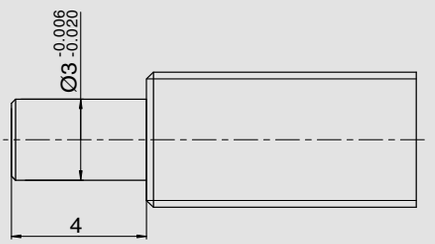
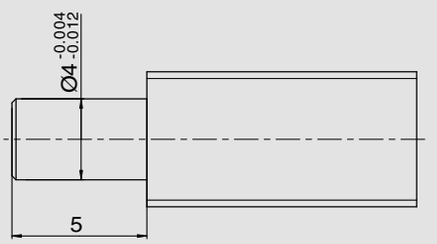
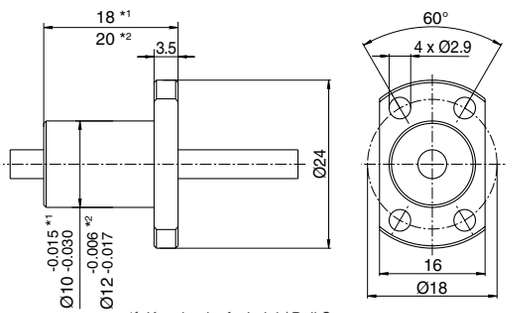
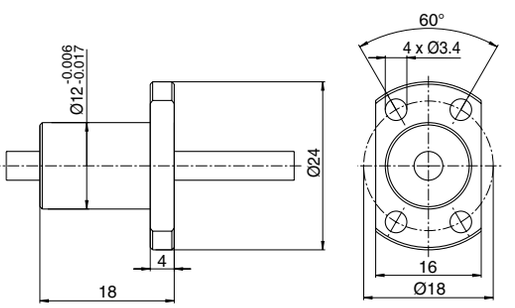
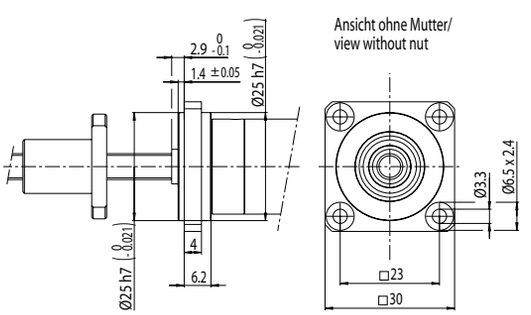
+ Motor	Page	+ Sensor/Brake	Page								
EC-max 22, 25 W	225			–	99.6	106.3	106.3	113.0	113.0	119.7	119.7	119.7
EC-max 22, 25 W	225	MR	354	–	109.3	116.0	116.0	122.7	122.7	129.4	129.4	129.4
EC-max 22, 25 W	225	AB 20	406	–	135.4	142.1	142.1	148.8	148.8	155.5	155.5	155.5
EC-max 30, 40 W	226			–	93.1	99.8	99.8	106.5	106.5	113.2	113.2	113.2
EC-max 30, 40 W	226	MR	355	–	105.3	112.0	112.0	118.7	118.7	125.4	125.4	125.4
EC-max 30, 40 W	226	HEDL5540	365	–	113.7	120.4	120.4	127.1	127.1	133.8	133.8	133.8
EC-max 30, 40 W	226	AB 20	406	–	128.9	135.6	135.6	142.3	142.3	148.3	148.3	148.3
EC-max 30, 40 W	226	HEDL 5540 / AB	365/406	–	149.5	156.2	156.2	162.9	162.9	169.6	169.6	169.6
EC-4pole 22, 90 W	233			99.7	99.7	106.4	106.4	113.1	113.1	119.8	119.8	119.8
EC-4pole 22, 90 W	233	HEDL 5540	366	121.2	121.2	127.9	127.9	134.6	134.6	141.3	141.3	141.3
EC-4pole 22,120 W	234			117.1	117.1	123.8	123.8	130.5	130.5	137.2	137.2	137.2
EC-4pole 22,120 W	234	HEDL 5540	366	138.6	138.6	145.3	145.3	152.0	152.0	158.7	158.7	158.7
EC-i 40, 50 W	243			82.7	82.7	89.4	89.4	96.1	96.1	102.8	102.8	102.8
EC-i 40, 50 W	243	16 EASY	356	94.4	94.4	101.1	101.1	107.8	107.8	114.5	114.5	114.5
EC-i 40, 50 W	243	HEDL 5540	366	105.7	105.7	112.4	112.4	119.1	119.1	125.8	125.8	125.8
EC-i 40, 70 W	245			92.7	92.7	99.4	99.4	106.1	106.1	112.8	112.8	112.8
EC-i 40, 70 W	245	16 EASY	356	104.4	104.4	111.1	111.1	117.8	117.8	124.5	124.5	124.5
EC-i 40, 70 W	245	HEDL 5540	366	115.7	115.7	122.4	122.4	129.1	129.1	135.8	135.8	135.8

Continuation of the modular system (irrespective of the spindle) on pages 334 and 335.

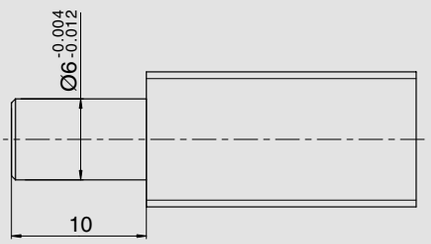
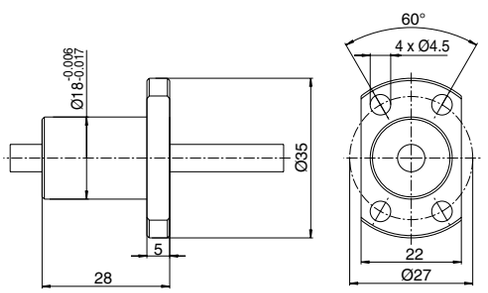
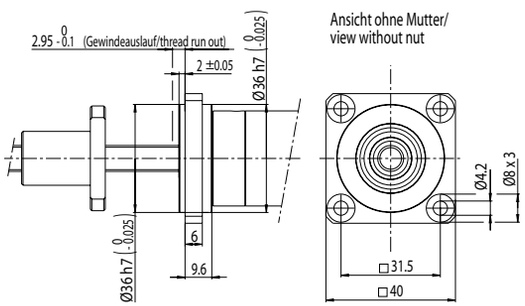
Spindle Drive Options

Option	to GP 6 S	to GP 8 S
Special length **Order reference SPIN01**	Without specification, the spindle 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 spindle is supplied in the standard length 56 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.
Spindle end **Order reference SPIN02** In order to support the end of the spindle by an additional bearing, it can be delivered according to the illustration. Customer specific spindle 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** Spindle drive with rectangular mounting flange allows mounting from the gearhead side.		

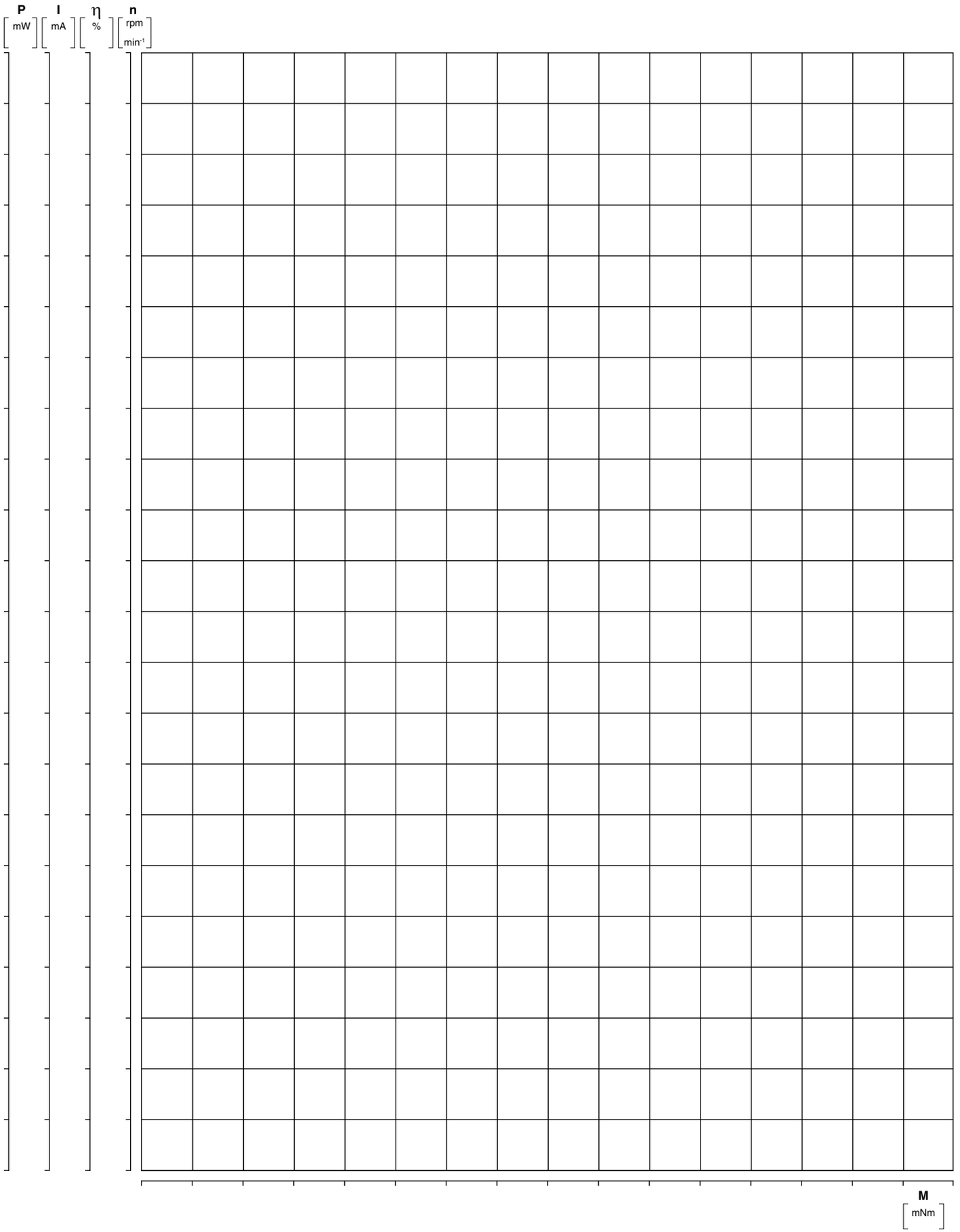
Spindle Drive Options

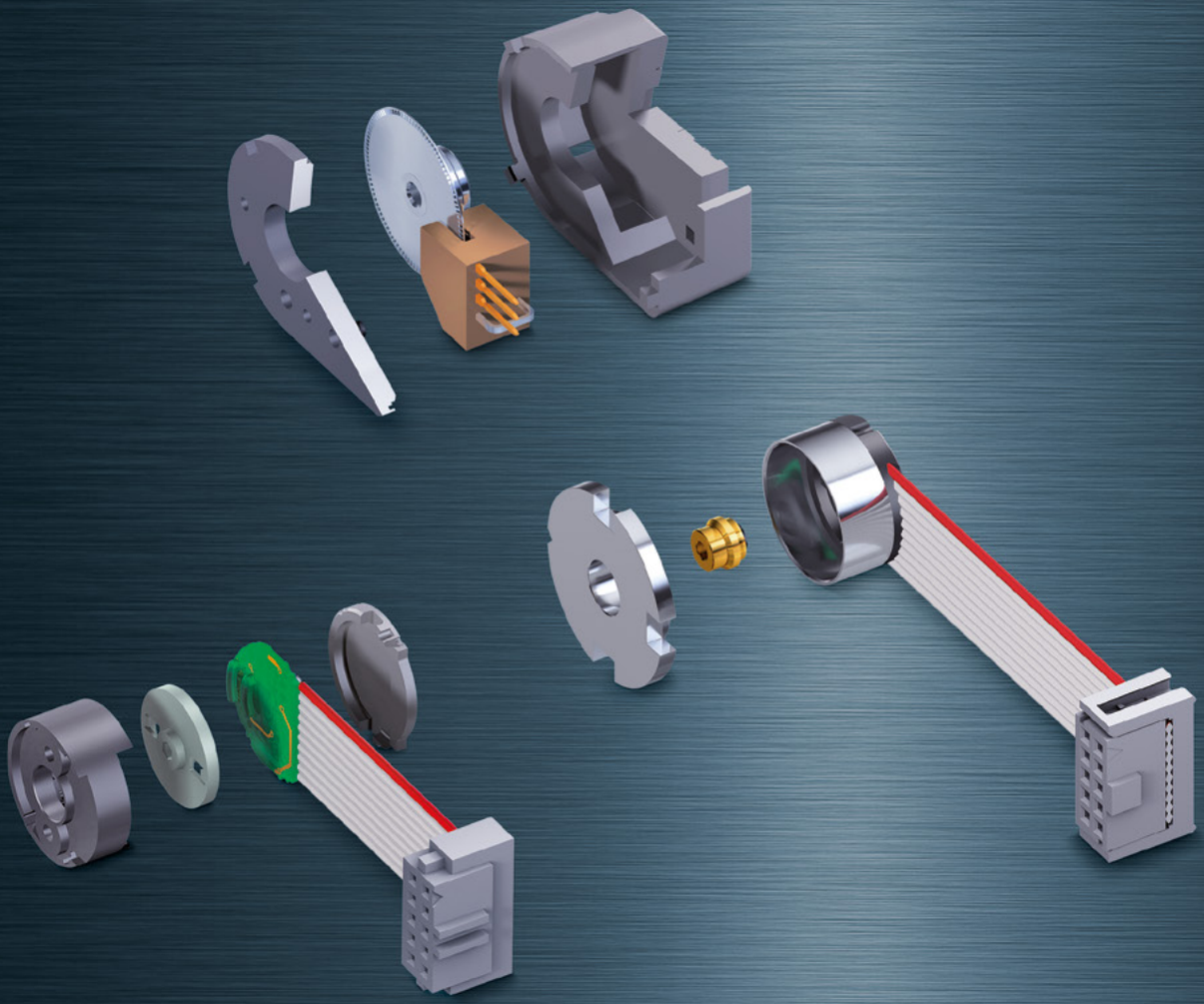
Option	to GP 16 S	to GP 22 S
Special length **Order reference SPIN01**	Without specification, the spindle is supplied in the standard length 102 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.	Without specification, the spindle is supplied in the standard length 151 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.
Spindle end **Order reference SPIN02** In order to support the end of the spindle by an additional bearing, it can be delivered according to the illustration. Customer specific spindle 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 Spindle	
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** Spindle 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.	On request.	

Spindle Drive Options

Option	to GP 32 S
Special length **Order reference SPIN01**	Without specification, the spindle is supplied in the standard length 200.8 mm. Special lengths can be ordered in 5 mm steps up to the stated maximum length.
Spindle end **Order reference SPIN02** In order to support the end of the spindle by an additional bearing, it can be delivered according to the illustration. Customer specific spindle 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** Spindle 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.	

For your personal notes



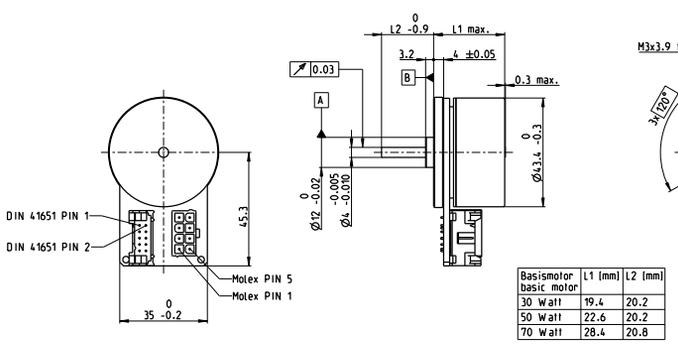


maxon sensor

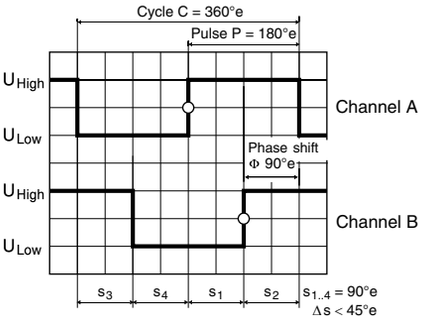
Robust encoders, DC tachometers, and resolvers with high accuracy and high signal resolution. Due to resonance, these are mainly mounted on motors with a continuous shaft. The assembly requires adjustment to the motors and may only be done in the delivery plant.

Encoder MILE 256–2048 CPT, 2 Channels, with Line Driver

Integrated into motor



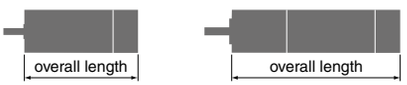
M 1:3



Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Type	Article Numbers			
	462002	462003	462004	462005
Counts per turn	256	512	1024	2048
Number of channels	2	2	2	2
Max. operating frequency (kHz)	500	500	500	500
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	261					19.4	19.4	19.4	19.4
EC 45 flat, 30 W	261	GP 42, 3 - 15 Nm	316			●	●	●	●
EC 45 flat, 30 W	261	GS 45, 0.5 - 2.0 Nm	317			●	●	●	●
EC 45 flat, 50 W	262					22.6	22.6	22.6	22.6
EC 45 flat, 50 W	262	GP 42, 3 - 15 Nm	316			●	●	●	●
EC 45 flat, 50 W	262	GS 45, 0.5 - 2.0 Nm	317			●	●	●	●
EC 45 flat, 70 W	263					28.4	28.4	28.4	28.4
EC 45 flat, 70 W	263	GP 42, 3 - 15 Nm	316			●	●	●	●
EC 45 flat, 70 W	263	GS 45, 0.5 - 2.0 Nm	317			●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Output signal	CMOS and TTL compatible
State length s_n 90°e (1000 rpm)	45…135°e
Signal rise time (typically, at C_L = 25 pF, R_L = 1 kΩ, 25 °C)	100 ns
Signal fall time (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	≤ 3.5 gcm²
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. 35	

Additional information can be found under 'Downloads' in the maxon online shop.

Pin Allocation

Connection motor

Pin 1 Hall sensor 1*
Pin 2 Hall sensor 2*
Pin 3 V_{Hall} 4.5...18 VDC
Pin 4 Motor winding 3
Pin 5 Hall sensor 3*
Pin 6 GND
Pin 7 Motor winding 1
Pin 8 Motor winding 2

*Internal pull-up (10 kΩ) on pin 3 (V_{Hall})

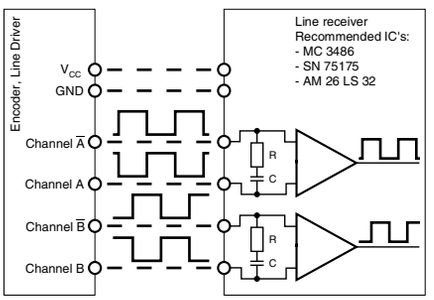
Connection Encoder

Pin 1 N.C.
Pin 2 V_{CC}
Pin 3 GND
Pin 4 N.C.
Pin 5 Channel $\overline{A}$
Pin 6 Channel A
Pin 7 Channel $\overline{B}$
Pin 8 Channel B
Pin 9 Do not connect
Pin 10 Do not connect

Connector:
39-28-1083 Molex
DIN 41651/EN 60603-13

Note: Pull-down resistors < 100 kΩ on the encoder outputs are not permitted. Pull-up resistors are permitted, but not required.

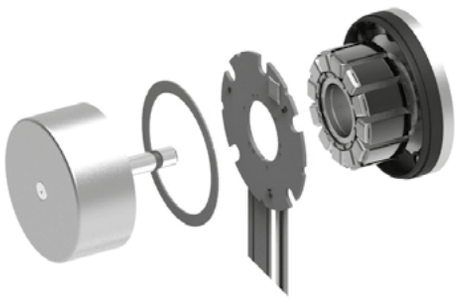
Connection example

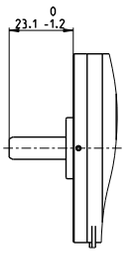


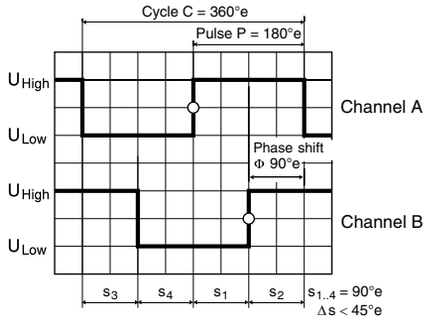
Opt. terminal resistance R = typical 120 Ω
Capacitor C ≥ 0.1 nF per m line length

Encoder MILE 512–4096 CPT, 2 Channels, with Line Driver

Integrated into motor



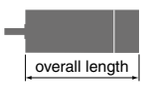


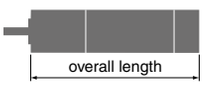


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	421985	421986	421987	421988
Type				
Counts per turn	512	1024	2048	4096
Number of channels	2	2	2	2
Max. operating frequency (kHz)	500	500	500	500
Max. speed (rpm)	6000	6000	6000	6000





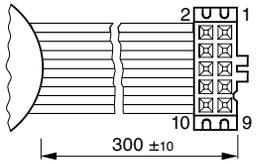
maxon Modular System						Overall length [mm] / ● see Gearhead			
+ Motor	Page	+ Gearhead	Page	+ Brake	Page				
EC 60 flat, IP00	266					39.0	39.0	39.0	39.0
EC 60 flat, IP00	266	GP 52, 4 - 30 Nm	319			●	●	●	●
EC 60 flat, IP54	266					43.0	43.0	43.0	43.0
EC 60 flat, IP54	266	GP 52, 4 - 30 Nm	319			●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Output signal	CMOS and TTL compatible
State length s_n (1000 rpm)	90°e ± <45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 1 kΩ, 25 °C)	100 ns
Signal fall time (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	≤ 13 gcm²
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. 35	

Additional information can be found under 'Downloads' in the maxon online shop.

Pin Allocation

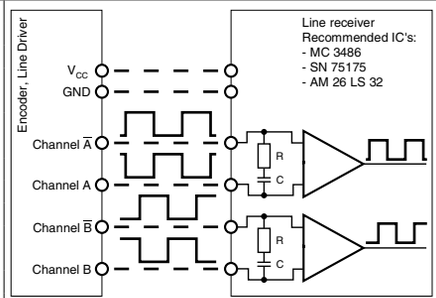


1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Do not connect
10	Do not connect

DIN Connector 41651/EN 60603-13
flat ribbon cable AWG 28

Note: Pull-down resistors < 100 kΩ on the encoder outputs are not permitted. Pull-up resistors are permitted, but not required.

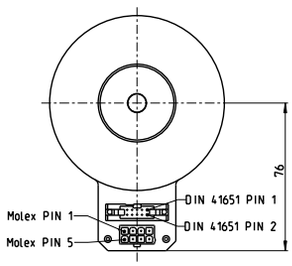
Connection example

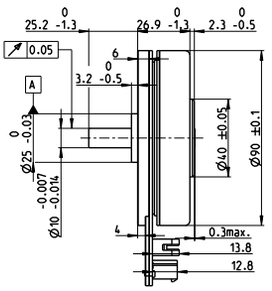


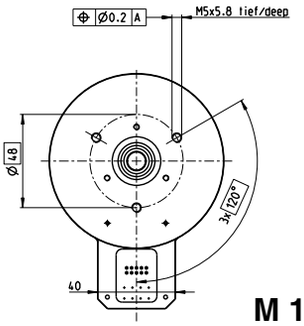
Opt. terminal resistance R = typical 120 Ω
Capacitor C ≥ 0.1 nF per m line length

Encoder MILE 512–6400 CPT, 2 Channels, with Line Driver RS 422

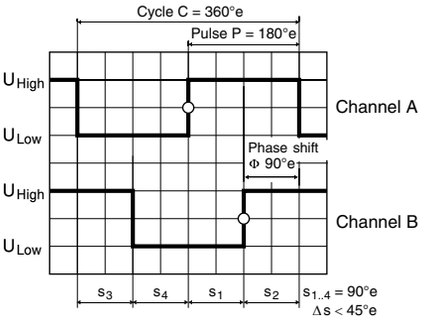
Integrated into motor







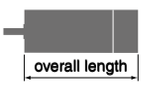
M 1:3



Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	453234	409996	453233	411964	453232	411965	453231	411966
Type								
Counts per turn	512	800	1024	1600	2048	3200	4096	6400
Number of channels	2	2	2	2	2	2	2	2
Max. operating frequency (kHz)	500	500	500	500	500	500	500	500
Max. speed (rpm)	5000	5000	5000	5000	5000	5000	5000	4650



maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead							
EC 90 flat	267					29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2
EC 90 flat	267	GP 52, 4 - 30 Nm	319			●	●	●	●	●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Output signal	EIA Standard RS422
driver used:	AM26C31QD
State length s_n (500 rpm)	90°e ± <45°e
Signal rise and fall times	
(typically, at C_L = 120 pF, R_L = 100 Ω)	20 ns
Operating temperature range	-40…+100 °C
Moment of inertia of code wheel	≤ 65 gcm²
Output current per channel	min. -20 mA, max. 20 mA
Wiring diagram for Hall sensors see p. 35	

Additional information can be found under 'Downloads' in the maxon online shop.

Pin Allocation

Connection motor

Pin 1 Hall sensor 1*
Pin 2 Hall sensor 2*
Pin 3 V_{Hall} 4.5...18 VDC
Pin 4 Motor winding 3
Pin 5 Hall sensor 3*
Pin 6 GND
Pin 7 Motor winding 1
Pin 8 Motor winding 2

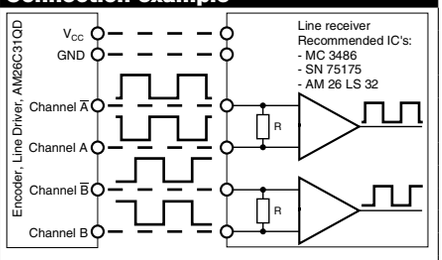
*Internal pull-up (10 kΩ) on pin 3 (V_{Hall})

Connection Encoder

Pin 1 N.C.
Pin 2 V_{CC}
Pin 3 GND
Pin 4 N.C.
Pin 5 Channel $\overline{A}$
Pin 6 Channel A
Pin 7 Channel $\overline{B}$
Pin 8 Channel B
Pin 9 Do not connect
Pin 10 Do not connect

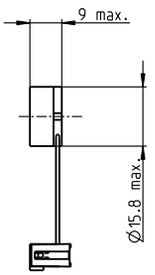
Connector:
39-28-1083 Molex
DIN 41651/EN 60603-13

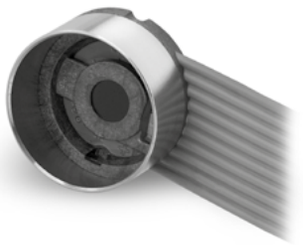
Connection example

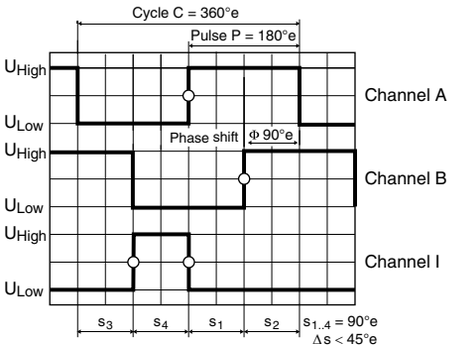


Opt. terminal resistance R = typical 120 Ω

Encoder 16 EASY 128–1024 CPT, 3 Channels, with Line Driver RS 422



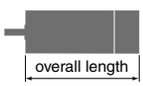


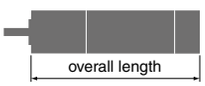


Direction of rotation cw (definition cw p. 106)

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)	200	400	800	800	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	243/244					37.7	37.7	37.7	37.7	37.7	37.7
EC-i 40, 50 W	243	GP 32, 1 - 6 Nm	308			●	●	●	●	●	●
EC-i 40, 50 W	243	GP 32 S	334-336			●	●	●	●	●	●
EC-i 40, 50 W	243/244	GP 42, 3 - 15 Nm	315			●	●	●	●	●	●
EC-i 40, 70 W	245/246					47.7	47.7	47.7	47.7	47.7	47.7
EC-i 40, 70 W	245	GP 32, 1 - 6 Nm	308			●	●	●	●	●	●
EC-i 40, 70 W	245/	GP 32 S	334-336			●	●	●	●	●	●
EC-i 40, 70 W	245/246	GP 42, 3 - 15 Nm	315			●	●	●	●	●	●
EC-i 40, 100 W	247					67.7	67.7	67.7	67.7	67.7	67.7
EC-i 40, 100 W	247	GP 42, 3 - 15 Nm	315			●	●	●	●	●	●

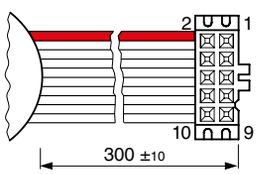
Technical Data

Supply voltage V_{CC}	5 V ± 10%
Output signal	EIA Standard RS 422
Operating temperature range	-40…+100 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
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. 32.

Additional information can be found in the maxon online shop under downloads.
The index signal I is synchronized with channel A or B.

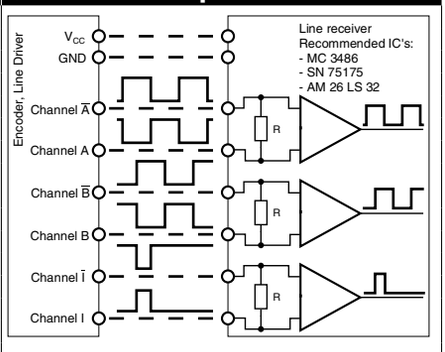
Pin Allocation



1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$ (Index)
10	Channel I (Index)

DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

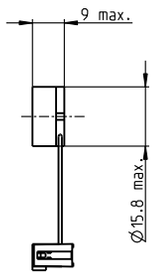
Connection example

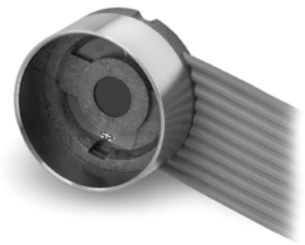


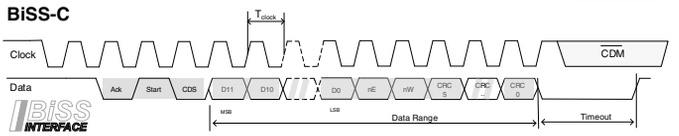
Opt. terminal resistance R = typical 120 Ω

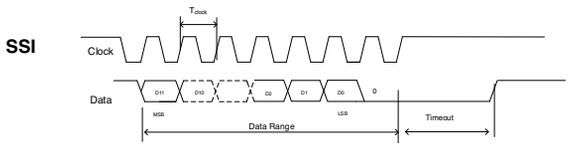
Encoder 16 EASY Absolute 4096 steps per turn

NEW







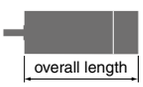


Angle values increase when direction of rotation is cw (definition of 'cw' on p. 106)

Stock program
Standard program
Special program (on request)

Part numbers

	488783	488782
Type (provisional)		
Steps per turn	4096	4096
Resolution (bit single turn)	12	12
Signal protocol	BiSS-C	SSI
Max. mech. speed (rpm)	30 000	30 000
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	+ Electronics	Page	+ Accessories*		Total length [mm]	
EC-i 40, 50 W	243/244					37.7	37.7
EC-i 40, 50 W	243/244	EPOS2 50/5	387	Signal Cable J5	300586	●	●
EC-i 40, 50 W	243/244	EPOS2 70/10	387	Signal Cable J5B	378173	●	●
EC-i 40, 50 W	243/244	EPOS3 70/10 EtherCAT	393	Signal Cable J5	300586	●	●
EC-i 40, 50 W	243/244	MAXPOS 50/5	396	Sensor Cable X6	451290	●	●
EC-i 40, 70 W	245/246					47.7	47.7
EC-i 40, 70 W	245/246	EPOS2 50/5	387	Signal Cable J5	300586	●	●
EC-i 40, 70 W	245/246	EPOS2 70/10	387	Signal Cable J5B	378173	●	●
EC-i 40, 70 W	245/246	EPOS3 70/10 EtherCAT	393	Signal Cable J5	300586	●	●
EC-i 40, 70 W	245/246	MAXPOS 50/5	396	Sensor Cable X6	451290	●	●
EC-i 40, 100 W	247					37.7	37.7
EC-i 40, 100 W	247	EPOS2 50/5	387	Signal Cable J5	300586	●	●
EC-i 40, 100 W	247	EPOS2 70/10	387	Signal Cable J5B	378173	●	●
EC-i 40, 100 W	247	EPOS3 70/10 EtherCAT	393	Signal Cable J5	300586	●	●
EC-i 40, 100 W	247	MAXPOS 50/5	396	Sensor Cable X6	451290	●	●

* + Adapter EASY Absolute 488167 (required for all maxon controllers)

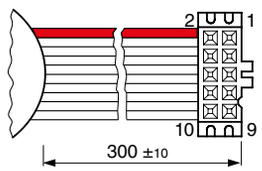
Technical data

Supply voltage V_{CC}	5 V ± 10%
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 gcm²
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. 32.

