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maxon



maxon **EC-max**
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Program 08/09

from the Leading Supplier of High Precision Drives
and Systems.

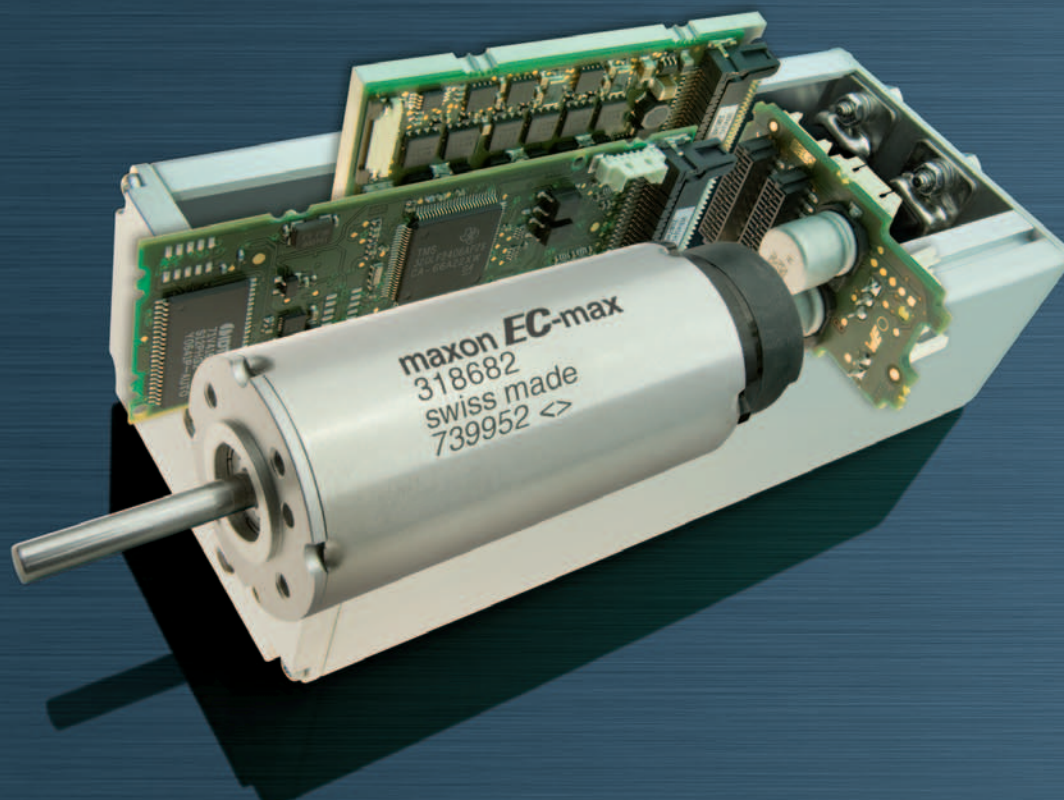
CD-ROM inside
www.maxonmotor.com

maxon motor

driven by precision

Compact drive intelligence.

maxon motor uses synergies of mechatronic solutions for intelligent compact drives, comprising motor, sensorics and controller. Details from page 301.



System requirements:

- Windows 98, NT, 2000, ME or XP
- Recommended memory (RAM):
at least 256 MB
- Recommended screen resolution:
at least 1024 x 768

The maxon selection program requires no installation. It can be copied into the hard disc or started using the CD-ROM. No settings have to be saved when using the CD-ROM.

maxon CD-ROM:

with new selection program

- Helps you find the maxon solution for your drive requirements
- No installation necessary

Adobe Reader is required to maximise the electronic catalog's full range of functions. This is contained on the CD-ROM.

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maxon motor

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Welcome to maxon motor



driven by precision

maxon motor is the world's leading supplier of high-precision drives and systems up to 500 watt output power. We develop and produce brushless and brush DC motors with our unique ironless maxon winding. Our modular program is complemented by flat motors with an iron core. The modular system with planetary, spur and special gearheads, sensors and control electronics, completes the range. High-tech CIM and MIM components are produced in a special competence center. maxon motor stands for top quality, innovation, competitiveness and a worldwide distribution network.

Born in Switzerland.

Grown around the world.

Based in Sachseln/Switzerland, maxon motor employs over 1600 staff worldwide and has production sites in Switzerland, Germany and Hungary as well as distribution companies in more than 30 countries. Around 1000 staff work in ultra-modern production sites in Central Switzerland, 300 in Sexau, Germany and 160 in Veszprém, Hungary. We manufacture all the major components of our drive systems on our own largely in-house developed machinery and production lines. This not only enables us to manufacture large series efficiently, but also provides maximum flexibility for special requirements or smaller unit sizes.

Dear customers

maxon motor can reflect on a successful year. Together with you, we have adopted ideas, honed concepts and created customised drive solutions. This would not have been possible without teamwork.

We at maxon motor attach the highest priority to precisely this partnership-based relationship with our customers. We do everything to support you onsite. To help deliver the ideal drive solution that suits your products the best.

Expansion of the sales network

maxon motor continued expanding its international distribution network in 2007. Three new subsidiaries in Italy, Australia and Taiwan plus the expansion of distribution operations with an exclusive partner in Turkey highlight our efforts to provide a customer-specific service right at the heart of the market. Today maxon motor has a worldwide presence on every continent through 12 subsidiaries and 19 authorised dealers.

Changes in the Executive Board

A new management team has been in charge at maxon motor since 1 March 2007. Since that time, our former CEO, Mr. Jürgen Mayer, has been concentrating on his role as Chairman of the Board of Directors. During the past 12 months, he has also been responsi-

ble for successfully building up maxon medical. This new division specialises in developing and producing microdrive systems for the medical technology sector.

The new management team and the entire workforce at maxon motor will keep on creating drive solutions for you with the same passion and commitment.

Optimising processes

The expansion of our production site in Hungary is now complete. The continuous improvement of production processes has speeded up order processing overall and considerably increased supply readiness. Our new storage system and ever greater focus on automation will also have an effect on process optimisations. This means that the quality of our products will improve even more.

Release of new products

This is the maxon motor 08/09 catalogue. As well as featuring proven drive systems, it also contains a large number of new innovative products, such as EC flat motors with integrated electronics, DC motors and intelligent controllers. This catalogue, which is being printed in 8 languages this year, contains information on our full program and all our services. If you would rather view



maxon motor products on your computer, simply use the enclosed CD or visit our website at www.maxonmotor.com to view the online catalogue.

**We look forward to your ideas.
As you know, we not only have a solution but one that is the right one.
Why not try us out!**

Yours faithfully,

A handwritten signature in black ink, appearing to read 'E. Elmiger', written in a cursive style.

Eugen Elmiger
Director, Sales and Marketing

Direction

left to right

Dr. Karl-Walter Braun

Controlling

Eugen Elmiger

Sales and Marketing

Ulrich Claessen

Development and Quality Assurance

Armin Lederer

Production, Human Resources

and Procurement

Speaker of the Executive Board



maxon motor

driven by precision



Production in Germany
Sexau and Emmendingen

Production in Veszprém, Hungary

Production at our satellite facilities.

Security policy arguments and the labor market have characterized maxon motor's decentralized production locations from the very beginning. This process began in September 1989 when we opened a production facility in Sexau, near Freiburg im Breisgau (Germany).

This was followed by a new production site in Veszprém, Hungary in 2001. Flexible production and assembly equipment coupled with systematic controls ensure that the manufacturing process is efficient, precise and meets a consistently high quality standard.



Optimum solutions for your drive problems are discussed by our sales teams in project meetings.



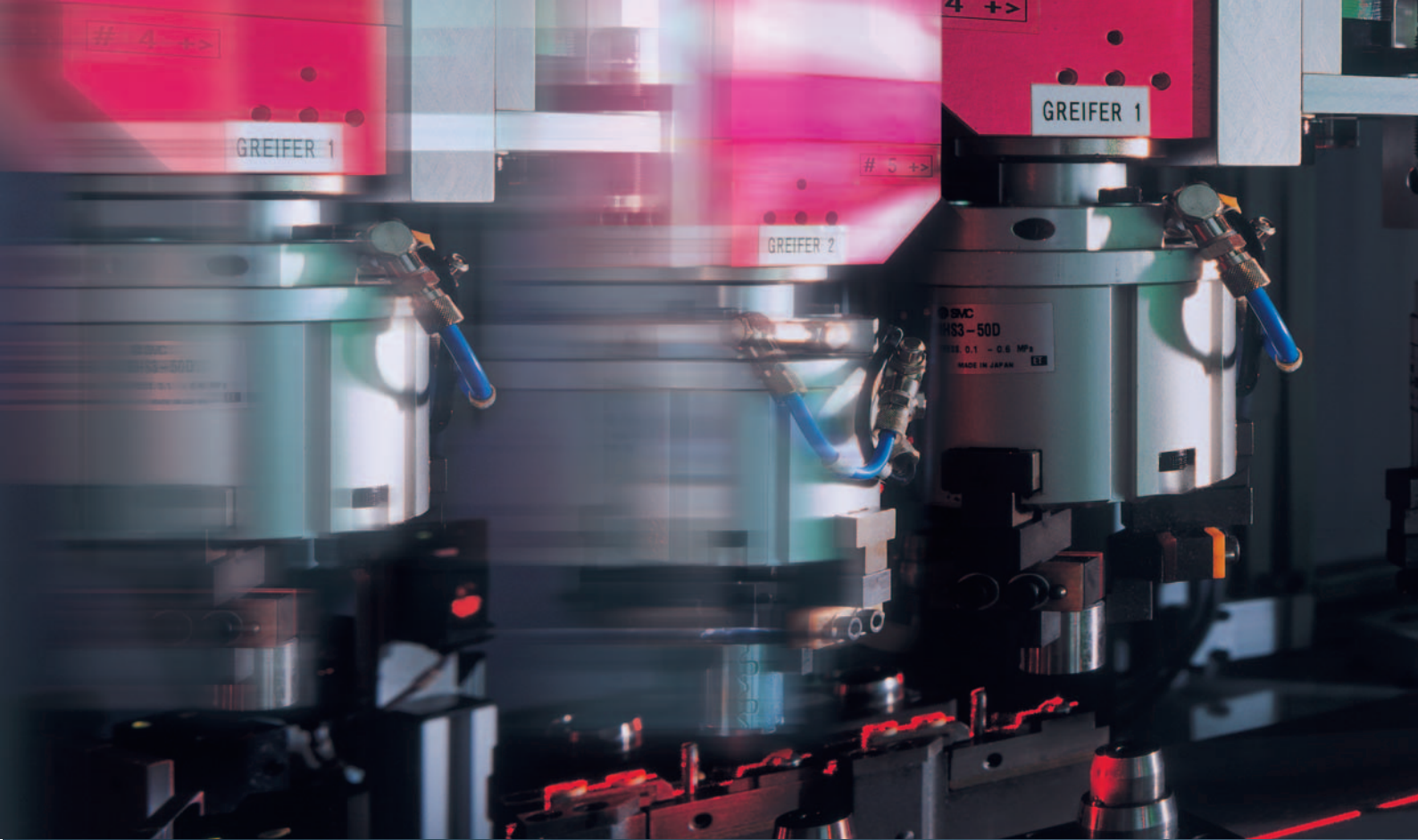
Our employees are thoroughly trained for their demanding tasks.

Support, Sales, Training.

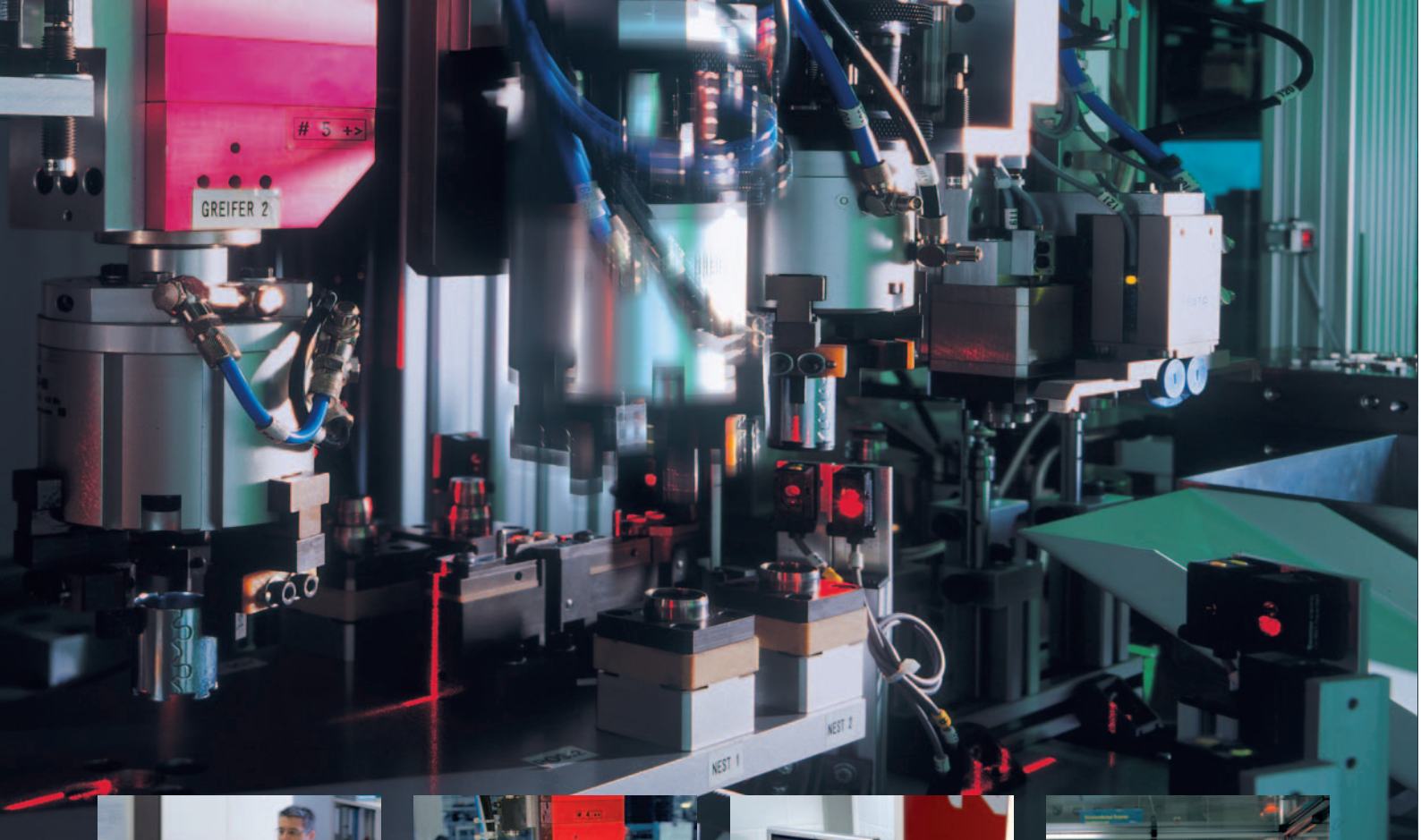
Our sales engineers are at your disposal to discuss tailored solutions for your specialized requirements. Our expertise: To convert electronic signals into highly dynamic mechanical motion. Sales engineers at the factory, in our subsidiaries, as well as carefully and continuously educated distribution partners offer you expert support and consulting – call for the maxon advantage!

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**Develop,
Automate,
Test.**



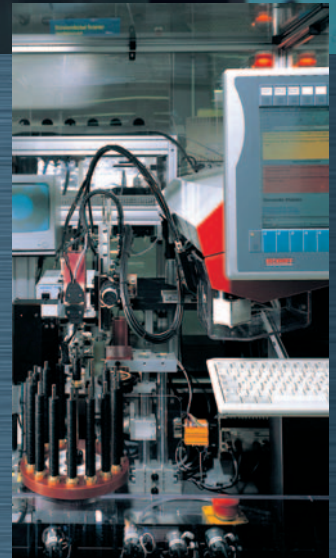
Modern means provide our engineers with the necessary assistance in their demanding tasks. This method further permits working out customer-specific solutions within the shortest possible time.



Modern production methods and highly automated processes guarantee efficient and low-cost production with an unprecedented accuracy of repetition. Flexible production lines mean quick changeovers to different production series.



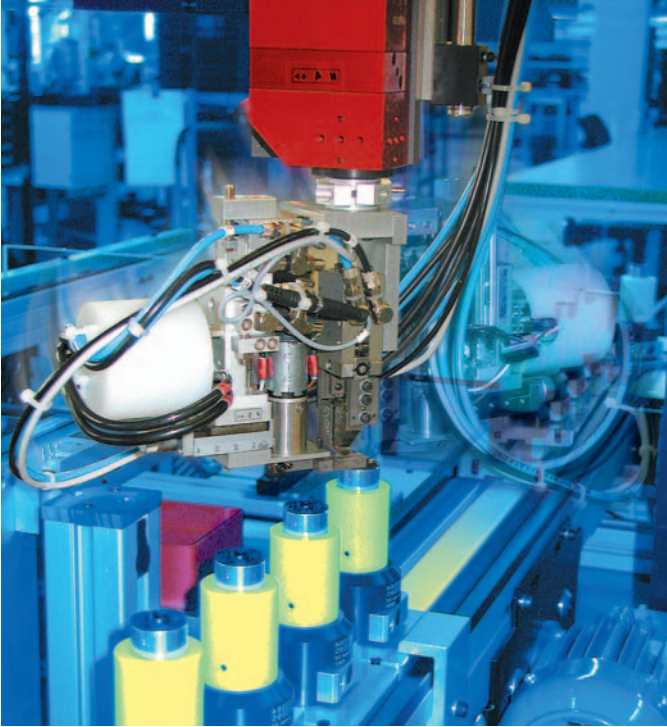
Most modern measuring methods serve to assure highest quality, starting with the individual parts. Prior to starting production, newly developed motors and gearheads are tested thoroughly – round the clock – using most modern equipment.



maxon's extensive R & D department is able to meet the requirements of the rapidly developing market of high technology drive systems. Our quality assurance system is organized and maintained, recognizing latest respective developments, thus offering you best possible assurance for a product of high quality.

maxon motor

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maxon System Engineering

maxon motor works according to the latest and up-to-date standards and norms in system technology. Our management and engineering methods and processes allow us to translate market requirements into demand oriented products on a systematic and economic basis. The difference between 'normal' technology and maxon's system technology only becomes apparent in the application. And where does the difference begin? With the manufacturer with us, maxon motor and our core competencies.

The Customer Connection

- Customer satisfaction as measure of our performance
- Sales partners in 30 countries
- Competent customer advisory service
- Transparent processes

The Company

- Operates worldwide in development, production and sales
- More than 1500 competent and motivated staff
- Powerful, flexible and innovative

Profitability

- Efficient production of large and small series
- Cost-aware designs
- International purchase of goods
- Long-term planning

Progress

- Integral quality assurance system SN EN ISO 9001:2000
- Certification for medical products under SN EN ISO 13485:2003 for the German subsidiary in Sexau, Germany.
- Qualified team of engineers
- More than 30 years' professional experience
- State-of-the-art data processing systems
- Environmental management system certified according to SN EN ISO 14001:2004

Application Support

- Documentation offering real support
- Online catalog with selection program
- Computer service and motors networked

Your benefits are

- Optimum total solutions at attractive prices
- A comprehensive, innovative and modular product range
- A verifiable quality assurance system
- Flexibility for made-to-order and series production

ISO 9001:2000 ISO 14001:2004

Some definitions

ISO International Organization for Standardization. Over 90 countries are associated with this organization.

ISO 9001:2000 – Quality management system requirements. This international norm promotes the choice of a process-oriented approach for developing, realizing and improving the effectiveness of a quality management system in order to increase customer satisfaction by meeting customer requirements.

SN EN ISO 9001:2000

The European norm is identical to ISO 9001:2000. It exists in three official versions (English, French and German). There are also versions available in the relevant languages for OEN members.

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 behaviour and constantly seek to improve its procedures and documentation.

BV Bureau Veritas, headquartered in Paris, was founded in 1828 and operates approximately 500 inspection centres in 125 countries as the world's oldest independent inspection and classification company. This is an assurance for broad international recognition.



maxon Quality Assurance

One of maxon motor's main objectives is to offer our business partners high-quality products at attractive prices.

Quality is interpreted in a very comprehensive way at maxon motor. Quality not only refers to the objective properties of the products, but extends to the manner in which our employees think and act.

Our quality assurance system:

As one of the first ten Swiss companies, we were awarded the Quality Certificate with the most stringent requirements according to international norm, on July 12, 1988. The structure and procedural organization, liabilities and responsibilities, as well as special assessments of processes and procedures are exactly documented for the entire staff, including management. Our Quality System is completely operational and practical. It is rigorously applied, maintained and periodically verified, the latter through BVQI Bureau Veritas Quality International since September 1991.



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 minimise potential risks for patients. The traceability of processes and raw materials must also be guaranteed.

The competence center in Sexau received certification for the development, production and distribution of ceramic dental implants.

maxon motor

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Where are maxon motors used today?



maxon motors have an extremely wide range of applications. In medical technology, for example, they not only make machines work, but also help people with impaired mobility literally get back on their feet.

maxon motor has become a name of distinction in the world of micromotors with ironless rotors. Today maxon stands for creativity, commitment, quality and top-class employees around the world.

Every day we work to supply products to our customers even quicker and more competitively. Worldwide.

Medical science

Battery-driven hand-held devices
Surgical robots
Micro-pumps
Dialysis systems
Dosing systems
Radiation equipment



Electronics / Semiconductor technology

Ultra-fast feeders
SMT placement equipment
Lithography systems
Wafer processing systems

Robotics

Humanoid robots
Service robots
Educational robots
Research robots



Security technology

Mobile inspection systems
Surveillance cameras
Access and lock systems
Automated gates

Cash and ticket dispensers

Card readers
Money changing machines
Labelling machines



Consumer goods

Household robots
Golf caddies

Industrial automation / Mechanical engineering

Industrial robots
Handling systems
Positioning systems



Instrumentation

Microscopes
Precision scales
Laser levelling systems

Power tools

Battery-driven professional quality tools
Power screwdrivers
Nail guns
Secateurs

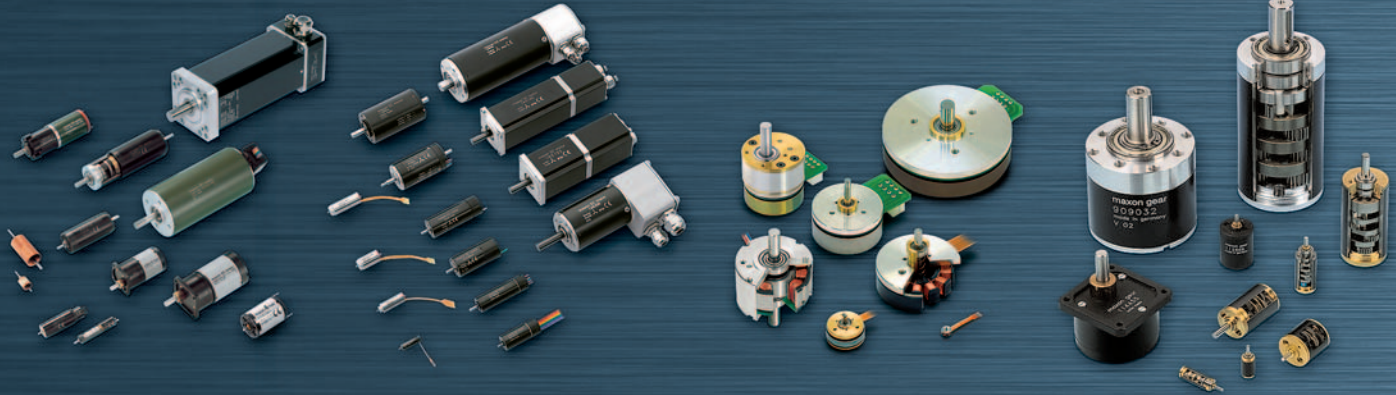


Automotive industry

Adjustable shock-absorbers
Electronic tachographs
Active charging-air pressure adjustments

maxon motor

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maxon DC motor

maxon DC motors are high-quality motors fitted with powerful permanent magnets. The “heart” of the motor is the worldwide patented ironless rotor. This means using cutting-edge technology to produce compact, powerful and low inertia drives. These DC motors have very fast acceleration thanks to their low mass moment of inertia. The modular construction of the A-max and RE-max programmes offer countless options and top performance at competitive prices.

maxon EC motor

Our electronically commutated DC motors are characterised in particular by favourable torque behaviour, high performance, an extremely wide speed range and unprecedented service life. Their outstanding control features help create precision positioning drives. Similar to the ideology of the A-max programme, a modular motor range is available with the EC-max programme. The EC-powermax range provides top performance per volume unit, pushing the boundaries of technology.

maxon flat motor

The flat design of the brushless DC flat motors makes them the ideal drive for many applications. Designed as internal or external rotor motors, they are often the ideal solution when space is limited. The well thought-out and simple design means that production is largely automated, helping keep down the price.

maxon gear

The precision spur and planetary gearheads are compatible with maxon motors. In addition to a large standard program, maxon shows its strengths with customer-oriented special designs based on a broad know-how. State-of-the-art tools and production techniques are used to boost performance. It is a great advantage that the gearheads can be adjusted adapted directly in the workshop for the required motors.

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 four program groups to help guarantee our customers the shortest delivery times.

Stock program

The market-oriented selection from our extensive range offers you the following key advantages:

- Quick delivery times
- In stock at our sales offices around the world

Special program

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

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 optimised application.

Special design

maxon develops special versions to fit customers’ special needs. maxon is strong in this sector.



maxon tacho

Encoders, DC tachos and resolvers enable speed and angular position to be evaluated accurately and form the basis for high-precision positioning. For resonance reasons, sensors are only mounted on motors with continuous shafts to ensure high precision and signal resolution. Assembly is compatible with the motors and must be carried out in the supplier's workshop.



maxon motor control

Controls are used to their full advantage in maxon motors. Different 4-quadrant servoamplifiers cover all requirements in terms of performance and speed accuracy in maxon DC motors. Should you require maxon EC motors, you benefit from the latest design in electronic communication. The 1 and 4-quadrant amplifiers offer a range of useful additional functions. When combined with maxon motors, the innovative maxon positioning controllers are complete solutions for accurate positioning and regulated rotary movements.



maxon compact drive

maxon's compact drives feature controllers, sensors and motors in a modern aluminium casing, which, when combined with existing compatible maxon products, produce robust, space-saving and high power density drive solutions. The decentralised concept of these intelligent drives minimises the use of centralised position controllers. The compact drive's controller-motor combination has an optimum layout and can be used immediately.

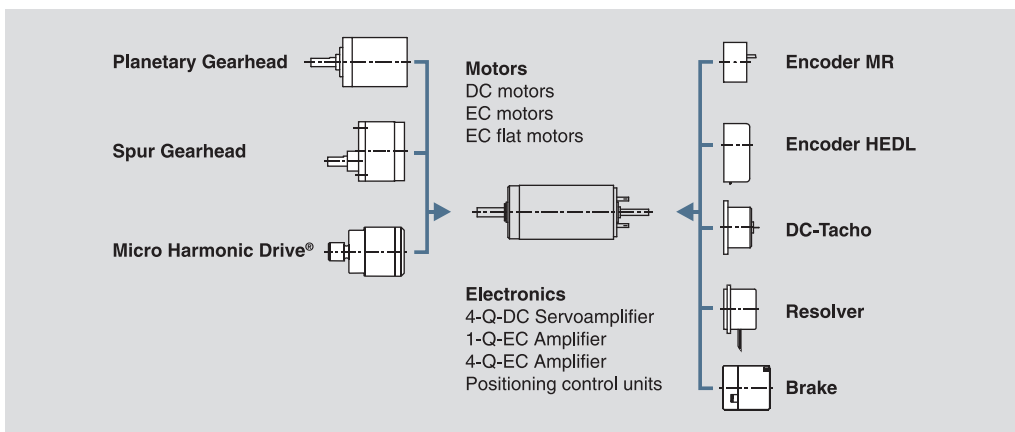


maxon ceramic

A technological leap into the future. An innovative tool, ceramic material is becoming more prominent wherever metals are pushed to their limits, such as for use in tools, parts for medical technology or components for high-grade drive technology. The innovative use of high-tech ceramic components leads to a marked improvement in performance and service life of our motors and drives. Volume-optimised and low-cost parts can be produced using MIM parts.

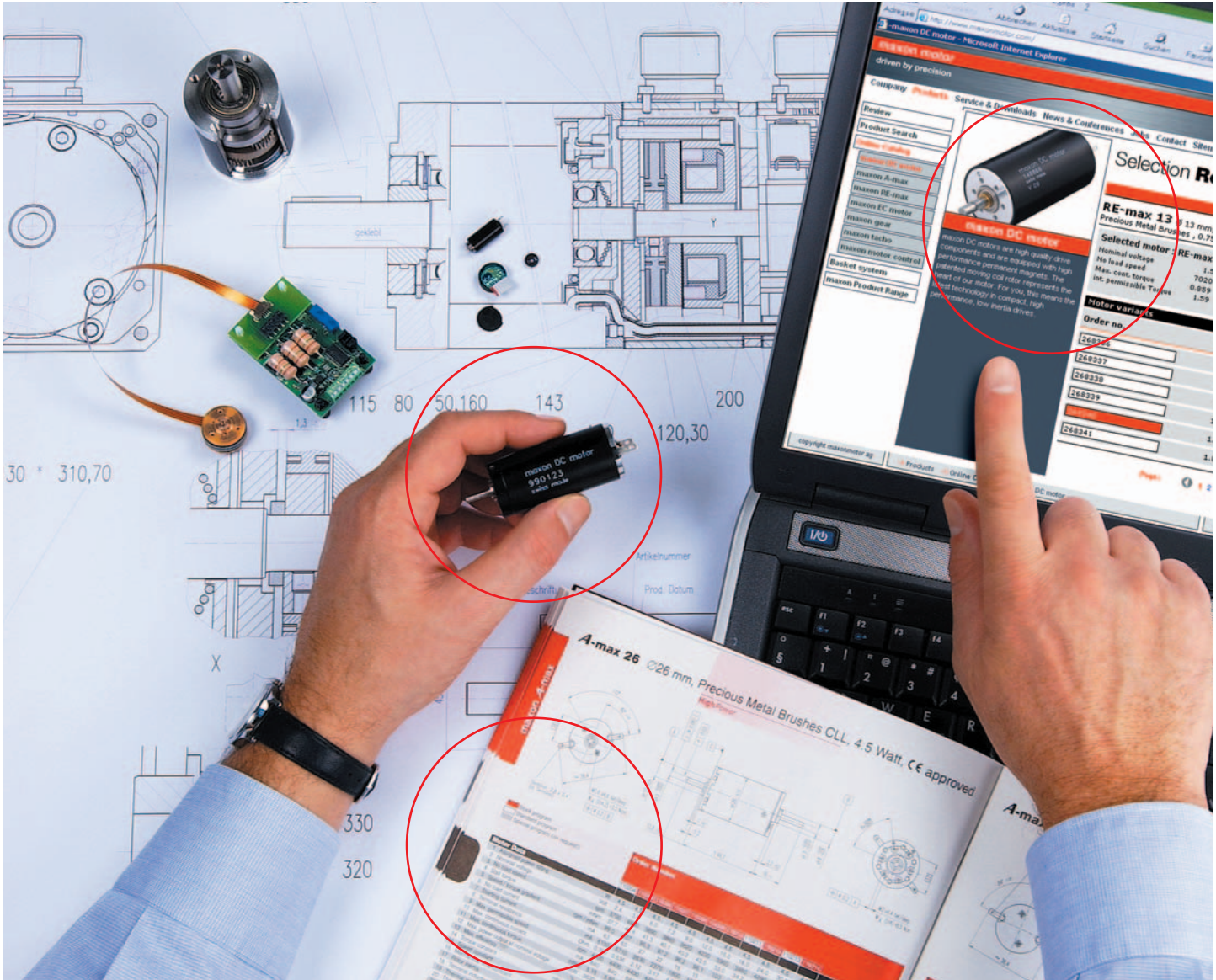
The maxon modular system

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.



maxon motor

driven by precision



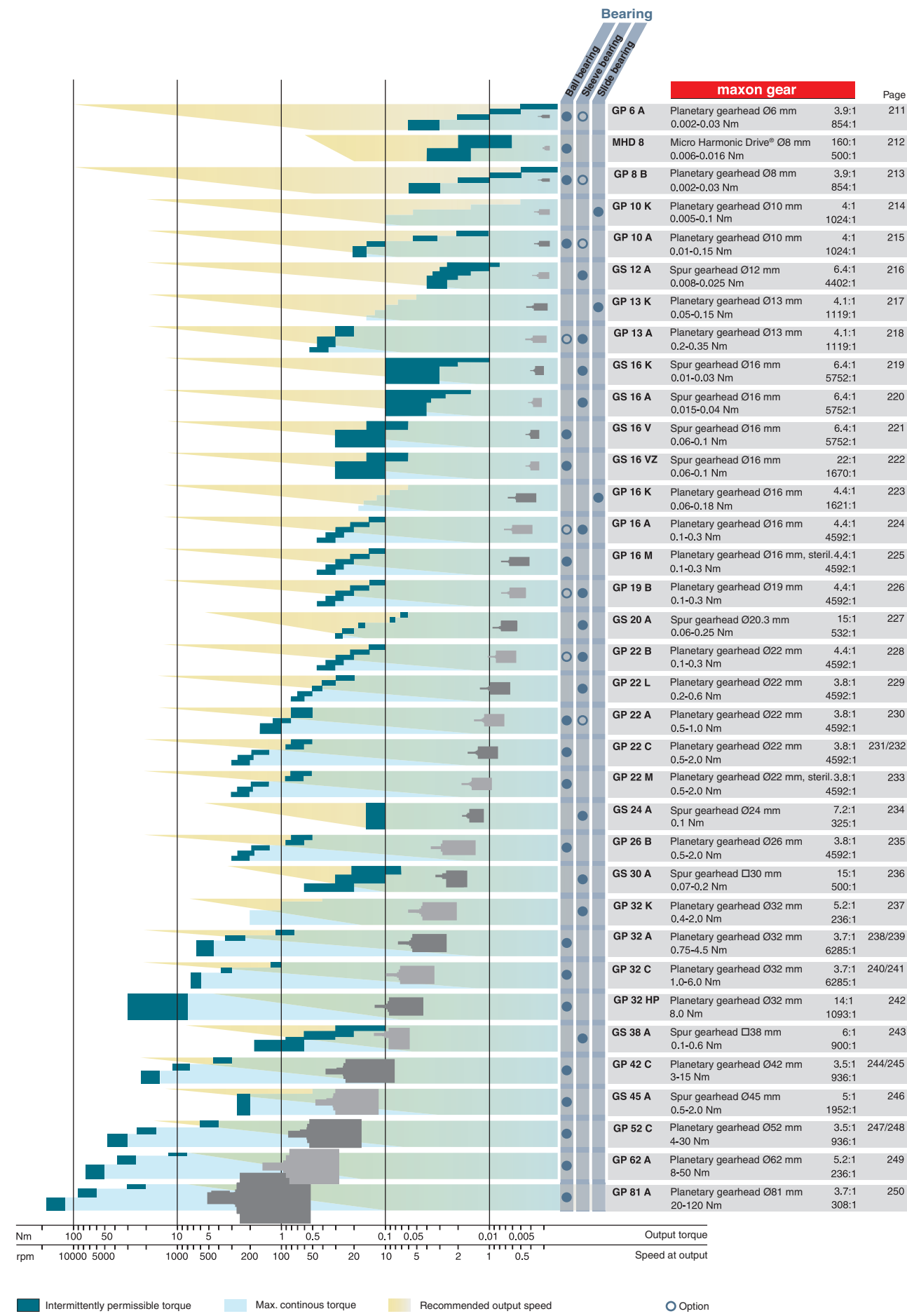
Selection guide maxon motor

Classification of the maxon motor 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 motor selection guide. Our data sheets provide detailed characteristics related to individual motors. Should you need any additional information, simply call us!

maxon motor
driven by precision

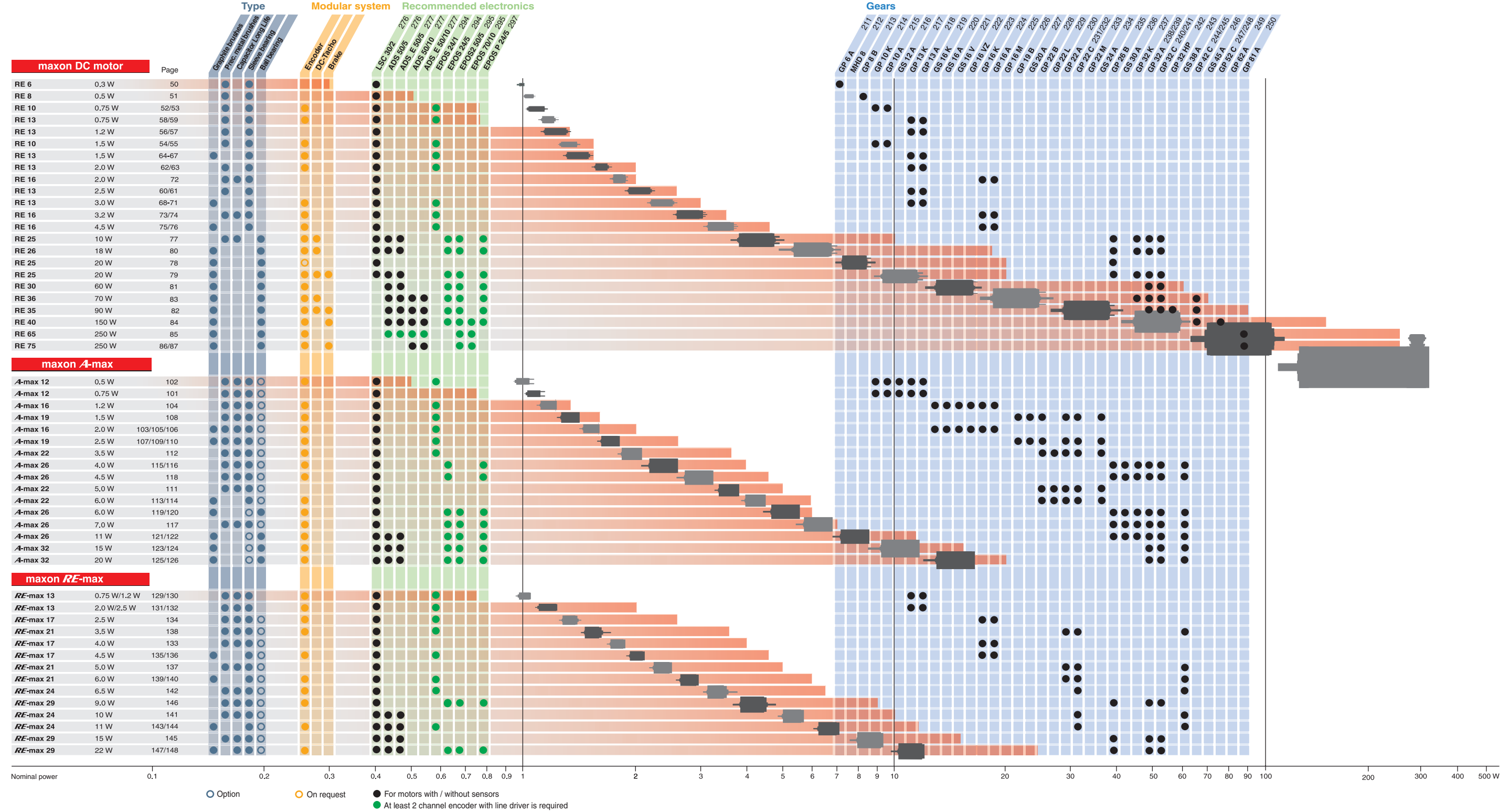
Selection Guide

maxon gears



Selection Guide

maxon DC motors



maxon DC motor

Maximum performance motors designed using rare earth Neodymium (NdFeB) magnets. Motors with precious metal brushes and sintered bearings for fine rotary motions. Graphite brushes and ball bearings for more rigorous applications having high load peaks.



maxon A-max

Breakthrough DC-motor program with high performance, excellent quality and short delivery times. The patented moving coil rotor represents the heart of the motor with the million times proven maxon winding technology. The motor is equipped with AlNiCo magnets.



maxon RE-max

Same design as the innovative and award-winning A-max range. Thanks to Neodymium magnets, one of the most powerful permanent magnets available today, the RE-max motor delivers even more than an A-max motor. There is only a slight additional due to the more expensive magnet.

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maxon DC motor

DC motors with moving coil rotor

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GM 20 Ø20 mm, Gear motor, 1.2 Watt	90

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maxon EC motor

Brushless DC servomotors

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maxon gear

Gearheads

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maxon tacho

Encoder and DC-Tacho

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Encoder MR, 16 - 1024 CPT, 2 / 3 channel	252-259	Encoder HEDS 6540, 1000 CPT, 3 channel	268
Encoder Enc 22, 100 CPT, 2 channel	260-261	Encoder MEnc 10, 12 CPT, 2 channel	269
Encoder HEDS 5540, 500 CPT, 3 channel	262-263	Encoder MEnc 13, 16 CPT, 2 channel	270
Encoder HEDL 5540, 500 CPT, 3 channel	264-266	DC-Tacho DCT 22, 0.52 V	271
Encoder HEDL 9140, 500 CPT, 3 channel	267	Resolver Res 26, 10 V	272

maxon motor control

Electronics for DC motors and EC motors

Type	Page	Type	Page
4-Q-DC Servoamplifier LSC	275	4-Q-EC Servoamplifier DES	283
4-Q-DC Servoamplifier ADS	275	Positioning control unit EPOS	292-295
1-Q-EC Servoamplifier DECS	280	Positioning control unit EPOS P	296-297
1-Q-EC Servoamplifier DEC	280-281	Summary maxon motor control	298
4-Q-EC Servoamplifier DECV / DEC	282	Summary accessories	299

maxon compact drive

Compact Drives

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Accessories	304		

maxon accessories

Accessories

Type	Page	Type	Page
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Brake AB 28, 24 VDC, 0.4 Nm	307-309	End caps	312
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maxon special program

Type	Page	Type	Page
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maxon special design

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maxon ceramic

Type	Page		
CIM products	335		
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maxon worldwide

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Info

DC motor

EC motor

Gearhead

Tacho

Electronics

Compact Drive

Accessories

Special program

Special design

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

Program

- **A-max-Program**
- **RE-max-Program**
- **RE-Program**
- **A-Program**
- **F-Program**

- 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)

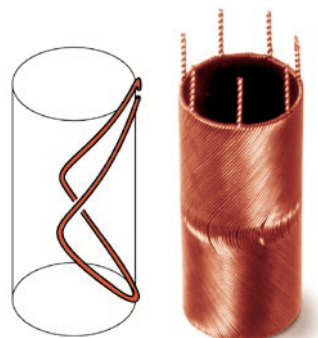
High terminal resistance

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

Turning speed

The optimal operating speeds are between 4000 rpm and 9000 rpm depending on the motor size. Speeds of more than 20 000 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.

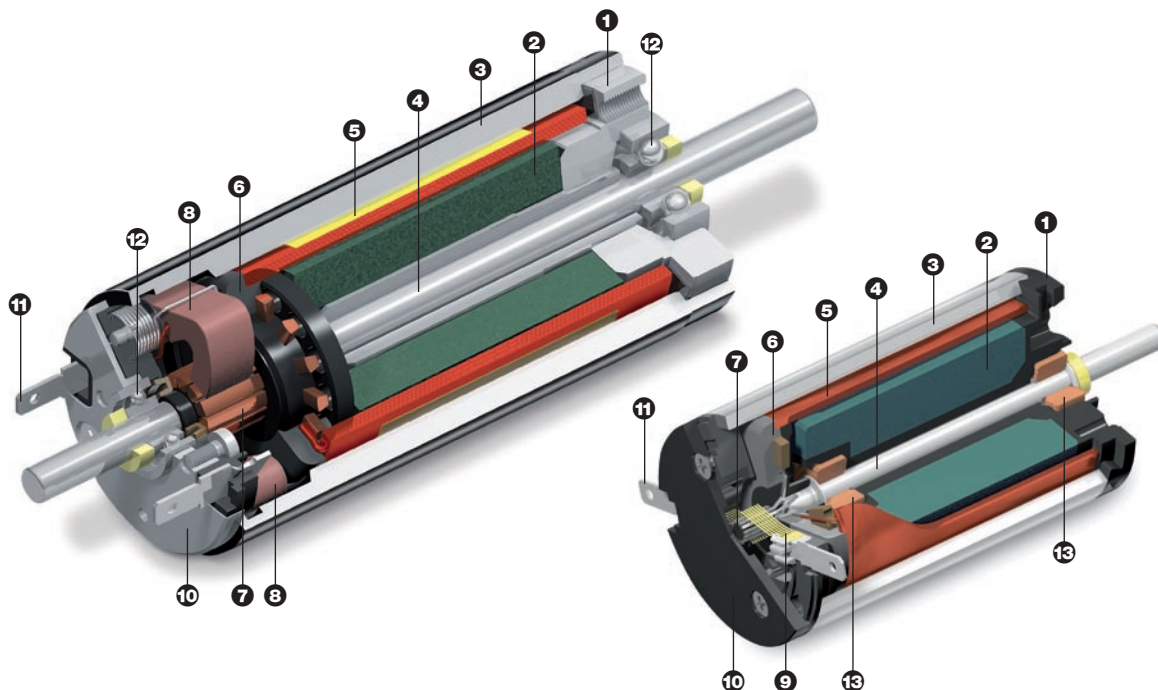


Service life

A general statement about service life cannot be made due to many influencing factors. Service life can vary between more than 20 000 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

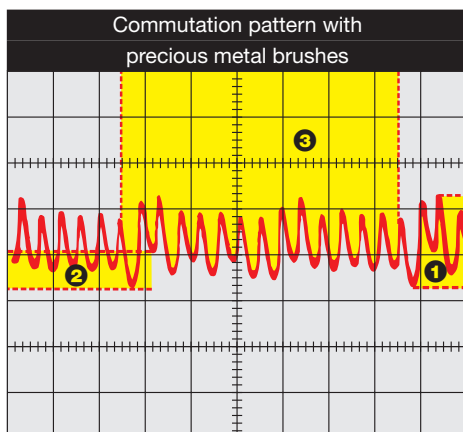
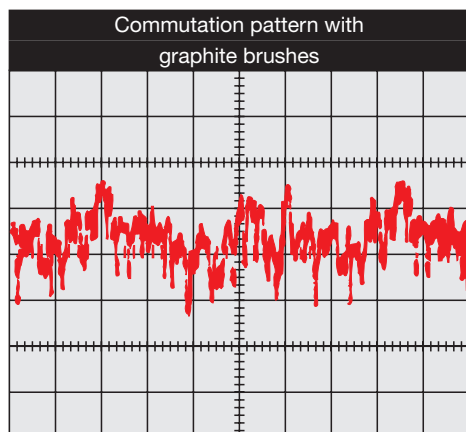
The commutation pattern is uniform and free of spikes, as opposed to that of other motors. The combination of precious metal brushes and maxon rotor system results in minimum of high-frequency interference, which otherwise leads to major problems in electronic circuits. The motors need practically no 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 49 or "The Design of High-Precision Microdrives" by Dr. Urs Kafader.



Commutation pattern

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

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

Legend

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

maxon EC motor ironless winding

Technology – short and to the point

Characteristics of maxon EC motors

- Brushless DC motor
- Long service life
- Speeds of up to 50 000 rpm and higher are possible
- 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.
- Lowest residual unbalance

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 powermax range

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

Bearings and service life

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

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

Legend

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

The commutation rotor position is identical to the motor shaft position for motors with 1 pole pair.

The values of the shaft position are halved for motors with 2 pole pairs.

Program

- EC-Program
- EC-max-Program
- EC-powermax
- with Hall sensors
- sensorless
- with integrated electronics

Electronical commutation

Block commutation

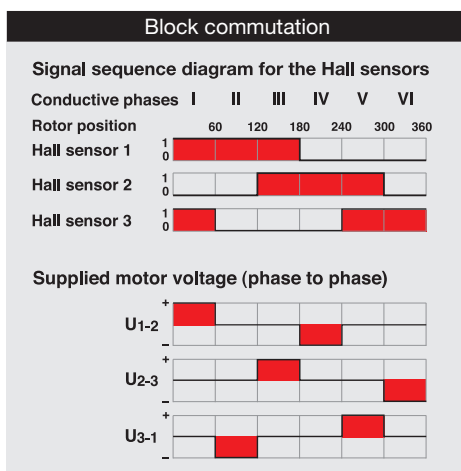
Rotor position is reported by three in-built Hall sensors. The Hall sensors arranged offset by 120° provide six different signal combinations per revolution. The three partial windings are now supplied in six different conducting phases in accordance with the sensor information. The current and voltage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

Properties of block commutation

- Relatively simple and favorably priced electronics
- Torque ripple of 14 %
- Controlled motor start-up
- High starting torques and accelerations possible
- The data of the maxon EC motors are determined with block commutation.

Possible applications

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



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

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).

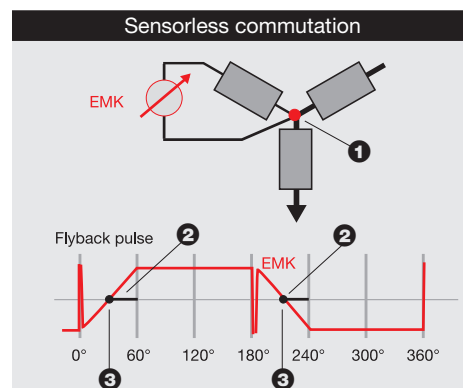
The amplitude of the induced voltage is dependent on the speed. When stalled or at low speed, the voltage signal is too small and the zero crossing cannot be detected precisely. This is why special algorithms are required for starting (similar to stepper motor control). To allow EC motors to be commuted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

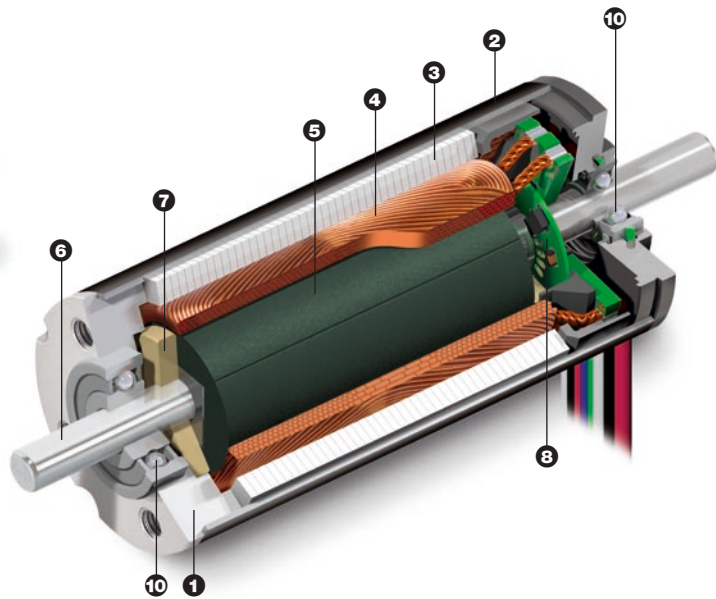
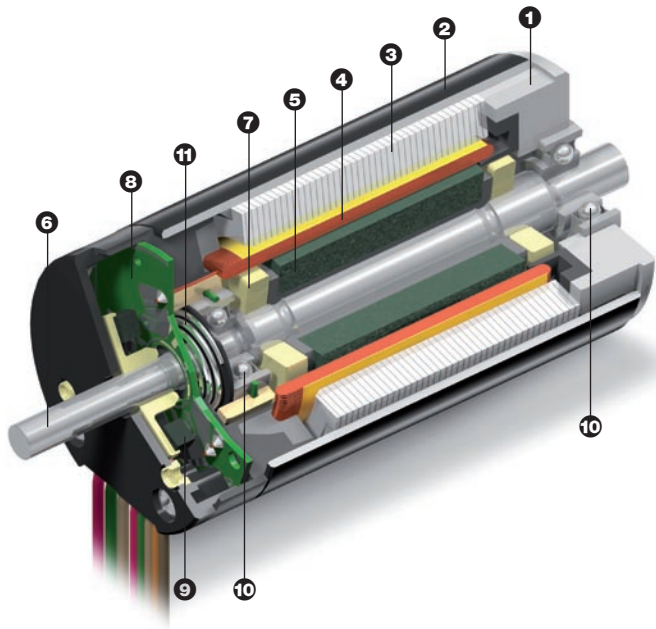
Properties of sensorless commutation

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

Possible applications

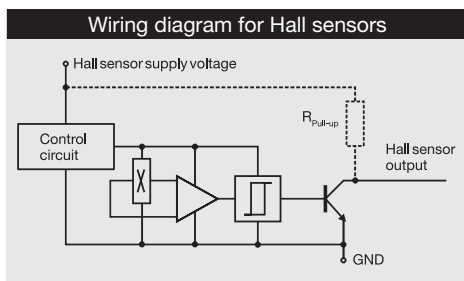
- Continuous operation at higher speeds
- Fans





Hall sensor circuit

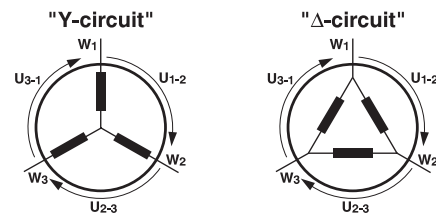
The open collector output of Hall sensors does not normally have its own pull-up resistance, as this is integral in maxon controllers. Any exceptions are specifically mentioned in the relevant motor data sheets.



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 line with requirements.



The maximum permissible winding temperature is 125°C. (EC-max and EC-powermax 155°C).

Sinusoidal commutation

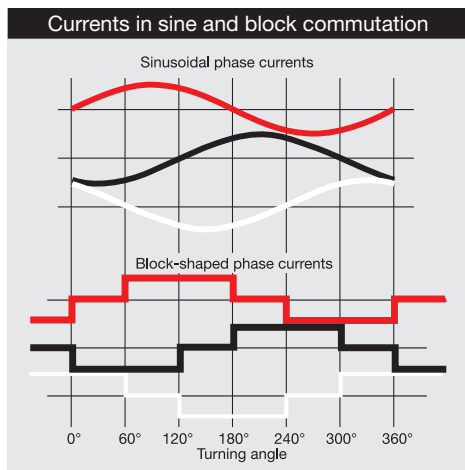
The high resolution signals from the encoder or resolver are used for generating sine-wave motor currents in the electronics. The currents through the three motor windings are related to the rotor position and are shifted at each phase by 120 degrees (sinusoidal commutation). This results in the very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



Legend

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

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
- 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
- Speeds of up to 20 000 rpm rotor with 1 pole pair

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

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.

Programm

- EC flat motor
- with Hall sensors
- sensorless
- with integrated electronics

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

- 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)

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).

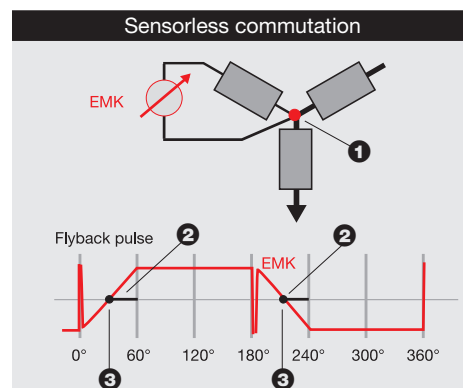
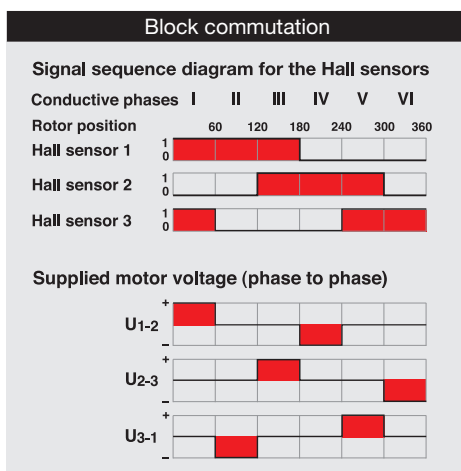
The amplitude of the induced voltage is dependent on the speed. When stalled or at low speed, the voltage signal is too small and the zero crossing cannot be detected precisely. This is why special algorithms are required for starting (similar to stepper motor control). To allow EC motors to be commuted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

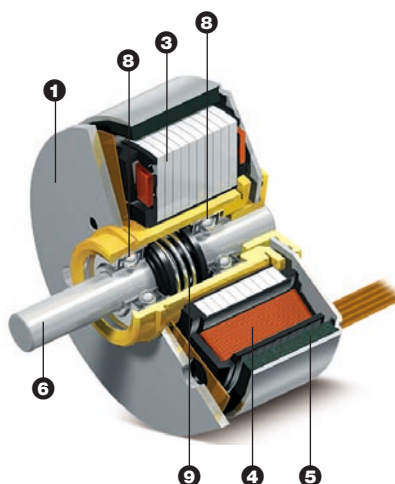
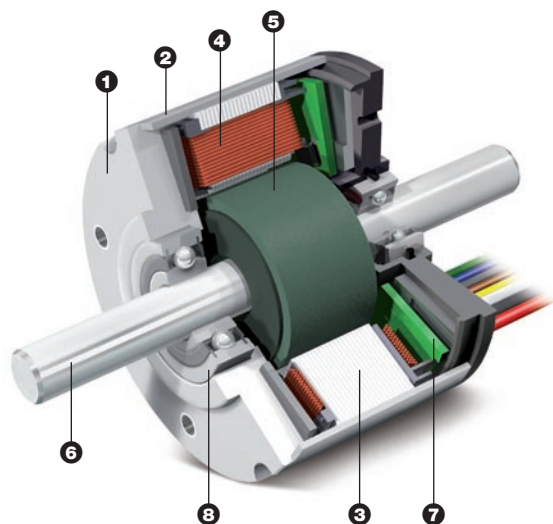
Properties of sensorless commutation

- No defined start-up
- Not suitable for low speeds
- Not suitable for dynamic applications

Possible applications

- Continuous operation at higher speeds
- Fans, pumps





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

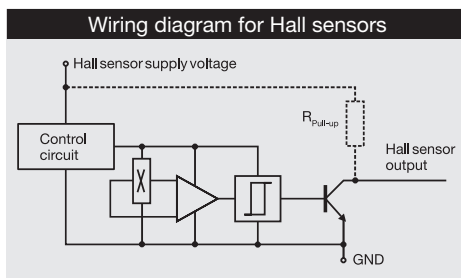
For motors with integrated electronics, the electronic commutation (mostly block commutation with Hall sensors) is built in. A speed controller and other functionalities can also be implemented.

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

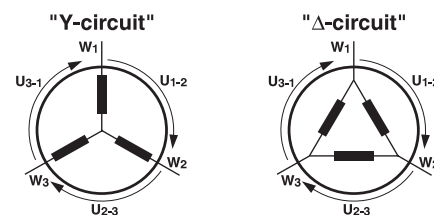
Hall sensor circuit

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.



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



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

For further explanations, please see page 151 or "The Design of High-Precision Microdrives" by Dr. Urs Kafader.

Legend

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

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.

Program

- Planetary gearhead
- Spur gearhead
- Micro Harmonic Drive®

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

Spur gearhead

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

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

Planetary gearhead

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

- For transferring high torques up to 180 Nm
- Reduction ratios of 4 : 1 to 6285 : 1
- External - Ø6 - 81 mm
- High performance in a small space
- High reduction ratio in a small space
- Concentric gear input and output

Conversion

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

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

$$M_{mot} = \frac{M_B}{i \cdot \eta_G}$$

where:

- i : reduction
- η_G : Gearhead efficiency

Selection of gears

As with motors, speed and torque limits also apply to gearheads. Operating torque must be below gearhead $M_{N,G}$ nominal torque (max. continuous torque).

$$M_{N,G} > M_B$$

With short-term loads, the intermittent torque of the gear should also be taken into consideration.

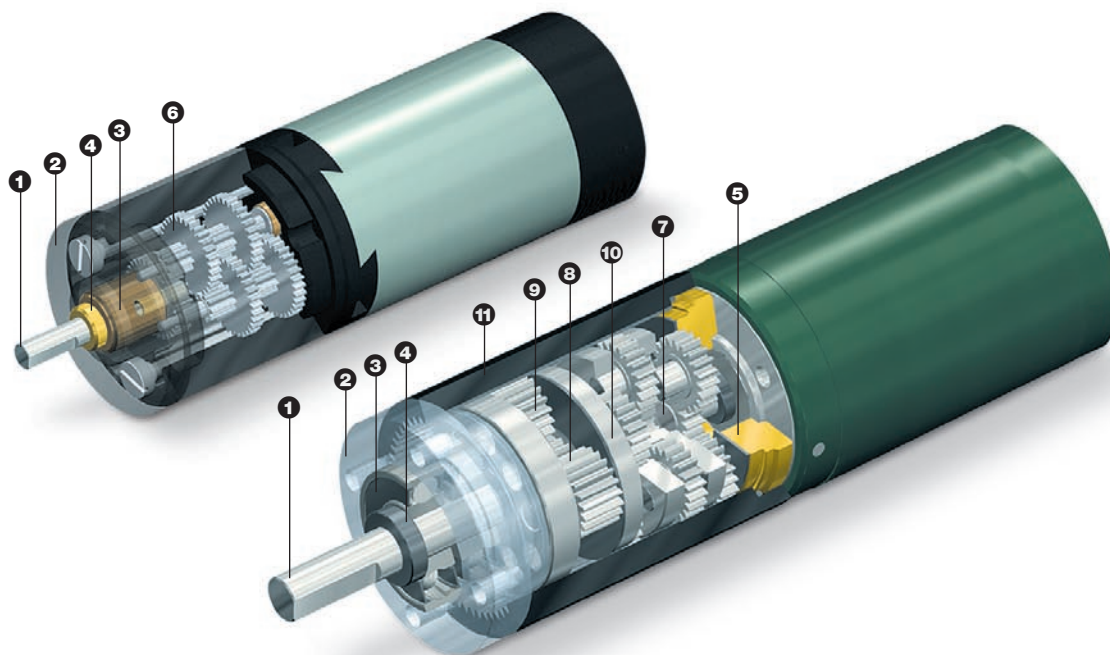
Note that the nominal torque (continuous torque) of the gear is dependent on the number of stages.

Where possible, the input speed of the gear i_{max} 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

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

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





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.

The following have an influence:

- 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.

Materials

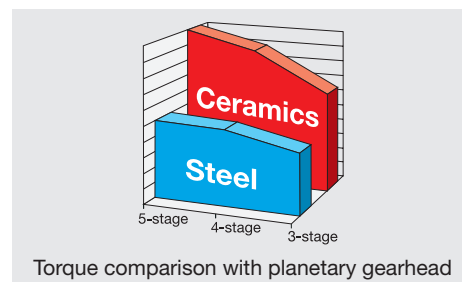
Ceramics

Ceramic components are increasingly used in planetary gears, as they can significantly improve the wear characteristics of critical components.

This results in:

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

You can also benefit from high-tech ceramic components that have proved their worth millions of times over in maxon's drive technology (see also pages 323 - 327).

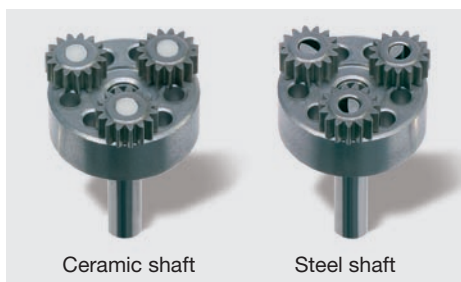


Planetary gearheads with ceramic axes can achieve much higher torques than with steel axes, as ceramic axes are much more wear-resistant than steel ones.

Plastic

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.

For further explanations, please see page 210 or "The Design of High-Precision Microdrives" by Dr. Urs Kafader.



Unlike steel axes which demonstrate high levels of wear and tear, ceramic axes show almost none over the same running time.

maxon tacho

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

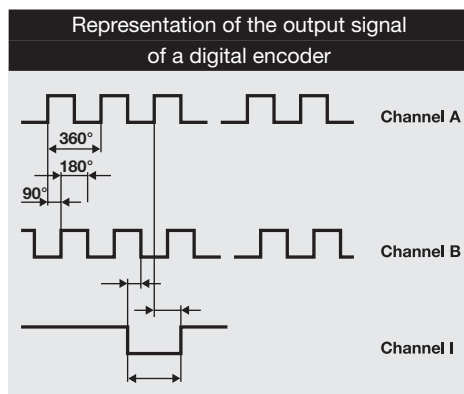
Digital Incremental Encoder

Encoder signals

The encoders provide a simple square signal for further processing in the control system. Its impulses can be counted for exact positioning or determining speed. Channels A and B pick up phase shifted signals, which are compared with one another to determine the rotation direction.

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 \bar{A} , \bar{B} , \bar{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.



Program

- Digital MR encoder
- Digital Hall effect encoder
- Digital optical encoder
- DC Tacho
- Resolver

Magneto-resistant (MR) principle

In an MR-encoder, the multipole magnetic disc mounted on the motor shaft produces a sinusoidal voltage in the MR sensor. The typical encoder signals are created by interpolation and electronic signal refinement.

Advantages

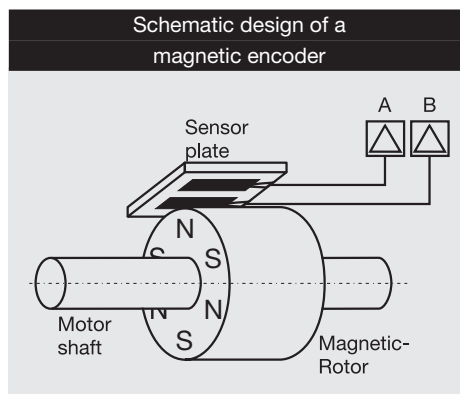
- Needs very little space
- No protruding parts
- High number of pulses by interpolation
- Different number of pulses can be selected
- Index channel possible
- Line driver possible

Magnetic principle with Hall sensors

Here, a small multipole permanent magnet sits on the motor shaft. The changes in magnetic flux are read by Hall sensors and fed into the electronics as channel A and B.

Features

- Small design
- 2 channels A and B
- No line driver possible
- Low number of pulses



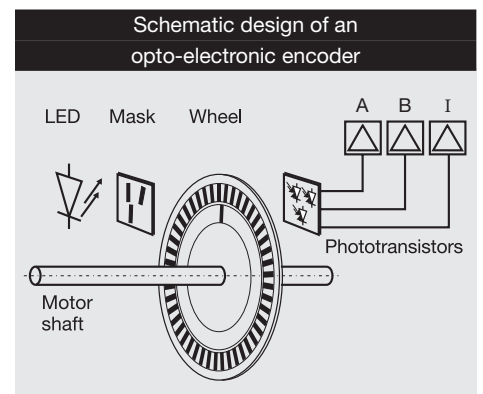
- 1 End cap
- 2 Electrical connections motor and encoder
- 3 Print
- 4 MR sensor
- 5 ASIC
- 6 Magnetic multi-pole wheel
- 7 Encoder housing
- 8 Motor connections
- 9 Motor

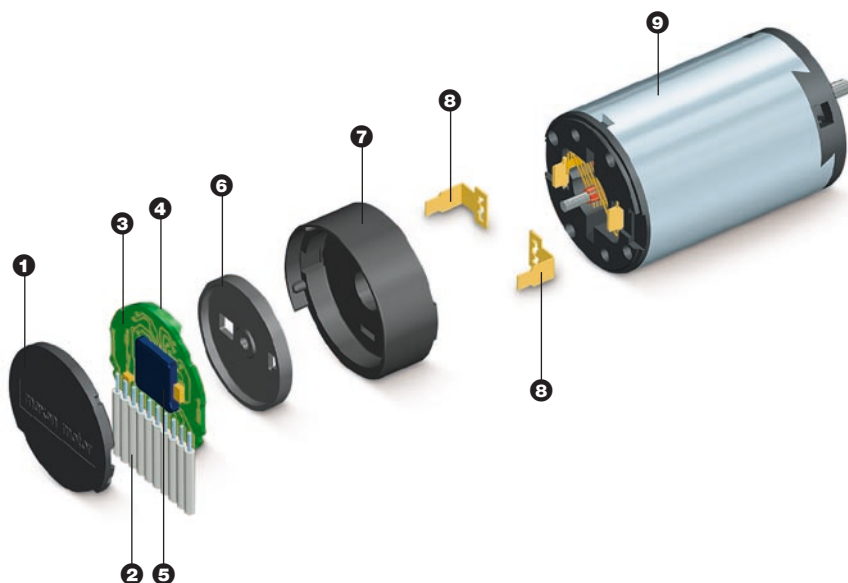
Optical principle

The opto-electronic principle sends an LED light through a finely screened code wheel that is rigidly mounted onto the motor shaft. The receiver (photo transistor) changes light/dark signals into corresponding electrical impulses that are amplified and processed in the electronics.

Features

- Needs large space with protruding part
- High number of pulses
- Index channel possible
- Line driver possible





Tips on encoder selection

Principal features of the maxon incremental encoder are:

- The number of pulses per revolution (increments)
- The use of an index channel
- The use of a line driver.

The maxon controllers are optimally designed for encoders with 500 increments. The size sometimes dictates that an encoder with a lower number of pulses must be selected.

The higher the number of pulses, the better a smooth, jerk-free operation can be achieved even at low speeds.

maxon controllers can be set to operate at low speed and/or for an encoder with a low number of pulses.

The frequency restrictions of the encoder and subsequent controller, limit the maximum speed up to which the encoder signals can be processed. The frequency limit of maxon encoders is typically 100 kHz, which is equivalent to a speed of 12 000 rpm with a 500 pulse encoder.

The following applies especially to positioning systems:

- 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.
- 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.

Advantages and features

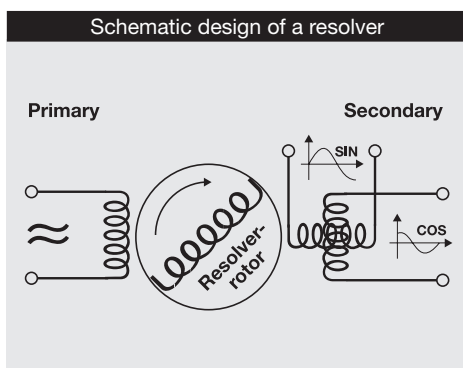
- The output DC voltage is proportional to the speed thanks to the precious metal brushes.
- AlNiCo magnet for high signal stability with temperature fluctuations
- No additional tacho bearings or friction
- No couplings, high resonant frequency

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 $\sin \varphi$ and $\cos \varphi$, where φ is the rotation angle.

Advantages and Features:

- 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



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

- 4-Q servoamplifiers for DC motors
- Sensorless controllers for EC motors
- 1-Q and 4-Q servoamplifiers for EC motors
- Position controllers for DC and 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

Power amplifiers

- Linear
- Pulsed
- 1 quadrant
- 4 quadrant

Circuit technology

- Digital
- Analog

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 also improves the dynamics of a superior positioning or speed control circuit.

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.

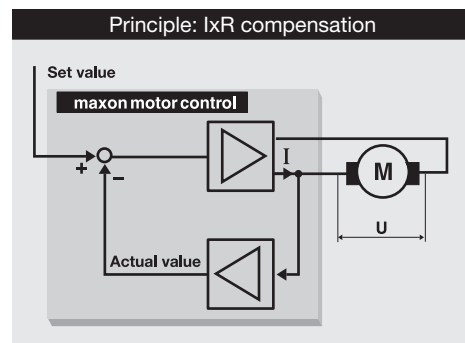
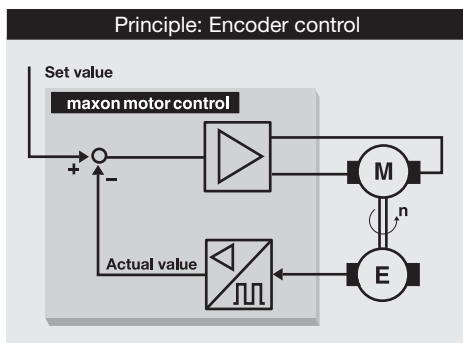
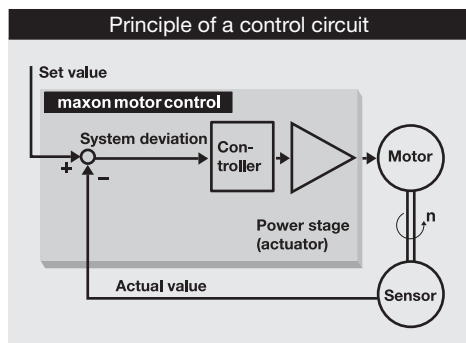
- Digital encoders are often found in positioning controls, in order to derive and measure the travel or angle.
- Digital encoders are not subject to mechanical wear.
- In conjunction with digital controllers there are no drift effects.
- If Hall sensor signals of an EC motor are used for control, this 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





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
- Only for DC motors
- Ideal for stringent demands on speed dynamics

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

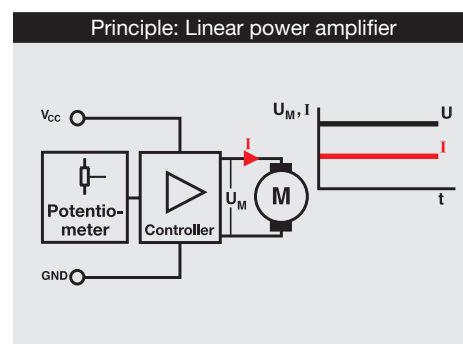
Power amplifiers

One of the following two principles to control the power stage transistors is used in maxon controllers:

Linear power stage

The operating voltage is divided between the motor and the power amplifier. The controller changes the voltage on the motor (U_M) linearly and proportionally. The voltage applied to the power amplifier (U_T) causes power dissipation

- High currents and low motor voltages cause significant power dissipation
- Simple and favorably priced design of the power amplifier

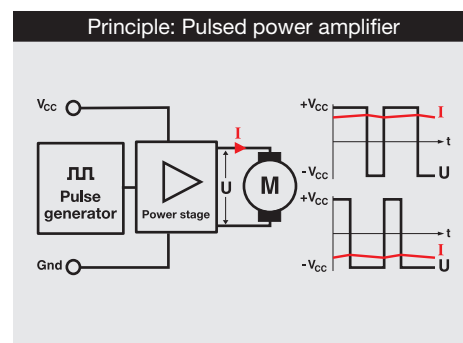
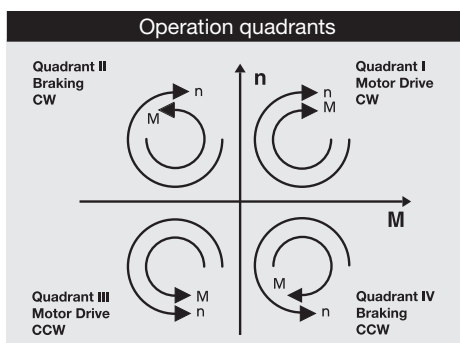
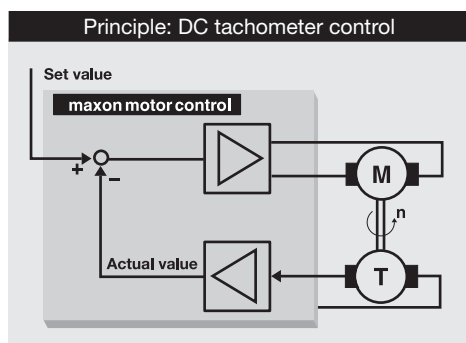


Pulsed power stage (PWM)

The controller switches the motor on and off in short intervals (pulses/cycles). If the off interval is longer, the motor loses speed. The decisive average value of the voltage changes in relation to the on-to-off time. Only little energy is converted into heat.

- More expensive power amplifier
- High efficiency

For further explanations, please see page 274.



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 and voltage U) 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

$$U \cdot I = \frac{\pi}{30\,000} n \cdot M + R \cdot I^2$$

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 .

$$M = k_M \cdot I$$

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 , power output P_2 and efficiency η are applied as a function of torque M at constant voltage U .

Speed-torque line

This curve describes the mechanical behavior of the motor at a constant voltage U :

- 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

$$n_0 \approx k_n \cdot U$$

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).

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

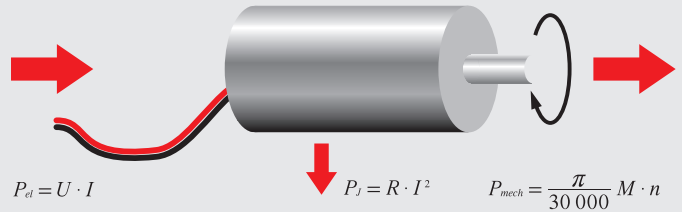
See also: Technology – short and to the point, explanation of the motor

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 42).

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)

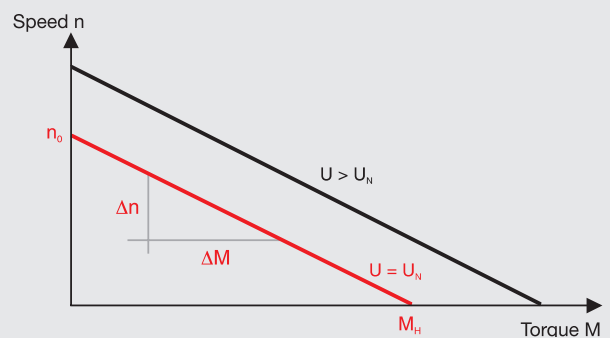


Motor constants

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 with torque M using the torque constant in the detailed power balance:

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

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 .

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

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.

$$\eta = \frac{\pi}{30\,000} \cdot \frac{n \cdot (M - M_R)}{U \cdot I}$$

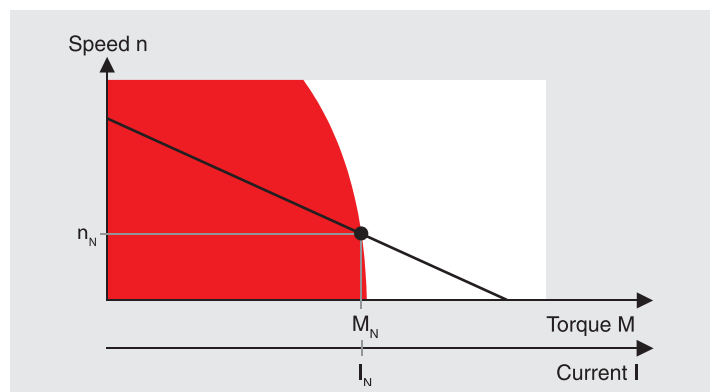
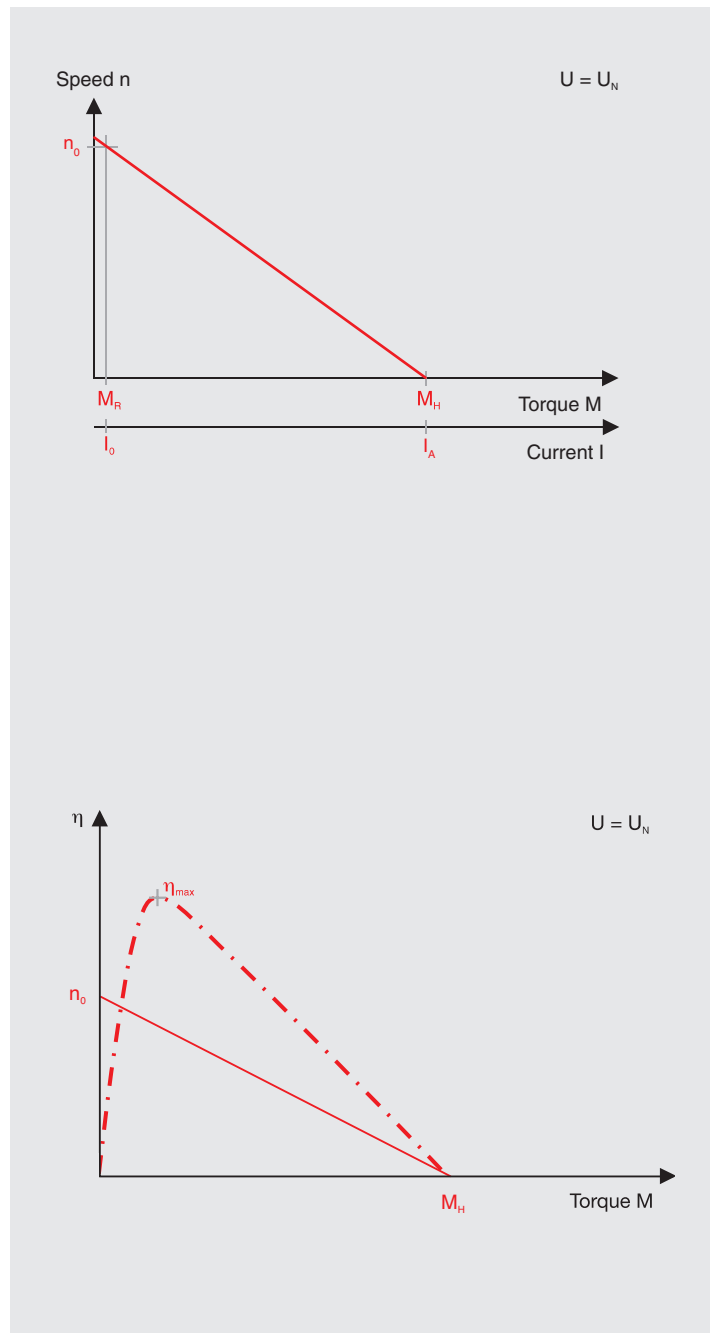
One can see that at constant applied voltage U and due to the proportionality of torque and current, the efficiency increases with increasing speed (decreasing torque). At low torques, friction losses become increasingly significant and efficiency rapidly approaches zero. Maximum efficiency (line 9 of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

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

A rule of thumb is that maximum efficiency occurs at roughly one seventh of the stall torque. This means that maximum efficiency and maximum output power do not occur at the same torque.

Rated working point

The rated working point is an ideal working 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 working point follows from the equivalence of torque and current, and 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 catalogue 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 I_{cont} , 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

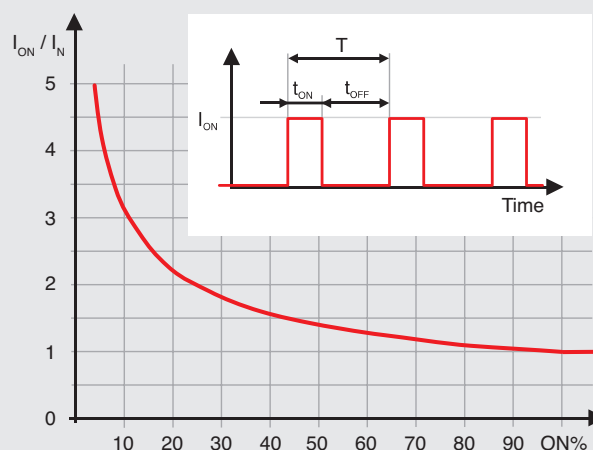
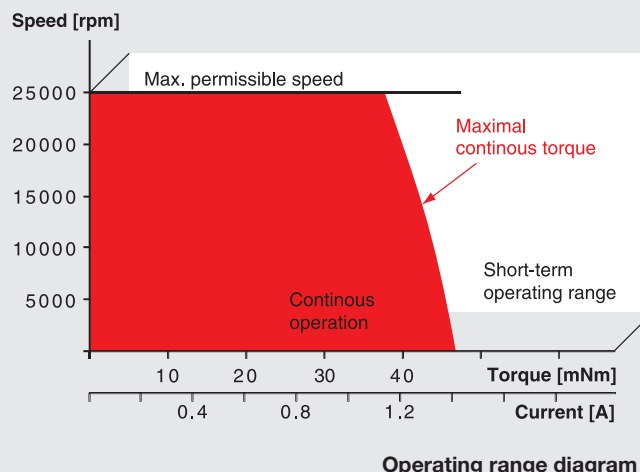
for DC motors is primarily limited by the commutation system. The commutator and brushes wear more rapidly at very high speeds. The reasons are:

- 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.



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

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

maxon flat 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 working point. The achievable speed-torque gradient is approximately.

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

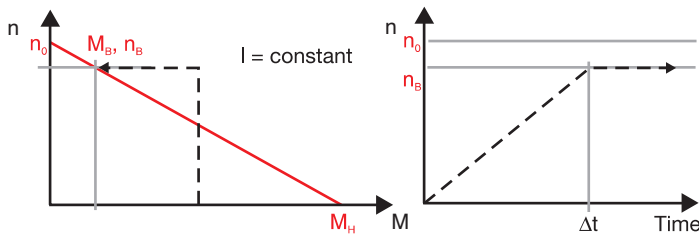
Acceleration

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.



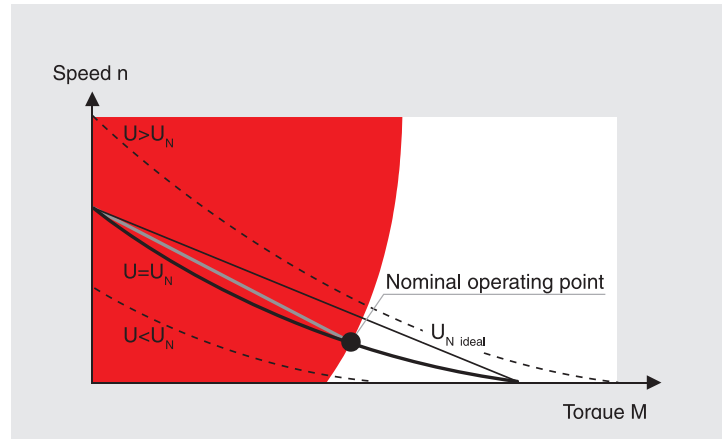
- Angular acceleration α (in rad / s^2) at constant current I or constant torque M with an additional load of inertia J_L :

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

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

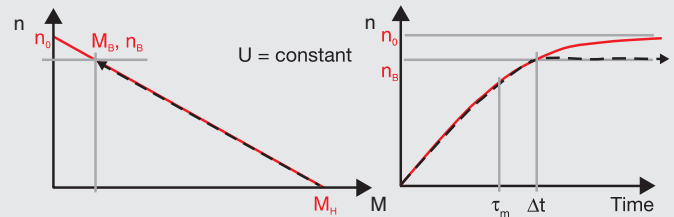
$$\Delta t = \frac{\pi}{300} \cdot \Delta n \cdot \frac{J_R + J_L}{k_M \cdot I}$$

(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 / s^2) of the unloaded motor:

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

- Maximum angular acceleration α_{\max} (in rad / s^2) with an additional load inertia J_L :

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

- Run-up time (in ms) at constant voltage up to the operating point (M_B, n_B):

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

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} .

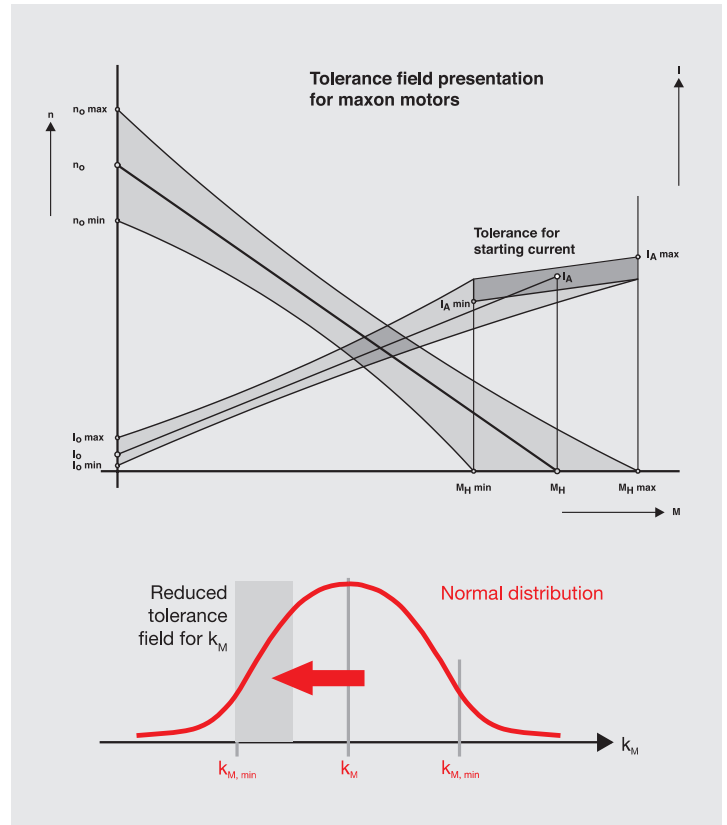
$$T_W - T_U = \Delta T_W = (R_{th1} + R_{th2}) \cdot P_J$$

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 50% 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 $I = I_{RMS}$).

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

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:

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

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

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

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

$$M_{HT} = k_M \cdot I_{AT} = k_M \cdot \frac{U}{R_T}$$

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 point (M_B, n_B). The motor types in question must have a nominal torque (= max. continuous torque) M_N that is greater than operating torque M_B .

$$M_N > M_B$$

In work cycles, such as start/stop operation, the motor's nominal torque must be greater than the effective load torque (quadratically averaged). 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.

Unregulated 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_B, M_B).

$$n_{0,theor} = n_B + \frac{\Delta n}{\Delta M} M_B$$

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

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

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

Motor current I is calculated from the torque constant k_M of the selected winding and the operating torque M_B .

$$I = \frac{M_B}{k_M}$$

Tips for evaluating the requirements:

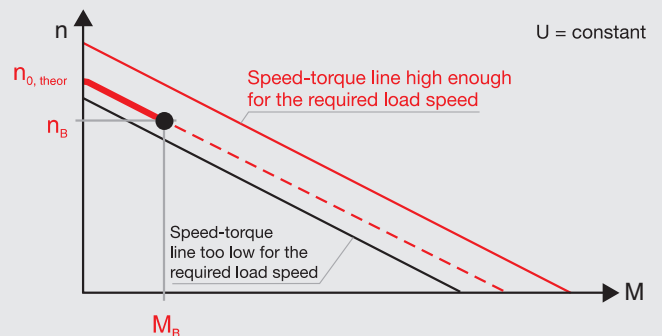
Often the load points (especially the torque) are not known or are difficult to determine. In such cases you can operate your device with a measuring motor roughly estimated according to size and power. Vary the voltage until the desired operating points and motion sequences have been achieved. Measure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

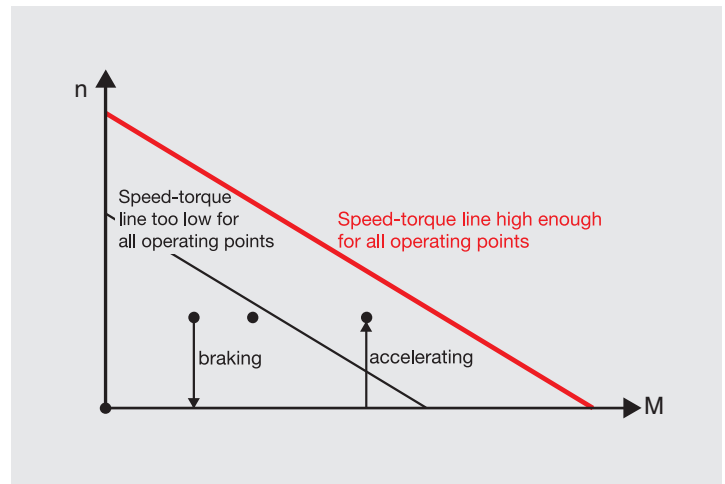


Regulated servo drives

In work 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_B, M_B):

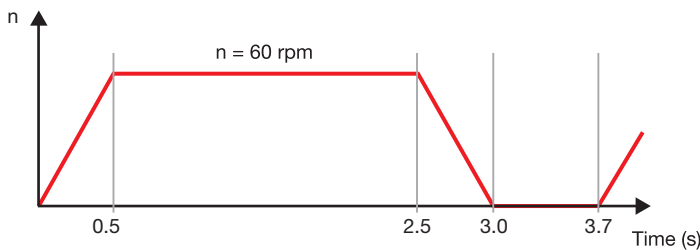
$$k_n \cdot U_{max} = n_0 > n_B + \frac{\Delta n}{\Delta M} M_B$$

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 in accordance with the following speed diagram.



The inertia of load J_L to be accelerated is 130 000 gcm². The constant friction torque is 300 mNm. The motor is to be driven with the linear 4-Q servo amplifier from maxon (LSC). The power supply delivers max. 5 A and 24 V.

Calculation of load data

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

$$M_\alpha = J_L \cdot \alpha = J_L \cdot \frac{\pi}{30} \frac{\Delta n}{\Delta t} = 0.013 \cdot \frac{\pi}{30} \cdot \frac{60}{0.5} = 0.163 \text{ Nm} = 163 \text{ mNm}$$

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

– Acceleration phase	(duration 0.5 s)	463 mNm
– Constant speed	(duration 2 s)	300 mNm
– Braking (friction brakes with 300 mNm)	(duration 0.5 s)	137 mNm
– Standstill	(duration 0.7 s)	0 mNm

Peak torque occurs during acceleration.

The RMS determined torque of the entire work cycle is

$$M_{RMS} = \sqrt{\frac{1}{t_{tot}} (t_1 M_1^2 + t_2 M_2^2 + t_3 M_3^2 + t_4 M_4^2)}$$

$$= \sqrt{\frac{1}{3.7} (0.5 \cdot 463^2 + 2 \cdot 300^2 + 0.5 \cdot 137^2 + 0.7 \cdot 0^2)} \approx 280 \text{ mNm}$$

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

$$P_{max} = M_{max} \cdot n_{max} \cdot \frac{\pi}{30} = 0.46 \cdot 60 \cdot \frac{\pi}{30} \approx 2.9 \text{ W}$$

Physical variables

		and their units	
		SI	Catalog
i	Gear reduction*		
I	Motor current	A	A, mA
I_A	Starting current*	A	A, mA
I_0	No-load current*	A	mA
I_{RMS}	RMS determined current	A	A, mA
I_N	Nominal current*	A	A, mA
J_R	Moment of inertia of the rotor*	kgm ²	gcm ²
J_L	Moment of inertia of the load	kgm ²	gcm ²
k_M	Torque constant*	Nm/A	mNm/A
k_n	Speed constant*		rpm/V
M	(Motor) torque	Nm	mNm
M_B	Operating 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_B	Operating speed		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	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		
α_{max}	Maximum angle acceleration		rad/s ²
$\Delta n / \Delta M$	Curve gradient*		rpm/mNm
ΔT_W	Temperature difference winding/ambient	K	K
Δt	Run up time	s	ms
η	(Motor) efficiency		%
η_G	(Gear) efficiency*		%
η_{max}	Maximum efficiency*		%
τ_m	Mechanical time constant*	s	ms
τ_S	Therm. time constant of the stator*	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 0.46 Nm. This requirement is fulfilled, for example, by a planetary gear with 22 mm diameter (metal version). 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 smallest reduction of 84 : 1 (stock program). Efficiency is max. 59%.

Motor type selection

Speed and torque are calculated to the motor shaft

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

$$M_{\text{mot, RMS}} = \frac{M_{\text{RMS}}}{i \cdot \eta} = \frac{280}{84 \cdot 0.59} \approx 5.7 \text{ mNm}$$

$$M_{\text{mot, max}} = \frac{M_{\text{max}}}{i \cdot \eta} = \frac{460}{84 \cdot 0.59} = 9.3 \text{ mNm}$$

The possible motors, which match the selected gears in accordance with the maxon modular system, are summarized in the table opposite. The table only contains motors with graphite commutation which are better suited to start/stop operation.

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:

$$n_{0, \text{theor}} = n_{\max} + \frac{\Delta n}{\Delta M} M_{\max} = 5040 + 450 \cdot 9.3 \approx 9200 \text{ rpm}$$

The extreme working 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 working points in the speed / torque diagram. This target no-load speed must be achieved with the maximum voltage $U = 19 \text{ V}$ supplied by the control (LSC), (voltage drop of the power amplifier of the LSC 5 V), which defines the minimum target speed constant $k_{n, \text{theor}}$ of the motor.

$$k_{n, \text{theor}} = \frac{n_{0, \text{theor}}}{U} = \frac{9200}{19} = 485 \frac{\text{rpm}}{\text{V}}$$

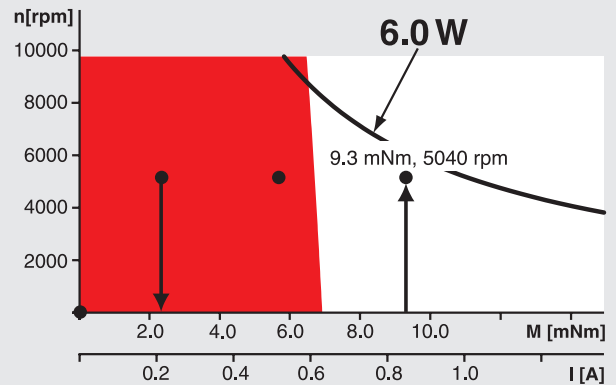
Based on the calculation, motor 110162 is chosen which corresponds to the winding with the next highest speed constant (689 rpm/V) and has a second shaft end for mounting the encoder. The winding's higher speed constant compared to the target value means that the motor runs faster than required at 19 V which, however, can be compensated for by the controller. This selection also ensures that there is a speed regulating reserve of more than 20%. Thus, even unfavorable tolerances are not a problem.

The torque constant of this winding is 13.9 mNm/A. The maximum torque corresponds to a peak current of:

$$I_{\max} = \frac{M_{\max}}{k_M} + I_0 = \frac{9.3}{13.9} + 0.036 \approx 0.7 \text{ A}$$

This current is lower than the maximum current (2 A) of the controller (LSC).

Therefore, a gear motor combination has been found that fulfills the requirements (torque and speed) and can be operated with the controller provided.

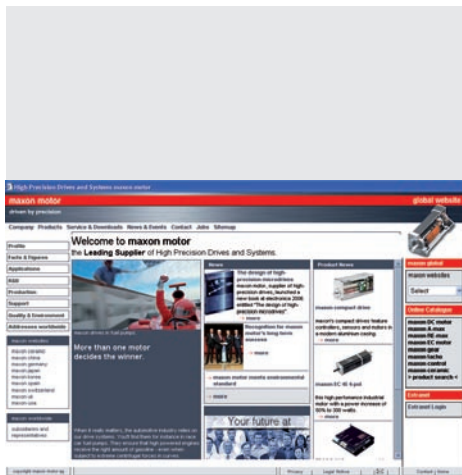


Motor	M_N	Suitability
A-max 22, 6 W	$\approx 6.9 \text{ mNm}$	Good
A-max 19, 2.5 W	$\approx 3.8 \text{ mNm}$	Too weak
RE-max 21, 6 W	$\approx 6.8 \text{ mNm}$	Good

The electronic catalogue

All the information in this printed catalogue are stored independently from the maxon selection program on the CD-ROM.

Adobe Reader is required to maximise the electronic catalog's full range of functions. This is contained on the CD-ROM.



maxon Online

Internet website www.maxonmotor.com offers you all the benefits of our system technology. Browse here to quickly find up-to-date product details and downloads.

Visit us online...

www.maxonmotor.com

maxon selection program

The maxon selection program is available in 5 languages on CD or at www.maxonmotor.com. After selecting your drive requirements, the maxon selection program shows the possible solution combinations available from our extensive product program:

- Motor/gearhead combinations
- Matching maxon controllers
- Matching encoders and DC tachos

The solutions can be evaluated using various criteria:

- Dimensions
- Charge
- Power and voltage requirement

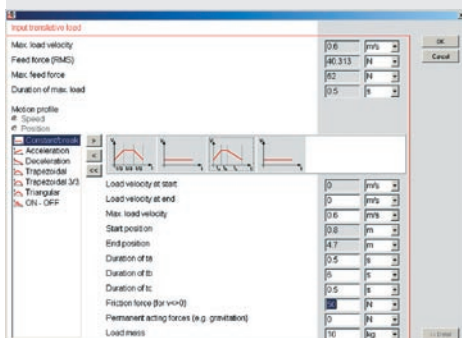
Easy-to-follow layout of chosen solution

- System overview
- Input data and peripheral conditions
- Motor data: nominal data with tolerances and typical values for the application
- Gearhead data, controller and sensor data

Calculation and layout of achievable operating data for an existing drive unit.

Quick search for a replacement for an existing motor/gearhead combination, showing matching maxon controllers and sensors.

Integrated moment of inertia calculator to help you calculate moments of inertia.



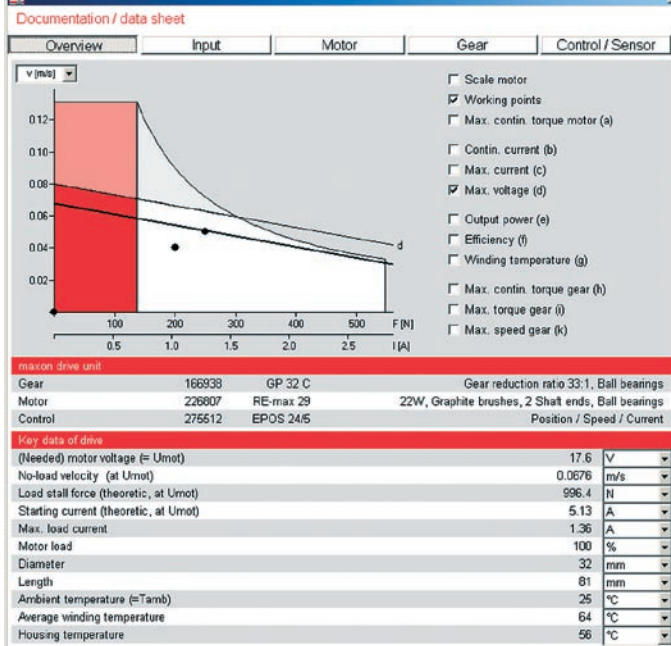
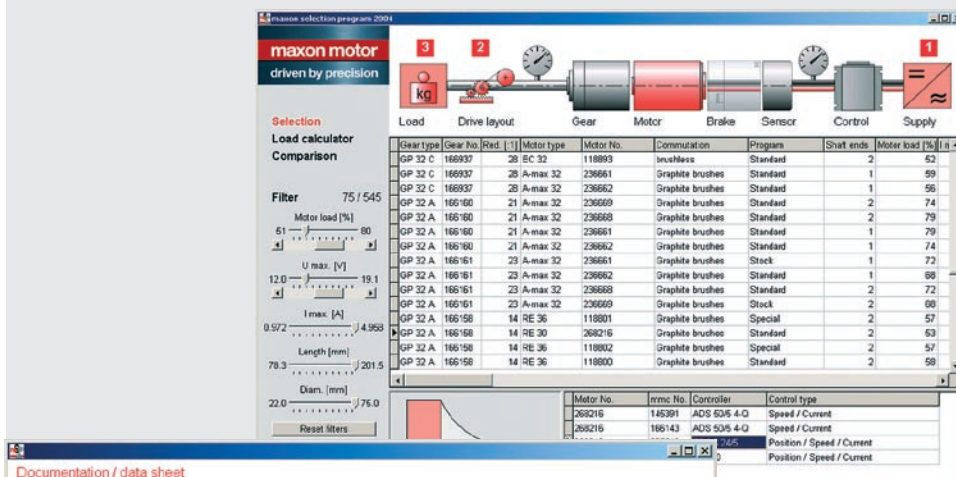
Selection menu for a discrete application

System requirements

- Windows 98, NT, 2000, ME or XP
- Recommended memory (RAM): at least 256 MB
- Recommended screen resolution: at least 1024 x 768

The maxon selection program requires no installation. It can be copied into the hard disc or started using the CD-ROM.

No settings have to be saved when using the CD-ROM.



Display of possible drive solutions

Graphical description of a particular drive solution

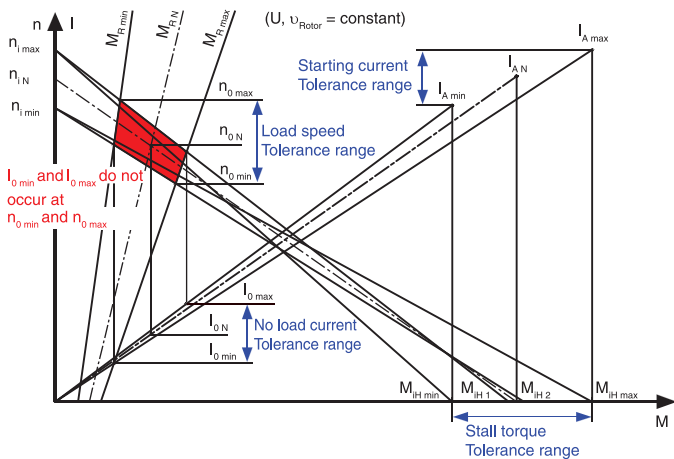
Our Computer Service is at your disposal and at no charge. On request, you will receive all nominal data with applicable tolerances as well as operational values for your specific application for any motor manufactured by maxon.

Operational Data

The data provided is based on continuous operation. If requested, the information can be tailored to your individual needs.

Nominal Data and Tolerances

We provide comprehensive information pertaining to all motor parameters of consequence. This can be of invaluable assistance when working out drive concepts using maxon motors. You simply provide us with the motor type chosen and the operating voltage in your application. We deliver nominal data and inform you of the min / max. deviations in each case, specific to the selected motor.



The tolerances indicated in this diagram are shown in an exaggerated fashion for better clarity (see also page 40).

- n_i "Ideal" or theoretical no load speed [rpm]
 - n_0 No load speed [rpm]
 - M_{iH} Stall torque, also called Starting torque [mNm]
 - M_R Frictional torque, caused by brushes and bearing friction [mNm]
 - I_0 No load current [mA]
 - I_A, I_H Starting current [mA]
- Index**
- N** Nominal
 - max** Max. value
 - min** Min. value

maxon academy In depth knowledge direct from the manufacturer

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, with CD-ROM, ISBN 978-3-9520143-4-6

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



maxon Conversion Tables

General Information

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

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

Conversion Example

A known unit
B unit sought

known: multiply by sought:
oz-in 7.06 mNm

Factors used for ...

... conversions:

1 oz = 2.834952313 · 10⁻² kg
1 in = 2.54 · 10⁻² m

... gravitational acceleration:

g = 9.80665 m s⁻²
= 386.08858 in s⁻²

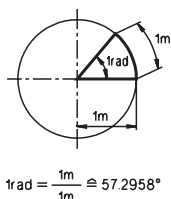
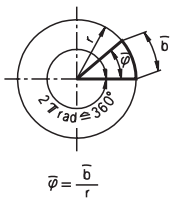
... derived units:

1 yd = 3 ft = 36 in
1 lb = 16 oz = 7000 gr (grains)
1 kp = 1 kg · 9.80665 ms⁻²
1 N = 1 kgms⁻²
1 W = 1 Nms⁻¹ = 1 kgm²s⁻³
1 J = 1 Nm = 1 Ws

Decimal multiples and fractions of units

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

Arc definition



Power

		P [W]							
B \ A		oz-in-s ⁻¹	oz-in-rpm	in-lbf-s ⁻¹	ft-lbf-s ⁻¹	Nm s ⁻¹ = W	mW	kpm s ⁻¹	mNm rpm
W = Nm s ⁻¹		7.06 · 10 ⁻³	1.17 · 10 ⁻⁴	0.113	1.356	1	1 · 10 ⁻³	9.807	1/60000
mW		7.06	0.117	112.9	1.356 · 10 ³	1 · 10 ³	1	9.807 · 10 ³	1/60
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]					Force F [N]					
B \ A		oz	lb	gr (grain)	kg	g	B \ A	oz	lbf	N	kp	p
kg		28.35 · 10 ⁻³	0.454	64.79 · 10 ⁻⁶	1	1 · 10 ³	N	0.278	4.448	1	9.807	9.807 · 10 ⁻³
g		28.35	0.454 · 10 ³	64.79 · 10 ⁻³	1 · 10 ³	1	kp	0.028	0.454	0.102	1	1 · 10 ⁻³
oz		1	16	2.28 · 10 ⁻³	35.27	35.27 · 10 ³	oz	1	16	3.600	35.27	35.27 · 10 ⁻³
lb		1/16	1	1/7000	2.205	2.205 · 10 ³	lbf	1/16	1	0.225	2.205	2.205 · 10 ⁻³
gr (grain)		437.5	7000	1	15.43 · 10 ³	15.43 · 10 ⁶	pdl	2.011	32.17	7.233	70.93	70.93 · 10 ⁻³

Length

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

Angular Velocity

		ω [s ⁻¹]			Angular Acceleration α [s ⁻²]			
B \ A		s ⁻¹ = Hz	rpm	rad s ⁻¹	B \ A	min ⁻²	s ⁻²	rad s ⁻²
rad s ⁻¹		2π	π/30	1	s ⁻²	1/3600	1	1/2π
rpm		1/60	1	30/π	rad s ⁻²	π/1800	2π	1

Linear Velocity

		v [m s ⁻¹]							
B \ A		in-s ⁻¹	in-rpm	ft-s ⁻¹	ft-min ⁻¹	m s ⁻¹	cm s ⁻¹	mm s ⁻¹	m rpm
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

Units used in this brochure



maxon DC motor

maxon DC motors are high-quality motors fitted with powerful permanent magnets. The “heart” of the motor is the worldwide patented ironless rotor. For you, this means cutting-edge technology in compact, powerful and low inertia drives.

Explanation of the DC motors	49
RE-Program	50 - 87
A-Program	88 - 90
F-Program	91 - 98

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".

Electrical equipment must meet certain minimum requirements, which was introduced into the European market after 1.1.96. Small motors will be identified as components and will therefore represent no separate electrical equipment within the sense of the guidelines. Nevertheless the majority of the maxon motor program are already CE certified. Certifying the motors takes place during operation at no-load and in the new condition.



The CE sign means that the product conforms to EU guidelines and procedures designed to achieve conformity were carried out.

If additional requirements need to be met, we shall cooperate with you to work out more detailed specifications.

Note to the Catalogue 2008/09:

maxon motor ag accepts no liability for the accuracy of the information contained in this catalogue, nor for any damages which may result directly or indirectly from the use of such information.

This disclaimer does not apply to wilful intent, gross negligence, and does not affect legislation governing product liability.

The Standard Specification No. 100 for maxon DC motor, maxon A-max and maxon RE-max

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 sub-assemblies 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 ≥ 3 V)

No-load speed +/- 10 %
No-load current \leq maximum specified value

Sense of rotation cw = clockwise
Motor position horizontal

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: Representatively winding resistance is verified through random sampling instead. It should be noted that terminal resistance depends on the rotor's rotational position. The highest reading is recorded. No useful results are gained by measuring the resistance of graphite brushes on an ohmmeter on account of their current density-based transfer resistance. Too low a reading is produced with precious metal brush motors if a set of brush blades bridges two commutator segments, thereby short-circuiting one coil segment.

Commutation: The neutral position of the brushes is tested and checks for open or partially short-circuited windings for example are made using storage oscilloscopes. Commutation displays for precious metal brushes and graphite brushes are not directly comparable. Precious metal brush commutation display features clean traces 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. Although every motor is fully adjusted and tested during manufacturing, the Quality Control Department rechecks these values through random sampling.

2.2 **Mechanical data** per outline drawing:

Standard measuring 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 **Other data**

Rotor imbalance: Rotors are balanced according to standard data or customer requirements during manufacturing. The completely assembled motor permits only a subjective assessment which is done using the random sampling method.

Inductance is determined during the first sample test.

Measuring frequency 1 kHz.

Corrosion resistance: Our products are tested according to test climate 23/83-1 DIN 50015 at the first sample test.

Coating: Surface treatment and coating procedures used by maxon were selected on the basis of their merits to resist corrosion. Evaluations of these treatments are made according to their applicable standard, such as ISO 2082 or DIN 50017 KK.

2.4 **Noise:** Depending on speed the necessary motions in the motor cause noise and vibration of varying degrees, frequency and intensity. An objective assessment can only be made at great expense and with precise specifications. For this reason, maxon chooses to evaluate routinely, but only on a subjective basis and for extremes within a lot. 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 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. For this reason, maxon performs internal tests under uniform criteria during the initial sampling procedure.

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.

April 2005 edition / subject to change

Explanation of the pages 50 - 148

Dimensional drawings

On the enclosed CD ROM dimensional drawings (DXF-files) are available and are suitable for import to any CAD system. Presentation of the views according to the projection method E (ISO )
All dimensions in [mm].

Mounting threads 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).

Line 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.

Line 2 No load speed n_0 [rpm]

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

Line 3 No load current I_0 [mA]

This is the current 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.

Line 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.

Line 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.

Line 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.

Line 7 Stall torque M_H [mNm]

is the torque produced by the motor when at standstill. Rising motor temperatures reduce stall torque.

Line 8 Starting current I_A [A]

is the quotient from nominal voltage and the motor's terminal resistance. Starting current is equivalent to stall torque. With larger motors, I_A cannot often be reached due to the amplifier's current limits.

Line 9 Maximum 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.

Line 10 Terminal resistance R [Ω]

is the resistance at the terminals at 25°C and determines the starting 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.

Line 11 Terminal inductance L [mH]

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

Line 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.

Line 13 Speed constant k_n [rpm/V]

shows the ideal speed per 1 volt of applied voltage. Friction losses not taken into account.

Line 14 Speed / torque gradient

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

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

Line 15 Mechanical time constant

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

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

Line 16 Rotor inertia J_R [gcm²]

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

Line 17 Thermal resistance housing-ambient R_{th2} [K/W]

Line 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.

Line 19 Thermal time constant winding

$$\tau_w \text{ [s]}$$

Line 20 Thermal time constant motor

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

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.

Line 21 Ambient temperature [°C]

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

Line 22 Max. winding temperature [°C]

Maximum permissible winding temperature.

Line 23 Maximum permissible speed

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

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

Line 24 Axial play [mm]

For non-preloaded motors, this represents the tolerance limits of the factory-set bearing play. The latter is included in shaft length tolerances. Pre-loading cancels out axial play up to the given axial loading.

Line 25 Radial play [mm]

Radial play derives from the bearings' radial air. A spring (bearing preload) cancels out radial play up to the given axial loading.

Line 26/27 Max. axial loading [N]

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

statistically: 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.

Line 28 Max. radial loading [N]

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

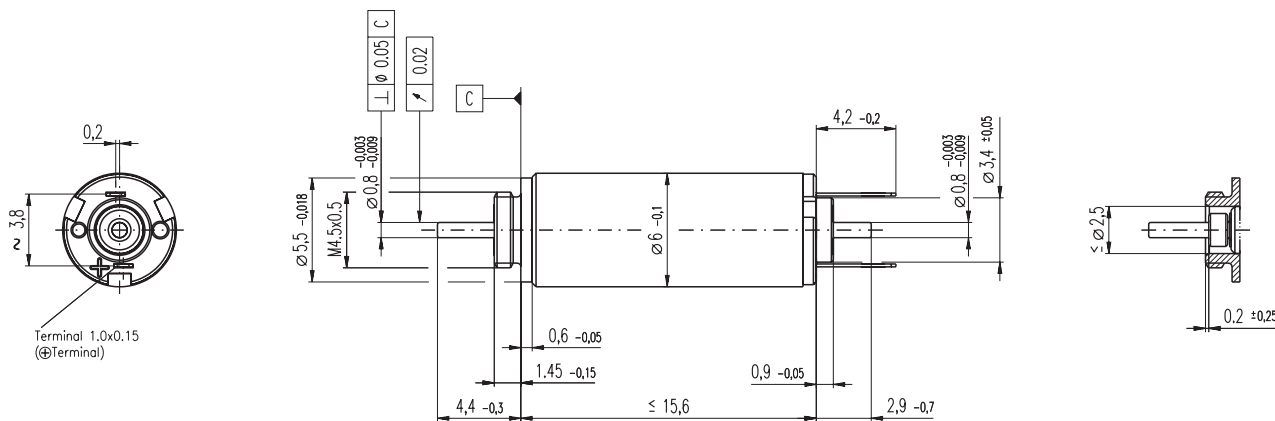
Line 29 Number of pole pairs

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.

Line 30 Number of commutator segments

Line 31 Weight of motor [g]

RE 6 $\varnothing 6$ mm, Precious Metal Brushes, 0.3 Watt



M 2.5:1

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

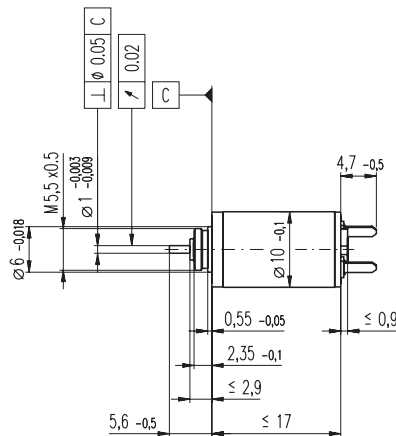
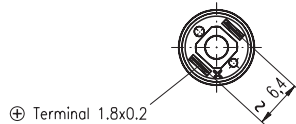
Order Number				
349189	349190	349191	349192	

Motor Data (provisional)						
Values at nominal voltage						
1	Nominal voltage	V	1.5	3.0	4.5	6.0
2	No load speed	rpm	18200	18500	18400	18400
3	No load current	mA	48.0	24.2	16.1	12.1
4	Nominal speed	rpm	4520	5620	5370	5320
5	Nominal torque (max. continuous torque)	mNm	0.304	0.327	0.322	0.321
6	Nominal current (max. continuous current)	A	0.449	0.241	0.158	0.118
7	Stall torque	mNm	0.419	0.485	0.469	0.465
8	Starting current	A	0.581	0.336	0.217	0.161
9	Max. efficiency	%	52.4	55.2	54.5	54.4
Characteristics						
10	Terminal resistance	Ω	2.58	8.92	20.8	37.2
11	Terminal inductance	mH	0.0227	0.0907	0.204	0.363
12	Torque constant	mNm / A	0.72	1.44	2.16	2.88
13	Speed constant	rpm / V	13300	6630	4420	3310
14	Speed / torque gradient	rpm / mNm	47500	41000	42400	42700
15	Mechanical time constant	ms	7.45	7.18	7.24	7.24
16	Rotor inertia	gcm ²	0.015	0.0167	0.0163	0.0162

Specifications	Operating Range	Comments
<p>Thermal data</p> <p>17 Thermal resistance housing-ambient 77 K / W</p> <p>18 Thermal resistance winding-housing 16.2 K / W</p> <p>19 Thermal time constant winding 1.39 s</p> <p>20 Thermal time constant motor 16.3 s</p> <p>21 Ambient temperature -20 ... +65°C</p> <p>22 Max. permissible winding temperature +85°C</p> <p>Mechanical data (sleeve bearings)</p> <p>23 Max. permissible speed 23000 rpm</p> <p>24 Axial play 0.02 - 0.1 mm</p> <p>25 Radial play 0.012 mm</p> <p>26 Max. axial load (dynamic) 0.15 N</p> <p>27 Max. force for press fits (static) 10 N</p> <p>28 Max. radial loading, 4 mm from flange 0.6 N</p>	<p>Operating Range</p>	<p>Comments</p> <p> Continuous operation In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.</p> <p> Short term operation The motor may be briefly overloaded (recurring).</p> <p> Assigned power rating</p>

Other specifications	maxon Modular System	Overview on page 16 - 21
<p>29 Number of pole pairs 1</p> <p>30 Number of commutator segments 5</p> <p>31 Weight of motor 2.3 g</p> <p>Values listed in the table are nominal. Explanation of the figures on page 49.</p>	<p>Planetary Gearhead</p> <p>$\varnothing 6$ mm</p> <p>0.002 - 0.03 Nm</p> <p>Page 211</p>	<p>Recommended Electronics: LSC 30/2 Page 276 Notes 18</p>

RE 10 \varnothing 10 mm, Precious Metal Brushes, 0.75 Watt, CE approved



M 1:1

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

Order Number

118382 118383 118384 118385 118386 118387 118388 118389 118390 118391

Motor Data

Values at nominal voltage		118382	118383	118384	118385	118386	118387	118388	118389	118390	118391	
1	Nominal voltage	V	2.4	3.0	3.6	4.5	6.0	6.0	7.2	7.2	9.0	12.0
2	No load speed	rpm	10300	10400	9930	11300	13000	11400	11700	10600	10700	11600
3	No load current	mA	16.0	12.8	10.1	9.51	8.5	7.18	6.21	5.46	4.44	3.68
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	0.800	0.784	0.718	0.757	0.746
6	Nominal current (max. continuous current)	A	0.367	0.306	0.243	0.222	0.190	0.170	0.143	0.119	0.101	0.081
7	Stall torque	mNm	0.924	1.00	0.949	1.09	1.25	1.13	1.12	0.944	0.957	1.01
8	Starting current	A	0.432	0.375	0.284	0.297	0.292	0.232	0.198	0.150	0.123	0.106
9	Max. efficiency	%	66	67	66	68	69	68	68	66	66	67
Characteristics												
10	Terminal resistance	Ω	5.55	8.00	12.7	15.2	20.6	25.8	36.4	47.9	72.9	114
11	Terminal inductance	mH	0.0461	0.0720	0.112	0.136	0.184	0.240	0.325	0.398	0.605	0.920
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	7.90	7.90	7.85	7.93	8.04	8.04	8.11
16	Rotor inertia	gcm ²	0.0656	0.0707	0.0700	0.0702	0.0702	0.0722	0.0701	0.0662	0.0662	0.0651

Specifications

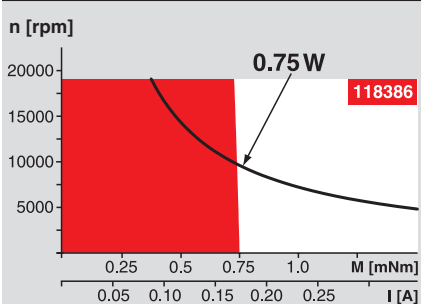
Thermal data		
17	Thermal resistance housing-ambient	45.5 K / W
18	Thermal resistance winding-housing	19.5 K / W
19	Thermal time constant winding	3.14 s
20	Thermal time constant motor	108 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 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 49.

Operating Range



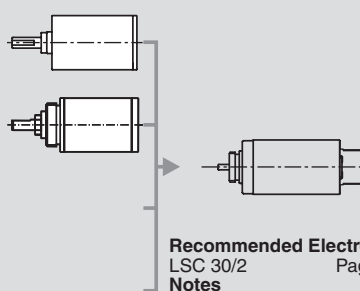
Comments

- 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

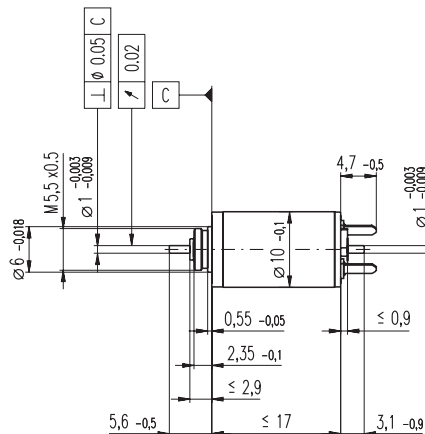
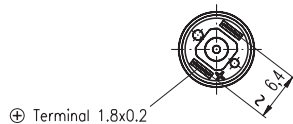
Overview on page 16 - 21

- Planetary Gearhead**
 \varnothing 10 mm
0.005 - 0.1 Nm
Page 214
- Planetary Gearhead**
 \varnothing 10 mm
0.01 - 0.15 Nm
Page 215



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 10 \varnothing 10 mm, Precious Metal Brushes, 0.75 Watt, CE approved



M 1:1

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

Order Number

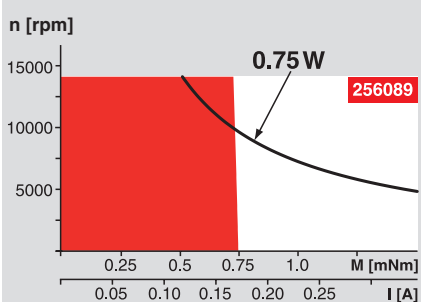
256085 **256086** 256087 256088 **256089** 256090 256091 256092 256093 **256094**

Motor Data		256085	256086	256087	256088	256089	256090	256091	256092	256093	256094
Values at nominal voltage											
1 Nominal voltage	V	2.4	3.0	3.6	4.5	6.0	6.0	7.2	7.2	9.0	12.0
2 No load speed	rpm	10200	10300	9840	11200	12900	11300	11600	10500	10600	11500
3 No load current	mA	19.8	15.8	12.5	11.8	10.6	8.93	7.74	6.77	5.51	4.58
4 Nominal speed	rpm	1630	1990	1500	2950	4670	3160	3340	1860	2000	2790
5 Nominal torque (max. continuous torque)	mNm	0.752	0.784	0.779	0.781	0.777	0.795	0.778	0.752	0.752	0.741
6 Nominal current (max. continuous current)	A	0.367	0.306	0.243	0.222	0.190	0.170	0.143	0.125	0.101	0.081
7 Stall torque	mNm	0.924	1.00	0.949	1.09	1.25	1.13	1.12	0.944	0.957	1.01
8 Starting 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	%	62	64	63	65	66	65	65	63	63	63
Characteristics											
10 Terminal resistance	Ω	5.55	8.00	12.7	15.2	20.6	25.8	36.4	47.9	72.9	114
11 Terminal inductance	mH	0.0461	0.072	0.112	0.136	0.184	0.240	0.325	0.398	0.605	0.920
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	7.90	7.90	7.85	7.93	8.04	8.04	8.11
16 Rotor inertia	gcm ²	0.0656	0.0707	0.0700	0.0702	0.0702	0.0722	0.0701	0.0662	0.0662	0.0651

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 3.14 s
 - 20 Thermal time constant motor 108 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 4 mm from flange 0.4 N

Operating Range



Comments

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

Other specifications

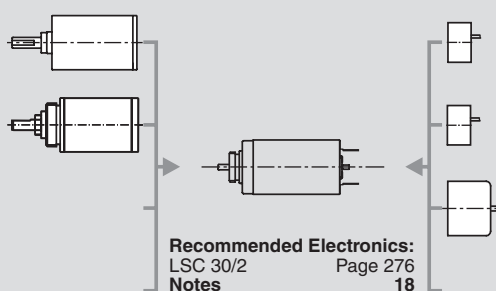
- 29 Number of pole pairs 1
- 30 Number of commutator segments 7
- 31 Weight of motor 7.9 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

maxon Modular System

Overview on page 16 - 21

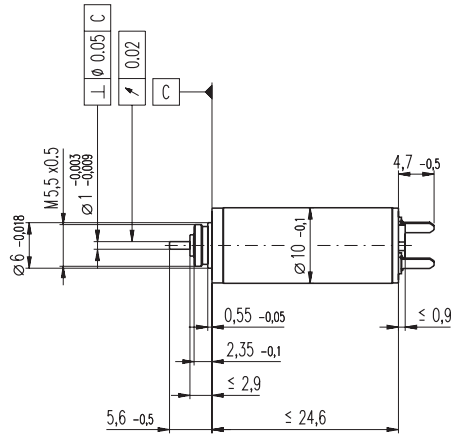
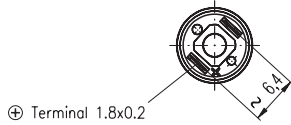
- Planetary Gearhead**
 \varnothing 10 mm
0.005 - 0.1 Nm
Page 214
- Planetary Gearhead**
 \varnothing 10 mm
0.01 - 0.15 Nm
Page 215



- Encoder MR**
16 CPT,
2 channels
Page 252
- Encoder MR**
64 - 256 CPT,
2 channels
Page 253
- Encoder MEnc**
 \varnothing 10 mm
12 CPT, 2 channels
Page 269

Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 10 \varnothing 10 mm, Precious Metal Brushes, 1.5 Watt, CE approved



M 1:1

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

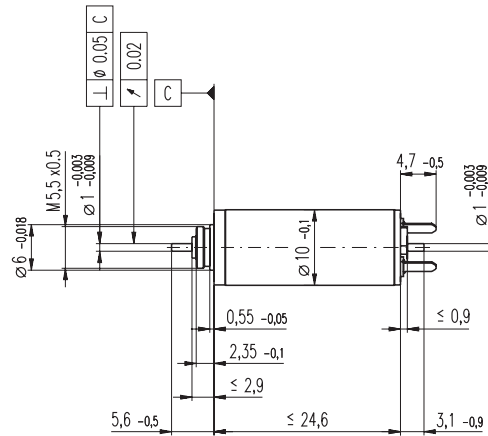
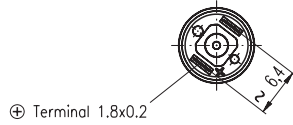
Order Number										
118392	118393	118394	118395	118396	118397	118398	118399	118400		

Motor Data		118392	118393	118394	118395	118396	118397	118398	118399	118400	
Values at nominal voltage											
1	Nominal voltage	V	3.0	3.0	4.5	4.5	6.0	6.0	9.0	9.0	12.0
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	6760	4380	6500	4190	6140	3870	6070	4980	6500
5	Nominal torque (max. continuous torque)	mNm	1.48	1.47	1.48	1.47	1.50	1.57	1.53	1.54	1.54
6	Nominal current (max. continuous current)	A	0.705	0.578	0.460	0.378	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	Starting current	A	1.44	0.963	0.919	0.619	0.660	0.458	0.444	0.371	0.360
9	Max. efficiency	%	76	75	76	74	76	75	76	76	77
Characteristics											
10	Terminal resistance	Ω	2.08	3.11	4.90	7.27	9.09	13.1	20.3	24.3	33.3
11	Terminal inductance	mH	0.0173	0.0253	0.0402	0.0586	0.0766	0.120	0.178	0.215	0.299
12	Torque constant	mNm / A	2.16	2.62	3.30	3.99	4.56	5.70	6.95	7.63	9.00
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	4.60	4.58	4.57	4.57	4.55	4.54	4.56	4.54	4.53
16	Rotor inertia	gcm ²	0.103	0.101	0.102	0.0998	0.104	0.112	0.109	0.109	0.110

Specifications	Operating Range	Comments
<p>Thermal data</p> <p>17 Thermal resistance housing-ambient 37.5 K / W</p> <p>18 Thermal resistance winding-housing 9.0 K / W</p> <p>19 Thermal time constant winding 2.21 s</p> <p>20 Thermal time constant motor 188 s</p> <p>21 Ambient temperature -20 ... +65°C</p> <p>22 Max. permissible winding temperature +85°C</p> <p>Mechanical data (sleeve bearings)</p> <p>23 Max. permissible speed 19000 rpm</p> <p>24 Axial play 0.05 - 0.15 mm</p> <p>25 Radial play 0.012 mm</p> <p>26 Max. axial load (dynamic) 0.15 N</p> <p>27 Max. force for press fits (static) 15 N</p> <p>28 Max. radial loading, 4 mm from flange 0.4 N</p>	<p>Operating Range</p>	<p>Continuous operation</p> <p>In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.</p> <p>Short term operation</p> <p>The motor may be briefly overloaded (recurring).</p> <p>Assigned power rating</p>

maxon Modular System	Overview on page 16 - 21
<p>29 Number of pole pairs 1</p> <p>30 Number of commutator segments 7</p> <p>31 Weight of motor 10 g</p> <p>Values listed in the table are nominal. Explanation of the figures on page 49.</p>	<p>Planetary Gearhead \varnothing10 mm 0.005 - 0.1 Nm Page 214</p> <p>Planetary Gearhead \varnothing10 mm 0.01 - 0.15 Nm Page 215</p> <p>Recommended Electronics: LSC 30/2 Page 276 Notes 18</p>

RE 10 \varnothing 10 mm, Precious Metal Brushes, 1.5 Watt, CE approved



M 1:1

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

Order Number

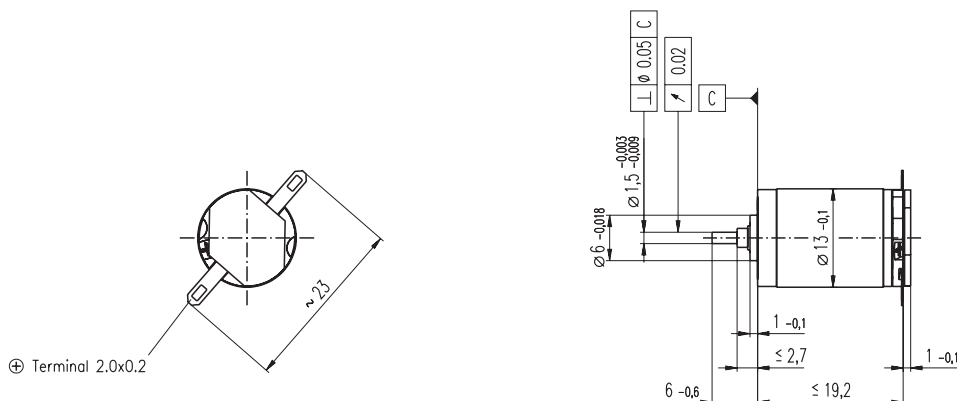
256096 256097 256099 256100 256101 256102 256103 256104 256105

Motor Data		256096	256097	256099	256100	256101	256102	256103	256104	256105	
Values at nominal voltage											
1	Nominal voltage	V	2.4	2.4	4.5	4.5	6.0	7.2	9.0	10.0	12.0
2	No load speed	rpm	10400	8550	12800	10600	12400	11900	12200	12300	12500
3	No load current	mA	21.7	17.0	15.1	11.8	10.8	8.55	7.06	6.45	5.50
4	Nominal speed	rpm	4100	2180	6500	4190	6140	5890	6070	6240	6500
5	Nominal torque (max. continuous torque)	mNm	1.49	1.48	1.48	1.47	1.50	1.56	1.53	1.53	1.54
6	Nominal current (max. continuous current)	A	0.707	0.579	0.460	0.378	0.338	0.281	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	Starting current	A	1.15	0.771	0.919	0.619	0.660	0.549	0.444	0.412	0.360
9	Max. efficiency	%	75	73	76	75	76	77	77	77	77
Characteristics											
10	Terminal resistance	Ω	2.08	3.11	4.90	7.27	9.09	13.1	20.3	24.3	33.3
11	Terminal inductance	mH	0.0173	0.0253	0.0402	0.0586	0.0766	0.120	0.178	0.215	0.299
12	Torque constant	mNm / A	2.16	2.62	3.30	3.99	4.56	5.70	6.95	7.63	9.00
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	4.60	4.58	4.57	4.57	4.55	4.54	4.56	4.54	4.53
16	Rotor inertia	gcm ²	0.103	0.101	0.102	0.0998	0.104	0.112	0.109	0.109	0.110

Specifications	Operating Range	Comments
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 2.21 s 20 Thermal time constant motor 188 s 21 Ambient temperature -20 ... +65°C 22 Max. permissible winding temperature +85°C Mechanical data (sleeve bearings) 23 Max. permissible 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 loading, 4 mm from flange 0.4 N	Operating Range 	Comments <div style="background-color: red; width: 15px; height: 10px; display: inline-block; margin-right: 5px;"></div> Continuous operation In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit. <div style="border: 1px solid black; width: 15px; height: 10px; display: inline-block; margin-right: 5px;"></div> Short term operation The motor may be briefly overloaded (recurring). — Assigned power rating

Other specifications	maxon Modular System	Overview on page 16 - 21
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 49.	Planetary Gearhead \varnothing 10 mm 0.005 - 0.1 Nm Page 214 Planetary Gearhead \varnothing 10 mm 0.01 - 0.15 Nm Page 215	

RE 13 \varnothing 13 mm, Precious Metal Brushes, 1.2 Watt, $\text{C}\epsilon$ approved



M 1:1

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

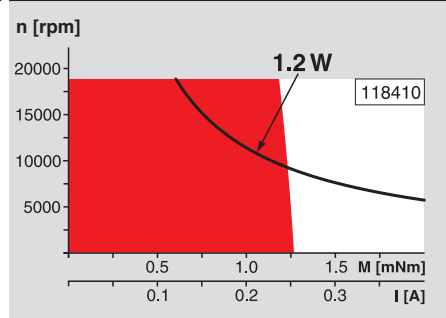
Order Number

Motor Data	118401	118402	118403	118404	118405	118406	118407	118408	118409	118410	118411	118412	118413	118414	118415
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Values at nominal voltage		1.0	1.2	1.5	1.8	2.4	3.0	3.6	4.2	5.0	6.0	8.0	9.0	10.0	12.0	15.0	
1 Nominal voltage	V	1.0	1.2	1.5	1.8	2.4	3.0	3.6	4.2	5.0	6.0	8.0	9.0	10.0	12.0	15.0	
2 No load speed	rpm	11600	11300	11100	11000	11300	11600	12100	11500	11300	11000	11700	10600	11100	11200	10700	
3 No load current	mA	104	84.0	65.6	53.8	42.0	34.5	30.6	24.5	20.1	16.0	13.2	10.3	9.76	8.31	6.20	
4 Nominal speed	rpm	9580	8370	7540	6480	5890	6300	7020	6390	6100	5740	6510	5310	5700	5930	5300	
5 Nominal torque (max. continuous torque)	mNm	0.500	0.631	0.826	1.02	1.24	1.28	1.32	1.32	1.30	1.31	1.29	1.28	1.27	1.28	1.27	
6 Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.669	0.563	0.505	0.410	0.334	0.270	0.215	0.172	0.159	0.136	0.103	
7 Stall torque	mNm	2.95	2.48	2.61	2.54	2.64	2.87	3.20	3.02	2.87	2.80	2.95	2.62	2.67	2.75	2.58	
8 Starting current	A	3.68	2.53	2.10	1.68	1.35	1.19	1.16	0.890	0.701	0.551	0.467	0.334	0.319	0.278	0.198	
9 Max. efficiency	%	70	67	68	68	68	69	71	70	70	69	70	69	69	69	68	
Characteristics																	
10 Terminal resistance	Ω	0.272	0.474	0.716	1.07	1.78	2.51	3.11	4.72	7.14	10.9	17.1	26.9	31.4	43.1	75.8	
11 Terminal inductance	mH	0.0061	0.0091	0.0147	0.0216	0.0362	0.0545	0.0719	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59	
12 Torque constant	mNm / A	0.802	0.980	1.25	1.51	1.96	2.41	2.76	3.39	4.10	5.08	6.33	7.84	8.38	9.89	13.0	
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	4040	4710	4390	4470	4420	4140	3890	3930	4060	4030	4090	4180	4270	4210	4270	
15 Mechanical time constant	ms	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.9	12.9	12.9	13.0	13.1	13.0	13.0	13.1	
16 Rotor inertia	gcm ²	0.356	0.290	0.298	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.295	0.292	

Specifications	Operating Range	Comments
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Thermal data	
17 Thermal resistance housing-ambient	46 K / W
18 Thermal resistance winding-housing	14 K / W
19 Thermal time constant winding	5.14 s
20 Thermal time constant motor	276 s
21 Ambient temperature	-20 ... +65°C
22 Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. permissible 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) (static, shaft supported)	15 N / 170 N
28 Max. radial loading, 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



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

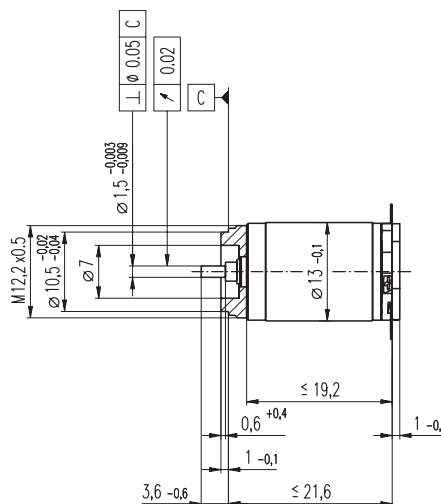
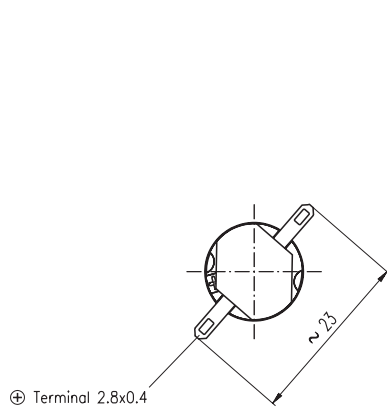
Short term operation
The motor may be briefly overloaded (recurring).

Assigned power rating

Values listed in the table are nominal.
Explanation of the figures on page 49.

Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 13 \varnothing 13 mm, Precious Metal Brushes, 1.2 Watt, $\text{C}\epsilon$ approved



M 1:1

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

Order Number

118416	118417	118418	118419	118420	118421	118422	118423	118424	118425	118426	118427	118428	118429	118430
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Motor Data		118416	118417	118418	118419	118420	118421	118422	118423	118424	118425	118426	118427	118428	118429	118430
Values at nominal voltage																
1	Nominal voltage	V	1.0	1.2	1.5	1.8	2.4	3.0	3.6	4.2	5.0	6.0	8.0	9.0	10.0	15.0
2	No load speed	rpm	11600	11300	11100	11000	11300	11600	12100	11500	11300	11000	11700	10600	11100	10700
3	No load current	mA	104	84.0	65.6	53.8	42.0	34.5	30.6	24.5	20.1	16.0	13.2	10.3	9.76	6.20
4	Nominal speed	rpm	9580	8370	7540	6480	5890	6300	7020	6390	6100	5740	6510	5310	5700	5300
5	Nominal torque (max. continuous torque)	mNm	0.500	0.631	0.826	1.02	1.24	1.28	1.32	1.32	1.30	1.31	1.29	1.28	1.27	1.27
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.669	0.563	0.505	0.410	0.334	0.270	0.215	0.172	0.159	0.103
7	Stall torque	mNm	2.95	2.48	2.61	2.54	2.64	2.87	3.20	3.02	2.87	2.80	2.95	2.62	2.67	2.58
8	Starting current	A	3.68	2.53	2.10	1.68	1.35	1.19	1.16	0.890	0.701	0.551	0.467	0.334	0.319	0.198
9	Max. efficiency	%	70	67	68	68	68	69	71	70	70	69	70	69	69	68
Characteristics																
10	Terminal resistance	Ω	0.272	0.474	0.716	1.07	1.78	2.51	3.11	4.72	7.14	10.9	17.1	26.9	31.4	75.8
11	Terminal inductance	mH	0.0061	0.0091	0.0147	0.0216	0.0362	0.0545	0.0719	0.108	0.158	0.243	0.377	0.579	0.661	1.59
12	Torque constant	mNm / A	0.802	0.980	1.25	1.51	1.96	2.41	2.76	3.39	4.10	5.08	6.33	7.84	8.38	13.0
13	Speed constant	rpm / V	11900	9740	7650	6300	4870	3970	3460	2820	2330	1880	1510	1220	1140	734
14	Speed / torque gradient	rpm / mNm	4040	4710	4390	4470	4420	4140	3890	3930	4060	4030	4090	4180	4270	4270
15	Mechanical time constant	ms	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.9	12.9	12.9	13.0	13.1	13.0	13.1
16	Rotor inertia	gcm ²	0.356	0.290	0.298	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.292

Specifications

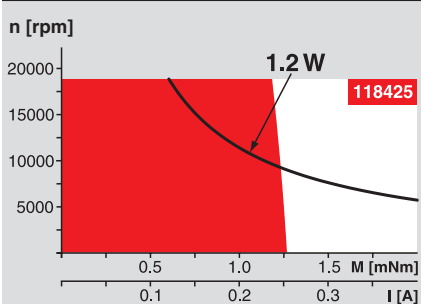
- Thermal data**
- 17 Thermal resistance housing-ambient 46 K / W
 - 18 Thermal resistance winding-housing 14 K / W
 - 19 Thermal time constant winding 5.14 s
 - 20 Thermal time constant motor 345 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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) (static, shaft supported) 15 N
 - 28 Max. radial loading, 5 mm from flange 170 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 49.

Operating Range



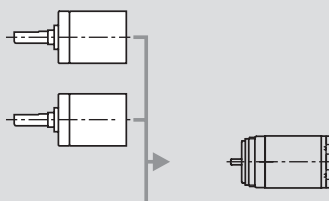
Comments

- 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

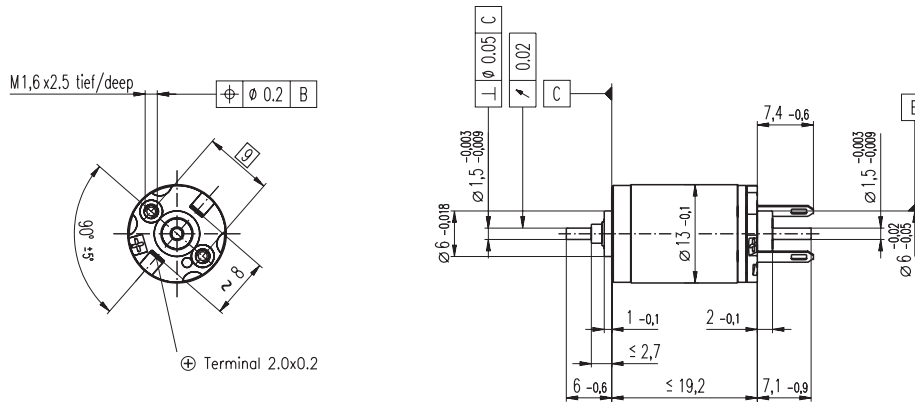
Overview on page 16 - 21

- 1 **Planetary Gearhead**
 \varnothing 13 mm
0.05 - 0.15 Nm
Page 217
- 7 **Planetary Gearhead**
 \varnothing 13 mm
0.2 - 0.35 Nm
Page 218



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 13 \varnothing 13 mm, Precious Metal Brushes, 0.75 Watt, $\text{C}\epsilon$ approved



M 1:1

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

Order Number

118431	118432	118433	118434	118435	118436	118437	118438	118439	118440	118441	118442	118443	118444	118445
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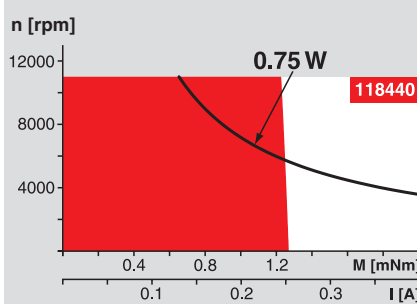
Motor Data		118431	118432	118433	118434	118435	118436	118437	118438	118439	118440	118441	118442	118443	118444	118445	
Values at nominal voltage																	
1	Nominal voltage	V	0.6	0.72	0.9	1.2	1.5	1.8	1.8	2.4	3.0	3.6	4.8	6.0	6.0	7.2	10.0
2	No load speed	rpm	6860	6680	6580	7240	6990	6850	5960	6490	6700	6490	6950	7010	6540	6660	7040
3	No load current	mA	88.1	71.6	56.1	47.3	36.2	29.4	24.7	20.6	17.1	13.7	11.2	9.06	8.34	7.09	5.47
4	Nominal speed	rpm	4810	3690	2940	2690	1460	1490	2980	1560	1390	1500	1620	1620	1430	3330	1590
5	Nominal torque (max. continuous torque)	mNm	0.512	0.643	0.838	1.03	1.27	1.31	0.774	1.27	1.32	1.25	1.32	1.30	1.21	0.799	1.29
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.674	0.568	0.302	0.391	0.337	0.257	0.217	0.173	0.151	0.087	0.103
7	Stall torque	mNm	1.77	1.49	1.57	1.69	1.65	1.72	1.60	1.72	1.68	1.77	1.75	1.60	1.65	1.65	1.72
8	Starting current	A	2.21	1.52	1.26	1.12	0.843	0.717	0.579	0.509	0.420	0.331	0.280	0.223	0.191	0.167	0.132
9	Max. efficiency	%	64	62	63	64	63	64	63	64	64	64	64	64	63	63	64
Characteristics																	
10	Terminal resistance	Ω	0.272	0.474	0.716	1.07	1.78	2.51	3.11	4.72	7.14	10.9	17.1	26.9	31.4	43.1	75.8
11	Terminal inductance	mH	0.0061	0.0091	0.0147	0.0216	0.0362	0.0545	0.0719	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59
12	Torque constant	mNm / A	0.802	0.980	1.25	1.51	1.96	2.41	2.76	3.39	4.10	5.08	6.33	7.84	8.38	9.89	13.0
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	4040	4710	4390	4470	4420	4140	3890	3930	4060	4030	4090	4180	4270	4210	4270
15	Mechanical time constant	ms	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.9	12.9	12.9	13.0	13.1	13.0	13.0	13.1
16	Rotor inertia	gcm ²	0.356	0.290	0.298	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.295	0.292

Specifications

Thermal data		
17	Thermal resistance housing-ambient	46 K / W
18	Thermal resistance winding-housing	14 K / W
19	Thermal time constant winding	5.14 s
20	Thermal time constant motor	345 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static) (static, shaft supported)	15 N
28	Max. radial loading, 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 49.

Operating Range

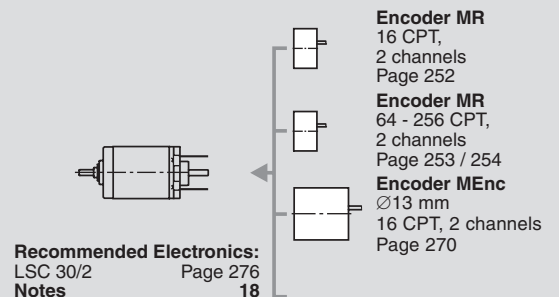


Comments

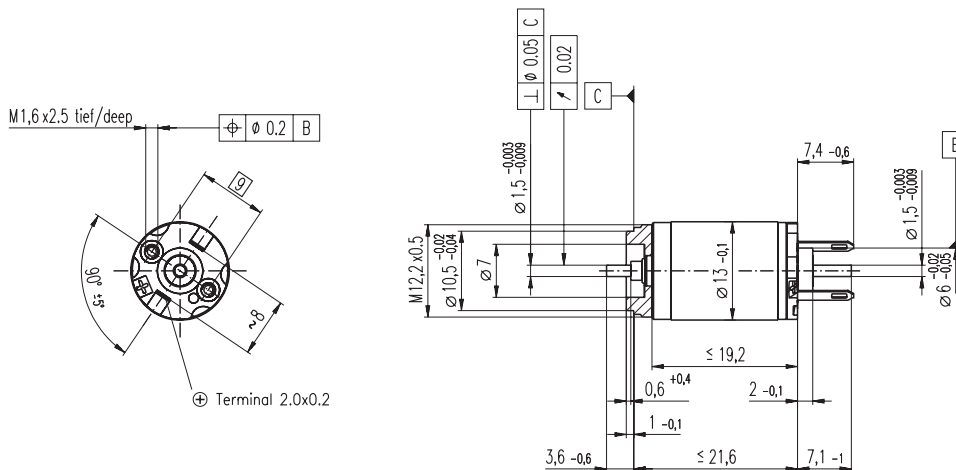
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

maxon Modular System

Overview on page 16 - 21



RE 13 $\varnothing 13$ mm, Precious Metal Brushes, 0.75 Watt, CE approved



M 1:1

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

Order Number

Motor Data	118446	118447	118448	118449	118450	118451	118452	118453	118454	118455	118456	118457	118458	118459	118460	
Values at nominal voltage																
1 Nominal voltage	V	0.6	0.7	0.9	1.2	1.5	1.8	1.8	2.4	3.0	3.6	4.8	6.0	6.0	7.2	10.0
2 No load speed	rpm	6860	6490	6580	7240	6990	6850	5960	6490	6700	6490	6950	7010	6540	6660	7040
3 No load current	mA	88.1	71.1	56.1	47.3	36.2	29.4	24.7	20.6	17.1	13.7	11.2	9.06	8.34	7.09	5.47
4 Nominal speed	rpm	4810	3500	2940	2690	1460	1490	2980	1560	1390	1500	1620	1620	1430	3330	1590
5 Nominal torque (max. continuous torque)	mNm	0.512	0.644	0.838	1.03	1.27	1.31	0.774	1.27	1.32	1.25	1.32	1.30	1.21	0.799	1.29
6 Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.674	0.568	0.302	0.391	0.337	0.257	0.217	0.173	0.151	0.087	0.103
7 Stall torque	mNm	1.77	1.45	1.57	1.69	1.65	1.72	1.60	1.72	1.68	1.77	1.75	1.60	1.65	1.72	
8 Starting current	A	2.21	1.48	1.26	1.12	0.843	0.717	0.579	0.509	0.420	0.331	0.280	0.223	0.191	0.167	0.132
9 Max. efficiency	%	64	61	63	64	63	64	63	64	64	64	64	64	63	63	64
Characteristics																
10 Terminal resistance	Ω	0.272	0.474	0.716	1.07	1.78	2.51	3.11	4.72	7.14	10.9	17.1	26.9	31.4	43.1	75.8
11 Terminal inductance	mH	0.0061	0.0091	0.0147	0.0216	0.0362	0.0545	0.0719	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.59
12 Torque constant	mNm / A	0.802	0.980	1.25	1.51	1.96	2.41	2.76	3.39	4.10	5.08	6.33	7.84	8.38	9.89	13.0
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	4040	4710	4390	4470	4420	4140	3890	3930	4060	4030	4090	4180	4270	4210	4270
15 Mechanical time constant	ms	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.9	12.9	12.9	13.0	13.1	13.0	13.0	13.1
16 Rotor inertia	gcm ²	0.356	0.290	0.298	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.295	0.292

Specifications

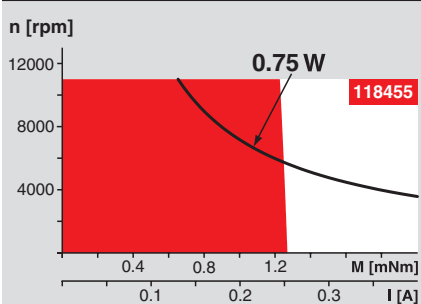
- Thermal data**
- 17 Thermal resistance housing-ambient 46 K / W
 - 18 Thermal resistance winding-housing 14 K / W
 - 19 Thermal time constant winding 5.14 s
 - 20 Thermal time constant motor 345 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 11000 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.014 mm
 - 26 Max. axial load (dynamic) 0.8 N
 - 27 Max. force for press fits (static) (static, shaft supported) 15 N
 - 28 Max. radial loading, 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 49.

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).

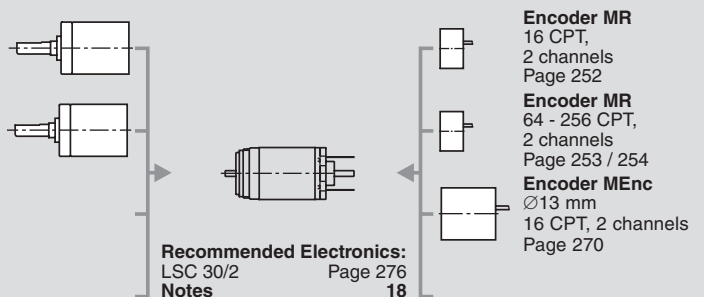
— Assigned power rating

maxon Modular System

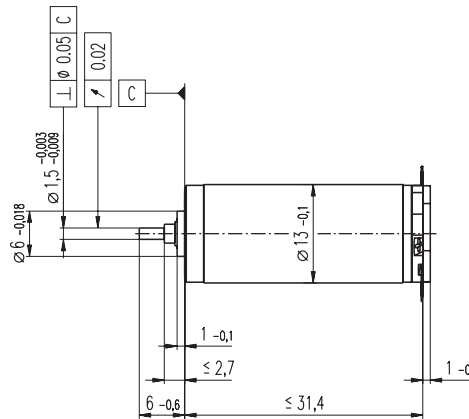
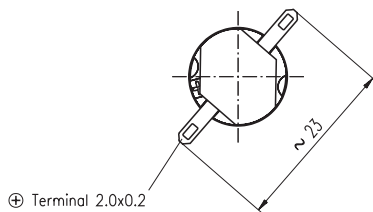
Overview on page 16 - 21

Planetary Gearhead
 $\varnothing 13$ mm
0.05 - 0.15 Nm
Page 217

Planetary Gearhead
 $\varnothing 13$ mm
0.2 - 0.35 Nm
Page 218



RE 13 $\varnothing 13$ mm, Precious Metal Brushes, 2.5 Watt, $\text{C}\epsilon$ approved



M 1:1

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

Order Number

118461	118462	118463	118464	118465	118466	118467	118468	118469	118470	118471	118472	118473	118474	118475
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Motor Data

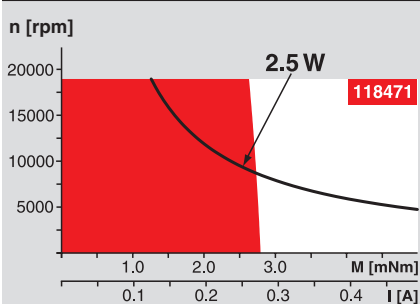
Values at nominal voltage		118461	118462	118463	118464	118465	118466	118467	118468	118469	118470	118471	118472	118473	118474	118475	
1	Nominal voltage	V	2.4	3.0	3.0	3.6	4.8	4.8	6.0	7.2	8.0	10.0	12.0	15.0	15.0	18.0	24.0
2	No load speed	rpm	10500	12200	10700	10800	11400	10100	11400	11400	10900	11400	11000	11100	10300	10600	11500
3	No load current	mA	51.3	50.7	41.9	35.5	28.7	24.3	23.0	19.1	16.1	13.8	11.0	8.85	7.97	6.89	5.81
4	Nominal speed	rpm	8990	10300	8350	7930	7800	6390	7620	7700	7290	7760	7370	7460	6610	6910	7790
5	Nominal torque (max. continuous torque)	mNm	1.45	1.56	1.81	2.16	2.76	2.85	2.79	2.85	2.97	2.90	2.89	2.90	2.88	2.90	2.84
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.720	0.658	0.582	0.494	0.441	0.362	0.291	0.235	0.217	0.186	0.149
7	Stall torque	mNm	9.96	10.2	8.35	8.26	8.82	7.79	8.52	8.85	9.11	9.17	8.79	8.91	8.14	8.45	8.88
8	Starting 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	3.50	4.85	6.11	9.03	14.0	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.0213	0.0247	0.0323	0.0456	0.0727	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.870	1.19	1.79
12	Torque constant	mNm / A	2.15	2.32	2.65	3.15	3.97	4.47	4.97	5.96	6.95	8.28	10.3	12.7	13.7	16.1	19.7
13	Speed constant	rpm / V	4440	4120	3610	3040	2400	2140	1920	1600	1370	1150	930	749	695	595	485
14	Speed / torque gradient	rpm / mNm	1070	1210	1290	1320	1310	1320	1350	1300	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.58	7.48	7.39	7.31	7.22	7.20	7.22	7.17	7.10	7.14	7.15	7.15	7.15	7.16	7.21
16	Rotor inertia	gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.540	0.526

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	4.85 s
20	Thermal time constant motor	346 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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) (static, shaft supported)	15 N / 95 N
28	Max. radial loading, 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 49.

Operating Range

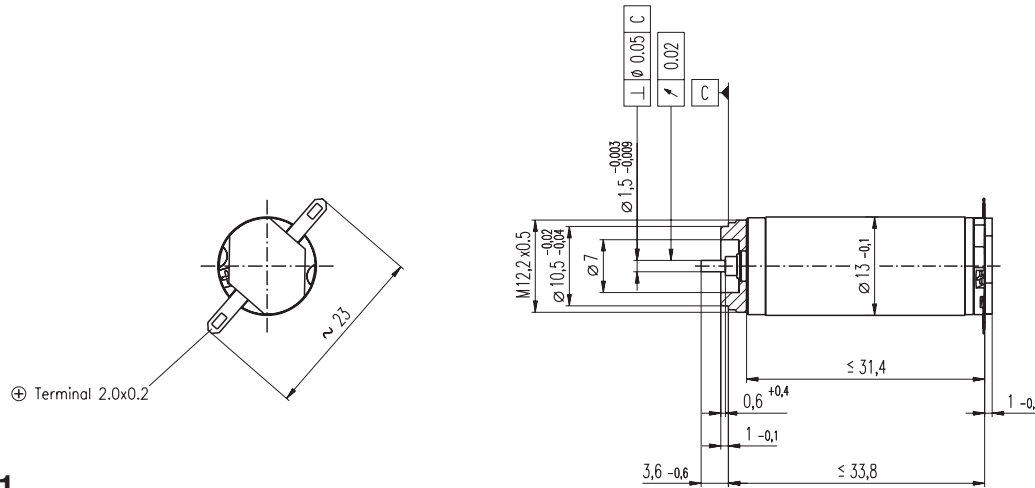


Comments

- 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**

Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 13 \varnothing 13 mm, Precious Metal Brushes, 2.5 Watt, CE approved



M 1:1

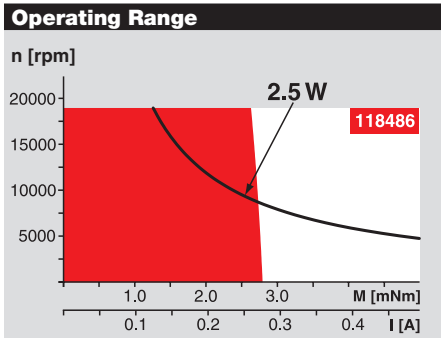
- Stock program
- Standard program
- Special program (on request)

Order Number

Motor Data	118476	118477	118478	118479	118480	118481	118482	118483	118484	118485	118486	118487	118488	118489	118490
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Values at nominal voltage		118476	118477	118478	118479	118480	118481	118482	118483	118484	118485	118486	118487	118488	118489	118490	
1 Nominal voltage		V	2.4	3.0	3.0	3.6	4.8	4.8	6.0	7.2	8.0	10.0	12.0	15.0	15.0	18.0	24.0
2 No load speed		rpm	10500	12200	10700	10800	11400	10100	11400	11400	10900	11400	11000	11100	10300	10600	11500
3 No load current		mA	51.3	50.7	41.9	35.5	28.7	24.3	23.0	19.1	16.1	13.8	11.0	8.85	7.97	6.89	5.81
4 Nominal speed		rpm	8990	10300	8350	7930	7800	6390	7620	7700	7290	7760	7370	7460	6610	6910	7790
5 Nominal torque (max. continuous torque)		mNm	1.45	1.56	1.81	2.16	2.76	2.85	2.79	2.85	2.97	2.90	2.89	2.90	2.88	2.90	2.84
6 Nominal current (max. continuous current)		A	0.720	0.720	0.720	0.720	0.720	0.658	0.582	0.494	0.441	0.362	0.291	0.235	0.217	0.186	0.149
7 Stall torque		mNm	9.96	10.2	8.35	8.26	8.82	7.79	8.52	8.85	9.11	9.17	8.79	8.91	8.14	8.45	8.88
8 Starting 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	3.50	4.85	6.11	9.03	14.0	21.5	25.3	34.2	53.2
11 Terminal inductance		mH	0.0213	0.0247	0.0323	0.0456	0.0727	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.870	1.19	1.79
12 Torque constant		mNm / A	2.15	2.32	2.65	3.15	3.97	4.47	4.97	5.96	6.95	8.28	10.3	12.7	13.7	16.1	19.7
13 Speed constant		rpm / V	4440	4120	3610	3040	2400	2140	1920	1600	1370	1150	930	749	695	595	485
14 Speed / torque gradient		rpm / mNm	1070	1210	1290	1320	1310	1320	1350	1300	1210	1260	1270	1260	1280	1270	1310
15 Mechanical time constant		ms	7.58	7.48	7.39	7.31	7.22	7.20	7.22	7.17	7.10	7.14	7.15	7.15	7.15	7.16	7.21
16 Rotor inertia		gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.540	0.526

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	4.85 s
20 Thermal time constant motor	346 s
21 Ambient temperature	-20 ... +65°C
22 Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. permissible 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) (static, shaft supported)	15 N / 95 N
28 Max. radial loading, 5 mm from flange	1.4 N
Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	21 g



Comments

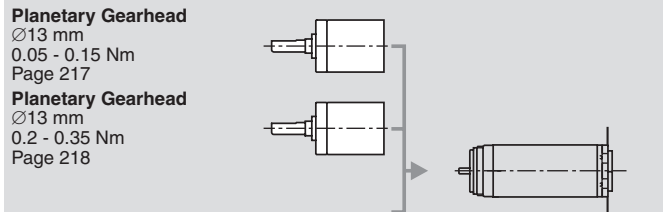
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— **Assigned power rating**

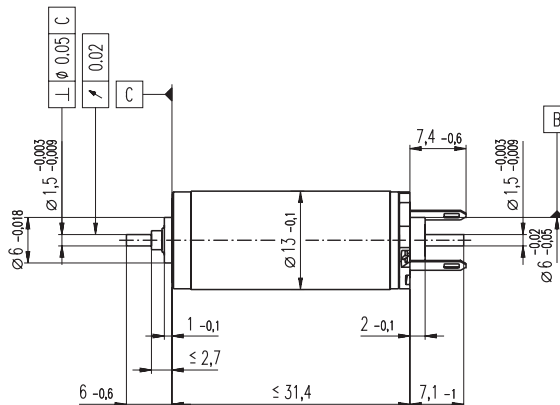
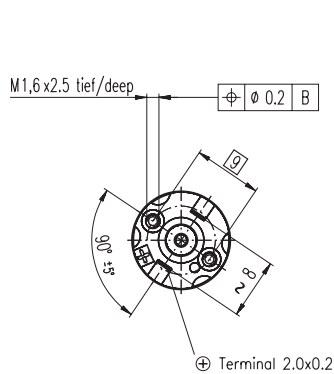
maxon Modular System Overview on page 16 - 21

1	Planetary Gearhead
7	\varnothing 13 mm
0.05 - 0.15 Nm	
Page 217	
1	Planetary Gearhead
7	\varnothing 13 mm
0.2 - 0.35 Nm	
Page 218	



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 13 $\varnothing 13$ mm, Precious Metal Brushes, 2 Watt, C€ approved



M 1:1

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

Order Number

118491	118492	118493	118494	118495	118496	118497	118498	118499	118500	118501	118502	118503	118504	118505
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Motor Data

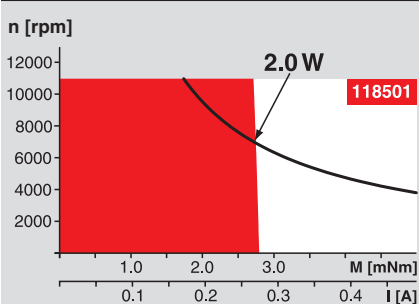
		118491	118492	118493	118494	118495	118496	118497	118498	118499	118500	118501	118502	118503	118504	118505	
Values at nominal voltage																	
1	Nominal voltage	V	1.5	1.5	1.8	2.4	3.0	3.0	3.6	4.2	4.8	6.0	7.2	9.0	10.0	12.0	15.0
2	No load speed	rpm	6560	6070	6370	7160	7080	6290	6790	6610	6480	6800	6580	6620	6830	7010	7140
3	No load current	mA	43.7	39.7	35.2	30.7	24.2	20.8	19.1	15.8	13.5	11.5	9.17	7.40	6.93	5.97	4.90
4	Nominal speed	rpm	5000	4170	4020	4290	3470	2510	2970	2850	2860	3110	2870	2930	3110	3320	3390
5	Nominal torque (max. continuous torque)	mNm	1.46	1.58	1.82	2.18	2.78	2.88	2.84	2.90	3.01	2.95	2.93	2.94	2.92	2.93	2.88
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.720	0.663	0.587	0.499	0.445	0.366	0.293	0.237	0.218	0.188	0.150
7	Stall torque	mNm	6.22	5.12	5.01	5.51	5.51	4.87	5.11	5.16	5.47	5.5	5.27	5.34	5.42	5.64	5.55
8	Starting 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	3.50	4.85	6.11	9.03	14.0	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.0213	0.0247	0.0323	0.0456	0.0727	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.870	1.19	1.79
12	Torque constant	mNm / A	2.15	2.32	2.65	3.15	3.97	4.47	4.97	5.96	6.95	8.28	10.3	12.7	13.7	16.1	19.7
13	Speed constant	rpm / V	4440	4120	3610	3040	2400	2140	1920	1600	1370	1150	930	749	695	595	485
14	Speed / torque gradient	rpm / mNm	1070	1210	1290	1320	1310	1320	1350	1300	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.58	7.48	7.39	7.31	7.22	7.20	7.22	7.17	7.10	7.14	7.15	7.15	7.15	7.16	7.21
16	Rotor inertia	gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.540	0.526

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 4.85 s
 - 20 Thermal time constant motor 346 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 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 49.