Additional information can be found under 'Downloads' in the maxon online shop.

Pin assignment

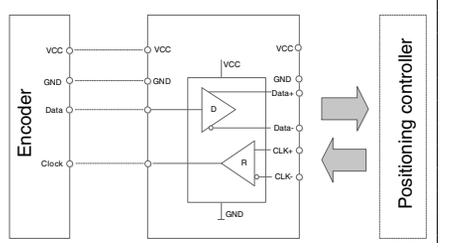


1	Data
2	V_{CC}
3	GND
4	CLK
5	Do not connect ($\overline{A}$)
6	Do not connect (A)
7	Do not connect ($\overline{B}$)
8	Do not connect (B)
9	Do not connect ($\overline{I}$)
10	Do not connect (I)

DIN Connector 41651/
EN 60603-13
flat ribbon cable AWG 28

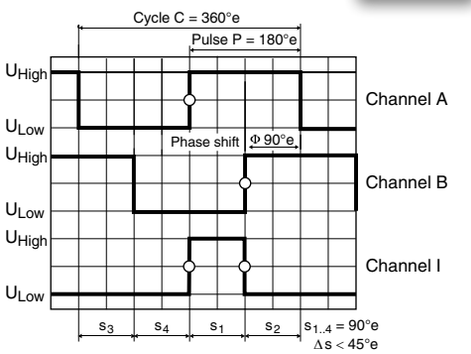
Connection example

Adapter EASY Absolute 488167



Encoder 6–8 MAG 64–256 CPT, 3 Channels

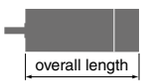
NEW

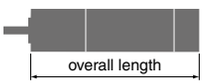


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers			
	502804	502805	502806
Type (provisional)			
Counts per turn	64	128	256
Number of channels	3	3	3
Max. operating frequency (kHz)	64	64	64
Max. speed (rpm)	120000	60000	30000





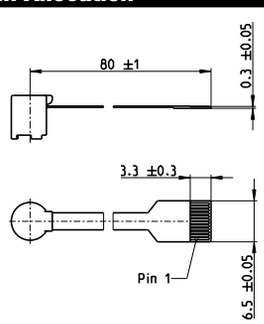
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead		
EC 6, 1.5 W	192					23.4	23.4	23.4
EC 6, 1.5 W	192	GP 6, 0.002 - 0.03 Nm	273			●	●	●
EC 6, 1.5 W	192	GP 6 S	325-326			●	●	●
EC 6, 2.0 W	193					23.4	23.4	23.4
EC 6, 2.0 W	193	GP 6, 0.002 - 0.03 Nm	273			●	●	●
EC 6, 2.0 W	193	GP 6 S	325-326			●	●	●

Technical Data

Supply voltage V_{CC}	3 - 3.6 V
Output signal V_{CC} = 3.3 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-40…+125 °C
Moment of inertia of code wheel	≤ 0.001 gcm²
Output current per channel	≤ 4 mA

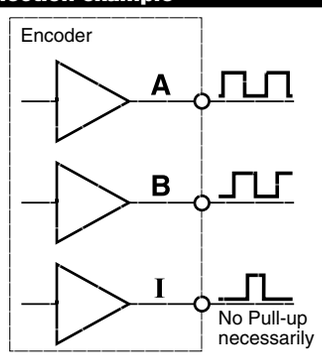
Pin Allocation



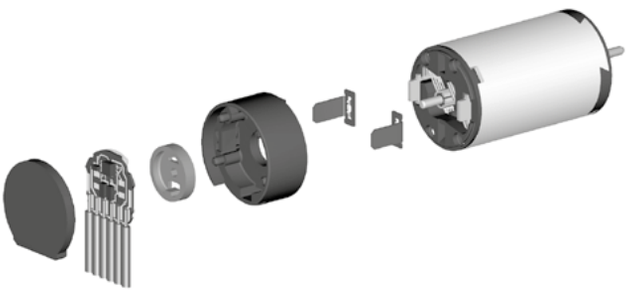
	DC	EC
1	Motor +	W1
2	Motor –	W2
3	NC	W3
4	GND	GND
5	V_{CC}	V_{CC}
6	Channel A	Channel A
7	Channel B	Channel B
8	Channel I	Channel I
9	NC	H1
10	NC	H2
11	NC	H3
12	NC	NC

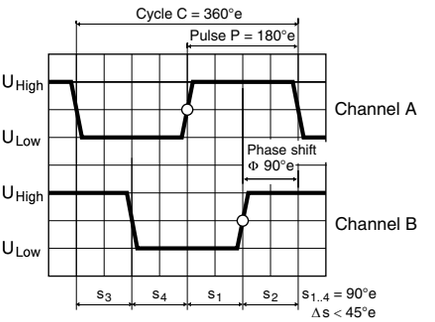
Compatible connector: Molex 52745-0697, Tyco 1-1734839-4
Adapter: 498158

Connection example



Encoder MR Type S, 16 CPT, 2 Channels

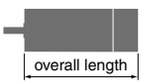


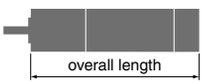


Direction of rotation cw (definition cw p. 106)

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)	30 000	30 000





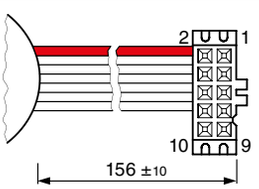
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
RE 10, 0.75 W	111					22.8	
RE 10, 0.75 W	111	GP 10, 0.005 - 0.15 Nm	275/276			●	
RE 10, 1.5 W	113					30.4	
RE 10, 1.5 W	113	GP 10, 0.005 - 0.15 Nm	275/276			●	
RE 13, 0.75 W	116						26.3
RE 13, 0.75 W	117						28.7
RE 13, 0.75 W	117	GP 13, 0.05 - 0.15 Nm	278				●
RE 13, 0.75 W	117	GP 13, 0.2 - 0.35 Nm	279				●
RE 13, 2 W	120						38.5
RE 13, 2 W	121						40.9
RE 13, 2 W	121	GP 13, 0.05 - 0.15 Nm	278				●
RE 13, 2 W	121	GP 13, 0.2 - 0.35 Nm	279				●
RE 13, 1.5 W	124						28.4
RE 13, 1.5 W	125						30.8
RE 13, 1.5 W	125	GP 13, 0.05 - 0.15 Nm	278				●
RE 13, 1.5 W	125	GP 13, 0.2 - 0.35 Nm	279				●
RE 13, 3 W	128						40.6
RE 13, 3 W	129						43.0
RE 13, 3 W	129	GP 13, 0.05 - 0.15 Nm	278				●
RE 13, 3 W	129	GP 13, 0.2 - 0.35 Nm	279				●
A-max 12, 0.5 W	148					25.3	
A-max 12, 0.5 W	148	GP 10, 0.01 - 0.15 Nm	276			●	
A-max 12, 0.5 W	148	GS 12, 0.01 - 0.03 Nm	277			●	
A-max 12, 0.5 W	148	GP 13, 0.05 - 0.15 Nm	278			●	
A-max 12, 0.5 W	148	GP 13, 0.2 - 0.35 Nm	279			●	
RE-max 13, 0.75 W	176						25.2
RE-max 13, 0.75 W	176	GP 13, 0.05 - 0.15 Nm	278				●
RE-max 13, 0.75 W	176	GP 13, 0.2 - 0.35 Nm	279				●
RE-max 13, 2 W	178						36.2
RE-max 13, 2 W	178	GP 13, 0.05 - 0.15 Nm	278				●
RE-max 13, 2 W	178	GP 13, 0.2 - 0.35 Nm	279				●

Technical Data

Supply voltage V_{CC}	2.7 - 5.5 V
Output signal V_{CC} = 5 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Operating temperature range	-25…+85 °C
Moment of inertia of code wheel	≤ 0.005 gcm²
Output current per channel	max. 5 mA

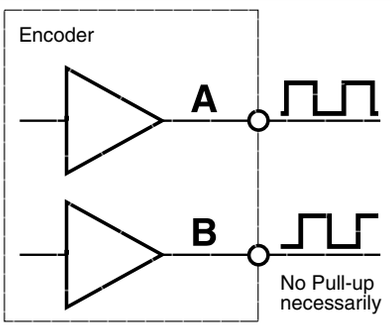
Pin Allocation



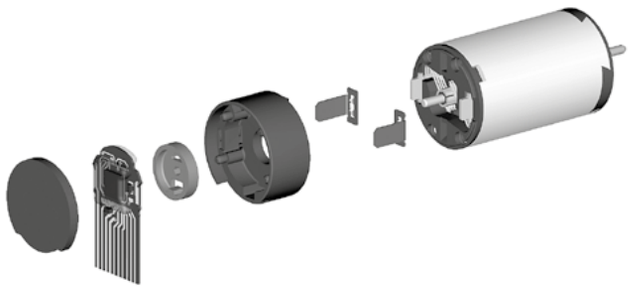
1 Motor +
2 V_{CC}
3 Channel A
4 Channel B
5 GND
6 Motor –

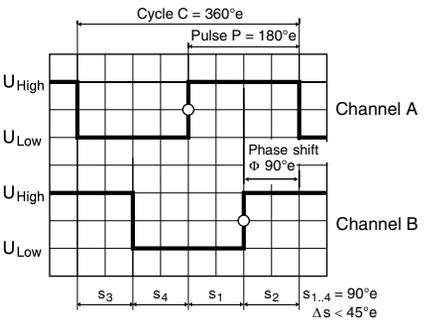
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

Connection example



Encoder MR Type S, 64–256 CPT, 2 Channels, with Line Driver

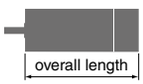


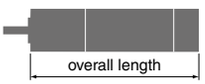


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	323049	323050	334910	323051	323052	323053	323054
Type							
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	+ Brake	Page	Overall length [mm] / ● see Gearhead						
RE 8, 0.5 W, A	109					22.6						
RE 8, 0.5 W, A	109	GP 8, 0.01 - 0.1 Nm	274			●						
RE 8, 0.5 W, A	109	GP 8 S	327–328			●						
RE 10, 0.75 W	111					22.8			22.8		22.8	
RE 10, 0.75 W	111	GP 10, 0.005 - 0.15 Nm	275/276			●			●		●	
RE 10, 1.5 W	113					30.4			30.4		30.4	
RE 10, 1.5 W	113	GP 10, 0.005 - 0.15 Nm	275/276			●			●		●	
RE 13, 0.75 W	116						26.3			26.3		26.3
RE 13, 0.75 W	117						28.7			28.7		28.7
RE 13, 0.75 W	117	GP 13, 0.05 - 0.15 Nm	278				●			●		●
RE 13, 0.75 W	117	GP 13, 0.2 - 0.35 Nm	279				●			●		●
RE 13, 2 W	120						38.5			38.5		38.5
RE 13, 2 W	121						40.9			40.9		40.9
RE 13, 2 W	121	GP 13, 0.05 - 0.15 Nm	278				●			●		●
RE 13, 2 W	121	GP 13, 0.2 - 0.35 Nm	279				●			●		●
RE 13, 1.5 W	124						28.4			28.4		28.4
RE 13, 1.5 W	125						30.8			30.8		30.8
RE 13, 1.5 W	125	GP 13, 0.05 - 0.15 Nm	278				●			●		●
RE 13, 1.5 W	125	GP 13, 0.2 - 0.35 Nm	279				●			●		●
RE 13, 3 W	128						40.6			40.6		40.6
RE 13, 3 W	129						43.0			43.0		43.0
RE 13, 3 W	129	GP 13, 0.05 - 0.15 Nm	278				●			●		●
RE 13, 3 W	129	GP 13, 0.2 - 0.35 Nm	279				●			●		●
A-max 12, 0.5 W	148					25.3			25.3		25.3	
A-max 12, 0.5 W	148	GP 10, 0.01 - 0.15 Nm	276			●			●		●	
A-max 12, 0.5 W	148	GS 12, 0.01 - 0.03 Nm	277			●			●		●	
A-max 12, 0.5 W	148	GP 13, 0.05 - 0.15 Nm	278			●			●		●	
A-max 12, 0.5 W	148	GP 13, 0.2 - 0.35 Nm	279			●			●		●	
RE-max 13, 0.75 W	176						25.2			25.2		25.2
RE-max 13, 0.75 W	176	GP 13, 0.05 - 0.15 Nm	278				●			●		●
RE-max 13, 0.75 W	176	GP 13, 0.2 - 0.35 Nm	279				●			●		●
RE-max 13, 2 W	178						36.2			36.2		36.2
RE-max 13, 2 W	178	GP 13, 0.05 - 0.15 Nm	278				●			●		●
RE-max 13, 2 W	178	GP 13, 0.2 - 0.35 Nm	279				●			●		●

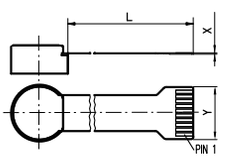
Technical Data

Supply voltage V_{CC}	5 V ± 5%
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 gcm²
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

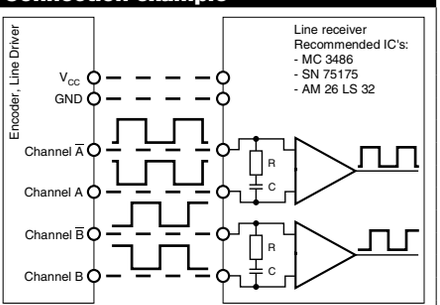
1	Motor +
2	V_{CC}
3	GND
4	Motor –
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	N.C.
10	N.C.



Part Numbers 334910
Pin 1–8 / X = 0.3 ±0.03 / Y = 4.5 ±0.07 / L = 84 ±3
Compatible connector:
Molex 52745-0833

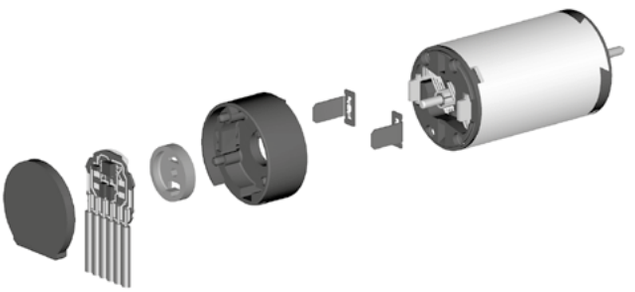
1	Motor +
2	V_{CC}
3	GND
4	Motor –
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B

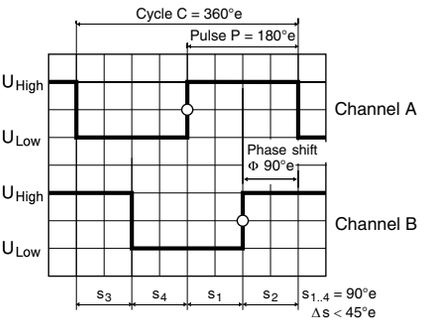
Connection example



Terminal resistance R = typical 120 Ω
Capacitor C ≥ 0.1 nF per m line length

Encoder MR Type S, 64–256 CPT, 2 Channels

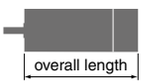


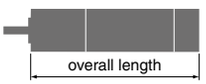


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers			
	241057	241060	241062
Type			
Counts per turn	64	128	256
Number of channels	2	2	2
Max. operating frequency (kHz)	80	160	320
Max. speed (rpm)	75000	75000	75000





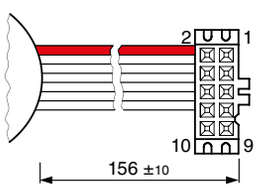
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead		
RE 13, 0.75 W	116					26.3	26.3	26.3
RE 13, 0.75 W	117					28.7	28.7	28.7
RE 13, 0.75 W	117	GP 13, 0.05 - 0.15 Nm	278			●	●	●
RE 13, 0.75 W	117	GP 13, 0.2 - 0.35 Nm	279			●	●	●
RE 13, 2 W	120					38.5	38.5	38.5
RE 13, 2 W	121					40.9	40.9	40.9
RE 13, 2 W	121	GP 13, 0.05 - 0.15 Nm	278			●	●	●
RE 13, 2 W	121	GP 13, 0.2 - 0.35 Nm	279			●	●	●
RE 13, 1.5 W	124					28.4	28.4	28.4
RE 13, 1.5 W	125					30.8	30.8	30.8
RE 13, 1.5 W	125	GP 13, 0.05 - 0.15 Nm	278			●	●	●
RE 13, 1.5 W	125	GP 13, 0.2 - 0.35 Nm	279			●	●	●
RE 13, 3 W	128					40.6	40.6	40.6
RE 13, 3 W	129					43.0	43.0	43.0
RE 13, 3 W	129	GP 13, 0.05 - 0.15 Nm	278			●	●	●
RE 13, 3 W	129	GP 13, 0.2 - 0.35 Nm	279			●	●	●
RE-max 13, 0.75 W	176					25.2	25.2	25.2
RE-max 13, 0.75 W	176	GP 13, 0.05 - 0.15 Nm	278			●	●	●
RE-max 13, 0.75 W	176	GP 13, 0.2 - 0.35 Nm	279			●	●	●
RE-max 13, 2 W	178					36.2	36.2	36.2
RE-max 13, 2 W	178	GP 13, 0.05 - 0.15 Nm	278			●	●	●
RE-max 13, 2 W	178	GP 13, 0.2 - 0.35 Nm	279			●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
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 gcm²
Output current per channel	max. 5 mA

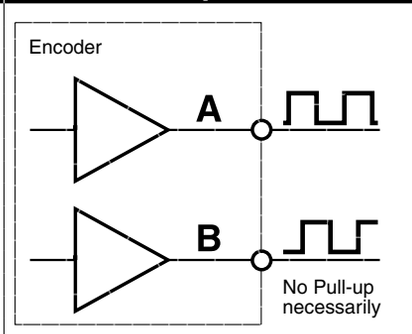
Pin Allocation



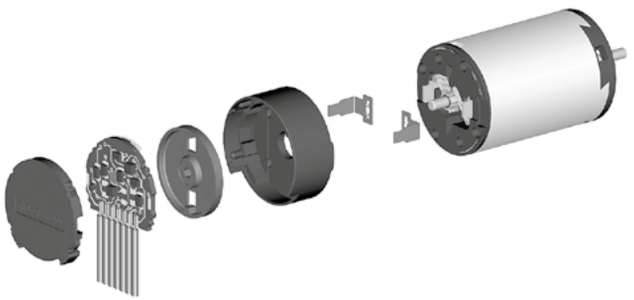
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –
7	N.C.

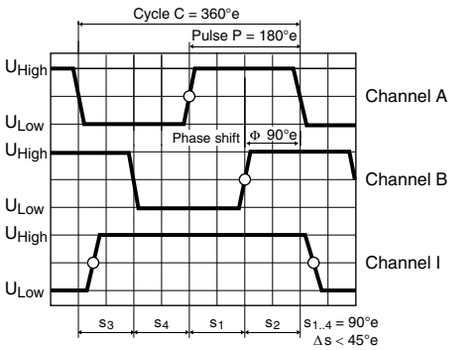
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

Connection example



Encoder MR Type M, 32 CPT, 2/3 Channels

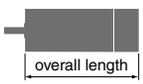


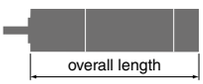


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	201935	201938
Type		
Counts per turn	32	32
Number of channels	2	3
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	15000	15000





maxon Modular System

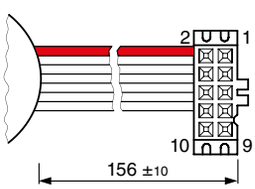
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
RE 16, 2 W	130					28.0	28.0
RE 16, 2 W	130	GP 16, 0.1 - 0.6 Nm	285/286			●	●
RE 16, 2 W	130	GP 16 S	329/330			●	●
RE 16, 3.2 W	132					45.4	45.4
RE 16, 3.2 W	132	GP 16, 0.1 - 0.6 Nm	285/286			●	●
RE 16, 3.2 W	132	GP 16 S	329/330			●	●
RE 16, 4.5 W	134					48.4	48.4
RE 16, 4.5 W	134	GP 16, 0.1 - 0.6 Nm	285/286			●	●
RE 16, 4.5 W	134	GP 16 S	329/330			●	●
A-max 16	150/152					30.4	30.4
A-max 16	150/152	GS 16, 0.01 - 0.1 Nm	281-284			●	●
A-max 16	150/152	GP 16, 0.1 - 0.3 Nm	285			●	●
A-max 16	150/152	GP 16 S	329/330			●	●
A-max 19, 1.5 W	154					34.0	34.0
A-max 19, 1.5 W	154	GP 19, 0.1 - 0.3 Nm	288			●	●
A-max 19, 1.5 W	154	GP 22, 0.5 - 2.0 Nm	295			●	●
A-max 19, 1.5 W	154	GS 24, 0.1 Nm	300			●	●
A-max 19, 1.5 W	154	GP 22 S	332/333			●	●
A-max 19, 2.5 W	156					35.8	35.8
A-max 19, 2.5 W	156	GP 19, 0.1 - 0.3 Nm	288			●	●
A-max 19, 2.5 W	156	GS 20, 0.06 - 0.25 Nm	290			●	●
A-max 19, 2.5 W	156	GP 22, 0.5 - 2.0 Nm	295			●	●
A-max 19, 2.5 W	156	GS 24, 0.1 Nm	300			●	●
A-max 19, 2.5 W	156	GP 22 S	332/333			●	●
A-max 22	158/160					36.9	36.9
A-max 22	158/160	GP 22, 0.1 - 0.6 Nm	291/292			●	●
A-max 22	158/160	GP 22, 0.5 - 2.0 Nm	291-295			●	●
A-max 22	158/160	GS 24, 0.1 Nm	300			●	●
A-max 22	158/160	GP 22 S	332/333			●	●

Technical Data

Supply voltage V_{CC}	2.7–5.5 V
Output signal V_{CC} = 5 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Operating temperature range	-25…+85 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	max. 5 mA

The index signal I is not synchronized with channel A or B.
The length of the index signal can last more than one cycle.

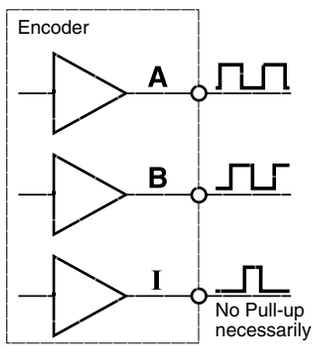
Pin Allocation



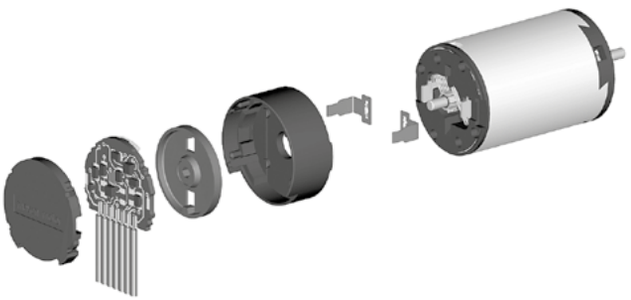
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –
7*	Channel I (Index)

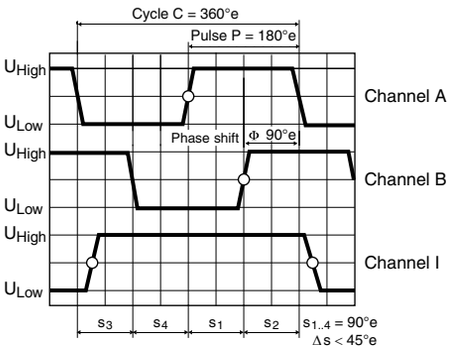
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28
*version with 3 channels

Connection example



Encoder MR Type M, 32 CPT, 2/3 Channels

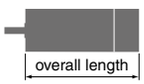


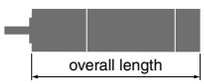


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	201935	201938
Type		
Counts per turn	32	32
Number of channels	2	3
Max. operating frequency (kHz)	8	8
Max. speed (rpm)	15000	15000





maxon Modular System

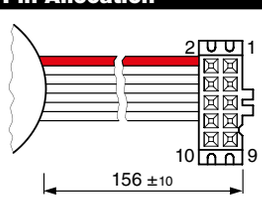
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead	
RE-max 21, 3.5 W	180					34.0	34.0
RE-max 21, 3.5 W	180	GP 22, 0.5 - 2.0 Nm	293/295			●	●
RE-max 21, 3.5 W	180	GS 38, 0.1 - 0.6 Nm	313			●	●
RE-max 21, 3.5 W	180	GP 22 S	332/333			●	●
RE-max 21, 6 W	182					35.8	35.8
RE-max 21, 6 W	182	GP 22, 0.5 - 2.0 Nm	293/295			●	●
RE-max 21, 6 W	182	GS 38, 0.1 - 0.6 Nm	313			●	●
RE-max 21, 6 W	182	GP 22 S	332/333			●	●

Technical Data

Supply voltage V_{CC}	2.7–5.5 V
Output signal V_{CC} = 5 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Operating temperature range	-25…+85 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	max. 5 mA

The index signal I is not synchronized with channel A or B.
The length of the index signal can last more than one cycle.

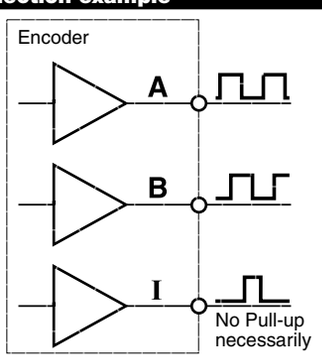
Pin Allocation



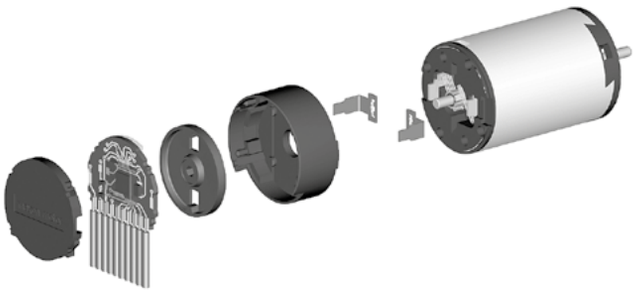
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –
7*	Channel I (Index)

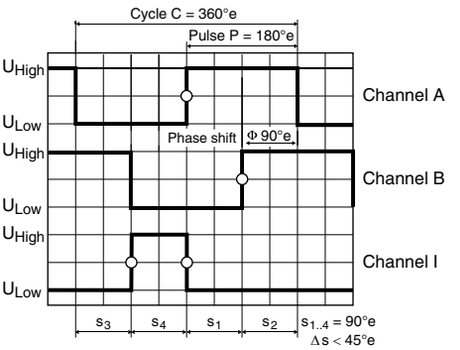
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28
*version with 3 channels

Connection example



Encoder MR Type M, 128–512 CPT, 2/3 Channels, with Line Driver

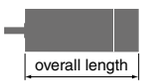


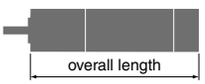


Direction of rotation cw (definition cw p. 106)

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

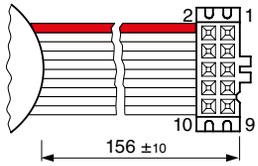
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead					
RE 16, 2 W	130					28.0	28.0	28.0	28.0	28.0	28.0
RE 16, 2 W	130	GP 16, 0.1 - 0.6 Nm	285/286			●	●	●	●	●	●
RE 16, 2 W	130	GP 16 S	329/330			●	●	●	●	●	●
RE 16, 3.2 W	132					45.4	45.4	45.4	45.4	45.4	45.4
RE 16, 3.2 W	132	GP 16, 0.1 - 0.6 Nm	285/286			●	●	●	●	●	●
RE 16, 3.2 W	132	GP 16 S	329/330			●	●	●	●	●	●
RE 16, 4.5 W	134					48.4	48.4	48.4	48.4	48.4	48.4
RE 16, 4.5 W	134	GP 16, 0.1 - 0.6 Nm	285/286			●	●	●	●	●	●
RE 16, 4.5 W	134	GP 16 S	329/330			●	●	●	●	●	●
A-max 16	150/152					30.4	30.4	30.4	30.4	30.4	30.4
A-max 16	150/152	GS 16, 0.01 - 0.1 Nm	281-284			●	●	●	●	●	●
A-max 16	150/152	GP 16, 0.1 - 0.6 Nm	285/286			●	●	●	●	●	●
A-max 16	150/152	GP 16 S	329/330			●	●	●	●	●	●
A-max 19, 1.5 W	154					34.0	34.0	34.0	34.0	34.0	34.0
A-max 19, 1.5 W	154	GP 19, 0.1 - 0.3 Nm	288			●	●	●	●	●	●
A-max 19, 1.5 W	154	GP 22, 0.5 - 2.0 Nm	293/295			●	●	●	●	●	●
A-max 19, 1.5 W	154	GS 24, 0.1 Nm	300			●	●	●	●	●	●
A-max 19, 1.5 W	154	GP 22 S	332/333			●	●	●	●	●	●
A-max 19, 2.5 W	156					35.8	35.8	35.8	35.8	35.8	35.8
A-max 19, 2.5 W	156	GP 19, 0.1 - 0.3 Nm	288			●	●	●	●	●	●
A-max 19, 2.5 W	156	GS 20 0.06 - 0.25 Nm	290			●	●	●	●	●	●
A-max 19, 2.5 W	156	GP 22, 0.5 - 2.0 Nm	293/295			●	●	●	●	●	●
A-max 19, 2.5 W	156	GS 24, 0.1 Nm	300			●	●	●	●	●	●
A-max 19, 2.5 W	156	GP 22 S	332/333			●	●	●	●	●	●
A-max 22	158/160					36.9	36.9	36.9	36.9	36.9	36.9
A-max 22	158/160	GP 22, 0.1 - 0.6 Nm	291/292			●	●	●	●	●	●
A-max 22	158/160	GP 22, 0.5 - 2.0 Nm	293/295			●	●	●	●	●	●
A-max 22	158/160	GS 24, 0.1 Nm	300			●	●	●	●	●	●
A-max 22	158/160	GP 22 S	332/333			●	●	●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
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 gcm²
Output current per channel	max. 5 mA

The index signal I is synchronized with channel A or B.

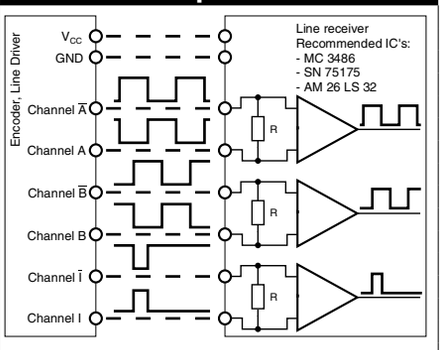
Pin Allocation



1	Motor +
2	V_{CC}
3	GND
4	Motor –
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9*	Channel $\overline{I}$ (Index)
10*	Channel I (Index)

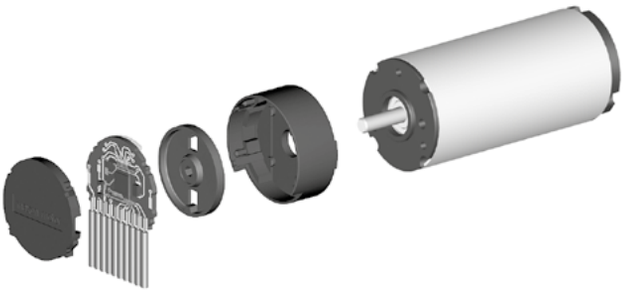
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28
*version with 3 channels

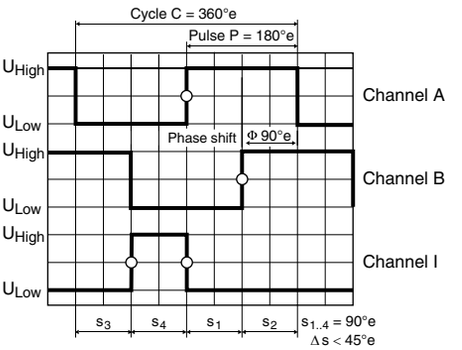
Connection example



Opt. terminal resistance R > 1 kΩ

Encoder MR Type M, 128–512 CPT, 2/3 Channels, with Line Driver





Direction of rotation cw (definition cw p. 106)

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)	37 500	37 500	37 500	37 500	37 500	37 500

maxon Modular System

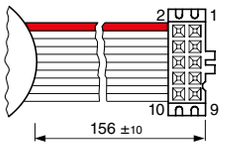
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead					
RE-max 21, 3.5 W	180					34.0	34.0	34.0	34.0	34.0	34.0
RE-max 21, 3.5 W	180	GP 22, 0.5 - 2.0 Nm	293/295			●	●	●	●	●	●
RE-max 21, 3.5 W	180	GS 38, 0.1 - 0.6 Nm	313			●	●	●	●	●	●
RE-max 21, 3.5 W	180	GP 22 S	332/333			●	●	●	●	●	●
RE-max 21, 6 W	182					35.8	35.8	35.8	35.8	35.8	35.8
RE-max 21, 6 W	182	GP 22, 0.5 - 2.0 Nm	293/295			●	●	●	●	●	●
RE-max 21, 6 W	182	GS 38, 0.1 - 0.6 Nm	313			●	●	●	●	●	●
RE-max 21, 6 W	182	GP 22 S	332/333			●	●	●	●	●	●
EC 16, 30 W	200					50.7	50.7	50.7	50.7	50.7	50.7
EC 16, 30 W	200	GP 16, 0.1 - 0.6 Nm	285/286			●	●	●	●	●	●
EC 16, 30 W	200	GP 22, 0.5 - 1.0 Nm	293			●	●	●	●	●	●
EC 16, 30 W	200	GP 16 S	329/330			●	●	●	●	●	●
EC 16, 60 W	202					66.7	66.7	66.7	66.7	66.7	66.7
EC 16, 60 W	202	GP 16, 0.2 - 0.6 Nm	286			●	●	●	●	●	●
EC 16, 60 W	202	GP 22, 0.5 - 2.0 Nm	293/296			●	●	●	●	●	●
EC 16, 60 W	202	GP 16 S/GP 22 S	329/333			●	●	●	●	●	●
EC 22, 40 W	207					50.5	50.5	50.5	50.5	50.5	50.5
EC 22, 40 W	207	GP 22, 0.5 - 3.4 Nm	296/297			●	●	●	●	●	●
EC 22, 40 W	207	GP 22 S	332/333			●	●	●	●	●	●
EC 22, 100 W	209					68.7	68.7	68.7	68.7	68.7	68.7
EC 22, 100 W	209	GP 22, 0.5 - 3.4 Nm	296/297			●	●	●	●	●	●
EC 22, 100 W	209	GP 22 S	332/333			●	●	●	●	●	●
EC-max 16, 5 W	221					31.3	31.3	31.3	31.3	31.3	31.3
EC-max 16, 5 W	221	GP 16, 0.1 - 0.6 Nm	285/286			●	●	●	●	●	●
EC-max 16, 5 W	221	GP 16 S	329/330			●	●	●	●	●	●
EC-max 16, 8 W	223					43.3	43.3	43.3	43.3	43.3	43.3
EC-max 16, 8 W	223	GP 16, 0.2 - 0.6 Nm	286			●	●	●	●	●	●
EC-max 16, 8 W	223	GP 22, 0.5 - 2.0 Nm	296			●	●	●	●	●	●
EC-max 16, 8 W	223	GP 16 S/GP 22 S	329/333			●	●	●	●	●	●
EC-max 22, 12 W	224					41.7	41.7	41.7	41.7	41.7	41.7
EC-max 22, 12 W	224	GP 22, 0.5 - 2.0 Nm	296/297			●	●	●	●	●	●
EC-max 22, 12 W	224	KD 32, 1.0 - 4.5 Nm	312			●	●	●	●	●	●
EC-max 22, 12 W	224	GP 22 S	332/333			●	●	●	●	●	●
EC-max 22, 25 W	225					58.2	58.2	58.2	58.2	58.2	58.2
EC-max 22, 25 W	225	GP 22/GP 32	297/308			●	●	●	●	●	●
EC-max 22, 25 W	225	GP 32 S	334-336			●	●	●	●	●	●

Technical Data

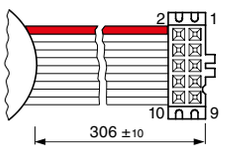
Supply voltage V_{CC}	5 V ± 5%
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-25…+85 °C
Moment of inertia of code wheel	≤ 0.09 gcm²
Output current per channel	max. 5 mA

The index signal I is synchronized with channel A or B.

Pin Allocation



MR Encoder EC-max 16 / EC-max 22



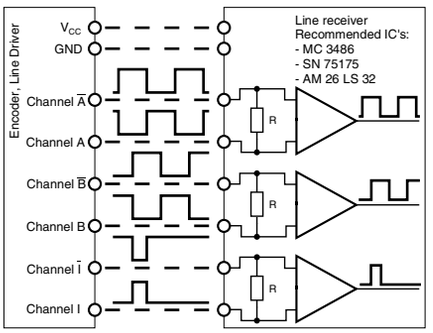
MR Encoder EC 16 / EC 22

1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9* Channel $\overline{I}$ (Index)
10* Channel I (Index)

DIN Connector 41651/
EN 60603-13
flat band cable AWG 28
*version with 3 channels

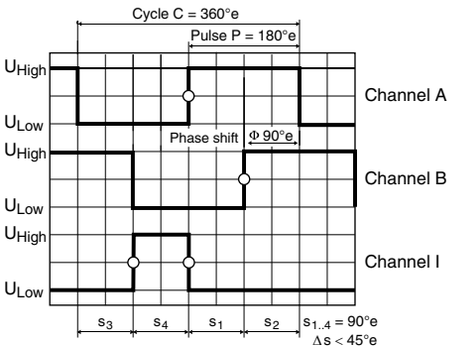
Pin assignment for RE-max see Page 353

Connection example



Opt. terminal resistance R > 1 kΩ

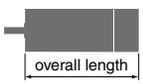
Encoder MR Type ML, 128–1000 CPT, 3 Channels, with Line Driver

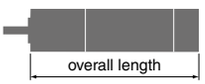


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	225771	225773	225778	225805	225780
Type					
Counts per turn	128	256	500	512	1000
Number of channels	3	3	3	3	3
Max. operating frequency (kHz)	80	160	200	320	200
Max. speed (rpm)	37500	37500	24000	37500	12000





maxon Modular System

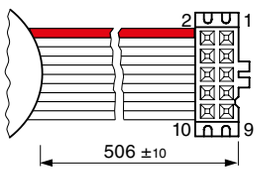
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
RE 25	135/137					65.5	65.5	65.5	65.5	65.5
RE 25	135/137	GP 26, 0.75 - 2.0 Nm	301			●	●	●	●	●
RE 25	135/137	GP 32, 0.75 - 6.0 Nm	303-308			●	●	●	●	●
RE 25	135/137	KD 32, 1.0 - 4.5 Nm	312			●	●	●	●	●
RE 25	135/137	GP 32 S	334-336			●	●	●	●	●
RE 25, 20 W	136					54.0	54.0	54.0	54.0	54.0
RE 25, 20 W	136	GP 22, 0.5 Nm	293			●	●	●	●	●
RE 25, 20 W	136	GP 26, 0.75 - 2.0 Nm	301			●	●	●	●	●
RE 25, 20 W	136	GP 32, 0.75 - 6.0 Nm	303-308			●	●	●	●	●
RE 25, 20 W	136	KD 32, 1.0 - 4.5 Nm	312			●	●	●	●	●
RE 25, 20 W	136	GP 32 S	334-336			●	●	●	●	●
A-max 26	162-168					53.5	53.5	53.5	53.5	53.5
A-max 26	162-168	GP 26, 0.75 - 4.5 Nm	301			●	●	●	●	●
A-max 26	162-168	GS 30, 0.07 - 0.2 Nm	302			●	●	●	●	●
A-max 26	162-168	GP 32, 0.75 - 6.0 Nm	303-308			●	●	●	●	●
A-max 26	162-168	GS 38, 0.1 - 0.6 Nm	313			●	●	●	●	●
A-max 26	162-168	GP 32 S	334-336			●	●	●	●	●
RE-max 29	183-186					53.5	53.5	53.5	53.5	53.5
RE-max 29	183-186	GP 32, 0.75 - 6.0 Nm	304-308			●	●	●	●	●
RE-max 29	183-186	GP 32 S	334-336			●	●	●	●	●
EC-max 30, 40 W	226							54.2		54.2
EC-max 30, 40 W	226	GP 32, 1 - 8.0 Nm	308/310					●		●
EC-max 30, 40 W	226	KD 32, 1.0 - 4.5 Nm	312					●		●
EC-max 30, 40 W	226	GP 32 S	334-336					●		●
EC-max 30, 60 W	227							76.2		76.2
EC-max 30, 60 W	227	GP 32, 1 - 8.0 Nm	308/310					●		●
EC-max 30, 60 W	227	KD 32, 1.0 - 4.5 Nm	312					●		●
EC-max 30, 60 W	227	GP 42, 3 - 15 Nm	315					●		●
EC-4pole 30	235							59.2		59.2
EC-4pole 30	235	GP 32, 4.0 - 8.0 Nm	310					●		●
EC-4pole 30	235	GP 42, 3 - 15 Nm	315					●		●
EC-4pole 30	237							76.2		76.2
EC-4pole 30	237	GP 32, 4.0 - 8.0 Nm	310					●		●
EC-4pole 30	237	GP 42, 3 - 15 Nm	315					●		●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
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 gcm²
Output current per channel	max. 5 mA

The index signal I is synchronized with channel A or B.

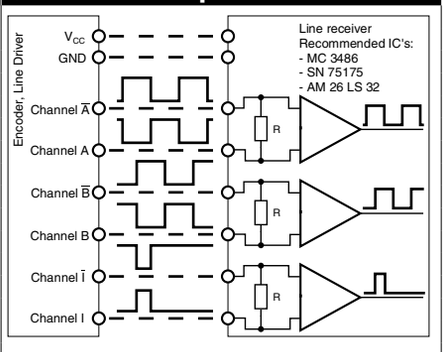
Pin Allocation



1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$ (Index)
10	Channel I (Index)

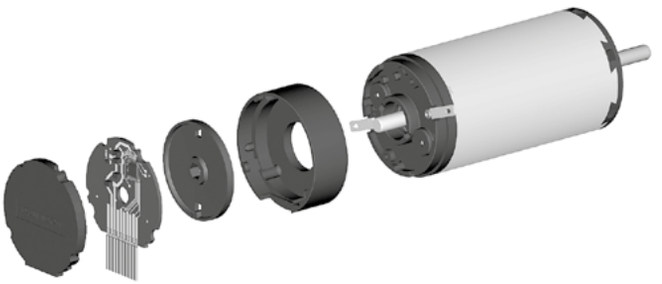
DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

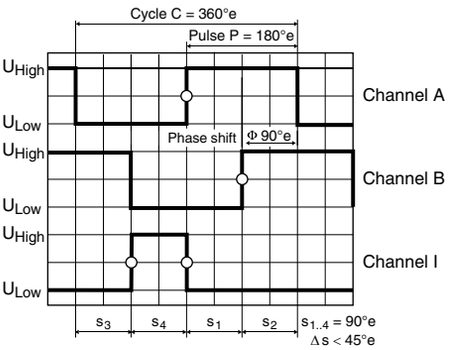
Connection example



Opt. terminal resistance R > 1 kΩ

Encoder MR Type L, 256–1024 CPT, 3 Channels, with Line Driver

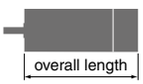


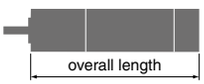


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	225783	228452	225785	228456	225787
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

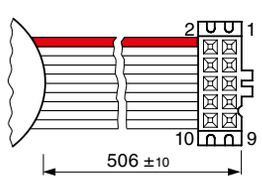
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
RE 30, 15 W	138					79.4	79.4	79.4	79.4	79.4
RE 30, 15 W	138	GP 32, 0.75 - 4.5 Nm	305			●	●	●	●	●
RE 30, 60 W	139					79.4	79.4	79.4	79.4	79.4
RE 30, 60 W	139	GP 32, 0.75 - 4.5 Nm	303			●	●	●	●	●
RE 30, 60 W	139	GP 32, 0.75 - 6.0 Nm	305-309			●	●	●	●	●
RE 30, 60 W	139	GP 32 S	334-336			●	●	●	●	●
RE 35, 90 W	140					82.4	82.4	82.4	82.4	82.4
RE 35, 90 W	140	GP 32, 0.75 - 4.5 Nm	303			●	●	●	●	●
RE 35, 90 W	140	GP 32, 0.75 - 6.0 Nm	305-309			●	●	●	●	●
RE 35, 90 W	140	GP 32, 4.0 - 8.0 Nm	310			●	●	●	●	●
RE 35, 90 W	140	GP 42, 3 - 15 Nm	314			●	●	●	●	●
RE 35, 90 W	140	GP 32 S	334-336			●	●	●	●	●
RE 40, 25 W	141					82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	142					82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	142	GP 42, 3 - 15 Nm	314			●	●	●	●	●
RE 40, 150 W	142	GP 52, 4 - 30 Nm	318			●	●	●	●	●
A-max 32	170/172					72.7	72.7	72.7	72.7	72.7
A-max 32	170/172	GP 32, 0.75 - 6.0 Nm	305-308			●	●	●	●	●
A-max 32	170/172	GS 38, 0.1 - 0.6 Nm	313			●	●	●	●	●
A-max 32	170/172	GP 32 S	334-336			●	●	●	●	●
EC-max 40, 70 W	228					73.9	73.9	73.9	73.9	73.9
EC-max 40, 70 W	228	GP 42, 3 - 15 Nm	315			●	●	●	●	●
EC-max 40, 120 W	229					103.9	103.9	103.9	103.9	103.9
EC-max 40, 120 W	229	GP 52, 4 - 30 Nm	319			●	●	●	●	●

Technical Data

Supply voltage V_{CC}	5 V ± 5%
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 gcm²
Output current per channel	max. 5 mA

The index signal I is synchronized with channel A or B.

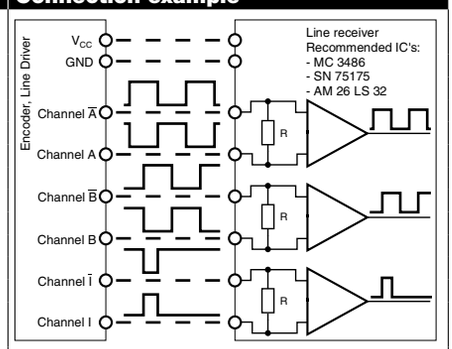
Pin Allocation



1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$ (Index)
10	Channel I (Index)

DIN Connector 41651/
EN 60603-13
flat band cable AWG 28

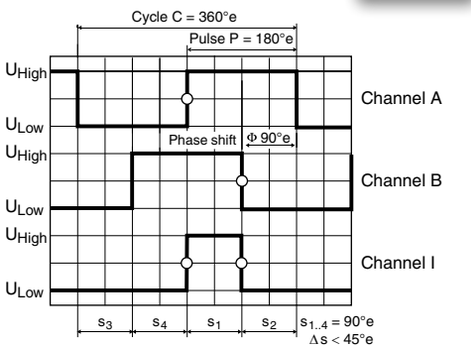
Connection example



Opt. terminal resistance R > 1 kΩ

Encoder 6–8 OPT 128 CPT, 3 Channels

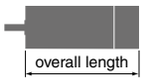
NEW

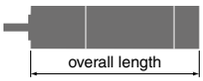


Direction of rotation cw (definition cw p. 106)

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)	64
Max. speed (rpm)	60000





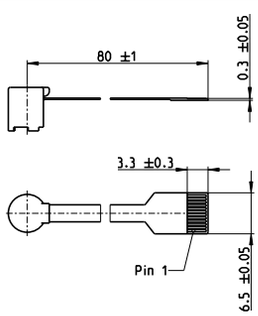
maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
EC 6, 1.5 W	192					23.4
EC 6, 1.5 W	192	GP 6, 0.002 - 0.03 Nm	273			●
EC 6, 1.5 W	192	GP 6 S	325-326			●
EC 6, 2.0 W	193					23.4
EC 6, 2.0 W	193	GP 6, 0.002 - 0.03 Nm	273			●
EC 6, 2.0 W	193	GP 6 S	325-326			●

Technical Data

Supply voltage V_{CC}	3 - 6 V
Phase shift Φ	90°e ± 45°e
Index pulse width	90°e ± 45°e
Operating temperature range	-20…+85 °C
Moment of inertia of code wheel	≤ 0.001 gcm²
Output current per channel	≤ 5 mA

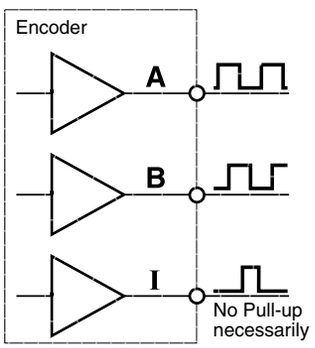
Pin Allocation



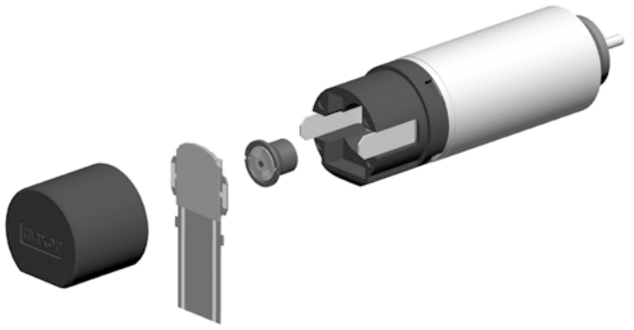
	DC	EC
1	Motor +	W1
2	Motor –	W2
3	NC	W3
4	GND	GND
5	V_{CC}	V_{CC}
6	Channel A	Channel A
7	Channel B	Channel B
8	Channel I	Channel I
9	NC	NC
10	NC	NC
11	NC	NC
12	NC	NC

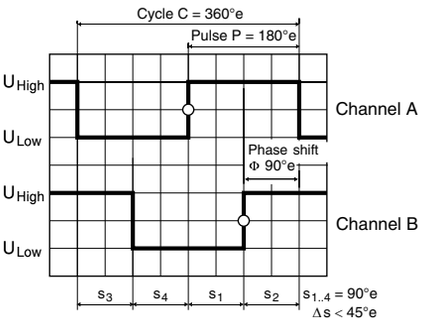
Compatible connector: Molex 52745-0697, Tyco 1-1734839-4
Adapter: 498158

Connection example



Encoder 8 OPT 50 CPT, 2 Channels

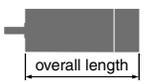


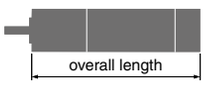


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	
	473594
Type (provisional)	
Counts per turn	50
Number of channels	2
Max. operating frequency (kHz)	15
Max. speed (rpm)	18000





maxon Modular System

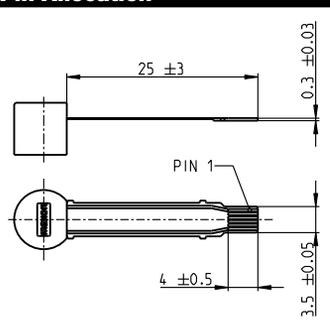
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead
RE 8, 0.5 W, A	109					24.2
RE 8, 0.5 W, A	109	GP 8, 0.01 - 0.1 Nm	274			●
RE 8, 0.5 W, A	109	GP 8 S	327–328			●

Technical Data

Supply voltage V_{CC} [1]	3 V ± 10%
Phase shift Φ	90°e ± 45°e
Operating temperature range	-20…+85 °C
Moment of inertia of code wheel	≤ 0.001 gcm²
Output current per channel	min. -1 mA, max. 8 mA

[1] Not in combination with maxon controllers.

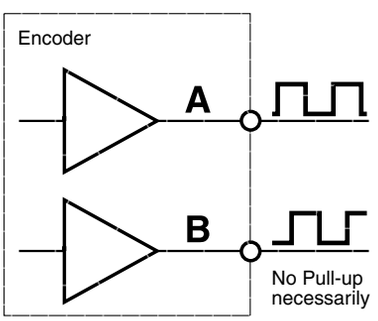
Pin Allocation



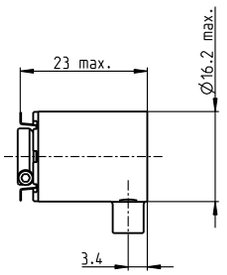
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –

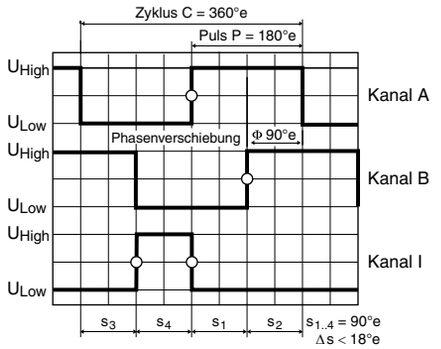
Compatible connector:
Molex 52745-0697

Connection example



Encoder SCH16F 2000–3600 CPT, 3 Channels, with Line Driver RS 422

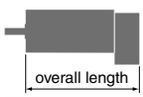




Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers			
	461212	461211	X drives
Type (provisional)			
Counts per turn	2000	3600	2000–3600
Number of channels	3	3	3
Max. operating frequency (kHz)	200	200	200
Max. speed (rpm)	6000	3333	6000–3333
Shaft diameter (mm)	3	3	2



maxon Modular System

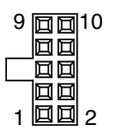
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead		
DCX 22 S	68-69							online
DCX 22 L	70-71							online
EC-4pole 22, 90 W	233					76.1	76.1	
EC-4pole 22, 120 W	234					93.5	93.5	

Technical Data

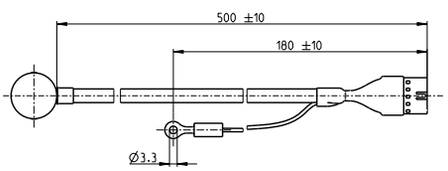
Supply voltage V_{CC}	4.5 - 30 V
Output signal	EIA Standard RS 422
Operating temperature range	-20…+70 °C
Moment of inertia of code wheel	0.25 gcm²
Output current per channel	± 20 mA
Phase shift Φ	90°e ± 18°e
Index pulse width	90°e ± 18°e
Max. startup torque at 25 °C	< 5 mNm

The index signal I is synchronized with channel A or B.

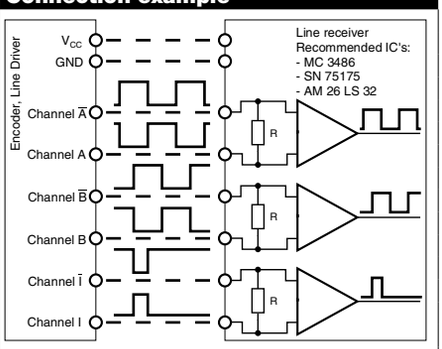
Pin Allocation



1	N.C.	DIN Connector 41651/ EN 60603-13
2	V_{CC}	
3	GND	
4	N.C.	Ring terminal Molex 19324-0002
5	Channel $\overline{A}$	
6	Channel A	
7	Channel $\overline{B}$	
8	Channel B	
9	Channel $\overline{I}$ (Index)	
10	Channel I (Index)	

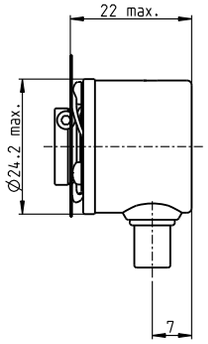


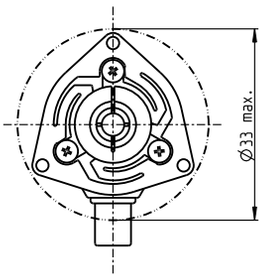
Connection example

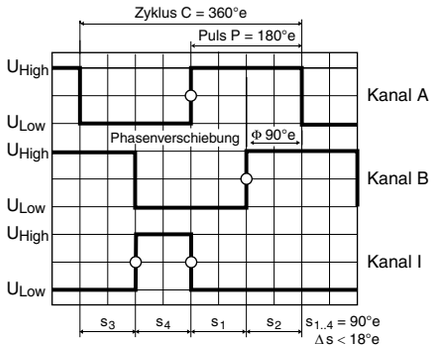


Opt. terminal resistance R = typical 120 Ω

Encoder 2RMHF 3000–5000 CPT, 3 Channels, with Line Driver RS 422



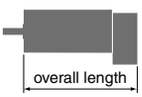




Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	461214	461216	461213	461215	X drives
Type (provisional)					
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

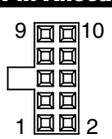
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead				
DCX 32 L	74									online
DCX 35 L	75									online
EC-4pole 30, 100 W	235					75.2		75.2		
EC-4pole 30, 200 W	237					92.2		92.2		
EC-i 40, 50 W	243/244						56.2		56.2	
EC-i 40, 70 W	245/246						66.2		66.2	
EC-i 40, 100 W	247						86.2		86.2	

Technical Data

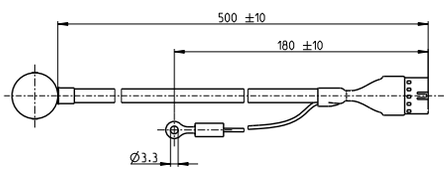
Supply voltage V_{CC}	4.5 - 30 V
Output signal	EIA Standard RS 422
driver used:	26C31
Operating temperature range	-40…+85 °C
Moment of inertia of code wheel	1.0 gcm²
Output current per channel	± 30 mA
Phase shift Φ	90°e ± 18°e
Index pulse width	90°e ± 18°e
Max. startup torque at 25 °C	< 5 mNm

The index signal I is synchronized with channel A or B.

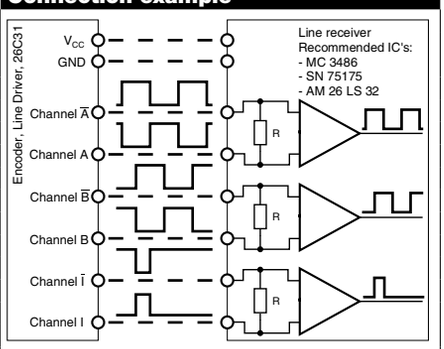
Pin Allocation



1	N.C.	DIN Connector 41651/ EN 60603-13
2	V_{CC}	
3	GND	
4	N.C.	Ring terminal Molex 19324-0002
5	Channel $\overline{A}$	
6	Channel A	
7	Channel $\overline{B}$	
8	Channel B	
9	Channel $\overline{I}$ (Index)	
10	Channel I (Index)	

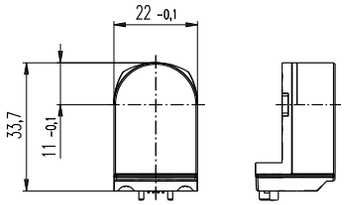


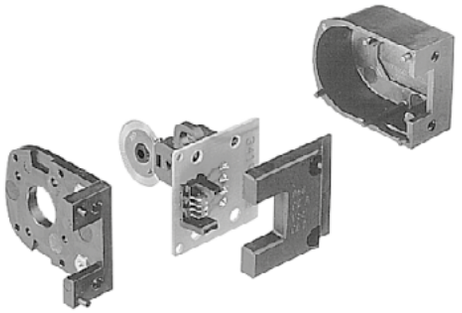
Connection example

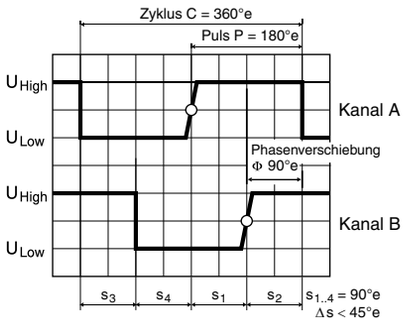


Opt. terminal resistance R = typical 120 Ω

Encoder Enc 22 100 CPT, 2 Channels



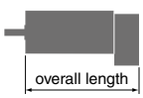


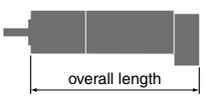


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	103935	110520	110521
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





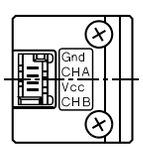
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead								
RE 25	135/137			68.6								
RE 25	135/137	GP 26, 0.75 - 2.0 Nm	301	●								
RE 25	135/137	GP 32, 0.75 - 4.5 Nm	303	●								
RE 25	135/137	GP 32, 0.75 - 4.5 Nm	304	●								
RE 25	135/137	GP 32, 1.0 - 6.0 Nm	307	●								
RE 25	135/137	GP 32 S	334-336	●								
A-max 19, 1.5 W	154				43.3							
A-max 19, 1.5 W	154	GP 19, 0.1 - 0.3 Nm	288		●							
A-max 19, 1.5 W	154	GS 20, 0.06 - 0.25 Nm	290		●							
A-max 19, 1.5 W	154	GP 22, 0.1 - 2.0 Nm	293/295		●							
A-max 19, 1.5 W	154	GS 24, 0.1 Nm	300		●							
A-max 19, 1.5 W	154	GP 22 S	332/333		●							
A-max 19, 2.5 W	156				45.9							
A-max 19, 2.5 W	156	GP 19, 0.1 - 0.3 Nm	288		●							
A-max 19, 2.5 W	156	GP 22, 0.1 - 2.0 Nm	293/295		●							
A-max 19, 2.5 W	156	GS 24, 0.1 Nm	300		●							
A-max 19, 2.5 W	156	GP 22 S	332/333		●							
A-max 22	158/160				46.3							
A-max 22	158/160	GP 22, 0.1 - 0.3 Nm	291		●							
A-max 22	158/160	GP 22, 0.2 - 0.6 Nm	292		●							
A-max 22	158/160	GP 22, 0.1 - 2.0 Nm	291-295		●							
A-max 22	158/160	GS 24, 0.1 Nm	300		●							
A-max 22	158/160	GP 22 S	332/333		●							
A-max 26	162-168					59.1						
A-max 26	162-168	GP 26, 0.75 - 4.5 Nm	301			●						
A-max 26	162-168	GS 30, 0.07 - 0.2 Nm	302			●						
A-max 26	162-168	GP 32, 0.75 - 4.5 Nm	303			●						
A-max 26	162-168	GP 32, 0.75 - 4.5 Nm	304			●						
A-max 26	162-168	GP 32, 1.0 - 6.0 Nm	308			●						
A-max 26	162-168	GS 38, 0.1 - 0.6 Nm	313			●						
A-max 26	162-168	GP 32 S	334-336			●						

Technical Data

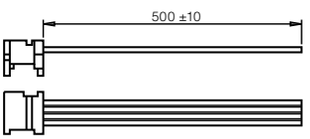
Supply voltage V_{CC}	5 V ± 10%
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	200 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	50 ns
Operating temperature range	-20…+85 °C
Moment of inertia of code wheel	≤ 0.05 gcm²
Output current per channel	min. -1 mA, max. 5 mA

Pin Allocation

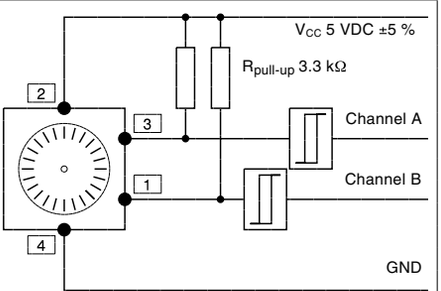


Micromodule contact strip
Type Lumberg MICS 4
Pin 4 GND
Pin 3 Channel A
Pin 2 V_{CC}, Pin 1 Channel B
recommended connectors:
Micromodule connector
Type Lumberg MICA 4

Order number for connector with cable: 3419.506

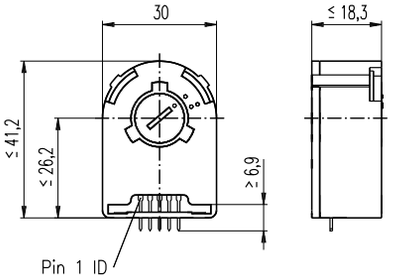


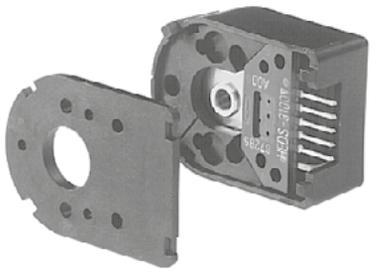
Connection example

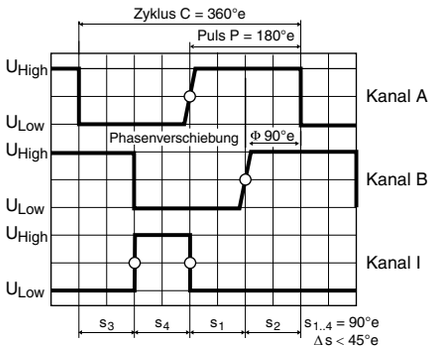


Ambient temperature range ϑ_U = 22 - 25 °C

Encoder HEDS 5540 500 CPT, 3 Channels



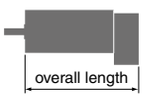


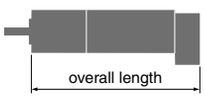


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	110511	110513	110515
Type			
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	4	6





maxon Modular System

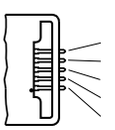
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead		
RE 25	135/137					75.3		
RE 25	135/137	GP 26, 0.75 - 2.0 Nm	301			●		
RE 25	135/137	GP 32, 0.75 - 6.0 Nm	303-307			●		
RE 25	135/137	KD 32, 1.0 - 4.5 Nm	312			●		
RE 25	135/137	GP 32 S	334-336			●		
RE 25, 20 W	137			AB 28	408	105.8		
RE 25, 20 W	137	GP 26, 0.75 - 2.0 Nm	301	AB 28	408	●		
RE 25, 20 W	137	GP 32, 0.75 - 6.0 Nm	303-307	AB 28	408	●		
RE 25, 20 W	137	KD 32, 1.0 - 4.5 Nm	312	AB 28	408	●		
RE 25, 20 W	137	GP 32 S	334-336	AB 28	408	●		
RE 30, 15 W	138					88.8		
RE 30, 15 W	138	GP 32, 0.75 - 4.5 Nm	305			●		
RE 30, 60 W	139					88.8		
RE 30, 60 W	139	GP 32, 0.75 - 6.0 Nm	303-309			●		
RE 30, 60 W	139	KD 32, 1.0 - 4.5 Nm	312			●		
RE 30, 60 W	139	GP 32 S	334-336			●		
RE 35, 90 W	140						91.7	
RE 35, 90 W	140	GP 32, 0.75 - 8.0 Nm	303-310				●	
RE 35, 90 W	140	GP 42, 3.0 - 15 Nm	314				●	
RE 35, 90 W	140	GP 32 S	334-336				●	
RE 35, 90 W	140			AB 28	408	124.3		
RE 35, 90 W	140	GP 32, 0.75 - 8.0 Nm	303-310	AB 28	408	●		
RE 35, 90 W	140	GP 42, 3.0 - 15 Nm	314	AB 28	408	●		
RE 35, 90 W	140	GP 32 S	334-336	AB 28	408	●		
RE 40, 25 W	141					91.7		
RE 40, 150 W	142						91.7	
RE 40, 150 W	142	GP 42, 3.0 - 15 Nm	314				●	
RE 40, 150 W	142	GP 52, 4.0 - 30 Nm	318				●	
RE 40, 150 W	142			AB 28	408	124.3		
RE 40, 150 W	142	GP 42, 3.0 - 15 Nm	314	AB 28	408	●		
RE 40, 150 W	142	GP 52, 4.0 - 30 Nm	318	AB 28	408	●		

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width (nominal)	90°e
Operating temperature range	-40…+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s⁻²
Output current per channel	min. -1 mA, max. 5 mA

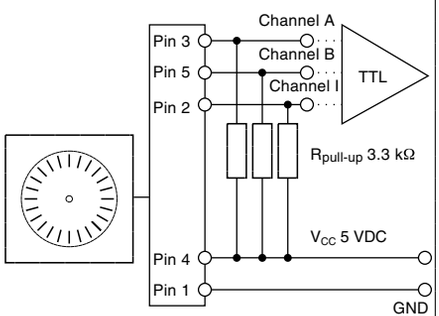
The index signal I is synchronized with channel A or B.