Operating Range

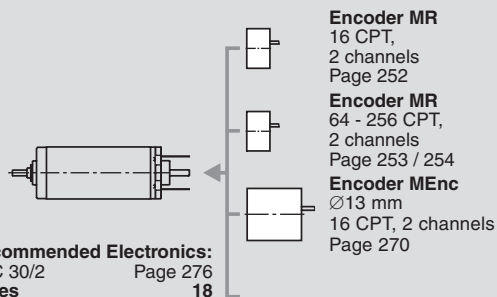


Comments

- 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**

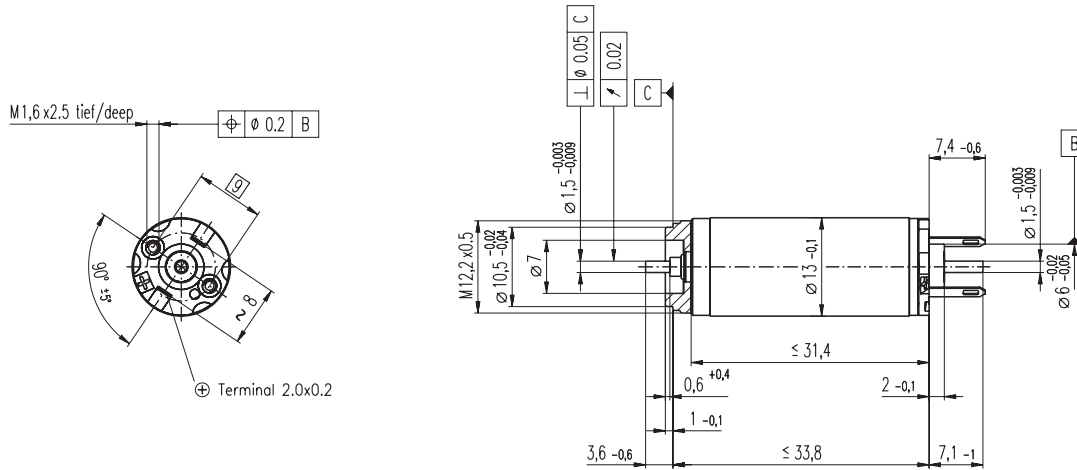
maxon Modular System

Overview on page 16 - 21



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 13 $\varnothing 13$ mm, Precious Metal Brushes, 2 Watt, CE approved



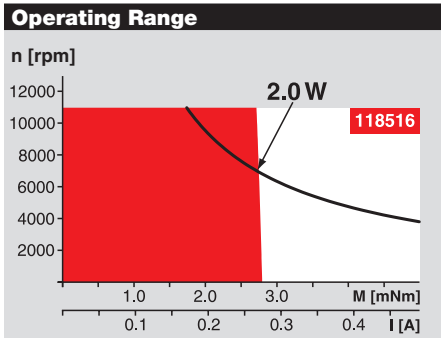
M 1:1

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

Order Number																
118506	118507	118508	118509	118510	118511	118512	118513	118514	118515	118516	118517	118518	118519	118520		

Motor Data		118506	118507	118508	118509	118510	118511	118512	118513	118514	118515	118516	118517	118518	118519	118520	
Values at nominal voltage																	
1	Nominal voltage	V	1.5	1.5	1.8	2.4	3.0	3.0	3.6	4.2	4.8	6.0	7.2	9.0	10.0	12.0	15.0
2	No load speed	rpm	6560	6070	6370	7160	7080	6290	6790	6610	6480	6800	6580	6620	6830	7010	7140
3	No load current	mA	43.7	39.7	35.2	30.7	24.2	20.8	19.1	15.8	13.5	11.5	9.17	7.40	6.93	5.97	4.90
4	Nominal speed	rpm	5000	4170	4020	4290	3470	2510	2970	2850	2860	3110	2870	2930	3110	3320	3390
5	Nominal torque (max. continuous torque)	mNm	1.46	1.58	1.82	2.18	2.78	2.88	2.84	2.90	3.01	2.95	2.93	2.94	2.92	2.93	2.88
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.720	0.663	0.587	0.499	0.445	0.366	0.293	0.237	0.218	0.188	0.150
7	Stall torque	mNm	6.22	5.12	5.01	5.51	5.51	4.87	5.11	5.16	5.47	5.50	5.27	5.34	5.42	5.64	5.55
8	Starting 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	3.50	4.85	6.11	9.03	14.0	21.5	25.3	34.2	53.2
11	Terminal inductance	mH	0.0213	0.0247	0.0323	0.0456	0.0727	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.870	1.19	1.79
12	Torque constant	mNm / A	2.15	2.32	2.65	3.15	3.97	4.47	4.97	5.96	6.95	8.28	10.3	12.7	13.7	16.1	19.7
13	Speed constant	rpm / V	4440	4120	3610	3040	2400	2140	1920	1600	1370	1150	930	749	695	595	485
14	Speed / torque gradient	rpm / mNm	1070	1210	1290	1320	1310	1320	1350	1300	1210	1260	1270	1260	1280	1270	1310
15	Mechanical time constant	ms	7.58	7.48	7.39	7.31	7.22	7.20	7.22	7.17	7.10	7.14	7.15	7.15	7.15	7.16	7.21
16	Rotor inertia	gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.540	0.526

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	4.85 s
20	Thermal time constant motor	346 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static) (static, shaft supported)	15 N / 95 N
28	Max. radial loading, 5 mm from flange	1.4 N



Comments

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

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

— **Assigned power rating**

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

Values listed in the table are nominal.
Explanation of the figures on page 49.

maxon Modular System

Planetary Gearhead
 $\varnothing 13$ mm
0.05 - 0.15 Nm
Page 217

Planetary Gearhead
 $\varnothing 13$ mm
0.2 - 0.35 Nm
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Overview on page 16 - 21

Encoder MR
16 CPT,
2 channels
Page 252

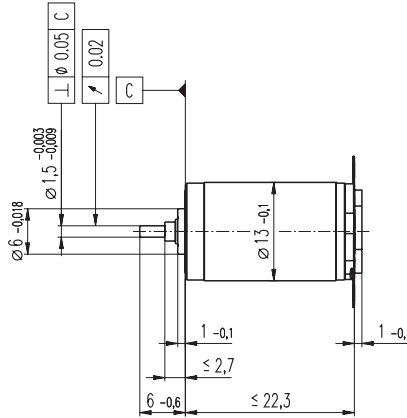
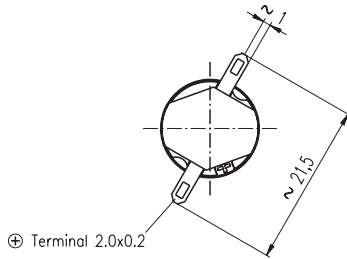
Encoder MR
64 - 256 CPT,
2 channels
Page 253 / 254

Encoder MEnc
 $\varnothing 13$ mm
16 CPT, 2 channels
Page 270

Recommended Electronics:
LSC 30/2
Notes

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18

RE 13 \varnothing 13 mm, Graphite Brushes, 1.5 Watt



M 1:1

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

Order Number

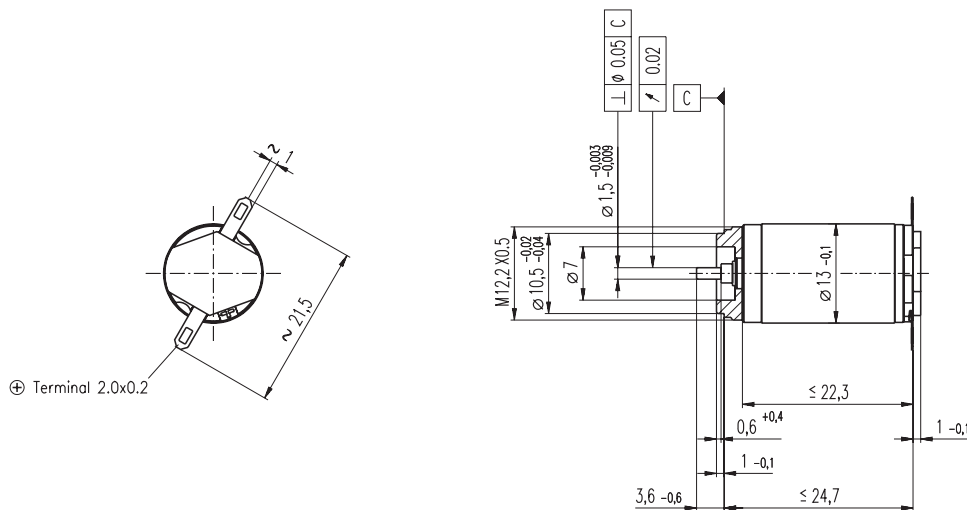
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Motor Data		118521	118522	118523	118524	118525	118526	118527	118528	118529	118530	118531	118532	118533	118534	118535	
Values at nominal voltage																	
1	Nominal voltage	V	1.2	1.5	2.4	3.0	3.6	4.2	4.8	6.0	7.2	9.0	12.0	12.0	15.0	18.0	20.0
2	No load speed	rpm	12800	12900	13600	13200	13000	13300	12300	12700	12300	12300	13300	12400	13200	14000	13300
3	No load current	mA	472	388	257	196	158	139	110	92.2	73.5	59.0	49.1	44.6	38.8	35.1	29.6
4	Nominal speed	rpm	11900	11200	10300	8420	7770	8270	7180	7550	7100	7110	8150	7060	7990	9010	8150
5	Nominal torque (max. continuous torque)	mNm	0.205	0.337	0.724	1.06	1.24	1.28	1.30	1.27	1.29	1.28	1.23	1.25	1.23	1.23	1.22
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.66	0.591	0.486	0.394	0.321	0.256	0.202	0.189	0.160	0.142	0.121
7	Stall torque	mNm	3.13	2.85	3.21	3.17	3.32	3.61	3.34	3.35	3.27	3.24	3.41	3.13	3.36	3.65	3.35
8	Starting current	A	4.00	2.97	2.17	1.65	1.41	1.34	1.01	0.836	0.658	0.524	0.445	0.382	0.347	0.333	0.264
9	Max. efficiency	%	43	41	44	44	45	47	46	45	45	45	45	44	45	47	45
Characteristics																	
10	Terminal resistance	Ω	0.300	0.504	1.11	1.81	2.55	3.14	4.76	7.18	10.9	17.2	27.0	31.4	43.2	54.0	75.8
11	Terminal inductance	mH	0.0061	0.0091	0.0216	0.0362	0.0545	0.0719	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm / A	0.783	0.958	1.48	1.92	2.35	2.70	3.31	4.00	4.96	6.18	7.66	8.18	9.66	11.0	12.7
13	Speed constant	rpm / V	12200	9970	6450	4990	4060	3540	2890	2380	1920	1540	1250	1170	988	871	751
14	Speed / torque gradient	rpm / mNm	4670	5250	4820	4720	4400	4120	4150	4270	4240	4300	4390	4480	4420	4290	4480
15	Mechanical time constant	ms	17.4	15.9	14.5	14.2	13.9	13.7	13.6	13.6	13.6	13.6	13.7	13.7	13.7	13.5	13.7
16	Rotor inertia	gcm ²	0.356	0.290	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.295	0.302	0.292

Specifications	Operating Range	Comments
Thermal data 17 Thermal resistance housing-ambient 46 K / W 18 Thermal resistance winding-housing 14 K / W 19 Thermal time constant winding 5.35 s 20 Thermal time constant motor 345 s 21 Ambient temperature -20 ... +85°C 22 Max. permissible winding temperature +125°C Mechanical data (sleeve bearings) 23 Max. permissible 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 loading, 5 mm from flange 1.4 N Other specifications 29 Number of pole pairs 1 30 Number of commutator segments 7 31 Weight of motor 15 g	Operating Range 	<div style="background-color: red; width: 20px; height: 10px; margin-bottom: 5px;"></div> Continuous operation In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
		<div style="background-color: white; border: 1px solid black; width: 20px; height: 10px; margin-bottom: 5px;"></div> Short term operation The motor may be briefly overloaded (recurring).
		— Assigned power rating

Recommended Electronics:
 LSC 30/2 Page 276
 Notes 18

RE 13 \varnothing 13 mm, Graphite Brushes, 1.5 Watt



M 1:1

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

Order Number

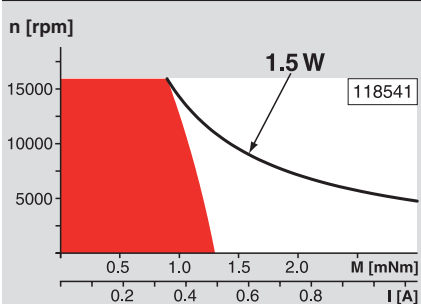
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Motor Data		118536	118537	118538	118539	118540	118541	118542	118543	118544	118545	118546	118547	118548	118549	118550	
Values at nominal voltage																	
1	Nominal voltage	V	1.2	1.5	2.4	3.0	3.6	4.2	4.8	6.0	7.2	9.0	12.0	12.0	15.0	18.0	20.0
2	No load speed	rpm	12800	12900	13600	13200	13000	13300	12300	12300	12300	13300	12400	13200	14000	13300	
3	No load current	mA	472	388	257	196	158	139	110	92.2	73.5	59.0	49.1	44.6	38.8	35.1	29.6
4	Nominal speed	rpm	11900	11200	10300	8420	7770	8270	7180	7550	7100	7110	8150	7060	7990	9010	8150
5	Nominal torque (max. continuous torque)	mNm	0.205	0.337	0.724	1.06	1.24	1.28	1.30	1.27	1.29	1.28	1.23	1.25	1.23	1.23	1.22
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.660	0.591	0.486	0.394	0.321	0.256	0.202	0.189	0.160	0.142	0.121
7	Stall torque	mNm	3.13	2.85	3.21	3.17	3.32	3.61	3.34	3.35	3.27	3.24	3.41	3.13	3.36	3.65	3.35
8	Starting current	A	4.00	2.97	2.17	1.65	1.41	1.34	1.01	0.836	0.658	0.524	0.445	0.382	0.347	0.333	0.264
9	Max. efficiency	%	43	41	44	44	45	47	46	45	45	45	45	44	45	47	45
Characteristics																	
10	Terminal resistance	Ω	0.300	0.504	1.11	1.81	2.55	3.14	4.76	7.18	10.9	17.2	27.0	31.4	43.2	54.0	75.8
11	Terminal inductance	mH	0.0061	0.0091	0.0216	0.0362	0.0545	0.0719	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm / A	0.783	0.958	1.48	1.92	2.35	2.70	3.31	4.00	4.96	6.18	7.66	8.18	9.66	11.0	12.7
13	Speed constant	rpm / V	12200	9970	6450	4990	4060	3540	2890	2380	1920	1540	1250	1170	988	871	751
14	Speed / torque gradient	rpm / mNm	4670	5250	4820	4720	4400	4120	4150	4270	4240	4300	4390	4480	4420	4290	4480
15	Mechanical time constant	ms	17.4	15.9	14.5	14.2	13.9	13.7	13.6	13.6	13.6	13.7	13.7	13.7	13.7	13.5	13.7
16	Rotor inertia	gcm ²	0.356	0.290	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.295	0.302	0.292

Specifications

Thermal data		
17	Thermal resistance housing-ambient	46 K / W
18	Thermal resistance winding-housing	14 K / W
19	Thermal time constant winding	5.35 s
20	Thermal time constant motor	391 s
21	Ambient temperature	-20 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	1.4 N

Operating Range



Comments

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

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	17 g

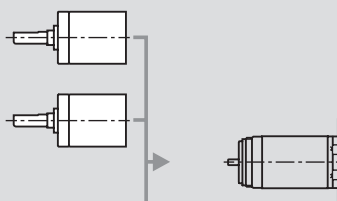
Values listed in the table are nominal.
Explanation of the figures on page 49.

maxon Modular System

Overview on page 16 - 21

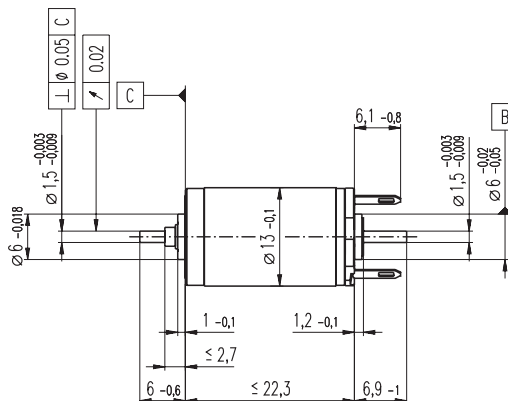
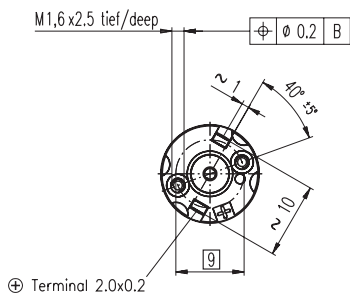
Planetary Gearhead
 \varnothing 13 mm
0.05 - 0.15 Nm
Page 217

Planetary Gearhead
 \varnothing 13 mm
0.2 - 0.35 Nm
Page 218



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 13 \varnothing 13 mm, Graphite Brushes, 1.5 Watt



M 1:1

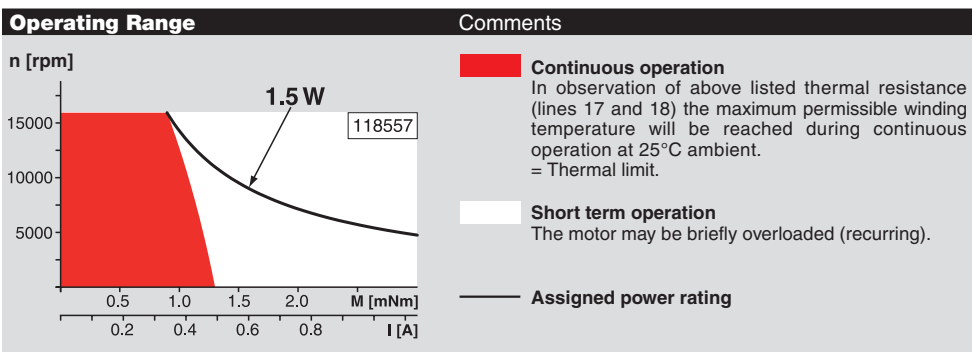
- Stock program
- Standard program
- Special program (on request)

Order Number

Motor Data	118552	118553	118554	118555	118556	118557	118558	118559	118560	118561	118562	118563	118564	118565	118566
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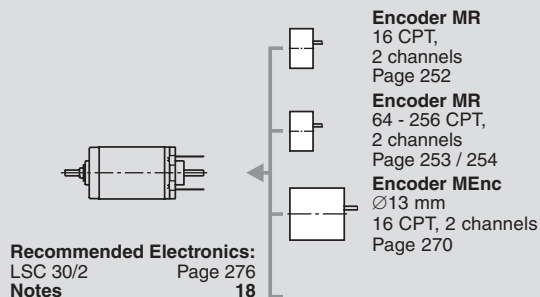
Values at nominal voltage																	
1	Nominal voltage	V	1.2	1.5	2.4	3.0	3.6	4.2	4.8	6.0	7.2	9.0	12.0	12.0	15.0	18.0	20.0
2	No load speed	rpm	12800	12900	13600	13200	13000	13300	12300	12700	12300	12300	13300	12400	13200	14000	13300
3	No load current	mA	472	388	257	196	158	139	110	92.2	73.5	59.0	49.1	44.6	38.8	35.1	29.6
4	Nominal speed	rpm	11900	11200	10300	8420	7770	8270	7180	7550	7100	7110	8150	7060	7990	9010	8150
5	Nominal torque (max. continuous torque)	mNm	0.205	0.337	0.724	1.06	1.24	1.28	1.30	1.27	1.29	1.28	1.23	1.25	1.23	1.23	1.22
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.660	0.591	0.486	0.394	0.321	0.256	0.202	0.189	0.160	0.142	0.121
7	Stall torque	mNm	3.13	2.85	3.21	3.17	3.32	3.61	3.34	3.35	3.27	3.24	3.41	3.13	3.36	3.65	3.35
8	Starting current	A	4.00	2.97	2.17	1.65	1.41	1.34	1.01	0.836	0.658	0.524	0.445	0.382	0.347	0.333	0.264
9	Max. efficiency	%	43	41	44	44	45	47	46	45	45	45	45	44	45	47	45
Characteristics																	
10	Terminal resistance	Ω	0.300	0.504	1.11	1.81	2.55	3.14	4.76	7.18	10.9	17.2	27.0	31.4	43.2	54.0	75.8
11	Terminal inductance	mH	0.0061	0.0091	0.0216	0.0362	0.0545	0.0719	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm / A	0.783	0.958	1.48	1.92	2.35	2.70	3.31	4.00	4.96	6.18	7.66	8.18	9.66	11.0	12.7
13	Speed constant	rpm / V	12200	9970	6450	4990	4060	3540	2890	2380	1920	1540	1250	1170	988	871	751
14	Speed / torque gradient	rpm / mNm	4670	5250	4820	4720	4400	4120	4150	4270	4240	4300	4390	4480	4420	4290	4480
15	Mechanical time constant	ms	17.4	15.9	14.5	14.2	13.9	13.7	13.6	13.6	13.6	13.7	13.7	13.7	13.7	13.5	13.7
16	Rotor inertia	gcm ²	0.356	0.290	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.295	0.302	0.292

Specifications		
Thermal data		
17	Thermal resistance housing-ambient	46 K / W
18	Thermal resistance winding-housing	14 K / W
19	Thermal time constant winding	5.35 s
20	Thermal time constant motor	345 s
21	Ambient temperature	-20 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	16000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static) (static, shaft supported)	15 N / 140 N
28	Max. radial loading, 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

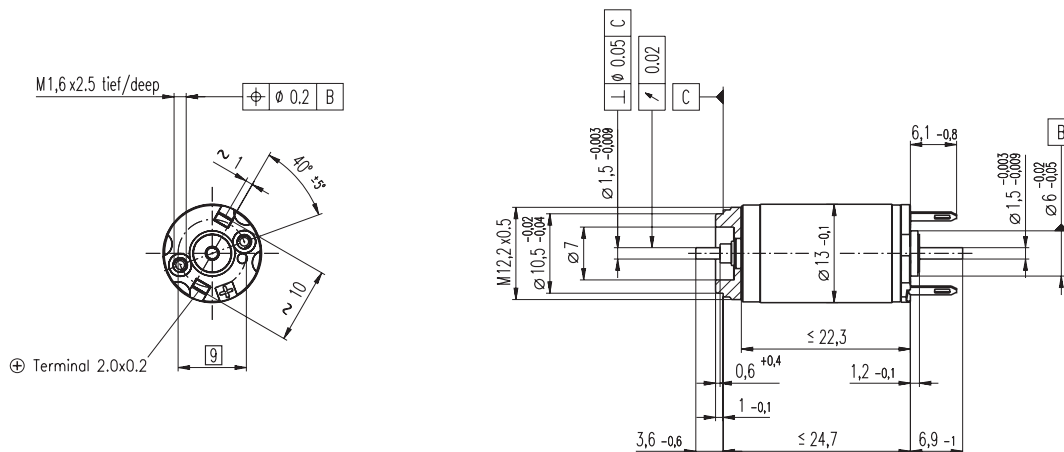


maxon Modular System Overview on page 16 - 21

Values listed in the table are nominal.
Explanation of the figures on page 49.



RE 13 \varnothing 13 mm, Graphite Brushes, 1.5 Watt



M 1:1

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

Order Number

118567	118568	118569	118570	118571	118572	118573	118574	118575	118576	118577	118578	118579	118580	118581
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Motor Data		118567	118568	118569	118570	118571	118572	118573	118574	118575	118576	118577	118578	118579	118580	118581	
Values at nominal voltage																	
1	Nominal voltage	V	1.2	1.5	2.4	3.0	3.6	4.2	4.8	6.0	7.2	9.0	12.0	12.0	15.0	18.0	20.0
2	No load speed	rpm	12800	12900	13600	13200	13000	13300	12300	12700	12300	13300	12400	13200	14000	13300	
3	No load current	mA	472	388	257	196	158	139	110	92.2	73.5	59.0	49.1	44.6	38.8	35.1	29.6
4	Nominal speed	rpm	11900	11200	10300	8420	7770	8270	7180	7550	7100	7110	8150	7060	7990	9010	8150
5	Nominal torque (max. continuous torque)	mNm	0.205	0.337	0.724	1.06	1.24	1.28	1.30	1.27	1.29	1.28	1.23	1.25	1.23	1.23	1.22
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.660	0.591	0.486	0.394	0.321	0.256	0.202	0.189	0.160	0.142	0.121
7	Stall torque	mNm	3.13	2.85	3.21	3.17	3.32	3.61	3.34	3.35	3.27	3.24	3.41	3.13	3.36	3.65	3.35
8	Starting current	A	4.00	2.97	2.17	1.65	1.41	1.34	1.01	0.836	0.658	0.524	0.445	0.382	0.347	0.333	0.264
9	Max. efficiency	%	43	41	44	44	45	47	46	45	45	45	45	44	45	47	45
Characteristics																	
10	Terminal resistance	Ω	0.300	0.504	1.11	1.81	2.55	3.14	4.76	7.18	10.9	17.2	27.0	31.4	43.2	54.0	75.8
11	Terminal inductance	mH	0.0061	0.0091	0.0216	0.0362	0.0545	0.0719	0.108	0.158	0.243	0.377	0.579	0.661	0.921	1.19	1.59
12	Torque constant	mNm / A	0.783	0.958	1.48	1.92	2.35	2.70	3.31	4.00	4.96	6.18	7.66	8.18	9.66	11.0	12.7
13	Speed constant	rpm / V	12200	9970	6450	4990	4060	3540	2890	2380	1920	1540	1250	1170	988	871	751
14	Speed / torque gradient	rpm / mNm	4670	5250	4820	4720	4400	4120	4150	4270	4240	4300	4390	4480	4420	4290	4480
15	Mechanical time constant	ms	17.4	15.9	14.5	14.2	13.9	13.7	13.6	13.6	13.6	13.7	13.7	13.7	13.7	13.5	13.7
16	Rotor inertia	gcm ²	0.356	0.290	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.295	0.302	0.292

Specifications

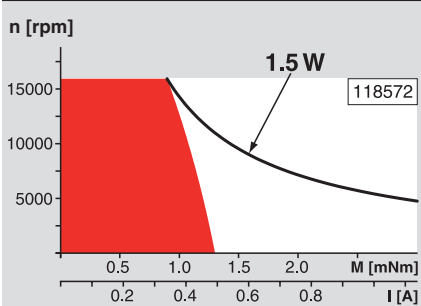
- Thermal data**
- 17 Thermal resistance housing-ambient 46 K / W
 - 18 Thermal resistance winding-housing 14 K / W
 - 19 Thermal time constant winding 5.35 s
 - 20 Thermal time constant motor 345 s
 - 21 Ambient temperature -20 ... +85°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 16000 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.014 mm
 - 26 Max. axial load (dynamic) 0.8 N
 - 27 Max. force for press fits (static) (static, shaft supported) 15 N
 - 28 Max. radial loading, 5 mm from flange 1.4 N

Other specifications

- 29 Number of pole pairs 7
- 30 Number of commutator segments 15
- 31 Weight of motor 15 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range

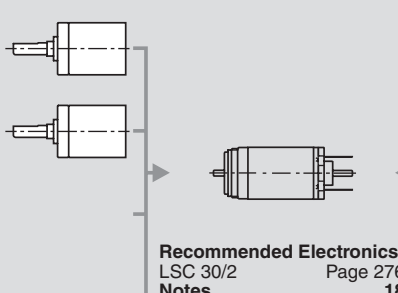


Comments

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

maxon Modular System

- Planetary Gearhead**
 \varnothing 13 mm
0.05 - 0.15 Nm
Page 217
- Planetary Gearhead**
 \varnothing 13 mm
0.2 - 0.35 Nm
Page 218

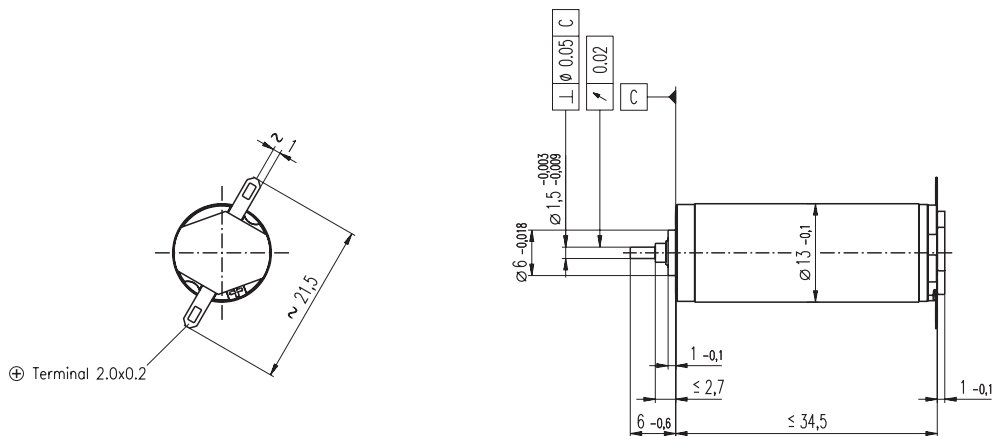


Overview on page 16 - 21

- Encoder MR**
16 CPT,
2 channels
Page 252
- Encoder MR**
64 - 256 CPT,
2 channels
Page 253 / 254
- Encoder MEnc**
 \varnothing 13 mm
16 CPT, 2 channels
Page 270

Recommended Electronics:
LSC 30/2
Notes
Page 276
18

RE 13 \varnothing 13 mm, Graphite Brushes, 3 Watt



M 1:1

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

Order Number

118582	118583	118584	118585	118586	118587	118588	118589	118590	118591	118592	118593	118594	118595	118596
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Motor Data

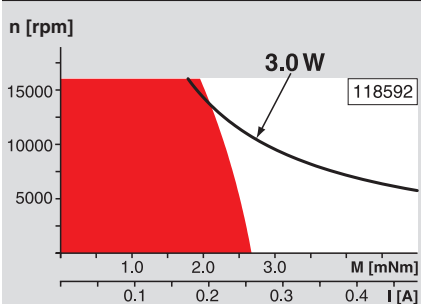
		118582	118583	118584	118585	118586	118587	118588	118589	118590	118591	118592	118593	118594	118595	118596	
Values at nominal voltage																	
1	Nominal voltage	V	3.0	3.6	3.6	4.8	6.0	6.0	7.2	9.0	10.0	12.0	15.0	18.0	21.0	24.0	30.0
2	No load speed	rpm	12700	14100	12300	13800	13700	12100	13100	13700	13100	13100	13300	12800	13900	13600	13800
3	No load current	mA	168	163	135	119	93.9	79.5	73.8	62.6	52.7	44.4	35.9	28.5	27.3	23.2	19.0
4	Nominal speed	rpm	11300	12500	10200	11300	10700	9030	10000	10700	10200	10200	10300	9820	10900	10600	10900
5	Nominal torque (max. continuous torque)	mNm	1.22	1.33	1.60	1.95	2.35	2.44	2.35	2.37	2.51	2.45	2.44	2.47	2.39	2.42	2.37
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.668	0.608	0.532	0.448	0.403	0.331	0.266	0.217	0.196	0.169	0.135
7	Stall torque	mNm	12.1	12.0	9.90	11.0	11.1	9.79	10.3	11.2	11.5	11.1	11.1	10.9	11.6	11.5	11.3
8	Starting current	A	5.51	5.11	3.67	3.43	2.74	2.15	2.04	1.84	1.63	1.32	1.07	0.837	0.828	0.701	0.563
9	Max. efficiency	%	68	68	66	67	67	66	66	67	68	67	67	67	68	68	67
Characteristics																	
10	Terminal resistance	Ω	0.544	0.705	0.980	1.40	2.19	2.79	3.53	4.88	6.14	9.07	14.1	21.5	25.4	34.2	53.3
11	Terminal inductance	mH	0.0213	0.0247	0.0323	0.0456	0.0727	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.870	1.19	1.79
12	Torque constant	mNm / A	2.19	2.36	2.70	3.20	4.04	4.55	5.05	6.06	7.07	8.42	10.4	13.0	14.0	16.3	20.0
13	Speed constant	rpm / V	4360	4050	3540	2980	2360	2100	1890	1570	1350	1130	914	736	683	584	476
14	Speed / torque gradient	rpm / mNm	1080	1210	1290	1310	1280	1290	1320	1270	1170	1220	1230	1220	1240	1220	1270
15	Mechanical time constant	ms	7.69	7.51	7.36	7.21	7.08	7.04	7.04	6.97	6.90	6.92	6.93	6.91	6.92	6.93	6.97
16	Rotor inertia	gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.540	0.526

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	4.85 s
20	Thermal time constant motor	380 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 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	23 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range

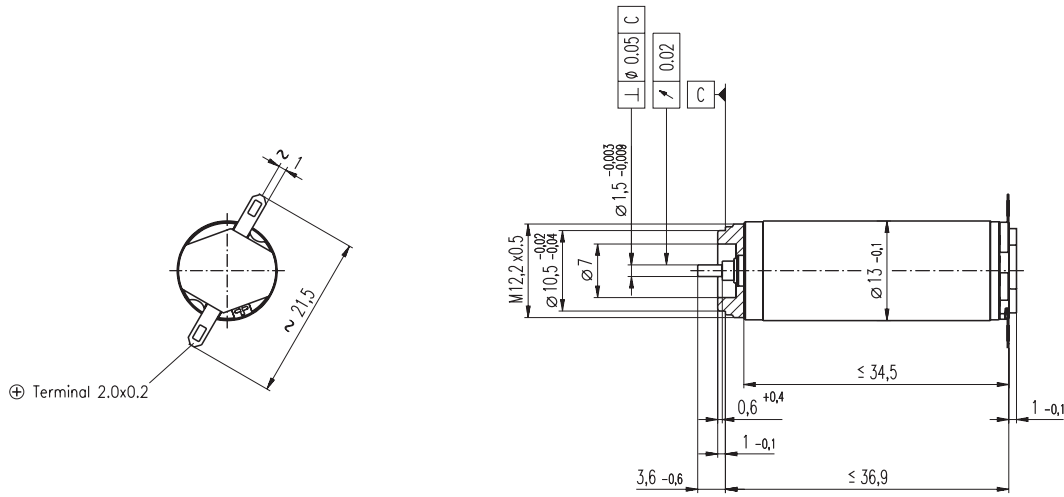


Comments

- 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**

Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 13 \varnothing 13 mm, Graphite Brushes, 3 Watt



M 1:1

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

Order Number

118597	118598	118599	118600	118601	118602	118603	118604	118605	118606	118607	118608	118609	118610	118611
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Motor Data		118597	118598	118599	118600	118601	118602	118603	118604	118605	118606	118607	118608	118609	118610	118611	
Values at nominal voltage																	
1	Nominal voltage	V	3.0	3.6	3.6	4.8	6.0	6.0	7.2	9.0	10.0	12.0	15.0	18.0	21.0	24.0	30.0
2	No load speed	rpm	12700	14100	12300	13800	13700	12100	13100	13700	13100	13100	13300	12800	13900	13600	13800
3	No load current	mA	168	163	135	119	93.9	79.5	73.8	62.6	52.7	44.4	35.9	28.5	27.3	23.2	19.0
4	Nominal speed	rpm	11300	12500	10200	11300	10700	9030	10000	10700	10200	10200	10300	9820	10900	10600	10900
5	Nominal torque (max. continuous torque)	mNm	1.22	1.33	1.60	1.95	2.35	2.44	2.35	2.37	2.51	2.45	2.44	2.47	2.39	2.42	2.37
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.668	0.608	0.532	0.448	0.403	0.331	0.266	0.217	0.196	0.169	0.135
7	Stall torque	mNm	12.1	12.0	9.90	11.0	11.1	9.79	10.3	11.2	11.5	11.1	11.1	10.9	11.6	11.5	11.3
8	Starting current	A	5.51	5.11	3.67	3.43	2.74	2.15	2.04	1.84	1.63	1.32	1.07	0.837	0.828	0.701	0.563
9	Max. efficiency	%	68	68	66	67	67	66	66	67	68	67	67	67	68	68	67
Characteristics																	
10	Terminal resistance	Ω	0.544	0.705	0.980	1.40	2.19	2.79	3.53	4.88	6.14	9.07	14.1	21.5	25.4	34.2	53.3
11	Terminal inductance	mH	0.0213	0.0247	0.0323	0.0456	0.0727	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.870	1.19	1.79
12	Torque constant	mNm / A	2.19	2.36	2.70	3.20	4.04	4.55	5.05	6.06	7.07	8.42	10.4	13.0	14.0	16.3	20.0
13	Speed constant	rpm / V	4360	4050	3540	2980	2360	2100	1890	1570	1350	1130	914	736	683	584	476
14	Speed / torque gradient	rpm / mNm	1080	1210	1290	1310	1280	1290	1320	1270	1170	1220	1230	1220	1240	1220	1270
15	Mechanical time constant	ms	7.69	7.51	7.36	7.21	7.08	7.04	7.04	6.97	6.90	6.92	6.93	6.91	6.92	6.93	6.97
16	Rotor inertia	gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.540	0.526

Specifications

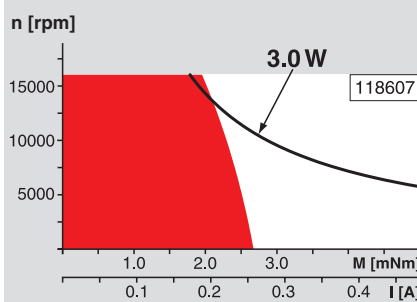
- Thermal data**
- 17 Thermal resistance housing-ambient 33 K / W
 - 18 Thermal resistance winding-housing 7.0 K / W
 - 19 Thermal time constant winding 4.85 s
 - 20 Thermal time constant motor 380 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 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 23 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range



Comments

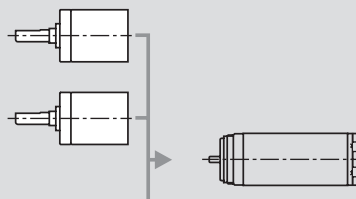
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

maxon Modular System

Overview on page 16 - 21

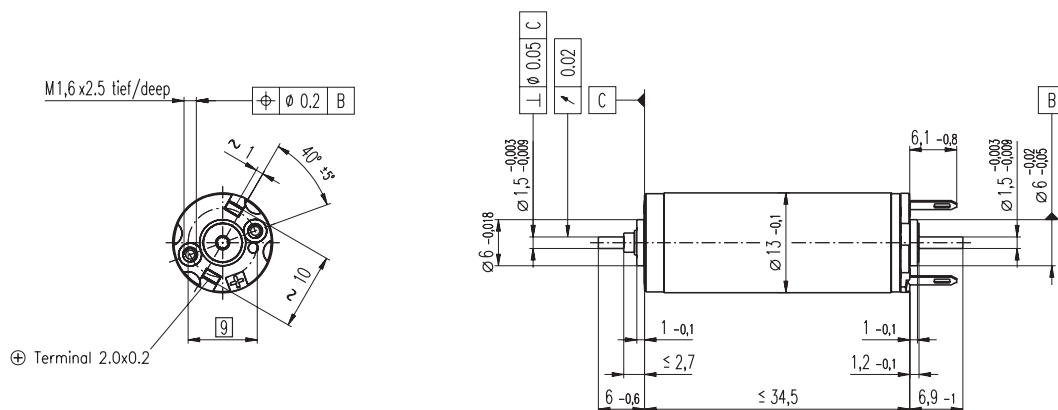
Planetary Gearhead
 \varnothing 13 mm
0.05 - 0.15 Nm
Page 217

Planetary Gearhead
 \varnothing 13 mm
0.2 - 0.35 Nm
Page 218



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 13 \varnothing 13 mm, Graphite Brushes, 3 Watt



M 1:1

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

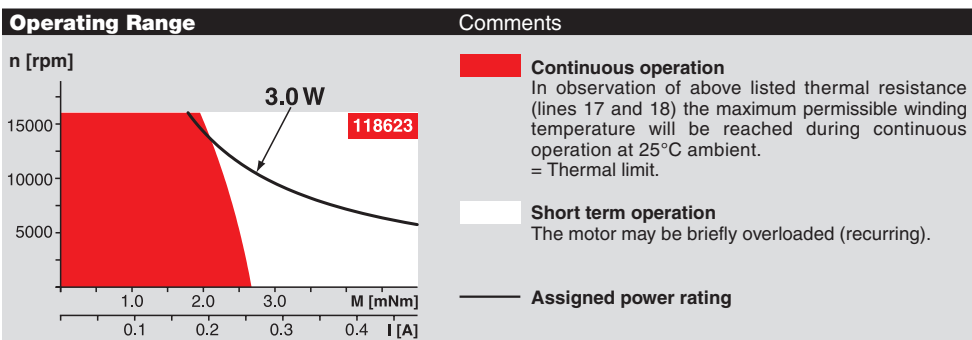
Order Number

Motor Data	118613	118614	118615	118616	118617	118618	118619	118620	118621	118622	118623	118624	118625	118626	118627
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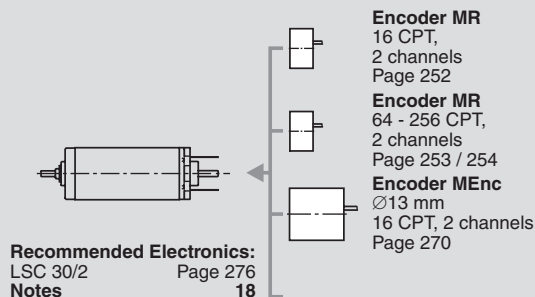
Values at nominal voltage																
1	Nominal voltage	V	3.0	3.6	3.6	4.8	6.0	6.0	7.2	9.0	10.0	12.0	15.0	18.0	21.0	30.0
2	No load speed	rpm	12700	14100	12300	13800	13700	12100	13100	13700	13100	13100	13300	12800	13900	13800
3	No load current	mA	168	163	135	119	93.9	79.5	73.8	62.6	52.7	44.4	35.9	28.5	27.3	19.0
4	Nominal speed	rpm	11300	12500	10200	11300	10700	9030	10000	10700	10200	10200	10300	9820	10900	10900
5	Nominal torque (max. continuous torque)	mNm	1.22	1.33	1.60	1.95	2.35	2.44	2.35	2.37	2.51	2.45	2.44	2.47	2.39	2.37
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.668	0.608	0.532	0.448	0.403	0.331	0.266	0.217	0.196	0.135
7	Stall torque	mNm	12.1	12.0	9.90	11.0	11.1	9.79	10.3	11.2	11.5	11.1	11.1	10.9	11.6	11.3
8	Starting current	A	5.51	5.11	3.67	3.43	2.74	2.15	2.04	1.84	1.63	1.32	1.07	0.837	0.828	0.563
9	Max. efficiency	%	68	68	66	67	67	66	66	67	68	67	67	67	68	67
Characteristics																
10	Terminal resistance	Ω	0.544	0.705	0.980	1.40	2.19	2.79	3.53	4.88	6.14	9.07	14.1	21.5	25.4	53.3
11	Terminal inductance	mH	0.0213	0.0247	0.0323	0.0456	0.0727	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.870	1.79
12	Torque constant	mNm / A	2.19	2.36	2.70	3.20	4.04	4.55	5.05	6.06	7.07	8.42	10.4	13.0	14.0	20.0
13	Speed constant	rpm / V	4360	4050	3540	2980	2360	2100	1890	1570	1350	1130	914	736	683	476
14	Speed / torque gradient	rpm / mNm	1080	1210	1290	1310	1280	1290	1320	1270	1170	1220	1230	1220	1240	1270
15	Mechanical time constant	ms	7.69	7.51	7.36	7.21	7.08	7.04	7.04	6.97	6.90	6.92	6.93	6.91	6.92	6.97
16	Rotor inertia	gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.526

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	4.85 s
20	Thermal time constant motor	380 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	16000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static) (static, shaft supported)	15 N / 80 N
28	Max. radial loading, 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	23 g

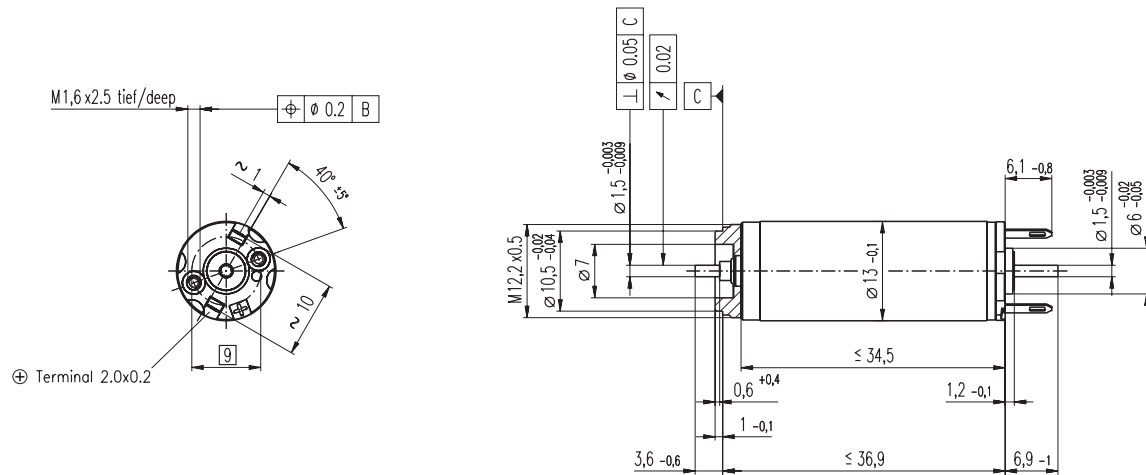
Values listed in the table are nominal.
Explanation of the figures on page 49.



maxon Modular System Overview on page 16 - 21



RE 13 $\varnothing 13$ mm, Graphite Brushes, 3 Watt



M 1:1

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

Order Number

118628	118629	118630	118631	118632	118633	118634	118635	118636	118637	118638	118639	118640	118641	118642
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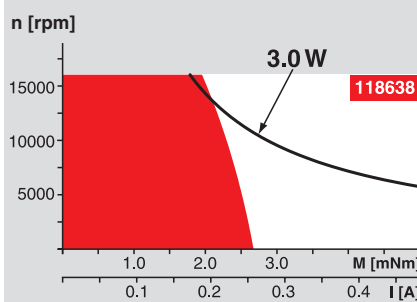
Motor Data		118628	118629	118630	118631	118632	118633	118634	118635	118636	118637	118638	118639	118640	118641	118642	
Values at nominal voltage																	
1	Nominal voltage	V	3.0	3.6	3.6	4.8	6.0	6.0	7.2	9.0	10.0	12.0	15.0	18.0	21.0	24.0	30.0
2	No load speed	rpm	12700	14100	12300	13800	13700	12100	13100	13700	13100	13100	13300	12800	13900	13600	13800
3	No load current	mA	168	163	135	119	93.9	79.5	73.8	62.6	52.7	44.4	35.9	28.5	27.3	23.2	19.0
4	Nominal speed	rpm	11300	12500	10200	11300	10700	9030	10000	10700	10200	10200	10300	9820	10900	10600	10900
5	Nominal torque (max. continuous torque)	mNm	1.22	1.33	1.60	1.95	2.35	2.44	2.35	2.37	2.51	2.45	2.44	2.47	2.39	2.42	2.37
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.668	0.608	0.532	0.448	0.403	0.331	0.266	0.217	0.196	0.169	0.135
7	Stall torque	mNm	12.1	12.0	9.90	11.0	11.1	9.79	10.3	11.2	11.5	11.1	11.1	10.9	11.6	11.5	11.3
8	Starting current	A	5.51	5.11	3.67	3.43	2.74	2.15	2.04	1.84	1.63	1.32	1.07	0.837	0.828	0.701	0.563
9	Max. efficiency	%	68	68	66	67	67	66	66	67	68	67	67	67	68	68	67
Characteristics																	
10	Terminal resistance	Ω	0.544	0.705	0.980	1.40	2.19	2.79	3.53	4.88	6.14	9.07	14.1	21.5	25.4	34.2	53.3
11	Terminal inductance	mH	0.0213	0.0247	0.0323	0.0456	0.0727	0.092	0.114	0.164	0.223	0.316	0.485	0.749	0.870	1.19	1.79
12	Torque constant	mNm / A	2.19	2.36	2.70	3.20	4.04	4.55	5.05	6.06	7.07	8.42	10.4	13.0	14.0	16.3	20.0
13	Speed constant	rpm / V	4360	4050	3540	2980	2360	2100	1890	1570	1350	1130	914	736	683	584	476
14	Speed / torque gradient	rpm / mNm	1080	1210	1290	1310	1280	1290	1320	1270	1170	1220	1230	1220	1240	1220	1270
15	Mechanical time constant	ms	7.69	7.51	7.36	7.21	7.08	7.04	7.04	6.97	6.90	6.92	6.93	6.91	6.92	6.93	6.97
16	Rotor inertia	gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.540	0.526

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 4.85 s
 - 20 Thermal time constant motor 380 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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) 80 N
 - 28 Max. radial loading, 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 23 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range



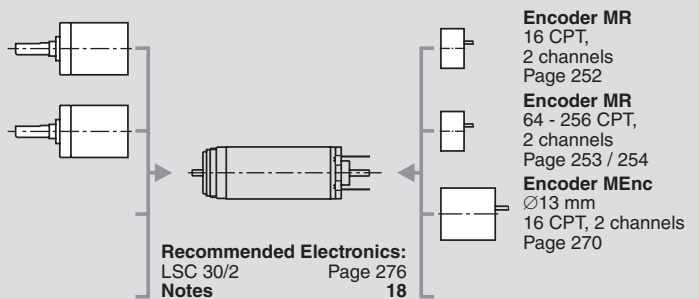
Comments

- 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**

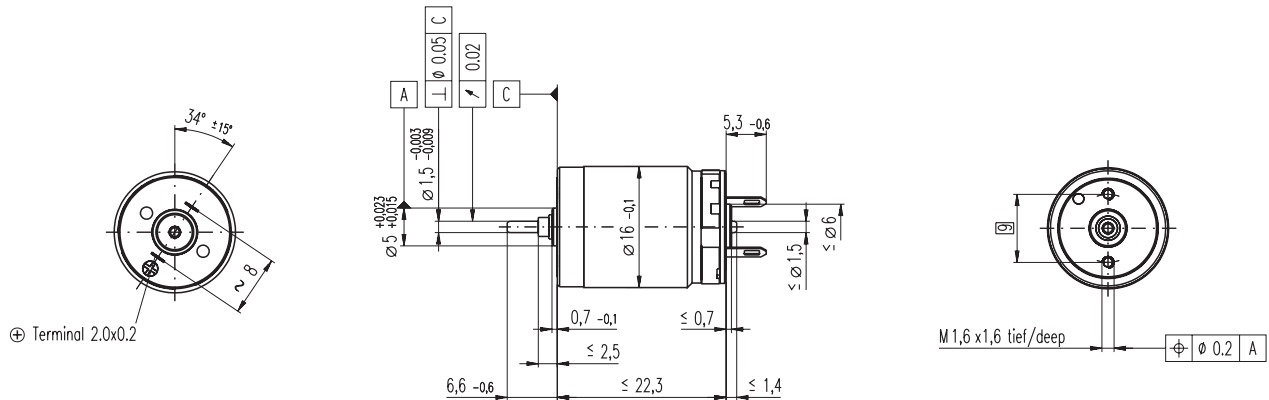
maxon Modular System

Overview on page 16 - 21

- 1 **Planetary Gearhead**
 $\varnothing 13$ mm
0.05 - 0.15 Nm
Page 217
- 7 **Planetary Gearhead**
 $\varnothing 13$ mm
0.2 - 0.35 Nm
Page 218



RE 16 \varnothing 16 mm, Precious Metal Brushes CLL, 2 Watt



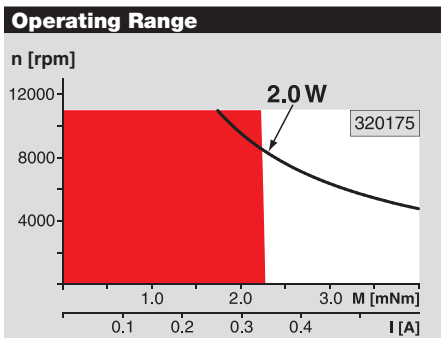
M 1:1

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

Order Number							

Motor Data (provisional)		320173	320174	320175	320176	320177	320178	320179
Values at nominal voltage								
1 Nominal voltage	V	1.8	3.0	6.0	9.0	12.0	18.0	24.0
2 No load speed	rpm	8250	8350	8500	8250	8130	7960	7780
3 No load current	mA	29.1	17.7	9.09	5.81	4.27	2.77	2.01
4 Nominal speed	rpm	6080	4730	4830	4580	4340	4140	3850
5 Nominal torque (max. continuous torque)	mNm	1.43	2.39	2.38	2.39	2.31	2.29	2.23
6 Nominal current (max. continuous current)	A	0.720	0.720	0.365	0.237	0.170	0.110	0.0784
7 Stall torque	mNm	5.46	5.55	5.55	5.40	5.01	4.81	4.45
8 Starting current	A	2.65	1.64	0.833	0.524	0.359	0.226	0.153
9 Max. efficiency	%	80	81	81	80	80	79	79
Characteristics								
10 Terminal resistance	Ω	0.679	1.83	7.20	17.2	33.4	79.8	157
11 Terminal inductance	mH	0.0168	0.0456	0.176	0.421	0.77	1.80	3.35
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	10.3	9.91	9.81	9.82	9.92	9.87	10.1
16 Rotor inertia	gcm ²	0.646	0.622	0.605	0.606	0.577	0.562	0.543

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	5.3 s
20 Thermal time constant motor	268 s
21 Ambient temperature	-20 ... +85°C
22 Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. permissible speed	11000 rpm
24 Axial play	0.05 - 0.15 mm
25 Radial play	0.014 mm
26 Max. axial load (dynamic)	0.8 N
27 Max. force for press fits (static)	15 N
28 Max. radial loading, 5 mm from flange	1.5 N



Comments

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

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

— **Assigned power rating**

Other specifications	
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	21 g
CLL = Capacitor Long Life	
Values listed in the table are nominal. Explanation of the figures on page 49.	

maxon Modular System

Planetary Gearhead
 \varnothing 16 mm
0.06 - 0.18 Nm
Page 223

Planetary Gearhead
 \varnothing 16 mm
0.1 - 0.3 Nm
Page 224

Overview on page 16 - 21

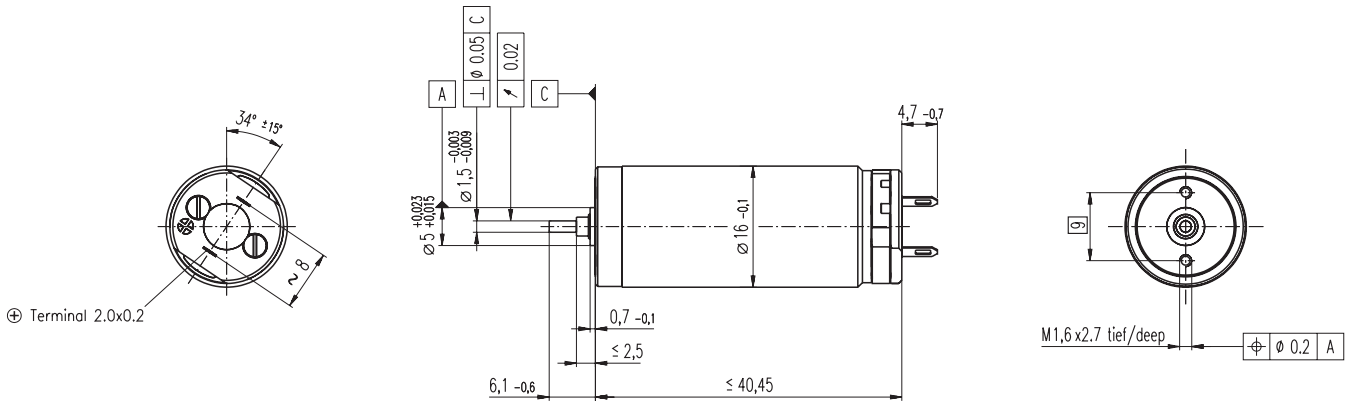
Encoder MR
32 CPT,
2 / 3 channels
Page 255

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

Recommended Electronics:
LSC 30/2
Notes

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RE 16 $\varnothing 16$ mm, Precious Metal Brushes CLL, 3.2 Watt, $\text{C}\epsilon$ approved



M 1:1

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

Order Number

Motor Data

	118678	118679	118680	118681	118682	118683	118684	118685	118686	118687	118688	118689	118690	118691	118692	
Values at nominal voltage																
1 Nominal voltage	V	1.8	2.4	3.0	3.2	4.5	4.8	7.2	9.0	12.0	12.0	15.0	18.0	24.0	30.0	48.0
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	22.9	18.6	14.8	10.8	9.56	7.39	6.05	4.63	3.72	3.02	3.11	2.08	1.02
4 Nominal speed	rpm	4220	5420	5740	4860	4990	3610	4790	4620	5020	3830	3840	3720	5070	4220	3180
5 Nominal torque (max. continuous torque)	mNm	2.39	2.50	2.89	3.41	4.48	5.55	5.50	5.46	5.47	5.37	5.35	5.33	5.28	5.18	5.01
6 Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.720	0.703	0.562	0.436	0.347	0.286	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	15.0	11.9
8 Starting current	A	4.53	4.71	4.19	3.13	2.74	1.90	1.82	1.37	1.16	0.784	0.628	0.500	0.561	0.341	0.144
9 Max. efficiency	%	86	86	86	85	86	86	86	86	86	85	85	85	86	85	84
Characteristics																
10 Terminal resistance	Ω	0.397	0.510	0.715	1.02	1.64	2.53	3.95	6.56	10.3	15.3	23.9	36.0	42.8	88.0	333
11 Terminal inductance	mH	0.0207	0.0227	0.0302	0.0415	0.0711	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	16.0	19.0	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	5.81	5.67	5.53	5.43	5.33	5.28	5.26	5.26	5.24	5.26	5.27	5.28	5.28	5.33	5.39
16 Rotor inertia	gcm ²	1.72	1.43	1.32	1.25	1.30	1.33	1.31	1.29	1.29	1.24	1.24	1.23	1.22	1.18	1.11

Specifications

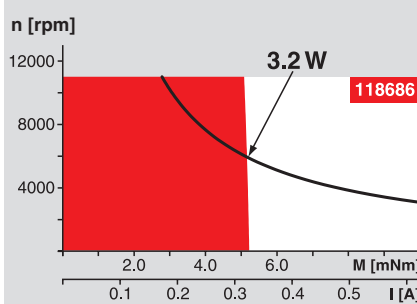
Thermal data		
17 Thermal resistance housing-ambient	30 K / W	
18 Thermal resistance winding-housing	8.5 K / W	
19 Thermal time constant winding	10.5 s	
20 Thermal time constant motor	570 s	
21 Ambient temperature	-20 ... +65°C	
22 Max. permissible winding temperature	+85°C	
Mechanical data (sleeve bearings)		
23 Max. permissible speed	11000 rpm	
24 Axial play	0.05 - 0.15 mm	
25 Radial play	0.014 mm	
26 Max. axial load (dynamic)	0.8 N	
27 Max. force for press fits (static)	15 N	
28 Max. radial loading, 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 49.

Operating Range



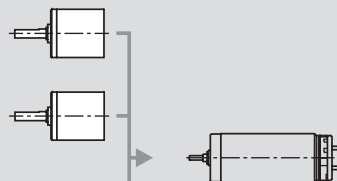
Comments

- 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

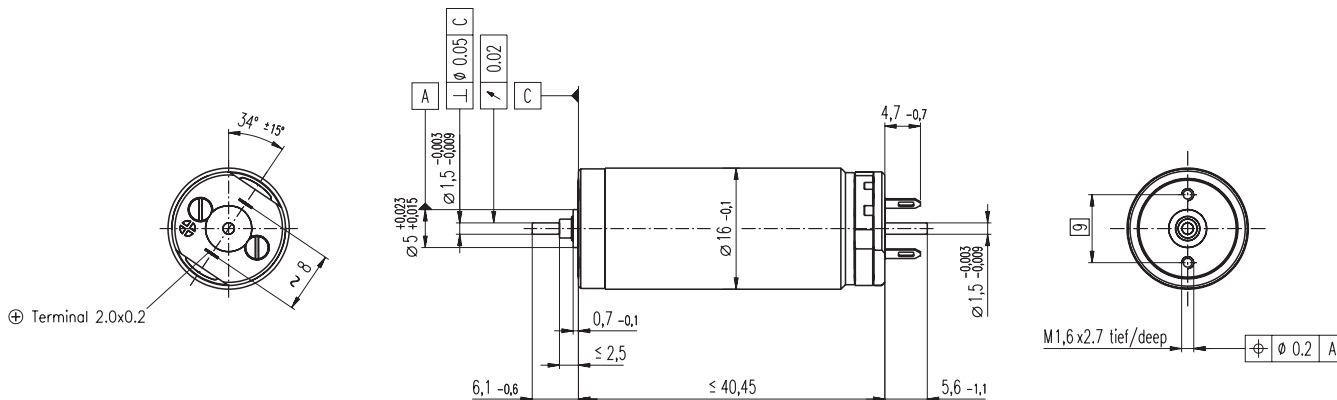
Overview on page 16 - 21

- Planetary Gearhead**
 $\varnothing 16$ mm
0.06 - 0.18 Nm
Page 223
- Planetary Gearhead**
 $\varnothing 16$ mm
0.1 - 0.3 Nm
Page 224



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 16 \varnothing 16 mm, Precious Metal Brushes CLL, 3.2 Watt, $\text{C}\epsilon$ approved



M 1:1

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

Order Number

118693	118694	118695	118696	118697	118698	118699	118700	118701	118702	118703	118704	118705	118706	118707
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Motor Data																	
Values at nominal voltage																	
1	Nominal voltage	V	1.8	2.4	3.0	3.2	4.5	4.8	7.2	9.0	12.0	12.0	15.0	18.0	24.0	30.0	48.0
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	22.9	18.6	14.8	10.8	9.56	7.39	6.05	4.63	3.72	3.02	3.11	2.08	1.02
4	Nominal speed	rpm	4220	5420	5740	4860	4990	3610	4790	4620	5020	3830	3840	3720	5070	4220	3180
5	Nominal torque (max. continuous torque)	mNm	2.39	2.50	2.89	3.41	4.48	5.55	5.50	5.46	5.47	5.37	5.35	5.33	5.28	5.18	5.01
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.720	0.720	0.703	0.562	0.436	0.347	0.286	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	15.0	11.9
8	Starting current	A	4.53	4.71	4.19	3.13	2.74	1.90	1.82	1.37	1.16	0.784	0.628	0.500	0.561	0.341	0.144
9	Max. efficiency	%	86	86	86	85	86	86	86	86	85	85	85	86	85	84	
Characteristics																	
10	Terminal resistance	Ω	0.397	0.510	0.715	1.02	1.64	2.53	3.95	6.56	10.3	15.3	23.9	36.0	42.8	88.0	333
11	Terminal inductance	mH	0.0207	0.0227	0.0302	0.0415	0.0711	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	16.0	19.0	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	5.81	5.67	5.53	5.43	5.33	5.28	5.26	5.26	5.24	5.26	5.27	5.28	5.28	5.33	5.39
16	Rotor inertia	gcm ²	1.72	1.43	1.32	1.25	1.30	1.33	1.31	1.29	1.29	1.24	1.24	1.23	1.22	1.18	1.11

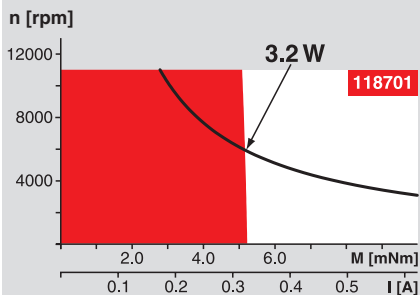
Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 30 K / W
 - 18 Thermal resistance winding-housing 8.5 K / W
 - 19 Thermal time constant winding 10.5 s
 - 20 Thermal time constant motor 570 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 11000 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.014 mm
 - 26 Max. axial load (dynamic) 0.8 N
 - 27 Max. force for press fits (static) (static, shaft supported) 15 N
 - 28 Max. radial loading, 5 mm from flange 70 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 49.

Operating Range

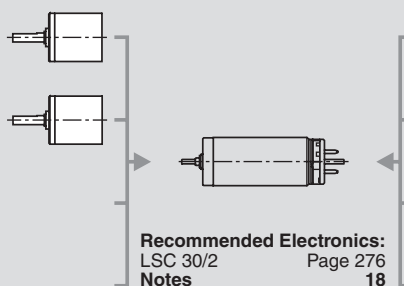


Comments

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

maxon Modular System

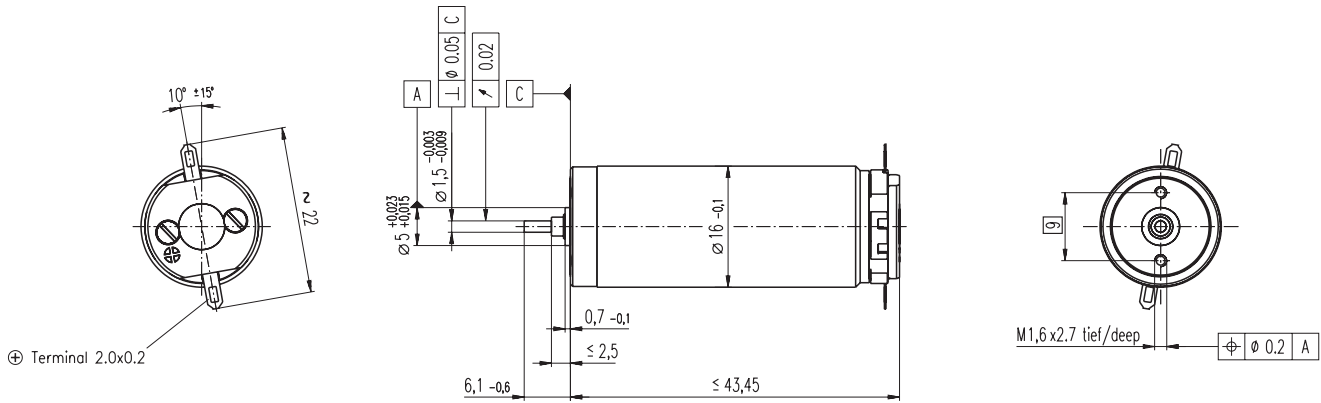
- 1 **Planetary Gearhead**
 \varnothing 16 mm
0.06 - 0.18 Nm
Page 223
- 7 **Planetary Gearhead**
 \varnothing 16 mm
0.1 - 0.3 Nm
Page 224



Overview on page 16 - 21

- Encoder MR**
32 CPT,
2 / 3 channels
Page 255
- Encoder MR**
128 / 256 / 512 CPT,
2 / 3 channels
Page 256
- Encoder MENC**
 \varnothing 13 mm
16 CPT, 2 channels
Page 270

RE 16 \varnothing 16 mm, Graphite Brushes, 4.5 Watt



M 1:1

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

Order Number

Motor Data

		118710	118711	118712	118713	118714	118715	118716	118717	118718	118719	118720	118721	118722	118723	118724	
Values at nominal voltage																	
1	Nominal voltage	V	4.8	4.8	6.0	7.2	9.0	12.0	15.0	18.0	24.0	30.0	36.0	45.0	48.0	48.0	48.0
2	No load speed	rpm	12700	12200	13300	13700	13100	13900	14000	13200	14000	14700	14100	14500	14200	10100	5320
3	No load current	mA	105	98.8	87.7	75.5	57.0	46.0	37.1	28.5	23.0	19.6	15.6	12.9	11.8	7.66	3.64
4	Nominal speed	rpm	10400	9750	10800	11200	10900	11900	12100	11300	12100	12900	12300	12700	12400	8130	3170
5	Nominal torque (max. continuous torque)	mNm	2.16	2.28	2.67	3.16	3.67	3.95	4.14	4.35	4.42	4.32	4.41	4.39	4.40	4.64	4.77
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.715	0.625	0.531	0.446	0.365	0.294	0.243	0.198	0.162	0.149	0.111	0.0603
7	Stall torque	mNm	19.2	16.2	17.4	18.8	23.3	28.8	31.4	31.1	34.7	35.7	34.9	35.8	35.0	24.1	12.1
8	Starting current	A	5.52	4.46	4.15	3.82	3.61	3.55	3.12	2.42	2.14	1.85	1.45	1.22	1.10	0.539	0.144
9	Max. efficiency	%	68	68	71	73	76	78	79	79	80	81	80	81	81	78	71
Characteristics																	
10	Terminal resistance	Ω	0.870	1.08	1.45	1.89	2.49	3.38	4.81	7.44	11.2	16.2	24.8	36.9	43.7	89.1	334
11	Terminal inductance	mH	0.0208	0.0227	0.0303	0.0415	0.0711	0.113	0.174	0.285	0.452	0.640	0.994	1.48	1.75	3.44	12.1
12	Torque constant	mNm / A	3.48	3.64	4.20	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	687	778	785	745	575	490	453	429	408	415	410	409	411	425	453
15	Mechanical time constant	ms	12.3	11.6	10.9	9.73	7.84	6.84	6.22	5.79	5.53	5.41	5.32	5.26	5.24	5.23	5.25
16	Rotor inertia	gcm ²	1.72	1.43	1.32	1.25	1.30	1.33	1.31	1.29	1.29	1.24	1.24	1.23	1.22	1.18	1.11

Specifications

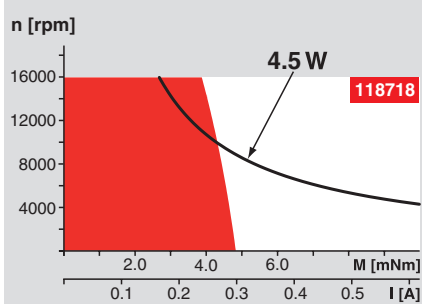
Thermal data		
17	Thermal resistance housing-ambient	30 K / W
18	Thermal resistance winding-housing	8.5 K / W
19	Thermal time constant winding	10.5 s
20	Thermal time constant motor	600 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 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 49.

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).

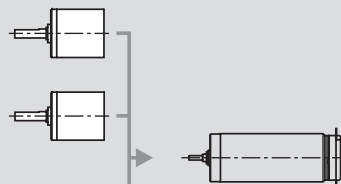
— Assigned power rating

maxon Modular System

Overview on page 16 - 21

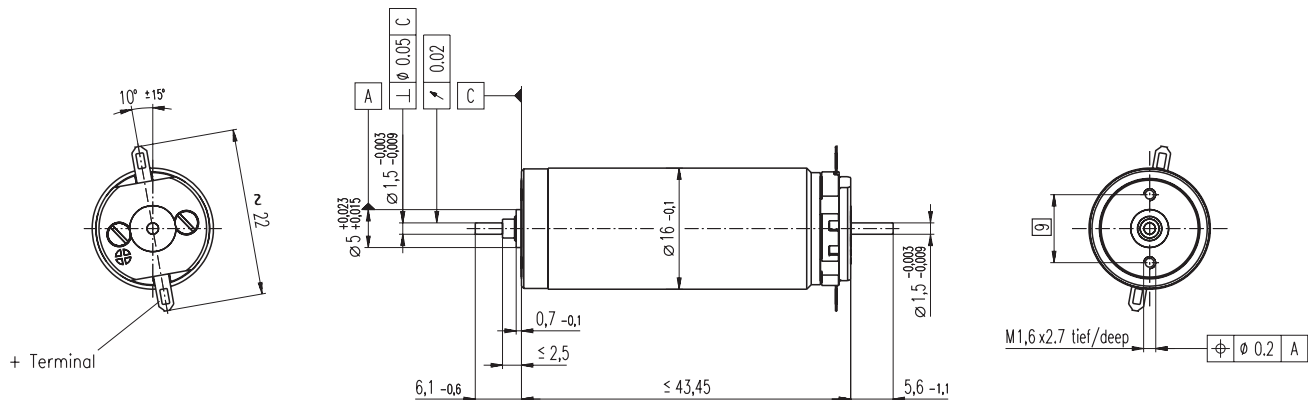
Planetary Gearhead
 \varnothing 16 mm
0.06 - 0.18 Nm
Page 223

Planetary Gearhead
 \varnothing 16 mm
0.1 - 0.3 Nm
Page 224



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE 16 $\varnothing 16$ mm, Graphite Brushes, 4.5 Watt



M 1:1

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

Order Number

118725	118726	118727	118728	118729	118730	118731	118732	118733	118734	118735	118736	118737	118738	118739
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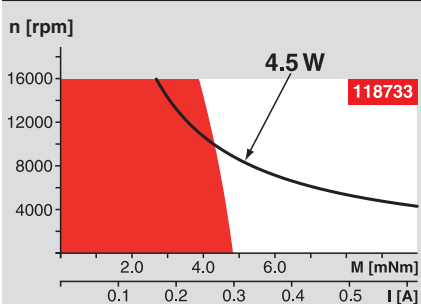
Motor Data

		118725	118726	118727	118728	118729	118730	118731	118732	118733	118734	118735	118736	118737	118738	118739	
Values at nominal voltage																	
1	Nominal voltage	V	4.8	4.8	6.0	7.2	9.0	12.0	15.0	18.0	24.0	30.0	36.0	45.0	48.0	48.0	
2	No load speed	rpm	12700	12200	13300	13700	13100	13900	14000	13200	14000	14700	14100	14500	14200	10100	
3	No load current	mA	105	98.8	87.7	75.5	57.0	46.0	37.1	28.5	23.0	19.6	15.6	12.9	11.8	7.66	
4	Nominal speed	rpm	10400	9750	10800	11200	10900	11900	12100	11300	12100	12900	12300	12700	12400	8130	
5	Nominal torque (max. continuous torque)	mNm	2.16	2.28	2.67	3.16	3.67	3.95	4.14	4.35	4.42	4.32	4.41	4.39	4.40	4.64	
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.715	0.625	0.531	0.446	0.365	0.294	0.243	0.198	0.162	0.149	0.111	
7	Stall torque	mNm	19.2	16.2	17.4	18.8	23.3	28.8	31.4	31.1	34.7	35.7	34.9	35.8	35.0	24.1	
8	Starting current	A	5.52	4.46	4.15	3.82	3.61	3.55	3.12	2.42	2.14	1.85	1.45	1.22	1.10	0.539	
9	Max. efficiency	%	68	68	71	73	76	78	79	79	80	81	80	81	81	78	
Characteristics																	
10	Terminal resistance	Ω	0.870	1.08	1.45	1.89	2.49	3.38	4.81	7.44	11.2	16.2	24.8	36.9	43.7	89.1	
11	Terminal inductance	mH	0.0208	0.0227	0.0303	0.0415	0.0711	0.113	0.174	0.285	0.452	0.640	0.994	1.48	1.75	3.44	
12	Torque constant	mNm / A	3.48	3.64	4.20	4.91	6.43	8.11	10.1	12.9	16.2	19.3	24.1	29.4	31.9	44.8	
13	Speed constant	rpm / V	2750	2630	2280	1940	1480	1180	948	742	589	495	397	325	299	213	
14	Speed / torque gradient	rpm / mNm	687	778	785	745	575	490	453	429	408	415	410	409	411	425	
15	Mechanical time constant	ms	12.3	11.6	10.9	9.73	7.84	6.84	6.22	5.79	5.53	5.41	5.32	5.26	5.24	5.23	
16	Rotor inertia	gcm ²	1.72	1.43	1.32	1.25	1.30	1.33	1.31	1.29	1.29	1.24	1.24	1.23	1.22	1.18	

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 10.5 s
 - 20 Thermal time constant motor 600 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 1.5 N

Operating Range



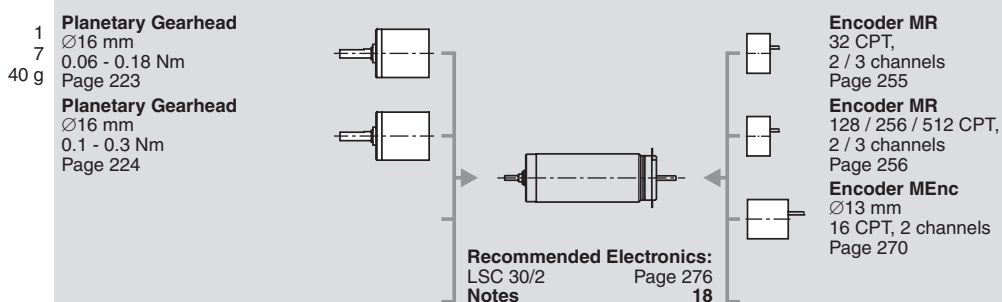
Comments

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

Other specifications

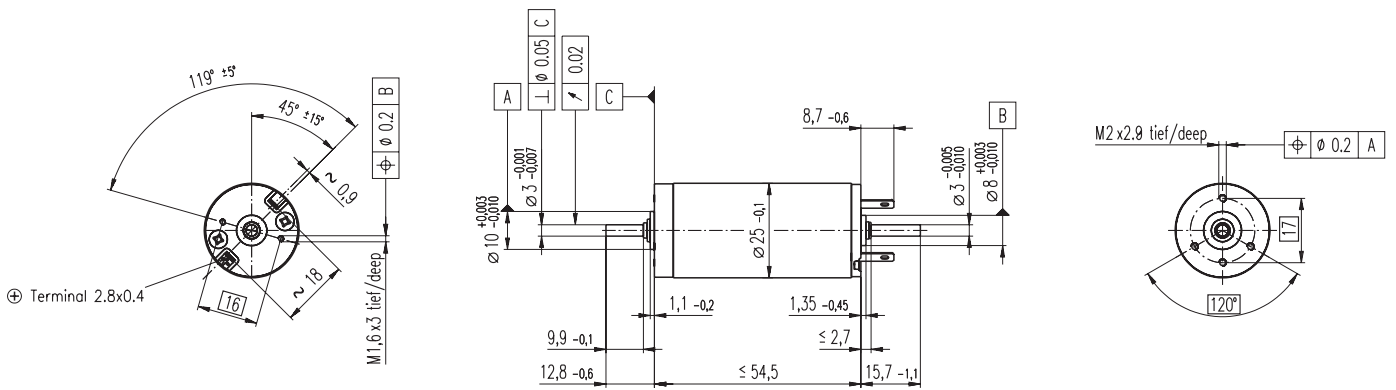
- 29 Number of pole pairs 1
 - 30 Number of commutator segments 7
 - 31 Weight of motor 40 g
- Values listed in the table are nominal.
Explanation of the figures on page 49.

maxon Modular System



Overview on page 16 - 21

RE 25 $\varnothing 25$ mm, Precious Metal Brushes CLL, 10 Watt, $\text{C}\epsilon$ approved



M 1:2

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

Order Number

118740 118741 **118742** 118743 118744 118745 **118746** 118747 118748

Motor Data		118740	118741	118742	118743	118744	118745	118746	118747	118748	
Values at nominal voltage											
1	Nominal voltage	V	4.5	8.0	9.0	12.0	15.0	18.0	24.0	32.0	48.0
2	No load speed	rpm	5350	5310	5230	4850	4980	4780	5190	5510	5070
3	No load current	mA	79.6	44.3	38.6	26.2	21.7	17.2	14.3	11.6	6.95
4	Nominal speed	rpm	4910	4510	4230	3820	3940	3740	4150	4470	4030
5	Nominal torque (max. continuous torque)	mNm	11.4	20.9	24.0	29.1	28.8	28.9	28.8	28.6	28.7
6	Nominal current (max. continuous current)	A	1.50	1.50	1.50	1.26	1.03	0.823	0.668	0.529	0.325
7	Stall torque	mNm	138	139	126	137	138	133	144	152	140
8	Starting current	A	17.2	9.73	7.72	5.82	4.83	3.72	3.28	2.76	1.56
9	Max. efficiency	%	87	87	86	87	87	87	87	88	87
Characteristics											
10	Terminal resistance	Ω	0.261	0.822	1.17	2.06	3.10	4.84	7.31	11.6	30.9
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	8.00	14.3	16.4	23.5	28.6	35.8	44.0	55.2	90.0
13	Speed constant	rpm / V	1190	667	584	406	333	267	217	173	106
14	Speed / torque gradient	rpm / mNm	39.0	38.3	41.6	35.6	36.1	36.0	36.1	36.3	36.4
15	Mechanical time constant	ms	4.74	4.15	4.12	4.00	3.98	3.97	3.97	3.97	3.97
16	Rotor inertia	gcm ²	11.6	10.3	9.45	10.7	10.5	10.5	10.5	10.4	10.4

Specifications

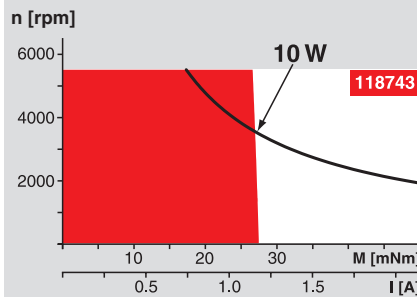
- Thermal data**
- 17 Thermal resistance housing-ambient 14 K / W
 - 18 Thermal resistance winding-housing 3.1 K / W
 - 19 Thermal time constant winding 12.4 s
 - 20 Thermal time constant motor 910 s
 - 21 Ambient temperature -20 ... +85°C
 - 22 Max. permissible winding temperature +100°C
- Mechanical data (ball bearings)**
- 23 Max. permissible speed 5500 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.025 mm
 - 26 Max. axial load (dynamic) 3.2 N
 - 27 Max. force for press fits (static) (static, shaft supported) 64 N
 - 28 Max. radial loading, 5 mm from flange 270 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 49.

- 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

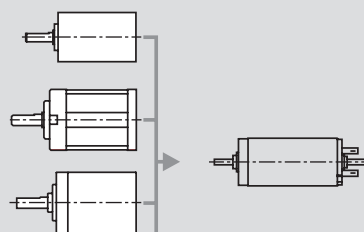
maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
 $\varnothing 26$ mm
0.5 - 2.0 Nm
Page 235

Planetary Gearhead
 $\varnothing 32$ mm
0.4 - 2.0 Nm
Page 237

Planetary Gearhead
 $\varnothing 32$ mm
0.75 - 6.0 Nm
Page 238 / 240



- Recommended Electronics:**
- LSC 30/2 Page 276
 - ADS 50/5 276
 - ADS_E 50/5 277
 - EPOS 24/5 294
 - EPOS2 50/5 295
 - EPOS P 24/5 297
 - Notes 18

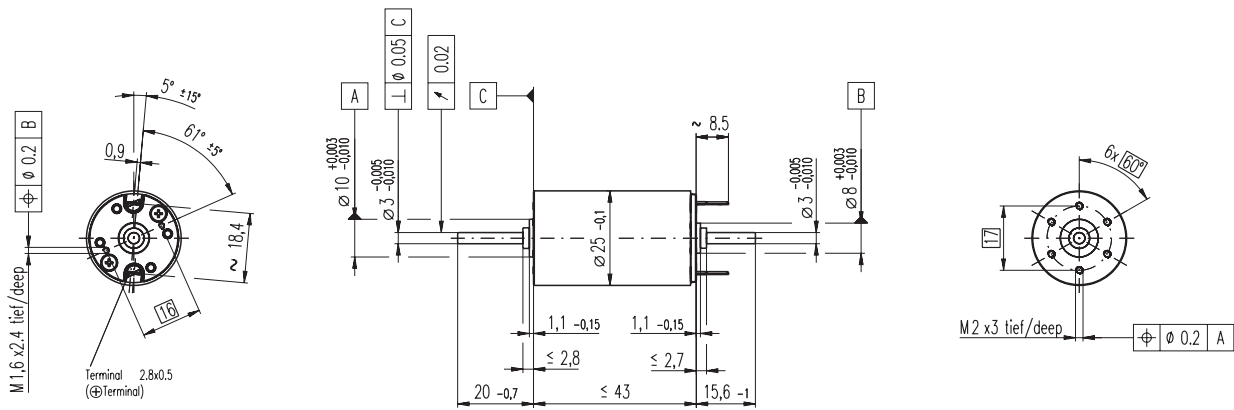
Encoder MR
128 - 1000 CPT,
3 channels
Page 258

Encoder Enc
22 mm
100 CPT, 2 channels
Page 260

Encoder HED_5540
500 CPT,
3 channels
Page 262 / 264

DC-Tacho DCT
 $\varnothing 22$ mm
0.52 V
Page 271

RE 25 Ø25 mm, Graphite Brushes, 20 Watt



M 1:2

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

Order Number

302534 339149 339150 339151 339152 339153 339154 339155 339156 339157 339158

Motor Data (provisional)

Values at nominal voltage															
1	Nominal voltage	V	7.2	9.0	12.0	18.0	24.0	30.0	36.0	48.0	48.0	48.0	48.0		
2	No load speed	rpm	10600	9820	9770	10600	11100	9390	10300	9740	8630	6860	4740		
3	No load current	mA	321	225	165	123	97.3	60.7	57.5	39.8	33.4	24.3	14.9		
4	Nominal speed	rpm	9340	8590	8630	9530	10100	8300	9190	8660	7530	5720	3550		
5	Nominal torque (max. continuous torque)	mNm	17.8	20.5	23.5	24.7	25.8	27.6	26.6	27.8	28.9	30.1	30.6		
6	Nominal current (max. continuous current)	A	3.27	2.70	2.25	1.69	1.37	0.978	0.863	0.637	0.583	0.479	0.336		
7	Stall torque	mNm	252	231	261	289	316	258	271	263	236	187	124		
8	Starting current	A	42.1	28.1	23.2	18.4	15.6	8.61	8.24	5.67	4.51	2.84	1.30		
9	Max. efficiency	%	74	76	79	81	83	83	83	83	83	82	79		
Characteristics															
10	Terminal resistance	Ω	0.171	0.320	0.517	0.98	1.53	3.49	4.37	8.47	10.6	16.9	36.8		
11	Terminal inductance	mH	0.0163	0.0308	0.0573	0.112	0.186	0.407	0.493	0.979	1.25	1.97	4.11		
12	Torque constant	mNm / A	5.99	8.24	11.2	15.7	20.2	29.9	32.9	46.4	52.4	65.9	95.1		
13	Speed constant	rpm / V	1590	1160	850	607	472	319	290	206	182	145	100		
14	Speed / torque gradient	rpm / mNm	45.5	45.1	39.1	37.8	35.8	37.1	38.4	37.5	37.0	37.2	38.9		
15	Mechanical time constant	ms	6.83	6.35	5.89	5.62	5.49	5.42	5.41	5.37	5.36	5.37	5.39		
16	Rotor inertia	gcm ²	14.3	13.4	14.4	14.2	14.6	14.0	13.4	13.7	13.8	13.8	13.2		

Specifications

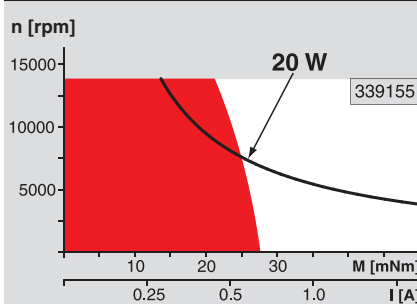
- Thermal data**
- 17 Thermal resistance housing-ambient 14.4 K / W
 - 18 Thermal resistance winding-housing 5.1 K / W
 - 19 Thermal time constant winding 27.6 s
 - 20 Thermal time constant motor 535 s
 - 21 Ambient temperature -30 ... +100°C
 - 22 Max. permissible winding temperature +155°C
- Mechanical data (ball bearings)**
- 23 Max. permissible 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
 - 28 Max. radial loading, 5 mm from flange 1000 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 49.

Option

- Encoder MR on request
- Encoder HED_ 5540 on request

Operating Range



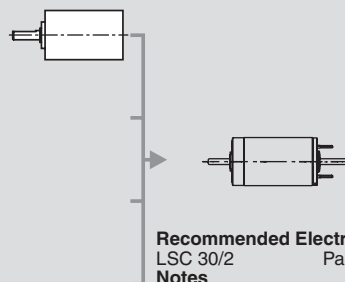
Comments

- 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**

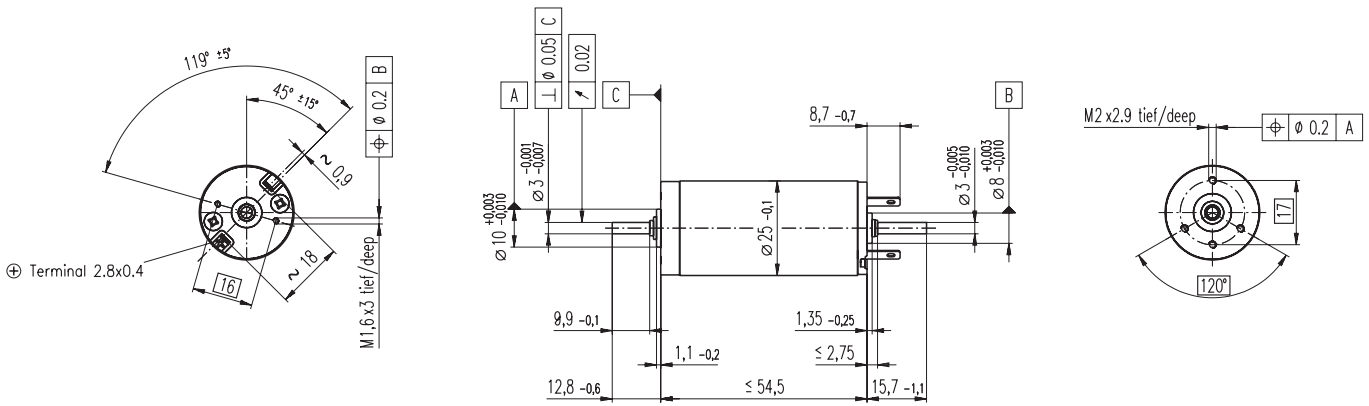
maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
Ø26 mm
0.5 - 2.0 Nm
Page 235



RE 25 Ø25 mm, Graphite Brushes, 20 Watt



M 1:2

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

according to dimensional drawing
shaft length 15.7 shortened to 4 mm

Order Number									
118749	118750	118751	118752	118753	118754	118755	118756	118757	118757
302002	302003	302004	302005	302006	302007	302001	302008	302009	302009

Motor Data											
Values at nominal voltage											
1	Nominal voltage	V	9.0	15.0	18.0	24.0	30.0	42.0	48.0	48.0	48.0
2	No load speed	rpm	10000	9650	10200	9550	9860	11100	10300	8230	5050
3	No load current	mA	110	60.7	53.9	36.9	30.5	25.2	20.1	15.2	8.51
4	Nominal speed	rpm	8980	8470	8890	8360	8680	9950	9190	7070	3870
5	Nominal torque (max. continuous torque)	mNm	11.1	20.6	23.1	26.7	27.2	27.6	28.4	29.4	30.8
6	Nominal current (max. continuous current)	A	1.50	1.50	1.47	1.17	0.983	0.799	0.667	0.548	0.352
7	Stall torque	mNm	244	237	233	257	263	299	280	222	136
8	Starting current	A	30.7	16.6	14.3	11.0	9.21	8.39	6.38	4.03	1.52
9	Max. efficiency	%	77	83	84	86	86	88	88	87	85
Characteristics											
10	Terminal resistance	Ω	0.293	0.902	1.26	2.19	3.26	5.00	7.53	11.9	31.6
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	7.97	14.3	16.3	23.4	28.5	35.7	43.8	55.0	89.7
13	Speed constant	rpm / V	1200	669	585	407	335	268	218	173	106
14	Speed / torque gradient	rpm / mNm	44.1	42.3	45.3	38.1	38.2	37.5	37.4	37.6	37.5
15	Mechanical time constant	ms	5.36	4.58	4.49	4.28	4.20	4.13	4.11	4.10	4.09
16	Rotor inertia	gcm ²	11.6	10.3	9.45	10.7	10.5	10.5	10.5	10.4	10.4

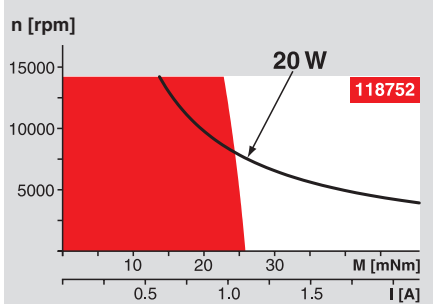
Specifications

Thermal data		
17	Thermal resistance housing-ambient	14 K / W
18	Thermal resistance winding-housing	3.1 K / W
19	Thermal time constant winding	12.4 s
20	Thermal time constant motor	910 s
21	Ambient temperature	-30 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max. permissible speed	14000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.2 N
27	Max. force for press fits (static) (static, shaft supported)	64 N / 270 N
28	Max. radial loading, 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 49.

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

Planetary Gearhead
Ø26 mm
0.5 - 2.0 Nm
Page 235

Planetary Gearhead
Ø32 mm
0.4 - 2.0 Nm
Page 237

Planetary Gearhead
Ø32 mm
0.75 - 6.0 Nm
Page 238 / 240

Encoder MR
128 - 1000 CPT,
3 channels
Page 258

Encoder Enc
22 mm
100 CPT, 2 channels
Page 260

Encoder HED_5540
500 CPT,
3 channels
Page 262 / 264

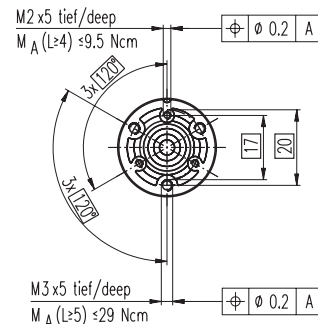
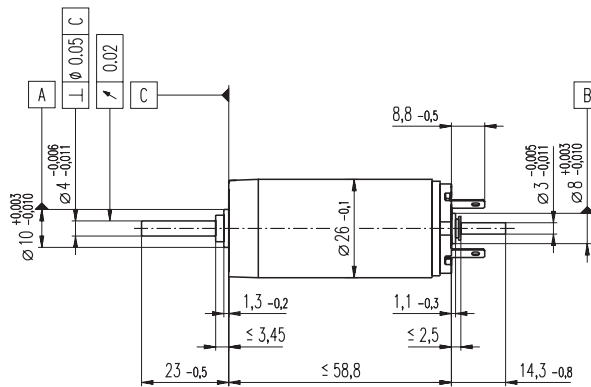
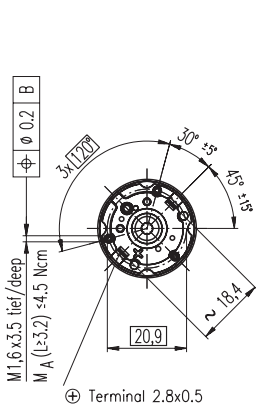
DC-Tacho DCT
Ø22 mm,
0.52 V
Page 271

Brake AB 28
Ø40 mm
24 VDC, 0.4 Nm
Page 308

Recommended Electronics:

- LSC 30/2 Page 276
- ADS 50/5 276
- ADS_E 50/5 277
- EPOS 24/5 294
- EPOS2 50/5 295
- EPOS P 24/5 297
- Notes 18

RE 26 \varnothing 26 mm, Graphite Brushes, 18 Watt



M 1:2

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

Order Number

118767 118768 118769 118770 118771 118772 118773 118774 118775

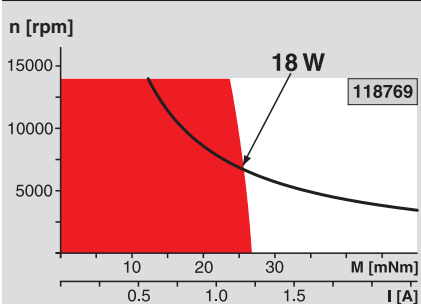
Motor Data

Values at nominal voltage															
1	Nominal voltage	V	15.0	18.0	24.0	30.0	36.0	36.0	45.0	48.0	48.0				
2	No load speed	rpm	10400	9910	10600	9500	10300	9400	9520	9080	5200				
3	No load current	mA	79.7	61.4	50.8	34.4	32.3	28.2	23.0	20.1	9.28				
4	Nominal speed	rpm	9060	8430	9100	8110	8930	8020	8170	7730	3800				
5	Nominal torque (max. continuous torque)	mNm	19.2	24.6	27.7	31.0	30.8	31.3	31.8	32.1	32.9				
6	Nominal current (max. continuous current)	A	1.50	1.50	1.35	1.07	0.961	0.888	0.73	0.659	0.384				
7	Stall torque	mNm	199	202	226	236	252	230	237	227	125				
8	Starting current	A	14.8	11.8	10.6	7.88	7.62	6.34	5.28	4.52	1.42				
9	Max. efficiency	%	82	84	85	86	86	86	87	87	84				
Characteristics															
10	Terminal resistance	Ω	1.01	1.52	2.27	3.81	4.72	5.68	8.52	10.6	33.7				
11	Terminal inductance	mH	0.0596	0.0956	0.149	0.293	0.359	0.432	0.659	0.825	2.51				
12	Torque constant	mNm / A	13.5	17.1	21.3	29.9	33.1	36.3	44.8	50.2	87.5				
13	Speed constant	rpm / V	708	559	447	320	289	263	213	190	109				
14	Speed / torque gradient	rpm / mNm	53.3	49.9	47.5	40.7	41.2	41.2	40.5	40.3	42.1				
15	Mechanical time constant	ms	6.22	5.84	5.56	5.32	5.26	5.23	5.16	5.13	5.10				
16	Rotor inertia	gcm ²	11.2	11.2	11.2	12.5	12.2	12.1	12.2	12.1	11.6				

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 9.7 K / W
 - 18 Thermal resistance winding-housing 4.2 K / W
 - 19 Thermal time constant winding 15.9 s
 - 20 Thermal time constant motor 728 s
 - 21 Ambient temperature -30 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (ball bearings)**
- 23 Max. permissible 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) 270 N
 - 28 Max. radial loading, 5 mm from flange 16 N

Operating Range



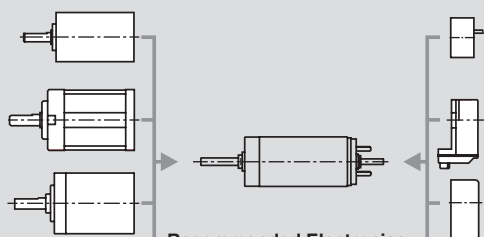
Comments

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

- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of commutator segments 11
 - 31 Weight of motor 150 g
- Values listed in the table are nominal.
Explanation of the figures on page 49.
- ⚠ Tolerances may vary from the standard specification.
- Option**
Preloaded ball bearings

maxon Modular System

- Planetary Gearhead**
 \varnothing 26 mm
0.5 - 2.0 Nm
Page 235
- Planetary Gearhead**
 \varnothing 32 mm
0.4 - 2.0 Nm
Page 237
- Planetary Gearhead**
 \varnothing 32 mm
0.75 - 6.0 Nm
Page 238 / 240

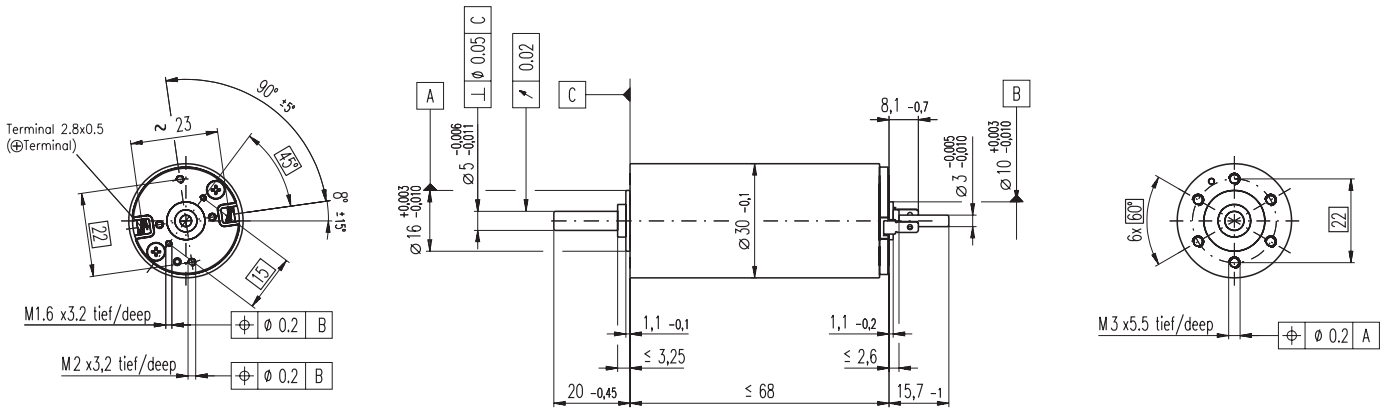


- Recommended Electronics:**
- LSC 30/2 Page 276
 - ADS 50/5 276
 - ADS_E 50/5 277
 - EPOS 24/5 294
 - EPOS2 50/5 295
 - EPOS P 24/5 297
 - Notes 18

Overview on page 16 - 21

- Encoder MR**
128 - 1000 CPT,
3 channels
Page 258
- Encoder Enc**
22 mm
100 CPT, 2 channels
Page 260
- Encoder HED_5540**
500 CPT,
3 channels
Page 262 / 264
- DC-Tacho DCT**
 \varnothing 22 mm
0.52 V
Page 271

RE 30 \varnothing 30 mm, Graphite Brushes, 60 Watt



M 1:2

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

according to dimensional drawing
shaft length 15.7 shortened to 8.7 mm

Order Number

310005	310006	310007	310008	310009
268193	268213	268214	268215	268216

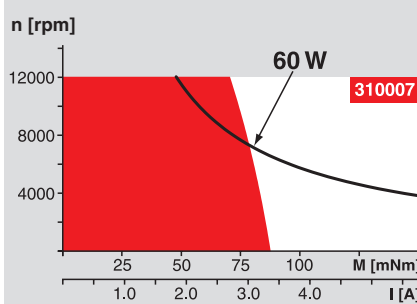
Motor Data

Values at nominal voltage							
1	Nominal voltage	V	12.0	18.0	24.0	36.0	48.0
2	No load speed	rpm	8170	8590	8810	8590	8490
3	No load current	mA	300	212	164	106	78.5
4	Nominal speed	rpm	7630	7900	8050	7810	7750
5	Nominal torque (max. continuous torque)	mNm	51.7	75.5	85.0	83.4	88.2
6	Nominal current (max. continuous current)	A	4.00	4.00	3.44	2.20	1.72
7	Stall torque	mNm	844	991	1020	936	1020
8	Starting current	A	60.5	49.8	39.3	23.5	19.0
9	Max. efficiency	%	86	87	87	87	88
Characteristics							
10	Terminal resistance	Ω	0.198	0.362	0.611	1.53	2.52
11	Terminal inductance	mH	0.0345	0.0703	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	9.74	8.71	8.69	9.22	8.33
15	Mechanical time constant	ms	3.42	3.25	3.03	3.17	3.01
16	Rotor inertia	gcm ²	33.5	35.7	33.3	32.9	34.5

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 16.2 s
 - 20 Thermal time constant motor 714 s
 - 21 Ambient temperature -30 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 28 N

Operating Range



Comments

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

Other specifications

- 29 Number of pole pairs 1
- 30 Number of commutator segments 13
- 31 Weight of motor 238 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

⚠ Tolerances may vary from the standard specification.

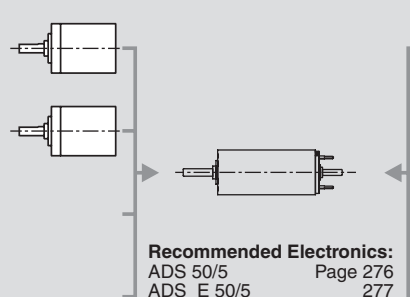
Option

Preloaded ball bearings

maxon Modular System

Planetary Gearhead
 \varnothing 32 mm
0.75 - 4.5 Nm
Page 239

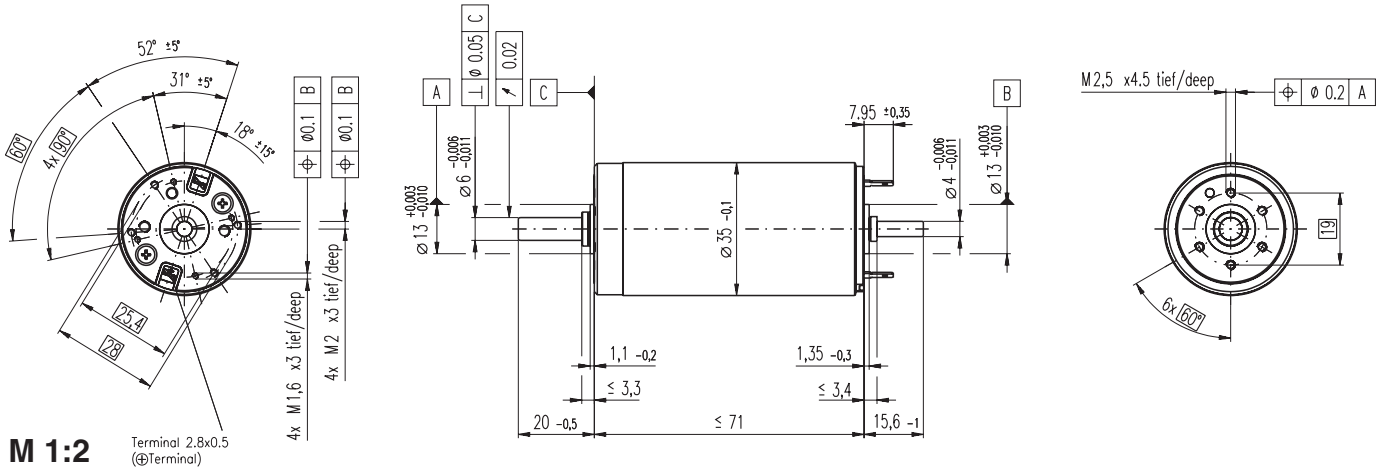
Planetary Gearhead
 \varnothing 32 mm
1.0 - 6.0 Nm
Page 240



Overview on page 16 - 21

Recommended Electronics:
ADS 50/5 Page 276
ADS_E 50/5 277
EPOS 24/5 294
EPOS2 50/5 295
EPOS P 24/5 297
Notes 18

RE 35 Ø35 mm, Graphite Brushes, 90 Watt



M 1:2

Terminal 2.8x0.5
(ØTerminal)

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

according to dimensional drawing
shaft length 15.7 shortened to 4 mm

Order Number

273752	323890	273753	273754	273755	273756	273757	273758	273759	273760	273761	273762	273763
285785	323891	285786	285787	285788	285789	285790	285791	285792	285793	285794	285795	285796

Motor Data

Values at nominal voltage		273752	323890	273753	273754	273755	273756	273757	273758	273759	273760	273761	273762	273763	
1	Nominal voltage	V	15.0	24.0	30.0	42.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	
2	No load speed	rpm	7070	7670	7220	7530	7270	6650	5960	4740	3810	3140	2570	1620	
3	No load current	mA	245	168	123	92.7	77.3	68.7	59.7	44.7	34.2	27.1	21.6	12.9	
4	Nominal speed	rpm	6270	6910	6420	6770	6490	5860	5150	3920	2970	2280	1710	732	
5	Nominal torque (max. continuous torque)	mNm	73.2	93.3	92.4	97.7	96.5	98.2	98.8	102	105	105	104	104	
6	Nominal current (max. continuous current)	A	4.00	3.36	2.50	1.95	1.63	1.51	1.36	1.12	0.915	0.752	0.621	0.391	
7	Stall torque	mNm	874	1160	949	1070	967	878	766	613	493	394	320	253	
8	Starting current	A	45.0	39.7	24.4	20.3	15.5	12.9	10.1	6.43	4.16	2.74	1.83	0.704	
9	Max. efficiency	%	81	84	84	86	85	85	84	83	82	80	79	74	
Characteristics			273752	323890	273753	273754	273755	273756	273757	273758	273759	273760	273761	273762	273763
10	Terminal resistance	Ω	0.334	0.605	1.23	2.07	3.09	3.72	4.75	7.46	11.5	17.5	26.2	40.5	68.2
11	Terminal inductance	mH	0.085	0.191	0.340	0.620	0.870	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	8.43	6.79	7.76	7.16	7.62	7.67	7.89	7.85	7.84	8.08	8.19	8.46	8.55
15	Mechanical time constant	ms	5.97	5.60	5.50	5.40	5.38	5.38	5.39	5.38	5.37	5.38	5.39	5.39	5.41
16	Rotor inertia	gcm ²	67.6	78.7	67.6	72.0	67.4	67.0	65.2	65.4	65.5	63.6	62.8	60.8	60.4

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 s
 - 20 Thermal time constant motor 1050 s
 - 21 Ambient temperature -30 ... +100°C
 - 22 Max. permissible winding temperature +155°C
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 28 N

Other specifications

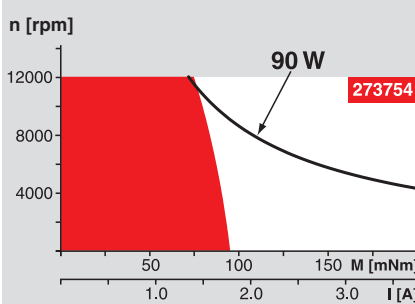
- 29 Number of pole pairs 1
- 30 Number of commutator segments 13
- 31 Weight of motor 340 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

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

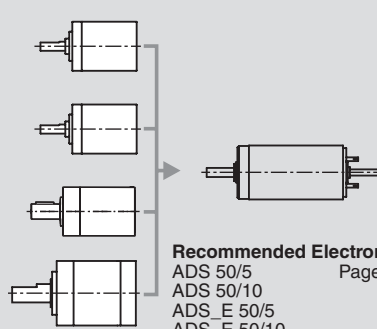
maxon Modular System

Planetary Gearhead
Ø32 mm
0.75 - 4.5 Nm
Page 239

Planetary Gearhead
Ø32 mm
1.0 - 6.0 Nm
Page 240

Planetary Gearhead
Ø32 mm
8 Nm
Page 242

Planetary Gearhead
Ø42 mm
3 - 15 Nm
Page 244



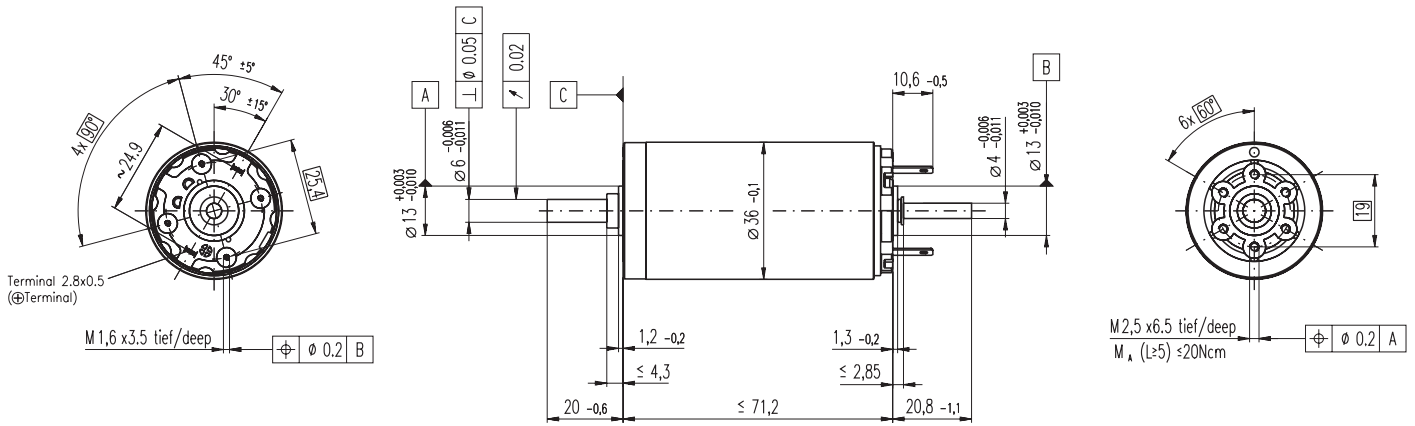
Recommended Electronics:

- ADS 50/5 276
- ADS 50/10 277
- ADS_E 50/5 277
- ADS_E 50/10 277
- EPOS 24/5 294
- EPOS2 50/5 295
- EPOS P 24/5 297
- Notes 18

Overview on page 16 - 21

- Encoder MR**
256 - 1024 CPT,
3 channels
Page 259
- Encoder HED_ 5540**
500 CPT,
3 channels
Page 262 / 264
- DC-Tacho DCT**
Ø22 mm
0.52 V
Page 271
- Brake AB 28**
Ø40 mm
24 VDC, 0.4 Nm
Page 308

RE 36 Ø36 mm, Graphite Brushes, 70 Watt



M 1:2

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

Order Number

118797 118798 118799 118800 118801 118802 118803 118804 118805 118806 118807 118808 118809 118810

Motor Data

Values at nominal voltage		118797	118798	118799	118800	118801	118802	118803	118804	118805	118806	118807	118808	118809	118810	
1	Nominal voltage	V	18.0	24.0	32.0	42.0	42.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	
2	No load speed	rpm	6610	6210	6790	7020	6340	6420	5220	4320	3450	2830	2280	1780	1420	1180
3	No load current	mA	153	105	88.6	70.4	61.4	54.6	41.6	32.6	24.7	19.5	15.2	11.5	8.97	7.31
4	Nominal speed	rpm	5880	5530	6120	6350	5660	5740	4520	3600	2720	2090	1530	1010	651	390
5	Nominal torque (max. continuous torque)	mNm	70.2	78.2	77.1	77.9	79.9	79.5	81.5	82.2	83.6	84.1	84.1	83.8	84.1	83.1
6	Nominal current (max. continuous current)	A	2.90	2.25	1.82	1.45	1.33	1.18	0.978	0.813	0.660	0.545	0.439	0.343	0.275	0.226
7	Stall torque	mNm	730	783	832	866	786	785	627	504	403	326	258	198	158	127
8	Starting current	A	28.6	21.5	18.7	15.3	12.6	11.1	7.22	4.80	3.06	2.04	1.30	0.784	0.501	0.334
9	Max. efficiency	%	84	85	86	86	86	86	85	84	82	81	79	77	75	72
Characteristics		118797	118798	118799	118800	118801	118802	118803	118804	118805	118806	118807	118808	118809	118810	
10	Terminal resistance	Ω	0.628	1.11	1.71	2.74	3.35	4.32	6.65	10.0	15.7	23.5	36.8	61.3	95.8	144
11	Terminal inductance	mH	0.0988	0.201	0.300	0.487	0.597	0.760	1.15	1.68	2.62	3.87	5.96	9.70	15.1	21.9
12	Torque constant	mNm / A	25.5	36.4	44.5	56.6	62.6	70.7	86.9	105	131	160	198	253	315	380
13	Speed constant	rpm / V	375	263	215	169	152	135	110	90.9	72.7	59.8	48.2	37.8	30.3	25.1
14	Speed / torque gradient	rpm / mNm	9.23	8.05	8.27	8.18	8.14	8.25	8.41	8.65	8.67	8.80	8.96	9.17	9.21	9.51
15	Mechanical time constant	ms	6.00	5.89	5.84	5.81	5.81	5.80	5.81	5.81	5.82	5.83	5.84	5.86	5.85	5.88
16	Rotor inertia	gcm ²	62.0	69.9	67.5	67.8	68.1	67.2	66.0	64.2	64.1	63.3	62.2	61.1	60.7	59.0

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 6.4 K / W
 - 18 Thermal resistance winding-housing 3.4 K / W
 - 19 Thermal time constant winding 44.2 s
 - 20 Thermal time constant motor 1120 s
 - 21 Ambient temperature -30 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (ball bearings)**
- 23 Max. permissible 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) 5.6 N (static, shaft supported) 1200 N
 - 28 Max. radial loading, 5 mm from flange 28 N

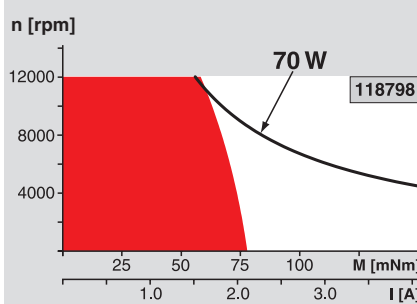
Other specifications

- 29 Number of pole pairs 1
 - 30 Number of commutator segments 13
 - 31 Weight of motor 350 g
- Values listed in the table are nominal.
Explanation of the figures on page 49.
- △ Tolerances may vary from the standard specification.

Option

Preloaded ball bearings

Operating Range

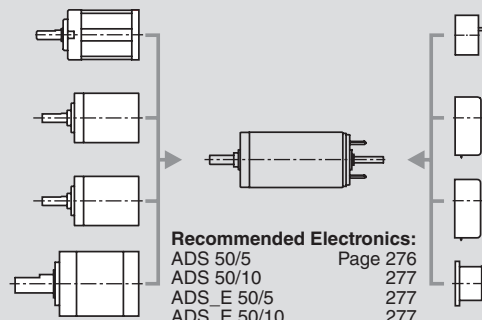


Comments

- 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

- Planetary Gearhead**
Ø32 mm
0.4 - 2.0 Nm
Page 237
- Planetary Gearhead**
Ø32 mm
0.75 - 4.5 Nm
Page 239
- Planetary Gearhead**
Ø32 mm
1.0 - 6.0 Nm
Page 240
- Planetary Gearhead**
Ø42 mm
3 - 15 Nm
Page 244

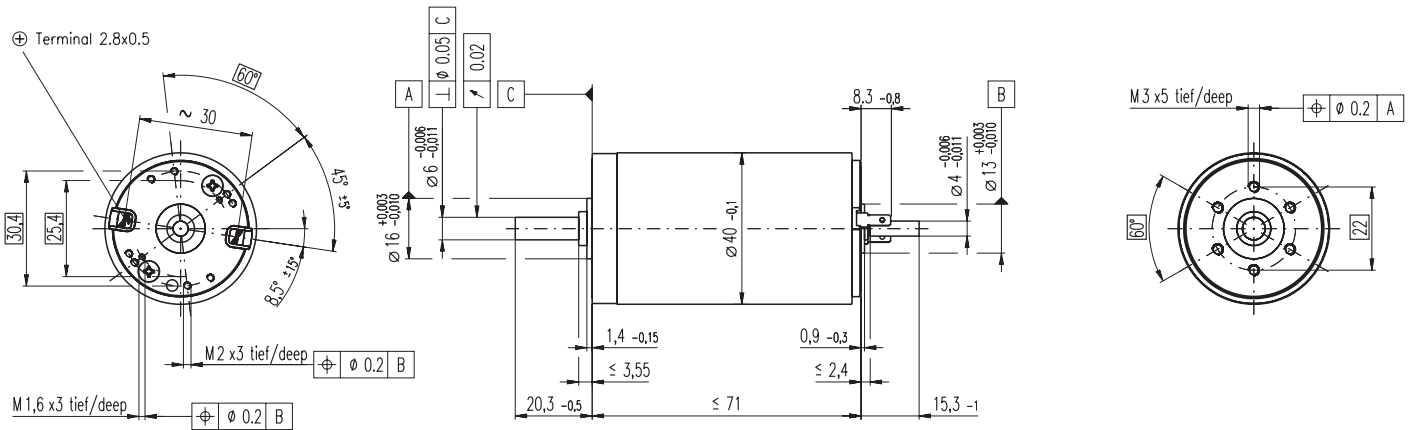


- Recommended Electronics:**
- ADS 50/5 276
 - ADS 50/10 277
 - ADS_E 50/5 277
 - ADS_E 50/10 277
 - EPOS 24/5 294
 - EPOS2 50/5 295
 - EPOS P 24/5 297
 - Notes 18

Overview on page 16 - 21

- Encoder MR**
256 - 1024 CPT,
3 channels
Page 259
- Encoder HEDS 5540**
500 CPT,
3 channels
Page 262
- Encoder HEDL 5540**
500 CPT,
3 channels
Page 264
- DC-Tacho DCT**
Ø22 mm
0.52 V
Page 271

RE 40 Ø40 mm, Graphite Brushes, 150 Watt



M 1:2

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

Order Number

148866 148867 148877 218008 218009 218010 218011 218012 218013 218014 218015

Motor Data

Values at nominal voltage		148866	148867	148877	218008	218009	218010	218011	218012	218013	218014	218015
1	Nominal voltage	V	12.0	24.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
2	No load speed	rpm	6920	7580	7580	6420	5560	3330	2690	2130	1710	1420
3	No load current	mA	241	137	68.6	53.7	43.7	21.9	16.7	12.5	9.67	7.77
4	Nominal speed	rpm	6370	6930	7000	5810	4920	2700	2050	1500	1080	774
5	Nominal torque (max. continuous torque)	mNm	94.9	170	184	183	177	187	189	189	188	188
6	Nominal current (max. continuous current)	A	6.00	5.77	3.12	2.62	2.20	1.38	1.12	0.898	0.721	0.593
7	Stall torque	mNm	1680	2280	2500	1990	1580	995	796	641	512	415
8	Starting current	A	102	75.7	41.4	28.0	19.2	7.26	4.68	3.00	1.92	1.29
9	Max. efficiency	%	88	91	92	91	91	89	88	87	86	85
Characteristics												
10	Terminal resistance	Ω	0.117	0.317	1.16	1.72	2.50	6.61	10.2	16.0	24.9	37.1
11	Terminal inductance	mH	0.0245	0.0823	0.329	0.460	0.612	1.70	2.62	4.14	6.40	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	4.81	4.39	4.36	4.35	4.31	4.31	4.31	4.31	4.32
16	Rotor inertia	gcm ²	139	138	138	129	118	123	121	123	122	120

Specifications

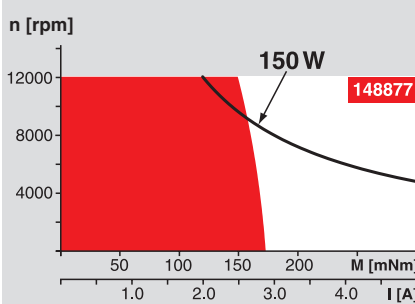
- Thermal data**
- 17 Thermal resistance housing-ambient 4.65 K / W
 - 18 Thermal resistance winding-housing 1.93 K / W
 - 19 Thermal time constant winding 41.6 s
 - 20 Thermal time constant motor 1120 s
 - 21 Ambient temperature -30 ... +100°C
 - 22 Max. permissible winding temperature +155°C
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 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 49.

- 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.

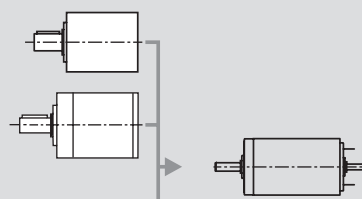
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

Planetary Gearhead
Ø42 mm
3 - 15 Nm
Page 244

Planetary Gearhead
Ø52 mm
4 - 30 Nm
Page 247



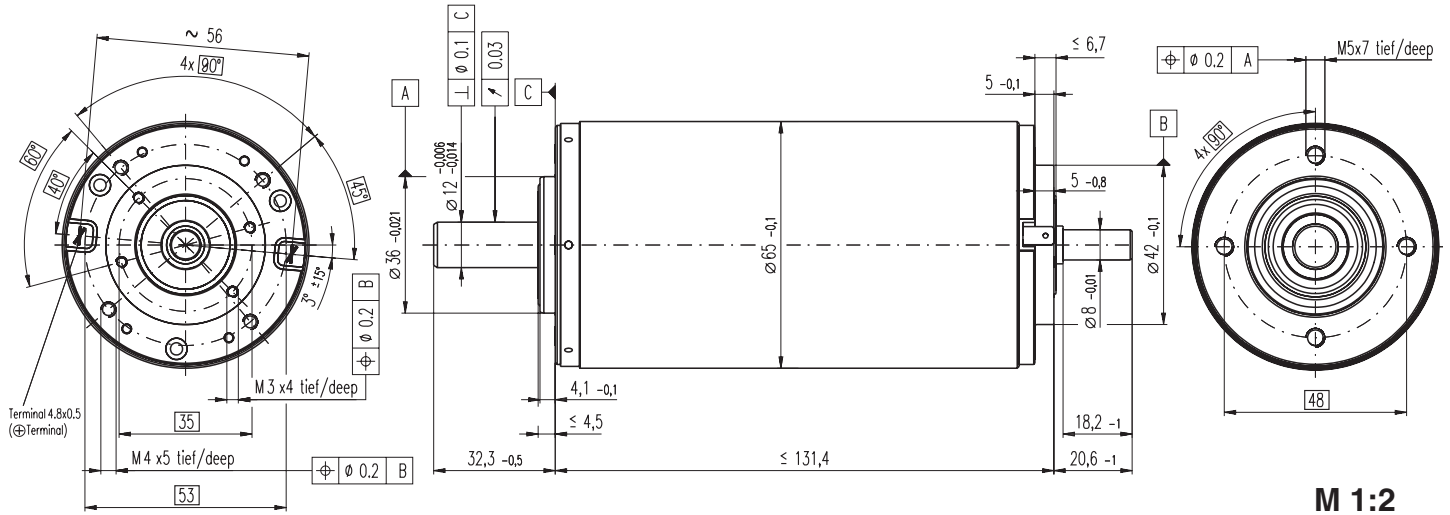
- Recommended Electronics:**
- ADS 50/5 Page 276
 - ADS 50/10 277
 - ADS_E 50/5 277
 - ADS_E 50/10 277
 - EPOS 24/5 294
 - EPOS2 50/5 295
 - EPOS 70/10 295
 - EPOS P 24/5 297
 - Notes 18

Overview on page 16 - 21

- Encoder MR**
256 - 1024 CPT,
3 channels
Page 259
- Encoder HED_ 5540**
500 CPT,
3 channels
Page 262 / 264
- Brake AB 28**
Ø45 mm
24 VDC, 0.4 Nm
Page 308
- Industrial Version Encoder HEDL 9140**
Page 267
- Brake AB 28**
Page 309

RE 65 \varnothing 65 mm, Graphite Brushes, 250 Watt

NEW



M 1:2

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

Order Number

353294 353295 353296 353297 353298 353299 353300 353301

Motor Data (provisional)

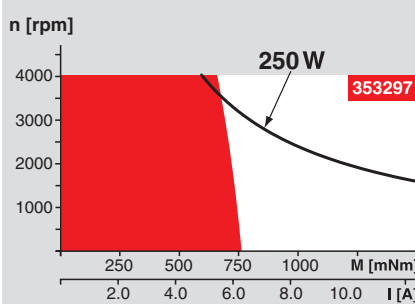
Values at nominal voltage										
1	Nominal voltage	V	18.0	24.0	36.0	48.0	60.0	70.0	70.0	70.0
2	No load speed	rpm	3350	3880	3770	3480	3490	3260	3020	2550
3	No load current	mA	714	647	407	271	217	170	153	123
4	Nominal speed	rpm	3100	3640	3550	3270	3290	3060	2820	2350
5	Nominal torque (max. continuous torque)	mNm	452	510	654	746	782	819	830	886
6	Nominal current (max. continuous current)	A	10.0	9.62	7.74	6.02	5.04	4.21	3.94	3.54
7	Stall torque	mNm	14700	16800	18600	17100	17200	16000	14500	12900
8	Starting current	A	302	297	208	132	106	78.8	66.3	49.9
9	Max. efficiency	%	81.6	84.3	87.3	88.5	89.1	89.3	89.1	88.9
Characteristics										
10	Terminal resistance	Ω	0.0596	0.0809	0.173	0.363	0.566	0.888	1.06	1.4
11	Terminal inductance	mH	0.252	0.343	0.848	1.79	2.8	4.38	5.11	7.18
12	Torque constant	mNm / A	48.6	56.7	89.1	130	162	203	219	259
13	Speed constant	rpm / V	196	168	107	73.7	58.9	47.2	43.7	36.8
14	Speed / torque gradient	rpm / mNm	0.241	0.24	0.208	0.206	0.206	0.207	0.211	0.199
15	Mechanical time constant	ms	3.49	3.25	3.0	2.9	2.85	2.83	2.83	2.8
16	Rotor inertia	gcm ²	1380	1290	1380	1340	1320	1310	1280	1340

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 1.3 K / W
 - 18 Thermal resistance winding-housing 1.85 K / W
 - 19 Thermal time constant winding 127 s
 - 20 Thermal time constant motor 991 s
 - 21 Ambient temperature -30 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 4000 rpm
 - 24 Axial play at axial load < 25 N 0 mm
 - 24 Axial play at axial load > 25 N 0.1 mm preloaded
 - 25 Radial play 70 N
 - 26 Max. axial load (dynamic) 420 N
 - 27 Max. force for press fits (static) (static, shaft supported) 12000 N
 - 28 Max. radial loading, 15 mm from flange 350 N
- Other specifications**
- 29 Number of pole pairs 2
 - 30 Number of commutator segments 26
 - 31 Weight of motor 2480 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range



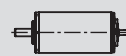
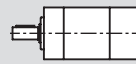
Comments

- 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 16 - 21

Planetary Gearhead
 $\varnothing 81$ mm
20 - 120 Nm
Page 250

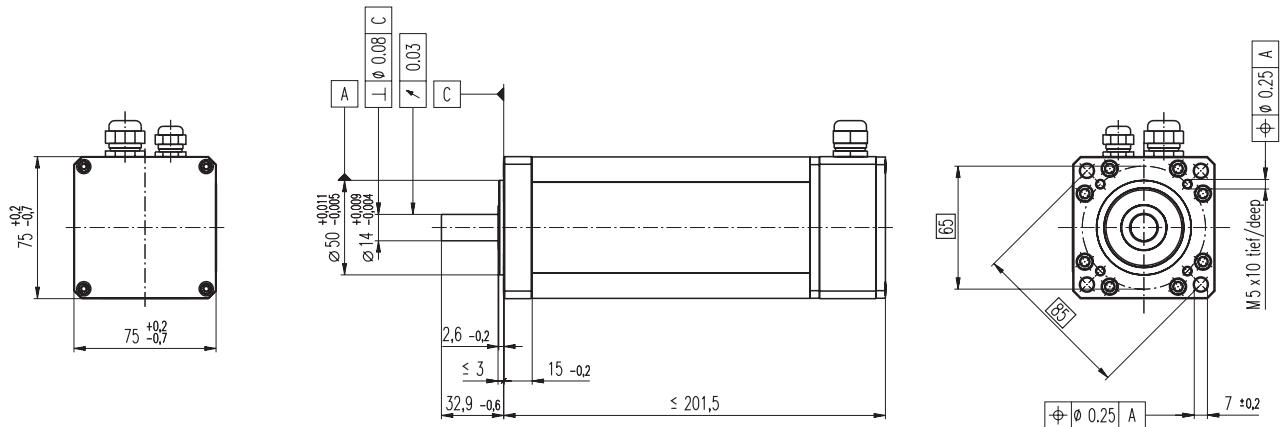


Encoder HEDS 5540
500 CPT,
3 channels
Page 263

Encoder HEDL 5540
500 CPT,
3 channels
Page 265

Recommended Electronics:
ADS 50/5 Page 276
ADS 50/10 277
ADS_E 50/5 277
ADS_E 50/10 277
EPOS2 50/5 295
EPOS 70/10 295
Notes 18

RE 75 □75 mm, Graphite Brushes, 250 Watt



M 1:4

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

Order Number

118819 118820 118821 118822 118823 118824 118825 118826 118827 118828 118829

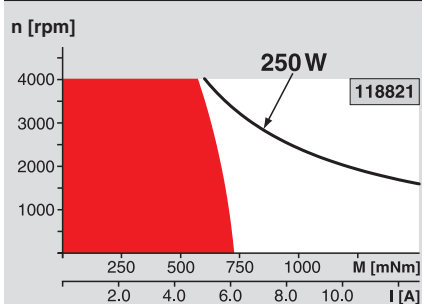
Motor Data

Values at nominal voltage		118819	118820	118821	118822	118823	118824	118825	118826	118827	118828	118829
1	Nominal voltage	V	12.0	24.0	36.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0
2	No load speed	rpm	1820	2760	2880	3100	2480	2300	1940	1550	1270	1020
3	No load current	mA	568	518	366	306	214	190	146	105	78.6	58.0
4	Nominal speed	rpm	1540	2510	2650	2870	2250	2060	1710	1320	1030	909
5	Nominal torque (max. continuous torque)	mNm	551	630	697	718	776	786	839	867	875	884
6	Nominal current (max. continuous current)	A	10.0	8.37	6.34	5.23	4.47	4.19	3.74	3.08	2.53	2.32
7	Stall torque	mNm	5960	10600	11300	12100	9630	8760	7810	6190	4900	4450
8	Starting current	A	103	133	97.0	83.6	53.0	44.6	33.6	21.3	13.8	11.3
9	Max. efficiency	%	75	83	85	86	86	85	85	85	84	84
Characteristics												
10	Terminal resistance	Ω	0.117	0.181	0.371	0.574	0.905	1.08	1.43	2.25	3.49	4.23
11	Terminal inductance	mH	0.0402	0.076	0.161	0.251	0.393	0.458	0.643	1.01	1.51	1.83
12	Torque constant	mNm / A	58.1	79.9	116	145	182	196	233	291	356	392
13	Speed constant	rpm / V	164	119	82.1	65.7	52.6	48.7	41.1	32.9	26.8	24.3
14	Speed / torque gradient	rpm / mNm	0.331	0.270	0.262	0.26	0.262	0.267	0.252	0.255	0.263	0.263
15	Mechanical time constant	ms	4.95	4.25	4.01	3.93	3.92	3.92	3.86	3.86	3.86	3.86
16	Rotor inertia	gcm ²	1430	1500	1460	1450	1430	1400	1460	1450	1400	1400

Specifications

Thermal data		
17	Thermal resistance housing-ambient	1.3 K / W
18	Thermal resistance winding-housing	1.6 K / W
19	Thermal time constant winding	106 s
20	Thermal time constant motor	1820 s
21	Ambient temperature	-30 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible speed	4000 rpm
24	Axial play at axial load < 18 N	0 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	70 N
27	Max. force for press fits (static) (static, shaft supported)	420 N 12000 N
28	Max. radial loading, 15 mm from flange	350 N

Operating Range



Comments

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

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

— Assigned power rating

Other specifications

29	Number of pole pairs	2
30	Number of commutator segments	26
31	Weight of motor	2800 g

Connection

Ring terminals	∅ 6 mm
Screw fitting for cable	PG 13
Diameter of opening	∅ 8 - 15 mm
Recommended cable size	2 x 4 mm ²

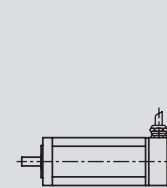
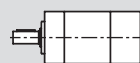
Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

Output shaft with feather key A5 (5 x 5 x 25 DIN 6885)	
Brush monitoring system	
Output signal that is free of potential, SPST, N.C.	
Contact load	max. 3 Watt
Switching voltage	max. 150 VDC
Switching current	max. 0.25 ADC
Screw fitting for cable	PG 7
Diameter of opening	∅ 5 - 7 mm

maxon Modular System

Planetary Gearhead
∅81 mm
20 - 120 Nm
Page 250



Overview on page 16 - 21

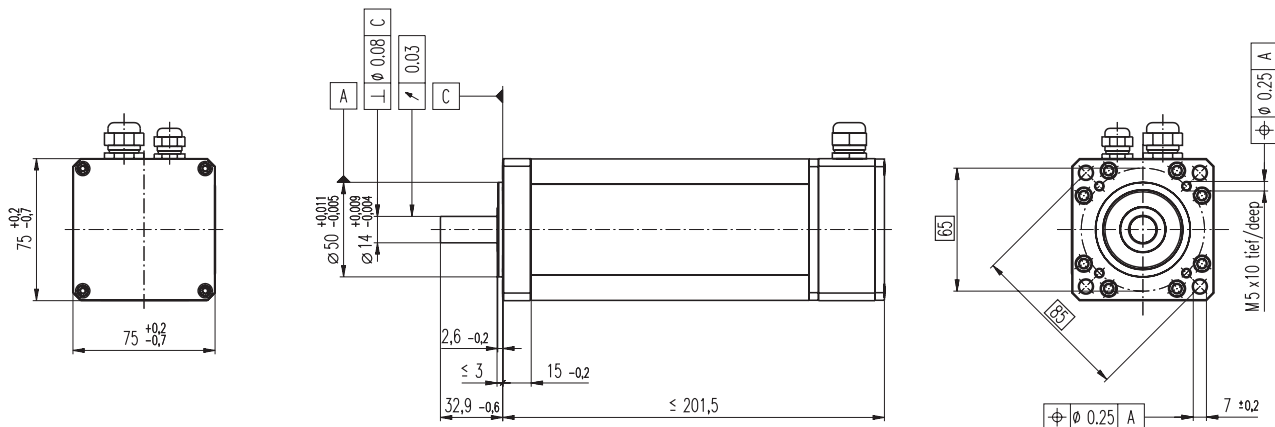
Encoder HEDS 5540
500 CPT,
3 channels
Page 263

Encoder HEDL 5540
500 CPT,
3 channels
Page 265

Brake AB 75
□75 mm
24 VDC, 1.4 Nm
Page 311

Recommended Electronics:
ADS 50/10 Page 277
ADS_E 50/10 277
EPOS2 50/5 295
EPOS 70/10 295
Notes 18

RE 75 □75 mm, Graphite Brushes, 250 Watt, IP54



M 1:4

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

Order Number

118854 118855 118856 118857 118858 118859 118860 118861 118862 118863 118864

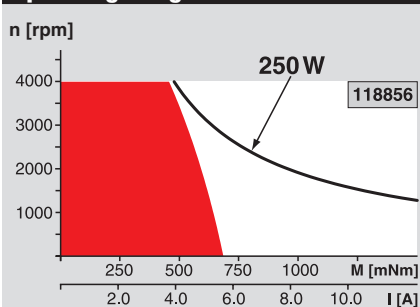
Motor Data

Values at nominal voltage		118854	118855	118856	118857	118858	118859	118860	118861	118862	118863	118864	
1	Nominal voltage	V	24.0	30.0	48.0	60.0	72.0	80.0	96.0	120	140	160	180
2	No load speed	rpm	3750	3450	3850	3870	3720	3830	3890	3900	3720	3860	3840
3	No load current	mA	1440	1020	723	580	458	428	363	291	234	214	190
4	Nominal speed	rpm	3560	3260	3680	3700	3550	3670	3730	3740	3550	3690	3680
5	Nominal torque (max. continuous torque)	mNm	371	477	507	535	574	565	589	601	622	612	614
6	Nominal current (max. continuous current)	A	7.79	6.97	5.07	4.26	3.61	3.30	2.89	2.36	1.98	1.77	1.57
7	Stall torque	mNm	13500	13600	15300	15300	14700	14900	16000	15800	14600	15200	14900
8	Starting current	A	233	170	132	106	80.7	75.7	68.6	54.4	41.0	38.7	33.6
9	Max. efficiency	%	79	80	83	84	84	84	85	85	85	85	85
Characteristics													
10	Terminal resistance	Ω	0.103	0.176	0.365	0.569	0.892	1.06	1.40	2.20	3.41	4.14	5.35
11	Terminal inductance	mH	0.0402	0.076	0.161	0.251	0.393	0.458	0.643	1.01	1.51	1.83	2.34
12	Torque constant	mNm / A	58.1	79.9	116	145	182	196	233	291	356	392	443
13	Speed constant	rpm / V	164	119	82.1	65.7	52.6	48.7	41.1	32.9	26.8	24.3	21.5
14	Speed / torque gradient	rpm / mNm	0.291	0.264	0.258	0.257	0.258	0.262	0.247	0.249	0.257	0.257	0.260
15	Mechanical time constant	ms	4.36	4.15	3.94	3.89	3.86	3.85	3.78	3.77	3.78	3.77	3.78
16	Rotor inertia	gcm ²	1430	1500	1460	1450	1430	1400	1460	1450	1400	1400	1390

Specifications

Thermal data		
17	Thermal resistance housing-ambient	1.3 K / W
18	Thermal resistance winding-housing	1.6 K / W
19	Thermal time constant winding	106 s
20	Thermal time constant motor	1820 s
21	Ambient temperature	-30 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible speed	4000 rpm
24	Axial play at axial load < 18 N	0 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	70 N
27	Max. force for press fits (static) (static, shaft supported)	420 N
28	Max. radial loading, 15 mm from flange	350 N

Operating Range



Comments

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

Other specifications		
29	Number of pole pairs	2
30	Number of commutator segments	26
31	Weight of motor	2800 g
	Protection to	IP54
Connection		
	Ring terminals	∅ 6 mm
	Screw fitting for cable	PG 13
	Diameter of opening	∅ 8 - 15 mm
	Recommended cable size	2 x 4 mm ²

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

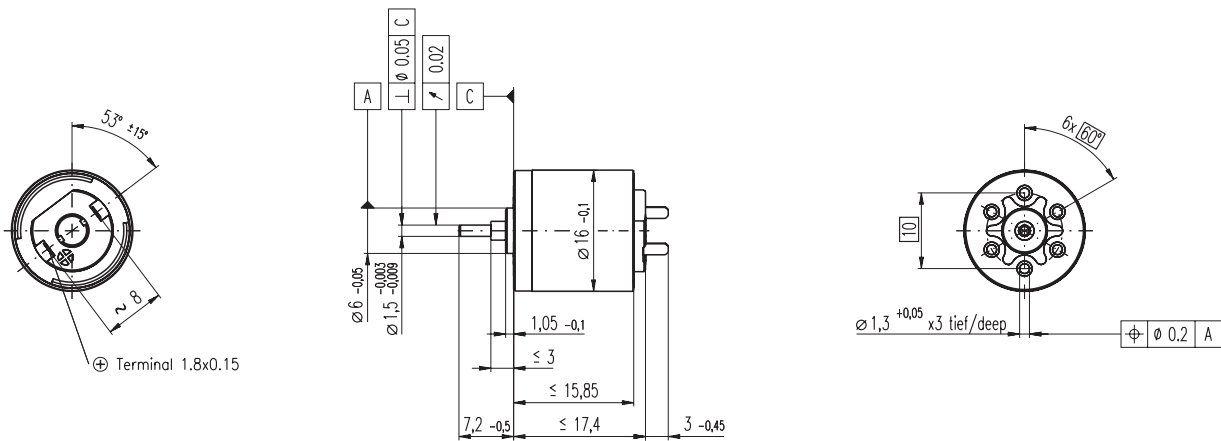
	Output shaft with feather key A5 (5 x 5 x 25 DIN 6885)	
	Brush monitoring system	
	Output signal that is free of potential, SPST, N.C.	
	Contact load	max. 3 Watt
	Switching voltage	max. 150 VDC
	Switching current	max. 0.25 ADC
	Screw fitting for cable	PG 7
	Diameter of opening	∅ 5 - 7 mm

maxon Modular System

Overview on page 16 - 21

Recommended Electronics:
 ADS 50/10 Page 277
 ADS_E 50/10 277
Notes 18

A 2516 $\varnothing 16$ mm, Precious Metal Brushes, 0.8 Watt



M 1:1

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

Order Number

2516. ... -11.111-000 (Insert winding number)

Winding number

805	800	804
-----	-----	-----

Motor Data

Values at nominal voltage		805	800	804	
1	Nominal voltage	V	4.5	12.0	24.0
2	No load speed	rpm	16600	16100	18200
3	No load current	mA	31.4	11.4	7.00
4	Nominal speed	rpm	6940	4990	7400
5	Nominal torque (max. continuous torque)	mNm	0.759	0.654	0.661
6	Nominal current (max. continuous current)	A	0.329	0.105	0.0603
7	Stall torque	mNm	1.32	0.964	1.13
8	Starting current	A	0.542	0.147	0.0968
9	Max. efficiency	%	60	54	56
Characteristics					
10	Terminal resistance	Ω	8.30	81.5	248
11	Terminal inductance	mH	0.128	0.926	2.95
12	Torque constant	mNm / A	2.43	6.55	11.7
13	Speed constant	rpm / V	3930	1460	817
14	Speed / torque gradient	rpm / mNm	13400	18200	17300
15	Mechanical time constant	ms	66.0	72.6	72.2
16	Rotor inertia	gcm ²	0.470	0.382	0.398

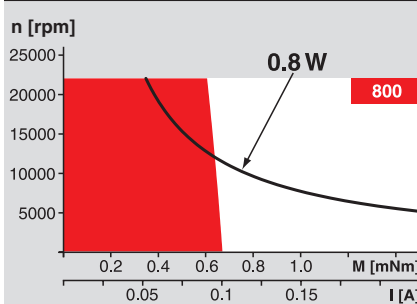
Specifications

Thermal data		
17	Thermal resistance housing-ambient	25.5 K / W
18	Thermal resistance winding-housing	28.2 K / W
19	Thermal time constant winding	5.78 s
20	Thermal time constant motor	158 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	22000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.5 N
27	Max. force for press fits (static)	40 N
28	Max. radial loading, 5 mm from flange	1.4 N

Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	5
31	Weight of motor	12.4 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range



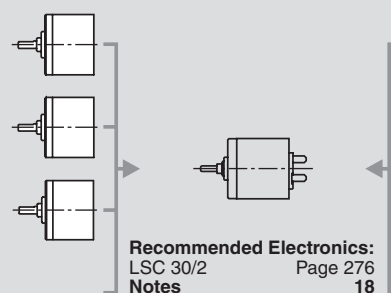
Comments

- 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 16 - 21

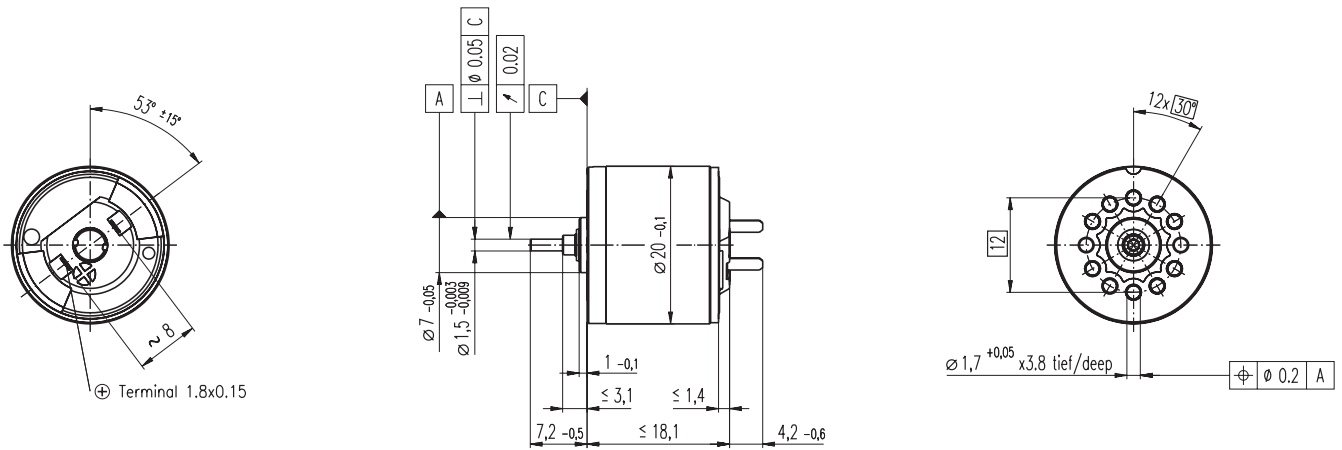
- Spur Gearhead**
 $\varnothing 16$ mm
0.01 - 0.03 Nm
Page 219
- Spur Gearhead**
 $\varnothing 16$ mm
0.015 - 0.04 Nm
Page 220
- Spur Gearhead**
 $\varnothing 16$ mm
0.06 - 0.1 Nm
Page 221 / 222



- Encoder MEnc**
 $\varnothing 13$ mm
16 CPT, 2 channels
Page 270

Recommended Electronics:
LSC 30/2 Page 276
Notes 18

A 2520 Ø20 mm, Precious Metal Brushes, 1.2 Watt



M 1:1

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

Order Number

2520. ... -11.111-000 (Insert winding number)

Winding number

854	852	853
-----	-----	-----

Motor Data

Values at nominal voltage		854	852	853	
1	Nominal voltage	V	6.0	9.0	12.0
2	No load speed	rpm	13600	13400	13000
3	No load current	mA	18.5	12.2	8.73
4	Nominal speed	rpm	6400	5730	4090
5	Nominal torque (max. continuous torque)	mNm	1.07	0.998	0.858
6	Nominal current (max. continuous current)	A	0.275	0.169	0.107
7	Stall torque	mNm	2.05	1.76	1.27
8	Starting current	A	0.504	0.287	0.152
9	Max. efficiency	%	67	65	60
Characteristics					
10	Terminal resistance	Ω	11.9	31.4	78.7
11	Terminal inductance	mH	0.209	0.475	0.875
12	Torque constant	mNm / A	4.07	6.14	8.33
13	Speed constant	rpm / V	2350	1560	1150
14	Speed / torque gradient	rpm / mNm	6870	7950	10800
15	Mechanical time constant	ms	59.7	61.2	65.8
16	Rotor inertia	gcm ²	0.830	0.735	0.580

Specifications

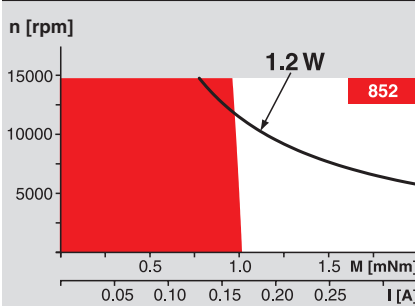
Thermal data		
17	Thermal resistance housing-ambient	25.5 K / W
18	Thermal resistance winding-housing	28.2 K / W
19	Thermal time constant winding	9.65 s
20	Thermal time constant motor	255 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	14700 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.5 N
27	Max. force for press fits (static)	40 N
28	Max. radial loading, 5 mm from flange	1.4 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	5
31	Weight of motor	20 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

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.

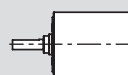
Short term operation
The motor may be briefly overloaded (recurring).

— **Assigned power rating**

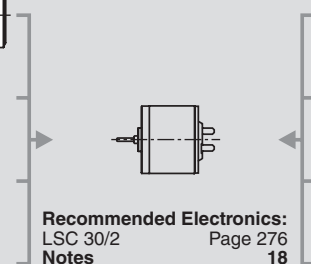
maxon Modular System

Overview on page 16 - 21

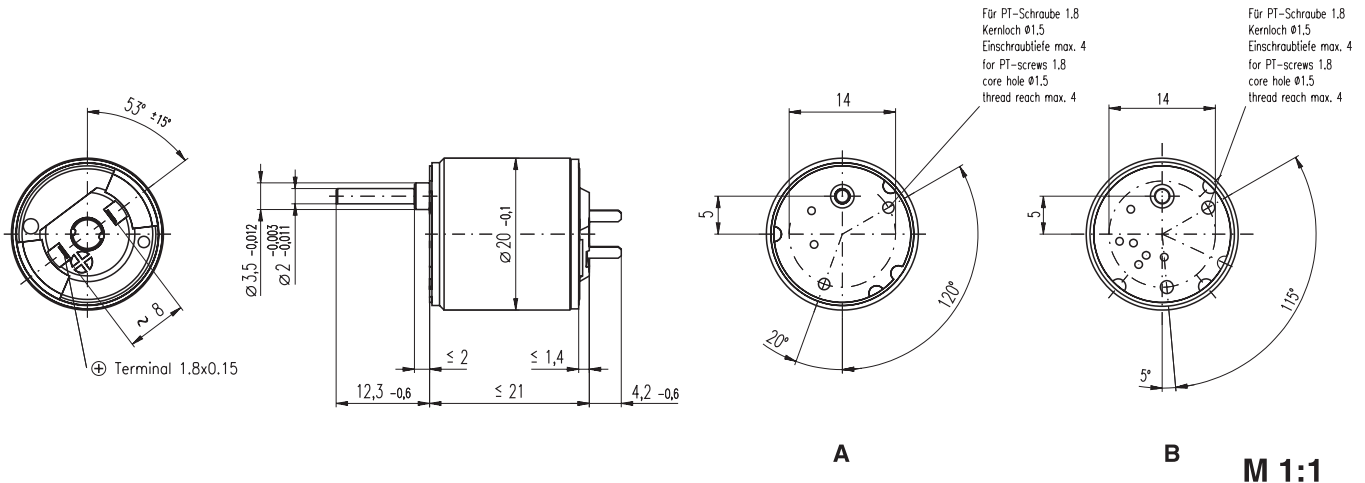
Planetary Gearhead
Ø19 mm
0.1 - 0.3 Nm
Page 226



Encoder MEnc
Ø13 mm
16 CPT, 2 channels
Page 270



GM 20 Ø20 mm, Precious Metal Brushes, 1.2 Watt



■ Stock program	□ Standard program	□ Special program (on request)	Dimension Drawing A	Order Number	167171	167172	167173	167165	167166	167167	167168	167169	167170	204978	204977	204968	204965	204975	204974
			Dimension Drawing B		2.5:1	10.5:1	55.1:1	159:1	371:1	2.5:1	10.5:1	55.1:1	159:1	371:1	2.5:1	10.5:1	55.1:1	159:1	371:1
			Gearhead reduction ratio																

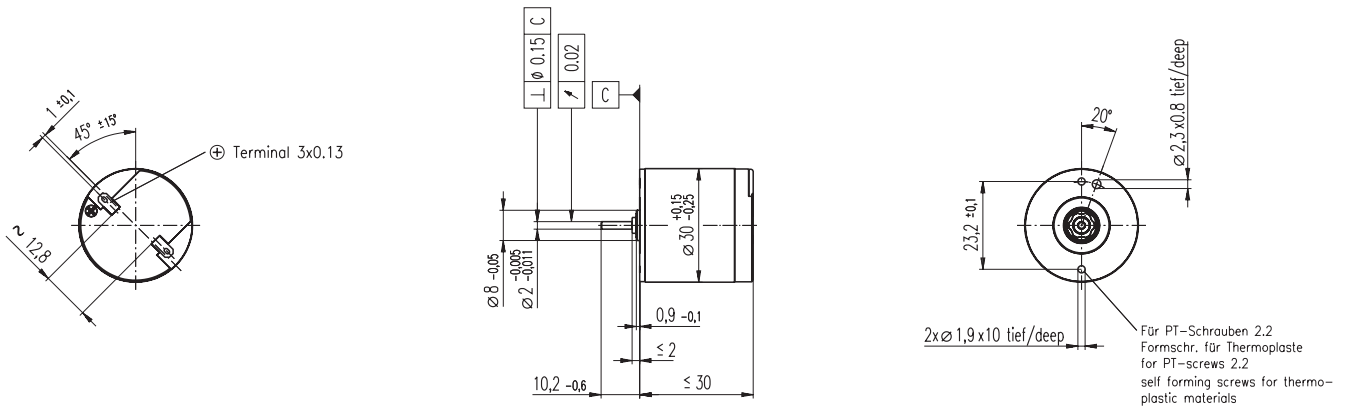
Motor Data																				
Values at nominal voltage																				
1	Nominal voltage	V	6.0	6.0	6.0	6.0	6.0	9.0	9.0	9.0	9.0	9.0	12.0	12.0	12.0	12.0	12.0			
2	No load speed motor shaft	rpm	13500	13700	13700	13700	13700	13000	13400	13300	13400	13400	12900	13200	13100	13200	13200			
2	No load speed ¹⁾	rpm	5260	1300	248	86.1	36.9	5070	1270	241	83.9	36.0	5020	1250	238	82.9	35.5			
3	No load current	mA	19.9	12.5	14.1	12.8	12.9	12.8	8.15	9.17	8.33	8.39	9.37	5.94	6.7	6.08	6.12			
4	Nominal speed ¹⁾	rpm	2910	711	157	74.0	34.4	1430	347	78.8	62.4	31.6	1590	386	95.8	63.9	31.6			
5	Nominal torque ¹⁾	mNm	2.10	7.90	30.0	30.0	30.0	1.86	6.96	30.0	30.0	1.98	7.44	30.0	30.0	30.0				
6	Nominal current (max. continuous current)	A	0.236	0.235	0.194	0.0821	0.0458	0.136	0.136	0.127	0.0536	0.0299	0.107	0.107	0.0939	0.0396	0.022			
7	Stall torque ¹⁾	mNm	2.10	7.90	30.0	30.0	30.0	1.93	7.15	30.0	30.0	2.07	7.65	30.0	30.0	30.0				
8	Starting current	A	0.223	0.227	0.183	0.0705	0.0336	0.136	0.136	0.122	0.0468	0.0223	0.107	0.107	0.0896	0.0344	0.0164			
9	Max. efficiency ¹⁾	%	59	58	51	47	42	51	52	45	42	38	53	53	46	43	39			
Characteristics																				
10	Terminal resistance	Ω	11.9	11.9	11.9	11.9	11.9	48.8	48.8	48.8	48.8	48.8	78.7	78.7	78.7	78.7	78.7			
11	Terminal inductance	mH	0.209	0.209	0.209	0.209	0.209	0.475	0.475	0.475	0.475	0.475	0.875	0.875	0.875	0.875	0.875			
12	Torque constant ¹⁾	mNm / A	10.5	43.0	224	648	1510	15.8	64.9	338	978	2280	21.4	88.1	459	1330	3100			
13	Speed constant motor	rpm / V	2350	2350	2350	2350	2350	1560	1560	1560	1560	1560	1150	1150	1150	1150	1150			
13	Speed constant ¹⁾	rpm / V	913	222	42.6	14.7	6.31	605	147	28.2	9.77	4.19	446	108	20.8	7.19	3.08			
14	Speed / torque gradient ¹⁾	rpm / mNm	1040	61.4	2.26	0.271	0.0497	1870	111	4.07	0.488	0.0896	1640	96.8	3.56	0.427	0.0783			
15	Mechanical time constant ¹⁾	ms	59.6	59.6	59.6	59.6	59.6	67.4	67.4	67.4	67.4	65.7	65.7	65.7	65.7	65.7	65.7			
16	Moment of inertia ¹⁾	gcm ²	5.48	92.7	2520	21000	115000	3.44	58.2	1580	13200	71900	3.83	64.8	1760	14700	80100			
Recommended limits																				
	Max. permissible speed ¹⁾	rpm	4700	1100	220	75.0	32.0	4700	1100	220	75.0	32.0	4700	1100	220	75.0	32.0			
	Max. torque short-term ¹⁾	mNm	3.00	10.0	50.0	100	100	3.00	10.0	50.0	100	100	3.00	10.0	50.0	100	100			

¹⁾ Values refer to gearhead output shaft

Specifications	Operating Range	Comments
Thermal data 17 Thermal resistance housing-ambient 25.5 K / W 18 Thermal resistance winding-housing 28.5 K / W 19 Thermal time constant winding 7.7 s 20 Thermal time constant gearmotor 255 s 21 Ambient temperature -20 ... +65°C 22 Max. permissible winding temperature +85°C Mechanical data (sleeve bearings) 23 Max. permissible speed motor shaft 14700 rpm 24 Axial play 0.05 - 0.15 mm 25 Radial play 0.005 mm 26 Max. axial load (dynamic) 0.12 N 27 Max. force for press fits (static) 12 N 28 Max. radial loading, 3 mm from flange 0.6 N Other specifications 29 Number of pole pairs 1 30 Number of commutator segments 5 31 Weight of motor 20 g	Operating Range 	Continuous operation In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit. Short term operation The motor may be briefly overloaded (recurring). — Assigned power rating

Spur Gearhead	maxon Modular System	Encoder MEnc
Reduction No. of stages Sense of rotations 2.57 : 1 1 10.57 : 1 2 55.1 : 1 3 159.21 : 1 4 371.49 : 1 5		Overview on page 16 - 21 Encoder MEnc Ø13 mm 16 CPT, 2 channels Page 270
Values listed in the table are nominal. Explanation of the figures on page 49.	Recommended Electronics: LSC 30/2 Page 276 Notes 18	

F 2130 Ø30 mm, Precious Metal Brushes CLL, 2.5 Watt, CE approved



M 1:2

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

Order Number

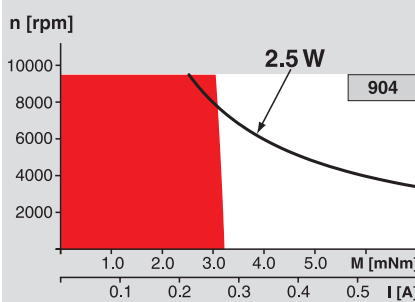
2130. ... -22.112-050 (Insert winding number)

Motor Data	Winding number	Order Number															
		917	900	903	904	905	906	907	908	910							
Values at nominal voltage																	
1	Nominal voltage	V	2.0	3.0	6.0	6.0	9.0	12.0	12.0	15.0	24.0						
2	No load speed	rpm	5250	5750	6020	4790	5980	6480	5290	5310	5380						
3	No load current	mA	43.7	33.7	18.2	12.6	12.0	10.3	7.37	5.94	3.79						
4	Nominal speed	rpm	1780	2470	2660	1410	2570	3050	1820	1810	1850						
5	Nominal torque (max. continuous torque)	mNm	3.41	3.59	3.49	3.52	3.44	3.39	3.41	3.38	3.34						
6	Nominal current (max. continuous current)	A	0.992	0.761	0.388	0.311	0.253	0.204	0.166	0.133	0.0831						
7	Stall torque	mNm	5.23	6.35	6.32	5.05	6.09	6.48	5.25	5.19	5.15						
8	Starting current	A	1.48	1.31	0.682	0.435	0.436	0.376	0.25	0.198	0.125						
9	Max. efficiency	%	70	71	71	70	71	71	70	69	69						
Characteristics																	
10	Terminal resistance	Ω	1.35	2.29	8.79	13.8	20.6	31.9	48.1	75.7	193						
11	Terminal inductance	mH	0.0720	0.136	0.496	0.780	1.13	1.71	2.56	3.96	9.87						
12	Torque constant	mNm / A	3.53	4.85	9.27	11.6	14.0	17.2	21.0	26.2	41.3						
13	Speed constant	rpm / V	2700	1970	1030	822	683	555	454	365	231						
14	Speed / torque gradient	rpm / mNm	1040	930	978	976	1010	1030	1040	1050	1080						
15	Mechanical time constant	ms	43.9	42.9	42.9	42.7	43.0	43.2	43.3	43.5	43.6						
16	Rotor inertia	gcm ²	4.05	4.40	4.19	4.18	4.07	4.02	3.99	3.94	3.87						

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 23.1 K / W
 - 18 Thermal resistance winding-housing 13.3 K / W
 - 19 Thermal time constant winding 22.1 s
 - 20 Thermal time constant motor 705 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 9500 rpm
 - 24 Axial play 0.15 - 0.25 mm
 - 25 Radial play 0.014 mm
 - 26 Max. axial load (dynamic) 0.4 N
 - 27 Max. force for press fits (static) 50 N
 - 28 Max. radial loading, 5 mm from flange 2.0 N

Operating Range



Comments

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

Other specifications

- 29 Number of pole pairs 1
- 30 Number of commutator segments 7
- 31 Weight of motor 61 g
- CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 49.