Pin Allocation



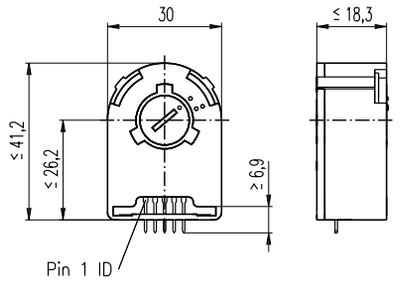
Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	V_{CC}	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

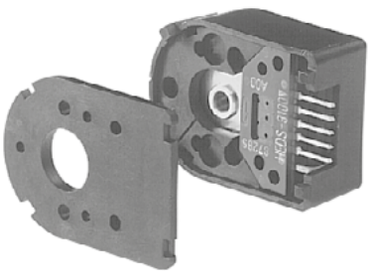
Connection example

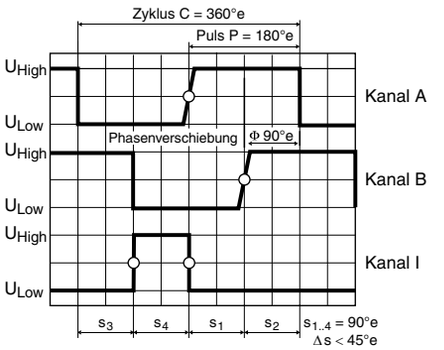


Ambient temperature range ϑ_U = 25 °C

Encoder HEDS 5540 500 CPT, 3 Channels







Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Type	Part Numbers			
	110511	110513	110515	110517
Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	8

maxon Modular System

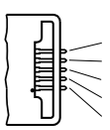
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead			
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	303			●			
RE 25, 20 W	136	GP 32, 0.75 - 6.0 Nm	304/307			●			
RE 25, 20 W	136	KD 32, 1.0 - 4.5 Nm	312			●			
RE 25, 20 W	136	GP 32 S	334-336			●			
RE 25, 20 W	136			AB 28	408	94.3			
RE 25, 20 W	136	GP 22, 0.5 Nm	293			●			
RE 25, 20 W	136	GP 26, 0.75 - 2.0 Nm	301	AB 28	408	●			
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	303	AB 28	408	●			
RE 25, 20 W	136	GP 32, 0.75 - 6.0 Nm	304/307	AB 28	408	●			
RE 25, 20 W	136	KD 32, 1.0 - 4.5 Nm	312	AB 28	408	●			
RE 25, 20 W	136	GP 32 S	334-336	AB 28	408	●			
RE 50, 200 W	143								128.7
RE 50, 200 W	143	GP 52, 4 - 30 Nm	319						●
RE 50, 200 W	143	GP 62, 8 - 50 Nm	320						●
RE 65, 250 W	144								157.3
RE 65, 250 W	144	GP 81, 20 - 120 Nm	321						●
A-max 26	162-168					63.1			
A-max 26	162-168	GP 26, 0.75 - 4.5 Nm	301			●			
A-max 26	162-168	GS 30, 0.07 - 0.2 Nm	302			●			
A-max 26	162-168	GP 32, 0.75 - 4.5 Nm	303			●			
A-max 26	162-168	GP 32, 0.75 - 6.0 Nm	304/308			●			
A-max 26	162-168	GS 38, 0.1 - 0.6 Nm	313			●			
A-max 26	162-168	GP 32 S	334-336			●			
A-max 32	170/172						82.3		
A-max 32	170/172	GP 32, 0.75 - 6.0 Nm	303-308				●		
A-max 32	170/172	GS 38, 0.1 - 0.6 Nm	313				●		
A-max 32	170/172	GP 32 S	334-336				●		
EC 32, 80 W	214						78.4		
EC 32, 80 W	214	GP 32, 0.75 - 6.0 Nm	303-309				●		
EC 32, 80 W	214	GP 32 S	334-336				●		
EC 40, 170 W	215							103.4	
EC 40, 170 W	215	GP 42, 3.0 - 15 Nm	314					●	
EC 40, 170 W	215	GP 52, 4.0 - 30 Nm	318					●	

Technical Data

Supply voltage V_{CC}	5 V ± 10%
Output signal	TTL compatible
Phase shift Φ	90°e ± 45°e
Signal rise time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s^{-2}
Output current per channel	min. -1 mA, max. 5 mA

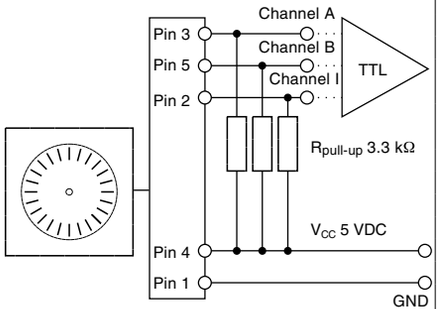
The index signal I is synchronized with channel A or B.

Pin Allocation



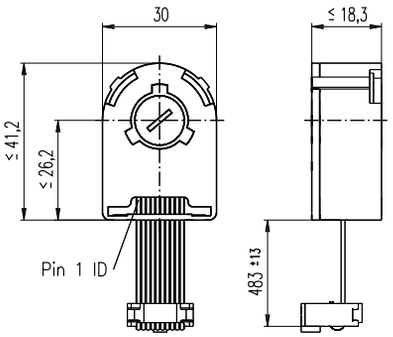
Encoder	Description	Pin no. from 3409.506
Pin 5	Channel B	1
Pin 4	V_{CC}	2
Pin 3	Channel A	3
Pin 2	Channel I	4
Pin 1	GND	5

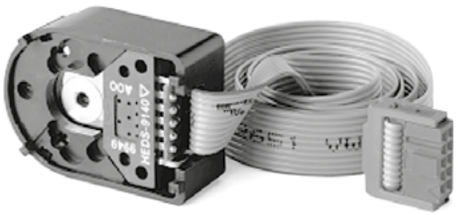
Connection example

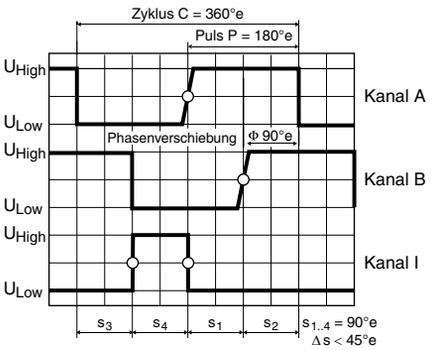


Ambient temperature range ϑ_U = 25 °C

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



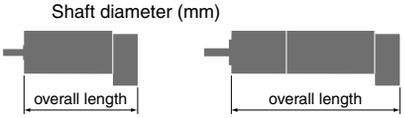




Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	110512	110514	110516
Type			
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	4	6



maxon Modular System

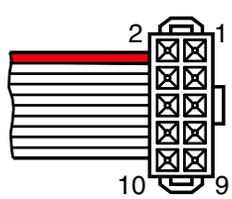
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead		
RE 25	135/137					75.3		
RE 25	135/137	GP 26/GP 32	301/303			●		
RE 25	135/137	KD 32, 1.0 - 4.5 Nm	312			●		
RE 25	135/137	GP 32, 0.75 - 6.0 Nm	304/307			●		
RE 25	135/137	GP 32 S	334-336			●		
RE 25, 20 W	136					63.8		
RE 25, 20 W	136	GP 26/GP 32	301/303			●		
RE 25, 20 W	136	KD 32, 1.0 - 4.5 Nm	312			●		
RE 25, 20 W	136	GP 32, 0.75 - 6.0 Nm	304/307			●		
RE 25, 20 W	136	GP 32 S	334-336			●		
RE 25, 20 W	136			AB 28	408	94.3		
RE 25, 20 W	136	GP 26/GP 32	301/303	AB 28	408	●		
RE 25, 20 W	136	KD 32, 1.0 - 4.5 Nm	312	AB 28	408	●		
RE 25, 20 W	136	GP 32, 0.75 - 6.0 Nm	304/307	AB 28	408	●		
RE 25, 20 W	136	GP 32 S	334-336	AB 28	408	●		
RE 25, 20 W	137			AB 28	408	105.8		
RE 25, 20 W	137	GP 26/GP 32	301/303	AB 28	408	●		
RE 25, 20 W	137	KD 32, 1.0 - 4.5 Nm	312	AB 28	408	●		
RE 25, 20 W	137	GP 32, 0.75 - 6.0 Nm	304/307	AB 28	408	●		
RE 25, 20 W	137	GP 32 S	334-336	AB 28	408	●		
RE 30, 15 W	138					88.8		
RE 30, 15 W	138	GP 32, 0.75 - 4.5 Nm	305			●		
RE 30, 60 W	139					88.8		
RE 30, 60 W	139	GP 32, 0.75 - 6.0 Nm	303-309			●		
RE 30, 60 W	139	KD 32, 1.0 - 4.5 Nm	312			●		
RE 30, 60 W	139	GP 32 S	334-336			●		
RE 35, 90 W	140						91.7	
RE 35, 90 W	140	GP 32, 0.75 - 8.0 Nm	303-310				●	
RE 35, 90 W	140	GP 42, 3.0 - 15 Nm	314				●	
RE 35, 90 W	140	GP 32 S	334-336				●	
RE 35, 90 W	140			AB 28	408	124.3		
RE 35, 90 W	140	GP 32, 0.75 - 8.0 Nm	303-310	AB 28	408	●		
RE 35, 90 W	140	GP 42, 3.0 - 15 Nm	314	AB 28	408	●		

Technical Data

Supply voltage V_{CC}	5 V ± 10%
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 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s⁻²
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 Counts per turn, 2 Channels

The index signal I is synchronized with channel A or B.

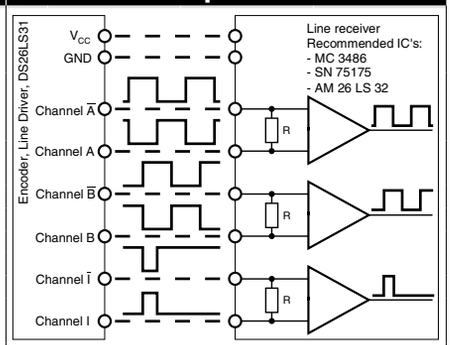
Pin Allocation



1 N.C.
2 V_{CC}
3 GND
4 N.C.
5 Channel $\overline{A}$
6 Channel A
7 Channel $\overline{B}$
8 Channel B
9 Channel $\overline{I}$ (Index)
10 Channel I (Index)

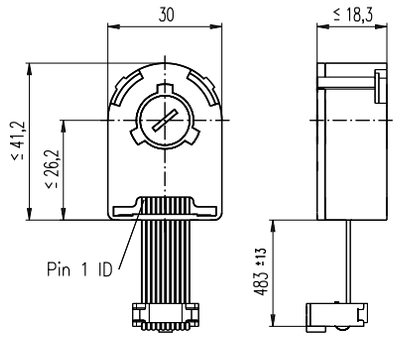
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

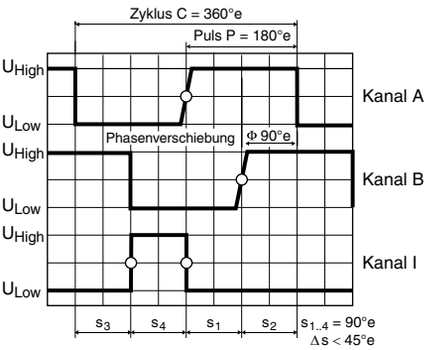
Connection example



Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422

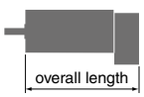




Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	110512	110514	110516	110518
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

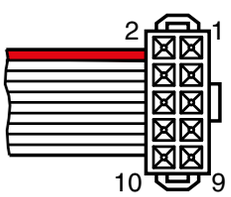
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead			
RE 40, 25 W	141						91.7		
RE 40, 150 W	142						91.7		
RE 40, 150 W	142	GP 42, 3.0 - 15 Nm	314				●		
RE 40, 150 W	142	GP 52, 4.0 - 30 Nm	318				●		
RE 40, 150 W	142			AB 28	408	124.3			
RE 40, 150 W	142	GP 42, 3.0 - 15 Nm	314	AB 28	408	●			
RE 40, 150 W	142	GP 52, 4.0 - 30 Nm	318	AB 28	408	●			
RE 50, 200 W	143								128.7
RE 50, 200 W	143	GP 52, 4 - 30 Nm	319						●
RE 50, 200 W	143	GP 62, 8 - 50 Nm	320						●
RE 65, 250 W	144								157.3
RE 65, 250 W	144	GP 81, 20 - 120 Nm	321						●
A-max 26	162-168					63.1			
A-max 26	162-168	GP 26, 0.75 - 4.5 Nm	301			●			
A-max 26	162-168	GS 30/GP 32	302/305			●			
A-max 26	162-168	GP 32, 0.75 - 6.0 Nm	304/308			●			
A-max 26	162-168	GS 38, 0.1 - 0.6 Nm	313			●			
A-max 26	162-168	GP 32 S	334-336			●			
A-max 32	170/172						82.3		
A-max 32	170/172	GP 32, 0.75 - 6.0 Nm	303-308				●		
A-max 32	170/172	GS 38, 0.1 - 0.6 Nm	313				●		
A-max 32	170/172	GP 32 S	334-336				●		

Technical Data

Supply voltage V_{CC}	5 V ± 10%
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 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40…+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s^{-2}
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 Counts per turn, 2 Channels

The index signal I is synchronized with channel A or B.

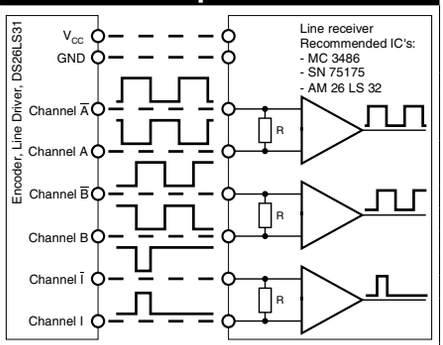
Pin Allocation



1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$ (Index)
10	Channel I (Index)

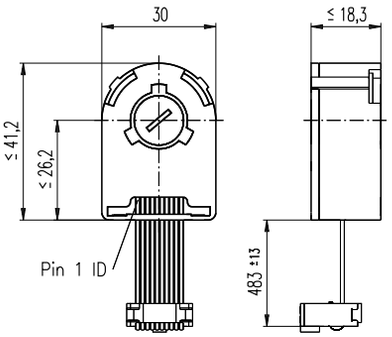
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

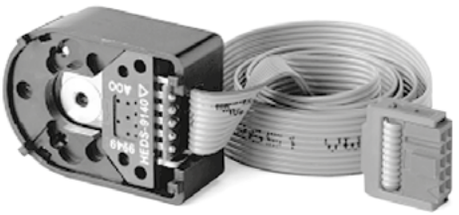
Connection example

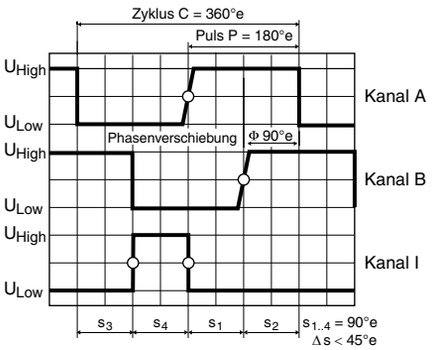


Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422



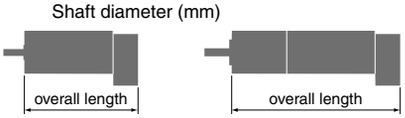




Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	110512	110514	110516
Type			
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Max. speed (rpm)	12000	12000	12000
Shaft diameter (mm)	3	4	6



maxon Modular System

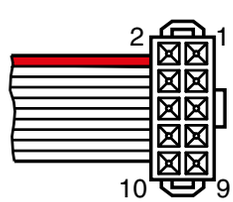
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead		
EC 32, 80 W	214					78.4		
EC 32, 80 W	214	GP 32, 0.75 - 6.0 Nm	303-309			●		
EC 32, 80 W	214	GP 32 S	334-336			●		
EC 40, 170 W	215						103.4	
EC 40, 170 W	215	GP 42, 3.0 - 15 Nm	314				●	
EC 40, 170 W	215	GP 52, 4.0 - 30 Nm	318				●	
EC-max 30, 40 W	226					62.6		
EC-max 30, 40 W	226	GP 32, 1.0 - 8.0 Nm	308/310			●		
EC-max 30, 40 W	226	KD 32, 1.0 - 4.5 Nm	312			●		
EC-max 30, 40 W	226	GP 32 S	334-336			●		
EC-max 30, 40 W	226			AB 20	406	98.4		
EC-max 30, 40 W	226	GP 32, 1.0 - 8.0 Nm	308/310	AB 20	406	●		
EC-max 30, 40 W	226	KD 32, 1.0 - 4.5 Nm	312	AB 20	406	●		
EC-max 30, 40 W	226	GP 32 S	334-336	AB 20	406	●		
EC-max 30, 60 W	227					84.6		
EC-max 30, 60 W	227	GP 32, 1.0 - 8.0 Nm	308/310			●		
EC-max 30, 60 W	227	KD 32, 1.0 - 4.5 Nm	312			●		
EC-max 30, 60 W	227	GP 42, 3 - 15 Nm	315			●		
EC-max 30, 60 W	227			AB 20	406	120.4		
EC-max 30, 60 W	227	GP 32, 1.0 - 8.0 Nm	308/310	AB 20	406	●		
EC-max 30, 60 W	227	KD 32, 1.0 - 4.5 Nm	312	AB 20	406	●		
EC-max 30, 60 W	227	GP 42, 3 - 15 Nm	315	AB 20	406	●		
EC-max 40, 70 W	228						81.4	
EC-max 40, 70 W	228	GP 42, 3 - 15 Nm	315				●	
EC-max 40, 70 W	228			AB 28	407		110.7	
EC-max 40, 70 W	228	GP 42, 3 - 15 Nm	315	AB 28	407		●	
EC-max 40, 120 W	229						111.4	
EC-max 40, 120 W	229	GP 52, 4 - 30 Nm	319				●	
EC-max 40, 120 W	229			AB 28	407		140.7	
EC-max 40, 120 W	229	GP 52, 4 - 30 Nm	319	AB 28	407		●	

Technical Data

Supply voltage V_{CC}	5 V ± 10%
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 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40...+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s⁻²
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 Counts per turn, 2 Channels

The index signal I is synchronized with channel A or B.

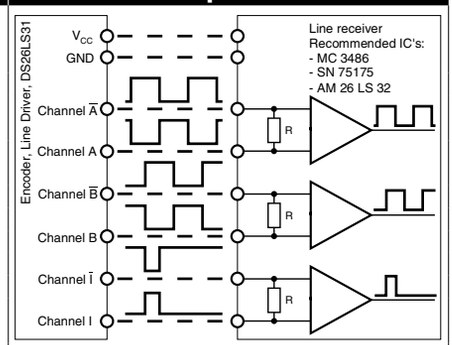
Pin Allocation



1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$ (Index)
10	Channel I (Index)

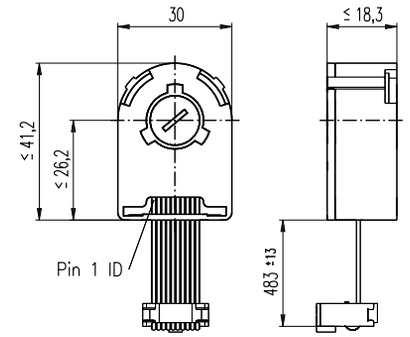
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

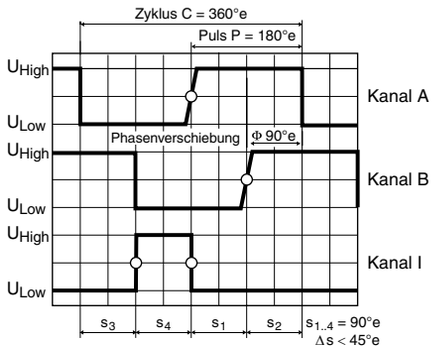
Connection example



Terminal resistance R = typical 120 Ω

Encoder HEDL 5540 500 CPT, 3 Channels, with Line Driver RS 422

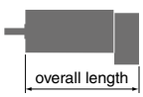




Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	110512	110514	110516	X drives
Type				
Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Max. speed (rpm)	12000	12000	12000	12000
Shaft diameter (mm)	3	4	6	2–4



maxon Modular System

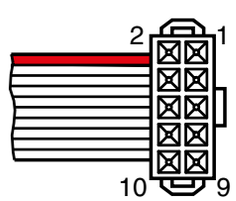
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see Gearhead			
EC-4pole 22, 90 W	233					70.1			
EC-4pole 22, 90 W	233	GP 22/GP 32	297/308			●			
EC-4pole 22, 90 W	233	GP 32 S	334-336			●			
EC-4pole 22, 120 W	234					87.5			
EC-4pole 22, 120 W	234	GP 22/GP 32	297/308			●			
EC-4pole 22, 120 W	234	GP 32 S	334-336			●			
EC-4pole 30, 100 W	235						67.6		
EC-4pole 30, 100 W	235	GP 32, 4.0 - 8.0 Nm	310				●		
EC-4pole 30, 100 W	235	GP 42, 3 - 15 Nm	315				●		
EC-4pole 30, 100 W	235			AB 20	406		104.0		
EC-4pole 30, 100 W	235	GP 32, 4.0 - 8.0 Nm	310	AB 20	406		●		
EC-4pole 30, 100 W	235	GP 42, 3 - 15 Nm	315	AB 20	406		●		
EC-4pole 30, 200 W	237						84.6		
EC-4pole 30, 200 W	237	GP 32, 4.0 - 8.0 Nm	310				●		
EC-4pole 30, 200 W	237	GP 42, 3 - 15 Nm	315				●		
EC-4pole 30, 200 W	237			AB 20	406		121.0		
EC-4pole 30, 200 W	237	GP 32, 4.0 - 8.0 Nm	310	AB 20	406		●		
EC-4pole 30, 200 W	237	GP 42, 3 - 15 Nm	315	AB 20	406		●		
EC-i 40, 50 W	243/244							49.0	
EC-i 40, 50 W	243	GP 32, 1 - 6 Nm	308					●	
EC-i 40, 50 W	243/244	GP 42, 3 - 15 Nm	315					●	
EC-i 40, 50 W	243	GP 32 S	334-336					●	
EC-i 40, 70 W	245/246							59.0	
EC-i 40, 70 W	245	GP 32, 1 - 6 Nm	308					●	
EC-i 40, 70 W	245/246	GP 42, 3 - 15 Nm	315					●	
EC-i 40, 70 W	245	GP 32 S	334-336					●	
EC-i 40, 100 W	247							79.0	
EC-i 40, 100 W	247	GP 42, 3 - 15 Nm	315					●	
DCX 22 S	68-69								online
DCX 22 L	70-71								online
DCX 26 L	72-73								online
DCX 32 L	74								online
DCX 35 L	75								online

Technical Data

Supply voltage V_{CC}	5 V ± 10%
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 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 2.7 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40…+100 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s^{-2}
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 Counts per turn, 2 Channels

The index signal I is synchronized with channel A or B.

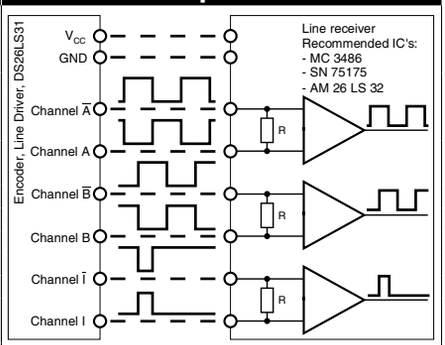
Pin Allocation



1	N.C.
2	V_{CC}
3	GND
4	N.C.
5	Channel $\overline{A}$
6	Channel A
7	Channel $\overline{B}$
8	Channel B
9	Channel $\overline{I}$ (Index)
10	Channel I (Index)

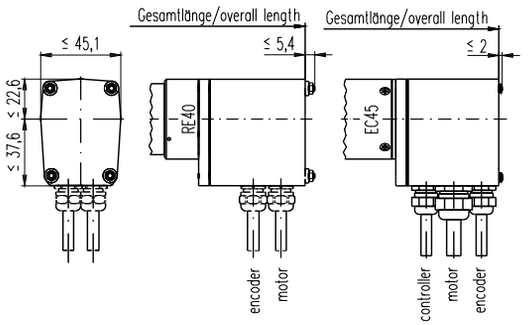
Pin type DIN 41651/
EN 60603-13
flat band cable AWG 28

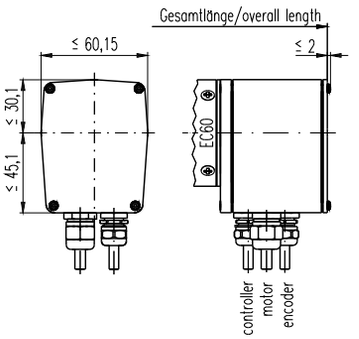
Connection example

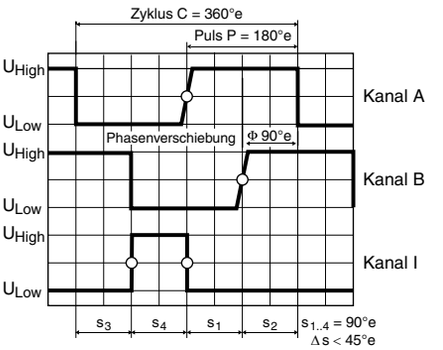


Terminal resistance R = typical 120 Ω

Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422





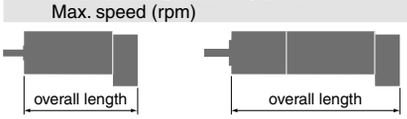


Direction of rotation cw (definition cw p. 106)

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	142					125.1
RE 40, 150 W	142	GP 42, 3 - 15 Nm	314			●
RE 40, 150 W	142	GP 52, 4 - 30 Nm	318			●
RE 40, 150 W	142			AB 28	409	135.6
RE 40, 150 W	142	GP 42, 3 - 15 Nm	314	AB 28	409	●
RE 40, 150 W	142	GP 52, 4 - 30 Nm	318	AB 28	409	●
EC 45, 150 W	216					126.8
EC 45, 150 W	216	GP 42, 3 - 15 Nm	314			●
EC 45, 150 W	216	GP 52, 4 - 30 Nm	318			●
EC 45, 150 W	216			AB 28	409	135.6
EC 45, 150 W	216	GP 42, 3 - 15 Nm	314	AB 28	409	●
EC 45, 150 W	216	GP 52, 4 - 30 Nm	318	AB 28	409	●
EC 45, 250 W	217					159.6
EC 45, 250 W	217	GP 42, 3 - 15 Nm	315			●
EC 45, 250 W	217	GP 52, 4 - 30 Nm	318			●
EC 45, 250 W	217	GP 62, 8 - 50 Nm	320			●
EC 45, 250 W	217			AB 28	409	168.4
EC 45, 250 W	217	GP 42, 3 - 15 Nm	315	AB 28	409	●
EC 45, 250 W	217	GP 52, 4 - 30 Nm	318	AB 28	409	●
EC 45, 250 W	217	GP 62, 8 - 50 Nm	320	AB 28	409	●
EC 60, 400 W	218					177.3
EC 60, 400 W	218	GP 81, 20 - 120 Nm	321			●
EC 60, 400 W	218			AB 41	411	214.9
EC 60, 400 W	218	GP 81, 20 - 120 Nm	321	AB 41	411	●

Technical Data

Supply voltage V_{CC}	5 V ± 10%
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 = 11 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40…+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s⁻²
Output current per channel	min. -20 mA, max. 20 mA

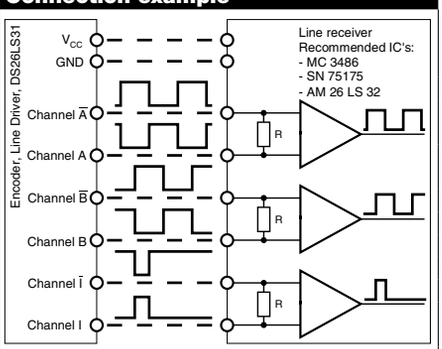
The index signal I is synchronized with channel A or B.

Pin Allocation

Cable white	=	2	V_{CC} 5 VDC
Cable brown	=	3	GND
Cable green	=	5	Channel $\overline{A}$
Cable yellow	=	6	Channel A
Cable grey	=	7	Channel $\overline{B}$
Cable pink	=	8	Channel B
Cable blue	=	9	Channel $\overline{I}$ (Index)
Cable red	=	10	Channel I (Index)

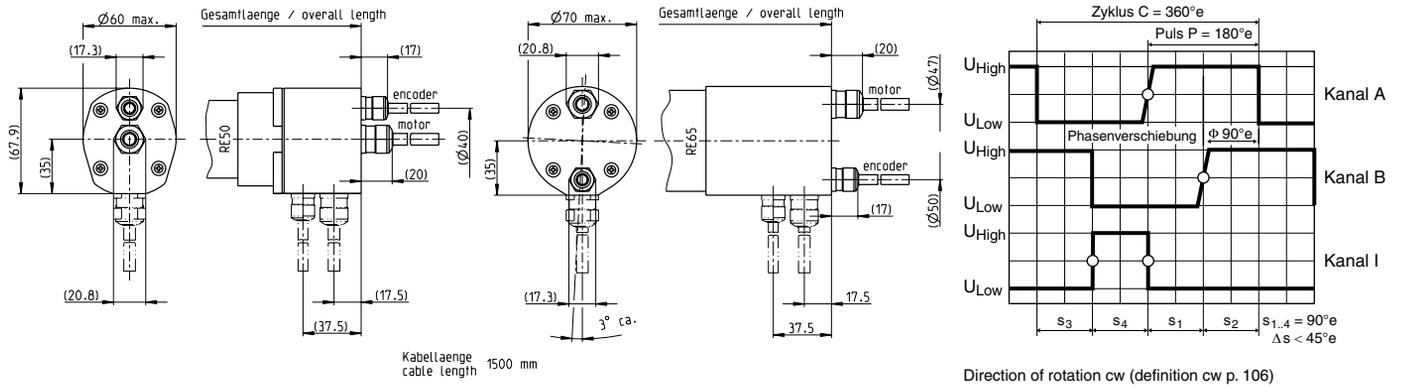
Cable size 8 × 0.25 mm²

Connection example



Terminal resistance R = typical 120 Ω

Encoder HEDL 9140 500 CPT, 3 Channels, with Line Driver RS 422

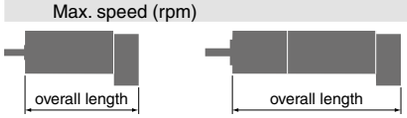


Direction of rotation cw (definition cw p. 106)

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	143					170.4	
RE 50, 200 W	143	GP 52, 4 - 30 Nm	319			●	
RE 50, 200 W	143	GP 62, 8 - 50 Nm	320			●	
RE 50, 200 W	143			AB 44	412	183.4	
RE 50, 200 W	143	GP 52, 4 - 30 Nm	319	AB 44	412	●	
RE 50, 200 W	143	GP 62, 8 - 50 Nm	320	AB 44	412	●	
RE 65, 250 W	144						187.5
RE 65, 250 W	144	GP 81, 20 - 120 Nm	321				●
RE 65, 250 W	144			AB 44	412		205.5
RE 65, 250 W	144	GP 81, 20 - 120 Nm	321	AB 44	412		●

Technical Data

Supply voltage V_{CC}	5 V ± 10%
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 = 11 kΩ, 25 °C)	180 ns
Signal fall time (typically, at C_L = 25 pF, R_L = 11 kΩ, 25 °C)	40 ns
Index pulse width	90°e
Operating temperature range	-40…+85 °C
Moment of inertia of code wheel	≤ 0.6 gcm²
Max. angular acceleration	250000 rad s⁻²
Output current per channel	min. -20 mA, max. 20 mA
Protection to	IP54

The index signal I is synchronized with channel A or B.