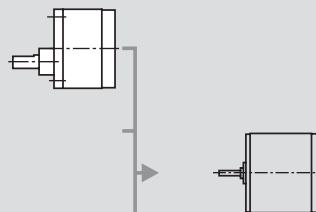
Option

- Ball bearings in place of sleeve bearings

maxon Modular System

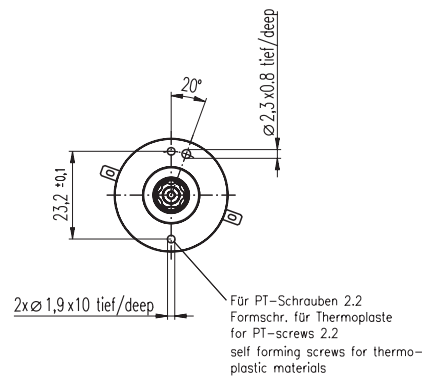
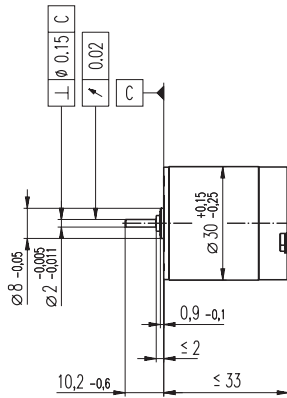
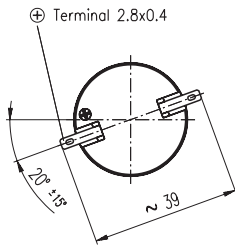
Overview on page 16 - 21

Spur Gearhead
Ø30 mm
0.07 - 0.2 Nm
Page 236



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

F 2130 Ø30 mm, Graphite Brushes, 3 Watt, CE approved



M 1:2

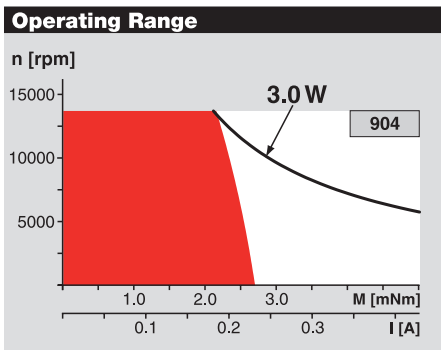
- Stock program
- Standard program
- Special program (on request)

Order Number

2130. ... -22.116-050 (Insert winding number)

		Winding number								
		900	903	904	905	906	907	908	910	
Motor Data										
Values at nominal voltage										
1	Nominal voltage	V	3.0	6.0	6.0	9.0	12.0	12.0	15.0	24.0
2	No load speed	rpm	4220	5260	4190	5470	6050	4920	4990	5140
3	No load current	mA	56.5	31.2	23.5	20.9	17.5	13.5	10.9	6.96
4	Nominal speed	rpm	987	2020	929	2200	2780	1600	1650	1760
5	Nominal torque (max. continuous torque)	mNm	2.41	2.84	2.98	2.97	3.00	3.07	3.08	3.11
6	Nominal current (max. continuous current)	A	0.544	0.332	0.276	0.230	0.189	0.157	0.127	0.0809
7	Stall torque	mNm	3.52	5.01	4.10	5.31	5.87	4.81	4.85	4.96
8	Starting current	A	0.725	0.540	0.353	0.380	0.341	0.228	0.185	0.120
9	Max. efficiency	%	37	51	49	54	57	55	56	57
Characteristics										
10	Terminal resistance	Ω	4.14	11.1	17.0	23.7	35.2	52.5	80.9	200
11	Terminal inductance	mH	0.136	0.496	0.780	1.13	1.71	2.56	3.96	9.87
12	Torque constant	mNm / A	4.85	9.27	11.6	14.0	17.2	21.0	26.2	41.3
13	Speed constant	rpm / V	1970	1030	822	683	555	454	365	231
14	Speed / torque gradient	rpm / mNm	1680	1230	1200	1160	1130	1130	1130	1120
15	Mechanical time constant	ms	72.6	50.6	49.2	46.1	44.5	44.1	43.3	42.1
16	Rotor inertia	gcm ²	4.13	3.91	3.91	3.80	3.75	3.71	3.67	3.60

Specifications		
Thermal data		
17	Thermal resistance housing-ambient	23.1 K / W
18	Thermal resistance winding-housing	13.3 K / W
19	Thermal time constant winding	22.1 s
20	Thermal time constant motor	728 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	13600 rpm
24	Axial play	0.15 - 0.25 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.4 N
27	Max. force for press fits (static)	50 N
28	Max. radial loading, 5 mm from flange	2.0 N



Comments

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

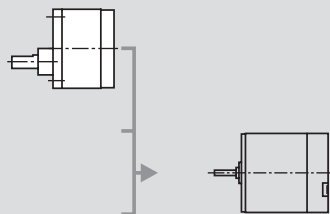
Short term operation
The motor may be briefly overloaded (recurring).

— **Assigned power rating**

Mechanical data (ball bearings)		
23	Max. permissible speed	13600 rpm
24	Axial play	0.15 - 0.25 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	1.0 N
27	Max. force for press fits (static)	24 N
28	Max. radial loading, 5 mm from flange	5 N
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	63 g

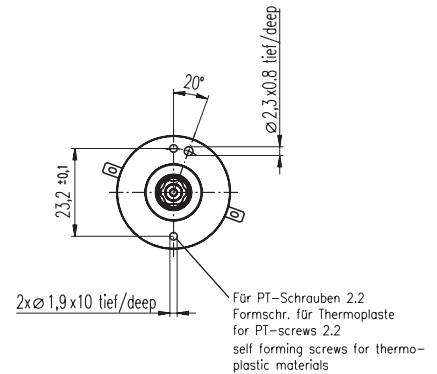
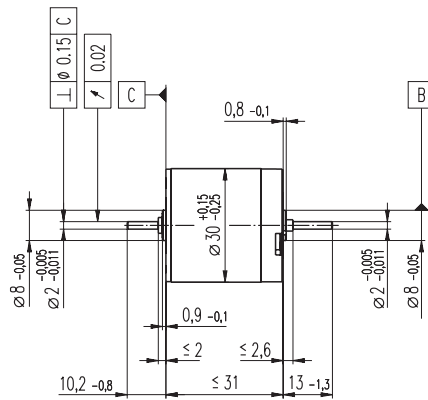
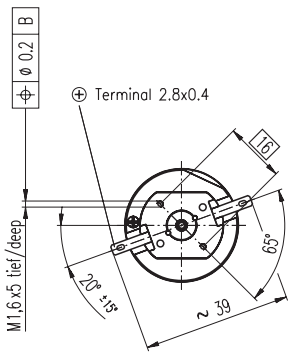
maxon Modular System Overview on page 16 - 21

Spur Gearhead
Ø30 mm
0.07 - 0.2 Nm
Page 236



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

F 2130 Ø30 mm, Graphite Brushes, 3 Watt, CE approved



M 1:2

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

Order Number

2130. ... -57.236-050 (Insert winding number)

Motor Data	Winding number	Order Number								
		900	903	904	905	906	907	908	910	
Values at nominal voltage										
1 Nominal voltage	V	3.0	6.0	6.0	9.0	12.0	12.0	15.0	24.0	
2 No load speed	rpm	4060	5150	4080	5380	5970	4830	4910	5050	
3 No load current	mA	72.2	38.7	30.2	25.7	21.1	16.9	13.6	8.65	
4 Nominal speed	rpm	987	2030	929	2210	2790	1610	1650	1770	
5 Nominal torque (max. continuous torque)	mNm	2.31	2.73	2.87	2.87	2.89	2.96	2.98	3.00	
6 Nominal current (max. continuous current)	A	0.544	0.331	0.276	0.230	0.188	0.157	0.127	0.0808	
7 Stall torque	mNm	3.52	5.01	4.10	5.31	5.87	4.81	4.85	4.96	
8 Starting current	A	0.725	0.540	0.353	0.380	0.341	0.228	0.185	0.120	
9 Max. efficiency	%	32	46	44	50	53	50	51	52	
Characteristics										
10 Terminal resistance	Ω	4.14	11.1	17.0	23.7	35.2	52.5	80.9	200	
11 Terminal inductance	mH	0.136	0.496	0.780	1.13	1.71	2.56	3.96	9.87	
12 Torque constant	mNm / A	4.85	9.27	11.6	14.0	17.2	21.0	26.2	41.3	
13 Speed constant	rpm / V	1970	1030	822	683	555	454	365	231	
14 Speed / torque gradient	rpm / mNm	1680	1230	1200	1160	1130	1130	1130	1120	
15 Mechanical time constant	ms	72.6	50.6	49.2	46.1	44.5	44.1	43.3	42.1	
16 Rotor inertia	gcm ²	4.13	3.91	3.91	3.80	3.75	3.71	3.67	3.60	

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 23.1 K / W
 - 18 Thermal resistance winding-housing 13.3 K / W
 - 19 Thermal time constant winding 22.1 s
 - 20 Thermal time constant motor 728 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (ball bearings)**
- 23 Max. permissible speed 13600 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.025 mm
 - 26 Max. axial load (dynamic) 1.0 N
 - 27 Max. force for press fits (static) (static, shaft supported) 24 N
 - 28 Max. radial loading, 5 mm from flange 5 N

Other specifications

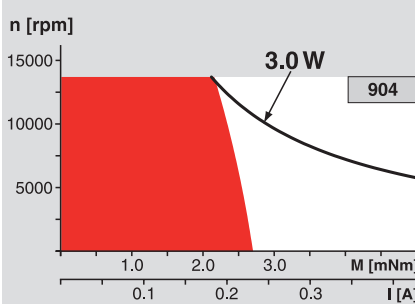
- 29 Number of pole pairs 1
- 30 Number of commutator segments 7
- 31 Weight of motor 63 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

Preloaded ball bearings

Operating Range



Comments

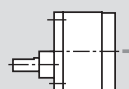
■ **Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

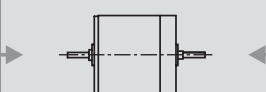
maxon Modular System

Spur Gearhead
Ø30 mm
0.07 - 0.2 Nm
Page 236



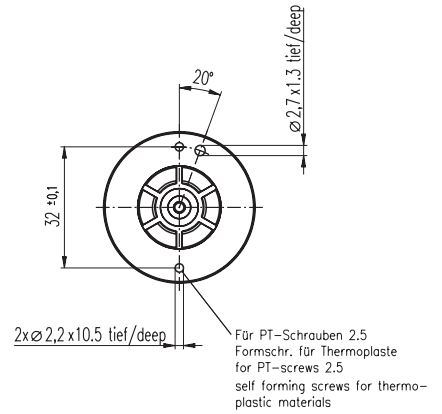
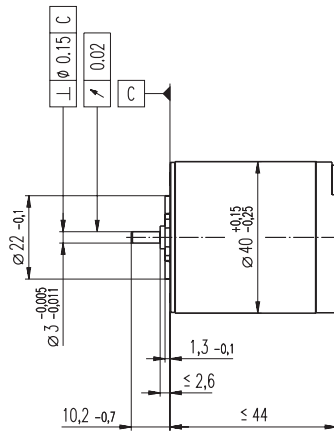
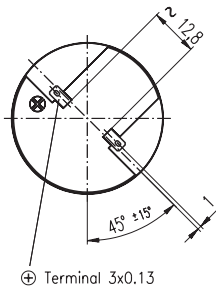
Overview on page 16 - 21

Encoder Enc
22 mm
100 CPT, 2 channels
Page 261



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

F 2140 Ø40 mm, Precious Metal Brushes CLL, 4 Watt, CE approved



M 1:2

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

Order Number

2140. ... -22.112-050 (Insert winding number)

Motor Data	Winding number	Order Number								
		931	932	933	934	935	936	937	939	
Values at nominal voltage										
1 Nominal voltage	V	6.0	9.0	9.0	12.0	15.0	18.0	24.0	36.0	
2 No load speed	rpm	3940	4630	3740	4090	4080	3850	4110	4130	
3 No load current	mA	23.1	20.1	14.2	12.3	9.77	7.43	6.19	4.17	
4 Nominal speed	rpm	2270	2990	2080	2430	2410	2160	2420	2400	
5 Nominal torque (max. continuous torque)	mNm	13.8	13.9	13.9	13.9	13.8	13.6	13.6	13.3	
6 Nominal current (max. continuous current)	A	0.974	0.773	0.624	0.508	0.404	0.314	0.251	0.164	
7 Stall torque	mNm	32.6	39.5	31.6	34.2	33.9	31.2	33.1	31.8	
8 Starting current	A	2.26	2.15	1.39	1.23	0.974	0.706	0.601	0.387	
9 Max. efficiency	%	81	82	81	82	81	81	81	81	
Characteristics										
10 Terminal resistance	Ω	2.65	4.19	6.47	9.73	15.4	25.5	40.0	93.0	
11 Terminal inductance	mH	0.341	0.558	0.853	1.27	1.99	3.21	5.02	11.2	
12 Torque constant	mNm / A	14.4	18.4	22.7	27.8	34.8	44.1	55.2	82.3	
13 Speed constant	rpm / V	664	519	420	344	275	216	173	116	
14 Speed / torque gradient	rpm / mNm	122	118	120	121	122	125	125	131	
15 Mechanical time constant	ms	32.2	31.9	31.9	31.9	32.0	32.1	32.1	32.5	
16 Rotor inertia	gcm ²	25.1	25.7	25.5	25.3	25.1	24.6	24.5	23.6	

Specifications

Thermal data	
17 Thermal resistance housing-ambient	10.4 K / W
18 Thermal resistance winding-housing	8.8 K / W
19 Thermal time constant winding	45.5 s
20 Thermal time constant motor	988 s
21 Ambient temperature	-20 ... +65°C
22 Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)	
23 Max. permissible speed	6400 rpm
24 Axial play	0.2 - 0.3 mm
25 Radial play	0.025 mm
26 Max. axial load (dynamic)	0.5 N
27 Max. force for press fits (static)	50 N
28 Max. radial loading, 5 mm from flange	2.5 N

Other specifications

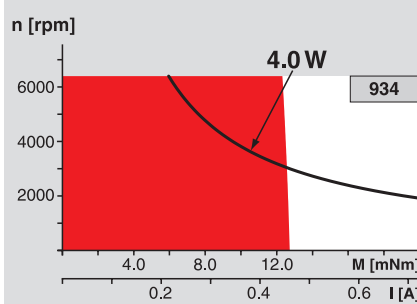
29 Number of pole pairs	1
30 Number of commutator segments	7
31 Weight of motor	190 g
CLL = Capacitor Long Life	

Values listed in the table are nominal.
Explanation of the figures on page 49.

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.

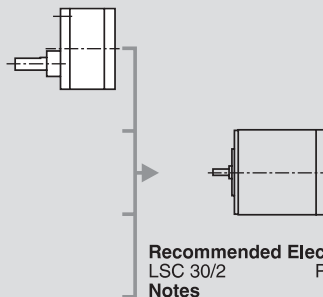
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

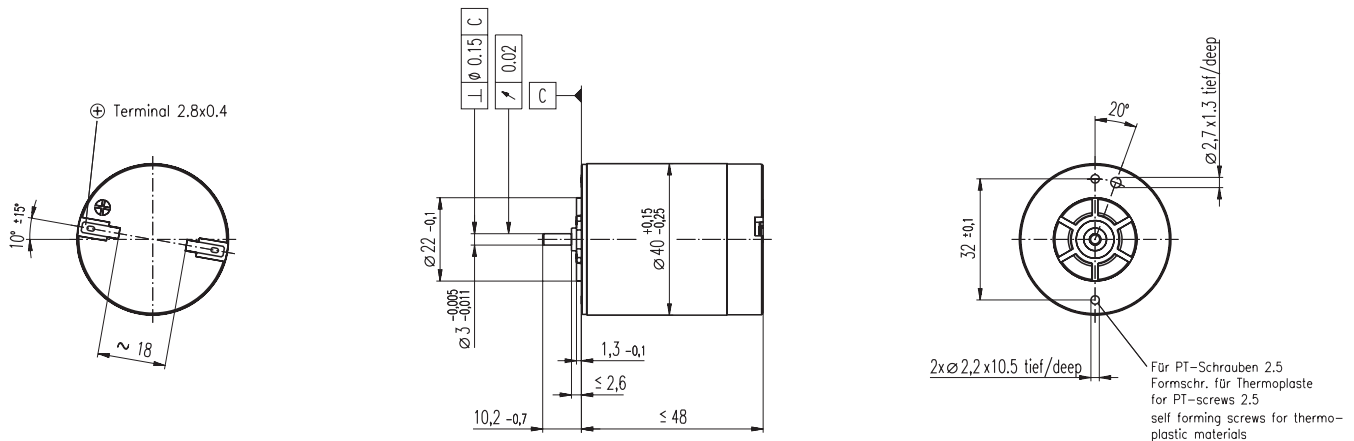
Overview on page 16 - 21

Spur Gearhead
Ø38 mm
0.1 - 0.6 Nm
Page 243



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

F 2140 Ø40 mm, Graphite Brushes, 6 Watt, CE approved



M 1:2

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

Order Number

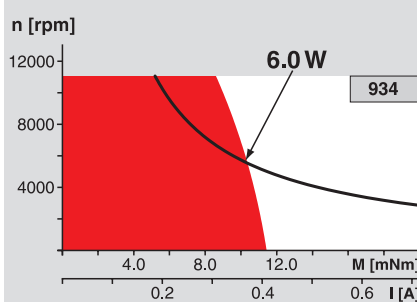
2140. ... -22.116-050 (Insert winding number)

Motor Data	Winding number	Order Number								
		931	932	933	934	935	936	937	939	
Values at nominal voltage										
1 Nominal voltage	V	6.0	9.0	9.0	12.0	15.0	18.0	24.0	36.0	
2 No load speed	rpm	3550	4320	3500	3880	3910	3710	3990	4030	
3 No load current	mA	53.3	45.6	33.5	28.7	23.0	17.7	14.6	9.87	
4 Nominal speed	rpm	1900	2720	1880	2270	2300	2080	2360	2380	
5 Nominal torque (max. continuous torque)	mNm	11.1	11.7	12.1	12.3	12.5	12.5	12.6	12.5	
6 Nominal current (max. continuous current)	A	0.815	0.672	0.560	0.466	0.377	0.298	0.240	0.160	
7 Stall torque	mNm	26.3	34.4	27.9	31.2	31.6	29.5	31.9	31.1	
8 Starting current	A	1.83	1.87	1.23	1.13	0.909	0.669	0.578	0.378	
9 Max. efficiency	%	61	66	65	68	69	69	70	70	
Characteristics										
10 Terminal resistance	Ω	3.28	4.81	7.35	10.7	16.5	26.9	41.5	95.2	
11 Terminal inductance	mH	0.341	0.558	0.853	1.27	1.99	3.21	5.02	11.2	
12 Torque constant	mNm / A	14.4	18.4	22.7	27.8	34.8	44.1	55.2	82.3	
13 Speed constant	rpm / V	664	519	420	344	275	216	173	116	
14 Speed / torque gradient	rpm / mNm	152	136	136	132	130	132	130	134	
15 Mechanical time constant	ms	37.9	34.9	34.4	33.3	32.6	32.2	31.7	31.5	
16 Rotor inertia	gcm ²	23.9	24.5	24.2	24.0	23.9	23.3	23.2	22.4	

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 10.4 K / W
 - 18 Thermal resistance winding-housing 8.8 K / W
 - 19 Thermal time constant winding 45.5 s
 - 20 Thermal time constant motor 988 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 11000 rpm
 - 24 Axial play 0.2 - 0.3 mm
 - 25 Radial play 0.014 mm
 - 26 Max. axial load (dynamic) 0.5 N
 - 27 Max. force for press fits (static) 50 N
 - 28 Max. radial loading, 5 mm from flange 2.5 N

Operating Range



Comments

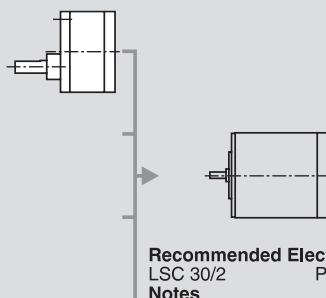
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

- Mechanical data (ball bearings)**
- 23 Max. permissible speed 11000 rpm
 - 24 Axial play 0.2 - 0.3 mm
 - 25 Radial play 0.025 mm
 - 26 Max. axial load (dynamic) 1.5 N
 - 27 Max. force for press fits (static) 50 N
 - 28 Max. radial loading, 5 mm from flange 7.5 N
- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of commutator segments 7
 - 31 Weight of motor 190 g

maxon Modular System

Overview on page 16 - 21

Spur Gearhead
Ø38 mm
0.1 - 0.6 Nm
Page 243



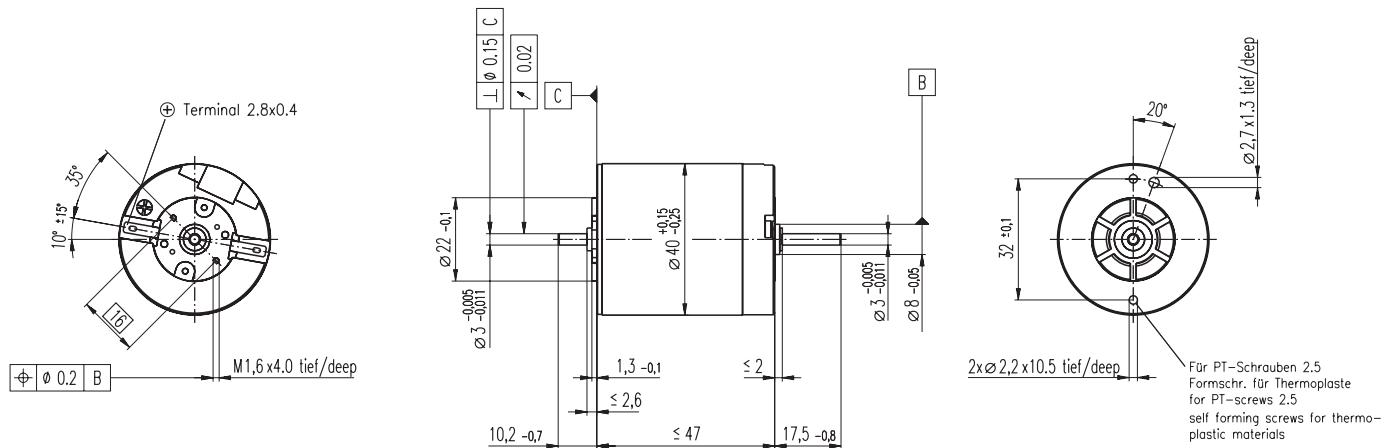
Recommended Electronics:
LSC 30/2 Page 276
Notes 18

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

Ball bearings in place of sleeve bearings

F 2140 Ø40 mm, Graphite Brushes, 6 Watt, CE approved



M 1:2

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

Order Number

2140. ... -58.236-050 (Insert winding number)

Motor Data	Winding number	Order Number								
		931	932	933	934	935	936	937	939	
Values at nominal voltage										
1 Nominal voltage	V	6.0	9.0	9.0	12.0	15.0	18.0	24.0	36.0	
2 No load speed	rpm	3540	4310	3490	3880	3900	3710	3980	4030	
3 No load current	mA	55.5	46.6	34.9	29.7	23.7	18.4	15.1	10.2	
4 Nominal speed	rpm	1900	2730	1880	2270	2300	2080	2360	2380	
5 Nominal torque (max. continuous torque)	mNm	11.0	11.6	12.0	12.2	12.4	12.5	12.5	12.4	
6 Nominal current (max. continuous current)	A	0.814	0.671	0.559	0.465	0.377	0.298	0.240	0.160	
7 Stall torque	mNm	26.3	34.4	27.9	31.2	31.6	29.5	31.9	31.1	
8 Starting current	A	1.83	1.87	1.23	1.13	0.909	0.669	0.578	0.378	
9 Max. efficiency	%	61	66	65	67	68	68	69	70	
Characteristics										
10 Terminal resistance	Ω	3.28	4.81	7.35	10.7	16.5	26.9	41.5	95.2	
11 Terminal inductance	mH	0.341	0.558	0.853	1.27	1.99	3.21	5.02	11.2	
12 Torque constant	mNm / A	14.4	18.4	22.7	27.8	34.8	44.1	55.2	82.3	
13 Speed constant	rpm / V	664	519	420	344	275	216	173	116	
14 Speed / torque gradient	rpm / mNm	152	136	136	132	130	132	130	134	
15 Mechanical time constant	ms	37.9	34.9	34.4	33.3	32.6	32.2	31.7	31.5	
16 Rotor inertia	gcm ²	23.9	24.5	24.2	24.0	23.9	23.3	23.2	22.4	

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 10.4 K / W
 - 18 Thermal resistance winding-housing 8.8 K / W
 - 19 Thermal time constant winding 45.5 s
 - 20 Thermal time constant motor 988 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (ball bearings)**
- 23 Max. permissible speed 11000 rpm
 - 24 Axial play 0.2 - 0.3 mm
 - 25 Radial play 0.025 mm
 - 26 Max. axial load (dynamic) 1.5 N
 - 27 Max. force for press fits (static) (static, shaft supported) 50 N
 - 28 Max. radial loading, 5 mm from flange 700 N

Other specifications

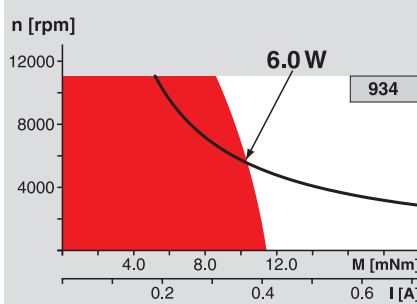
- 29 Number of pole pairs 1
- 30 Number of commutator segments 7
- 31 Weight of motor 190 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

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.

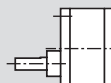
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

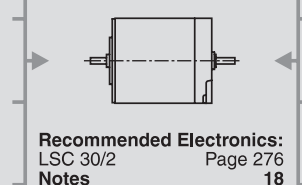
maxon Modular System

Overview on page 16 - 21

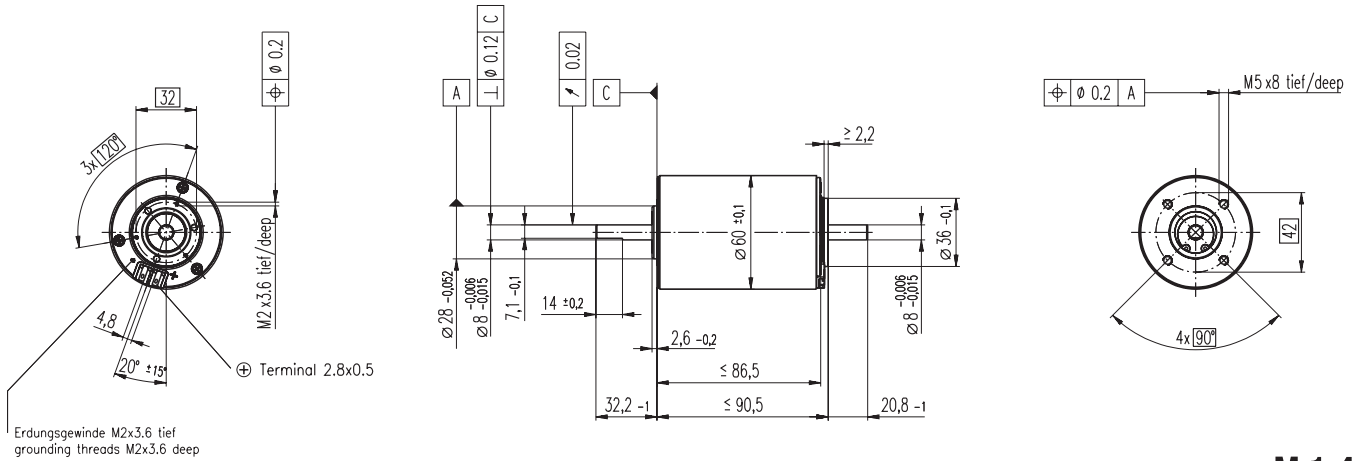
Spur Gearhead
Ø38 mm
0.1 - 0.6 Nm
Page 243



Encoder Enc
22 mm
100 CPT, 2 channels
Page 261



F 2260 Ø60 mm, Graphite Brushes, 40 Watt



M 1:4

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

Order Number

2260. ... -51.216-200 (Insert winding number)

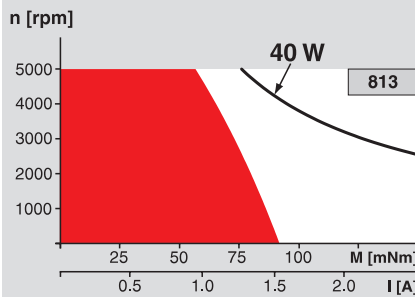
Motor Data	Winding number	Order Number													
		811	812	813	814	815	816	817	818	810	819	820			
Values at nominal voltage															
1	Nominal voltage	V	18.0	21.0	24.0	30.0	36.0	42.0	45.0	48.0	48.0	48.0	48.0		
2	No load speed	rpm	4440	4000	3620	4230	4550	4210	3680	3160	2560	2060	1600		
3	No load current	mA	533	403	314	297	267	210	168	133	107	85	65.8		
4	Nominal speed	rpm	4040	3580	3180	3820	4150	3800	3230	2670	2040	1510	1030		
5	Nominal torque (max. continuous torque)	mNm	65.6	77.8	85.9	78.5	74.6	81.4	88.8	95.3	102	106	109		
6	Nominal current (max. continuous current)	A	2.33	2.03	1.74	1.5	1.29	1.09	0.955	0.815	0.701	0.585	0.47		
7	Stall torque	mNm	883	847	775	890	939	882	762	651	529	419	321		
8	Starting current	A	24.2	17.8	12.9	13.7	12.9	9.59	6.77	4.67	3.09	1.99	1.2		
9	Max. efficiency	%	68.7	69.1	68.7	70.8	71.7	71.4	69.9	68.1	65.5	62.1	57.9		
Characteristics															
10	Terminal resistance	Ω	0.743	1.18	1.87	2.19	2.79	4.38	6.64	10.3	15.5	24.2	40		
11	Terminal inductance	mH	0.917	1.56	2.5	2.91	3.67	5.83	8.74	13.4	20.2	30.7	49.5		
12	Torque constant	mNm / A	36.5	47.5	60.2	65	72.9	91.9	113	139	171	211	268		
13	Speed constant	rpm / V	262	201	159	147	131	104	84.9	68.5	55.8	45.3	35.7		
14	Speed / torque gradient	rpm / mNm	5.34	4.98	4.91	4.96	5.02	4.95	5.01	5.05	5.07	5.19	5.33		
15	Mechanical time constant	ms	37.2	36.1	35.5	35.2	34.9	34.7	34.6	34.6	34.6	34.6	34.8		
16	Rotor inertia	gcm ²	665	691	691	678	665	669	659	654	652	636	623		

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 5.0 K / W
 - 18 Thermal resistance winding-housing 2.4 K / W
 - 19 Thermal time constant winding 79 s
 - 20 Thermal time constant motor 1980 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 5000 rpm
 - 24 Axial play at axial load < 15 N 0 mm
 - 24 Axial play at axial load > 15 N 0.01 - 0.15 mm preloaded
 - 25 Radial play 15 N
 - 26 Max. axial load (dynamic) 15 N
 - 27 Max. force for press fits (static) (static, shaft supported) 400 N
 - 27 Max. force for press fits (static) (static, shaft supported) 10000 N
 - 28 Max. radial loading, 5 mm from flange 100 N
- Other specifications**
- 29 Number of pole pairs 2
 - 30 Number of commutator segments 26
 - 31 Weight of motor 790 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range



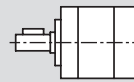
Comments

- 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**

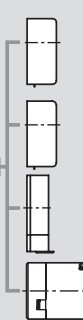
maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
Ø62 mm
8 - 50 Nm
Page 249



Recommended Electronics:
ADS 50/5 Page 276
ADS_E 50/5 277
EPOS 24/5 294
EPOS2 50/5 295
EPOS P 24/5 297
Notes 18



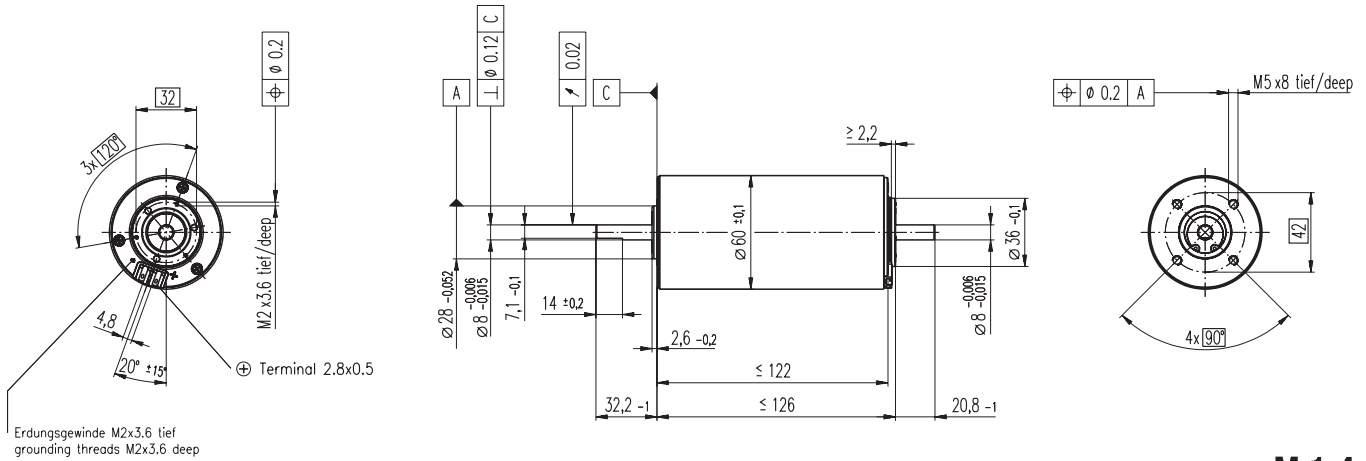
Encoder HEDS 5540
500 CPT,
3 channels
Page 263

Encoder HEDL 5540
500 CPT,
3 channels
Page 265

Encoder HEDS 6540
1000 CPT,
3 channels
Page 268

Brake AB 28
Ø40 mm
24 VDC, 0.4 Nm
Page 308

F 2260 Ø60 mm, Graphite Brushes, 80 Watt



M 1:4

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

Order Number

2260. ... -51.216-200 (Insert winding number)

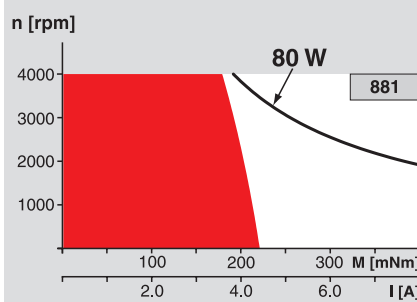
Motor Data	Winding number	Order Number												
		880	881	882	883	884	885	886	887	888	889	890		
Values at nominal voltage														
1 Nominal voltage	V	15.0	18.0	18.0	24.0	24.0	24.0	36.0	42.0	48.0	48.0	48.0		
2 No load speed	rpm	3950	3300	2640	2840	2630	2220	2690	2570	2670	2360	1800		
3 No load current	mA	563	367	278	226	206	168	140	113	103	89.1	64.6		
4 Nominal speed	rpm	3560	2900	2230	2440	2220	1810	2290	2160	2260	1950	1380		
5 Nominal torque (max. continuous torque)	mNm	195	231	253	258	262	280	277	279	279	284	302		
6 Nominal current (max. continuous current)	A	6.20	4.97	4.31	3.52	3.30	2.96	2.35	1.93	1.75	1.57	1.27		
7 Stall torque	mNm	2820	2370	1890	2050	1860	1660	2010	1860	1940	1690	1360		
8 Starting current	A	82.0	47.3	30.2	26.2	22.0	16.6	16.1	12.2	11.5	8.88	5.42		
9 Max. efficiency	%	78	79	78	79	79	78	81	80	81	80	79		
Characteristics														
10 Terminal resistance	Ω	0.183	0.38	0.596	0.917	1.09	1.44	2.24	3.45	4.17	5.40	8.86		
11 Terminal inductance	mH	0.0662	0.140	0.219	0.342	0.399	0.56	0.875	1.31	1.59	2.03	3.50		
12 Torque constant	mNm / A	34.4	50.0	62.5	78.2	84.4	100	125	153	169	191	250		
13 Speed constant	rpm / V	278	191	153	122	113	95.4	76.3	62.3	56.5	50.1	38.2		
14 Speed / torque gradient	rpm / mNm	1.48	1.45	1.45	1.43	1.46	1.38	1.37	1.40	1.40	1.42	1.35		
15 Mechanical time constant	ms	21.2	20.2	20.0	19.5	19.4	19.2	18.8	18.7	18.6	18.6	18.6		
16 Rotor inertia	gcm ²	1370	1330	1310	1300	1270	1330	1310	1270	1270	1260	1310		

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 3.4 K / W
 - 18 Thermal resistance winding-housing 1.1 K / W
 - 19 Thermal time constant winding 72.5 s
 - 20 Thermal time constant motor 2210 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (Preloaded ball bearings)**
- 23 Max. permissible speed 4000 rpm
 - 24 Axial play at axial load < 15 N 0 mm
 - 24 Axial play at axial load > 15 N 0.01 - 0.15 mm preloaded
 - 25 Radial play 15 N
 - 26 Max. axial load (dynamic) 400 N
 - 27 Max. force for press fits (static) (static, shaft supported) 10000 N
 - 28 Max. radial loading, 5 mm from flange 100 N
- Other specifications**
- 29 Number of pole pairs 2
 - 30 Number of commutator segments 26
 - 31 Weight of motor 1300 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range



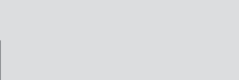
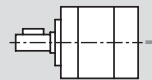
Comments

- 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 16 - 21

Planetary Gearhead
Ø62 mm
8 - 50 Nm
Page 249



Encoder HEDS 5540
500 CPT,
3 channels
Page 263

Encoder HEDL 5540
500 CPT,
3 channels
Page 265

Encoder HEDS 6540
1000 CPT,
3 channels
Page 268

Brake AB 28
Ø40 mm
24 VDC, 0.4 Nm
Page 308

- Recommended Electronics:**
- ADS 50/5 Page 276
 - ADS 50/10 277
 - ADS_E 50/5 277
 - ADS_E 50/10 277
 - EPOS 24/5 294
 - EPOS2 50/5 295
 - EPOS P 24/5 297
- Notes** 18



maxon A-max

maxon A-max

maxon A-max motors are an innovative range of high-quality DC motors, equipped with powerful AlNiCo permanent magnets. The “heart” of our motors is the ironless maxon winding, that has been tested millions of times over. This is the latest technology for compact, powerful and low-inertia drives.

Summary

100

DC motor 12 - 32 mm in diameter

101 - 126

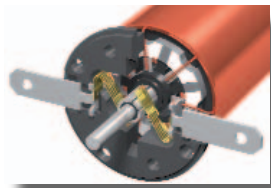
The

maxon A-max program

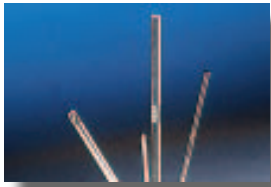
The economically priced DC motor program that gives you top performance and convincing quality.



Motor housing, precision-made from rolled steel, delivers high strength yet minimizes waste material to reduce costs.



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



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



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



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



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

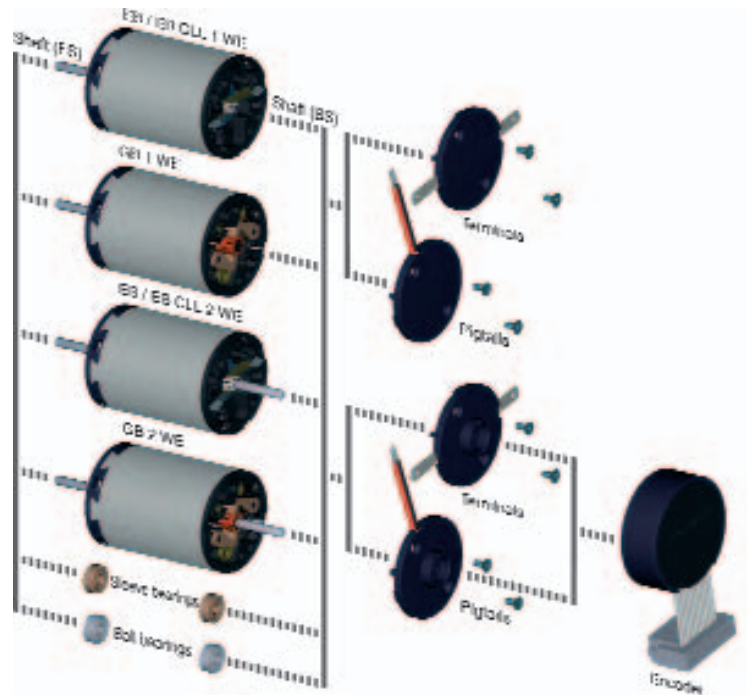


Proven winding technology provides a high-performance relationship between the coil and magnet system.



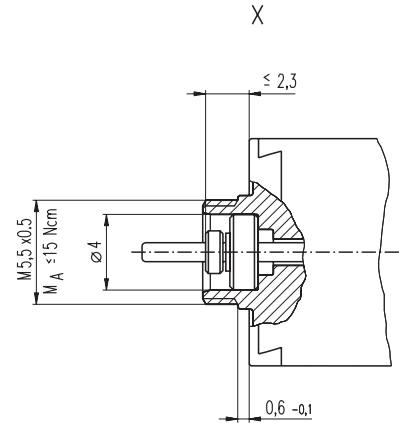
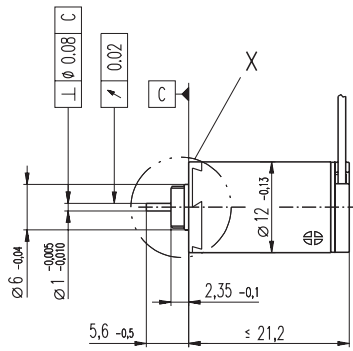
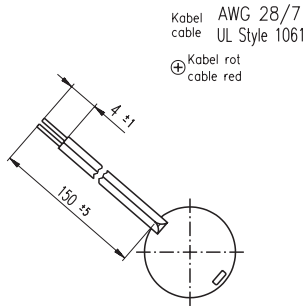
Graphite brushes for the most demanding tasks. 4-, 5- or 7-fingered precious metal brushes for fine rotary motions.

Modular construction of the A-max series



		WE = Shaft end	A-max 12 1 WE	A-max 12 2 WE	A-max 16 1 WE	A-max 16 2 WE	A-max 19 1 WE	A-max 19 2 WE	A-max 22 1 WE	A-max 22 2 WE	A-max 26 1 WE	A-max 26 2 WE	A-max 32 1 WE	A-max 32 2 WE
		X = Standard												
		X = Option												
Precious Metal Brushes (EB)					X	X	X	X	X	X	X	X		
Precious Metal Brushes (EB) and CLL	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Graphite Brushes (GB)			X	X	X	X	X	X	X	X	X	X	X	X
Sleeve Bearings		X	X	X	X	X	X	X	X	X	X	X	X	X
Ball Bearings		X	X	X	X	X	X	X	X	X	X	X	X	X
Terminals					X	X	X	X	X	X	X	X	X	X
Pigtails		X	X	X	X	X	X	X	X	X	X	X	X	X
Shaft flange side (FS)	min.	4.5	4.5	4.5	4.5	5.0	5.0	5.0	5.0	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	30.0	30.0	30.0	30.0	30.0
Shaft brush side (BS)	min.		1.7	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0
	max.		9.4	10.0	16.6	16.0	16.0	16.0	16.0	16.0	16.0	16.0	19.3	

A-max 12 Ø12 mm, Precious Metal Brushes CLL, 0.75 Watt, CE approved



M 1:1

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

Order Number

200937 265374 265375 265376 265377 265378

Motor Data

Values at nominal voltage		3.0	4.5	6.0	9.0	12.0	15.0
1	Nominal voltage	V	3.0	4.5	6.0	9.0	15.0
2	No load speed	rpm	13900	11900	12800	12100	13800
3	No load current	mA	21.1	11.5	9.47	5.87	4.50
4	Nominal speed	rpm	5930	4360	5250	4460	5030
5	Nominal torque (max. continuous torque)	mNm	0.891	0.959	0.946	0.941	0.931
6	Nominal current (max. continuous current)	A	0.462	0.281	0.225	0.141	0.107
7	Stall torque	mNm	1.58	1.55	1.63	1.52	1.29
8	Starting current	A	0.789	0.438	0.374	0.220	0.168
9	Max. efficiency	%	70	71	71	70	68
Characteristics		3.80	10.3	16.0	40.9	71.6	116
10	Terminal resistance	Ω	3.80	10.3	16.0	40.9	71.6
11	Terminal inductance	mH	0.0851	0.263	0.402	1.01	1.74
12	Torque constant	mNm / A	2.01	3.53	4.36	6.92	9.06
13	Speed constant	rpm / V	4760	2710	2190	1380	1050
14	Speed / torque gradient	rpm / mNm	9030	7880	8060	8170	8330
15	Mechanical time constant	ms	20.5	20.2	20.3	20.3	20.4
16	Rotor inertia	gcm ²	0.217	0.245	0.240	0.237	0.233

Specifications

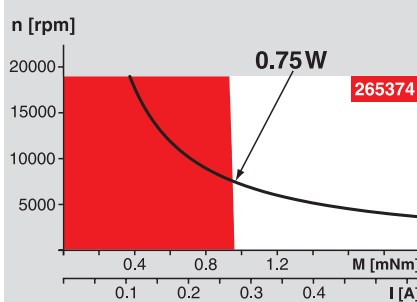
Thermal data		
17	Thermal resistance housing-ambient	44.5 K / W
18	Thermal resistance winding-housing	15 K / W
19	Thermal time constant winding	4.99 s
20	Thermal time constant motor	245 s
21	Ambient temperature	-30 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 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 49.

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 16 - 21

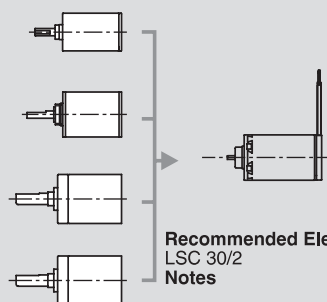
Planetary Gearhead

Ø10 mm
0.005 - 0.15 Nm
Page 214 / 215

Spur Gearhead
Ø12 mm
0.008 - 0.025 Nm
Page 216

Planetary Gearhead
Ø13 mm
0.05 - 0.15 Nm
Page 217

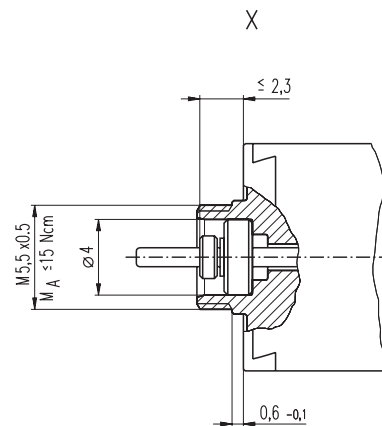
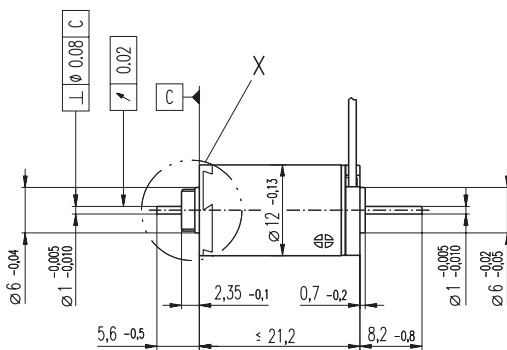
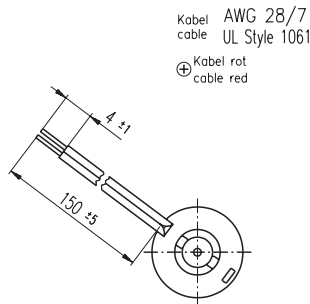
Planetary Gearhead
Ø13 mm
0.2 - 0.35 Nm
Page 218



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

A-max 12 Ø12 mm, Precious Metal Brushes CLL, 0.5 Watt, CE approved

maxon A-max



M 1:1

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

Order Number

200938 **265389** 265390 265391 265392 265393

Motor Data

		200938	265389	265390	265391	265392	265393
Values at nominal voltage							
1	Nominal voltage	V	3.0	4.5	6.0	9.0	12.0
2	No load speed	rpm	13700	11700	12600	11900	12100
3	No load current	mA	34.5	18.8	15.5	9.63	7.38
4	Nominal speed	rpm	5950	4370	5260	4470	4620
5	Nominal torque (max. continuous torque)	mNm	0.866	0.935	0.921	0.917	0.907
6	Nominal current (max. continuous current)	A	0.461	0.281	0.225	0.141	0.106
7	Stall torque	mNm	1.58	1.55	1.63	1.52	1.52
8	Starting current	A	0.789	0.438	0.374	0.220	0.168
9	Max. efficiency	%	63	63	64	63	63
Characteristics							
10	Terminal resistance	Ω	3.80	10.3	16.0	40.9	71.6
11	Terminal inductance	mH	0.0851	0.263	0.402	1.01	1.74
12	Torque constant	mNm / A	2.01	3.53	4.36	6.92	9.06
13	Speed constant	rpm / V	4760	2710	2190	1380	1050
14	Speed / torque gradient	rpm / mNm	9030	7880	8060	8170	8330
15	Mechanical time constant	ms	20.5	20.2	20.3	20.3	20.4
16	Rotor inertia	gcm ²	0.217	0.245	0.240	0.237	0.233

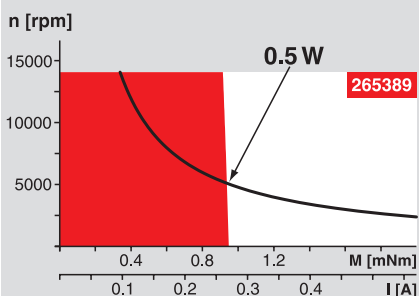
Specifications

Thermal data	
17	Thermal resistance housing-ambient
18	Thermal resistance winding-housing
19	Thermal time constant winding
20	Thermal time constant motor
21	Ambient temperature
22	Max. permissible winding temperature
Mechanical data (sleeve bearings)	
23	Max. permissible speed
24	Axial play
25	Radial play
26	Max. axial load (dynamic)
27	Max. force for press fits (static)
28	Max. radial loading, 4 mm from flange

Other specifications	
29	Number of pole pairs
30	Number of commutator segments
31	Weight of motor
CLL = Capacitor Long Life	
Alignment of the electronic connections not specified.	

Values listed in the table are nominal.
Explanation of the figures on page 49.

Operating Range

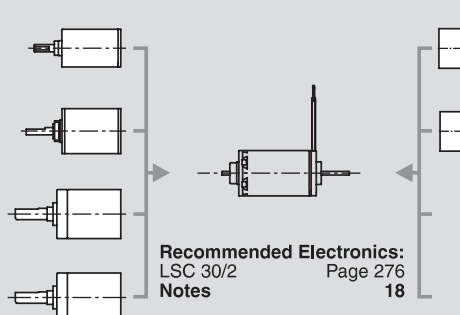


Comments

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

maxon Modular System

- Planetary Gearhead**
Ø10 mm
0.005 - 0.15 Nm
Page 214 / 215
- Spur Gearhead**
Ø12 mm
0.008 - 0.025 Nm
Page 216
- Planetary Gearhead**
Ø13 mm
0.05 - 0.15 Nm
Page 217
- Planetary Gearhead**
Ø13 mm
0.2 - 0.35 Nm
Page 218

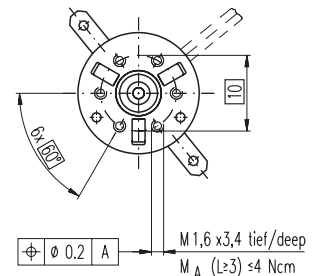
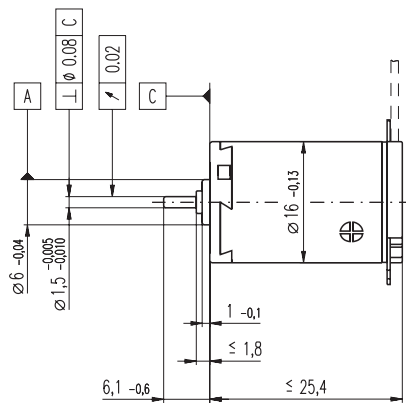
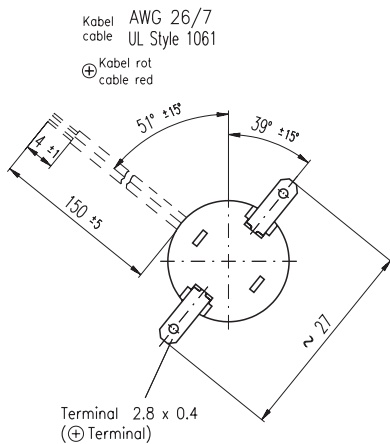


Overview on page 16 - 21

- Encoder MR**
16 CPT,
2 channels
Page 252
- Encoder MR**
64 - 256 CPT,
2 channels
Page 253

Recommended Electronics:
LSC 30/2
Page 276
Notes
18

A-max 16 $\varnothing 16$ mm, Precious Metal Brushes CLL, 2 Watt, $\text{C}\epsilon$ approved



M 1:1

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

Order Number

with terminals	110041	110042	110043	110044	110045	110046	110047	110048	110049	110050
with cables	139820	352815	134844	231379	220514	304672	352823	352816	260678	352817

Motor Data

Values at nominal voltage			1.5	3.0	6.0	9.0	12.0	15.0	18.0	21.0	24.0	30.0
1	Nominal voltage	V	1.5	3.0	6.0	9.0	12.0	15.0	18.0	21.0	24.0	30.0
2	No load speed	rpm	10800	12300	10100	12300	12300	13200	14100	13700	13800	11400
3	No load current	mA	61.3	38.1	13.9	12.7	9.54	8.57	7.99	6.53	5.83	3.37
4	Nominal speed	rpm	9140	8690	4510	6690	6650	7580	8480	8040	8120	5480
5	Nominal torque (max. continuous torque)	mNm	0.713	1.30	2.21	2.18	2.17	2.17	2.15	2.14	2.10	2.08
6	Nominal current (max. continuous current)	A	0.600	0.600	0.406	0.326	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	Starting current	A	3.66	1.97	0.723	0.702	0.520	0.482	0.453	0.362	0.315	0.164
9	Max. efficiency	%	76	75	75	76	76	76	76	76	75	74
Characteristics												
10	Terminal resistance	Ω	0.410	1.52	8.30	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	12.0	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	25.2	23.7	23.1	23.2	23.2	23.2	23.3	23.3	23.4	23.8
16	Rotor inertia	gcm ²	1.05	0.816	0.864	0.854	0.844	0.854	0.848	0.834	0.811	0.788

Specifications

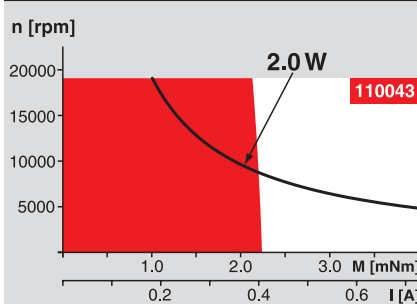
Thermal data		
17	Thermal resistance housing-ambient	29.8 K / W
18	Thermal resistance winding-housing	5.5 K / W
19	Thermal time constant winding	3.53 s
20	Thermal time constant motor	313 s
21	Ambient temperature	-30 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	1.4 N
Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 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 49.

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.

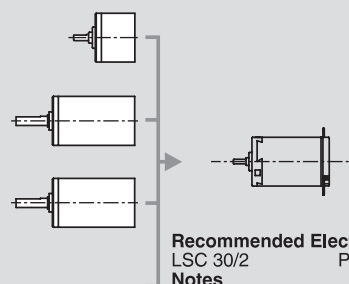
Short term operation
The motor may be briefly overloaded (recurring).

— **Assigned power rating**

maxon Modular System

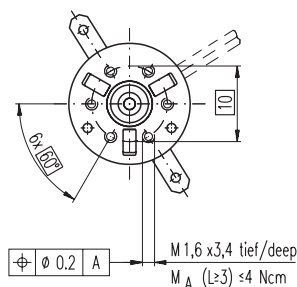
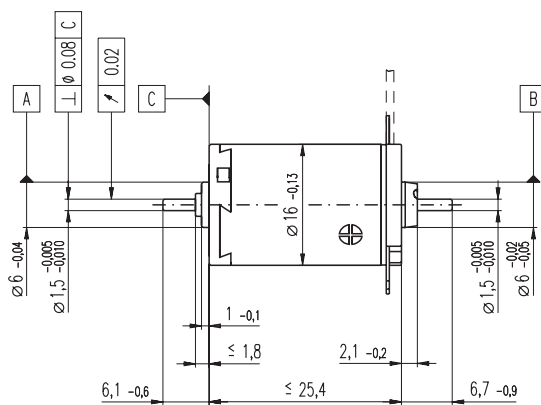
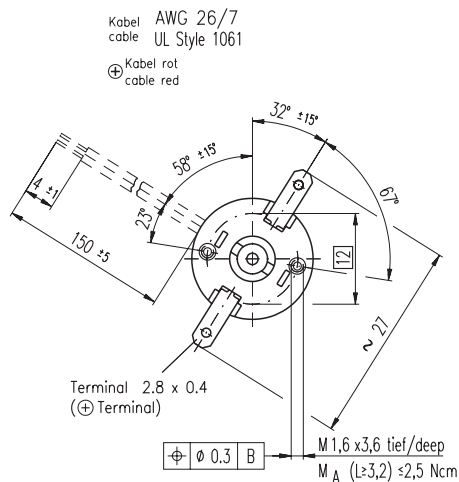
Overview on page 16 - 21

- Spur Gearhead**
 $\varnothing 16$ mm
0.01 - 0.1 Nm
Page 219 / 220 / 221 / 222
- Planetary Gearhead**
 $\varnothing 16$ mm
0.06 - 0.18 Nm
Page 223
- Planetary Gearhead**
 $\varnothing 16$ mm
0.1 - 0.3 Nm
Page 224



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

A-max 16 $\varnothing 16$ mm, Precious Metal Brushes CLL, 1.2 Watt, $\text{C}\epsilon$ approved



M 1:1

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

Order Number

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	6.0	7.2	9.0	12.0	15.0	18.0	18.0	30.0			
2	No load speed	rpm	8530	9720	10000	9740	9110	10400	11600	11600	10300	11300			
3	No load current	mA	73.8	44.1	18.3	14.7	10.8	9.69	8.99	7.49	6.34	4.33			
4	Nominal speed	rpm	6960	6190	4520	4190	3520	4900	6090	6050	4580	5500			
5	Nominal torque (max. continuous torque)	mNm	0.695	1.29	2.18	2.16	2.15	2.16	2.13	2.12	2.09	2.04			
6	Nominal current (max. continuous current)	A	0.600	0.600	0.406	0.326	0.244	0.209	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	Starting current	A	2.93	1.58	0.723	0.561	0.390	0.386	0.378	0.311	0.236	0.164			
9	Max. efficiency	%	71	70	71	71	70	71	72	72	70	71			
Characteristics															
10	Terminal resistance	Ω	0.410	1.52	8.30	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	12.0	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	25.1	23.6	23.1	23.1	23.1	23.2	23.3	23.2	23.3	23.7			
16	Rotor inertia	gcm ²	1.05	0.814	0.862	0.852	0.842	0.852	0.846	0.832	0.809	0.786			

Specifications

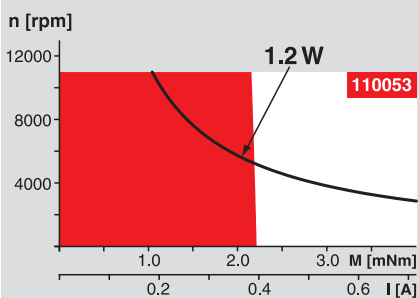
Thermal data	
17	Thermal resistance housing-ambient 29.8 K / W
18	Thermal resistance winding-housing 5.5 K / W
19	Thermal time constant winding 3.53 s
20	Thermal time constant motor 328 s
21	Ambient temperature -30 ... +65°C
22	Max. permissible winding temperature +85°C
Mechanical data (sleeve bearings)	
23	Max. permissible 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 loading, 5 mm from flange 1.4 N
Mechanical data (ball bearings)	
23	Max. permissible 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 loading, 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 49.

Options

- Ball bearings in place of sleeve bearings
- Without CLL

Operating Range



Comments

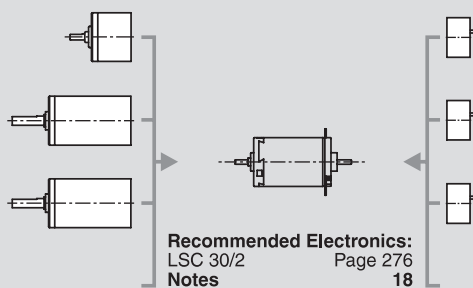
■ **Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

maxon Modular System

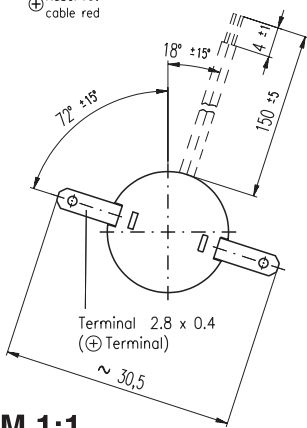
- Spur Gearhead**
 $\varnothing 16$ mm
0.01 - 0.1 Nm
Page 219 / 220 / 221 / 222
- Planetary Gearhead**
 $\varnothing 16$ mm
0.06 - 0.18 Nm
Page 223
- Planetary Gearhead**
 $\varnothing 16$ mm
0.1 - 0.3 Nm
Page 224



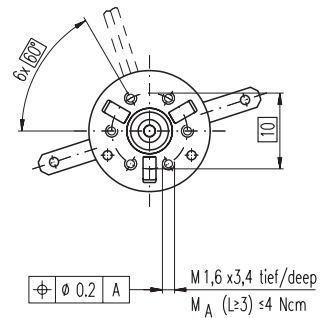
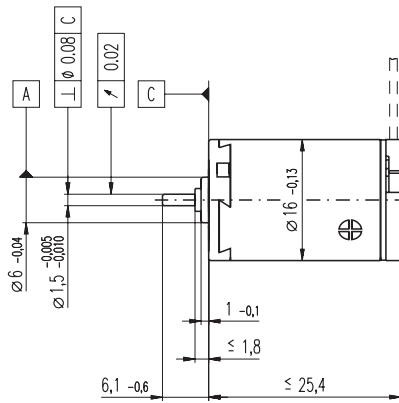
Overview on page 16 - 21

A-max 16 Ø16 mm, Graphite Brushes, 2 Watt

Kabel AWG 26/7
 cable UL Style 1061
 ⊕ Kabel rot
 cable red



M 1:1



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

Order Number

	110061	110062	110063	110064	110065	110066	110067	110068	110069	110070
with terminals	139821	352853	352854	352855	325083	352856	205903	352857	266076	352858
with cables										

Motor Data

Values at nominal voltage																				
1	Nominal voltage	V	1.5	3.0	6.0	9.0	12.0	14.0	15.0	18.0	21.0	30.0								
2	No load speed	rpm	10200	11700	9620	11800	11800	11800	11200	11200	11600	10800								
3	No load current	mA	201	117	46.7	39.1	29.3	25.1	22.2	18.5	16.5	10.7								
4	Nominal speed	rpm	8670	7860	3240	5460	5410	5450	4820	4780	5070	4160								
5	Nominal torque (max. continuous torque)	mNm	0.686	1.40	2.51	2.47	2.45	2.46	2.46	2.44	2.39	2.35								
6	Nominal current (max. continuous current)	A	0.720	0.720	0.494	0.394	0.294	0.253	0.225	0.186	0.162	0.105								
7	Stall torque	mNm	4.93	4.51	4.02	4.82	4.76	4.81	4.53	4.47	4.48	4.03								
8	Starting current	A	3.76	1.97	0.721	0.700	0.519	0.450	0.377	0.310	0.275	0.164								
9	Max. efficiency	%	58	57	56	58	58	58	58	57	57	55								
Characteristics																				
10	Terminal resistance	Ω	0.399	1.52	8.32	12.8	23.1	31.1	39.8	58.0	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	12.0	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	2220	2770	2560	2600	2630	2600	2630	2670	2750	2880								
15	Mechanical time constant	ms	24.5	23.7	23.2	23.2	23.2	23.2	23.4	23.3	23.4	23.8								
16	Rotor inertia	gcm ²	1.05	0.816	0.864	0.854	0.844	0.854	0.848	0.834	0.811	0.788								

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	3.53 s
20	Thermal time constant motor	313 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	1.4 N

Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 5 mm from flange	7.8 N

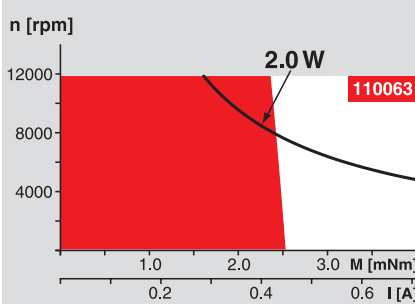
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	21 g

Values listed in the table are nominal.
 Explanation of the figures on page 49.

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.

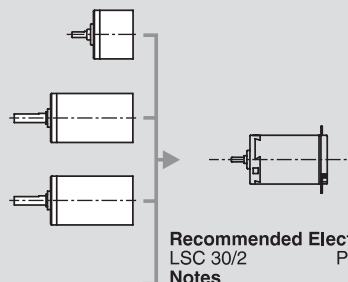
Short term operation
 The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

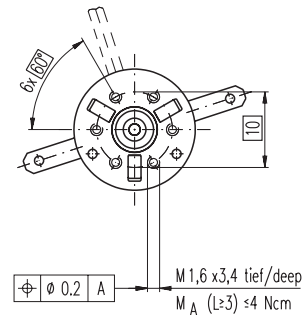
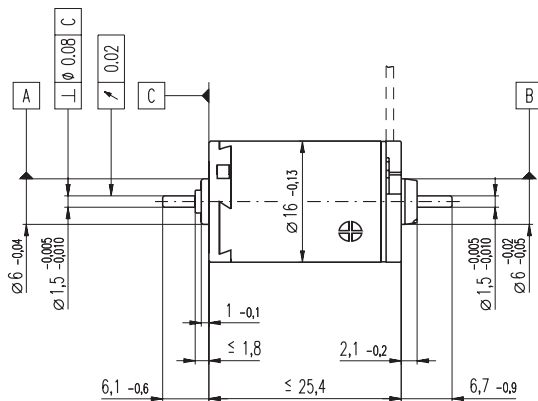
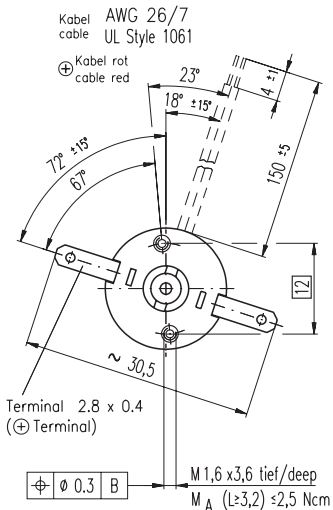
Overview on page 16 - 21

- Spur Gearhead**
 Ø16 mm
 0.01 - 0.1 Nm
 Page 219 / 220 / 221 / 222
- Planetary Gearhead**
 Ø16 mm
 0.06 - 0.18 Nm
 Page 223
- Planetary Gearhead**
 Ø16 mm
 0.1 - 0.3 Nm
 Page 224



Recommended Electronics:
 LSC 30/2 Page 276
 Notes 18

A-max 16 Ø16 mm, Graphite Brushes, 2 Watt



M 1:1

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

Order Number

	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			1.5	3.0	6.0	9.0	12.0	14.0	15.0	18.0	21.0	30.0
1	Nominal voltage	V	1.5	3.0	6.0	9.0	12.0	14.0	15.0	18.0	21.0	30.0
2	No load speed	rpm	10200	11700	9620	11800	11800	11200	11200	11600	10800	
3	No load current	mA	201	117	46.7	39.1	29.3	25.1	22.2	18.5	16.5	10.7
4	Nominal speed	rpm	8670	7860	3240	5460	5410	5450	4820	4780	5070	4160
5	Nominal torque (max. continuous torque)	mNm	0.686	1.40	2.51	2.47	2.45	2.46	2.46	2.44	2.39	2.35
6	Nominal current (max. continuous current)	A	0.720	0.720	0.494	0.394	0.294	0.253	0.225	0.186	0.162	0.105
7	Stall torque	mNm	4.93	4.51	4.02	4.82	4.76	4.81	4.53	4.47	4.48	4.03
8	Starting current	A	3.76	1.97	0.721	0.700	0.519	0.45	0.377	0.31	0.275	0.164
9	Max. efficiency	%	58	57	56	58	58	58	58	57	57	55
Characteristics												
10	Terminal resistance	Ω	0.399	1.52	8.32	12.8	23.1	31.1	39.8	58.0	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	12.0	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	2220	2770	2560	2600	2630	2600	2630	2670	2750	2880
15	Mechanical time constant	ms	24.5	23.7	23.2	23.2	23.2	23.2	23.4	23.3	23.4	23.8
16	Rotor inertia	gcm ²	1.05	0.816	0.864	0.854	0.844	0.854	0.848	0.834	0.811	0.788

Specifications

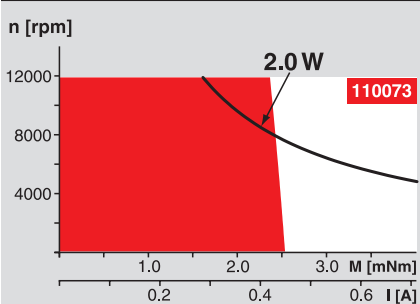
- Thermal data**
- 17 Thermal resistance housing-ambient 29.8 K / W
 - 18 Thermal resistance winding-housing 5.5 K / W
 - 19 Thermal time constant winding 3.53 s
 - 20 Thermal time constant motor 328 s
 - 21 Ambient temperature -30 ... +85°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 280 N
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 280 N
- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of commutator segments 7
 - 31 Weight of motor 22 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

Ball bearings in place of sleeve bearings

Operating Range

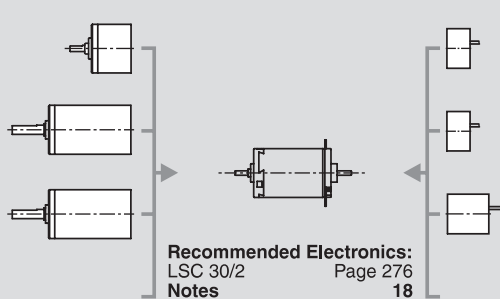


Comments

- 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

- Spur Gearhead**
Ø16 mm
0.01 - 0.1 Nm
Page 219 / 220 / 221 / 222
- Planetary Gearhead**
Ø16 mm
0.06 - 0.18 Nm
Page 223
- Planetary Gearhead**
Ø16 mm
0.1 - 0.3 Nm
Page 224

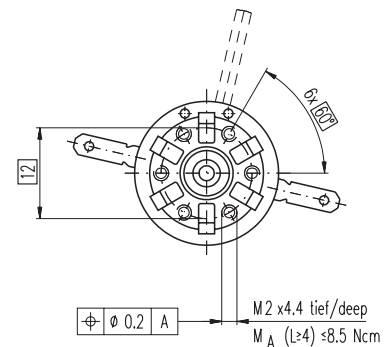
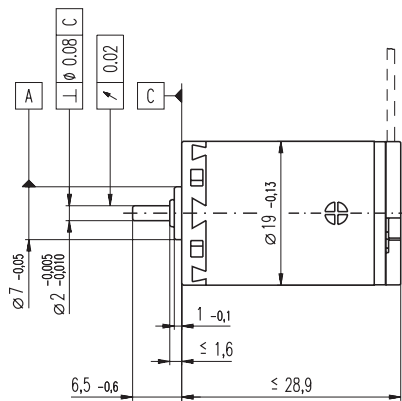
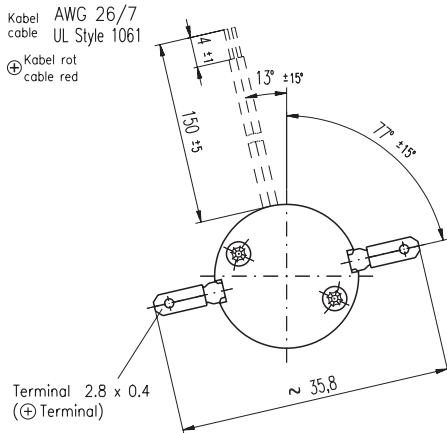


Overview on page 16 - 21

Recommended Electronics:
LSC 30/2 Page 276
Notes 18

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

Kabel AWG 26/7
cable UL Style 1061
⊕ Kabel rot
cable red



M 1:1

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

Order Number

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	6.0	9.0	12.0	15.0	18.0	24.0
2	No load speed	rpm	8010	10800	9400	7780	9200	10300	10300	9290	8850
3	No load current	mA	77.5	52.6	33.5	18.5	16.2	14.6	11.7	8.22	5.7
4	Nominal speed	rpm	6660	8040	5690	4020	5490	6530	6520	5470	4930
5	Nominal torque (max. continuous torque)	mNm	1.35	2.49	3.61	3.61	3.62	3.52	3.52	3.51	3.43
6	Nominal current (max. continuous current)	A	0.840	0.840	0.828	0.513	0.406	0.333	0.266	0.199	0.139
7	Stall torque	mNm	8.12	9.79	9.19	7.52	9.02	9.67	9.65	8.57	7.80
8	Starting current	A	4.62	3.13	2.04	1.04	0.982	0.884	0.705	0.472	0.307
9	Max. efficiency	%	76	76	77	76	77	77	77	76	75
Characteristics											
10	Terminal resistance	Ω	0.325	1.15	2.20	5.77	9.17	13.6	21.3	38.2	78.2
11	Terminal inductance	mH	0.0186	0.0587	0.121	0.314	0.506	0.719	1.12	1.98	3.87
12	Torque constant	mNm / A	1.76	3.13	4.50	7.23	9.19	10.9	13.7	18.2	25.4
13	Speed constant	rpm / V	5430	3050	2120	1320	1040	873	698	525	376
14	Speed / torque gradient	rpm / mNm	1000	1120	1040	1050	1040	1080	1090	1100	1160
15	Mechanical time constant	ms	26.6	24.3	23.7	23.6	23.5	23.6	23.7	23.7	24.0
16	Rotor inertia	gcm ²	2.53	2.07	2.18	2.14	2.16	2.08	2.08	2.05	1.98

Specifications

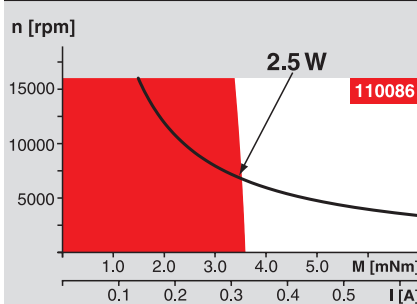
Thermal data	
17	Thermal resistance housing-ambient 21.3 K / W
18	Thermal resistance winding-housing 10.5 K / W
19	Thermal time constant winding 11 s
20	Thermal time constant motor 351 s
21	Ambient temperature -30 ... +65°C
22	Max. permissible winding temperature +85°C
Mechanical data (sleeve bearings)	
23	Max. permissible 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 loading, 5 mm from flange 2.7 N
Mechanical data (ball bearings)	
23	Max. permissible 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 loading, 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 49.

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

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Planetary Gearhead

Ø19 mm
0.1 - 0.3 Nm
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Spur Gearhead

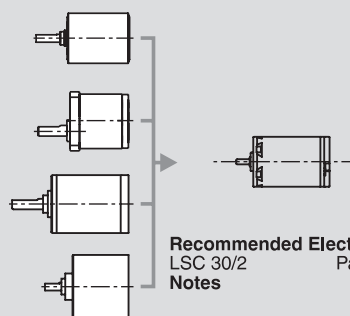
Ø20.3 mm
0.06 - 0.25 Nm
Page 227

Planetary Gearhead

Ø22 mm
0.1 - 2.0 Nm
Page 228 / 230 / 231

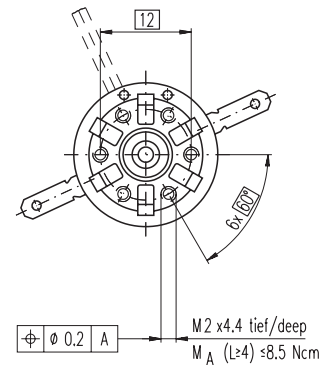
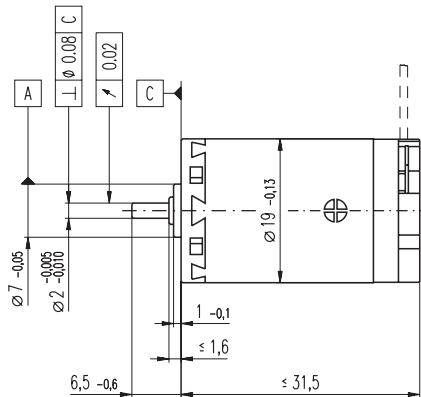
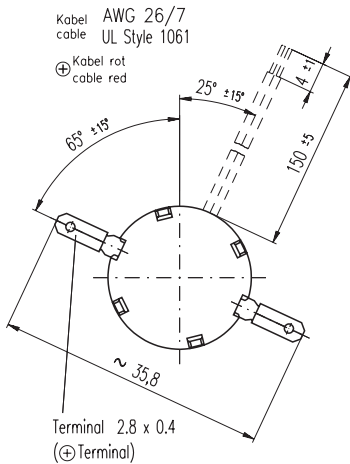
Spur Gearhead

Ø24 mm
0.1 Nm
Page 234



Recommended Electronics:
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Notes 18

A-max 19 Ø19 mm, Graphite Brushes, 2.5 Watt



M 1:1

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

Order Number

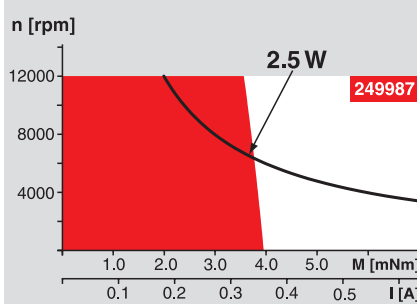
	249982	249983	249984	249985	249986	249987	249988	249989	249990
with terminals	240133	352942	310977	352943	352944	352945	352946	352947	310980
with cables									

Motor Data																				
Values at nominal voltage																				
1	Nominal voltage	V	2.4	3.6	6.0	7.2	9.0	12.0	15.0	18.0	24.0									
2	No load speed	rpm	11700	10200	12100	8960	8830	9920	9930	8920	8470									
3	No load current	mA	287	157	113	66.0	51.8	44.5	35.6	26.2	18.6									
4	Nominal speed	rpm	9580	7240	8530	4570	4540	5620	5650	4600	4050									
5	Nominal torque (max. continuous torque)	mNm	0.783	1.79	2.76	3.84	3.95	3.86	3.89	3.91	3.84									
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.591	0.476	0.393	0.316	0.239	0.168									
7	Stall torque	mNm	4.78	6.59	9.77	8.23	8.50	9.29	9.40	8.45	7.74									
8	Starting current	A	2.72	2.11	2.17	1.14	0.925	0.849	0.687	0.465	0.305									
9	Max. efficiency	%	46	53	60	58	59	60	60	58	57									
Characteristics																				
10	Terminal resistance	Ω	0.883	1.71	2.76	6.33	9.72	14.1	21.8	38.7	78.8									
11	Terminal inductance	mH	0.0186	0.0587	0.121	0.314	0.506	0.719	1.12	1.98	3.87									
12	Torque constant	mNm / A	1.76	3.13	4.50	7.23	9.19	10.9	13.7	18.2	25.4									
13	Speed constant	rpm / V	5430	3050	2120	1320	1040	873	698	525	376									
14	Speed / torque gradient	rpm / mNm	2720	1670	1300	1160	1100	1130	1110	1120	1170									
15	Mechanical time constant	ms	73.2	36.7	30.1	26.2	25.2	25.0	24.7	24.4	24.6									
16	Rotor inertia	gcm ²	2.56	2.10	2.21	2.17	2.19	2.11	2.11	2.08	2.01									

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 351 s
 - 21 Ambient temperature -30 ... +85°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 2.7 N

Operating Range



Comments

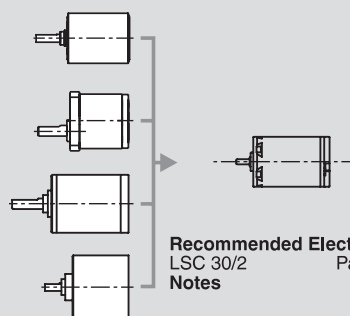
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 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

maxon Modular System

Overview on page 16 - 21

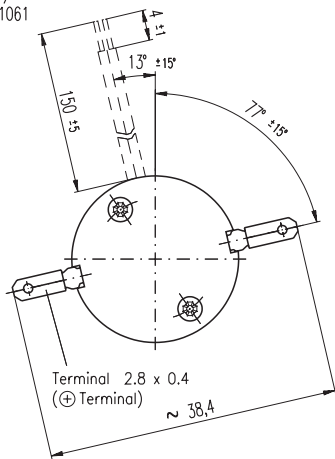
- Planetary Gearhead**
Ø19 mm
0.1 - 0.3 Nm
Page 226
- Spur Gearhead**
Ø20.3 mm
0.06 - 0.25 Nm
Page 227
- Planetary Gearhead**
Ø22 mm
0.1 - 2.0 Nm
Page 228 / 230 / 231
- Spur Gearhead**
Ø24 mm
0.1 Nm
Page 234



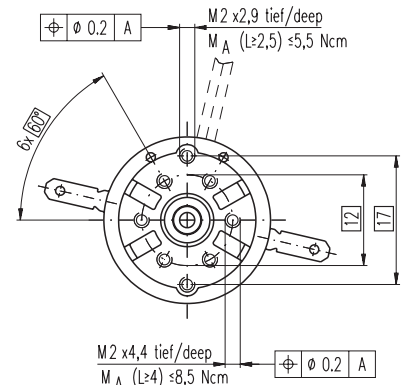
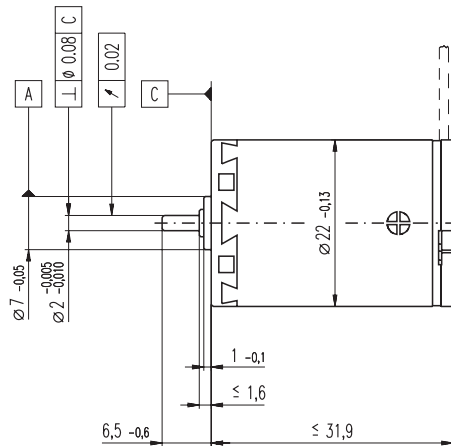
Recommended Electronics:
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Notes 18

A-max 22 Ø22 mm, Precious Metal Brushes CLL, 5 Watt, CE approved

Kabel AWG 24/7
cable UL Style 1061
⊕ Kabel rot
cable red



M 1:1



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

Order Number

with terminals
with cables

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

Motor Data

Values at nominal voltage		110117	110119	110120	110121	110122	110123	110124	110125	110126	110127	110128	110129	
1	Nominal voltage	V	6.0	9.0	9.0	12.0	12.0	15.0	18.0	24.0	30.0	36.0	48.0	48.0
2	No load speed	rpm	9640	9980	8770	10400	9410	10300	9970	10700	10800	9800	9290	8380
3	No load current	mA	29.6	20.9	16.9	16.9	14.2	13.1	10.4	8.83	7.20	5.07	3.48	2.94
4	Nominal speed	rpm	7480	7350	6150	7820	6760	7620	7310	8060	8160	7090	6520	5620
5	Nominal torque (max. continuous torque)	mNm	4.81	6.33	6.42	6.36	6.31	6.29	6.25	6.23	6.18	6.15	6.03	6.10
6	Nominal current (max. continuous current)	A	0.840	0.757	0.673	0.597	0.533	0.465	0.374	0.301	0.241	0.181	0.126	0.115
7	Stall torque	mNm	21.5	24.1	21.5	25.5	22.5	24.5	23.5	25.2	25.1	22.3	20.3	18.6
8	Starting current	A	3.65	2.81	2.21	2.34	1.86	1.77	1.37	1.19	0.957	0.641	0.414	0.343
9	Max. efficiency	%	83	84	84	84	84	84	84	84	84	83	83	83
Characteristics		110117	110119	110120	110121	110122	110123	110124	110125	110126	110127	110128	110129	
10	Terminal resistance	Ω	1.64	3.20	4.07	5.13	6.46	8.48	13.1	20.2	31.3	56.2	116	140
11	Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.584	0.890	1.37	2.10	3.68	7.29	8.95
12	Torque constant	mNm / A	5.90	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	452	418	410	412	422	422	428	429	435	443	462	454
15	Mechanical time constant	ms	19.1	18.8	18.7	18.7	18.7	18.7	18.7	18.8	18.8	18.9	19.1	19.0
16	Rotor inertia	gcm ²	4.04	4.29	4.35	4.33	4.24	4.24	4.18	4.18	4.14	4.07	3.95	3.99

Specifications

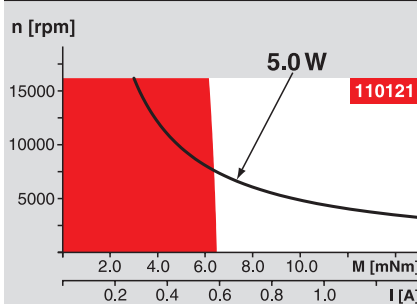
- Thermal data**
- 17 Thermal resistance housing-ambient 20 K / W
 - 18 Thermal resistance winding-housing 6.0 K / W
 - 19 Thermal time constant winding 10.1 s
 - 20 Thermal time constant motor 540 s
 - 21 Ambient temperature -30 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 2.8 N
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 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 49.

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

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Planetary Gearhead

Ø22 mm
0.1 - 0.6 Nm
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Planetary Gearhead

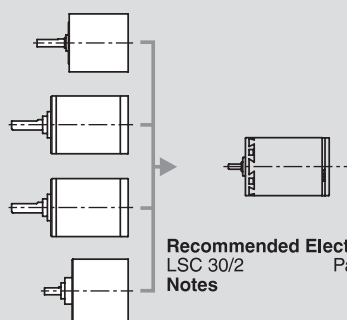
Ø22 mm
0.5 - 1.0 Nm
Page 230

Planetary Gearhead

Ø22 mm
0.5 - 2.0 Nm
Page 231

Spur Gearhead

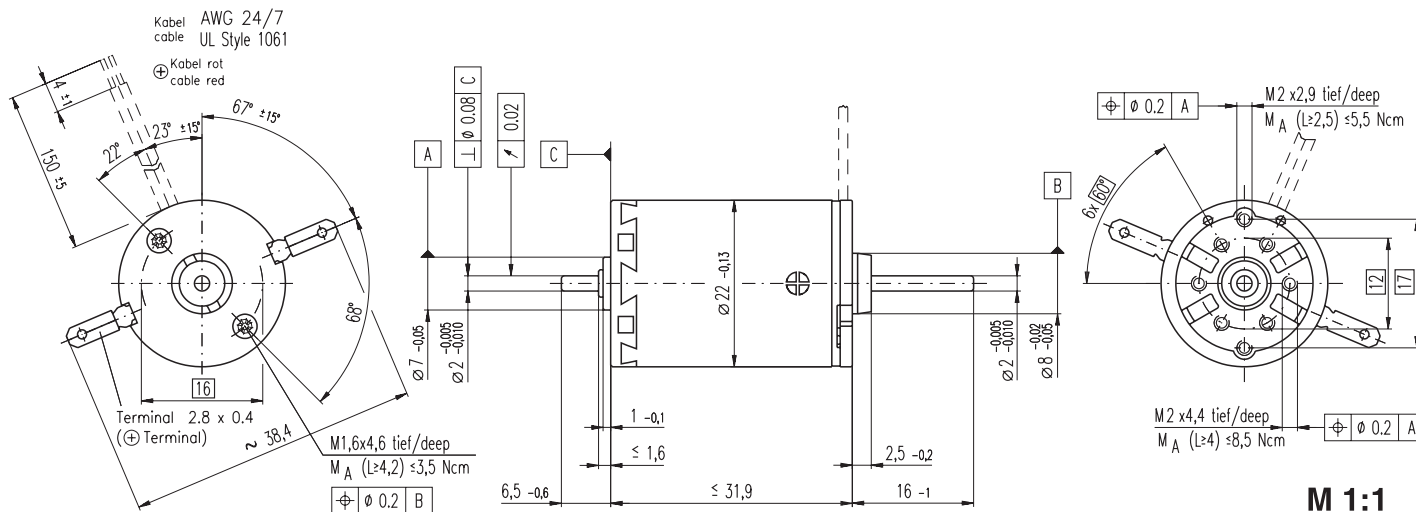
Ø24 mm
0.1 Nm
Page 234



Recommended Electronics:
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Notes 18

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

maxon A-max



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

Order Number

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	6.0	7.2	7.2	7.2	9.0	12.0	15.0	18.0	24.0	36.0	42.0		
2	No load speed	rpm	7220	6640	7000	6240	5630	6140	6640	6680	6480	6520	6950	7320		
3	No load current	mA	26.7	17.8	16.0	13.6	11.8	10.6	8.88	7.17	5.73	4.33	3.16	2.92		
4	Nominal speed	rpm	5050	3980	4380	3600	2950	3470	3950	3990	3780	3790	4170	4560		
5	Nominal torque (max. continuous torque)	mNm	4.82	6.38	6.43	6.43	6.37	6.36	6.30	6.29	6.25	6.19	6.06	6.10		
6	Nominal current (max. continuous current)	A	0.840	0.761	0.674	0.601	0.536	0.468	0.376	0.302	0.243	0.182	0.126	0.115		
7	Stall torque	mNm	16.1	16.0	17.2	15.3	13.5	14.7	15.7	15.7	15.1	14.9	15.2	16.3		
8	Starting current	A	2.74	1.88	1.77	1.40	1.11	1.06	0.916	0.741	0.574	0.427	0.311	0.300		
9	Max. efficiency	%	82	82	82	82	81	81	82	82	81	81	81	82		
Characteristics																
10	Terminal resistance	Ω	1.64	3.20	4.07	5.13	6.46	8.48	13.1	20.2	31.3	56.2	116	140		
11	Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.584	0.890	1.37	2.10	3.68	7.29	8.95		
12	Torque constant	mNm / A	5.90	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	452	418	410	412	422	422	428	429	435	443	462	454		
15	Mechanical time constant	ms	19.1	18.8	18.7	18.7	18.7	18.8	18.7	18.8	18.8	18.9	19.1	19.0		
16	Rotor inertia	gcm ²	4.05	4.30	4.35	4.33	4.24	4.25	4.18	4.18	4.14	4.07	3.95	3.99		

Specifications

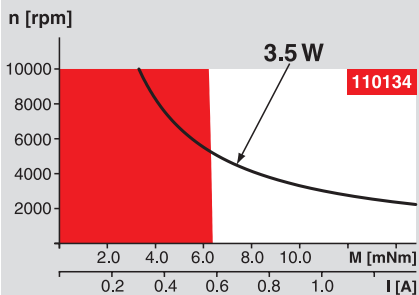
Thermal data		
17	Thermal resistance housing-ambient	20 K / W
18	Thermal resistance winding-housing	6.0 K / W
19	Thermal time constant winding	10.1 s
20	Thermal time constant motor	540 s
21	Ambient temperature	-30 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	10000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static) (static, shaft supported)	80 N / 440 N
28	Max. radial loading, 5 mm from flange	2.8 N
Mechanical data (ball bearings)		
23	Max. permissible speed	10000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static) (static, shaft supported)	45 N / 440 N
28	Max. radial loading, 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 49.

Option

- Ball bearings in place of sleeve bearings
- Without CLL

Operating Range

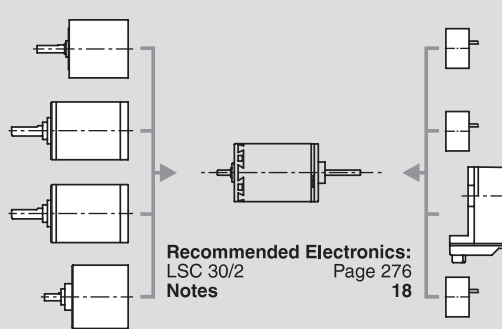


Comments

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

maxon Modular System

- Planetary Gearhead**
Ø22 mm
0.1 - 0.6 Nm
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- Planetary Gearhead**
Ø22 mm
0.5 - 1.0 Nm
Page 230
- Planetary Gearhead**
Ø22 mm
0.5 - 2.0 Nm
Page 231
- Spur Gearhead**
Ø24 mm
0.1 Nm
Page 234

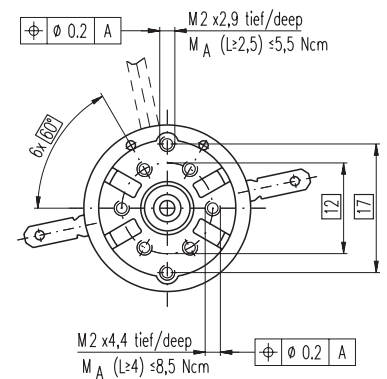
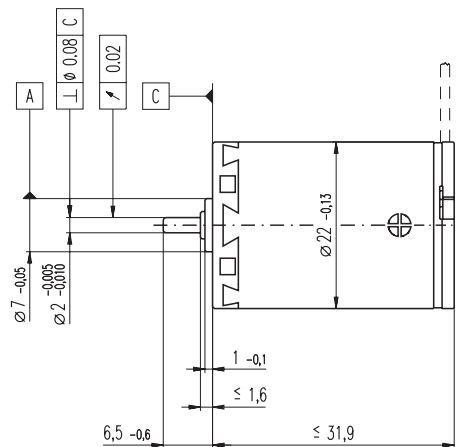
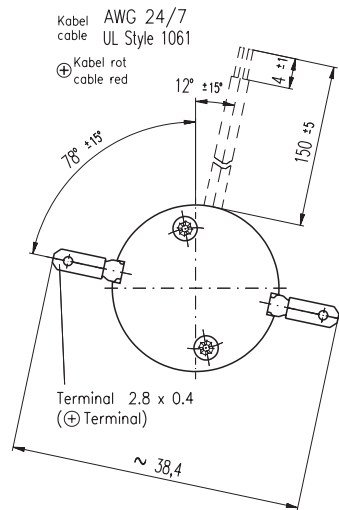


Recommended Electronics:
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Overview on page 16 - 21

- Encoder MR**
32 CPT,
2 / 3 channels
Page 255
- Encoder MR**
128 / 256 / 512 CPT,
2 / 3 channels
Page 256
- Encoder Enc**
22 mm
100 CPT, 2 channels
Page 261
- Encoder MEnc**
Ø13 mm
16 CPT, 2 channels
Page 270

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



M 1:1

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

Order Number

with terminals
with cables

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

Motor Data

Values at nominal voltage																
1	Nominal voltage	V	6.0	9.0	9.0	12.0	12.0	15.0	18.0	24.0	24.0	36.0	48.0	48.0		
2	No load speed	rpm	9250	9710	8530	10200	9200	10100	9800	10500	8500	9650	9130	8220		
3	No load current	mA	83.2	57.9	49.7	45.9	40.5	36.0	29.0	23.7	18.4	14.2	10.0	8.85		
4	Nominal speed	rpm	5550	6370	5240	6990	5960	6880	6630	7430	5340	6500	5920	5020		
5	Nominal torque (max. continuous torque)	mNm	5.82	6.52	6.76	6.77	6.82	6.87	6.94	6.97	7.07	7.00	6.91	7.02		
6	Nominal current (max. continuous current)	A	1.06	0.816	0.741	0.664	0.602	0.529	0.433	0.350	0.287	0.214	0.150	0.138		
7	Stall torque	mNm	16.1	20.4	18.7	22.8	20.4	22.7	22.3	24.3	19.5	21.9	20.1	18.5		
8	Starting current	A	2.73	2.38	1.92	2.09	1.69	1.64	1.30	1.14	0.745	0.631	0.411	0.340		
9	Max. efficiency	%	65	70	69	72	71	72	72	73	71	72	71	70		
Characteristics																
10	Terminal resistance	Ω	2.20	3.78	4.69	5.74	7.12	9.15	13.8	21.0	32.2	57.1	117	141		
11	Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.584	0.890	1.37	2.10	3.68	7.29	8.95		
12	Torque constant	mNm / A	5.90	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	604	494	473	461	465	455	451	445	447	450	466	458		
15	Mechanical time constant	ms	25.1	21.8	21.2	20.6	20.3	19.9	19.4	19.1	19.0	18.9	18.9	18.8		
16	Rotor inertia	gcm ²	3.97	4.22	4.28	4.26	4.17	4.17	4.11	4.11	4.07	4.00	3.88	3.92		

Specifications

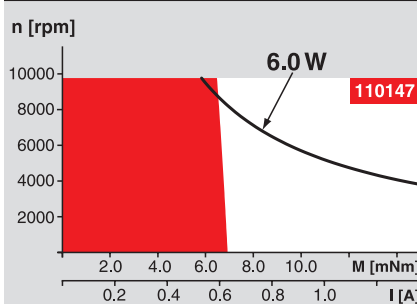
Thermal data		
17	Thermal resistance housing-ambient	20 K / W
18	Thermal resistance winding-housing	6.0 K / W
19	Thermal time constant winding	10.1 s
20	Thermal time constant motor	540 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	2.8 N
Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 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 49.

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 16 - 21

Planetary Gearhead

Ø22 mm
0.1 - 0.6 Nm
Page 228 / 229

Planetary Gearhead

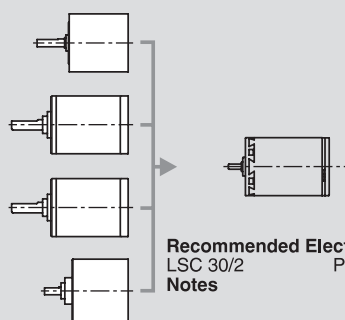
Ø22 mm
0.5 - 1.0 Nm
Page 230

Planetary Gearhead

Ø22 mm
0.5 - 2.0 Nm
Page 231

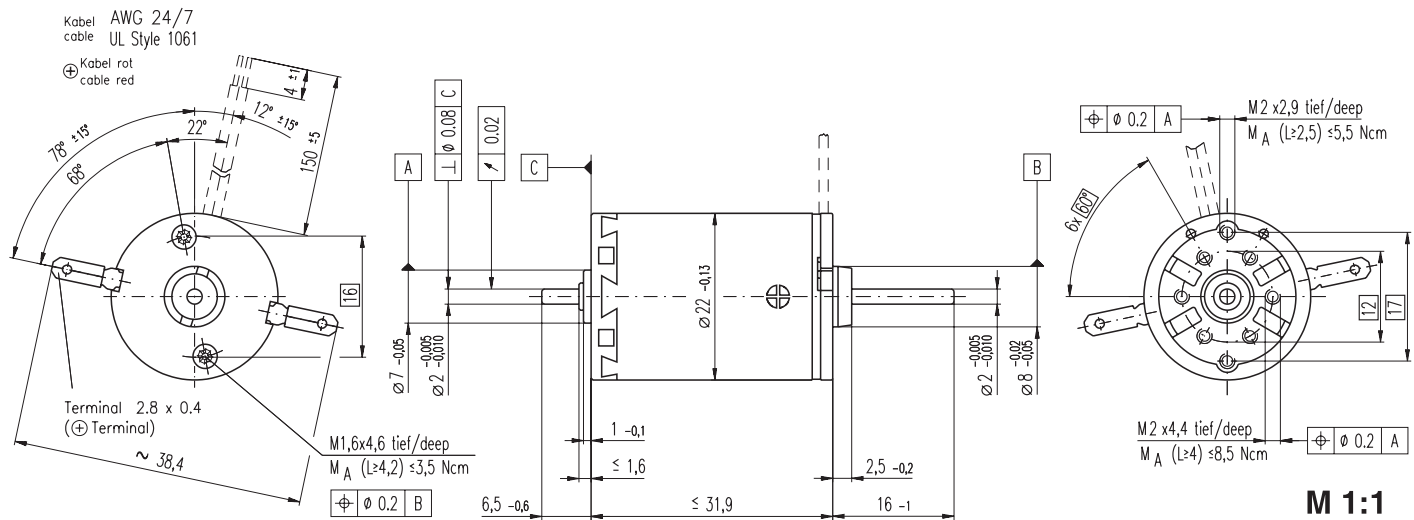
Spur Gearhead

Ø24 mm
0.1 Nm
Page 234



Recommended Electronics:
LSC 30/2
Page 276
Notes
18

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



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

Order Number

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	6.0	9.0	9.0	12.0	12.0	15.0	18.0	24.0	24.0	36.0	48.0	48.0	
2	No load speed	rpm	9250	9710	8530	10200	9200	10100	9800	10500	8500	9650	9130	8220	
3	No load current	mA	83.2	57.9	49.7	45.9	40.5	36.0	29.0	23.7	18.4	14.2	10.0	8.85	
4	Nominal speed	rpm	5550	6370	5240	6990	5960	6880	6630	7430	5340	6500	5920	5020	
5	Nominal torque (max. continuous torque)	mNm	5.82	6.52	6.76	6.77	6.82	6.87	6.94	6.97	7.07	7.00	6.91	7.02	
6	Nominal current (max. continuous current)	A	1.06	0.816	0.741	0.664	0.602	0.529	0.433	0.350	0.287	0.214	0.150	0.138	
7	Stall torque	mNm	16.1	20.4	18.7	22.8	20.4	22.7	22.3	24.3	19.5	21.9	20.1	18.5	
8	Starting current	A	2.73	2.38	1.92	2.09	1.69	1.64	1.30	1.14	0.745	0.631	0.411	0.340	
9	Max. efficiency	%	65	70	69	72	71	72	72	73	71	72	71	70	
Characteristics															
10	Terminal resistance	Ω	2.20	3.78	4.69	5.74	7.12	9.15	13.8	21.0	32.2	57.1	117	141	
11	Terminal inductance	mH	0.106	0.222	0.288	0.362	0.445	0.584	0.890	1.37	2.10	3.68	7.29	8.95	
12	Torque constant	mNm / A	5.90	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	604	494	473	461	465	455	451	445	447	450	466	458	
15	Mechanical time constant	ms	25.2	21.8	21.2	20.6	20.3	19.9	19.4	19.1	19.0	18.9	18.9	18.8	
16	Rotor inertia	gcm ²	3.98	4.22	4.28	4.26	4.17	4.17	4.11	4.11	4.07	4.00	3.88	3.92	

Specifications

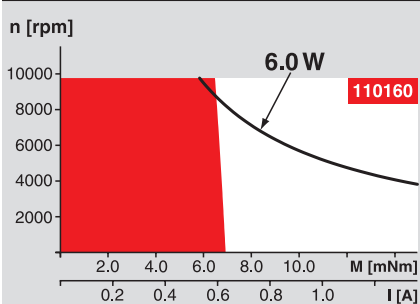
Thermal data			
17	Thermal resistance housing-ambient	20 K / W	
18	Thermal resistance winding-housing	6.0 K / W	
19	Thermal time constant winding	10.1 s	
20	Thermal time constant motor	540 s	
21	Ambient temperature	-30 ... +85°C	
22	Max. permissible winding temperature	+125°C	
Mechanical data (sleeve bearings)			
23	Max. permissible speed	9800 rpm	
24	Axial play	0.05 - 0.15 mm	
25	Radial play	0.012 mm	
26	Max. axial load (dynamic)	1 N	
27	Max. force for press fits (static) (static, shaft supported)	80 N / 440 N	
28	Max. radial loading, 5 mm from flange	2.8 N	
Mechanical data (ball bearings)			
23	Max. permissible speed	9800 rpm	
24	Axial play	0.05 - 0.15 mm	
25	Radial play	0.025 mm	
26	Max. axial load (dynamic)	3.3 N	
27	Max. force for press fits (static) (static, shaft supported)	45 N / 440 N	
28	Max. radial loading, 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 49.

Option

Ball bearings in place of sleeve bearings

Operating Range



Comments

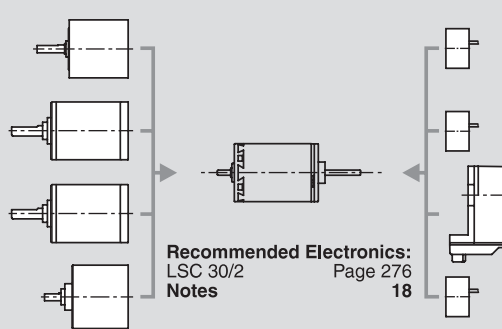
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

maxon Modular System

- Planetary Gearhead**
Ø22 mm
0.1 - 0.6 Nm
Page 228 / 229
- Planetary Gearhead**
Ø22 mm
0.5 - 1.0 Nm
Page 230
- Planetary Gearhead**
Ø22 mm
0.5 - 2.0 Nm
Page 231
- Spur Gearhead**
Ø24 mm
0.1 Nm
Page 234

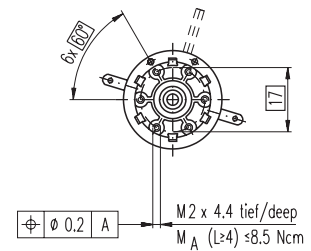
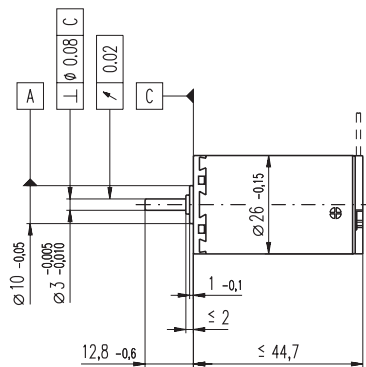
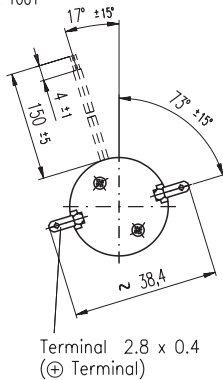


Overview on page 16 - 21

- Encoder MR**
32 CPT,
2 / 3 channels
Page 255
- Encoder MR**
128 / 256 / 512 CPT,
2 / 3 channels
Page 256
- Encoder Enc**
22 mm
100 CPT, 2 channels
Page 261
- Encoder MEnc**
Ø13 mm
16 CPT, 2 channels
Page 270

A-max 26 Ø26 mm, Precious Metal Brushes CLL, 4 Watt, CE approved

Kabel AWG 24/7
 cable UL Style 1061
 ⊕ Kabel rot
 cable red



M 1:2

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

Order Number

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	12.0	12.0	15.0	18.0	18.0	24.0	30.0	42.0	
2	No load speed	rpm	6110	5230	3860	5110	5590	5020	5430	5980	5340	5670	5890	5520	
3	No load current	mA	60.0	47.4	30.3	28.5	19.6	16.7	15.0	14.5	12.2	10.0	8.49	5.51	
4	Nominal speed	rpm	5090	3860	2360	3260	3470	2880	3180	3690	3160	3500	3680	3270	
5	Nominal torque (max. continuous torque)	mNm	5.45	6.47	8.95	10.9	12.4	12.4	11.7	11.4	12.1	12.1	11.9	11.7	
6	Nominal current (max. continuous current)	A	0.840	0.840	0.840	0.840	0.629	0.564	0.463	0.414	0.391	0.312	0.254	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	Starting current	A	4.70	3.08	2.12	2.27	1.62	1.30	1.10	1.05	0.940	0.797	0.665	0.403	
9	Max. efficiency	%	79	77	78	79	80	79	78	78	79	79	79	78	
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	11.0	13.3	20.2	22.5	26.0	28.3	31.8	39.9	48.0	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	24.4	24.2	23.7	23.5	23.5	23.4	23.6	23.8	23.6	23.6	23.7	23.8	
16	Rotor inertia	gcm ²	12.3	10.9	13.5	13.1	13.0	12.9	11.7	11.2	12.5	12.4	12.1	11.7	

Specifications

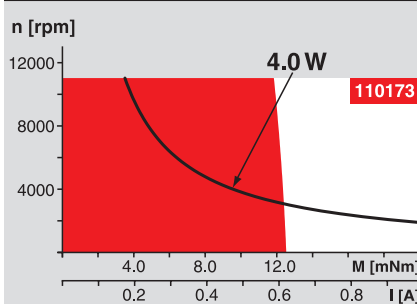
Thermal data			
17	Thermal resistance housing-ambient	13.2 K / W	
18	Thermal resistance winding-housing	3.2 K / W	
19	Thermal time constant winding	12.4 s	
20	Thermal time constant motor	660 s	
21	Ambient temperature	-30 ... +65°C	
22	Max. permissible winding temperature	+85°C	
Mechanical data (sleeve bearings)			
23	Max. permissible 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 loading, 5 mm from flange	5.5 N	
Mechanical data (ball bearings)			
23	Max. permissible speed	11000 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 loading, 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 49.

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 16 - 21

Planetary Gearhead

Ø26 mm
 0.5 - 2.0 Nm
 Page 235

Spur Gearhead

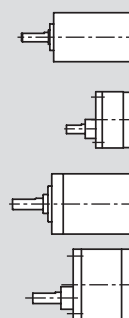
Ø30 mm
 0.07 - 0.2 Nm
 Page 236

Planetary Gearhead

Ø32 mm
 0.4 - 6.0 Nm
 Page 237 / 238 / 241

Spur Gearhead

Ø38 mm
 0.1 - 0.6 Nm
 Page 243



Recommended Electronics:

LSC 30/2 Page 276
 EPOS 24/5 294
 EPOS2 50/5 295
 EPOS P 24/5 297
Notes 18

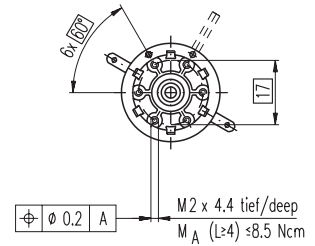
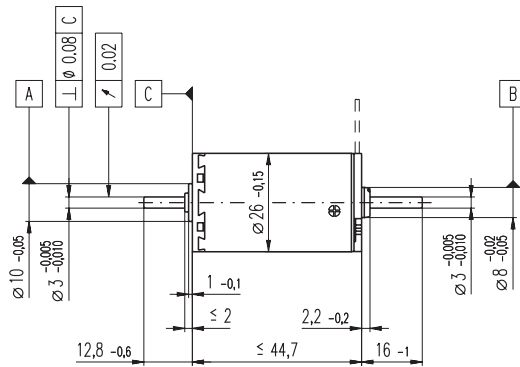
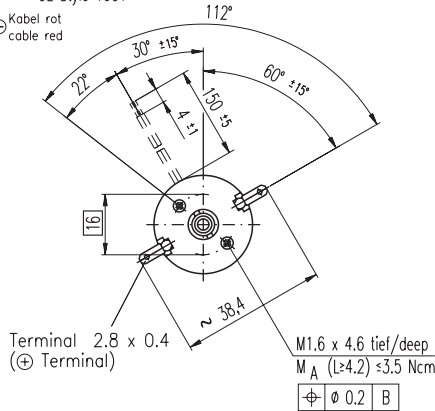
Encoder MEnc

Ø13 mm
 16 CPT, 2 channels
 Page 270

A-max 26 Ø26 mm, Precious Metal Brushes CLL, 4 Watt, CE approved

Kabel AWG 24/7
cable UL Style 1061

⊕ Kabel rot
cable red



M 1:2

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

Order Number

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

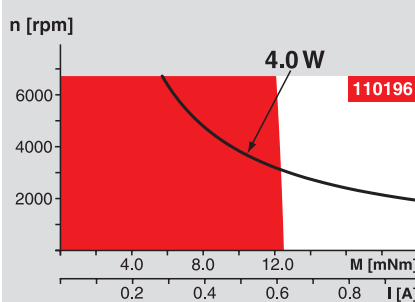
Motor Data

Values at nominal voltage																	
1	Nominal voltage	V	3.6	4.5	6.0	7.2	9.0	9.0	12.0	15.0	18.0	21.0	24.0	30.0			
2	No load speed	rpm	4870	5210	5140	5090	4180	3740	4320	4960	5320	4950	4690	3920			
3	No load current	mA	63.8	56.8	41.5	34.1	20.2	17.2	16.0	15.8	14.6	11.2	9.04	5.54			
4	Nominal speed	rpm	3850	3860	3670	3260	2040	1600	2080	2670	3160	2780	2480	1660			
5	Nominal torque (max. continuous torque)	mNm	5.44	6.41	8.84	10.8	12.5	12.5	11.8	11.4	12.1	12.1	11.9	11.8			
6	Nominal current (max. continuous current)	A	0.840	0.840	0.840	0.840	0.630	0.565	0.464	0.415	0.391	0.312	0.255	0.168			
7	Stall torque	mNm	26.1	24.9	31.1	30.2	24.6	22.0	22.8	24.9	29.9	27.8	25.5	20.6			
8	Starting current	A	3.76	3.08	2.83	2.27	1.22	0.974	0.878	0.879	0.940	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	0.862	1.07	1.42	1.69	2.13	3.35	4.85	10.8			
12	Torque constant	mNm / A	6.94	8.09	11.0	13.3	20.2	22.5	26.0	28.3	31.8	39.9	48.0	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	24.5	24.3	23.7	23.6	23.5	23.5	23.7	23.8	23.6	23.6	23.7	23.9			
16	Rotor inertia	gcm ²	12.3	10.9	13.5	13.2	13.0	12.9	11.7	11.2	12.5	12.5	12.1	11.7			

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 12.4 s
 - 20 Thermal time constant motor 660 s
 - 21 Ambient temperature -30 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 5.5 N
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 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 49.
- Option**
Ball bearings in place of sleeve bearings
Without CLL

Operating Range

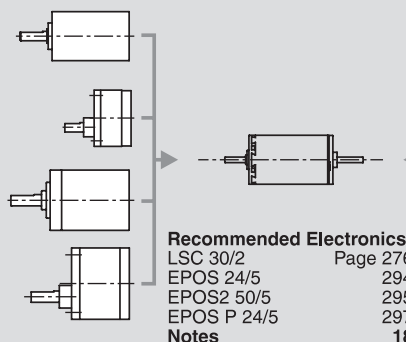


Comments

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

maxon Modular System

- Planetary Gearhead**
Ø26 mm
0.5 - 2.0 Nm
Page 235
- Spur Gearhead**
Ø30 mm
0.07 - 0.2 Nm
Page 236
- Planetary Gearhead**
Ø32 mm
0.4 - 6.0 Nm
Page 237 / 238 / 241
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 243



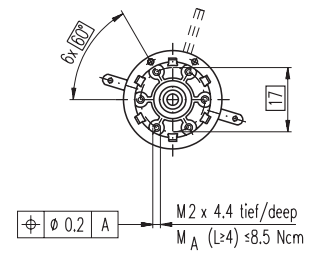
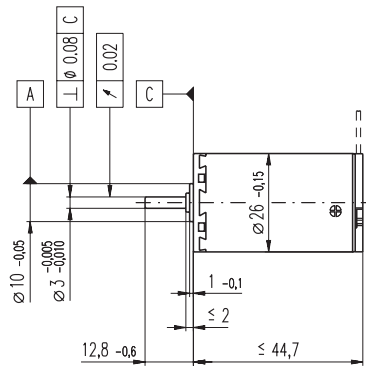
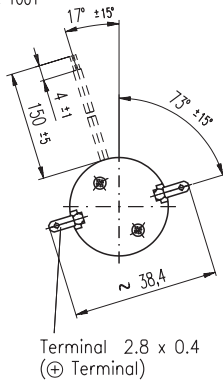
Overview on page 16 - 21

- Encoder MR**
128 - 1000 CPT,
3 channels
Page 258
- Encoder Enc**
22 mm
100 CPT, 2 channels
Page 261
- Encoder HEDS 5540**
500 CPT,
3 channels
Page 263
- Encoder HDL 5540**
500 CPT,
3 channels
Page 265

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

HighPower

Kabel AWG 24/7
cable UL Style 1061
⊕ Kabel rot
cable red



M 1:2

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

Order Number

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	6.0	9.0	12.0	15.0	18.0	24.0	30.0	36.0	42.0	48.0
2	No load speed	rpm	7310	8670	6160	6780	6720	6690	5670	6090	6780	6570	6050
3	No load current	mA	78.8	77.6	30.1	26.3	20.7	17.1	9.96	8.89	8.75	7.14	5.5
4	Nominal speed	rpm	6830	8070	4970	5310	5060	5000	3930	4360	5060	4820	4280
5	Nominal torque (max. continuous torque)	mNm	4.46	5.03	11.3	13.7	15.7	15.6	15.3	15.3	15.2	15.0	15.0
6	Nominal current (max. continuous current)	A	0.840	0.840	0.840	0.840	0.762	0.625	0.390	0.336	0.310	0.253	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	Starting current	A	11.5	11.2	4.25	3.78	3.01	2.43	1.25	1.16	1.20	0.930	0.683
9	Max. efficiency	%	84	84	84	84	84	84	83	84	84	84	83
Characteristics													
10	Terminal resistance	Ω	0.390	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	0.770	1.90	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	16.4	15.9	14.9	14.8	14.7	14.7	14.8	14.8	14.8	14.9	14.9
16	Rotor inertia	gcm ²	14.3	12.8	13.5	13.1	13.2	13.0	12.5	12.5	12.4	12.1	12.0

Specifications

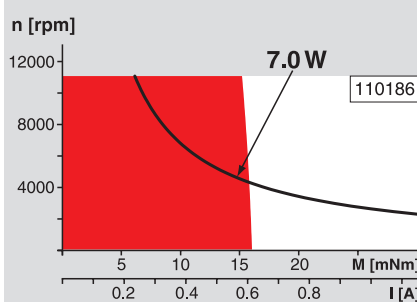
Thermal data		
17	Thermal resistance housing-ambient	13.2 K / W
18	Thermal resistance winding-housing	3.2 K / W
19	Thermal time constant winding	12.4 s
20	Thermal time constant motor	772 s
21	Ambient temperature	-30 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	5.5 N
Mechanical data (ball bearings)		
23	Max. permissible speed	11000 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 loading, 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 49.

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 16 - 21

Planetary Gearhead

Ø26 mm
0.5 - 2.0 Nm
Page 235

Spur Gearhead

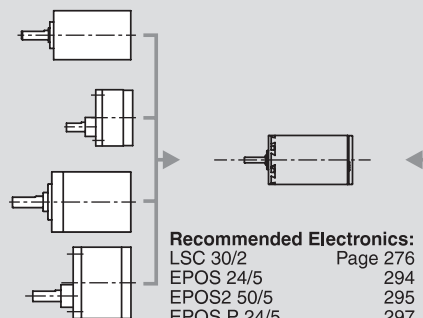
Ø30 mm
0.07 - 0.2 Nm
Page 236

Planetary Gearhead

Ø32 mm
0.4 - 6.0 Nm
Page 237 / 238 / 241

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 243



Encoder MEnc

Ø13 mm
16 CPT, 2 channels
Page 270

Recommended Electronics:

LSC 30/2 Page 276
EPOS 24/5 294
EPOS2 50/5 295
EPOS P 24/5 297
Notes 18

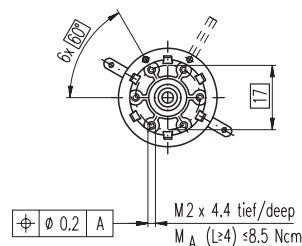
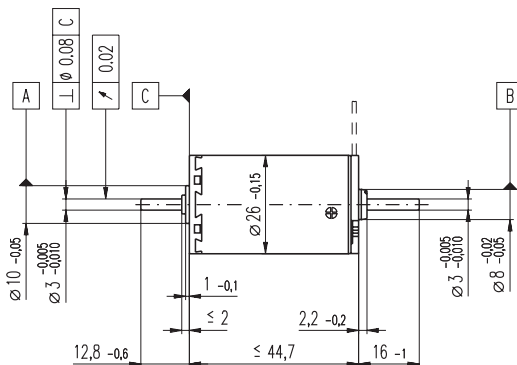
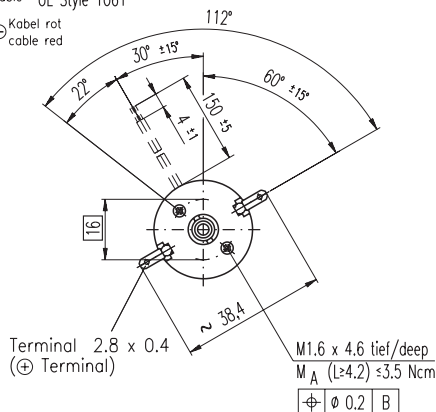
A-max 26 Ø26 mm, Precious Metal Brushes CLL, 4.5 Watt, CE approved

HighPower

maxon A-max

Kabel AWG 24/7
cable UL Style 1061

⊕ Kabel rot
cable red



M 1:2

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

Order Number

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	6.0	7.2	9.0	12.0	15.0	18.0	24.0	30.0	36.0			
2	No load speed	rpm	3880	5180	4090	4050	4020	4440	3530	3640	4510	4680	4520			
3	No load current	mA	67.6	69.8	29.2	24.0	19.0	16.5	9.4	8.2	8.44	7.15	5.66			
4	Nominal speed	rpm	3390	4580	2910	2580	2340	2750	1780	1900	2770	2920	2750			
5	Nominal torque (max. continuous torque)	mNm	4.53	5.09	11.3	13.8	15.9	15.7	15.4	15.5	15.4	15.1	15.0			
6	Nominal current (max. continuous current)	A	0.840	0.840	0.840	0.840	0.768	0.629	0.392	0.338	0.312	0.255	0.204			
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	Starting current	A	6.15	6.71	2.83	2.27	1.80	1.62	0.783	0.697	0.797	0.665	0.513			
9	Max. efficiency	%	80	81	81	81	81	81	80	80	81	81	80			
Characteristics																
10	Terminal resistance	Ω	0.390	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	0.770	1.90	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	16.4	16.0	14.9	14.8	14.8	14.8	14.8	14.8	14.8	14.9	15.0			
16	Rotor inertia	gcm ²	14.3	12.8	13.5	13.2	13.3	13.0	12.5	12.5	12.5	12.1	12.0			

Specifications

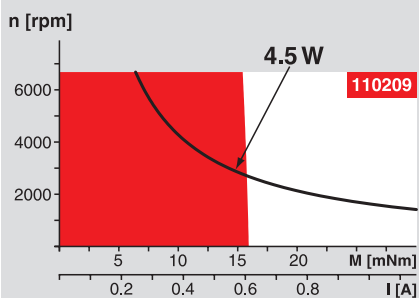
Thermal data		
17	Thermal resistance housing-ambient	13.2 K / W
18	Thermal resistance winding-housing	3.2 K / W
19	Thermal time constant winding	12.4 s
20	Thermal time constant motor	785 s
21	Ambient temperature	-30 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	6700 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1.7 N
27	Max. force for press fits (static) (static, shaft supported)	80 N
28	Max. radial loading, 5 mm from flange	1200 N
		5.5 N
Mechanical data (ball bearings)		
23	Max. permissible speed	6700 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static) (static, shaft supported)	75 N
28	Max. radial loading, 5 mm from flange	1200 N
		20.5 N
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	119 g
	CLL= Capacitor Long Life	

Values listed in the table are nominal.
Explanation of the figures on page 49.

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 16 - 21

Planetary Gearhead

Ø26 mm
0.5 - 2.0 Nm
Page 235

Spur Gearhead

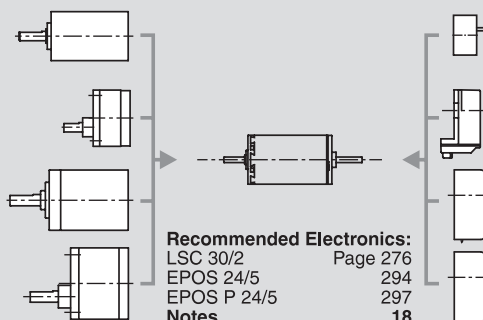
Ø30 mm
0.07 - 0.2 Nm
Page 236

Planetary Gearhead

Ø32 mm
0.4 - 6.0 Nm
Page 237 / 238 / 241

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 243



Recommended Electronics:
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EPOS 24/5 294
EPOS P 24/5 297
Notes 18

Encoder MR

128 - 1000 CPT,
3 channels
Page 258

Encoder Enc

22 mm
100 CPT, 2 channels
Page 261

Encoder HEDS 5540

500 CPT,
3 channels
Page 263

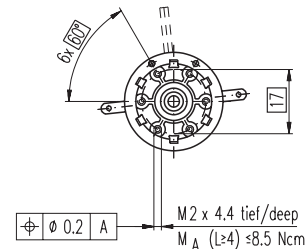
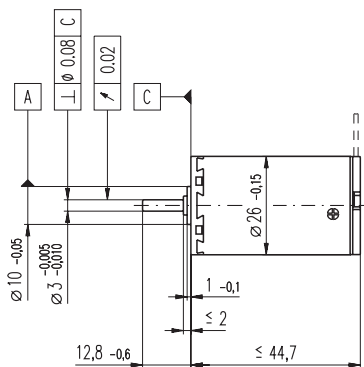
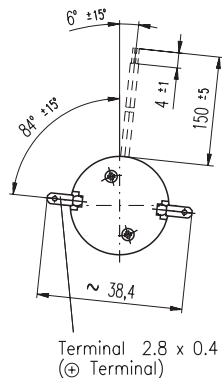
Encoder HDL 5540

500 CPT,
3 channels
Page 265

A-max 26 Ø26 mm, Graphite Brushes, 6 Watt

Kabel AWG 24/7
cable UL Style 1061

⊕ Kabel rot
cable red



M 1:2

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

Order Number

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

Motor Data

Values at nominal voltage																		
1	Nominal voltage	V	7.2	9.0	12.0	12.0	18.0	18.0	24.0	24.0	30.0	36.0	42.0	48.0				
2	No load speed	rpm	9270	10000	10000	8300	8260	7410	8590	7870	8810	8440	8170	6240				
3	No load current	mA	118	104	76.8	59.7	39.2	34.0	30.8	27.6	25.4	20.0	16.4	10.3				
4	Nominal speed	rpm	7160	7620	7600	5590	5640	4790	5880	5100	6210	5850	5550	3550				
5	Nominal torque (max. continuous torque)	mNm	6.73	7.97	11.1	13.0	13.6	13.8	13.1	12.9	13.7	13.8	13.7	13.7				
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.03	0.708	0.642	0.532	0.481	0.452	0.365	0.300	0.201				
7	Stall torque	mNm	38.2	39.7	52.7	43.8	45.6	41.0	43.5	38.1	47.9	46.4	43.7	32.6				
8	Starting current	A	5.50	4.90	4.80	3.29	2.25	1.82	1.67	1.34	1.51	1.16	0.911	0.455				
9	Max. efficiency	%	67	69	73	72	74	73	74	73	75	75	75	72				
Characteristics																		
10	Terminal resistance	Ω	1.31	1.84	2.50	3.65	8.00	9.91	14.4	17.9	19.9	31.0	46.1	106				
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	11.0	13.3	20.2	22.5	26.0	28.3	31.8	39.9	48.0	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	260	268	198	197	186	186	203	213	188	186	191	197				
15	Mechanical time constant	ms	33.4	30.5	27.9	27.1	25.4	25.2	24.9	24.9	24.5	24.2	24.2	24.2				
16	Rotor inertia	gcm ²	12.3	10.9	13.5	13.1	13.0	12.9	11.7	11.2	12.5	12.5	12.1	11.7				

Specifications

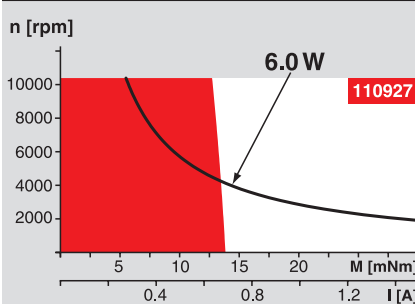
Thermal data		
17	Thermal resistance housing-ambient	13.2 K / W
18	Thermal resistance winding-housing	3.2 K / W
19	Thermal time constant winding	12.4 s
20	Thermal time constant motor	647 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 5 mm from flange	20.5 N
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 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 49.

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 16 - 21

Planetary Gearhead

Ø26 mm
0.5 - 2.0 Nm
Page 235

Spur Gearhead

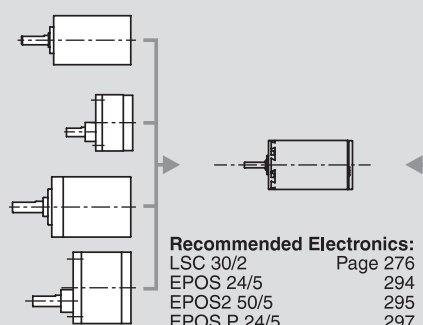
Ø30 mm
0.07 - 0.2 Nm
Page 236

Planetary Gearhead

Ø32 mm
0.4 - 6.0 Nm
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Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 243



Recommended Electronics:

LSC 30/2 Page 276
EPOS 24/5 294
EPOS2 50/5 295
EPOS P 24/5 297

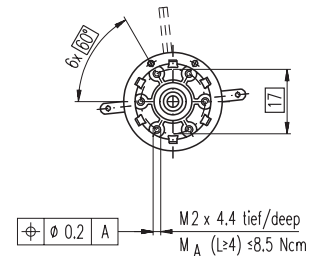
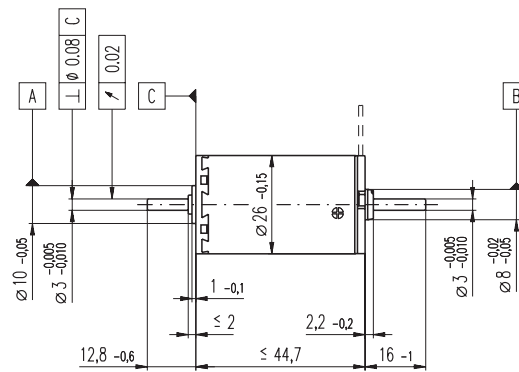
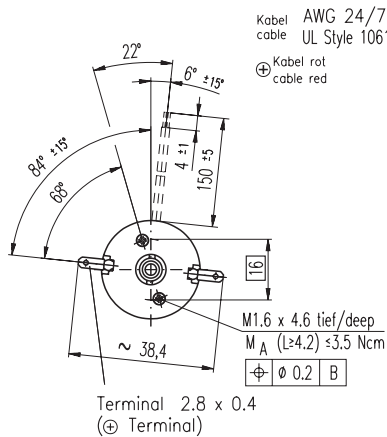
Notes

18

Encoder MEnc

Ø13 mm
16 CPT, 2 channels
Page 270

A-max 26 Ø26 mm, Graphite Brushes, 6 Watt



M 1:2

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

Order Number

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	9.0	12.0	12.0	18.0	18.0	24.0	24.0	30.0	36.0	42.0	48.0		
2	No load speed	rpm	9270	10000	10000	8300	8260	7410	8590	7870	8810	8440	8170	6240		
3	No load current	mA	118	104	76.8	59.7	39.2	34.0	30.8	27.6	25.4	20.0	16.4	10.3		
4	Nominal speed	rpm	7160	7620	7600	5590	5640	4790	5880	5100	6210	5850	5550	3550		
5	Nominal torque (max. continuous torque)	mNm	6.73	7.97	11.1	13.0	13.6	13.8	13.1	12.9	13.7	13.8	13.7	13.7		
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.03	0.708	0.642	0.532	0.481	0.452	0.365	0.300	0.201		
7	Stall torque	mNm	38.2	39.7	52.7	43.8	45.6	41.0	43.5	38.1	47.9	46.4	43.7	32.6		
8	Starting current	A	5.50	4.90	4.80	3.29	2.25	1.82	1.67	1.34	1.51	1.16	0.911	0.455		
9	Max. efficiency	%	67	69	73	72	74	73	74	73	75	75	75	72		
Characteristics																
10	Terminal resistance	Ω	1.31	1.84	2.50	3.65	8.00	9.91	14.4	17.9	19.9	31.0	46.1	106		
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	11.0	13.3	20.2	22.5	26.0	28.3	31.8	39.9	48.0	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	260	268	198	197	186	186	203	213	188	186	191	197		
15	Mechanical time constant	ms	33.4	30.5	27.9	27.1	25.4	25.2	24.9	24.9	24.5	24.3	24.2	24.2		
16	Rotor inertia	gcm ²	12.3	10.9	13.5	13.2	13.0	12.9	11.7	11.2	12.5	12.5	12.1	11.7		

Specifications

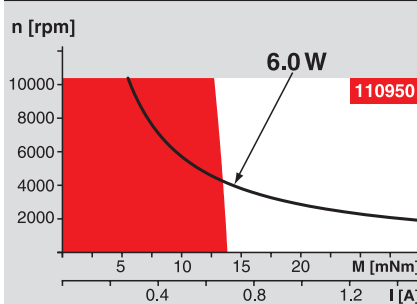
Thermal data		
17	Thermal resistance housing-ambient	13.2 K / W
18	Thermal resistance winding-housing	3.2 K / W
19	Thermal time constant winding	12.4 s
20	Thermal time constant motor	660 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max. permissible speed	10400 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5 N
27	Max. force for press fits (static) (static, shaft supported)	75 N / 1200 N
28	Max. radial loading, 5 mm from flange	20.5 N
Mechanical data (sleeve bearings)		
23	Max. permissible speed	10400 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1.7 N
27	Max. force for press fits (static) (static, shaft supported)	80 N / 1200 N
28	Max. radial loading, 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 49.

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

Planetary Gearhead

Ø26 mm
0.5 - 2.0 Nm
Page 235

Spur Gearhead

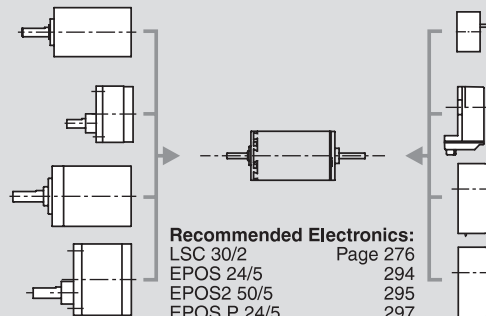
Ø30 mm
0.07 - 0.2 Nm
Page 236

Planetary Gearhead

Ø32 mm
0.4 - 6.0 Nm
Page 237 / 238 / 241

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 243



Notes

Overview on page 16 - 21

Encoder MR
128 - 1000 CPT,
3 channels
Page 258

Encoder Enc
22 mm
100 CPT, 2 channels
Page 261

Encoder HEDS 5540
500 CPT,
3 channels
Page 263

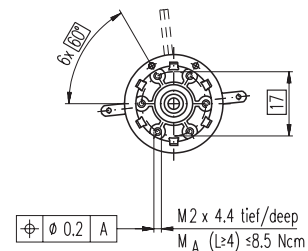
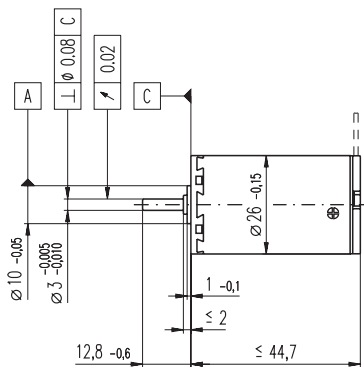
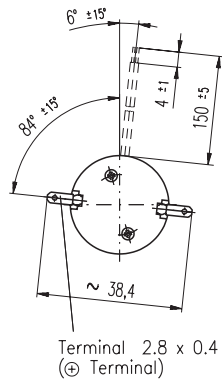
Encoder HDL 5540
500 CPT,
3 channels
Page 265

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

HighPower

Kabel AWG 24/7
cable UL Style 1061

⊕ Kabel rot
cable red



M 1:2

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

Order Number

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	6.0	7.2	12.0	15.0	18.0	24.0	30.0	36.0	42.0	48.0	48.0				
2	No load speed	rpm	9110	9850	8010	8320	7950	8820	7020	7250	7850	7450	6000				
3	No load current	mA	140	128	56.7	47.3	37.0	31.7	18.9	15.5	12.7	9.67					
4	Nominal speed	rpm	7560	8230	6030	6150	5830	6730	4910	5160	5770	5340	3860				
5	Nominal torque (max. continuous torque)	mNm	5.53	6.30	14.2	16.5	17.2	17.2	17.6	17.7	17.6	17.5	17.7				
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.03	0.846	0.704	0.455	0.394	0.365	0.300	0.244				
7	Stall torque	mNm	54.4	59.6	66.6	70.3	69.8	77.6	60.5	63.1	68.4	63.2	50.6				
8	Starting current	A	9.32	9.07	4.80	4.19	3.30	3.04	1.51	1.35	1.36	1.04	0.672				
9	Max. efficiency	%	68	70	76	77	78	79	78	79	79	79	77				
Characteristics																	
10	Terminal resistance	Ω	0.644	0.794	2.50	3.58	5.46	7.90	19.9	26.6	30.9	46.0	71.4				
11	Terminal inductance	mH	0.0402	0.0509	0.227	0.332	0.528	0.770	1.90	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	180	176	124	122	116	116	118	117	116	120	121				
15	Mechanical time constant	ms	27.1	23.6	17.5	16.7	16.2	15.7	15.4	15.3	15.2	15.2	15.2				
16	Rotor inertia	gcm ²	14.3	12.8	13.5	13.1	13.2	13.0	12.5	12.5	12.5	12.1	12.0				

Specifications

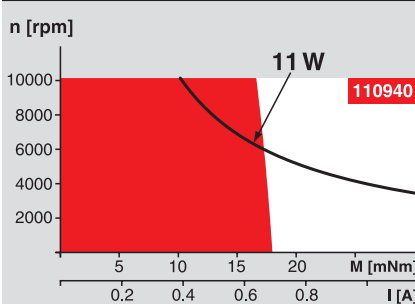
Thermal data		
17	Thermal resistance housing-ambient	13.2 K / W
18	Thermal resistance winding-housing	3.2 K / W
19	Thermal time constant winding	12.4 s
20	Thermal time constant motor	772 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 5 mm from flange	20.5 N
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 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 49.

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 16 - 21

Planetary Gearhead

Ø26 mm
0.5 - 2.0 Nm
Page 235

Spur Gearhead

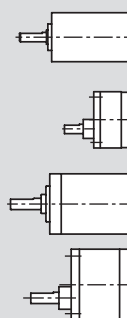
Ø30 mm
0.07 - 0.2 Nm
Page 236

Planetary Gearhead

Ø32 mm
0.4 - 6.0 Nm
Page 237 / 238 / 241

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 243



Recommended Electronics:

LSC 30/2	Page 276
ADS 50/5	276
ADS_E 50/5	277
EPOS 24/5	294
EPOS2 50/5	295
EPOS P 24/5	297
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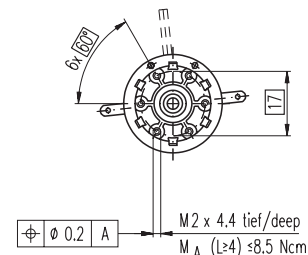
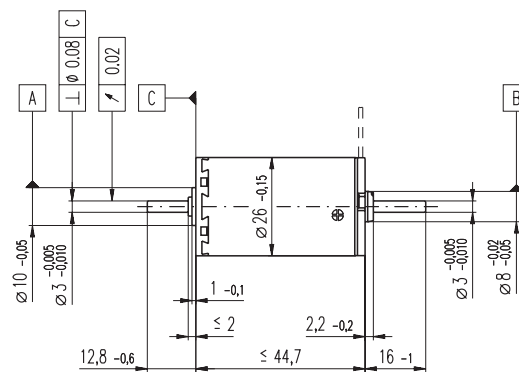
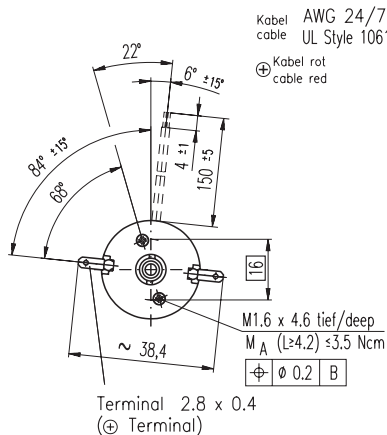
Encoder MEnc

Ø13 mm
16 CPT, 2 channels
Page 270

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

HighPower

maxon A-max



M 1:2

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

Order Number

	110958	110959	110960	110961	110962	110963	110964	110965	110966	110967	110968
with terminals											
with cables	353606	353607	353608	353609	353610	353611	353612	353613	353614	353615	353616

Motor Data

Values at nominal voltage												
1	Nominal voltage	V	6.0	7.2	12.0	15.0	18.0	24.0	30.0	36.0	42.0	48.0
2	No load speed	rpm	9110	9850	8010	8320	7950	8820	7020	7250	7850	6000
3	No load current	mA	140	128	56.7	47.3	37.0	31.7	18.9	16.3	15.5	9.67
4	Nominal speed	rpm	7560	8230	6030	6150	5830	6730	4910	5160	5770	5340
5	Nominal torque (max. continuous torque)	mNm	5.53	6.30	14.2	16.5	17.2	17.2	17.6	17.7	17.6	17.5
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.03	0.846	0.704	0.455	0.394	0.365	0.300
7	Stall torque	mNm	54.4	59.6	66.6	70.3	69.8	77.6	60.5	63.1	68.4	63.2
8	Starting current	A	9.32	9.07	4.80	4.19	3.30	3.04	1.51	1.35	1.36	1.04
9	Max. efficiency	%	68	70	76	77	78	79	78	79	79	77
Characteristics												
10	Terminal resistance	Ω	0.644	0.794	2.50	3.58	5.46	7.90	19.9	26.6	30.9	46.0
11	Terminal inductance	mH	0.0402	0.0509	0.227	0.332	0.528	0.770	1.90	2.57	2.99	4.34
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
13	Speed constant	rpm / V	1640	1450	689	569	451	374	238	205	190	158
14	Speed / torque gradient	rpm / mNm	180	176	124	122	116	116	118	117	116	120
15	Mechanical time constant	ms	27.1	23.6	17.6	16.7	16.2	15.8	15.4	15.3	15.2	15.2
16	Rotor inertia	gcm ²	14.3	12.8	13.5	13.2	13.2	13.0	12.5	12.5	12.5	12.0

Specifications

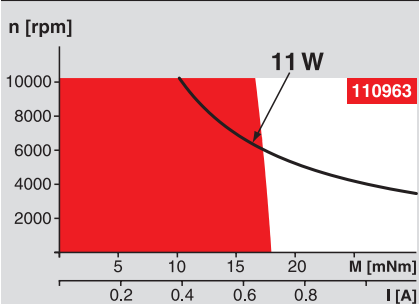
Thermal data		
17	Thermal resistance housing-ambient	13.2 K / W
18	Thermal resistance winding-housing	3.2 K / W
19	Thermal time constant winding	12.4 s
20	Thermal time constant motor	785 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 5 mm from flange	20.5 N
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 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 49.

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

Planetary Gearhead

Ø26 mm
0.5 - 2.0 Nm
Page 235

Spur Gearhead

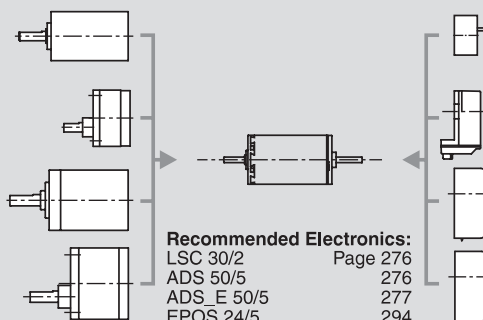
Ø30 mm
0.07 - 0.2 Nm
Page 236

Planetary Gearhead

Ø32 mm
0.4 - 6.0 Nm
Page 237 / 238 / 241

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
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Recommended Electronics:

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ADS 50/5	276
ADS_E 50/5	277
EPOS 24/5	294
EPOS2 50/5	295
EPOS P 24/5	297
Notes	18

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Encoder MR
128 - 1000 CPT,
3 channels
Page 258

Encoder Enc
22 mm
100 CPT, 2 channels
Page 261

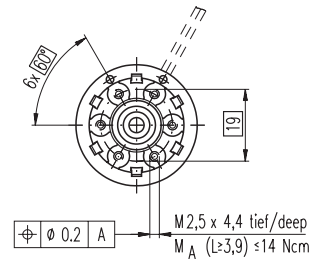
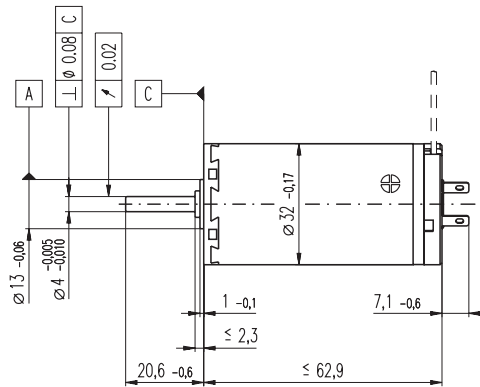
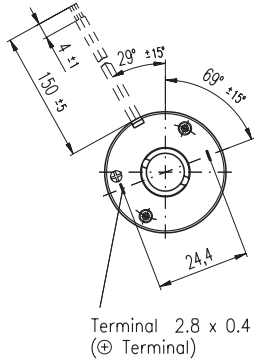
Encoder HEDS 5540
500 CPT,
3 channels
Page 263

Encoder HDL 5540
500 CPT,
3 channels
Page 265

A-max 32 $\varnothing 32$ mm, Graphite Brushes, 15 Watt

Kabel AWG 22/7
 cable UL Style 1061

⊕ Kabel rot
 cable red



M 1:2

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

Order Number

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	6.0	9.0	12.0	18.0	24.0	30.0	36.0	48.0
2	No load speed	rpm	5830	4930	4670	5270	5930	5870	5830	3870
3	No load current	mA	153	83.2	58.4	44.8	38.6	30.5	25.2	11.7
4	Nominal speed	rpm	3800	2980	2860	3550	4180	4140	4090	2080
5	Nominal torque (max. continuous torque)	mNm	31.4	33.1	36.0	37.5	36.7	37.1	36.8	36.9
6	Nominal current (max. continuous current)	A	3.42	2.02	1.55	1.21	0.998	0.798	0.656	0.328
7	Stall torque	mNm	99.7	87.4	95.9	118	127	128	125	81.3
8	Starting current	A	10.4	5.12	3.98	3.66	3.34	2.66	2.15	0.698
9	Max. efficiency	%	75	75	77	79	80	80	80	76
Characteristics										
10	Terminal resistance	Ω	0.577	1.76	3.02	4.92	7.19	11.3	16.7	68.8
11	Terminal inductance	mH	0.0657	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	59.9	57.6	49.5	45.5	47.1	46.3	47.1	48.4
15	Mechanical time constant	ms	27.6	23.5	22.4	21.8	21.7	21.5	21.5	21.5
16	Rotor inertia	gcm ²	43.9	39.0	43.3	45.9	44.0	44.4	43.6	42.4

Specifications

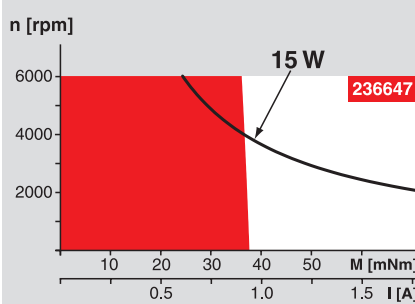
Thermal data		
17	Thermal resistance housing-ambient	7.5 K / W
18	Thermal resistance winding-housing	2.1 K / W
19	Thermal time constant winding	17.7 s
20	Thermal time constant motor	791 s
21	Ambient temperature	-20 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 5 mm from flange	32 N
Mechanical data (sleeve bearings)		
23	Max. permissible speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static)	110 N
28	Max. radial loading, 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 49.

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

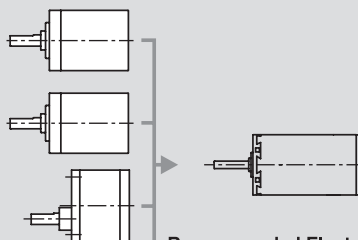
maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
 $\varnothing 32$ mm
 0.75 - 4.5 Nm
 Page 239

Planetary Gearhead
 $\varnothing 32$ mm
 1.0 - 6.0 Nm
 Page 241

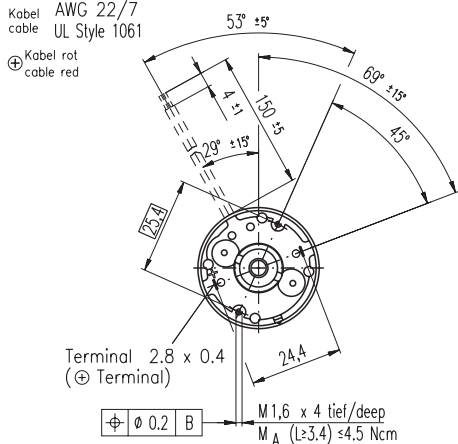
Spur Gearhead
 $\varnothing 38$ mm
 0.1 - 0.6 Nm
 Page 243



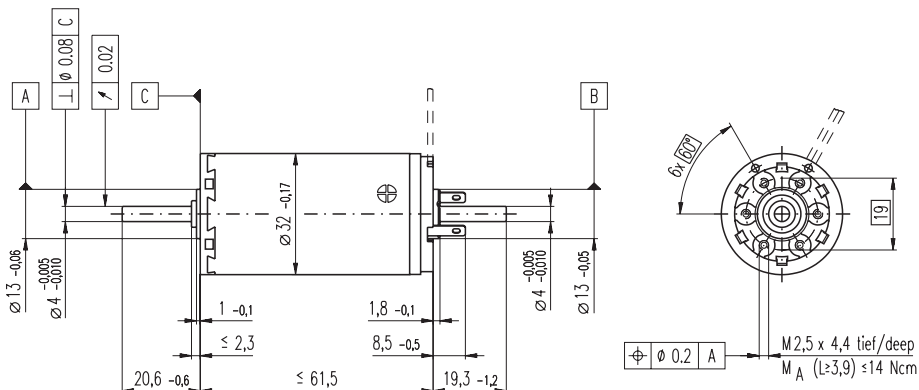
Recommended Electronics:
 LSC 30/2 Page 276
 ADS 50/5 276
 ADS_E 50/5 277
 Notes 18

A-max 32 Ø32 mm, Graphite Brushes, 15 Watt

Kabel AWG 22/7
 cable UL Style 1061
 ⊕ Kabel rot
 cable red



Verlegung der Kabel im Bürstendeckel nicht dargestellt



M 1:2

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

Order Number

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	6.0	9.0	12.0	18.0	24.0	30.0	36.0	48.0
2	No load speed	rpm	5830	4930	4670	5270	5930	5870	5830	3870
3	No load current	mA	153	83.2	58.4	44.8	38.6	30.5	25.2	11.7
4	Nominal speed	rpm	3800	2980	2860	3550	4180	4140	4090	2080
5	Nominal torque (max. continuous torque)	mNm	31.4	33.1	36.0	37.5	36.7	37.1	36.8	36.9
6	Nominal current (max. continuous current)	A	3.42	2.02	1.55	1.21	0.998	0.798	0.656	0.328
7	Stall torque	mNm	99.7	87.4	95.9	118	127	128	125	81.3
8	Starting current	A	10.4	5.12	3.98	3.66	3.34	2.66	2.15	0.698
9	Max. efficiency	%	75	75	77	79	80	80	80	76
Characteristics										
10	Terminal resistance	Ω	0.577	1.76	3.02	4.92	7.19	11.3	16.7	68.8
11	Terminal inductance	mH	0.0657	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	59.9	57.6	49.5	45.5	47.1	46.3	47.1	48.4
15	Mechanical time constant	ms	27.6	23.5	22.4	21.8	21.7	21.5	21.5	21.5
16	Rotor inertia	gcm ²	43.9	39.0	43.3	45.9	44.0	44.4	43.6	42.4

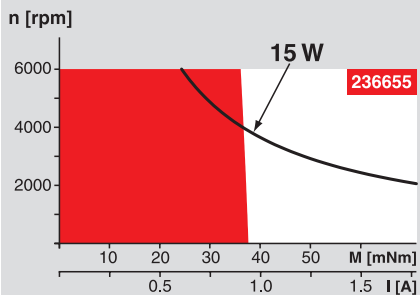
Specifications

- 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 17.7 s
 - 20 Thermal time constant motor 791 s
 - 21 Ambient temperature -20 ... +85°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (ball bearings)**
- 23 Max. permissible speed 6000 rpm
 - 24 Axial play 0.12 - 0.22 mm
 - 25 Radial play 0.025 mm
 - 26 Max. axial load (dynamic) 7.6 N
 - 27 Max. force for press fits (static) (static, shaft supported) 110 N
 - 28 Max. radial loading, 5 mm from flange 32 N
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 6000 rpm
 - 24 Axial play 0.12 - 0.22 mm
 - 25 Radial play 0.012 mm
 - 26 Max. axial load (dynamic) 5.0 N
 - 27 Max. force for press fits (static) (static, shaft supported) 2000 N
 - 28 Max. radial loading, 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 49.

Option
 Sleeve bearings in place of ball bearings

Operating Range

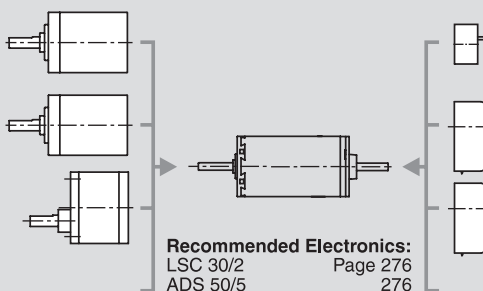


Comments

- 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

- Planetary Gearhead**
 Ø32 mm
 0.75 - 4.5 Nm
 Page 239
- Planetary Gearhead**
 Ø32 mm
 1.0 - 6.0 Nm
 Page 241
- Spur Gearhead**
 Ø38 mm
 0.1 - 0.6 Nm
 Page 243



- Recommended Electronics:**
- LSC 30/2 Page 276
 - ADS 50/5 276
 - ADS_E 50/5 277
 - EPOS 24/5 294
 - EPOS2 50/5 295
 - EPOS P 24/5 297
- Notes** 18

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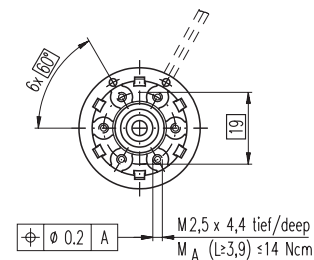
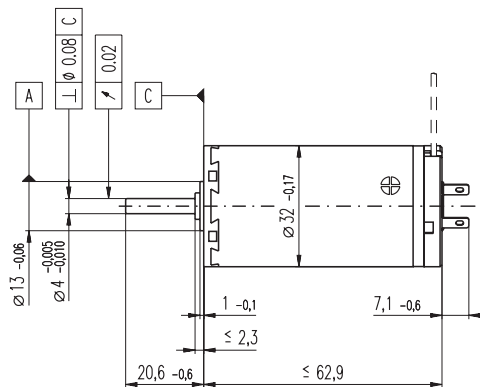
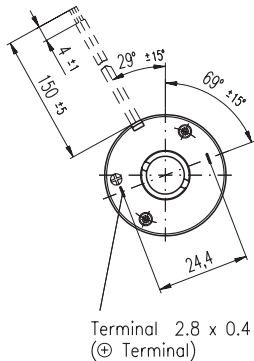
- Encoder MR**
 256 - 1024 CPT,
 3 channels
 Page 259
- Encoder HEDS 5540**
 500 CPT,
 3 channels
 Page 263
- Encoder HEDL 5540**
 500 CPT,
 3 channels
 Page 265

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

HighPower

Kabel AWG 22/7
cable UL Style 1061

⊕ Kabel rot
cable red



M 1:2

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

Order Number

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	6.0	9.0	12.0	24.0	30.0	36.0	42.0
2	No load speed	rpm	4850	4980	4660	6460	6160	5850	5650
3	No load current	mA	122	83.8	58.0	42.7	32.2	25.2	20.7
4	Nominal speed	rpm	3140	3350	3100	5020	4710	4420	4200
5	Nominal torque (max. continuous torque)	mNm	38.4	40.0	42.1	44.4	44.4	45.0	44.7
6	Nominal current (max. continuous current)	A	3.43	2.43	1.79	1.30	0.994	0.796	0.655
7	Stall torque	mNm	120	129	131	205	193	186	177
8	Starting current	A	10.4	7.62	5.39	5.81	4.18	3.19	2.51
9	Max. efficiency	%	77	79	80	83	83	83	83
Characteristics									
10	Terminal resistance	Ω	0.577	1.18	2.23	4.13	7.17	11.3	16.7
11	Terminal inductance	mH	0.0601	0.129	0.264	0.555	0.953	1.52	2.22
12	Torque constant	mNm / A	11.6	17.0	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	41.1	39.1	36.1	31.9	32.2	31.8	32.3
15	Mechanical time constant	ms	18.9	16.6	15.7	15.0	14.8	14.8	14.7
16	Rotor inertia	gcm ²	43.9	40.6	41.4	45.0	44.0	44.4	43.6

Specifications

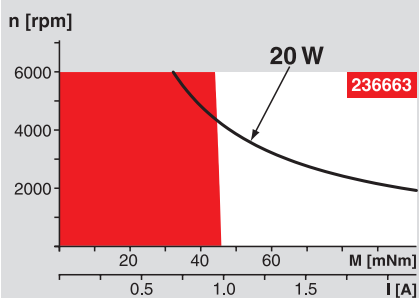
Thermal data		
17	Thermal resistance housing-ambient	7.5 K / W
18	Thermal resistance winding-housing	2.1 K / W
19	Thermal time constant winding	17.7 s
20	Thermal time constant motor	900 s
21	Ambient temperature	-20 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 5 mm from flange	32 N
Mechanical data (sleeve bearings)		
23	Max. permissible speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static)	110 N
28	Max. radial loading, 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 49.

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

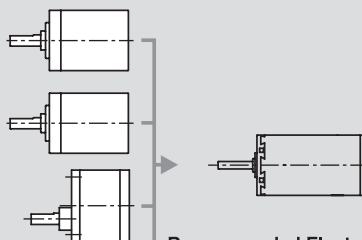
maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
Ø32 mm
0.75 - 4.5 Nm
Page 239

Planetary Gearhead
Ø32 mm
1.0 - 6.0 Nm
Page 241

Spur Gearhead
Ø38 mm
0.1 - 0.6 Nm
Page 243

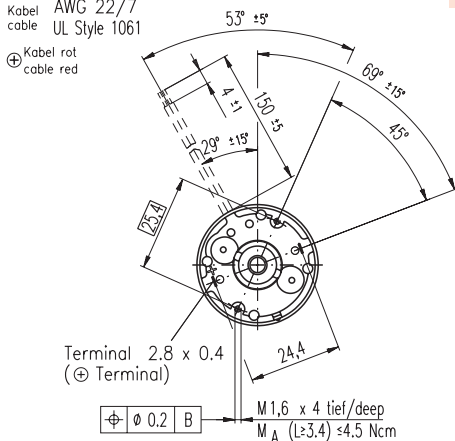


Recommended Electronics:
LSC 30/2 Page 276
ADS 50/5 276
ADS_E 50/5 277
Notes 18

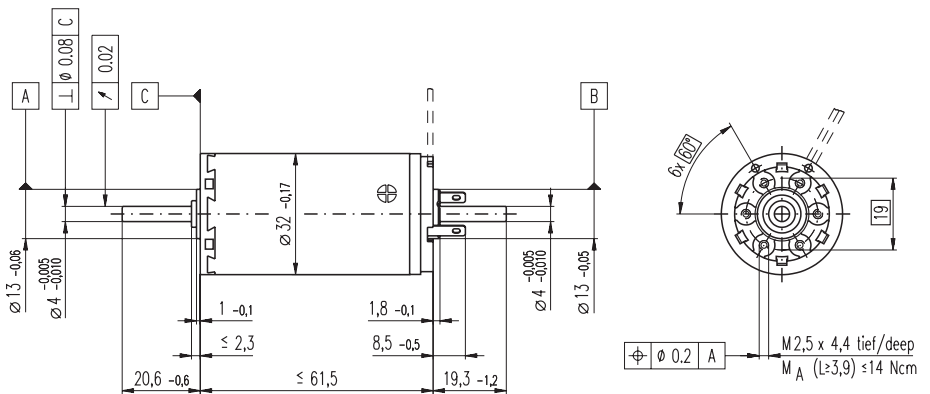
A-max 32 Ø32 mm, Graphite Brushes, 20 Watt

HighPower

Kabel AWG 22/7
cable UL Style 1061
⊕ Kabel rot
cable red



Verlegung der Kabel im
Bürstendeckel nicht dargestellt



M 1:2

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

Order Number

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	6.0	9.0	12.0	24.0	30.0	36.0	42.0
2	No load speed	rpm	4850	4980	4660	6460	6160	5850	5650
3	No load current	mA	122	83.8	58.0	42.7	32.2	25.2	20.7
4	Nominal speed	rpm	3140	3350	3100	5020	4710	4420	4200
5	Nominal torque (max. continuous torque)	mNm	38.4	40.0	42.1	44.4	44.4	45.0	44.7
6	Nominal current (max. continuous current)	A	3.43	2.43	1.79	1.30	0.994	0.796	0.655
7	Stall torque	mNm	120	129	131	205	193	186	177
8	Starting current	A	10.4	7.62	5.39	5.81	4.18	3.19	2.51
9	Max. efficiency	%	77	79	80	83	83	83	83
Characteristics									
10	Terminal resistance	Ω	0.577	1.18	2.23	4.13	7.17	11.3	16.7
11	Terminal inductance	mH	0.0601	0.129	0.264	0.555	0.953	1.52	2.22
12	Torque constant	mNm / A	11.6	17.0	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	41.1	39.1	36.1	31.9	32.2	31.8	32.3
15	Mechanical time constant	ms	18.9	16.6	15.7	15.0	14.8	14.8	14.7
16	Rotor inertia	gcm ²	43.9	40.6	41.4	45.0	44.0	44.4	43.6

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	17.7 s
20	Thermal time constant motor	900 s
21	Ambient temperature	-20 ... +85°C
22	Max. permissible winding temperature	+125°C

Mechanical data (ball bearings)		
23	Max. permissible speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	7.6 N
27	Max. force for press fits (static) (static, shaft supported)	110 N / 2000 N
28	Max. radial loading, 5 mm from flange	32 N

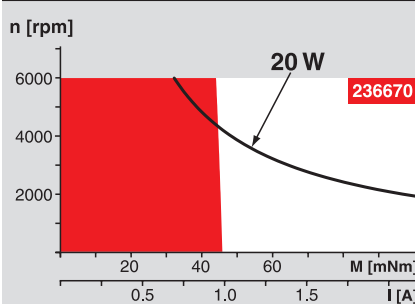
Mechanical data (sleeve bearings)		
23	Max. permissible speed	6000 rpm
24	Axial play	0.12 - 0.22 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	5.0 N
27	Max. force for press fits (static) (static, shaft supported)	110 N / 2000 N
28	Max. radial loading, 5 mm from flange	10.5 N

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 49.

Option
Sleeve bearings in place of ball bearings

Operating Range



Comments

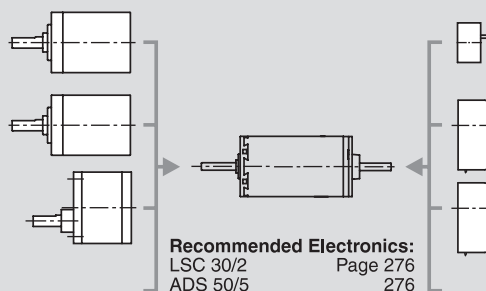
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

maxon Modular System

- Planetary Gearhead**
Ø32 mm
0.75 - 4.5 Nm
Page 239
- Planetary Gearhead**
Ø32 mm
1.0 - 6.0 Nm
Page 241
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 243



- Recommended Electronics:**
LSC 30/2 Page 276
ADS 50/5 276
ADS_E 50/5 277
EPOS 24/5 294
EPOS2 50/5 295
EPOS P 24/5 297
Notes 18

Overview on page 16 - 21

- Encoder MR**
256 - 1024 CPT,
3 channels
Page 259
- Encoder HEDS 5540**
500 CPT,
3 channels
Page 263
- Encoder HEDL 5540**
500 CPT,
3 channels
Page 265



maxon RE-max

maxon RE-max

- High-performance at low cost
- 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

Summary

128

DC motors 13 - 29 mm in diameter

129 - 148

The maxon RE-max program

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



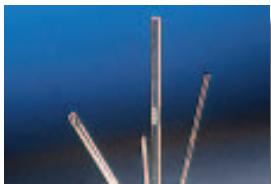
Same design as the innovative and award-winning A-max range. Consistent implementation of the same part platform.



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.

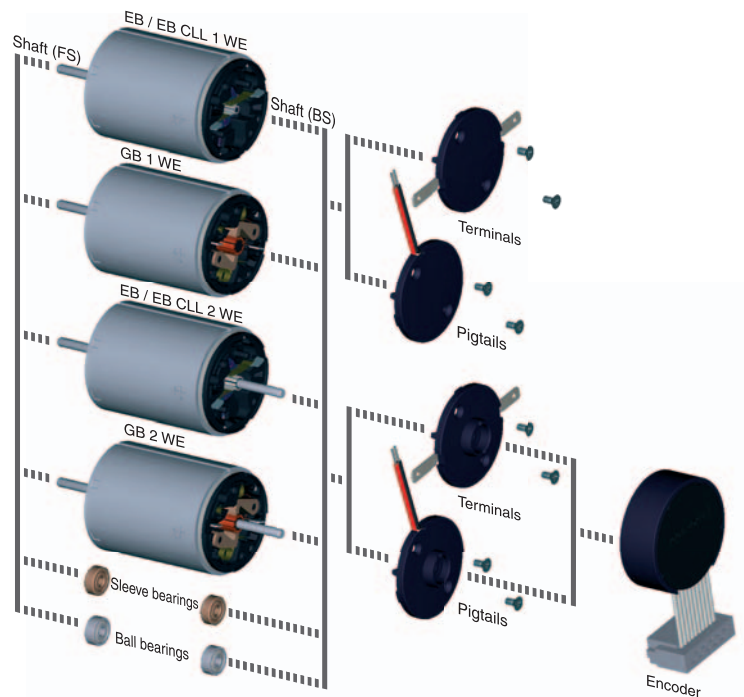


The "heart" of our motors is the ironless winding System maxon®. This means – physically dependent – advantages like an efficiency of up to 90%, the best regulating dynamics and small dimensions.



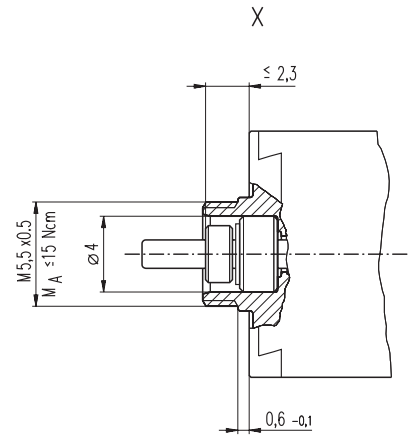
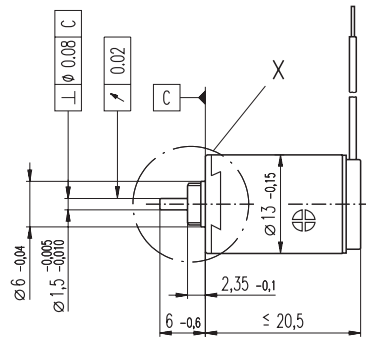
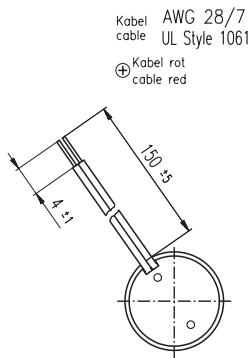
Graphite brushes for hard use with the highest peak loads. Precious metal brushes for fine rotational movements.

Modular construction of the RE-max series



		WE = Shaft end		WE = Shaft end		WE = Shaft end		WE = Shaft end		WE = Shaft end	
		RE-max 13 1 WE	RE-max 13 2 WE	RE-max 17 1 WE	RE-max 17 2 WE	RE-max 21 1 WE	RE-max 21 2 WE	RE-max 24 1 WE	RE-max 24 2 WE	RE-max 29 1 WE	RE-max 29 2 WE
X = Standard											
X = Option											
Precious Metal Brushes (EB)		X	X	X	X	X	X	X	X	X	X
Precious Metal Brushes (EB) and CLL		X	X	X	X	X	X	X	X	X	X
Graphite Brushes (GB)				X	X	X	X	X	X	X	X
Sleeve Bearings		X	X	X	X	X	X	X	X	X	X
Ball Bearings				X	X	X	X	X	X	X	X
Terminals				X	X	X	X	X	X	X	X
Pigtails		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	6.0	6.0	6.0	6.0
	max.	15.0	15.0	15.0	15.0	27.4	27.4	25.0	25.0	30.0	30.0
Shaft brush side (BS)	min.			2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	max.			10.0	10.0	16.6	16.6	16.0	16.0	16.0	16.0

RE-max 13 Ø13 mm, Precious Metal Brushes CLL, 1.2 Watt



M 1:1

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

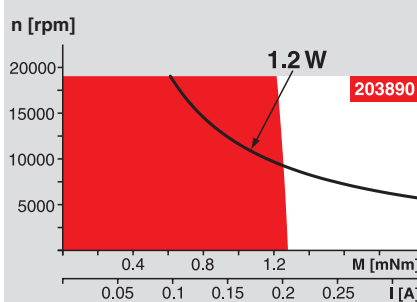
Order Number

Motor Data	Order Number															
	201352	203881	203882	203883	203884	203885	203886	203887	203888	203889	203890	203891	203892	203893	203894	
Values at nominal voltage																
1 Nominal voltage	V	1.0	1.2	1.5	1.8	2.4	3.0	3.6	4.2	5.0	6.0	8.0	9.0	10.0	12.0	15.0
2 No load speed	rpm	11600	11400	11200	11100	11400	11700	12200	11600	11400	11100	11800	10700	11200	11400	10800
3 No load current	mA	67.8	54.9	42.8	35.0	27.5	22.7	20.2	16.1	13.1	10.4	8.69	6.65	6.35	5.43	4.01
4 Nominal speed	rpm	10000	9200	8630	7920	7390	7010	7190	6400	6120	5780	6540	5360	5750	5970	5350
5 Nominal torque (max. continuous torque)	mNm	0.335	0.422	0.552	0.682	0.897	1.11	1.28	1.33	1.31	1.32	1.31	1.30	1.28	1.29	1.28
6 Nominal current (max. continuous current)	A	0.480	0.480	0.480	0.480	0.480	0.480	0.480	0.404	0.330	0.267	0.213	0.170	0.158	0.135	0.102
7 Stall torque	mNm	2.42	2.21	2.41	2.41	2.56	2.81	3.14	2.98	2.85	2.78	2.94	2.61	2.67	2.75	2.57
8 Starting current	A	3.02	2.25	1.94	1.59	1.31	1.17	1.14	0.879	0.695	0.548	0.465	0.333	0.318	0.278	0.198
9 Max. efficiency	%	73	72	73	73	74	75	76	75	75	75	75	74	74	75	74
Characteristics																
10 Terminal resistance	Ω	0.331	0.533	0.775	1.13	1.84	2.57	3.17	4.78	7.20	11.0	17.2	27.0	31.4	43.2	75.8
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	0.980	1.25	1.51	1.96	2.41	2.76	3.39	4.10	5.08	6.33	7.84	8.38	9.89	13.0
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	4920	5300	4760	4710	4570	4240	3960	3980	4090	4050	4100	4190	4280	4220	4280
15 Mechanical time constant	ms	18.4	16.1	14.8	14.2	13.7	13.4	13.1	13.1	13.1	13.0	13.0	13.1	13.1	13.0	13.1
16 Rotor inertia	gcm ²	0.356	0.290	0.298	0.288	0.287	0.301	0.317	0.313	0.305	0.306	0.303	0.298	0.292	0.295	0.292

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 5.08 s
 - 20 Thermal time constant motor 356 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 1.4 N

Operating Range



Comments

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

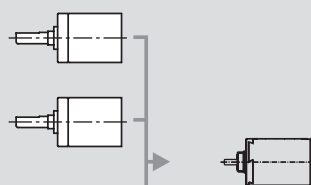
Other specifications

- 29 Number of pole pairs 1
 - 30 Number of commutator segments 7
 - 31 Weight of motor 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 49.

maxon Modular System

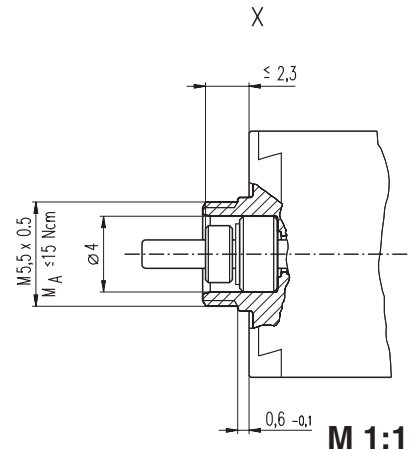
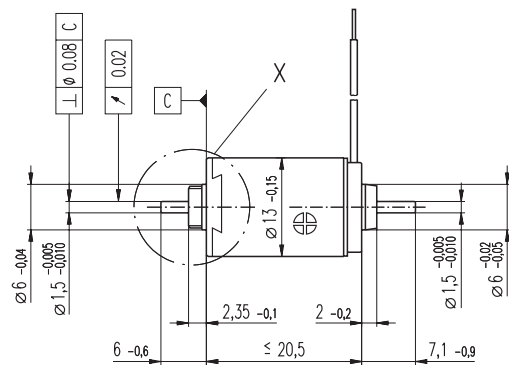
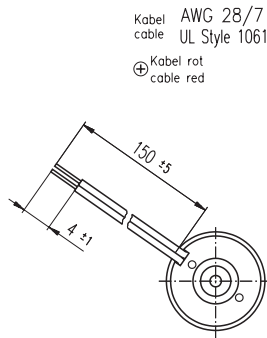
Overview on page 16 - 21

- Planetary Gearhead**
Ø13 mm
0.05 - 0.15 Nm
Page 217
- Planetary Gearhead**
Ø13 mm
0.2 - 0.35 Nm
Page 218



Recommended Electronics:
LSC 30/2 Page 276
Notes 18

RE-max 13 Ø13 mm, Precious Metal Brushes, 0.75 Watt



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

Order Number

268336	268337	268338	268339	268340	268341	268342	268343	268344	268345	268346	268347	268348	268349	268350
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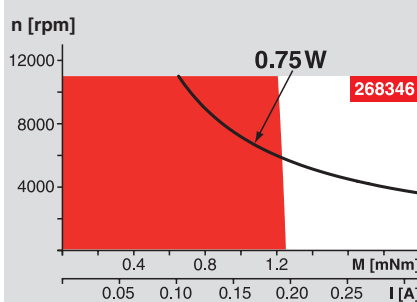
Motor Data

		268336	268337	268338	268339	268340	268341	268342	268343	268344	268345	268346	268347	268348	268349	268350	
Values at nominal voltage																	
1	Nominal voltage	V	0.6	0.72	0.9	1.2	1.5	1.8	1.8	2.4	3.0	3.6	4.8	6.0	6.0	7.2	10.0
2	No load speed	rpm	6830	6680	6590	7260	7010	6880	5980	6520	6730	6520	6980	7040	6570	6690	7070
3	No load current	mA	78.8	63.9	49.9	42.7	32.6	26.3	21.8	18.3	15.3	12.2	10.1	8.15	7.43	6.33	4.92
4	Nominal speed	rpm	5250	4520	4040	4140	3010	2250	2990	3260	1440	1470	1680	1680	3290	3340	1660
5	Nominal torque (max. continuous torque)	mNm	0.328	0.416	0.546	0.674	0.892	1.11	0.766	0.832	1.31	1.26	1.31	1.30	0.780	0.805	1.28
6	Nominal current (max. continuous current)	A	0.480	0.480	0.480	0.480	0.480	0.480	0.295	0.260	0.331	0.258	0.214	0.171	0.0992	0.0865	0.102
7	Stall torque	mNm	1.45	1.32	1.45	1.61	1.60	1.68	1.57	1.70	1.71	1.67	1.77	1.74	1.60	1.65	1.72
8	Starting current	A	1.81	1.35	1.16	1.06	0.816	0.700	0.569	0.502	0.417	0.329	0.279	0.222	0.191	0.167	0.132
9	Max. efficiency	%	63	62	64	65	65	66	65	66	66	66	66	65	66	66	66
Characteristics																	
10	Terminal resistance	Ω	0.331	0.533	0.775	1.13	1.84	2.57	3.17	4.78	7.20	11.0	17.2	27.0	31.4	43.2	75.8
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	0.980	1.25	1.51	1.96	2.41	2.76	3.39	4.10	5.08	6.33	7.84	8.38	9.89	13.0
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	4920	5300	4760	4710	4570	4240	3960	3980	4090	4050	4100	4190	4280	4220	4280
15	Mechanical time constant	ms	18.6	16.3	15.1	14.5	14.0	13.6	13.3	13.3	13.3	13.2	13.2	13.3	13.3	13.3	13.3
16	Rotor inertia	gcm ²	0.361	0.295	0.303	0.293	0.292	0.306	0.322	0.318	0.310	0.311	0.308	0.303	0.297	0.300	0.297

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 5.08 s
 - 20 Thermal time constant motor 356 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 11000 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.014 mm
 - 26 Max. axial load (dynamic) 0.8 N
 - 27 Max. force for press fits (static) (static, shaft supported) 35 N
 - 28 Max. radial loading, 5 mm from flange 140 N

Operating Range



Comments

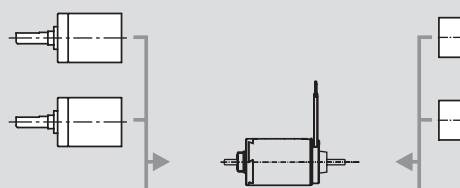
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

Other specifications

- 29 Number of pole pairs 1
 - 30 Number of 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 49.

maxon Modular System

- Planetary Gearhead**
Ø13 mm
0.05 - 0.15 Nm
Page 217
- Planetary Gearhead**
Ø13 mm
0.2 - 0.35 Nm
Page 218

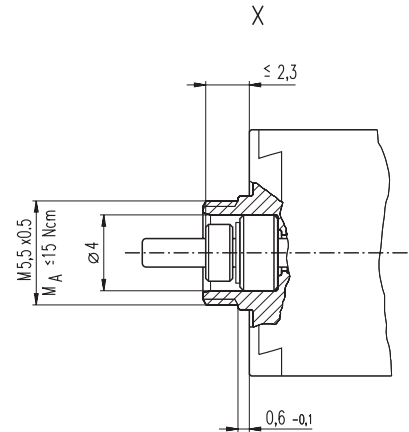
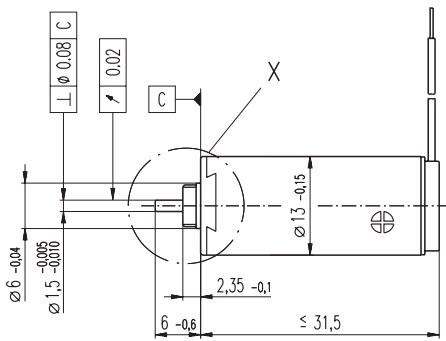
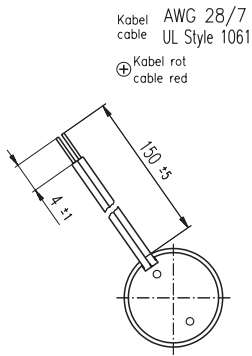


Overview on page 16 - 21

- Encoder MR**
16 CPT,
2 channels
Page 252
- Encoder MR**
64 - 256 CPT,
2 channels
Page 253 / 254

Recommended Electronics:
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EPOS 24/1 294
Notes 18

RE-max 13 Ø13 mm, Precious Metal Brushes CLL, 2.5 Watt



M 1:1

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

Order Number

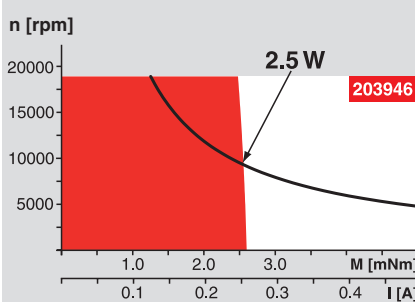
201353	203937	203938	203939	203940	203941	203942	203943	203944	203945	203946	203947	203948	203949	203950
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data		201353	203937	203938	203939	203940	203941	203942	203943	203944	203945	203946	203947	203948	203949	203950	
Values at nominal voltage																	
1	Nominal voltage	V	2.4	3.0	3.0	3.6	4.8	4.8	6.0	7.2	8.0	10.0	12.0	15.0	15.0	18.0	24.0
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	14.0	11.7	9.66	8.39	6.62	5.35	4.72	4.11	3.55
4	Nominal speed	rpm	9440	10900	9090	8870	9000	7390	8270	7970	7560	8050	7660	7750	6900	7210	8080
5	Nominal torque (max. continuous torque)	mNm	0.97	1.04	1.21	1.45	1.84	2.09	2.32	2.65	2.77	2.71	2.7	2.71	2.7	2.71	2.66
6	Nominal current (max. continuous current)	A	0.480	0.480	0.480	0.480	0.480	0.480	0.480	0.456	0.407	0.335	0.269	0.218	0.201	0.173	0.138
7	Stall torque	mNm	8.91	9.40	7.84	7.90	8.56	7.61	8.35	8.72	9.00	9.08	8.73	8.86	8.10	8.42	8.85
8	Starting current	A	4.15	4.06	2.97	2.52	2.16	1.71	1.69	1.47	1.30	1.10	0.852	0.697	0.591	0.526	0.450
9	Max. efficiency	%	84	84	83	83	83	83	83	83	84	84	84	84	83	84	83
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	0.120	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	16.0	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	8.50	8.18	7.89	7.66	7.46	7.40	7.38	7.29	7.21	7.22	7.22	7.20	7.20	7.21	7.26
16	Rotor inertia	gcm ²	0.677	0.592	0.545	0.527	0.527	0.523	0.509	0.525	0.562	0.541	0.537	0.541	0.533	0.540	0.526

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 37 K / W
 - 18 Thermal resistance winding-housing 10 K / W
 - 19 Thermal time constant winding 6.93 s
 - 20 Thermal time constant motor 444 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 1.4 N

Operating Range



Comments

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

Other specifications

- 29 Number of pole pairs 1
 - 30 Number of commutator segments 7
 - 31 Weight of motor 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 49.

maxon Modular System

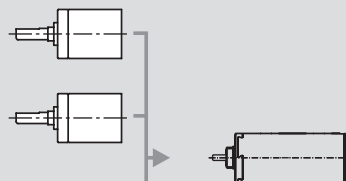
Overview on page 16 - 21

Planetary Gearhead

Ø13 mm
0.05 - 0.15 Nm
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Planetary Gearhead

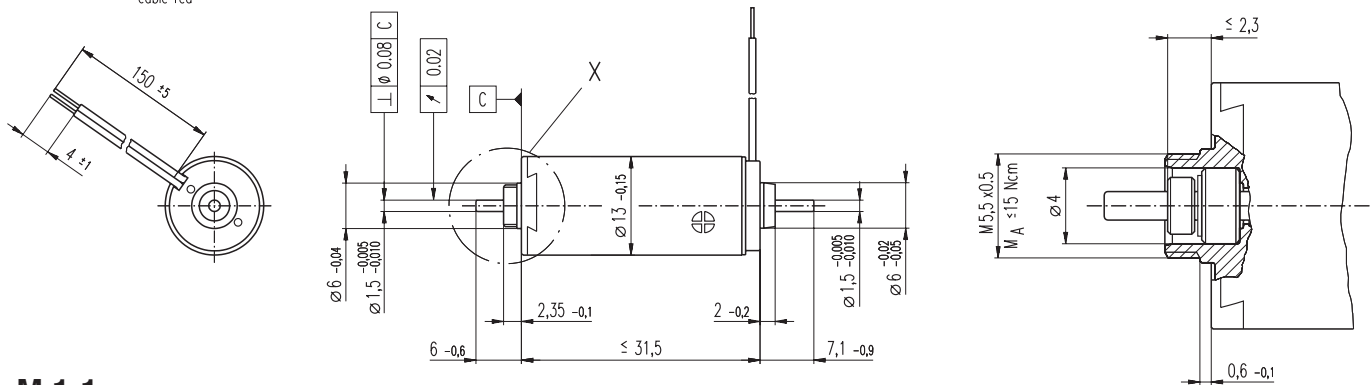
Ø13 mm
0.2 - 0.35 Nm
Page 218



Recommended Electronics:
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Notes 18

RE-max 13 Ø13 mm, Precious Metal Brushes CLL, 2 Watt

Kabel AWG 28/7
 cable UL Style 1061
 ⊕ Kabel rot
 cable red



M 1:1

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

Order Number

268351 268353 268355 268356 **268357** 268358 268359 268360 268361 268362 **268363** 268364 268365 268366 **268367**

Motor Data

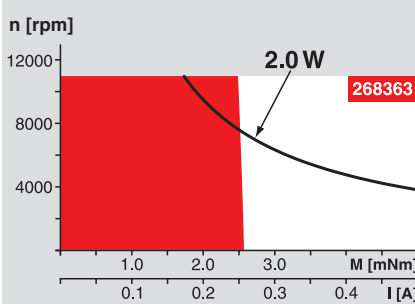
Values at nominal voltage		268351	268353	268355	268356	268357	268358	268359	268360	268361	268362	268363	268364	268365	268366	268367	
1	Nominal voltage	V	1.5	1.5	1.8	2.4	3.0	3.0	3.6	4.2	4.8	6.0	7.2	9.0	10.0	12.0	15.0
2	No load speed	rpm	6560	6070	6380	7170	7100	6300	6810	6620	6490	6820	6600	6640	6840	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	9.20	7.42	6.95	5.99	4.91
4	Nominal speed	rpm	5440	4730	4750	5210	4660	3530	3650	3140	3150	3410	3170	3230	3410	3620	3700
5	Nominal torque (max. continuous torque)	mNm	0.941	1.02	1.18	1.42	1.82	2.06	2.30	2.64	2.75	2.69	2.68	2.69	2.67	2.69	2.64
6	Nominal current (max. continuous current)	A	0.480	0.480	0.480	0.480	0.480	0.480	0.480	0.457	0.408	0.336	0.270	0.218	0.201	0.173	0.139
7	Stall torque	mNm	5.57	4.70	4.71	5.26	5.35	4.76	5.01	5.09	5.40	5.45	5.24	5.32	5.40	5.61	5.53
8	Starting current	A	2.59	2.03	1.78	1.68	1.35	1.07	1.01	0.856	0.779	0.660	0.511	0.418	0.394	0.350	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	0.120	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	16.0	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	8.56	8.25	7.96	7.73	7.53	7.47	7.45	7.36	7.27	7.29	7.28	7.27	7.27	7.28	7.33
16	Rotor inertia	gcm ²	0.682	0.597	0.550	0.532	0.532	0.528	0.514	0.530	0.567	0.546	0.542	0.546	0.538	0.545	0.531

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 37 K / W
 - 18 Thermal resistance winding-housing 10 K / W
 - 19 Thermal time constant winding 6.93 s
 - 20 Thermal time constant motor 444 s
 - 21 Ambient temperature -20 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 11000 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.014 mm
 - 26 Max. axial load (dynamic) 0.8 N
 - 27 Max. force for press fits (static) (static, shaft supported) 35 N
 - 28 Max. radial loading, 5 mm from flange 140 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 49.

Operating Range



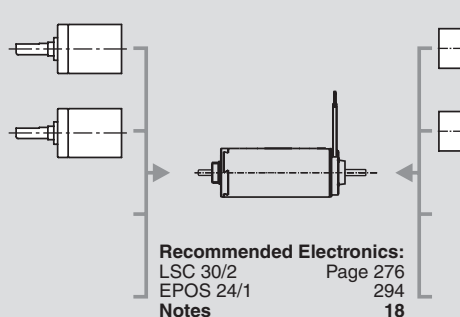
Comments

- 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**

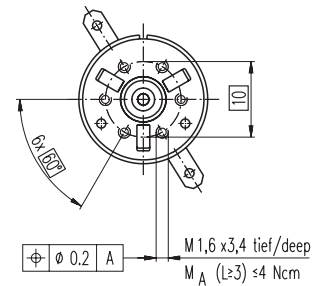
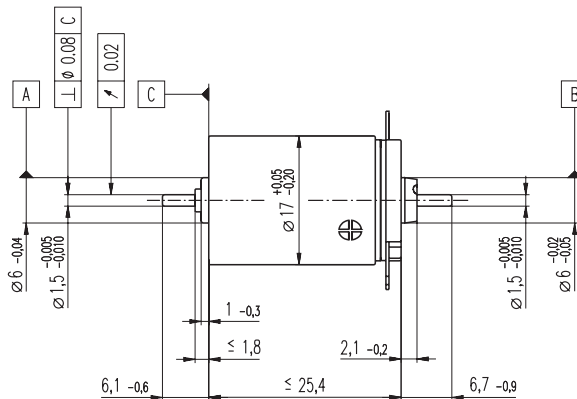
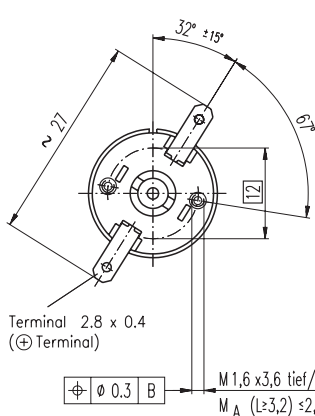
maxon Modular System

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- Planetary Gearhead**
 Ø13 mm
 0.05 - 0.15 Nm
 Page 217
- Planetary Gearhead**
 Ø13 mm
 0.2 - 0.35 Nm
 Page 218



RE-max 17 Ø17 mm, Precious Metal Brushes CLL, 2.5 Watt



M 1:1

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

Order Number

215988	215989	215990	215991	215992	215993	215994	215995	215996	215997
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data

Values at nominal voltage		215988	215989	215990	215991	215992	215993	215994	215995	215996	215997	
1	Nominal voltage	V	2.0	3.0	7.2	9.0	12.0	15.0	18.0	21.0	24.0	36.0
2	No load speed	rpm	8100	6920	6840	6920	6920	7420	7940	7720	7810	7720
3	No load current	mA	47.6	25.8	10.6	8.60	6.45	5.65	5.15	4.25	3.78	2.48
4	Nominal speed	rpm	7170	4870	4130	4190	4180	4690	5200	4950	5010	4850
5	Nominal torque (max. continuous torque)	mNm	1.29	2.36	3.39	3.36	3.34	3.35	3.32	3.31	3.25	3.18
6	Nominal current (max. continuous current)	A	0.600	0.600	0.351	0.282	0.210	0.181	0.160	0.132	0.115	0.0745
7	Stall torque	mNm	11.4	8.05	8.61	8.60	8.50	9.20	9.70	9.31	9.13	8.63
8	Starting current	A	4.88	1.97	0.868	0.702	0.520	0.482	0.453	0.362	0.315	0.196
9	Max. efficiency	%	81	79	79	79	79	80	80	80	80	79
Characteristics												
10	Terminal resistance	Ω	0.410	1.52	8.30	12.8	23.1	31.1	39.7	57.9	76.2	183
11	Terminal inductance	mH	0.0114	0.0349	0.206	0.314	0.558	0.759	0.956	1.38	1.75	4.04
12	Torque constant	mNm / A	2.34	4.09	9.92	12.3	16.3	19.1	21.4	25.7	29.0	44.0
13	Speed constant	rpm / V	4090	2340	962	779	584	501	446	372	329	217
14	Speed / torque gradient	rpm / mNm	718	871	804	815	825	817	828	839	865	906
15	Mechanical time constant	ms	7.91	7.43	7.26	7.27	7.28	7.29	7.33	7.30	7.33	7.46
16	Rotor inertia	gcm ²	1.05	0.814	0.862	0.852	0.842	0.852	0.846	0.832	0.809	0.786

Specifications

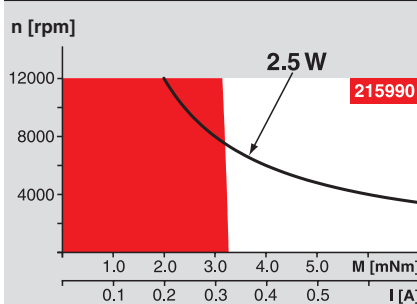
Thermal data		
17	Thermal resistance housing-ambient	35 K / W
18	Thermal resistance winding-housing	12 K / W
19	Thermal time constant winding	7.7 s
20	Thermal time constant motor	472 s
21	Ambient temperature	-30 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.8 N
27	Max. force for press fits (static) (static, shaft supported)	35 N / 280 N
28	Max. radial loading, 5 mm from flange	1.4 N
Mechanical data (ball bearings)		
23	Max. permissible speed	12000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.2 N
27	Max. force for press fits (static) (static, shaft supported)	30 N / 280 N
28	Max. radial loading, 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	27 g
CLL = Capacitor Long Life		

Values listed in the table are nominal.
Explanation of the figures on page 49.

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.

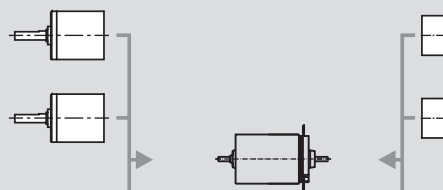
Short term operation
The motor may be briefly overloaded (recurring).

— **Assigned power rating**

maxon Modular System

Planetary Gearhead
Ø16 mm
0.06 - 0.18 Nm
Page 223

Planetary Gearhead
Ø16 mm
0.1 - 0.3 Nm
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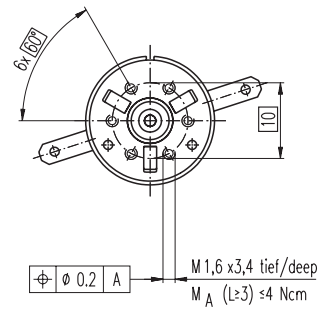
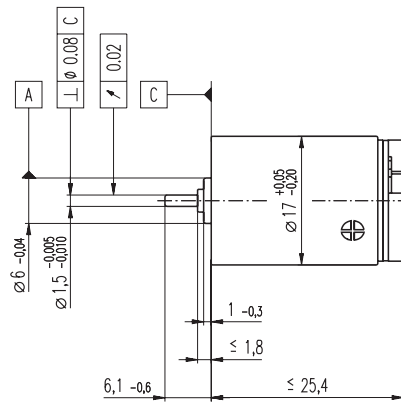
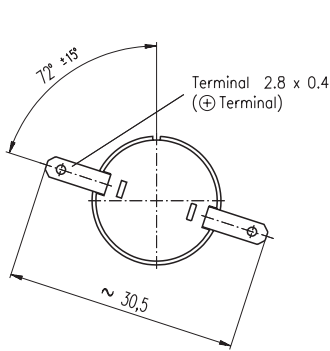
Encoder MR
32 CPT,
2 / 3 channels
Page 255

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
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Recommended Electronics:
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EPOS 24/1 Page 294
Notes **18**

Overview on page 16 - 21

RE-max 17 Ø17 mm, Graphite Brushes, 4.5 Watt



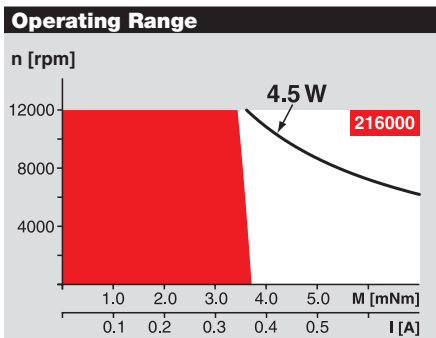
M 1:1

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

Order Number												
215998	215999	269569	216000	216001	216002	216003	216004	216005	216006	216007		

Motor Data		215998	215999	269569	216000	216001	216002	216003	216004	216005	216006	216007	
Values at nominal voltage													
1	Nominal voltage	V	3.0	4.8	9.0	12.0	15.0	21.0	24.0	24.0	30.0	36.0	48.0
2	No load speed	rpm	11900	10800	11300	11200	11300	11900	11600	10400	10800	11500	10100
3	No load current	mA	116	65.4	36.4	27.1	22.0	16.6	14.2	12.4	10.4	9.31	6.0
4	Nominal speed	rpm	10900	8510	8190	8120	8240	8810	8570	7230	7660	8310	6790
5	Nominal torque (max. continuous torque)	mNm	1.43	2.72	3.90	3.91	3.88	3.84	3.87	3.88	3.84	3.76	3.71
6	Nominal current (max. continuous current)	A	0.720	0.720	0.555	0.414	0.333	0.248	0.214	0.191	0.157	0.137	0.089
7	Stall torque	mNm	18.2	13.1	14.6	14.5	14.5	15.1	14.9	13.1	13.5	13.9	11.7
8	Starting current	A	7.70	3.17	1.95	1.45	1.17	0.909	0.771	0.604	0.517	0.472	0.262
9	Max. efficiency	%	76	73	75	75	75	75	75	74	74	74	72
Characteristics													
10	Terminal resistance	Ω	0.390	1.52	4.61	8.30	12.8	23.1	31.1	39.7	58.0	76.2	183
11	Terminal inductance	mH	0.0114	0.0349	0.114	0.206	0.314	0.558	0.759	0.956	1.38	1.75	4.04
12	Torque constant	mNm / A	2.37	4.14	7.49	10.1	12.4	16.6	19.3	21.7	26.0	29.4	44.5
13	Speed constant	rpm / V	4040	2310	1270	950	769	577	494	440	367	325	214
14	Speed / torque gradient	rpm / mNm	665	844	785	784	795	805	797	807	818	844	883
15	Mechanical time constant	ms	7.34	7.21	7.10	7.09	7.11	7.12	7.13	7.16	7.14	7.17	7.29
16	Rotor inertia	gcm ²	1.05	0.816	0.864	0.864	0.854	0.844	0.854	0.848	0.834	0.811	0.788

Specifications		
Thermal data		
17	Thermal resistance housing-ambient	35 K / W
18	Thermal resistance winding-housing	12 K / W
19	Thermal time constant winding	7.7 s
20	Thermal time constant motor	455 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	1.4 N



Comments

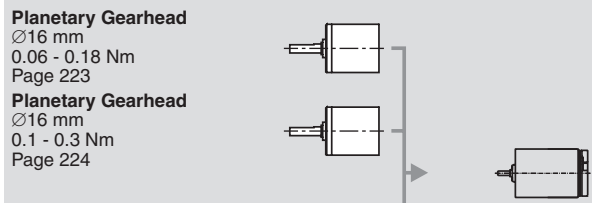
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— **Assigned power rating**

Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 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	26 g

maxon Modular System Overview on page 16 - 21



Planetary Gearhead
Ø16 mm
0.06 - 0.18 Nm
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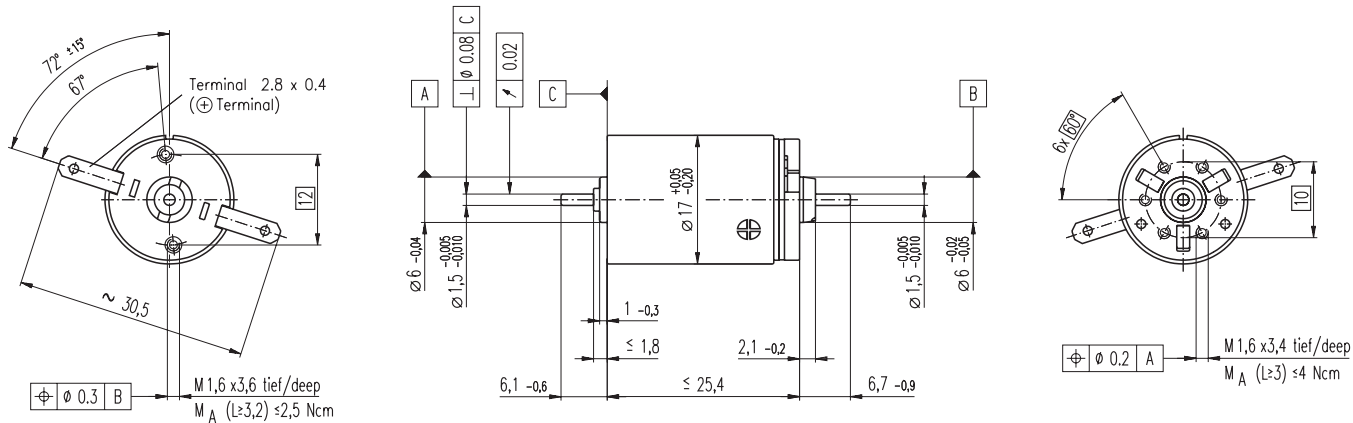
Planetary Gearhead
Ø16 mm
0.1 - 0.3 Nm
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Recommended Electronics:
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Notes 18

Values listed in the table are nominal.
Explanation of the figures on page 49.

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

RE-max 17 $\varnothing 17$ mm, Graphite Brushes, 4.5 Watt



M 1:1

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

Order Number

216008	216009	269571	216010	216011	216012	216013	216014	216015	216016	216017
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Motor Data		216008	216009	269571	216010	216011	216012	216013	216014	216015	216016	216017	
Values at nominal voltage													
1	Nominal voltage	V	3.0	4.8	9.0	12.0	15.0	21.0	24.0	24.0	30.0	36.0	48.0
2	No load speed	rpm	11900	10800	11300	11200	11300	11900	11600	10400	10800	11500	10100
3	No load current	mA	116	65.4	36.4	27.1	22.0	16.6	14.2	12.4	10.4	9.31	6.0
4	Nominal speed	rpm	10900	8510	8190	8120	8240	8810	8570	7230	7660	8310	6790
5	Nominal torque (max. continuous torque)	mNm	1.43	2.72	3.90	3.91	3.88	3.84	3.87	3.88	3.84	3.76	3.71
6	Nominal current (max. continuous current)	A	0.720	0.720	0.555	0.414	0.333	0.248	0.214	0.191	0.157	0.137	0.089
7	Stall torque	mNm	18.2	13.1	14.6	14.5	14.5	15.1	14.9	13.1	13.5	13.9	11.7
8	Starting current	A	7.70	3.17	1.95	1.45	1.17	0.909	0.771	0.604	0.517	0.472	0.262
9	Max. efficiency	%	76	73	75	75	75	75	75	74	74	74	72
Characteristics													
10	Terminal resistance	Ω	0.390	1.52	4.61	8.30	12.8	23.1	31.1	39.7	58.0	76.2	183
11	Terminal inductance	mH	0.0114	0.0349	0.114	0.206	0.314	0.558	0.759	0.956	1.38	1.75	4.04
12	Torque constant	mNm / A	2.37	4.14	7.49	10.1	12.4	16.6	19.3	21.7	26.0	29.4	44.5
13	Speed constant	rpm / V	4040	2310	1270	950	769	577	494	440	367	325	214
14	Speed / torque gradient	rpm / mNm	665	844	785	784	795	805	797	807	818	844	883
15	Mechanical time constant	ms	7.34	7.21	7.10	7.09	7.11	7.12	7.13	7.16	7.14	7.17	7.29
16	Rotor inertia	gcm ²	1.05	0.816	0.864	0.864	0.854	0.844	0.854	0.848	0.834	0.811	0.788

Specifications

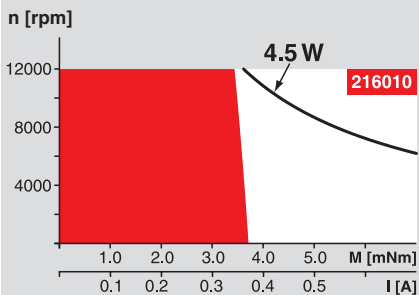
- Thermal data**
- 17 Thermal resistance housing-ambient 35 K / W
 - 18 Thermal resistance winding-housing 12 K / W
 - 19 Thermal time constant winding 7.7 s
 - 20 Thermal time constant motor 455 s
 - 21 Ambient temperature -30 ... +85°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 1.4 N
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 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 26 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

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

Operating Range



Comments

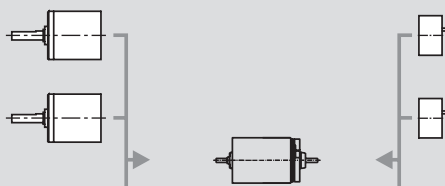
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
 $\varnothing 16$ mm
0.06 - 0.18 Nm
Page 223

Planetary Gearhead
 $\varnothing 16$ mm
0.1 - 0.3 Nm
Page 224

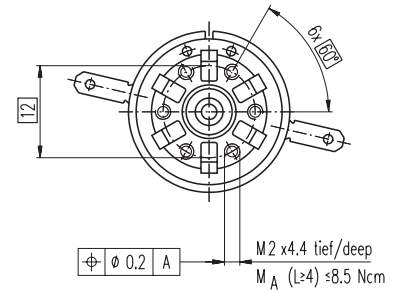
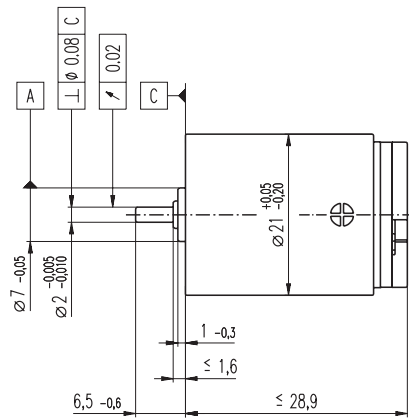
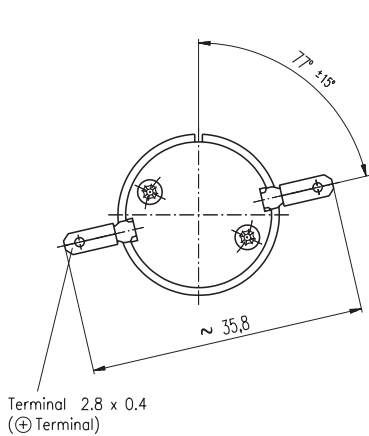


Encoder MR
32 CPT,
2 / 3 channels
Page 255

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

Recommended Electronics:
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EPOS 24/1 Page 294
Notes 18

RE-max 21 Ø21 mm, Precious Metal Brushes CLL, 5 Watt



M 1:1

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

Order Number

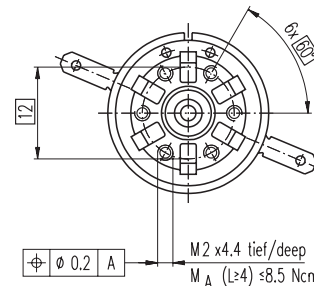
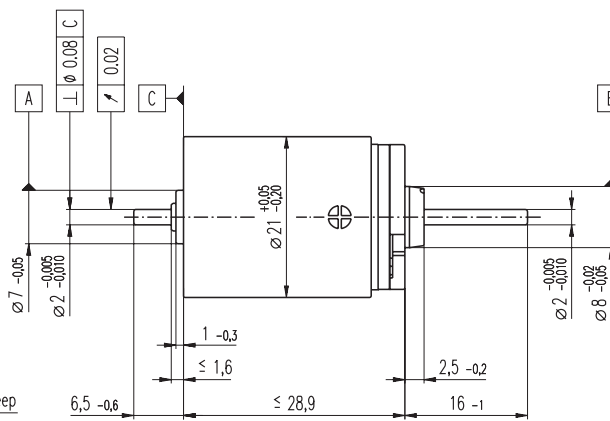
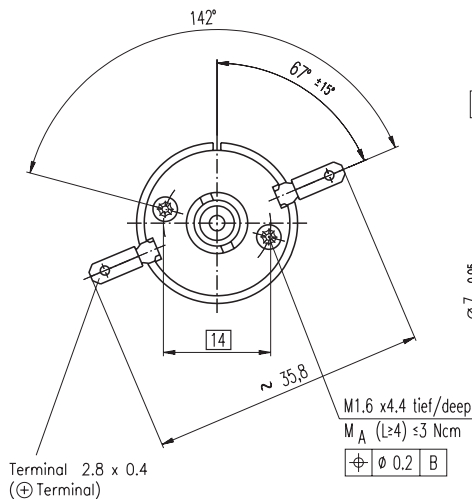
221009	221010	221011	221012	221013	221015	221016	221017	221019												
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Motor Data		221009	221010	221011	221012	221013	221015	221016	221017	221019										
Values at nominal voltage																				
1	Nominal voltage	V	3.0	6.0	9.0	12.0	18.0	21.0	24.0	36.0	48.0									
2	No load speed	rpm	8860	9960	10400	8610	10200	9960	9110	10300	9800									
3	No load current	mA	43.6	26.6	19.1	10.4	9.20	7.61	5.71	4.69	3.24									
4	Nominal speed	rpm	8090	8400	8480	6660	8250	8000	7130	8300	7770									
5	Nominal torque (max. continuous torque)	mNm	2.57	4.67	6.21	6.22	6.22	6.10	6.11	6.03	5.90									
6	Nominal current (max. continuous current)	A	0.840	0.840	0.771	0.479	0.378	0.311	0.249	0.185	0.130									
7	Stall torque	mNm	29.7	29.9	33.6	27.5	33.0	31.0	28.3	31.4	28.5									
8	Starting current	A	9.23	5.22	4.09	2.08	1.96	1.55	1.13	0.943	0.614									
9	Max. efficiency	%	87	87	87	87	87	87	87	87	86									
Characteristics																				
10	Terminal resistance	Ω	0.325	1.15	2.20	5.77	9.17	13.6	21.3	38.2	78.2									
11	Terminal inductance	mH	0.0130	0.041	0.0846	0.219	0.353	0.502	0.784	1.38	2.70									
12	Torque constant	mNm / A	3.22	5.72	8.23	13.2	16.8	20.0	25.0	33.3	46.5									
13	Speed constant	rpm / V	2970	1670	1160	721	568	477	381	287	205									
14	Speed / torque gradient	rpm / mNm	299	335	311	315	310	323	324	329	345									
15	Mechanical time constant	ms	7.94	7.26	7.08	7.04	7.00	7.05	7.06	7.08	7.17									
16	Rotor inertia	gcm ²	2.53	2.07	2.18	2.14	2.16	2.08	2.08	2.05	1.98									

Specifications	Operating Range	Comments
Thermal data 17 Thermal resistance housing-ambient 28 K / W 18 Thermal resistance winding-housing 8.0 K / W 19 Thermal time constant winding 8.77 s 20 Thermal time constant motor 588 s 21 Ambient temperature -30 ... +65°C 22 Max. permissible winding temperature +85°C Mechanical data (sleeve bearings) 23 Max. permissible 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 loading, 5 mm from flange 2.7 N	Operating Range 	Continuous operation In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit. Short term operation The motor may be briefly overloaded (recurring). — Assigned power rating

Mechanical data (ball bearings)	Other specifications	maxon Modular System	Overview on page 16 - 21
23 Max. permissible speed 16000 rpm 24 Axial play 0.05 - 0.15 mm 25 Radial play 0.012 mm 26 Max. axial load (dynamic) 3.3 N 27 Max. force for press fits (static) 45 N 28 Max. radial loading, 5 mm from flange 11.9 N	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 49. Option Ball bearings in place of sleeve bearings Pigtailed in place of terminals Without CLL	Planetary Gearhead Ø22 mm 0.5 - 1.0 Nm Page 230 Planetary Gearhead Ø22 mm 0.5 - 2.0 Nm Page 231 Spur Gearhead Ø38 mm 0.1 - 0.6 Nm Page 243	 Recommended Electronics: LSC 30/2 Page 276 Notes 18

RE-max 21 Ø21 mm, Precious Metal Brushes CLL, 3.5 Watt



M 1:1

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

Order Number

221020 221023 **221024** 221025 221026 221028 221030 221031 221032

Motor Data

Values at nominal voltage		221020	221023	221024	221025	221026	221028	221030	221031	221032	
1	Nominal voltage	V	2.0	3.6	5.0	8.4	10.0	12.0	15.0	21.0	30.0
2	No load speed	rpm	5870	5940	5740	6000	5620	5660	5660	5960	6090
3	No load current	mA	54.4	30.8	21.1	13.4	10.2	8.59	6.87	5.3	3.83
4	Nominal speed	rpm	5120	4390	3810	4060	3690	3690	3690	3980	4060
5	Nominal torque (max. continuous torque)	mNm	2.54	4.66	6.25	6.20	6.27	6.13	6.12	6.06	5.91
6	Nominal current (max. continuous current)	A	0.840	0.840	0.777	0.480	0.381	0.313	0.250	0.187	0.130
7	Stall torque	mNm	19.8	17.9	18.7	19.3	18.4	17.7	17.7	18.3	17.9
8	Starting current	A	6.16	3.13	2.27	1.46	1.09	0.884	0.705	0.550	0.384
9	Max. efficiency	%	82	81	82	82	82	82	82	82	81
Characteristics											
10	Terminal resistance	Ω	0.325	1.15	2.20	5.77	9.17	13.6	21.3	38.2	78.2
11	Terminal inductance	mH	0.0130	0.0410	0.0846	0.219	0.353	0.502	0.784	1.38	2.70
12	Torque constant	mNm / A	3.22	5.73	8.23	13.2	16.8	20.0	25.1	33.3	46.5
13	Speed constant	rpm / V	2960	1670	1160	721	567	476	381	287	205
14	Speed / torque gradient	rpm / mNm	299	335	310	314	309	323	323	329	345
15	Mechanical time constant	ms	7.94	7.26	7.08	7.04	7.00	7.05	7.07	7.08	7.17
16	Rotor inertia	gcm ²	2.54	2.07	2.18	2.14	2.16	2.09	2.09	2.06	1.99

Specifications

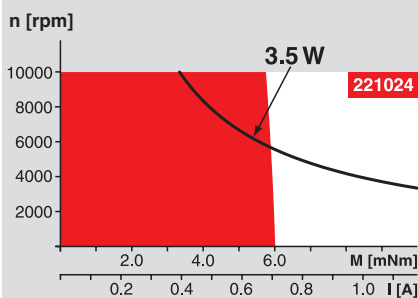
Thermal data	
17	Thermal resistance housing-ambient 28 K / W
18	Thermal resistance winding-housing 8.0 K / W
19	Thermal time constant winding 8.77 s
20	Thermal time constant motor 602 s
21	Ambient temperature -30 ... +65°C
22	Max. permissible winding temperature +85°C
Mechanical data (sleeve bearings)	
23	Max. permissible speed 10000 rpm
24	Axial play 0.05 - 0.15 mm
25	Radial play 0.012 mm
26	Max. axial load (dynamic) 1 N
27	Max. force for press fits (static) (static, shaft supported) 80 N / 480 N
28	Max. radial loading, 5 mm from flange 2.7 N
Mechanical data (ball bearings)	
23	Max. permissible speed 10000 rpm
24	Axial play 0.05 - 0.15 mm
25	Radial play 0.025 mm
26	Max. axial load (dynamic) 3.3 N
27	Max. force for press fits (static) (static, shaft supported) 45 N / 480 N
28	Max. radial loading, 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 49.

Option

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

Operating Range

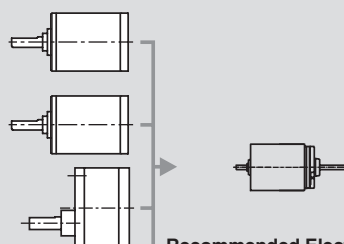


Comments

- 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

- Planetary Gearhead**
Ø22 mm
0.5 - 1.0 Nm
Page 230
- Planetary Gearhead**
Ø22 mm
0.5 - 2.0 Nm
Page 231
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 243

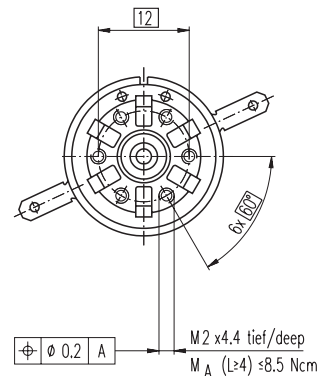
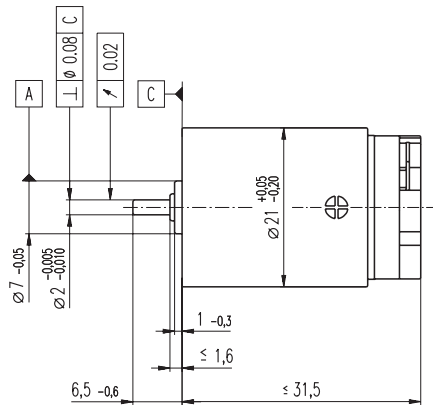
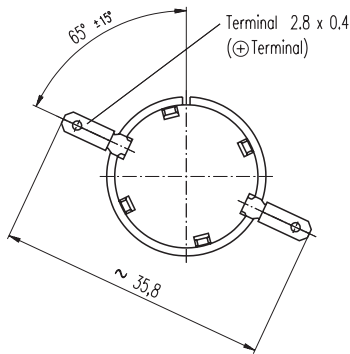


Recommended Electronics:
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Notes 18

Overview on page 16 - 21

- Encoder MR**
32 CPT,
2 / 3 channels
Page 255
- Encoder MR**
128 / 256 / 512 CPT,
2 / 3 channels
Page 256

RE-max 21 Ø21 mm, Graphite Brushes, 6 Watt



M 1:1

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

Order Number

250000 250001 **250002** 250003 250004 250005 250006 250007 250008

Motor Data (provisional)

		250000	250001	250002	250003	250004	250005	250006	250007	250008	
Values at nominal voltage											
1	Nominal voltage	V	4.0	6.0	9.0	15.0	18.0	21.0	24.0	36.0	48.0
2	No load speed	rpm	11400	9680	10200	10600	9980	9760	8920	10100	9600
3	No load current	mA	155	83.9	59.0	37.0	28.8	24.0	18.9	14.6	10.3
4	Nominal speed	rpm	9890	7890	8070	8320	7770	7530	6670	7860	7330
5	Nominal torque (max. continuous torque)	mNm	1.85	3.69	5.51	6.64	6.85	6.78	6.89	6.78	6.68
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.532	0.431	0.359	0.291	0.216	0.152
7	Stall torque	mNm	14.7	20.3	27.1	31.6	31.4	30.0	27.8	31.2	28.6
8	Starting current	A	4.53	3.51	3.26	2.37	1.85	1.49	1.10	0.930	0.609
9	Max. efficiency	%	67	72	75	77	77	76	76	77	76
Characteristics											
10	Terminal resistance	Ω	0.883	1.71	2.76	6.33	9.72	14.1	21.8	38.7	78.8
11	Terminal inductance	mH	0.0130	0.0410	0.0846	0.219	0.353	0.502	0.784	1.38	2.70
12	Torque constant	mNm / A	3.25	5.77	8.30	13.4	17.0	20.2	25.3	33.6	46.9
13	Speed constant	rpm / V	2940	1650	1150	715	563	472	378	284	204
14	Speed / torque gradient	rpm / mNm	799	489	382	339	323	330	326	328	342
15	Mechanical time constant	ms	21.5	10.7	8.83	7.69	7.40	7.32	7.23	7.16	7.20
16	Rotor inertia	gcm ²	2.56	2.10	2.21	2.17	2.19	2.11	2.11	2.08	2.01

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	8.77 s
20	Thermal time constant motor	588 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	2.7 N

Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 5 mm from flange	11.9 N

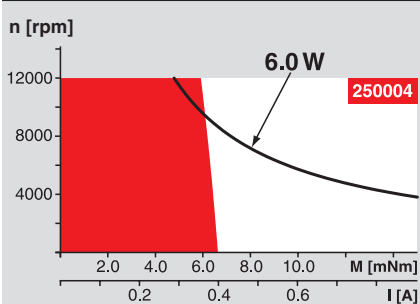
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	42 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

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

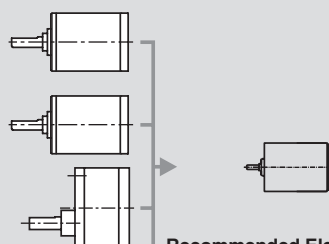
maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
Ø22 mm
0.5 - 1.0 Nm
Page 230

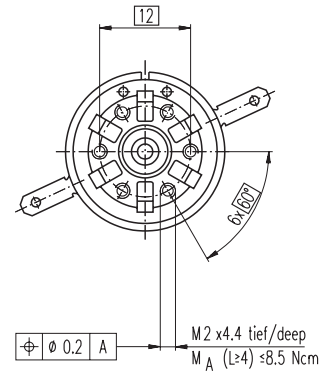
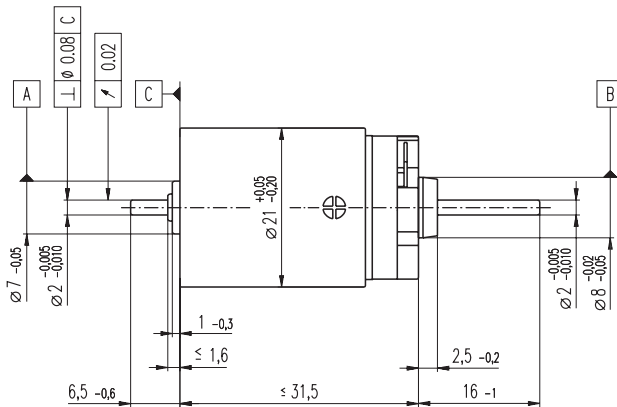
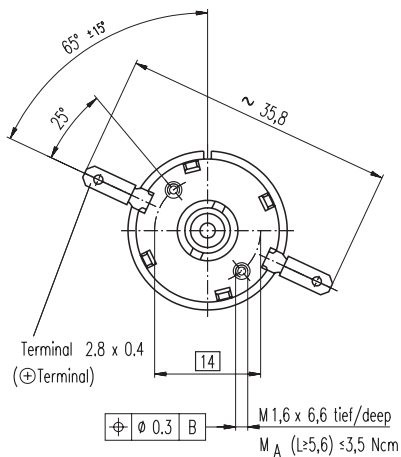
Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 231

Spur Gearhead
Ø38 mm
0.1 - 0.6 Nm
Page 243



Recommended Electronics:
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Notes 18

RE-max 21 Ø21 mm, Graphite Brushes, 6 Watt



M 1:1

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

Order Number

250020 250021 **250022** 250023 250024 250025 250026 250027 250028

Motor Data (provisional)

Values at nominal voltage		250020	250021	250022	250023	250024	250025	250026	250027	250028	
1	Nominal voltage	V	4.0	6.0	9.0	15.0	18.0	21.0	24.0	36.0	48.0
2	No load speed	rpm	11400	9680	10200	10600	9980	9760	8920	10100	9600
3	No load current	mA	155	83.9	59.0	37.0	28.8	24.0	18.9	14.6	10.3
4	Nominal speed	rpm	9890	7890	8070	8320	7770	7530	6670	7860	7330
5	Nominal torque (max. continuous torque)	mNm	1.85	3.69	5.51	6.64	6.85	6.78	6.89	6.78	6.68
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.532	0.431	0.359	0.291	0.216	0.152
7	Stall torque	mNm	14.7	20.3	27.1	31.6	31.4	30.0	27.8	31.2	28.6
8	Starting current	A	4.53	3.51	3.26	2.37	1.85	1.49	1.10	0.930	0.609
9	Max. efficiency	%	67	72	75	77	77	76	76	77	76
Characteristics											
10	Terminal resistance	Ω	0.883	1.71	2.76	6.33	9.72	14.1	21.8	38.7	78.8
11	Terminal inductance	mH	0.0130	0.0410	0.0846	0.219	0.353	0.502	0.784	1.38	2.70
12	Torque constant	mNm / A	3.25	5.77	8.30	13.4	17.0	20.2	25.3	33.6	46.9
13	Speed constant	rpm / V	2940	1650	1150	715	563	472	378	284	204
14	Speed / torque gradient	rpm / mNm	799	489	382	339	323	330	326	328	342
15	Mechanical time constant	ms	21.5	10.8	8.84	7.70	7.40	7.32	7.23	7.16	7.20
16	Rotor inertia	gcm ²	2.57	2.10	2.21	2.17	2.19	2.12	2.12	2.08	2.01

Specifications

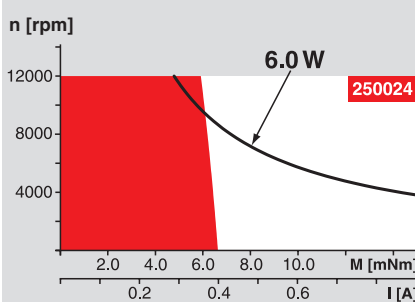
- Thermal data**
- 17 Thermal resistance housing-ambient 28 K / W
 - 18 Thermal resistance winding-housing 8.0 K / W
 - 19 Thermal time constant winding 8.77 s
 - 20 Thermal time constant motor 588 s
 - 21 Ambient temperature -30 ... +85°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 2.7 N
- Mechanical data (ball bearings)**
- 23 Max. permissible 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) 480 N
 - 28 Max. radial loading, 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 49.

Option

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

Operating Range



Comments

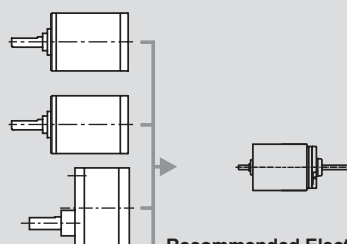
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

maxon Modular System

- Planetary Gearhead**
Ø22 mm
0.5 - 1.0 Nm
Page 230
- Planetary Gearhead**
Ø22 mm
0.5 - 2.0 Nm
Page 231
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 243

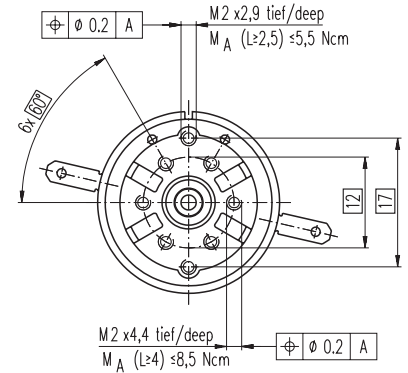
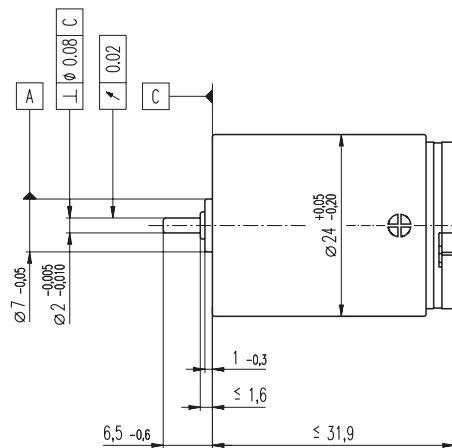
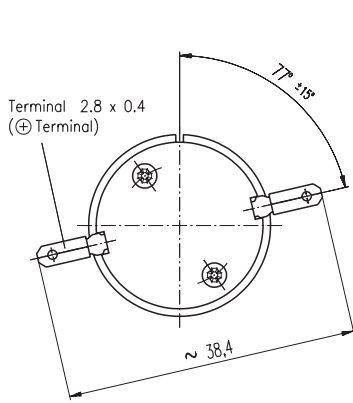


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EPOS 24/1 Page 294
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Overview on page 16 - 21

- Encoder MR**
32 CPT,
2 / 3 channels
Page 255
- Encoder MR**
128 / 256 / 512 CPT,
2 / 3 channels
Page 256

RE-max 24 Ø24 mm, Precious Metal Brushes CLL, 10 Watt



M 1:1

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

Order Number

220404	220405	220406	220407	220408	220410	220415	220416	220418	220419	220422	220423
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Motor Data

		220404	220405	220406	220407	220408	220410	220415	220416	220418	220419	220422	220423
Values at nominal voltage													
1	Nominal voltage	V	9.0	15.0	15.0	18.0	20.0	24.0	30.0	36.0	42.0	48.0	48.0
2	No load speed	rpm	8240	9470	8320	8910	8930	9350	9470	9160	8640	7450	5290
3	No load current	mA	18.8	14.1	11.5	10.7	9.64	8.65	7.06	5.57	4.35	3.01	1.79
4	Nominal speed	rpm	7000	8070	6920	7510	7510	7940	8050	7730	7200	5980	3780
5	Nominal torque (max. continuous torque)	mNm	8.55	10.5	10.7	10.6	10.5	10.5	10.4	10.4	10.3	10.3	10.2
6	Nominal current (max. continuous current)	A	0.840	0.709	0.631	0.561	0.500	0.436	0.350	0.282	0.227	0.170	0.119
7	Stall torque	mNm	56.9	70.7	63.3	67.4	66.0	69.1	69.0	66.6	62.0	52.4	35.8
8	Starting current	A	5.47	4.69	3.69	3.51	3.10	2.83	2.29	1.78	1.34	0.855	0.414
9	Max. efficiency	%	89	89	89	89	89	89	89	89	89	87	87
Characteristics													
10	Terminal resistance	Ω	1.64	3.20	4.07	5.13	6.46	8.48	13.1	20.2	31.3	56.2	116
11	Terminal inductance	mH	0.0735	0.154	0.200	0.251	0.309	0.406	0.618	0.952	1.45	2.56	5.06
12	Torque constant	mNm / A	10.4	15.1	17.2	19.2	21.3	24.4	30.1	37.4	46.3	61.3	86.3
13	Speed constant	rpm / V	919	634	557	497	448	391	317	255	206	156	111
14	Speed / torque gradient	rpm / mNm	145	134	132	133	136	136	138	138	140	143	149
15	Mechanical time constant	ms	6.16	6.04	6.01	6.01	6.02	6.03	6.02	6.04	6.06	6.07	6.14
16	Rotor inertia	gcm ²	4.04	4.29	4.35	4.33	4.24	4.24	4.18	4.18	4.14	4.07	3.95

Specifications

Thermal data		
17	Thermal resistance housing-ambient	24 K / W
18	Thermal resistance winding-housing	5.1 K / W
19	Thermal time constant winding	8.26 s
20	Thermal time constant motor	840 s
21	Ambient temperature	-30 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	2.8 N

Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 5 mm from flange	12.3 N

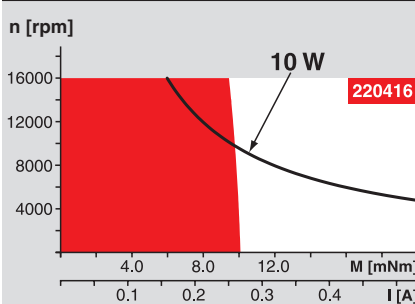
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	9
31	Weight of motor	70 g
CLL = Capacitor Long Life		

Values listed in the table are nominal.
Explanation of the figures on page 49.

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

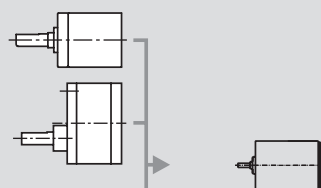
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Planetary Gearhead

Ø22 mm
0.5 - 2.0 Nm
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Spur Gearhead

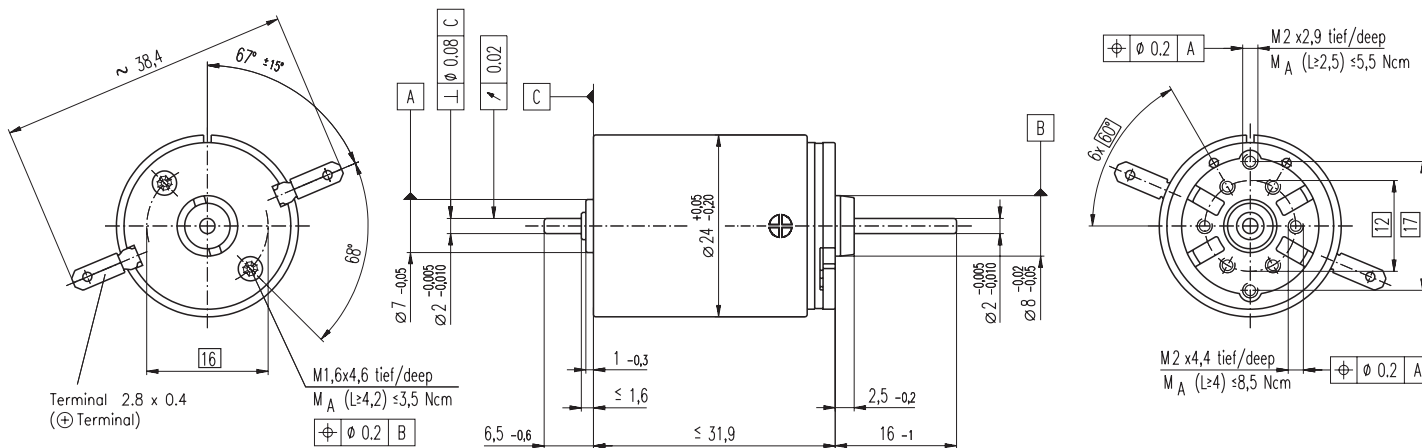
Ø38 mm
0.1 - 0.6 Nm
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RE-max 24 Ø24 mm, Precious Metal Brushes CLL, 6.5 Watt



M 1:1

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

Order Number

220425	220426	220427	220428	220429	220430	220431	220432	220433	220434	220435	220437
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Motor Data

Values at nominal voltage		220425	220426	220427	220428	220429	220430	220431	220432	220433	220434	220435	220437	
1	Nominal voltage	V	6.0	9.0	9.0	12.0	12.0	15.0	18.0	24.0	30.0	36.0	48.0	48.0
2	No load speed	rpm	5480	5680	4990	5930	5350	5840	5670	6100	6160	5580	5280	4770
3	No load current	mA	18.7	13.1	10.9	10.5	9.03	8.17	6.54	5.44	4.42	3.19	2.22	1.92
4	Nominal speed	rpm	4240	4250	3570	4520	3920	4410	4230	4660	4720	4110	3790	3280
5	Nominal torque (max. continuous torque)	mNm	8.56	10.6	10.7	10.7	10.6	10.6	10.5	10.5	10.4	10.3	10.1	10.2
6	Nominal current (max. continuous current)	A	0.840	0.716	0.636	0.565	0.504	0.439	0.354	0.284	0.228	0.171	0.119	0.109
7	Stall torque	mNm	37.9	42.4	38.0	45.0	39.6	43.2	41.4	44.4	44.3	39.3	35.7	32.8
8	Starting current	A	3.65	2.81	2.21	2.34	1.86	1.77	1.37	1.19	0.957	0.641	0.414	0.343
9	Max. efficiency	%	86	87	87	87	87	87	87	87	87	86	86	
Characteristics			220425	220426	220427	220428	220430	220431	220432	220433	220434	220435	220437	
10	Terminal resistance	Ω	1.64	3.20	4.07	5.13	6.46	8.48	13.1	20.2	31.3	56.2	116	140
11	Terminal inductance	mH	0.0735	0.154	0.200	0.251	0.309	0.406	0.618	0.952	1.45	2.56	5.06	6.22
12	Torque constant	mNm / A	10.4	15.1	17.2	19.2	21.3	24.4	30.1	37.4	46.3	61.3	86.3	95.6
13	Speed constant	rpm / V	919	634	557	497	448	391	317	255	206	156	111	99.8
14	Speed / torque gradient	rpm / mNm	145	134	132	133	136	136	138	138	140	143	149	146
15	Mechanical time constant	ms	6.16	6.04	6.01	6.02	6.03	6.03	6.03	6.04	6.07	6.08	6.15	6.11
16	Rotor inertia	gcm ²	4.05	4.30	4.35	4.33	4.24	4.25	4.18	4.18	4.14	4.07	3.95	3.99

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 24 K / W
 - 18 Thermal resistance winding-housing 5.1 K / W
 - 19 Thermal time constant winding 8.26 s
 - 20 Thermal time constant motor 852 s
 - 21 Ambient temperature -30 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible speed 9500 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.012 mm
 - 26 Max. axial load (dynamic) 1 N
 - 27 Max. force for press fits (static) (static, shaft supported) 80 N / 440 N
 - 28 Max. radial loading, 5 mm from flange 2.8 N

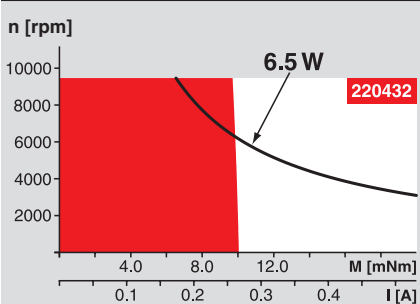
- Mechanical data (ball bearings)**
- 23 Max. permissible speed 9500 rpm
 - 24 Axial play 0.05 - 0.15 mm
 - 25 Radial play 0.025 mm
 - 26 Max. axial load (dynamic) 3.3 N
 - 27 Max. force for press fits (static) (static, shaft supported) 45 N / 440 N
 - 28 Max. radial loading, 5 mm from flange 12.3 N

- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of commutator segments 9
 - 31 Weight of motor 71 g
- CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 49.

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

Operating Range

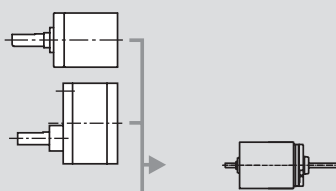


Comments

- 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

- Planetary Gearhead**
Ø22 mm
0.5 - 2.0 Nm
Page 231
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
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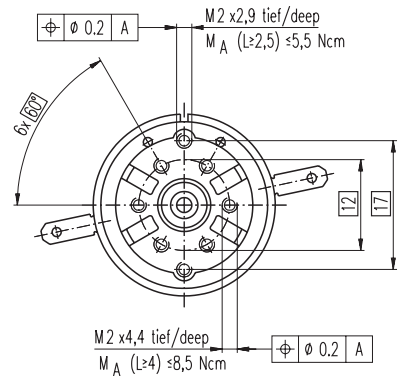
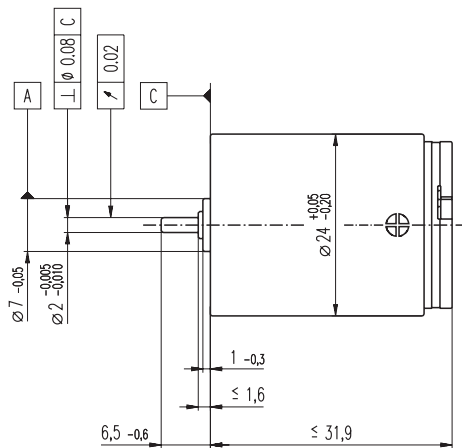
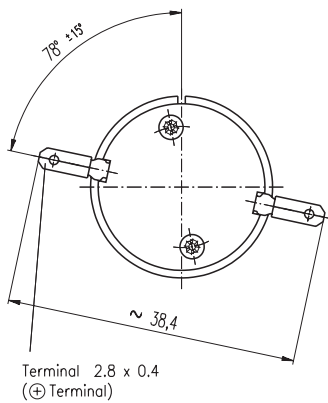


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- Encoder MR**
32 CPT,
2 / 3 channels
Page 255
- Encoder MR**
128 / 256 / 512 CPT,
2 / 3 channels
Page 256

RE-max 24 Ø24 mm, Graphite Brushes, 11 Watt



M 1:1

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

Order Number

222036 **222037** 222038 222039 222040 222041 222042 **222043** 222044 222045 **222046** 222047

Motor Data

Values at nominal voltage		222036	222037	222038	222039	222040	222041	222042	222043	222044	222045	222046	222047	
1	Nominal voltage	V	9.0	12.0	15.0	18.0	18.0	24.0	24.0	36.0	42.0	48.0	48.0	
2	No load speed	rpm	8190	7540	8290	8870	8000	9310	7540	9120	8600	7410	5250	4730
3	No load current	mA	45.6	31.0	27.7	25.0	22.1	19.8	15.5	12.9	10.3	7.60	5.15	4.59
4	Nominal speed	rpm	6640	5870	6650	7240	6330	7670	5850	7450	6920	5690	3470	2960
5	Nominal torque (max. continuous torque)	mNm	10.8	12.4	12.4	12.3	12.3	12.1	12.2	12.1	12.0	12.0	12.1	
6	Nominal current (max. continuous current)	A	1.08	0.853	0.752	0.666	0.598	0.516	0.421	0.335	0.270	0.204	0.144	0.131
7	Stall torque	mNm	57.7	56.9	63.6	67.7	59.5	69.3	55.3	66.6	62.0	52.4	35.7	32.8
8	Starting current	A	5.55	3.78	3.71	3.52	2.79	2.83	1.83	1.78	1.34	0.855	0.414	0.343
9	Max. efficiency	%	83	83	83	84	83	84	83	84	83	82	79	78
Characteristics														
10	Terminal resistance	Ω	1.62	3.18	4.05	5.11	6.44	8.47	13.1	20.2	31.3	56.2	116	140
11	Terminal inductance	mH	0.0735	0.154	0.200	0.251	0.309	0.406	0.618	0.952	1.45	2.56	5.06	6.22
12	Torque constant	mNm / A	10.4	15.1	17.2	19.2	21.3	24.4	30.1	37.4	46.3	61.3	86.3	95.6
13	Speed constant	rpm / V	919	634	557	497	448	391	317	255	206	156	111	99.8
14	Speed / torque gradient	rpm / mNm	143	134	131	132	135	135	138	138	140	143	149	146
15	Mechanical time constant	ms	5.96	5.90	5.88	5.89	5.91	5.92	5.92	5.93	5.96	5.97	6.03	6.00
16	Rotor inertia	gcm ²	3.97	4.22	4.28	4.26	4.17	4.17	4.11	4.11	4.07	4.00	3.88	3.92

Specifications

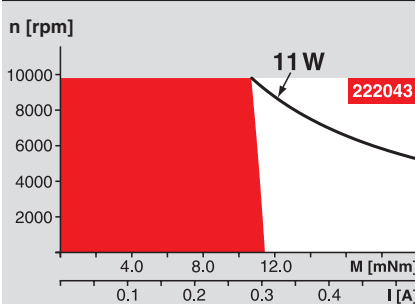
Thermal data		
17	Thermal resistance housing-ambient	24 K / W
18	Thermal resistance winding-housing	5.1 K / W
19	Thermal time constant winding	8.26 s
20	Thermal time constant motor	840 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. permissible 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 loading, 5 mm from flange	2.8 N
Mechanical data (ball bearings)		
23	Max. permissible 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 loading, 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	70 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

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

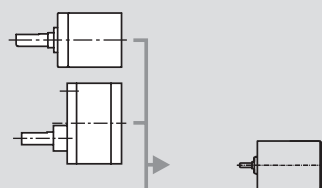
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Planetary Gearhead

Ø22 mm
0.5 - 2.0 Nm
Page 231

Spur Gearhead

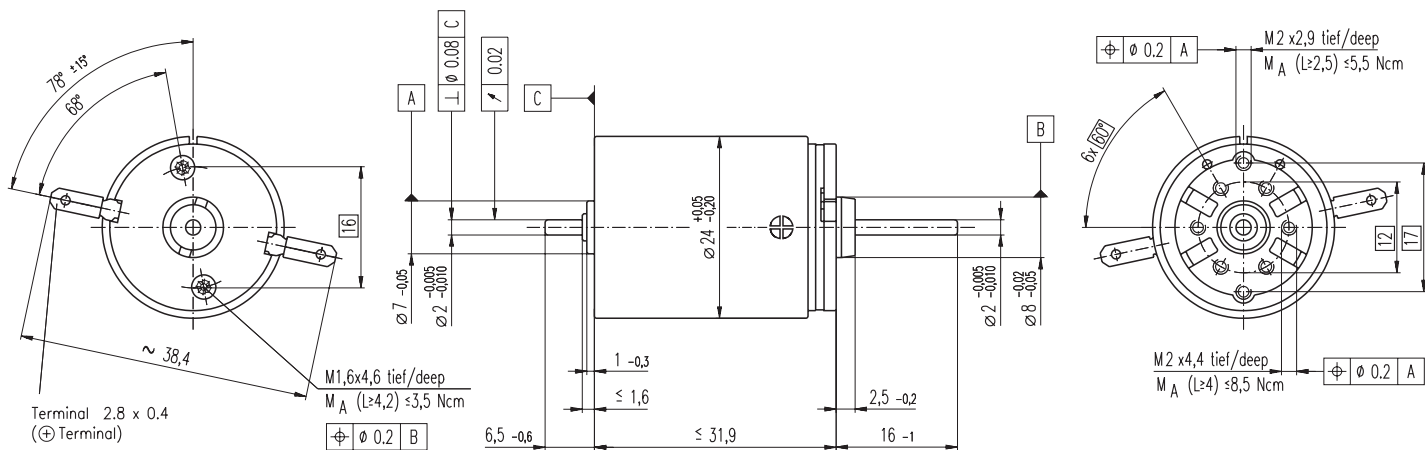
Ø38 mm
0.1 - 0.6 Nm
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Recommended Electronics:

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Notes 18

RE-max 24 Ø24 mm, Graphite Brushes, 11 Watt



M 1:1

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

Order Number

222048 **222049** 222050 222051 222052 222053 222054 **222055** 222056 222057 **222058** 222059

Motor Data

Values at nominal voltage		222048	222049	222050	222051	222052	222053	222054	222055	222056	222057	222058	222059
1	Nominal voltage	V	9.0	12.0	15.0	18.0	18.0	24.0	24.0	36.0	42.0	48.0	48.0
2	No load speed	rpm	8190	7540	8290	8870	8000	9310	7540	9120	8600	7410	5250
3	No load current	mA	45.6	31.0	27.7	25.0	22.1	19.8	15.5	12.9	10.3	7.60	5.15
4	Nominal speed	rpm	6640	5870	6650	7240	6330	7670	5850	7450	6920	5690	3470
5	Nominal torque (max. continuous torque)	mNm	10.8	12.4	12.4	12.3	12.3	12.1	12.2	12.1	12.0	12.0	12.1
6	Nominal current (max. continuous current)	A	1.08	0.853	0.752	0.666	0.598	0.516	0.421	0.335	0.270	0.204	0.144
7	Stall torque	mNm	57.7	56.9	63.6	67.7	59.5	69.3	55.3	66.6	62.0	52.4	35.7
8	Starting current	A	5.55	3.78	3.71	3.52	2.79	2.83	1.83	1.78	1.34	0.855	0.414
9	Max. efficiency	%	83	83	83	84	83	84	83	84	83	82	79
Characteristics													
10	Terminal resistance	Ω	1.62	3.18	4.05	5.11	6.44	8.47	13.1	20.2	31.3	56.2	116
11	Terminal inductance	mH	0.0735	0.154	0.200	0.251	0.309	0.406	0.618	0.952	1.45	2.56	5.06
12	Torque constant	mNm / A	10.4	15.1	17.2	19.2	21.3	24.4	30.1	37.4	46.3	61.3	86.3
13	Speed constant	rpm / V	919	634	557	497	448	391	317	255	206	156	111
14	Speed / torque gradient	rpm / mNm	143	134	131	132	135	135	138	138	140	143	149
15	Mechanical time constant	ms	5.96	5.90	5.88	5.89	5.91	5.92	5.92	5.93	5.96	5.97	6.03
16	Rotor inertia	gcm ²	3.97	4.22	4.28	4.26	4.17	4.17	4.11	4.11	4.07	4.00	3.88

Specifications

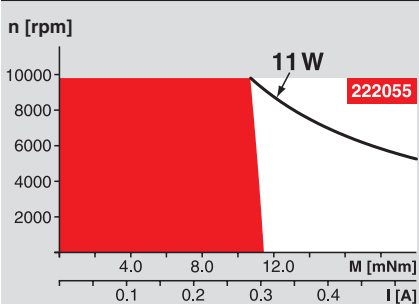
Thermal data		
17	Thermal resistance housing-ambient	24 K / W
18	Thermal resistance winding-housing	5.1 K / W
19	Thermal time constant winding	8.26 s
20	Thermal time constant motor	852 s
21	Ambient temperature	-30 ... +85°C
22	Max. permissible winding temperature	+125°C
Mechanical data (sleeve bearings)		
23	Max. permissible speed	9800 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static) (static, shaft supported)	80 N / 440 N
28	Max. radial loading, 5 mm from flange	2.8 N
Mechanical data (ball bearings)		
23	Max. permissible speed	9800 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	3.3 N
27	Max. force for press fits (static) (static, shaft supported)	45 N / 440 N
28	Max. radial loading, 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	71 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

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

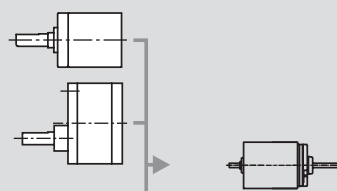
maxon Modular System

Planetary Gearhead

Ø22 mm
0.5 - 2.0 Nm
Page 231

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 243



Recommended Electronics:

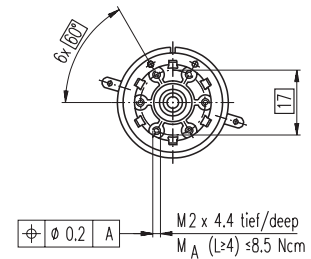
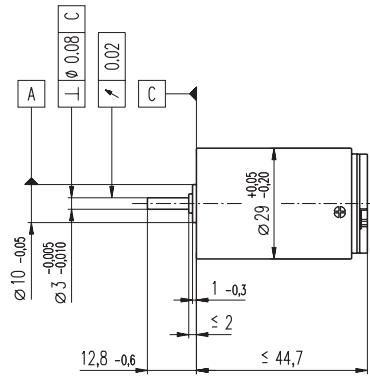
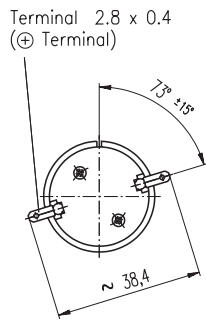
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ADS 50/5 276
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Overview on page 16 - 21

Encoder MR
32 CPT,
2 / 3 channels
Page 255

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

RE-max 29 Ø29 mm, Precious Metal Brushes CLL, 15 Watt



M 1:2

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

Order Number

Motor Data

	226748	226749	226751	226752	226753	226754	226755	226756	226757	226759	226760	226761	226762	226763	226764	
Values at nominal voltage																
1 Nominal voltage	V	7.2	9.0	12.0	18.0	18.0	24.0	30.0	36.0	42.0	48.0	48.0	48.0	48.0	48.0	48.0
2 No load speed	rpm	6480	7190	6160	6820	5630	5960	6170	6640	6710	6280	5400	5000	4160	3350	2790
3 No load current	mA	45.1	43.6	24.7	19.8	14.0	11.6	9.90	9.43	8.25	6.39	4.87	4.26	3.08	2.13	1.57
4 Nominal speed	rpm	6200	6850	5550	6160	4810	5110	5320	5790	5820	5410	4520	4130	3260	2440	1870
5 Nominal torque (max. continuous torque)	mNm	8.44	9.51	15.1	20.7	25.2	26.1	25.8	25.7	24.3	25.2	25.4	25.5	25.2	25.2	24.9
6 Nominal current (max. continuous current)	A	0.840	0.840	0.840	0.840	0.840	0.691	0.566	0.506	0.416	0.352	0.304	0.283	0.232	0.186	0.153
7 Stall torque	mNm	195	200	152	214	173	185	188	201	183	182	157	146	117	93.3	75.6
8 Starting current	A	18.4	16.8	8.22	8.49	5.68	4.81	4.05	3.90	3.07	2.51	1.86	1.59	1.06	0.683	0.461
9 Max. efficiency	%	91	90	90	91	90	91	91	91	90	90	90	90	89	89	89
Characteristics																
10 Terminal resistance	Ω	0.390	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	10.6	11.9	18.5	25.2	30.4	38.4	46.3	51.6	59.6	72.8	84.7	91.3	110	136	164
13 Speed constant	rpm / V	902	802	515	380	314	249	206	185	160	131	113	105	86.8	70.0	58.2
14 Speed / torque gradient	rpm / mNm	33.2	36.1	40.6	32.0	32.7	32.3	32.9	33.1	36.8	34.5	34.4	34.5	35.6	36.0	37.0
15 Mechanical time constant	ms	4.99	4.84	4.62	4.51	4.49	4.48	4.48	4.47	4.51	4.50	4.50	4.49	4.52	4.53	4.54
16 Rotor inertia	gcm ²	14.3	12.8	10.9	13.5	13.1	13.2	13.0	12.9	11.7	12.5	12.5	12.4	12.1	12.0	11.7

Specifications

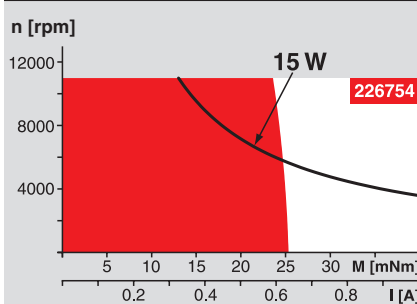
- Thermal data**
- 17 Thermal resistance housing-ambient 15.8 K / W
 - 18 Thermal resistance winding-housing 4.0 K / W
 - 19 Thermal time constant winding 15.8 s
 - 20 Thermal time constant motor 1260 s
 - 21 Ambient temperature -30 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 5.5 N
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 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 49.

Option

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

Operating Range



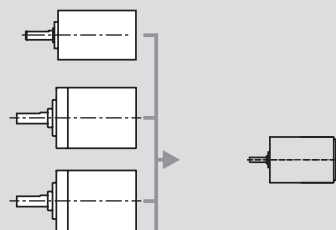
Comments

- 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

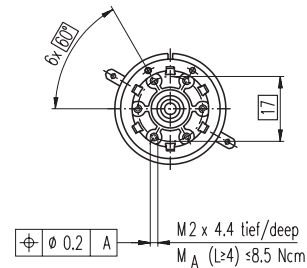
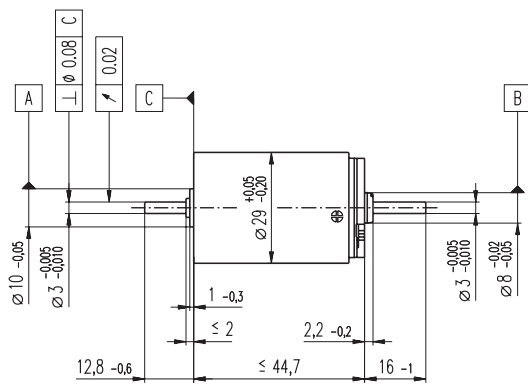
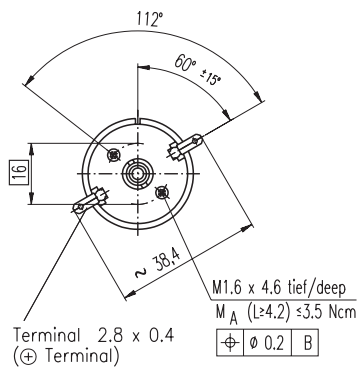
Overview on page 16 - 21

- Planetary Gearhead**
Ø26 mm
0.5 - 2.0 Nm
Page 235
- Planetary Gearhead**
Ø32 mm
0.75 - 4.5 Nm
Page 238
- Planetary Gearhead**
Ø32 mm
1.0 - 6.0 Nm
Page 241



- Recommended Electronics:**
- LSC 30/2 Page 276
 - ADS 50/5 276
 - ADS_E 50/5 277
 - Notes 18

RE-max 29 Ø29 mm, Precious Metal Brushes CLL, 9 Watt



M 1:2

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

Order Number

226765	226767	226770	226771	226772	226773	226774	226775	226776	226778	226779	226780	226781	226782	226783
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Motor Data

		226765	226767	226770	226771	226772	226773	226774	226775	226776	226778	226779	226780	226781	226782	226783	
Values at nominal voltage																	
1	Nominal voltage	V	4.5	6.0	9.0	12.0	15.0	18.0	24.0	24.0	30.0	36.0	36.0	42.0	48.0	48.0	
2	No load speed	rpm	4040	4790	4620	4540	4690	4460	4930	4420	4790	4710	4040	4380	4150	3350	2780
3	No load current	mA	41.1	40.4	25.4	18.5	15.6	12.0	10.6	8.88	8.07	6.53	5.13	4.98	4.02	2.87	2.18
4	Nominal speed	rpm	3760	4450	4010	3880	3870	3620	4080	3570	3890	3830	3170	3500	3260	2450	1870
5	Nominal torque (max. continuous torque)	mNm	8.48	9.55	15.1	20.7	25.2	26.2	25.9	25.9	24.5	25.3	25.5	25.4	25.0	25.0	24.8
6	Nominal current (max. continuous current)	A	0.840	0.840	0.840	0.840	0.840	0.693	0.568	0.510	0.418	0.353	0.305	0.282	0.231	0.186	0.153
7	Stall torque	mNm	122	133	114	142	144	139	150	134	131	137	118	127	117	93.3	75.6
8	Starting current	A	11.5	11.2	6.16	5.66	4.73	3.61	3.24	2.60	2.20	1.88	1.39	1.39	1.06	0.683	0.461
9	Max. efficiency	%	89	89	88	89	89	89	89	89	88	89	88	89	88	88	87
Characteristics																	
10	Terminal resistance	Ω	0.390	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	10.6	11.9	18.5	25.2	30.4	38.4	46.3	51.6	59.6	72.8	84.7	91.3	110	136	164
13	Speed constant	rpm / V	902	802	515	380	314	249	206	185	160	131	113	105	86.8	70	58.2
14	Speed / torque gradient	rpm / mNm	33.2	36.1	40.6	32.0	32.7	32.3	32.9	33.1	36.8	34.5	34.4	34.5	35.6	36.0	37.0
15	Mechanical time constant	ms	4.99	4.85	4.63	4.52	4.50	4.48	4.48	4.48	4.52	4.51	4.51	4.50	4.53	4.54	4.55
16	Rotor inertia	gcm ²	14.3	12.8	10.9	13.5	13.2	13.3	13.0	12.9	11.7	12.5	12.5	12.5	12.1	12.0	11.7

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 15.8 s
 - 20 Thermal time constant motor 1270 s
 - 21 Ambient temperature -30 ... +65°C
 - 22 Max. permissible winding temperature +85°C
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 5.5 N

- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 20.5 N

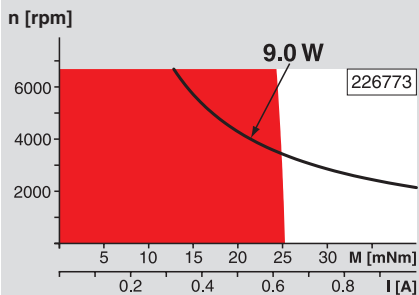
- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of commutator segments 13
 - 31 Weight of motor 161 g
- CLL = Capacitor Long Life

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

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

Operating Range



Comments

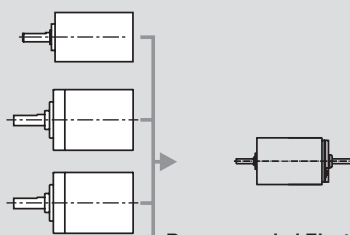
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

maxon Modular System

- Planetary Gearhead**
Ø26 mm
0.5 - 2.0 Nm
Page 235
- Planetary Gearhead**
Ø32 mm
0.75 - 4.5 Nm
Page 238
- Planetary Gearhead**
Ø32 mm
1.0 - 6.0 Nm
Page 241

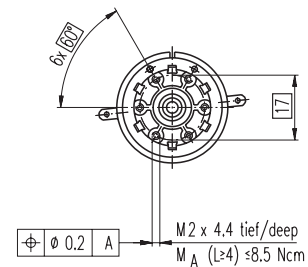
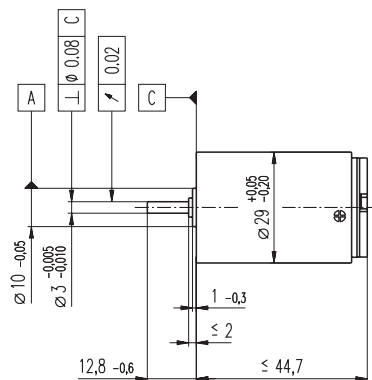
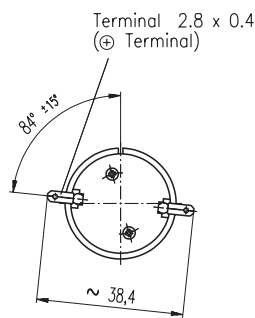


- Recommended Electronics:**
LSC 30/2 Page 276
EPOS 24/5 294
EPOS2 50/5 295
EPOS P 24/5 297
Notes 18

Overview on page 16 - 21

- Encoder MR**
128 - 1000 CPT,
3 channels
Page 258

RE-max 29 Ø29 mm, Graphite Brushes, 22 Watt



M 1:2

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

Order Number

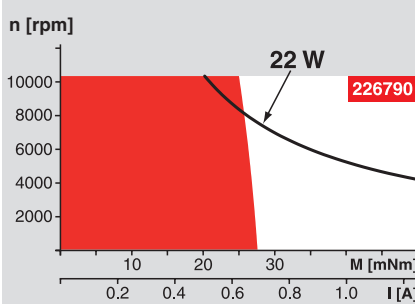
226784	226785	226787	226788	226789	226790	226791	226792	226793	226795	226796	226797	226798	226799	226800
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Motor Data		226784	226785	226787	226788	226789	226790	226791	226792	226793	226795	226796	226797	226798	226799	226800	
Values at nominal voltage																	
1	Nominal voltage	V	9.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	
2	No load speed	rpm	7630	9130	8890	8780	9090	8660	8380	8600	7450	6100	5240	4860	4030	3250	2700
3	No load current	mA	77.4	73.1	46.6	34.2	28.6	22.3	18.3	16.5	13.7	10.5	8.70	7.93	6.33	4.90	3.96
4	Nominal speed	rpm	6690	8170	7760	7690	8020	7630	7360	7590	6380	5060	4200	3810	2970	2180	1610
5	Nominal torque (max. continuous torque)	mNm	10.9	12.3	19.7	26.8	27.4	28.5	28.9	29.0	28.2	29.8	30.3	30.4	30.3	30.5	30.3
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.07	0.903	0.745	0.625	0.563	0.475	0.409	0.357	0.332	0.275	0.222	0.184
7	Stall torque	mNm	171	207	202	262	273	268	257	265	208	182	157	146	118	94.1	76.5
8	Starting current	A	15.8	16.9	10.6	10.2	8.73	6.80	5.41	4.99	3.40	2.43	1.81	1.56	1.04	0.672	0.455
9	Max. efficiency	%	79	82	84	87	87	88	88	88	87	86	86	85	83	82	
Characteristics																	
10	Terminal resistance	Ω	0.571	0.708	1.69	2.36	3.44	5.29	7.76	9.61	14.1	19.7	26.5	30.8	46.1	71.4	106
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	19.0	25.8	31.2	39.4	47.5	53.0	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	46.2	45.3	44.7	33.9	33.6	32.6	32.8	32.7	36.1	33.8	33.5	33.5	34.5	34.8	35.6
15	Mechanical time constant	ms	6.94	6.08	5.10	4.78	4.63	4.52	4.46	4.42	4.44	4.41	4.39	4.38	4.38	4.38	4.38
16	Rotor inertia	gcm ²	14.3	12.8	10.9	13.5	13.1	13.2	13.0	12.9	11.7	12.5	12.5	12.5	12.1	12.0	11.7

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 15.8 s
 - 20 Thermal time constant motor 1260 s
 - 21 Ambient temperature -30 ... +85°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (ball bearings)**
- 23 Max. permissible 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 loading, 5 mm from flange 20.5 N

Operating Range



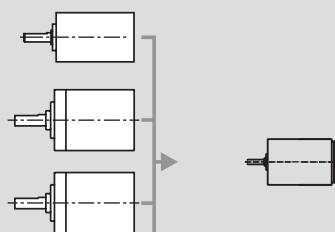
Comments

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

- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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 loading, 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 159 g

maxon Modular System

- Planetary Gearhead**
Ø26 mm
0.5 - 2.0 Nm
Page 235
- Planetary Gearhead**
Ø32 mm
0.75 - 4.5 Nm
Page 238
- Planetary Gearhead**
Ø32 mm
1.0 - 6.0 Nm
Page 241



- Recommended Electronics:**
- LSC 30/2 Page 276
 - ADS 50/5 276
 - ADS_E 50/5 277
 - Notes 18

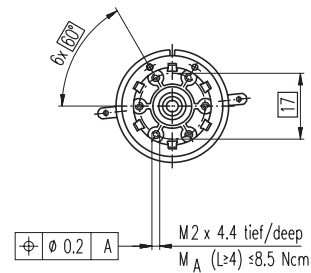
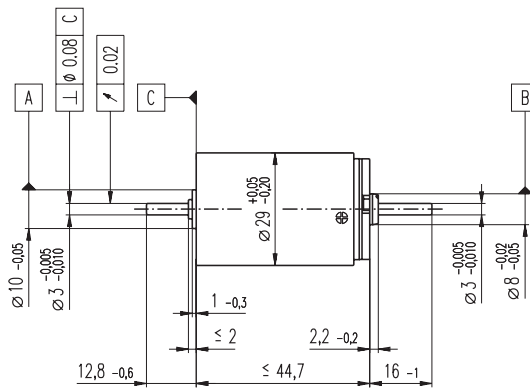
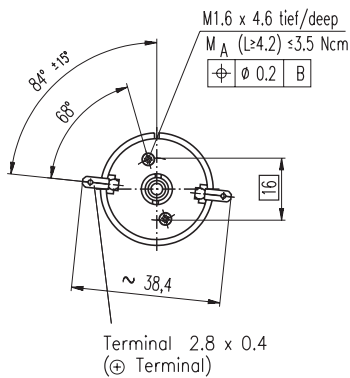
Overview on page 16 - 21

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

- Sleeve bearings in place of ball bearings
- Pigtails in place of terminals

RE-max 29 Ø29 mm, Graphite Brushes, 22 Watt



M 1:2

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

Order Number

226801	226802	226805	226806	226807	226808	226809	226810	226811	226815	226816	226817	226818	226819	226820
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Motor Data		226801	226802	226805	226806	226807	226808	226809	226810	226811	226815	226816	226817	226818	226819	226820	
Values at nominal voltage																	
1	Nominal voltage	V	9.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	
2	No load speed	rpm	7640	9130	8900	8790	9090	8670	8380	8600	7450	6100	5240	4860	4030	3250	2700
3	No load current	mA	73.1	69.1	44.0	32.3	27.0	21.0	17.2	15.6	12.9	9.93	8.20	7.47	5.95	4.61	3.73
4	Nominal speed	rpm	6690	8170	7760	7680	8020	7630	7350	7580	6380	5050	4200	3810	2970	2180	1610
5	Nominal torque (max. continuous torque)	mNm	11.0	12.4	19.7	26.9	27.5	28.7	29.0	29.2	28.3	29.9	30.4	30.5	30.4	30.5	30.3
6	Nominal current (max. continuous current)	A	1.08	1.08	1.08	1.08	0.907	0.748	0.627	0.565	0.476	0.410	0.357	0.333	0.275	0.222	0.184
7	Stall torque	mNm	171	207	202	262	273	268	257	265	208	182	157	146	118	94.1	76.5
8	Starting current	A	15.8	16.9	10.6	10.2	8.73	6.80	5.41	4.99	3.40	2.43	1.81	1.56	1.04	0.672	0.455
9	Max. efficiency	%	79	82	85	87	88	88	88	88	87	87	87	86	85	84	83
Characteristics																	
10	Terminal resistance	Ω	0.571	0.708	1.69	2.36	3.44	5.29	7.76	9.61	14.1	19.7	26.5	30.8	46.1	71.4	106
11	Terminal inductance	mH	0.0345	0.0437	0.106	0.195	0.285	0.454	0.661	0.820	1.09	1.63	2.21	2.57	3.72	5.73	8.27
12	Torque constant	mNm / A	10.9	12.2	19.0	25.8	31.2	39.4	47.5	53.0	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	46.2	45.3	44.7	33.9	33.6	32.6	32.8	32.7	36.1	33.8	33.5	33.5	34.5	34.8	35.6
15	Mechanical time constant	ms	6.94	6.08	5.10	4.78	4.63	4.52	4.46	4.43	4.44	4.41	4.39	4.38	4.39	4.39	4.39
16	Rotor inertia	gcm ²	14.3	12.8	10.9	13.5	13.2	13.2	13.0	12.9	11.7	12.5	12.5	12.5	12.1	12.0	11.7

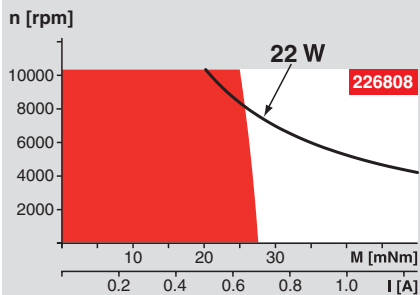
Specifications

- 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 15.8 s
 - 20 Thermal time constant motor 1270 s
 - 21 Ambient temperature -30 ... +85°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (ball bearings)**
- 23 Max. permissible 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) (static, shaft supported) 75 N / 440 N
 - 28 Max. radial loading, 5 mm from flange 20.5 N
- Mechanical data (sleeve bearings)**
- 23 Max. permissible 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) (static, shaft supported) 80 N / 440 N
 - 28 Max. radial loading, 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 161 g

Values listed in the table are nominal.
 Explanation of the figures on page 49.

Option
 Sleeve bearings in place of ball bearings
 Pigtailed in place of terminals

Operating Range

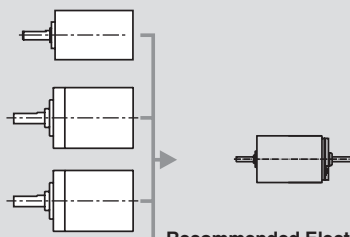


Comments

- 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

- Planetary Gearhead**
 Ø26 mm
 0.5 - 2.0 Nm
 Page 235
- Planetary Gearhead**
 Ø32 mm
 0.75 - 4.5 Nm
 Page 238
- Planetary Gearhead**
 Ø32 mm
 1.0 - 6.0 Nm
 Page 241



- Recommended Electronics:**
- LSC 30/2 Page 276
 - ADS 50/5 276
 - ADS_E 50/5 277
 - EPOS 24/5 294
 - EPOS2 50/5 295
 - EPOS P 24/5 297
 - Notes 18

Overview on page 16 - 21

Encoder MR
 128 - 1000 CPT,
 3 channels
 Page 258



maxon EC motor

The electronically commutated EC motors are characterized especially by their favorable torque characteristics, high power, extremely broad speed range and, of course, by their unsurpassed service life.

Explanation of the EC motors	151
EC motors 6 - 60 mm in diameter	152 - 170

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".

Electrical equipment must meet certain minimum requirements, which was introduced into the European market after 1.1.96. Small motors will be identified as components and will therefore represent no separate electrical equipment within the sense of the guidelines. Nevertheless the majority of the maxon motor program are already CE certified. Certifying the motors takes place during operation at no-load and in the new condition.



The CE sign means that the product conforms to EU guidelines and procedures designed to achieve conformity were carried out.

If additional requirements need to be met, we shall cooperate with you to work out more detailed specifications.

Note to the Catalogue 2008/09:

maxon motor ag accepts no liability for the accuracy of the information contained in this catalogue, nor for any damages which may result directly or indirectly from the use of such information.

This disclaimer does not apply to wilful intent, gross negligence, and does not affect legislation governing product liability.

The Standard Specification No. 101 for maxon EC motor, maxon *EC*-max, *EC*-powermax and maxon flat 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 sub-assemblies 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)

No-load speed +/- 10 %
No-load current \leq maximum specified value

Sense of rotation CW / CCW
Motor position horizontal

When connecting the motor according to the catalogue (or printed matter), the shaft turns CW as seen from the mounting end.

Terminal resistance is verified through random sampling. The specified electro-mechanical parameters are sufficiently guaranteed with these measurements. Although every motor is fully adjusted and tested during manufacturing, the Quality Control Department rechecks these values through random sampling.

2.2 **Mechanical data** per outline drawing: Standard measuring 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 Other data

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.

Inductance is determined during initial sampling checks.
Measuring frequency 1 kHz.

Corrosion resistance: Our products are tested according to test climate 23/83-1 DIN 50015 at the first sample test.

Electric strength: Every motor is tested in its completed mounted state for earth short circuit

Coating: Surface treatment and coating procedures used by maxon were selected on the basis of their merits to resist corrosion. Evaluations of these treatments are made according to their applicable standard, such as ISO 2082 or DIN 50017 KK.

2.4 **Noise:** Depending on speed the necessary motions in the motor cause noise and vibration in varying degrees, frequency and intensity. An objective assessment can only be made at great expense and with precise specifications. For this reason, maxon chooses to evaluate routinely, but only a subjective basis and for extremes within a lot. 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 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. For this reason, maxon performs internal tests under uniform criteria during the initial sampling procedure.


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 2005 edition / subject to change

Explanation of the pages 152 - 207

Dimensional drawings

On the enclosed CD-ROM dimensional drawings (DXF-files) are available and are suitable for import to any CAD system.

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.

Line 1 Nominal voltage U_N [Volt]

is the applied voltage between two powered phases in block commutation. See page 26 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.

Line 2 No load speed n_0 [rpm]

is the speed at which the unloaded motor runs with the nominal voltage applied. It is approximately proportional to the applied voltage.

Line 3 No load current I_0 [mA]

This is the current the unloaded motor draws. 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.

Line 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.

Line 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.

Line 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 EC flat motor types up to Ø10 mm, the nominal working point is given varying at half no-load speed, as the thermal limit is not reached at nominal voltage.

Line 7 Stall torque M_H [mNm]

is the torque produced by the motor when at standstill. Rising motor temperatures reduce stall torque.

Line 8 Starting current I_A [A]

is the quotient from nominal voltage and the motor's terminal resistance. Starting current is equivalent to stall torque. With larger motors, I_A cannot often be reached due to the amplifier's current limits.

Line 9 Maximum 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.

Line 10 Terminal resistance phase to phase R [Ω]

is determined through the resistance at 25°C between two connections.

Line 11 Terminal inductance phase to phase L [mH]

is the winding inductance between two connections. It is measured at 1 kHz, sinusoidal.

Line 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.

Line 13 Speed constant k_n [rpm/V]

indicates the theoretical speed per volt of applied voltage, disregarding friction losses.

Line 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 (tolerance $\pm 20\%$).

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 working point (see page 36).

Line 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.

Line 16 Rotor moment of inertia J_R [gcm²]

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

Line 17 Thermal resistance housing-ambient R_{th2} [K/W]

Line 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.

Line 19 Thermal time constant winding

τ_w [s]

Line 20 Thermal time constant motor

τ_m [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.

Line 21 Ambient temperature [°C]

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

Line 22 Max. winding temperature [°C]

Maximum permissible winding temperature.

Line 23 Maximum permissible 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.

Line 24 Axial play [mm]

For non-preloaded motors, this represents the tolerance limits of the factory-set bearing play. The latter is included in shaft length tolerances. Preloading cancels out axial play up to the given axial loading.

Line 25 Radial play [mm]

Radial play derives from the bearings' radial air. A spring (bearing preload) cancels out radial play up to the given axial loading.

Line 26/27 Max. axial loading [N]

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

statistically: 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.

Line 28 Max. radial loading [N]

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

Line 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.

Line 30 Number of phases

All maxon EC motors have three phases.

Line 31 Weight of motor [g]

Line 33 Max. torque M_{\max} [mNm]

Maximum torque the motor can briefly deliver. It is limited by the overload protection of the electronics.

Line 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.

Line 35 Control variable

"Speed" means that the drive is fitted with an integral speed controller. "Unregulated" means that the drive is fitted with true commutation electronics.

Line 36 Supply voltage $+V_{cc}$ [V]

Range of supply voltages measured in respect of GND at which the drive functions.

Line 37 Set speed 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.

Line 38 Scaling Set speed value input k_c [rpm/V]

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

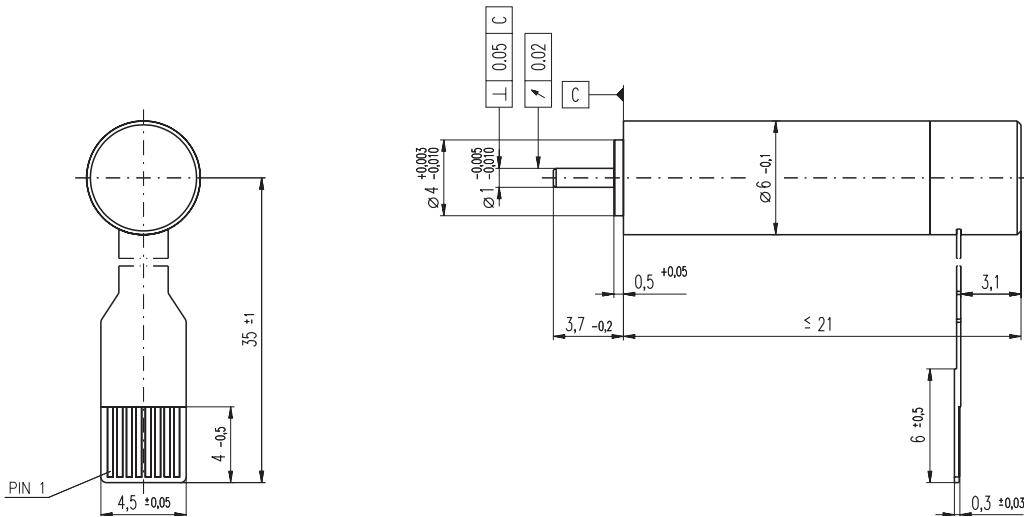
Line 39 Speed range

Achievable speeds in the controlled range.

Line 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 6 Ø6 mm, brushless, 1.2 Watt



M 2.5:1

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

Order Number

310599 250101

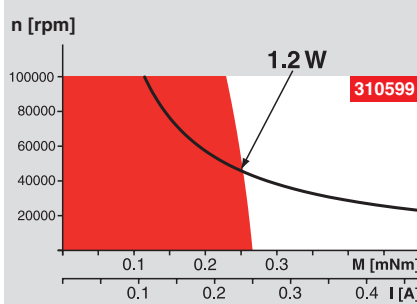
Motor Data (provisional)

Values at nominal voltage		310599	250101
1	Nominal voltage	V	6.0
2	No load speed	rpm	47500
3	No load current	mA	57.4
4	Nominal speed	rpm	23800
5	Nominal torque (max. continuous torque)	mNm	0.232
6	Nominal current (max. continuous current)	A	0.265
7	Stall torque	mNm	0.509
8	Starting current	A	0.480
9	Max. efficiency	%	43
Characteristics			
10	Terminal resistance phase to phase	Ω	12.5
11	Terminal inductance phase to phase	mH	0.0911
12	Torque constant	mNm / A	1.06
13	Speed constant	rpm / V	9010
14	Speed / torque gradient	rpm / mNm	106000
15	Mechanical time constant	ms	5.56
16	Rotor inertia	gcm ²	0.00500

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 75 K / W
 - 18 Thermal resistance winding-housing 5.0 K / W
 - 19 Thermal time constant winding 0.464 s
 - 20 Terminal inductance phase to phase 80.2 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 100000 rpm
 - 24 Axial play at axial load < 0.15 N 0 mm
 - > 0.15 N max. 0.06 mm
 - 25 Radial play preloaded 0.1 N
 - 26 Max. axial load (dynamic) 10 N
 - 27 Max. force for press fits (static) 2 N
 - 28 Max. radial loading, 2 mm from flange

Operating Range



Comments

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

Other specifications

- 29 Number of pole pairs 1
- 30 Number of phases 3
- 31 Weight of motor 2.8 g

Values listed in the table are nominal.

Connection

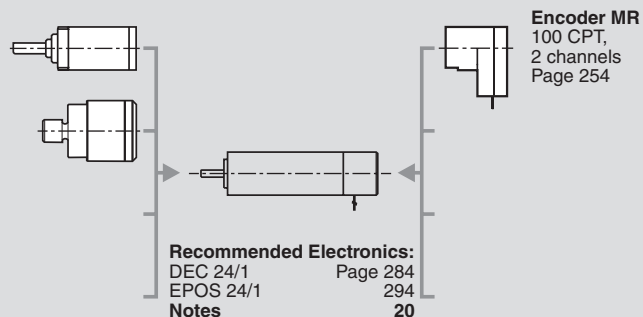
- Pin 1 Motor winding 3
 - Pin 2 Motor winding 2
 - Pin 3 Hall sensor 3
 - Pin 4 V_{Hall} 4.5 ... 12 VDC
 - Pin 5 GND
 - Pin 6 Hall sensor 1
 - Pin 7 Hall sensor 2
 - Pin 8 Motor winding 1
- Connector for Flexprint, MOLEX 52745-0896, FPC, 8 pole, pitch 0.5 mm, top contact style.
Wiring diagram for Hall sensors see page 27

Option

- Sterilisable version

maxon Modular System

- 1 Planetary Gearhead
Ø6 mm
0.002 - 0.03 Nm
Page 211
- Micro Harmonic Drive®
Ø8 mm
0.006 - 0.016 Nm
Page 212

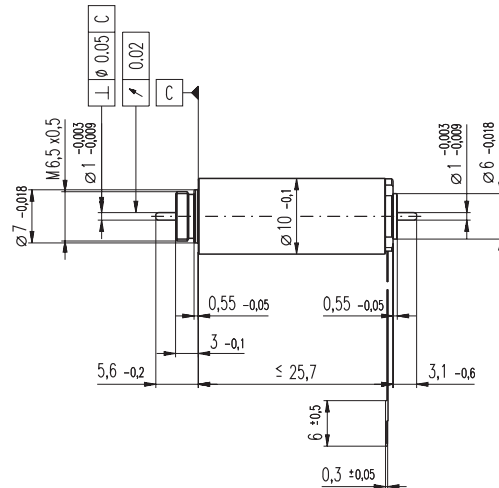
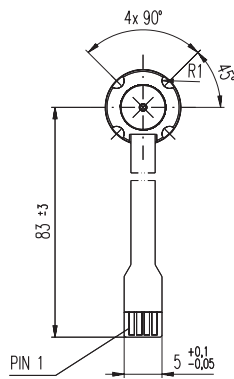
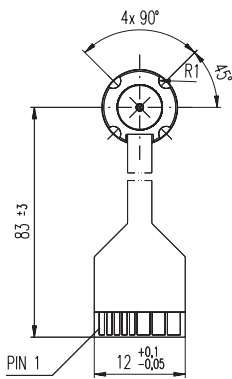


Overview on page 16 - 21

EC 10 \varnothing 10 mm, brushless, 8 Watt

A with Hall sensors

B sensorless



M 1:1

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

Order Number

A with Hall sensors
B sensorless

315170	315171	315172	315173
315174	315175	315176	315177

Motor Data (provisional)

Values at nominal voltage						
1	Nominal voltage	V	9.0	12.0	18.0	24.0
2	No load speed	rpm	80200	76000	86700	82600
3	No load current	mA	181	124	103	71.1
4	Nominal speed	rpm	74300	69900	81400	77200
5	Nominal torque (max. continuous torque)	mNm	1.14	1.2	1.07	1.18
6	Nominal current (max. continuous current)	A	1.24	0.921	0.644	0.495
7	Stall torque	mNm	16.6	16.0	19.0	19.3
8	Starting current	A	15.7	10.7	9.69	7.02
9	Max. efficiency	%	80	80	81	81
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	1.06	1.49	1.96	2.74
13	Speed constant	rpm / V	9020	6410	4870	3480
14	Speed / torque gradient	rpm / mNm	4900	4810	4620	4330
15	Mechanical time constant	ms	3.54	3.48	3.34	3.13
16	Rotor inertia	gcm ²	0.0691	0.0691	0.0691	0.0691

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 45 K / W
 - 18 Thermal resistance winding-housing 2.21 K / W
 - 19 Thermal time constant winding 0.65 s
 - 20 Thermal time constant motor 250 s
 - 21 Ambient temperature -40 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 80000 rpm
 - 24 Axial play at axial load < 0.5 N 0 mm
 - > 0.5 N max. 0.07 mm
 - 25 Radial play preloaded
 - 26 Max. axial load (dynamic) 0.5 N
 - 27 Max. force for press fits (static) 40 N
 - (static, shaft supported) 400 N
 - 28 Max. radial loading, 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

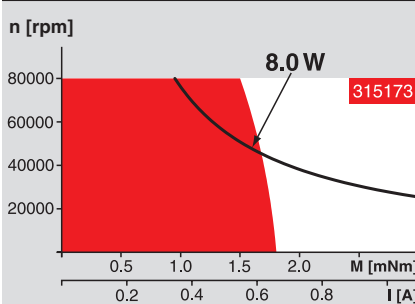
Values listed in the table are nominal.

Connection with Hall sensors	sensorless
Pin 1 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	Order Number	Order Number
see p. 299	220300	220310
Connector	Article number	Article number
TYCO	1-84953-1	84953-4
MOLEX	52207-1185	52207-0485
MOLEX	52089-1119	52089-0419

Pin for design with Hall sensors:
FPC, 11 pole, pitch 1.0 mm, top contact style
Option: Sterilisable version
Encoder MR on request

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.

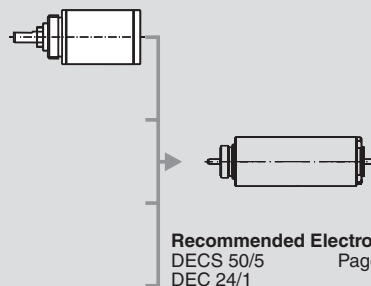
Short term operation
The motor may be briefly overloaded (recurring).

— **Assigned power rating**

maxon Modular System

Overview on page 16 - 21

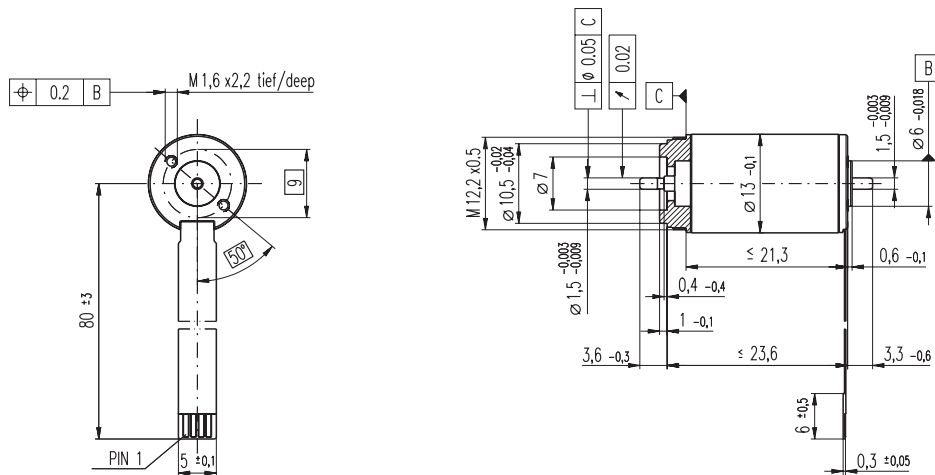
Planetary Gearhead
 \varnothing 10 mm
0.01 - 0.15 Nm
Page 215



Recommended Electronics:

DECS 50/5	Page 284
DEC 24/1	284
DEC 50/5	285
DECV 50/5	286
Notes	20

EC 13 \varnothing 13 mm, brushless, 6 Watt



M 1:1

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

Order Number

305190	305191	305192	305193	305194
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Motor Data (provisional)

		305190	305191	305192	305193	305194
Values at nominal voltage						
1	Nominal voltage	V	6.0	9.0	12.0	18.0
2	No load speed	rpm	28300	30100	27000	27400
3	No load current	mA	194	140	90.5	61.7
4	Nominal speed	rpm	20500	22700	19400	19600
5	Nominal torque (max. continuous torque)	mNm	2.2	2.34	2.3	2.23
6	Nominal current (max. continuous current)	A	1.31	0.973	0.645	0.424
7	Stall torque	mNm	8.30	9.93	8.47	8.13
8	Starting current	A	4.30	3.62	2.09	1.36
9	Max. efficiency	%	63	65	63	62
Characteristics						
10	Terminal resistance phase to phase	Ω	1.40	2.48	5.74	13.2
11	Terminal inductance phase to phase	mH	0.0206	0.0416	0.0910	0.198
12	Torque constant	mNm / A	1.93	2.74	4.05	5.98
13	Speed constant	rpm / V	4950	3480	2360	1600
14	Speed / torque gradient	rpm / mNm	3580	3160	3340	3530
15	Mechanical time constant	ms	6.18	5.46	5.77	6.10
16	Rotor inertia	gcm ²	0.165	0.165	0.165	0.165

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. permissible winding temperature +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 50000 rpm
 - 24 Axial play at axial load < 1 N 0 mm
 - 25 Radial play > 1 N max. 0.05 mm preloaded
 - 26 Max. axial load (dynamic) 1 N
 - 27 Max. force for press fits (static) (static, shaft supported) 40 N
 - 28 Max. radial loading, 5 mm from flange 250 N
- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of phases 3
 - 31 Weight of motor 15 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 N.C.

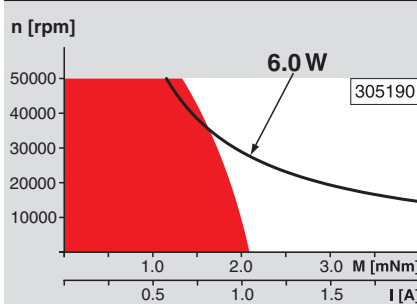
Connector Article number

- TYCO 84953-4
- MOLEX 52207-0485
- MOLEX 52089-0419

Option

- Hall sensors on request
- Encoder MR on request

Operating Range



Comments

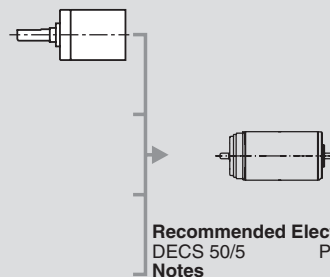
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

maxon Modular System

Overview on page 16 - 21

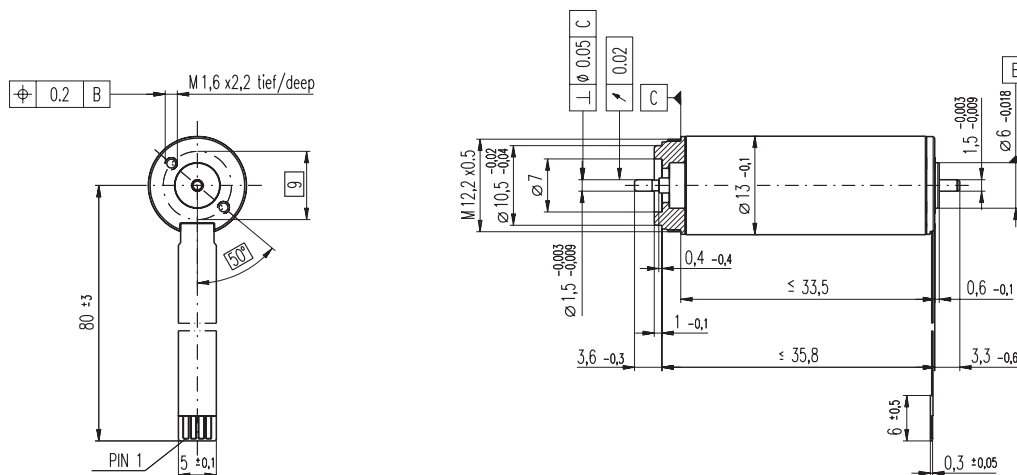
Planetary Gearhead

- \varnothing 13 mm
- 0.2 - 0.35 Nm
- Page 218



Recommended Electronics:
DECS 50/5 Page 284
Notes 20

EC 13 \varnothing 13 mm, brushless, 12 Watt



M 1:1

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

Order Number

305195	305196	305197	305198	305199	305200
--------	--------	--------	--------	--------	--------

Motor Data (provisional)

		305195	305196	305197	305198	305199	305200
Values at nominal voltage							
1	Nominal voltage	V	6.0	9.0	12.0	18.0	24.0
2	No load speed	rpm	25500	25600	25500	26300	25500
3	No load current	mA	229	153	114	79.2	57.2
4	Nominal speed	rpm	20100	20600	20100	21300	20200
5	Nominal torque (max. continuous torque)	mNm	4.73	5.2	4.73	5.11	4.79
6	Nominal current (max. continuous current)	A	2.36	1.71	1.18	0.867	0.595
7	Stall torque	mNm	23.2	27.7	23.2	27.7	23.7
8	Starting current	A	10.5	8.40	5.27	4.32	2.69
9	Max. efficiency	%	73	75	73	75	73
Characteristics							
10	Terminal resistance phase to phase	Ω	0.569	1.07	2.28	4.17	8.93
11	Terminal inductance phase to phase	mH	0.0103	0.0233	0.0413	0.0879	0.165
12	Torque constant	mNm / A	2.20	3.30	4.40	6.42	8.80
13	Speed constant	rpm / V	4340	2890	2170	1490	1090
14	Speed / torque gradient	rpm / mNm	1120	940	1120	966	1100
15	Mechanical time constant	ms	3.82	3.19	3.82	3.29	3.74
16	Rotor inertia	gcm ²	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 0.6 s
 - 20 Thermal time constant motor 263 s
 - 21 Ambient temperature -40 ... +100°C
 - 22 Max. permissible winding temperature +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 50000 rpm
 - 24 Axial play at axial load < 1 N 0 mm
 - 25 Radial play > 1 N max. 0.05 mm preloaded
 - 26 Max. axial load (dynamic) 1 N
 - 27 Max. force for press fits (static) (static, shaft supported) 40 N
 - 28 Max. radial loading, 5 mm from flange 250 N
- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of phases 3
 - 31 Weight of motor 25 g

Connection

- Pin 1 Motor winding 1
- Pin 2 Motor winding 2
- Pin 3 Motor winding 3
- Pin 4 N.C.

Values listed in the table are nominal.

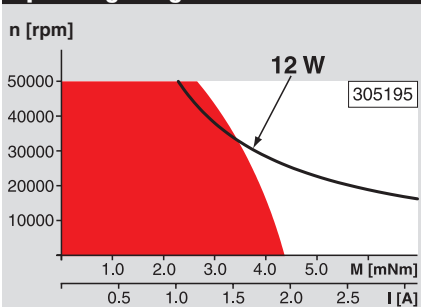
Connector Article number

- TYCO 84953-4
- MOLEX 52207-0485
- MOLEX 52089-0419

Option

- Hall sensors on request
- Encoder MR on request

Operating Range



Comments

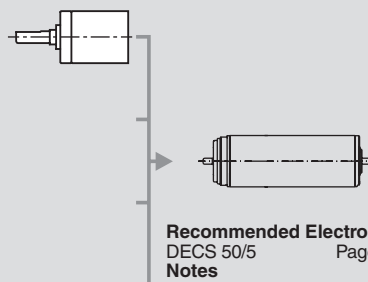
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

maxon Modular System

Overview on page 16 - 21

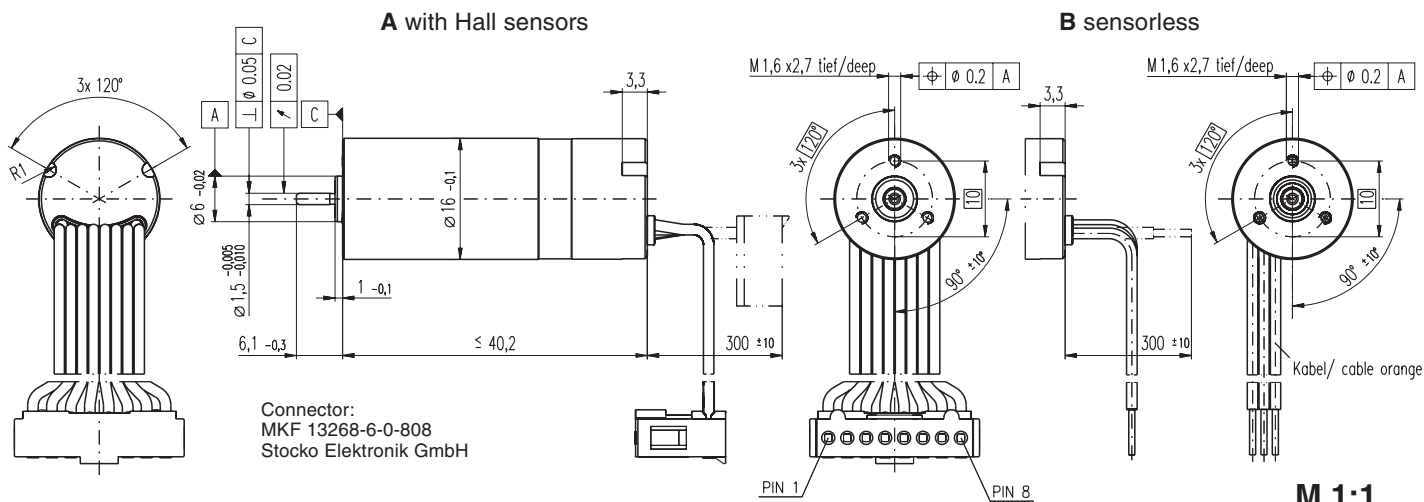
Planetary Gearhead

- \varnothing 13 mm
- 0.2 - 0.35 Nm
- Page 218



Recommended Electronics:
DECS 50/5 Page 284
Notes 20

EC 16 $\varnothing 16$ mm, brushless, 15 Watt



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

Order Number

A with Hall sensors
B sensorless

266521	236918	266519	236917
266523	236922	266522	236921

Motor Data

Values at nominal voltage						
1	Nominal voltage	V	12.0	18.0	24.0	32.0
2	No load speed	rpm	33900	37400	39200	38400
3	No load current	mA	234	179	144	105
4	Nominal speed	rpm	28200	31700	33700	32800
5	Nominal torque (max. continuous torque)	mNm	4.96	4.76	4.89	4.77
6	Nominal current (max. continuous current)	A	1.71	1.22	0.984	0.707
7	Stall torque	mNm	31.2	33.1	36.9	34.4
8	Starting current	A	9.47	7.38	6.47	4.43
9	Max. efficiency	%	72	72	73	72
Characteristics						
10	Terminal resistance phase to phase	Ω	1.27	2.44	3.71	7.22
11	Terminal inductance phase to phase	mH	0.0350	0.0648	0.105	0.194
12	Torque constant	mNm / A	3.30	4.48	5.71	7.77
13	Speed constant	rpm / V	2900	2130	1670	1230
14	Speed / torque gradient	rpm / mNm	1110	1160	1090	1140
15	Mechanical time constant	ms	8.75	9.10	8.53	8.98
16	Rotor inertia	gcm ²	0.750	0.750	0.750	0.750

Specifications

Thermal data			
17	Thermal resistance housing-ambient	15.6 K / W	
18	Thermal resistance winding-housing	1.8 K / W	
19	Thermal time constant winding	1.24 s	
20	Thermal time constant motor	265 s	
21	Ambient temperature	-20 ... +100°C	
22	Max. permissible winding temperature	+125°C	
Mechanical data (preloaded ball bearings)			
23	Max. permissible speed	50000 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)	40 N	
	(static, shaft supported)	250 N	
28	Max. radial loading, 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

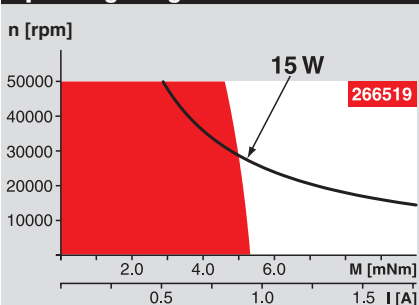
brown	Motor winding 1	Pin 1
red	Motor winding 2	Pin 2
orange	Motor winding 3	Pin 3
yellow	V _{Hall} 4.5 ... 24 VDC	Pin 4
green	GND	Pin 5
blue	Hall sensor 1	Pin 6
violet	Hall sensor 2	Pin 7
grey	Hall sensor 3	Pin 8

Connection B (Cable AWG 24)

brown	Motor winding 1
red	Motor winding 2
orange	Motor winding 3

Wiring diagram for Hall sensors see page 27

Operating Range



Comments

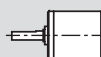
■ **Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— **Assigned power rating**

maxon Modular System

Planetary Gearhead
 $\varnothing 16$ mm
0.1 - 0.3 Nm
Page 224

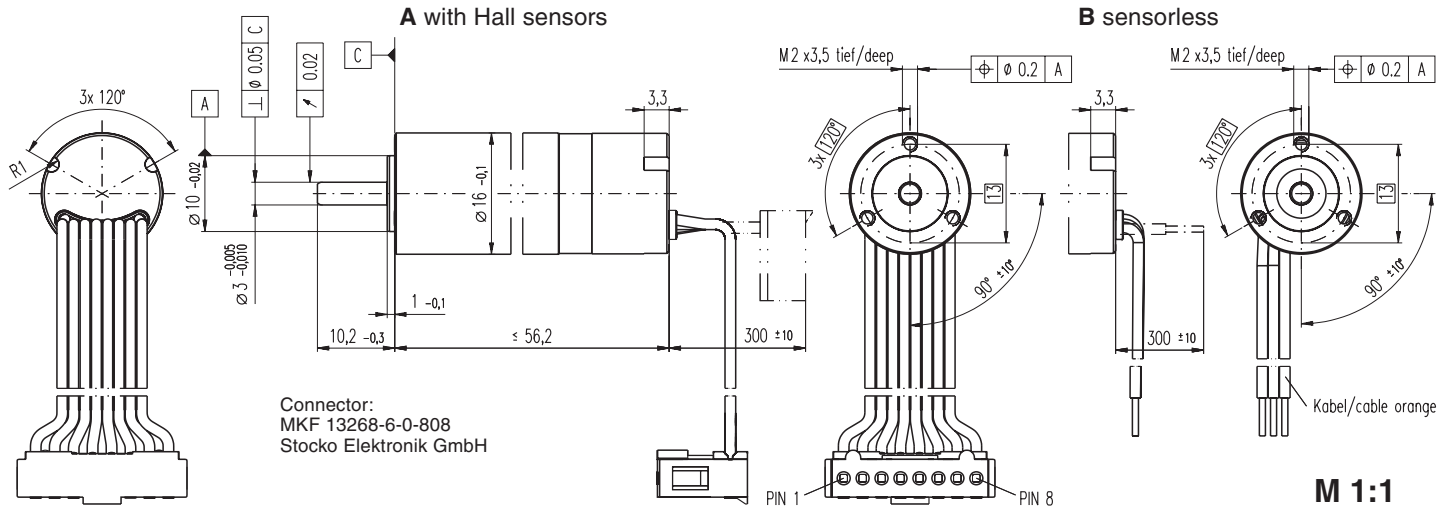


Overview on page 16 - 21

for type A:
Encoder MR
128 / 256 / 512 CPT,
Page 257

Recommended Electronics:	
DECS 50/5	Page 284
DEC 24/1	284
DEC 24/3	285
DEC 50/5	285
DECV 50/5	286
DES 50/5	287
EPOS 24/1	294
Notes	20

EC 16 Ø16 mm, brushless, 40 Watt



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

Order Number

A with Hall sensors
B sensorless

232242	262860	232241	262862
235689	262864	235686	262866

Motor Data

Values at nominal voltage						
1	Nominal voltage	V	12.0	18.0	24.0	32.0
2	No load speed	rpm	35800	40300	41400	41400
3	No load current	mA	358	284	222	166
4	Nominal speed	rpm	32100	36700	37900	37900
5	Nominal torque (max. continuous torque)	mNm	13.3	13.4	13.9	13.8
6	Nominal current (max. continuous current)	A	4.51	3.41	2.71	2.03
7	Stall torque	mNm	141	166	184	183
8	Starting current	A	44.5	39.3	33.5	24.9
9	Max. efficiency	%	83	84	85	85
Characteristics						
10	Terminal resistance phase to phase	Ω	0.269	0.458	0.716	1.28
11	Terminal inductance phase to phase	mH	0.0140	0.0249	0.0420	0.0746
12	Torque constant	mNm / A	3.18	4.23	5.50	7.33
13	Speed constant	rpm / V	3010	2260	1740	1300
14	Speed / torque gradient	rpm / mNm	255	244	226	228
15	Mechanical time constant	ms	3.39	3.25	3.01	3.03
16	Rotor inertia	gcm ²	1.27	1.27	1.27	1.27

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 2.08 s
 - 20 Thermal time constant motor 299 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 50000 rpm
 - 24 Axial play at axial load < 3.5 N 0 mm
 - 24 Axial play at axial load > 3.5 N max. 0.14 mm preloaded
 - 25 Radial play 3 N
 - 26 Max. axial load (dynamic) 40 N
 - 27 Max. force for press fits (static) (static, shaft supported) 250 N
 - 28 Max. radial loading, 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.

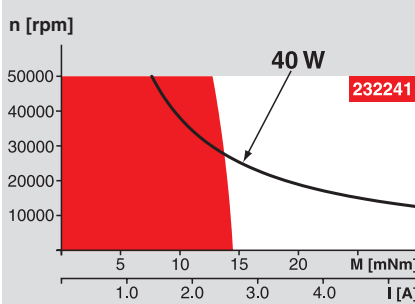
Connection A

- | | | |
|--------|----------------------------------|-------|
| brown | Motor winding 1 | Pin 1 |
| red | Motor winding 2 | Pin 2 |
| orange | Motor winding 3 | Pin 3 |
| yellow | V _{Hall} 4.5 ... 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 |

Connection B (Cable AWG 24)

- | | |
|--------|-----------------|
| brown | Motor winding 1 |
| red | Motor winding 2 |
| orange | Motor winding 3 |
- Wiring diagram for Hall sensors see page 27

Operating Range

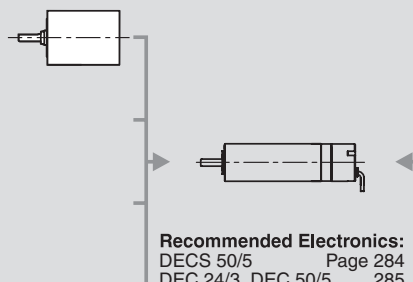


Comments

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

maxon Modular System

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 232

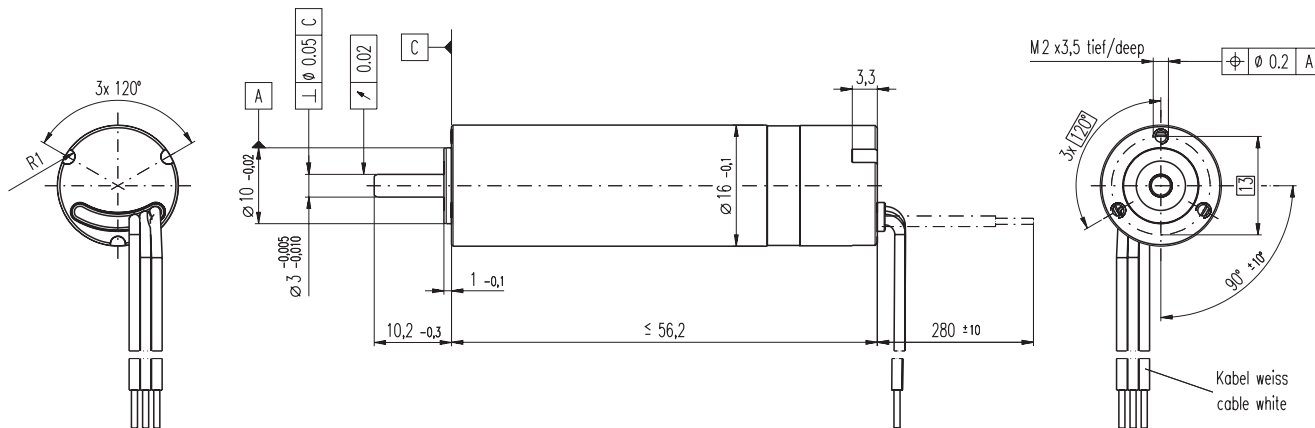


Overview on page 16 - 21

for type A:
Encoder MR
128 / 256 / 512 CPT,
Page 257

- Recommended Electronics:**
- | | |
|--------------------|----------|
| DECS 50/5 | Page 284 |
| DEC 24/3, DEC 50/5 | 285 |
| DECV 50/5 | 286 |
| DES 50/5 | 287 |
| EPOS 24/1 | 294 |
| EPOS 24/5 | 294 |
| EPOS2 50/5 | 295 |
| EPOS P 24/5 | 297 |
| Notes | 20 |

EC 16 \varnothing 16 mm, brushless, 40 Watt, sterilisable



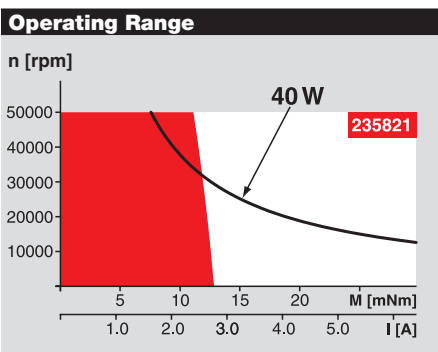
M 1:1

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

Order Number	
235823	235821

Motor Data (provisional)		235823	235821
Values at nominal voltage			
1	Nominal voltage	V	12.0
2	No load speed	rpm	42100
3	No load current	mA	572
4	Nominal speed	rpm	38100
5	Nominal torque (max. continuous torque)	mNm	10.3
6	Nominal current (max. continuous current)	A	4.36
7	Stall torque	mNm	120
8	Starting current	A	44.5
9	Max. efficiency	%	79
Characteristics			
10	Terminal resistance phase to phase	Ω	0.269
11	Terminal inductance phase to phase	mH	0.0140
12	Torque constant	mNm / A	2.68
13	Speed constant	rpm / V	3560
14	Speed / torque gradient	rpm / mNm	357
15	Mechanical time constant	ms	5.12
16	Rotor inertia	gcm ²	1.37

Specifications	
Thermal data	
17	Thermal resistance housing-ambient
18	Thermal resistance winding-housing
19	Thermal time constant winding
20	Thermal time constant motor
21	Ambient temperature
22	Max. permissible winding temperature
Mechanical data (preloaded ball bearings)	
23	Max. permissible speed
24	Axial play at axial load < 3.5 N
	> 3.5 N
25	Radial play
26	Max. axial load (dynamic)
27	Max. force for press fits (static)
	(static, shaft supported)
28	Max. radial loading, 5 mm from flange
Other specifications	
29	Number of pole pairs
30	Number of phases
31	Weight of motor



Comments

Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will 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	Sterilisation information
 Medicine / surgery / chemicals	The motor can be sterilised at least 100 times in autoclave. No need to dismantle.
Hand tools that can be sterilised, such as bone saw, bone drilling and grinding machine	Sterilisation with steam
Dermatological and dental tools	Temperature +134°C ± 4°C
Infusion pumps	Compression pressure up to 2.3 bar
ECG	Rel. humidity 100 %
Therapy aid, analysis and dialysis equipment	Cycle length 20 minutes

Values listed in the table are nominal.

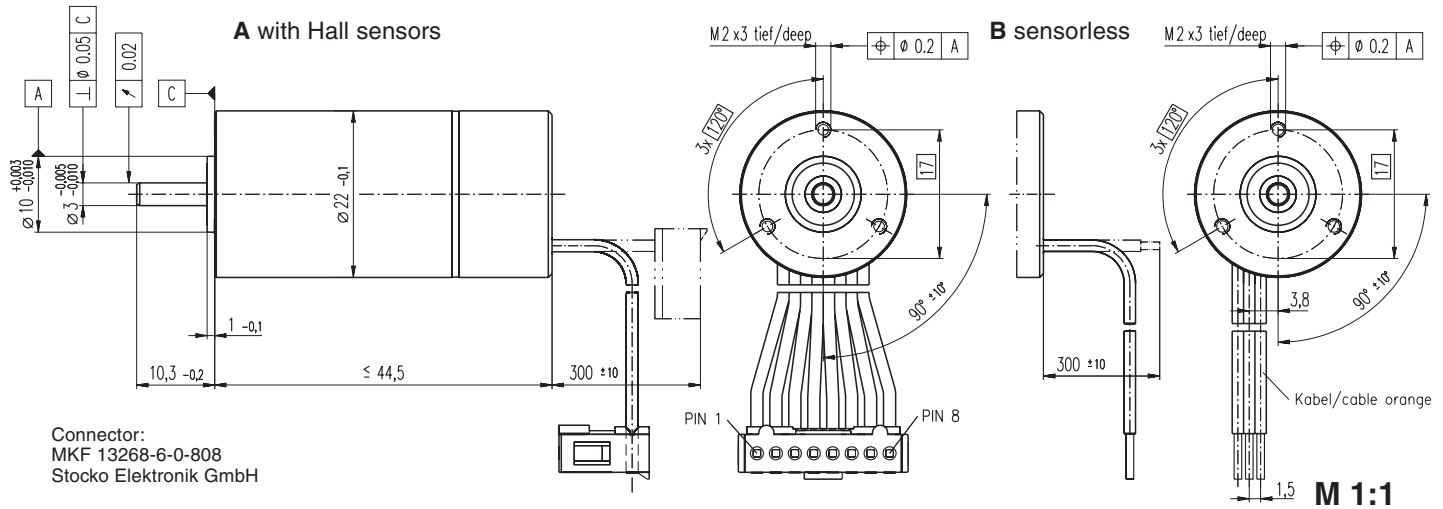
Connection (Cable AWG 22)
 red Motor winding 1
 black Motor winding 2
 white Motor winding 3

maxon-Baukastensystem Overview on page 16 - 21

Planetary Gearhead
 sterilisable
 \varnothing 16 mm
 0.1 - 0.3 Nm
 Page 225

Recommended Electronics:
 DECS 50/5 Page 284
 Notes 20

EC 22 Ø22 mm, brushless, 20 Watt



Connector:
MKF 13268-6-0-808
Stocko Elektronik GmbH

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

Order Number

A with Hall sensors
B sensorless

169007	169008	200685	200118
200859	200857	200860	200858

Motor Data

Values at nominal voltage					
1	Nominal voltage	V	24.0	24.0	24.0
2	No load speed	rpm	35500	20500	16700
3	No load current	mA	168	74.1	55.6
4	Nominal speed	rpm	30900	16500	12700
5	Nominal torque (max. continuous torque)	mNm	15.8	16.9	15.9
6	Nominal current (max. continuous current)	A	2.48	1.51	1.16
7	Stall torque	mNm	195	117	82.7
8	Starting current	A	30.4	10.5	6.08
9	Max. efficiency	%	86	84	82
Characteristics					
10	Terminal resistance phase to phase	Ω	0.789	2.28	3.95
11	Terminal inductance phase to phase	mH	0.071	0.214	0.322
12	Torque constant	mNm / A	6.40	11.1	13.6
13	Speed constant	rpm / V	1490	861	702
14	Speed / torque gradient	rpm / mNm	184	177	204
15	Mechanical time constant	ms	5.78	5.56	6.40
16	Rotor inertia	gcm ²	3.00	3.00	3.00

Specifications

Thermal data	
17	Thermal resistance housing-ambient 10 K / W
18	Thermal resistance winding-housing 2.0 K / W
19	Thermal time constant winding 4.93 s
20	Thermal time constant motor 300 s
21	Ambient temperature -20 ... +100°C
22	Max. permissible winding temperature +125°C
Mechanical data (preloaded ball bearings)	
23	Max. permissible speed ¹⁾ 50000 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) 4 N
27	Max. force for press fits (static) 60 N
	(static, shaft supported) 250 N
28	Max. radial loading, 5 mm from flange 16 N
	1) in combination with encoder MR n _{max} = 37500 rpm
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	V _{Hall} 4.5 ... 18 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

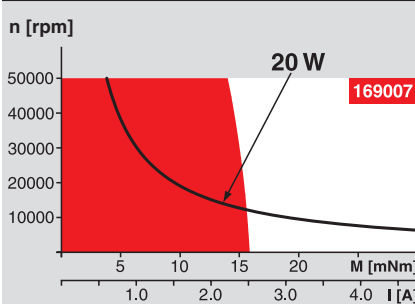
*Internal pull-up (7 ... 13 kΩ) on pin 4

Connection B (Cable AWG 24)

brown	Motor winding 1
red	Motor winding 2
orange	Motor winding 3

Wiring diagram for Hall sensors see page 27

Operating Range



Comments

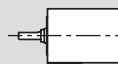
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

maxon Modular System

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 232



Overview on page 16 - 21

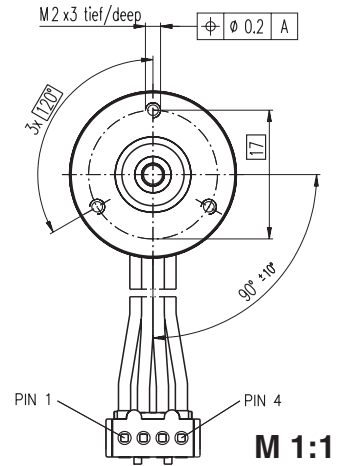
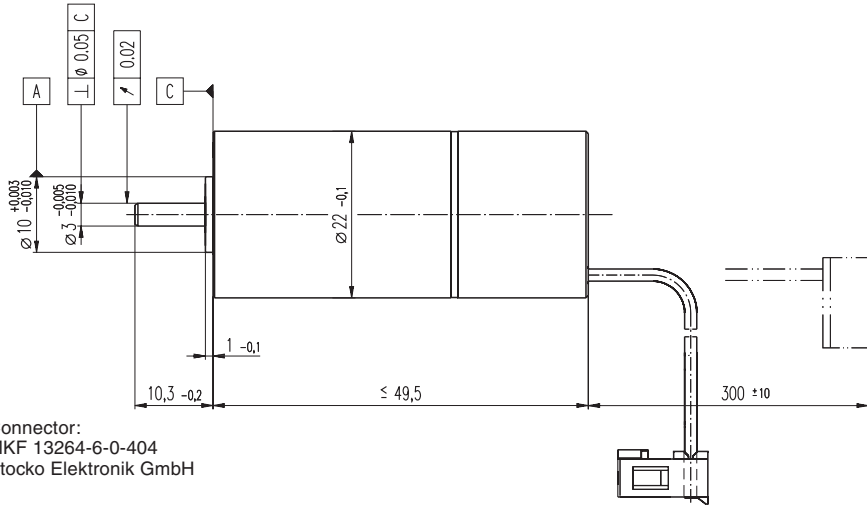
for type A:
Encoder MR
128 / 256 / 512 CPT,
Page 257

for type B:
Resolver Res 26
on request

Recommended Electronics:

DECS 50/5	Page 284
DEC 24/1	284
DEC 24/3, DEC 50/5	285
DECV 50/5	286
DES 50/5	287
EPOS 24/1	294
EPOS 24/5	294
EPOS2 50/5	295
EPOS P 24/5	297
Notes	20

EC 22 Ø22 mm, brushless, 20 Watt, with integrated electronics



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

Order Number

201162	200863	201163	200864
--------	--------	--------	--------

Motor Data

Values at nominal voltage		201162	200863	201163	200864
1	Nominal voltage	V	24.0	24.0	24.0
2	No load speed	rpm	35400	20500	16700
3	No load current	mA	123	57.4	44.0
4	Nominal speed	rpm	32200	16500	12600
5	Nominal torque (max. continuous torque)	mNm	8.22	14.9	15.3
6	Nominal current (max. continuous current)	A	1.36	1.34	1.11
7	Stall torque	mNm	16.0	27.8	34.0
8	Starting current	A	2.50	2.50	2.50
9	Max. efficiency	%	85	85	83
Characteristics					
10	Terminal resistance phase to phase	Ω	n.i.	n.i.	n.i.
11	Terminal inductance phase to phase	mH	n.i.	n.i.	n.i.
12	Torque constant	mNm / A	6.41	11.1	13.6
13	Speed constant	rpm / V	1490	860	701
14	Speed / torque gradient	rpm / mNm	277	207	224
15	Mechanical time constant	ms	8.69	6.52	7.03
16	Rotor inertia	gcm ²	3.00	3.00	3.00

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 10 K / W
 - 18 Thermal resistance winding-housing 2.0 K / W
 - 19 Thermal time constant winding 4.93 s
 - 20 Thermal time constant motor 300 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 50000 rpm
 - 24 Axial play at axial load < 5 N 0 mm
 - 24 Axial play at axial load > 5 N max. 0.14 mm preloaded
 - 25 Radial play preloaded
 - 26 Max. axial load (dynamic) 4 N
 - 27 Max. force for press fits (static) (static, shaft supported) 60 N
 - 27 Max. force for press fits (static) (static, shaft supported) 250 N
 - 28 Max. radial loading, 5 mm from flange 16 N
 - Max. temperature of electronics (max. loading capacity of the motor is defined by the electronics.) +125°C
- 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.

Caution

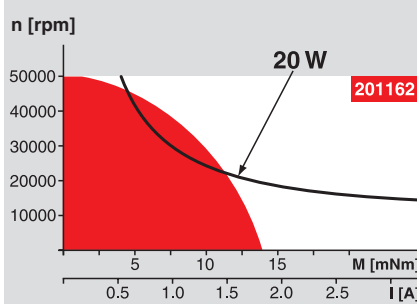
Wrong polarity will destroy the electronics

- ⚠ **Caution:** the direction of rotation (DIR) may only be changed when the motor is at standstill, otherwise the electronics can be damaged.

Connection

green	+V _{CC} 10 ... 50 VDC	Pin 1
blue	GND	Pin 2
violet	Disable	Pin 3
grey	Direction	Pin 4

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.

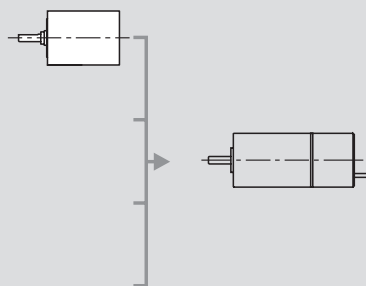
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

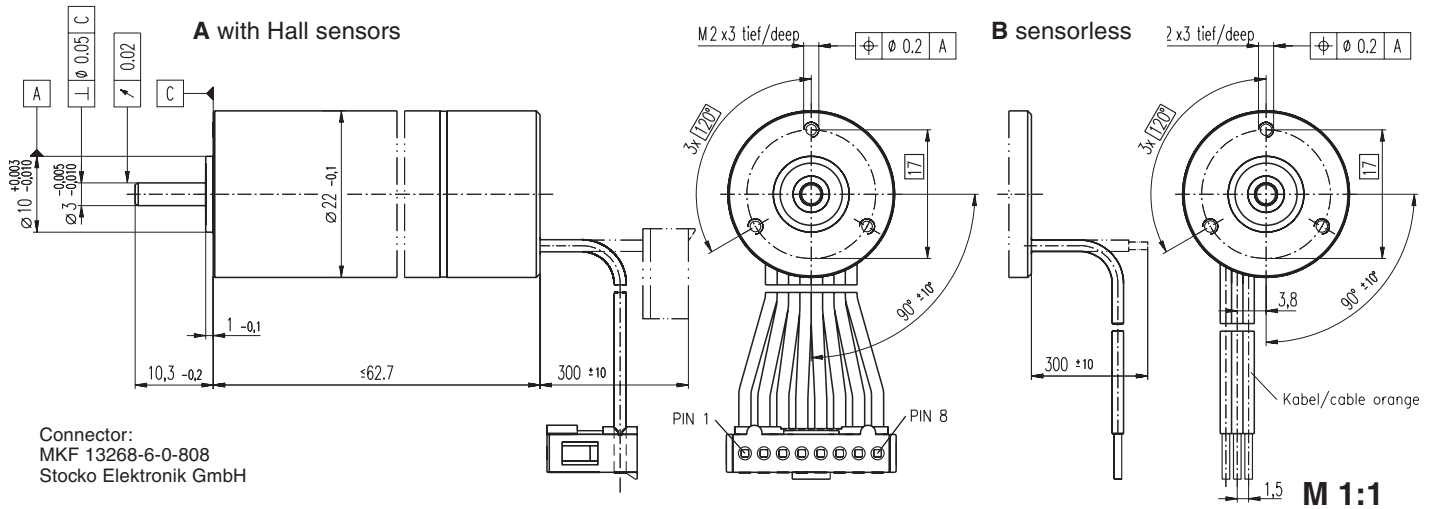
maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 232



EC 22 Ø22 mm, brushless, 50 Watt



Connector:
MKF 13268-6-0-808
Stocko Elektronik GmbH

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

Order Number

A with Hall sensors	167130	167129
B sensorless	201049	201048

Motor Data

Values at nominal voltage			
1	Nominal voltage	V	32.0
2	No load speed	rpm	38700
3	No load current	mA	327
4	Nominal speed	rpm	36600
5	Nominal torque (max. continuous torque)	mNm	30.6
6	Nominal current (max. continuous current)	A	4.16
7	Stall torque	mNm	692
8	Starting current	A	88.2
9	Max. efficiency	%	88
Characteristics			
10	Terminal resistance phase to phase	Ω	0.363
11	Terminal inductance phase to phase	mH	0.0490
12	Torque constant	mNm / A	7.85
13	Speed constant	rpm / V	1220
14	Speed / torque gradient	rpm / mNm	56.2
15	Mechanical time constant	ms	2.47
16	Rotor inertia	gcm ²	4.20

Specifications

Thermal data	
17	Thermal resistance housing-ambient
18	Thermal resistance winding-housing
19	Thermal time constant winding
20	Thermal time constant motor
21	Ambient temperature
22	Max. permissible winding temperature
Mechanical data (preloaded ball bearings)	
23	Max. permissible speed ¹⁾
24	Axial play at axial load < 5 N
25	Radial play
26	Max. axial load (dynamic)
27	Max. force for press fits (static)
28	Max. radial loading, 5 mm from flange
1) in combination with encoder MR n _{max} = 37500 rpm	
Other specifications	
29	Number of pole pairs
30	Number of phases
31	Weight of motor

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} 4.5 ... 18 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

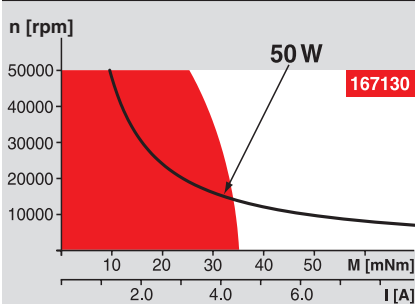
*Internal pull-up (7 ... 13 kΩ) on pin 4

Connection B (Cable AWG 24)

brown	Motor winding 1
red	Motor winding 2
orange	Motor winding 3

Wiring diagram for Hall sensors see page 27

Operating Range



Comments

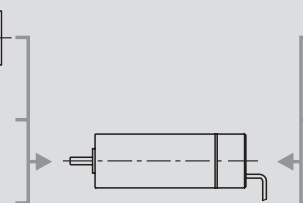
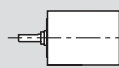
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

maxon Modular System

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 232



Overview on page 16 - 21

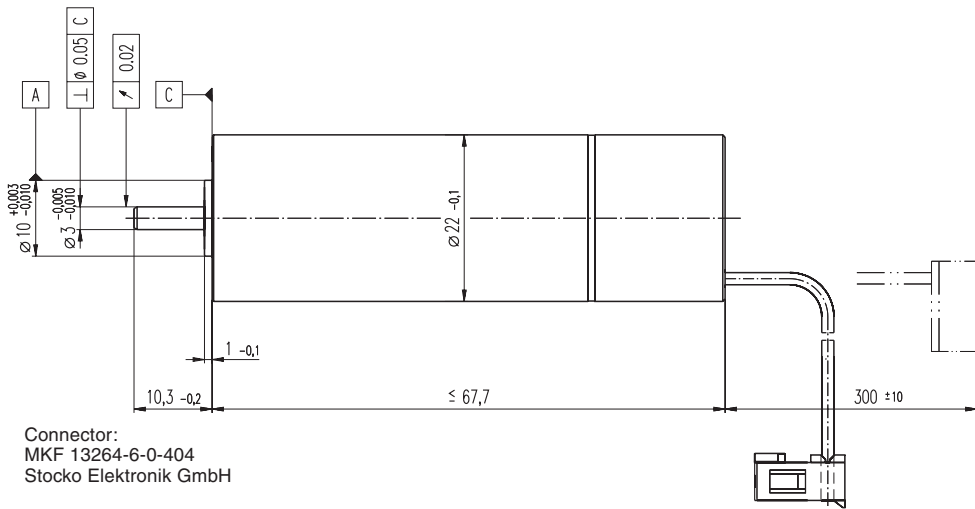
for type A:
Encoder MR
128 / 256 / 512 CPT
Page 257

for type B:
Resolver Res 26
on request

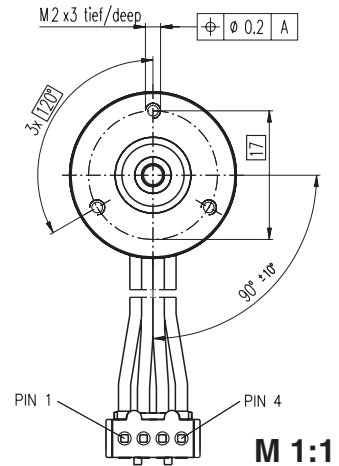
Recommended Electronics:

DECS 50/5	Page 284
DEC 24/3, DEC 50/5	285
DECV 50/5	286
DES 50/5	287
EPOS 24/1	294
EPOS 24/5	294
EPOS2 50/5	295
EPOS P 24/5	297
Notes	20

EC 22 Ø22 mm, brushless, 20 Watt, with integrated electronics



Connector:
MKF 13264-6-0-404
Stocko Elektronik GmbH



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

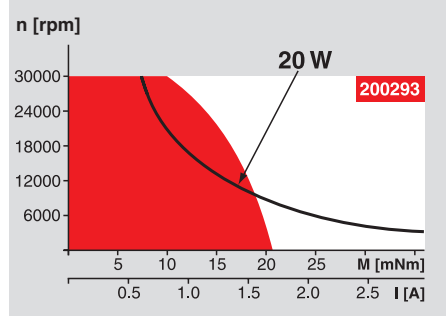
Order Number

201164	200293
--------	--------

Motor Data		201164	200293
Values at nominal voltage			
1	Nominal voltage	V	24.0
2	No load speed	rpm	28900
3	No load current	mA	264
4	Nominal speed	rpm	27800
5	Nominal torque (max. continuous torque)	mNm	8.98
6	Nominal current (max. continuous current)	A	1.39
7	Stall torque	mNm	19.6
8	Starting current	A	2.50
9	Max. efficiency	%	83
Characteristics			
10	Terminal resistance phase to phase	Ω	n.i.
11	Terminal inductance phase to phase	mH	n.i.
12	Torque constant	mNm / A	7.85
13	Speed constant	rpm / V	1220
14	Speed / torque gradient	rpm / mNm	118
15	Mechanical time constant	ms	5.20
16	Rotor inertia	gcm ²	4.20

Specifications	Operating Range	Comments
----------------	-----------------	----------

- Thermal data**
- 17 Thermal resistance housing-ambient 10.5 K / W
 - 18 Thermal resistance winding-housing 1.0 K / W
 - 19 Thermal time constant winding 5.06 s
 - 20 Thermal time constant motor 532 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 30000 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) 4 N
 - 27 Max. force for press fits (static) 60 N
 - (static, shaft supported) 250 N
 - 28 Max. radial loading, 5 mm from flange 16 N
 - Max. temperature of electronics (max. loading capacity of the motor is defined by the electronics.) +125°C
- Other specifications**
- 29 Number of pole pairs 1
 - 30 Number of phases 3
 - 31 Weight of motor 130 g



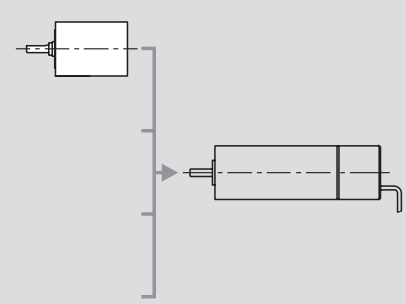
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

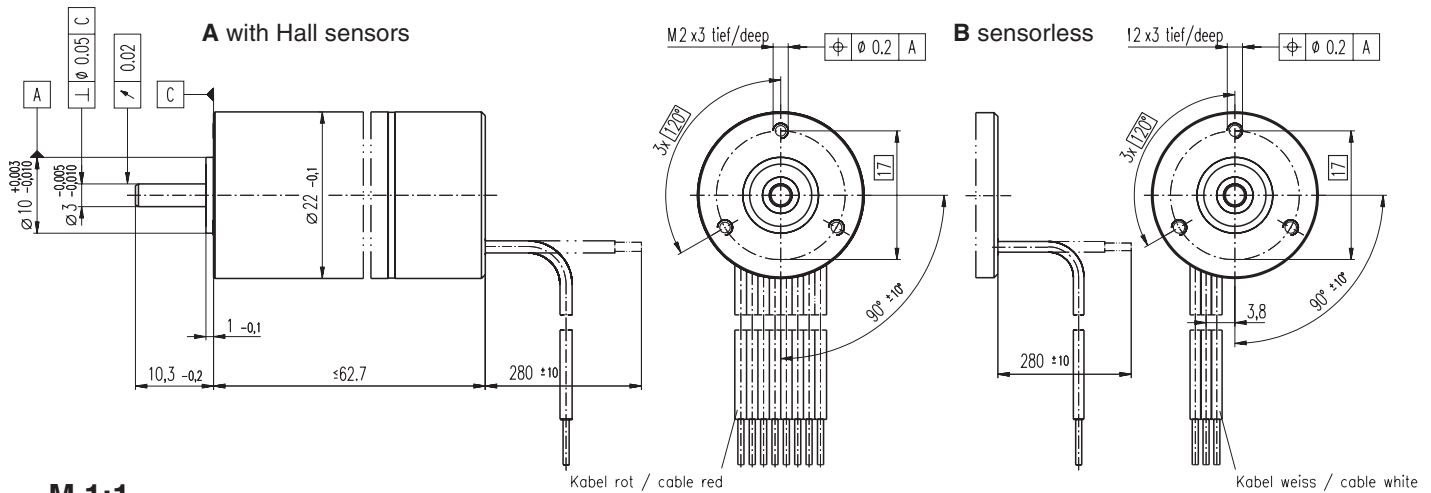
maxon Modular System Overview on page 16 - 21

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 232



- Values listed in the table are nominal.
- Caution**
Wrong polarity will destroy the electronics
- Caution:** the direction of rotation (DIR) may only be changed when the motor is at standstill, otherwise the electronics can be damaged.
- Connection**
- | | | |
|--------|--------------------------------|-------|
| green | +V _{CC} 10 ... 50 VDC | Pin 1 |
| blue | GND | Pin 2 |
| violet | Disable | Pin 3 |
| grey | Direction | Pin 4 |

EC 22 Ø22 mm, brushless, 50 Watt, sterilisable



M 1:1

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

A with Hall sensors
B sensorless

Order Number

266520	264443
275312	254168

Motor Data (provisional)

Values at nominal voltage			
1	Nominal voltage	V	32.0
2	No load speed	rpm	41100
3	No load current	mA	364
4	Nominal speed	rpm	38900
5	Nominal torque (max. continuous torque)	mNm	28.6
6	Nominal current (max. continuous current)	A	4.18
7	Stall torque	mNm	652
8	Starting current	A	88.2
9	Max. efficiency	%	88
Characteristics			
10	Terminal resistance phase to phase	Ω	0.363
11	Terminal inductance phase to phase	mH	0.0490
12	Torque constant	mNm / A	7.39
13	Speed constant	rpm / V	1290
14	Speed / torque gradient	rpm / mNm	63.4
15	Mechanical time constant	ms	3.08
16	Rotor inertia	gcm ²	4.63

Specifications

Thermal data		
17	Thermal resistance housing-ambient	7.0 K / W
18	Thermal resistance winding-housing	1.0 K / W
19	Thermal time constant winding	5.06 s
20	Thermal time constant motor	355 s
21	Ambient temperature	-40 ... +135°C
22	Max. permissible winding temperature	+155°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible speed	50000 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)	4 N
27	Max. force for press fits (static)	60 N
	(static, shaft supported)	250 N
28	Max. radial loading, 5 mm from flange	16 N
Other specifications		
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	130 g

Values listed in the table are nominal.