Pin Allocation

Encoder

Cable white	=	V_{CC} 5 VDC
Cable brown	=	GND
Cable green	=	Channel $\overline{A}$
Cable yellow	=	Channel A
Cable grey	=	Channel $\overline{B}$
Cable pink	=	Channel B
Cable blue	=	Channel $\overline{I}$ (Index)
Cable red	=	Channel I (Index)

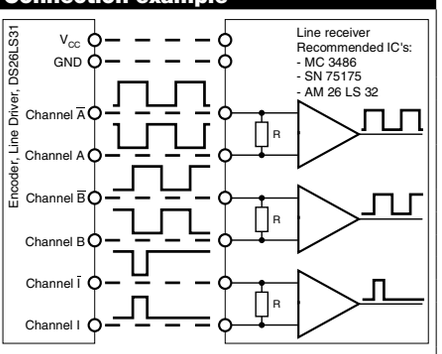
Cable size 8 × 0.25 mm²

Motor

Cable white	=	Motor +
Cable brown	=	Motor -

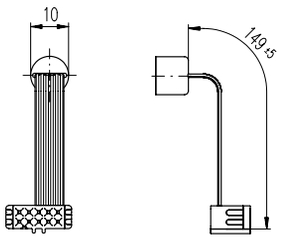
Cable size 2 × 1.0 mm²

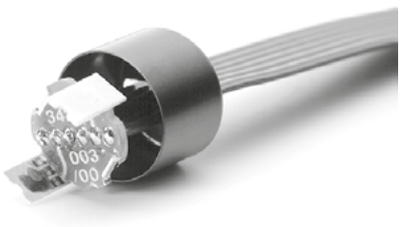
Connection example

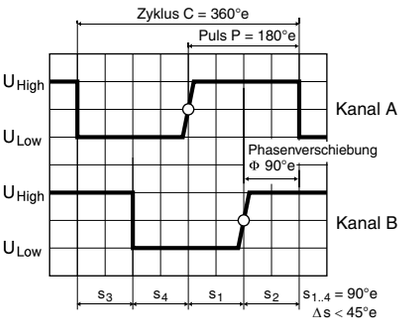


Terminal resistance R = typical 120 Ω

Encoder MEnc 10 12 CPT, 2 Channels



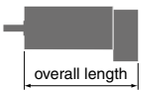


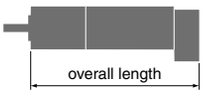


Direction of rotation cw (definition cw p. 106)

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



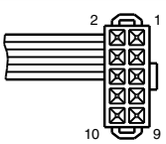


maxon Modular System				
+ Motor	Page	**+ Gearhead**	Page	**Overall length [mm] / ● see Gearhead**
RE 10, 0.75 W	111			25.1
RE 10, 0.75 W	111	GP 10, 0.005 - 0.1 Nm	275	●
RE 10, 0.75 W	111	GP 10, 0.01 - 0.15 Nm	276	●
RE 10, 1.5 W	113			32.7
RE 10, 1.5 W	113	GP 10, 0.005 - 0.1 Nm	275	●
RE 10, 1.5 W	113	GP 10, 0.01 - 0.15 Nm	276	●

Technical Data	
Supply voltage V_{CC}	3.8 - 24 V
Output signal V_{CC} = 5 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Power input at V_{CC} 5 VDC	max. 8 mA
Inertia of the magnetic disc	0.03 gcm²
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.

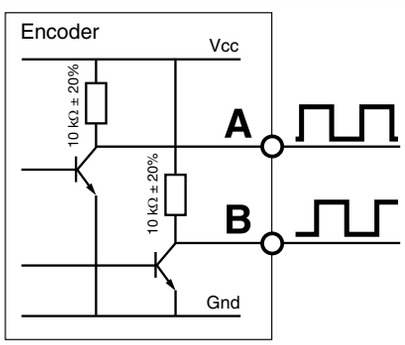
Pin Allocation



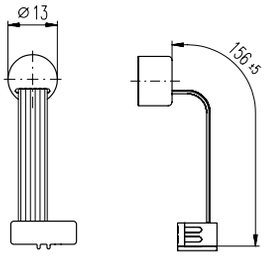
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –

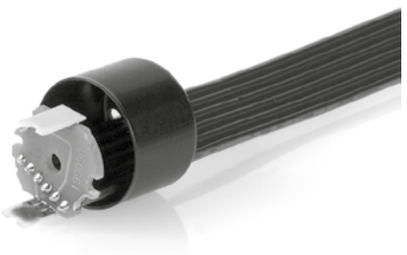
Pin type DIN 41651/
EN 60603-13
(Type 3M 89110-0101 HA)
flat band cable AWG 28

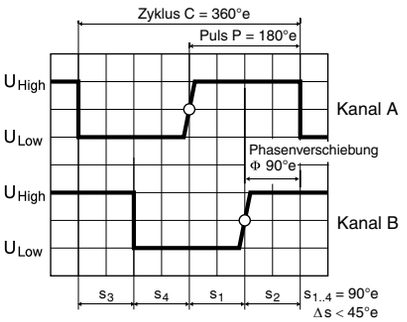
Connection example



Encoder MEnc 13 16 CPT, 2 Channels



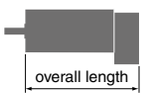


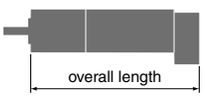


Direction of rotation cw (definition cw p. 106)

Stock program
Standard program
Special program (on request)

Part Numbers	
	110778
Type	
Counts per turn	16
Number of channels	2
Max. operating frequency (kHz)	20
Max. speed (rpm)	75000





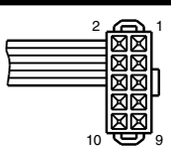
maxon Modular System

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
RE 13, 0.75 W	116/117			27.0/29.4
RE 13, 0.75 W	117	GP 13, 0.05 - 0.15 Nm	278	●
RE 13, 0.75 W	117	GP 13, 0.2 - 0.35 Nm	279	●
RE 13, 2 W	120/121			39.2/41.6
RE 13, 2 W	121	GP 13, 0.05 - 0.15 Nm	278	●
RE 13, 2 W	121	GP 13, 0.2 - 0.35 Nm	279	●
RE 13, 1.5 W	124/125			30.3/32.7
RE 13, 1.5 W	125	GP 13, 0.05 - 0.15 Nm	278	●
RE 13, 1.5 W	125	GP 13, 0.2 - 0.35 Nm	279	●
RE 13, 3 W	128/129			42.5/44.9
RE 13, 3 W	129	GP 13, 0.05 - 0.15 Nm	278	●
RE 13, 3 W	129	GP 13, 0.2 - 0.35 Nm	279	●
RE 16, 3.2 W	132			46.5
RE 16, 3.2 W	132	GP 16, 0.1 - 0.6 Nm	285/286	●
RE 16, 3.2 W	132	GP 16 S	329/330	●
RE 16, 4.5 W	134			49.7
RE 16, 4.5 W	134	GP 16, 0.1 - 0.6 Nm	285/286	●
RE 16, 4.5 W	134	GP 16 S	329/330	●
A-max 16	150/152			33.5
A-max 16	150/152	GS 16, 0.01 - 0.03 Nm	281/282	●
A-max 16	150/152	GS 16, 0.06 - 0.1 Nm	283/284	●
A-max 16	150/152	GP 16, 0.1 - 0.3 Nm	285	●
A-max 16	150/152	GP 16 S	329/330	●
A-max 19	154/156			36.4/39.0
A-max 19	154/156	GP 19, 0.1 - 0.3 Nm	288	●
A-max 19	154/156	GP 22, 0.5 - 2.0 Nm	293/295	●
A-max 19	154/156	GS 24, 0.1 Nm	300	●
A-max 19	154/156	GP 22 S	332/333	●

Technical Data

Supply voltage V_{CC}	3.8 - 24 V
Output signal V_{CC} = 5 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Power input at V_{CC} 5 VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm²
Operating temperature range	-20…+80 °C
Open collector output with integrated pull-up resistance	10 kΩ ± 20%

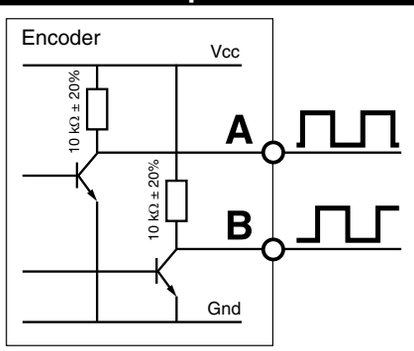
Pin Allocation



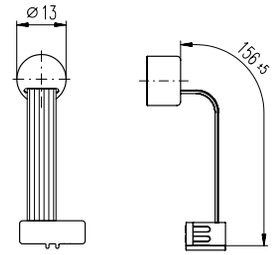
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –

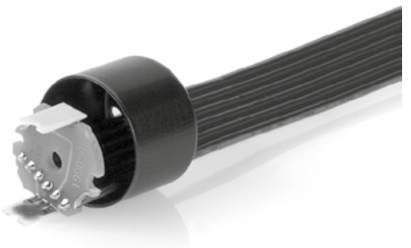
Pin type
DIN 41651/EN 60603-13
(Type 3M 89110-0101 HA)
flat band cable AWG 28

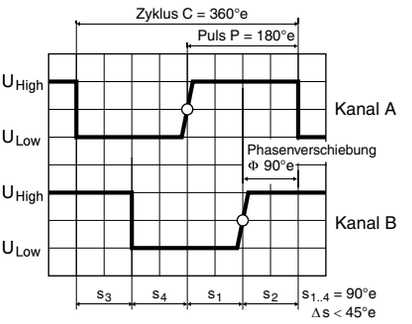
Connection example



Encoder MEnc 13 16 CPT, 2 Channels





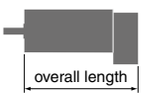


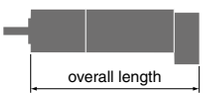
Direction of rotation cw (definition cw p. 106)

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

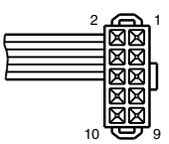




maxon Modular System				
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead
A-max 22	158/160			39.0
A-max 22	158/160	GP 22, 0.1 - 0.6 Nm	291/292	●
A-max 22	158/160	GP 22, 0.5 - 2.0 Nm	293/295	●
A-max 22	158/160	GS 24, 0.1 Nm	300	●
A-max 22	158/160	GP 22 S	332/333	●
A-max 26	162-168			51.8
A-max 26	162-168	GP 26, 0.75 - 4.5 Nm	301	●
A-max 26	162-168	GS 30, 0.07 - 0.2 Nm	302	●
A-max 26	162-168	GP 32, 0.75 - 4.5 Nm	303	●
A-max 26	162-168	GP 32, 0.75 - 6.0 Nm	304	●
A-max 26	162-168	GS 38, 0.1 - 0.6 Nm	313	●
A-max 26	162-168	GP 32 S	334-336	●

Technical Data	
Supply voltage V_{CC}	3.8 - 24 V
Output signal V_{CC} = 5 VDC	TTL compatible
Phase shift Φ	90°e ± 45°e
Power input at V_{CC} 5 VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm²
Operating temperature range	-20…+80 °C
Open collector output with integrated pull-up resistance	10 kΩ ± 20%

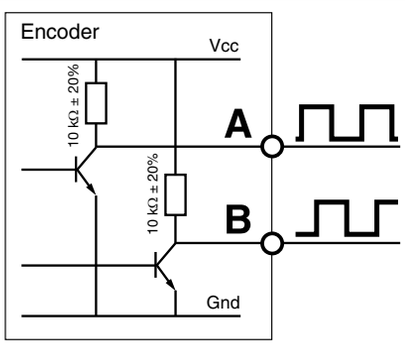
Pin Allocation



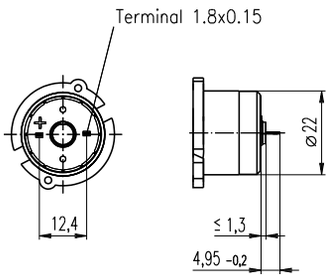
1	Motor +
2	V_{CC}
3	Channel A
4	Channel B
5	GND
6	Motor –

Pin type
DIN 41651/EN 60603-13
(Type 3M 89110-0101 HA)
flat band cable AWG 28

Connection example



DC Tacho DCT 22 0.52 Volt



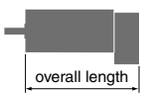
Important Information

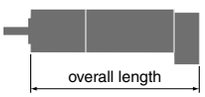
- Tacho with moving coil, maxon system.
- Tacho with precious metal commutation.
- To establish total inertia add motor and tacho inertias.
- With the output shaft turning CW as seen from the mounting surface, the tacho output voltage will be positive at the + terminal.
- A high impedance load is recommended at tacho terminals.
- The tacho current should be kept low.
- The indicated resonance frequency refers to the motor-tacho rotor system.

maxon sensor

Stock program
Standard program
Special program (on request)

Part Numbers		
	118909	118910
Type		
Shaft diameter (mm)	3	4





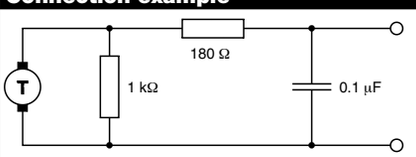
maxon Modular System

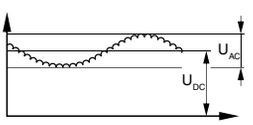
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead						
RE 25	135/137			76.8						
RE 25	135/137	GP 26, 0.75 - 2.0 Nm	301	●						
RE 25	135/137	GP 32, 0.75 - 4.5 Nm	303/304	●						
RE 25	135/137	GP 32, 0.75 - 6.0 Nm	307	●						
RE 25	135/137	GP 32, 1.0 - 4.5 Nm	312	●						
RE 25	135/137	GP 32 S	334-336	●						
RE 25, 20 W	136			65.3						
RE 25, 20 W	136	GP 22, 0.5 Nm	293	●						
RE 25, 20 W	136	GP 26, 0.75 - 2.0 Nm	301	●						
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	303/304	●						
RE 25, 20 W	136	GP 32, 0.75 - 6.0 Nm	307	●						
RE 25, 20 W	136	GP 32, 1.0 - 4.5 Nm	312	●						
RE 25, 20 W	136	GP 32 S	334-336	●						
RE 35, 90 W	140				89.1					
RE 35, 90 W	140	GP 32, 0.75 - 6.0 Nm	303-309		●					
RE 35, 90 W	140	GP 32, 8 Nm	310		●					
RE 35, 90 W	140	GP 42, 3.0 - 15 Nm	314		●					
RE 35, 90 W	140	GP 32 S	334-336		●					

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 gcm²
Ripple frequency per turn	14	Resonance frequency with motors on p. 135 – 137	> 2 kHz
Linear voltage tolerance, 500 to 5000 rpm	± 0.2 %	with motors on p. 140	> 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

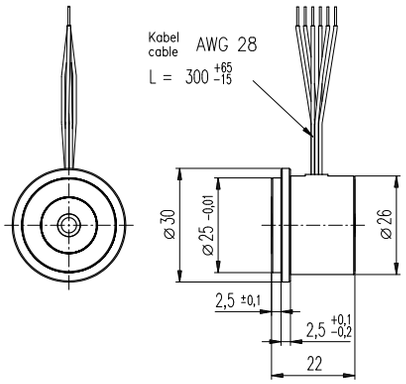


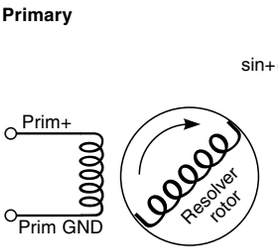


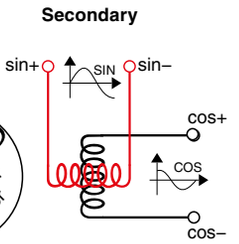
$$\text{Ripple} = \frac{U_{AC}}{U_{DC}} \times 100\ (\%)$$

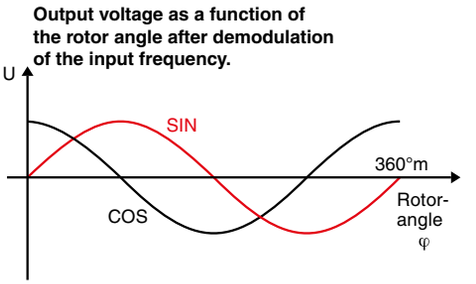
Resonance frequency Motor winding-Tacho winding $f_R \geq 4$ kHz

Resolver Res 26 10 Volt



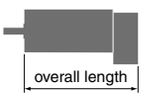


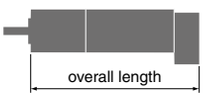




Stock program
Standard program
Special program (on request)

Part Numbers	166488	133405	268912	199287
Type				
Shaft diameter (mm)	4	6	6	6
Max. speed (rpm)	10000	10000	10000	10000





maxon Modular System

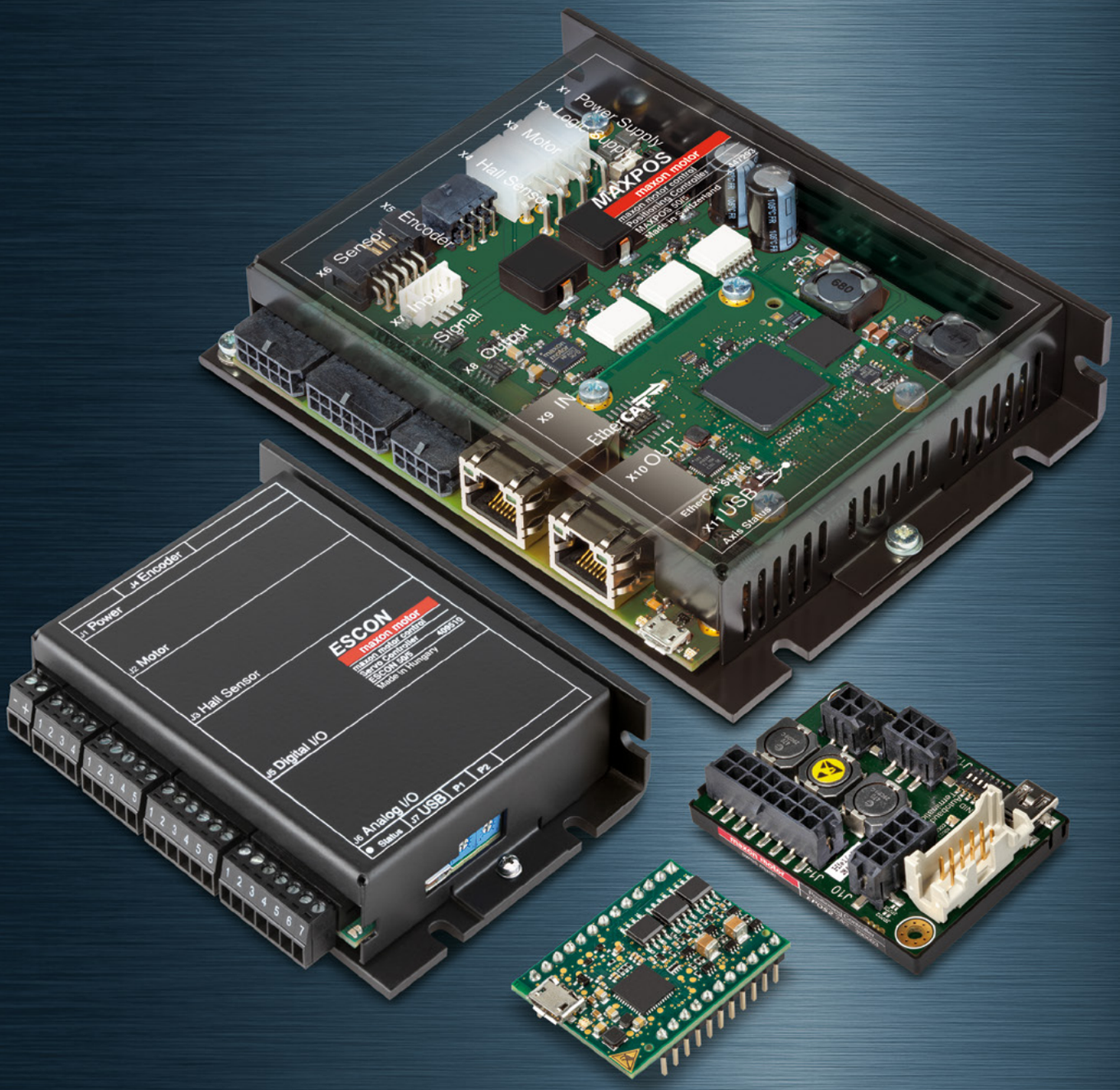
+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see Gearhead				
EC 32, 80 W	214			80.1				
EC 32, 80 W	214	GP 32, 0.75 - 6.0 Nm	303-309	●				
EC 32, 80 W	214	GP 32 S	334-336	●				
EC 40, 170 W	215				107.2			
EC 40, 170 W	215	GP 42, 3.0 - 15 Nm	314		●			
EC 40, 170 W	215	GP 52, 4.0 - 30 Nm	318		●			
EC 45, 150 W	216					111.2		
EC 45, 150 W	216	GP 42, 3.0 - 15 Nm	314			●		
EC 45, 150 W	216	GP 52, 4.0 - 30 Nm	318			●		
EC 45, 250 W	217					144.0		
EC 45, 250 W	217	GP 42, 3.0 - 15 Nm	314			●		
EC 45, 250 W	217	GP 52, 4.0 - 30 Nm	318			●		
EC 45, 250 W	217	GP 62, 8.0 - 50 Nm	320			●		
EC 60, 400 W	218						177.3	
EC 60, 400 W	218	GP 81, 20 - 120 Nm	321				●	

Technical Data

Input voltage	10 V peak, 10 kHz
Transmission ratio	0.5
Electrical error	± 10 minutes
Rotor inertia	6 gcm²
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



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.

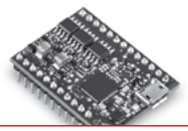
ESCON Overview

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.

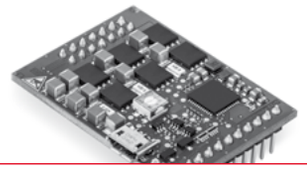
NEW ESCON Module 24/2
466023



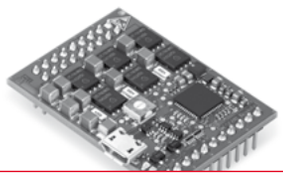
ESCON 36/2 DC
403112

ESCON 36/3 EC
414533

ESCON Module 50/4 EC-S
446925



ESCON Module 50/5
438725



ESCON 50/5
409510

ESCON 70/10
422969

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 tacho:** The DC tacho 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.

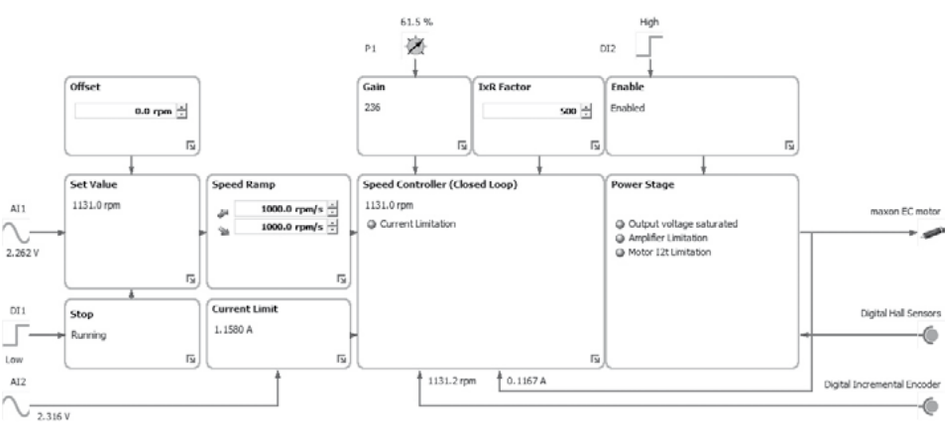
Various functionalities are available to **enable** the power stage.
- **Enable:** Enables or disables the power stage.
- **Enable & Direction:** Enables or disables the power stage and determines the motor shaft’s direction of rotation.
- **Enable CW:** Enables or disables the power stage in direction 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 rotor can only turn in defined direction. 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



ESCON Studio (Controller Monitor)

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.
- **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.

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.

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 8, Windows 7, Windows XP SP3
Communication interface: USB 2.0/3.0 (full speed)

Accessories ESCON*	M 24/2	36/2 DC	36/3 EC	M 50/4 EC-S	M 50/5	50/5	70/10
404404 ESCON 36/2 DC Connector Set	—	✓	—	—	—	—	—
425255 ESCON 36/3 EC Connector Set	—	—	✓	—	—	—	—
403962 DC Motor Cable	—	✓	—	—	—	—	—
403964 I/O Cable 7core (analog I/O’s)	—	✓	✓	—	—	—	—
403965 I/O Cable 6core (digital I/O’s)	—	✓	✓	—	—	—	—
275934 Encoder Cable	—	✓	—	—	—	✓	✓
403957 Power Cable	—	✓	✓	—	—	—	—
403968 USB Type A - micro B Cable	✓	✓	✓	✓	✓	✓	✓
418719 Adapter BLACK FPC11poles	—	—	✓	—	—	—	—
418723 Adapter BLUE FPC8poles	—	—	✓	—	—	—	—
418721 Adapter GREEN FPC8poles	—	—	✓	—	—	—	—
486400 ESCON Module 24/2 Motherboard	✓	—	—	—	—	—	—
438779 ESCON Module Motherboard	—	—	—	—	✓	—	—
450237 ESCON Module Motherboard Sensorless	—	—	—	✓	—	—	—
409286 ESCON USB Stick	✓	✓	✓	✓	✓	✓	✓
*not included in delivery							

ESCON Feature Comparison Chart

NEW

	ESCON Module 24/2	ESCON 36/2 DC
DC motors up to	48 W	72 W
EC motors up to	48 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 x V_{CC}	0.98 x 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 µH / 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 Resolution, Range, Circuit	2 12-bit, -10…+10 V, differential	2 12-bit, -10…+10 V, differential
Analog outputs Resolution, Range	2 12-bit, -4…+4 V	2 12-bit, -4…+4 V
Auxiliary voltage output	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)
Hall sensor supply voltage	+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	-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)	20…80%	20…80%
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 398	Order accessories separately, from page 398

ESCON Feature Comparison Chart

ESCON 36/3 EC	ESCON Module 50/4 EC-S	ESCON Module 50/5
	–	250 W
97 W	200 W	250 W
–	–	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)
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)
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	–	–
H1, H2, H3	–	H1, H2, H3
–	–	A, A\, B, B\
–	–	1 MHz (100 kHz)
1	1	1
2	2	2
2	2	2
2 12-bit, -10…+10 V, differential	2 12-bit, -10…+10 V, differential	2 12-bit, -10…+10 V, differential
2 12-bit, -4…+4 V	2 12-bit, -4…+4 V	2 12-bit, -4…+4 V
+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
-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
20…80%	20…80%	20…80%
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	Pluggable (socket headers with 2.54 mm pitch)	Pluggable (socket headers with 2.54 mm pitch)
414533 ESCON 36/3 EC	**446925** ESCON Module 50/4 EC-S	**438725** ESCON Module 50/5
Order accessories separately, from page 398	Order accessories separately, from page 398	Order accessories separately, from page 398

ESCON Feature Comparison Chart

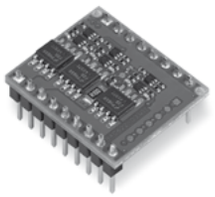
	ESCON 50/5	ESCON 70/10
DC motors up to	250 W	700 W
EC motors up to	250 W	700 W
Sensors		
	Digital Incremental Encoder (2 channel with or without Line Driver)	Digital Incremental Encoder (2 channel with or without Line Driver)
	DC Tacho	DC Tacho
	Without sensor (DC motors)	Without sensor (DC motors)
	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 x V_{CC}	0.95 x 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)	150 000 rpm	150 000 rpm
Built-in motor choke	3 x 30 µH / 5 A	3 x 15 µH / 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 Resolution, Range, Circuit	2 12-bit, -10…+10 V, differential	2 12-bit, -10…+10 V, differential
Analog outputs Resolution, Range	2 12-bit, -4…+4 V	2 12-bit, -4…+4 V
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	-30…+45°C	-30…+45°C
Temperature – Extended range	+45…+85°C; Derating: -0.113 A/°C	+45…+82°C; Derating: -0.270 A/°C
Temperature – Storage	-40…+85°C	-40…+85°C
Humidity (condensation not permitted)	20…80%	20…80%
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 398	Order accessories separately, from page 398

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 382

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 optimised for OEM applications in small appliances.

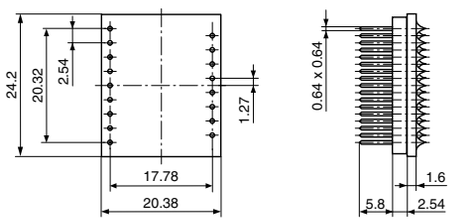
OEM Module
Miniaturized open electronics board. Two connector arrays arranged in a 2.54 mm (0.1“) pattern support easy connectivity and integration into the motherboard.

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.

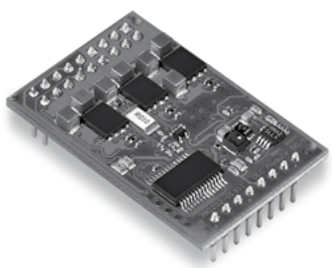
DEC Module 24/2

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 382

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 optimised for OEM applications in small appliances.

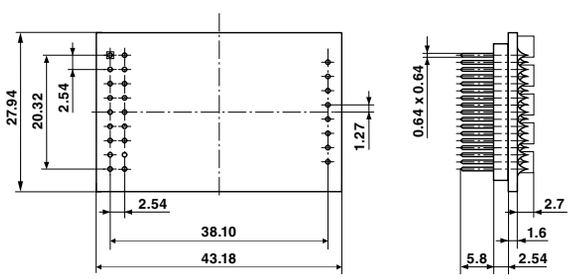
OEM Module
Miniaturized open electronics board. Connector arrays arranged in a 2.54 mm (0.1“) pattern support easy connectivity and integration into the motherboard.

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.