Connection A, Motor (Cable AWG 22)

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

Connection A, Sensoren (Cable AWG 26)

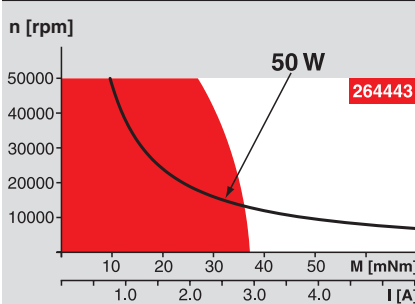
green	V _{Hall} + 5 VDC
blue	GND
red / grey	Hall sensor 1
black / grey	Hall sensor 2
white / grey	Hall sensor 3

Connection B (Cable AWG 22)

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

Wiring diagram for Hall sensors see page 27

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

Medicine / surgery / chemicals

Hand tools that can be sterilised, such as bone saw, bone drilling and grinding machine
Dermatological and dental tools
Infusion pumps
ECG
Therapy aid, analysis and dialysis equipment

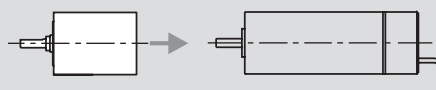
Sterilisation information

The motor can be sterilised at least 100 times in autoclave. No need to dismantle.

Sterilisation with steam	
Temperature	+134°C ± 4°C
Compression pressure up to	2.3 bar
Rel. humidity	100 %
Cycle length	20 minutes

maxon-Baukastensystem

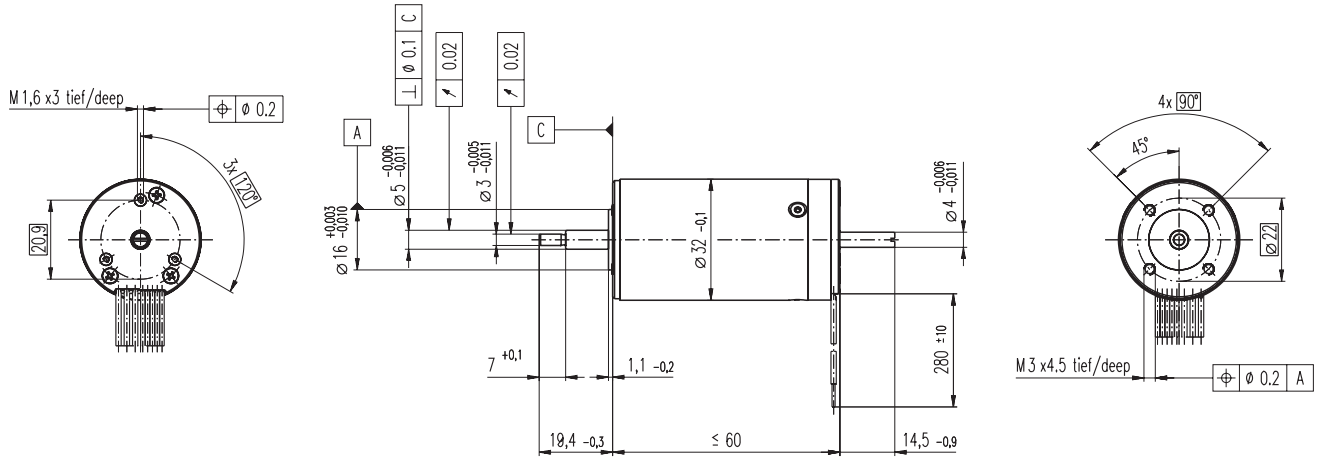
Planetary Gearhead
sterilisable
Ø22 mm
0.5 - 2.0 Nm
Page 233



Übersicht Seite 16 - 21

Recommended Electronics:	
DECS 50/5	Page 284
DEC 24/3	285
DEC 50/5	285
DECV 50/5	286
Notes	20

EC 32 \varnothing 32 mm, brushless, 80 Watt, CE approved



M 1:2

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

Order Number

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

Motor Data

Values at nominal voltage		118891	118892	118888	118889	118893	118890	
1	Nominal voltage	V	12.0	18.0	18.0	24.0	36.0	48.0
2	No load speed	rpm	15000	14300	13000	11000	14700	11300
3	No load current	mA	901	555	487	286	289	148
4	Nominal speed	rpm	13600	12800	11600	9510	13200	9790
5	Nominal torque (max. continuous torque)	mNm	37.5	40.1	41.2	43.6	39.7	42.6
6	Nominal current (max. continuous current)	A	5.82	3.88	3.61	2.37	1.98	1.19
7	Stall torque	mNm	428	443	407	355	454	353
8	Starting current	A	57.2	37.4	31.4	17.3	19.7	8.84
9	Max. efficiency	%	77.0	77.6	77.1	76.4	77.7	76.2
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	13.0	20.5	23.1	40.0
13	Speed constant	rpm / V	1280	806	737	465	414	239
14	Speed / torque gradient	rpm / mNm	35.8	32.7	32.6	31.5	32.8	32.5
15	Mechanical time constant	ms	7.49	6.86	6.82	6.59	6.87	6.8
16	Rotor inertia	gcm ²	20.0	20.0	20.0	20.0	20.0	20.0

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 15.4 s
 - 20 Thermal time constant motor 1180 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 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) 110 N
 - (static, shaft supported) 1200 N
 - 28 Max. radial loading, 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

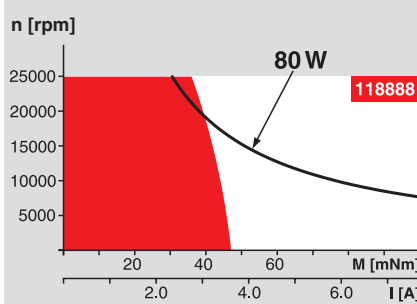
- Connection Sensoren** (Cable AWG 26)¹⁾

- 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 page 27

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

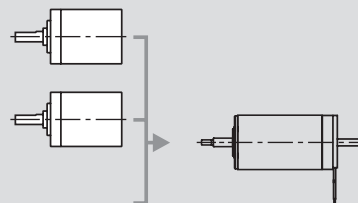
Overview on page 16 - 21

Planetary Gearhead

\varnothing 32 mm
0.75 - 4.5 Nm
Page 239

Planetary Gearhead

\varnothing 32 mm
1.0 - 6.0 Nm
Page 241



Recommended Electronics:

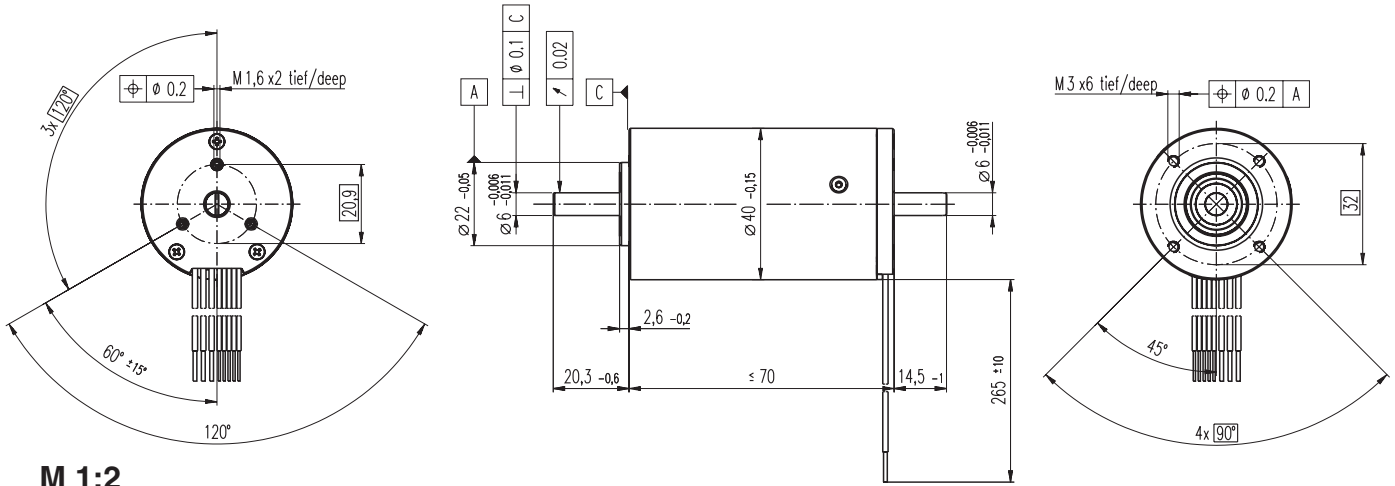
DECS 50/5	Page 284
DEC 50/5	285
DECV 50/5	286
DEC 70/10	286
DES 50/5	287
EPOS 24/5	294
EPOS 70/10	295
EPOS2 50/5	295
EPOS P 24/5	297
Notes	20

Encoder HEDS 5540
500 CPT,
3 channels
Page 263

Encoder HEDL 5540
500 CPT,
3 channels
Page 265

Resolver Res 26
 \varnothing 26 mm
10 V
Page 272

EC 40 Ø40 mm, brushless, 120 Watt, CE approved



M 1:2

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

Order Number

167176	167177	118894	118895	167178	167179	118896	118897	167180	118898	167181	167183	118899	118901
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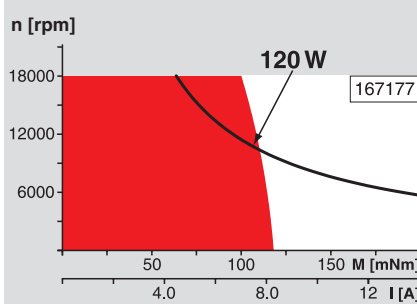
Motor Data

Values at nominal voltage		167176	167177	118894	118895	167178	167179	118896	118897	167180	118898	167181	167183	118899	118901
1	Nominal voltage	V	12.0	18.0	21.0	30.0	24.0	36.0	42.0	48.0	48.0	48.0	48.0	48.0	48.0
2	No load speed	rpm	10300	12000	10400	11600	10300	9830	10400	7560	10300	5930	5420	3530	2020
3	No load current	mA	886	754	515	426	443	275	258	139	222	97.8	86.2	48.6	24.4
4	Nominal speed	rpm	9050	10900	9240	10500	9160	8710	9290	6450	9190	4830	4290	2400	893
5	Nominal torque (max. continuous torque)	mNm	107	113	116	120	120	123	122	127	123	130	126	127	129
6	Nominal current (max. continuous current)	A	10.4	8.62	6.46	5.24	5.78	3.76	3.40	2.22	2.96	1.77	1.57	1.03	0.599
7	Stall torque	mNm	985	1340	1150	1420	1210	1200	1280	940	1270	743	639	410	237
8	Starting current	A	89.2	94.4	60.1	57.9	55.0	34.6	33.5	15.7	28.8	9.72	7.65	3.21	1.07
9	Max. efficiency	%	81	83	83	84	83	84	82	84	81	80	77	76	72
Characteristics															
10	Terminal resistance phase to phase	Ω	0.134	0.191	0.349	0.518	0.436	1.04	1.25	3.07	1.66	4.94	6.28	14.9	44.8
11	Terminal inductance phase to phase	mH	0.0266	0.0439	0.0797	0.132	0.106	0.263	0.319	0.788	0.425	1.28	1.52	3.56	10.7
12	Torque constant	mNm / A	11.0	14.2	19.1	24.6	22.1	34.7	38.2	60.1	44.1	76.4	83.5	128	221
13	Speed constant	rpm / V	865	673	500	389	433	275	250	159	216	125	114	74.8	43.2
14	Speed / torque gradient	rpm / mNm	10.5	9.05	9.13	8.20	8.55	8.26	8.20	8.12	8.16	8.07	8.59	8.76	8.75
15	Mechanical time constant	ms	9.39	8.06	8.13	7.30	7.61	7.35	7.30	7.22	7.26	7.18	7.64	7.79	7.78
16	Rotor inertia	gcm ²	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 3.2 K / W
 - 18 Thermal resistance winding-housing 1.2 K / W
 - 19 Thermal time constant winding 17.1 s
 - 20 Thermal time constant motor 1050 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 18000 rpm
 - 24 Axial play at axial load < 8 N 0 mm
 - 25 Radial play > 8 N max. 0.14 mm preloaded
 - 26 Max. axial load (dynamic) 10 N
 - 27 Max. force for press fits (static) (static, shaft supported) 170 N
 - 28 Max. radial loading, 5 mm from flange 5000 N
 - 29 Max. radial loading, 5 mm from flange 70 N

Operating Range



Comments

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

Other specifications

- 29 Number of pole pairs 1
- 30 Number of phases 3
- 31 Weight of motor 390 g

Values listed in the table are nominal.
Explanation of the figures on page 151.

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 page 27

¹⁾ Not lead through in combination with resolver.

maxon Modular System

Planetary Gearhead
Ø42 mm
3 - 15 Nm
Page 244

Planetary Gearhead
Ø52 mm
4 - 30 Nm
Page 247

Encoder HEDS 5540
500 CPT,
3 channels
Page 263

Encoder HEDL 5540
500 CPT,
3 channels
Page 265

Resolver Res 26
Ø26 mm
10 V
Page 272

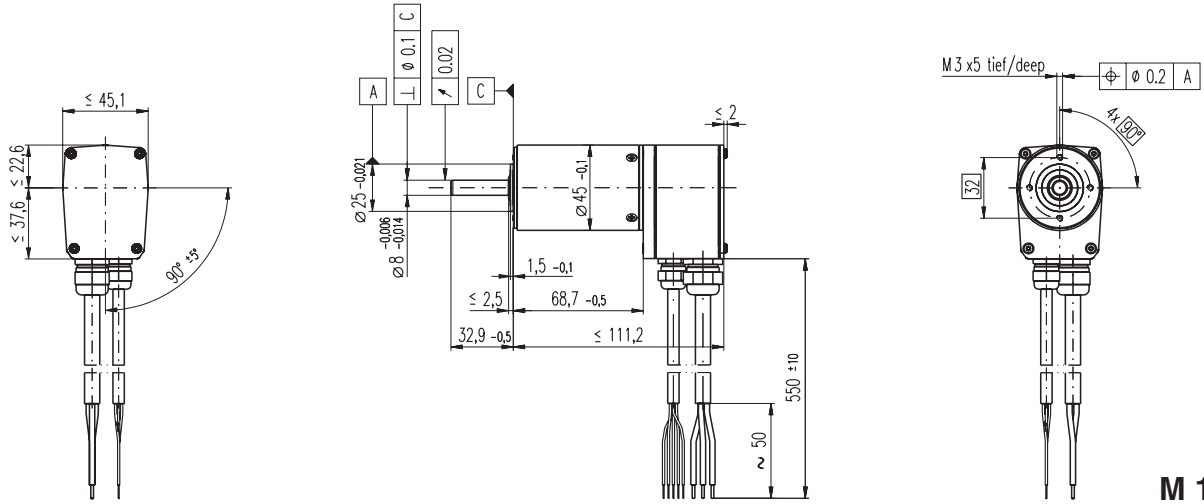
Brake AB 28
Ø40 mm
24 VDC, 0.4 Nm
Page 308

Recommended Electronics:

DECS 50/5	Page 284
DEC 50/5	285
DECV 50/5	286
DEC 70/10	286
DES 50/5	287
DES 70/10	287
EPOS 24/5	294
EPOS 70/10	295
EPOS2 50/5	295
EPOS P 24/5	297
Notes	20

Overview on page 16 - 21

EC 45 Ø45 mm, brushless, 150 Watt, CE approved



M 1:4

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

Order Number

136202	136196	136203	136197	136204	136198	136205	136200	136206	136201
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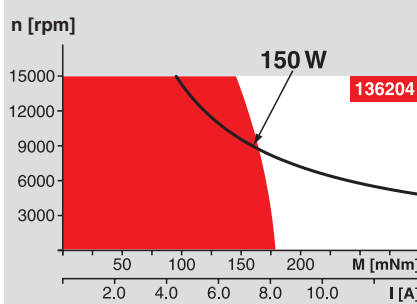
Motor Data

Values at nominal voltage		136202	136196	136203	136197	136204	136198	136205	136200	136206	136201
1	Nominal voltage	V	12.0	12.0	18.0	18.0	24.0	24.0	36.0	36.0	48.0
2	No load speed	rpm	9770	5630	10300	5920	10500	6070	9340	5380	10100
3	No load current	mA	1860	722	1350	522	1060	409	572	223	496
4	Nominal speed	rpm	8610	4430	9100	4710	9360	4860	8180	4200	8980
5	Nominal torque (max. continuous torque)	mNm	168	182	165	181	163	179	174	188	168
6	Nominal current (max. continuous current)	A	16.0	9.61	11.1	6.69	8.45	5.10	5.24	3.13	4.16
7	Stall torque	mNm	1590	916	1650	955	1670	965	1590	916	1670
8	Starting current	A	138	45.8	100	33.4	78.0	26.0	43.8	14.6	37.6
9	Max. efficiency	%	79	77	79	77	79	77	79	77	79
Characteristics											
10	Terminal resistance phase to phase	Ω	0.0873	0.262	0.180	0.539	0.308	0.923	0.823	2.47	1.28
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
12	Torque constant	mNm / A	11.5	20.0	16.5	28.6	21.4	37.1	36.3	62.8	44.5
13	Speed constant	rpm / V	827	478	579	334	445	257	263	152	214
14	Speed / torque gradient	rpm / mNm	6.25	6.25	6.30	6.30	6.39	6.39	5.97	5.97	6.16
15	Mechanical time constant	ms	7.79	7.79	7.86	7.86	7.97	7.97	7.44	7.44	7.67
16	Rotor inertia	gcm ²	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 s
 - 20 Thermal time constant motor 1600 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible 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) 20 N
 - 27 Max. force for press fits (static) 170 N
 - (static, shaft supported) 5000 N
 - 28 Max. radial loading, 5 mm from flange 140 N

Operating Range



Comments

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

Other specifications

- 29 Number of pole pairs 1
- 30 Number of phases 3
- 31 Weight of motor 850 g
- Protection to IP54

Values listed in the table are nominal.

Connection Motor (Cable AWG 16)

- Cable 1 Motor winding 1
- Cable 2 Motor winding 2
- Cable 3 Motor winding 3

Connection Sensoren (Cable AWG 24)

- white Hall sensor 3
- braun Hall sensor 2
- green Hall sensor 1
- gelb GND
- grey V_{Hall} 4.5 ... 24 VDC

Wiring diagram for Hall sensors see page 27

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,
- Motor connection with plug

maxon Modular System

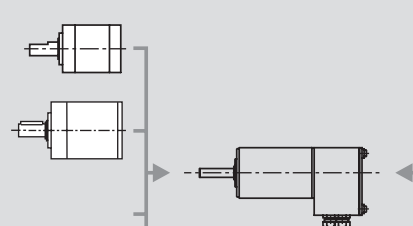
Overview on page 16 - 21

Planetary Gearhead

- Ø42 mm
- 3 - 15 Nm
- Page 244

Planetary Gearhead

- Ø52 mm
- 4 - 30 Nm
- Page 247



Recommended Electronics:

- DECS 50/5 Page 284
- DEC 50/5 285
- DECV 50/5 286
- DEC 70/10 286
- DES 50/5 287
- DES 70/10 287
- EPOS 70/10 295
- EPOS2 50/5 295
- Notes 20

Encoder HEDL 9140

- 500 CPT,
- 3 channels
- Page 267

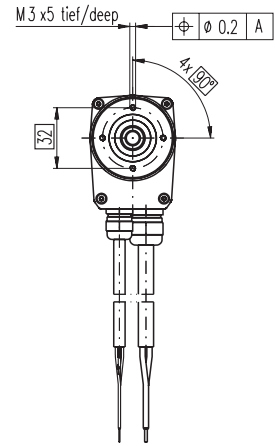
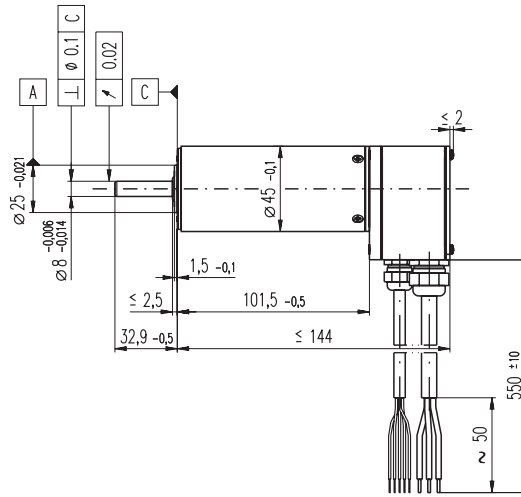
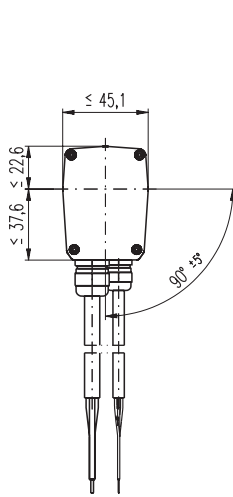
Resolver Res 26

- Ø26 mm
- 10 V
- Page 272

Brake AB 28

- Ø28 mm, 24 VDC
- 0.4 Nm
- Page 309

EC 45 Ø45 mm, brushless, 250 Watt, CE approved



M 1:4

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

Order Number

136210	136207	136211	136208	136212	136209
--------	--------	--------	--------	--------	--------

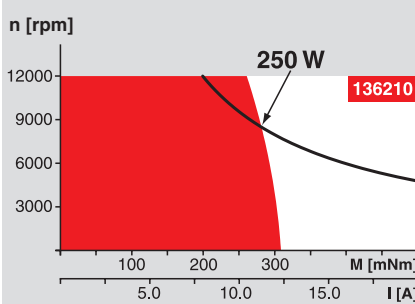
Motor Data

Values at nominal voltage			136210	136207	136211	136208	136212	136209
1	Nominal voltage	V	24.0	24.0	36.0	36.0	48.0	48.0
2	No load speed	rpm	9090	5250	10900	6300	11200	6460
3	No load current	mA	1140	435	1060	397	830	311
4	Nominal speed	rpm	8380	4520	10200	5590	10500	5760
5	Nominal torque (max. continuous torque)	mNm	285	310	283	318	280	316
6	Nominal current (max. continuous current)	A	12.3	7.47	9.95	6.16	7.59	4.72
7	Stall torque	mNm	4180	2420	5470	3160	5580	3220
8	Starting current	A	167	55.8	175	58.3	137	45.8
9	Max. efficiency	%	85	84	85	85	85	85
Characteristics								
10	Terminal resistance phase to phase	Ω	0.143	0.430	0.206	0.617	0.350	1.05
11	Terminal inductance phase to phase	mH	0.0565	0.170	0.0883	0.265	0.149	0.448
12	Torque constant	mNm / A	25.0	43.3	31.2	54.1	40.6	70.4
13	Speed constant	rpm / V	382	221	306	176	235	136
14	Speed / torque gradient	rpm / mNm	2.19	2.19	2.01	2.01	2.02	2.02
15	Mechanical time constant	ms	4.80	4.80	4.40	4.40	4.43	4.43
16	Rotor inertia	gcm ²	209	209	209	209	209	209

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 1.7 K / W
 - 18 Thermal resistance winding-housing 1.1 K / W
 - 19 Thermal time constant winding 30.8 s
 - 20 Thermal time constant motor 1570 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed 12000 rpm
 - 24 Axial play at axial load < 20 N 0 mm
 - 24 Axial play at axial load > 20 N max. 0.14 mm
 - 25 Radial play preloaded
 - 26 Max. axial load (dynamic) 20 N
 - 27 Max. force for press fits (static) 170 N
 - 27 Max. force for press fits (static) (static, shaft supported) 5000 N
 - 28 Max. radial loading, 5 mm from flange 180 N

Operating Range



Comments

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

Other specifications

- 29 Number of pole pairs 1
- 30 Number of phases 3
- 31 Weight of motor 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 Sensoren (Cable AWG 24)

- white Hall sensor 3
- braun Hall sensor 2
- green Hall sensor 1
- gelb GND
- grey V_{Hall} 4.5 ... 24 VDC

Wiring diagram for Hall sensors see page 27

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
- motor connection with plug

maxon Modular System

Overview on page 16 - 21

Planetary Gearhead

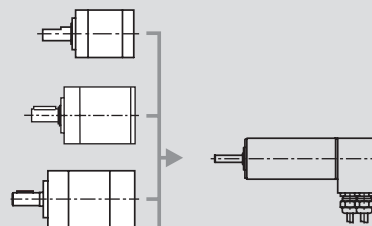
- Ø42 mm
- 3 - 15 Nm
- Page 245

Planetary Gearhead

- Ø52 mm
- 4 - 30 Nm
- Page 247

Planetary Gearhead

- Ø62 mm
- 8 - 50 Nm
- Page 249



Recommended Electronics:

- DECS 50/5 Page 284
- DEC 50/5 285
- DEC 70/10 286
- DES 50/5 287
- DES 70/10 287
- EPOS 70/10 295
- EPOS2 50/5 295
- Notes 20

Encoder HEDL 9140

- 500 CPT,
- 3 channels
- Page 267

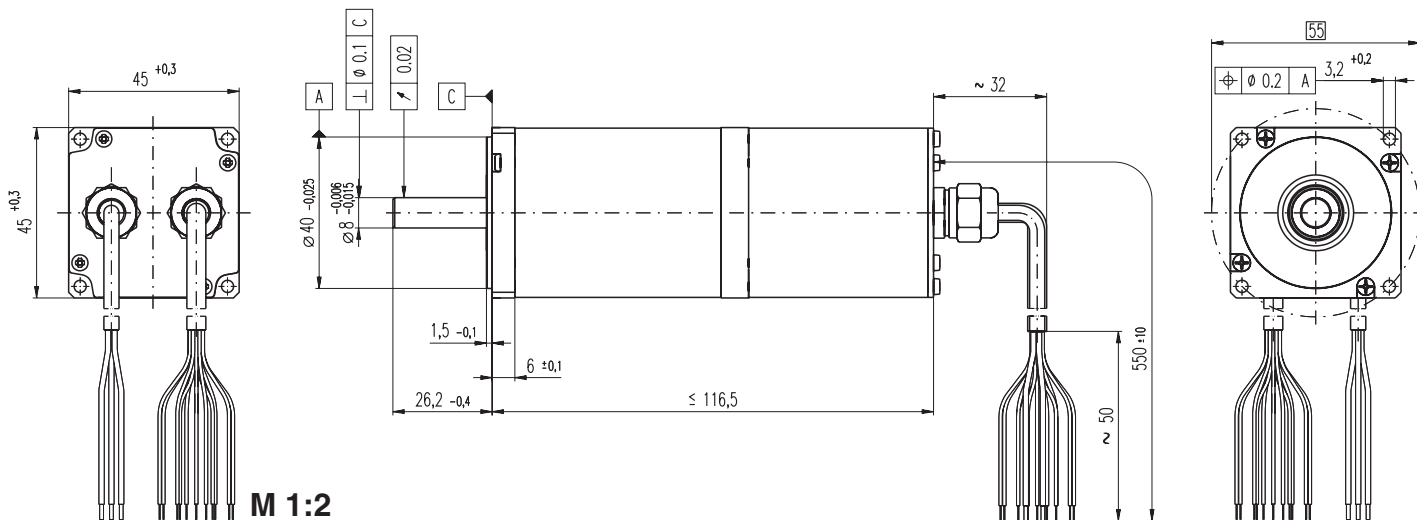
Resolver Res 26

- Ø28 mm
- 10 V
- Page 272

Brake AB 28

- Ø28 mm, 24 VDC
- 0.4 Nm
- Page 309

EC 45 4-pol □45 mm, brushless, 200 Watt, CE approved



M 1:2

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

Order Number

	with encoder	266052	252463	252464
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Motor Data (provisional)

Values at nominal voltage				
1	Nominal voltage	V	48.0	48.0
2	No load speed	rpm	8730	6120
3	No load current	mA	473	261
4	Nominal speed	rpm	8150	5580
5	Nominal torque (max. continuous torque)	mNm	237	297
6	Nominal current (max. continuous current)	A	4.93	4.16
7	Stall torque	mNm	4420	4070
8	Starting current	A	84.8	54.7
9	Max. efficiency	%	86	87

Characteristics

10	Terminal resistance phase to phase	Ω	0.566	0.878
11	Terminal inductance phase to phase	mH	0.172	0.350
12	Torque constant	mNm / A	52.2	74.5
13	Speed constant	rpm / V	183	128
14	Speed / torque gradient	rpm / mNm	1.99	1.51
15	Mechanical time constant	ms	4.16	3.16
16	Rotor inertia	gcm ²	200	200

Specifications

Thermal data		
17	Thermal resistance housing-ambient	3.1 K / W
18	Thermal resistance winding-housing	1.0 K / W
19	Thermal time constant winding	31.8 s
20	Thermal time constant motor	1550 s
21	Ambient temperature	-10 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible speed	10000 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)	20 N
27	Max. force for press fits (static) (static, shaft supported)	170 N
		5000 N
28	Max. radial loading, 5 mm from flange	140 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	1000 g
	Protection to	IP54

Values listed in the table are nominal.

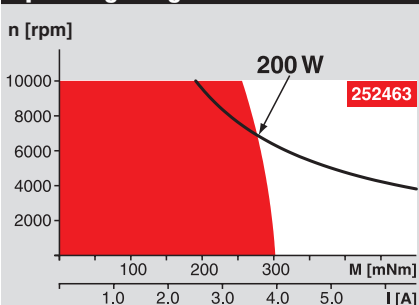
Connection Motor (Cable AWG 18)

Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

Option

Temperature monitoring, PTC resistance
R 20°C < 0.3 kΩ
R 130°C = 7.0 ... 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

Integrated encoder R35i

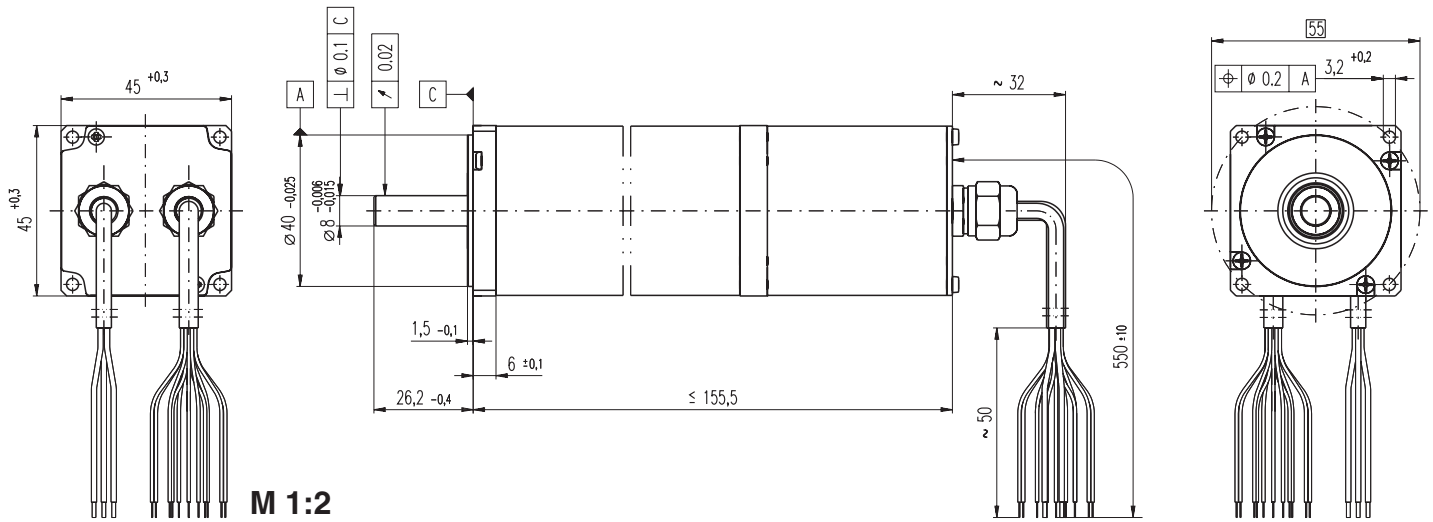
Connection Encoder (Cable AWG 26)		
green	(Pin 1)	Channel A
yellow	(Pin 2)	Channel A
red	(Pin 3)	Channel B
blue	(Pin 4)	Channel B
pink	(Pin 5)	Channel I (Index)
grey	(Pin 6)	Channel I (Index)
violet	(Pin 7)	Commutation signal S 1
red/blue	(Pin 8)	GND 2
black	(Pin 9)	Commutation signal S 2
white/green	(Pin 10)	V _{CC} 2
grey/pink	(Pin 11)	Commutation signal S 3
	(Pin 12)	n.c.
white	(Pin 13)	V _{CC} 1
brown	(Pin 14)	GND 1

Counts per turn	2048
Number of channels	3
Max. operating frequency (kHz)	200
Supply voltage	5 V ± 5 %
Output signal	RS 422
Phase shift Φ (nominal)	90°e
Logic state width s	min. 45°e
Index pulse width (nominal)	360°e
Operating temperature range	-10 ... +100°C
Moment of inertia	≤ 3.11 gcm ²

Recommended Electronics:

DECS 50/5	Page 284
DEC 50/5	285
DEC 70/10	286
DES 50/5	287
DES 70/10	287
EPOS 70/10	295
EPOS2 50/5	295
Notes	20

EC 45 4-pol □45 mm, brushless, 300 Watt, CE approved



maxon EC motor

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

Order Number

with encoder 283150

Motor Data (provisional)

Values at nominal voltage		
1	Nominal voltage	V 48.0
2	No load speed	rpm 4010
3	No load current	mA 193
4	Nominal speed	rpm 3580
5	Nominal torque (max. continuous torque)	mNm 635
6	Nominal current (max. continuous current)	A 5.61
7	Stall torque	mNm 7690
8	Starting current	A 67.6
9	Max. efficiency	% 90
Characteristics		
10	Terminal resistance phase to phase	Ω 0.710
11	Terminal inductance phase to phase	mH 0.677
12	Torque constant	mNm / A 114
13	Speed constant	rpm / V 84.0
14	Speed / torque gradient	rpm / mNm 0.524
15	Mechanical time constant	ms 2.02
16	Rotor inertia	gcm ² 368

Specifications

Thermal data	
17	Thermal resistance housing-ambient 1.97 K / W
18	Thermal resistance winding-housing 0.718 K / W
19	Thermal time constant winding 34.3 s
20	Thermal time constant motor 1600 s
21	Ambient temperature -10 ... +100°C
22	Max. permissible winding temperature +125°C
Mechanical data (preloaded ball bearings)	
23	Max. permissible speed 10000 rpm
24	Axial play at axial load < 20 N 0 mm
	> 20 N max. 0.14 mm preloaded
25	Radial play preloaded
26	Max. axial load (dynamic) 20 N
27	Max. force for press fits (static) (static, shaft supported) 170 N
28	Max. radial loading, 5 mm from flange 5000 N
	140 N

Other specifications

29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	1130 g
	Protection to	IP54

Values listed in the table are nominal.

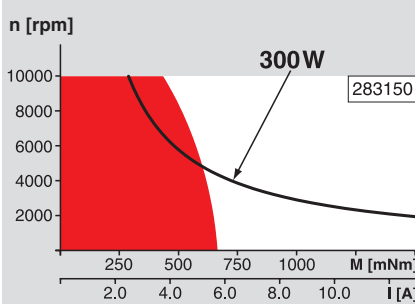
Connection Motor (Cable AWG 18)

Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

Optionen

Temperature monitoring, PTC resistance	R 20°C < 0.3 kΩ
	R 130°C = 7.0 ... 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

Integrated encoder R35i

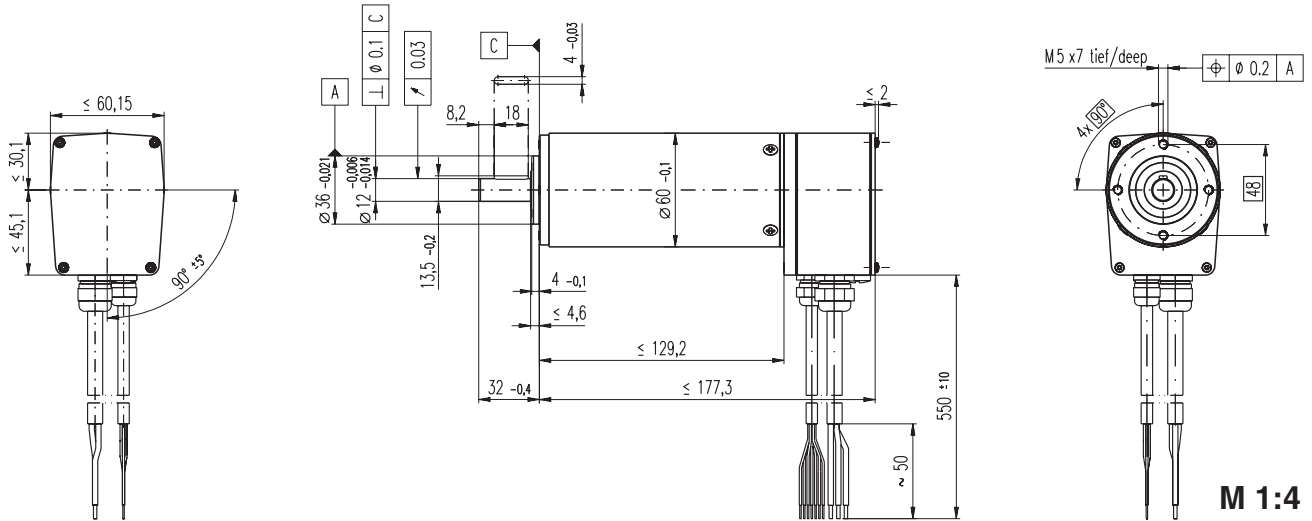
Connection Encoder (Cable AWG 26)		
green	(Pin 1)	Channel A
yellow	(Pin 2)	Channel A
red	(Pin 3)	Channel B
blue	(Pin 4)	Channel B
pink	(Pin 5)	Channel I (Index)
grey	(Pin 6)	Channel I (Index)
violet	(Pin 7)	Commutation signal S 1
red/blue	(Pin 8)	GND 2
black	(Pin 9)	Commutation signal S 2
white/green	(Pin 10)	V _{CC} 2
grey/pink	(Pin 11)	Commutation signal S 3
	(Pin 12)	n.c.
white	(Pin 13)	V _{CC} 1
brown	(Pin 14)	GND 1

Overview on page 16 - 21	
Counts per turn	2048
Number of channels	3
Max. operating frequency (kHz)	200
Supply voltage	5 V ± 5 %
Output signal	RS 422
Phase shift Φ (nominal)	90°e
Logic state width s	min. 45°e
Index pulse width (nominal)	360°e
Operating temperature range	-10 ... +100°C
Moment of inertia	≤ 3.11 gcm ²

Recommended Electronics:

DECS 50/5	Page 284
DEC 50/5	285
DEC 70/10	286
DES 50/5	287
DES 70/10	287
EPOS 70/10	295
Notes	20

EC 60 Ø60 mm, brushless, 400 Watt, CE approved



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

Order Number

167132 167131

Motor Data

Values at nominal voltage		167132	167131	
1	Nominal voltage	V	48.0	48.0
2	No load speed	rpm	5370	3100
3	No load current	mA	733	304
4	Nominal speed	rpm	4960	2680
5	Nominal torque (max. continuous torque)	mNm	747	830
6	Nominal current (max. continuous current)	A	9.38	5.85
7	Stall torque	mNm	11800	6820
8	Starting current	A	139	46.4
9	Max. efficiency	%	86	85
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	65.0
14	Speed / torque gradient	rpm / mNm	0.457	0.457
15	Mechanical time constant	ms	3.98	3.98
16	Rotor inertia	gcm ²	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	33.7 s
20	Thermal time constant motor	1200 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (Preloaded ball bearings)		
23	Max. permissible 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)	26 N
27	Max. force for press fits (static) (static, shaft supported)	320 N
28	Max. radial loading, 5 mm from flange	240 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	2450 g
	Protection to	IP54

Values listed in the table are nominal.

Connection Motor (Cable AWG 16)

Cable 1	Motor winding 1
Cable 2	Motor winding 2
Cable 3	Motor winding 3

Connection Sensors (Cable AWG 24)

white	Hall sensor 3
braun	Hall sensor 2
green	Hall sensor 1
gelb	GND
grey	V _{Hall} 4.5 ... 24 VDC
blue	Temperature sensor (PTC)
rosa	Temperature sensor (PTC)

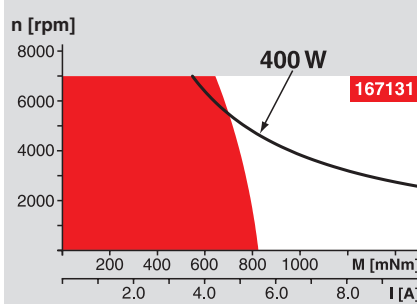
Temperature monitoring

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 page 26

Option: motor connection with plug

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).

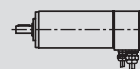
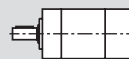
— Assigned power rating

maxon Modular System

Overview on page 16 - 21

Planetary Gearhead

Ø81 mm
20 - 120 Nm
Page 250



Recommended Electronics:

DECS 50/5	Page 284
DEC 50/5	285
DEC 70/10	286
DES 50/5	287
DES 70/10	287
EPOS 70/10	295
Notes	20

Encoder HEDL 9140
500 CPT,
3 channels
Page 267

Resolver Res
Ø26 mm
10 V
Page 272

Brake AB 41
Ø41 mm
24 VDC, 2.0 Nm
Page 310



maxon EC-max

The new 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.

Summary	172
EC-max motors 16 - 40 mm in diameter	173 - 181

The

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.



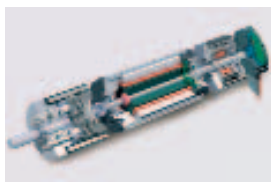
Shaft with no groove guarantees torsional stability and smooth running.



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.

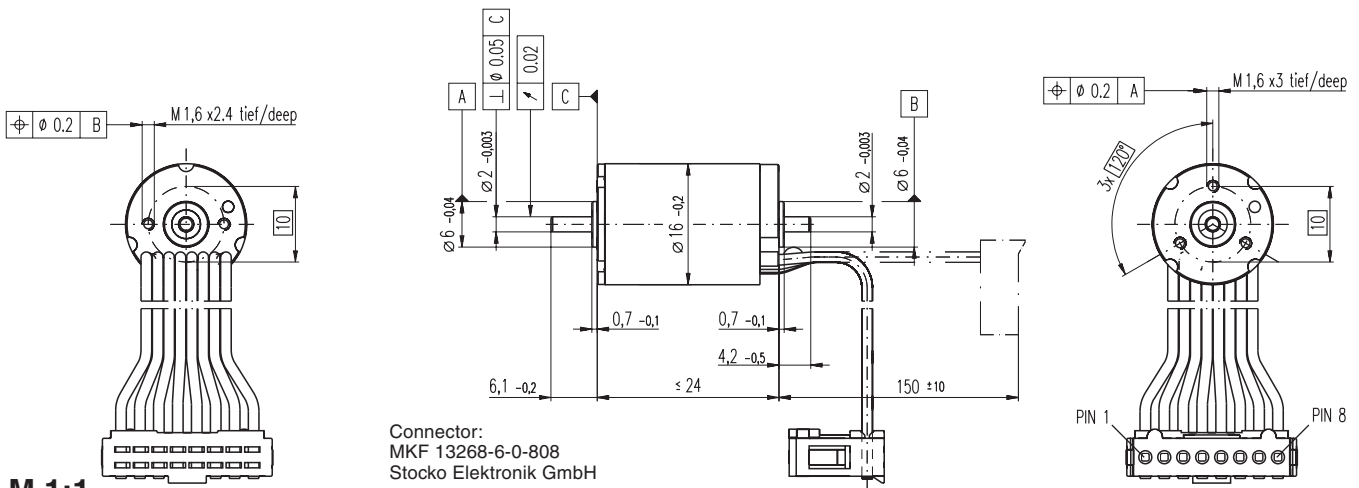


Modular construction with gears, sensors and brakes.



The modular EC-motor program with an impressive price / performance ratio

EC-max 16 \varnothing 16 mm, brushless, 5 Watt



Connector:
MKF 13268-6-0-808
Stocko Elektronik GmbH

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

Order Number

283825	283826	283827	283828
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Motor Data (provisional)

		283825	283826	283827	283828	
Values at nominal voltage						
1	Nominal voltage	V	4.5	6.0	9.0	12.0
2	No load speed	rpm	12400	13000	12200	13000
3	No load current	mA	121	97.6	59.1	48.8
4	Nominal speed	rpm	4960	5430	4680	5540
5	Nominal torque (max. continuous torque)	mNm	3.53	3.41	3.50	3.46
6	Nominal current (max. continuous current)	A	1.17	0.900	0.573	0.455
7	Stall torque	mNm	6.15	6.11	5.95	6.27
8	Starting current	A	1.89	1.49	0.901	0.762
9	Max. efficiency	%	57	56	56	57
Characteristics						
10	Terminal resistance phase to phase	Ω	2.38	4.04	9.99	15.7
11	Terminal inductance phase to phase	mH	0.0396	0.0634	0.163	0.254
12	Torque constant	mNm / A	3.25	4.12	6.60	8.23
13	Speed constant	rpm / V	2940	2320	1450	1160
14	Speed / torque gradient	rpm / mNm	2150	2280	2190	2220
15	Mechanical time constant	ms	9.64	10.2	9.81	9.95
16	Rotor inertia	gcm ²	0.428	0.428	0.428	0.428

Specifications

Thermal data		
17	Thermal resistance housing-ambient	23.5 K / W
18	Thermal resistance winding-housing	2.57 K / W
19	Thermal time constant winding	0.883 s
20	Thermal time constant motor	390 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+155°C
Mechanical data (preloaded ball bearings)		
23	Max permissible speed	20000 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)	1.5 N
27	Max. force for press fits (static) (static, shaft supported)	40 N
28	Max. radial loading, 5 mm from flange	6 N
Other specifications		
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	30 g

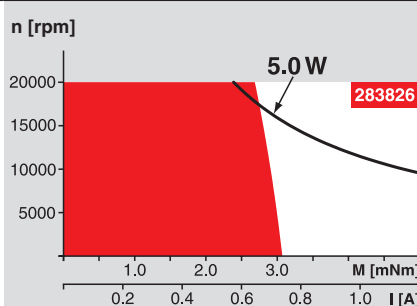
Values listed in the table are nominal.

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} 4.5 ... 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 page 27

Operating Range



Comments

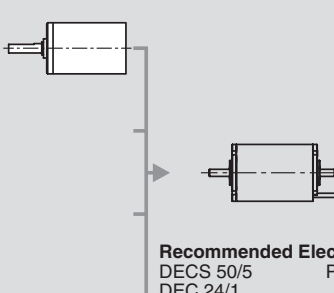
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

maxon Modular System

Planetary Gearhead
 \varnothing 16 mm
0.1 - 0.3 Nm
Page 224

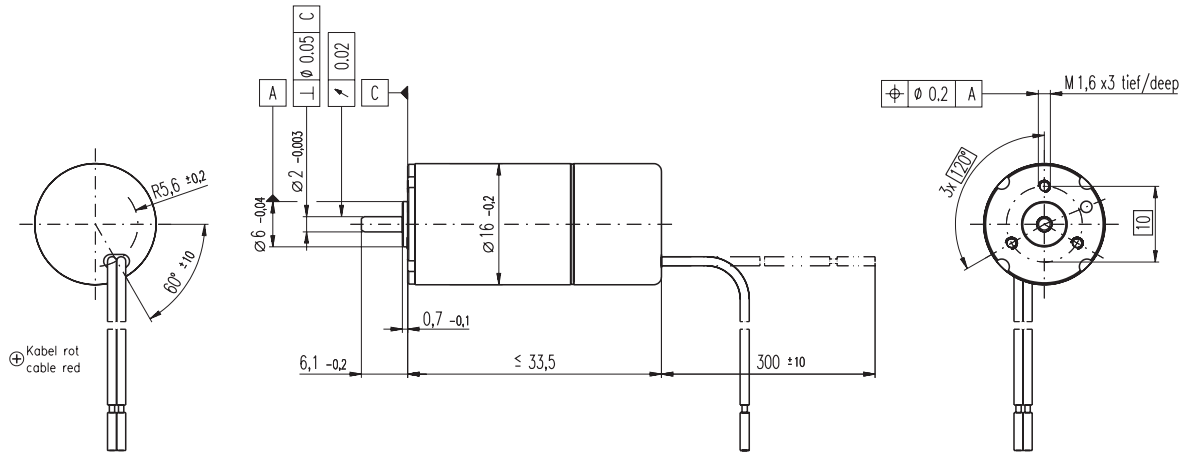
Overview on page 16 - 21

Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 257



Recommended Electronics:
DECS 50/5 Page 284
DEC 24/1 284
DECV 50/5 286
DES 50/5 287
EPOS 24/1 294
Notes 20

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



M 1:1

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

Order Number

320816	320817	320818	320819
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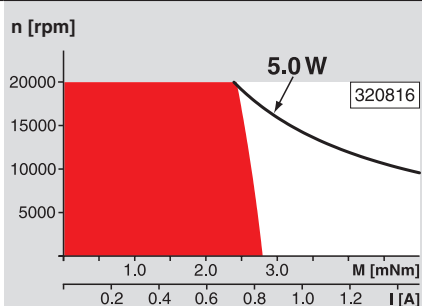
Motor Data

		320816	320817	320818	320819	
Values at nominal voltage						
1	Nominal voltage	V	5.0	6.0	9.0	12.0
2	No load speed	rpm	13600	12900	12100	13000
3	No load current	mA	126.0	97.1	58.9	48.8
4	Nominal speed	rpm	7200	6530	6040	7010
5	Nominal torque (max. continuous torque)	mNm	2.41	2.47	2.66	2.64
6	Nominal current (max. continuous current)	A	0.838	0.675	0.448	0.359
7	Stall torque	mNm	k.A.	k.A.	k.A.	k.A.
8	Starting current	A	1.66	1.28	0.842	0.729
9	Max. efficiency	%	54	54	55	56
Characteristics						
10	Terminal resistance phase to phase	Ω	k.A.	k.A.	k.A.	k.A.
11	Terminal inductance phase to phase	mH	k.A.	k.A.	k.A.	k.A.
12	Torque constant	mNm / A	3.25	4.12	6.60	8.23
13	Speed constant	rpm / V	2940	2320	1450	1160
14	Speed / torque gradient	rpm / mNm	2730	2650	2340	2320
15	Mechanical time constant	ms	12.2	11.9	10.5	10.4
16	Rotor inertia	gcm ²	0.428	0.428	0.428	0.428

Specifications

Thermal data		
17	Thermal resistance housing-ambient	23.5 K / W
18	Thermal resistance winding-housing	2.57 K / W
19	Thermal time constant winding	0.92 s
20	Thermal time constant motor	390 s
21	Ambient temperature	-20 ... +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 permissible speed	20000 rpm
24	Axial play at axial load	0 mm
	< 2.0 N	
	> 2.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	1.5 N
27	Max. force for press fits (static)	40 N
28	Max. radial loading, 5 mm from flange	6 N

Operating Range



Comments

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

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	26 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

Electronic data

Operating voltage range	+5 ... +15 VDC
Protection against wrong polarity up to max. 18 VDC	
Shaft blocking protection at speed	< 76 rpm
Temperature monitoring	> 104°C
Current limitation	1.6 A \pm 15%
Low voltage monitoring	< 4 VDC

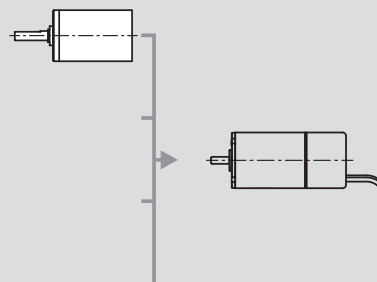
△ Attention: Operating voltage V_{CC} > 18 VDC will destroy the electronics

Option: Sense of rotation: counter-clockwise (CCW)

maxon Modular System

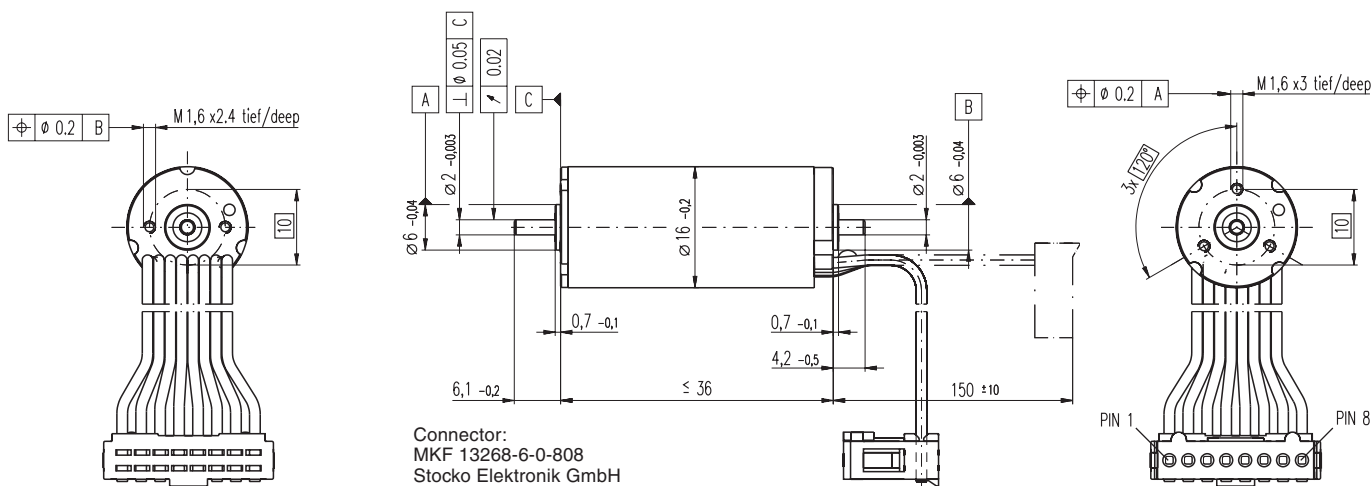
Planetary Gearhead

\varnothing 16 mm
0.1 - 0.3 Nm
Page 224



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EC-max 16 \varnothing 16 mm, brushless, 8 Watt



Connector:
MKF 13268-6-0-808
Stocko Elektronik GmbH

M 1:1

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

Order Number					
283831	283832	283833	283834	283835	

Motor Data							
Values at nominal voltage							
1	Nominal voltage	V	6.0	9.0	12.0	18.0	24.0
2	No load speed	rpm	12100	11900	12000	11900	11900
3	No load current	mA	119	77.5	58.5	38.8	29.0
4	Nominal speed	rpm	7170	7110	7310	7180	7350
5	Nominal torque (max. continuous torque)	mNm	7.62	7.80	8.04	7.90	8.23
6	Nominal current (max. continuous current)	A	1.74	1.17	0.907	0.593	0.461
7	Stall torque	mNm	19.2	19.8	21.1	20.3	22.0
8	Starting current	A	4.17	2.82	2.27	1.45	1.17
9	Max. efficiency	%	70	70	71	71	72
Characteristics							
10	Terminal resistance phase to phase	Ω	1.44	3.19	5.30	12.4	20.5
11	Terminal inductance phase to phase	mH	0.0343	0.0793	0.140	0.317	0.566
12	Torque constant	mNm / A	4.61	7.02	9.32	14.0	18.7
13	Speed constant	rpm / V	2070	1360	1020	681	510
14	Speed / torque gradient	rpm / mNm	646	619	582	602	556
15	Mechanical time constant	ms	5.75	5.51	5.18	5.36	4.95
16	Rotor inertia	gcm ²	0.850	0.850	0.850	0.850	0.850

Specifications	Operating Range	Comments
<p>Thermal data</p> <p>17 Thermal resistance housing-ambient 17.7 K / W</p> <p>18 Thermal resistance winding-housing 1.41 K / W</p> <p>19 Thermal time constant winding 0.983 s</p> <p>20 Thermal time constant motor 427 s</p> <p>21 Ambient temperature -20 ... +100°C</p> <p>22 Max. permissible winding temperature +155°C</p> <p>Mechanical data (preloaded ball bearings)</p> <p>23 Max permissible speed 20000 rpm</p> <p>24 Axial play at axial load < 2.0 N 0 mm</p> <p style="padding-left: 20px;">> 2.0 N 0.14 mm preloaded</p> <p>25 Radial play</p> <p>26 Max. axial load (dynamic) 1.5 N</p> <p>27 Max. force for press fits (static) 40 N</p> <p style="padding-left: 20px;">(static, shaft supported) 400 N</p> <p>28 Max. radial loading, 5 mm from flange 6 N</p> <p>Other specifications</p> <p>29 Number of pole pairs 1</p> <p>30 Number of phases 3</p> <p>31 Weight of motor 45 g</p>	<p>Operating Range</p>	<p>Comments</p> <p> Continuous operation In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.</p> <p> Short term operation The motor may be briefly overloaded (recurring).</p> <p> Assigned power rating</p>

maxon Modular System

Planetary Gearhead
 \varnothing 22 mm
0.5 - 2.0 Nm
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Overview on page 16 - 21

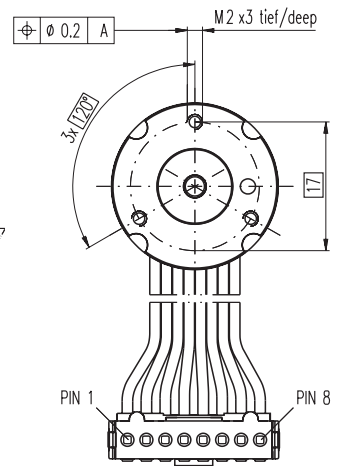
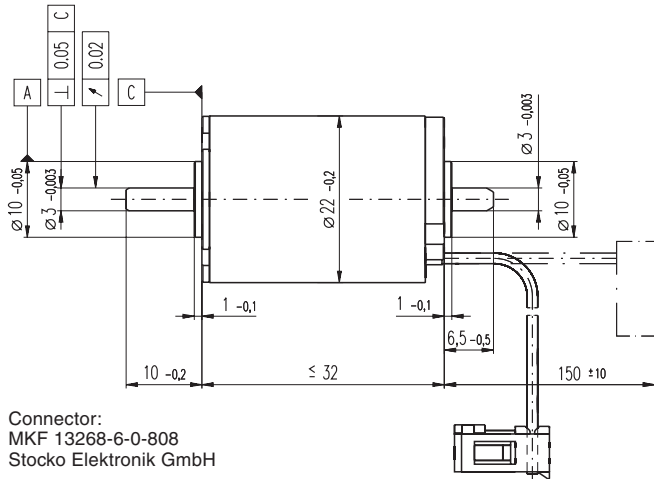
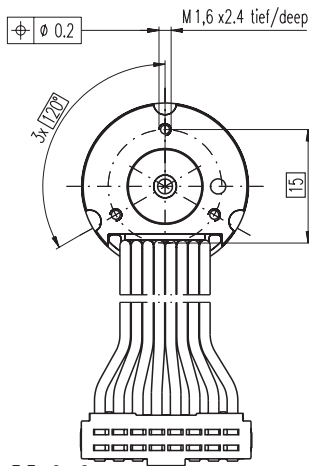
Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 257

Recommended Electronics:

DECS 50/5	Page 284
DEC 24/1	284
DEC 24/3	285
DECV 50/5	286
DES 50/5	287
EPOS 24/1	294

Notes 20

EC-max 22 Ø22 mm, brushless, 12 Watt



Connector:
MKF 13268-6-0-808
Stocko Elektronik GmbH

M 1:1

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

Order Number

283837	283838	283839	283840	283841
--------	--------	--------	--------	--------

Motor Data

		283837	283838	283839	283840	283841
Values at nominal voltage						
1	Nominal voltage	V	6.0	12.0	18.0	24.0
2	No load speed	rpm	10800	11500	11500	11500
3	No load current	mA	221	123	81.1	61.0
4	Nominal speed	rpm	6840	7550	7740	7690
5	Nominal torque (max. continuous torque)	mNm	11.4	11.2	11.9	11.7
6	Nominal current (max. continuous current)	A	2.38	1.25	0.884	0.661
7	Stall torque	mNm	31.9	33.3	37.7	36.2
8	Starting current	A	6.23	3.47	2.60	1.94
9	Max. efficiency	%	67	67	69	68
Characteristics						
10	Terminal resistance phase to phase	Ω	0.963	3.46	6.93	12.4
11	Terminal inductance phase to phase	mH	0.0343	0.121	0.275	0.488
12	Torque constant	mNm / A	5.12	9.60	14.5	19.3
13	Speed constant	rpm / V	1870	995	658	495
14	Speed / torque gradient	rpm / mNm	351	358	314	318
15	Mechanical time constant	ms	8.27	8.45	7.41	7.49
16	Rotor inertia	gcm ²	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	1.82 s
20	Thermal time constant motor	567 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+155°C
Mechanical data (preloaded ball bearings)		
23	Max permissible speed	18000 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)	4.5 N
27	Max. force for press fits (static)	60 N
	(static, shaft supported)	1400 N
28	Max. radial loading, 5 mm from flange	16 N
Other specifications		
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	67 g

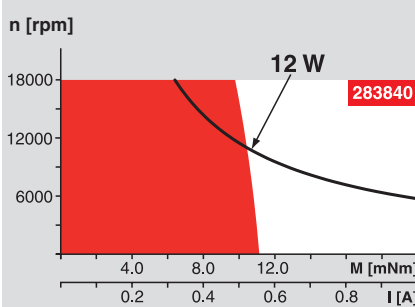
Values listed in the table are nominal.

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} 4.5 ... 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 page 27

Operating Range



Comments

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

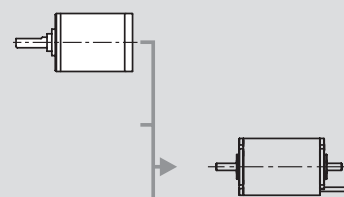
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
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Overview on page 16 - 21



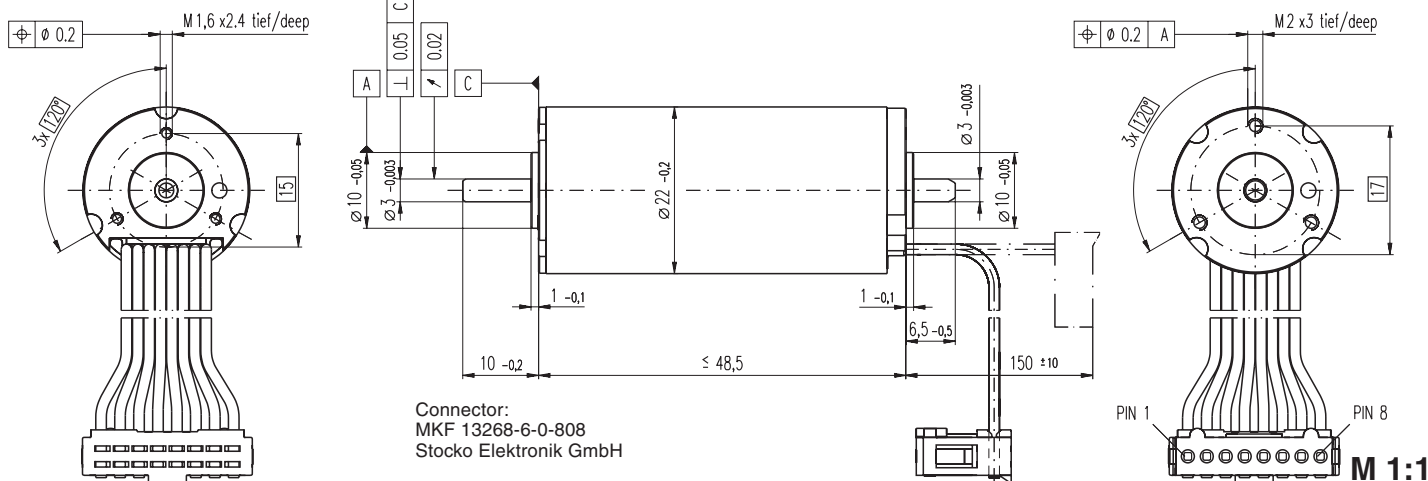
Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
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Brake AB 20
Ø20 mm
24 VDC, 0.1 Nm
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Recommended Electronics:

DECS 50/5	Page 284
DEC 24/1	284
DEC 24/3	285
DECV 50/5	286
DES 50/5	287
EPOS 24/1	294
EPOS 24/5	294
EPOS2 50/5	295
EPOS P 24/5	297
Notes	20

EC-max 22 Ø22 mm, brushless, 25 Watt



Connector:
MKF 13268-6-0-808
Stocko Elektronik GmbH

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

Order Number

283856 283857 283858 283859 283860

Motor Data

Values at nominal voltage		283856	283857	283858	283859	283860	
1	Nominal voltage	V	12.0	18.0	24.0	36.0	48.0
2	No load speed	rpm	12400	12900	12900	12200	13000
3	No load current	mA	214	153	115	69.7	57.6
4	Nominal speed	rpm	9820	10300	10400	9610	10500
5	Nominal torque (max. continuous torque)	mNm	22.9	21.9	22.9	22.7	23.4
6	Nominal current (max. continuous current)	A	2.69	1.80	1.41	0.877	0.720
7	Stall torque	mNm	114	112	121	111	127
8	Starting current	A	12.6	8.55	6.97	4.00	3.66
9	Max. efficiency	%	76	76	77	76	77
Characteristics							
10	Terminal resistance phase to phase	Ω	0.955	2.10	3.44	9.01	13.1
11	Terminal inductance phase to phase	mH	0.0499	0.103	0.182	0.462	0.730
12	Torque constant	mNm / A	9.10	13.0	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	5.50	5.06	5.23	4.82
16	Rotor inertia	gcm ²	4.45	4.45	4.45	4.45	4.45

Specifications

Thermal data		
17	Thermal resistance housing-ambient	10.2 K / W
18	Thermal resistance winding-housing	1.02 K / W
19	Thermal time constant winding	1.97 s
20	Thermal time constant motor	628 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+155°C
Mechanical data (preloaded ball bearings)		
23	Max permissible speed	18000 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)	4.5 N
27	Max. force for press fits (static) (static, shaft supported)	60 N
28	Max. radial loading, 5 mm from flange	1000 N
		16 N
Other specifications		
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	110 g

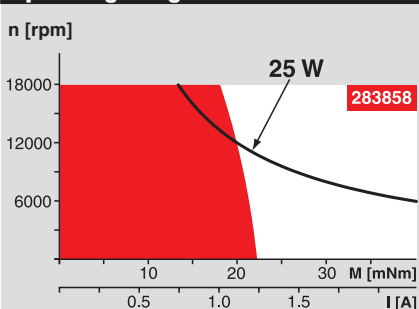
Values listed in the table are nominal.

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} 4.5 ... 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 page 27

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.

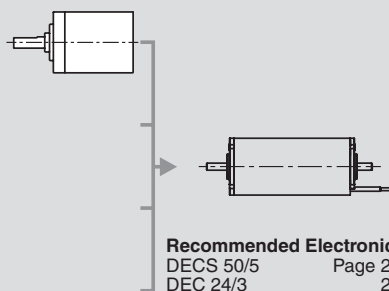
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
Ø32 mm
1.0 - 6.0 Nm
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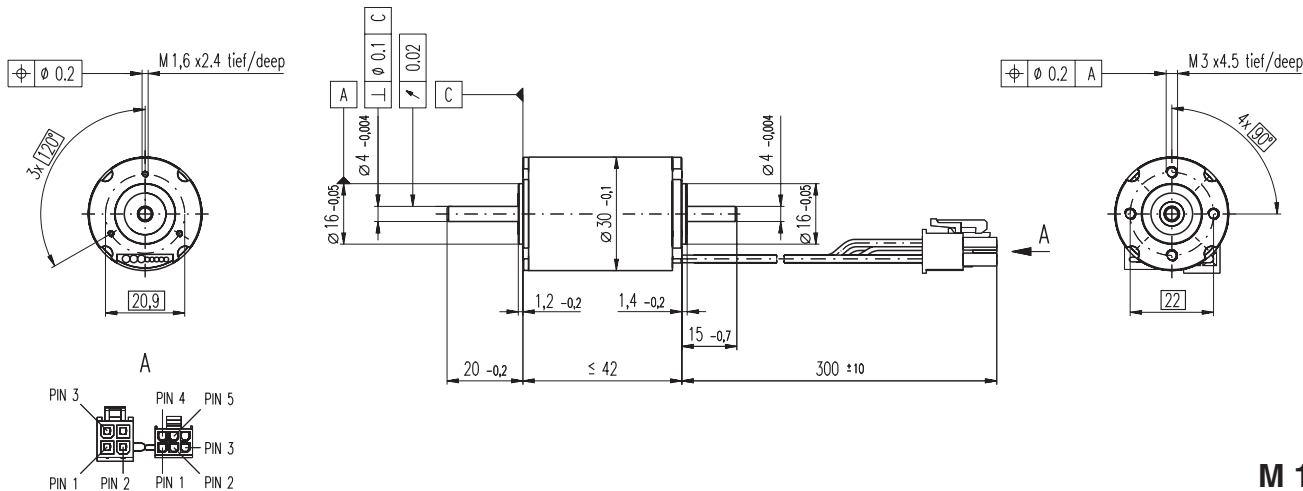
Encoder MR
128 / 256 / 512 CPT,
2 / 3 channels
Page 257

Brake AB 20
Ø20 mm
24 VDC, 0.1 Nm
Page 306

Recommended Electronics:

DECS 50/5	Page 284
DEC 24/3	285
DEC 50/5	285
DECV 50/5	286
DES 50/5	287
EPOS 24/5	294
EPOS2 50/5	295
EPOS P 24/5	297
Notes	20

EC-max 30 \varnothing 30 mm, brushless, 40 Watt



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

Order Number

272766 272768 272769 272770

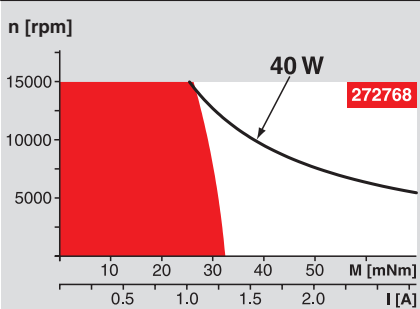
Motor Data

Values at nominal voltage		272766	272768	272769	272770	
1	Nominal voltage	V	12.0	24.0	36.0	48.0
2	No load speed	rpm	8700	9270	9160	9270
3	No load current	mA	202	112	73.2	55.9
4	Nominal speed	rpm	6640	7210	7080	7190
5	Nominal torque (max. continuous torque)	mNm	35.0	34.3	33.9	34.0
6	Nominal current (max. continuous current)	A	2.85	1.50	0.976	0.743
7	Stall torque	mNm	153	160	154	157
8	Starting current	A	11.8	6.57	4.18	3.24
9	Max. efficiency	%	76	76	76	76
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	6.90
16	Rotor inertia	gcm ²	11.0	11.0	11.0	11.0

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 3.12 s
 - 20 Thermal time constant motor 777 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max permissible 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) 5.5 N
 - 27 Max. force for press fits (static) 100 N
 - (static, shaft supported) 2000 N
 - 28 Max. radial loading, 5 mm from flange 25 N

Operating Range



Comments

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

Other specifications

- 29 Number of pole pairs 1
- 30 Number of phases 3
- 31 Weight of motor 165 g

Values listed in the table are nominal.

Connection Motor (Cable AWG 20)

- red Motor winding 1 Pin 1
- black Motor winding 2 Pin 2
- white Motor winding 3 Pin 3
- N.C. N.C. Pin 4

Connector Article number

Molex 39-01-2040

Connection Sensors (Cable AWG 26)

- yellow Hall sensor 1 Pin 1
- brown Hall sensor 2 Pin 2
- grey Hall sensor 3 Pin 3
- blue GND Pin 4
- green V_{Hall} 4.5 ... 24 VDC Pin 5
- N.C. N.C. Pin 6

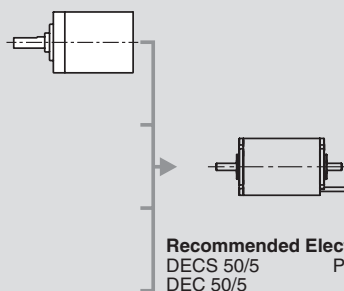
Connector Article number

Molex 430-25-0600

Wiring diagram for Hall sensors see page 27

maxon Modular System

- 1 Planetary Gearhead \varnothing 32 mm
- 3 1.0 - 6.0 Nm
- Page 241



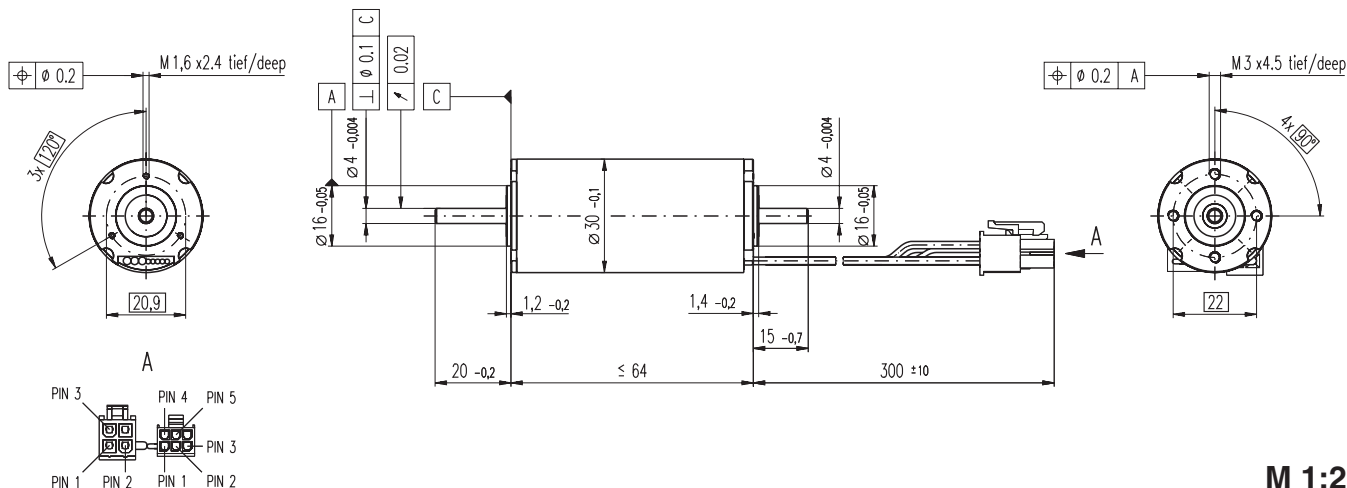
Overview on page 16 - 21

- Encoder MR**
128 - 1000 CPT,
3 channels
Page 258
- Encoder HEDL 5540**
500 CPT,
3 channels
Page 266
- Brake AB 20**
 \varnothing 20 mm
24 VDC, 0.1 Nm
Page 306

Recommended Electronics:

- DECS 50/5 Page 284
- DEC 50/5 285
- DECV 50/5 286
- DES 50/5 287
- EPOS 24/5 294
- EPOS2 50/5 295
- EPOS P 24/5 297
- Notes 20

EC-max 30 \varnothing 30 mm, brushless, 60 Watt



M 1:2

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

Order Number

272762 272763 272764 272765

Motor Data

Values at nominal voltage		272762	272763	272764	272765	
1	Nominal voltage	V	12.0	24.0	36.0	48.0
2	No load speed	rpm	7990	9350	9500	9360
3	No load current	mA	268	170	116	85.1
4	Nominal speed	rpm	6630	8040	8260	8120
5	Nominal torque (max. continuous torque)	mNm	62.4	61.3	64.7	65.3
6	Nominal current (max. continuous current)	A	4.61	2.66	1.90	1.41
7	Stall torque	mNm	381	458	522	519
8	Starting current	A	26.8	18.8	14.5	10.7
9	Max. efficiency	%	81	82	83	83
Characteristics						
10	Terminal resistance phase to phase	Ω	0.447	1.27	2.48	4.49
11	Terminal inductance phase to phase	mH	0.0490	0.143	0.312	0.573
12	Torque constant	mNm / A	14.2	24.3	35.9	48.6
13	Speed constant	rpm / V	672	393	266	197
14	Speed / torque gradient	rpm / mNm	21.2	20.6	18.4	18.2
15	Mechanical time constant	ms	4.86	4.73	4.21	4.17
16	Rotor inertia	gcm ²	21.9	21.9	21.9	21.9

Specifications

Thermal data		
17	Thermal resistance housing-ambient	7.4 K / W
18	Thermal resistance winding-housing	0.5 K / W
19	Thermal time constant winding	2.69 s
20	Thermal time constant motor	1000 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+155°C
Mechanical data (preloaded ball bearings)		
23	Max permissible 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)	5.5 N
27	Max. force for press fits (static) (static, shaft supported)	100 N
		1300 N
28	Max. radial loading, 5 mm from flange	25 N

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	275 g

Values listed in the table are nominal.

Connection Motor (Cable AWG 20)

red	Motor winding 1	Pin 1
black	Motor winding 2	Pin 2
white	Motor winding 3	Pin 3
	N.C.	Pin 4

Connector Article number

Molex 39-01-2040

Connection Sensoren (Cable AWG 26)

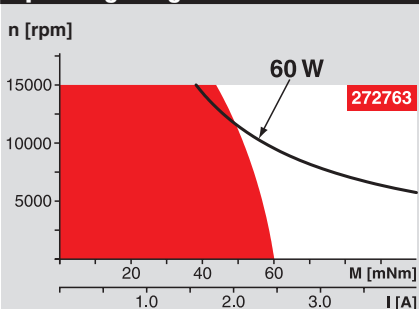
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V _{Hall} 4.5 ... 24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number

Molex 430-25-0600

Wiring diagram for Hall sensors see page 27

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.

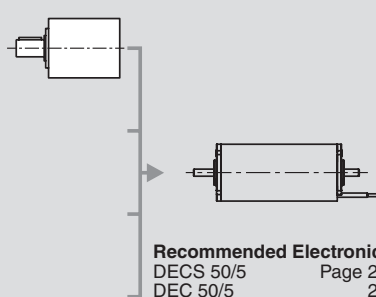
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

Overview on page 16 - 21

1 Planetary Gearhead
 \varnothing 42 mm
3 - 15 Nm
Page 245



Encoder MR
128 - 1000 CPT,
3 channels
Page 258

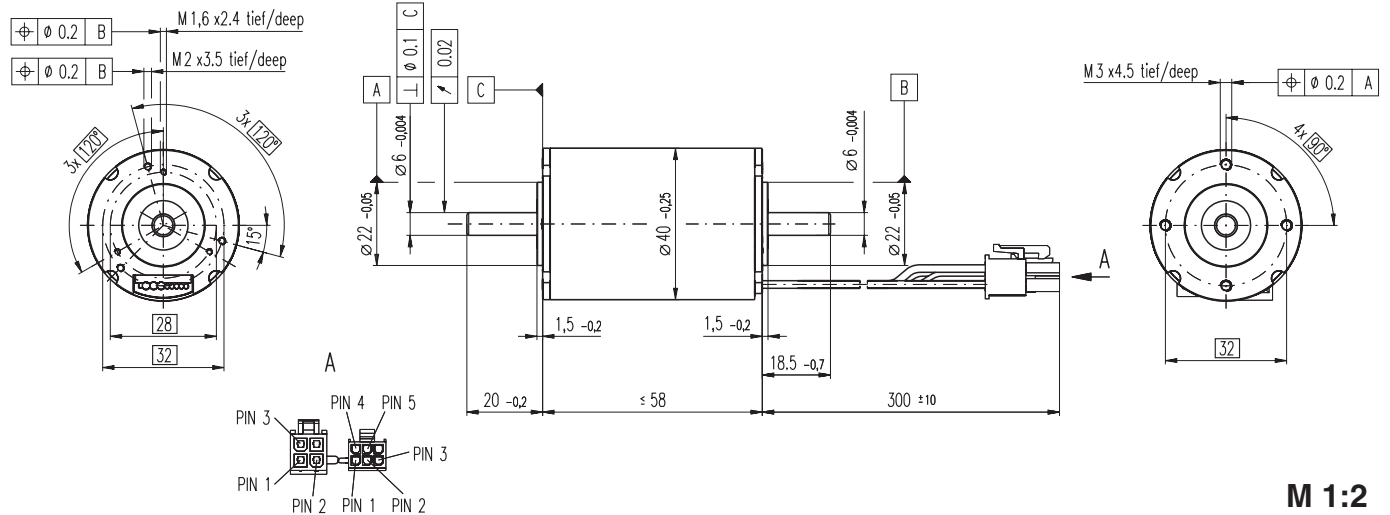
Encoder HEDL 5540
500 CPT,
3 channels
Page 266

Brake AB 20
 \varnothing 20 mm
24 VDC, 0.1 Nm
Page 306

Recommended Electronics:

DECS 50/5	Page 284
DEC 50/5	285
DECV 50/5	286
DES 50/5	287
EPOS 24/5	294
EPOS2 50/5	295
EPOS P 24/5	297
Notes	20

EC-max 40 $\varnothing 40$ mm, brushless, 70 Watt



M 1:2

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

Order Number

283866	283867	283868	283869
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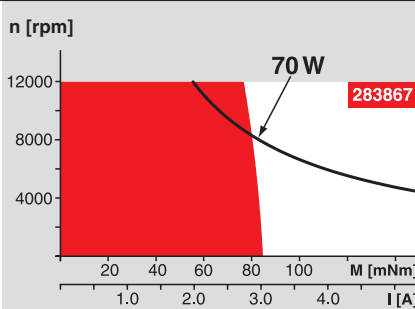
Motor Data

		283866	283867	283868	283869	
Values at nominal voltage						
1	Nominal voltage	V	12.0	24.0	36.0	48.0
2	No load speed	rpm	8020	8030	8450	9020
3	No load current	mA	631	316	228	190
4	Nominal speed	rpm	6490	6540	7050	7620
5	Nominal torque (max. continuous torque)	mNm	85.1	88.0	93.7	92.9
6	Nominal current (max. continuous current)	A	6.58	3.39	2.52	2.01
7	Stall torque	mNm	466	497	595	636
8	Starting current	A	33.3	17.8	14.9	12.7
9	Max. efficiency	%	75	76	77	78
Characteristics						
10	Terminal resistance phase to phase	Ω	0.360	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	14.0	28.0	40.0	50.0
13	Speed constant	rpm / V	682	341	239	191
14	Speed / torque gradient	rpm / mNm	17.6	16.5	14.4	14.4
15	Mechanical time constant	ms	9.41	8.82	7.74	7.73
16	Rotor inertia	gcm ²	51.2	51.2	51.2	51.2

Specifications

Thermal data		
17	Thermal resistance housing-ambient	4.63 K / W
18	Thermal resistance winding-housing	0.542 K / W
19	Thermal time constant winding	3.76 s
20	Thermal time constant motor	926 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+155°C
Mechanical data (preloaded ball bearings)		
23	Max permissible 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)	9 N
27	Max. force for press fits (static) (static, shaft supported)	170 N / 5000 N
28	Max. radial loading, 5 mm from flange	80 N

Operating Range



Comments

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

Other specifications

29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	400 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	

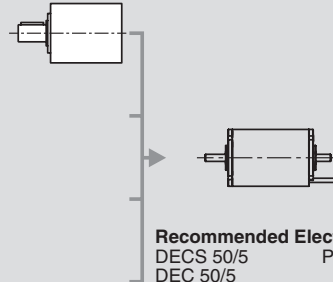
Connection (Cable AWG 26)		
yellow	Hall sensor 1	Pin 1
brown	Hall sensor 2	Pin 2
grey	Hall sensor 3	Pin 3
blue	GND	Pin 4
green	V _{Hall} 4.5 ... 24 VDC	Pin 5
	N.C.	Pin 6

Connector Article number		
Molex	430-25-0600	

Wiring diagram for Hall sensors see page 27

maxon Modular System

Planetary Gearhead
 $\varnothing 42$ mm
 3 - 15 Nm
 Page 245



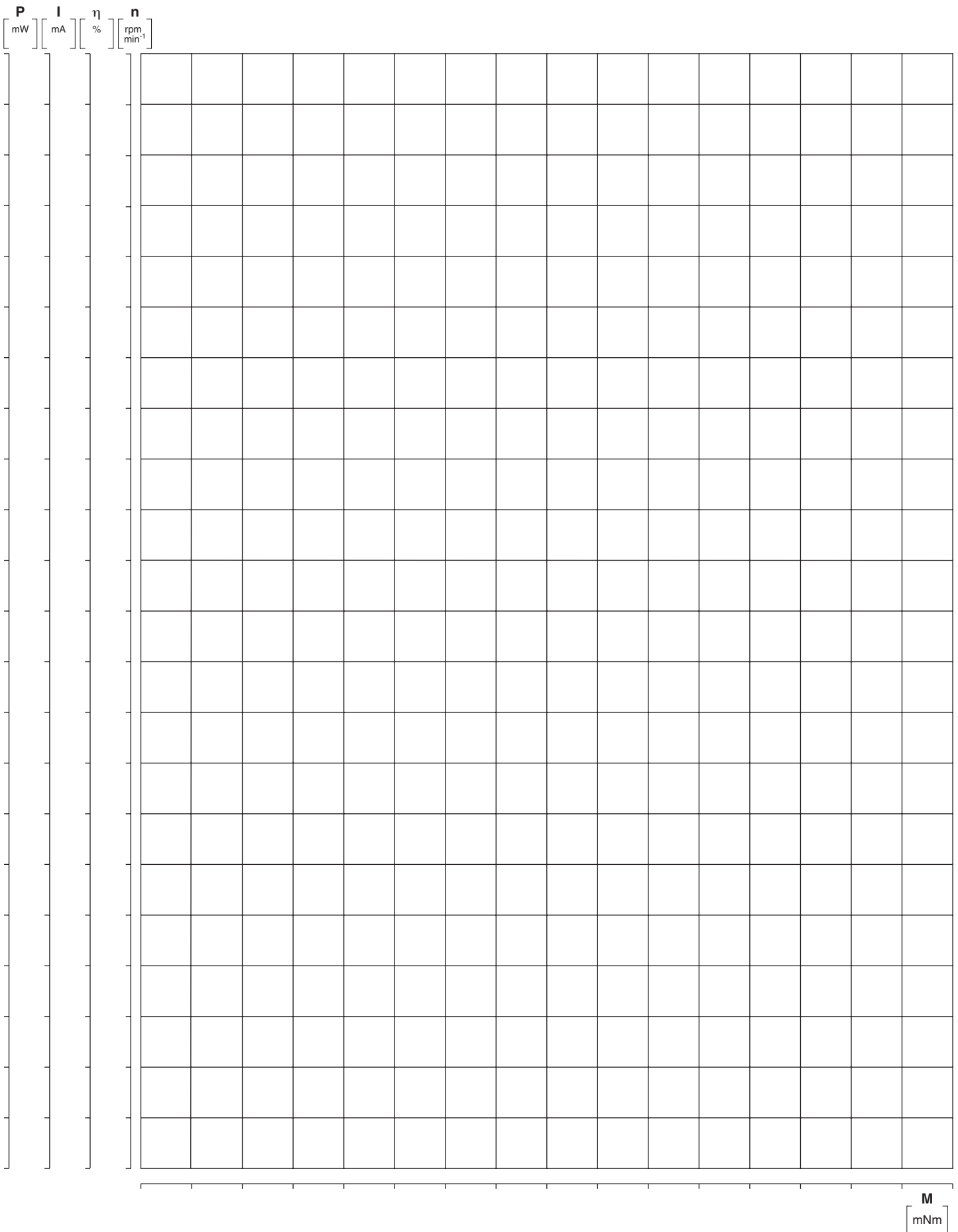
Overview on page 16 - 21

- Encoder MR**
256 - 1024 CPT,
3 channels
Page 259
- Encoder HEDL 5540**
500 CPT,
3 channels
Page 266
- Brake AB 28**
 $\varnothing 28$ mm
24 VDC, 0.4 Nm
Page 307

- Recommended Electronics:**
- | | |
|-------------|----------|
| DECS 50/5 | Page 284 |
| DEC 50/5 | 285 |
| DECV 50/5 | 286 |
| DES 50/5 | 287 |
| EPOS 24/5 | 294 |
| EPOS2 50/5 | 295 |
| EPOS P 24/5 | 297 |
- Notes** 20

For your personal notes

maxon motor





maxon *EC*-powermax

maxon *EC*-powermax

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, inertia-free motion and of course an unprecedented service life.

Summary

184

EC-powermax motors
22 - 30 mm in diameter

185 - 188

The maxon **EC-powermax**



The “heart” is the ironless winding, System maxon®. This means physically dependent – advantages like no detent, high efficiency and excellent regulating dynamics.



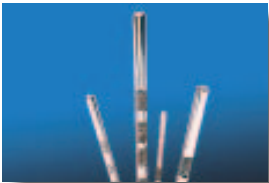
The motor housing, a simple tube made of stainless steel – non magnetic, rigid, rustproof.



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.



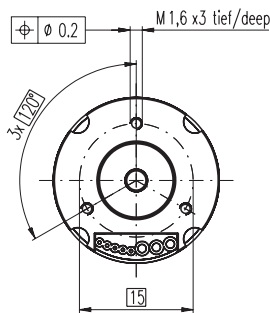
High quality, thanks to a process monitored production on the most modern assembly lines which are, in part, developed by maxon.



The EC-motor program delivers top performance per volume and weight unit.

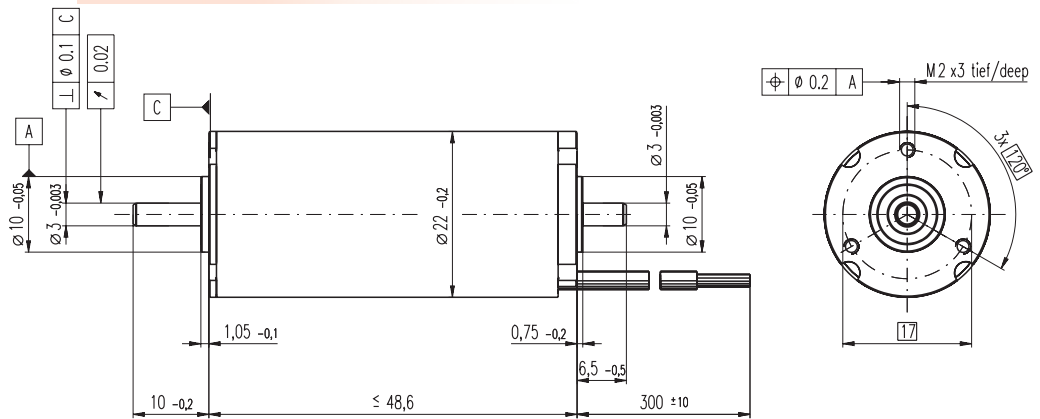
EC-powermax 22 Ø22 mm, brushless, 90 Watt

HighPower



Lage des Kabelabgangs zum Befestigungsbohrbild ±10°

Alignment of cables relative to mounting holes ±10°



M 1:1

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

Order Number

323217 323218 **323219** 323220 327739

Motor Data (provisional)

Values at nominal voltage		323217	323218	323219	323220	327739	
1	Nominal voltage	V	18.0	24.0	36.0	48.0	48.0
2	No load speed	rpm	16200	16200	16200	16200	6900
3	No load current	mA	275	206	137	103	21.5
4	Nominal speed	rpm	14700	14700	14700	14700	5420
5	Nominal torque (max. continuous torque)	mNm	45.0	47.0	46.0	45.0	47.4
6	Nominal current (max. continuous current)	A	4.43	3.46	2.26	1.66	0.722
7	Stall torque	mNm	607	661	633	607	242
8	Starting current	A	57.7	47.1	30.1	21.6	3.67
9	Max. efficiency	%	87	88	87	87	86
Characteristics							
10	Terminal resistance phase to phase	Ω	0.312	0.510	1.20	2.22	13.1
11	Terminal inductance phase to phase	mH	0.0597	0.106	0.239	0.425	2.34
12	Torque constant	mNm / A	10.5	14.0	21.1	28.1	66.0
13	Speed constant	rpm / V	907	680	453	340	145
14	Speed / torque gradient	rpm / mNm	26.9	24.7	25.8	26.9	28.7
15	Mechanical time constant	ms	1.56	1.43	1.50	1.56	1.66
16	Rotor inertia	gcm ²	5.54	5.54	5.54	5.54	5.54

Specifications

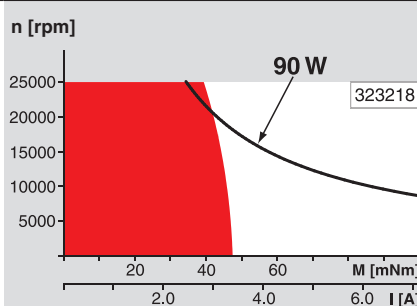
Thermal data		
17	Thermal resistance housing-ambient	9.08 K / W
18	Thermal resistance winding-housing	0.904 K / W
19	Thermal time constant winding	3.98 s
20	Thermal time constant motor	358 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+155°C
Mechanical data (preloaded ball bearings)		
23	Max permissible speed	25000 rpm
24	Axial play at axial load < 5.0 N	0 mm
	> 5.0 N	0.14 mm
25	Radial play	
26	Max. axial load (dynamic)	4.5 N
27	Max. force for press fits (static) (static, shaft supported)	60 N
		1000 N
28	Max. radial loading, 5 mm from flange	16 N
Other specifications		
29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	110 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} 4.5 ... 24 VDC
 blue GND

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).

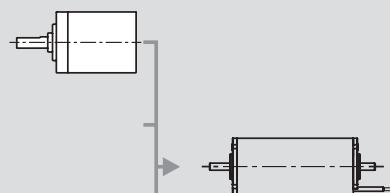
— Assigned power rating

maxon Modular System

Overview on page 16 - 21

Planetary Gearhead

Ø32 mm
 1.0 - 6.0 Nm
 Page 241

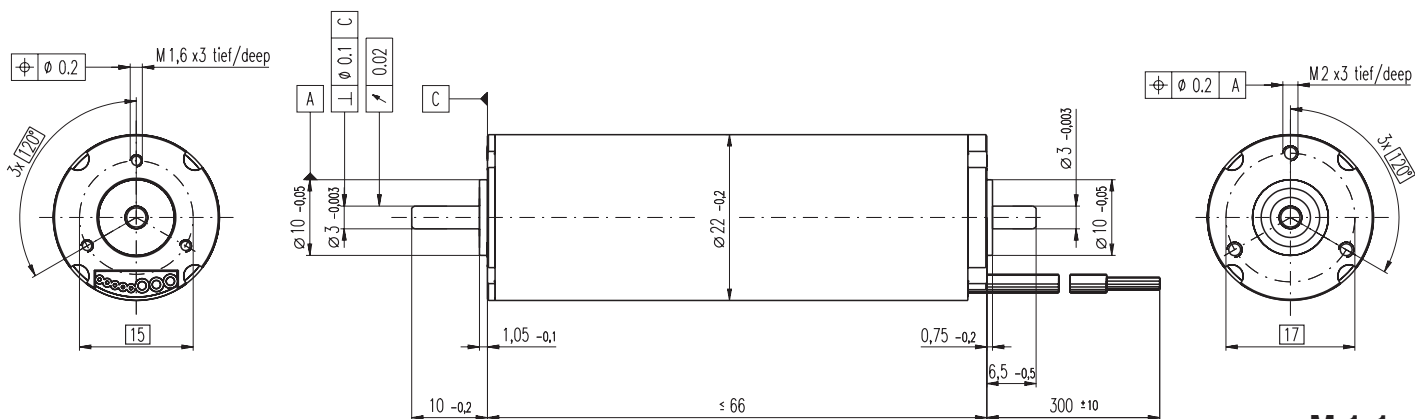


Recommended Electronics:
 DECS 50/5 Page 284
 DEC 50/5 285
 DECV 50/5 286
 DEC 70/10 286
Notes 20

EC-powermax 22 Ø22 mm, brushless, 120 Watt

HighPower

maxon EC-powermax



M 1:1

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

Order Number

311535 **311536** 311537 311538

Motor Data (provisional)

Values at nominal voltage						
1	Nominal voltage	V	18.0	24.0	36.0	48.0
2	No load speed	rpm	16800	16500	17800	16900
3	No load current	mA	330	248	183	124
4	Nominal speed	rpm	15600	15700	16700	15700
5	Nominal torque (max. continuous torque)	mNm	59.0	61.8	63.1	64.1
6	Nominal current (max. continuous current)	A	6.06	4.75	3.43	2.46
7	Stall torque	mNm	904	990	1130	1060
8	Starting current	A	88.9	73.1	59.0	39.2
9	Max. efficiency	%	88	89	89	89
Characteristics						
10	Terminal resistance phase to phase	Ω	0.202	0.329	0.610	1.22
11	Terminal inductance phase to phase	mH	0.0173	0.0308	0.0618	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	18.7	17.1	15.8	15.9
15	Mechanical time constant	ms	1.75	1.59	1.47	1.49
16	Rotor inertia	gcm ²	8.91	8.91	8.91	8.91

Specifications

Thermal data		
17	Thermal resistance housing-ambient	8.01 K / W
18	Thermal resistance winding-housing	1 K / W
19	Thermal time constant winding	6.36 s
20	Thermal time constant motor	476 s
21	Ambient temperature	-20 ... +100°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 < 5.0 N	0 mm
	> 5.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	4.5 N
27	Max. force for press fits (static) (static, shaft supported)	60 N
		1000 N
28	Max. radial loading, 5 mm from flange	16 N
Other specifications		
29	Number of pole pairs	2
30	Number of phases	3
31	Weight of motor	160 g

Values listed in the table are nominal.

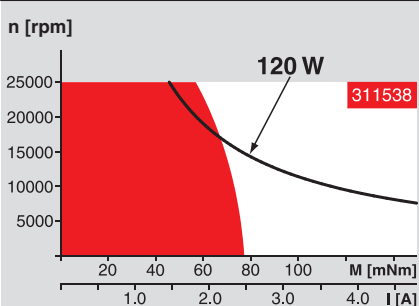
Connection Motor (Cable AWG 18)
 red Motor winding 1
 white Motor winding 3
 black Motor winding 2

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

Option

Encoder MR on request

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).

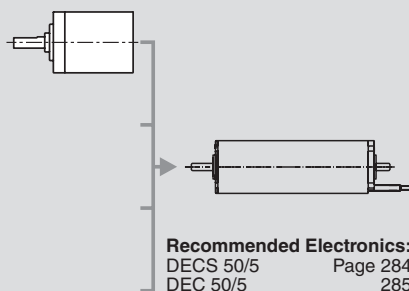
— Assigned power rating

maxon Modular System

Overview on page 16 - 21

Planetary Gearhead

Ø32 mm
 1.0 - 6.0 Nm
 Page 241

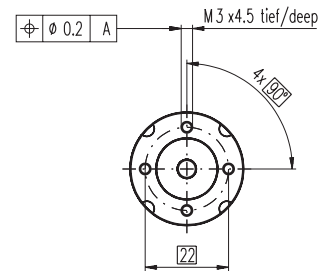
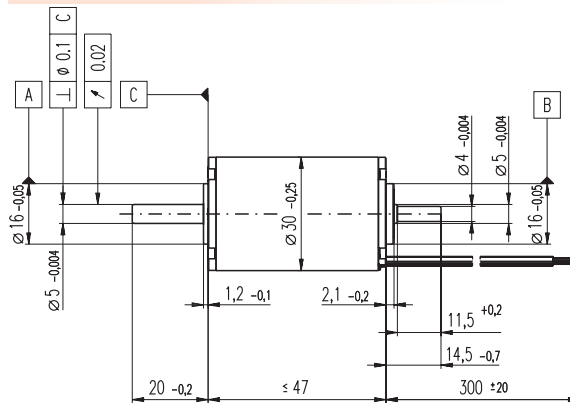
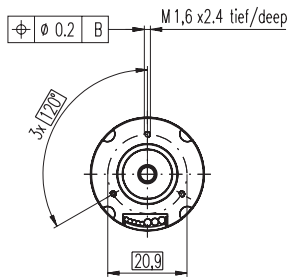


Recommended Electronics:
 DECS 50/5 Page 284
 DEC 50/5 285
 DECV 50/5 286
 DEC 70/10 286
Notes 20

EC-powermax 30 Ø30 mm, brushless, 100 Watt

HighPower

maxon EC-powermax



M 1:2

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

Order Number

309755	309756	309757	309758
--------	--------	--------	--------

Motor Data (provisional)

Values at nominal voltage		309755	309756	309757	309758	
1	Nominal voltage	V	18.0	24.0	36.0	48.0
2	No load speed	rpm	17800	17800	17800	17800
3	No load current	mA	773	580	387	290
4	Nominal speed	rpm	16700	16700	16800	16800
5	Nominal torque (max. continuous torque)	mNm	64.4	63.3	69.7	69.4
6	Nominal current (max. continuous current)	A	7.38	5.45	3.96	2.96
7	Stall torque	mNm	1280	1240	1480	1470
8	Starting 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	2.70	2.78	2.33	2.35
16	Rotor inertia	gcm ²	18.3	18.3	18.3	18.3

Specifications

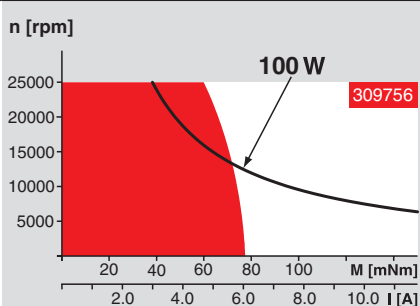
- Thermal data**
- 17 Thermal resistance housing-ambient 7.95 K / W
 - 18 Thermal resistance winding-housing 0.831 K / W
 - 19 Thermal time constant winding 4.28 s
 - 20 Thermal time constant motor 859 s
 - 21 Ambient temperature -20 ... +100°C
 - 22 Max. permissible winding temperature +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max permissible speed 25000 rpm
 - 24 Axial play at axial load < 8.0 N 0 mm
 - > 8.0 N 0.14 mm preloaded
 - 25 Radial play 5.5 N
 - 26 Max. axial load (dynamic) 100 N
 - 27 Max. force for press fits (static) (static, shaft supported) 2000 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 165 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} 4.5 ... 24 VDC
 - red/grey Hall sensor 1
 - white/grey Hall sensor 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

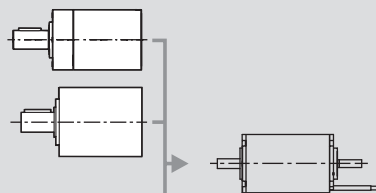
Overview on page 16 - 21

Planetary Gearhead

- Ø32 mm
- 8 Nm
- Page 242

Planetary Gearhead

- Ø42 mm
- 3 - 15 Nm
- Page 245

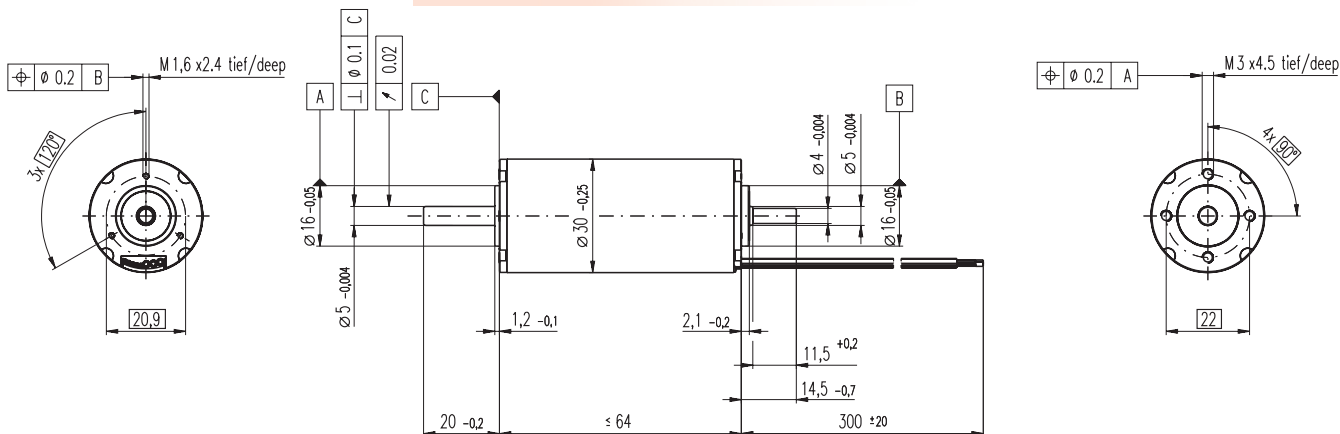


- Encoder MR**
128 - 1000CTP,
3 channels
Page 258
- Encoder HEDL 5540**
500CTP,
3 channels
Page 266
- Brake AB 20**
Ø20 mm
24 VDC, 0.1 Nm
Page 306

- Recommended Electronics:**
- DECS 50/5 Page 284
 - DEC 70/10 286
 - DES 70/10 287
 - EPOS 70/10 295
 - EPOS2 50/5 295
 - Notes** 20

EC-powermax 30 Ø30 mm, brushless, 200 Watt

HighPower



M 1:2

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

Order Number

305013 305014 305015

Motor Data (provisional)

Values at nominal voltage		305013	305014	305015	
1	Nominal voltage	V	24.0	36.0	48.0
2	No load speed	rpm	17000	17000	16500
3	No load current	mA	885	590	422
4	Nominal speed	rpm	16200	16200	15800
5	Nominal torque (max. continuous torque)	mNm	114	119	120
6	Nominal current (max. continuous current)	A	9.21	6.39	4.70
7	Stall torque	mNm	3180	3460	3430
8	Starting current	A	236	171	124
9	Max. efficiency	%	88	89	89
Characteristics					
10	Terminal resistance phase to phase	Ω	0.102	0.210	0.386
11	Terminal inductance phase to phase	mH	0.0163	0.0368	0.0653
12	Torque constant	mNm / A	13.5	20.2	27.6
13	Speed constant	rpm / V	710	473	346
14	Speed / torque gradient	rpm / mNm	5.36	4.92	4.83
15	Mechanical time constant	ms	1.87	1.72	1.68
16	Rotor inertia	gcm ²	33.3	33.3	33.3

Specifications

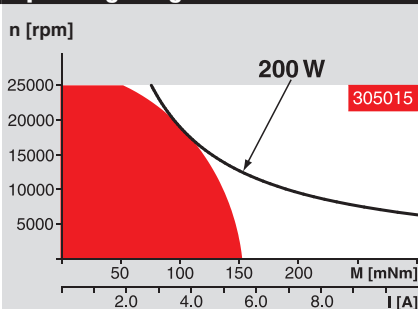
Thermal data		
17	Thermal resistance housing-ambient	5.3 K / W
18	Thermal resistance winding-housing	0.0785 K / W
19	Thermal time constant winding	0.738 s
20	Thermal time constant motor	848 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+155°C
Mechanical data (preloaded ball bearings)		
23	Max permissible speed	25000 rpm
24	Axial play at axial load < 6.0 N	0 mm
	> 6.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	5.5 N
27	Max. force for press fits (static) (static, shaft supported)	100 N
		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	271 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} 4.5 ... 24 VDC
 red/grey Hall sensor 1
 white/grey Hall sensor 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

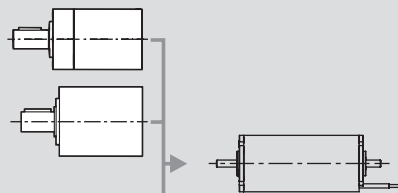
Overview on page 16 - 21

Planetary Gearhead

Ø32 mm
 8 Nm
 Page 242

Planetary Gearhead

Ø42 mm
 3 - 15 Nm
 Page 245



Recommended Electronics:

DECS 50/5	Page 284
DEC 70/10	286
DES 70/10	287
EPOS 70/10	295
EPOS2 50/5	295
Notes	20

Encoder MR

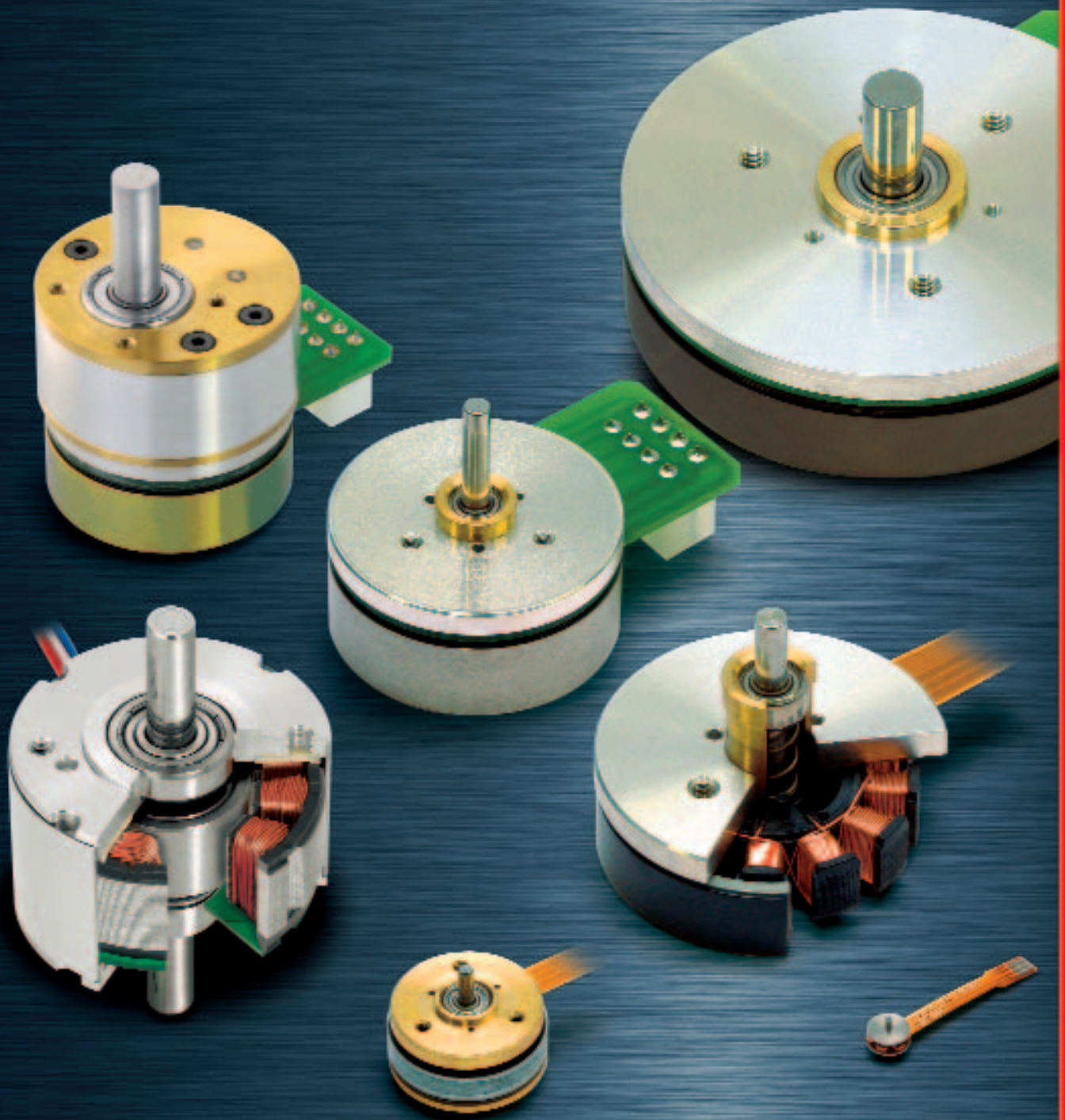
128 - 1000CTP,
 3 channels
 Page 258

Encoder HEDL 5540

500CTP,
 3 channels
 Page 266

Brake AB 20

Ø20 mm
 24 VDC, 0.1 Nm
 Page 306



maxon flat motor

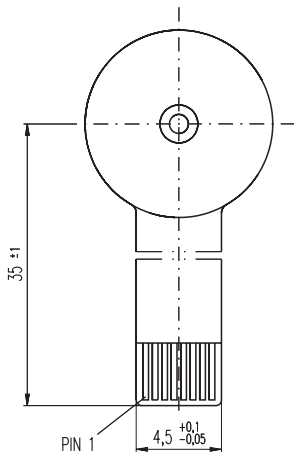
Thanks to their flat design, the brushless EC flat motors are exactly the right drive for many applications. The well-conceived, simple engineering allows mainly automated production which results in a favorable price.

EC flat motors
10 - 90 mm in diameter

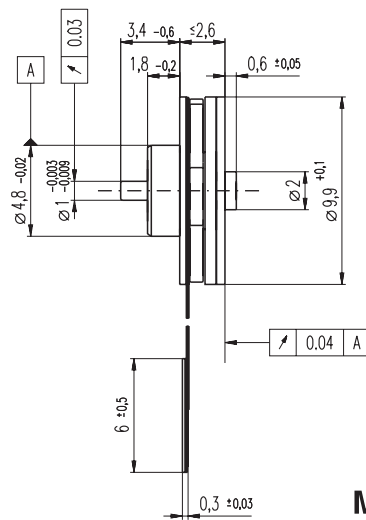
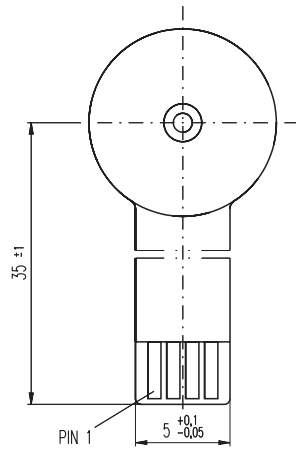
190 - 207

EC 10 flat $\varnothing 10$ mm, brushless, 0.2 Watt

A with hall sensors



B sensorless



M 2.5:1

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

Order Number

A with hall sensors
B sensorless

302000
301999

Motor Data (provisional)

Values at nominal voltage			
1	Nominal voltage	V	4.0
2	No load speed	rpm	15000
3	No load current	mA	15.1
4	Nominal speed	rpm	n.i.
5	Nominal torque	mNm	0.24
6	Nominal current	A	0.111
7	Stall torque	mNm	0.18
8	Starting current	A	0.0862
9	Max. efficiency	%	36.3
Characteristics			
10	Terminal resistance phase to phase	Ω	46.4
11	Terminal inductance phase to phase	mH	0.277
12	Torque constant	mNm / A	2.09
13	Speed constant	rpm / V	4570
14	Speed / torque gradient	rpm / mNm	101000
15	Mechanical time constant	ms	85
16	Rotor inertia	gcm ²	0.0800

Specifications

Thermal data		
17	Thermal resistance housing-ambient	50 K / W
18	Thermal resistance winding-housing	50 K / W
19	Thermal time constant winding	2.2 s
20	Thermal time constant motor	20.5 s
21	Ambient temperature	-40 ... +85°C
22	Max. permissible winding temperature	+100°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible speed	22000 rpm
24	Axial play at axial load < 0.1 N	0 mm
	> 0.1 N	0.06 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	0.1 N
27	Max. force for press fits (static)	6 N
	(static, shaft supported)	20 N
28	Max. radial loading, 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

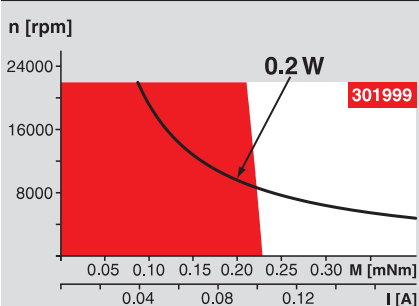
Values listed in the table are nominal.

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} 4.5...12 VDC	N.C.
Pin 5	GND	
Pin 6	Hall sensor 1	
Pin 7	Hall sensor 2	
Pin 8	Motor winding 1	
Connector	Article number	Article 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 29

Operating Range

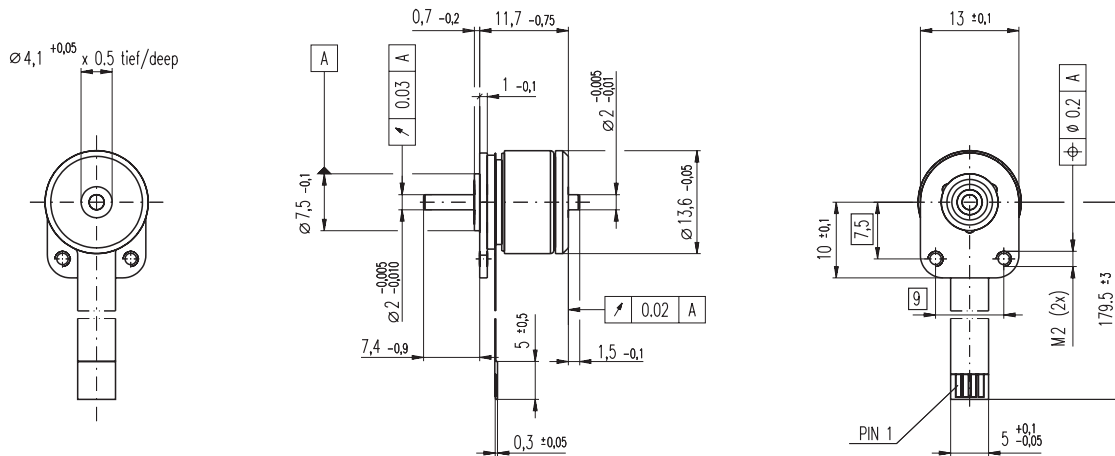


Comments

- 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**

Recommended Electronics:
DECS 50/5 Page 284
DEC 24/1 284
Notes 20

EC 14 flat $\varnothing 13.6$ mm, brushless, 1.5 Watt



M 1:1

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

Order Number

sensorless 339251 339252 **236679** 339253

Motor Data (provisional)

Values at nominal voltage						
1	Nominal voltage	V	6.0	12.0	18.0	24.0
2	No load speed	rpm	21200	22100	21000	21200
3	No load current	mA	173	93.8	57.4	43.2
4	Nominal speed	rpm	10200	10700	9960	10200
5	Nominal torque (max. continuous torque)	mNm	1.67	1.59	1.61	1.67
6	Nominal current (max. continuous current)	A	0.796	0.404	0.257	0.199
7	Stall torque	mNm	3.54	3.42	3.36	3.54
8	Starting current	A	1.50	0.764	0.474	0.374
9	Max. efficiency	%	45	44	44	45
Characteristics						
10	Terminal resistance phase to phase	Ω	4.01	15.7	38.0	64.1
11	Terminal inductance phase to phase	mH	0.107	0.428	0.962	1.71
12	Torque constant	mNm / A	2.36	4.47	7.08	9.45
13	Speed constant	rpm / V	4040	2130	1350	1010
14	Speed / torque gradient	rpm / mNm	6860	7500	7230	6860
15	Mechanical time constant	ms	79.1	86.3	83.3	79.1
16	Rotor inertia	gcm ²	1.10	1.10	1.10	1.10

Specifications

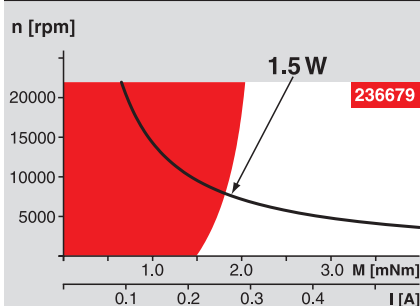
Thermal data		
17	Thermal resistance housing-ambient	7.92 K / W
18	Thermal resistance winding-housing	11 K / W
19	Thermal time constant winding	1.33 s
20	Thermal time constant motor	33.6 s
21	Ambient temperature	-40 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible speed	22000 rpm
24	Axial play at axial load < 1.5 N	0 mm
	> 1.5 N	0.14 mm preloaded
25	Radial play	
26	Max. axial load (dynamic)	1.3 N
27	Max. force for press fits (static) (static, shaft supported)	10 N
28	Max. radial loading, 5 mm from flange	1.8 N
Other specifications		
29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	8.5 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	Order number
see p. 299	220310
Connector	Article number
AMP	487951-4
MOLEX	52207-0490
MOLEX	52089-0410

Operating Range



Comments

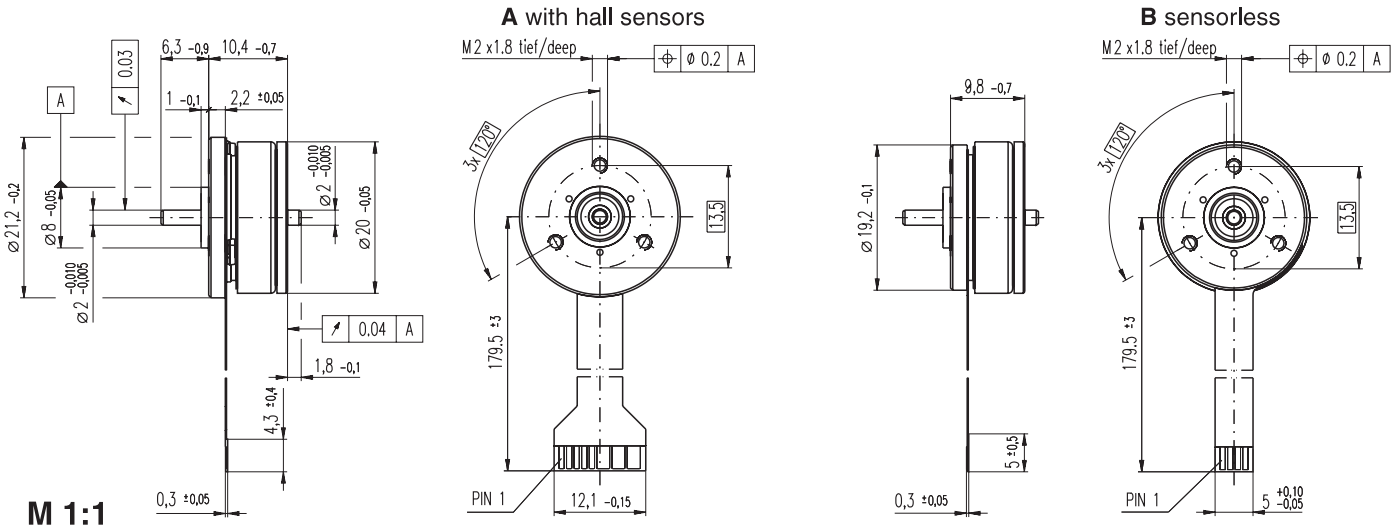
Continuous operation
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.

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

— Assigned power rating

Recommended Electronics:
DECS 50/5 Page 284
Notes 20

EC 20 flat Ø20 mm, brushless, 3 Watt



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

Order Number

	A with hall sensors	B sensorless		
	351098	351099	351100	351101
	339255	241916	339257	339258

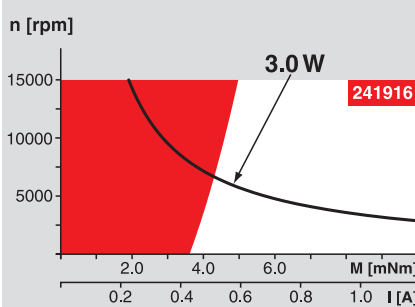
Motor Data

Values at nominal voltage						
1	Nominal voltage	V	6.0	9.0	12.0	24.0
2	No load speed	rpm	8960	9630	9370	9310
3	No load current	mA	62.5	44.9	33.1	16.2
4	Nominal speed	rpm	3160	4230	3530	3840
5	Nominal torque (max. continuous torque)	mNm	3.07	3.91	3.16	3.67
6	Nominal current (max. continuous current)	A	0.548	0.470	0.292	0.163
7	Stall torque	mNm	5.29	8.04	5.67	7.12
8	Starting current	A	0.900	0.957	0.503	0.309
9	Max. efficiency	%	55	62	56	60
Characteristics						
10	Terminal resistance phase to phase	Ω	6.67	9.40	23.9	77.7
11	Terminal inductance phase to phase	mH	0.639	1.30	2.35	9.80
12	Torque constant	mNm / A	5.88	8.40	11.3	23
13	Speed constant	rpm / V	1620	1140	847	414
14	Speed / torque gradient	rpm / mNm	1840	1270	1790	1400
15	Mechanical time constant	ms	74.1	51.2	72.1	56.2
16	Rotor inertia	gcm ²	3.84	3.84	3.84	3.84

Specifications

Thermal data		
17	Thermal resistance housing-ambient	15.3 K / W
18	Thermal resistance winding-housing	7.5 K / W
19	Thermal time constant winding	3.28 s
20	Thermal time constant motor	25.4 s
21	Ambient temperature	-40 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible 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)	10 N
	(static, shaft supported)	200 N
28	Max. radial loading, 5 mm from flange	1.8 N

Operating Range



Comments

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

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

— **Assigned power rating**

Other specifications		
29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	15 g

Values listed in the table are nominal.

Connection	with hall sensors	sensorless
Pin 1	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	Order number	Order number
see p. 299	220300	220310

Connector	Article number	Article number
AMP	1-487951-1	487951-4
MOLEX	52207-1190	52207-0490
MOLEX	52089-1110	52089-0410

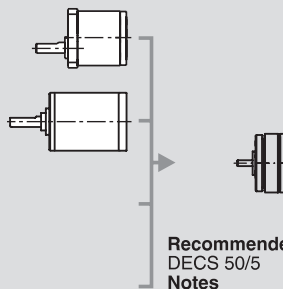
Pin for design with Hall sensors:
FPC, 11 pole, pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see page 29

maxon Modular System

Overview on page 16 - 21

Spur Gearhead
Ø20.3 mm
0.06 - 0.25 Nm
Page 227

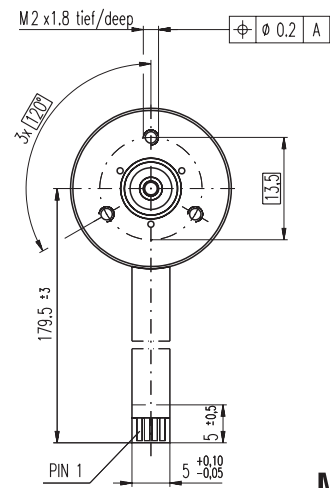
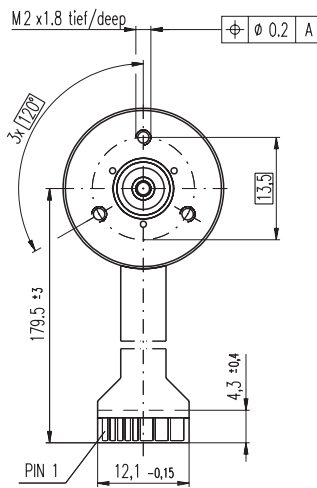
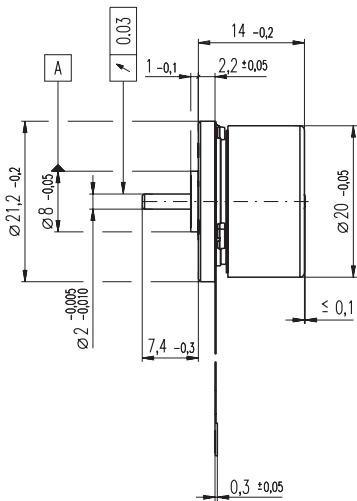
Planetary Gearhead
Ø22 mm
0.5 - 1.0 Nm
Page 230



Recommended Electronics:
DECS 50/5 Page 284
Notes 20

EC 20 flat Ø20 mm, brushless, 5 Watt

NEW



M 1:1

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

Order Number

A with hall sensors
B sensorless

351005	351006	351007	351008
351054	351055	351056	351057

Motor Data (provisional)

Values at nominal voltage						
1	Nominal voltage	V	6.0	9.0	12.0	24.0
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	5110	5480	5250	5250
5	Nominal torque (max. continuous torque)	mNm	7.01	8.2	7.43	7.69
6	Nominal current (max. continuous current)	A	1.22	0.934	0.642	0.327
7	Stall torque	mNm	17.2	22.4	18.9	19.9
8	Starting current	A	2.93	2.54	1.61	0.838
9	Max. efficiency	%	67	70.6	68.4	69.2
Characteristics						
10	Terminal resistance phase to phase	Ω	2.05	3.54	7.45	28.6
11	Terminal inductance phase to phase	mH	0.189	0.424	0.754	3.09
12	Torque constant	mNm / A	5.88	8.82	11.8	23.8
13	Speed constant	rpm / V	1620	1080	812	402
14	Speed / torque gradient	rpm / mNm	567	435	515	484
15	Mechanical time constant	ms	30.3	23.2	27.5	25.8
16	Rotor inertia	gcm ²	5.1	5.1	5.1	5.1

Specifications

Thermal data			
17	Thermal resistance housing-ambient	13.7 K / W	
18	Thermal resistance winding-housing	2.66 K / W	
19	Thermal time constant winding	1.77 s	
20	Thermal time constant motor	22.8 s	
21	Ambient temperature	-40 ... +100°C	
22	Max. permissible winding temperature	+125°C	
Mechanical data (preloaded ball bearings)			
23	Max. permissible 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)	20 N	
	(static, shaft supported)	200 N	
28	Max. radial loading, 5 mm from flange	10 N	

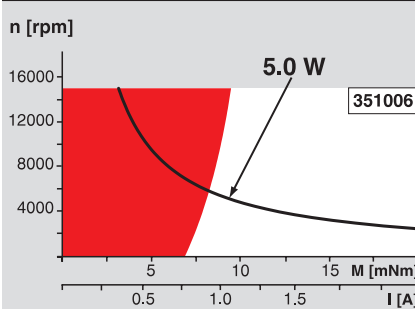
Other specifications

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	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	Order number	Order number
see p. 299	220300	220310
Connector	Article number	Article number
AMP	1-487951-1	487951-4
MOLEX	52207-1190	52207-0490
MOLEX	52089-1110	52089-0410
Pin for design with Hall sensors: FPC, 11 pole, pitch 1.0 mm, top contact style Wiring diagram for Hall sensors see page 29		

Operating Range



Comments

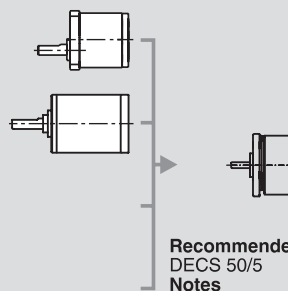
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

maxon Modular System

Overview on page 16 - 21

Spur Gearhead
Ø20.3 mm
0.06 - 0.25 Nm
Page 227

Planetary Gearhead
Ø22 mm
0.5 - 1.0 Nm
Page 230



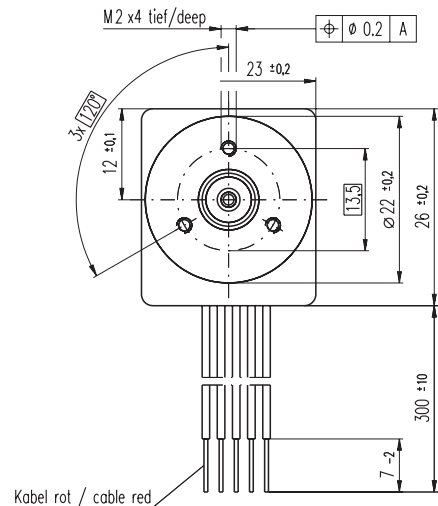
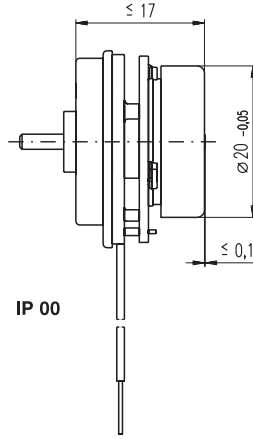
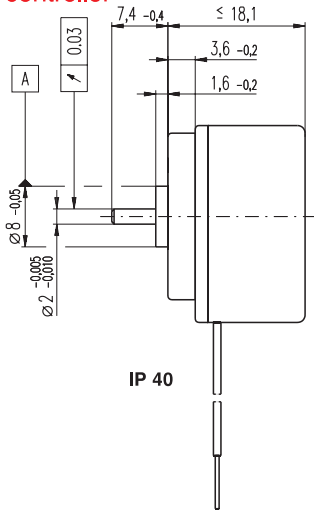
Recommended Electronics:
DECS 50/5 Page 284
Notes 20

EC 20 flat brushless, 2 Watt, with integrated electronics

NEW

1-Q-speed controller

maxon flat motor



M 1:1

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

IP 40 (with cover)
IP 00 (without cover)

Order Number

2 wire		5 wire
350795	350796	350794
350776	350778	349694

Motor Data (provisional)

Values at nominal voltage		2 wire	5 wire	5 wire	
1	Nominal voltage	V	24	24	24
2	No load speed	rpm	3000	6000	6000
3	No load current	mA	14.5	19.8	19.8
4	Nominal speed	rpm	3000	6000	6000
5	Nominal torque (max. continuous torque)	mNm	3.74	3.74	3.74
6	Nominal current (max. continuous current)	A	0.196	0.278	0.278
33	Max. torque	mNm	5	5	5
34	Max. current	A	0.33	0.33	0.33
9	Max. efficiency	%	25	37	37
Characteristics					
35	Control variable	Speed	Speed	Speed	
36	Supply voltage + V _{CC}	V	10 ... 28	10 ... 28	10 ... 28
37	Speed set value input	V	= V _{CC}	= V _{CC}	0.33 ... 10.8
38	Scale speed set value input	rpm / V	125	250	600
39	Turning speed range	rpm	1250 ... 3500	2500 ... 7000	200 ... 6480
40	Max. acceleration	rpm / s	3000	6000	6000

Specifications

Thermal data		
17	Thermal resistance housing-ambient	13 K / W
18	Thermal resistance winding-housing	10 K / W
19	Thermal time constant winding	2.38 s
20	Thermal time constant motor	133 s
21	Ambient temperature	-40 ... +85°C
22	Max. permissible winding temperature	+125°C
41	Max. temperature of electronics	+105°C
Mechanical data (preloaded ball bearings)		
16	Rotor inertia	3.2 gcm ²
24	Axial play at axial load < 2 N	0 mm
	> 2 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	1.8 N
27	Max. axial load (static)	20 N
	(static, shaft supported)	200 N
28	Max. radial loading, 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

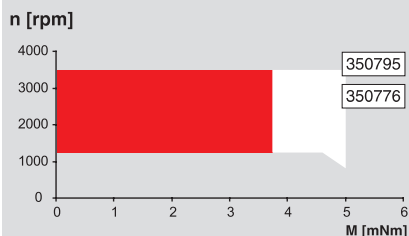
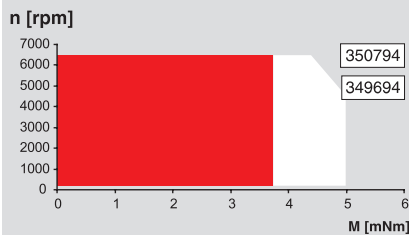
Connection 2 wire version (Cable AWG 28)

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 (2.4 ... 28 VDC)

Operating Range



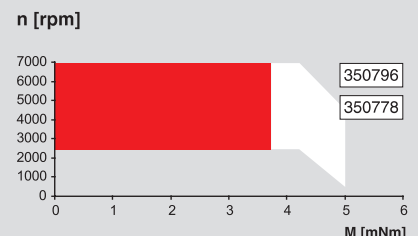
Comments

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

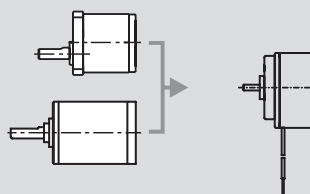
Overview on page 16 - 21

Spur Gearhead

∅20.3 mm
0.06 - 0.25 Nm
Page 227

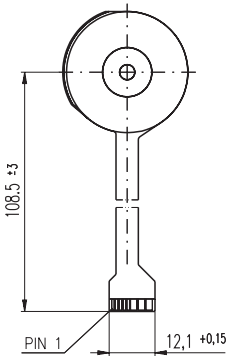
Planetary Gearhead

∅22 mm
0.5 - 1.0 Nm
Page 230

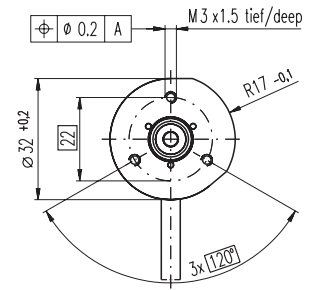
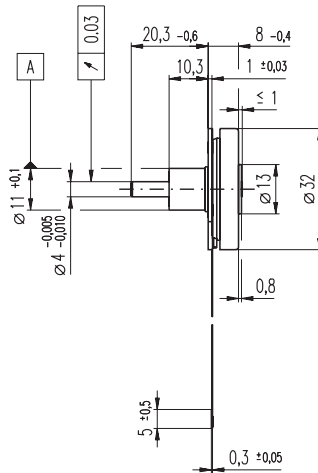
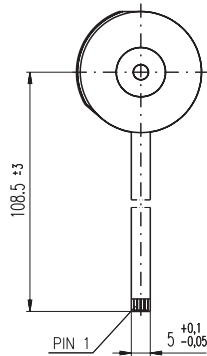


EC 32 flat $\varnothing 32$ mm, brushless, 6 Watt

A with hall sensors



B sensorless



M 1:2

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

Order Number

A with hall sensors	339259	200187	339260	339261
B sensorless	339263	200138	339264	339265

Motor Data

Values at nominal voltage						
1	Nominal voltage	V	6.0	9.0	12.0	24.0
2	No load speed	rpm	9210	8380	7970	9310
3	No load current	mA	186	107	75.6	46.2
4	Nominal speed	rpm	4030	3710	3240	4500
5	Nominal torque (max. continuous torque)	mNm	7.35	8.74	7.92	9.38
6	Nominal current (max. continuous current)	A	1.33	0.915	0.609	0.399
7	Stall torque	mNm	15.5	19.0	15.7	22.8
8	Starting current	A	2.73	2.00	1.19	0.995
9	Max. efficiency	%	55	60	57	62
Characteristics						
10	Terminal resistance phase to phase	Ω	2.20	4.50	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	9.50	13.2	23.0
13	Speed constant	rpm / V	1680	1010	724	416
14	Speed / torque gradient	rpm / mNm	651	476	551	437
15	Mechanical time constant	ms	94.8	69.3	80.3	63.6
16	Rotor inertia	gcm ²	13.9	13.9	13.9	13.9

Specifications

Thermal data	
17 Thermal resistance housing-ambient	6.28 K / W
18 Thermal resistance winding-housing	5.83 K / W
19 Thermal time constant winding	3.35 s
20 Thermal time constant motor	16.8 s
21 Ambient temperature	-40 ... +100°C
22 Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)	
23 Max. permissible speed	12000 rpm
24 Axial play at axial load < 5.0 N	0 mm
24 Axial play at axial load > 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)	50 N
27 Max. force for press fits (static) (static, shaft supported)	1000 N
28 Max. radial loading, 7.5 mm from flange	5.5 N

Other specifications

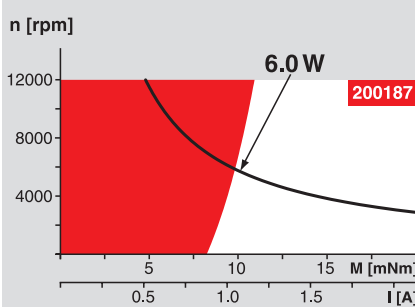
29 Number of pole pairs	4
30 Number of phases	3
31 Weight of motor	32 g

Values listed in the table are nominal.

Connection	with hall sensors	sensorless
Pin 1	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	Order number	Order number
see p. 299	220300	220310
Connector	Article number	Article number
AMP	1-487951-1	487951-4
MOLEX	52207-1190	52207-0490
MOLEX	52089-1110	52089-0410

Pin for design with Hall sensors:
FPC, 11 pole, pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see page 29

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.

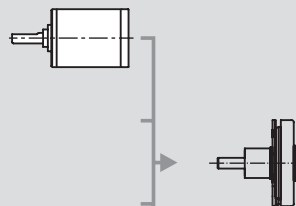
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

Overview on page 16 - 21

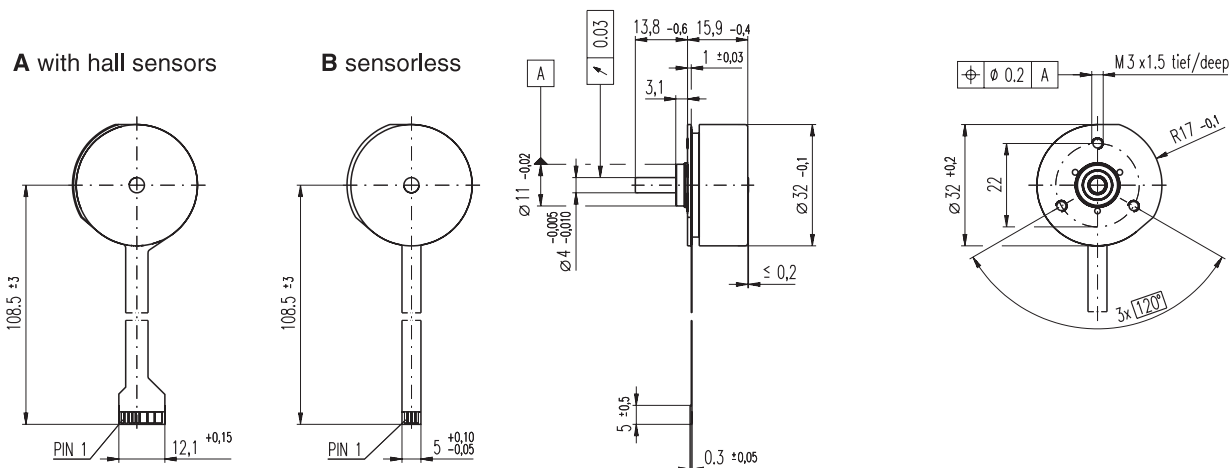
Planetary Gearhead
 $\varnothing 22$ mm
0.5 - 1.0 Nm
Page 230



Recommended Electronics:

DECS 50/5	Page 284
DEC 24/1	284
DEC 24/3	285
DEC 50/5	285
DECV 50/5	286
EPOS 24/1	294
Notes	20

EC 32 flat Ø32 mm, brushless, 15 Watt



M 1:2

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

Order Number

	A with hall sensors	B sensorless		
	339267	339268	267121	339269
	339271	339272	226006	339273

Motor Data

Values at nominal voltage						
1	Nominal voltage	V	9.0	12.0	24.0	48.0
2	No load speed	rpm	3590	4460	4390	4630
3	No load current	mA	152	150	73.4	39.4
4	Nominal speed	rpm	2120	2850	2800	2980
5	Nominal torque (max. continuous torque)	mNm	22.5	22.8	23.3	22.4
6	Nominal current (max. continuous current)	A	1.05	0.981	0.490	0.251
7	Stall torque	mNm	70.0	84.1	85.8	84.1
8	Starting current	A	3.13	3.49	1.75	0.906
9	Max. efficiency	%	61	63	64	63
Characteristics						
10	Terminal resistance phase to phase	Ω	2.87	3.43	13.7	53.0
11	Terminal inductance phase to phase	mH	1.61	1.87	7.73	27.8
12	Torque constant	mNm / A	22.4	24.1	49.0	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	20.0	21.5
16	Rotor inertia	gcm ²	35.0	35.0	35.0	35.0

Specifications

Thermal data		
17	Thermal resistance housing-ambient	9.74 K / W
18	Thermal resistance winding-housing	4.63 K / W
19	Thermal time constant winding	8.1 s
20	Thermal time constant motor	108 s
21	Ambient temperature	-40 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible 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)	50 N
	(static, shaft supported)	1000 N
28	Max. radial loading, 7.5 mm from flange	5.5 N

Other specifications

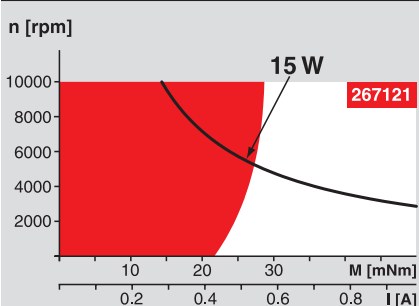
29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	46 g

Values listed in the table are nominal.

Connection	with hall sensors	sensorless
Pin 1	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	Order number	Order number
see p. 299	220300	220310
Connector	Article number	Article number
AMP	1-487951-1	487951-4
MOLEX	52207-1190	52207-0490
MOLEX	52089-1110	52089-0410

Pin for design with Hall sensors:
FPC, 11 pole, pitch 1.0 mm, top contact style
Wiring diagram for Hall sensors see page 29

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

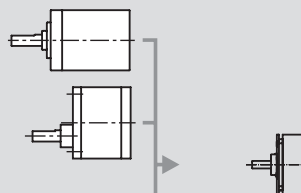
Overview on page 16 - 21

Planetary Gearhead

Ø32 mm
0.75 - 4.5 Nm
Page 239

Spur Gearhead

Ø38 mm
0.1 - 0.6 Nm
Page 243



Recommended Electronics:

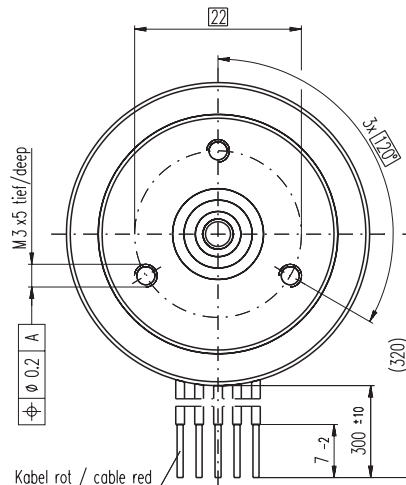
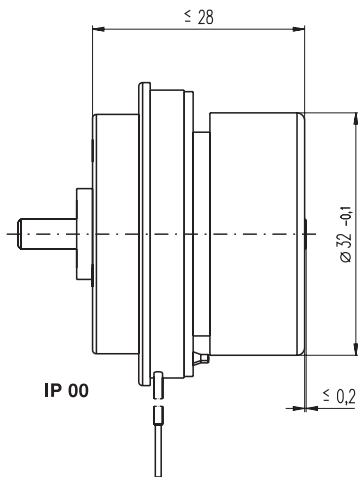
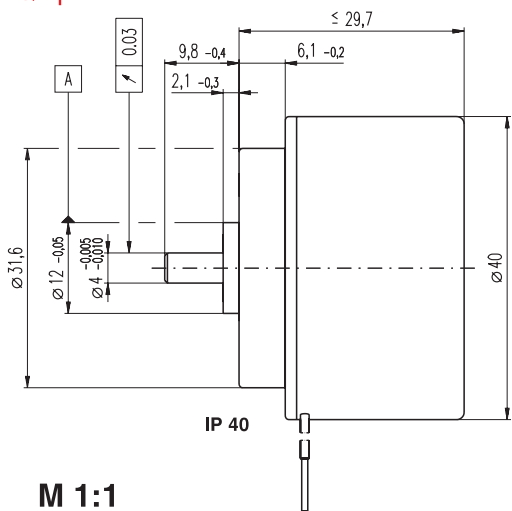
DECS 50/5	Page 284
DEC 24/1	284
DEC 24/3	285
DEC 50/5	285
DECV 50/5	286
EPOS 24/1	294
Notes	20

EC 32 flat brushless, 15 Watt, with integrated electronics

NEW

1-Q-speed controller

maxon flat motor



M 1:1

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

Order Number

IP 40 (with cover)
IP 00 (without cover)

	2 wire	5 wire
IP 40 (with cover)	353400	353401
IP 00 (without cover)	353324	353325

Motor Data (provisional)

Values at nominal voltage		2 wire	5 wire
1 Nominal voltage	V	24	24
2 No load speed	rpm	3000	6000
3 No load current	mA	43	86
4 Nominal speed	rpm	3000	6000
5 Nominal torque (max. continuous torque)	mNm	26.2	24
6 Nominal current (max. continuous current)	A	0.56	0.95
33 Max. torque	mNm	34.4	34
34 Max. current	A	1.2	1.6
9 Max. efficiency	%	54	64
Characteristics			
35 Control variable	Speed	Speed	Speed
36 Supply voltage + V _{CC}	V	10 ... 28	10 ... 28
37 Speed set value input	V	= V _{CC}	0.33 ... 10.8
38 Scale speed set value input	rpm / V	125	250
39 Turning speed range	rpm	1250 ... 3500	2500 ... 7000
40 Max. acceleration	rpm / s	3000	6000

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 7.6 K / W
 - 18 Thermal resistance winding-housing 5.9 K / W
 - 19 Thermal time constant winding 10.3 s
 - 20 Thermal time constant motor 72.6 s
 - 21 Ambient temperature -40 ... +85°C
 - 22 Max. permissible 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 < 2 N 0 mm
 - > 2 N 0.14 mm
 - 25 Radial play preloaded
 - 26 Max. axial load (dynamic) 6.8 N
 - 27 Max. axial load (static) 70 N
 - (static, shaft supported) 1000 N
 - 28 Max. radial loading, 7.5 mm from flange 32 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

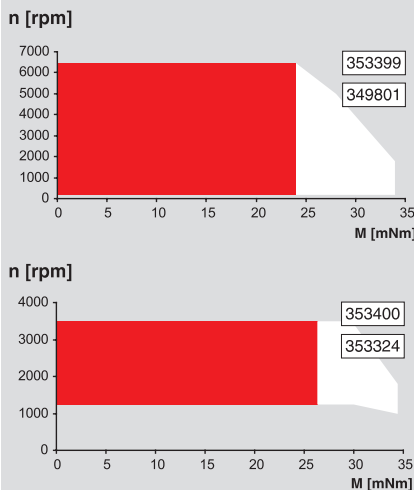
Connection 2 wire version (Cable AWG 24)

- 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 (2.4 ... 28 VDC)

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

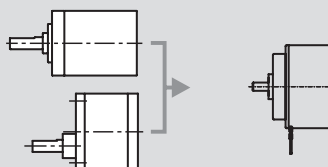
Overview on page 16 - 21

Planetary Gearhead

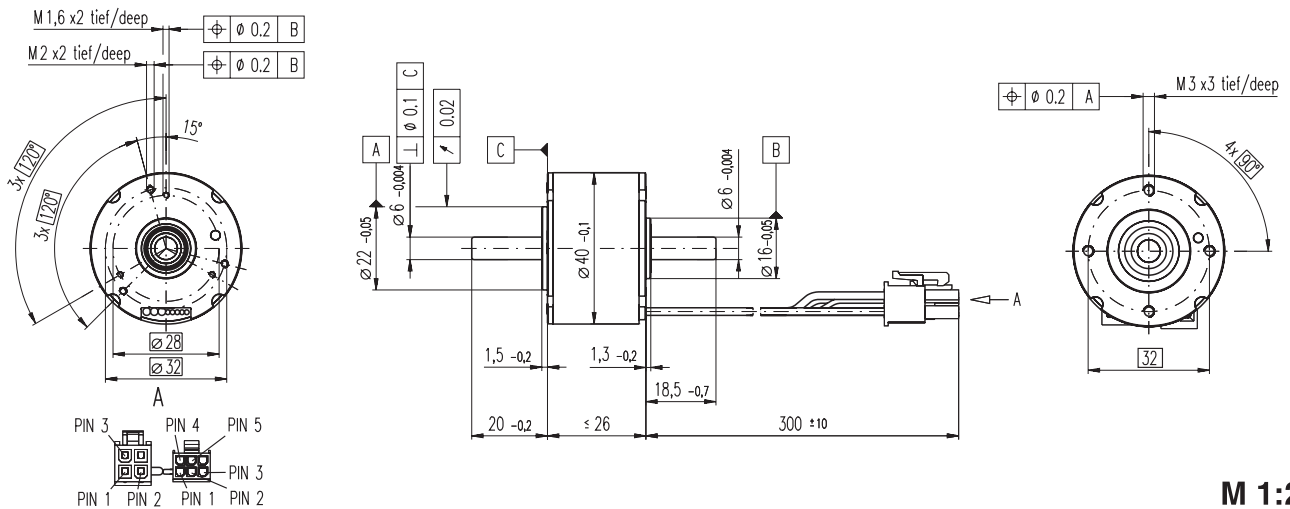
∅32 mm
0.75 - 4.5 Nm
Page 239

Spur Gearhead

∅38 mm
0.1 - 0.6 Nm
Page 243



EC-i 40 \varnothing 40 mm, brushless, 50 Watt



M 1:2

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

Order Number

with hall sensors 339241 313320

Motor Data (provisional)

Values at nominal voltage			
1	Nominal voltage	V	12.0 24.0
2	No load speed	rpm	11600 12400
3	No load current	mA	635 351
4	Nominal speed	rpm	9390 9900
5	Nominal torque (max. continuous torque)	mNm	38.9 51.0
6	Nominal current (max. continuous current)	A	4.07 2.65
7	Stall torque	mNm	459 821
8	Starting current	A	48.3 45.8
9	Max. efficiency	%	79 84
Characteristics			
10	Terminal resistance phase to phase	Ω	0.248 0.524
11	Terminal inductance phase to phase	mH	0.109 0.390
12	Torque constant	mNm / A	9.50 17.9
13	Speed constant	rpm / V	1010 532
14	Speed / torque gradient	rpm / mNm	26.3 15.6
15	Mechanical time constant	ms	2.89 1.71
16	Rotor inertia	gcm ²	10.5 10.5

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 9.66 K / W
 - 18 Thermal resistance winding-housing: 2.57 K / W
 - 19 Thermal time constant winding: 17.5 s
 - 20 Thermal time constant motor: 676 s
 - 21 Ambient temperature: -40 ... +100°C
 - 22 Max. permissible winding temperature: +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible 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): 8 N
 - 27 Max. force for press fits (static): 100 N
 - (static, shaft supported): 2000 N
 - 28 Max. radial loading, 5 mm from flange: 50 N
- Other specifications**
- 29 Number of pole pairs: 7
 - 30 Number of phases: 3
 - 31 Weight of motor: 130 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

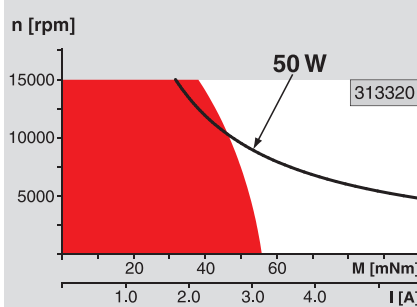
Connection (Cable AWG 26)

- 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

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.

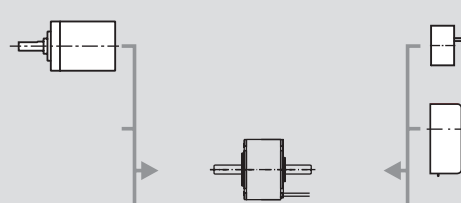
Short term operation
The motor may be briefly overloaded (recurring).