Operating modes		
	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 x 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)	80000 rpm	80000 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°C	T > 100°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 381)	43.18 x 27.94 x 12.7 mm (see page 381)
Mounting	mountable on socket terminal strips pitch 2.54 mm	mountable on socket terminal strips pitch 2.54 mm
Connections	See page 381	See page 381
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

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 384–386

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**

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 384–386

Slave version (online commanding) using CAN Master (EPOS2 P, PC, PLC, SoftPLC, µ-Processor, etc.) or PC via USB *) or RS232 interface

*) 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 384–387

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 384–387

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 384–387

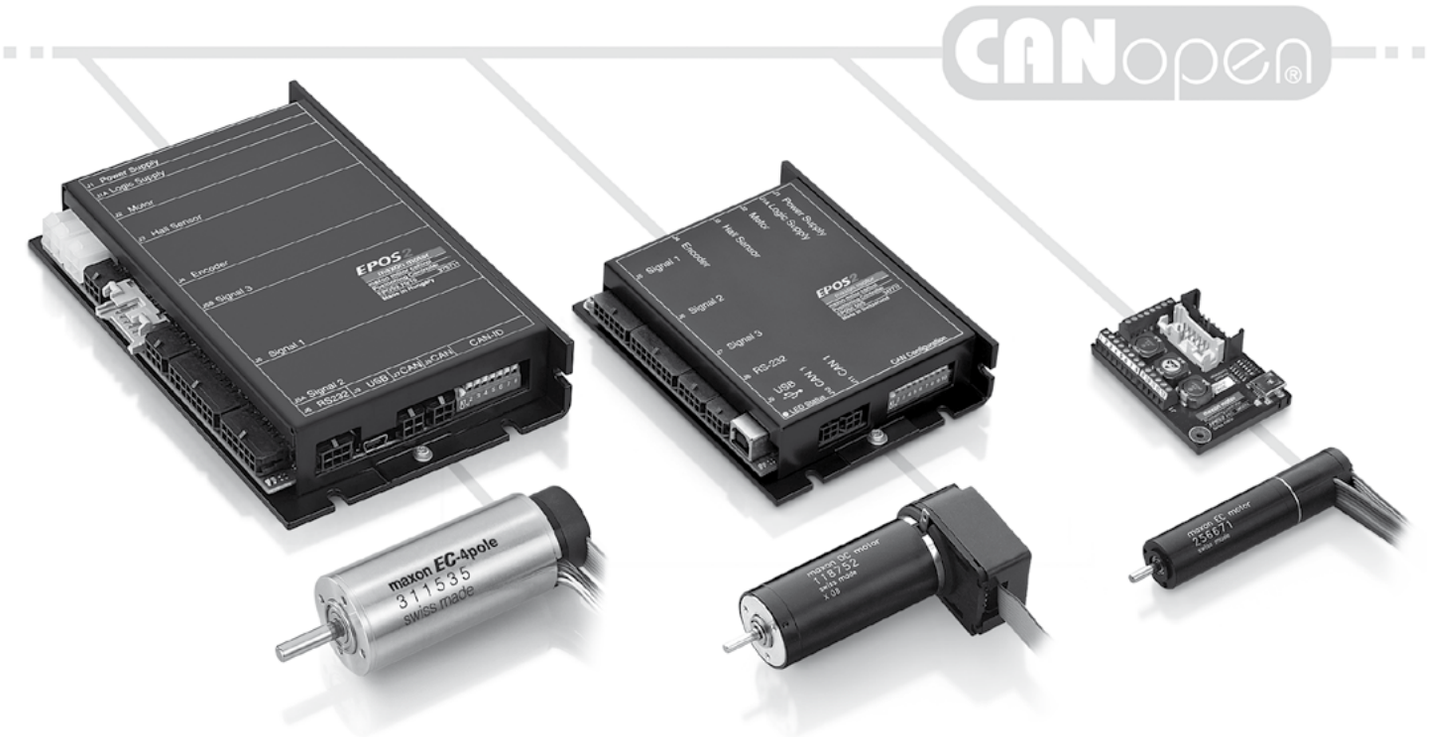
Slave version (online commanding) using CAN Master (EPOS2 P, PC, PLC, SoftPLC, etc.) or PC via USB or RS232 interface

Typical applications:
- Production equipment
- System automation tasks
- Plant construction

Part Number

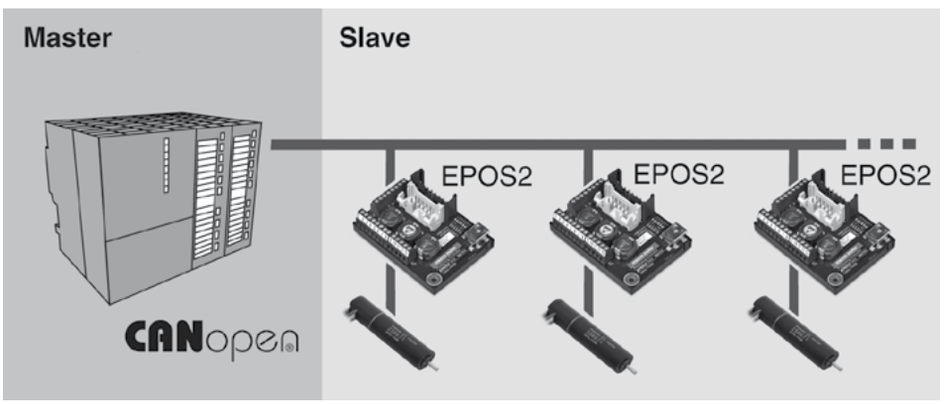
EPOS2 70/10	**375711**

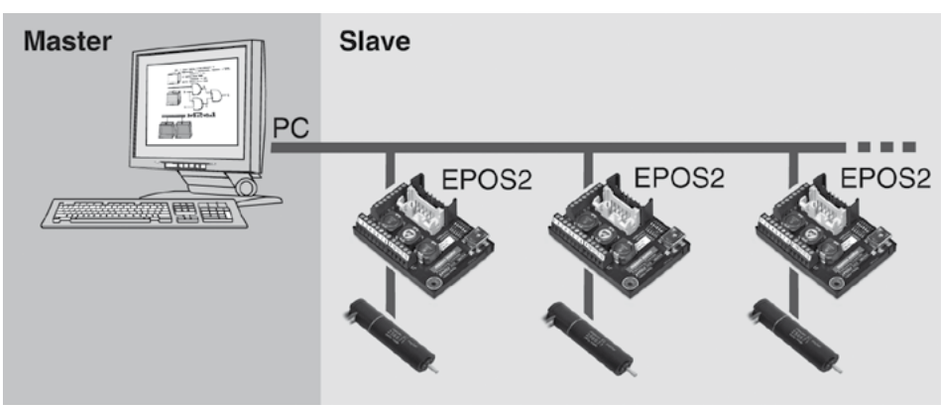
EPOS2 Positioning Controllers



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.
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 are more than 30 methods available for finding the reference position.

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. There the delay times can be individually configured for switching on and off.

Additional information for technical data of page 386/387

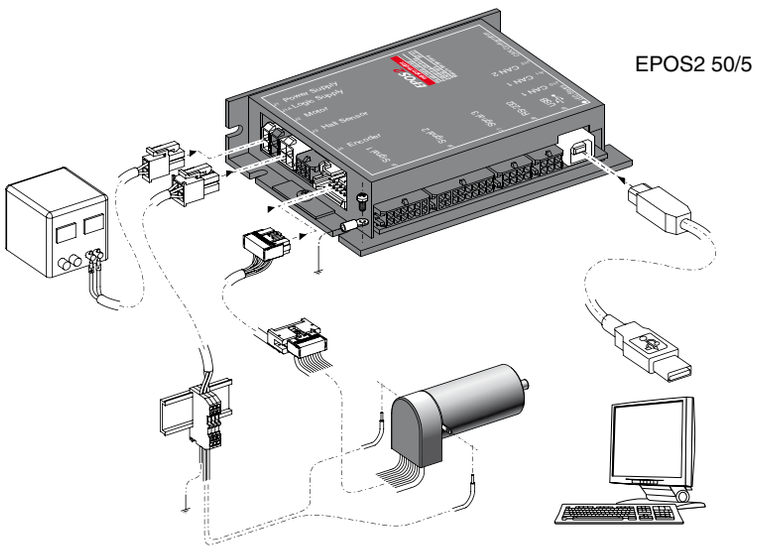
Standardized, extendable
CANopen standard CiA 301, 402 and 305. Can easily be integrated into existing CANopen systems. Networks with other CANopen modules. Alternatively controllable by serial interface (USB and RS232).

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 ARMv6/v7 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.

State-of-the-art
Digital position, speed and current/torque control. Sinusoidal commutation for smooth operation of EC motors.

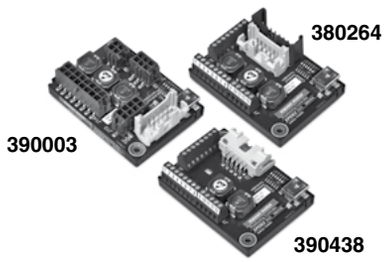


EPOS2 50/5

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 398.

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 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 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 x V_{CC}	0.9 x 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)	25 000 rpm (sinusoidal); 100 000 rpm (block)	25 000 rpm (sinusoidal); 100 000 rpm (block)
Built-in motor choke per phase	47 µH / 2 A	10 µH / 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
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. 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 **380264** EPOS2 24/2 for EC motors **390003** EPOS2 24/2 for DC/EC motors	**360665** EPOS2 Module 36/2
Accessories		
	309687 DSR 50/5 Shunt regulator	**363407** EPOS2 Module Starter-Kit
	Order accessories separately, see page 398	Order accessories separately, see page 398

EPOS2 24/5
Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder, from 5 to 120 watts.

EPOS2 50/5
Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder, from 5 to 250 watts.

EPOS2 70/10
Matched with DC brush motors with encoder or brushless EC motors with Hall sensors or encoder, from 80 to 700 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)	
+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
Ambient temperature and humidity range		
-10…+45°C	-10…+45°C	-10…+45°C
-40…+85°C	-40…+85°C	-40…+85°C
20…80%	20…80%	20…80%
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 398	Order accessories separately, see page 398	Order accessories separately, see page 398

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 390

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 Acquistion 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**

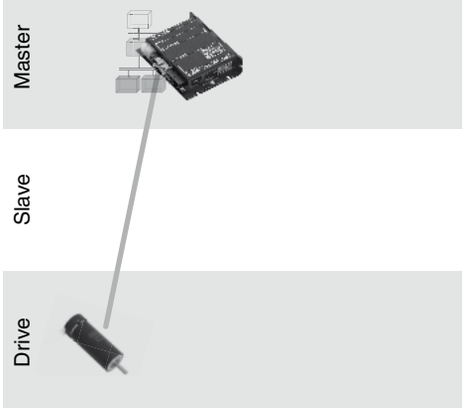
EPOS2 P is a freely programmable positioning controller with an integrated power stage, based on the EPOS2 slave version. It is suitable for brushless and brush DC motors with incremental encoder and up to 120 watt output.

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.

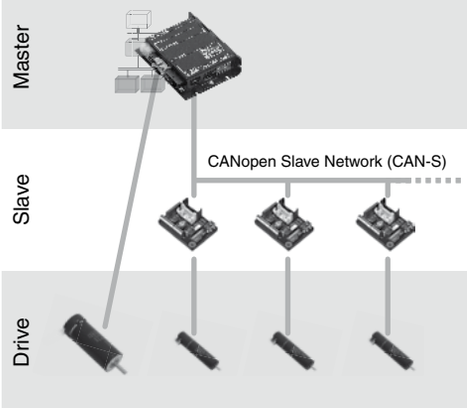
Via the CAN Bus all axes can be coordinated simultaneously. The combination with maxon motors produces drive systems for highly dynamic movements.

Standalone

Single Axis System

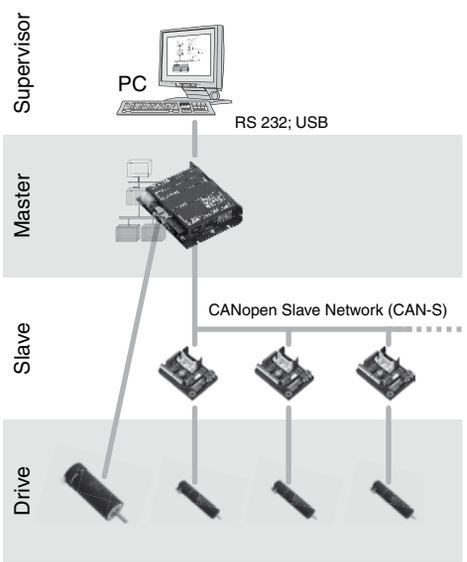


Multi Axis System

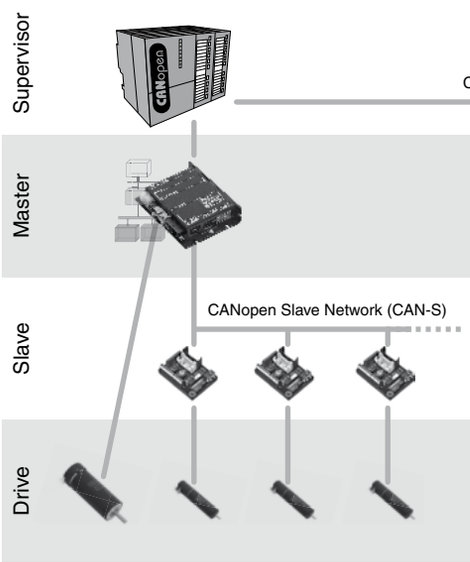


Supervisory Control

Single Standalone System



Multi Standalone System



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 widly-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.

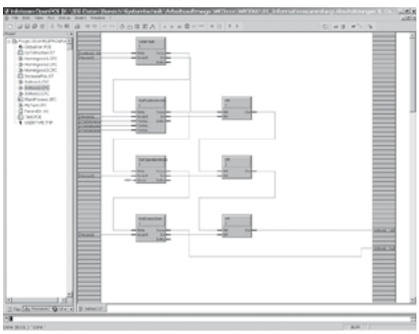
Technical data page 390

Performance features

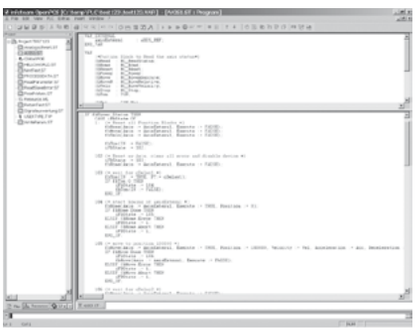
- 32 bit host processor, 60 MHz
- 1 MB memory, with 768 KB free user program memory
- typicaly 2.5 ms / 5000 lines IL
- 4 KB non-volatile memory
- Digital motion control signal processor

Software features

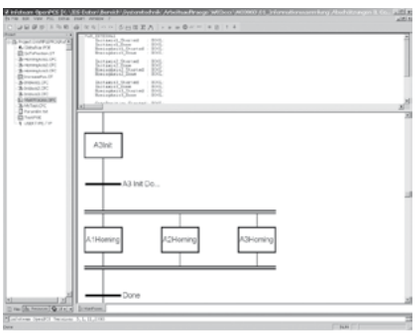
- Windows-based development environment
- IEC 61131-3 programming languages (ST, IL, FBD, LD, SFC)
- IEC 61131-3 standard libraries
- Motion control function blocks
- maxon utility function block library
- CANopen function block library
- User libraries
- Network variables and data exchange
- Online 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

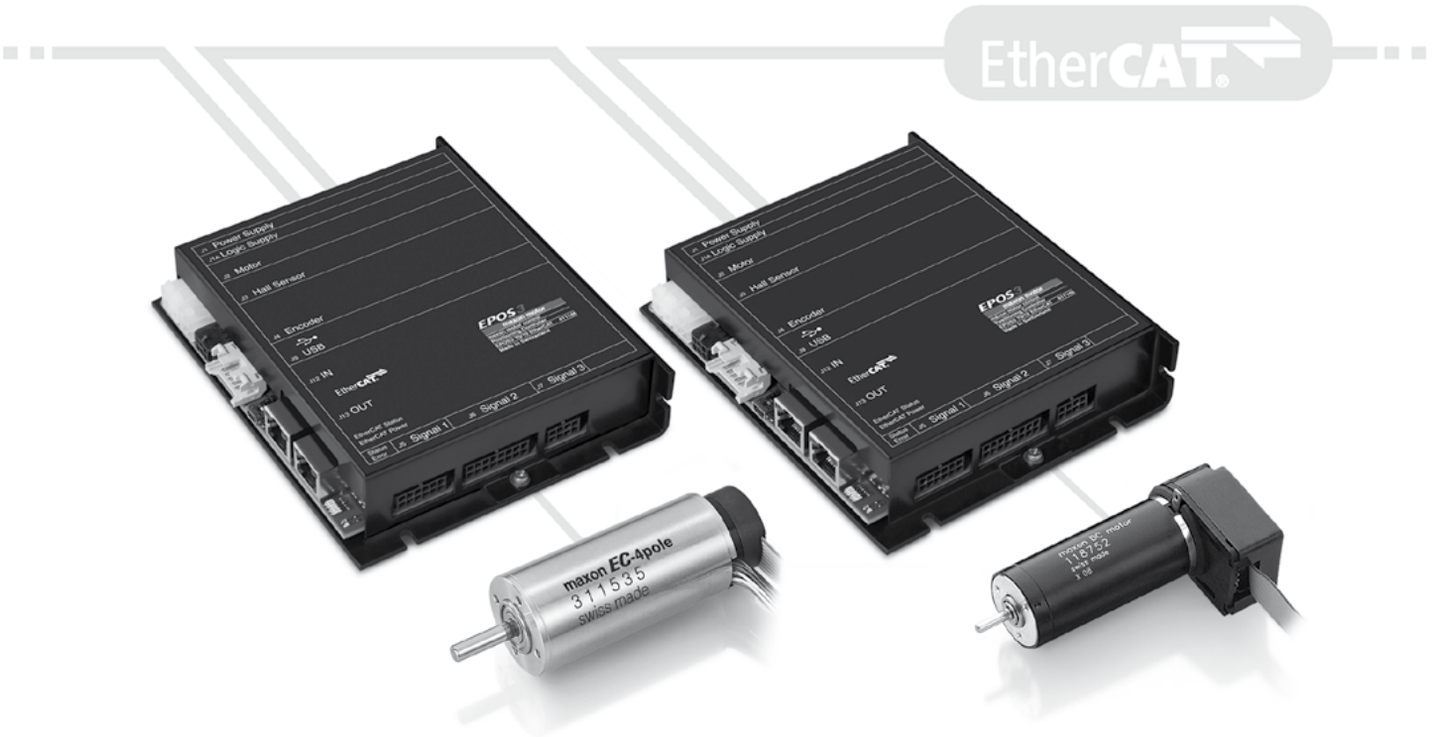
EPOS2 P 24/5
Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder, from 5 to 120 watts.

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 x 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 µH / 5 A
Input	
Hall sensor signals	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (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
Ambient temperature and humidity range	
Operation	-10…+45°C
Storage	-40…+85°C
No condensation	20…80%
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 398340

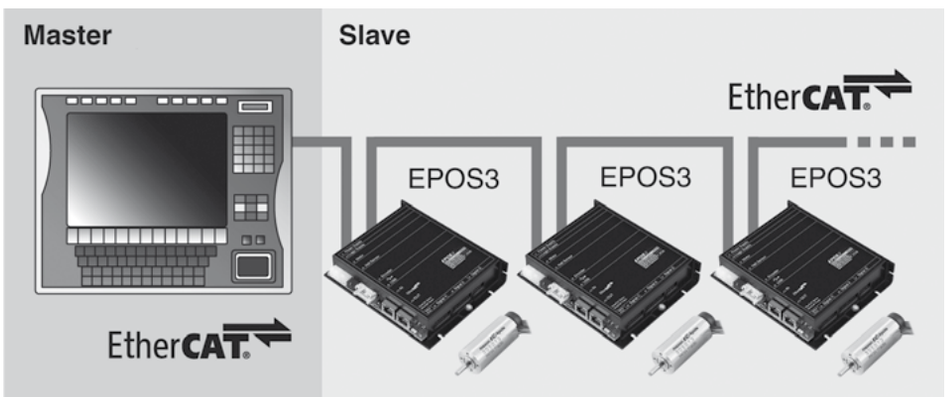
Operating modes
CANopen Profile Position, Profile Velocity- and Homing Mode
Position, Velocity and Current Mode
Path generating with trapezoidal or sinusoidal profiles
Feed forward for velocity and acceleration
Interpolated Position Mode (PVT)
Sinusoidal or block commutation for EC motors
Communication
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 398.

EPOS3 Positioning Controller Summary



EPOS3 70/10 EtherCAT Slave

The EPOS3 70/10 EtherCAT positioning controller receives motion and I/O commands from a superordinate EtherCAT-Master, which operates as sequence control system. The EPOS3 70/10 EtherCAT supports CoE (CAN application layer over EtherCAT).



The EPOS3 70/10 EtherCAT is a modular, digital positioning controller and suits DC and EC motors with incremental encoder in the range up to 700 Watt.
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 EPOS3.
The position control loop runs in the EPOS3. The EPOS3 delivers the measured actual position, 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 EPOS3. The speed control loop runs in the EPOS3. The EPOS3 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 synchronously via the EtherCAT network to the EPOS3. The torque (current) control loop runs in the EPOS3. The EPOS3 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).

Interpolated Position Mode (PVT)
Thanks to Interpolated Position Mode, the EPOS3 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. EPOS3 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 are more than 30 methods available for finding the reference position.

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).

Control of Holding Brakes
Control of the holding brake can be integrated in the device status management. Thereby the delay times can be individually configured for switching on and off.

Additional information for technical data of page 393

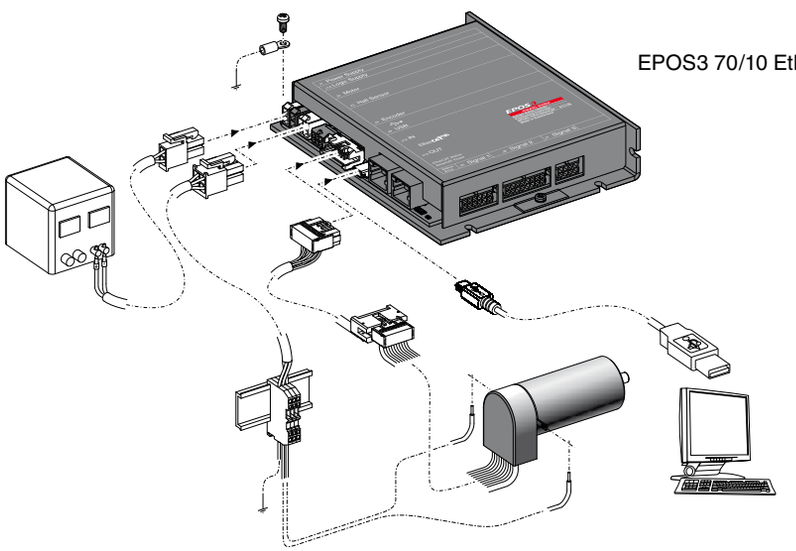
Standardized
EtherCAT Slave: CoE (CAN application layer over EtherCAT) according to CANopen standard CiA 402 Device Profile Drives and Motion Control. Easy integration into existing EtherCAT systems. Can be networked with additional EtherCAT units. Alternatively configurable via serial interface (USB 2.0/3.0).

Flexible, modular
The same technology for DC and EC motors. Configurable inputs and outputs for limit switches, reference switches, 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.

EtherCAT Master (Beckhoff TwinCAT®): Integration made easy
Easy integration of the position controller EPOS3 70/10 EtherCAT into the Beckhoff-TwinCAT SoftPLC thanks to existing device description file (ESI file) and device-specific configuration instructions.

State-of-the-art
Digital position, speed and current/torque control. Sinusoidal commutation for smooth operation of EC motors.



EPOS3 70/10 EtherCAT

Operating modes
Cyclic Synchronuous Position (CSP), Cyclic Synchronuous Velocity (CSV), Cyclic Synchronuous Torque (CST)
Profile Position-, Profile Velocity- and Homing 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
Dual loop position and speed controller
Communication
Communication via EtherCAT
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
Free analog inputs
Available software
EPOS Studio
Firmware
Available documentation
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 398.

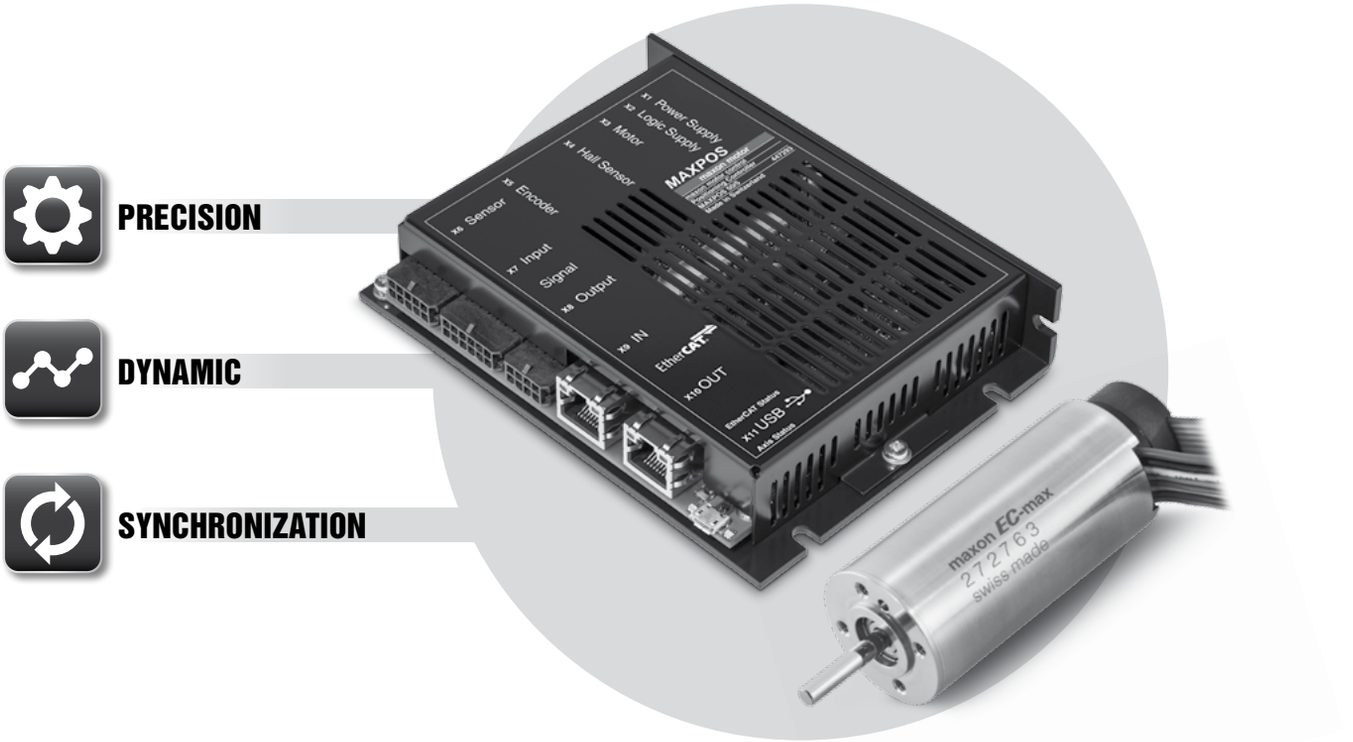
EPOS3 Positioning Controller Data

EtherCAT USB GUI

EPOS3 70/10 EtherCAT
Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder to 700 watts.

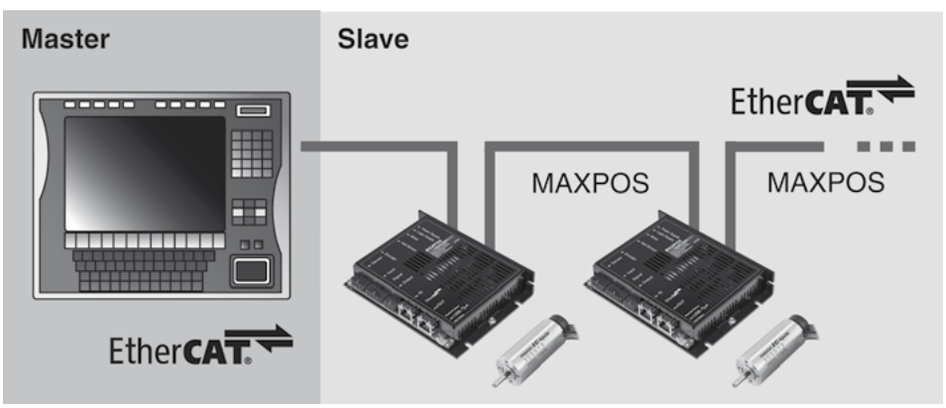
Controller versions	
	EtherCAT Slave
Electrical Data	
Operating voltage V_{CC}	11 - 70 VDC
Logic supply voltage V_C (optional)	11 - 70 VDC
Max. output voltage	0.9 x V_{CC}
Max. output current I_{max} (<1 s)	25 A
Continuous output current I_{cont}	10 A
Switching frequency of power stage	50 kHz
Sample 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	22 µH / 10 A
Input	
Hall sensor signals	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 5 MHz)
Digital inputs	11 (7 optically isolated, 4 differential)
Analog inputs	2 (differential) 12-bit resolution, ±10 V
Output	
Digital outputs	5 (4 optically isolated, 1 differential)
Analog outputs	1 (12-bit resolution, 0…10 V)
Encoder voltage output	+5 VDC, max. 100 mA
Hall sensor voltage output	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA
Interface	
EtherCAT	IEEE 802.3 100 Base T (100 Mbit/s, Full Duplex)
USB 2.0/3.0	Data+; Data- (full speed)
Indicator	
Device	green LED, red LED
EtherCAT	green LED, red LED
EtherCAT Port	green LED, yellow LED
Ambient temperature and humidity range	
Operation	-10…+45°C
Storage	-40…+85°C
No condensation	20…80%
Mechanical data	
Weight	Approx. 442 g
Dimensions (L x W x H)	150 x 120 x 29 mm
Mounting	Flange for M3-screws
Part Numbers	
	411146 EPOS3 70/10 EtherCAT
Accessories	
	235811 DSR 70/30 Shunt regulator
	Order accessories separately, see page 398

MAXPOS Positioning Controller Summary



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).



MAXPOS is a modular, digital positioning controller. It is suitable for permanent magnet-activated DC brushed and brushless (maxon EC) motors with incremental or absolute encoders with an operational range of up to 250 W.
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 position, 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 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 suitable sensors: Digital incremental encoders, analog incremental encoders (sin/cos), SSI and BiSS-C absolute encoders (EnDat2.2 available soon).

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.

Trigger output (Position Compare)
Digital outputs can be configured so that a digital signal is emitted at a set position value (available soon).

Control of Holding Brakes
Control of the holding brake can be integrated in the device status management. Thereby the delay times can be individually configured for switching on and off.

Additional information for technical data of page 396

Standardized
IEC 61158 type 12 EtherCAT slave: CoE (CAN Application Layer over EtherCAT) according to IEC 61800-7 profile type 1 (CiA 402) CANopen standard device profile for drives and motion control. Easily integrated in existing EtherCAT systems. It can be connected to a network of other EtherCAT units. Alternatively configurable via serial interface (USB 2.0/3.0).

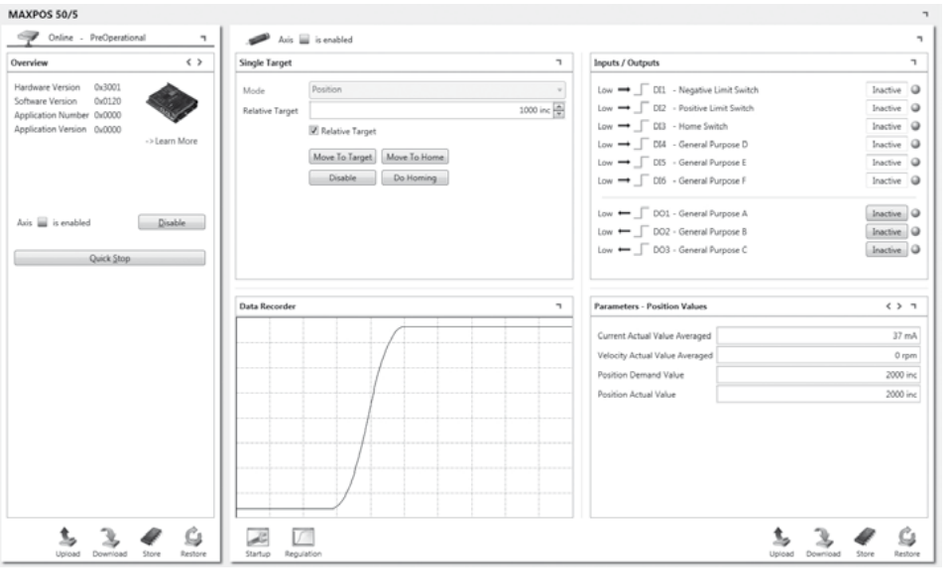
Flexible, modular
The same technology for DC and EC motors. Configurable inputs and outputs for limit switches, reference switches, holding brakes and for other sensors and indicators near the drive.

Easy start-up procedure
Graphic user interface with many functions and wizards for start-up procedure, automatic control settings, I/O configuration, tests.

Optimal control characteristics
The fast controller rates and short cycle times of the EtherCAT communication enable applications with exacting requirements for the dynamics of the drive system. Control input from the EtherCAT master can be accepted by the MAXPOS at a frequency of up to 10 kHz and transmitted to the controllers. Distributed Clocks are supported to optimize synchronization of multiple drive axes. With MAXPOS, all the requirements are met for optimal performance in a wide range of high-performance applications.

EtherCAT Master: Integration made easy
Integration of the MAXPOS 50/5 position controller in a wide variety of master systems is simplified with the provided device description file (ESI file) and device-specific configuration instructions. For a current overview, please visit http://maxpos.maxonmotor.com

State-of-the-art
Digital position, speed and current/torque control. Sinusoidal commutation (FOC) for smooth operation of EC motors.



Operating modes
Cyclic Synchronuous Position (CSP), Cyclic Synchronuous Velocity (CSV), Cyclic Synchronuous 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 398.

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 x 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 µs)
Sample rate of PI - speed controller	10 kHz (100 µs)
Sample rate of PID - positioning control	10 kHz (100 µs)
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 µH / 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	4 (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
Ambient temperature and humidity range	
Operation	-30…+45°C
Storage	-40…+85°C
No condensation	20…80%
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 398

Summary maxon motor control

4-Q Servocontroller				Page
ESCON	**NEW**	466023	ESCON Module 24/2, for DC/EC motors, speed control (open loop/closed loop), current control, 2/6 A, 10–24 VDC	378
		403112	ESCON 36/2 DC, for DC motors, speed control (open loop/closed loop), current control, 2/4 A, 10–36 VDC	378
		414533	ESCON 36/3 EC, for EC motors, speed control (open loop/closed loop), current control, 2.7/9 A, 10–36 VDC	379
		446925	ESCON Module 50/4 EC-S, for sensorless EC motors, speed control (open loop/closed loop), 4/12 A, 10–50 VDC	379
		409510	ESCON 50/5, for DC/EC motors, speed control (open loop/closed loop), current control, 5/15 A, 10–50 VDC	380
		438725	ESCON Module 50/5, for DC/EC motors, speed control (open loop/closed loop), current control, 5/15 A, 10–50 VDC	379
		422969	ESCON 70/10, for DC/EC motors, speed control (open loop/closed loop), current control, 10/30 A, 10–70 VDC	380

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	201583	ADS 50/10, pulsed (PWM) 4-Q-DC Servoamplifier 50 V/10 A in module housing	
	NRND	166143	ADS_E 50/5, pulsed (PWM) 4-Q-DC Servoamplifier 50 V/5 A in racket card (Eurocard)	
	NRND	168049	ADS_E 50/10, pulsed (PWM) 4-Q-DC Servoamplifier 50 V/10 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	382
		380200	DEC Module 50/5, digital 1-Q-EC Amplifier 50 V/5 A, speed control, OEM module	382
	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				
EPOS2		380264	EPOS2 24/2 for EC motors, digital positioning controller, 2 A, 9–24 VDC	386
		390003	EPOS2 24/2 for DC/EC motors, digital positioning controller, 2 A, 9–24 VDC	386
		390438	EPOS2 24/2 for DC motors, digital positioning controller, 2 A, 9–24 VDC	386
		360665	EPOS2 Module 36/2 OEM positioning controller plug-in module, 2 A, 11–36 VDC	386
		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	387
		347717	EPOS2 50/5, digital positioning controller, 5 A, 11–50 VDC	387
		375711	EPOS2 70/10, digital positioning controller, 10 A, 11- 70 VDC	387
EPOS2 P		378308	EPOS2 P 24/5, digital positioning controller, programmable, 5 A, 11–24 VDC	390
EPOS3		411146	EPOS3 70/10 EtherCAT, digital positioning controller, 10 A, 11–70 VDC	393
MAXPOS		447293	MAXPOS 50/5, digital positioning controller, 5 A, 10–50 VDC	396

Summary maxon motor control Accessories

Backplane		
NRND	166873	Backplane with screw type terminal block to ADS_E 50/5 (166143) and ADS_E 50/10 (168049)
Front panel		
NRND	167850	Front panel 3HE / 5TE to ADS_E 50/5 (166143)
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 with 403112, 414533
	403965	I/O Cable 6core (length 1.5 m) for digital I/Os with 403112, 414533
	403968	USB Type A - micro B Cable (length 1.5 m) to 466023, 403112, 414533, 409510, 438725, 422969, 446925, 447293
	275829	Power Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 411146, 447293
	275851	Motor Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 411146, 447293
	303490	DC Motor Cable (length 3 m) to 390003
	275878	Hall Sensor Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 407582, 411146, 447293
	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, 411146, 422969, 438779, 447293, 486400
	275932	Signal Cable 16core (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003, 411146
	300586	Signal Cable 6x2core (length 3 m) to 347717, 375711, 411146
	350390	Signal Cable 4x2core (length 3 m) to 347717, 411146
	378173	Signal Cable 3x2core (length 3m) to 375711
	275900	RS232-COM Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	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, 411146
	275908	CAN-COM Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	275926	CAN-CAN Cable (length 3 m) to 347717, 361435, 367676, 375711, 378308, 390003
	319471	CAN-Y Cable to 390003, 378308
	422827	Ethernet Cable (length 2 m) to 411146, 447293
	451290	Sensor Cable 5x2core (length 3 m) to 447293
	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
	423544	EPOS3 70/10 Connector Set to 411146
	451746	MAXPOS 50/5 Connector Set to 447293

Summary maxon motor control Accessories

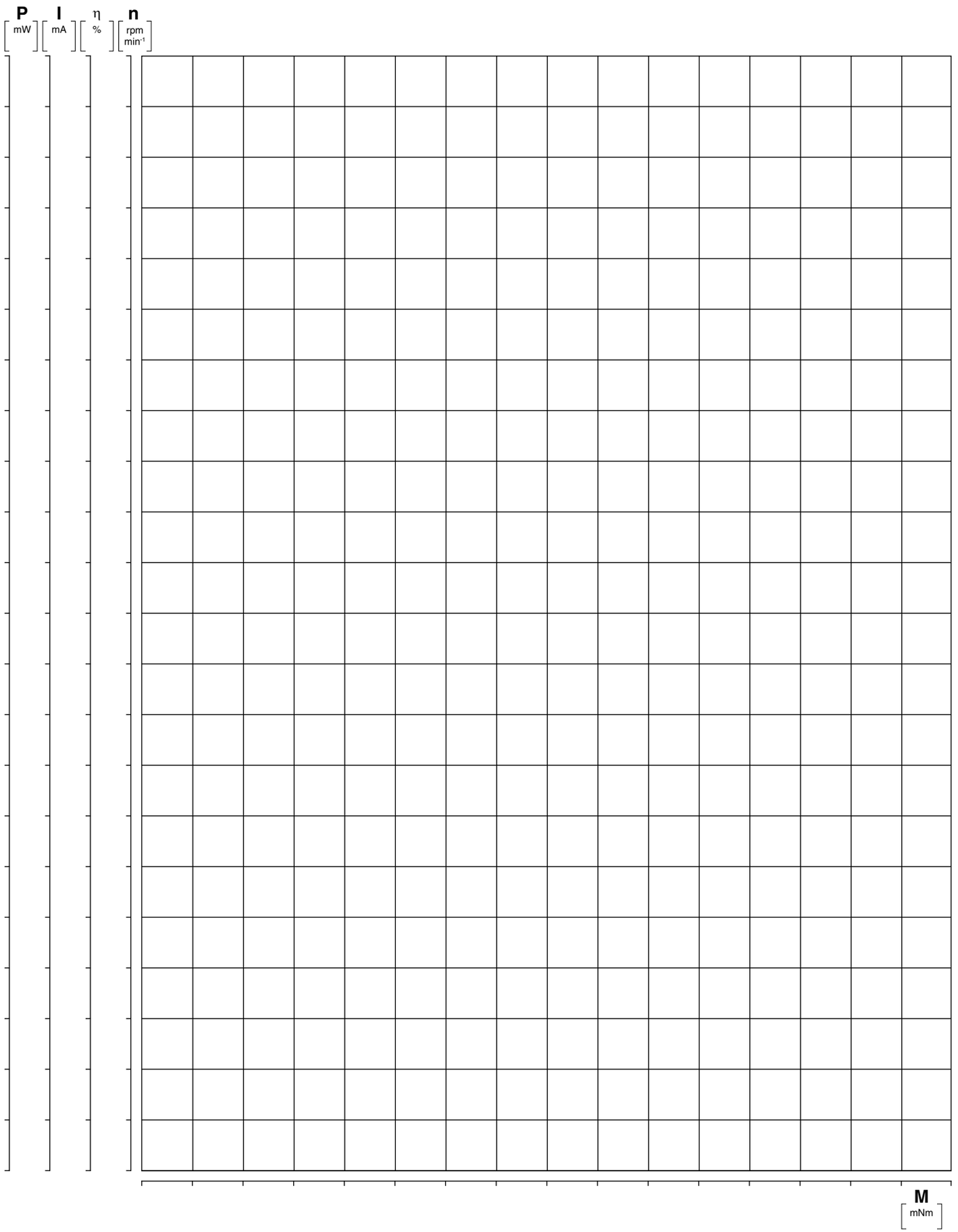
Adapter			
		220300	Adapter 11-pole flexprint connector to 8-pole screw terminal, for use with motors EC 10/13, EC 20/32/45 flat
		220310	Adapter 4-pole flexprint connector to 4-pole screw terminal, for use with EC micro motors without Hall sensors
		425931	Adapter 8-pole flexprint connector to 8-pole screw terminal, for use with motors EC 6 (1.5 W/2 W) EC 8, EC 9.2 flat
	NEW	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
	NRND	397973	Adapter EC 6 MILE encoder to terminal strip and DIN 41651 connector
	NEW	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

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			
DEC		370652	DEC Module Evaluation Board, with switch, LED, potentiometer etc., for use with 367661 and 380200
ESCON	**NEW**	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
		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

Software		
ESCON	409286	ESCON USB Stick including ESCON Setup, for use with 466023, 403112, 414533, 446925, 409510, 438725, 422969
MAXPOS	459639	MAXPOS USB Stick including MAXPOS Setup, for use with 447293

For your personal notes

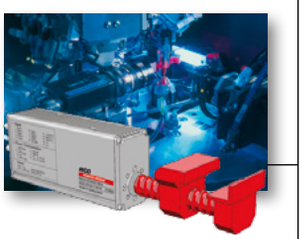


maxon compact drive

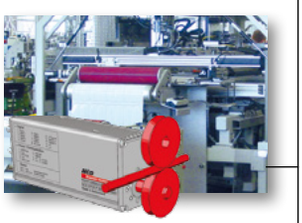
maxon's compact drives feature controllers, sensors and motors in a modern aluminium casing. The use of existing maxon products with an adapted design results in robust, space-saving drive solutions with high power density. The decentralized concept of these intelligent drives minimizes the use of centralized controllers.

MCD EPOS Intelligent compact drive

Driving
A reliable drive solution is the key to production machinery with many years of maintenance-free operation in a variety of applications.

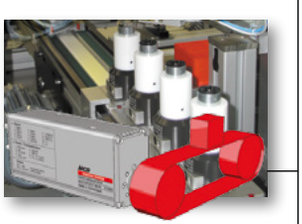


Setting-up
The rapid set-up of processing machinery which offers both precision and long-term accuracy is the key to efficient production.



Guiding
Products that are dynamically guided throughout the entire process ensure consistent product quality.

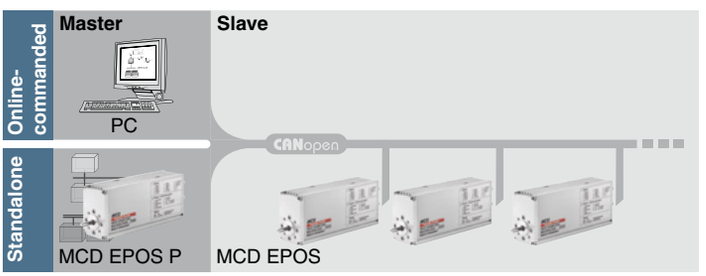
Dispensing
The precise set-up of dispensing systems provides maximum flexibility through the accurate dosing of individual component quantities.



Positioning
Several synchronized axes transport the product to the correct location with both high accuracy and sustained reproducibility.

Maintenance-free positioning drive with tried and trusted components
The combination of the brushless maxon EC motor, digital MR encoder and the fully digital EPOS positioning controller results in a highly dynamic, maintenance-free positioning drive with excellent functionality and high efficiency. The programmable version MCD EPOS P is equipped with a processor and memory for standalone operation.

A complete system – easy start-up procedure
The compact drive's controller-motor combination is optimally tuned and ready for use. Wiring is kept to a minimum through direct connection to the CANopen bus or a PLC. Wiring errors are largely avoided and installation time is significantly reduced. The drive is controlled, parameterized and diagnosed via the CAN bus or the serial port (RS232).



Intelligence at the right place
maxon's compact drives are fitted with several optically isolated inputs and outputs. Sensor signals and events can be evaluated directly in the drive. Cable lengths are shorter, thus reducing susceptibility to interference.

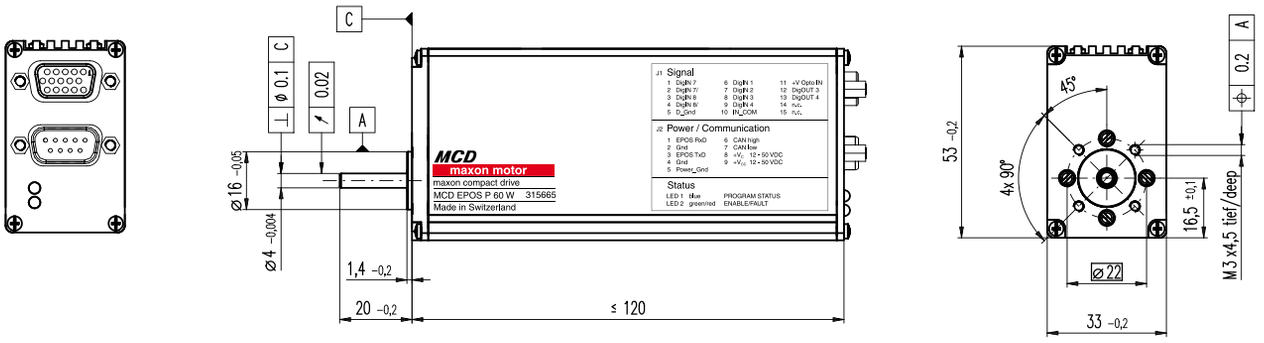
CANopen, IEC 61131-3 and Motion Control Library – key to standardized operation
The MCD can be connected according to the CANopen standard, allowing communication with other CANopen devices.
Drive programming complies with the IEC 61131-3 standard using the powerful "EPOS Studio" tool.
The integration of the Motion Control Library under the widely used standards reduces program complexity and development costs.

Everything integrated – also a question of price
Substantial cost-savings have been made thanks to the careful selection and optimization of components. The resulting drive is available at an unsurpassed price which is well below the cost of the individual parts. Simplified mounting results in further cost-savings.

Drives with a broad application spectrum
The requirements of compact design and enhanced functionality have been completely realized with maxon's compact drives. Their supreme flexibility ensures use in a wide range of industrial applications.

MCD EPOS and EPOS P 60 W Compact Drive

DIGITAL CANopen RS232 GUI



M 1:2

Motor Data

Nominal torque (Max. continuous torque)		54 mNm (T_U=25°C, 5000 rpm)
Max. torque		218 mNm
Max. speed (restricted by econder)		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 gcm²
Axial play at axial load (Preloaded ball bearings)	< 6 N > 6 N	0 mm 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°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°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)
Interfaces	
RS-232 (EIA-standard RS-232)	max. 115 200 bit/s
CAN (high-speed; ISO 11898 compatible)	max. 1 MBit/s
CAN ID	LSS CiA 305
Protective functions	Current Limit (adjustable), Under-/over-voltage limitation, Temperature monitoring
LED indicator	
Bi-colour LED	green = Enable, red = Fault blink pattern = Operating status
Blue LED (only master version)	program status

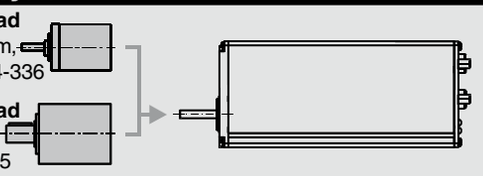
Performance features MCD EPOS P

- 32 bit host processor, 60 MHz
- 512 KB memory, with 256 KB free user program memory
- Typical 2.5 ms/5000 lines AWL
- 512 Byte non-volatile memory
- Digital motion control signal processor

maxon Modular System

Planetary Gearhead
∅32 mm, 1.0-8.0 Nm,
P. 303/308/310/334-336

Planetary Gearhead
∅42 mm,
3.0 - 15.0 Nm, p. 315



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

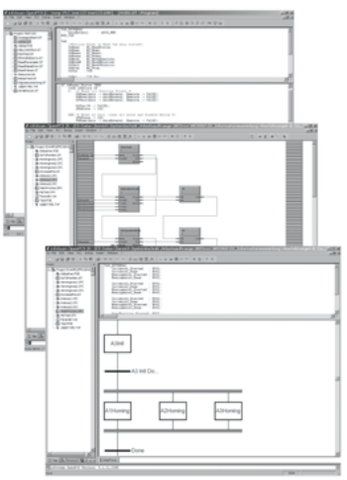
Electronic gearing
— Synchronizing (also with intermediate factor) with an externally produced reference variable

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

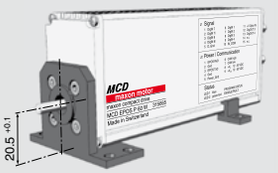
The complexity and development costs of drive systems are substantially reduced. The Motion Firmware Library was implemented according to the widely-used Motion Control Standard. Standardized function blocks make implementation easy.

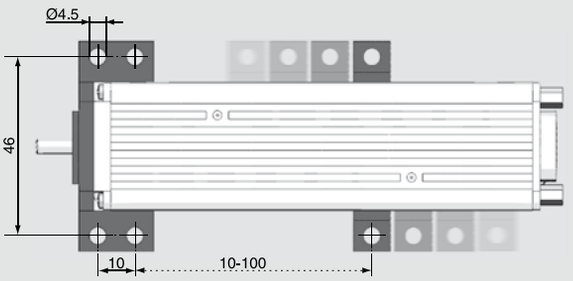
— Drive control
— Referencing (Homing)
— Speed control
— Positioning absolute and relative
— Error management
— Parameter handling

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.

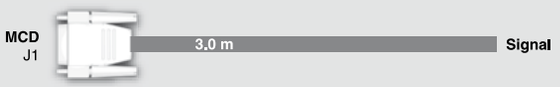




Part Number
326930 MCD EPOS 60 W Mounting-Kit

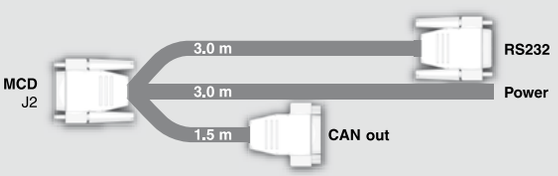
Cable

Signal cable



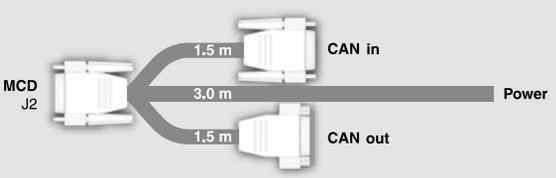
Part Number
326923 MCD EPOS Signal Cable

Power/RS232-CAN cable



Part Number
325939 MCD EPOS Power/RS232-CAN Cable

Power/CAN-CAN cable

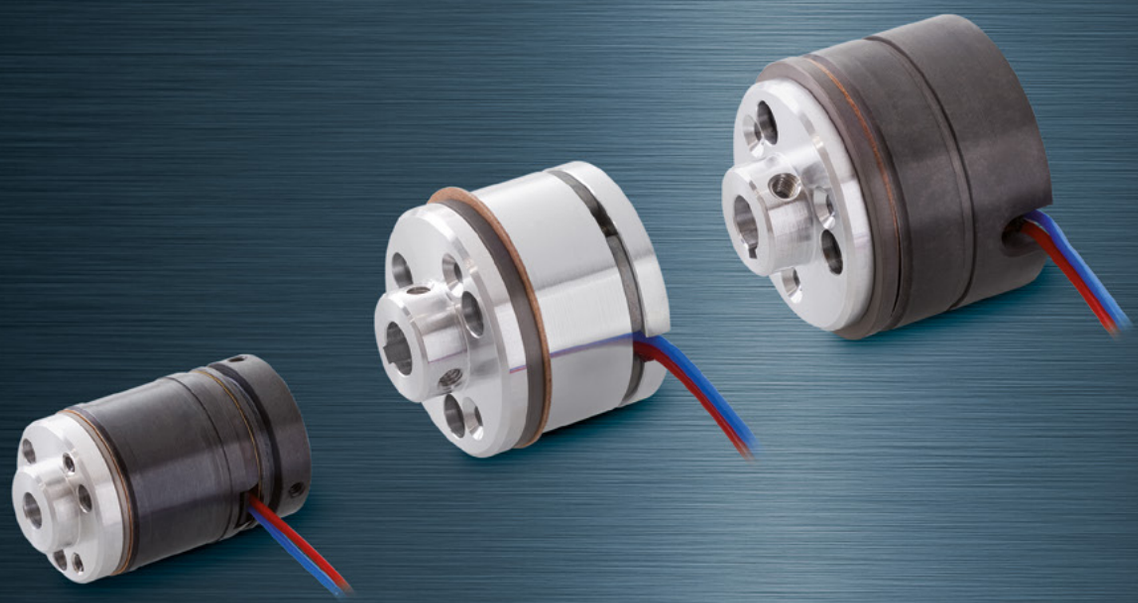


Part Number
325235 MCD EPOS Power/CAN-CAN Cable

CAN Termination plug

Is required as line termination for the CAN-Network.

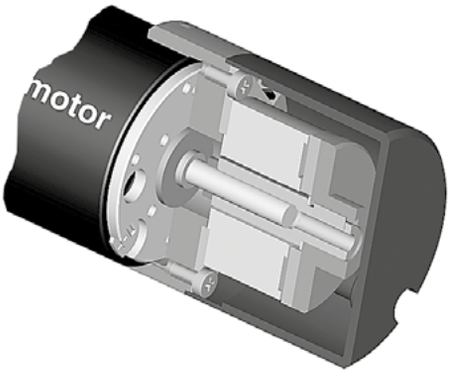
Part Number
326925 MCD EPOS CAN Termination Plug



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



Important Information

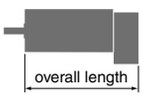
- Permanent magnet - single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.

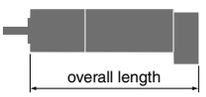
Stock program
Standard program
Special program (on request)

Part Numbers

301212	301213

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Ø AB [mm]	Overall length [mm] / • see Gearhead
EC-max 22, 12 W	224					22	67.8
EC-max 22, 12 W	224	GP 22, 0.5 - 2.0 Nm	296/297			22	•
EC-max 22, 12 W	224	KD 32	312			22	•
EC-max 22, 12 W	224	GP 22 S	332/333			22	•
EC-max 22, 25 W	225					22	84.2
EC-max 22, 25 W	225	GP 22, 0.5 - 3.4 Nm	297			22	•
EC-max 22, 25 W	225	GP 32, 1 - 6 Nm	308			22	•
EC-max 22, 25 W	225	KD 32	312			22	•
EC-max 22, 25 W	225	GP 32 S	334-336			22	•
EC-max 30, 40 W	226					30	77.6
EC-max 30, 40 W	226	GP 32, 1.0 - 8.0 Nm	308/310			30	•
EC-max 30, 40 W	226	KD 32, 1.0 - 4.5 Nm	312			30	•
EC-max 30, 40 W	226	GP 32 S	334-336			30	•
EC-max 30, 40 W	226			HEDL 5540	365	30	98.4
EC-max 30, 40 W	226	GP 32, 1.0 - 8.0 Nm	308/310	HEDL 5540	365	30	•
EC-max 30, 40 W	226	KD 32, 1.0 - 4.5 Nm	312	HEDL 5540	365	30	•
EC-max 30, 40 W	226	GP 32 S	334-336	HEDL 5540	365	30	•
EC-max 30, 60 W	227					30	99.6
EC-max 30, 60 W	227	GP 32, 1.0 - 8.0 Nm	308/310			30	•
EC-max 30, 60 W	227	KD 32, 1.0 - 4.5 Nm	312			30	•
EC-max 30, 60 W	227	GP 42, 3 - 15 Nm	315			30	•
EC-max 30, 60 W	227			HEDL 5540	365	30	120.4
EC-max 30, 60 W	227	GP 32, 1.0 - 8.0 Nm	308/310	HEDL 5540	365	30	•
EC-max 30, 60 W	227	KD 32, 1.0 - 4.5 Nm	312	HEDL 5540	366	30	•
EC-max 30, 60 W	227	GP 42, 3 - 15 Nm	315	HEDL 5540	365	30	•
EC-4pole 30, 100 W	235					30	83.2
EC-4pole 30, 100 W	235	GP 32, 8 Nm	310			30	•
EC-4pole 30, 100 W	235	GP 42, 3 - 15 Nm	315			30	•
EC-4pole 30, 100 W	235			HEDL 5540	366	30	104
EC-4pole 30, 100 W	235	GP 32, 8 Nm	310	HEDL 5540	366	30	•
EC-4pole 30, 100 W	235	GP 42, 3 - 15 Nm	315	HEDL 5540	366	30	•
EC-4pole 30, 200 W	237					30	100.2
EC-4pole 30, 200 W	237	GP 32, 8 Nm	310			30	•
EC-4pole 30, 200 W	237	GP 42, 3 - 15 Nm	315			30	•
EC-4pole 30, 200 W	237			HEDL 5540	366	30	121
EC-4pole 30, 200 W	237	GP 32, 8 Nm	310	HEDL 5540	366	30	•
EC-4pole 30, 200 W	237	GP 42, 3 - 15 Nm	315	HEDL 5540	366	30	•

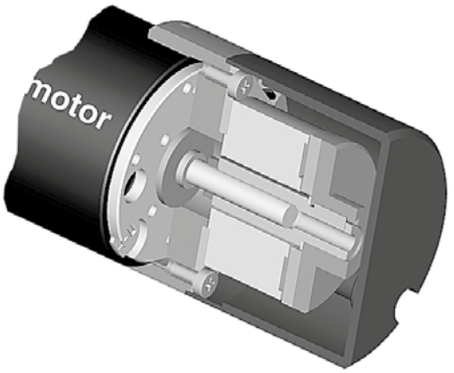
Technical Data

Max. permissible static torque at 20°C	0.1 Nm	Nominal voltage, smoothed		24 VDC ±10%	
Mass inertia	1.8 gcm²	Resistance		R_{20} = 227 Ω ±6%	
Max. speed	49000 rpm	Duty cycle		100%	
Weight	29 g	Reaction time	– Coupling	≤ 12 ms	
Ambient temperature range	-40…+100°C		– Opening	≤ 6 ms	

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

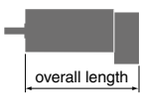
- Permanent magnet - single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

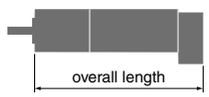
Stock program
Standard program
Special program (on request)

Part Numbers

301215

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Ø AB [mm]	Overall length [mm] / • see Gearhead
EC-max 40, 70 W	228					40	92.4
EC-max 40, 70 W	228	GP 42, 3 - 15 Nm	315			40	•
EC-max 40, 70 W	228			HEDL 5540	365	40	110.7
EC-max 40, 70 W	228	GP 42, 3 - 15 Nm	315	HEDL 5540	365	40	•
EC-max 40, 120 W	229					40	122.4
EC-max 40, 120 W	229	GP 52, 4 - 30 Nm	319			40	•
EC-max 40, 120 W	229			HEDL 5540	365	40	140.7
EC-max 40, 120 W	229	GP 52, 4 - 30 Nm	319	HEDL 5540	365	40	•

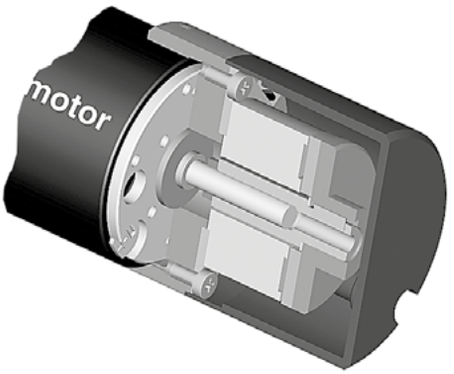
Technical Data

Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed		24 VDC ±10%	
Mass inertia	10 gcm²	Resistance		R_{20} = 92.5 Ω ±6%	
Max. speed	16000 rpm	Duty cycle		100%	
Weight	0.05 kg	Reaction time	– Coupling	≤ 12 ms	
Ambient temperature range	-5…+85°C		– Opening	≤ 6 ms	

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

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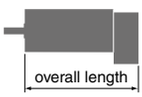
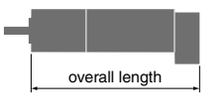
Stock program
Standard program
Special program (on request)

Part Numbers

228384	228387

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Ø AB [mm]	Overall length [mm] / • see Gearhead	
RE 25, 20 W	136					40	77.1	
RE 25, 20 W	136	GP 22, 0.5 Nm	293			40	•	
RE 25, 20 W	136	GP 26, 0.75 - 4.5 Nm	301			40	•	
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	303			40	•	
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	304			40	•	
RE 25, 20 W	136	GP 32, 1.0 - 6.0 Nm	307/312			40	•	
RE 25, 20 W	136	GP 32 S	334-336			40	•	
RE 25, 20 W	136			HED_ 5540	363/366	40		94.3
RE 25, 20 W	136	GP 22, 0.5 Nm	293	HED_ 5540	363/366	40		•
RE 25, 20 W	136	GP 26, 0.75 - 4.5 Nm	301	HED_ 5540	363/366	40		•
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	303	HED_ 5540	363/366	40		•
RE 25, 20 W	136	GP 32, 0.75 - 4.5 Nm	304	HED_ 5540	363/366	40		•
RE 25, 20 W	136	GP 32, 1.0 - 6.0 Nm	307/312	HED_ 5540	363/366	40		•
RE 25, 20 W	136	GP 32 S	334-336	HED_ 5540	363/366	40		•
RE 25, 20 W	137					40	88.6	
RE 25, 20 W	137	GP 26, 0.75 - 4.5 Nm	301			40	•	
RE 25, 20 W	137	GP 32, 0.75 - 4.5 Nm	303			40	•	
RE 25, 20 W	137	GP 32, 0.75 - 4.5 Nm	304			40	•	
RE 25, 20 W	137	GP 32, 1.0 - 6.0 Nm	307/312			40	•	
RE 25, 20 W	137	GP 32 S	334-336			40	•	
RE 25, 20 W	137			HED_ 5540	362/364	40		105.8
RE 25, 20 W	137	GP 26, 0.75 - 4.5 Nm	301	HED_ 5540	362/364	40		•
RE 25, 20 W	137	GP 32, 0.4 - 2.0 Nm	303	HED_ 5540	362/364	40		•
RE 25, 20 W	137	GP 32, 0.75 - 4.5 Nm	304	HED_ 5540	362/364	40		•
RE 25, 20 W	137	GP 32, 1.0 - 6.0 Nm	307/312	HED_ 5540	362/364	40		•
RE 25, 20 W	137	GP 32 S	334-336	HED_ 5540	362/364	40		•
RE 35, 90 W	140					40	107.1	
RE 35, 90 W	140	GP 32, 0.75 - 6.0 Nm	303-309			40	•	
RE 35, 90 W	140	GP 32, 4.0 - 8.0 Nm	310			40	•	
RE 35, 90 W	140	GP 42, 3 - 15 Nm	314			40	•	
RE 35, 90 W	140			HED_ 5540	362/364	40		124.3
RE 35, 90 W	140	GP 32, 0.75 - 6.0 Nm	303-309	HED_ 5540	362/364	40		•
RE 35, 90 W	140	GP 32, 4.0 - 8.0 Nm	310	HED_ 5540	362/364	40		•
RE 35, 90 W	140	GP 42, 3 - 15 Nm	314	HED_ 5540	362/364	40		•
RE 35, 90 W	140	GP 32 S	334-336			40	•	
RE 35, 90 W	140	GP 32 S	334-336	HED_ 5540	362/364	40		•
RE 40, 150 W	142					45	107.1	
RE 40, 150 W	142	GP 42, 3 - 15 Nm	314			45	•	
RE 40, 150 W	142	GP 52, 4 - 30 Nm	318			45	•	
RE 40, 150 W	142			HED_ 5540	362/364	45		124.3
RE 40, 150 W	142	GP 42, 3 - 15 Nm	314	HED_ 5540	362/364	45		•
RE 40, 150 W	142	GP 52, 4 - 30 Nm	318	HED_ 5540	362/364	45		•

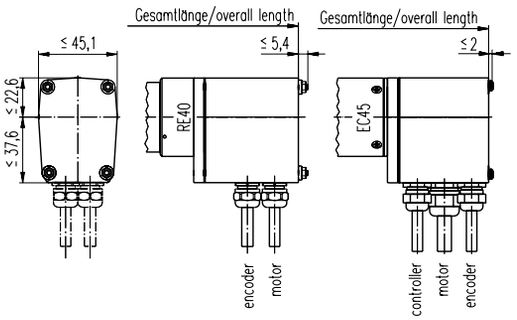
Technical Data

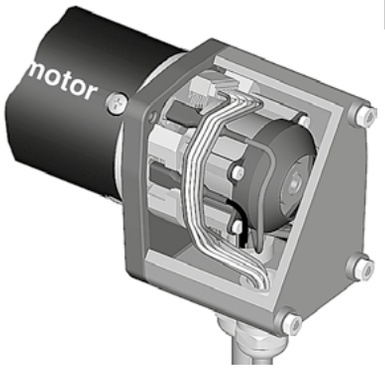
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed		24 VDC ±10%
Mass inertia	10 gcm²	Resistance		R_{20} = 92.5 Ω ±6%
Max. speed	16000 rpm	Duty cycle		100%
Weight	0.05 kg	Reaction time	– Coupling	≤ 13 ms
Ambient temperature range	-5…+85°C		– Opening	≤ 27 ms