— Assigned power rating

maxon Modular System

Overview on page 16 - 21

7 Planetary Gearhead
 \varnothing 32 mm
1.0 - 6.0 Nm
Page 241



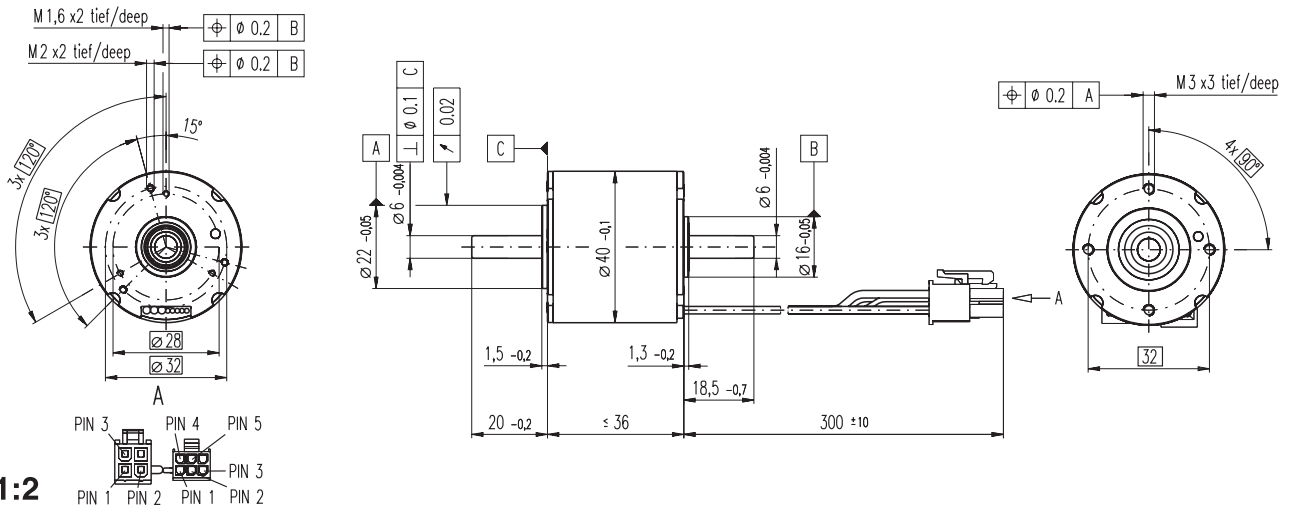
Encoder MR
256 - 1024 CPT,
3 channels
Page 259

Encoder HEDL 5540
500 CPT,
3 channels
Page 266

Recommended Electronics:

- DECS 50/5 Page 284
- DEC 50/5 285
- DECV 50/5 286
- DEC 70/10 286
- EPOS 24/5 294
- EPOS P 24/5 297
- Notes 20

EC-i 40 \varnothing 40 mm, brushless, 70 Watt



M 1:2

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

Order Number

with hall sensors 339243 339244

Motor Data (provisional)

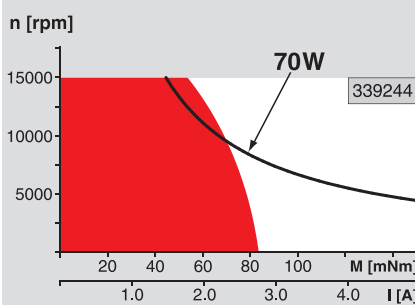
Values at nominal voltage		24.0	48.0	
1	Nominal voltage	V	24.0	48.0
2	No load speed	rpm	13900	14800
3	No load current	mA	386	213
4	Nominal speed	rpm	11900	12600
5	Nominal torque (max. continuous torque)	mNm	53.5	66.7
6	Nominal current (max. continuous current)	A	3.28	2.08
7	Stall torque	mNm	1060	1810
8	Starting current	A	65.4	59.5
9	Max. efficiency	%	86	89
Characteristics		0.367	0.807	
10	Terminal resistance phase to phase	Ω	0.367	0.807
11	Terminal inductance phase to phase	mH	0.180	0.644
12	Torque constant	mNm / A	16.1	30.5
13	Speed constant	rpm / V	592	313
14	Speed / torque gradient	rpm / mNm	13.5	8.31
15	Mechanical time constant	ms	3.41	2.11
16	Rotor inertia	gcm ²	24.2	24.2

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient: 7.8 K / W
 - 18 Thermal resistance winding-housing: 2.6 K / W
 - 19 Thermal time constant winding: 28.2 s
 - 20 Thermal time constant motor: 385 s
 - 21 Ambient temperature: -40 ... +100°C
 - 22 Max. permissible winding temperature: +155°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible speed: 15000 rpm
 - 24 Axial play at axial load < 6.0 N: 0 mm
 - > 6.0 N: 0.14 mm
 - 25 Radial play preloaded: 8 N
 - 26 Max. axial load (dynamic): 100 N
 - 27 Max. force for press fits (static) (static, shaft supported): 2000 N
 - 28 Max. radial loading, 5 mm from flange: 50 N
- Other specifications**
- 29 Number of pole pairs: 7
 - 30 Number of phases: 3
 - 31 Weight of motor: 210 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

Operating Range

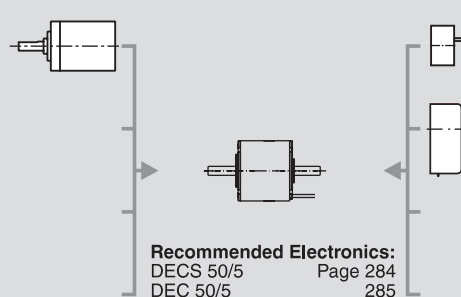


Comments

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

maxon Modular System

Planetary Gearhead
 \varnothing 32 mm
 1.0 - 6.0 Nm
 Page 241



Overview on page 16 - 21

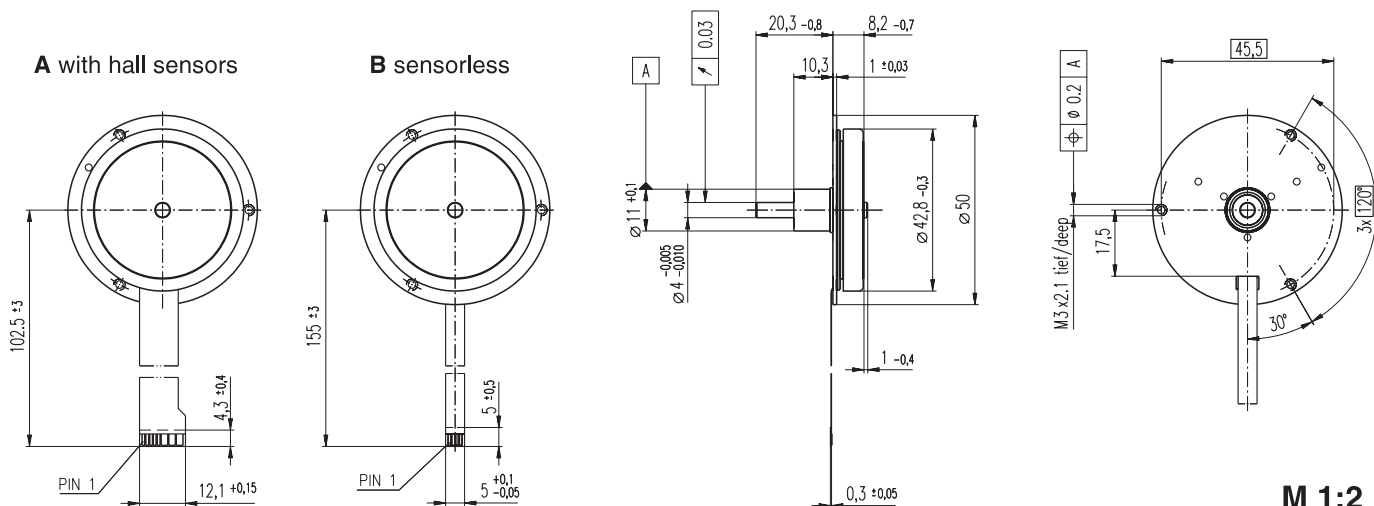
Encoder MR
 256 - 1024 CPT,
 3 channels
 Page 259

Encoder HEDL 5540
 500 CPT,
 3 channels
 Page 266

Recommended Electronics:

DECS 50/5	Page 284
DEC 50/5	285
DECV 50/5	286
DEC 70/10	286
EPOS 24/5	294
EPOS 70/10	295
EPOS P 24/5	297
Notes	20

EC 45 flat $\varnothing 45$ mm, brushless, 12 Watt



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

	Order Number						
A with hall sensors	200188		339275		339276		
B sensorless		200141		339277		339278	

Motor Data								
Values at nominal voltage								
1	Nominal voltage	V	9.0	9.0	12.0	12.0	24.0	24.0
2	No load speed	rpm	8030	8010	8190	8180	7320	7320
3	No load current	mA	128	128	99.0	99.0	42.2	42.2
4	Nominal speed	rpm	4840	4350	4840	4790	4380	4370
5	Nominal torque (max. continuous torque)	mNm	22.8	23.9	19.1	18.3	25.8	25.4
6	Nominal current (max. continuous current)	A	1.96	2.07	1.31	1.27	0.739	0.730
7	Stall torque	mNm	89.1	74.9	66.3	61.3	106	103
8	Starting current	A	8.57	7.20	4.90	4.53	3.46	3.37
9	Max. efficiency	%	77	76	74	73	79	79
Characteristics								
10	Terminal resistance phase to phase	Ω	1.05	1.25	2.45	2.65	6.93	7.13
11	Terminal inductance phase to phase	mH	0.320	0.320	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	92.7	110	128	138	71.1	73.2
15	Mechanical time constant	ms	50.8	60.4	70.1	75.8	38.9	40.1
16	Rotor inertia	gcm ²	52.3	52.3	52.3	52.3	52.3	52.3

Specifications		Operating Range		Comments		
Thermal data		n [rpm]		<div style="background-color: red; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> Continuous operation In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.		
17	Thermal resistance housing-ambient	5.17 K / W				
18	Thermal resistance winding-housing	5.05 K / W		<div style="background-color: white; border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> Short term operation The motor may be briefly overloaded (recurring).		
19	Thermal time constant winding	8.24 s				
20	Thermal time constant motor	147 s				
21	Ambient temperature	-40 ... +100°C				
22	Max. permissible winding temperature	+125°C				
Mechanical data (preloaded ball bearings)		M [mNm]			<div style="border-bottom: 1px solid black; width: 20px; display: inline-block; margin-right: 5px;"></div> Assigned power rating	
23	Max. permissible speed	10000 rpm				
24	Axial play at axial load < 5.0 N	0 mm				
	> 5.0 N	typ. 0.6 mm preloaded				
25	Radial play					
26	Max. axial load (dynamic)	4.8 N				
27	Max. force for press fits (static) (static, shaft supported)	50 N				
28	Max. radial loading, 7.5 mm from flange	1000 N				
		5.5 N				
Other specifications		I [A]				
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	4.5 ... 18 VDC	Motor winding 1
Pin 2	Hall sensor 3*	Motor winding 2
Pin 3	Hall sensor 1*	Motor winding 3
Pin 4	Hall sensor 2*	neutral point
Pin 5	GND	
Pin 6	Motor winding 3	
Pin 7	Motor winding 2	
Pin 8	Motor winding 1	

*internal pull-up (7 ... 13 k Ω) on pin 1
 Wiring diagram for Hall sensors see page 29

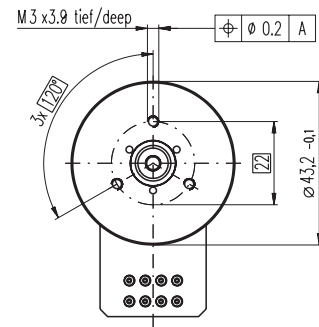
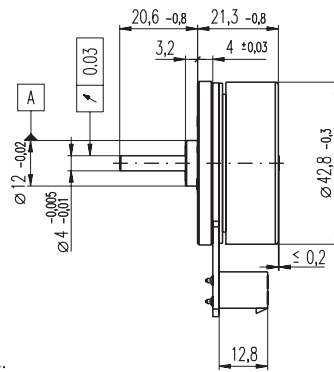
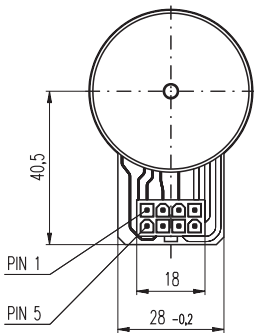
Adapter	Order number	Order number
see p. 299	220300	220310
Connector	Article number	Article number
AMP	1-487951-1	487951-4
MOLEX	52207-1190	52207-0490
MOLEX	52089-1110	52089-0410

Pin for design with Hall sensors:
 FPC, 11 pole, pitch 1.0 mm, top contact style

Recommended Electronics:

DECS 50/5	Page 284
DEC 24/1	284
DEC 24/3	285
DEC 50/5	285
DECV 50/5	286
EPOS 24/1	294
Notes	20

EC 45 flat $\varnothing 45$ mm, brushless, 50 Watt



Connector:
39-28-1083
MOLEX

M 1:2

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

Order Number

with hall sensors

339285	251601	339286	339287
--------	--------	--------	--------

Motor Data

Values at nominal voltage		339285	251601	339286	339287	
1	Nominal voltage	V	18.0	24.0	24.0	36.0
2	No load speed	rpm	6710	6700	4700	3360
3	No load current	mA	294	201	116	46.9
4	Nominal speed	rpm	5250	5260	3410	2320
5	Nominal torque (max. continuous torque)	mNm	96.9	84.3	64.2	94.3
6	Nominal current (max. continuous current)	A	3.54	2.36	1.32	0.861
7	Stall torque	mNm	1100	822	337	488
8	Starting current	A	43.6	24.5	7.10	4.86
9	Max. efficiency	%	84.5	83	77	82
Characteristics						
10	Terminal resistance phase to phase	Ω	0.413	0.978	3.38	7.41
11	Terminal inductance phase to phase	mH	0.322	0.573	1.15	5.15
12	Torque constant	mNm / A	25.1	33.5	47.5	101
13	Speed constant	rpm / V	380	285	201	95.0
14	Speed / torque gradient	rpm / mNm	6.24	8.32	14.3	7.00
15	Mechanical time constant	ms	8.82	11.8	20.3	9.90
16	Rotor inertia	gcm ²	135	135	135	135

Specifications

Thermal data		
17	Thermal resistance housing-ambient	4.25 K / W
18	Thermal resistance winding-housing	4.5 K / W
19	Thermal time constant winding	16.6 s
20	Thermal time constant motor	212 s
21	Ambient temperature	-40 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible speed	10000 rpm
24	Axial play at axial load < 4.0 N	0 mm
	> 4.0 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	3.8 N
27	Max. force for press fits (static) (static, shaft supported)	50 N
28	Max. radial loading, 7.5 mm from flange	5.5 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	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

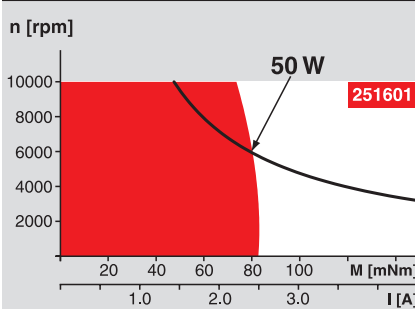
*internal pull-up (7 ... 13 k Ω) on pin 3

Wiring diagram for Hall sensors see page 29

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

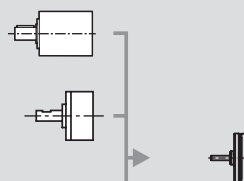
Overview on page 16 - 21

Planetary Gearhead

$\varnothing 42$ mm
3 - 15 Nm
Page 244

Spur Gearhead

$\varnothing 45$ mm
0.5 - 2.0 Nm
Page 246



Recommended Electronics:

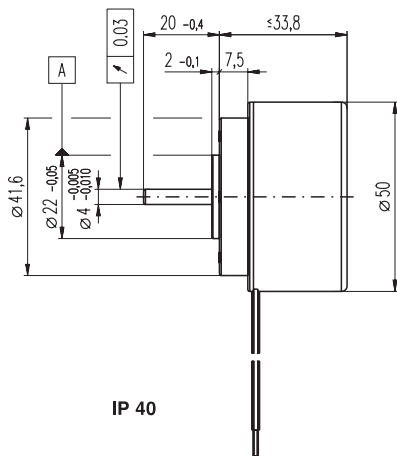
DECS 50/5	Page 284
DEC 24/3	285
DEC 50/5	285
DECV 50/5	286
EPOS 24/1	294
EPOS 24/5	294
EPOS P 24/5	297
Notes	20

EC 45 flat brushless, 30 Watt, with integrated electronics

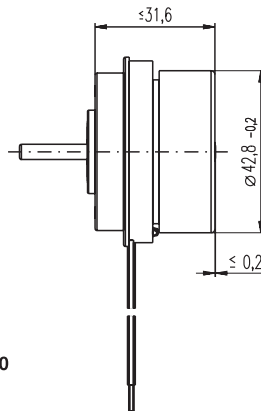
1-Q-speed controller

NEW

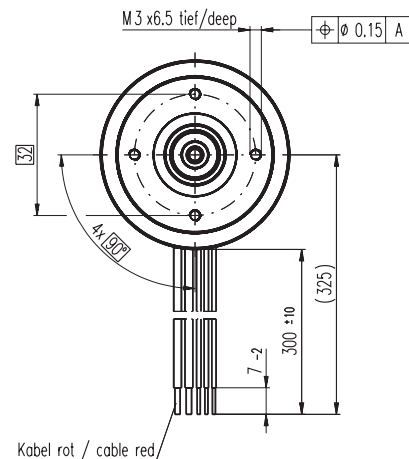
maxon flat motor



IP 40



IP 00



Kabel rot / cable red

M 1:2

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

IP 40 (with cover)
IP 00 (without cover)

Order Number

2 wire version				5 wire version			
353518		353519		350909			
	353516		353517		352886		

Motor Data (provisional)

Values at nominal voltage		353518		353519		350909		352886	
1	Nominal voltage	V	24	24	24	24	24	24	24
2	No load speed	rpm	3000	3000	6000	6000	6000	6000	6000
3	No load current	mA	105	105	222	222	222	222	222
4	Nominal speed	rpm	3000	3000	6000	6000	6000	6000	6000
5	Nominal torque (max. continuous torque)	mNm	65	91	67	91	67	91	91
6	Nominal current (max. continuous current)	A	1.2	1.8	2.4	3	2.4	3	3
33	Max. torque	mNm	106	106	104	104	104	104	104
34	Max. current	A	2.1	2.1	3.6	3.6	3.6	3.6	3.6
9	Max. efficiency	%	71	71	73	77	73	77	77
Characteristics		Speed		Speed		Speed		Speed	
35	Control variable		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
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
38	Scale speed set value input	rpm / V	125	125	250	250	600	600	600
39	Turning speed range	rpm	1250 ... 3500	1250 ... 3500	2500 ... 7000	2500 ... 7000	200 ... 6480	200 ... 6480	200 ... 6480
40	Max. acceleration	rpm / s	3000	3000	6000	6000	6000	6000	6000

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 5.8 (3.5) K / W
 - 18 Thermal resistance winding-housing 5 K / W
 - 19 Thermal time constant winding 25 s
 - 20 Thermal time constant motor 650 (400) s
 - 21 Ambient temperature -40 ... +85°C
 - 22 Max. permissible 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 < 2 N 0 mm
 - > 2 N 0.14 mm
 - 25 Radial play preloaded
 - 26 Max. axial load (dynamic) 6.8 N
 - 27 Max. axial load (static) 95 N
 - (static, shaft supported) 1000 N
 - 28 Max. radial loading, 7.5 mm from flange 51 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

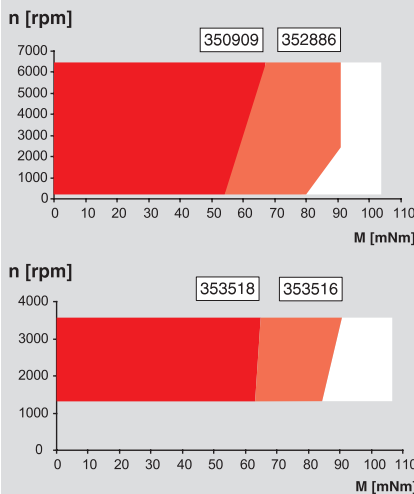
Connection 2 wire version (Cable AWG 18/24)

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 (2.4 ... 28 VDC)

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

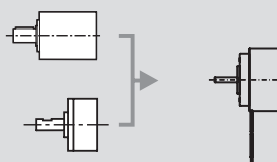
Overview on page 16 - 21

Planetary Gearhead

Ø42 mm
3 - 15 Nm
Page 244

Spur Gearhead

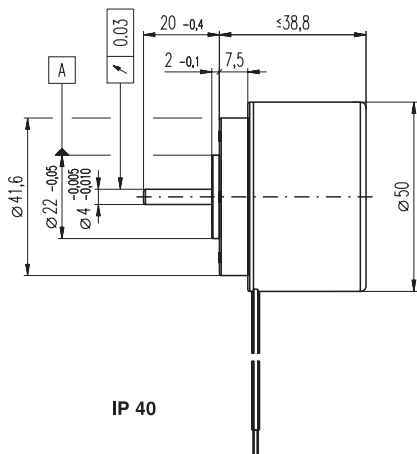
Ø45 mm
0.5 - 2.0 Nm
Page 246



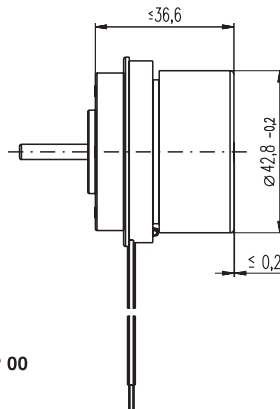
EC 45 flat brushless, 50 Watt, with integrated electronics

1-Q-speed controller

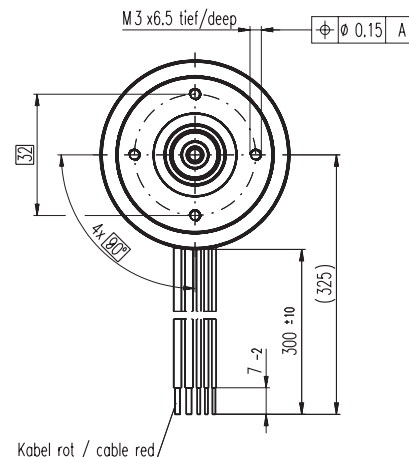
NEW



IP 40



IP 00



Kabel rot / cable red

M 1:2

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

IP 40 (with cover)
IP 00 (without cover)

Order Number

2 wire version		5 wire version	
353526		350910	
	353524		352887

Motor Data (provisional)

Values at nominal voltage		IP 40 (with cover)		IP 00 (without cover)	
1	Nominal voltage	V	24	24	24
2	No load speed	rpm	3000	3000	4500
3	No load current	mA	127	127	192
4	Nominal speed	rpm	3000	3000	4500
5	Nominal torque (max. continuous torque)	mNm	66	123	71
6	Nominal current (max. continuous current)	A	1.2	2.4	2
33	Max. torque	mNm	154	154	154
34	Max. current	A	3.3	3.3	3.8
9	Max. efficiency	%	74	74	79
Characteristics		IP 40 (with cover)		IP 00 (without cover)	
35	Control variable	Speed	Speed	Speed	Speed
36	Supply voltage + V _{CC}	V	10 ... 28	10 ... 28	10 ... 28
37	Speed set value input	V	= V _{CC}	= V _{CC}	0.33 ... 10.8
38	Scale speed set value input	rpm / V	125	125	600
39	Turning speed range	rpm	1250 ... 3500	1250 ... 3500	200 ... 6480
40	Max. acceleration	rpm / s	3000	3000	6000

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 5.8 (2.4) K / W
 - 18 Thermal resistance winding-housing 4 K / W
 - 19 Thermal time constant winding 27 s
 - 20 Thermal time constant motor 290 (116) s
 - 21 Ambient temperature -40 ... +85°C
 - 22 Max. permissible winding temperature +125°C
 - 41 Max. temperature of electronics +105°C
- Mechanical data (preloaded ball bearings)**
- 16 Rotor inertia 193 gcm²
 - 24 Axial play at axial load < 2 N 0 mm
 - > 2 N 0.14 mm
 - 25 Radial play preloaded
 - 26 Max. axial load (dynamic) 6.8 N
 - 27 Max. axial load (static) 95 N
 - (static, shaft supported) 1000 N
 - 28 Max. radial loading, 5 mm from flange 54 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

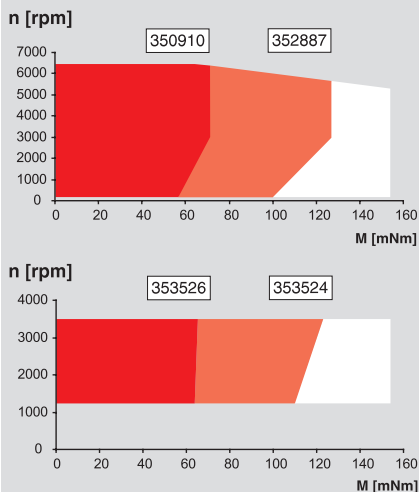
Connection 2 wire version (Cable AWG 18/24)

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 (2.4 ... 28 VDC)

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

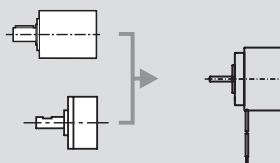
Overview on page 16 - 21

Planetary Gearhead

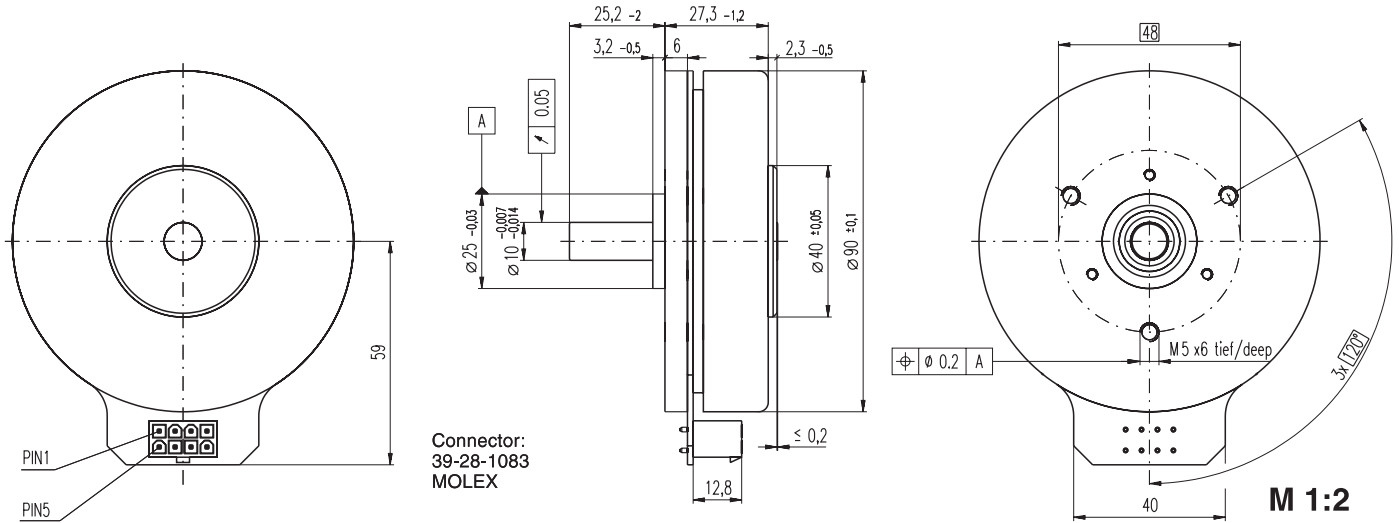
Ø42 mm
3 - 15 Nm
Page 244

Spur Gearhead

Ø45 mm
0.5 - 2.0 Nm
Page 246



EC 90 flat $\varnothing 90$ mm, brushless, 90 Watt



Connector:
39-28-1083
MOLEX

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

Order Number

with hall sensors

323772 **244879**

Motor Data

Values at nominal voltage		323772	244879	
1	Nominal voltage	V	24.0	48.0
2	No load speed	rpm	3190	2080
3	No load current	mA	539	130
4	Nominal speed	rpm	2650	1640
5	Nominal torque (max. continuous torque)	mNm	387	494
6	Nominal current (max. continuous current)	A	5.39	2.12
7	Stall torque	mNm	4670	4530
8	Starting current	A	66.2	20.9
9	Max. efficiency	%	83	85
Characteristics				
10	Terminal resistance phase to phase	Ω	0.363	2.30
11	Terminal inductance phase to phase	mH	0.264	2.50
12	Torque constant	mNm / A	70.5	217
13	Speed constant	rpm / V	135	44.0
14	Speed / torque gradient	rpm / mNm	0.697	0.466
15	Mechanical time constant	ms	22.3	14.9
16	Rotor inertia	gcm ²	3060	3060

Specifications

- Thermal data**
- 17 Thermal resistance housing-ambient 1.89 K / W
 - 18 Thermal resistance winding-housing 2.99 K / W
 - 19 Thermal time constant winding 52.6 s
 - 20 Thermal time constant motor 281 s
 - 21 Ambient temperature -40 ... +100°C
 - 22 Max. permissible winding temperature +125°C
- Mechanical data (preloaded ball bearings)**
- 23 Max. permissible 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) 150 N
 - (static, shaft supported) 8000 N
 - 28 Max. radial loading, 7.5 mm from flange 30 N
- Other specifications**
- 29 Number of pole pairs 12
 - 30 Number of phases 3
 - 31 Weight of motor 648 g

Values listed in the table are nominal.

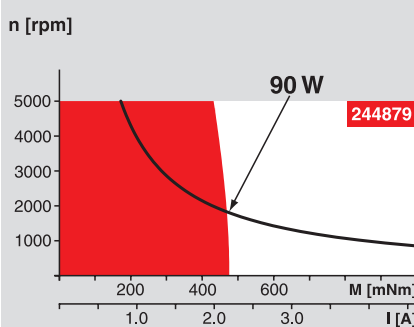
Connection

- Pin 1 Hall sensor 1
 - Pin 2 Hall sensor 2
 - Pin 3 4.5 ... 24 VDC
 - Pin 4 Motor winding 3
 - Pin 5 Hall sensor 3
 - Pin 6 GND
 - Pin 7 Motor winding 1
 - Pin 8 Motor winding 2
- Wiring diagram for Hall sensors see page 29

Cable

- Connection cable Universal, L = 500 mm **339380**
- Connection cable to EPOS, L = 500 mm **354045**

Operating Range



Comments

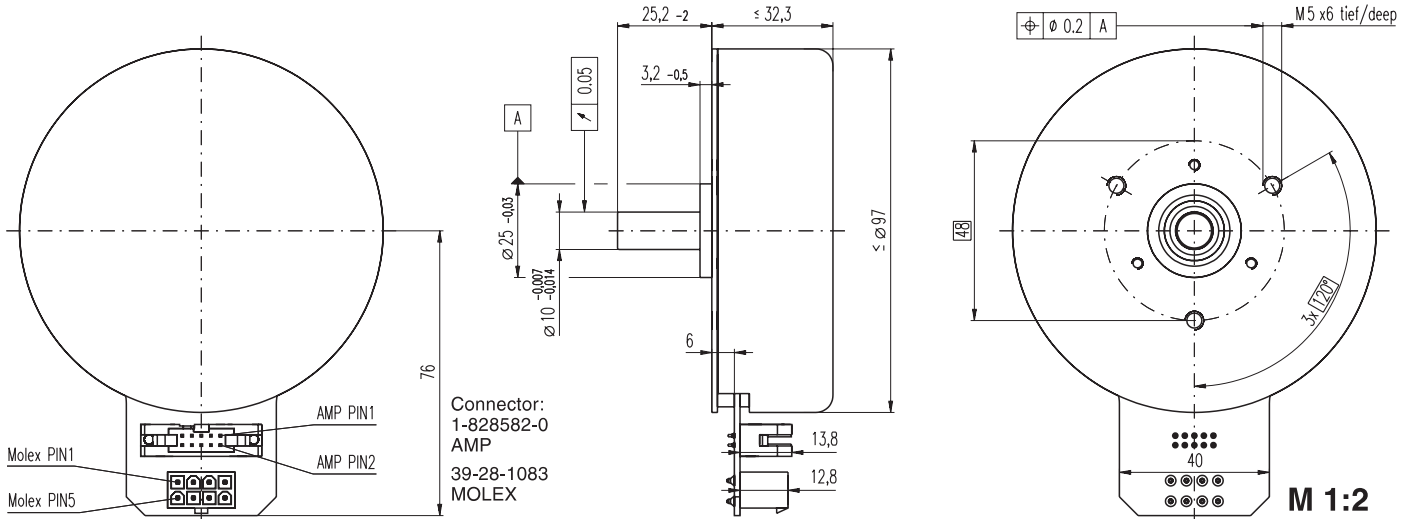
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

Recommended Electronics:

- DECS 50/5 Page 284
- DEC 50/5 285
- DECV 50/5 286
- DEC 70/10 286
- EPOS 24/5 294
- EPOS 70/10 295
- EPOS P 24/5 297
- Notes** 20

EC 90 flat brushless, 60 Watt, with encoder

NEW



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

Order Number

	with hall sensors	353984	346970
Motor Data (provisional)			

Values at nominal voltage			
1	Nominal voltage	V	12.0
2	No load speed	rpm	1600
3	No load current	mA	338
4	Nominal speed	rpm	1260
5	Nominal torque (max. continuous torque)	mNm	327
6	Nominal current (max. continuous current)	A	4.56
7	Stall torque	mNm	2330
8	Starting current	A	33.1
9	Max. efficiency	%	81.2
Characteristics			
10	Terminal resistance phase to phase	Ω	0.363
11	Terminal inductance phase to phase	mH	0.264
12	Torque constant	mNm / A	70.5
13	Speed constant	rpm / V	135
14	Speed / torque gradient	rpm / mNm	0.697
15	Mechanical time constant	ms	22.3
16	Rotor inertia	gcm ²	3060

Specifications

Thermal data		
17	Thermal resistance housing-ambient	3.7 K / W
18	Thermal resistance winding-housing	3.4 K / W
19	Thermal time constant winding	60 s
20	Thermal time constant motor	549 s
21	Ambient temperature	-20 ... +70°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max. permissible speed	1750 rpm
24	Axial play at axial load < 15 N	0 mm
	> 15 N	0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	12 N
27	Max. force for press fits (static) (static, shaft supported)	150 N
28	Max. radial loading, 7.5 mm from flange	8000 N
		30 N
Other specifications		
29	Number of pole pairs	12
30	Number of phases	3
31	Weight of motor	713 g

Values listed in the table are nominal.

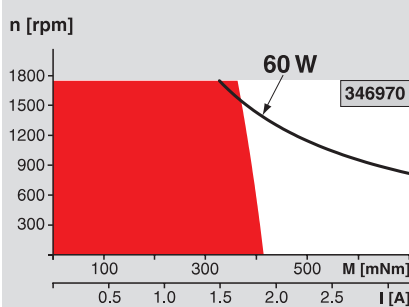
Technical Data Encoder

Function principle	optical
Counts per turn	2048
Number of channels	2
Max. operating frequency	60 kHz
Supply voltage V _{CC}	5V ± 10%
Output signal	EIA Standard RS422
Driver used	DS26C31T
Output current per channel	-20 ... +20 mA
Signal rise and fall times (typical, at C _L = 25pF, R _L = 1kΩ)	30 ns

Cable

Connection cable to EPOS, L = 500 mm	354045
Connection cable Encoder, L = 500 mm	354046

Operating Range



Comments

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

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

— Assigned power rating

Connection Motor

Pin 1	Hall sensor 1
Pin 2	Hall sensor 2
Pin 3	4.5 ... 24 VDC
Pin 4	Motor winding 3
Pin 5	Hall sensor 3
Pin 6	GND
Pin 7	Motor winding 1
Pin 8	Motor winding 2

Wiring diagram for Hall sensors see page 29

Connection Encoder

Pin 1	N.C.
Pin 2	V _{CC}
Pin 3	GND
Pin 4	N.C.
Pin 5	A\
Pin 6	A
Pin 7	B\
Pin 8	B
Pin 9	N.C.
Pin 10	N.C.

Recommended Electronics:

EPOS 24/5	Page 294
EPOS2 50/5	295
EPOS 70/10	295
EPOS P 24/5	297

Notes 20



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.


Important considerations 210

Spur- and planetary gearheads 211 - 250

Explanation of the pages 211 - 250

Dimensional drawings

On the enclosed CD-ROM dimensional drawings (DXF-files) are available and are suitable for import to any CAD system.

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

Mounting threads 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!

Technical data

Recommended 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 permissible temperature range can be extended to -35°C , but extreme temperatures require much greater power consumption. Special lubricants can be supplied on request.

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.

Gearhead Data

Reduction

The reduction indicates the ratio by which the speed of the gear output shaft is smaller than the motor speed.

Absolute reduction

provides the reduction as an exact ratio of two integer numbers.

Max. continuous torque

The continuous torque provides the maximum load permanently applied to the output shaft. If it is exceeded, the service life is greatly shortened. This is caused by cracking of the lubricant at high temperatures and the mechanical destruction of the components.

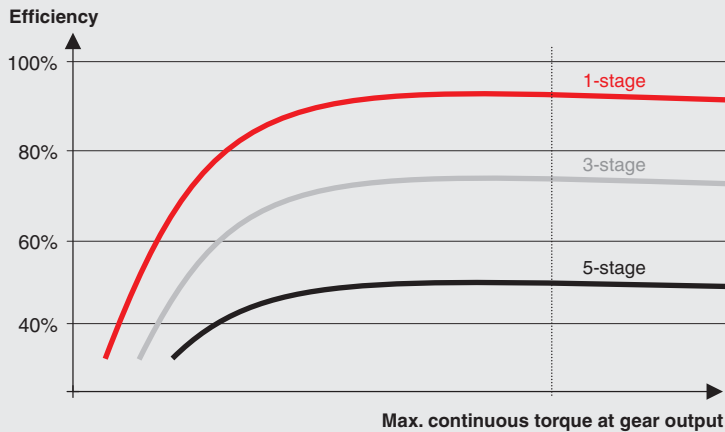
Intermittent torque

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.

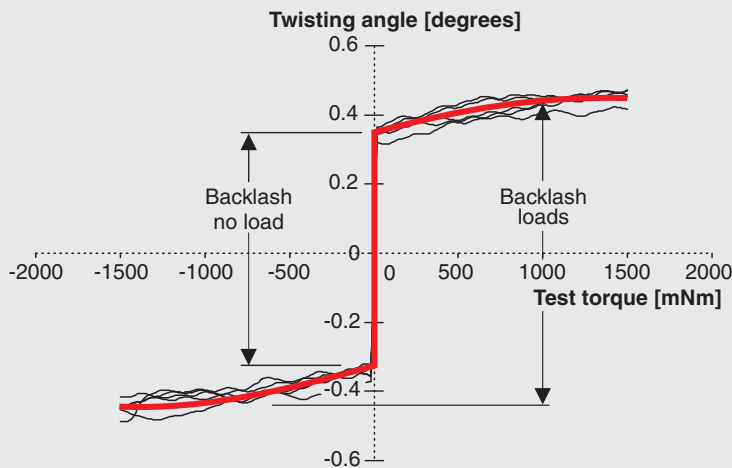
Gearhead efficiency as a function of torque (schematic)



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.

Gear play measurement



Gear play

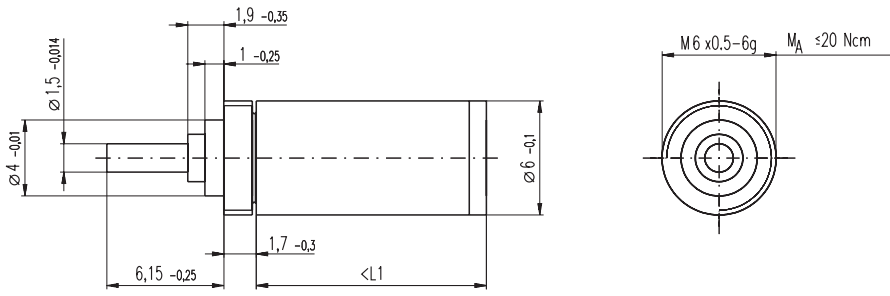
Gear play is the turning angle of the gear output shaft, if it is turned from one end position to the opposite at blocked input (motor) shaft. The end positions depend on the torque applied to the output shaft (see diagram).

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.

Mass inertia

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.

Planetary Gearhead GP 6 A $\varnothing 6$ mm, 0.002 - 0.03 Nm



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

M 2.5:1

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	0.02 - 0.10 mm
Max. radial load, 5 mm from flange	5 N
Max. permissible axial load	5 N
Max. permissible force for press fits	10 N
Sense of rotation, drive to output	=
Recommended input speed	< 40 000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +100°C

Option: sterilisable version, rust-proof version

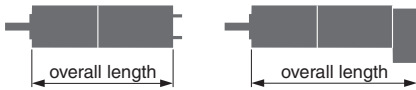
Order Number

in combination with EC 6
in combination with RE 6

199687	199688	199689	199690	199691	304178	304179	304180	304181	304182
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Gearhead Data

		199687	199688	199689	199690	199691	304178	304179	304180	304181	304182
1 Reduction		3.9 : 1	15 : 1	57 : 1	221 : 1	854 : 1	3.9 : 1	15 : 1	57 : 1	221 : 1	854 : 1
2 Reduction absolute		$\frac{27}{7}$	$\frac{729}{49}$	$\frac{19683}{343}$	$\frac{531441}{2401}$	$\frac{14348907}{16807}$	$\frac{27}{7}$	$\frac{729}{49}$	$\frac{19683}{343}$	$\frac{531441}{2401}$	$\frac{14348907}{16807}$
3 Max. motor shaft diameter	mm	1	1	1	1	1	1	1	1	1	1
4 Number of stages		1	2	3	4	5	1	2	3	4	5
5 Max. continuous torque	Nm	0.002	0.005	0.010	0.030	0.030	0.002	0.005	0.010	0.030	0.030
6 Intermittently permissible torque at gear output	Nm	0.005	0.010	0.020	0.060	0.060	0.005	0.010	0.020	0.060	0.060
7 Max. efficiency	%	88	77	68	60	52	88	77	68	60	52
8 Weight	g	1.8	2.2	2.6	3.0	3.4	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	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	0.001	0.001	0.001	0.001	0.001
11 Gearhead length L1	mm	7.0	9.5	12.1	14.7	17.3	6.2	8.7	11.3	13.9	16.5

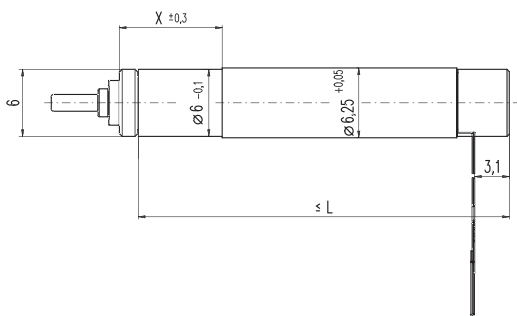


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts								
RE 6, 0.3 W	50			21.9	24.4	27.0	29.6	32.2				
EC 6, 1.2 W	152			28.1	30.6	33.2	35.8	38.4				
EC 6, 1.2 W	152	MR	254	32.1	34.6	37.2	39.8	42.4				

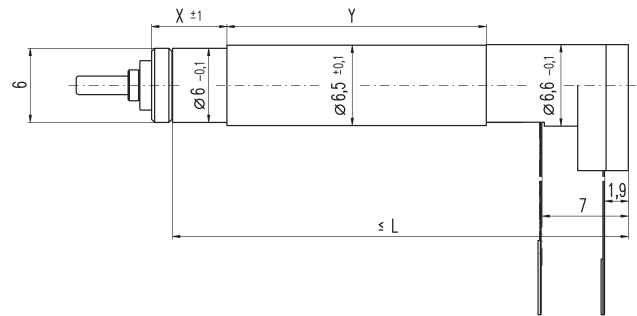
Variant dimensions for the EC 6 combination (including assembly sleeve)

Combinations of EC 6 with GP 6



Reduction	Number of stages	L	X
3.9 : 1	1	28.1	4.2
15 : 1	2	30.6	6.6
57 : 1	3	33.2	9.2
221 : 1	4	35.8	11.8
854 : 1	5	38.4	14.4

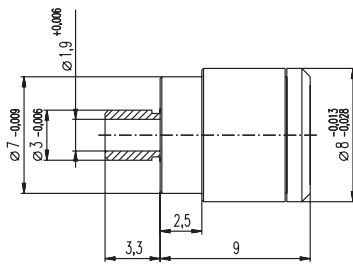
Combinations of EC 6 with GP 6 and MR encoder



Reduction	Number of stages	L	X	Y
3.9 : 1	1	32.1	3.6	18
15 : 1	2	34.6	3.1	21
57 : 1	3	37.2	5.7	21
221 : 1	4	39.8	8.3	21
854 : 1	5	42.4	10.9	21

Micro Harmonic Drive® MHD 8 $\varnothing 8$ mm, 0.006 Nm

Play-free micro gearhead



M 2:1

Technical Data

Play-free micro gearhead	
Output shaft	stainless steel
Bearing at output	ball bearing
Max. radial load, 5 mm from flange (static)	15 N
Max. radial load, 5 mm from flange (dynamic)	3 N
Max. permissible axial load	10 N
Max. permissible force for press fits	10 N
Sense of rotation, drive to output	≠
Recommended input speed	< 10 000 rpm
Max. motor speed	30 000 rpm
Repeating accuracy	± 10 arcsec

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

Order Number

311038

Gearhead Data (provisional)

1 Reduction		160 : 1
2 Max. motor shaft diameter	mm	1.5
3 Number of stages		1
4 Nominal torque	Nm	0.003
5 Max. continuous torque	Nm	0.006
6 Intermittently permissible torque at gear output	Nm	0.020
7 Max. efficiency	%	63
8 Torque loss	μ Nm	70
9 Torsional rigidity	Nm / rad	2.29
10 Weight	g	2.2
11 Mass inertia	gcm ²	0.0007
12 Gearhead length L1	mm	9

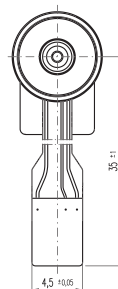
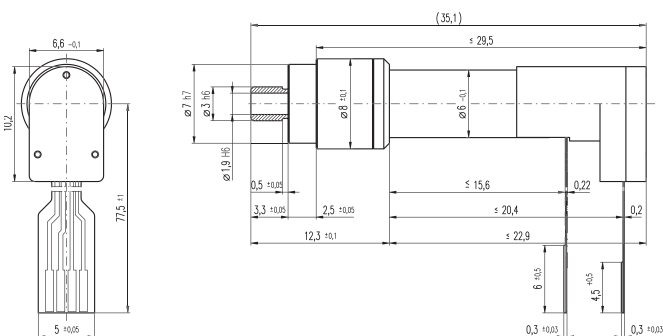


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts
EC 6, 1.2 W	152			28
EC 6, 1.2 W	152	MR	254	32

Positioning Drive Unit

- Brushless maxon EC motor EC 6 with assigned power rating 1.2 Watt
- Micro Harmonic Drive® gearhead with 3 mNm output torque
- 2-channel 100 pulse Encoder MR (Magneto-Resistance)
- Precise: 100 encoder pulses produce a play-free operating angle of 0.0225 degrees at a 160:1 gearhead reduction ratio
- Hollow shaft with bore diameter 0.65mm for a wide range of application possibilities, e.g. air, vacuum, light

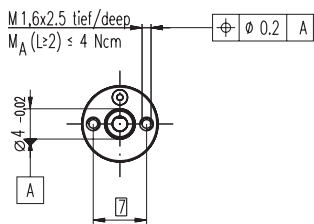
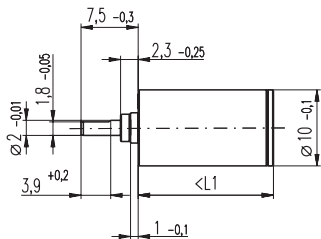


M 1.5:1

Planetary Gearhead GP 10 K $\varnothing 10$ mm, 0.005 - 0.1 Nm

Plastic Version

maxon gear



M 1:1

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. radial load, 5 mm from flange	1 N
Max. permissible axial load	2 N
Max. permissible force for press fits	10 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +80°C
Extended area as option	-35 ... +80°C

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

Order Number

Gearhead Data	Order Number				
	110308	110309	110310	110311	110312
1 Reduction	4 : 1	16 : 1	64 : 1	256 : 1	1024:1
2 Reduction absolute	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 Intermittently permissible torque at gear output Nm	0.005	0.015	0.054	0.100	0.100
7 Max. efficiency %	90	80	70	60	55
8 Weight g	2.1	2.5	2.8	3.2	3.6
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
10 Mass inertia gcm ²	0.004	0.003	0.003	0.003	0.003
11 Gearhead length L1 mm	10.2	14.3	18.4	22.5	26.6

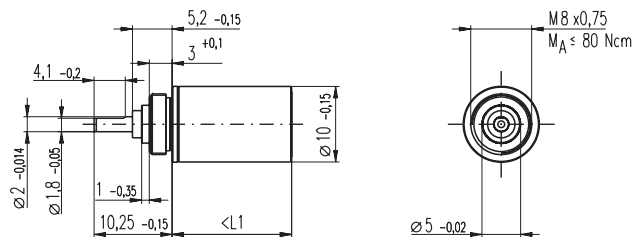


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts				
RE 10, 0.75 W	52/53			27.3	31.4	35.5	39.6	43.7
RE 10, 0.75 W	53	MR	252/253	33.1	37.2	41.3	45.4	49.5
RE 10, 0.75 W	53	MEnc 10	269	35.4	39.5	43.6	47.7	51.8
RE 10, 1.5 W	54/55			34.9	39.0	43.1	47.2	51.3
RE 10, 1.5 W	55	MR	252/253	40.7	44.8	48.9	53.0	57.1
RE 10, 1.5 W	55	MEnc 10	269	43.0	47.1	51.2	55.3	59.4
A-max 12	101/102			31.5	35.6	39.7	43.8	47.9
A-max 12, 0.5 W	102	MR	252/253	35.6	39.7	43.8	47.9	52.0

Planetary Gearhead GP 10 A $\varnothing 10$ mm, 0.01 - 0.15 Nm

Metal Version



M 1:1

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Option	sleeve bearing
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. permissible axial load	5 N
Max. permissible force for press fits	10 N
Sense of rotation, drive to output	=
Recommended input speed	< 12000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +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)

Order Number

in combination with RE 10 / A-max 12
in combination with EC 10

218415	218416	218417	218418	218419	332422	332423	332424	332425	332426
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Gearhead Data

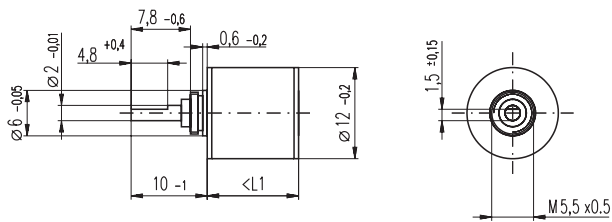
	218415	218416	218417	218418	218419	332422	332423	332424	332425	332426
1 Reduction	4 : 1	16 : 1	64 : 1	256 : 1	1024:1	4 : 1	16 : 1	64 : 1	256 : 1	1024:1
2 Reduction absolute	4	16	64	256	1024	4	16	64	256	1024
3 Max. motor shaft diameter	mm 1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
4 Number of stages	1	2	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 Intermittently permissible torque at gear output	Nm 0.020	0.050	0.150	0.200	0.200	0.020	0.050	0.150	0.200	0.200
7 Max. efficiency	% 90	81	73	65	59	90	81	73	65	59
8 Weight	g 6.7	7.2	7.7	8.2	8.7	6.7	7.2	7.7	8.2	8.7
9 Average backlash no load	° 1.5	1.8	2.0	2.2	2.5	1.5	1.8	2.0	2.2	2.5
10 Mass inertia	gcm ² 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
11 Gearhead length L1	mm 10.4	14.1	17.2	20.4	23.5	10.4	14.1	17.2	20.4	23.5



Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts								
RE 10, 0.75 W	52/53			27.5	31.2	34.3	37.5	40.6				
RE 10, 0.75 W	53	MR	252/253	33.3	37.0	40.1	43.3	46.4				
RE 10, 0.75 W	53	MEnc 10	269	35.6	39.3	42.4	45.6	48.7				
RE 10 1.5 W	54/55			35.1	38.8	41.9	45.1	48.2				
RE 10 1.5 W	55	MR	252/253	40.9	44.6	47.7	50.9	54.0				
RE 10, 1.5 W	55	MEnc 10	269	43.2	46.9	50.0	53.2	56.3				
A-max 12	101/102			31.7	35.4	38.5	41.7	44.8				
A-max 12, 0.5 W	102	MR	252/253	35.8	39.5	42.6	45.8	48.9				
EC 10, 8 W	153								36.2	39.9	43.0	46.2 49.3

Spur Gearhead GS 12 A $\varnothing 12$ mm, 0.008 - 0.025 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	0.05 mm
Axial play	0.02 - 0.12 mm
Max. radial load, 6.5 mm from flange	1.5 N
Max. permissible axial load	2 N
Max. permissible force for press fits	10 N
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +100°C

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

Order Number

	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 Reduction absolute	403/63	21866/1694	724594/12474	20138716/142884	26782109/72171	624300196/1285956	11535969787/372008
3 Max. motor shaft diameter mm	1.2	1.0	1.0	1.2	1.0	1.2	1.2
Order Number	310302	310304	310307	313992		310313	310317
1 Reduction	9.1:1	22:1	76:1	200:1		900:1	4402:1
2 Reduction absolute	899/99	12493/567	387283/5103	22462414/112266		372178963/413342	25733436102/584585
3 Max. motor shaft diameter mm	1.0	1.2	1.2	1.2		1.2	1.0
Order Number		310305	310308	310310		310314	
1 Reduction		31:1	108:1	261:1		1278:1	
2 Reduction absolute		27869/891	863939/8019	1200573/45927		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	0.008	0.010	0.015	0.020	0.020	0.025	0.025
6 Intermittently permissible torque at gear output Nm	0.025	0.030	0.035	0.040	0.040	0.040	0.040
7 Sense of rotation, drive to output	=	≠	=	≠	≠	=	≠
8 Max. efficiency %	81	73	66	59	59	53	48
9 Weight g	6.5	7.4	8.3	9.2	9.2	10.1	11
10 Average backlash no load °	1	1	1.2	1.2	1.2	1.2	1.5
11 Mass inertia gcm ²	0.002	0.002	0.002	0.002	0.002	0.002	0.002
12 Gearhead length mm	10	12	14	16	16	18	20

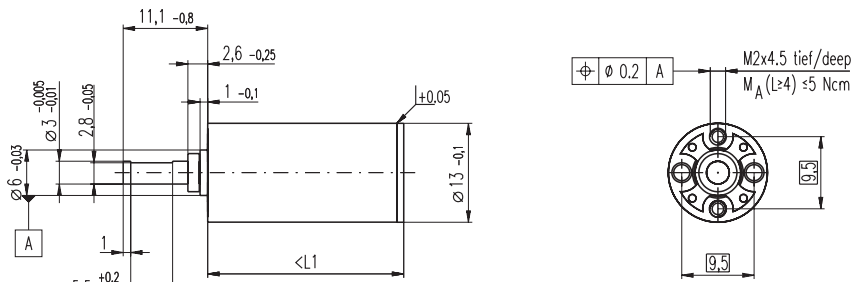


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts						
A-max 12	101/102			31.3	33.3	35.3	37.3	37.3	39.3	41.3
A-max 12, 0.5 W	102	MR	252/253	35.2	37.2	39.2	41.2	41.2	43.2	45.2

Planetary Gearhead GP 13 K $\varnothing 13$ mm, 0.05 - 0.15 Nm

Plastic Version



M 1:1

Technical Data

Planetary Gearhead	straight teeth
Housing, planetary wheels	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.12 mm
Axial play	0.02 - 0.10 mm
Max. permissible axial load	5 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +80°C
Extended area as option	-35 ... +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)

Order Number

	137149	137150	137151	137152	137153
Gearhead Data					
1 Reduction	4.1 : 1	17 : 1	67 : 1	275 : 1	1119 : 1
2 Reduction absolute	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 Intermittently permissible torque at gear output Nm	0.050	0.075	0.100	0.125	0.150
7 Max. efficiency %	85	70	60	50	45
8 Weight g	5.9	6.5	7.0	7.5	8.0
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
10 Mass inertia gcm ²	0.025	0.009	0.008	0.008	0.008
11 Gearhead length L1* mm	15.5	21.4	25.1	28.8	32.5

*for RE 13 is L1 + 0.4 mm



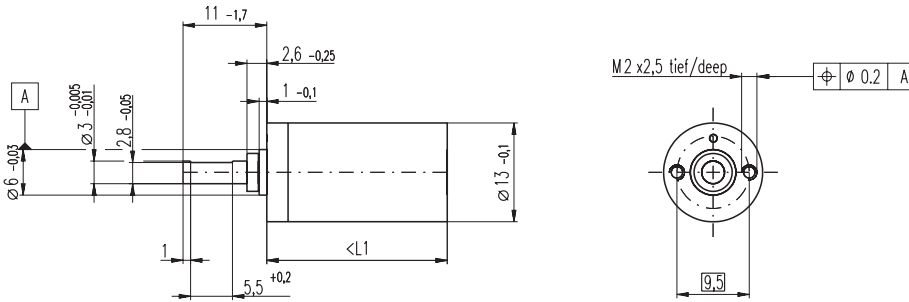
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts				
RE 13	57/59			34.8	40.7	44.4	48.1	51.8
RE 13, 0.75 W	59	MR	252-254	41.9	47.8	51.5	55.2	58.9
RE 13, 0.75 W	59	MEnc 13	270	42.6	48.5	52.2	55.9	59.6
RE 13	61/63			47.0	52.9	56.6	60.3	64.0
RE 13, 2 W	63	MR	252-254	54.1	60.0	63.7	67.4	71.1
RE 13, 2 W	63	MEnc 13	270	54.8	60.7	64.4	68.1	71.8
RE 13, 1.5 W	65/67			37.9	43.8	47.5	51.2	54.9
RE 13, 1.5 W	67	MR	252-254	44.0	49.9	53.6	57.3	61.0
RE 13, 1.5 W	67	MEnc 13	270	45.9	51.8	55.5	59.2	62.9
RE 13, 3 W	69/71			50.1	56.0	59.7	63.4	67.1
RE 13, 3 W	71	MR	252-254	56.2	62.1	65.8	69.5	73.2
RE 13, 3 W	71	MEnc 13	270	58.1	64.0	67.7	71.4	75.1
A-max 12	101/102			36.8	42.7	46.4	50.1	53.8
A-max 12, 0.5 W	102	MR	252-254	40.7	46.6	50.3	54.0	57.7
RE-max 13	129/130			36.1	42.0	45.7	49.4	53.1
RE-max 13, 0.75 W	130	MR	252-254	40.8	46.7	50.4	54.1	57.8
RE-max 13	131/132			47.1	53.0	56.7	60.4	64.1
RE-max 13, 2 W	132	MR	252-254	51.8	57.7	61.4	65.1	68.8

Planetary Gearhead GP 13 A $\varnothing 13$ mm, 0.2 - 0.35 Nm

Metal Version, Sleeve Bearing

maxon gear



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. permissible axial load	8 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +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)

Order Number

110313	110314	110315	110316	110317
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Gearhead Data

	110313	110314	110315	110316	110317
1 Reduction	4.1 : 1	17 : 1	67 : 1	275 : 1	1119 : 1
2 Reduction absolute	57/14	3249/196	185193/2744	10556001/38416	601692057/537824
3 Max. motor shaft diameter	1.5	1.5	1.5	1.5	1.5
Order Number	352365	352366	352367	352368	352369
1 Reduction	5.1 : 1	26 : 1	131 : 1	664 : 1	3373 : 1
2 Reduction absolute	66/13	4356/169	287496/2197	18974736/28561	1252332576/371293
3 Max. motor shaft diameter	1.5	1.5	1.5	1.5	1.5
4 Number of stages	1	2	3	4	5
5 Max. continuous torque	0.20	0.20	0.30	0.30	0.35
6 Intermittently permissible torque at gear output	0.30	0.30	0.45	0.45	0.53
7 Max. efficiency	91	83	75	69	62
8 Weight	11	14	17	20	23
9 Average backlash no load	1.0	1.2	1.5	1.8	2.0
10 Mass inertia	0.025	0.015	0.015	0.015	0.015
11 Gearhead length L1*	16.0	19.9	23.7	27.6	31.4

* for A-max 12 and RE-max 13 is L1 + 0.2 mm



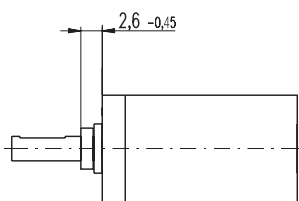
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts				
RE 13	57/59			35.4	39.3	43.1	47.0	50.8
RE 13, 0.75 W	59	MR	252-254	42.5	46.4	50.2	54.1	57.9
RE 13, 0.75 W	59	MEnc 13	270	43.2	47.1	50.9	54.8	58.6
RE 13	61/63			47.6	51.5	55.3	59.2	63.0
RE 13, 2 W	63	MR	252-254	54.7	58.6	62.4	66.3	70.1
RE 13, 2 W	63	MEnc 13	270	55.4	59.3	63.1	67.0	70.8
RE 13, 1.5 W	65/67			38.5	42.4	46.2	50.1	53.9
RE 13, 1.5 W	67	MR	252-254	44.6	48.5	52.3	56.2	60.0
RE 13, 1.5 W	67	MEnc 13	270	46.5	50.4	54.2	58.1	61.9
RE 13, 3 W	69/71			50.7	54.6	58.4	62.3	66.1
RE 13, 3 W	71	MR	252-254	56.8	60.7	64.5	68.4	72.2
RE 13, 3 W	71	MEnc 13	270	58.7	62.6	66.4	70.3	74.1
A-max 12	101/102			37.6	41.5	45.3	49.2	53.0
A-max 12, 0.5 W	102	MR	252-254	41.5	45.4	49.2	53.1	56.9
RE-max 13	129/130			36.9	40.8	44.6	48.5	52.3
RE-max 13, 2 W	130	MR	252-254	41.6	45.5	49.3	53.2	57.0
RE-max 13	131/132			47.9	51.8	55.6	59.5	63.3
RE-max 13, 2 W	132	MR	252-254	52.6	56.5	60.3	64.2	68.0
EC 13, 6 W	154			37.4	43.3	45.1	49.0	52.8
EC 13, 12 W	155			49.6	53.5	57.3	61.2	65.0

Option Ball Bearing

Order Number

Technical Data

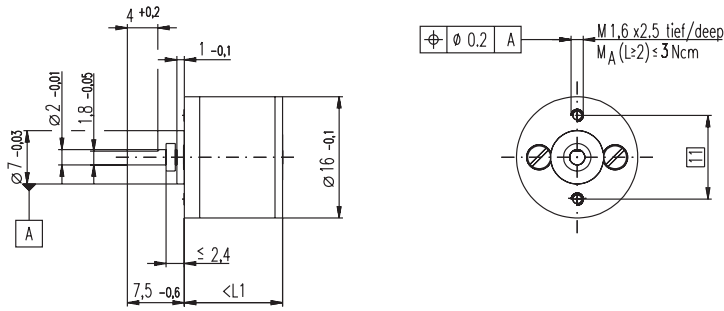


Gearhead length: L1 + 0.1 mm

	110313	110314	110315	110316	110317
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	
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. permissible axial load					8 N
Max. permissible force for press fits					25 N
Sense of rotation, drive to output					=
Recommended input speed					< 8000 rpm
Recommended temperature range					-15 ... +100°C
Extended area as option					-35 ... +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					

Spur Gearhead GS 16 K $\varnothing 16$ mm, 0.01 - 0.03 Nm

Plastic Version



M 1:1

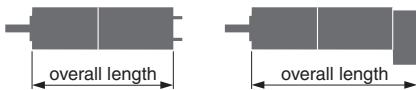
Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6.5 mm from flange	max. 0.15 mm
Axial play	0.02 - 0.12 mm
Max. radial load, 6.5 mm from flange	1 N
Max. permissible axial load	2 N
Max. permissible force for press fits	15 N
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +80°C
Extended area as option	-35 ... +80°C

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

Order Number

Gearhead Data	Order Number						
	201463	201465	201467	201469	201471	201473	
1 Reduction	6.4 : 1	22 : 1	76 : 1	261 : 1	900 : 1	3101 : 1	
2 Reduction absolute	403/63	12493/567	387283/5103	12005773/45927	372178963/413343	11537547853/3720067	
3 Max. motor shaft diameter mm	1.5	1.5	1.5	1.5	1.5	1.5	
Order Number	207405	207406	207407	207408	207409	207410	
1 Reduction	9.1 : 1	31 : 1	108 : 1	371 : 1	1278 : 1	4402 : 1	
2 Reduction absolute	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	
Order Number	201464	201466	201468	201470	201472	201474	
1 Reduction	12 : 1	41 : 1	141 : 1	485 : 1	1670 : 1	5752 : 1	
2 Reduction absolute	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 Intermittently permissible torque at gear output Nm	0.10	0.10	0.10	0.10	0.10	0.10	
7 Sense of rotation, drive to output	=	≠	=	≠	=	≠	
8 Max. efficiency %	81	73	66	59	53	48	
9 Weight g	9.0	9.8	10.2	10.7	11.3	11.7	
10 Average backlash no load °	1.0	1.0	1.2	1.2	1.5	1.5	
11 Mass inertia gcm ²	0.0032	0.0031	0.0031	0.0031	0.0031	0.0031	
12 Gearhead length L1 mm	11.8	12.8	14.8	16.8	18.8	20.8	



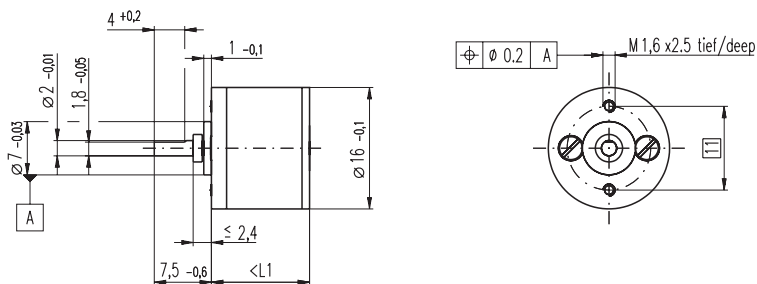
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts					
A 2516, 0.8 W	88			29.3	30.3	32.3	34.3	36.3	38.3
A 2516, 0.8 W	88	MEnc 13	270	36.6	37.6	39.6	41.6	43.6	45.6
A-max 16	103-106			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	104/106	MR	255/256	42.3	43.3	45.3	47.3	49.3	51.3
A-max 16	104/106	MEnc 13	270	45.4	46.4	48.4	50.4	52.4	54.4

Spur Gearhead GS 16 A $\varnothing 16$ mm, 0.015 - 0.04 Nm

Metal Version

maxon gear



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. radial load, 6.5 mm from flange	1.5 N
Max. permissible axial load	2 N
Max. permissible force for press fits	30 N
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +100°C

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

Order Number

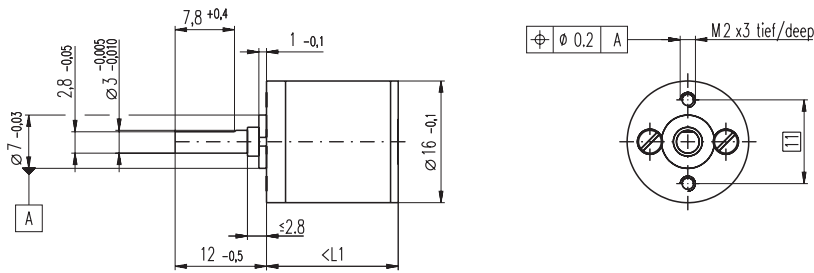
Gearhead Data	Order Number					
	144409	143761	143763	143765	143767	143769
1 Reduction	6.4 : 1	22 : 1	76 : 1	261 : 1	900 : 1	3101 : 1
2 Reduction absolute	403/63	12493/567	387283/5103	12005773/45927	372178963/413343	11537547853/3720067
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5	1.5
Order Number	207834	207835	207836	207837	207838	207839
1 Reduction	9.1 : 1	31 : 1	108 : 1	371 : 1	1278 : 1	4402 : 1
2 Reduction absolute	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
Order Number	144410	143762	143764	143766	143768	143770
1 Reduction	12 : 1	41 : 1	141 : 1	485 : 1	1670 : 1	5752 : 1
2 Reduction absolute	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 Intermittently permissible torque at gear output	Nm 0.10	0.10	0.10	0.10	0.10	0.10
7 Sense of rotation, drive to output	=	≠	=	≠	=	≠
8 Max. efficiency	% 81	73	66	59	53	48
9 Weight	g 9.0	9.8	10.2	10.7	11.3	11.7
10 Average backlash no load	° 1.0	1.0	1.2	1.2	1.5	1.5
11 Mass inertia	gcm ² 0.0032	0.0031	0.0031	0.0031	0.0031	0.0031
12 Gearhead length L1	mm 11.8	12.8	14.8	16.8	18.8	20.8



Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts					
A 2516, 0.8 W	88			29.3	30.3	32.3	34.3	36.3	38.3
A 2516, 0.8 W	88	MEnc 13	270	36.6	37.6	39.6	41.6	43.6	45.6
A-max 16	103-106			37.3	38.3	40.3	42.3	44.3	46.3
A-max 16	104/106	MR	255/256	42.3	43.3	45.3	47.3	49.3	51.3
A-max 16	104/106	MEnc 13	270	45.4	46.4	48.4	50.4	52.4	54.4

Spur Gearhead GS 16 V $\varnothing 16$ mm, 0.06 - 0.1 Nm



M 1:1

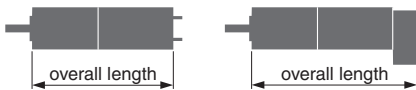
Technical Data

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. radial load, 6.5 mm from flange	25 N
Max. permissible axial load	5 N
Max. permissible force for press fits	5 N
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +100°C

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

Order Number

Gearhead Data	Order Number						
	235066	235070	235073	235076	235079	235082	
1 Reduction	6.4 : 1	22 : 1	76 : 1	261 : 1	900 : 1	3101 : 1	
2 Reduction absolute	403/63	12493/567	387283/5103	12005773/45927	372178963/413343	11537547853/3720067	
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5	1.5	
Order Number	235068	235071	235074	235077	235080	235083	
1 Reduction	9.1 : 1	31 : 1	108 : 1	371 : 1	1278 : 1	4402 : 1	
2 Reduction absolute	899/99	27869/891	863939/8019	26782109/72171	830245379/649539	25737606748/5845851	
3 Max. motor shaft diameter	mm 1.5	1.5	1.5	1.5	1.5	1.5	
Order Number	235069	235072	235075	235078	235081	235084	
1 Reduction	12 : 1	41 : 1	141 : 1	485 : 1	1670 : 1	5752 : 1	
2 Reduction absolute	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 Intermittently permissible torque at gear output	Nm 0.15	0.15	0.30	0.30	0.30	0.30	
7 Sense of rotation, drive to output	=	≠	=	≠	=	≠	
8 Max. efficiency	% 81	73	66	59	53	48	
9 Weight	g 13.8	14.5	15.8	17.0	17.9	18.5	
10 Average backlash no load	° 1.0	1.0	1.2	1.2	1.5	1.5	
11 Mass inertia	gcm ² 0.0057	0.0052	0.0035	0.0032	0.0032	0.0032	
12 Gearhead length L1	mm 14.3	17.3	19.3	21.3	23.3	25.3	



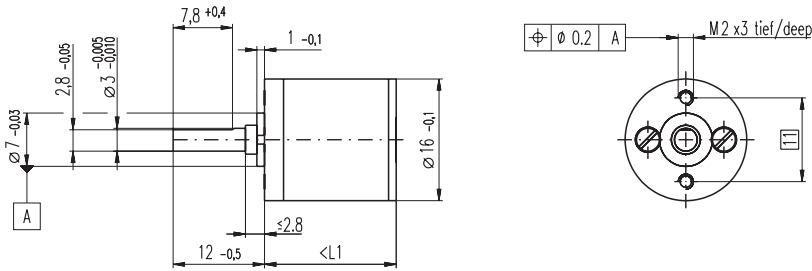
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts					
A 2516, 0.8 W	88			31.8	34.8	36.8	38.8	40.8	42.8
A 2516, 0.8 W	88	MEnc 13	270	39.1	42.1	44.1	46.1	48.1	50.1
A-max 16	103-106			39.8	42.8	44.8	46.8	48.8	50.8
A-max 16	104/106	MR	255/256	44.8	47.8	49.8	51.8	53.8	55.8
A-max 16	104/106	MEnc 13	270	47.9	50.9	52.9	54.9	56.9	58.9

Spur Gearhead GS 16 VZ $\varnothing 16$ mm, 0.06 - 0.1 Nm

Low Backlash

NEW



M 1:1

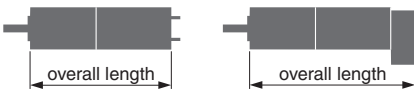
Technical Data

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. radial load, 6.5 mm from flange	25 N
Max. permissible axial load	5 N
Max. permissible force for press fits	5 N
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +100°C

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

Order Number

	321201	327789	327796	327800
Gearhead Data				
1 Reduction	22 : 1	76 : 1	261 : 1	900 : 1
2 Reduction absolute	12493/567	387283/5103	12005773/45927	372178963/413343
3 Max. motor shaft diameter mm	1.5	1.5	1.5	1.5
Order Number	327787	327788	327797	327801
1 Reduction	31 : 1	108 : 1	371 : 1	1278 : 1
2 Reduction absolute	27869/891	863939/8019	26782109/72171	830245379/649539
3 Max. motor shaft diameter mm	1.5	1.5	1.5	1.5
Order Number	325066	327790	327799	327802
1 Reduction	41 : 1	141 : 1	485 : 1	1670 : 1
2 Reduction absolute	29791/729	923521/6561	28629151/59049	887503681/531441
3 Max. motor shaft diameter mm	1	1	1	1
4 Number of stages	3	4	5	6
5 Max. continuous torque Nm	0.06	0.10	0.10	0.10
6 Intermittently permissible torque at gear output Nm	0.15	0.30	0.30	0.30
7 Sense of rotation, drive to output	≠	=	≠	=
8 Max. efficiency %	69	62	54	48
9 Weight g	15.7	17.2	18.7	20.2
10 Average backlash no load °	≤ 0.25	≤ 0.3	≤ 0.45	≤ 0.5
11 Mass inertia gcm ²	0.02	0.017	0.014	0.013
12 Gearhead length L1 mm	17.3	19.3	21.3	23.3

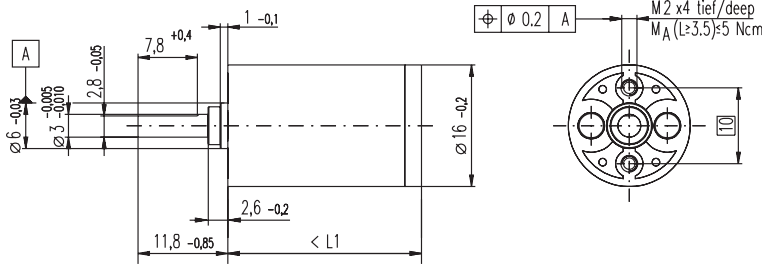


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts			
A 2516, 0.8 W	88			34.8	36.8	38.8	40.8
A 2516, 0.8 W	88	MEnc 13	270	42.1	44.1	46.1	48.1
A-max 16	103-106			42.8	44.8	46.8	48.8
A-max 16	104/106	MR	255/256	47.8	49.8	51.8	53.8
A-max 16	104/106	MEnc 13	270	50.9	52.9	54.9	56.9

Planetary Gearhead GP 16 K $\varnothing 16$ mm, 0.06 - 0.18 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. 0.14 mm
Axial play	0.02 - 0.10 mm
Max. permissible axial load	5 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +80°C
Extended area as option	-35 ... +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)

Order Number

Gearhead Data	Order Number				
	112862	112863	112864	112865	112866
1 Reduction	4.4 : 1	19 : 1	84 : 1	370 : 1	1621 : 1
2 Reduction absolute	$57/13$	$3249/169$	$185193/2197$	$10556001/28561$	$601692057/371293$
3 Max. motor shaft diameter mm	2	2	2	2	2
4 Number of stages	1	2	3	4	5
5 Max. continuous torque Nm	0.06	0.09	0.12	0.15	0.18
6 Intermittently permissible torque at gear output Nm	0.06	0.09	0.12	0.15	0.18
7 Max. efficiency %	85	70	60	50	45
8 Weight g	6.4	7.7	8.4	9.1	9.8
9 Average backlash no load °	1.8	2.0	2.2	2.5	2.8
10 Mass inertia gcm ²	0.06	0.03	0.03	0.03	0.03
11 Gearhead length L1* mm	16.5	22.0	25.5	29.0	32.5

* for RE 15 and RE 16 is L1 - 1.0 mm

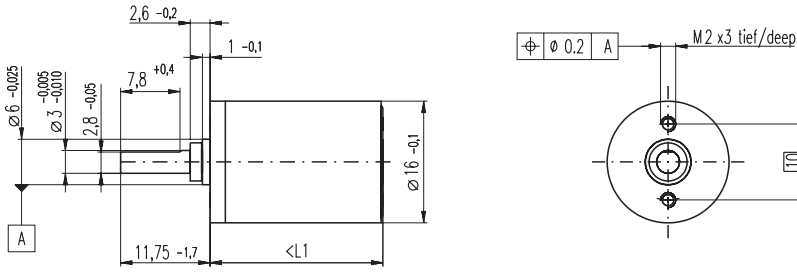


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts				
RE 16, 2 W	72			37.9	43.4	46.9	50.4	53.9
RE 16, 2 W	72	MR	255/256	43.6	49.1	52.6	56.1	59.6
RE 16, 3.2 W	73/74			56.0	61.5	65.0	68.5	72.0
RE 16, 3.2 W	74	MR	255/256	61.0	66.5	70.0	73.5	77.0
RE 16, 3.2 W	74	MEnc 13	270	62.1	67.6	71.1	74.6	78.1
RE 16, 4.5 W	75/76			59.0	64.5	68.0	71.5	75.0
RE 16, 4.5 W	76	MR	255/256	64.0	69.5	73.0	76.5	80.0
RE 16, 4.5 W	76	MEnc 13	270	65.1	70.6	74.1	77.6	81.1
A-max 16	103-106			42.0	47.5	51.0	54.5	58.0
A-max 16	104/106	MR	255/256	47.0	52.5	56.0	59.5	63.0
A-max 16	104/106	MEnc 13	270	50.1	55.6	59.1	62.6	66.1
RE-max 17	133-136			42.0	47.5	51.0	54.5	58.0
RE-max 17	134/136	MR	255/256	47.0	52.5	56.0	59.5	63.0

Planetary Gearhead GP 16 A $\varnothing 16$ mm, 0.1 - 0.3 Nm

Metal Version, Sleeve Bearing



M 1:1

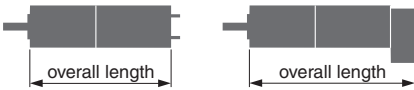
Technical Data

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. permissible axial load	8 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +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)

Order Number

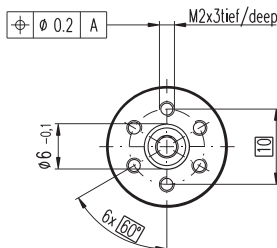
	110321	110322	110323	118186	110324	134782	110325	134785
Gearhead Data								
1 Reduction	4.4 : 1	19 : 1	84 : 1	157 : 1	370 : 1	690 : 1	1621 : 1	3027 : 1
2 Reduction absolute	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter mm	2	2	2	1.5	2	2	2	2
Order Number	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 Reduction absolute	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
Order Number		118185	134779		134781		134784	118188
1 Reduction		29 : 1	128 : 1		561 : 1		2458 : 1	4592 : 1
2 Reduction absolute		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 Intermittently permissible 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 gcm ²	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



Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts							
RE 16, 2 W	72			37.9	41.5	45.1	45.1	48.7	48.7	52.3	52.3
RE 16, 2 W	72	MR	255/256	43.6	47.2	50.8	50.8	54.4	54.4	58.0	58.0
RE 16, 3.2 W	73/74			56.0	59.6	63.2	63.2	66.8	66.8	70.4	70.4
RE 16, 3.2 W	74	MR	255/256	61.0	64.6	68.2	68.2	71.8	71.8	75.4	75.4
RE 16, 3.2 W	74	MEnc 13	270	62.1	65.7	69.3	69.3	72.9	72.9	76.5	76.5
RE 16, 4.5 W	75/76			59.0	62.6	66.2	66.2	69.8	69.8	73.4	73.4
RE 16, 4.5 W	76	MR	255/256	64.0	67.6	71.2	71.2	74.8	74.8	78.4	78.4
RE 16, 4.5 W	76	MEnc 13	270	65.1	68.7	72.3	72.3	75.9	75.9	79.5	79.5
A-max 16	103-106			41.0	44.6	48.2	48.2	51.8	51.8	55.4	55.4
A-max 16	104/106	MR	255/256	46.0	49.6	53.2	53.2	56.8	56.8	60.4	60.4
A-max 16	104/106	MEnc 13	270	49.1	52.7	56.3	56.3	59.9	59.9	63.5	63.5
RE-max 17	133-136			41.0	44.6	48.2	48.2	51.8	51.8	55.4	55.4
RE-max 17	134/136	MR	255/256	46.0	49.6	53.2	53.2	56.8	56.8	60.4	60.4
EC 16, 15 W	156			55.8	59.4	63.0	63.0	66.6	66.6	70.2	70.2
EC 16, 15 W	156	MR	257	65.9	69.5	73.1	73.1	76.7	76.7	80.3	80.3
EC-max 16, 5 W	173			39.6	43.2	46.8	46.8	50.4	50.4	54.0	54.0
EC-max 16, 5 W	173	MR	257	46.9	50.5	54.1	54.1	57.7	57.7	61.3	61.3
EC-max 16, 2-wire	174			49.1	52.7	56.3	56.3	59.9	59.9	63.5	63.5

Option Ball Bearing



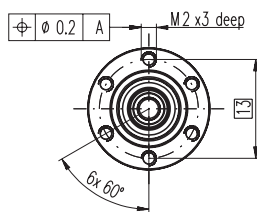
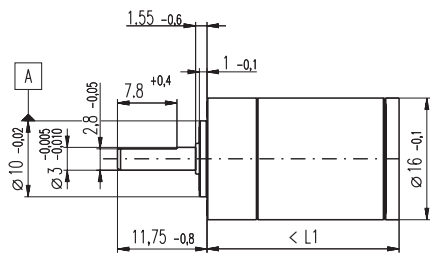
Order Number

Technical Data

	Order Number	Order Number	Order Number	Order Number	Order Number
4.4 : 1	138333	455 : 1	138343	Planetary Gearhead	straight teeth
5.4 : 1	138334	561 : 1	138344	Output shaft	stainless steel, hardened
19 : 1	138335	690 : 1	138345	Bearing at output	preloaded ball bearings
24 : 1	138336	850 : 1	138346	Radial play, 6 mm from flange	max. 0.08 mm
29 : 1	138337	1621 : 1	138347	Axial play at axial load	< 4 N 0 mm > 4 N max. 0.05 mm
84 : 1	138338	1996 : 1	138348	Max. permissible axial load	8 N
104 : 1	138339	2458 : 1	138349	Max. permissible force for press fits	25 N
128 : 1	138340	3027 : 1	138350	Sense of rotation, drive to output	=
157 : 1	138341	3728 : 1	138351	Recommended input speed	< 8000 rpm
370 : 1	138342	4592 : 1	138352	Recommended temperature range	-15 ... +100°C
				Extended area as option	-35 ... +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 M $\varnothing 16$ mm, 0.1 - 0.3 Nm

Sterilisable



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. permissible axial load	50 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +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

maxon gear

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

Order Number

Gearhead Data

	312908	312910	312913	312916	312917	312920	312922	312925
1 Reduction	4.4:1	19:1	84:1	157:1	370:1	690:1	1621:1	3027:1
2 Reduction absolute	57/13	3249/169	185193/2197	19683/125	10556001/28561	1121931/1625	601692057/371293	63950067/21125
3 Max. motor shaft diameter	2 mm	2	2	1.5	2	2	2	2
Order Number	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 Reduction absolute	27/5	1539/65	87723/845		5000211/10985	531441/625	285012027/142805	30292137/8125
3 Max. motor shaft diameter	1.5 mm	2	2		2	1.5	2	2
Order Number		312912	312915		312919		312924	312927
1 Reduction		29:1	128:1		561:1		2458:1	4592:1
2 Reduction absolute		729/25	41553/325		2368521/4225		135005697/54925	14348907/3125
3 Max. motor shaft diameter		1.5 mm	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 Intermittently permissible 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



Combination

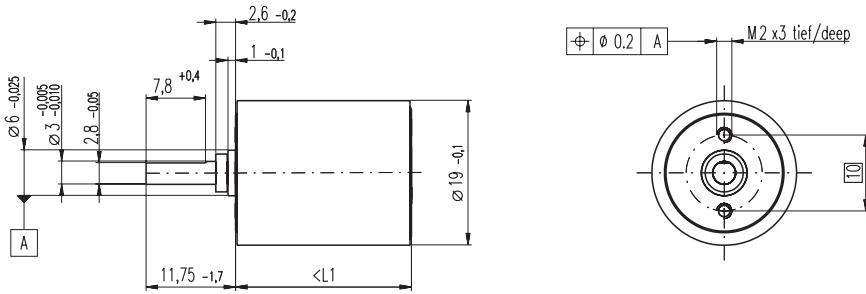
+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts							
EC 16, 40 W, ster.	158			76.6	80.2	83.8	83.8	87.4	87.4	91.0	91.0

Application	Sterilisation information
Medicine / surgery / chemicals Hand tools that can be sterilised, such as bone saw, bone drilling and grinding machine Dermatological and dental tools Infusion pumps ECG Therapy aid, analysis and dialysis equipment	The motor can be sterilised at least 100 times in autoclave. No need to dismantle. Sterilisation with steam Temperature +134°C ± 4°C Compression pressure up to 2.3 bar Rel. humidity 100 % Cycle length 20 minutes

Planetary Gearhead GP 19 B $\varnothing 19$ mm, 0.1 - 0.3 Nm

Sleeve Bearing

maxon gear



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	< 0.08 mm
Axial play	0.02 - 0.12 mm
Max. permissible axial load	8 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +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

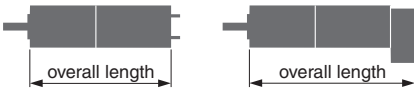
- Stock program
- Standard program
- Special program (on request)

Order Number

149039	149041	149044	149047	149048	149051	149053	149056
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Gearhead Data

1 Reduction	4.4 : 1	19 : 1	84 : 1	157 : 1	370 : 1	690 : 1	1621 : 1	3027 : 1
2 Reduction absolute	$\frac{57}{13}$	$\frac{3249}{169}$	$\frac{185193}{2197}$	$\frac{19683}{125}$	$\frac{10556001}{28561}$	$\frac{1121931}{1625}$	$\frac{601692057}{371293}$	$\frac{63950067}{21125}$
3 Max. motor shaft diameter	mm 2	2	2	1.5	2	2	2	2
Order Number	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 Reduction absolute	$\frac{27}{5}$	$\frac{1539}{65}$	$\frac{87723}{845}$		$\frac{5000211}{10985}$	$\frac{531441}{625}$	$\frac{285012027}{142805}$	$\frac{30292137}{8125}$
3 Max. motor shaft diameter	mm 1.5	2	2		2	1.5	2	2
Order Number		149043	149046		149050		149055	149058
1 Reduction		29 : 1	128 : 1		561 : 1		2458 : 1	4592 : 1
2 Reduction absolute		$\frac{729}{25}$	$\frac{41553}{325}$		$\frac{2368521}{4225}$		$\frac{135005697}{54925}$	$\frac{14348907}{3125}$
3 Max. motor shaft diameter	mm	1.5	2		2		2	1.5
4 Number of stages		1	2	3	3	4	4	5
5 Max. continuous torque	Nm	0.10	0.15	0.20	0.20	0.25	0.25	0.30
6 Intermittently permissible torque at gear output	Nm	0.150	0.225	0.300	0.300	0.375	0.375	0.450
7 Max. efficiency	%	90	81	73	73	65	65	59
8 Weight	g	26	31	36	36	41	41	46
9 Average backlash no load	°	1.4	1.6	2.0	2.0	2.4	2.4	3.0
10 Mass inertia	gcm ²	0.07	0.05	0.05	0.05	0.05	0.05	0.05
11 Gearhead length L1	mm	15.9	19.5	23.1	23.1	26.7	26.7	30.3



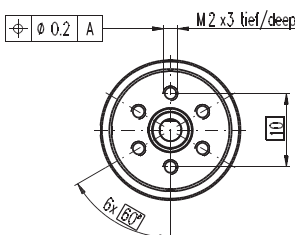
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts							
A 2520, 1.2 W	89			34.1	37.7	41.3	41.3	44.9	44.9	48.5	48.5
A 2520, 1.2 W	89	MEnc 13	270	41.6	45.2	48.8	48.8	52.4	52.4	56.0	56.0
A-max 19	107/108			44.9	48.5	52.1	52.1	55.7	55.7	59.3	59.3
A-max 19, 1.5 W	108	MR	255/256	50.0	53.6	57.2	57.2	60.8	60.8	64.4	64.4
A-max 19, 1.5 W	108	Enc 22	261	59.3	62.9	66.5	66.5	70.1	70.1	73.7	73.7
A-max 19, 1.5 W	108	MEnc 13	270	52.4	56.0	59.6	59.6	63.2	63.2	66.8	66.8
A-max 19, 2.5 W	109/110			47.5	51.1	54.7	54.7	58.3	58.3	61.9	61.9
A-max 19, 2.5 W	110	MR	255/256	51.8	55.4	59.0	59.0	62.6	62.6	66.2	66.2
A-max 19, 2.5 W	110	Enc 22	261	61.9	65.5	69.1	69.1	72.7	72.7	76.3	76.3
A-max 19, 2.5 W	110	MEnc 13	270	55.0	58.6	62.2	62.2	65.8	65.8	69.4	69.4

Option Ball Bearing

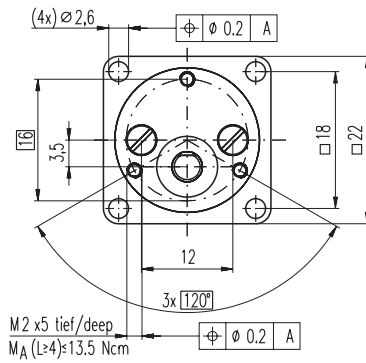
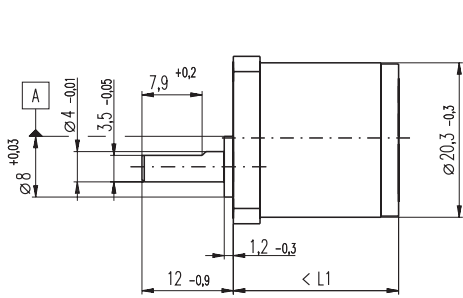
Order Number

Technical Data



4.4 : 1	227632	455 : 1	227642	Planetary Gearhead	straight teeth
5.4 : 1	227633	561 : 1	227643	Output shaft	stainless steel, hardened
19 : 1	227634	690 : 1	227644	Bearing at output	preloaded ball bearings
24 : 1	227635	850 : 1	227645	Radial play, 6 mm from flange	< 0.08 mm
29 : 1	227636	1621 : 1	227646	Axial play at axial load	< 4 N 0 mm > 4 N max. 0.05 mm
84 : 1	227637	1996 : 1	227647	Max. permissible axial load	8 N
104 : 1	227638	2458 : 1	227648	Max. permissible force for press fits	25 N
128 : 1	227639	3027 : 1	227649	Sense of rotation, drive to output	=
157 : 1	227640	3728 : 1	227650	Recommended input speed	< 8000 rpm
370 : 1	227641	4592 : 1	227651	Recommended temperature range	-15 ... +100°C
				Extended area as option	-35 ... +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	

Spur Gearhead GS 20 A $\varnothing 20.3$ mm, 0.06 - 0.25 Nm



Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	< 0.1 mm
Axial play	< 0.3 mm
Max. permissible axial load	8 N
Max. permissible force for press fits	20 N
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +80°C
Extended area as option	-35 ... +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

M 1:1

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

Order Number

258042	258044	258045	258047	258049
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Gearhead Data (provisional)

	15 : 1	36 : 1	88 : 1	216 : 1	532 : 1
1 Reduction	15 : 1	36 : 1	88 : 1	216 : 1	532 : 1
2 Reduction absolute	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 Intermittently permissible torque at gear output Nm	0.07	0.09	0.18	0.25	0.30
7 Sense of rotation, drive to output	≠	=	≠	=	≠
8 Max. efficiency %	91	83	75	69	62
9 Weight g	11.8	13.0	14.3	15.6	16.8
10 Average backlash no load °	1.6	2.0	2.4	2.8	3.2
11 Mass inertia gcm ²	0.016	0.015	0.015	0.015	0.015
11 Gearhead length L1* mm	19.6	21.8	24.1	26.3	28.6

* for EC 20 flat is L1 + 4.0 mm



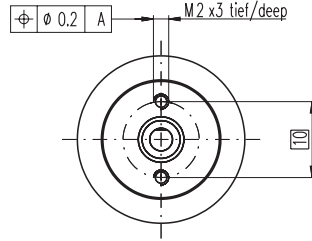
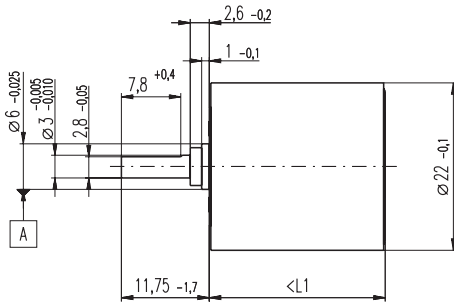
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts				
A-max 19	107/108			48.6	50.8	53.1	55.3	57.6
A-max 19, 1.5 W	108	MR	255/256	53.7	55.9	58.2	60.4	62.7
A-max 19, 1.5 W	108	Enc 22	261	63.0	65.2	67.5	69.7	72.0
A-max 19, 1.5 W	108	MEnc 13	270	56.1	58.3	60.6	62.8	65.1
A-max 19, 2.5 W	109/110			51.2	53.4	55.7	57.9	60.2
A-max 19, 2.5 W	110	MR	255/256	55.5	57.7	60.0	62.2	64.5
A-max 19, 2.5 W	110	Enc 22	261	65.6	67.8	70.1	72.3	74.6
A-max 19, 2.5 W	110	MEnc 13	270	58.7	60.9	63.2	65.4	67.7
EC 20 flat, 3 W, A	192			34.1	36.3	38.6	40.8	43.1
EC 20 flat, 3 W, B	192			33.5	35.7	38.0	40.2	42.5
EC 20 flat, 5 W	193			37.6	39.8	42.1	44.3	46.6
EC 20 flat, IE, IP 00	194			40.7	42.9	45.2	47.4	49.7
EC 20 flat, IE, IP 40	194			41.8	44.0	46.3	48.5	50.8
EC 20 flat, IE, IP 00	195			44.7	46.9	49.2	51.4	53.7
EC 20 flat, IE, IP 40	195			45.8	48.0	50.3	52.5	54.8

Planetary Gearhead GP 22 B $\varnothing 22$ mm, 0.1 - 0.3 Nm

Sleeve Bearing

maxon gear



M 1:1

Technical Data

Planetary Gearhead	straight teeth
Housing	steel
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 6 mm from flange	max. 0.06 mm
Axial play	0.02 - 0.10 mm
Max. permissible axial load	8 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-15 ... +100°C
Extended area as option	-35 ... +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

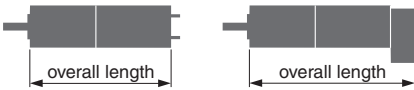
- Stock program
- Standard program
- Special program (on request)

Order Number

110355	110356	110357	118653	110358	134772	110359	134775
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Gearhead Data

1 Reduction	4.4 : 1	19 : 1	84 : 1	157 : 1	370 : 1	690 : 1	1621 : 1	3027 : 1
2 Reduction absolute	$\frac{57}{13}$	$\frac{3249}{169}$	$\frac{185193}{2197}$	$\frac{19683}{125}$	$\frac{10556001}{28561}$	$\frac{1121931}{1625}$	$\frac{601692057}{371293}$	$\frac{63950067}{21125}$
3 Max. motor shaft diameter	mm 2	2	2	15	2	2	2	2
Order Number	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 Reduction absolute	$\frac{27}{5}$	$\frac{1539}{65}$	$\frac{87723}{845}$		$\frac{5000211}{10985}$	$\frac{531441}{625}$	$\frac{285012027}{142805}$	$\frac{30292137}{8125}$
3 Max. motor shaft diameter	mm 1.5	2	2		2	1.5	2	2
Order Number		118652	134769		134771		134774	118655
1 Reduction		29 : 1	128 : 1		561 : 1		2458 : 1	4592 : 1
2 Reduction absolute		$\frac{729}{25}$	$\frac{41553}{325}$		$\frac{2368521}{4225}$		$\frac{135005697}{54925}$	$\frac{14348907}{3125}$
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 Intermittently permissible 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	gcm ² 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



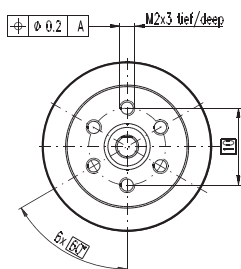
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts							
A-max 19	107/108			44.9	48.5	52.1	52.1	55.7	55.7	59.3	59.3
A-max 19, 1.5 W	108	MR	255/256	50.0	53.6	57.2	57.2	60.8	60.8	64.4	64.4
A-max 19, 1.5 W	108	Enc 22	261	59.3	62.9	66.5	66.5	70.1	70.1	73.7	73.7
A-max 19, 1.5 W	108	MEnc 13	270	52.4	56.0	59.6	59.6	63.2	63.2	66.8	66.8
A-max 19, 2.5 W	109/110			47.5	51.1	54.7	54.7	58.3	58.3	61.9	61.9
A-max 19, 2.5 W	110	MR	255/256	51.8	55.4	59.0	59.0	62.6	62.6	66.2	66.2
A-max 19, 2.5 W	110	Enc 22	261	61.9	65.5	69.1	69.1	72.7	72.7	76.3	76.3
A-max 19, 2.5 W	110	MEnc 13	270	55.0	58.6	62.2	62.2	65.8	65.8	69.4	69.4
A-max 22	111-114			47.9	51.5	55.1	55.1	58.7	58.7	62.3	62.3
A-max 22	112/114	MR	255/256	52.9	56.5	60.1	60.1	63.7	63.7	67.3	67.3
A-max 22	112/114	Enc 22	261	62.3	65.9	69.5	69.5	73.1	73.1	76.7	76.7
A-max 22	112/114	MEnc 13	270	55.0	58.6	62.2	62.2	65.8	65.8	69.4	69.4

Option Ball Bearing

Order Number

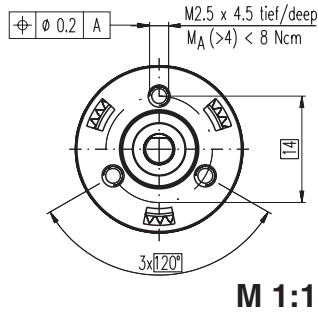
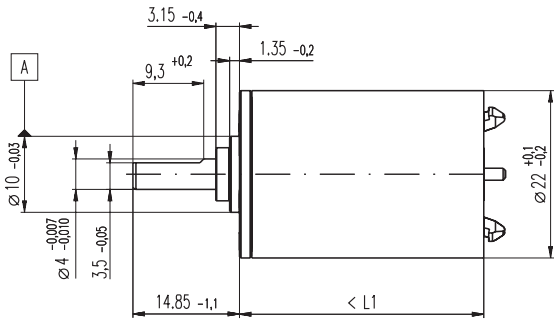
Technical Data



4.4 : 1	144137	455 : 1	144147	Planetary Gearhead	straight teeth
5.4 : 1	144138	561 : 1	144148	Housing	steel
19 : 1	144139	690 : 1	144149	Output shaft	stainless steel, hardened
24 : 1	144140	850 : 1	144150	Bearing at output	preloaded ball bearings
29 : 1	144141	1621 : 1	144151	Radial play, 6 mm from flange	< 0.08 mm
84 : 1	144142	1996 : 1	144152	Axial play at axial load	< 4 N 0 mm > 4 N max. 0.05 mm
104 : 1	144143	2458 : 1	144153	Max. permissible axial load	8 N
128 : 1	144144	3027 : 1	144154	Max. permissible force for press fits	25 N
157 : 1	144145	3728 : 1	144155	Sense of rotation, drive to output	=
370 : 1	144146	4592 : 1	144156	Recommended input speed	< 8000 rpm
				Recommended temperature range	-15 ... +100°C
				Extended area as option	-35 ... +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 $\varnothing 22$ mm, 0.2 - 0.6 Nm

Plastic Version



Technical Data

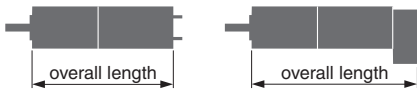
Planetary Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. permissible axial load	20 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 6000 rpm
Recommended temperature range	-15 ... +80°C
Extended area as option	-35 ... +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

maxon gear

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

Order Number

	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 Reduction absolute	15/4	225/16	3375/64	8723/845	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
Order Number											
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 Reduction absolute	57/13	855/52	12825/208	2187/20	192375/832	263169/676	1121931/1625	2885625/3328	39847535/2704	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
Order Number											
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 Reduction absolute	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
Order Number											
1 Reduction		20 : 1	76 : 1	157 : 1	285 : 1	455 : 1		1068 : 1	1621 : 1	2458 : 1	
2 Reduction absolute		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	601692057/371293	135006697/54925	
3 Max. motor shaft diameter		4	4	2.5	4	3.2		4	3.2	3.2	
Order Number											
1 Reduction		24 : 1	84 : 1		316 : 1	479 : 1		1185 : 1	1707 : 1	2589 : 1	
2 Reduction absolute		1539/65	185193/2197		2777895/8788	124659/260		41668425/35152	15000633/8788	3365793/1300	
3 Max. motor shaft diameter		3.2	3.2		3.2	3.2		3.2	3.2	3.2	
Order Number											
1 Reduction		29 : 1	89 : 1		333 : 1	561 : 1		1249 : 1	1798 : 1	3027 : 1	
2 Reduction absolute		729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/21125	
3 Max. motor shaft diameter		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 Intermittently permissible 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



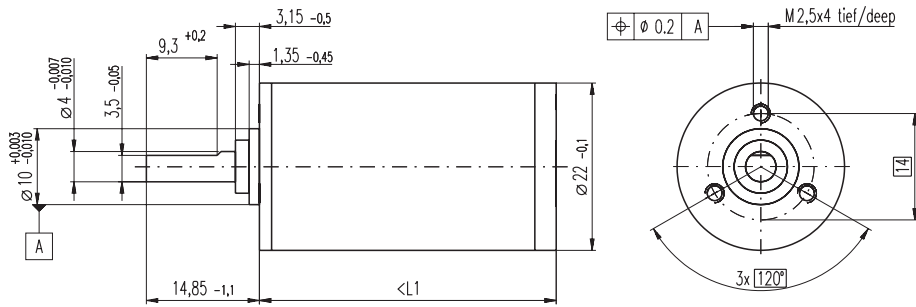
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts									
A-max 22	111-114			54.7	61.5	68.3	68.3	75.1	75.1	75.1	81.9	81.9	81.9
A-max 22	112/114	MR	255/256	59.7	66.5	73.3	73.3	80.1	80.1	80.1	86.9	86.9	86.9
A-max 22	112/114	Enc 22	261	69.1	75.9	82.7	82.7	89.5	89.5	89.5	96.3	96.3	96.3
A-max 22	112/114	MEnc 13	270	61.8	68.6	75.4	75.4	82.2	82.2	82.2	89.0	89.0	89.0

Planetary Gearhead GP 22 A $\varnothing 22$ mm, 0.5 - 1.0 Nm

Metal Version

maxon gear



M 1:1

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. radial load, 10 mm from flange	70 N
Max. permissible axial load	100 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 6000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

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

Order Number

134156	134158	134163	134168	134172	110340	134183	134186	134190	134195	134203
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Gearhead Data		134156	134158	134163	134168	134172	110340	134183	134186	134190	134195	134203
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 Reduction absolute		15/4	225/16	3375/64	87723/845	50625/256	10556001/28561	59049/100	799375/1024	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
Order Number		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 Reduction absolute		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
Order Number		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 Reduction absolute		27/5	3249/169	48735/676	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/3125
3 Max. motor shaft diameter	mm	2.5	3.2	3.2	3.2	4	2.5	3.2	3.2	4	4	2.5
Order Number			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 Reduction absolute			81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	601692057/371293	135006697/54925	
3 Max. motor shaft diameter	mm		4	4	2.5	4	3.2		4	3.2	3.2	
Order Number			134161	110339		134175	134181		134189	134194	134201	
1 Reduction			24 : 1	84 : 1		316 : 1	479 : 1		1185 : 1	1707 : 1	2589 : 1	
2 Reduction absolute			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	
Order Number			134162	134167		134177	134182		134192	134197	134202	
1 Reduction			29 : 1	89 : 1		333 : 1	561 : 1		1249 : 1	1798 : 1	3027 : 1	
2 Reduction absolute			729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/2125	
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 Intermittently permissible 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	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 20 flat is L1 - 28.0 mm, for EC 32 flat is L1 + 6.3 mm

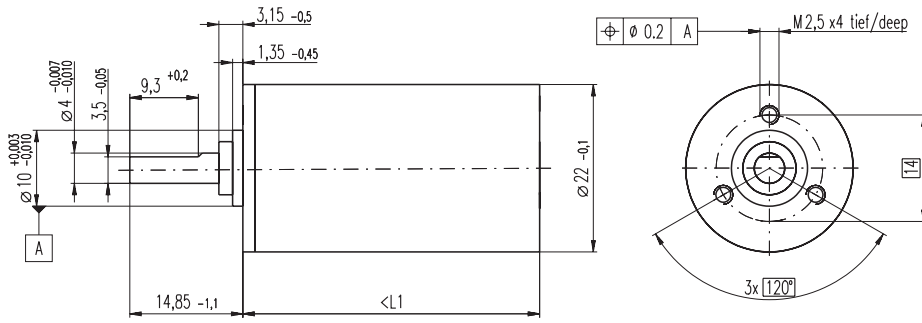


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts										
A-max 19	107/108			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	108	MR	255/256	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	108	Enc 22	261	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	108	MEnc 13	270	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	109/110			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	110	MR	255/256	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	110	Enc 22	261	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	110	MEnc 13	270	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	111-114			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	112/114	MR	255/256	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	112/114	Enc 22	261	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	112/114	MEnc 13	270	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	137/138			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	138	MR	255/256	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	139/140			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	140	MR	255/256	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7	85.7	85.7	85.7
EC 20 flat, 3 W, A	192			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	192			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	193			36.6	43.4	50.2	50.2	57.0	57.0	57.0	63.8	63.8	63.8	63.8
EC 20 flat, IE, IP 00	194			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	194			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	195			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	195			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	196			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 C $\varnothing 22$ mm, 0.5 - 2.0 Nm

Ceramic Version



M 1:1

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. radial load, 10 mm from flange	70 N
Max. permissible axial load	100 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

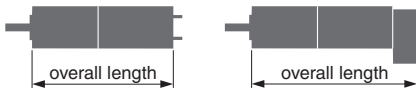
maxon gear

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

Order Number

	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 Reduction absolute	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
Order Number	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 Reduction absolute	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
Order Number	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 Reduction absolute	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
Order Number		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 Reduction absolute		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	601692057/371293	135006697/54925	
3 Max. motor shaft diameter mm		4	4	2.5	4	3.2		4	3.2	3.2	
Order Number		143978	143984		143994	144000		144009	144015	144021	
1 Reduction		24 : 1	84 : 1		316 : 1	479 : 1		1185 : 1	1707 : 1	2589 : 1	
2 Reduction absolute		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	
Order Number		143979	143985		143995	144001		144010	144016	144022	
1 Reduction		29 : 1	89 : 1		333 : 1	561 : 1		1249 : 1	1798 : 1	3027 : 1	
2 Reduction absolute		729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/2125	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages		1	2	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm		0.5	0.6	1.2	1.2	1.8	1.8	2.0	2.0	2.0	2.0
6 Intermittently permissible torque at gear output Nm		0.8	0.9	1.9	1.9	2.7	2.7	3.0	3.0	3.0	3.0
7 Max. efficiency %		84	70	59	59	49	49	42	42	42	42
8 Weight g		42	55	68	68	81	81	81	94	94	94
9 Average backlash no load °		1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia gcm ²		0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1* mm		25.4	32.2	39.0	39.0	45.8	45.8	45.8	52.6	52.6	52.6

*L1 - 2.8 mm for calculating the overall length



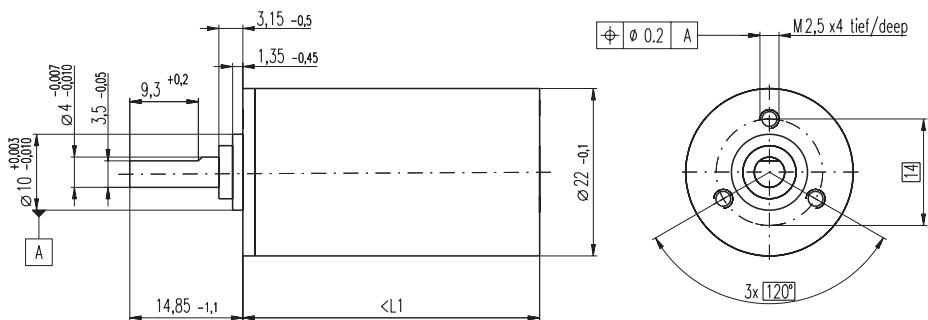
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts									
A-max 19	107/108			51.6	58.4	65.2	65.2	72.0	72.0	78.8	78.8	78.8	78.8
A-max 19, 1.5 W	108	MR	255/256	56.7	63.5	70.3	70.3	77.1	77.1	77.1	83.9	83.9	83.9
A-max 19, 1.5 W	108	Enc 22	261	66.0	72.8	79.6	79.6	86.4	86.4	86.4	93.2	93.2	93.2
A-max 19, 1.5 W	108	MEnc 13	270	59.1	65.9	72.7	72.7	79.5	79.5	79.5	86.3	86.3	86.3
A-max 19, 2.5 W	109/110			54.2	61.0	67.8	67.8	74.6	74.6	74.6	81.4	81.4	81.4
A-max 19, 2.5 W	110	MR	255/256	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7	85.7	85.7
A-max 19, 2.5 W	110	Enc 22	261	68.6	75.4	82.2	82.2	89.0	89.0	89.0	95.8	95.8	95.8
A-max 19, 2.5 W	110	MEnc 13	270	61.7	68.5	75.3	75.3	82.1	82.1	82.1	88.9	88.9	88.9
A-max 22	111-114			54.6	61.4	68.2	68.2	75.0	75.0	75.0	81.8	81.8	81.8
A-max 22	112/114	MR	255/256	59.6	66.4	73.2	73.2	80.0	80.0	80.0	86.8	86.8	86.8
A-max 22	112/114	Enc 22	261	69.0	75.8	82.6	82.6	89.4	89.4	89.4	96.2	96.2	96.2
A-max 22	112/114	MEnc 13	270	61.7	68.5	75.3	75.3	82.1	82.1	82.1	88.9	88.9	88.9
RE-max 21	137/138			51.6	58.4	65.2	65.2	72.0	72.0	72.0	78.8	78.8	78.8
RE-max 21, 3.5 W	138	MR	255/256	56.7	63.5	70.3	70.3	77.1	77.1	77.1	83.9	83.9	83.9
RE-max 21	139/140			54.2	61.0	67.8	67.8	74.6	74.6	74.6	81.4	81.4	81.4
RE-max 21, 6 W	140	MR	255/256	58.5	65.3	72.1	72.1	78.9	78.9	78.9	85.7	85.7	85.7
RE-max 24	141-144			54.6	61.4	68.2	68.2	75.0	75.0	75.0	81.8	81.8	81.8
RE-max 24	142/144	MR	255/256	59.6	66.4	73.2	73.2	80.0	80.0	80.0	86.8	86.8	86.8

Planetary Gearhead GP 22 C $\varnothing 22$ mm, 0.5 - 2.0 Nm

Ceramic Version

maxon gear



M 1:1

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.2 mm
Axial play	max. 0.2 mm
Max. radial load, 10 mm from flange	70 N
Max. permissible axial load	100 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

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

Order Number

	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 Reduction absolute	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
Order Number	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 Reduction absolute	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
Order Number	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 Reduction absolute	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
Order Number		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 Reduction absolute		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	601692057/371293	135006697/54925	
3 Max. motor shaft diameter mm		4	4	2.5	4	3.2		4	3.2	3.2	
Order Number		143978	143984		143994	144000		144009	144015	144021	
1 Reduction		24 : 1	84 : 1		316 : 1	479 : 1		1185 : 1	1707 : 1	2589 : 1	
2 Reduction absolute		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	
Order Number		143979	143985		143995	144001		144010	144016	144022	
1 Reduction		29 : 1	89 : 1		333 : 1	561 : 1		1249 : 1	1798 : 1	3027 : 1	
2 Reduction absolute		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 Max. continuous torque Nm		0.5	0.6	1.2	1.2	1.8	1.8	1.8	2.0	2.0	2.0
6 Intermittently permissible torque at gear output Nm		0.8	0.9	1.9	1.9	2.7	2.7	2.7	3.0	3.0	3.0
7 Max. efficiency %		84	70	59	59	49	49	49	42	42	42
8 Weight g		42	55	68	68	81	81	81	94	94	94
9 Average backlash no load °		1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia gcm ²		0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1*		25.4	32.2	39.0	39.0	45.8	45.8	45.8	52.6	52.6	52.6

* for EC-max 16 is L1 - 2.8 mm

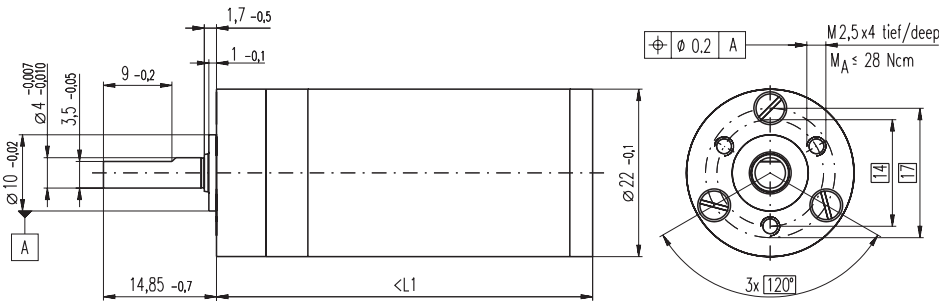


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts										
EC 16, 40 W	157			81.7	88.5	95.3	95.3	102.1	102.1	102.1	108.9	108.9	108.9	108.9
EC 16, 40 W	157	MR	257	92.4	99.2	106.0	106.0	112.8	112.8	112.8	119.6	119.6	119.6	119.6
EC 22, 20 W	159			70.0	76.8	83.6	83.6	90.4	90.4	90.4	97.2	97.2	97.2	97.2
EC 22, 20 W	159	MR	257	76.0	82.8	89.6	89.6	96.4	96.4	96.4	103.2	103.2	103.2	103.2
EC 22, 20 W	160			75.0	81.8	88.6	88.6	95.4	95.4	95.4	102.2	102.2	102.2	102.2
EC 22, 50 W	161			88.2	95.0	101.8	101.8	108.6	108.6	108.6	115.4	115.4	115.4	115.4
EC 22, 50 W	161	MR	257	94.2	101.0	107.8	107.8	114.6	114.6	114.6	121.4	121.4	121.4	121.4
EC 22, 20 W	162			93.2	100.0	106.8	106.8	113.6	113.6	113.6	120.4	120.4	120.4	120.4
EC-max 16, 8 W	175			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	175	MR	257	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	176			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	176	MR	257	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	176	AB 20	306	109.6	116.4	123.2	123.2	130.0	130.0	130.0	136.8	136.8	136.8	136.8

Planetary Gearhead GP 22 M Ø22 mm, 0.5 - 2.0 Nm

Sterilisable



M 1:1

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.12 mm
Axial play	max. 0.05 mm
Max. radial load, 10 mm from flange	25 N
Max. permissible axial load	100 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

maxon gear

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


Order Number

	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 Reduction absolute	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	4.0	4.0	4.0	3.2	4.0	3.2	4.0	4.0	3.2	3.2	4.0
Order Number	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 Reduction absolute	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	4.0	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Order Number	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 Reduction absolute	27/5	3249/169	48735/676	41553/325	731025/2704	6561/16	531441/625	10965375/10816	98415/64	177147/80	14348907/8125
3 Max. motor shaft diameter mm	2.5	3.2	3.2	3.2	3.2	4.0	2.5	3.2	4.0	4.0	2.5
Order Number		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 Reduction absolute		81/4	1215/16	19683/125	18225/64	5000211/10985		273375/256	801682057/371293	135005697/54925	
3 Max. motor shaft diameter mm		4.0	4.0	2.5	4.0	3.2		4.0	3.2	3.2	
Order Number		305136	305142		305152	305158		305167	305173	305179	
1 Reduction		24 : 1	84 : 1		316 : 1	479 : 1		1185 : 1	1707 : 1	2589 : 1	
2 Reduction absolute		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	
Order Number		305137	305143		305153	305159		305168	305174	305180	
1 Reduction		29 : 1	89 : 1		333 : 1	561 : 1		1249 : 1	1798 : 1	3027 : 1	
2 Reduction absolute		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 Max. continuous torque Nm		0.5	0.6	1.2	1.2	1.8	1.8	1.8	2.0	2.0	2.0
6 Intermittently permissible torque at gear output Nm		0.8	0.9	1.9	1.9	2.7	2.7	2.7	3.0	3.0	3.0
7 Max. efficiency %		84	70	59	59	49	49	49	42	42	42
8 Weight g		64	77	90	90	103	103	103	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
10 Mass inertia gcm ²		0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1 mm		35.8	42.6	49.4	49.4	56.2	56.2	56.2	63.0	63.0	63.0



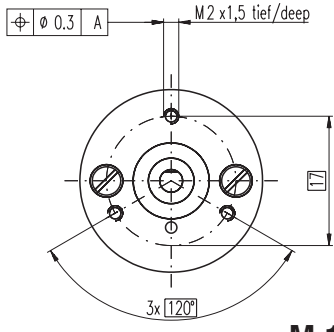
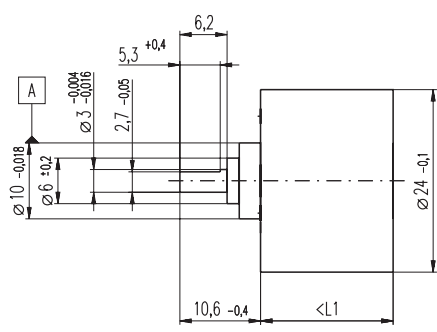
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts										
EC 22, 50 W, ster.	163			98.6	105.4	112.2	112.2	119.0	119.0	119.0	125.8	125.8	125.8	125.8

Application	Sterilisation information
 Medicine / surgery / chemicals	The motor can be sterilised at least 100 times in autoclave. No need to dismantle.
Hand tools that can be sterilised, such as bone saw, bone drilling and grinding machine	Sterilisation with steam
Dermatological and dental tools	Temperature +134°C ± 4°C
Infusion pumps	Compression pressure up to 2.3 bar
ECG	Rel. humidity 100 %
Therapy aid, analysis and dialysis equipment	Cycle length 20 minutes

Spur Gearhead GS 24 A Ø24 mm, 0.1 Nm

maxon gear



M 1:1

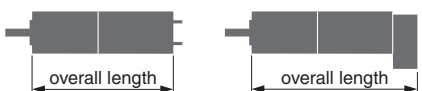
Technical Data	
Spur Gearhead	straight teeth
Housing	plastic
Output shaft	stainless steel, hardened
Bearing at output	sleeve bearing
Radial play, 8 mm from flange	max. 0.038 mm
Axial play	0.03 - 0.30 mm
Max. radial load, 8 mm from flange	5 N
Max. permissible axial load	8 N
Max. permissible force for press fits	500 N
Recommended input speed	< 4000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

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

Order Number

Gearhead Data	Order Number							
	110480	110481	110482	110483	110484	110485	110486	
1 Reduction	7.2 : 1	20 : 1	32 : 1	64 : 1	131 : 1	199 : 1	325 : 1	
2 Reduction absolute	⁹³ / ₁₃	¹²¹⁹¹⁵ / ₆₁₅₃	¹⁵¹⁸¹⁹ / ₄₆₉₅	⁸³⁷ / ₁₃	²¹²⁶²⁹ / ₁₆₂₅	⁷⁷⁸⁶⁴² / ₃₉₀₉	¹⁰⁹³³⁶⁵ / ₃₃₆₂	
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 Intermittently permissible torque at gear output Nm	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
7 Sense of rotation, drive to output	=	=	=	=	=	=	=	
8 Max. efficiency %	81	66	66	66	66	53	53	
9 Weight g	25	28	28	28	28	30	30	
10 Average backlash no load °	1.0	2.0	2.0	2.0	2.0	3.0	3.0	
11 Mass inertia gcm ²	0.008	0.01	0.008	0.007	0.006	0.008	0.006	
12 Gearhead length L1* mm	13.7	17.4	17.4	17.4	17.4	21.2	21.2	

* for A-max 19 is L1 + 2.8 mm

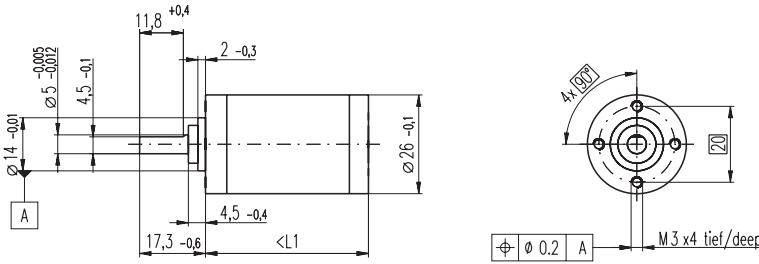


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts						
A-max 19	107/108			45.5	49.2	49.2	49.2	49.2	53.0	53.0
A-max 19, 1.5 W	108	MR	255/256	50.6	54.3	54.3	54.3	54.3	58.1	58.1
A-max 19, 1.5 W	108	Enc 22	261	59.9	63.6	63.6	63.6	63.6	67.4	67.4
A-max 19, 1.5 W	108	MEnc 13	270	53.0	56.7	56.7	56.7	56.7	60.5	60.5
A-max 19, 2.5 W	109/110			48.1	51.8	51.8	51.8	51.8	55.6	55.6
A-max 19, 2.5 W	110	MR	255/256	52.4	56.1	56.1	56.1	56.1	59.9	59.9
A-max 19, 2.5 W	110	Enc 22	261	62.5	66.2	66.2	66.2	66.2	70.0	70.0
A-max 19, 2.5 W	110	MEnc 13	270	55.6	59.3	59.3	59.3	59.3	63.1	63.1
A-max 22	111-114			45.7	49.4	49.4	49.4	49.4	53.2	53.2
A-max 22	112/114	MR	255/256	50.7	54.4	54.4	54.4	54.4	58.2	58.2
A-max 22	112/114	Enc 22	261	60.1	63.8	63.8	63.8	63.8	67.6	67.6
A-max 22	112/114	MEnc 13	270	52.8	56.5	56.5	56.5	56.5	60.3	60.3

Planetary Gearhead GP 26 B $\varnothing 26$ 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. 0.08 mm
Axial play at axial load	< 4 N 0 mm > 4 N max. 0.05 mm
Max. radial load, 10 mm from flange	70 N
Max. permissible axial load	100 N
Max. permissible force for press fits	100 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

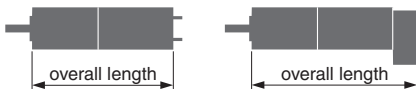
maxon gear

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

Order Number

	144026	144029	144035	144041	144045	144051	144057	144059	144066	144072	144078
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 Reduction absolute	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
Order Number	144027	144031	144036	144042	144046	144052	144058	144061	144067	144073	144079
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 Reduction absolute	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
Order Number	144028	144031	144037	144043	144047	144053	144060	144062	144068	144074	144080
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 Reduction absolute	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
Order Number		144032	144038	144044	144048	144054		144063	144069	144075	
1 Reduction		20 : 1	76 : 1	157 : 1	285 : 1	455 : 1		1068 : 1	1621 : 1	2458 : 1	
2 Reduction absolute		81/4	1215/16	19683/125	18225/64	500211/10985		273375/256	601692057/371293	135006697/54925	
3 Max. motor shaft diameter mm		4	4	2.5	4	3.2		4	3.2	3.2	
Order Number		144033	144039		144049	144055		144064	144070	144076	
1 Reduction		24 : 1	84 : 1		316 : 1	479 : 1		1185 : 1	1707 : 1	2589 : 1	
2 Reduction absolute		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	
Order Number		144034	144040		144050	144056		144065	144071	144077	
1 Reduction		29 : 1	89 : 1		333 : 1	561 : 1		1249 : 1	1798 : 1	3027 : 1	
2 Reduction absolute		729/25	4617/52		69255/208	2368521/4225		1038825/832	373977/208	63950067/2125	
3 Max. motor shaft diameter mm		2.5	3.2		3.2	3.2		3.2	3.2	3.2	
4 Number of stages		1	2	3	4	4	4	5	5	5	5
5 Max. continuous torque Nm		0.5	0.6	1.3	1.8	1.8	1.8	2.0	2.0	2.0	2.0
6 Intermittently permissible torque at gear output Nm		0.8	0.9	1.9	2.7	2.7	2.7	3.0	3.0	3.0	3.0
7 Max. efficiency %		84	70	59	49	49	49	42	42	42	42
8 Weight g		65	86	108	108	130	130	130	152	152	152
9 Average backlash no load °		1.0	1.2	1.6	1.6	2.0	2.0	2.0	2.0	2.0	2.0
10 Mass inertia gcm ²		0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11 Gearhead length L1* mm		29.2	36.0	42.8	42.8	49.6	49.6	49.6	56.4	56.4	56.4

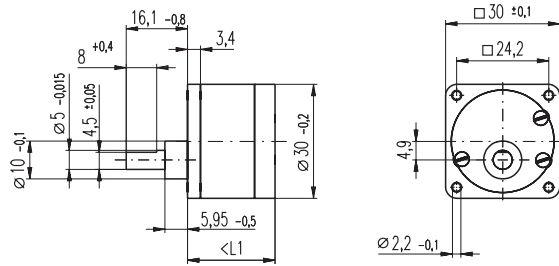
* for A-max 26 and RE-max 29 is L1 - 2.2 mm



Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts								
RE 25, 10 W	77			83.8	90.6	97.4	97.4	104.2	104.2	111.0	111.0	111.0
RE 25, 10 W	77	MR	258	94.8	101.6	108.4	108.4	115.2	115.2	122.0	122.0	122.0
RE 25, 10 W	77	Enc 22	260	97.9	104.7	111.5	111.5	118.3	118.3	125.1	125.1	125.1
RE 25, 10 W	77	HED_ 5540	262/264	104.6	111.4	118.2	118.2	125.0	125.0	131.8	131.8	131.8
RE 25, 10 W	77	DCT22	271	106.1	112.9	119.7	119.7	126.5	126.5	133.3	133.3	133.3
RE 25, 20 W	78			72.3	79.1	85.9	85.9	92.7	92.7	99.5	99.5	99.5
RE 25, 20 W	79			83.8	90.6	97.4	97.4	104.2	104.2	111.0	111.0	111.0
RE 25, 20 W	79	MR	258	94.8	101.6	108.4	108.4	115.2	115.2	122.0	122.0	122.0
RE 25, 20 W	79	Enc 22	260	97.9	104.7	111.5	111.5	118.3	118.3	125.1	125.1	125.1
RE 25, 20 W	79	HED_ 5540	262/264	104.6	111.4	118.2	118.2	125.0	125.0	131.8	131.8	131.8
RE 25, 20 W	79	DCT 22	271	106.1	112.9	119.7	119.7	126.5	126.5	133.3	133.3	133.3
RE 25, 20 W	79	AB 28	308	117.9	124.7	131.5	131.5	138.3	138.3	145.1	145.1	145.1
RE 25, 20 W	79	HED_ 5540 / AB 28	262	135.0	141.8	148.6	148.6	155.4	155.4	162.2	162.2	162.2
RE 26, 18 W	80			88.1	94.9	101.7	101.7	108.5	108.5	115.3	115.3	115.3
RE 26, 18 W	80	MR	258	99.1	105.9	112.7	112.7	119.5	119.5	126.3	126.3	126.3
RE 26, 18 W	80	Enc 22	260	105.5	112.3	119.1	119.1	125.9	125.9	132.7	132.7	132.7
RE 26, 18 W	80	HED_ 5540	262/264	106.5	113.3	120.1	120.1	126.9	126.9	133.7	133.7	133.7
RE 26, 18 W	80	DCT 22	271	109.1	115.9	122.7	122.7	129.5	129.5	136.3	136.3	136.3
A-max 26	115-122			71.8	78.6	85.4	85.4	92.2	92.2	99.0	99.0	99.0
A-max 26	115-121	MEnc 13	270	78.9	85.7	92.5	92.5	99.3	99.3	106.1	106.1	106.1
A-max 26	116-122	MR	258	80.6	87.4	94.2	94.2	101.0	101.0	107.8	107.8	107.8
A-max 26	116-122	Enc 22	261	86.2	93.0	99.8	99.8	106.6	106.6	113.4	113.4	113.4
A-max 26	116-122	HED_ 5540	263/265	90.6	97.4	104.2	104.2	111.0	111.0	117.8	117.8	117.8
RE-max 29	145-148			71.8	78.6	85.4	85.4	92.2	92.2	99.0	99.0	99.0
RE-max 29	146/148	MR	258	80.6	87.4	94.2	94.2	101.0	101.0	107.8	107.8	107.8

Spur Gearhead GS 30 A $\varnothing 30$ mm, 0.07 - 0.2 Nm



M 1:2

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. radial load, 5 mm from flange	35 N
Max. permissible axial load	15 N
Max. permissible force for press fits	400 N
Recommended input speed	< 5000 rpm
Recommended temperature range	-5 ... +80°C

Option: Low-noise version

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

Order Number

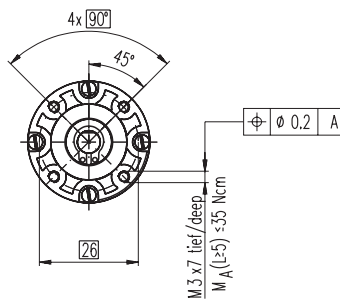
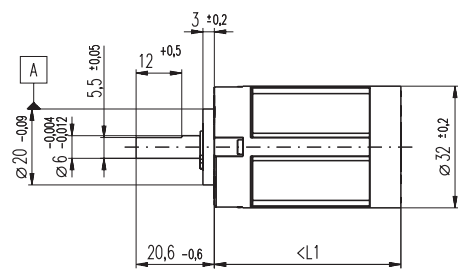
Gearhead Data	Order Number					
	110445	110446	110447	110448	110449	110450
1 Reduction	15 : 1	30 : 1	60 : 1	100 : 1	200 : 1	500 : 1
2 Reduction absolute	15	30	60	100	200	500
3 Max. motor shaft diameter mm	2	2	2	2	2	2
4 Number of stages	3	3	4	4	5	6
5 Max. continuous torque Nm	0.07	0.07	0.10	0.10	0.20	0.20
6 Intermittently permissible torque at gear output Nm	0.21	0.21	0.30	0.30	0.60	0.60
7 Sense of rotation, drive to output	≠	≠	=	=	≠	=
8 Max. efficiency %	73	73	66	66	60	53
9 Weight g	40	40	45	45	50	55
10 Average backlash no load °	1.0	1.0	1.5	1.5	2.0	2.5
11 Mass inertia gcm ²	0.17	0.14	0.12	0.10	0.10	0.10
12 Gearhead length L1 mm	23.0	23.0	25.5	25.5	30.5	30.5



Combination		Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts							
+ Motor	Page	+ Tacho / Brake	Page						
F 2130, 2.5 W	91			53.1	53.1	55.6	55.6	60.6	60.6
F 2130, 3 W	92			56.1	56.1	58.6	58.6	63.6	63.6
F 2130, 3 W	93			54.1	54.1	56.6	56.6	61.6	61.6
F 2130, 3 W	93	Enc 22	261	68.1	68.1	70.6	70.6	75.6	75.6
A-max 26	115-122			67.8	67.8	70.3	70.3	75.3	75.3
A-max 26	115-121	MEnc 13	270	74.9	74.9	77.4	77.4	82.4	82.4
A-max 26	116-122	MR	258	76.6	76.6	79.1	79.1	84.1	84.1
A-max 26	116-122	Enc 22	261	82.2	82.2	84.7	84.7	89.7	89.7
A-max 26	116-122	HED_ 5540	263/265	86.6	86.6	89.1	89.1	94.1	94.1

Planetary Gearhead GP 32 K $\varnothing 32$ mm, 0.4 - 2.0 Nm

Plastic Version



M 1:2

Technical Data

Planetary Gearhead	straight teeth
Housing, planetary wheels	plastic
Output shaft	steel
Bearing at output	sleeve bearing
Radial play, 5 mm from flange	max. 0.12 mm
Axial play	max. 0.6 mm
Max. permissible force for press fits	150 N
Sense of rotation, drive to output	=
Recommended input speed	< 4000 rpm
Recommended temperature range	-15 ... +65°C
Number of stages	1 2 3
Max. radial load, 10 mm from flange	15 N 30 N 45 N
Max. permissible axial load	5 N 10 N 15 N
Average backlash no load	< 2.5° < 3.0° < 3.5°

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

Order Number

Gearhead Data	Order Number									
	110384	110387	110385	110386	110388	110389	110390	110391	110392	
1 Reduction	5.2 : 1	19 : 1	27 : 1	35 : 1	71 : 1	100 : 1	139 : 1	181 : 1	236 : 1	
2 Reduction absolute	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	0.4	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	
6 Intermittently permissible torque at gear output Nm	0.4	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	
7 Max. efficiency %	75	70	70	70	65	65	65	65	65	
8 Weight g	75	90	90	90	105	105	105	105	105	
9 Gearhead length L1 mm	30.0	39.5	39.5	39.5	49.0	49.0	49.0	49.0	49.0	



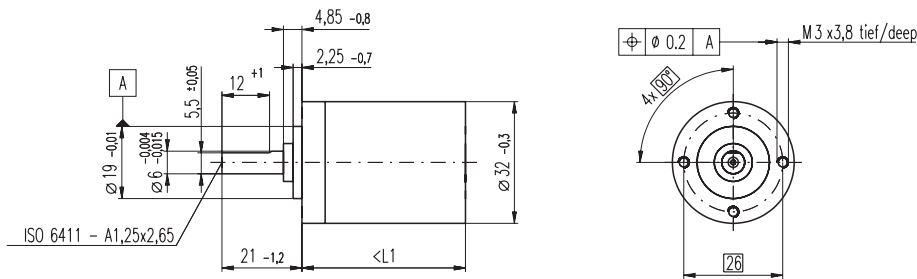
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts								
RE 25, 10 W	77			84.6	94.1	94.1	94.1	103.6	103.6	103.6	103.6	103.6
RE 25, 10 W	77	MR	258	95.6	105.1	105.1	105.1	114.6	114.6	114.6	114.6	114.6
RE 25, 10 W	77	Enc 22	260	98.7	108.2	108.2	108.2	117.7	117.7	117.7	117.7	117.7
RE 25, 10 W	77	HED_ 5540	262/264	105.4	114.9	114.9	114.9	124.4	124.4	124.4	124.4	124.4
RE 25, 10 W	77	DCT 22	271	106.9	116.4	116.4	116.4	125.9	125.9	125.9	125.9	125.9
RE 25, 20 W	79			84.6	94.1	94.1	94.1	103.6	103.6	103.6	103.6	103.6
RE 25, 20 W	79	MR	258	95.6	105.1	105.1	105.1	114.6	114.6	114.6	114.6	114.6
RE 25, 20 W	79	Enc 22	260	98.7	108.2	108.2	108.2	117.7	117.7	117.7	117.7	117.7
RE 25, 20 W	79	HED_ 5540	262/264	105.4	114.9	114.9	114.9	124.4	124.4	124.4	124.4	124.4
RE 25, 20 W	79	DCT 22	271	106.9	116.4	116.4	116.4	125.9	125.9	125.9	125.9	125.9
RE 25, 20 W	79	AB 28	308	118.7	128.2	128.2	128.2	137.7	137.7	137.7	137.7	137.7
RE 25, 20 W	79	HED_ 5540 / AB 28	262/308	135.8	145.3	145.3	145.3	154.8	154.8	154.8	154.8	154.8
RE 26, 18 W	80			88.9	98.4	98.4	98.4	107.9	107.9	107.9	107.9	107.9
RE 26, 18 W	80	MR	258	99.9	109.4	109.4	109.4	118.9	118.9	118.9	118.9	118.9
RE 26, 18 W	80	Enc 22	260	106.3	115.8	115.8	115.8	125.3	125.3	125.3	125.3	125.3
RE 26, 18 W	80	HED_ 5540	262/264	107.3	116.8	116.8	116.8	126.3	126.3	126.3	126.3	126.3
RE 26, 18 W	80	DCT 22	271	109.9	119.4	119.4	119.4	128.9	128.9	128.9	128.9	128.9
RE 36, 70 W	83			101.3	110.8	110.8	110.8	120.3	120.3	120.3	120.3	120.3
RE 36, 70 W	83	MR	259	112.7	122.2	122.2	122.2	131.7	131.7	131.7	131.7	131.7
RE 36, 70 W	83	HED_ 5540	262/264	122.3	131.8	131.8	131.8	141.3	141.3	141.3	141.3	141.3
RE 36, 70 W	83	DCT 22	271	119.4	128.9	128.9	128.9	138.4	138.4	138.4	138.4	138.4
A-max 26	115-122			74.8	84.3	84.3	84.3	93.8	93.8	93.8	93.8	93.8
A-max 26	115-121	MEnc 13	270	81.9	91.4	91.4	91.4	100.9	100.9	100.9	100.9	100.9
A-max 26	116-122	MR	258	83.6	93.1	93.1	93.1	102.6	102.6	102.6	102.6	102.6
A-max 26	116-122	Enc 22	261	89.2	98.7	98.7	98.7	108.2	108.2	108.2	108.2	108.2
A-max 26	116-122	HED_ 5540	263/265	93.6	103.1	103.1	103.1	112.6	112.6	112.6	112.6	112.6

Planetary Gearhead GP 32 A $\varnothing 32$ mm, 0.75 - 4.5 Nm

Metal Version

maxon gear



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. radial load, 10 mm from flange	140 N
Max. permissible axial load	120 N
Max. permissible force for press fits	120 N
Sense of rotation, drive to output	=
Recommended input speed	< 6000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

M 1:2

Option: Low-noise version

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

Order Number

	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 Reduction absolute	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/6575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter	mm 6	6	3	6	4	4	3	3	4	4	3	3
Order Number	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 Reduction absolute	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
Order Number	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 Reduction absolute	23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256	9345024/6125	2066688/375	474513/140	6436343/1024
3 Max. motor shaft diameter	mm 3	3		3	3	4	3	3	4	3	3	3
Order Number		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 Reduction absolute		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	
Order Number		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 Reduction absolute		138/5		3588/35	12167/64	89401/196	158171/224		2238912/1225	2056623/784	3637933/896	
3 Max. motor shaft diameter		mm 3		3	3	3	3		3	3	3	
4 Number of stages		1		2	2	3	3		4	4	5	
5 Max. continuous torque	Nm	0.75	2.25	2.25	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
6 Intermittently permissible torque at gear output	Nm	1.1	3.4	3.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
7 Max. efficiency	%	80	75	75	70	70	60	60	60	50	50	50
8 Weight	g	118	162	162	194	194	226	226	226	258	258	258
9 Average backlash no load	°	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia	gcm ²	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1	mm	26.4	36.3	36.3	43.0	43.0	49.7	49.7	49.7	56.4	56.4	56.4

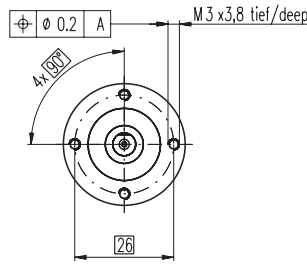
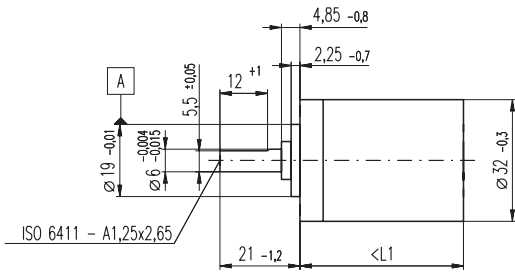


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts											
RE 25, 10 W	77			81.0	90.9	90.9	97.6	97.6	104.3	104.3	104.3	111.0	111.0	111.0	111.0
RE 25, 10 W	77	MR	258	92.0	101.9	101.9	108.6	108.6	115.3	115.3	115.3	122.0	122.0	122.0	122.0
RE 25, 10 W	77	Enc 22	260	95.1	105.0	105.0	111.7	111.7	118.4	118.4	118.4	125.1	125.1	125.1	125.1
RE 25, 10 W	77	HED_ 5540	262/264	101.8	111.7	111.7	118.4	118.4	125.1	125.1	125.1	131.8	131.8	131.8	131.8
RE 25, 10 W	77	DCT 22	271	103.3	113.2	113.2	119.9	119.9	126.6	126.6	126.6	133.3	133.3	133.3	133.3
RE 25, 20 W	78			69.5	79.4	79.4	86.1	86.1	92.8	92.8	92.8	99.5	99.5	99.5	99.5
RE 25, 20 W	79			81.0	90.9	90.9	97.6	97.6	104.3	104.3	104.3	111.0	111.0	111.0	111.0
RE 25, 20 W	79	MR	258	92.0	101.9	101.9	108.6	108.6	115.3	115.3	115.3	122.0	122.0	122.0	122.0
RE 25, 20 W	79	Enc 22	260	95.1	105.0	105.0	111.7	111.7	118.4	118.4	118.4	125.1	125.1	125.1	125.1
RE 25, 20 W	79	HED_ 5540	262/264	101.8	111.7	111.7	118.4	118.4	125.1	125.1	125.1	131.8	131.8	131.8	131.8
RE 25, 20 W	79	DCT 22	271	103.3	113.2	113.2	119.9	119.9	126.6	126.6	126.6	133.3	133.3	133.3	133.3
RE 25, 20 W	79	AB 28	308	115.1	125.0	125.0	131.7	131.7	138.4	138.4	138.4	145.1	145.1	145.1	145.1
RE 25, 20 W	79	HED_ 5540/AB 28	262/308	132.2	142.1	142.1	148.8	148.8	155.5	155.5	155.5	162.2	162.2	162.2	162.2
RE 26, 18 W	80			85.3	95.2	95.2	101.9	101.9	108.6	108.6	108.6	115.3	115.3	115.3	115.3
RE 26, 18 W	80	MR	258	96.3	106.2	106.2	112.9	112.9	119.6	119.6	119.6	126.3	126.3	126.3	126.3
RE 26, 18 W	80	Enc 22	260	102.7	112.6	112.6	119.3	119.3	126.0	126.0	126.0	132.7	132.7	132.7	132.7
RE 26, 18 W	80	HED_ 5540	262/264	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 26, 18 W	80	DCT 22	271	106.3	116.2	116.2	122.9	122.9	129.6	129.6	129.6	136.3	136.3	136.3	136.3
A-max 26	115-122			71.2	81.1	81.1	87.8	87.8	94.5	94.5	94.5	101.2	101.2	101.2	101.2
A-max 26	115-121	MEnc 13	270	78.3	88.2	88.2	94.9	94.9	101.6	101.6	101.6	108.3	108.3	108.3	108.3
A-max 26	116-122	MR	258	80.0	89.9	89.9	96.6	96.6	103.3	103.3	103.3	110.0	110.0	110.0	110.0
A-max 26	116-122	Enc 22	261	85.6	95.5	95.5	102.2	102.2	108.9	108.9	108.9	115.6	115.6	115.6	115.6
A-max 26	116-122	HED_ 5540	263/265	90.0	99.9	99.9	106.6	106.6	113.3	113.3	113.3	120.0	120.0	120.0	120.0
RE-max 29	145-148			71.2	81.1	81.1	87.8	87.8	94.5	94.5	94.5	101.2	101.2	101.2	101.2
RE-max 29	146/148	MR	258	80.0	89.9	89.9	96.6	96.6	103.3	103.3	103.3	110.0	110.0	110.0	110.0

Planetary Gearhead GP 32 A $\varnothing 32$ mm, 0.75 - 4.5 Nm

Metal 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. radial load, 10 mm from flange	140 N
Max. permissible axial load	120 N
Max. permissible force for press fits	120 N
Sense of rotation, drive to output	=
Recommended input speed	< 6000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

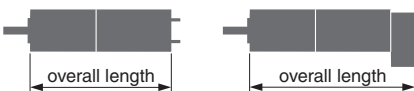
Option: Low-noise version

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

Order Number

	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 Reduction absolute	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	1012376/6575	8626176/4375	495144/175	109503/25
3 Max. motor shaft diameter mm	6	6	3	6	4	4	3	3	4	4	3	3
Order Number	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 Reduction absolute	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
Order Number	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 Reduction absolute	23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256	9345024/6125	2066688/375	474513/140	6436343/1024
3 Max. motor shaft diameter mm	3	3		3	3	4	3	3	4	3	3	3
Order Number		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 Reduction absolute		576/25		14976/175	1587/10	359424/375	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter mm		4		4	3	4	3		3	4	3	
Order Number		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 Reduction absolute		138/5		3588/35	12167/64	89401/196	158171/224		2238912/1225	2056623/784	3637933/896	
3 Max. motor shaft diameter mm		3		3	3	3	3		3	3	3	
4 Number of stages		1		2	2	3	3		4	4	5	
5 Max. continuous torque Nm		0.75		2.25	2.25	4.50	4.50		4.50	4.50	4.50	
6 Intermittently permissible torque at gear output Nm		1.1		3.4	3.4	6.5	6.5		6.5	6.5	6.5	
7 Max. efficiency %		80		75	75	70	70		60	60	50	
8 Weight g		118		162	162	194	194		226	226	258	
9 Average backlash no load °		0.7		0.8	0.8	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	
11 Gearhead length L1* mm		26.4		36.3	36.3	43.0	43.0		49.7	49.7	56.4	

* for EC 32 flat is L1 + 2.0 mm



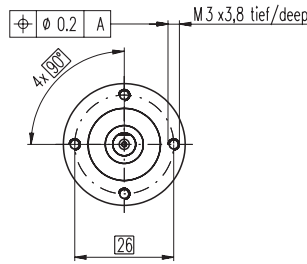
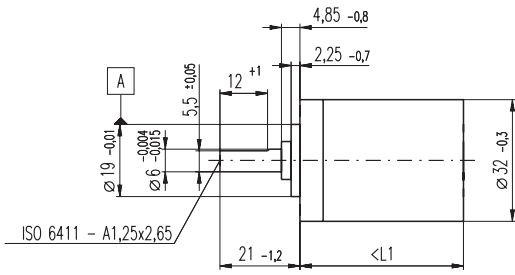
Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts
RE 30, 60 W	81			94.5 104.4 104.4 111.1 111.1 117.8 117.8 117.8 124.5 124.5 124.5 124.5
RE 30, 60 W	81	MR	259	105.9 115.8 115.8 122.5 122.5 129.2 129.2 129.2 135.9 135.9 135.9 135.9
RE 35, 90 W	82			97.4 107.3 107.3 114.0 114.0 120.7 120.7 120.7 127.4 127.4 127.4 127.4
RE 35, 90 W	82	MR	259	108.8 118.7 118.7 125.4 125.4 132.1 132.1 132.1 138.8 138.8 138.8 138.8
RE 35, 90 W	82	HED_ 5540	262/264	118.4 128.3 128.3 135.0 135.0 141.7 141.7 141.7 148.4 148.4 148.4 148.4
RE 35, 90 W	82	DCT 22	271	115.5 125.4 125.4 132.1 132.1 138.8 138.8 138.8 145.5 145.5 145.5 145.5
RE 35, 90 W	82	AB 28	308	133.5 143.4 143.4 150.1 150.1 156.8 156.8 156.8 163.5 163.5 163.5 163.5
RE 35, 90 W	82	HEDS 5540 / AB 28	262/308	150.6 160.5 160.5 167.2 167.2 173.9 173.9 173.9 180.6 180.6 180.6 180.6
RE 36, 70 W	83			97.7 107.6 107.6 114.3 114.3 121.0 121.0 121.0 127.7 127.7 127.7 127.7
RE 36, 70 W	83	MR	259	109.1 119.0 119.0 125.7 125.7 132.4 132.4 132.4 139.1 139.1 139.1 139.1
RE 36, 70 W	83	HED_ 5540	262/264	118.7 128.6 128.6 135.3 135.3 142.0 142.0 142.0 148.7 148.7 148.7 148.7
RE 36, 70 W	83	DCT 22	271	115.8 125.7 125.7 132.4 132.4 139.1 139.1 139.1 145.8 145.8 145.8 145.8
A-max 32	123/125			89.4 99.3 99.3 106.0 106.0 112.7 112.7 112.7 119.4 119.4 119.4 119.4
A-max 32	124/126			88.0 97.9 97.9 104.6 104.6 111.3 111.3 111.3 118.0 118.0 118.0 118.0
A-max 32	124/126 MR		259	99.2 109.1 109.1 115.8 115.8 122.5 122.5 122.5 129.2 129.2 129.2 129.2
A-max 32	124/126 HED_ 5540		262/264	108.8 118.7 118.7 125.4 125.4 132.1 132.1 132.1 138.8 138.8 138.8 138.8
EC 32, 80 W	164			86.5 96.4 96.4 103.1 103.1 109.8 109.8 109.8 116.5 116.5 116.5 116.5
EC 32, 80 W	164	HED_ 5540	263/265	104.9 114.8 114.8 121.5 121.5 128.2 128.2 128.2 134.9 134.9 134.9 134.9
EC 32, 80 W	164	Res 26	272	106.6 116.5 116.5 123.2 123.2 129.9 129.9 129.9 136.6 136.6 136.6 136.6
EC 32 flat, 15 W	197			44.4 54.3 54.3 61.0 61.0 67.7 67.7 67.7 74.4 74.4 74.4 74.4
EC 32 flat, IE, IP 00	198			54.5 64.4 64.4 71.1 71.1 77.8 77.8 77.8 84.5 84.5 84.5 84.5
EC 32 flat, IE, IP 40	198			56.2 66.1 66.1 72.8 72.8 79.5 79.5 79.5 86.2 86.2 86.2 86.2

Planetary Gearhead GP 32 C $\varnothing 32$ mm, 1.0 - 6.0 Nm

Ceramic Version

maxon gear



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. radial load, 10 mm from flange	140 N
Max. permissible axial load	120 N
Max. permissible force for press fits	120 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

Option: Low-noise version

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

Order Number

	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 Reduction absolute	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
Order Number	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 Reduction absolute	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
Order Number	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 Reduction absolute	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
Order Number		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 Reduction absolute		576 ₂₅		14976 ₁₇₅	1587 ₁₀	359424 ₈₇₅	79488 ₁₂₅		1162213 ₆₈₆	7962624 ₃₁₂₅	457056 ₁₂₅	
3 Max. motor shaft diameter	mm 4	4		4	3	4	3		3	4	3	
Order Number		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 Reduction absolute		138 ₅		3588 ₃₅	12167 ₆₄	89401 ₁₉₆	158171 ₂₂₄		2238912 ₁₂₂₅	2056223 ₇₈₄	363793 ₈₉₆	
3 Max. motor shaft diameter	mm 4	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 Intermittently permissible 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	60	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 26.4	36.3	36.3	43.0	43.0	49.7	49.7	49.7	56.4	56.4	56.4	56.4

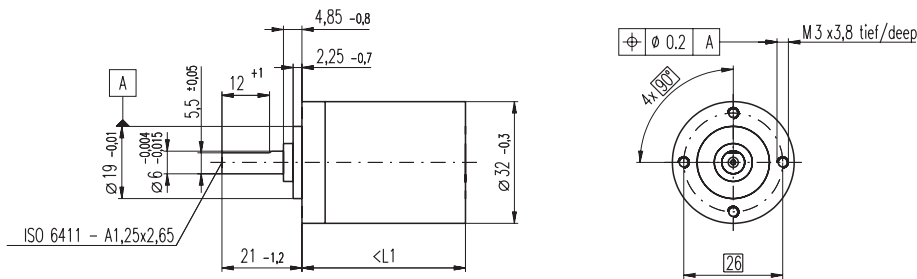


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm]	= Motor length + gearhead length + (tacho / brake) + assembly parts								
RE 25, 10 W	77			81.0 90.9 90.9 97.6 97.6 104.3 104.3 111.0 111.0 111.0 111.0									
RE 25, 10 W	77	MR	258	92.0 101.9 101.9 108.6 108.6 115.3 115.3 115.3 122.0 122.0 122.0 122.0									
RE 25, 10 W	77	Enc 22	260	95.1 105.0 105.0 111.7 111.7 118.4 118.4 118.4 125.1 125.1 125.1 125.1									
RE 25, 10 W	77	HED_ 5540	262/264	101.8 111.7 111.7 118.4 118.4 125.1 125.1 125.1 131.8 131.8 131.8 131.8									
RE 25, 10 W	77	DCT 22	271	103.3 113.2 113.2 119.9 119.9 126.6 126.6 126.6 133.3 133.3 133.3 133.3									
RE 25, 20 W	78			69.5 79.4 79.4 86.1 86.1 92.8 92.8 92.8 99.5 99.5 99.5 99.5									
RE 25, 20 W	79			81.0 90.9 90.9 97.6 97.6 104.3 104.3 104.3 111.0 111.0 111.0 111.0									
RE 25, 20 W	79	MR	258	92.0 101.9 101.9 108.6 108.6 115.3 115.3 115.3 122.0 122.0 122.0 122.0									
RE 25, 20 W	79	Enc 22	260	95.1 105.0 105.0 111.7 111.7 118.4 118.4 118.4 125.1 125.1 125.1 125.1									
RE 25, 20 W	79	HED_ 5540	262/264	101.8 111.7 111.7 118.4 118.4 125.1 125.1 125.1 131.8 131.8 131.8 131.8									
RE 25, 20 W	79	DCT 22	271	103.3 113.2 113.2 119.9 119.9 126.6 126.6 126.6 133.3 133.3 133.3 133.3									
RE 25, 20 W	79	HED_ 5540 / AB 28	308	132.2 142.1 142.1 148.8 148.8 155.5 155.5 155.5 162.2 162.2 162.2 162.2									
RE 26, 18 W	80			85.3 95.2 95.2 101.9 101.9 108.6 108.6 108.6 115.3 115.3 115.3 115.3									
RE 26, 18 W	80	MR	258	96.3 106.2 106.2 112.9 112.9 119.6 119.6 119.6 126.3 126.3 126.3 126.3									
RE 26, 18 W	80	Enc 22	260	102.7 112.6 112.6 119.3 119.3 126.0 126.0 126.0 132.7 132.7 132.7 132.7									
RE 26, 18 W	80	HED_ 5540	262/264	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 26, 18 W	80	DCT 22	271	106.3 116.2 116.2 122.9 122.9 129.6 129.6 129.6 136.3 136.3 136.3 136.3									
RE 30, 60 W	81			94.5 104.4 104.4 111.1 111.1 117.8 117.8 117.8 124.5 124.5 124.5 124.5									
RE 30, 60 W	81	MR	259	105.9 115.8 115.8 122.5 122.5 129.2 129.2 129.2 135.9 135.9 135.9 135.9									
RE 35, 90 W	82			97.4 107.3 107.3 114.0 114.0 120.7 120.7 120.7 127.4 127.4 127.4 127.4									
RE 35, 90 W	82	MR	259	108.8 118.7 118.7 125.4 125.4 132.1 132.1 132.1 138.8 138.8 138.8 138.8									
RE 35, 90 W	82	HED_ 5540	262/264	118.4 128.3 128.3 135.0 135.0 141.7 141.7 141.7 148.4 148.4 148.4 148.4									
RE 35, 90 W	82	DCT 22	271	115.5 125.4 125.4 132.1 132.1 138.8 138.8 138.8 145.5 145.5 145.5 145.5									
RE 35, 90 W	82	AB 28	308	133.5 143.4 143.4 150.1 150.1 156.8 156.8 156.8 163.5 163.5 163.5 163.5									
RE 35, 90 W	82	HEDS 5540 / AB 28	262/308	150.6 160.5 160.5 167.2 167.2 173.9 173.9 173.9 180.6 180.6 180.6 180.6									
RE 36, 70 W	83			97.7 107.6 107.6 114.3 114.3 121.0 121.0 121.0 127.7 127.7 127.7 127.7									
RE 36, 70 W	83	MR	259	109.1 119.0 119.0 125.7 125.7 132.4 132.4 132.4 139.1 139.1 139.1 139.1									
RE 36, 70 W	83	HED_ 5540	262/264	118.7 128.6 128.6 135.3 135.3 142.0 142.0 142.0 148.7 148.7 148.7 148.7									
RE 36, 70 W	83	DCT 22	271	115.8 125.7 125.7 132.4 132.4 139.1 139.1 139.1 145.8 145.8 145.8 145.8									

Planetary Gearhead GP 32 C $\varnothing 32$ mm, 1.0 - 6.0 Nm

Ceramic Version



M 1:2

Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Shaft diameter as option	8 mm
Bearing at output	ball bearing
Radial play, 5 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. radial load, 10 mm from flange	140 N
Max. permissible axial load	120 N
Max. permissible force for press fits	120 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

Option: Low-noise version

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

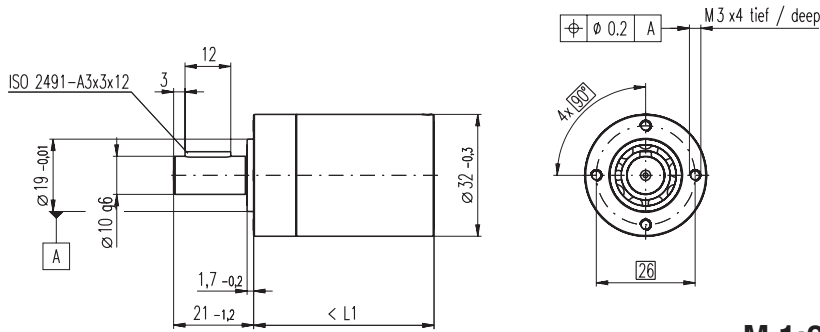
Order Number

	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 Reduction absolute	26/7	676/49	529/16	17576/343	13824/125	421824/1715	86112/175	19044/25	10123776/6575	8626176/4375	495144/1775	109503/25
3 Max. motor shaft diameter	mm 6	6	3	6	4	4	3	3	4	4	3	3
Order Number	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 Reduction absolute	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
Order Number	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 Reduction absolute	23/4	299/14		3887/49	3312/25	389376/1225	20631/35	279841/256	9345024/6125	2066688/375	474513/140	6436343/1024
3 Max. motor shaft diameter	mm 3	3		3	3	4	3	3	4	3	3	3
Order Number		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 Reduction absolute		576/25		14976/175	1587/10	359424/375	79488/125		1162213/686	7962624/3125	457056/125	
3 Max. motor shaft diameter		mm 4		4	3	4	3		3	4	3	
Order Number		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 Reduction absolute		138/5		3588/35	12167/64	89401/196	158171/224		2238912/1225	2056623/784	3637933/896	
3 Max. motor shaft diameter		mm 3		3	3	3	3		3	3	3	
4 Number of stages		1	2	2	3	3	4	4	4	5	5	5
5 Max. continuous torque	Nm	1	3	3	6	6	6	6	6	6	6	6
6 Intermittently permissible torque at gear output	Nm	1.25	3.75	3.75	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
7 Max. efficiency	%	80	75	75	70	70	60	60	60	50	50	50
8 Weight	g	118	162	162	194	194	226	226	226	258	258	258
9 Average backlash no load	°	0.7	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10 Mass inertia	gcm ²	1.5	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1	mm	26.4	36.3	36.3	43.0	43.0	49.7	49.7	49.7	56.4	56.4	56.4

Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts
A-max 26	115-122			71.2 81.1 81.1 87.8 87.8 94.5 94.5 94.5 101.2 101.2 101.2 101.2
A-max 26	115-121	MEnc 13	270	78.3 88.2 88.2 94.9 94.9 101.6 101.6 101.6 108.3 108.3 108.3 108.3
A-max 26	116-122	MR	254	80.0 89.9 89.9 96.6 96.6 103.3 103.3 103.3 110.0 110.0 110.0 110.0
A-max 26	116-122	Enc 22	260	85.6 95.5 95.5 102.2 102.2 108.9 108.9 108.9 115.6 115.6 115.6 115.6
A-max 26	116-122	HED_ 5540	262/264	90.0 99.9 99.9 106.6 106.6 113.3 113.3 113.3 120.0 120.0 120.0 120.0
A-max 32	123/125			89.4 99.3 99.3 106.0 106.0 112.7 112.7 112.7 119.4 119.4 119.4 119.4
A-max 32	124/126			88.0 97.9 97.9 104.6 104.6 111.3 111.3 111.3 118.0 118.0 118.0 118.0
A-max 32	124/126	MR	255	99.2 109.1 109.1 115.8 115.8 122.5 122.5 122.5 129.2 129.2 129.2 129.2
A-max 32	124/126	HED_ 5540	262/264	108.8 118.7 118.7 125.4 125.4 132.1 132.1 132.1 138.8 138.8 138.8 138.8
RE-max 29	145-148			71.2 81.1 81.1 87.8 87.8 94.5 94.5 94.5 101.2 101.2 101.2 101.2
RE-max 29	146/148	MR	254	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 32, 80 W	164			86.5 96.4 96.4 103.1 103.1 109.8 109.8 109.8 116.5 116.5 116.5 116.5
EC 32, 80 W	164	HED_ 5540	262/264	104.9 114.8 114.8 121.5 121.5 128.2 128.2 128.2 134.9 134.9 134.9 134.9
EC 32, 80 W	164	Res 26	272	106.6 116.5 116.5 123.2 123.2 129.9 129.9 129.9 136.6 136.6 136.6 136.6
EC-max 22, 25 W	177			75.0 84.9 84.9 91.6 91.6 98.3 98.3 98.3 105.0 105.0 105.0 105.0
EC-max 22, 25 W	177	MR	257	84.7 94.6 94.6 101.3 101.3 108.0 108.0 108.0 114.7 114.7 114.7 114.7
EC-max 22, 25 W	177	AB 20	306	110.6 120.5 120.5 127.2 127.2 133.9 133.9 133.9 140.6 140.6 140.6 140.6
EC-max 30, 40 W	178			68.5 78.4 78.4 85.1 85.1 91.8 91.8 91.8 98.5 98.5 98.5 98.5
EC-max 30, 40 W	178	MR	258	80.7 90.6 90.6 97.3 97.3 104.0 104.0 104.0 110.7 110.7 110.7 110.7
EC-max 30, 40 W	178	HEDL 5540	266	89.1 99.0 99.0 105.7 105.7 112.4 112.4 112.4 119.1 119.1 119.1 119.1
EC-max 30, 40 W	178	AB 20	306	104.1 114.0 114.0 120.7 120.7 127.4 127.4 127.4 134.1 134.1 134.1 134.1
EC-max 30, 40 W	178	HEDL 5540 / AB 20	266/306	128.1 138.0 138.0 144.7 144.7 151.4 151.4 151.4 158.1 158.1 158.1 158.1
EC-power 22, 90 W	185			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-power 22, 120 W	186			92.5 102.4 102.4 109.1 109.1 115.8 115.8 115.8 122.5 122.5 122.5 122.5
MCD EPOS, 60 W	303			146.5 156.4 156.4 163.1 163.1 169.8 169.8 169.8 176.5 176.5 176.5 176.5
MCD EPOS P, 60 W	303			146.5 156.4 156.4 163.1 163.1 169.8 169.8 169.8 176.5 176.5 176.5 176.5
EC-i 40, 50 W	199			58.0 67.9 67.9 74.6 74.6 81.3 81.3 81.3 88.0 88.0 88.0 88.0
EC-i 40, 50 W	199	MR	259	73.7 83.6 83.6 90.3 90.3 97.0 97.0 97.0 103.7 103.7 103.7 103.7
EC-i 40, 50 W	199	HEDL 5540	266	81.4 91.3 91.3 98.0 98.0 104.7 104.7 104.7 111.4 111.4 111.4 111.4
EC-i 40, 70 W	200			68.0 77.9 77.9 84.6 84.6 91.3 91.3 91.3 98.0 98.0 98.0 98.0
EC-i 40, 70 W	200	MR	259	83.7 93.6 93.6 100.3 100.3 107.0 107.0 107.0 113.7 113.7 113.7 113.7
EC-i 40, 70 W	200	HEDL 5540	266	91.4 101.3 101.3 108.0 108.0 114.7 114.7 114.7 121.4 121.4 121.4 121.4

Planetary Gearhead GP 32 HP $\varnothing 32$ mm, 8.0 Nm



Technical Data

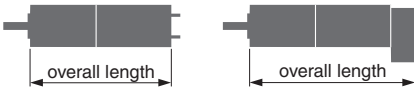
Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.14 mm
Axial play	max. 0.4 mm
Max. radial load, 10 mm from flange	200 N
Max. permissible axial load	120 N
Max. permissible force for press fits	120 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

M 1:2

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

Order Number

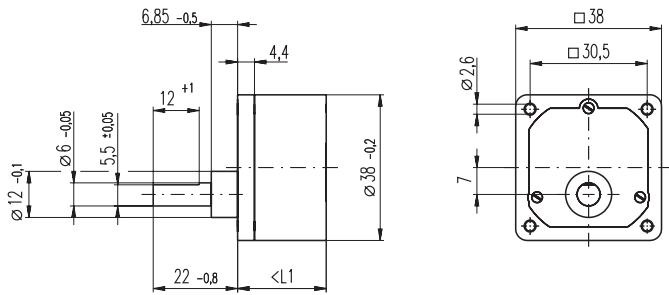
	320247	326663	326664	326668	326672	324947	324952
Gearhead Data							
1 Reduction	14 : 1	33 : 1	51 : 1	111:1	190 : 1	456 : 1	706 : 1
2 Reduction absolute	676/49	529/16	17576/343	13824/125	456976/2401	89401/196	158171/224
3 Max. motor shaft diameter mm	6	3	6	4	6	3	3
Order Number	326659		326665	326669	324942	324948	324953
1 Reduction	18 : 1		66 : 1	123 : 1	246 : 1	492 : 1	762 : 1
2 Reduction absolute	624/35		16224/245	6877/56	421824/1715	86112/175	19044/25
3 Max. motor shaft diameter mm	6		6	3	6	6	4
Order Number	326660		326666	326670	324944	324949	324954
1 Reduction	21 : 1		79 : 1	132 : 1	295 : 1	531 : 1	913 : 1
2 Reduction absolute	299/14		3887/49	3312/25	101062/343	331776/625	36501/40
3 Max. motor shaft diameter mm	6		6	4	6	4	3
Order Number	326661		326667	326671	324945	324950	
1 Reduction	23 : 1		86 : 1	159 : 1	318 : 1	589 : 1	
2 Reduction absolute	576/25		14976/175	1587/10	389376/1225	20631/35	
3 Max. motor shaft diameter mm	4		6	3	6	6	
Order Number	326662		320297		324946	324951	
1 Reduction	28 : 1		103 : 1		411 : 1	636 : 1	
2 Reduction absolute	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	8	8	8	8	8	8	8
6 Intermittently permissible torque at gear output Nm	12	12	12	12	12	12	12
7 Max. efficiency %	75	75	70	70	60	60	60
8 Weight g	178	178	213	213	249	249	249
9 Average backlash no load °	0.8	0.8	1.0	1.0	1.0	1.0	1.0
10 Mass inertia gcm ²	0.8	0.8	0.7	0.7	0.7	0.7	0.7
11 Gearhead length L1 mm	47.4	47.4	54.1	54.1	60.8	60.8	60.8



Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts						
RE 35, 90 W	82			118.5	118.5	125.2	125.2	131.9	131.9	131.9
RE 35, 90 W	82	MR	259	129.8	129.8	136.5	136.5	143.2	143.2	143.2
RE 35, 90 W	82	HED_ 5540	262/264	139.4	139.4	146.1	146.1	152.8	152.8	152.8
RE 35, 90 W	82	DCT 22	271	136.5	136.5	143.2	143.2	149.9	149.9	149.9
RE 35, 90 W	82	AB 28	308	154.5	154.5	161.2	161.2	167.9	167.9	167.9
RE 35, 90 W	82	HEDS 5540 / AB 28	262/308	171.6	171.6	178.3	178.3	185.0	185.0	185.0
EC-power 30, 100 W	187			94.5	94.5	101.2	101.2	107.9	107.9	107.9
EC-power 30, 100 W	187	MR	258	106.7	106.7	113.4	113.4	120.1	120.1	120.1
EC-power 30, 100 W	187	HEDL 5540	266	115.1	115.1	121.8	121.8	128.5	128.5	128.5
EC-power 30, 100 W	187	AB 20	306	130.7	130.7	137.4	137.4	144.1	144.1	144.1
EC-power 30, 100 W	187	HEDL 5540/AB 20	266/306	151.5	151.5	158.2	158.2	164.9	164.9	164.9
EC-power 30, 200 W	188			111.5	111.5	118.2	118.2	124.9	124.9	124.9
EC-power 30, 200 W	188	MR	258	123.7	123.7	130.4	130.4	137.1	137.1	137.1
EC-power 30, 200 W	188	HEDL 5540	266	132.1	132.1	138.8	138.8	145.5	145.5	145.5
EC-power 30, 200 W	188	AB 20	306	147.7	147.7	154.4	154.4	161.1	161.1	161.1
EC-power 30, 200 W	188	HEDL 5540/AB 20	266/306	168.5	168.5	175.2	175.2	181.9	181.9	181.9
MCD EPOS, 60 W	303			167.5	167.5	174.2	174.2	180.9	180.9	180.9
MCD EPOS P, 60 W	303			167.5	167.5	174.2	174.2	180.9	180.9	180.9

Spur Gearhead GS 38 A $\varnothing 38$ 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. radial load, 12 mm from flange	50 N
Max. permissible axial load	30 N
Max. permissible force for press fits	500 N
Recommended input speed	< 5000 rpm
Recommended temperature range	-5 ... +80°C

maxon gear

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

Order Number

110451	110452	110453	110454	110455	110456	110457	110458	110459
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Gearhead Data

	6 : 1	10 : 1	18 : 1	30 : 1	60 : 1	100 : 1	200 : 1	500 : 1	900 : 1
1 Reduction	6 : 1	10 : 1	18 : 1	30 : 1	60 : 1	100 : 1	200 : 1	500 : 1	900 : 1
2 Reduction absolute	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	0.6	0.6	0.6	0.6
6 Intermittently permissible torque at gear output Nm	0.3	0.3	0.6	0.6	0.9	1.8	1.8	1.8	1.8
7 Sense of rotation, drive to output	=	=	≠	≠	=	=	≠	=	=
8 Max. efficiency %	81	81	73	73	66	66	59	53	53
9 Weight g	55	55	60	60	65	65	70	75	75
10 Average backlash no load °	1.0	1.0	1.5	1.5	2.0	2.0	2.5	3.0	3.0
11 Mass inertia gcm ²	0.7	0.6	0.4	0.4	0.3	0.2	0.2	0.2	0.2
12 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 is L1 + 2.0 mm