Pin Allocation

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

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- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

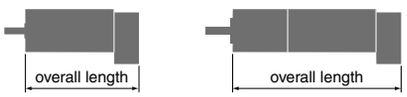
maxon accessories

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	142					115.1	
RE 40, 150 W	142	GP 42, 3 - 15 Nm	314			•	
RE 40, 150 W	142	GP 52, 4 - 30 Nm	318			•	
RE 40, 150 W	142			HEDL 9140	368	135.6	
RE 40, 150 W	142	GP 42, 3 - 15 Nm	314	HEDL 9140	368	•	
RE 40, 150 W	142	GP 52, 4 - 30 Nm	318	HEDL 9140	368	•	
EC 45, 150 W	216						118.6
EC 45, 150 W	216	GP 42, 3 - 15 Nm	314				•
EC 45, 150 W	216	GP 52, 4 - 30 Nm	318				•
EC 45, 150 W	216			HEDL 9140	368		135.6
EC 45, 150 W	216	GP 42, 3 - 15 Nm	314	HEDL 9140	368		•
EC 45, 150 W	216	GP 52, 4 - 30 Nm	318	HEDL 9140	368		•
EC 45, 250 W	217						151.4
EC 45, 250 W	217	GP 42, 3 - 15 Nm	315				•
EC 45, 250 W	217	GP 52, 4 - 30 Nm	318				•
EC 45, 250 W	217	GP 62, 8 - 50 Nm	320				•
EC 45, 250 W	217			HEDL 9140	368		168.4
EC 45, 250 W	217	GP 42, 3 - 15 Nm	315	HEDL 9140	368		•
EC 45, 250 W	217	GP 52, 4 - 30 Nm	318	HEDL 9140	368		•
EC 45, 250 W	217	GP 62, 8 - 50 Nm	320	HEDL 9140	368		•

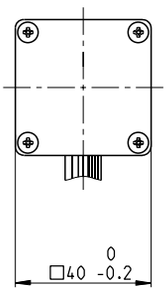
Technical Data

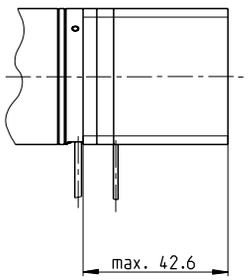
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed	24 VDC ±10%
Mass inertia	10 gcm²	Resistance	R_{20} = 92.5 Ω ±6%
Max. speed	16000 rpm	Duty cycle	100%
Weight	0.05 kg	Reaction time – Coupling	≤ 13 ms
Ambient temperature range	-5…+85°C	– Opening	≤ 27 ms

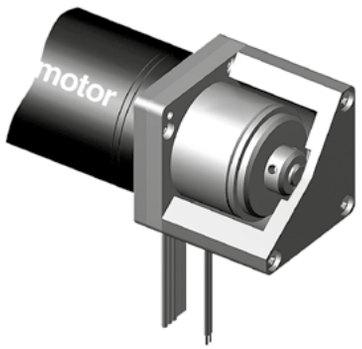
Pin Allocation

		from motor clamp RE 40	Designation
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

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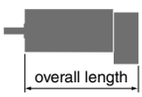
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

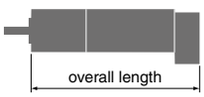
Stock program
Standard program
Special program (on request)

Part Numbers

392335

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
EC 40, 170 W	215					122.7
EC 40, 170 W	215	GP 42, 3 - 15 Nm	314			•
EC 40, 170 W	215	GP 52, 4 - 30 Nm	318			•
EC 40, 170 W	215			HED_ 5540	363/365	141.1
EC 40, 170 W	215	GP 42, 3 - 15 Nm	314	HED_ 5540	363/365	•
EC 40, 170 W	215	GP 52, 4 - 30 Nm	318	HED_ 5540	363/365	•

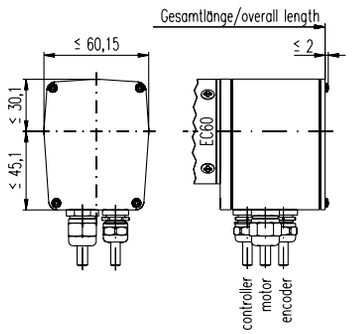
Technical Data

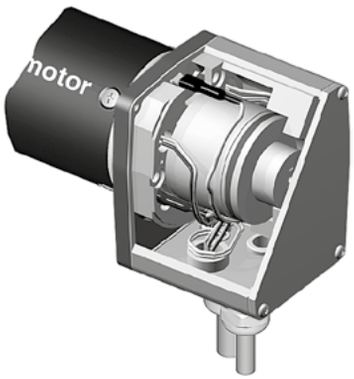
Max. permissible static torque at 20°C	0.4 Nm	Nominal voltage, smoothed		24 VDC ±10%
Mass inertia	19 gcm²	Resistance		R_{20} = 100 Ω ±7%
Max. speed	10000 rpm	Duty cycle		100%
Weight	0.1 kg	Reaction time	– Coupling	≤ 13 ms
Ambient temperature range	-40…+100°C		– Opening	≤ 24 ms

Pin Allocation

Cable (AWG 24)	Designation
red	U_{Brake} + 24 VDC
blue	U_{Brake} GND
Min. cable length	350 mm

Brake AB 41 24 VDC, 2.0 Nm





Important Information

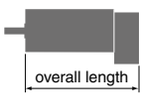
- Permanent magnet – single-face brake for DC (dry operation). Braking in unpowered condition.
- Holding brake, prevents rotation of the shaft at standstill or with turned off motor power.
- Not suitable for dynamic braking.
- It is possible to lower the voltage applied to the brake after it has been energized, for the purpose of reducing heat loss.

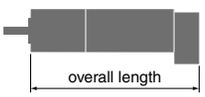
Stock program
Standard program
Special program (on request)

Part Numbers

228998

Type





maxon Modular System

+ Motor	Page	+ Gearhead	Page	+ Sensor	Page	Overall length [mm] / • see Gearhead
EC 60, 400 W	218					190.9
EC 60, 400 W	218	GP 81, 20 - 120 Nm	321			•
EC 60, 400 W	218			HEDL 9140	368	214.9
EC 60, 400 W	218	GP 81, 20 - 120 Nm	321	HEDL 9140	368	•

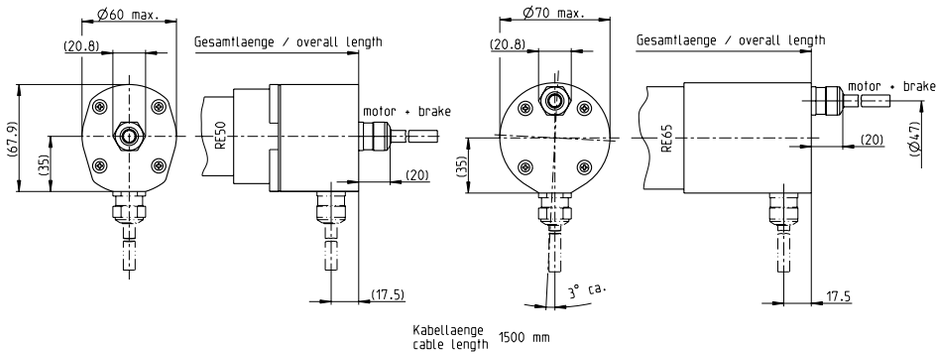
Technical Data

Max. permissible static torque at 20°C	2.0 Nm	Nominal voltage, smoothed	24 VDC -10 ... +6%
Mass inertia	45 gcm²	Resistance	R_{20} = 72 Ω ±7%
Max. speed	10 000 rpm	Duty cycle	100%
Weight	0.18 kg	Reaction time – Coupling	≤ 2 ms
Ambient temperature range	-5…+85°C	– Opening	≤ 25 ms

Pin Allocation

		from motor clamp	Designation
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	143					170.4	
RE 50, 200 W	143	GP 52, 4 - 30 Nm	319			•	
RE 50, 200 W	143	GP 62, 8 - 50 Nm	320			•	
RE 50, 200 W	143			HEDL 9140	369	183.4	
RE 50, 200 W	143	GP 52, 4 - 30 Nm	319	HEDL 9140	369	•	
RE 50, 200 W	143	GP 62, 8 - 50 Nm	320	HEDL 9140	369	•	
RE 65, 250 W	144						187.5
RE 65, 250 W	144	GP 81, 20 - 120 Nm	321				•
RE 65, 250 W	144			HEDL 9140	369		205.5
RE 65, 250 W	144	GP 81, 20 - 120 Nm	321	HEDL 9140	369		•

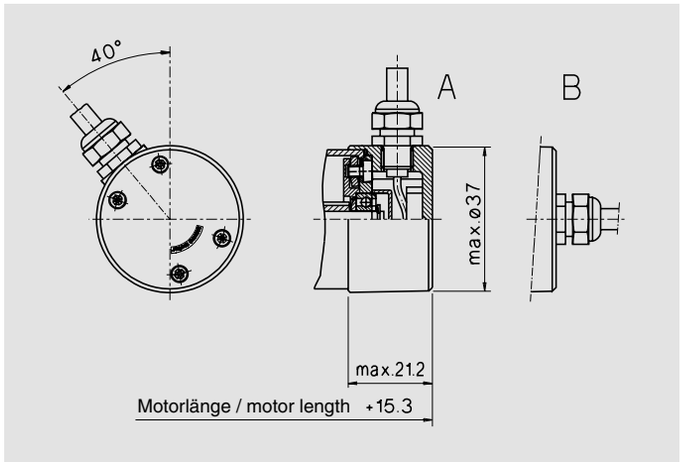
Technical Data

Max. permissible static torque at 20°C	2.5 Nm	Nominal voltage, smoothed		24 VDC ±10%
Mass inertia	90 gcm²	Resistance		R_{20} = 64 Ω ±7%
Max. speed	10000 rpm	Duty cycle		100%
Weight	0.19 kg	Reaction time	– Coupling	≤ 20 ms
Ambient temperature range	-40…+100°C		– Opening	≤ 35 ms

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 140

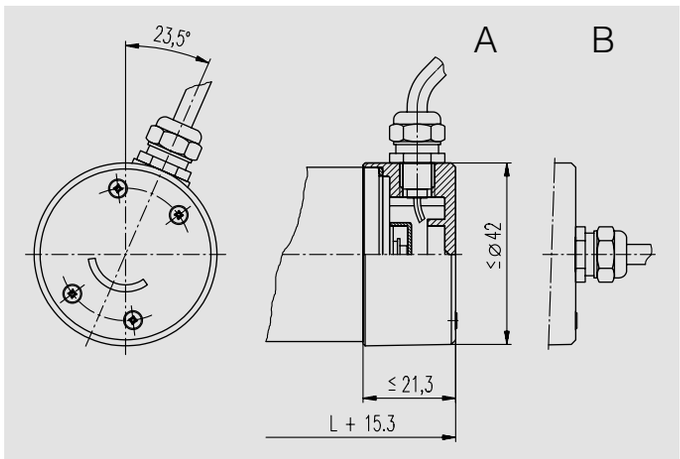
- Plastic housing
- Protection to IP54
- With 500 mm cable, AWG 20 (2 × 0.5 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	– Pol

Part Numbers

Type number		Version/Item
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 142

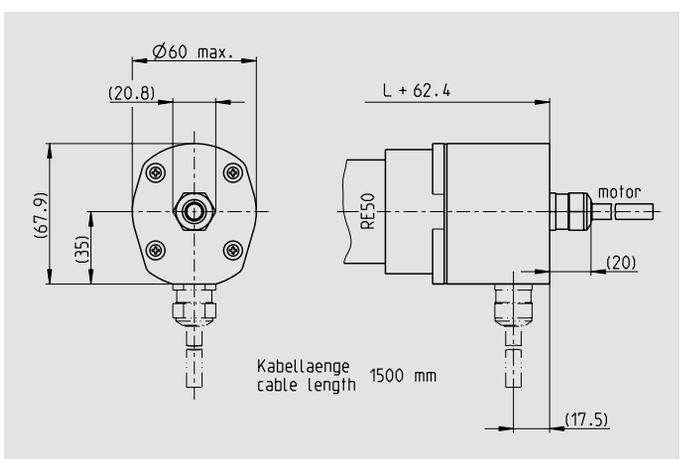
- Plastic housing
- Protection to IP54
- With 500 mm cable, AWG 20 (2 × 0.5 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	– Pol

Part Numbers

Type number		Version/Item
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 143

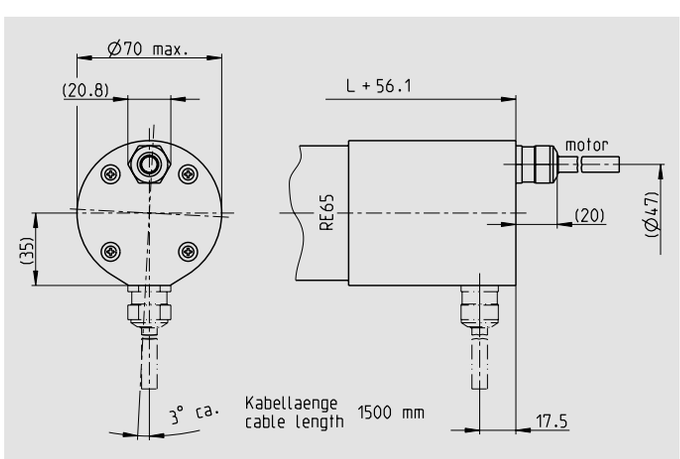
- Aluminium housing
- Protection to IP54
- With 1500 mm cable, AWG 18 (2 × 1.0 mm²) other lengths on request!
- Radial or axial cable outlet
- Assembly only by maxon motor.

Pin Allocation

Cable No.	Color	Motor
1	white	+ Pol
2	brown	– Pol

Part Numbers

Type number		Version/Item
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 144

- 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.

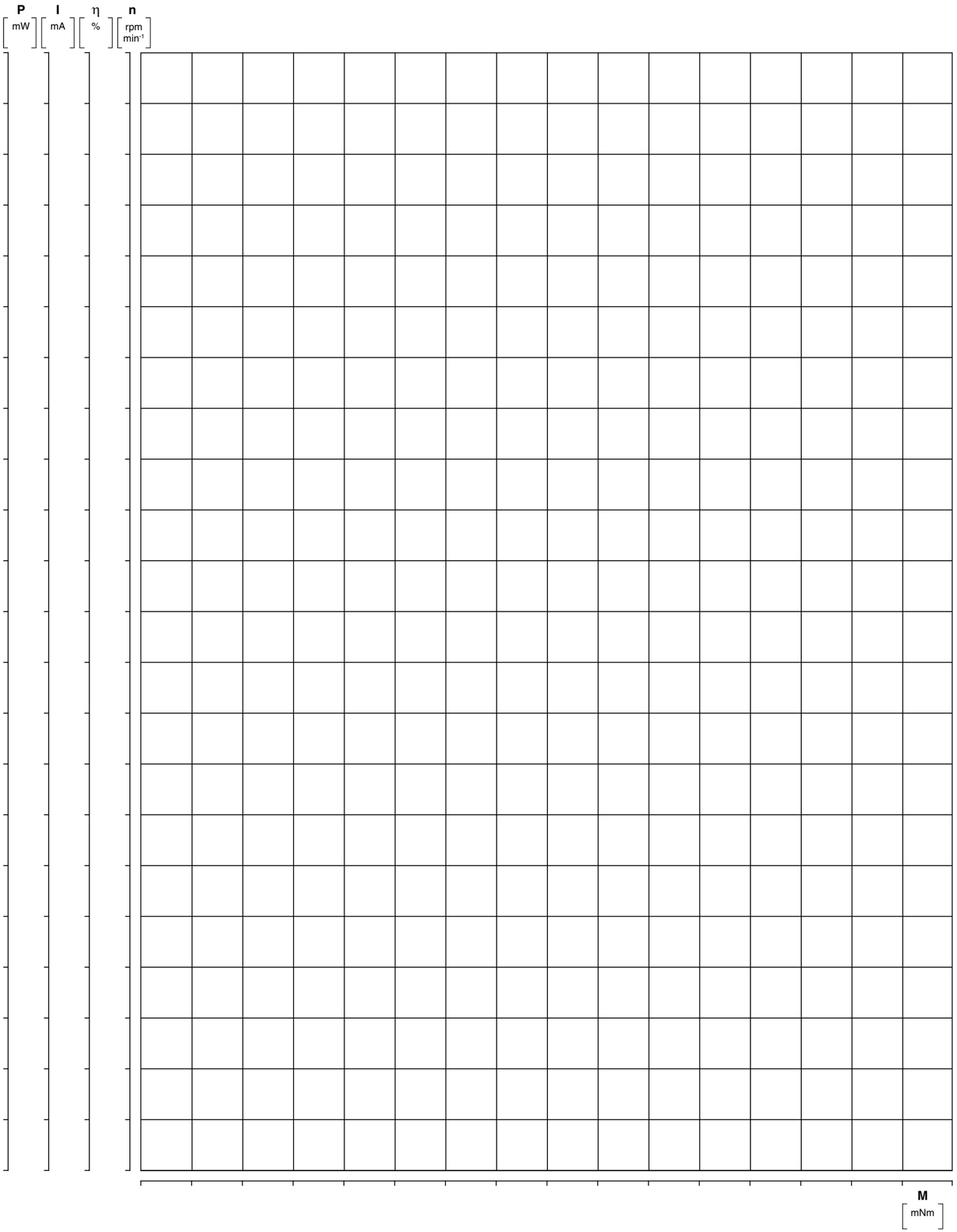
Pin Allocation

Cable No.	Color	Motor
1	white	+ Pol
2	brown	– Pol

Part Numbers

Type number		Version/Item
386004	**A**	End cap with radial cable outlet (1500 mm)
386003	**B**	End cap with axial cable outlet (1500 mm)

For your personal notes



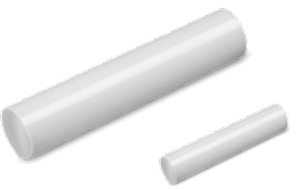
maxon ceramic

maxon ceramic

High performance industrial ceramic is used primarily for applications where customary materials would fail. maxon ceramic products include: precision spindles, axles and shafts, customer-specific components for microtechnology, and scratch-resistant housing components.

Smooth-running and wear-proof.

Ceramic precision spindles.



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.

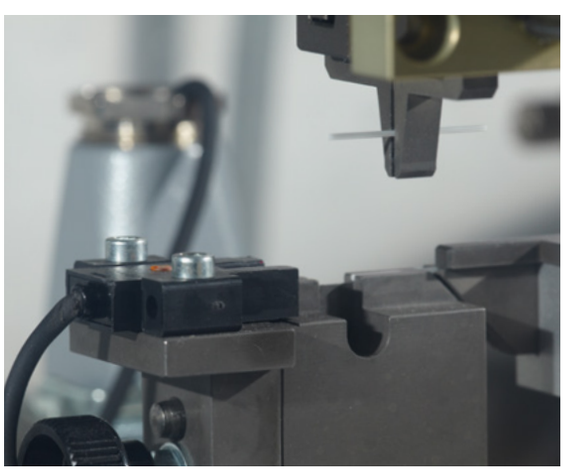
Experience and innovation.

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 spindles 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.

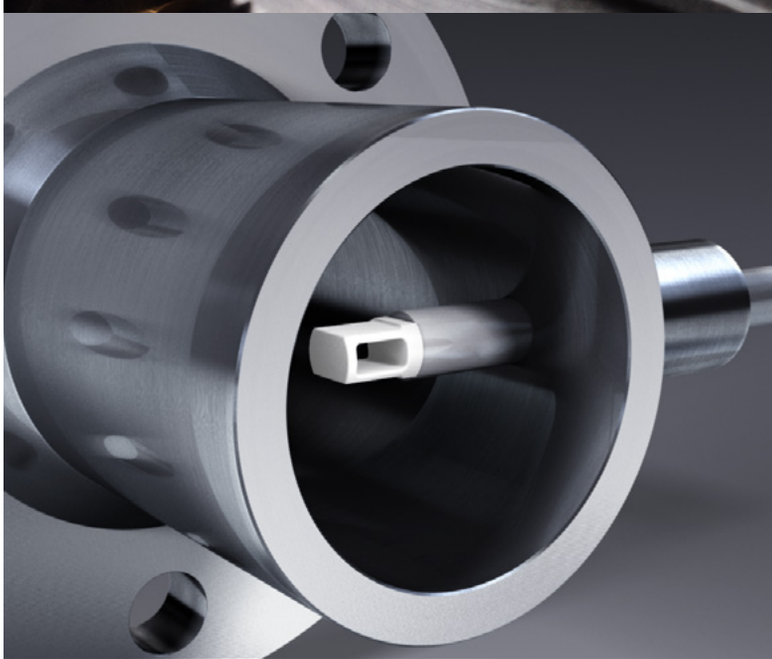
Ceramic pawls in automatic watches.

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/mm²
Elasticity modulus	2 x 10^5 N/mm²
Density	≥6.03 g/cm³
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 spindles made of ceramic.

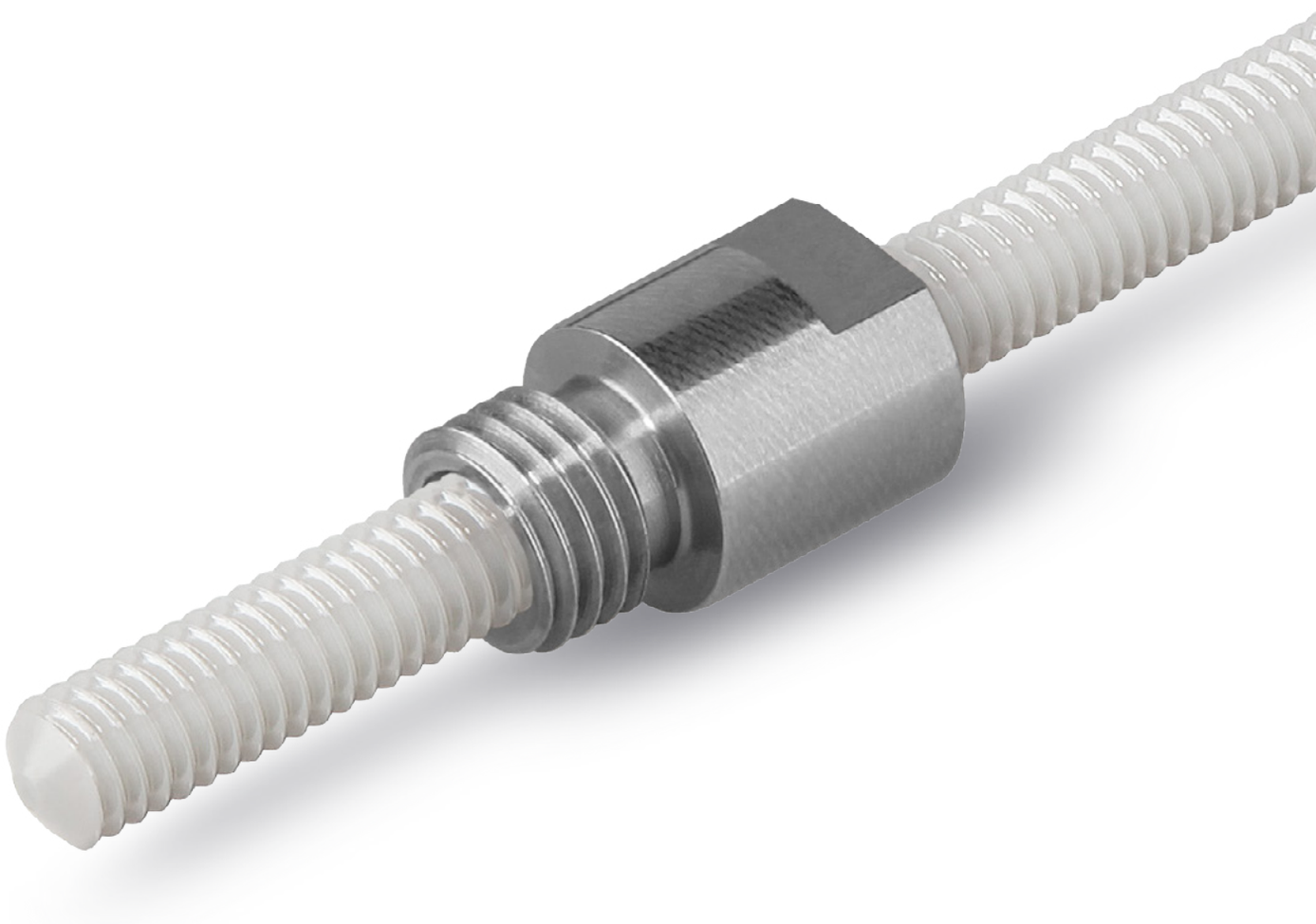
The maxon cgs spindle – smooth-running and wear-proof.

Ground ceramic surfaces are extremely suitable for sliding movements. Our ceramic spindles 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 spindles achieve an exceptionally long life span, especially in the case of dynamic operation. All these properties make ceramic spindles a better alternative to customary steel spindles and ball screws.

cgs surface for ceramic spindles.

To use this high-strength material for spindles, maxon ceramic has designed the spindle flanks with a special cgs surface structure. The result is an unprecedented wear resistance and extremely high efficiency.

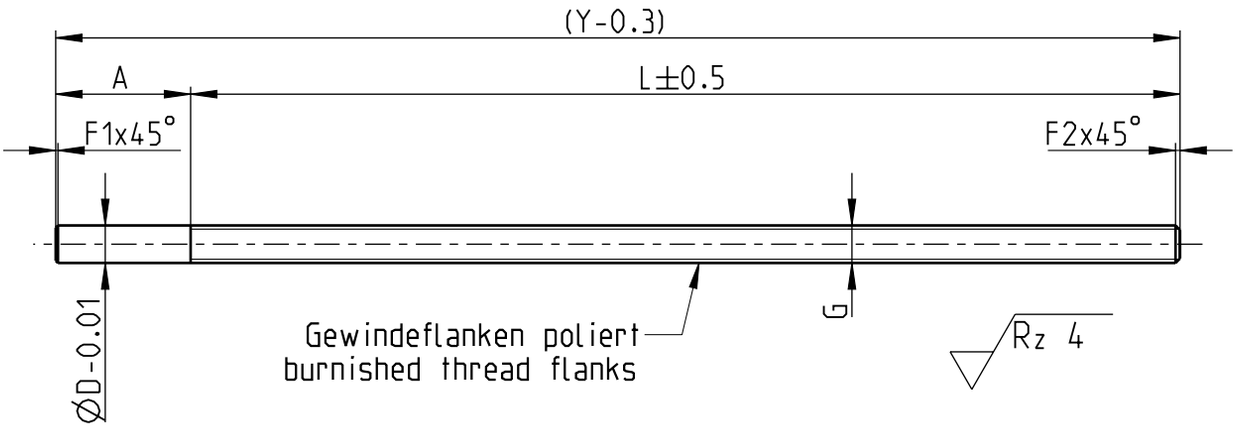


Ceramic as spindle material makes it possible to use the spindles in:

– 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 spindles:

– Excellent sliding characteristics
– Extreme wear resistance
– Significant increase in life span
– Excellent efficiency
– Almost non-existent stick-slip effect
– Thermally isolating
– Spindles 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 spindles.

Ceramic spindles (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 spindles (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

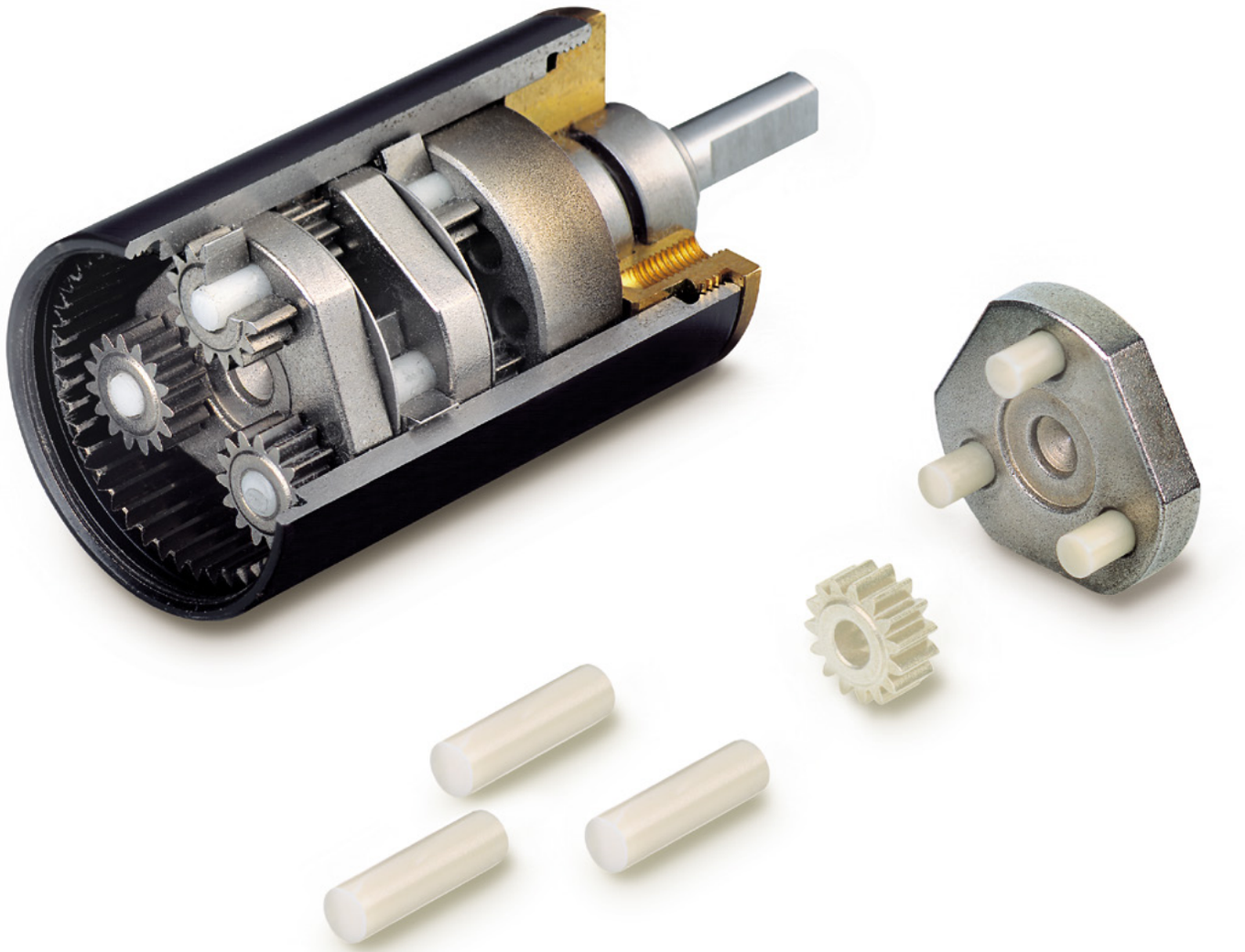
System-specific nuts.

The right nut for each application.

In combination with ceramic spindles, 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 spindles, this results in significantly longer life spans than those offered by metal spindles.
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 spindles and nuts tailored to your application needs. We provide spindles with fine thread, special leads, as well as double-thread spindles. A customer-specific integration with your bearing system is also possible. Please contact us if you are interested in learning more.

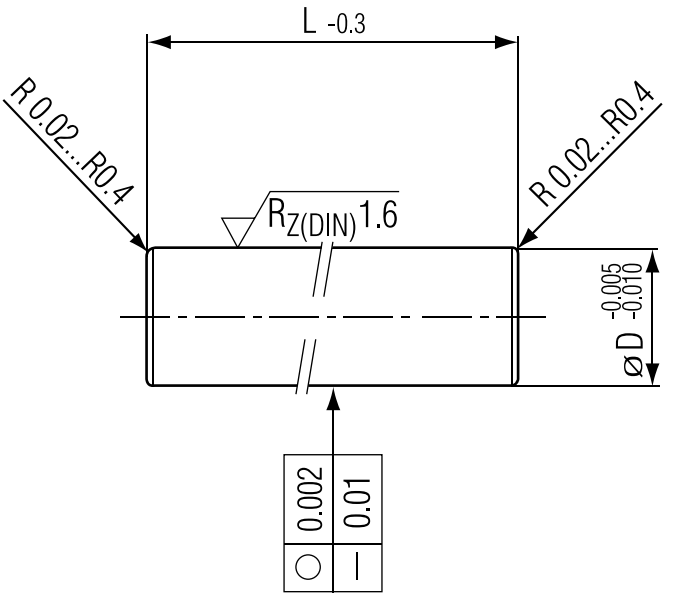


How can the life span of planetary gearheads be increased?

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

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