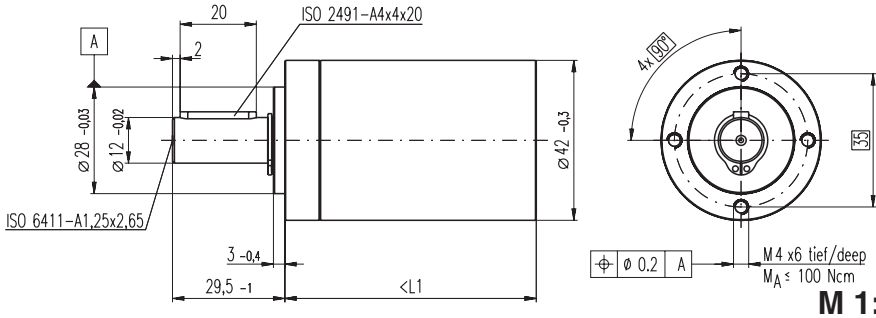


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts														
F 2140, 4 W	94			64.7	64.7	67.2	67.2	69.7	69.7	72.2	74.7	74.7						
F 2140, 6 W	95			68.7	68.7	71.2	71.2	73.7	73.7	76.2	78.7	78.7						
F 2140, 6 W	96			67.7	67.7	70.2	70.2	72.7	72.7	75.2	77.7	77.7						
F 2140, 6 W	96	Enc 22	261	86.2	86.2	88.7	88.7	91.2	91.2	93.7	96.2	96.2						
A-max 26	115-122			65.4	65.4	67.9	67.9	70.4	70.4	72.9	75.4	75.4						
A-max 26	115-121	MEnc 13	270	72.5	72.5	75.0	75.0	77.5	77.5	80.0	82.5	82.5						
A-max 26	116-122	MR	258	74.2	74.2	76.7	76.7	79.2	79.2	81.7	84.2	84.2						
A-max 26	116-122	Enc 22	261	79.8	79.8	82.3	82.3	84.8	84.8	87.3	89.8	89.8						
A-max 26	116-122	HED_ 5540	263/265	84.2	84.2	86.7	86.7	89.2	89.2	91.7	94.2	94.2						
A-max 32	123/125			83.6	83.6	86.1	86.1	88.6	88.6	91.1	93.6	93.6						
A-max 32	124/126			82.2	82.2	84.7	84.7	87.2	87.2	89.7	92.2	92.2						
A-max 32	124/126	MR	259	93.4	93.4	95.9	95.9	98.4	98.4	100.9	103.4	103.4						
A-max 32	124/126	HED_ 5540	263/265	103.0	103.0	105.5	105.5	108.0	108.0	110.5	113.0	113.0						
RE-max 21	137/138			49.6	49.6	52.1	52.1	54.6	54.6	57.1	59.6	59.6						
RE-max 21, 3.5 W	138	MR	255/256	54.7	54.7	57.2	57.2	59.7	59.7	62.2	64.7	64.7						
RE-max 21	139/140			52.2	52.2	54.7	54.7	57.2	57.2	59.7	62.2	62.2						
RE-max 21, 6 W	140	MR	255/256	56.5	56.5	59.0	59.0	61.5	61.5	64.0	66.5	66.5						
RE-max 24	141-144			52.6	52.6	55.1	55.1	57.6	57.6	60.1	62.6	62.6						
RE-max 24	142/144	MR	255/256	57.6	57.6	60.1	60.1	62.6	62.6	65.1	67.6	67.6						
EC 32 flat, 15 W	197			38.6	38.6	41.1	41.1	43.6	43.6	46.1	48.6	48.6						
EC 32 flat, IE, IP 00	198			48.7	48.7	51.2	51.2	53.7	53.7	56.2	58.7	58.7						
EC 32 flat, IE, IP 40	198			50.4	50.4	52.9	52.9	55.4	55.4	57.9	60.4	60.4						

Planetary Gearhead GP 42 C $\varnothing 42$ mm, 3 - 15 Nm

Ceramic Version



Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 12 mm from flange	max. 0.06 mm
Axial play at axial load	< 5 N 0 mm > 5 N max. 0.3 mm
Max. permissible axial load	150 N
Max. permissible force for press fits	300 N
Sense of rotation, drive to output	=
Recommended input speed	< 8000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	120 N 150 N 150 N 150 N

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

Order Number

203113	203115	203119	203120	203124	203129	203128	203133	203137	203141
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Gearhead Data

	203114	203116	203121	203125	203130	203134	203138	203142
1 Reduction	4.3 : 1	15 : 1	53 : 1	91 : 1	186 : 1	319 : 1	488 : 1	936 : 1
2 Reduction absolute	$\frac{13}{3}$	$\frac{91}{6}$	$\frac{637}{12}$	91	$\frac{4459}{24}$	$\frac{637}{2}$	$\frac{4394}{9}$	936
3 Mass inertia gcm ²	9.1	15	15	15	15	15	9.4	9.1
4 Max. motor shaft diameter mm	8	10	10	10	10	10	8	8
Order Number	203117	203122	203126	203131	203135	203139		
1 Reduction	19 : 1	66 : 1	113 : 1	230 : 1	353 : 1	546 : 1		
2 Reduction absolute	$\frac{169}{9}$	$\frac{1183}{18}$	$\frac{338}{3}$	$\frac{8281}{36}$	$\frac{28561}{81}$	546		
3 Mass inertia gcm ²	9.4	15	9.4	15	9.4	14		
4 Max. motor shaft diameter mm	8	10	8	10	8	10		
Order Number	203118	203123	203127	203132	203136	203140		
1 Reduction	21 : 1	74 : 1	126 : 1	257 : 1	394 : 1	676 : 1		
2 Reduction absolute	21	$\frac{147}{2}$	126	$\frac{1029}{4}$	$\frac{1183}{3}$	676		
3 Mass inertia gcm ²	14	15	14	15	15	9.1		
4 Max. motor shaft diameter mm	10	10	10	10	10	8		
5 Number of stages	1	2	2	3	3	3	4	4
6 Max. continuous torque Nm	3.0	7.5	7.5	15.0	15.0	15.0	15.0	15.0
7 Intermittently permissible torque at gear output Nm	4.5	11.3	11.3	22.5	22.5	22.5	22.5	22.5
8 Max. efficiency %	90	81	81	72	72	72	64	64
9 Weight g	260	360	360	460	460	460	560	560
10 Average backlash no load °	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5
11 Gearhead length L1* mm	40.9	55.4	55.4	69.9	69.9	69.9	84.4	84.4

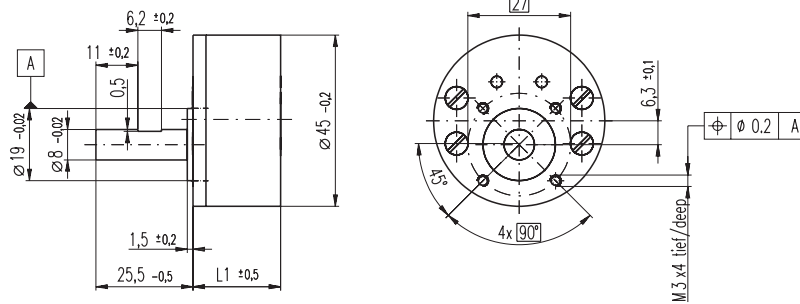
*for EC 45 flat is L1 - 3.5 mm



Combination

+ Motor	Page	+ Tacho	Page	+ Brake	Page	Overall length [mm]	= Motor length + gearhead length + (tacho / brake) + assembly parts									
RE 35, 90 W	82					111.9	126.4	126.4	140.9	140.9	155.4	155.4	155.4	155.4	155.4	
RE 35, 90 W	82	MR	259			123.3	137.8	137.8	152.3	152.3	166.8	166.8	166.8	166.8	166.8	
RE 35, 90 W	82	HED_ 5540	262/264			132.9	147.4	147.4	161.9	161.9	176.4	176.4	176.4	176.4	176.4	
RE 35, 90 W	82	DCT 22	271			130.0	144.5	144.5	159.0	159.0	173.5	173.5	173.5	173.5	173.5	
RE 35, 90 W	82			AB 28	308	148.0	162.5	162.5	177.0	177.0	191.5	191.5	191.5	191.5	191.5	
RE 36, 70 W	83					112.2	126.7	126.7	141.2	141.2	155.7	155.7	155.7	155.7	155.7	
RE 36, 70 W	83	MR	259			123.6	138.1	138.1	152.6	152.6	167.1	167.1	167.1	167.1	167.1	
RE 36, 70 W	83	HED_ 5540	262/264			133.2	147.7	147.7	162.2	162.2	176.7	176.7	176.7	176.7	176.7	
RE 36, 70 W	83	DCT 22	271			130.3	144.8	144.8	159.3	159.3	173.8	173.8	173.8	173.8	173.8	
RE 40, 150 W	84					112.0	126.5	126.5	141.0	141.0	155.5	155.5	155.5	155.5	155.5	
RE 40, 150 W	84	MR	259			123.4	137.9	137.9	152.4	152.4	166.9	166.9	166.9	166.9	166.9	
RE 40, 150 W	84	HED_ 5540	262/264			132.7	147.2	147.2	161.7	161.7	176.2	176.2	176.2	176.2	176.2	
RE 40, 150 W	84	HEDL 9140	267			166.1	180.6	180.6	195.1	195.1	209.6	209.6	209.6	209.6	209.6	
RE 40, 150 W	84			AB 28	308	148.1	162.6	162.6	177.1	177.1	191.6	191.6	191.6	191.6	191.6	
RE 40, 150 W	84			AB 28	309	156.1	170.6	170.6	185.1	185.1	199.6	199.6	199.6	199.6	199.6	
RE 40, 150 W	84	HED_ 5540	262/264	AB 28	308	165.2	179.7	179.7	194.2	194.2	208.7	208.7	208.7	208.7	208.7	
RE 40, 150 W	84	HEDL 9140	267	AB 28	309	176.6	191.1	191.1	205.6	205.6	220.1	220.1	220.1	220.1	220.1	
EC 40, 120 W	165					111.0	125.5	125.5	140.0	140.0	154.5	154.5	154.5	154.5	154.5	
EC 40, 120 W	165	HED_ 5540	263/265			129.4	143.9	143.9	158.4	158.4	172.9	172.9	172.9	172.9	172.9	
EC 40, 120 W	165	Res 26	272			137.6	152.1	152.1	166.6	166.6	181.1	181.1	181.1	181.1	181.1	
EC 40, 120 W	165			AB 28	308	141.8	156.3	156.3	170.8	170.8	185.3	185.3	185.3	185.3	185.3	
EC 45, 150 W	166					152.2	166.7	166.7	181.2	181.2	195.7	195.7	195.7	195.7	195.7	
EC 45, 150 W	166	HEDL 9140	267			167.8	182.3	182.3	196.8	196.8	211.3	211.3	211.3	211.3	211.3	
EC 45, 150 W	166	Res 26	272			152.2	166.7	166.7	181.2	181.2	195.7	195.7	195.7	195.7	195.7	
EC 45, 150 W	166			AB 28	309	159.6	174.1	174.1	188.6	188.6	203.1	203.1	203.1	203.1	203.1	
EC 45, 150 W	166	HEDL 9140	267	AB 28	309	176.6	191.1	191.1	205.6	205.6	220.1	220.1	220.1	220.1	220.1	
EC 45 flat, 30 W	202					53.9	68.4	68.4	82.9	82.9	97.4	97.4	97.4	97.4	97.4	
EC 45 flat, 50 W	203					58.8	73.3	73.3	87.8	87.8	102.3	102.3	102.3	102.3	102.3	
EC 45 fl, IE, IP 00	204					72.8	87.3	87.3	101.8	101.8	116.3	116.3	116.3	116.3	116.3	
EC 45 fl, IE, IP 40	204					75.0	89.5	89.5	104.0	104.0	118.5	118.5	118.5	118.5	118.5	
EC 45 fl, IE, IP 00	205					77.8	92.3	92.3	106.8	106.8	121.3	121.3	121.3	121.3	121.3	
EC 45 fl, IE, IP 40	205					80.0	94.5	94.5	109.0	109.0	123.5	123.5	123.5	123.5	123.5	

Spur Gearhead GS 45 A $\varnothing 45$ mm, 0.5 - 2.0 Nm



M 1:2

Technical Data

Spur Gearhead	straight teeth
Output shaft	stainless steel, hardened
Bearing at output	ball bearing
Radial play, 10 mm from flange	max. 0.15 mm
Axial play	0.02 - 0.2 mm
Max. radial load, 10 mm from flange	180 N
Max. permissible axial load	60 N
Max. permissible force for press fits	60 N
Recommended input speed	< 6000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C

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

Order Number

Gearhead Data	Order Number				
	301177	301175	301181	301186	301191
1 Reduction	5 : 1	18 : 1	61 : 1	212 : 1	732 : 1
2 Reduction absolute	51/10	459/26	20655/338	125862/595	492790/673
3 Mass inertia gcm ²	3.7	1.6	1.0	0.8	0.8
4 Max. motor shaft diameter mm	3	3	3	3	3
Order Number	301178	301173	301182	301187	301192
1 Reduction	7 : 1	26 : 1	89 : 1	310 : 1	1072 : 1
2 Reduction absolute	209/28	9405/364	66632/745	183281/592	307572/287
3 Mass inertia gcm ²	3.1	1.4	1.0	0.8	0.8
4 Max. motor shaft diameter mm	3	3	3	3	3
Order Number	301179	266595	301184	301188	301193
1 Reduction	9 : 1	32 : 1	111 : 1	385 : 1	1334 : 1
2 Reduction absolute	2295/247	8523/265	334/3	173808/451	198769/149
3 Mass inertia gcm ²	2.1	1.4	0.6	0.5	0.4
4 Max. motor shaft diameter mm	3	3	3	3	3
Order Number	301180	301171	301185	301189	301194
1 Reduction	14 : 1	47 : 1	163 : 1	564 : 1	1952 : 1
2 Reduction absolute	2475/182	6221/132	141157/861	161880/287	1929023/988
3 Mass inertia gcm ²	2.2	0.9	0.5	0.5	0.4
4 Max. motor shaft diameter mm	3	3	3	3	3
5 Number of stages	2	3	4	5	6
6 Max. continuous torque Nm	0.5	2.0	2.0	2.0	2.0
7 Intermittently permissible torque at gear output Nm	0.75	2.5	2.5	2.5	2.5
8 Sense of rotation, drive to output	=	≠	=	≠	=
9 Max. efficiency %	87	76	66	59	53
10 Weight g	224	224	255	287	313
11 Average backlash no load °	1.6	2.0	2.4	2.8	3.2
12 Gearhead length L1* mm	23.5	23.5	26.9	30.4	33.8

* for EC 45 flat, IE, is L1 max. + 4.0 mm

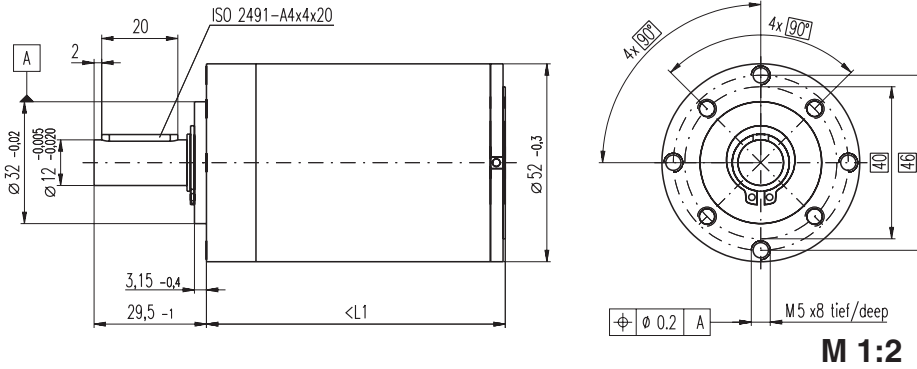


Combination

+ Motor	Page	+ Tacho / Brake	Page	Overall length [mm]
= Motor length + gearhead length + (tacho / brake) + assembly parts				
EC 45 flat, 30 W	202			40.5 40.5 43.9 47.4 50.8
EC 45 flat, 50 W	203			45.4 45.4 48.8 52.3 55.7
EC 45 flat, IE, IP 00	204			59.7 59.7 63.1 66.6 70.0
EC 45 flat, IE, IP 40	204			61.9 61.9 65.3 68.8 72.2
EC 45 flat, IE, IP 00	205			64.7 64.7 68.1 71.6 75.0
EC 45 flat, IE, IP 40	205			66.9 66.9 70.3 73.8 77.2

Planetary Gearhead GP 52 C $\varnothing 52$ mm, 4 - 30 Nm

Ceramic Version



Technical Data

Planetary Gearhead	straight teeth
Output shaft	stainless steel
Bearing at output	preloaded ball bearings
Radial play, 12 mm from flange	max. 0.06 mm
Axial play at axial load	< 5 N 0 mm > 5 N max. 0.3 mm
Max. permissible axial load	200 N
Max. permissible force for press fits	500 N
Sense of rotation, drive to output	=
Recommended input speed	< 6000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	500 N 700 N 900 N 900 N

M 1:2

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

Gearhead Data

	223080	223083	223089	223094	223097	223104	223109
1 Reduction	3.5 : 1	12 : 1	43 : 1	91 : 1	150 : 1	319 : 1	546 : 1
2 Reduction absolute	$7/2$	$49/4$	$343/8$	91	$2401/16$	$637/2$	546
3 Mass inertia	gcm ² 20.7	17.6	17.3	16.7	17.3	16.8	16.4
4 Max. motor shaft diameter	mm 10	10	10	10	10	10	10
Order Number	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 Reduction absolute	$13/3$	$91/6$	$637/12$	$338/3$	$4459/24$	$28561/81$	676
3 Mass inertia	gcm ² 12	16.8	17.2	9.3	17.3	9.4	9.1
4 Max. motor shaft diameter	mm 8	10	10	8	10	8	8
Order Number		223085	223091	223096	223101	223106	223111
1 Reduction		19 : 1	66 : 1	126 : 1	230 : 1	394 : 1	756 : 1
2 Reduction absolute		$169/9$	$1183/18$	126	$8281/36$	$1183/3$	756
3 Mass inertia	gcm ²	9.5	16.7	16.4	16.8	16.7	16.4
4 Max. motor shaft diameter	mm	8	10	10	10	10	10
Order Number		223086	223092	223098	223102	223107	223112
1 Reduction		21 : 1	74 : 1	156 : 1	257 : 1	441 : 1	936 : 1
2 Reduction absolute		21	$147/2$	156	$1029/4$	441	936
3 Mass inertia	gcm ²	16.5	17.2	9.1	17.3	16.5	9.1
4 Max. motor shaft diameter	mm	10	10	8	10	10	8
Order Number		223087	223093		223103	223108	
1 Reduction		26 : 1	81 : 1		285 : 1	488 : 1	
2 Reduction absolute		26	$2197/27$		$15379/54$	$4394/9$	
3 Mass inertia	gcm ²	9.1	9.4		16.7	9.4	
4 Max. motor shaft diameter	mm	8	8		10	8	
5 Number of stages		1	2	3	3	4	4
6 Max. continuous torque	Nm	4	15	30	30	30	30
7 Intermittently permissible torque at gear output	Nm	6	22.5	45	45	45	45
8 Max. efficiency	%	91	83	75	75	68	68
9 Weight	g	460	620	770	770	920	920
10 Average backlash no load	°	0.6	0.8	1.0	1.0	1.0	1.0
11 Gearhead length L1	mm	49.0	65.0	78.5	78.5	92.0	92.0



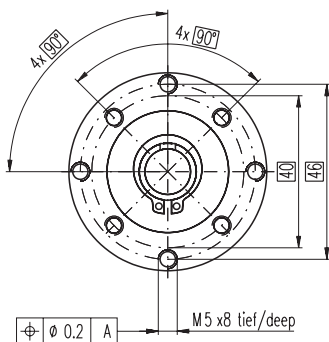
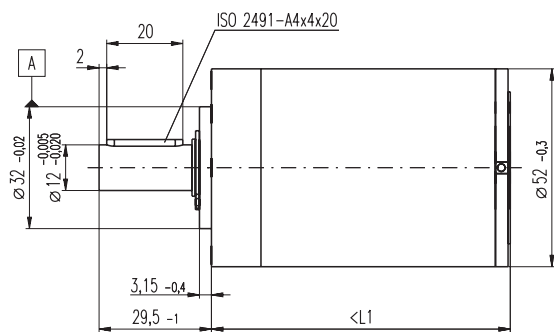
Combination

+ Motor	Page	+ Tacho	Page	+ Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts						
RE 40, 150 W	84					120.1	136.1	149.6	149.6	163.1	163.1	163.1
RE 40, 150 W	84	MR	259			131.5	147.5	161.0	161.0	174.5	174.5	174.5
RE 40, 150 W	84	HED_5540	262/264			140.8	156.8	170.3	170.3	183.8	183.8	183.8
RE 40, 150 W	84	HEDL 9140	267			174.1	190.1	203.6	203.6	217.1	217.1	217.1
RE 40, 150 W	84			AB 28	308	156.2	172.2	185.7	185.7	199.2	199.2	199.2
RE 40, 150 W	84			AB 28	309	164.2	180.2	193.7	193.7	207.2	207.2	207.2
RE 40, 150 W	84	HED_5540	262/264	AB 28	308	173.3	189.3	202.8	202.8	216.3	216.3	216.3
RE 40, 150 W	84	HEDL 9140	267	AB 28	309	184.6	200.6	214.1	214.1	227.6	227.6	227.6
EC 40, 120 W	165					119.1	135.1	148.6	148.6	162.1	162.1	162.1
EC 40, 120 W	165	HED_5540	263/265			137.5	153.5	167.0	167.0	180.5	180.5	180.5
EC 40, 120 W	165	Res 26	272			145.7	161.7	175.2	175.2	188.7	188.7	188.7
EC 40, 120 W	165			AB 28	308	149.9	165.9	179.4	179.4	192.9	192.9	192.9
EC 45, 150 W	166					160.3	176.3	189.8	189.8	203.3	203.3	203.3
EC 45, 150 W	166	HEDL 9140	267			175.9	191.9	205.4	205.4	218.9	218.9	218.9
EC 45, 150 W	166	Res 26	272			160.3	176.3	189.8	189.8	203.3	203.3	203.3
EC 45, 150 W	166			AB 28	309	167.7	183.7	197.2	197.2	210.7	210.7	210.7
EC 45, 150 W	166	HEDL 9140	267	AB 28	309	184.7	200.7	214.2	214.2	227.7	227.7	227.7
EC 45, 250 W	167					193.1	209.1	222.6	222.6	236.1	236.1	236.1
EC 45, 250 W	167	HEDL 9140	267			208.7	224.7	238.2	238.2	251.7	251.7	251.7
EC 45, 250 W	167	Res 26	272			193.1	209.1	222.6	222.6	236.1	236.1	236.1
EC 45, 250 W	167			AB 28	309	200.5	216.5	230.0	230.0	243.5	243.5	243.5
EC 45, 250 W	167	HEDL 9140	267	AB 28	309	217.5	233.5	247.0	247.0	260.5	260.5	260.5

Planetary Gearhead GP 52 C Ø52 mm, 4 - 30 Nm

Ceramic Version

maxon gear



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. permissible axial load	200 N
Max. permissible force for press fits	500 N
Sense of rotation, drive to output	=
Recommended input speed	< 6000 rpm
Recommended temperature range	-20 ... +100°C
Extended area as option	-35 ... +100°C
Number of stages	1 2 3 4
Max. radial load, 12 mm from flange	500 N 700 N 900 N 900 N

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

Order Number

Gearhead Data

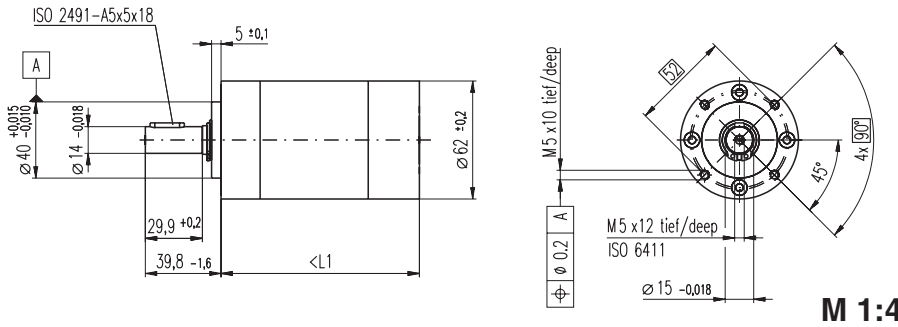
	223080	223083	223089	223094	223097	223104	223109
1 Reduction	3.5 : 1	12 : 1	43 : 1	91 : 1	150 : 1	319 : 1	546 : 1
2 Reduction absolute	7/2	49/4	343/6	91	2401/16	637/2	546
3 Mass inertia gcm ²	20.7	17.6	17.3	16.7	17.3	16.8	16.4
4 Max. motor shaft diameter mm	10	10	10	10	10	10	10
Order Number	223081	223084	223090	223095	223099	223105	223110
1 Reduction	4.3 : 1	15 : 1	53 : 1	113 : 1	186 : 1	353 : 1	676 : 1
2 Reduction absolute	13/3	91/6	637/12	338/3	4459/24	28561/81	676
3 Mass inertia gcm ²	12	16.8	17.2	9.3	17.3	9.4	9.1
4 Max. motor shaft diameter mm	8	10	10	8	10	8	8
Order Number		223085	223091	223096	223101	223106	223111
1 Reduction		19 : 1	66 : 1	126 : 1	230 : 1	394 : 1	756 : 1
2 Reduction absolute		169/9	1183/18	126	8281/36	1183/3	756
3 Mass inertia gcm ²		9.5	16.7	16.4	16.8	16.7	16.4
4 Max. motor shaft diameter mm		8	10	10	10	10	10
Order Number		223086	223092	223098	223102	223107	223112
1 Reduction		21 : 1	74 : 1	156 : 1	257 : 1	441 : 1	936 : 1
2 Reduction absolute		21	147/2	156	1029/4	441	936
3 Mass inertia gcm ²		16.5	17.2	9.1	17.3	16.5	9.1
4 Max. motor shaft diameter mm		10	10	8	10	10	8
Order Number		223087	223093		223103	223108	
1 Reduction		26 : 1	81 : 1		285 : 1	488 : 1	
2 Reduction absolute		26	2197/27		15379/54	4394/9	
3 Mass inertia gcm ²		9.1	9.4		16.7	9.4	
4 Max. motor shaft diameter mm		8	8		10	8	
5 Number of stages		1	2	3	3	4	4
6 Max. continuous torque Nm		4	15	30	30	30	30
7 Intermittently permissible torque at gear output Nm		6	22.5	45	45	45	45
8 Max. efficiency %		91	83	75	75	68	68
9 Weight g		460	620	770	770	920	920
10 Average backlash no load °		0.6	0.8	1.0	1.0	1.0	1.0
11 Gearhead length L1 mm		49.0	65.0	78.5	78.5	92.0	92.0



Combination

+ Motor	Page	+ Tacho	Page	+ Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts						
EC-max 40, 120 W	181					137.1	153.1	166.6	166.6	180.1	180.1	180.1
EC-max 40, 120 W	181	MR	259			153.0	169.0	182.5	182.5	196.0	196.0	196.0
EC-max 40, 120 W	181	HEDL 9140	267			160.5	176.5	190.0	190.0	203.5	203.5	203.5
EC-max 40, 120 W	181			AB 28	307	177.1	193.1	206.6	206.6	220.1	220.1	220.1
EC-max 40, 120 W	181	HEDL 9140	267	AB 28	307	200.5	216.5	230.0	230.0	243.5	243.5	243.5

Planetary Gearhead GP 62 A $\varnothing 62$ mm, 8 - 50 Nm



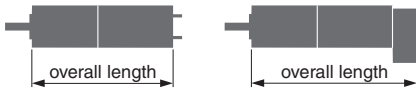
Technical Data

Planetary Gearhead	straight teeth
Output shaft	steel
Bearing at output	ball bearing
Radial play, 7 mm from flange	max. 0.08 mm
Axial play	max. 1 mm
Max. permissible axial load	120 N
Max. permissible force for press fits	1000 N
Sense of rotation, drive to output	=
Recommended 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)

Order Number

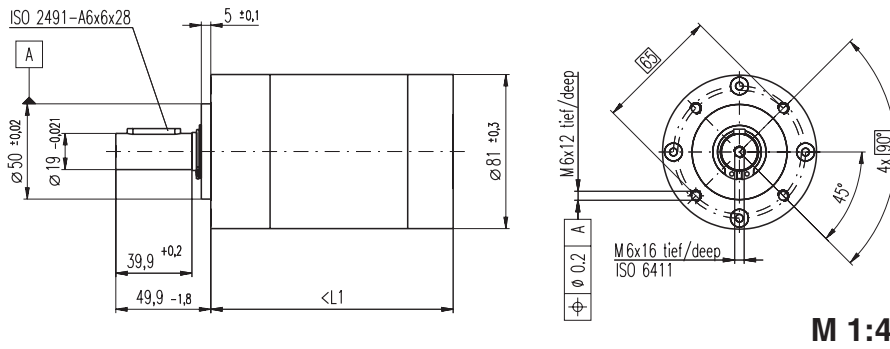
	110499	110501	110502	110503	110504	110505	110506	110507	110508
1 Reduction	5.2 : 1	19 : 1	27 : 1	35 : 1	71 : 1	100 : 1	139 : 1	181 : 1	236 : 1
2 Reduction absolute	57/11	3591/187	3249/121	1539/44	226223/3179	204687/2057	185193/1331	87723/484	41553/176
3 Max. motor shaft diameter	mm	8	8	8	8	8	8	8	8
4 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
6 Intermittently permissible torque at gear output	Nm	12	37	37	37	75	75	75	75
7 Max. efficiency	%	80	75	75	75	70	70	70	70
8 Weight	g	950	1250	1250	1250	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
10 Mass inertia	gcm ²	109	100	105	89	104	105	102	88
11 Gearhead length L1	mm	72.5	88.3	88.3	88.3	104.2	104.2	104.2	104.2



Combination

+ Motor	Page	+ Tacho	Page	+ Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts											
F 2260, 40 W	97					163.1	178.9	178.9	178.9	194.8	194.8	194.8	194.8	194.8			
F 2260, 40 W	97	HED_ 5540	263/265			184.5	200.3	200.3	200.3	216.2	216.2	216.2	216.2	216.2			
F 2260, 40 W	97	HEDS 6540	268			186.3	202.1	202.1	202.1	218.0	218.0	218.0	218.0	218.0			
F 2260, 40 W	97			AB 28	308	192.2	208.0	208.0	208.0	223.9	223.9	223.9	223.9	223.9			
F 2260, 40 W	97	HED_ 5540	263/265	AB 28	308	215.8	231.6	231.6	231.6	247.5	247.5	247.5	247.5	247.5			
F 2260, 80 W	97					198.6	214.4	214.4	214.4	230.3	230.3	230.3	230.3	230.3			
F 2260, 80 W	98	HED_ 5540	263/265			220.0	235.8	235.8	235.8	251.7	251.7	251.7	251.7	251.7			
F 2260, 80 W	98	HEDS 6540	268			221.8	237.6	237.6	237.6	253.5	253.5	253.5	253.5	253.5			
F 2260, 80 W	98			AB 28	308	227.7	243.5	243.5	243.5	259.4	259.4	259.4	259.4	259.4			
F 2260, 80 W	98	HED_ 5540	263/265	AB 28	308	251.3	267.1	267.1	267.1	283.0	283.0	283.0	283.0	283.0			
EC 45, 250 W	167					216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3	248.3			
EC 45, 250 W	167	HEDL 9140	267			232.2	248.0	248.0	248.0	263.9	263.9	263.9	263.9	263.9			
EC 45, 250 W	167	Res 26	272			216.6	232.4	232.4	232.4	248.3	248.3	248.3	248.3	248.3			
EC 45, 250 W	167			AB 28	309	224.0	239.8	239.8	239.8	255.7	255.7	255.7	255.7	255.7			
EC 45, 250 W	167	HEDL 9140	267	AB 28	309	241.0	256.8	256.8	256.8	272.7	272.7	272.7	272.7	272.7			

Planetary Gearhead GP 81 A $\varnothing 81$ mm, 20 - 120 Nm



Technical Data

Planetary Gearhead	straight teeth
Output shaft	steel
Bearing at output	ball bearing
Radial play, 8 mm from flange	max. 0.1 mm
Axial play	max. 1 mm
Max. permissible force for press fits	1500 N
Sense of rotation, drive to output	=
Recommended 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. permissible axial load	80 N 120 N 200 N

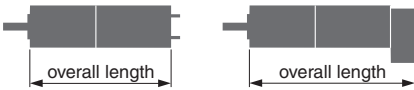
Option: low-play version

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

Order Number

	110408	110409	110410	110411	110412	110413
1 Reduction	3.7 : 1	14 : 1	25 : 1	51 : 1	93 : 1	308 : 1
2 Reduction absolute	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 Intermittently permissible 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	° 1.0	1.5	1.5	2.0	2.0	2.0
10 Mass inertia	gcm ² 165	155	125	88	154	89
11 Gearhead length L1*	mm 84.0	105.7	105.7	127.3	127.3	127.3

*for EC 60 is L1 + 8 mm



Combination

+ Motor	Page	+ Tacho	Page	+ Brake	Page	Overall length [mm] = Motor length + gearhead length + (tacho / brake) + assembly parts					
RE 65, 250 W	85					223.6	245.3	245.3	266.9	266.9	266.9
RE 65, 250 W	85	HEDS 5540	263			249.4	271.1	271.1	292.7	292.7	292.7
RE 65, 250 W	85	HEDL 5540	265			249.4	271.1	271.1	292.7	292.7	292.7
RE 75, 250 W	86					285.6	307.3	307.3	328.9	328.9	328.9
RE 75, 250 W	86	HED_ 5540	262/264			325.6	347.3	347.3	368.9	368.9	368.9
RE 75, 250 W	86			AB 75	311	325.6	347.3	347.3	368.9	368.9	368.9
RE 75, 250 W	86	HED_ 5540	262/264	AB 75	311	365.5	387.2	387.2	408.8	408.8	408.8
EC 60, 400 W	170					269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	170	HEDL 9140	267			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	170	Res 26	272			269.4	291.1	291.1	312.7	312.7	312.7
EC 60, 400 W	170			AB 41	310	283.0	304.7	304.7	326.3	326.3	326.3
EC 60, 400 W	170	HEDL 9140	267	AB 41	310	307.0	328.7	328.7	350.3	350.3	350.3

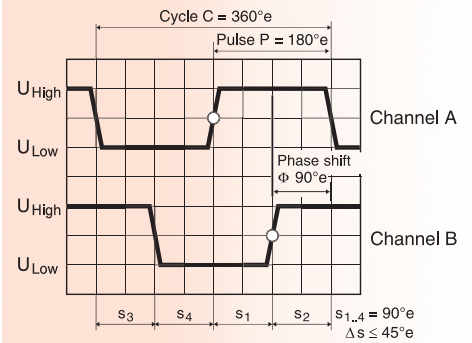


maxon tacho

High precision encoders, DC tachometers and resolvers with a high signal resolution are mounted exclusively on motors with through shafts for resonance reasons. The assembly requires adjustment to the motors and may only be done in the delivery plant.

MR Encoder	252 - 259
Encoder	260 - 270
DC-Tacho	271
Resolver	272

Encoder MR, Type S, 16 Counts per turn, 2 Channels



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

Order Number

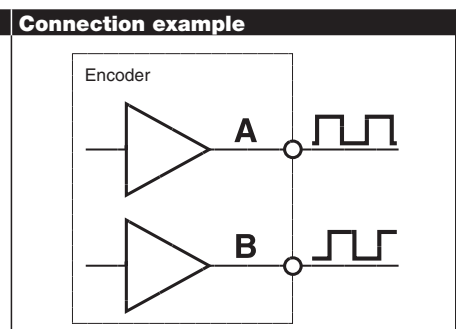
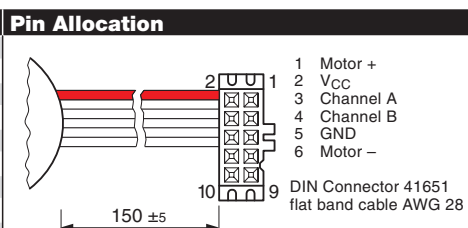
201933 224702

Type			
Counts per turn		16	16
Number of channels		2	2
Max. operating frequency (kHz)		8	8

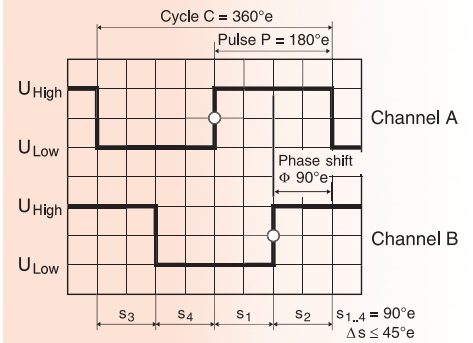


Combination						Overall length [mm] / • see: + Gearhead
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	
RE 10, 0.75 W	53					22.8
RE 10, 0.75 W	53	GP 10, 0.005 - 0.15 Nm	214/215			•
RE 10, 1.5 W	55					30.4
RE 10, 1.5 W	55	GP 10, 0.005 - 0.15 Nm	214/215			•
A-max 12, 0.5 W	102					25.3
A-max 12, 0.5 W	102	GP 10, 0.005 - 0.15 Nm	214/215			•
A-max 12, 0.5 W	102	GS 12, 0.01 - 0.02 Nm	216			•
A-max 12, 0.5 W	102	GP 13, 0.05 - 0.15 Nm	217			•
A-max 12, 0.5 W	102	GP 13, 0.2 - 0.35 Nm	218			•
RE 13, 0.75 W	58					26.3
RE 13, 0.75 W	59					28.7
RE 13, 0.75 W	59	GP 13, 0.05 - 0.15 Nm	217			•
RE 13, 0.75 W	59	GP 13, 0.2 - 0.35 Nm	218			•
RE 13, 2 W	62					38.5
RE 13, 2 W	63					40.9
RE 13, 2 W	63	GP 13, 0.05 - 0.15 Nm	217			•
RE 13, 2 W	63	GP 13, 0.2 - 0.35 Nm	218			•
RE 13, 1.5 W	66					28.4
RE 13, 1.5 W	67					30.8
RE 13, 1.5 W	67	GP 13, 0.05 - 0.15 Nm	217			•
RE 13, 1.5 W	67	GP 13, 0.2 - 0.35 Nm	218			•
RE 13, 3 W	70					40.6
RE 13, 3 W	71					43.0
RE 13, 3 W	71	GP 13, 0.05 - 0.15 Nm	217			•
RE 13, 3 W	71	GP 13, 0.2 - 0.35 Nm	218			•
RE-max 13, 0.75 W	130					25.2
RE-max 13, 0.75 W	130	GP 13, 0.05 - 0.15 Nm	217			•
RE-max 13, 0.75 W	130	GP 13, 0.2 - 0.35 Nm	218			•
RE-max 13, 2 W	132					36.2
RE-max 13, 2 W	132	GP 13, 0.05 - 0.15 Nm	217			•
RE-max 13, 2 W	132	GP 13, 0.2 - 0.35 Nm	218			•

Technical Data	
Supply voltage V_{CC}	2.7 - 5.5 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Operating temperature range	-25 ... +85°C
Moment of inertia of code wheel	≤ 0.005 gcm ²
Output current per channel	max. 5 mA



Encoder MR, Type S, 64 - 256 CPT, 2 Channels, with Line Driver



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

Order Number

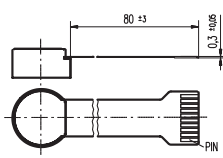
323049 323050 334910 323051 323052 323053 323054

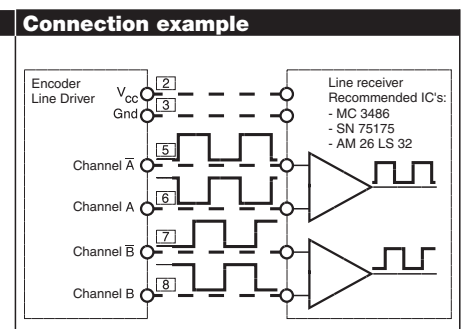
Type							
Counts per turn	64	64	100	128	128	256	256
Number of channels	2	2	2	2	2	2	2
Max. operating frequency (kHz)	80	80	100	160	160	320	320



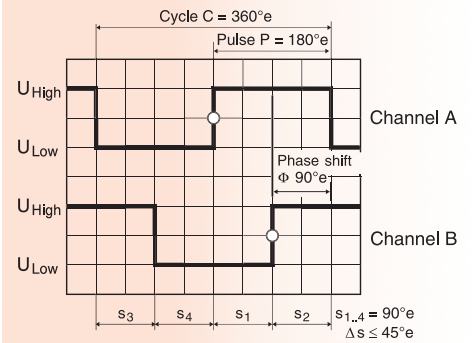
Combination						Overall length [mm] / • see: + Gearhead	
+ Motor	Page	+ Gearhead	Page	+ Brake	Page		
RE 8, 0.5 W	51					22.6	
RE 8, 0.5 W	51	GP 8	213			•	
RE 10, 0.75 W	53					22.8	22.8 22.8
RE 10, 0.75 W	53	GP 10, 0.005 - 0.15 Nm	214/215			•	•
RE 10, 1.5 W	55					30.4	30.4 30.4
RE 10, 1.5 W	55	GP 10, 0.005 - 0.15 Nm	214/215			•	•
A-max 12, 0.5 W	102					25.3	25.3 25.3
A-max 12, 0.5 W	102	GP 10, 0.005 - 0.15 Nm	214/215			•	•
A-max 12, 0.5 W	102	GS 12, 0.01 - 0.02 Nm	216			•	•
A-max 12, 0.5 W	102	GP 13, 0.05 - 0.15 Nm	217			•	•
A-max 12, 0.5 W	102	GP 13, 0.2 - 0.35 Nm	218			•	•
RE 13, 0.75 W	58					26.3	26.3 26.3
RE 13, 0.75 W	59					28.7	28.7 28.7
RE 13, 0.75 W	59	GP 13, 0.05 - 0.15 Nm	217			•	•
RE 13, 0.75 W	59	GP 13, 0.2 - 0.35 Nm	218			•	•
RE 13, 2 W	62					38.5	38.5 38.5
RE 13, 2 W	63					40.9	40.9 40.9
RE 13, 2 W	63	GP 13, 0.05 - 0.15 Nm	217			•	•
RE 13, 2 W	63	GP 13, 0.2 - 0.35 Nm	218			•	•
RE 13, 1.5 W	66					28.4	28.4 28.4
RE 13, 1.5 W	67					30.8	30.8 30.8
RE 13, 1.5 W	67	GP 13, 0.05 - 0.15 Nm	217			•	•
RE 13, 1.5 W	67	GP 13, 0.2 - 0.35 Nm	218			•	•
RE 13, 3 W	70					40.6	40.6 40.6
RE 13, 3 W	71					43.0	43.0 43.0
RE 13, 3 W	71	GP 13, 0.05 - 0.15 Nm	217			•	•
RE 13, 3 W	71	GP 13, 0.2 - 0.35 Nm	218			•	•
RE-max 13, 0.75 W	130					25.2	25.2 25.2
RE-max 13, 0.75 W	130	GP 13, 0.05 - 0.15 Nm	217			•	•
RE-max 13, 0.75 W	130	GP 13, 0.2 - 0.35 Nm	218			•	•
RE-max 13, 2 W	132					36.2	36.2 36.2
RE-max 13, 2 W	132	GP 13, 0.05 - 0.15 Nm	217			•	•
RE-max 13, 2 W	132	GP 13, 0.2 - 0.35 Nm	218			•	•

Technical Data	
Supply voltage	5 V ± 5 %
Output signal	TTL compatible
Operating temperature range	-25 ... +85°C
Moment of inertia of code wheel	≤ 0.005 gcm ²
Output current per channel	max. 5 mA

Pin Allocation	
	Pin 1 Motor + Pin 2 Vcc Pin 3 GND Pin 4 Motor - Pin 5 Channel A Pin 6 Channel B Pin 7 Channel A Pin 8 Channel B Pin 9 N.C. Pin 10 N.C.
Order Number 323049 - 323054, excl. 334910 Pin 1 - 10 Compatible connector: Molex 52207-1085, Tyco 1-84953-0 Adapter print to DIN 41651, Art. No. 327086	
Order Number 334910 Pin 1 - 8 Compatible connector: Molex 52745-0896	



Encoder MR, Type S, 64 - 256 Counts per turn, 2 Channels



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

Order Number

241057	310534	241060	241062
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Type	Counts per turn	64	100	128	256
Number of channels	2	2	2	2	2
Max. operating frequency (kHz)	80	200	160	320	



Combination

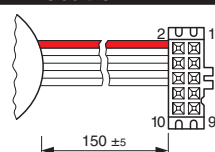
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / see: + Gearhead		
RE 13, 0.75 W	58					26.3		26.3
RE 13, 0.75 W	59					28.7		28.7
RE 13, 0.75 W	59	GP 13, 0.05 - 0.15 Nm	217			•	•	•
RE 13, 0.75 W	59	GP 13, 0.2 - 0.35 Nm	218			•	•	•
RE 13, 2 W	62					38.5		38.5
RE 13, 2 W	63					40.9		40.9
RE 13, 2 W	63	GP 13, 0.05 - 0.15 Nm	217			•	•	•
RE 13, 2 W	63	GP 13, 0.2 - 0.35 Nm	218			•	•	•
RE 13, 1.5 W	66					28.4		28.4
RE 13, 1.5 W	67					30.8		30.8
RE 13, 1.5 W	67	GP 13, 0.05 - 0.15 Nm	217			•	•	•
RE 13, 1.5 W	67	GP 13, 0.2 - 0.35 Nm	218			•	•	•
RE 13, 3 W	70					40.6		40.6
RE 13, 3 W	71					43.0		43.0
RE 13, 3 W	71	GP 13, 0.05 - 0.15 Nm	217			•	•	•
RE 13, 3 W	71	GP 13, 0.2 - 0.35 Nm	218			•	•	•
RE-max 13, 0.75 W	130					25.2		25.2
RE-max 13, 0.75 W	130	GP 13, 0.05 - 0.15 Nm	217			•	•	•
RE-max 13, 0.75 W	130	GP 13, 0.2 - 0.35 Nm	218			•	•	•
RE-max 13, 2 W	132					36.2		36.2
RE-max 13, 2 W	132	GP 13, 0.05 - 0.15 Nm	217			•	•	•
RE-max 13, 2 W	132	GP 13, 0.2 - 0.35 Nm	218			•	•	•
EC 6, 1.2 W*	152						25.0	
EC 6, 1.2 W*	152	GP 6, 0.002 - 0.03 Nm	211			•		
EC 6, 1.2 W*	152	MHD 8, 0.006 - 0.016 Nm	212			•		

* Different design

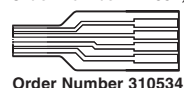
Technical Data

Supply voltage V_{CC}	5 V \pm 5 %
Output signal $V_{CC} = 5$ VDC	TTL compatible
Operating temperature range	-25 ... +85°C
Moment of inertia of code wheel	≤ 0.005 gcm ²
Output current per channel	max. 5 mA

Pin Allocation



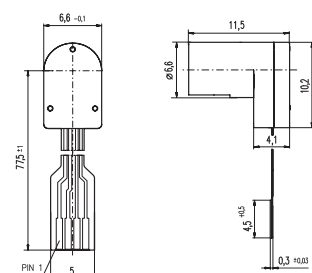
Order Number 241057, 241060, 241062



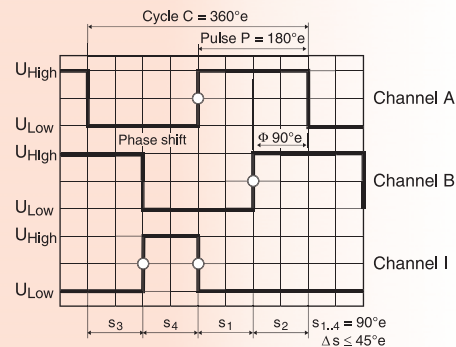
Order Number 310534

- 1 Motor +
 - 2 VCC
 - 3 Channel A
 - 4 Channel B
 - 5 GND
 - 6 Motor -
- DIN Connector 41651
flat band cable AWG 28
- 4 Channel B
 - 3 Channel A
 - 2 GND
 - 1 VCC
- Compatible connector:
Molex 52207-0485
Tyco 84953-4

Dimensional drawing for order 310534



Encoder MR, Typ M, 32 Counts per turn, 2 / 3 Channels



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

Order Number

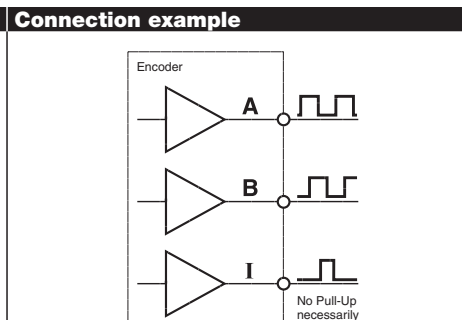
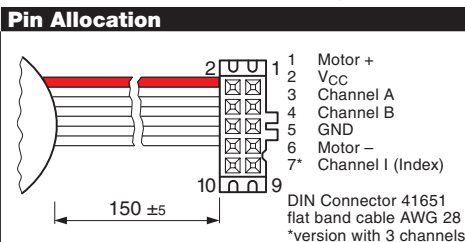
201935 201938

Type		
Counts per turn	32	32
Number of channels	2	3
Max. operating frequency (kHz)	8	8



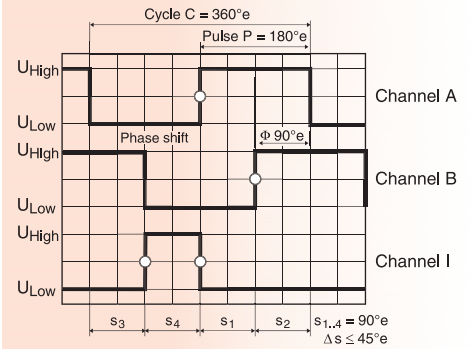
Combination						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see: + Gearhead
RE 16, 2 W	72					28.0 / 28.0
RE 16, 2 W	72	GP 16, 0.06 - 0.18 Nm	223			• / •
RE 16, 2 W	72	GP 16, 0.1 - 0.3 Nm	224			• / •
RE 16, 3.2 W	74					45.4 / 45.4
RE 16, 3.2 W	74	GP 16, 0.06 - 0.18 Nm	223			• / •
RE 16, 3.2 W	74	GP 16, 0.1 - 0.3 Nm	224			• / •
RE 16, 4.5 W	76					48.4 / 48.4
RE 16, 4.5 W	76	GP 16, 0.06 - 0.18 Nm	223			• / •
RE 16, 4.5 W	76	GP 16, 0.1 - 0.3 Nm	224			• / •
A-max 16	104/106					30.4 / 30.4
A-max 16	104/106	GS 16, 0.01 - 0.1 Nm	219-222			• / •
A-max 16	104/106	GP 16, 0.06 - 0.18 Nm	223			• / •
A-max 16	104/106	GP 16, 0.1 - 0.3 Nm	224			• / •
A-max 19, 1.5 W	108					34.0 / 34.0
A-max 19, 1.5 W	108	GP 19, 0.1 - 0.3 Nm	226			• / •
A-max 19, 1.5 W	108	GS 20, 0.06 - 0.25 Nm	227			• / •
A-max 19, 1.5 W	108	GP 22, 0.5 - 2.0 Nm	228/231			• / •
A-max 19, 1.5 W	108	GS 24, 0.1 Nm	234			• / •
A-max 19, 2.5 W	110					35.8 / 35.8
A-max 19, 2.5 W	110	GP 19, 0.1 - 0.3 Nm	226			• / •
A-max 19, 2.5 W	110	GS 20, 0.06 - 0.25 Nm	227			• / •
A-max 19, 2.5 W	110	GP 22, 0.1 - 2.0 Nm	228/231			• / •
A-max 19, 2.5 W	110	GS 24, 0.1 Nm	234			• / •
A-max 22	112/114					36.9 / 36.9
A-max 22	112/114	GP 22, 0.1 - 0.6 Nm	228/229			• / •
A-max 22	112/114	GP 22, 0.5 - 2.0 Nm	228-231			• / •
A-max 22	112/114	GS 24, 0.1 Nm	234			• / •
RE-max 17	134/136					30.4 / 30.4
RE-max 17	134/136	GP 16, 0.06 - 0.18 Nm	223			• / •
RE-max 17	134/136	GP 16, 0.1 - 0.3 Nm	224			• / •
RE-max 21, 3.5 W	138					34.0 / 34.0
RE-max 21, 3.5 W	138	GP 22, 0.5 - 2.0 Nm	230/231			• / •
RE-max 21, 3.5 W	138	GS 38, 0.1 - 0.6 Nm	243			• / •
RE-max 21, 6 W	140					35.8 / 35.8
RE-max 21, 6 W	140	GP 22, 0.5 - 2.0 Nm	230/231			• / •
RE-max 21, 6 W	140	GS 38, 0.1 - 0.6 Nm	243			• / •
RE-max 24	142/144					36.9 / 36.9
RE-max 24	142/144	GP 22, 0.5 - 2.0 Nm	231			• / •
RE-max 24	142/144	GS 38, 0.1 - 0.6 Nm	243			• / •

Technical Data	
Supply voltage V _{CC}	2.7 - 5.5 V
Output signal V _{CC} = 5 VDC	TTL compatible
Index pulse width (nominal)	90°e ± 45°e
Operating temperature range	-25 ... +85°C
Moment of inertia of code wheel	≤ 0.09 gcm ²
Output current per channel	max. 5 mA



The index signal I is not synchronised with channel A or B
The length of the index signal can last more than one cycle.

Encoder MR, Typ M, 128 - 512 CPT, 2 / 3 Channels, with Line Driver



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

Order Number

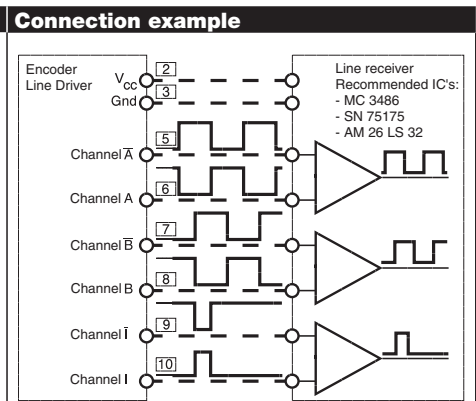
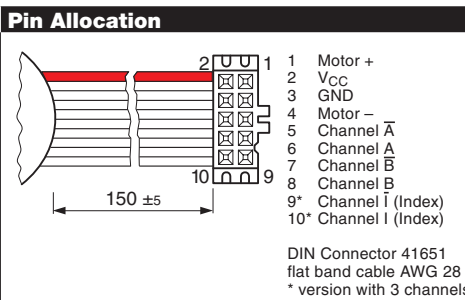
228179	228177	228181	228182	201937	201940
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Type	128	128	256	256	512	512
Counts per turn	128	128	256	256	512	512
Number of channels	2	3	2	3	2	3
Max. operating frequency (kHz)	80	80	160	160	320	320



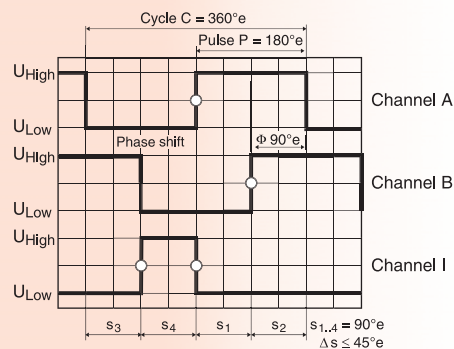
Combination		Page		Page		Overall length [mm]		+ Gearhead			
+ Motor	Page	+ Gearhead	Page	+ Brake	Page						
RE 16, 3.2 W	74					45.4	45.4	45.4	45.4	45.4	45.4
RE 16, 3.2 W	74	GP 16, 0.06 - 0.18 Nm	223			•	•	•	•	•	•
RE 16, 3.2 W	74	GP 16, 0.1 - 0.3 Nm	224			•	•	•	•	•	•
RE 16, 4.5 W	76					48.4	48.4	48.4	48.4	48.4	48.4
RE 16, 4.5 W	76	GP 16, 0.06 - 0.18 Nm	223			•	•	•	•	•	•
RE 16, 4.5 W	76	GP 16, 0.1 - 0.3 Nm	224			•	•	•	•	•	•
A-max 16	104/106					30.4	30.4	30.4	30.4	30.4	30.4
A-max 16	104/106	GS 16, 0.01 - 0.1 Nm	219-221			•	•	•	•	•	•
A-max 16	104/106	GP 16, 0.06 - 0.18 Nm	223			•	•	•	•	•	•
A-max 16	104/106	GP 16, 0.1 - 0.3 Nm	224			•	•	•	•	•	•
A-max 19, 1.5 W	108					34.0	34.0	34.0	34.0	34.0	34.0
A-max 19, 1.5 W	108	GP 19, 0.1 - 0.3 Nm	226			•	•	•	•	•	•
A-max 19, 1.5 W	108	GS 20 0.06 - 0.25 Nm	227			•	•	•	•	•	•
A-max 19, 1.5 W	108	GP 22, 0.5 - 2.0 Nm	230/231			•	•	•	•	•	•
A-max 19, 1.5 W	108	GS 24, 0.1 Nm	234			•	•	•	•	•	•
A-max 19, 2.5 W	110					35.8	35.8	35.8	35.8	35.8	35.8
A-max 19, 2.5 W	110	GP 19, 0.1 - 0.3 Nm	226			•	•	•	•	•	•
A-max 19, 2.5 W	110	GS 20 0.06 - 0.25 Nm	227			•	•	•	•	•	•
A-max 19, 2.5 W	110	GP 22, 0.5 - 2.0 Nm	230/231			•	•	•	•	•	•
A-max 19, 2.5 W	110	GS 24, 0.1 Nm	234			•	•	•	•	•	•
A-max 22	112/114					36.9	36.9	36.9	36.9	36.9	36.9
A-max 22	112/114	GP 22, 0.1 - 0.6 Nm	228/229			•	•	•	•	•	•
A-max 22	112/114	GP 22, 0.5 - 2.0 Nm	230/231			•	•	•	•	•	•
A-max 22	112/114	GS 24, 0.1 Nm	234			•	•	•	•	•	•
RE-max 17	134/136					30.4	30.4	30.4	30.4	30.4	30.4
RE-max 17	134/136	GP 16, 0.06 - 0.18 Nm	223			•	•	•	•	•	•
RE-max 17	134/136	GP 16, 0.1 - 0.3 Nm	224			•	•	•	•	•	•
RE-max 21, 3.5 W	138					34.0	34.0	34.0	34.0	34.0	34.0
RE-max 21, 3.5 W	138	GP 22, 0.5 - 2.0 Nm	230/231			•	•	•	•	•	•
RE-max 21, 3.5 W	138	GS 38, 0.1 - 0.6 Nm	243			•	•	•	•	•	•
RE-max 21, 6 W	140					35.8	35.8	35.8	35.8	35.8	35.8
RE-max 21, 6 W	140	GP 22, 0.5 - 2.0 Nm	230/231			•	•	•	•	•	•
RE-max 21, 6 W	140	GS 38, 0.1 - 0.6 Nm	243			•	•	•	•	•	•
RE-max 24	142/144					36.9	36.9	36.9	36.9	36.9	36.9
RE-max 24	142/144	GP 22, 0.5 - 2.0 Nm	231			•	•	•	•	•	•
RE-max 24	142/144	GS 38, 0.1 - 0.6 Nm	243			•	•	•	•	•	•

Technical Data	
Supply voltage V _{CC}	5 V ± 5 %
Output signal	TTL compatible
Index pulse width (nominal)	90° ± 45°e
Operating temperature range	-25 ... +85°C
Moment of inertia of code wheel	≤ 0.09 gcm ²
Output current per channel	max. 5 mA



The index signal I is synchronised with channel A or B.

Encoder MR, Type M, 128 - 512 CPT, 2 / 3 Channels, mit Line Driver



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

Order Number

228179	228177	228181	228182	201937	201940
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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

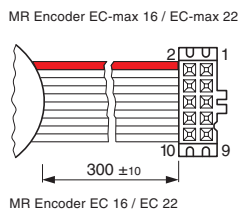
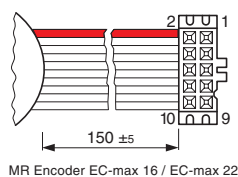


Combination						Overall length [mm] / ● see: + Gearhead					
+ Motor	Page	+ Gearhead	Page	+ Brake	Page						
RE 16, 2 W	72					28.0	28.0	28.0	28.0	28.0	28.0
RE 16, 2 W	72	GP 16, 0.06 - 0.18 Nm	223			●	●	●	●	●	●
RE 16, 2 W	72	GP 16, 0.1 - 0.3 Nm	224			●	●	●	●	●	●
EC 16, 15 W	156					50.9	50.9	50.9	50.9	50.9	50.9
EC 16, 15 W	156	GP 16, 0.1 - 0.3 Nm	224			●	●	●	●	●	●
EC 16, 40 W	157					66.9	66.9	66.9	66.9	66.9	66.9
EC 16, 40 W	157	GP 22, 0.5 - 2.0 Nm	232			●	●	●	●	●	●
EC 22, 20 W	159					50.5	50.5	50.5	50.5	50.5	50.5
EC 22, 20 W	159	GP 22, 0.5 - 2.0 Nm	232			●	●	●	●	●	●
EC 22, 50 W	161					68.7	68.7	68.7	68.7	68.7	68.7
EC 22, 50 W	161	GP 22, 0.5 - 2.0 Nm	232			●	●	●	●	●	●
EC-max 16, 5 W	173					31.3	31.3	31.3	31.3	31.3	31.3
EC-max 16, 5 W	173	GP 16, 0.1 - 0.3 Nm	224			●	●	●	●	●	●
EC-max 16, 8 W	175					43.3	43.3	43.3	43.3	43.3	43.3
EC-max 16, 8 W	175	GP 22, 0.5 - 2.0 Nm	232			●	●	●	●	●	●
EC-max 22, 12 W	176					41.7	41.7	41.7	41.7	41.7	41.7
EC-max 22, 12 W	176	GP 22, 0.5 - 2.0 Nm	232			●	●	●	●	●	●
EC-max 22, 25 W	177					58.2	58.2	58.2	58.2	58.2	58.2
EC-max 22, 25 W	177	GP 32, 1 - 6 Nm	241			●	●	●	●	●	●

Technical Data

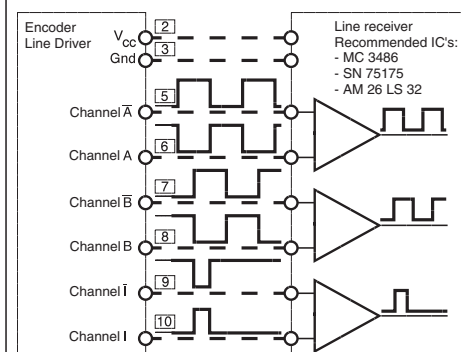
Supply voltage V_{CC}	$5 V \pm 5 \%$
Output signal	TTL compatible
Index pulse width (nominal)	$90^\circ e \pm 45^\circ e$
Operating temperature range	$-25 \dots +85^\circ C$
Moment of inertia of code wheel	$\leq 0.09 \text{ gcm}^2$
Output current per channel	max. 5 mA

Pin Allocation



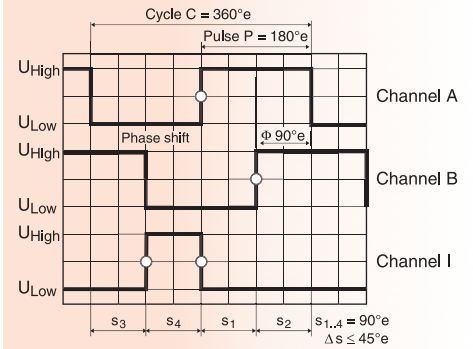
- 1 N.C.
 - 2 VCC
 - 3 GND
 - 4 N.C.
 - 5 Channel A
 - 6 Channel A
 - 7 Channel B
 - 8 Channel B
 - 9* Channel I (Index)
 - 10* Channel I (Index)
- DIN Connector 41651
flat band cable AWG 28
* version with 3 channels

Connection example



The index signal I is synchronised with channel A or B.

Encoder MR, Type ML, 128 - 1000 CPT, 3 Channels, with Line Driver



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

Order Number

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



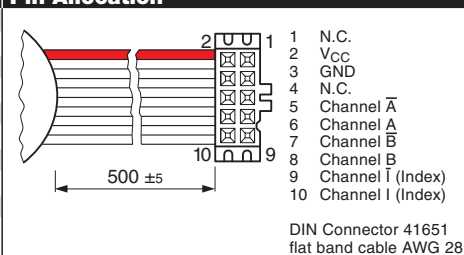
Combination

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see: + Gearhead				
RE 25	77/79					65.5	65.5	65.5	65.5	65.5
RE 25	77/79	GP 26, 0.5 - 2.0 Nm	235			•	•	•	•	•
RE 25	77/79	GP 32, 0.4 - 6.0 Nm	237-241			•	•	•	•	•
RE 26, 18 W	80					69.8	69.8	69.8	69.8	69.8
RE 26, 18 W	80	GP 26, 0.5 - 2.0 Nm	235			•	•	•	•	•
RE 26, 18 W	80	GP 32, 0.4 - 6.0Nm	237-241			•	•	•	•	•
A-max 26	116-122					53.5	53.5	53.5	53.5	53.5
A-max 26	116-122	GP 26, 0.5 - 2.0 Nm	235			•	•	•	•	•
A-max 26	116-122	GS 30, 0.07 - 0.2 Nm	236			•	•	•	•	•
A-max 26	116-122	GP 32, 0.4 - 6.0 Nm	237-241			•	•	•	•	•
A-max 26	116-122	GS 38, 0.1 - 0.6 Nm	243			•	•	•	•	•
RE-max 29	146/148					53.5	53.5	53.5	53.5	53.5
RE-max 29	146/148	GP 26, 0.5 - 2.0 Nm	235			•	•	•	•	•
RE-max 29	146/148	GP 32, 0.75 - 6.0 Nm	238-241			•	•	•	•	•
EC-max 30, 40 W	178							54.2		54.2
EC-max 30, 40 W	178	GP 32, 1 - 6 Nm	241					•		•
EC-max 30, 60 W	179							76.2		76.2
EC-max 30, 60 W	179	GP 42, 3 - 15 Nm	245					•		•
EC-powermax 30	187							59.2		59.2
EC-powermax 30	187	GP 32, 8 Nm	242					•		•
EC-powermax 30	187	GP 42, 3 - 15 Nm	245					•		•
EC-powermax 30	188							76.2		76.2
EC-powermax 30	188	GP 32, 8 Nm	242					•		•
EC-powermax 30	188	GP 42, 3 - 15 Nm	245					•		•

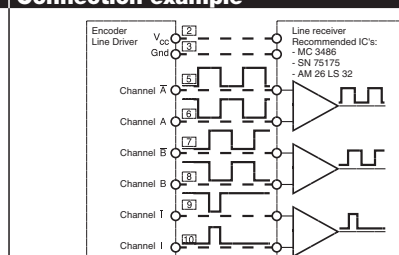
Technical Data

Supply voltage V _{CC}	5 V ± 5 %
Output signal	TTL compatible
Index pulse width (nominal)	90° ± 45°e
Operating temperature range	-25 ... +85°C
Moment of inertia of code wheel	≤ 0.7 gcm ²
Output current per channel	max. 5 mA

Pin Allocation

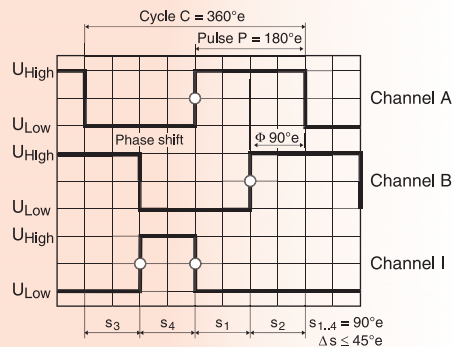
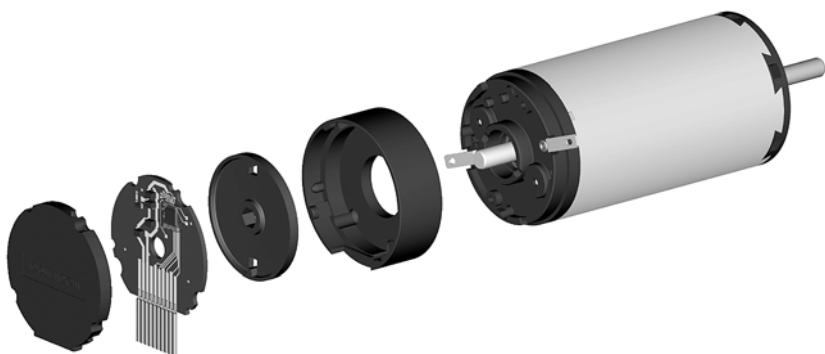


Connection example



The index signal I is synchronised with channel A or B.

Encoder MR, Type L, 256 - 1024 CPT, 3 Channels, with Line Driver



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

Order Number

225783	228452	225785	228456	225787
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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



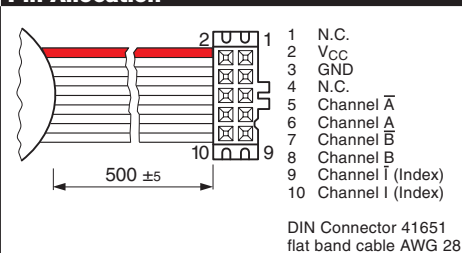
Combination

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see: + Gearhead				
RE 30, 60 W	81					79.4	79.4	79.4	79.4	79.4
RE 30, 60 W	81	GP 32, 0.75 - 6.0 Nm	239/240			●	●	●	●	●
RE 35, 90 W	82					82.3	82.3	82.3	82.3	82.3
RE 35, 90 W	82	GP 32, 0.75 - 6.0 Nm	239/240			●	●	●	●	●
RE 35, 90 W	82	GP 32, 8 Nm	242			●	●	●	●	●
RE 35, 90 W	82	GP 42, 3 - 15 Nm	244			●	●	●	●	●
RE 36, 70 W	83					82.6	82.6	82.6	82.6	82.6
RE 36, 70 W	83	GP 32, 0.4 - 2.0 Nm	237			●	●	●	●	●
RE 36, 70 W	83	GP 32, 0.75 - 6.0 Nm	239/240			●	●	●	●	●
RE 36, 70 W	83	GP 42, 3 - 15 Nm	244			●	●	●	●	●
RE 40, 150 W	84					82.4	82.4	82.4	82.4	82.4
RE 40, 150 W	84	GP 42, 3 - 15 Nm	244			●	●	●	●	●
RE 40, 150 W	84	GP 52, 4 - 30 Nm	247			●	●	●	●	●
A-max 32	124/126					72.7	72.7	72.7	72.7	72.7
A-max 32	124/126	GP 32, 0.75 - 6.0 Nm	239/241			●	●	●	●	●
A-max 32	124/126	GS 38, 0.1 - 0.6 Nm	243			●	●	●	●	●
EC-max 40, 70 W	180						73.9		73.9	
EC-max 40, 70 W	180	GP 42, 3 - 15 Nm	245			●	●	●	●	●
EC-max 40, 120 W	181						103.9		103.9	
EC-max 40, 120 W	181	GP 52, 4 - 30 Nm	248			●	●	●	●	●
EC-i 40, 50 W	199					42.0	42.0	42.0	42.0	42.0
EC-i 40, 50 W	199	GP 32, 1 - 6 Nm	241			●	●	●	●	●
EC-i 40, 70 W	200					52.0	52.0	52.0	52.0	52.0
EC-i 40, 70 W	200	GP 32, 1 - 6 Nm	241			●	●	●	●	●

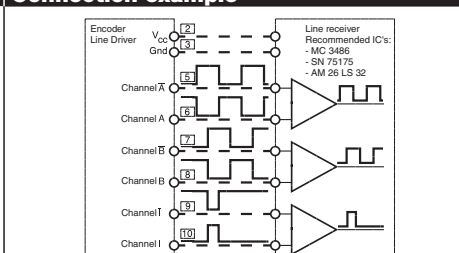
Technical Data

Supply voltage	5 V ± 5 %
Output signal	TTL compatible
Index pulse width (nominal)	90°e ± 45°e
Operating temperature range	-25 ... +85°C
Moment of inertia of code wheel	≤ 1.7 gcm ²
Output current per channel	max. 5 mA

Pin Allocation

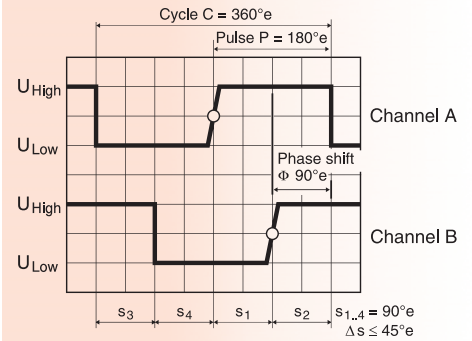
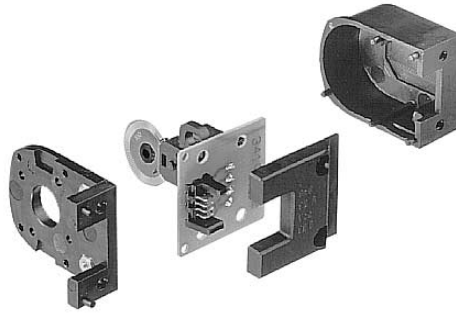
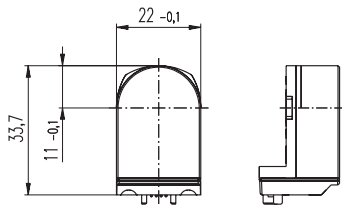


Connection example



The index signal I is synchronised with channel A or B.

Encoder Enc 22, 100 Counts per turn, 2 Channels



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

Order Number

103937	143330	103935	110520	168045	110521
--------	--------	--------	--------	--------	--------

Type	103937	143330	103935	110520	168045	110521
Counts per turn	100	100	100	100	100	100
Number of channels	2	2	2	2	2	2
Max. operating frequency (kHz)	20	20	20	20	20	20
Shaft diameter (mm)	2	2	3	2	3	3
Orientation encoder to motor mounting defined		± 5°			± 5°	



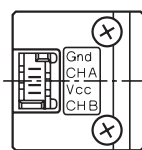
Combination

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see: + Gearhead
RE 25, 10 W	77			68.6
RE 25, 10 W	77	GP 26, 0.5 - 2.0 Nm	235	●
RE 25, 10 W	77	GP 32, 0.4 - 2.0 Nm	237	●
RE 25, 10 W	77	GP 32, 0.75 - 4.5 Nm	238	●
RE 25, 10 W	77	GP 32, 1.0 - 6.0 Nm	240	●
RE 25, 20 W	79			68.6
RE 25, 20 W	79	GP 26, 0.5 - 2.0 Nm	235	●
RE 25, 20 W	79	GP 32, 0.4 - 2.0 Nm	237	●
RE 25, 20 W	79	GP 32, 0.75 - 4.5 Nm	238	●
RE 25, 20 W	79	GP 32, 1.0 - 6.0 Nm	240	●
RE 26, 18 W	80			76.2
RE 26, 18 W	80	GP 26, 0.5 - 2.0 Nm	235	●
RE 26, 18 W	80	GP 32, 0.4 - 2.0 Nm	237	●
RE 26, 18 W	80	GP 32, 0.75 - 4.5 Nm	238	●
RE 26, 18 W	80	GP 32, 1.0 - 6.0 Nm	240	●

Technical Data

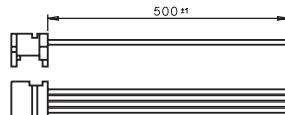
Supply voltage	5 V ± 10 %
Output signal	TTL compatible
Phase shift F (nominal)	90°e ± 45°e
Signal rise time (typical at C _L = 25 pF, R _L = 11 kΩ, 25°C)	200 ns
Signal fall time (typical at C _L = 25 pF, R _L = 11 kΩ, 25°C)	50 ns
Operating temperature range	-20 ... +85°C
Moment of inertia of code wheel	≤ 0.05 gcm ²
Output current per channel	min. -1 mA, max. 5 mA

Pin Allocation

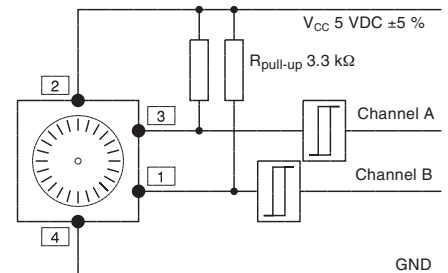


Micromodule contact strip
Type Lumberg MICS 4
Pin 4 GND
Pin 3 Channel A
Pin 2 V_{CC}, Pin 1 Channel B
recommended connectors:
Micromodule connector
Type Lumberg MICA 4

Order number for connector with cable: 3419.506

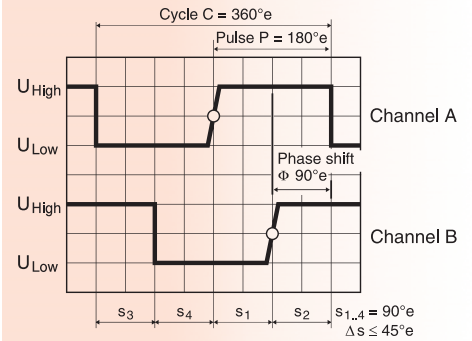
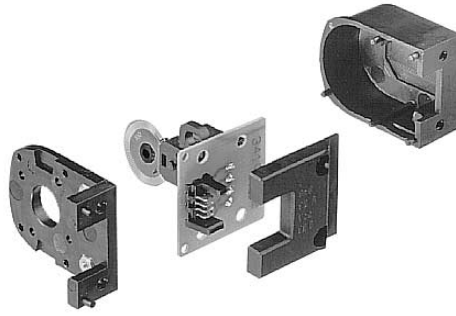
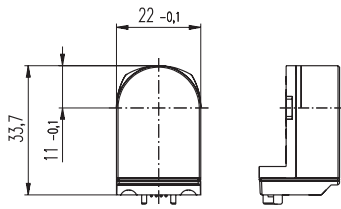


Connection example



Ambient temperature range $\delta U = 22 - 25^\circ\text{C}$

Encoder Enc 22, 100 Counts per turn, 2 Channels



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

Order Number

103937	143330	103935	110520	168045	110521
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Type	103937	143330	103935	110520	168045	110521
Counts per turn	100	100	100	100	100	100
Number of channels	2	2	2	2	2	2
Max. operating frequency (kHz)	20	20	20	20	20	20
Shaft diameter (mm)	2	2	3	2	3	3
Orientation encoder to motor mounting defined		± 5°			± 5°	



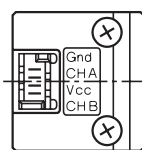
Combination

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see: + Gearhead
F 2130, 3 W	93			45.0
F 2130, 3 W	93	GS 30, 0.07 - 0.2 Nm	236	●
F 2140, 6 W	96			65.5
F 2140, 6 W	96	GS 38, 0.1 - 0.6 Nm	243	●
A-max 19, 1.5 W	108			43.3
A-max 19, 1.5 W	108	GP 19, 0.1 - 0.3 Nm	226	●
A-max 19, 1.5 W	108	GS 20, 0.06 - 0.25 Nm	227	●
A-max 19, 1.5 W	108	GP 22, 0.1 - 2.0 Nm	228-231	●
A-max 19, 1.5 W	108	GS 24, 0.1 Nm	234	●
A-max 19, 2.5 W	110			45.9
A-max 19, 2.5 W	110	GP 19, 0.1 - 0.3 Nm	226	●
A-max 19, 2.5 W	110	GS 20, 0.06 - 0.25 Nm	227	●
A-max 19, 2.5 W	110	GP 22, 0.1 - 2.0 Nm	228-231	●
A-max 19, 2.5 W	110	GS 24, 0.1 Nm	234	●
A-max 22	112/114			46.3
A-max 22	112/114	GP 22, 0.1 - 0.3 Nm	228	●
A-max 22	112/114	GP 22, 0.2 - 0.6 Nm	229	●
A-max 22	112/114	GP 22, 0.1 - 2.0 Nm	228-231	●
A-max 22	112/114	GS 24, 0.1 Nm	234	●
A-max 26	116-122			59.1
A-max 26	116-122	GP 26, 0.5 - 2.0 Nm	235	●
A-max 26	116-122	GS 30, 0.07 - 0.2 Nm	236	●
A-max 26	116-122	GP 32, 0.4 - 2.0 Nm	237	●
A-max 26	116-122	GP 32, 0.75 - 4.5 Nm	238	●
A-max 26	116-122	GP 32, 1.0 - 6.0 Nm	241	●
A-max 26	116-122	GS 38, 0.1 - 0.6 Nm	243	●

Technical Data

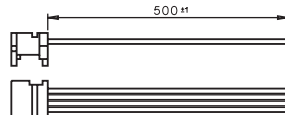
Supply voltage	5 V ± 10 %
Output signal	TTL compatible
Phase shift F (nominal)	90°e ± 45°e
Signal rise time (typical at C _L = 25 pF, R _L = 11 kΩ, 25°C)	200 ns
Signal fall time (typical at C _L = 25 pF, R _L = 11 kΩ, 25°C)	50 ns
Operating temperature range	-20 ... +85°C
Moment of inertia of code wheel	≤ 0.05 gcm ²
Output current per channel	min. -1 mA, max. 5 mA

Pin Allocation

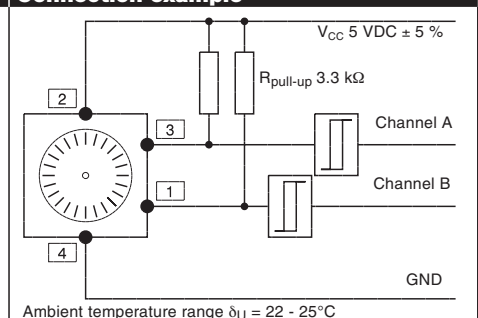


Micromodule contact strip
Type Lumberg MICS 4
Pin 4 GND
Pin 3 Channel A
Pin 2 V_{CC}, Pin 1 Channel B
recommended connectors:
Micromodule connector
Type Lumberg MICA 4

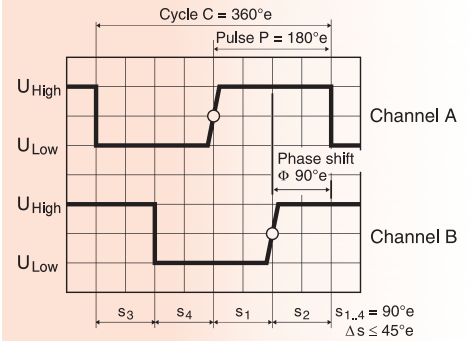
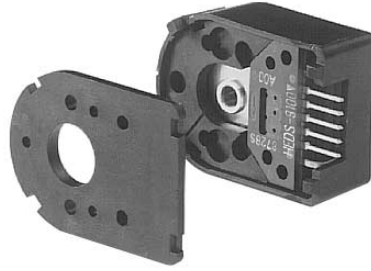
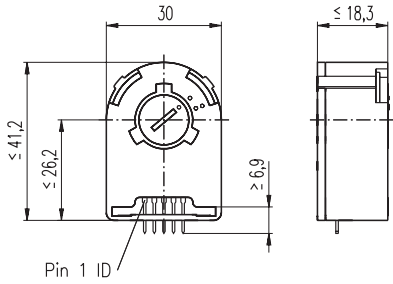
Order number for connector with cable: 3419.506



Connection example



Encoder HEDS 5540, 500 Counts per turn, 3 Channels



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

Order Number

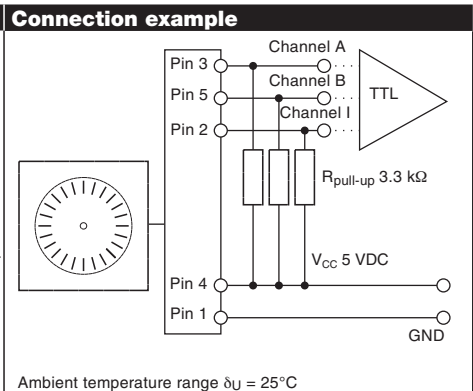
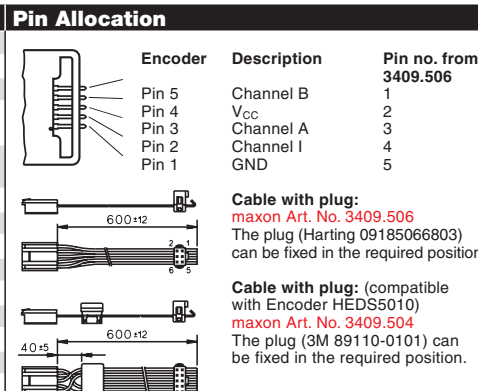
110511	110513	110515
--------	--------	--------

Type	110511	110513	110515
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Shaft diameter (mm)	3	4	6

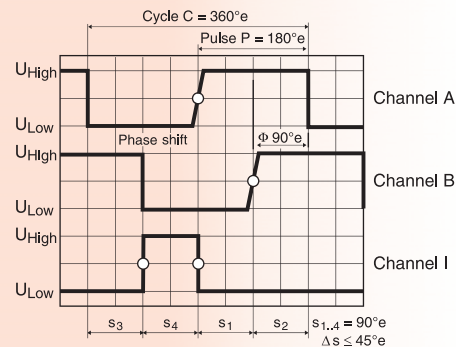
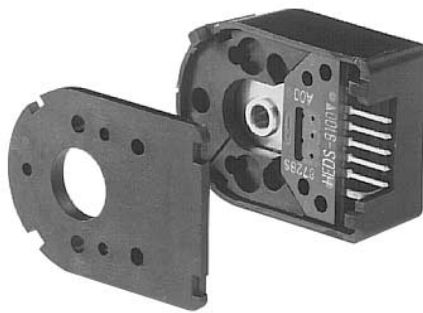
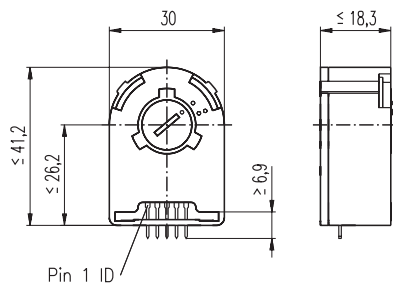


Combination						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see: + Gearhead
RE 25, 10 W	77					75.3
RE 25, 10 W	77	GP 26, 0.5 - 2.0 Nm	235			•
RE 25, 10 W	77	GP 32, 0.4 - 2.0 Nm	237			•
RE 25, 10 W	77	GP 32, 0.75 - 6.0 Nm	238/240			•
RE 25, 20 W	79					75.3
RE 25, 20 W	79	GP 26, 0.5 - 2.0 Nm	235			•
RE 25, 20 W	79	GP 32, 0.4 - 2.0 Nm	237			•
RE 25, 20 W	79	GP 32, 0.75 - 6.0 Nm	238/240			•
RE 25, 20 W	79			AB 28	308	105.7
RE 25, 20 W	79	GP 26, 0.5 - 2.0 Nm	235	AB 28	308	•
RE 25, 20 W	79	GP 32, 0.4 - 2.0 Nm	237	AB 28	308	•
RE 25, 20 W	79	GP 32, 0.75 - 6.0 Nm	238/240	AB 28	308	•
RE 26, 18 W	80					77.2
RE 26, 18 W	80	GP 26, 0.5 - 2.0 Nm	235			•
RE 26, 18 W	80	GP 32, 0.4 - 2.0 Nm	237			•
RE 26, 18 W	80	GP 32, 0.75 - 6.0 Nm	238/240			•
RE 35, 90 W	82					91.9
RE 35, 90 W	82	GP 32, 0.75 - 6.0 Nm	239/240			•
RE 35, 90 W	82	GP 32, 8 Nm	242			•
RE 35, 90 W	82	GP 42, 3.0 - 15 Nm	244			•
RE 35, 90 W	82			AB 28	308	124.1
RE 35, 90 W	82	GP 32, 0.75 - 6.0 Nm	239/240	AB 28	308	•
RE 35, 90 W	82	GP 42, 3.0 - 15 Nm	244	AB 28	308	•
RE 36, 70 W	83					92.2
RE 36, 70 W	83	GP 32, 0.4 - 2.0 Nm	237			•
RE 36, 70 W	83	GP 32, 0.75 - 6.0 Nm	239/240			•
RE 36, 70 W	83	GP 42, 3.0 - 15 Nm	244			•
RE 40, 150 W	84					91.7
RE 40, 150 W	84	GP 42, 3.0 - 15 Nm	244			•
RE 40, 150 W	84	GP 52, 4.0 - 30 Nm	247			•
RE 40, 150 W	84			AB 28	308	124.2
RE 40, 150 W	84	GP 42, 3.0 - 15 Nm	244	AB 28	308	•
RE 40, 150 W	84	GP 52, 4.0 - 30 Nm	247	AB 28	308	•

Technical Data	
Supply voltage	5 V ± 10 %
Output signal	TTL compatible
Phase shift F (nominal)	90°e ± 45°e
Signal rise time (typical at C _L = 25 pF, R _L = 2.7 kΩ, 25°C)	180 ns
Signal fall time (typical 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 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	min. -1 mA, max. 5 mA



Encoder HEDS 5540, 500 Counts per turn, 3 Channels



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

Order Number

110511	110513	110515	110517
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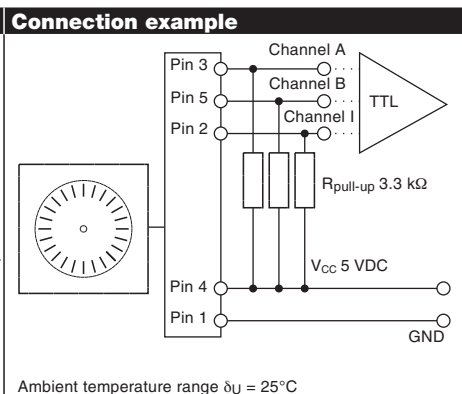
Type	110511	110513	110515	110517
Counts per turn	500	500	500	500
Number of channels	3	3	3	3
Max. operating frequency (kHz)	100	100	100	100
Shaft diameter (mm)	3	4	6	8



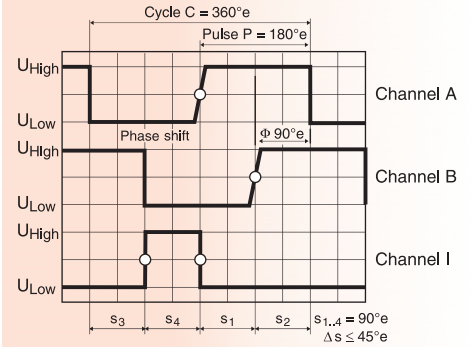
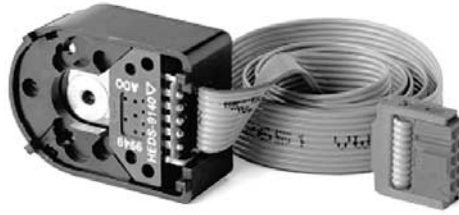
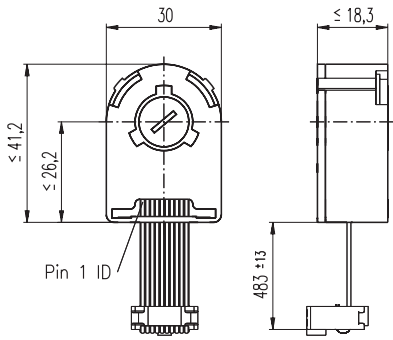
Combination						Overall length [mm] / • see: + Gearhead
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	
RE 65, 250 W	85					157.3
RE 65, 250 W	85	GP 81, 20 - 120 Nm	250			•
RE 75, 250 W	86					241.5
RE 75, 250 W	86	GP 81, 20 - 120 Nm	250			•
RE 75, 250 W	86			AB 75	311	281.4
RE 75, 250 W	86	GP 81, 20 - 120 Nm	250	AB 75	311	•
F 2260, 40 W	97					111.9
F 2260, 40 W	97	GP 62, 8.0 - 50 Nm	249			•
F 2260, 80 W	98					147.4
F 2260, 80 W	98	GP 62, 8.0 - 50 Nm	249			•
A-max 26	116-122					63.5
A-max 26	116-122	GP 26, 0.5 - 2.0 Nm	235			•
A-max 26	116-122	GS 30, 0.07 - 0.2 Nm	236			•
A-max 26	116-122	GP 32, 0.4 - 2.0 Nm	237			•
A-max 26	116-122	GP 32, 0.75 - 6.0 Nm	238/241			•
A-max 26	116-122	GS 38, 0.1 - 0.6 Nm	243			•
A-max 32	124/126					82.3
A-max 32	124/126	GP 32, 0.75 - 6.0 Nm	239/241			•
A-max 32	124/126	GS 38, 0.1 - 0.6 Nm	243			•
EC 32, 80 W	164					78.4
EC 32, 80 W	164	GP 32, 0.75 - 6.0 Nm	239/241			•
EC 40, 120 W	165					88.4
EC 40, 120 W	165	GP 42, 3.0 - 15 Nm	244			•
EC 40, 120 W	165	GP 52, 4.0 - 30 Nm	247			•

Technical Data	
Supply voltage	5 V ± 10 %
Output signal	TTL compatible
Phase shift F (nominal)	90°e ± 45°e
Signal rise time (typical at C _L = 25 pF, R _L = 2.7 kΩ, 25°C)	180 ns
Signal fall time (typical 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 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	min. -1 mA, max. 5 mA

Pin Allocation			
	Encoder	Description	Pin no. from 3409.506
	Pin 5	Channel B	1
	Pin 4	V _{CC}	2
	Pin 3	Channel A	3
	Pin 2	Channel I	4
	Pin 1	GND	5
		Cable with plug: maxon Art. Nr. 3409.506 The plug (Harting 918.906.6803) can be fixed in the required position.	
		Cable with plug: (compatible with Encoder HEDS5010) maxon Art. No. 3409.504 The plug (3M 891100101) can be fixed in the required position.	



Encoder HEDL 5540, 500 CPT, 3 Channels, with Line Driver RS 422



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

Order Number

110512	110514	110516
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Type	110512	110514	110516
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Shaft diameter (mm)	3	4	6



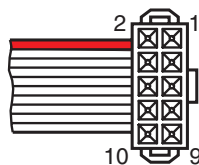
Combination

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see: + Gearhead
RE 25, 10 W	77					75.3
RE 25, 10 W	77	GP 26, 0.5 - 2.0 Nm	235			•
RE 25, 10 W	77	GP 32, 0.4 - 2.0 Nm	237			•
RE 25, 10 W	77	GP 32, 0.75 - 6.0 Nm	238/240			•
RE 25, 20 W	79					75.3
RE 25, 20 W	78/79	GP 26, 0.5 - 2.0 Nm	235			•
RE 25, 20 W	79	GP 32, 0.4 - 2.0 Nm	237			•
RE 25, 20 W	79	GP 32, 0.75 - 6.0 Nm	238/240			•
RE 25, 20 W	79			AB 28	308	105.7
RE 25, 20 W	79	GP 26, 0.5 - 2.0 Nm	235	AB 28	308	•
RE 25, 20 W	79	GP 32, 0.4 - 2.0 Nm	237	AB 28	308	•
RE 25, 20 W	79	GP 32, 0.75 - 6.0 Nm	238/240	AB 28	308	•
RE 26, 18 W	80					77.2
RE 26, 18 W	80	GP 26, 0.5 - 2.0 Nm	235			•
RE 26, 18 W	80	GP 32, 0.4 - 2.0 Nm	237			•
RE 26, 18 W	80	GP 32, 0.75 - 6.0 Nm	238/240			•
RE 35, 90 W	82					91.9
RE 35, 90 W	82	GP 32, 0.75 - 6.0 Nm	239/240			•
RE 35, 90 W	82	GP 42, 3.0 - 15 Nm	244			•
RE 35, 90 W	82			AB 28	308	124.1
RE 35, 90 W	82	GP 32, 0.75 - 6.0 Nm	239/240	AB 28	308	•
RE 35, 90 W	82	GP 32, 8 Nm	242			•
RE 35, 90 W	82	GP 42, 3.0 - 15 Nm	244	AB 28	308	•
RE 36, 70 W	83					92.2
RE 36, 70 W	83	GP 32, 0.4 - 2.0 Nm	237			•
RE 36, 70 W	83	GP 32, 0.75 - 6.0 Nm	239/240			•
RE 36, 70 W	83	GP 42, 3.0 - 15 Nm	244			•
RE 40, 150 W	84					91.7
RE 40, 150 W	84	GP 42, 3.0 - 15 Nm	244			•
RE 40, 150 W	84	GP 52, 4.0 - 30 Nm	247			•
RE 40, 150 W	84			AB 28	308	124.2
RE 40, 150 W	84	GP 42, 3.0 - 15 Nm	244	AB 28	308	•
RE 40, 150 W	84	GP 42, 4.0 - 30 Nm	247	AB 28	308	•

Technical Data

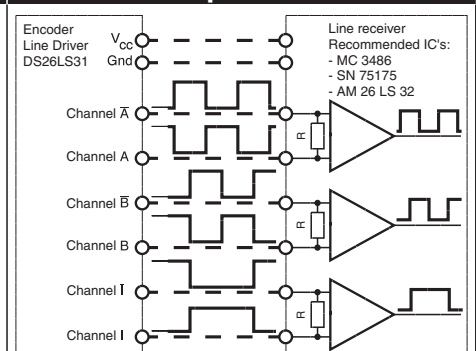
Supply voltage	5 V ± 10 %
Output signal drivers used:	EIA Standard RS 422 DS26LS31
Phase shift F (nominal)	90°e ± 45°e
Signal rise time (typical at C _L = 25 pF, R _L = 2.7 kΩ, 25°C)	180 ns
Signal fall time (typical at C _L = 25 pF, R _L = 2.7 kΩ, 25°C)	40 ns
Index pulse width (nominal)	90°e
Operating temperature range	0 ... +70°C
Operating temperature range optional	-40 ... +100°C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 counts per turn, 2 channel

Pin Allocation



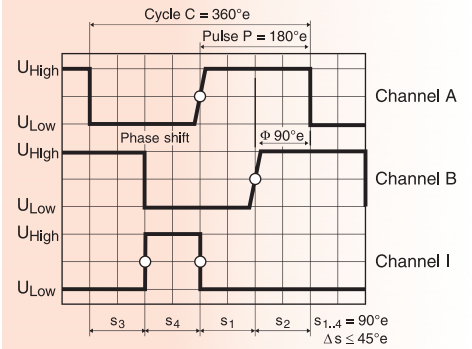
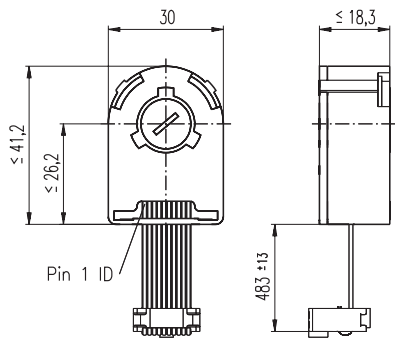
- 1 N.C.
 - 2 V_{CC}
 - 3 GND
 - 4 N.C.
 - 5 Channel A
 - 6 Channel A
 - 7 Channel B
 - 8 Channel B
 - 9 Channel I (Index)
 - 10 Channel I (Index)
- Pin type Berg 246770 flat band cable AWG 28

Connection example



Terminal resistance R = typical 100 Ω

Encoder HEDL 5540, 500 CPT, 3 Channels, with Line Driver RS 422



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

Order Number

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
Shaft diameter (mm)	3	4	6	8



Combination

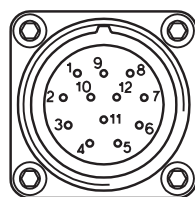
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see: + Gearhead
RE 65, 250 W	85					157.3
RE 65, 250 W	85	GP 81, 20 - 120 Nm	250			•
RE 75, 250 W	86					241.5
RE 75, 250 W	86	GP 81, 20 - 120 Nm	250			•
RE 75, 250 W	86			AB 75	311	281.4
RE 75, 250 W	86	GP 81, 20 - 120 Nm	250	AB 75	311	•
F 2260, 40 W*	97					111.9
F 2260, 40 W*	97	GP 62, 8.0 - 50 Nm	249			•
F 2260, 80 W*	98					147.4
F 2260, 80 W*	98	GP 62, 8.0 - 50 Nm	249			•
A-max 26*	116-122					63.5
A-max 26*	116-122	GP 26, 0.5 - 2.0 Nm	235			•
A-max 26*	116-122	GS 30, 0.07 - 0.2 Nm	236			•
A-max 26*	116-122	GP 32, 0.4 - 2.0 Nm	239			•
A-max 26*	116-122	GP 32, 0.75 - 6.0 Nm	238/241			•
A-max 26*	116-122	GS 38, 0.1 - 0.6 Nm	243			•
A-max 32*	124/126					82.3
A-max 32*	124/126	GP 32, 0.75 - 6.0 Nm	239/241			•
A-max 32*	124/126	GS 38, 0.1 - 0.6 Nm	243			•
EC 32, 80 W*	164					78.4
EC 32, 80 W*	164	GP 32, 0.75 - 6.0 Nm	239/241			•
EC 40, 120 W*	165					88.4
EC 40, 120 W*	165	GP 42, 3.0 - 15 Nm	244			•
EC 40, 120 W*	165	GP 52, 4.0 - 30 Nm	247			•

* Pin Allocation see page 264

Technical Data

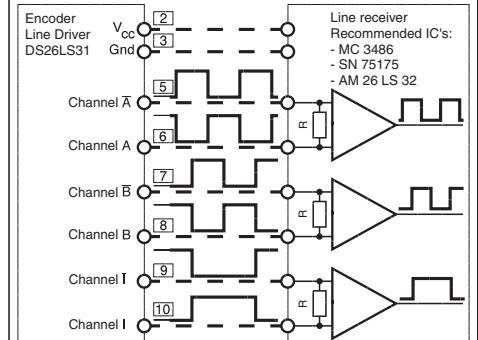
Supply voltage	5 V ± 10 %
Output signal drivers used:	EIA Standard RS 422 DS26LS31
Phase shift F (nominal)	90°e ± 45°e
Signal rise time (typical at C _L = 25 pF, R _L = 2.7 kΩ, 25°C)	180 ns
Signal fall time (typical at C _L = 25 pF, R _L = 2.7 kΩ, 25°C)	40 ns
Index pulse width (nominal)	90°e
Operating temperature range	0 ... +70°C
Operating temperature range optional	-40 ... +100°C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 counts per turn, 2 channel

Pin allocation for motor RE 75



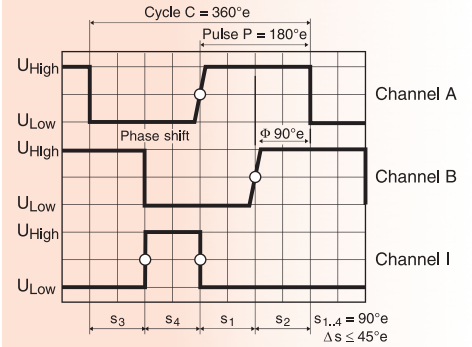
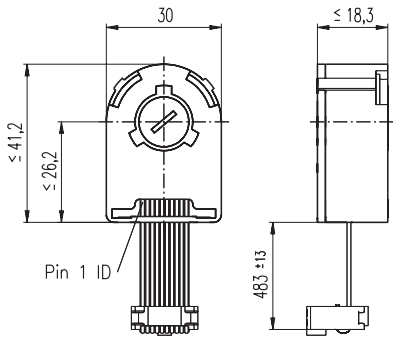
- Flanged connector**
Type SOURIAU 8GM-QL2-12P
- V_{CC}
 - N.C. (do not connect)
 - GND
 - N.C. (do not connect)
 - Channel I (Index)
 - Channel I
 - Channel B
 - Channel B
 - Channel A
 - Channel A
 - N.C. (do not connect)
 - N.C. (do not connect)
- recommended cable plug
Type SOURIAU 8GM-DM2-12S
(metal, straight exit:
maxon Art. No. 2675.538) or
8G-V2-12S (plastic, 90° angle:
maxon Art. No. 2675.539)

Connection example



Terminal resistance R = typical 100 Ω

Encoder HEDL 5540, 500 CPT, 3 Channels, with Line Driver RS 422



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

Order Number

110512	110514	110516
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Type	110512	110514	110516
Counts per turn	500	500	500
Number of channels	3	3	3
Max. operating frequency (kHz)	100	100	100
Shaft diameter (mm)	3	4	6



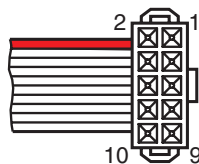
Combination

+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / • see: + Gearhead
EC-max 30, 40 W	178					62.6
EC-max 30, 40 W	178	GP 32, 1 - 6 Nm	241			•
EC-max 30, 40 W	178			AB 20	306	101.7
EC-max 30, 40 W	178	GP 32, 1 - 6 Nm	241	AB 20	306	•
EC-max 30, 60 W	179					84.6
EC-max 30, 60 W	179	GP 42, 3 - 15 Nm	245			•
EC-max 30, 60 W	179			AB 20	306	123.7
EC-max 30, 60 W	179	GP 42, 3 - 15 Nm	245	AB 20	306	•
EC-max 40, 70 W	180					81.4
EC-max 40, 70 W	180	GP 42, 3 - 15 Nm	245			•
EC-max 40, 70 W	180			AB 28	307	121.4
EC-max 40, 70 W	180	GP 42, 3 - 15 Nm	245	AB 28	307	•
EC-max 40, 120 W	181					111.4
EC-max 40, 120 W	181	GP 52, 4 - 30 Nm	248			•
EC-max 40, 120 W	181			AB 28	307	151.4
EC-max 40, 120 W	181	GP 52, 4 - 30 Nm	248	AB 28	307	•
EC-powermax 30	187					67.6
EC-powermax 30	187	GP 32, 8 Nm	242			•
EC-powermax 30	187	GP 42, 3 - 15 Nm	245			•
EC-powermax 30	187			AB 20	306	79.1
EC-powermax 30	187	GP 32, 8 Nm	242	AB 20	306	•
EC-powermax 30	187	GP 42, 3 - 15 Nm	245	AB 20	306	•
EC-powermax 30	188					84.6
EC-powermax 30	188	GP 32, 8 Nm	242			•
EC-powermax 30	188	GP 42, 3 - 15 Nm	245			•
EC-powermax 30	188			AB 20	306	96.1
EC-powermax 30	188	GP 32, 8 Nm	242	AB 20	306	•
EC-powermax 30	188	GP 42, 3 - 15 Nm	245	AB 20	306	•
EC-i 40, 50 W	199					49.0
EC-i 40, 50 W	199	GP 32, 1 - 6 Nm	241			•
EC-i 40, 70 W	200					59.0
EC-i 40, 70 W	200	GP 32, 1 - 6 Nm	241			•

Technical Data

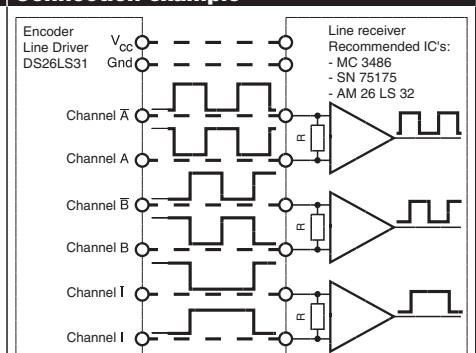
Supply voltage	5 V ± 10 %
Output signal drivers used:	EIA Standard RS 422 DS26LS31
Phase shift F (nominal)	90°e ± 45°e
Signal rise time (typical at C _L = 25 pF, R _L = 2.7 kΩ, 25°C)	180 ns
Signal fall time (typical at C _L = 25 pF, R _L = 2.7 kΩ, 25°C)	40 ns
Index pulse width (nominal)	90°e
Operating temperature range	0 ... +70°C
Operating temperature range optional	-40 ... +100°C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	min. -20 mA, max. 20 mA
Option	1000 counts per turn, 2 channel

Pin Allocation



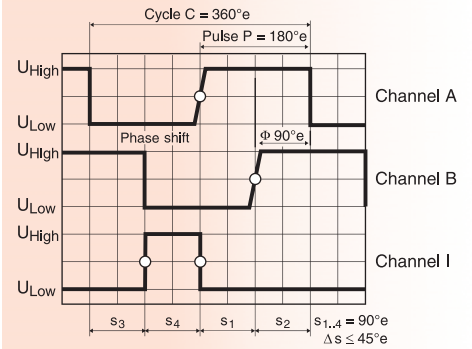
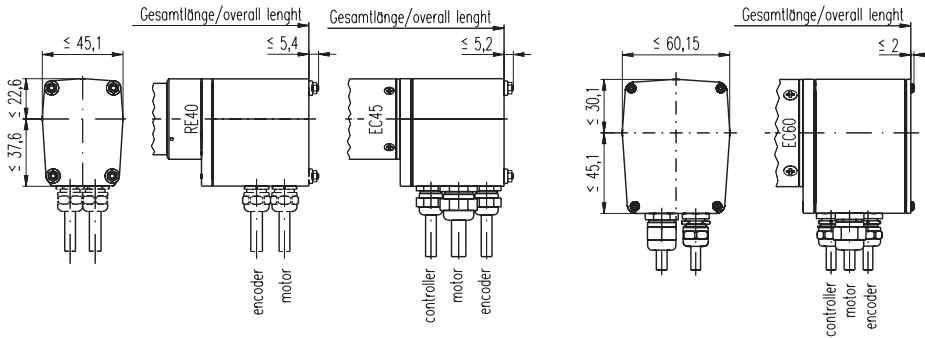
- 1 N.C.
 - 2 V_{CC}
 - 3 GND
 - 4 N.C.
 - 5 Channel A
 - 6 Channel A
 - 7 Channel B
 - 8 Channel B
 - 9 Channel I (Index)
 - 10 Channel I (Index)
- Pin type Berg 246770 flat band cable AWG 28

Connection example



Terminal resistance R = typical 100 Ω

Encoder HEDL 9140, 500 CPT, 3 Channels, with Line Driver RS 422



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

Order Number

137959

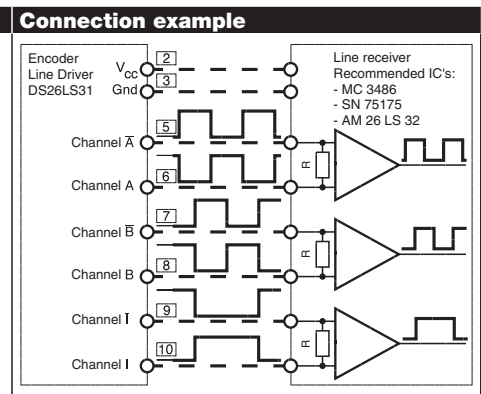
Type	
Counts per turn	500
Number of channels	3
Max. operating frequency (kHz)	100



Combination						
+ Motor	Page	+ Gearhead	Page	+ Brake	Page	Overall length [mm] / ● see: + Gearhead
RE 40, 150 W	84					125.1
RE 40, 150 W	84	GP 42, 3 - 15 Nm	244			●
RE 40, 150 W	84	GP 52, 4 - 30 Nm	247			●
RE 40, 150 W	84			AB 28	309	135.6
RE 40, 150 W	84	GP 42, 3 - 15 Nm	244	AB 28	309	●
RE 40, 150 W	84	GP 52, 4 - 30 Nm	247	AB 28	309	●
EC 45, 150 W	166					126.8
EC 45, 150 W	166	GP 42, 3 - 15 Nm	244			●
EC 45, 150 W	166	GP 52, 4 - 30 Nm	247			●
EC 45, 150 W	166			AB 28	309	135.6
EC 45, 150 W	166	GP 42, 3 - 15 Nm	244	AB 28	309	●
EC 45, 150 W	166	GP 52, 4 - 30 Nm	247	AB 28	309	●
EC 45, 250 W	167					159.6
EC 45, 250 W	167	GP 42, 3 - 15 Nm	245			●
EC 45, 250 W	167	GP 52, 4 - 30 Nm	247			●
EC 45, 250 W	167	GP 62, 8 - 50 Nm	249			●
EC 45, 250 W	167			AB 28	309	168.4
EC 45, 250 W	167	GP 42, 3 - 15 Nm	245	AB 28	309	●
EC 45, 250 W	167	GP 52, 4 - 30 Nm	247	AB 28	309	●
EC 45, 250 W	167	GP 62, 8 - 50 Nm	249	AB 28	309	●
EC 60, 400 W	170					177.3
EC 60, 400 W	170	GP 81, 20 - 120 Nm	250			●
EC 60, 400 W	170			AB 41	310	214.9
EC 60, 400 W	170	GP 81, 20 - 120 Nm	250	AB 41	310	●

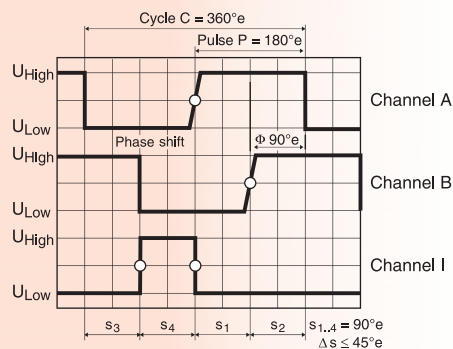
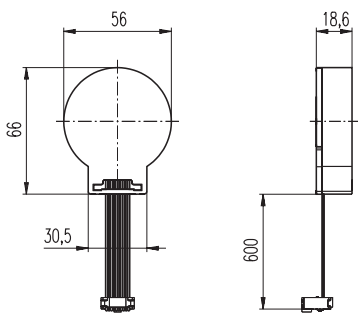
Technical Data	
Supply voltage	5 V ± 10 %
Output signal	EIA Standard RS 422
drivers used:	DS26LS31
Phase shift F (nominal)	90°e ± 45°e
Signal rise time (typical at C _L = 25 pF, R _L = 11 kΩ, 25°C)	180 ns
Signal fall time (typical at C _L = 25 pF, R _L = 11 kΩ, 25°C)	40 ns
Index pulse width (nominal)	90°e
Operating temperature range	0 ... +70°C
Operating temperature range optional	-40 ... +100°C
Moment of inertia of code wheel	≤ 0.6 gcm ²
Max. angular acceleration	250 000 rad s ⁻²
Output current per channel	min. -20 mA, max. 20 mA

Pin Allocation	
Cable white	= 2 V _{CC} 5 VDC
Cable brown	= 3 GND
Cable green	= 5 Channel A
Cable yellow	= 6 Channel A
Cable grey	= 7 Channel B
Cable pink	= 8 Channel B
Cable blue	= 9 Channel I (Index)
Cable red	= 10 Channel I (Index)
Cable size	8 x 0.25 mm ²



Terminal resistance R = typical 100 Ω

Encoder HEDS 6540, 1000 Counts per turn, 3 Channels



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

Order Number

136748

Type

Counts per turn	1000
Number of channels	3
Max. operating frequency (kHz)	100



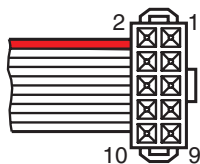
Combination

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / • see: + Gearhead
F 2260, 40 W	97			113.7
F 2260, 40 W	97	GP 62, 8 - 50 Nm	249	•
F 2260, 80 W	98			149.2
F 2260, 80 W	98	GP 62, 8 - 50 Nm	249	•

Technical Data

Supply voltage	5 V ± 10 %
Output signal	TTL compatible
Phase shift F (nominal)	90° ± 45°
Signal rise time (typical at C _L = 25 pF, R _L = 11 kΩ, 25°C)	180 ns
Signal fall time (typical at C _L = 25 pF, R _L = 11 kΩ, 25°C)	40 ns
Index pulse width (nominal)	90°
Operating temperature range	-40 ... +100°C
Moment of inertia of code wheel	7.7 gcm ²
Output current per channel	min. -1 mA, max. 5 mA

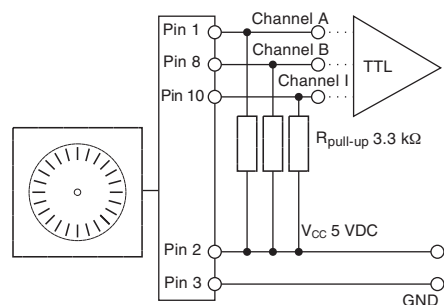
Pin Allocation



- 1 Channel A
- 2 V_{CC}
- 3 GND
- 4 N.C. oder GND
- 5 N.C. oder GND
- 6 GND
- 7 V_{CC}
- 8 Channel B
- 9 V_{CC}
- 10 Channel I

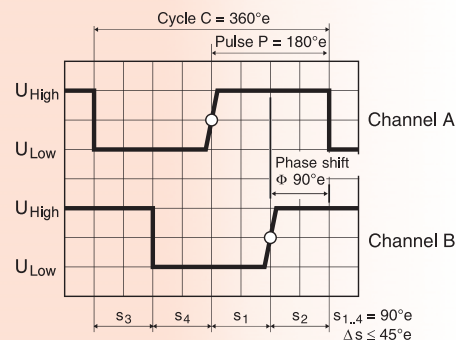
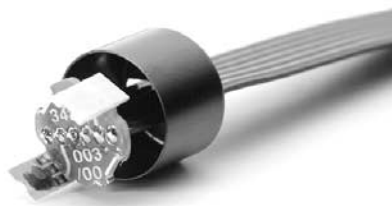
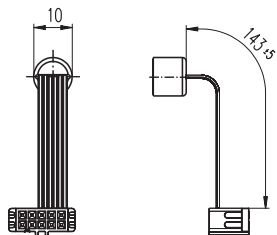
Pin type
Berg 65-692-001
flat band cable AWG 28

Connection example



Ambient temperature range $\delta U = 25^\circ\text{C}$

Encoder MEnc 10, 12 Counts per turn, 2 Channels



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

Order Number

138061

Type

Counts per turn	12
Number of channels	2
Max. operating frequency (kHz)	20



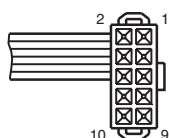
Combination

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / ● see: + Gearhead
RE 10, 0.75 W	53			25.1
RE 10, 0.75 W	53	GP 10, 0.005 - 0.1 Nm	214	●
RE 10, 0.75 W	53	GP 10, 0.01 - 0.15 Nm	215	●
RE 10, 1.5 W	55			32.7
RE 10, 1.5 W	55	GP 10, 0.005 - 0.1 Nm	214	●
RE 10, 1.5 W	55	GP 10, 0.01 - 0.15 Nm	215	●

Technical Data

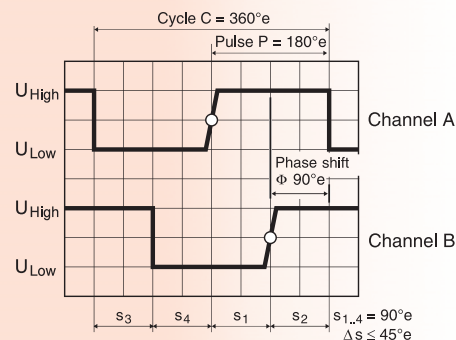
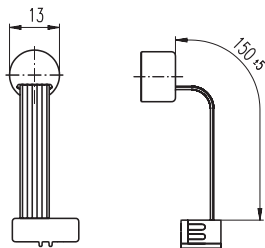
Supply voltage V_{CC}	3.8 - 24 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift	$90^\circ \pm 45^\circ$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.03 gcm^2
Operating temperature range	-20 ... +80°C

Pin Allocation



- 1 Motor+
 - 2 V_{CC}
 - 3 Channel A
 - 4 Channel B
 - 5 GND
 - 6 Motor-
 - 9 Motor-
 - 10 Motor-
- Pin type DIN 41651
(Typ 3M 89110-0101 HA)
flat band cable AWG 28

Encoder MEnc 13, 16 Counts per turn, 2 Channels



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

Order Number

110778

Type

Counts per turn	16
Number of channels	2
Max. operating frequency (kHz)	20



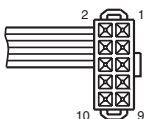
Combination

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / • see: + Gearhead
RE 13, 0.75 W	58/59			27.0 / 29.4
RE 13, 0.75 W	59	GP 13, 0.05 - 0.15 Nm	217	•
RE 13, 0.75 W	59	GP 13, 0.2 - 0.35 Nm	218	•
RE 13, 2 W	62/63			39.2 / 41.6
RE 13, 2 W	63	GP 13, 0.05 - 0.15 Nm	217	•
RE 13, 2 W	63	GP 13, 0.2 - 0.35 Nm	218	•
RE 13, 1.5 W	66/67			30.3 / 32.7
RE 13, 1.5 W	67	GP 13, 0.05 - 0.15 Nm	217	•
RE 13, 1.5 W	67	GP 13, 0.2 - 0.35 Nm	218	•
RE 13, 3 W	70/71			42.5 / 44.9
RE 13, 3 W	71	GP 13, 0.05 - 0.15 Nm	217	•
RE 13, 3 W	71	GP 13, 0.2 - 0.35 Nm	218	•
RE 16, 3.2 W	74			46.5
RE 16, 3.2 W	74	GP 16, 0.06 - 0.18 Nm	223	•
RE 16, 3.2 W	74	GP 16, 0.1 - 0.3 Nm	224	•
RE 16, 4.5 W	76			49.5
RE 16, 4.5 W	76	GP 16, 0.06 - 0.18 Nm	223	•
RE 16, 4.5 W	76	GP 16, 0.1 - 0.3 Nm	224	•
A 2516, 0.8 W	88			24.7
A 2516, 0.8 W	88	GS 16, 0.01 - 0.03 Nm	219	•
A 2516, 0.8 W	88	GS 16, 0.01 - 0.03 Nm	220	•
A 2516, 0.8 W	88	GS 16, 0.06 - 0.1 Nm	221/222	•
A 2520, 1.2 W	89			25.6
A 2520, 1.2 W	89	GP 19, 0.1 - 0.3 Nm	226	•
GM 20, 1.2 W	90	GS 20 (integriert)	90	28.5
A-max 16	104/106			33.5
A-max 16	104/106	GS 16, 0.01 - 0.03 Nm	219/220	•
A-max 16	104/106	GS 16, 0.06 - 0.1 Nm	221/222	•
A-max 16	104/106	GP 16, 0.06 - 0.18 Nm	223	•
A-max 16	104/106	GP 16, 0.1 - 0.3 Nm	224	•
A-max 19	108/110			36.4 / 39.0
A-max 19	108/110	GP 19, 0.1 - 0.3 Nm	226	•
A-max 19	108/110	GS 20, 0.06 - 0.25 Nm	227	•
A-max 19	108/110	GP 22, 0.5 - 2.0 Nm	230/231	•
A-max 19	108/110	GS 24, 0.1 Nm	234	•
A-max 22	112/114			39.0
A-max 22	112/114	GP 22, 0.1 - 0.6 Nm	228/229	•
A-max 22	112/114	GP 22, 0.5 - 2.0 Nm	230/231	•
A-max 22	112/114	GS 24, 0.1 Nm	234	•
A-max 26	115-121			51.8
A-max 26	115-121	GP 26, 0.5 - 2.0 Nm	235	•
A-max 26	115-121	GS 30, 0.07 - 0.2 Nm	236	•
A-max 26	115-121	GP 32, 0.4 - 2.0 Nm	237	•
A-max 26	115-121	GP 32, 0.75 - 6.0 Nm	237/238	•
A-max 26	115-121	GS 38, 0.1 - 0.6 Nm	243	•

Technical Data

Supply voltage V_{CC}	3.8 - 24 V
Output signal $V_{CC} = 5$ VDC	TTL compatible
Phase shift	$90^\circ \pm 45^\circ$
Power input at $V_{CC} = 5$ VDC	max. 8 mA
Inertia of the magnetic disc	0.07 gcm^2
Operating temperature range	$-20 \dots +80^\circ\text{C}$

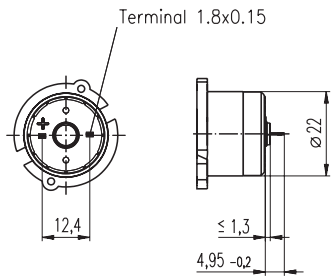
Pin Allocation



- 1 Motor+
- 2 V_{CC}
- 3 Channel A
- 4 Channel B
- 5 GND
- 6 Motor-

Pin type DIN 41651
(Type 3M 89110-0101HA)
flat band cable AWG 28

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 tacho

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

Order Number

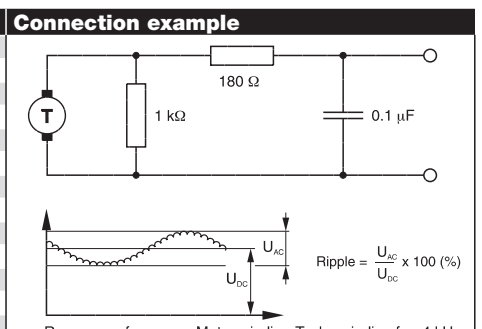
118908	118909	118910
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Type	2	3	4
Shaft diameter (mm)	2	3	4

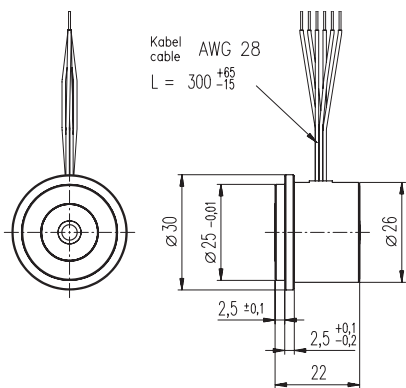


Combination					
+ Motor	Page	+ Gearhead	Page	Overall length [mm]	• see: + Gearhead
RE 25, 10 W	77			76.8	
RE 25, 10 W	77	GP 26, 0.5 - 2.0 Nm	235	•	
RE 25, 10 W	77	GP 32, 0.4 - 2.0 Nm	237	•	
RE 25, 10 W	77	GP 32, 0.75 - 4.5 Nm	238	•	
RE 25, 10 W	77	GP 32, 1.0 - 6.0 Nm	240	•	
RE 25, 20 W	79			76.8	
RE 25, 20 W	79	GP 26, 0.5 - 2.0 Nm	235	•	
RE 25, 20 W	79	GP 32, 0.4 - 2.0 Nm	237	•	
RE 25, 20 W	79	GP 32, 0.75 - 4.5 Nm	238	•	
RE 25, 20 W	79	GP 32, 1.0 - 6.0 Nm	240	•	
RE 26, 18 W	80			79.8	
RE 26, 18 W	80	GP 26, 0.5 - 2.0 Nm	235	•	
RE 26, 18 W	80	GP 32, 0.4 - 2.0 Nm	237	•	
RE 26, 18 W	80	GP 32, 0.75 - 4.5 Nm	238	•	
RE 26, 18 W	80	GP 32, 1.0 - 6.0 Nm	240	•	
RE 35, 90 W	82				89.0
RE 35, 90 W	82	GP 32, 0.75 - 4.5 Nm	239	•	
RE 35, 90 W	82	GP 32, 1.0 - 6.0 Nm	240	•	
RE 35, 90 W	82	GP 32, 8 Nm	242	•	
RE 35, 90 W	82	GP 42, 3.0 - 15 Nm	244	•	
RE 36, 70 W	83				89.3
RE 36, 70 W	83	GP 32, 0.4 - 2.0 Nm	237	•	
RE 36, 70 W	83	GP 32, 0.75 - 4.5 Nm	239	•	
RE 36, 70 W	83	GP 32, 1.0 - 6.0 Nm	240	•	
RE 36, 70 W	83	GP 42, 3.0 - 15 Nm	244	•	

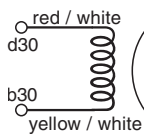
Technical Data	
Output voltage per 1000 rpm	0.52 V
Terminal resistance tacho	37.7 Ω
Typical peak to peak ripple	≤ 6 %
Ripple frequency per turn	14
Linearity between 500 and 5000 rpm unloaded	± 0.2 %
Linearity with 10 kΩ load resistance	± 0.7 %
Reversal error	± 0.1 %
Temperature coefficient of EMF (magnet)	-0.02 % / °C
Temperature coefficient of coil resistance	+0.4 % / °C
Max. recommended current	10 mA
Tolerance of the output voltage	± 15 %
Rotor inertia (tacho only)	< 3 gcm ²
Resonance frequency with motors on p. 76 - 79	> 2 kHz
with motors on pages 86, 88	> 3 kHz
with motors on pages 81, 82	> 4.5 kHz
Temperature range	-20 ... +65 °C
Option: Pigtails in place of solder terminals.	



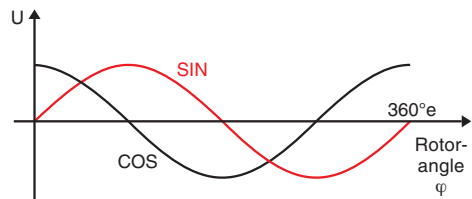
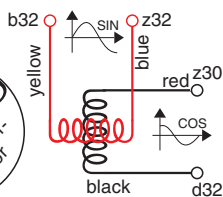
Resolver Res 26, 10 Volt



Primary



Secondary



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

Order Number

166488	133405	268912	199287
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Type

Shaft diameter (mm)	4	6	6	6
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Combination

+ Motor	Page	+ Gearhead	Page	Overall length [mm] / • see: + Gearhead
EC 32, 80 W	164			80.1
EC 32, 80 W	164	GP 32, 0.75 - 4.5 Nm	239	•
EC 32, 80 W	164	GP 32, 1.0 - 6.0 Nm	241	•
EC 40, 120 W	165			96.6
EC 40, 120 W	165	GP 42, 3.0 - 15 Nm	244	•
EC 40, 120 W	165	GP 52, 4.0 - 30 Nm	247	•
EC 45, 150 W	166			111.2
EC 45, 150 W	166	GP 42, 3.0 - 15 Nm	244	•
EC 45, 150 W	166	GP 52, 4.0 - 30 Nm	247	•
EC 45, 250 W	167			144.0
EC 45, 250 W	167	GP 42, 3.0 - 15 Nm	245	•
EC 45, 250 W	167	GP 52, 4.0 - 30 Nm	247	•
EC 45, 250 W	167	GP 62, 8.0 - 50 Nm	249	•
EC 60, 400 W	170			177.3
EC 60, 400 W	170	GP 81, 20 - 120 Nm	250	•

Technical Data

Input voltage	10 V peak, 10 kHz	Rotor inertia	6 gcm ²
Reduction ratio	0.5	Weight	40 g
Electrical error	± 10 minutes	Operating temperature range	-55 ... +155°C






maxon motor control

These control electronics are optimized for use with maxon motors. Various 4-quadrant servo-amplifiers meet your needs regarding performance and speed accuracy with maxon DC motors. The most sophisticated electronic commutation is available with maxon EC motors. Together with maxon motors, the positioning control represents a complete solution for precise positioning with controlled rotation.

4-Q-DC Servoamplifier	274 - 278
1-Q + 4-Q-EC Servoamplifier	279 - 290
Positioning control unit EPOS	291 - 295
Positioning control unit EPOS P	296 - 297
Order numbers and accessories	298 - 299

4-Q-DC Servoamplifier Summary

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">0 - 30 watts</p> 	<p>4-Q-DC Servoamplifier LSC</p> <ul style="list-style-type: none"> Five operating modes: Voltage regulation, IxR compensation, DC tacho/encoder speed control, current control Thanks to linear power stage, practically no electrical interference No motor choke necessary Stand alone – easy start-up procedure Operating voltage V_{CC} 12 - 30 VDC Max. output current I_{max} 2 A, $I_{cont} = I_{max}$
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">10 - 250 watts</p> 	<p>4-Q-DC Servoamplifier ADS Standard</p> <ul style="list-style-type: none"> Four operating modes: IxR compensation, DC tacho/encoder speed control, current control Pulse width modulated power stage Built in motor choke Module housing with screw type terminal block or eurocard format Operating voltage V_{CC} 12 - 50 VDC Max. output current I_{max} up to 10 A Continuous output current I_{cont} up to 5 A
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">80 - 500 watts</p> 	<p>4-Q-DC Servoamplifier ADS Power</p> <ul style="list-style-type: none"> Four operating modes: IxR compensation, DC tacho/encoder speed control, current control Pulse width modulated power stage Built in motor choke Module housing with screw type terminal block or eurocard format Operating voltage V_{CC} 12 - 50 VDC Max. output current I_{max} up to 20 A Continuous output current I_{cont} up to 10 A

Choosing the servoamplifier

Basically the final stages are controlled linearly (0 - 30 watts) or pulsed (10 - 500 watts). The arguments for one or the other technology are shown on page 34 / 35.

Choice of motor type

Select the motor or motor-gear type according to the required power output. See "Selection guide" and possibly items page 210.

Choice of motor winding

Every controller has an optimal operating range as well as absolute limits. The motor winding should be selected such that the controller is not operated continuously at the limits of its capability.

1. Take the **voltage drop** through the servoamplifier into consideration. (5 Volt for LSC, 2 Volt for ADS)
2. To be sure calculate the **load torque** 10 % higher.
3. Calculate the theoretical **speed constant** $k_{n,th}$.

$$k_{n,th} = \frac{1}{U} \cdot \left(n_L + \frac{\Delta n}{\Delta M} \cdot M_L \right)$$

- $k_{n,th}$ = Theoretical speed constant
- k_n = Speed constant [rpm/V] (line 13)
- n_L = Output speed, loaded [rpm]
- $\Delta n / \Delta M$ = Speed / torque gradient [rpm/mNm] (line 14)
- M_L = Required output torque [mNm]
- U = Max. voltage supplied by the maxon motor control [V]

4. Choose the winding with $k_n > k_{n,th}$ (see motor data, pages 48 - 146, line 13)

Choice of power supply unit

Any power supply, which fulfills the requests of the servoamplifiers, can be used:

- Output voltage $V_{CCmin}; V_{CCmax}$
- Remaining ripple $\leq 5\%$
- Output current continuous I_{cont}
max. I_{max} (0.1 s)

Consider

- Voltage and current must correspond to the desired operating point of the motor.
- The power supply must be able to buffer the back-fed energy from brake operation e.g. in a condenser. With electronically stabilized power supply units it is to ensure that the overcurrent protection responds in no operating condition.

LSC 4-Q-DC Servoamplifier



The LSC 30/2 (Linear Servo Controller) is a linear 4-Quadrant Servoamplifier used to control permanent magnet activated DC motors up to approx. 50 watts.

4-Q operation

Controlled operation for acceleration and braking in both directions.

Linear power stage

Ideally suited for small outputs power, low electromagnetic emission, no motor choke required.

Operating modes

Voltage regulator, IxR compensation, encoder speed control, DC tacho speed control or current control adjustable with a switch from outside.

Design

Robust metal housing with variable installation options on assembly plate or 19" rack.

Set value input

Via external potentiometer, external set value voltage or using internal potentiometer.

Easy start-up procedure

Pluggable screw type terminal block, simple set-up with potentiometer, robust designed PI controller.

Excellent price / performance ratio

Good value 4-Q-DC servoamplifier matched with small permanent magnet activated DC motors.

Technical data page 276

Dimensions and connections page 278

ADS 4-Q-DC Servoamplifier



ADS in module housing



ADS_E in Eurocard format

The ADS (Analogue DC Servoamplifier) is a powerful pulse-width modulated (PWM) servoamplifier for controlling permanent magnet activated DC motors. Standard Version from 10 - 250 watts and Power Version from 80 - 500 watts output power. Available in robust metallic housing and as Eurocard version for installation into a 19" rack.

Technical data page 276 / 277

Dimensions and connections page 278

Pulsed output stage

Suitable for controlling low and high output power. 95% efficiency thanks to state-of-the-art MOSFET technology.

Operating modes

IxR compensation, encoder speed control, DC tacho speed control or current control adjustable with a switch from outside.

Design versions

Robust metal housing in module form offers several mounting options. Standardized Eurocard version (with accessories) for the installation in a 19"-Rack or in a plug-in card system.

Excellent control characteristics

Stable speed behaviour when set value and disturbance variable change, fast current controller.

Protection circuit

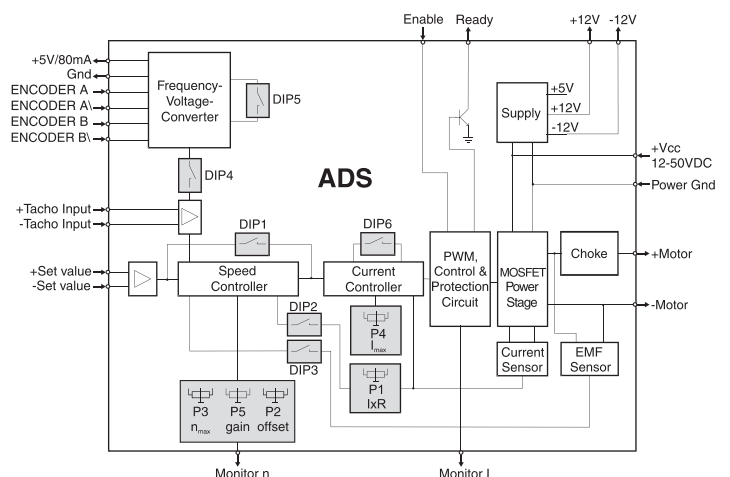
Protected against over current, overheating and short-circuit of motor cable.

Set value input

External potentiometer or external set value voltage.

Excellent price / performance ratio

Modern servoamplifier with many technical features, suitable for motors up to 500 watts.



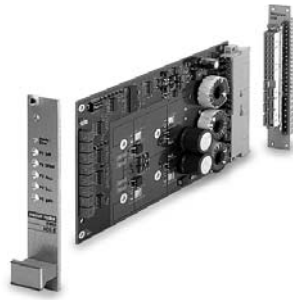
4-Q-DC Servoamplifier Data



LSC 30/2 4-Q-DC Servoamplifier
Linear 4-Quadrant servoamplifier for permanent magnet activated DC motors up to approx. 50 watts.

ADS 50/5 4-Q-DC Servoamplifier
Powerful PWM servoamplifier for permanent magnet-activated DC motors from 10 to approx. 250 watts output power. Available as Standard Version in module housing.

Operating modes	Voltage regulator, IxR compensation, encoder speed control, DC tacho speed control, current control	IxR compensation, encoder speed control, DC tacho speed control, current control
Electrical Data		
Operating voltage V_{cc} (ripple < 5%)	12 - 30 VDC	12 - 50 VDC
Max. output voltage	$V_{cc} - 5 V$	$0.9 \times V_{cc}$
Max. output current I_{max}	2 A	10 A
Continuous output current I_{cont}	2 A	5 A
Switching frequency of power stage		50 kHz
Max. efficiency		95 %
Built-in motor choke		150 μ H / 5 A
Input		
Set value	Configurable, -10 ... +10 V, -3.9 ... +3.9 V	-10 ... +10 V
Disable	«Disable» Disable min. $V_{cc} - 1 V$, Enable max. GND + 1 V	«Enable» +4 ... +50 V
DC tacho	Min. 2 VDC, max. 50 VDC	Min. 2 VDC, max. 50 VDC
Encoder signals	Channel A and channel B, max. 100 kHz, TTL	Channel A, A\, B, B\, max. 100 kHz, TTL
Output		
Status reading «Ready»	Open collector, max. 30 VDC ($I_L < 20$ mA)	Open collector max. 30 VDC ($I_L < 20$ mA)
Monitor current «Monitor I»		-10 ... +10 VDC (short circuit protected)
Monitor speed «Monitor n»		-10 ... +10 VDC (short circuit protected)
Voltage outputs		
Auxiliary voltages	+3.9 VDC, -3.9 VDC, max. 2 mA	+12 VDC, -12 VDC, max. 12 mA (short circuit prot.)
Encoder supply voltage	+5 VDC, max. 80 mA	+5 VDC, max. 80 mA
Trim potentiometer	I x R compensation, Offset, $n_{max} \cdot I_{max}$ gain	I x R compensation, Offset, $n_{max} \cdot I_{max}$ gain
Protective functions	Heat monitoring of power stage	Protected against over temperature, overcurrent and short-circuit of motor
Indicator	Green LED = READY, red LED = ERROR	Bi-colour LED, green = READY, red = ERROR
Ambient temperature / Humidity range		
Operation	0 ... +45°C	-10 ... +45°C
Storage	-40 ... +85°C	-40 ... +85°C
No condensation	20 ... 80 %	20 ... 80 %
Mechanical data		
Weight	Approx. 330 g	Approx. 400 g
Dimensions (L x W x H)	103 x 100 x 34 mm (see page 278)	180 x 103 x 26 mm (see page 278)
Mounting threads	Flange for M4-screws	Flange for M4-screws
Connections	See page 278	See page 278
Order Number		
	250521 LSC 30/2, 4-Q-DC Servoamplifier in module housing	145391 ADS 50/5, 4-Q-DC Servoamplifier Standard Version in module housing
Accessories		
		235811 DSR 70/30 Shunt regulator



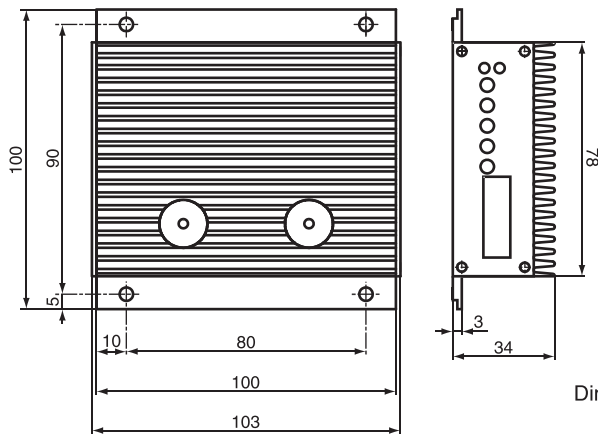
ADS 50/10 4-Q-DC Servoamplifier
Powerful PWM servoamplifier for permanent magnet activated DC motors from 80 to approx. 500 watts output power.
Available as Power Version in module housing.

ADS_E 50/5 4-Q-DC Servoamplifier
Powerful PWM servoamplifier for permanent magnet activated DC motors from 10 to approx. 250 watts output power.
Available as Standard Version in Eurocard format.

ADS_E 50/10 4-Q-DC Servoamplifier
Powerful PWM servoamplifier for permanent magnet activated DC motors from 80 to approx. 500 watts output power.
Available as Power Version in Eurocard format.

Operating modes		
IxR compensation, encoder speed control, DC tacho speed control, current control	IxR compensation, encoder speed control, DC tacho speed control, current control	IxR compensation, encoder speed control, DC tacho speed control, current control
Electrical Data		
12 - 50 VDC	12 - 50 VDC	12 - 50 VDC
0.9 x V _{cc}	0.9 x V _{cc}	0.9 x V _{cc}
20 A	10 A	20 A
10 A	5 A	10 A
50 kHz	50 kHz	50 kHz
95 %	95 %	95 %
75 µH / 10 A	150 µH / 5 A	75 µH / 10 A
Input		
-10 ... +10 V	-10 ... +10 V	-10 ... +10 V
«Enable»	«Enable»	«Enable»
+4 ... +50 V	+4 ... +50 V	+4 ... +50 V
Min. 2 VDC, max. 50 VDC	Min. 2 VDC, max. 50 VDC	Min. 2 VDC, max. 50 VDC
Channel A, A\, B, B\, max. 100 kHz, TTL	Channel A, A\, B, B\, max. 100 kHz, TTL	Channel A, A\, B, B\, max. 100 kHz, TTL
Output		
Open collector, max. 30 VDC (I _L < 20 mA)	Open collector max. 30 VDC (I _L < 20 mA)	Open collector max. 30 VDC (I _L < 20 mA)
-10 ... +10 VDC (short circuit protected)	-10 ... +10 VDC (short circuit protected)	-10 ... +10 VDC (short circuit protected)
-10 ... +10 VDC (short circuit protected)	-10 ... +10 VDC (short circuit protected)	-10 ... +10 VDC (short circuit protected)
Voltage outputs		
+12 VDC, -12 VDC, max. 12 mA (short circuit prot.)	+12 VDC, -12 VDC, max. 12 mA (short circuit prot.)	+12 VDC, -12 VDC, max. 12 mA (short circuit prot.)
+5 VDC, max. 80 mA	+5 VDC, max. 80 mA	+5 VDC, max. 80 mA
I x R compensation, Offset, n _{max} , I _{max} , gain	I x R compensation, Offset, n _{max} , I _{max} , gain	I x R compensation, Offset, n _{max} , I _{max} , gain
Protected against over temperature, overcurrent and short-circuit of motor	Protected against over temperature, overcurrent and short-circuit of motor	Protected against over temperature, overcurrent and short-circuit of motor
Bi-colour LED, green = READY, red = ERROR	Bi-colour LED, green = READY, red = ERROR	Bi-colour LED, green = READY, red = ERROR
Ambient temperature / 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. 400 g	Approx. 175 g	Approx. 410 g
180 x 103 x 26 mm (see page 278)	160 x 100 x 16 mm (see page 278)	160 x 100 x 30.5 mm (see page 278)
Flange for M4-screws	Rack-Installation	Rack-Installation
See page 278	See page 278	See page 278
Order Number		
201583 ADS 50/10 4-Q-DC Servoamplifier Power Version in module housing	166143 ADS_E 50/5 4-Q-DC Servoamplifier Standard Version in Eurocard format	168049 ADS_E 50/10 4-Q-DC Servoamplifier Power Version in Eurocard format
Accessories		
235811 DSR 70/30 Shunt regulator	167850 Front panel 3HE, 5TE 166873 Backplane with screw type terminal block	168910 Front panel 3HE, 7TE 166873 Backplane with screw type terminal block

4-Q-DC Servoamplifier Dimensions and connections



Dimensions in [mm]

LSC 30/2

Connections

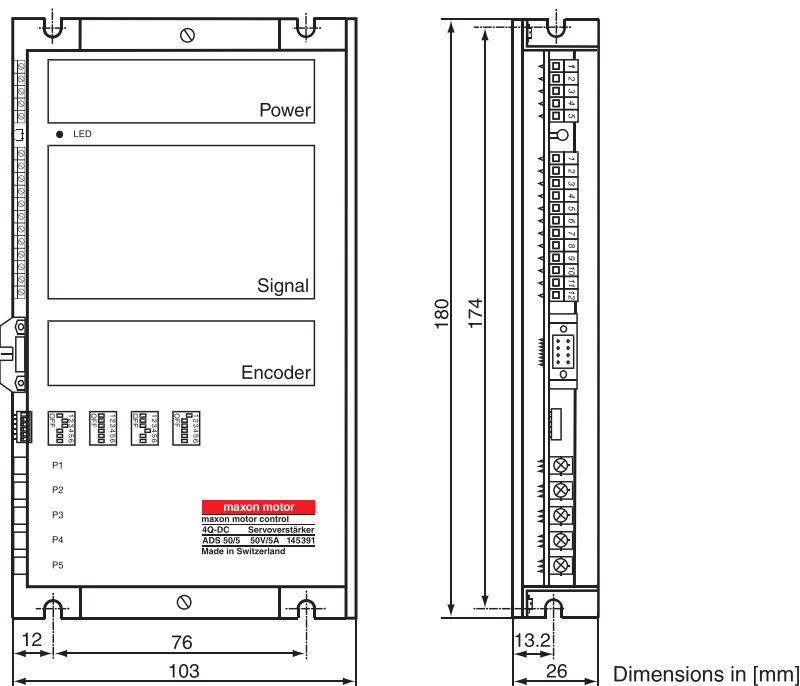
- Pluggable screw type terminal block 16 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.0 mm² multiple-stranded
- 0.14 ... 1.4 mm² single wire

Note

- It is advisable to consider mounting on a heat sinking surface if ambient temperature is high and there is high power loss in the LSC!

LSC 30/2

250521



Dimensions in [mm]

ADS in module housing

Connections Power

- Screw type terminal block 5 poles
- Pitch 3.81 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.0mm² multiple-stranded
- 0.14 ... 1.5mm² single wire

Connections Signal

- Screw type terminal block 12 poles
- Pitch 3.81 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.0mm² multiple-stranded
- 0.14 ... 1.5mm² single wire

Connection Encoder

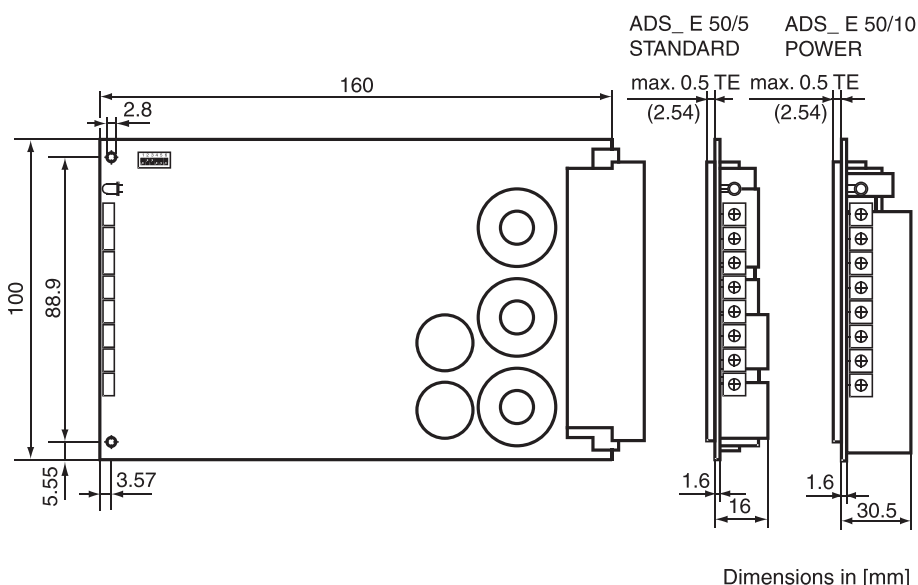
- Plug (DIN41651) 10 poles
- Pitch 1.27 mm
- Flat band cable, Suitable for wire cross section AWG 28

ADS 50/5 Standard

145391

ADS 50/10 Power

201583



Dimensions in [mm]

ADS_E in Eurocard format

Connections

- Contact strip Version DIN41612 H7/F24

ADS_E 50/5 Standard

166143

ADS_E 50/10 Power

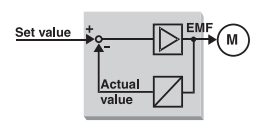

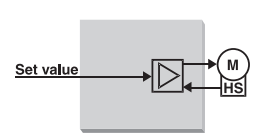
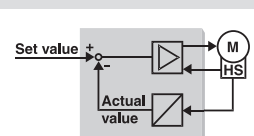

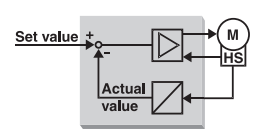

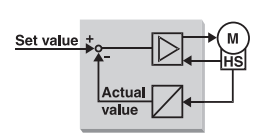

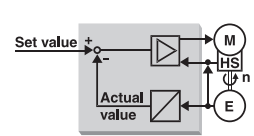

168049

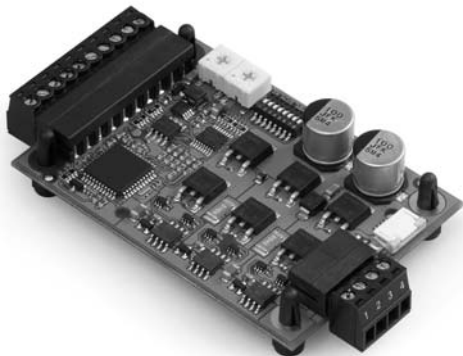
EC Amplifier Summary

The basic function of EC motors electronics is the electronic commutation of the motor winding. Simple speed controls are possible with and without Hall sensors. For high-quality controls the speed is de-

lected using encoder signals. A further distinction is made between open or closed loop speed control.

ected using encoder signals. A further distinction is made between open or closed loop speed control.

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">sensorless closed loop</p> 		<p>1-Q-EC Amplifier sensorless DECS 50/5</p> <ul style="list-style-type: none"> – Digital speed control for sensorless EC motors – Adjustable control gain – Different start sequences can be selected – Various options for set value – Small design – Motor current 5A / 8A – Supply voltage range 10 up to 50 VDC <p>Details on page 280</p> <p>Order Number DECS 50/5 343253</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Hall sensors open loop</p>  <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Hall sensors closed loop</p> 		<p>1-Q-EC Amplifier DEC</p> <ul style="list-style-type: none"> – Motor speed is adjustable with built-in potentiometer or external set value – 1-Q speed controller with Hall sensors (controlled acceleration) – Direction, brake and disable input – Connection ready module <p>Details on page 280 / 281</p> <p>Order Number DEC 24/1 318305 249630 DEC 24/3 249631 249632 DEC 50/5 336286 336287 DEC 50/5 230572</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Hall sensors closed loop</p> 		<p>4-Q-EC Amplifier DECV 50/5</p> <ul style="list-style-type: none"> – Motor speed and the current limitation can be adjusted through two different external set values – 4-Q speed controller with Hall sensors (controlled acceleration and braking) – Direction and disable can be set – Connection ready module – Motor current 5 A / 10 A – Supply voltage 12 up to 50 VDC <p>Details on page 282</p> <p>Order Number DECV 50/5 305259</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Hall sensors closed loop</p> 		<p>4-Q-EC Amplifier DEC 70/10</p> <ul style="list-style-type: none"> – Motor speed adjustable with built-in potentiometer or external set value – 4-Q speed controller with Hall sensors (controlled acceleration and braking) – Voltage regulator with IxR compensation, Hall sensor speed controller and current controller – Connection ready module – Motor current 10 A / 20 A – Supply voltage 10 up to 70 VDC <p>Details on page 282</p> <p>Order Number DEC 70/10 306089</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Hall sensors and Encoder closed loop</p> 		<p>4-Q-EC Servoamplifier DES</p> <ul style="list-style-type: none"> – High-quality digital speed control with encoder feedback – Digital current control (torque control) – 4-Q operation – Sinusoidal commutation – Suitable for positioning applications – Connection ready module – Communication by RS232 or CAN possible <p>Details on page 283</p> <p>Order Number DES 50/5 205679 DES 70/10 228597</p>

**Controlling sensorless EC motors**

The actual rotor position is evaluated by using the Back-EMF sensing technique. Different start sequences with varying start-up procedures can be easily selected.

Operating modes

Digital speed control with adjustable regulation gain.

Flexible

Large supply voltage range 10 - 50 VDC. Pluggable screw type terminal block and a flexprint connector compatible with maxon flat motors.

Small design

Open and compact electronics board. Easy mounting with hexagonal distance pins with inside thread.

All-round functionality

Direction can be predetermined using a logic signal. The motor shaft can be disabled or braked, as required. Speed can be monitored through the speed monitor output. Different protective functions safeguard the motor and amplifier. Status indicator with green and red LED.

Flexible set value input

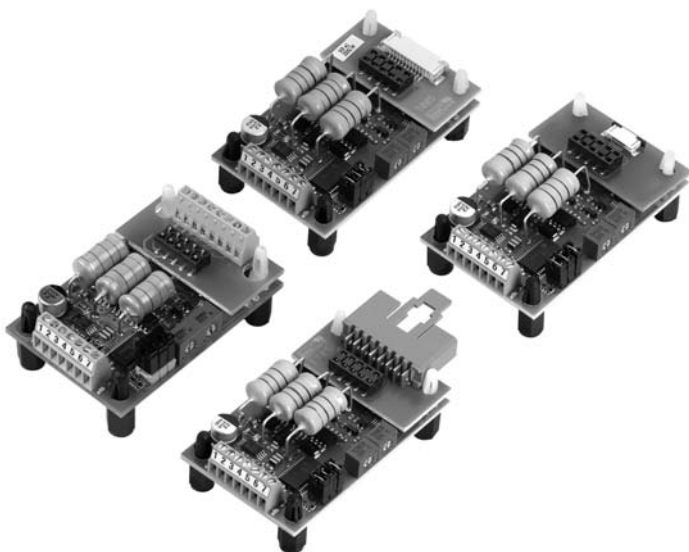
Set value input either by internal potentiometer or external analogue voltage. Different speed ranges can be selected using DIP switches.

The DECS (Digital EC Controller Sensorless) is a 1-quadrant amplifier for the control of sensorless EC motors with a maximum output of 250 watts.

Technical data page 284

Dimensions and connections page 288

DEC 24/1 1-Q-EC Amplifier

**Operating modes**

Digital speed control or open loop speed control operation can be selected with a built-in jumper.

Flexible

Wide supply voltage range 5 - 24 VDC. A range of adapter boards allows the use of different maxon micro motors.

Small design

Open and compact electronics board. Easy mounting with hexagonal distance pins with inside thread.

All-round functionality

Direction can be predetermined with a logic signal. Motor shaft can be disabled or slowed down as required. Adjustable maximum current limitation. Status indicator with green LED.

Flexible set value input

Set value input either by internal potentiometer or external, analogue voltage. Different speed ranges can be selected using built-in jumpers.

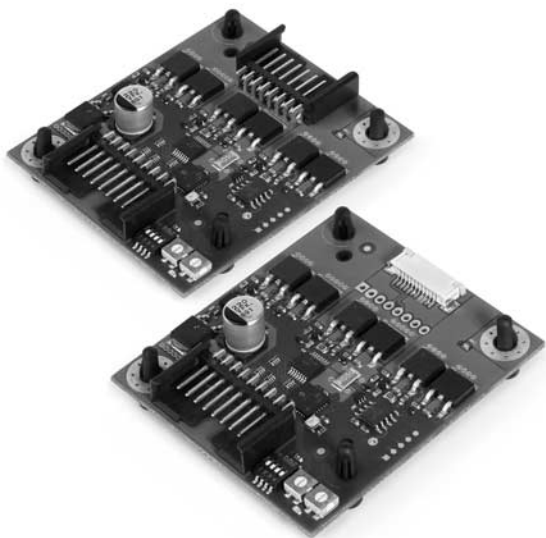
The DEC 24/1 (Digital EC Controller) is a 1-Quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 24 watts.

Technical data page 284

Dimensions and connections page 288

DEC 24/3 1-Q-EC Amplifier

DIGITAL



The DEC 24/3 (Digital EC Controller) is a 1-quadrant amplifier for the sensorless control of EC motors with a maximum output of 72 watts.

Technical data page 285
Dimensions and connections page 288

Operating modes

Digital speed control or open loop speed control operation can be selected with a built-in jumper.

Flexibel

Wide supply voltage range 5 - 24 VDC.
Two variants for direct connection of different maxon EC motors.

Small design

Open and compact electronics board. Easy mounting with hexagonal distance pins with inside thread.

All-round functionality

Direction can be predetermined with a logic signal. Motor shaft can be disabled or slowed down as required. Adjustable maximum current limitation. Status indicator with green LED.

Flexible set value input

Set value input either through internal potentiometer or external, analogue voltage. Different speed ranges can be selected using built-in DIP switches.

DEC 50/5 1-Q-EC Amplifier

DIGITAL



The DEC 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 285
Dimensions and connections page 289

Operating modes

Digital speed control, open loop speed control or current controller can be selected with a switch.

Small design

Robust and compact modular metallic housing offers various mounting options.

Easy start-up procedure

Plug-in terminal clamp, no extensive adjustment necessary.

All-round functionality

The motor's rotating direction, disabling of motor winding and braking of motor shaft can be set. Adjustable maximum current limitation. Operating status display with red and green LED.

Flexible set value input

Set value input by internal or external potentiometer by analogue voltage. Two pre-set speeds switchable. Speed ramp can be adjusted.

Protection circuit

The power stage is protected against thermal overload and control inputs against overvoltage.

DECV 50/5 4-Q-EC Amplifier

DIGITAL

maxon motor control



Operating modes

Speed controller for speeds from 1,000 rpm (not suitable for positioning tasks). Controlled acceleration and braking operation.

Easy start-up procedure

Pluggable screw type terminal block, simple adjustment using DIP switch. Stable speed behaviour when set value and disturbance variable change.

Reduced motor heating

Internally controlled DC link voltage reduces motor current ripple (lower self-heating of motor), particularly suitable for low-impedance motors. No additional motor chokes required.

Flexible

Robust and compact modular metallic housing offers various mounting options. Wide supply voltage range 12 - 50 VDC.

Protection circuit

Protected against overcurrent, overvoltage, under voltage, short-circuit of motor cables against each other and thermal overload.

The DECV 50/5 (Digital EC Controller Voltage regulated) is a small-sized 4-Quadrant digital speed controller for brushless EC motors up to 250 watts. The brushless EC motor must be only equipped with Hall sensors.

Technical data page 286

Dimensions and connections page 289

DEC 70/10 4-Q-EC Amplifier

DIGITAL



Operating modes

Voltage regulator with IxR compensation, Hall sensor speed controller (from 1,000 rpm) and current controller (suitable for positioning tasks) can be adjusted with DIP switch.

Easy start-up procedure

Pluggable screw type terminal block, set value input external (+/-10 V) or using internal potentiometer, simple adjustment with few potentiometers.

Design

Resistant metallic housing with various mounting options with excellent electromagnetic features.

Protection circuit

Protected against overcurrent, overvoltage, undervoltage, short-circuit of motor cables against each other and thermal overload.

The DEC 70/10 (Digital EC Controller) is a small 4-Quadrant digital controller of EC motors up to 700 watts. The brushless EC motor must be only equipped with Hall sensors.

Technical data page 286

Dimensions and connections page 289

DES 50/5 4-Q-EC Servoamplifier

DIGITAL CAN RS232 GUI



The DES (digital EC servoamplifier) is a very powerful digital servoamplifier with sinusoidal commutation for perfectly controlling EC motors up to 250 watts. The motor used must be fitted with Hall sensors and a 3-channel encoder.

Operating modes

Digital speed controller and current controller (torque controller), suitable for positioning tasks.

Digital

Modern digital signal processor (DSP) allows fast digital controlling. Parameters can be set digitally in a reproducible way.

Easy start-up procedure

Simple connection, compatible with maxon EC motors. Easy adjustment using few potentiometers or alternatively configurable and commanding by serial interface (RS232 or CAN).

Protection circuit

Monitoring of overcurrent, short-circuiting of motor cables and overvoltage.

PC based commanding

Support by graphical user interface (GUI), Windows DLL for RS232 with several programming examples.

Technical data page 287

Dimensions and connections page 290

DES 70/10 4-Q-EC Servoamplifier

DIGITAL CAN RS232 GUI



The DES (digital EC servoamplifier) is a very powerful digital servoamplifier with sinusoidal commutation for perfectly controlling EC motors up to 700 watts. The motor used must be fitted with Hall sensors and a 3-channel encoder.

Operating modes

Digital speed controller and current controller (torque controller), suitable for positioning tasks.

Digital

Modern digital signal processor (DSP) allows fast digital controlling. Parameters can be set digitally in a reproducible way.

Easy start-up procedure

Simple connection, compatible with maxon EC motors. Easy adjustment using few potentiometers or alternatively configurable and commanding by serial interface (RS232 or CAN).

Protection circuit

Monitoring of over current, short-circuiting of motor cables and over voltage.

PC based commanding

Support by graphical user interface (GUI), Windows DLL for RS232 with several programming examples.

Technical data page 287

Dimensions and connections page 290



DECS 50/5 1-Q-EC amplifier
1-quadrant amplifier for the control of sensorless EC motors with a maximum output of 250 watts.



DEC 24/1 1-Q-EC amplifier
1-quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 24 watts.

Operating modes

Speed controller (sensorless)

Speed controller, open loop speed controller

Electrical Data

Operating voltage V_{cc}	10 - 50 VDC	5 - 24 VDC
Max. output voltage	$0.8 \times V_{cc}$	V_{cc}
Max. output current I_{max}	8 A	2 A
Continuous output current I_{cont}	5 A	1 A
Switching frequency of power stage	50 kHz	39 kHz
Max. efficiency		
Band width current controller		
Max. speed (1 pole pair)	80 000 rpm	120 000 rpm
Built-in motor choke per phase		150 μ H / 1 A

Input

Set value	«Speed» 0 ... 5 V (1024 steps)	«Speed» 0 ... 5 V (1024 steps)
Current limit		
Enable	«Enable» + 3,5 ... +50 VDC	«/Disable» TTL, CMOS (5 V)
Direction	«Direction» + 3,5 ... +50 VDC	«Direction» TTL, CMOS (5 V)
Stop / Brake	«Brake» + 3,5 ... +50 VDC	«/Brake», TTL, CMOS (5 V)
Configurable		

Output

Monitor	«Monitor n», (+5 VDC)	«Monitor n», digital (5 V)
Status reading «Ready»	«Ready» max. +50 VDC	

Voltage outputs

Hall sensors supply voltage V_{cc} Hall		4.5 ... 5 VDC, max. 30 mA
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Auxiliary voltages	5 VDC	
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Possible adjustments	DIP switch	Jumpers
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Trim potentiometer	Speed, I_{max}	Speed, I_{max}
---------------------------	------------------	------------------

Indicator	Green LED = READY; red LED = ERROR	Green LED
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Protective functions

Blockage protection	Switches off after 5 unsuccessful starting attempts	Motor current limitation if motor shaft is blocked for longer than 1.5 s
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Heat monitoring of power stage	$T > 90^{\circ}\text{C}$	
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Dynamic current limit		$I_{max} = 2 \cdot I_{cont}$ is limited to $0.9 \cdot I_{cont}$ after 1 s
-----------------------	--	---

Under- / Overvoltage protection	Switches off when $V_{cc} < 9.5 \text{ V}$ or $V_{cc} > 59 \text{ V}$	
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Ambient temperature / Humidity range

Operation	-10 ... +45°C	-10 ... +45°C
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Storage	-40 ... +85°C	-40 ... +85°C
---------	---------------	---------------

No condensation	20 ... 80%	20 ... 80%
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Mechanical data

Weight	Approx. 40 g	Approx. 20 g
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Dimensions (L x W x H)	73,4 x 50,8 x 21 mm (see page 288)	57 x 36 x 24 mm (see page 288)
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Mounting threads	4 Hexagonal distance pins with M3 inner thread	4 Hexagonal distance pins with M3 inner thread
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Connections	See page 288	See page 288
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Order Number

343253 DECS 50/5 1-Q-EC amplifier sensorless

DEC 24/1 1-Q-EC Amplifier

318305 DEC 24/1 with FPC pitch 0.5 mm

249630 DEC 24/1 with FPC pitch 1.0 mm

249631 DEC 24/1 with a pin connector pitch 2.5 mm

249632 DEC 24/1 with screw type terminal block pitch 2.54 mm

Accessories

309687 DSR 50/5 Shunt regulator

DIGITAL



DEC 24/3 1-Q-EC Amplifier
1-Quadrant amplifier for controlling EC motors with Hall sensors with a maximum output of 72 watts.

DIGITAL



DEC 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, open loop speed controller

Speed controller, open loop speed controller, current controller

Electrical Data

Operating voltage V_{CC}	5 - 24 VDC	10 - 50 VDC
Max. output voltage	V_{CC}	$0.95 \times V_{CC}$
Max. output current I_{max}	6 A	10 A
Continuous output current I_{cont}	3 A	5 A
Switching frequency of power stage	39 kHz	39 kHz
Max. efficiency		
Band width current controller		15 Hz
Max. speed (1 pole pair)	120 000 rpm	120 000 rpm
Built-in motor choke per phase		
Input		
Set value	«Speed» 0 ... 5 V (1024 steps)	«Speed» 0 ... 5 V (1024 steps)
Current limit		
Enable	«Enable» +2.4 ... +24 VDC	«/Disable» +2.4 ... +50 VDC
Direction	«Direction» +2.4 ... +24 VDC	«Direction» +2.4 ... +50 VDC
Stop / Brake	«Brake» +2.4 ... +24 VDC	«/Brake» +2.4 ... +50 VDC
Configurable		«AUX» digital input / 5+ VDC output
Output		
Monitor	«Monitor n», digital, (5 V)	
Status reading «Ready»		
Voltage outputs		
Hall sensors supply voltage V_{CC} Hall	5 VDC, max. 30 mA	7 ... 12 VDC, max. 30 mA
Auxiliary voltages	5 VDC, max. 10 mA	
Possible adjustments	DIP switch	DIP switch
Trim potentiometer	Speed, I_{max}	Speed 1, Speed 2 / Ramp, I_{max} gain
Indicator	Green LED	Green LED = READY; red LED = ERROR
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
Heat monitoring of power stage		$T > 100^{\circ}\text{C}$
Dynamic current limit	$I_{max} = 2 \cdot I_{cont}$ is limited to $0.9 \cdot I_{cont}$ after 1 s	
Under- / Overvoltage protection	Switches off when $V_{CC} < 4.5$ V	
Ambient temperature / 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. 28 g	Approx. 155 g
Dimensions (L x W x H)	65 x 58 x 18 mm (see page 288)	95 x 75 x 24 mm (see page 289)
Mounting threads	4 Hexagonal distance pins with M3 inner thread	Flange for M3-screws
Connections	See page 288	See page 289
Order Number		
	DEC 24/3 1-Q-EC Amplifier	230572 DEC 50/5 1-Q-EC Amplifier
	336287 DEC 24/3 with FPC pitch 1.0 mm	
	336286 DEC 24/3 with a pin connector pitch 2.5 mm	

Accessories

4-Q-EC Amplifier Data

DIGITAL

DIGITAL

maxon motor control



DECV 50/5 4-Q-EC Amplifier
4-Quadrant digital speed controller for brushless EC motors with Hall sensors up to 250 watts.

DEC 70/10 4-Q-EC Amplifier
4-Quadrant digital controller for EC motors with Hall sensors up to 700 watts.

Operating modes	Speed controller	Voltage regulator with IxR compensation, Speed controller, current controller
Electrical Data		
Operating voltage V_{cc}	12 - 50 VDC	10 - 70 VDC
Max. output voltage	$0.95 \times V_{cc}$	$0.9 \times V_{cc}$
Max. output current I_{max}	10 A	20 A
Continuous output current I_{cont}	5 A	10 A
Switching frequency of power stage		50 kHz
Max. efficiency		95 %
Band width current controller		300 Hz
Max. speed (1 pole pair)	60 000 rpm	80 000 rpm
Built-in motor choke per phase		25 μ H / 10 A
Input		
Set value	«Set value speed» 0 ... 5 V (1024 steps)	«Set value» -10 ... +10 V (1024 steps)
Current limit	«Set value current» 0 ... 5 V (1024 steps)	
Enable	«Enable» +2.4 ... +50 VDC	«Enable» +4 ... +50 VDC
Direction	«Direction» +2.4 ... +50 VDC	
Stop / Brake	«STOP» +2.4 ... +50 VDC	«STOP» +4 ... +50 VDC
Configurable		«Digital IN» +4 ... +50 VDC
Output		
Monitor	«Monitor speed», analogue, 0 ... 5 V «Monitor current», analogue, 0 ... 5 V	«Monitor n» or «Monitor I» -10 ... +10 V
Status reading «Ready»	Open Collector max. 50 VDC ($I_L < 10$ mA)	Open Collector max. 30 VDC ($I_L < 20$ mA)
Voltage outputs		
Hall sensors supply voltage V_{cc} Hall	7 ... 12 VDC, max. 30 mA	5 VDC, max. 30 mA
Auxiliary voltages	5 VDC, max. 2 mA	+12 VDC, max. 4 mA, -12 VDC, max. 2 mA
Possible adjustments	DIP switch	DIP switch
Trim potentiometer		
Indicator	Green LED	n_{max} Offset, Ramp, I_{max} , n_{gain} , I_{gain} Bi-colour LED, green = READY, red = ERROR
Protective functions		
Blockage protection	Error message, if motor shaft is blocked for longer than 0.5 s	
Heat monitoring of power stage	$T > 100^\circ\text{C}$	$T > 115^\circ\text{C}$
Dynamic current limit	$I_{max} = 2 \cdot I_{cont}$ is limited to I_{cont} after 2 s	$I_{max} = 2 \cdot I_{cont}$ is limited to I_{cont} after 2 s
Under- / Overvoltage protection	Switches off if $V_{cc} < 10.3$ V or $V_{cc} < 58$ V	Switches off if $V_{cc} < 9.4$ V or $V_{cc} < 77$ V
Ambient temperature / Humidity range		
Operation	0 ... +45°C	-10 ... +45°C
Storage	-40 ... +85°C	-40 ... +85°C
No condensation	20 ... 80 %	20 ... 80 %
Mechanical data		
Weight	Approx. 180 g	Approx. 400 g
Dimensions (L x W x H)	95 x 75.5 x 24 mm (see page 289)	120 x 103 x 27 mm (see page 289)
Mounting threads	Flange for M4-screws	Flange for M3-screws
Connections		
	See page 289	See page 289
Order Number		
	305259 DECV 50/5 4-Q-EC Amplifier in module housing	306089 DEC 70/10 4-Q-EC Amplifier in module housing
Accessories		
	309687 DSR 50/5 Shunt regulator	235811 DSR 70/30 Shunt regulator

4-Q-EC Servoamplifier Data

DIGITAL

CAN

RS232

GUI



DES 50/5 4-Q-EC Servoamplifier
Digital servoamplifier with sinusoidal commutation for perfectly controlling EC motors with Hall sensors and encoder and an output of up to 250 watts.



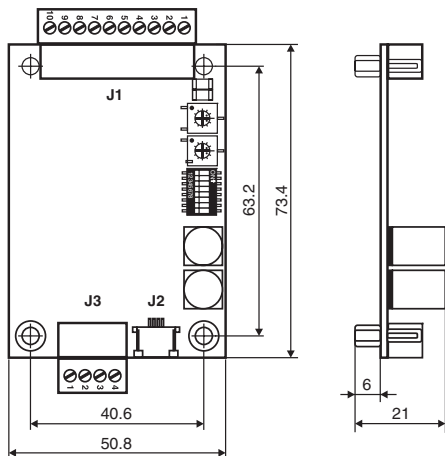
DES 70/10 4-Q-EC Servoamplifier
Digital servoamplifier with sinusoidal commutation for perfectly controlling EC motors with Hall sensors and encoder and an output of up to 700 watts.

maxon motor control

Operating modes	Speed controller, current controller	Speed controller, current controller
Electrical Data		
Operating voltage V_{CC}	12 - 50 VDC	24 - 70 VDC
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current I_{max}	15 A	30 A
Continuous output current I_{cont}	5 A	10 A
Switching frequency of power stage	50 kHz	50 kHz
Max. efficiency	92 %	92 %
Band width current controller	1 kHz	1 kHz
Max. speed (1 pole pair)	25 000 rpm	25 000 rpm
Built-in motor choke per phase	160 μ H / 5 A	Minimum terminal inductance 400 μ H
Input		
Set value configurable (1024 steps)	-10 ... +10 V / 0 ... +5 V	-10 ... +10 V / 0 ... +5 V
Disable «Enable»	+2.4 ... +50 VDC	+2.4 ... +50 VDC
Digital 1 (Switch «Monitor n» / «Monitor I»)	+2.4 ... +50 VDC	+2.4 ... +50 VDC
Digital 2 (speed- / current controller)	+2.4 ... +50 VDC	+2.4 ... +50 VDC
STOP	+2.4 ... +50 VDC	+2.4 ... +50 VDC
Encoder signals	A, A', B, B', I, I' max. 1 MHz 3-channel encoder is required	A, A', B, B', I, I' max. 1 MHz 3-channel encoder is required
Hall sensor signals	H1, H2, H3	H1, H2, H3
Output		
Monitor, configurable	-10 ... +10 VDC / 0 ... +5 VDC	-10 ... +10 VDC / 0 ... +5 VDC
Status reading «Ready»	Open Collector, max. 30 VDC ($I_L < 20$ mA)	Open Collector, max. 30 VDC ($I_L < 20$ mA)
Voltage outputs		
Encoder supply voltage	+5 VDC, max. 100 mA	+5 VDC, max. 100 mA
Hall sensors supply voltage	+5 VDC, max. 50 mA	+5 VDC, max. 50 mA
Auxiliary voltage	+5 VDC, max. 20 mA	+5 VDC, max. 20 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)
Trim potentiometer	n_{max} , Offset, I_{max} gain	n_{max} , Offset, I_{max} gain
Indicator	Bi-colour LED, green = READY, red = ERROR	Bi-colour LED, green = READY, red = ERROR
Ambient temperature / 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. 430 g	Approx. 400 g
Dimensions (L x W x H)	180 x 103 x 26 mm (see page 290)	180 x 103 x 29 mm (see page 290)
Mounting threads	Flange for M4-screws	Flange for M4-screws
Connections	See page 290	See page 290
Order Number		
	205679 DES 50/5, digital 4-Q-EC Servoamplifier in module housing	228597 DES 70/10, digital 4-Q-EC Servoamplifier in module housing

Accessories		
223774	Encoder adapter according to DIN41651 screw type terminal block	347919 Choke module 3 x 0.1 mH, 10 A
235811	DSR 70/30 Shunt regulator	223774 Encoder adapter according to DIN41651 on screw type terminal block
		235811 DSR 70/30 Shunt regulator

EC Amplifier Dimensions and connections



Dimensions in [mm]

DECS 50/5

Connections Power/Signal

- Pluggable screw type terminal block J1 10 poles
Pitch 3.5 mm
Suitable for wire cross section AWG 26 - 16
0.14 ... 1.5 mm²

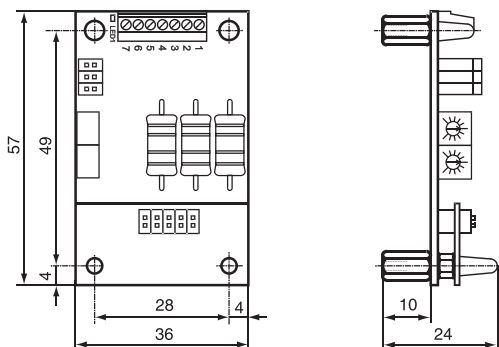
Connections Motor

- Pluggable screw type terminal block J3 4 poles
Pitch 3.5 mm
Suitable for wire cross section AWG 26 - 16
0.14 ... 1.5 mm²

- Flex print connector J2 4 poles
Pitch 1.0 mm

DECS 50/5

343253



Dimensions in [mm]

DEC 24/1

Connections Power/Signal

- Screw type terminal block 7 poles
Pitch 2.54 mm
Suitable for wire cross section AWG 26 - 20
0.14 ... 0.5 mm²

Connections Motor

- 318305**
Flex print connector 8 poles
Pitch 0.5 mm

- 249630**
Flex print connector 11 poles
Pitch 1.0 mm

- 249631**
Pin connector with snap-in 8 poles
Pitch 2.50 mm

- 249632**
Screw type terminal block 8 poles
Pitch 2.54 mm
AWG 26 - 20 0.14 ... 0.5 mm²

DEC 24/1 Adapter versions



318305



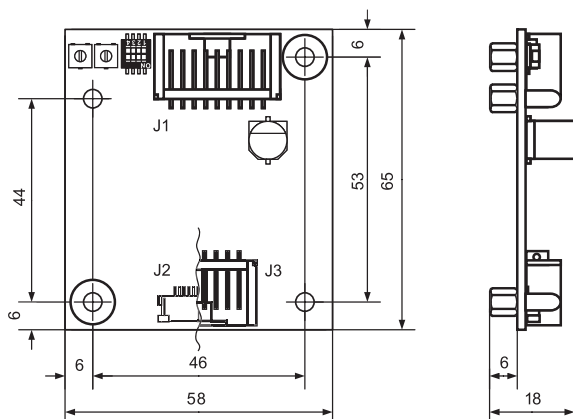
249630



249631



249632



Dimensions in [mm]

DEC 24/3

Connections Power/Signal

- Male header J1 9 poles
Pitch 2.5 mm
Flat band cable,
Suitable for wire cross section AWG 28

Connections Motor

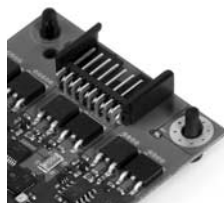
- 336287**
Flex print connector J2 11 poles
Pitch 1.0 mm

- 336286**
Male header J3 8 poles
Pitch 2.50 mm
Flat band cable,
Suitable for wire cross section AWG 28

DEC 24/3 Adapter versions

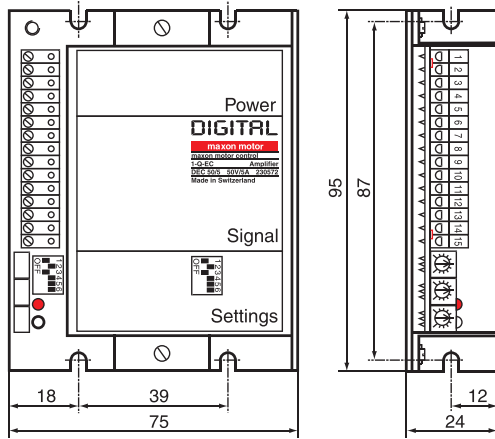


336287



336286

EC Amplifier Dimensions and connections



Dimensions in [mm]

DEC 50/5

Connections Power/Signal

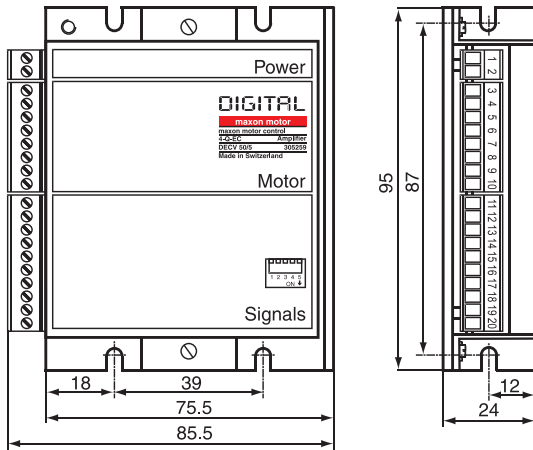
- Pluggable screw type terminal block 15 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.0 mm² multiple-stranded
- 0.14 ... 1.3 mm² single wire

Note

- The screw terminals are pluggable. In order to prevent the screw terminals from twisting, the recesses must be used for removal. (Maximum 20 plug-in cycles)

DEC 50/5

230572



Dimensions in [mm]

DECV 50/5

Connections Power

- Pluggable screw type terminal block 2 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.5 mm² multiple-stranded
- 0.14 ... 1.5 mm² single wire

Connections Motor

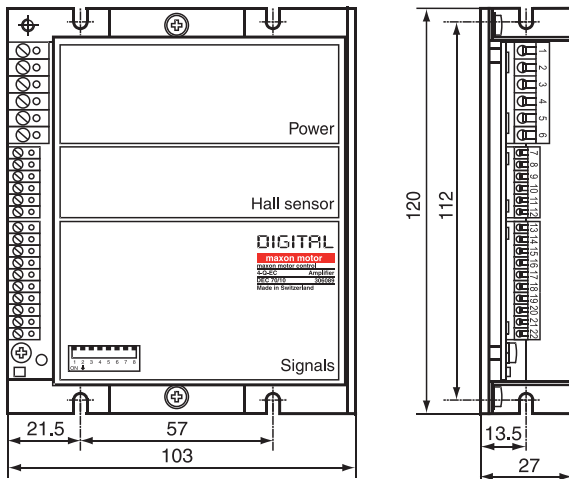
- Pluggable screw type terminal block 8 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.5 mm² multiple-stranded
- 0.14 ... 1.5 mm² single wire

Connections Signal

- Pluggable screw type terminal block 10 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.5 mm² multiple-stranded
- 0.14 ... 1.5 mm² single wire

DECV 50/5

305259



Dimensions in [mm]

DEC 70/10

Connections Power

- Pluggable screw type terminal block 6 poles
- Pitch 5.0 mm
- Suitable for wire cross section AWG 26 - 14
- 0.14 ... 1.5 mm² multiple-stranded
- 0.14 ... 2.5 mm² single wire

Connections Hall sensor

- Pluggable screw type terminal block 6 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.0 mm² multiple-stranded
- 0.14 ... 1.3 mm² single wire

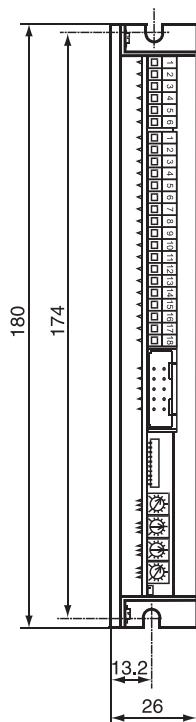
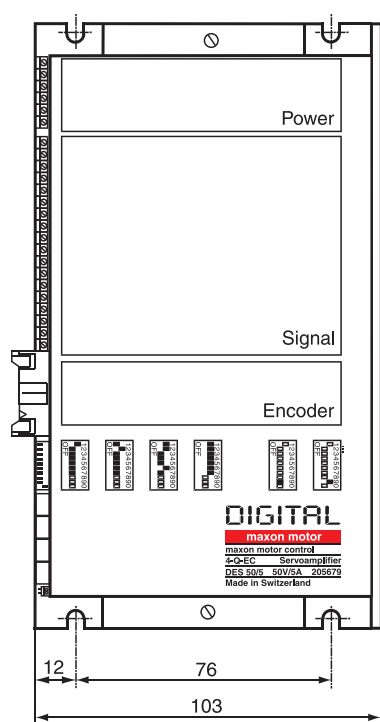
Connections Signal

- Pluggable screw type terminal block 10 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.0 mm² multiple-stranded
- 0.14 ... 1.3 mm² single wire

DEC 70/10

306089

4-Q-EC Servoamplifier Dimensions and connections



Dimensions in [mm]

DES 50/5

Connections Power

- Screw type terminal block 6 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.0 mm² multiple-stranded
- 0.14 ... 1.5 mm² single wire

Connections Signal

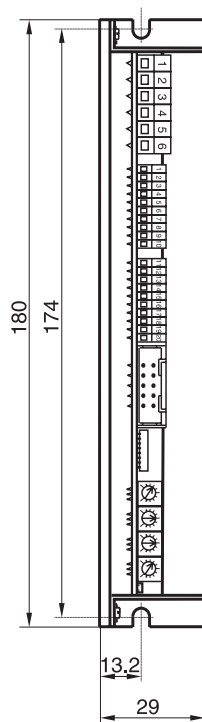
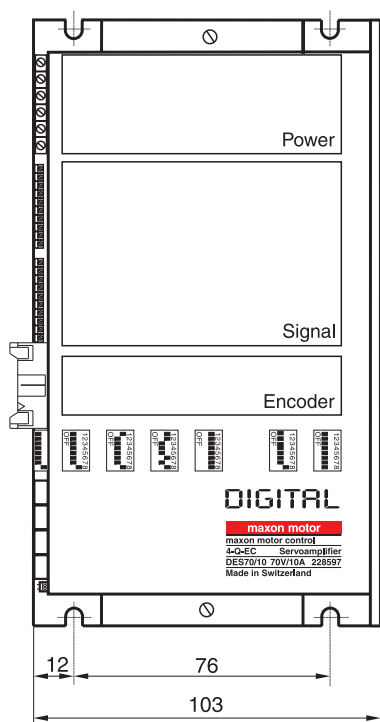
- Screw type terminal block 18 poles
- Pitch 3.5 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 ... 1.0 mm² multiple-stranded
- 0.14 ... 1.5 mm² single wire

Connections Encoder

- Plug (DIN41651) 10 poles
- Pitch 1.27 mm
- Flat band cable,
- Suitable for wire cross section AWG 28

DES 50/5

205679



Dimensions in [mm]

DES 70/10

Connections Power

- Screw type terminal block 6 poles
- Pitch 5.08 mm
- Suitable for wire cross section AWG 26 - 16
- 0.14 - 1.5 mm²

Connections Signal

- Screw type terminal block 20 poles (2x10)
- Pitch 2.54 mm
- Suitable for wire cross section AWG 26 - 20
- 0.14 ... 0.5 mm²

Connections Encoder

- Plug (DIN41651) 10 poles
- Pitch 1.27 mm
- Flat band cable,
- Suitable for wire cross section AWG 28

DES 70/10

228597

Positioning Control Units Summary

Online commanded



EPOS 24/1

- Several device variations allows the operation of various maxon DC and EC micromotors of up to 20 watts
 - Point to point control (1 axis)
 - Combination of several drives via CAN Bus
 - CANopen
 - 6 digital inputs (TTL level)
 - 2 digital outputs
 - 2 analogue inputs (10-bit ADC)
 - Miniaturised module design
- Details page 294

Slave version (online commanded) using CAN Master (EPOS P, PC, PLC, SoftPLC, etc.) or PC via RS232 interface.

- Typical applications:
- Small apparatus/appliances
 - System automation tasks
 - Drive technology

Order Number

EPOS 24/1

280937, 317270

302267, 302287

Online commanded



EPOS 24/5

- DC and EC motors up to 120 watts
 - Point to point control unit (1 axis)
 - Combination of several drives via CAN Bus
 - CANopen
 - 6 digital inputs (TTL and PLC level)
 - 4 digital outputs
 - 2 analogue inputs (10-bit ADC)
 - Compact module design
- Details page 294

Slave version (online commanded) using CAN Master (EPOS P, PC, PLC, SoftPLC, etc.) or PC via RS232 interface.

- Typical applications:
- Apparatus/appliances
 - Production equipment
 - System automation tasks

Order Number

EPOS 24/5

275512

Online commanded



NEW

EPOS2 50/5

- DC and EC motors up to 250 watts
 - Point to point control unit (1 axis)
 - Interpolated position mode
 - Combination of several drives via CAN Bus
 - CANopen
 - 11 digital inputs (optically isolated)
 - 5 digital outputs and 1 analogue output
 - 2 analogue inputs (12-bit ADC, differential)
 - Compact module design
- Details page 295

Slave version (online commanded) using CAN Master (EPOS P, PC, PLC, SoftPLC, etc.) or PC via USB or RS232 interface.

- Typical applications:
- Apparatus/appliances
 - Production equipment
 - System automation tasks

Order Number

EPOS2 50/5

347717

Online commanded



EPOS 70/10

- DC and EC motors up to 700 watts
 - Point to point control unit (1 axis)
 - Combination of several drives via CAN Bus
 - CANopen
 - 8 digital inputs (optically isolated)
 - 4 digital outputs
 - 2 analogue inputs (10-bit ADC)
 - Robust module design
- Details page 295

Slave version (online commanded) using CAN Master (EPOS P, PC, PLC, SoftPLC, etc.) or PC via RS232 interface.

- Typical applications:
- Production equipment
 - Automation tasks
 - Plant construction

Order Number

EPOS 70/10

300583

Standalone operation



EPOS P 24/5 (programmable)

- IEC 61131-3 programmable
 - CANopen Master Funktion
 - Multi-axis control via CAN Bus
 - Point to point control (1 axis)
 - DC and EC motors up to 120 watts
 - 6 digital inputs (TTL- and PLC level)
 - 4 digital outputs
 - 2 analogue inputs (10-bit ADC)
 - Compact module design
- Details page 296

Standalone operation, programmable from PC via RS232 with standard IEC 61131-3 program languages (ST, IL, FBD, LD, SFC) CANopen master function for controlling other axes. Standard motion control library.

- Typical applications:
- Work equipment manufacturing
 - Tool building
 - Automation tasks

Order Number

EPOS P 24/5

323232

EPOS Positioning control unit

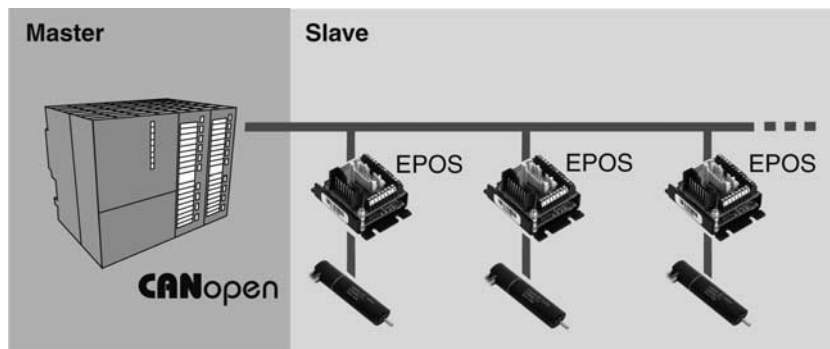


Slave version (commanded online)

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.

EPOS is a modular constructed digital positioning controller. It is suitable for DC and EC motors with incremental encoder with a power range from 1 - 700 watts.

A number of operating modes provides flexible application in a wide range of drive systems in automation technology and mechatronics.

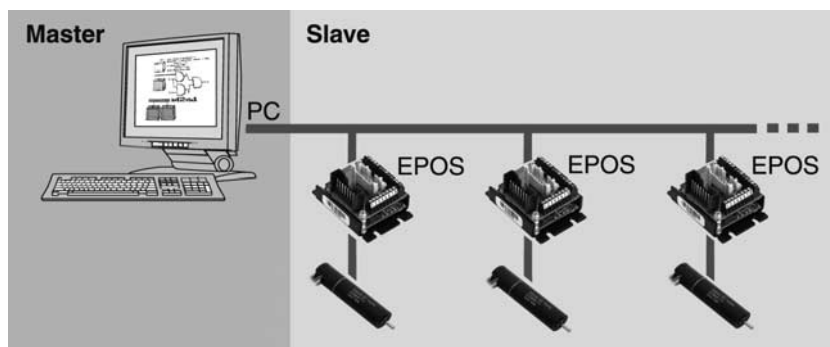


Point to point

The "CANopen Profile Position Mode" move 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 control with feed forward

The combination of feedback and feed forward control provides ideal motion behaviour. Feed forward control reduces control error. EPOS 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 synchronised 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 EPOS by a PLC without CAN interface.

Capture inputs (Position Marker)

EPOS digital inputs can be configured so that the current position value is saved when a positive and/or negative flank of an input appears.

Standardised, extendable	CANopen standard CiA DS-301 and DSP-402. Can easily be integrated into existing CANopen systems. Networks with other CANopen modules. Alternatively controllable by serial interface (RS232), EPOS2 additionally controllable by USB.
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 displays 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	Numerous IEC 61131-3 libraries free available for CAN-Master units of several PLC manufacturers providers (Beckhoff, Siemens/Helmholz, VIPA) and 32-bit Windows-DLLs for PC Master (IXXAT, Vector and National Instruments). Various programming examples free available for MS Visual C++, MS Visual Basic, Borland C++, Borland Delphi, National Instruments LabVIEW and National Instruments LabWindows/CVI.
State-of-the-art	Digital position, speed and current-torque control. Sinusoidal commutation for smooth operation of EC motors.

NEW EPOS2

Interpolated Position Mode

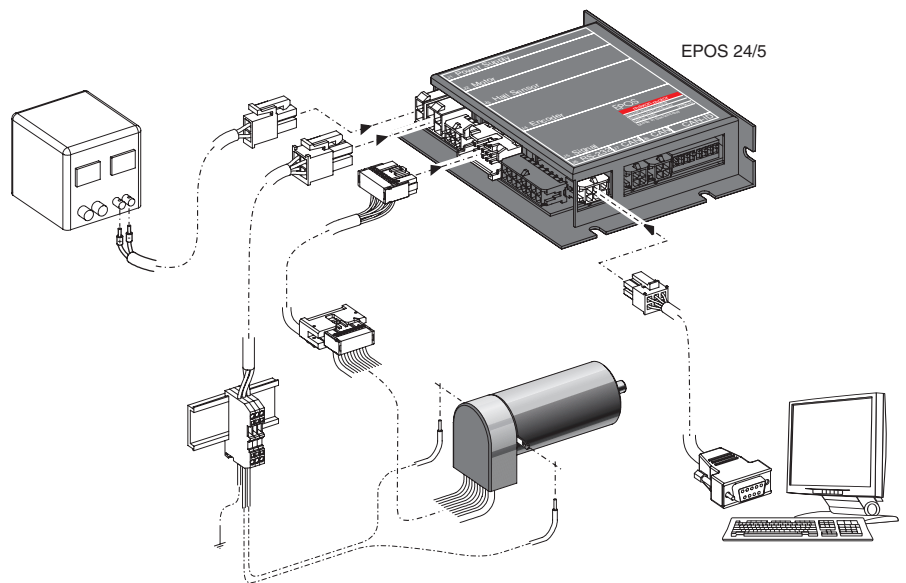
Thanks to interpolated position mode (IPM), the EPOS2 is able to synchronously run a path specified by interpolating points. With a suitable master, coordinated multi-axis movements as well as any profile in a 1-axis system can be carried out.

NEW EPOS2

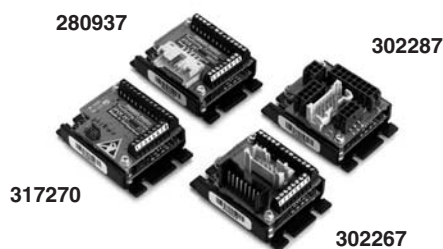
Trigger output (Position Compare)

EPOS2 digital outputs can be configured so that a digital signal is emitted at a set position value.

Technical data page 294 / 295



EPOS Positioning control unit Data



EPOS 24/1

Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder up to 20 watts.

EPOS 24/5

Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder, from 5 to 120 watts.

Controller versions

	Slave version	Slave version
Electrical Data		
Operating voltage V_{cc}	9 - 24 VDC	11 - 24 VDC
Logic supply voltage V_c (optional)		11 - 24 VDC
Max. output voltage	$0.98 \times V_{cc}$	$0.9 \times V_{cc}$
Max. output current I_{max} (<1 s)	2 A	10 A
Continuous output current I_{cont}	1 A	5 A
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	25 000 rpm
Built-in motor choke per phase	150 μ H / 1 A (DC / EC motors) 300 μ H / 0.7 A (EC 6 / EC 10 flat)	15 μ H / 5 A
Input		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A \bar , B, B \bar , I, I \bar (max. 1 MHz)	A, A \bar , B, B \bar , I, I \bar (max. 1 MHz)
Digital inputs	6 digital inputs	6 digital inputs
Analogue inputs	2 analogue inputs 10-bit resolution, 0 ... +5 V	2 analogue inputs 10-bit resolution, 0 ... +5 V
CAN-ID (CAN node identification)	Configurable with DIP switch 1 ... 4	Configurable with DIP switch 1 ... 7
Output		
Digital outputs	2 digital outputs	4 digital 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	V_{cc} , max. 1300 mA
Interfacen		
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		
Indicator		
LED green = READY, red = ERROR	Red LED, green LED	Bi-colour LED
Ambient temperature / 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. 45 g	Approx. 170 g
Dimensions (L x W x H)	55 x 40 x 25 mm	105 x 83 x 24 mm
Mounting threads	Flange for M3-screws	Flange for M3-screws
Order Number		
	280937 EPOS 24/1 for DC motors	275512 EPOS 24/5
	317270 EPOS 24/1 for EC 6 / EC 10 flat	
	302267 EPOS 24/1 for EC 16 / EC 22 motors	
	302287 EPOS 24/1 for DC / EC motors	
Accessories		
	309687 DSR 50/5 Shunt regulator	309687 DSR 50/5 Shunt regulator
	Order accessories separately, see page 299	Order accessories separately, see page 299

NEW**DIGITAL****CANopen****RS232****GUI****USB****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.

Additional information**Controller versions**

Slave version	Slave version
Electrical Data	
11 - 50 VDC	11 - 70 VDC
11 - 50 VDC	11 - 70 VDC
0.9 x V _{CC}	0.9 x V _{CC}
10 A	25 A
5 A	10 A
10 kHz	10 kHz
1 kHz	1 kHz
1 kHz	1 kHz
25 000 rpm (sinusoidal); 100 000 rpm (block)	25 000 rpm
22 µH / 5 A	25 µH / 10 A
Input	
H1, H2, H3	H1, H2, H3
A, A _l , B, B _l , I, I _l (max. 5 MHz)	A, A _l , B, B _l , I, I _l (max. 1 MHz)
11 digital inputs	8 digital inputs
2 analogue inputs (differential)	2 analogue inputs
12-bit resolution, ±10 V	10-bit resolution, 0 ... +5 V
Configurable with DIP switch 1 ... 10	Configurable with DIP switch 1 ... 7
Output	
5 digital outputs; 1 analogue 12-bit 0 ... 10 V	4 digital outputs
+5 VDC max. 100 mA	+5 VDC, max. 100 mA
+5 VDC max. 30 mA	+5 VDC, max. 30 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)
high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)
Data+; Data- (max. 12 Mbit/s)	
Indicator	
Red LED, green LED	Bi-colour LED
Ambient temperature / Humidity range	
-10 ... +45°C	-10 ... +45°C
-40 ... +85°C	-40 ... +85°C
20 ... 80 %	20 ... 80 %
Mechanical data	
Approx. 240 g	Approx. 330 g
120 x 93.5 x 27 mm	150 x 93 x 27 mm
Flange for M3-screws	Flange for M3-screws
Order Number	
347717 EPOS2 50/5	300583 EPOS 70/10

Modes of Operation

CANopen Profile Position-, Profile Velocity- and Homing Mode
 Position-, Velocity- and Current Mode
 Digital position setting by Step-Direction or Master Encoder
 Path generating with trapezoidal or sinusoidal velocity profiles
 Feed forward for velocity and acceleration
 EPOS2 additional interpolated position mode
 Sinusoidal or block commutation for EC motors

Communication

Communication via CANopen and/or RS232, EPOS2 additionally with USB 2.0
 Gateway RS232 to CAN
 EPOS2 additionally gateway USB to CAN

Inputs / Outputs

Free configurable digital inputs e.g. for limit switches and reference switches
 Free configurable digital outputs e.g. for brakes
 Free analogue inputs

Available software

EPOS Studio
 EPOS Graphical User Interface (GUI)
 Windows DLL
 IEC 61131-3 Libraries
 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 299.

Accessories

309687 DSR 50/5 Shunt regulator **235811** DSR 70/30 Shunt regulator
 Order accessories separately, see page 299 Order accessories separately, see page 299

EPOS P programmable positioning controller Data

EPOS P is a freely programmable positioning controller with integrated power stage for brushless and brush DC motors with an output of up to 120 watts.

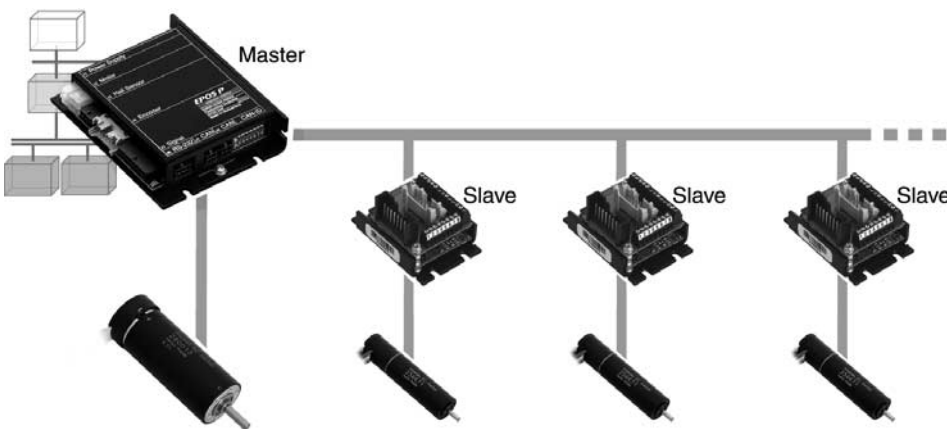
Standalone drive systems

The standalone version of EPOS can autonomously control single and multiple axis systems, dispensing with the need for a superior intelligent control unit. Multit-axis systems can be coordinated via the CAN Bus. The combination with maxon motors produces drive systems for highly dynamic movements.

Standalone - single axis system



Standalone - multi-axis 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 according to PLCopen standard

The complexity and development costs of drive systems are substantially reduced. The Motion Firmware Library was implemented according to the widely-used PLCopen Motion Control Standard. Standardized function blocks make implementation easy.

maxon utility library

Additional library simplifies the programming of tasks that often occur in motion systems. Best practice and application examples show the implementation.

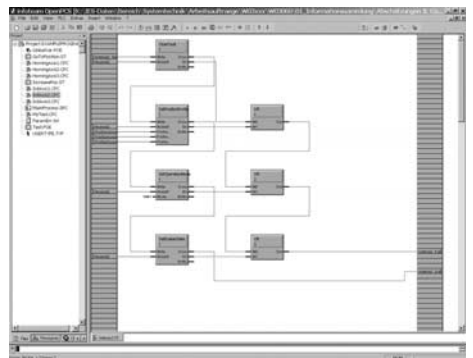
Technical data page 297

Performance features

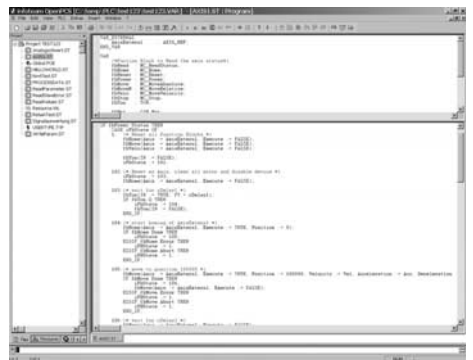
- 32 bit host processor, 60 MHz
- 1 MB memory
- Type 2.5 ms / 5000 lines IL
- 1 KB non-volatile memory
- Digital motion control signal processor

Software features

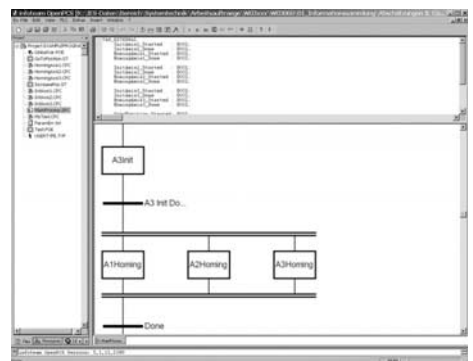
- Windows-based development environment
- IEC 61131-3 programming languages (ST, IL, FBD, LD, SFC)
- IEC 61131-3 standard libraries
- Motion control function blocks according to PLCopen standard
- CANopen function block library
- User libraries
- Network variables and data exchange
- Online debugger with break points and watch variables
- Axis configuration and parameterization
- Online help



FBD Editor



ST Editor



SFC Editor

Motion control library

- Drive control
- Referencing (Homing)
- Speed control
- Positioning absolute and relative
- Error management
- Parameter handling

**EPOS 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****Master-Version (programmable)****Electrical Data**

Operating voltage V_{cc} (ripple < 10%)	11 - 24 VDC
Logic supply voltage V_c (optional)	11 - 24 VDC
Max. output voltage	$0.9 \times V_{cc}$
Max. output current I_{max} (<1 s)	10 A
Continuous output current I_{cont}	5 A
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
Built-in motor choke per phase	15 μ H / 5 A

Input

Hall sensor signals	H1, H2, H3
Encoder signals	A, A \bar , B, B \bar , I, I \bar (max. 1 MHz)
Digital inputs	6 digital inputs
Analogue inputs	2 analogue inputs 10-bit resolution, 0 ... +5 V
CAN-ID (CAN node identification)	Configurable with DIP switch 1 ... 7

Output

Digital outputs	4 digital outputs
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)

Indicator

LED green = READY, red = ERROR	Bi-colour LED
--------------------------------	---------------

Ambient temperature / 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 threads	Flange for M3-screws

Order Number

323232 EPOS P 24/5

Accessories

309687 DSR 50/5 Shunt regulator

Order accessories separately, see page 299

Modes of Operation

CANopen Profile Position-, Profile Velocity- and Homing Mode

Position-, Velocity- and Current Mode

Path generating with trapezoidal or sinusoidal velocity profiles

Feed forward for velocity and acceleration

Velocity and acceleration feed forwarding

Sinusoidal or block commutation for EC motors

Communication

Programming interface (Windows)

serial RS232 maxon protocol

Inputs / Outputs

Free configurable digital inputs e.g. for limit switches and reference switches

Free configurable digital outputs e.g. for brakes

Free analogue inputs

Available software

EPOS Studio including programming tool according to IEC 61131-3

Motion Control Library according to PLCopen

maxon Utility Library

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 299.

Summary maxon motor control

4-Q-DC Servoamplifier			Page
LSC	250521	LSC 30/2, linear 4-Q-Servoamplifier 30 V / 2 A in module housing	276
ADS	145391	ADS 50/5, pulsed (PWM) 4-Q-DC Servoamplifier 50 V / 5 A in module housing	276
	201583	ADS 50/10, pulsed (PWM) 4-Q-DC Servoamplifier 50 V / 10 A in module housing	277
	166143	ADS_E 50/5, pulsed (PWM) 4-Q-DC Servoamplifier 50 V / 5 A in Eurocard format	277
	168049	ADS_E 50/10, pulsed (PWM) 4-Q-DC Servoamplifier 50 V / 10 A in Eurocard format	277

1-Q-EC Amplifier			Page
AECS	215738	AECS 35/3, 1-Q-EC Amplifier 35 V / 3 A, sensorless, speed control, open electronic circuit board	
DECS	274645	DECS 5/0.05, digital 1-Q-EC Amplifier 5 V / 0.05 A, sensorless, speed control, open electronic circuit board	
	343253	DECS 50/5, digital 1-Q-EC Amplifier 50 V / 5 A, sensorless, speed control, open electronic circuit board	284
DEC	318305	DEC 24/1, digital 1-Q-EC Amplifier 24 V / 1 A, speed control, adapter FPC pitch 0.5 mm	284
	249630	DEC 24/1, digital 1-Q-EC Amplifier 24 V / 1 A, speed control, adapter FPC pitch 1.0 mm	284
	249631	DEC 24/1, digital 1-Q-EC Amplifier 24 V / 1 A, speed control, adapter a pin connector pitch 2.5 mm	284
	249632	DEC 24/1, digital 1-Q-EC Amplifier 24 V / 1 A, speed control, adapter screw type terminal block pitch 2.54 mm	284
	249633	DEC 24/1, digital 1-Q-EC Amplifier 24 V / 1 A, speed control, basic module, no adapter	
	336286	DEC 24/3, digital 1-Q-EC Amplifier 24 V / 3 A, speed control, adapter a pin connector pitch 2.5 mm	285
	336287	DEC 24/3, digital 1-Q-EC Amplifier 24 V / 3 A, speed control, adapter FPC pitch 1.0 mm	285
	230572	DEC 50/5, digital 1-Q-EC Amplifier 50 V / 5 A, speed control, PWM operation	285

4-Q-EC Amplifier			Page
DECV	305259	DECV 50/5, digital 4-Q-EC Amplifier 50 V / 5 A, speed control	286
DEC	306089	DEC 70/10, digital 4-Q-EC Amplifier 70 V / 10 A, speed control, current control	286

4-Q-EC Servoamplifier			Page
DES	205679	DES 50/5, digital 4-Q-EC Servoamplifier 50 V / 5 A, sinusoidal commutation	287
	228597	DES 70/10, digital 4-Q-EC Servoamplifier 70 V / 10 A, sinusoidal commutation	287

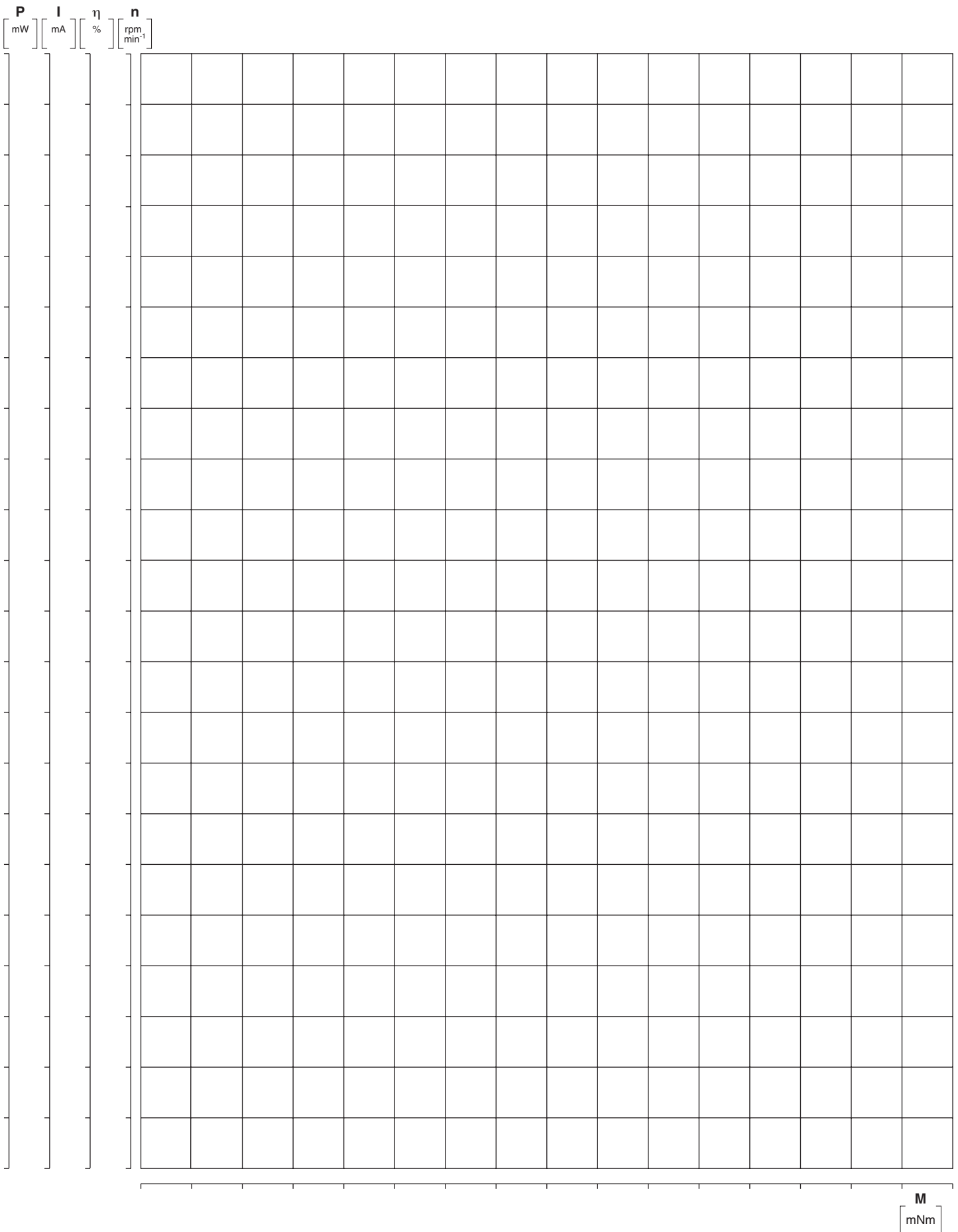
Positioning			Page
EPOS	280937	EPOS 24/1 for DC motors, digital positioning controller, 1 A, 9 - 24 VDC	294
	317270	EPOS 24/1 for EC 6 / EC 10 flat motors, digital positioning controller, 1 A, 9 - 24 VDC	294
	302267	EPOS 24/1 for EC 16 / EC 22 motors, digital positioning controller, 1 A, 9 - 24 VDC	294
	302287	EPOS 24/1 for DC / EC motors (with crimp connector), digital positioning controller, 1 A, 9 - 24 VDC	294
	275512	EPOS 24/5, digital positioning controller, 5 A, 11 - 24 VDC	294
	347717	EPOS2 50/5 digital positioning controller, 5 A, 11 - 50 VDC	295
	300583	EPOS 70/10, digital positioning controller, 10 A, 11 - 70 VDC	295
	323232	EPOS P 24/5, digital positioning controller, programmable, 5 A, 11 - 24 VDC	297
MIP 10	108971	MIP 10 with housing, 1-axis positioning control unit, 1.8 A, 9 - 24 VDC	
	111091	MIP 10 set, comprising 108971, 108088, 133367, 134795, 108977	
	111090	MIP 10 module, OEM 1-axis positioning module, 1.8 A, 9 - 24 VDC and 5 VDC	
MIP 20	251649	MIP 20 in housing, 1-axis positioning control unit, 2 A, 9 - 24 VDC	
	251669	MIP 20 set, comprising 251649, 108088, 133367, 134795, 108977	
MIP 50	200629	MIP 50 Eurocard, 1-axis positioning control unit, 5 A, 24 - 48 VDC	
MIP 100	246244	MIP 100 Eurocard, 1-axis positioning control unit, 10 A, 24 - 48 VDC	

Summary maxon motor control accessories

Backplane		Page
166873	Backplane with screw type terminal block to ADS_E 50/5 (166143) and ADS_E 50/10 (168049)	277
199950	Backplane with screw type terminal block to MIP 50 Eurocard, 200629	
245963	Backplane with screw type terminal block to MIP 100 Eurocard, 246244	
Front panel		
167850	Front panel 3HE / 5TE to ADS_E 50/5 (166143) clear anodised	277
168910	Front panel 3HE / 7TE to ADS_E 50/10 (168049) clear anodised	277
200640	19"-Front panel 3HE / 8TE, suitable to MIP 50 / 100 Eurocard, 200629 / 246244	
Motor choke		
137303	Choke module, 3 x 0.25 mH, each 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, each 10.0 A, L x W x H (90 x 70 x 49,7 mm) with screw type terminal block	
107892	Motor choke block, 2 x 0.2 mH, each 4.0 A, L x W x H (32 x 32 x 20 mm) for print assembly	
107893	Motor choke block, 2 x 0.32 mH, each 3.15 A, L x W x H (32 x 32 x 20 mm) for print assembly	
107894	Motor choke block, 2 x 0.8 mH, each 3.15 A, L x W x H (43 x 43 x 25 mm) for print assembly	
Cable		
275829	EPOS power cable (length 3 m) to 275512, 300583, 347717, 323232	
275851	EPOS motor cable (length 3 m) to 275512, 300583, 347717, 323232	
303490	EPOS motor cable (length 3 m) to 302287	
275878	EPOS Hall sensor cable (length 3 m) to 275512, 300583, 347717, 323232	
302948	EPOS motor- / Hall sensor cable (length 3 m) to 302287	
275934	EPOS encoder cable (length 3 m) to 275512, 300583, 347717, 323232	
275932	EPOS signal cable (length 3 m) to 275512, 300583, 302287, 347717, 323232	
300586	EPOS signal cable 2 (length 3 m) to 300583, 347717	
350390	EPOS2 signal cable 3 (length 3 m) to 347717	
275900	EPOS RS232-COM cable (length 3 m) to 275512, 300583, 347717, 323232	
350392	EPOS2 USB cable (length 3 m) to 347717	
275908	EPOS CAN-COM cable (length 3 m) to 275512, 300583, 347717, 323232	
275926	EPOS CAN-CAN cable (length 3 m) to 275512, 300583, 347717, 323232	
275937	EPOS CAN terminal resistance to 300583	
319471	EPOS CAN Y cable to 302287	
303807	EPOS connector set for 302287	
276248	EPOS connector set for 275512, 300583	
351061	EPOS2 connector set for 347717	
133367	MIP RS232-COM cable (length 3 m) to 108971, 251649	
134795	MIP encoder cable (length 3 m) to 108971, 251649	
108088	MIP motor- / power cable (length 3 m) to 108971, 251649	
Adapter		
108977	MIP- test connector to 108971, 251649	
220300	Adapter Flex print connector 11 poles on screw type terminal block 8 poles suitable to maxon flat motor	
220310	Adapter Flex print connector 4 poles on screw type terminal block 4 poles suitable to maxon flat motor	
223774	Adapter spring contact strip according to DIN41651 10 poles on screw type terminal block 8 poles	
262359	Adapter male header to DIN41651 10 poles on screw type terminal block 10 poles	
232818	Adapter to MIP 10 / MIP 20 and MR encoder with Line Driver	
251590	Adapter to MIP 10 / MIP 20 and MR encoder without Line Driver	
257703	Adapter to DEC 24/1: Flex print connector 8 poles, top contact style, pitch 0.5 mm	
249635	Adapter to DEC 24/1: Flex print connector 11 poles, top contact style, pitch 1.0 mm	
249636	Adapter to DEC 24/1: Pin connector with snap-in locking device (STOCKO) 8 poles, pitch 2.5 mm	
249637	Adapter to DEC 24/1: screw type terminal block 8 poles, pitch 2.54 mm, AWG 20 - 26	
Shunt regulator		
309687	DSR 50/5, shunt regulator 27 VDC and 56 VDC (adjustable), P _{max} 300 W, P _{cont} 10 W	
235811	DSR 70/30, shunt regulator 12-75 VDC (selectable), P _{max} 475 W, P _{cont} 25 W, module housing 180 x 103 x 26 mm	

For your personal notes

maxon motor





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 decentralised concept of these intelligent drives minimises the use of centralised controllers.

Summary
MCD EPOS

302
303 - 304

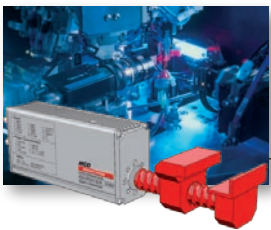
MCD EPOS Intelligent compact drive

CANopen



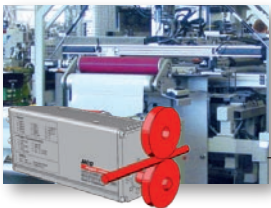
Driving

A reliable drive solution is the key to production machinery with many years of maintenance-free operation in a variety of applications.



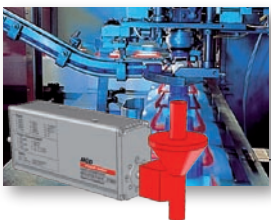
Setting-up

The rapid set-up of processing machinery which offers both precision and long-term accuracy is the key to efficient production.



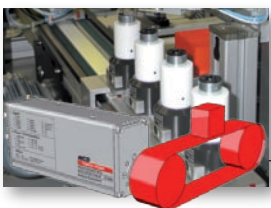
Guiding

Products that are dynamically guided throughout the entire process ensure consistent product quality.



Dispensing

The precise set-up of dispensing systems provides maximum flexibility through the accurate dosing of individual component quantities.



Positioning

Several synchronised axes transport the product to the correct location with both high accuracy and sustained reproducibility.

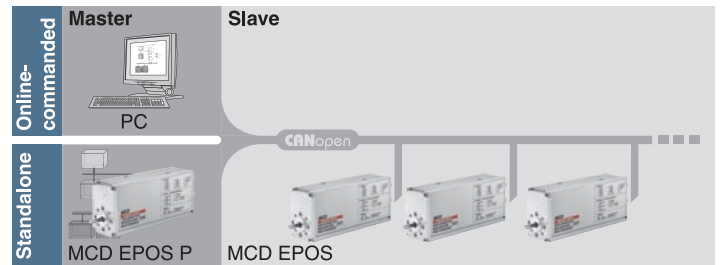


Maintenance-free positioning drive with tried and trusted components

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 an PLC. Wiring errors are largely avoided and installation time is significantly reduced. The drive is controlled, parameterised and diagnosed via the CAN bus or the serial port (RS232).



Intelligence at the right place

maxon's compact drives are fitted with several opto-coupled 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 PLCopen standard reduces programme complexity and development costs.

Everything integrated — also a question of price

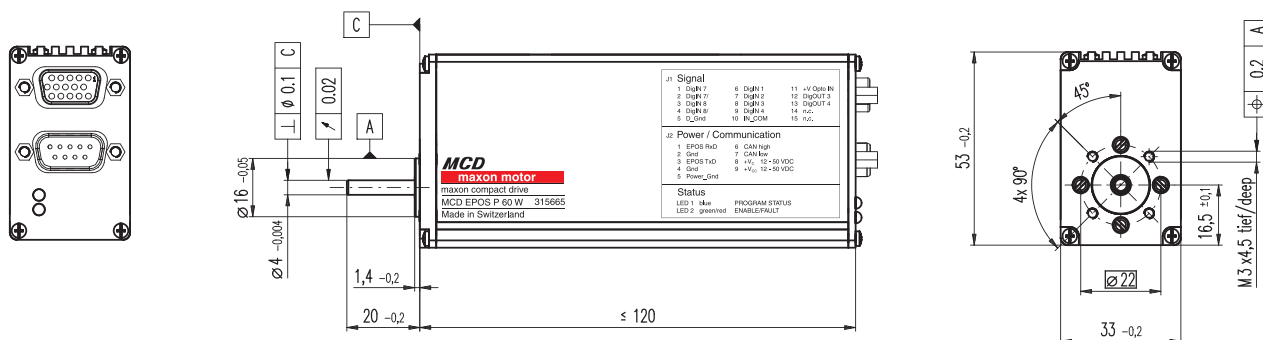
Substantial cost-savings have been made thanks to the careful selection and optimisation of components. The resulting drive is available at an unsurpassed price which is well below the cost of the individual parts. Simplified mounting results in further cost-savings.

Drives with a broad application spectrum

The requirements of compact design and enhanced functionality have been completely realised with maxon's compact drives. Their supreme flexibility ensures use in a wide range of industrial applications.

MCD EPOS and EPOS P 60 W Compact Drive

DIGITAL CANopen
RS232 GUI



M 1:2

Motor Data

Nominal torque (Max. continuous torque)	54 mNm
	($T_U=25^\circ\text{C}$, 5000 rpm)
Max. torque	218 mNm
Max. permissible speed (restricted by econdor)	12000 rpm
Max. efficiency	70 %
Torque constant	24.3 mNm / A
Speed constant	393 rpm / V
Speed / torque gradient	20.6 rpm / mNm
Rotor inertia	22.9 gcm ²
Axial play at axial load	< 6 N
(Preloaded ball bearings)	> 6 N
Radial play	preloaded
Max. axial load (dynamic)	5.5 N
Max. force for press fits (static)	100 N
Max. radial loading, 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 (optional IP54)
Operating	-20 ... +85°C
	power derating 1.4%/K from $T_U = 25^\circ\text{C}$
Storage	-40 ... +85°C
Non condensating	20 ... 80 %
Max. case temperature	< 100°C

Mechanical data

Weight	approx. 495 g
Dimensions (L x W x H)	120x33x53 mm
Mounting plate	four M3x4.5 threaded holes

Options

- Encoder MR with 500 counts per turn (account of the positioning precision 15000 rpm)
- Protection to IP54 (assembled and sealed connection cable)

Electrical data

Power supply voltage +V _{CC} (Ripple < 10%)	+12...+50 VDC
Logic supply voltage +V _c (Ripple < 10%)	(Optional) +12...+50 VDC
Max. output voltage	$0.9 \cdot V_{CC}$
Max. output current I _{max}	9 A
Continuous output current I _{cont}	2.6 A ($T_U = 25^\circ\text{C}$, 5000 rpm)
Switching frequency	50 kHz

Controller

Sample rate PI-current controller	10 kHz
Sample rate PI-speed controller	1 kHz
Sample rate PID-positioning controller	1 kHz
Position resolution	0.09°
Position accuracy	± 1°
Position reproducibility	± 0.09°
Encoder	1000 Imp./3 Channels

Inputs

4 digital inputs (opto-coupled)	+9...+24 VDC
2 digital inputs (differential)	EIA-standard RS-422

Outputs

2 digital outputs (opto-coupled)	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 DSP-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

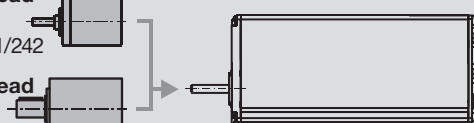
Performance features MCD EPOS P

- 32 bit host processor, 60 MHz
- 512 KB memory
- Typical 2.5 ms / 5000 lines AWL
- 512 Byte non-volatile memory
- Digital motion control signal processor

maxon modular system

Planetary Gearhead
Ø32 mm,
1.0 - 8.0 Nm, p. 241/242

Planetary Gearhead
Ø42 mm,
3.0 - 15.0 Nm, p. 245



Order numbers

326343
315665

MCD EPOS 60 W
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

- Synchronising (also with intermediate factor) with an externally produced reference variable

Step/direction

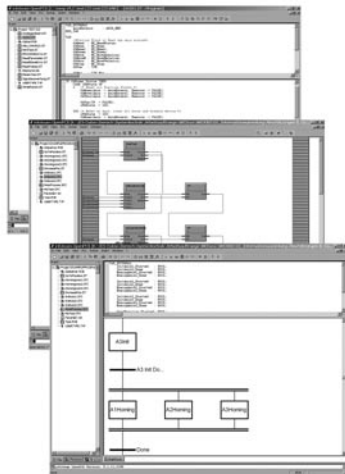
- Step-by-step movement of the motor axis

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 according to PLCopen standard
- 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

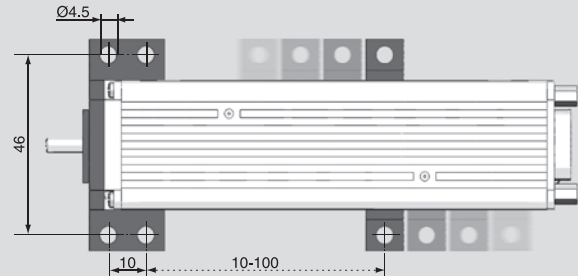
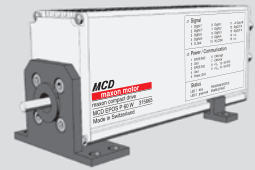
The complexity and development costs of drive systems are substantially reduced. The Motion Firmware Library was implemented according to the widely-used PLCopen Motion Control Standard. Standardized function blocks make implementation easy.

- Drive control
- Referencing
- 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.

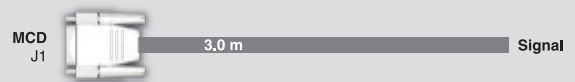


Order Number
326930

MCD EPOS 60 W Mounting-Kit

Cable

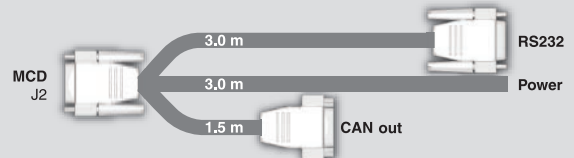
Signal cable



Order Number
326923

MCD EPOS Signal Cable

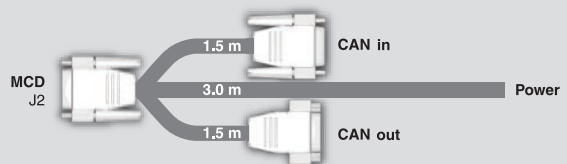
Power / RS232-CAN cable



Order Number
325939

MCD EPOS Power / RS232-CAN Cable

Power / CAN-CAN cable



Order Number
325235

MCD EPOS Power / CAN-CAN Cable

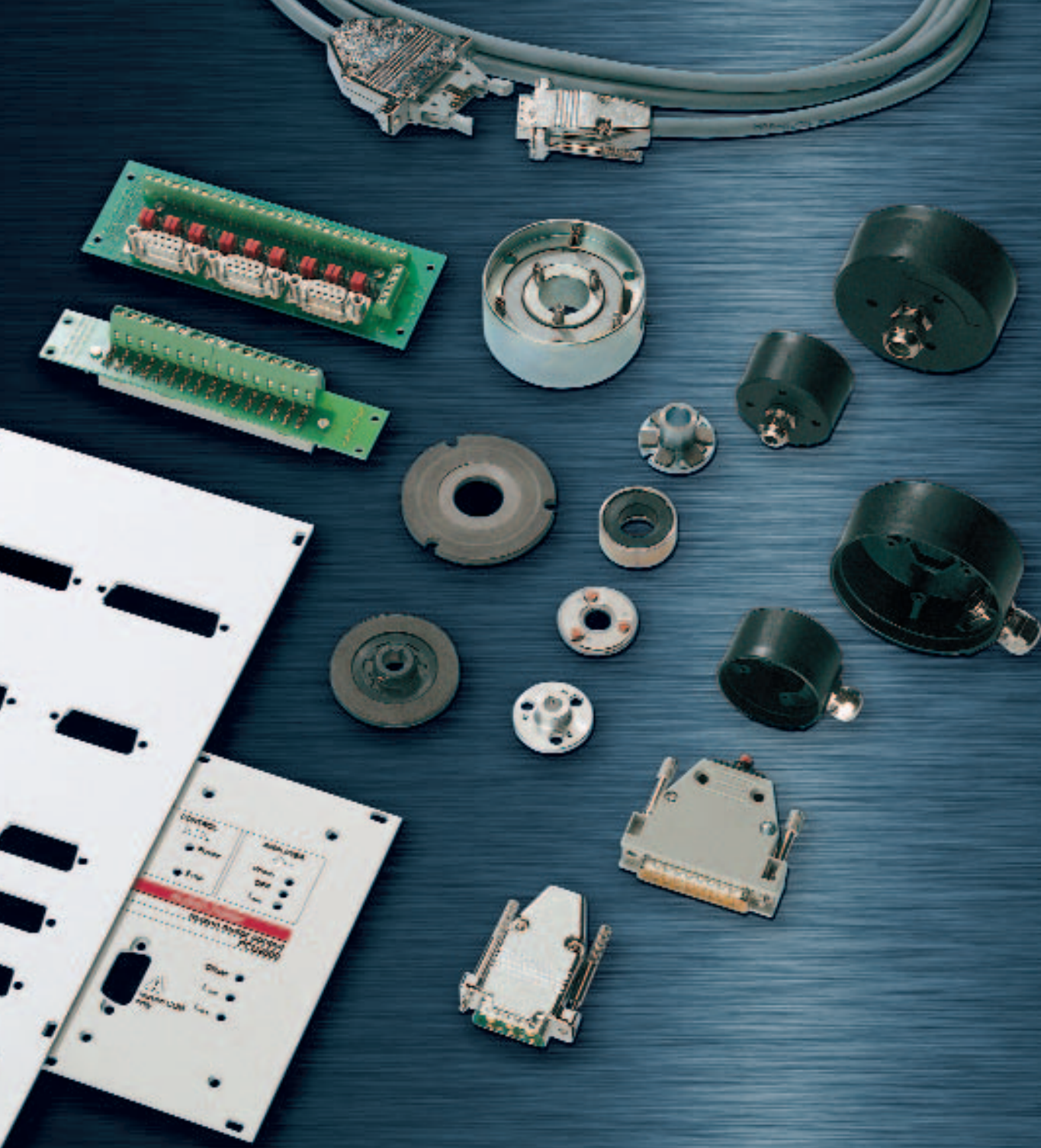
CAN Termination plug

Is required as line termination for the CAN-Network.



Order Number
326925

MCD EPOS CAN Termination Plug



maxon accessories

maxon accessories

Useful parts complete maxon's full range of drive technology products. Brakes may only be assembled with motors in the delivery plant.

Brakes	306 - 311
End caps	312
Accessories for maxon motor control	
refer to page 299	

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 braking.
- The brake voltage should be reduced to half the nominal voltage after activation to reduce heat loss.

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

Order Number

301212 301213

Type



Combination						Overall length [mm] / • see: + Gearhead
+ Motor	Page	+ Gearhead	Page	+ Tacho	Page	
EC-max 22, 12 W	176					67.7
EC-max 22, 12 W	176	GP 22, 0.5 - 2.0 Nm	232			•
EC-max 22, 25 W	177					84.2
EC-max 22, 25 W	177	GP 32, 1 - 6 Nm	241			•
EC-max 30, 40 W	178					77.6
EC-max 30, 40 W	178	GP 32, 1 - 6 Nm	241			•
EC-max 30, 40 W	178			HEDL 5540	266	96.0
EC-max 30, 40 W	178	GP 32, 1 - 6 Nm	241	HEDL 5540	266	•
EC-max 30, 60 W	179					99.6
EC-max 30, 60 W	179	GP 42, 3 - 15 Nm	245			•
EC-max 30, 60 W	179			HEDL 5540	266	118.0
EC-max 30, 60 W	179	GP 42, 3 - 15 Nm	245	HEDL 5540	266	•
EC-power 30	187					79.1
EC-power 30	187	GP 32, 8 Nm	242	HEDL 5540	266	•
EC-power 30	187	GP 42, 3 - 15 Nm	245			•
EC-power 30	187			HEDL 5540	266	99.7
EC-power 30	187	GP 32, 8 Nm	242	HEDL 5540	266	•
EC-power 30	187	GP 42, 3 - 15 Nm	245	HEDL 5540	266	•
EC-power 30	188					96.1
EC-power 30	188	GP 32, 8 Nm	242	HEDL 5540	266	•
EC-power 30	188	GP 42, 3 - 15 Nm	245			•
EC-power 30	188			HEDL 5540	266	116.7
EC-power 30	188	GP 32, 8 Nm	242	HEDL 5540	266	•
EC-power 30	188	GP 42, 3 - 15 Nm	245	HEDL 5540	266	•

Technical Data

Static braking moment at 20°C	> 0.1 Nm	Nominal voltage, smoothed	24 VDC ± 10 %
Mass inertia	1.8 gcm ²	Resistance	R ₂₀ = 227 Ω ± 6 %
Max. permissible speed	49 000 rpm	Duty cycle	100 %
Weight	29 g	Reaction time	– Rise time: 12 ms
Ambient temperature range	-5 ... +80°C		– Fall time: 6 ms

Pin Allocation

Cable (AWG 26)

red
blue

Designation

U_{Brake} + 24 VDC
U_{Brake} GND

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 braking.
- The brake voltage should be reduced to half the nominal voltage after activation to reduce heat loss.

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

Order Number

301214 301215

Type



Combination

+ Motor	Page	+ Gearhead	Page	+ Tacho	Page	Overall length [mm] / ● see: + Gearhead
EC-max 40, 70 W	180					98.0
EC-max 40, 70 W	180	GP 42, 3 - 15 Nm	245			●
EC-max 40, 70 W	180			HEDL 5540	266	121.4
EC-max 40, 70 W	180	GP 42, 3 - 15 Nm	245	HEDL 5540	266	●
EC-max 40, 120 W	181					128.0
EC-max 40, 120 W	181	GP 52, 4 - 30 Nm	248			●
EC-max 40, 120 W	181			HEDL 5540	266	151.4
EC-max 40, 120 W	181	GP 52, 4 - 30 Nm	248	HEDL 5540	266	●

Technical Data

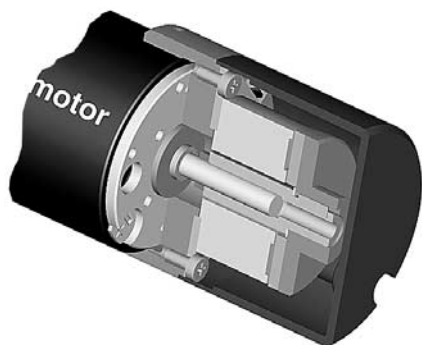
Static braking moment at 20°C	> 0.4 Nm	Nominal voltage, smoothed	24 VDC ± 10%
Mass inertia	10 gcm ²	Resistance	R ₂₀ = 92.5 Ω ± 6 %
Max. permissible speed	16 000 rpm	Duty cycle	100 %
Weight	0.05 kg	Reaction time	– Rise time ≤ 13 ms
Ambient temperature range	-5 ... +85°C		– Fall time ≤ 27 ms

Pin Allocation

Cable (AWG 26)
red
blue

Designation
U_{Brake} + 24 VDC
U_{Brake} GND

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 braking.
- The brake voltage should be reduced to half the nominal voltage after activation to reduce heat loss.

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

Order Number

228384	228386	228387	228388
--------	--------	--------	--------

Type



Combination

+ Motor	Page	+ Gearhead	Page	+ Tacho	Page	Overall length [mm] / • see: + Gearhead
RE 25, 20 W	79					88.6
RE 25, 20 W	79	GP 26, 0.5 - 2.0 Nm	235			•
RE 25, 20 W	79	GP 32, 0.4 - 2.0 Nm	237			•
RE 25, 20 W	79	GP 32, 0.75 - 4.5 Nm	238			•
RE 25, 20 W	79	GP 32, 1.0 - 6.0 Nm	240			•
RE 25, 20 W	79			HED_ 5540	262/264	105.7
RE 25, 20 W	79	GP 26, 0.5 - 2.0 Nm	235	HED_ 5540	262/264	•
RE 25, 20 W	79	GP 32, 0.4 - 2.0 Nm	237	HED_ 5540	262/264	•
RE 25, 20 W	79	GP 32, 0.75 - 4.5 Nm	238	HED_ 5540	262/264	•
RE 25, 20 W	79	GP 32, 1.0 - 6.0 Nm	240	HED_ 5540	262/264	•
RE 35, 90 W	82					107.0
RE 35, 90 W	82	GP 32, 0.75 - 4.5 Nm	239			•
RE 35, 90 W	82	GP 32, 1.0 - 6.0 Nm	240			•
RE 35, 90 W	82	GP 32, 8 Nm	242			•
RE 35, 90 W	82	GP 42, 3 - 15 Nm	244			•
RE 35, 90 W	82			HED_ 5540	262/264	124.1
RE 35, 90 W	82	GP 32, 0.75 - 4.5 Nm	239	HED_ 5540	262/264	•
RE 35, 90 W	82	GP 32, 1.0 - 6.0 Nm	240	HED_ 5540	262/264	•
RE 35, 90 W	82	GP 32, 8 Nm	242	HED_ 5540	262/264	•
RE 35, 90 W	82	GP 42, 3 - 15 Nm	244	HED_ 5540	262/264	•
RE 40, 150 W	84					107.1
RE 40, 150 W	84	GP 42, 3 - 15 Nm	244			•
RE 40, 150 W	84	GP 52, 4 - 30 Nm	247			•
RE 40, 150 W	84			HED_ 5540	262/264	124.2
RE 40, 150 W	84	GP 42, 3 - 15 Nm	244	HED_ 5540	262/264	•
RE 40, 150 W	84	GP 52, 4 - 30 Nm	247	HED_ 5540	262/264	•
F2260, 40 W	97					119.6
F2260, 40 W	97	GP 62, 8 - 50 Nm	249			•
F2260, 40 W	97			HED_ 5540	263/265	143.2
F2260, 40 W	97	GP 62, 8 - 50 Nm	249	HED_ 5540	263/265	•
F2260, 80 W	98					155.1
F2260, 80 W	98	GP 62, 8 - 50 Nm	249			•
F2260, 80 W	98			HED_ 5540	263/265	178.7
F2260, 80 W	98	GP 62, 8 - 50 Nm	249	HED_ 5540	263/265	•
EC 40, 120 W	165					100.8
EC 40, 120 W	165	GP 42, 3 - 15 Nm	244			•
EC 40, 120 W	165	GP 52, 4 - 30 Nm	247			•

Technical Data

Static braking moment at 20°C	> 0.4 Nm	Nominal voltage, smoothed	24 VDC ± 10 %
Mass inertia	10 gcm ²	Resistance	R ₂₀ = 92.5 Ω ± 6 %
Max. permissible speed	16 000 rpm	Duty cycle	100 %
Weight	0.05 kg	Reaction time	– Rise time ≤ 13 ms
Ambient temperature range	-5 ... +85°C		– Fall time ≤ 27 ms

Pin Allocation

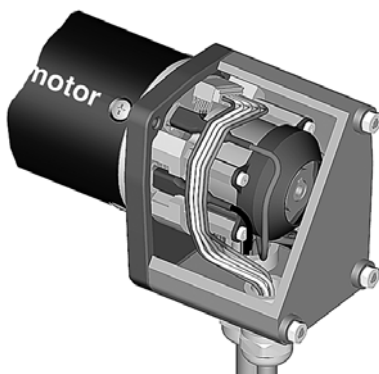
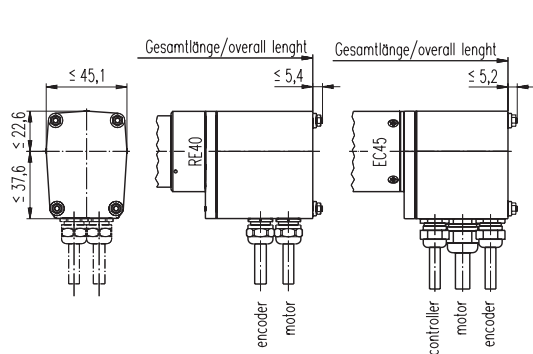
Cable (AWG 26)

red
blue
red
black

Designation

U _{Brake} + 24 VDC
U _{Brake} GND
Motor+
Motor-

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 braking.
- The brake voltage should be reduced to half the nominal voltage after activation to reduce heat loss.

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

Order Number

228389 228390

Type



Combination

+ Motor	Page	+ Gearhead	Page	+ Tacho	Page	Overall length [mm] / • see: + Gearhead
RE 40, 150 W	84					115.1
RE 40, 150 W	84	GP 42, 3 - 15 Nm	244			•
RE 40, 150 W	84	GP 52, 4 - 30 Nm	247			•
RE 40, 150 W	84			HEDL 9140	267	135.6
RE 40, 150 W	84	GP 42, 3 - 15 Nm	244	HEDL 9140	267	•
RE 40, 150 W	84	GP 52, 4 - 30 Nm	247	HEDL 9140	267	•
EC 45, 150 W	166					118.6
EC 45, 150 W	166	GP 42, 3 - 15 Nm	244			•
EC 45, 150 W	166	GP 52, 4 - 30 Nm	247			•
EC 45, 150 W	166			HEDL 9140	267	135.6
EC 45, 150 W	166	GP 42, 3 - 15 Nm	244	HEDL 9140	267	•
EC 45, 150 W	166	GP 52, 4 - 30 Nm	247	HEDL 9140	267	•
EC 45, 250 W	167					151.4
EC 45, 250 W	167	GP 42, 3 - 15 Nm	245			•
EC 45, 250 W	167	GP 52, 4 - 30 Nm	247			•
EC 45, 250 W	167	GP 62, 8 - 50 Nm	249			•
EC 45, 250 W	167			HEDL 9140	267	168.4
EC 45, 250 W	167	GP 42, 3 - 15 Nm	245	HEDL 9140	267	•
EC 45, 250 W	167	GP 52, 4 - 30 Nm	247	HEDL 9140	267	•
EC 45, 250 W	167	GP 62, 8 - 50 Nm	249	HEDL 9140	267	•

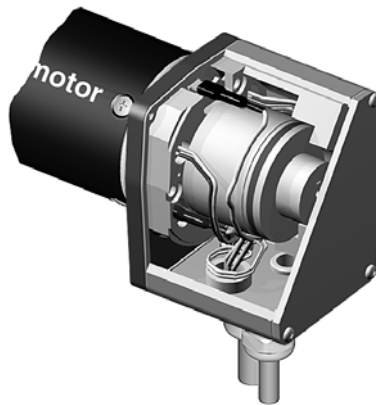
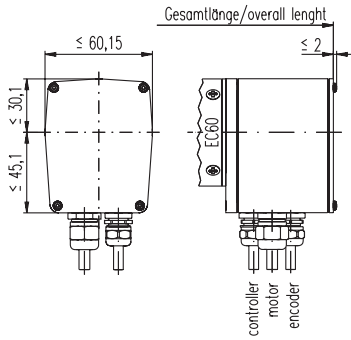
Technical Data

Static braking moment at 20°C	> 0.4 Nm	Nominal voltage, smoothed	24 VDC ± 10%
Mass inertia	10 gcm ²	Resistance	R ₂₀ = 92.5 Ω ± 6 %
Max. permissible speed	16 000 rpm	Duty cycle	100 %
Weight	0.05 kg	Reaction time	– Rise time ≤ 13 ms
Ambient temperature range	-5 ... +85°C		– Fall time ≤ 27 ms

Pin Allocation

Cable	Brake	from motor clamp Designation (Example EC 45)
red	Nr. 4	U _{Brake} + 24 VDC
blue	Nr. 5	U _{Brake} GND

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 braking.
- The brake voltage should be reduced to half the nominal voltage after activation to reduce heat loss.

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

Order Number

228998

Type



Combination

+ Motor	Page	+ Gearhead	Page	+ Tacho	Page	Overall length [mm] / • see: + Gearhead
EC 60, 400 W	170					190.9
EC 60, 400 W	170	GP 81, 20 - 120 Nm	250			•
EC 60, 400 W	170			HEDL 9140	267	214.9
EC 60, 400 W	170	GP 81, 20 - 120 Nm	250	HEDL 9140	267	•

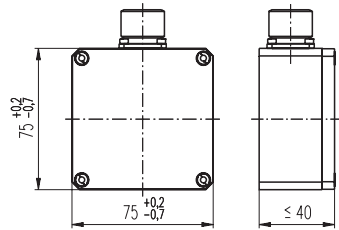
Technical Data

Static braking moment at 20°C	> 2.0 Nm	Nominal voltage, smoothed	24 VDC -10 ... +6 %
Mass inertia	45 gcm ²	Resistance	R ₂₀ = 72 Ω ± 7 %
Max. permissible speed	10 000 rpm	Duty cycle	100 %
Weight	0.19 kg	Reaction time	- Rise time = 2 ms
Ambient temperature range	-5 ... +85°C		- Fall time = 25 ms

Pin Allocation

Cable	Brake	from motor clamp	Designation
red	Nr. 4	U _{Brake} + 24 VDC	
black	Nr. 5	U _{Brake} GND	

Brake AB 75, 24 VDC, 1.4 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 braking.
- The brake voltage should be reduced to half the nominal voltage after activation to reduce heat loss.

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

Order Number

150646

Type



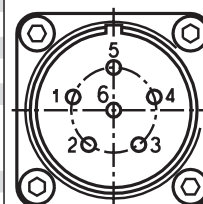
Combination

+ Motor	Page	+ Gearhead	Page	+ Tacho	Page	Overall length [mm] / • see: + Gearhead
RE 75, 250 W	86					241.5
RE 75, 250 W	86	GP 81, 20 - 120 Nm	250			•
RE 75, 250 W	86			HED_ 5540	262/264	281.4
RE 75, 250 W	86	GP 81, 20 - 120 Nm	250	HED_ 5540	262/264	•

Technical Data

Static braking moment	≥ 1.4 Nm	Nominal voltage	24 VDC
Mass inertia	96.0 gcm ²	Holding voltage	11.5 VDC
Max. permissible speed	8000 rpm	Resistance	R ₂₀ = 46.0 Ω
		Duty cycle	100 %
		Inductance	94 mH
		Reaction time at 0.7 I _{nom} DC, typical	
		– Rise time	15 ms
		– Fall time	20 ms

Pin Allocation

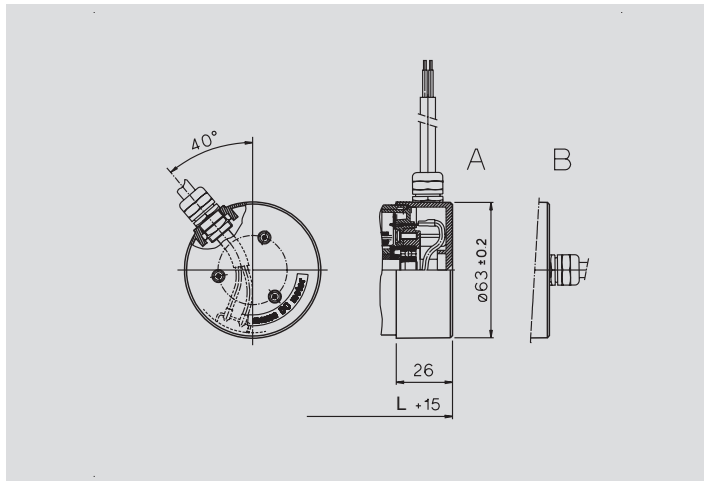


Flanged connector
Type SOURIAU 8GM-QL2-6P

Pin 1 U_{Brake} + 24 VDC
Pin 2 n.c. (do not connect)
Pin 3 n.c. (do not connect)
Pin 4 U_{Brake} GND
Pin 5 n.c. (do not connect)
Pin 6 n.c. (do not connect)

Recommended cable plug:
Type SOURIAU 8GM-DM2-6S
(Metal, straight exit:
maxon Art. No. 2675.536) or
8G-V2-6S (plastic, 90° angle:
maxon Art. No. 2675.537)

End Caps



End cap for maxon DC motor 2260.____-51.216-200

Details for motor see pages 97 and 98

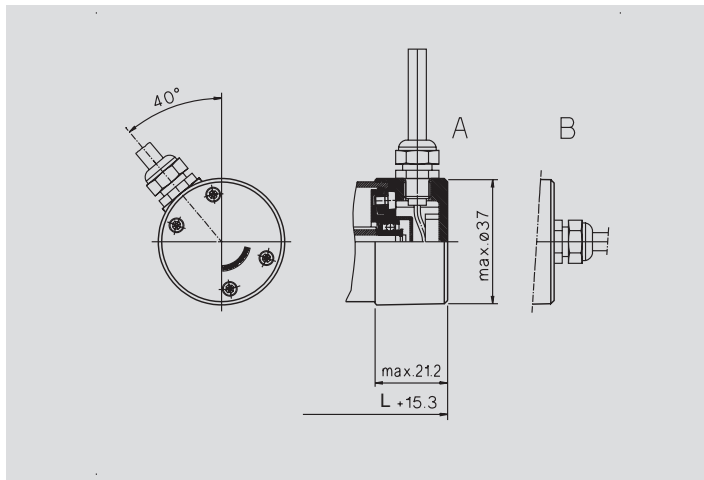
- Plastic housing
- Protection to IP54
- With 500 mm cable, 2 x 1.0 mm² (other lengths on request!)
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	- Pol

Order Number

Type number	Version / Item
137233	A End cap with radial cable outlet (500 mm)
137238	B End cap with axial cable outlet (500 mm)



End cap for maxon DC motor RE ø35 mm

Details for motor see page 82

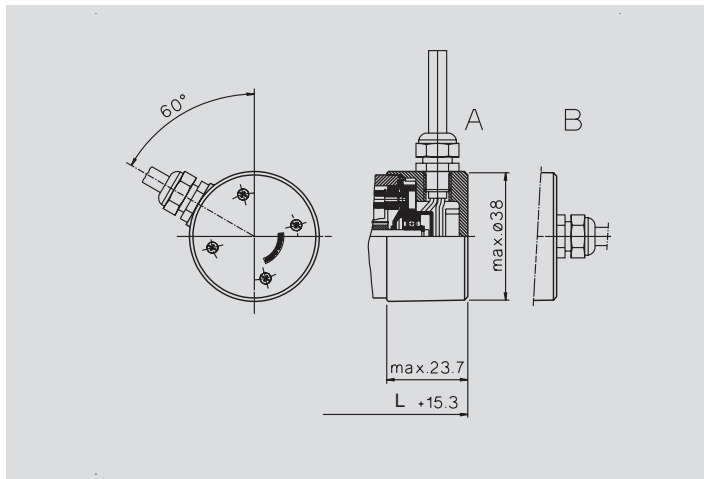
- Plastic housing
- Protection to IP54
- With 500 mm cable, 2 x 0.5 mm² (other lengths on request!)
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	- Pol

Order Number

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 ø36 mm

Details for motor see page 83

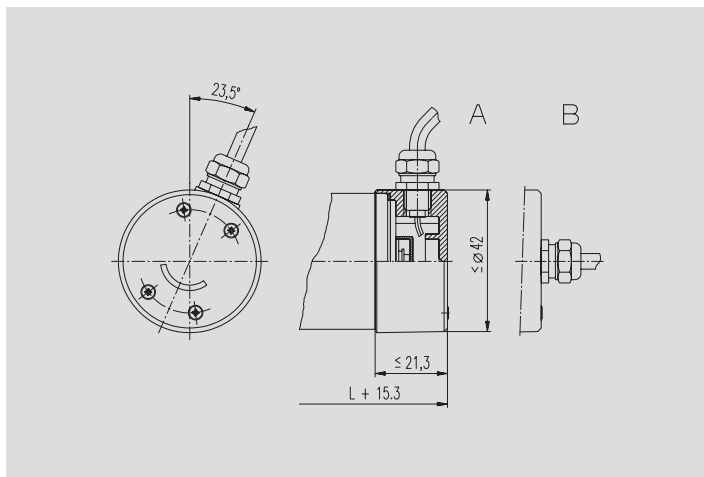
- Plastic housing
- Protection to IP54
- With 500 mm cable, 2 x 0.5 mm² (other lengths on request!)
- Radial or axial cable outlet
- Assembly only by maxon motor. The shaft must be shortened.

Pin Allocation

Cable No.	Color	Motor
1	black	+ Pol
2	black	- Pol

Order Number

Type number	Version / Item
137237	A End cap with radial cable outlet (500 mm)
137236	B End cap with axial cable outlet (500 mm)



End cap for maxon DC motor RE ø40 mm

Details for motor see page 84

- Plastic housing
- Protection to IP54
- With 500 mm cable, 2 x 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

Order Number

Type number	Version / Item
232341	A End cap with radial cable outlet (500 mm)
232343	B End cap with axial cable outlet (500 mm)



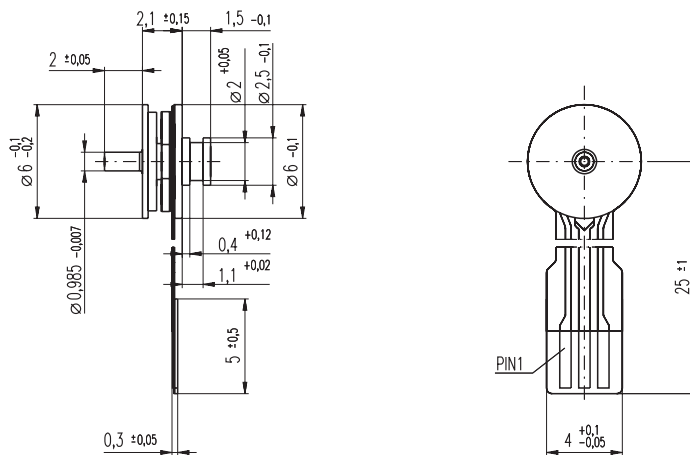
maxon special program

With the maxon program we offer a range of motors and combinations that are now only available on demand. The necessary production facilities are available. The material required is procured when ordered which means that minimum quantity orders are required (typical quantity 10,000 pcs.)

RE Special program
A Special program
S Special program

314 - 315
316
317 - 325

EC 6 flat $\varnothing 6$ mm, brushless, 0.03 Watt



M 2.5:1

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

Order Number

sensorless 263800

Motor Data (provisional)

Values at nominal voltage

1	Nominal voltage	V	1.0
2	No load speed	rpm	15900
3	No load current	mA	6.59
4	Nominal speed	rpm	k.A.
5	Nominal torque	mNm	0.0287
6	Nominal current	A	0.0706
7	Stall torque	mNm	0.00486
8	Starting current	A	0.0147
9	Max. efficiency	%	23

Characteristics

10	Terminal resistance phase to phase	Ω	68.0
11	Terminal inductance phase to phase	mH	0.121
12	Torque constant	mNm / A	0.330
13	Speed constant	rpm / V	28900
14	Speed / torque gradient	rpm / mNm	5960000
15	Mechanical time constant	ms	393
16	Rotor inertia	gcm ²	0.00630

Specifications

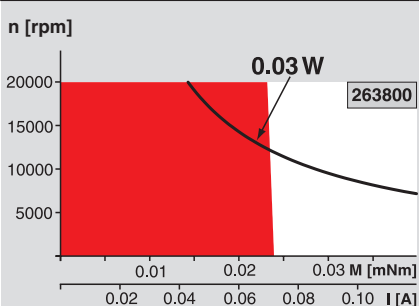
Thermal data		
17	Thermal resistance housing-ambient	80 K / W
18	Thermal resistance winding-housing	75 K / W
19	Thermal time constant winding	1 s
20	Thermal time constant motor	14 s
21	Ambient temperature	-40 ... +85°C
22	Max. permissible winding temperature	+100°C
Mechanical data (Ruby bearing)		
23	Max permissible speed	20000 rpm
24	Axial play	0.5 mm
24	Axial preload (> 0.03 N) given by the force between rotor and stator	
25	Radial play	0.007 mm
26	Max. axial load (dynamic)	0.03 N
27	Max. force for press fits (static) (static, shaft supported)	2 N / 20 N
28	Max. radial loading, 1 mm from flange	0.02 N
Other specifications		
29	Number of pole pairs	4
30	Number of phases	3
31	Weight of motor	0.35 g
Ruby bearing with axial pivot bearing		

Values listed in the table are nominal.

Connection

Pin 1	Motor winding 3
Pin 2	Motor winding 2
Pin 3	Motor winding 1
Connector	Article number
MOLEX	52207-0385

Operating Range



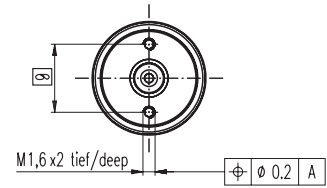
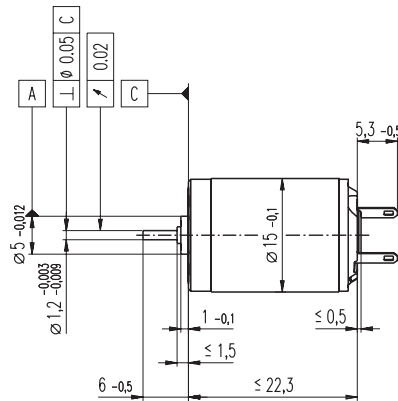
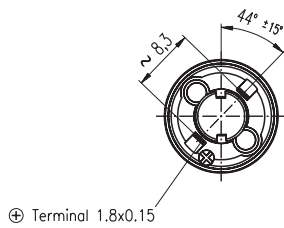
Comments

- 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**

Recommended Electronics:

DECS 5/0.05 Page 298
Notes 20

RE 15 Ø15 mm, Precious Metal Brushes CLL, 1.6 Watt, CE approved



M 1:1

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

Order Number

118643 118644 118645 118646 118647 118648 118649 118650

Motor Data

Values at nominal voltage										
1	Nominal voltage	V	3.0	4.5	6.0	7.2	9.0	12.0	15.0	24.0
2	No load speed	rpm	7770	7450	7980	7740	7710	8370	8110	9890
3	No load current	mA	27.2	17.2	14.1	11.3	8.97	7.45	5.73	4.59
4	Nominal speed	rpm	4420	3080	3610	3370	3320	3930	3700	5480
5	Nominal torque (max. continuous torque)	mNm	1.71	2.25	2.25	2.25	2.24	2.20	2.22	2.19
6	Nominal current (max. continuous current)	A	0.500	0.416	0.333	0.270	0.214	0.171	0.134	0.101
7	Stall torque	mNm	4.03	3.92	4.17	4.06	4.02	4.22	4.16	4.98
8	Starting current	A	1.12	0.697	0.596	0.469	0.370	0.316	0.241	0.220
9	Max. efficiency	%	72	71	72	72	72	72	72	74
Characteristics										
10	Terminal resistance	Ω	2.67	6.46	10.1	15.3	24.4	38.0	62.2	109
11	Terminal inductance	mH	0.0500	0.122	0.190	0.291	0.458	0.692	1.15	1.99
12	Torque constant	mNm / A	3.60	5.62	7.01	8.67	10.9	13.4	17.2	22.7
13	Speed constant	rpm / V	2660	1700	1360	1100	878	714	554	421
14	Speed / torque gradient	rpm / mNm	1970	1950	1960	1950	1970	2030	2000	2030
15	Mechanical time constant	ms	10.9	10.8	10.8	10.8	10.9	10.9	10.9	10.9
16	Rotor inertia	gcm ²	0.528	0.530	0.528	0.530	0.527	0.514	0.519	0.514

Specifications

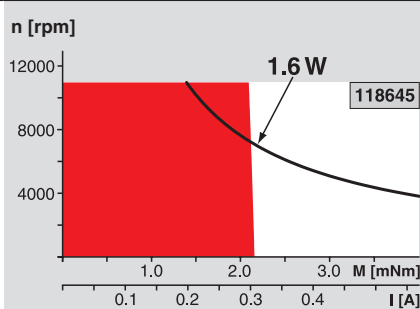
Thermal data		
17	Thermal resistance housing-ambient	35 K / W
18	Thermal resistance winding-housing	8.2 K / W
19	Thermal time constant winding	4.16 s
20	Thermal time constant motor	350 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearing)		
23	Max permissible speed	11000 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.014 mm
26	Max. axial load (dynamic)	0.2 N
27	Max. force for press fits (static)	20 N
28	Max. radial loading, 5 mm from flange	0.5 N

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	5
31	Weight of motor	20 g
CLL = Capacitor Long Life		

Values listed in the table are nominal.
Explanation of the figures on page 49.

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**

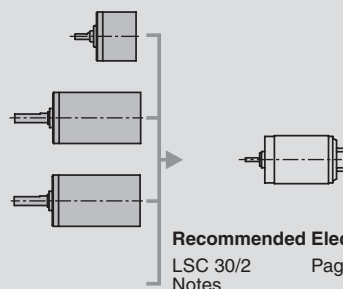
maxon Modular System

Overview on page 16 - 21

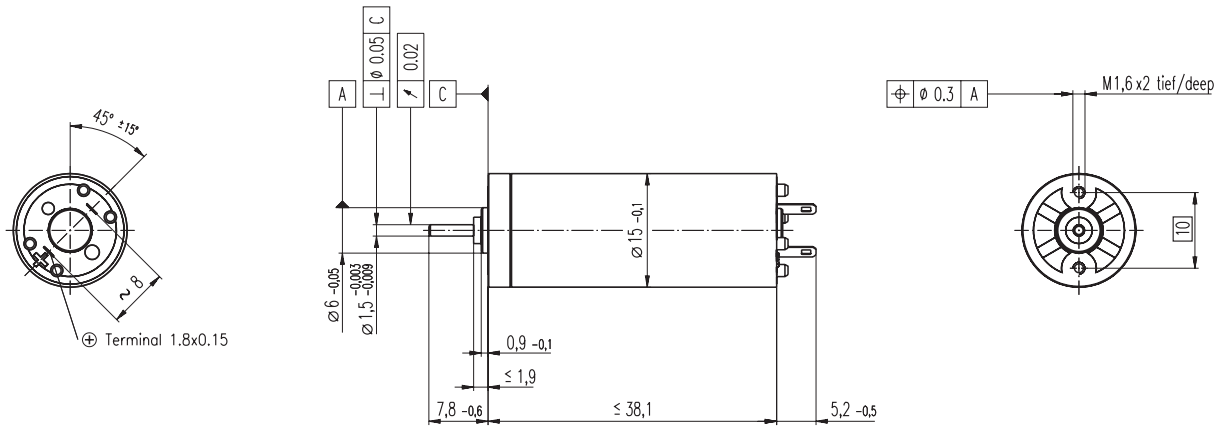
Spur Gearhead
Ø16 mm
0.015 - 0.04 Nm
Page 220

Planetary Gearhead
Ø16 mm
0.06 - 0.18 Nm
Page 223

Planetary Gearhead
Ø16 mm
0.1 - 0.3 Nm
Page 224



A 2515 $\varnothing 15$ mm, Precious Metal Brushes, 2 Watt, C€ approved



M 1:1

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

Order Number

2515. ... -11.111-000 (Insert winding number)

Winding number

980	981	984	985	986	987	988	989	990	992	994
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Motor Data

Values at nominal voltage		980	981	984	985	986	987	988	989	990	992	994	
1	Nominal voltage	Volt	1.2	1.2	3.0	3.6	4.5	6.0	7.2	9.0	12.0	18.0	24.0
2	No load speed	rpm	6010	5600	8070	7750	7740	8070	7740	8060	8600	8500	7180
3	No load current	mA	47.0	42.4	29.7	23.2	18.6	14.8	11.6	9.89	8.22	5.38	3.1
4	Nominal speed	rpm	4690	3970	5040	4040	4030	4330	4000	4260	4810	4650	3270
5	Nominal torque (max. continuous torque)	mNm	1.27	1.37	2.44	3.05	3.05	3.02	3.02	2.96	2.95	2.91	2.90
6	Nominal current (max. continuous current)	A	0.720	0.720	0.720	0.716	0.571	0.443	0.354	0.29	0.231	0.151	0.0946
7	Stall torque	mNm	5.83	4.77	6.54	6.43	6.40	6.57	6.30	6.33	6.74	6.48	5.36
8	Starting current	A	3.11	2.37	1.87	1.47	1.17	0.939	0.721	0.604	0.514	0.326	0.171
9	Max. efficiency	%	77	76	77	77	77	77	77	77	77	77	76
Characteristics			980	981	984	985	986	987	988	989	990	992	994
10	Terminal resistance	Ω	0.386	0.505	1.60	2.45	3.84	6.39	9.99	14.9	23.3	55.2	140
11	Terminal inductance	mH	0.0304	0.0348	0.105	0.164	0.257	0.421	0.657	0.947	1.48	3.4	8.46
12	Torque constant	mNm / A	1.88	2.01	3.49	4.37	5.46	6.99	8.74	10.5	13.1	19.9	31.3
13	Speed constant	rpm / V	5080	4750	2730	2190	1750	1370	1090	911	729	480	305
14	Speed / torque gradient	rpm / mNm	1050	1200	1250	1220	1230	1250	1250	1290	1300	1330	1360
15	Mechanical time constant	ms	18.6	18.1	17.0	16.8	16.8	16.8	16.7	16.8	16.8	16.9	16.9
16	Rotor inertia	gcm ²	1.70	1.44	1.30	1.31	1.30	1.28	1.28	1.24	1.24	1.21	1.18

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 s
20	Thermal time constant motor	n.i.
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearing)		
23	Max permissible speed	9500 rpm
24	Axial play	0.1 - 0.2 mm
25	Radial play	0.012 mm
26	Max. axial load (dynamic)	0.45 N
27	Max. force for press fits (static)	40 N
28	Max. radial loading, 5 mm from flange	1.5 N

Other specifications

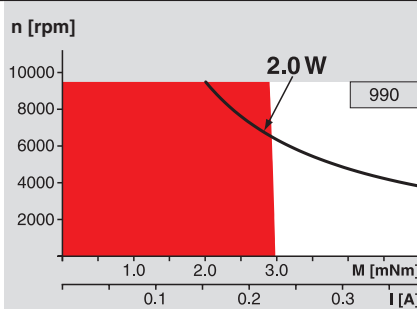
29	Number of pole pairs	1
30	Number of commutator segments	5
31	Weight of motor	30 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

Pigtails in place of terminals

Operating Range



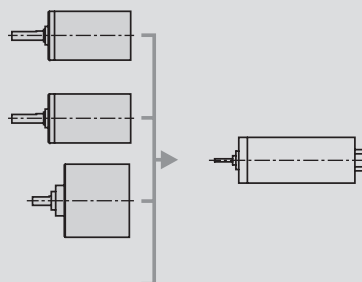
Comments

- 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**

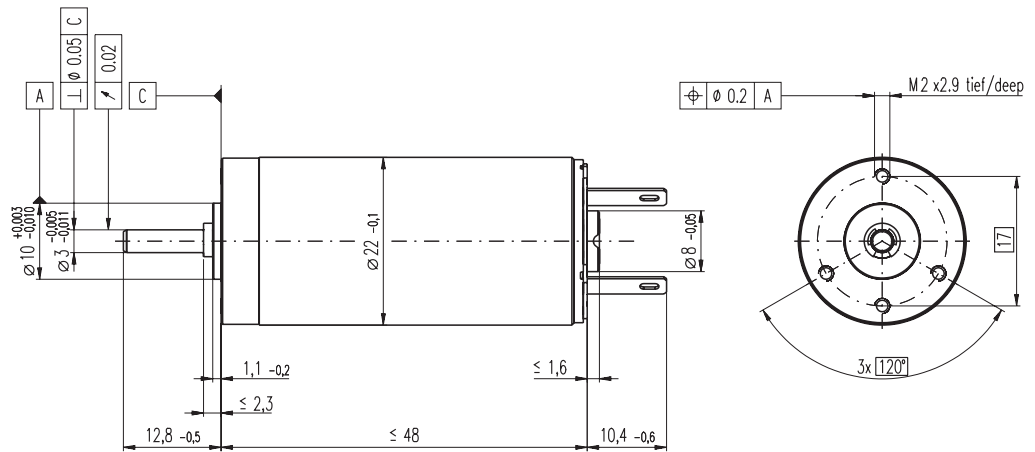
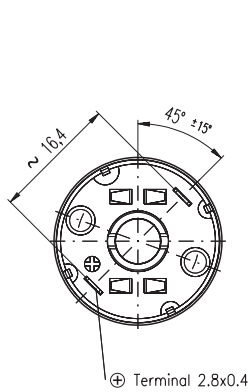
maxon Modular System

Overview on page 16 - 21

- Planetary Gearhead**
 $\varnothing 16$ mm
0.01 - 0.03 Nm
Page 219
- Planetary Gearhead**
 $\varnothing 16$ mm
0.06 - 0.18 Nm
Page 223
- Spur Gearhead**
 $\varnothing 24$ mm
0.1 Nm
Page 234



S 2322 Ø22 mm, Graphite Brushes, 6 Watt, C€ approved



M 1:1

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

Order Number

2322. ... -11.225-200 (Insert winding number)

Winding number

980 981 982 983 985 987

Motor Data

Values at nominal voltage		980	981	982	983	985	987		
1	Nominal voltage	Volt	12.0	15.0	18.0	18.0	24.0	36.0	48.0
2	No load speed	rpm	7010	7000	7530	6690	7190	7240	6370
3	No load current	mA	42.2	33.3	30.6	25.8	21.3	14.3	8.88
4	Nominal speed	rpm	4300	4310	4840	3970	4490	4500	3580
5	Nominal torque (max. continuous torque)	mNm	11.8	12.2	12.2	12.3	12.4	12.3	12.4
6	Nominal current (max. continuous current)	A	0.807	0.654	0.583	0.520	0.420	0.279	0.184
7	Stall torque	mNm	32.9	33.5	35.9	31.4	34.1	33.4	28.8
8	Starting current	A	2.14	1.72	1.64	1.28	1.11	0.724	0.411
9	Max. efficiency	%	70	71	72	71	73	73	73
Characteristics			980	981	982	983	985	987	
10	Terminal resistance	Ω	5.61	8.71	10.9	14.1	21.6	49.7	117
11	Terminal inductance	mH	0.492	0.790	0.995	1.26	1.97	4.43	10.2
12	Torque constant	mNm / A	15.4	19.4	21.8	24.6	30.7	46.1	69.9
13	Speed constant	rpm / V	622	491	437	389	311	207	137
14	Speed / torque gradient	rpm / mNm	227	220	219	223	219	224	228
15	Mechanical time constant	ms	13.9	13.5	13.3	13.3	130	12.9	12.8
16	Rotor inertia	gcm ²	5.84	5.86	5.79	5.70	5.68	5.50	5.37

Specifications

Thermal data		
17	Thermal resistance housing-ambient	14.1 K / W
18	Thermal resistance winding-housing	3.6 K / W
19	Thermal time constant winding	649 s
20	Thermal time constant motor	450 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max permissible speed	9500 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.8 N
27	Max. force for press fits (static)	64 N
28	Max. radial loading, 5 mm from flange	14 N

Other specifications

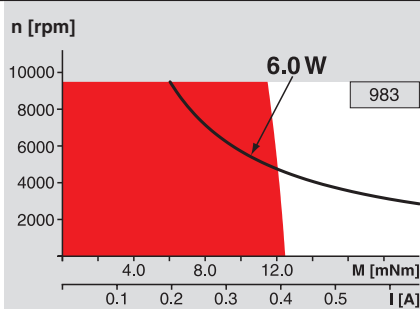
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	92 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

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**

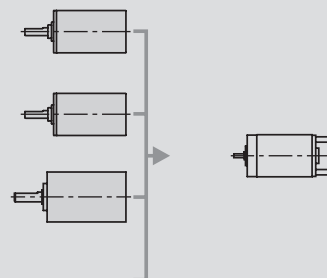
maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
Ø22 mm
0.5 - 1.0 Nm
Page 230

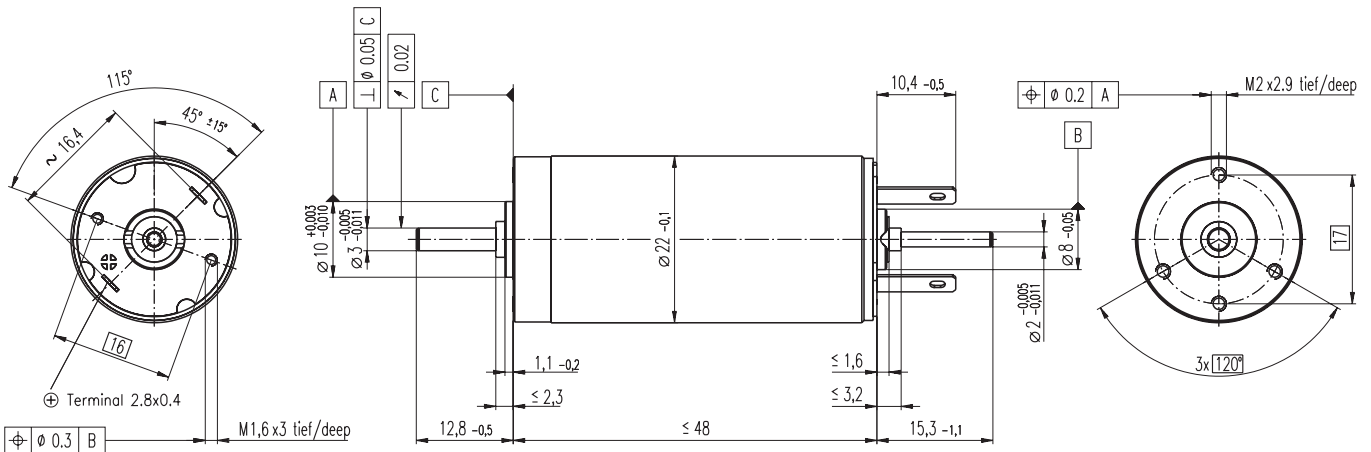
Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 231

Planetary Gearhead
Ø26 mm
0.5 - 2.0 Nm
Page 235



S 2322 Ø22 mm, Graphite Brushes, 6 Watt, C€ approved

maxon special program



M 1:1

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

Order Number

2322. ... -52.235-200 (Insert winding number)

Winding number

980	981	990	982	983	985	987
-----	-----	-----	-----	-----	-----	-----

Motor Data

Values at nominal voltage		980	981	990	982	983	985	987	
1	Nominal voltage	Volt	12.0	15.0	18.0	18.0	24.0	36.0	48.0
2	No load speed	rpm	7010	7000	7530	6690	7190	7240	6370
3	No load current	mA	42.2	33.3	30.6	25.8	21.3	14.3	8.88
4	Nominal speed	rpm	4300	4310	4840	3970	4490	4500	3580
5	Nominal torque (max. continuous torque)	mNm	11.8	12.2	12.2	12.3	12.4	12.3	12.4
6	Nominal current (max. continuous current)	A	0.807	0.654	0.583	0.520	0.420	0.279	0.184
7	Stall torque	mNm	32.9	33.5	35.9	31.4	34.1	33.4	28.8
8	Starting current	A	2.14	1.72	1.64	1.28	1.11	0.724	0.411
9	Max. efficiency	%	70	71	72	71	73	73	73
Characteristics			980	981	990	982	983	985	987
10	Terminal resistance	Ω	5.61	8.71	10.9	14.1	21.6	49.7	117
11	Terminal inductance	mH	0.492	0.790	0.995	1.26	1.97	4.43	10.2
12	Torque constant	mNm / A	15.4	19.4	21.8	24.6	30.7	46.1	69.9
13	Speed constant	rpm / V	622	491	437	389	311	207	137
14	Speed / torque gradient	rpm / mNm	227	220	219	223	219	224	228
15	Mechanical time constant	ms	13.9	13.5	13.3	13.3	13.0	12.9	12.8
16	Rotor inertia	gcm ²	5.84	5.86	5.79	5.70	5.68	5.50	5.37

Specifications

Thermal data		
17	Thermal resistance housing-ambient	14.1 K / W
18	Thermal resistance winding-housing	3.6 K / W
19	Thermal time constant winding	8.91 s
20	Thermal time constant motor	649 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max permissible speed	9500 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.8 N
27	Max. force for press fits (static) (static, shaft supported)	64 N / 240 N
28	Max. radial loading, 5 mm from flange	14 N

Other specifications

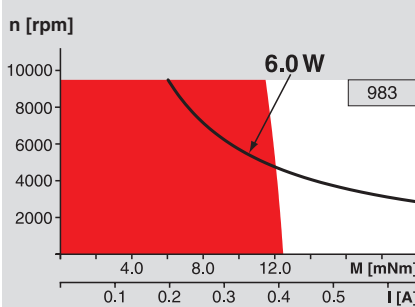
29	Number of pole pairs	1
30	Number of commutator segments	7
31	Weight of motor	92 g

Values listed in the table are nominal. Explanation of the figures on page 49.

Option

Sleeve bearings in place of ball bearings

Operating Range



Comments

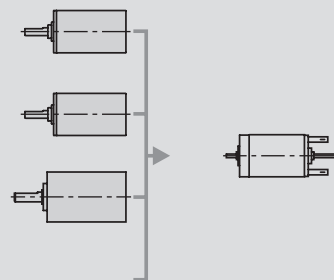
- **Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient. = Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- **Assigned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

maxon Modular System

Planetary Gearhead
Ø22 mm
0.5 - 1.0 Nm
Page 230

Planetary Gearhead
Ø22 mm
0.5 - 2.0 Nm
Page 231

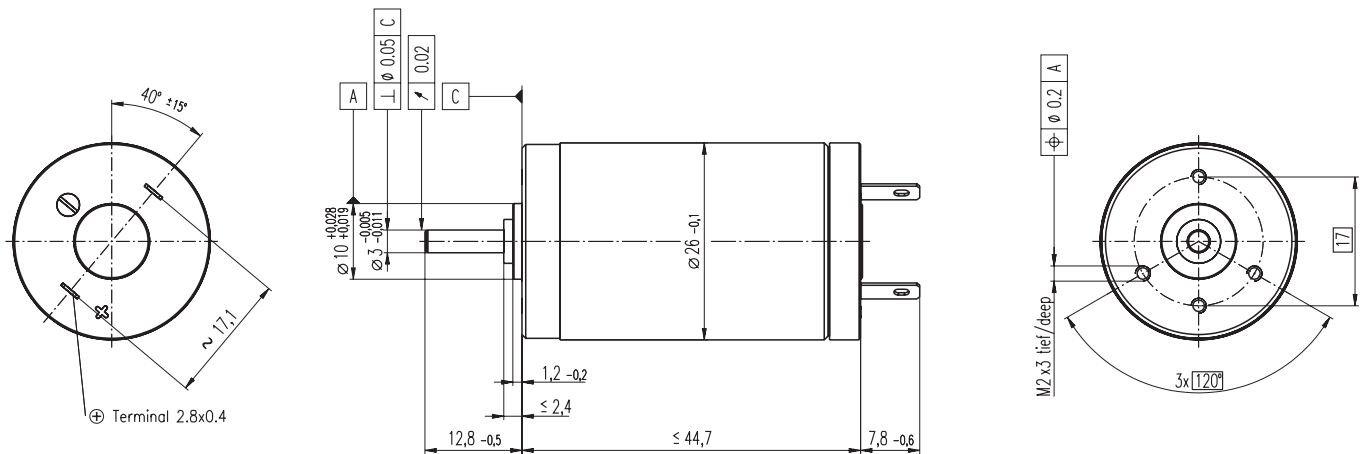
Planetary Gearhead
Ø26 mm
0.5 - 2.0 Nm
Page 235



Overview on page 16 - 21

Encoder Enc
22 mm
100 CPT, 2 channels
Page 260

S 2326 $\varnothing 26$ mm, Precious Metal Brushes, 4 Watt, C€ approved



M 1:1

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

Order Number

2326. ... -12.111-050 (Insert winding number)

Winding number	930	932	933	934	948	936	937	938	945	939	946	940	941	942	949
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Motor Data

Values at nominal voltage			930	932	933	934	948	936	937	938	945	939	946	940	941	942	949
1	Nominal voltage	Volt	3.0	3.6	4.5	6.0	6.0	7.2	9.0	12.0	12.0	15.0	18.0	18.0	24.0	30.0	42.0
2	No load speed	rpm	5380	5590	5920	6410	5390	4920	5120	5540	5390	5450	6030	5300	5940	6020	5680
3	No load current	mA	61.5	54.4	47.4	40.1	30.9	22.5	19.1	16.1	15.5	12.6	12.2	10.0	8.94	7.31	4.79
4	Nominal speed	rpm	4130	3910	4020	4060	2870	2460	2640	3030	2750	2910	3410	2740	3330	3390	2980
5	Nominal torque (max. continuous torque)	mNm	7.63	8.84	10.5	13	13.4	13.8	13.6	13.5	12.8	13.3	12.8	13.2	12.9	12.8	12.4
6	Nominal current (max. continuous current)	A	1.50	1.50	1.50	1.50	1.30	1.02	0.837	0.671	0.621	0.522	0.465	0.420	0.345	0.277	0.182
7	Stall torque	mNm	33.2	29.6	32.9	35.6	28.9	27.9	28.3	30.0	26.4	28.7	29.8	27.5	29.5	29.4	26.4
8	Starting current	A	6.29	4.87	4.57	4.02	2.75	2.02	1.71	1.46	1.25	1.11	1.06	0.858	0.773	0.626	0.378
9	Max. efficiency	%	82	80	81	81	80	80	80	81	79	80	80	80	80	80	79
Characteristics																	
10	Terminal resistance	Ω	0.477	0.739	0.984	1.49	2.18	3.57	5.27	8.19	9.57	13.6	17.1	21.0	31.0	48.0	111
11	Terminal inductance	mH	0.0652	0.0866	0.121	0.183	0.258	0.447	0.644	0.980	1.03	1.58	1.86	2.41	3.41	5.17	11.4
12	Torque constant	mNm / A	5.28	6.08	7.19	8.85	10.5	13.8	16.6	20.5	21.0	26.0	28.2	32.1	38.2	47.0	69.7
13	Speed constant	rpm / mNm	1810	1570	1330	1080	909	691	576	467	455	367	339	298	250	203	137
14	Speed / torque gradient	rpm / mNm	163	191	182	182	189	179	183	187	207	192	205	195	204	207	218
15	Mechanical time constant	ms	19.0	18.6	18.2	18.0	17.9	17.7	17.7	17.7	17.9	17.8	17.9	17.8	17.9	18.0	18.1
16	Rotor inertia	gcm ²	11.1	9.30	9.57	9.42	9.03	9.46	9.23	9.03	8.24	8.84	8.32	8.71	8.38	8.27	7.91

Specifications

Thermal data		
17	Thermal resistance housing-ambient	17 K / W
18	Thermal resistance winding-housing	2.4 K / W
19	Thermal time constant winding	5.72 s
20	Thermal time constant motor	926 s
21	Ambient temperature	-20 ... +65°C
22	Max. permissible winding temperature	+85°C
Mechanical data (sleeve bearing)		
23	Max permissible speed	6400 rpm
24	Axial play	0.05 - 0.15 mm
25	Radial play	0.02 mm
26	Max. axial load (dynamic)	1 N
27	Max. force for press fits (static)	100 N
28	Max. radial loading, 5 mm from flange	4.3 N

Other specifications

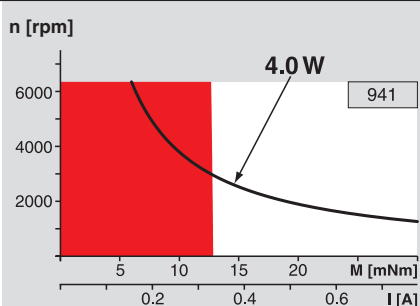
29	Number of pole pairs	1
30	Number of commutator segments	11
31	Weight of motor	107 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

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

Operating Range



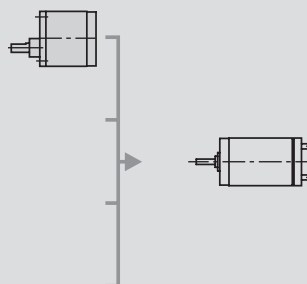
Comments

- **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

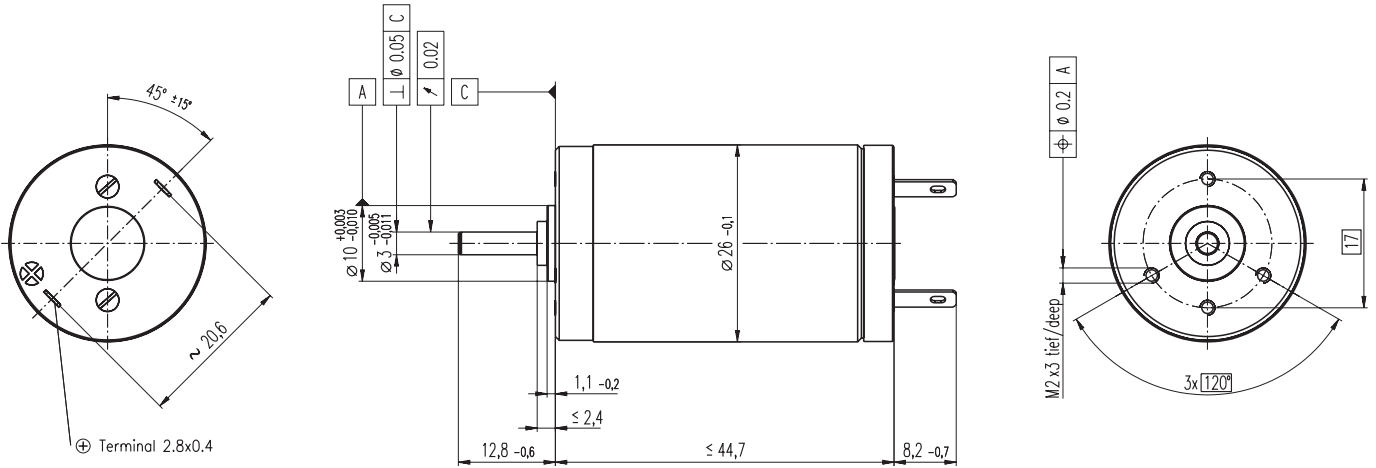
Overview on page 16 - 21

Spur Gearhead
 $\varnothing 30$ mm
0.07 - 0.2 Nm
Page 236



S 2326 Ø26 mm, Graphite Brushes, 6 Watt, C€ approved

maxon special program



M 1:1

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

Order Number

2326. ... -12.216-200 (Insert winding number)

Winding number	930	933	934	948	936	944	937	938	945	939	946	940	941	942	949
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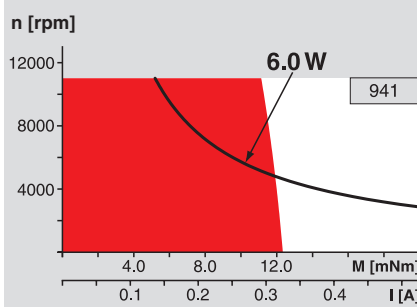
Motor Data

Values at nominal voltage			930	933	934	948	936	944	937	938	945	939	946	940	941	942	949
1	Nominal voltage	Volt	3.0	7.2	9.0	12.0	12.0	12.0	15.0	18.0	18.0	24.0	24.0	30.0	36.0	42.0	48.0
2	No load speed	rpm	5080	9270	9460	10700	8110	7770	8460	8240	8010	8660	7970	8780	8850	8380	6440
3	No load current	mA	114	101	82.6	72.9	50.0	47.4	42.3	34.0	32.7	27.2	24.4	22.2	18.7	14.9	9.21
4	Nominal speed	rpm	2980	6760	6870	8140	5640	5120	6020	5790	5440	6220	5440	6330	6360	5870	3820
5	Nominal torque (max. continuous torque)	mNm	7.38	10.1	11.4	11.3	12.3	11.5	12.3	12.4	11.8	12.3	12.0	12.3	12.0	12.0	12.0
6	Nominal current (max. continuous current)	A	1.50	1.50	1.36	1.15	0.936	0.839	0.781	0.636	0.592	0.498	0.448	0.403	0.332	0.269	0.180
7	Stall torque	mNm	20.9	42.5	45.7	51.7	42.7	35.1	44.4	43.0	38.0	44.7	38.7	44.9	43.6	40.7	29.9
8	Starting current	A	3.96	5.91	5.17	4.92	3.09	2.44	2.68	2.10	1.81	1.72	1.37	1.40	1.14	0.866	0.430
9	Max. efficiency	%	64	73	75	76	75	73	76	76	75	76	75	77	76	76	73
Characteristics																	
10	Terminal resistance	Ω	0.758	1.22	1.74	2.44	3.88	4.92	5.60	8.56	9.96	14.0	17.5	21.4	31.5	48.5	112
11	Terminal inductance	mH	0.0652	0.121	0.183	0.258	0.447	0.484	0.644	0.980	1.03	1.58	1.86	2.41	3.41	5.17	11.4
12	Torque constant	mNm / A	5.28	7.19	8.85	10.5	13.8	14.4	16.6	20.5	21.0	26.0	28.2	32.1	38.2	47.0	69.7
13	Speed constant	rpm / V	1810	1330	1080	909	691	664	576	467	455	367	339	298	250	203	137
14	Speed / torque gradient	rpm / mNm	260	225	213	211	194	227	194	195	215	197	210	199	207	210	220
15	Mechanical time constant	ms	30.2	22.6	21.0	20.0	19.3	19.3	18.8	18.5	18.6	18.3	18.4	18.2	18.2	18.2	18.2
16	Rotor inertia	gcm ²	11.1	9.58	9.43	9.04	9.47	8.11	9.25	9.05	8.25	8.86	8.34	8.72	8.40	8.28	7.93

Specifications

Thermal data		
17	Thermal resistance housing-ambient	17 K / W
18	Thermal resistance winding-housing	2.4 K / W
19	Thermal time constant winding	5.72 s
20	Thermal time constant motor	926 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max permissible speed	11000 rpm
24	Axial play	0.5 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	2.8 N
27	Max. force for press fits (static)	64 N
28	Max. radial loading, 5 mm from flange	14 N

Operating Range



Comments

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

Other specifications

29	Number of pole pairs	1
30	Number of commutator segments	11
31	Weight of motor	109 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

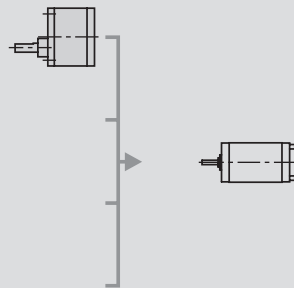
Option

- Sleeve bearings in place of ball bearings
- Pigtails in place of terminals

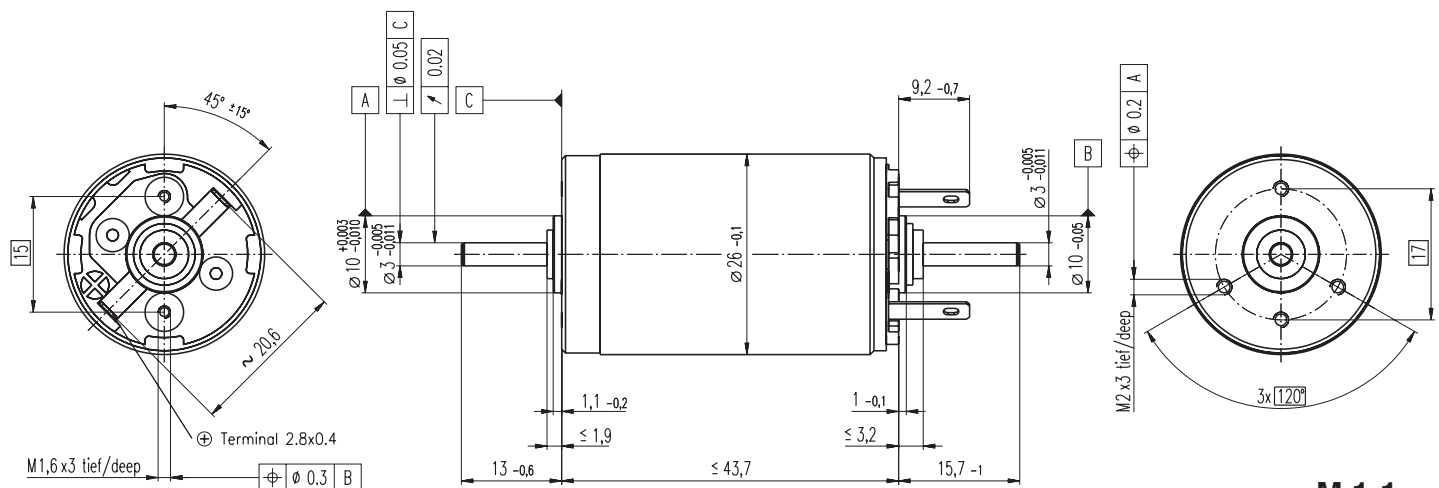
maxon Modular System

Overview on page 16 - 21

Spur Gearhead
Ø38 mm
0.1 - 0.6 Nm
Page 243



S 2326 $\varnothing 26$ mm, Graphite Brushes, 6 Watt, C€ approved



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

Order Number

2326. ... -52.236-200 (Insert winding number)

Winding number	930	933	934	948	936	944	937	938	945	939	946	940	941	942	949
----------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Motor Data

Values at nominal voltage			3.0	7.2	9.0	12.0	12.0	12.0	15.0	18.0	18.0	24.0	24.0	30.0	36.0	42.0	48.0
1	Nominal voltage	Volt	3.0	7.2	9.0	12.0	12.0	12.0	15.0	18.0	18.0	24.0	24.0	30.0	36.0	42.0	48.0
2	No load speed	rpm	5080	9270	9460	10700	8110	7770	8460	8240	8010	8660	7970	8780	8850	8380	6440
3	No load current	mA	114	101	82.6	72.9	50.0	47.4	42.3	34.0	32.7	27.2	24.4	22.2	18.7	14.9	9.21
4	Nominal speed	rpm	2980	6760	6870	8140	5640	5120	6020	5790	5440	6220	5440	6330	6360	5870	3820
5	Nominal torque (max. continuous torque)	mNm	7.38	10.1	11.4	11.3	12.3	11.5	12.3	12.4	11.8	12.3	12.0	12.3	12.0	12.0	12.0
6	Nominal current (max. continuous current)	A	1.50	1.50	1.36	1.15	0.936	0.839	0.781	0.636	0.592	0.498	0.448	0.403	0.332	0.269	0.180
7	Stall torque	mNm	20.9	42.5	45.7	51.7	42.7	35.1	44.4	43.0	38.0	44.7	38.7	44.9	43.6	40.7	29.9
8	Starting current	A	3.96	5.91	5.17	4.92	3.09	2.44	2.68	2.10	1.81	1.72	1.37	1.40	1.14	0.866	0.43
9	Max. efficiency	%	64	73	75	76	75	73	76	76	75	76	75	77	76	76	73
Characteristics			0.758	1.22	1.74	2.44	3.88	4.92	5.60	8.56	9.96	14.0	17.5	21.4	31.5	48.5	112
10	Terminal resistance	Ω	0.758	1.22	1.74	2.44	3.88	4.92	5.60	8.56	9.96	14.0	17.5	21.4	31.5	48.5	112
11	Terminal inductance	mH	0.0652	0.121	0.183	0.258	0.447	0.484	0.644	0.980	1.03	1.58	1.86	2.41	3.41	5.17	11.4
12	Torque constant	mNm / A	5.28	7.19	8.85	10.5	13.8	14.4	16.6	20.5	21.0	26.0	28.2	32.1	38.2	47.0	69.7
13	Speed constant	rpm / V	1810	1330	1080	909	691	664	576	467	455	367	339	298	250	203	137
14	Speed / torque gradient	rpm / mNm	260	225	213	211	194	227	194	195	215	197	210	199	207	210	220
15	Mechanical time constant	ms	30.2	22.6	21.0	20.0	19.3	19.3	18.8	18.5	18.6	18.3	18.4	18.2	18.2	18.2	18.2
16	Rotor inertia	gcm ²	11.1	9.58	9.43	9.04	9.47	8.11	9.25	9.05	8.25	8.86	8.34	8.72	8.40	8.28	7.93

Specifications

Thermal data			17 K / W
17	Thermal resistance housing-ambient	17 K / W	17 K / W
18	Thermal resistance winding-housing	2.4 K / W	2.4 K / W
19	Thermal time constant winding	5.72 s	5.72 s
20	Thermal time constant motor	926 s	926 s
21	Ambient temperature	-20 ... +100°C	-20 ... +100°C
22	Max. permissible winding temperature	+125°C	+125°C
Mechanical data (ball bearings)			11000 rpm
23	Max permissible speed	11000 rpm	11000 rpm
24	Axial play	0.5 - 0.15 mm	0.5 - 0.15 mm
25	Radial play	0.025 mm	0.025 mm
26	Max. axial load (dynamic)	2.8 N	2.8 N
27	Max. force for press fits (static) (static, shaft supported)	64 N	64 N
28	Max. radial loading, 5 mm from flange	700 N	700 N
		14 N	14 N

Other specifications

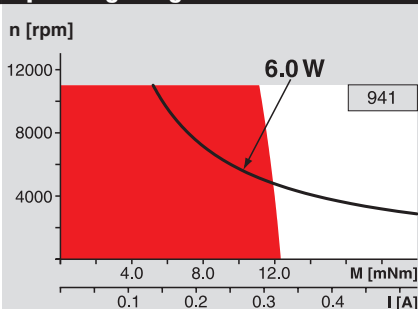
29	Number of pole pairs	1
30	Number of commutator segments	11
31	Weight of motor	109 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

Sleeve bearings in place of ball bearings
Pigtails in place of terminals

Operating Range

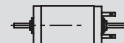
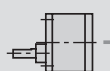


Comments

- **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

Spur Gearhead
 $\varnothing 38$ mm
0.1 - 0.6 Nm
Page 243

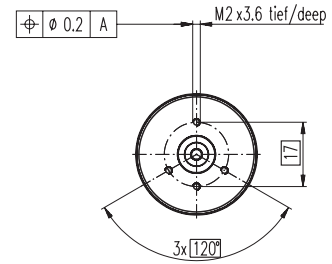
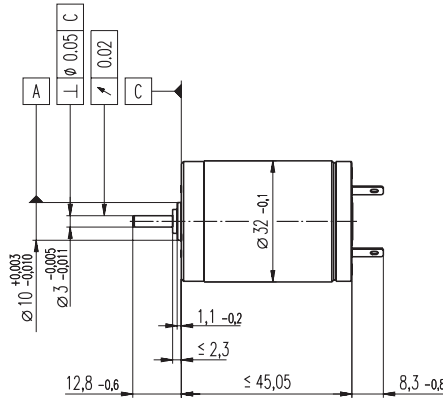
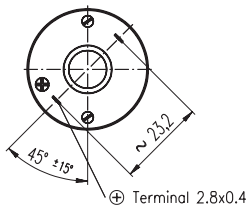


Overview on page 16 - 21

- Encoder Enc**
22 mm
100 CPT, 2 channels
Page 260
- Encoder HEDS 5540**
500 CPT,
3 channels
Page 263
- Encoder HEDL 5540**
500 CPT,
3 channels
Page 264
- DC-Tacho DCT**
 $\varnothing 22$ mm
0.52 V
Page 271

S 2332 Ø32 mm, Graphite Brushes, 11 Watt, CE approved

maxon special program



M 1:2

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

Order Number

2332. ... -12.256-200 (Insert winding number)

Winding number

900	904	905	906	908	909	910	911	912	913
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Motor Data

Values at nominal voltage		900	904	905	906	908	909	910	911	912	913	
1	Nominal voltage	Volt	4.5	9.0	9.0	12.0	18.0	24.0	30.0	36.0	48.0	48.0
2	No load speed	rpm	7730	8510	7370	7930	7980	8830	8770	8400	8930	7390
3	No load current	mA	160	82.8	68.0	55.2	36.5	31.1	24.5	19.2	15.6	12.1
4	Nominal speed	rpm	6070	6410	5120	5740	5820	6690	6640	6230	6780	5190
5	Nominal torque (max. continuous torque)	mNm	6.32	13.3	15.4	16.1	16.9	17.0	17.3	17.3	17.4	17.4
6	Nominal current (max. continuous current)	A	1.50	1.50	1.48	1.23	0.847	0.703	0.565	0.448	0.359	0.298
7	Stall torque	mNm	52.3	66.4	58.8	66.2	67.4	74.5	74.7	69.4	74.5	59.9
8	Starting current	A	11.2	7.10	5.42	4.84	3.25	2.96	2.34	1.73	1.48	0.986
9	Max. efficiency	%	60	72	72	75	77	78	79	79	80	78
Characteristics												
10	Terminal resistance	Ω	0.403	1.27	1.66	2.48	5.54	8.12	12.8	20.8	32.5	48.7
11	Terminal inductance	mH	0.0417	0.167	0.224	0.357	0.821	1.21	1.94	3.06	4.85	7.05
12	Torque constant	mNm / A	4.68	9.35	10.8	13.7	20.8	25.2	31.9	40.0	50.4	60.8
13	Speed constant	rpm / V	2040	1020	881	698	460	379	300	239	189	157
14	Speed / torque gradient	rpm / mNm	176	138	135	126	123	122	120	124	122	126
15	Mechanical time constant	ms	39.5	28.1	27.7	26.1	24.8	24.3	24.0	23.9	23.6	23.7
16	Rotor inertia	gcm ²	21.5	19.4	19.6	19.7	19.3	19.0	19.0	18.4	18.5	18.0

Specifications

Thermal data		
17	Thermal resistance housing-ambient	13.5 K / W
18	Thermal resistance winding-housing	2.2 K / W
19	Thermal time constant winding	8.51 s
20	Thermal time constant motor	1170 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max permissible speed	9200 rpm
24	Axial play	0.5 - 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
28	Max. radial loading, 5 mm from flange	16 N

Other specifications

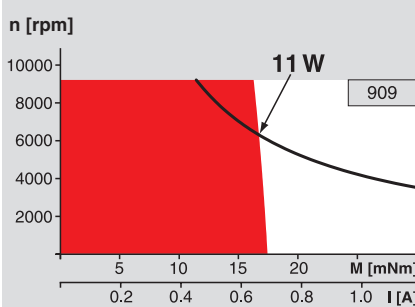
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	174 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

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**

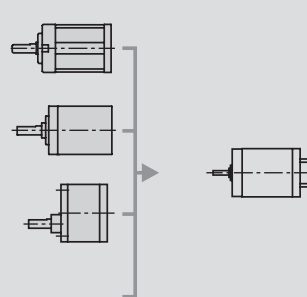
maxon Modular System

Overview on page 16 - 21

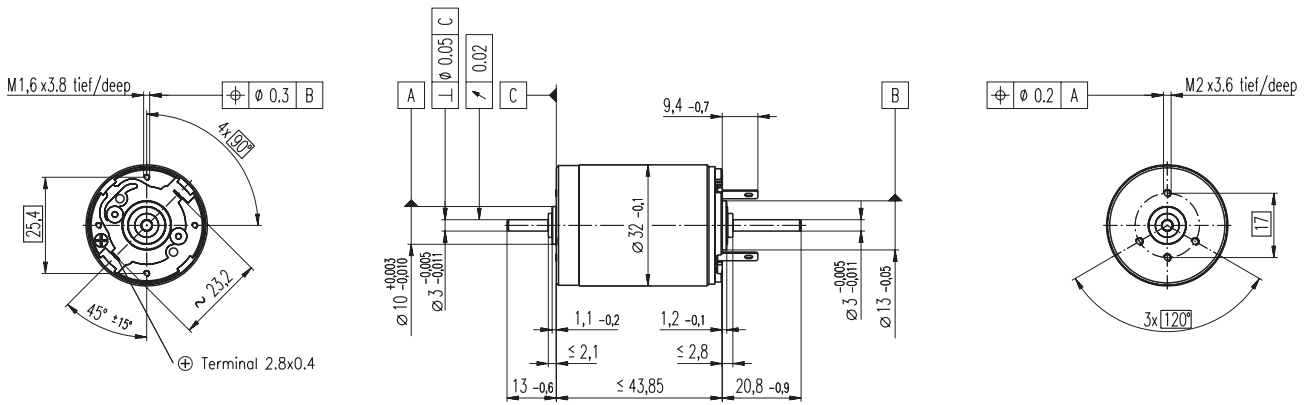
Planetary Gearhead
Ø32 mm
0.4 - 2.0 Nm
Page 237

Planetary Gearhead
Ø32 mm
0.75 - 4.5 Nm
Page 238

Spur Gearhead
Ø38 mm
0.1 - 0.6 Nm
Page 243



S 2332 Ø32 mm, Graphite Brushes, 11 Watt, CE approved



M 1:2

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

Order Number

2332. ... -55.276-200 (Insert winding number)

Winding number

900	904	905	906	908	909	910	911	912	913
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Motor Data

Values at nominal voltage		900	904	905	906	908	909	910	911	912	913	
1	Nominal voltage	Volt	4.5	9.0	9.0	12.0	18.0	24.0	30.0	36.0	48.0	48.0
2	No load speed	rpm	7730	8510	7370	7930	7980	8830	8770	8400	8930	7390
3	No load current	mA	160	82.8	68.0	55.2	36.5	31.1	24.5	19.2	15.6	12.1
4	Nominal speed	rpm	6070	6410	5120	5740	5820	6690	6640	6230	6780	5190
5	Nominal torque (max. continuous torque)	mNm	6.32	13.3	15.4	16.1	16.9	17.0	17.3	17.3	17.4	17.4
6	Nominal current (max. continuous current)	A	1.50	1.50	1.48	1.23	0.847	0.703	0.565	0.448	0.359	0.298
7	Stall torque	mNm	52.3	66.4	58.8	66.2	67.4	74.5	74.7	69.4	74.5	59.9
8	Starting current	A	11.2	7.10	5.42	4.84	3.25	2.96	2.34	1.73	1.48	0.986
9	Max. efficiency	%	60	72	72	75	77	78	79	79	80	78
Characteristics			900	904	905	906	908	909	910	911	912	913
10	Terminal resistance	Ω	0.403	1.27	1.66	2.48	5.54	8.12	12.8	20.8	32.5	48.7
11	Terminal inductance	mH	0.0417	0.167	0.224	0.357	0.821	1.21	1.94	3.06	4.85	7.05
12	Torque constant	mNm / A	4.68	9.35	10.8	13.7	20.8	25.2	31.9	40.0	50.4	60.8
13	Speed constant	rpm / V	2040	1020	881	698	460	379	300	239	189	157
14	Speed / torque gradient	rpm / mNm	176	138	135	126	123	122	120	124	122	126
15	Mechanical time constant	ms	39.5	28.1	27.7	26.1	24.8	24.3	24.0	23.9	23.6	23.7
16	Rotor inertia	gcm ²	21.5	19.4	19.6	19.7	19.3	19.0	19.0	18.4	18.5	18.0

Specifications

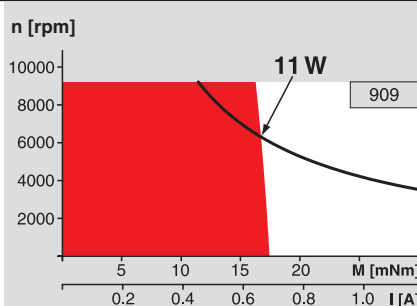
Thermal data		
17	Thermal resistance housing-ambient	13.5 K / W
18	Thermal resistance winding-housing	2.2 K / W
19	Thermal time constant winding	8.51 s
20	Thermal time constant motor	1170 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (preloaded ball bearings)		
23	Max permissible speed	9200 rpm
24	Axial play	0.5 - 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)	1200 N
28	Max. radial loading, 5 mm from flange	16 N
Other specifications		
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	174 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

- Sleeve bearings in place of ball bearings
- Pigtails in place of terminals

Operating Range

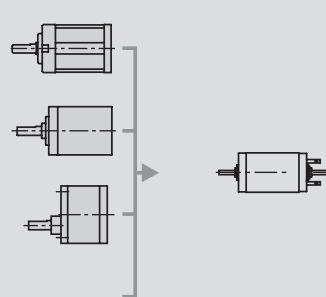


Comments

- 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

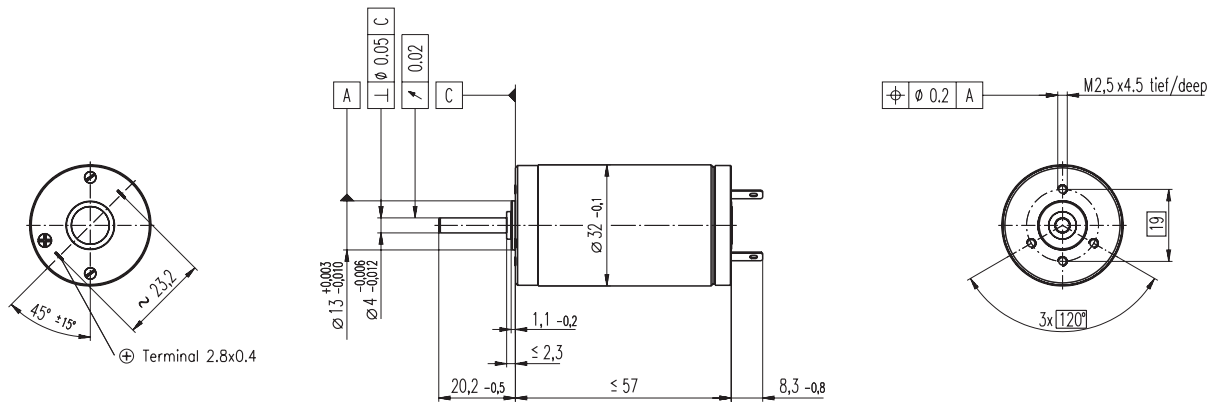
- Planetary Gearhead**
Ø32 mm
0.4 - 2.0 Nm
Page 237
- Planetary Gearhead**
Ø32 mm
0.75 - 4.5 Nm
Page 238
- Spur Gearhead**
Ø38 mm
0.1 - 0.6 Nm
Page 243



Overview on page 16 - 21

- Encoder Enc**
22 mm
100 CPT, 2 channels
Page 260
- Encoder HEDS 5540**
500 CPT,
3 channels
Page 263
- Encoder HEDL 5540**
500 CPT,
3 channels
Page 265
- DC-Tacho DCT**
Ø22 mm
0.52 V
Page 271

S 2332 Ø32 mm, Graphite Brushes, 15 Watt, CE approved



M 1:2

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

Order Number

2332. ... -12.216-200 (Insert winding number)

Winding number

960	963	964	965	966	967	968	969	970	971	972	973
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Motor Data

Values at nominal voltage		960	963	964	965	966	967	968	969	970	971	972	973
1	Nominal voltage	Volt	6.0	9.0	12.0	12.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
2	No load speed	rpm	5810	5310	6650	5870	4880	5380	5750	6000	5710	5270	4860
3	No load current	mA	110	63.9	65.0	54.6	42.4	32.1	26.3	22.3	17.3	13.3	10.4
4	Nominal speed	rpm	4560	3780	5040	4230	3250	3880	4280	4530	4250	3790	3370
5	Nominal torque (max. continuous torque)	mNm	13.2	22.7	24.3	25.9	26.5	28.6	29.1	28.9	29.3	29.2	29.3
6	Nominal current (max. continuous current)	A	1.50	1.50	1.50	1.40	1.19	0.939	0.763	0.633	0.508	0.399	0.323
7	Stall torque	mNm	89.1	91.1	116	104	85.6	109	119	122	118	106	97.1
8	Starting current	A	9.45	5.79	6.87	5.42	3.72	3.46	3.02	2.59	1.97	1.41	1.04
9	Max. efficiency	%	73	77	79	79	78	81	82	82	82	81	81
Characteristics			960	963	964	965	966	967	968	969	970	971	972
10	Terminal resistance	Ω	0.635	1.56	1.75	2.21	3.22	5.21	7.94	11.6	18.2	29.8	46.1
11	Terminal inductance	mH	0.0883	0.246	0.283	0.363	0.526	0.985	1.54	2.22	3.53	5.64	
12	Torque constant	mNm / A	9.43	15.7	16.9	19.1	23.0	31.5	39.3	47.2	59.6	75.3	
13	Speed constant	rpm / V	1010	607	566	500	415	303	243	202	160	127	
14	Speed / torque gradient	rpm / mNm	68.3	60.0	58.7	57.9	58.2	50.2	49.0	49.6	49.1	50.3	
15	Mechanical time constant	ms	23.6	17.2	16.4	16.0	15.5	14.6	14.3	14.1	14.0	13.9	
16	Rotor inertia	gcm ²	33.0	27.4	26.7	26.4	25.5	27.9	27.8	27.2	27.1	26.4	

Specifications

Thermal data		
17	Thermal resistance housing-ambient	12.5 K / W
18	Thermal resistance winding-housing	1.9 K / W
19	Thermal time constant winding	10.9 s
20	Thermal time constant motor	1440 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max permissible speed	9200 rpm
24	Axial play	0.5 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.6 N
27	Max. force for press fits (static)	113 N
28	Max. radial loading, 5 mm from flange	28 N

Other specifications

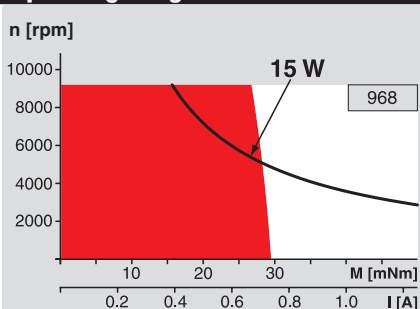
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	230 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

Sleeve bearings in place of ball bearings
Pigtails in place of terminals

Operating Range



Comments

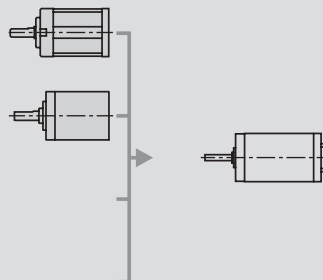
- Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- Assigned power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

maxon Modular System

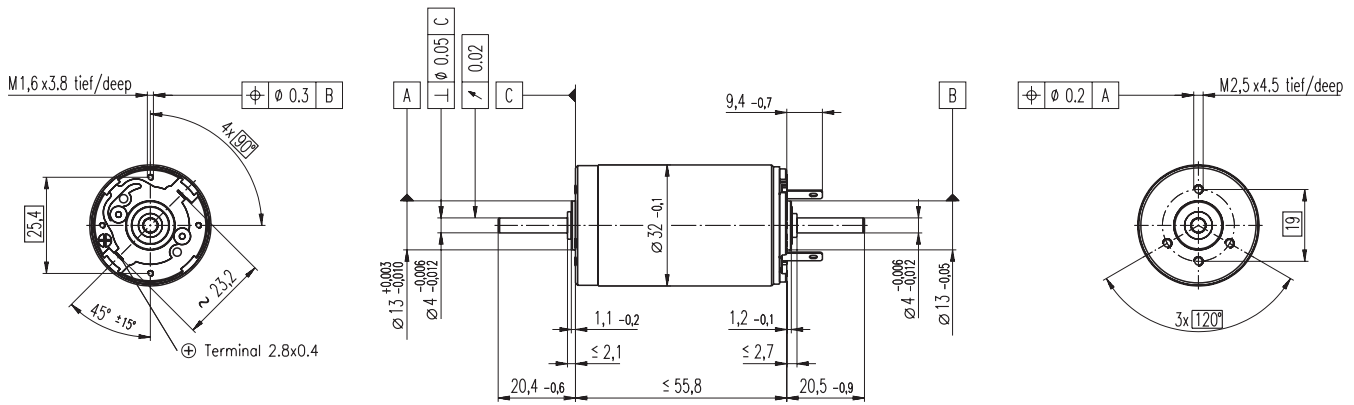
Overview on page 16 - 21

Planetary Gearhead
Ø32 mm
0.4 - 2.0 Nm
Page 237

Planetary Gearhead
Ø32 mm
0.75 - 4.5 Nm
Page 238



S 2332 Ø32 mm, Graphite Brushes, 15 Watt, CE approved



M 1:2

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

Order Number

2332. ... -51.236-200 (Insert winding number)

Winding number

960	963	964	965	966	967	968	969	970	971	972	973
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Motor Data

Values at nominal voltage		960	963	964	965	966	967	968	969	970	971	972	973
1	Nominal voltage	Volt	6.0	9.0	12.0	12.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0
2	No load speed	rpm	5810	5310	6650	5870	4880	5380	5750	6000	5710	5270	4860
3	No load current	mA	110	63.9	65.0	54.6	42.4	32.1	26.3	22.3	17.3	13.3	10.4
4	Nominal speed	rpm	4560	3780	5040	4230	3250	3880	4280	4530	4250	3790	3370
5	Nominal torque (max. continuous torque)	mNm	13.2	22.7	24.3	25.9	26.5	28.6	29.1	28.9	29.3	29.2	29.3
6	Nominal current (max. continuous current)	A	1.50	1.50	1.50	1.40	1.19	0.939	0.763	0.633	0.508	0.399	0.323
7	Stall torque	mNm	89.1	91.1	116	104	85.6	109	119	122	118	106	97.1
8	Starting current	A	9.45	5.79	6.87	5.42	3.72	3.46	3.02	2.59	1.97	1.41	1.04
9	Max. efficiency	%	73	77	79	79	78	81	82	82	82	81	81
Characteristics			960	963	964	965	966	967	968	969	970	971	972
10	Terminal resistance	Ω	0.635	1.56	1.75	2.21	3.22	5.21	7.94	11.6	18.2	29.8	46.1
11	Terminal inductance	mH	0.0883	0.246	0.283	0.363	0.526	0.985	1.54	2.22	3.53	5.64	
12	Torque constant	mNm / A	9.43	15.7	16.9	19.1	23.0	31.5	39.3	47.2	59.6	75.3	
13	Speed constant	rpm / V	1010	607	566	500	415	303	243	202	160	127	
14	Speed / torque gradient	rpm / mNm	68.3	60.0	58.7	57.9	58.2	50.2	49.0	49.6	49.1	50.3	
15	Mechanical time constant	ms	23.6	17.2	16.4	16.0	15.5	14.6	14.3	14.1	14.0	13.9	
16	Rotor inertia	gcm ²	33.0	27.4	26.7	26.4	25.5	27.9	27.8	27.2	27.1	26.4	

Specifications

Thermal data		
17	Thermal resistance housing-ambient	12.5 K / W
18	Thermal resistance winding-housing	1.9 K / W
19	Thermal time constant winding	10.9 s
20	Thermal time constant motor	1440 s
21	Ambient temperature	-20 ... +100°C
22	Max. permissible winding temperature	+125°C
Mechanical data (ball bearings)		
23	Max permissible speed	9200 rpm
24	Axial play	0.5 - 0.15 mm
25	Radial play	0.025 mm
26	Max. axial load (dynamic)	5.6 N
27	Max. force for press fits (static)	113 N
	(static, shaft supported)	1200 N
28	Max. radial loading, 5 mm from flange	28 N

Other specifications

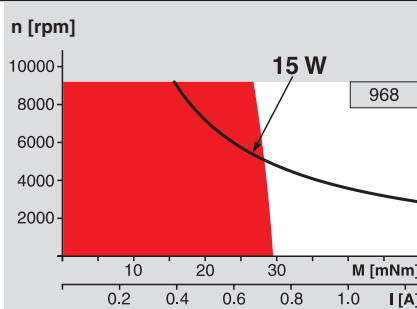
29	Number of pole pairs	1
30	Number of commutator segments	13
31	Weight of motor	230 g

Values listed in the table are nominal.
Explanation of the figures on page 49.

Option

- Sleeve bearings in place of ball bearings
- Pigtails in place of terminals

Operating Range



Comments

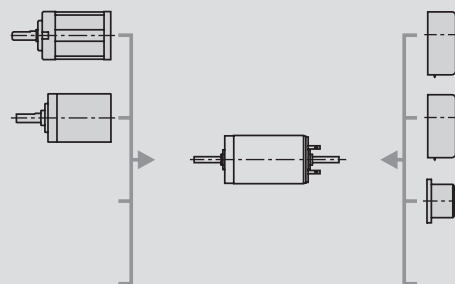
- **Continuous operation**
In observation of above listed thermal resistance (lines 17 and 18) the maximum permissible winding temperature will be reached during continuous operation at 25°C ambient.
= Thermal limit.
- Short term operation**
The motor may be briefly overloaded (recurring).
- **Assigned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

maxon Modular System

Overview on page 16 - 21

Planetary Gearhead
Ø32 mm
0.4 - 2.0 Nm
Page 237

Planetary Gearhead
Ø32 mm
0.75 - 4.5 Nm
Page 238



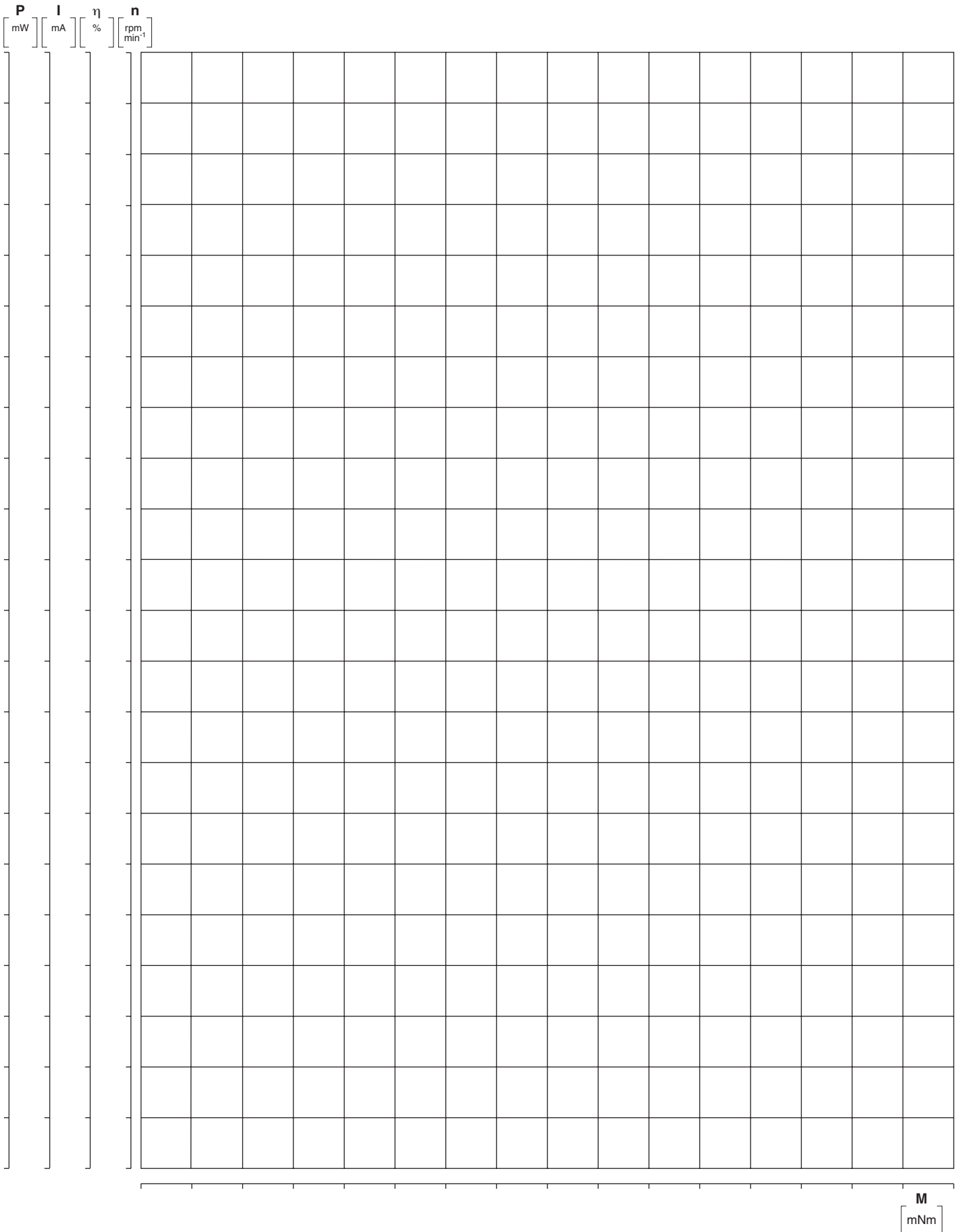
Encoder HEDS 5540
500 CPT,
3 channels
Page 263

Encoder HEDL 5540
500 CPT,
3 channels
Page 265

DC-Tacho DCT
Ø22 mm
0.52 V
Page 271

For your personal notes

maxon motor





maxon special design

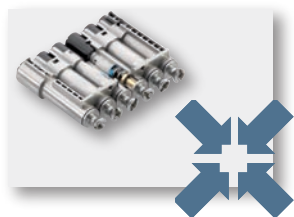
In addition to the extensive range of standard products, maxon develops, together with the customer, custom made solutions for special drive problems. This ranges from modification of standard products, through newly designed assembly parts to the complete new development of drive units.

Special motors and gearheads

328 - 332

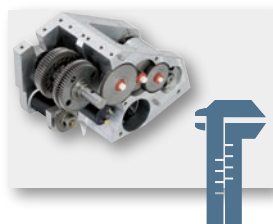
maxon special design

New products demand new solutions



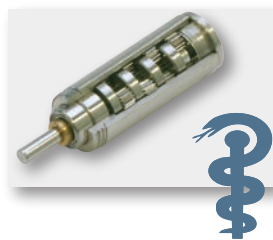
Compactness

Increasing miniaturisation demands exceptional functionality in minimal space. As the dimensions are so small, controllers and drives must be developed on a coupled basis.



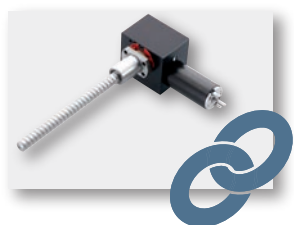
Precision

Only high-precision drive solutions enable today's machinery to make fine mechanical movements – a must for different types of applications.



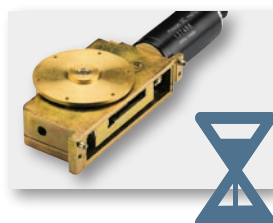
Sterilisability

The inclusion of electrical drive technology in medical and food technology requires sterilisability, a process that is very demanding on drive solutions and for which expert knowledge is essential.



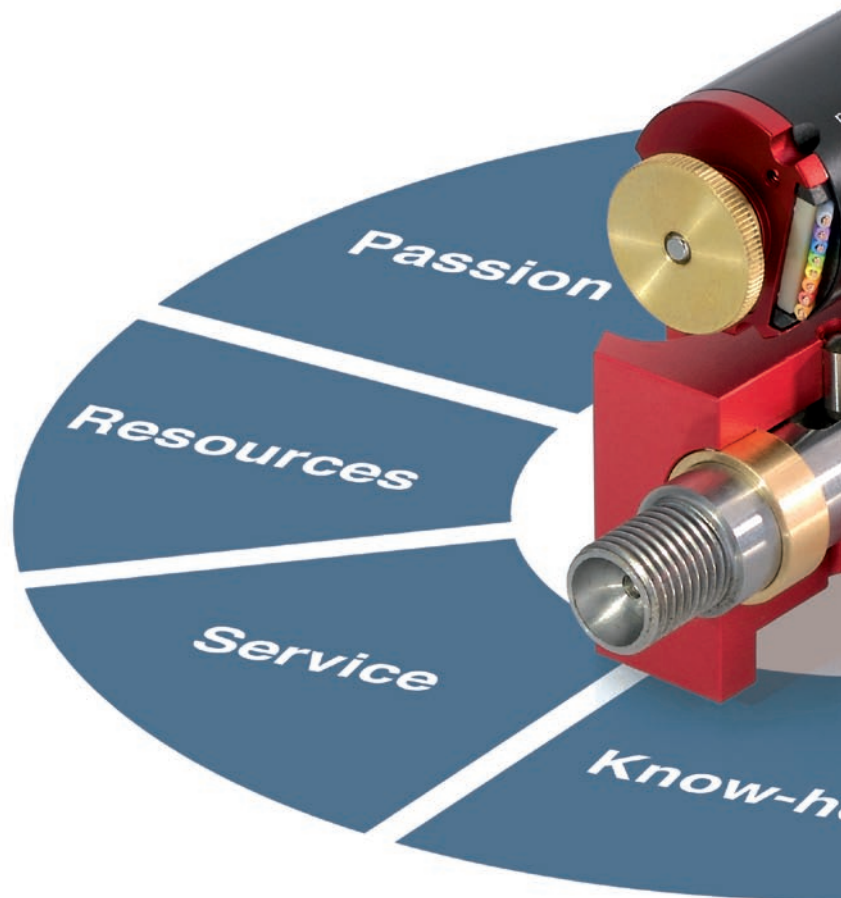
Reliability

Seamless function processes are based on drive systems that demonstrate absolute reliability – from the first to the last movement.



Service life

The drives are placed under enormous strain when used over a long period. Low-maintenance drive solutions help minimise down-times.



Know-how

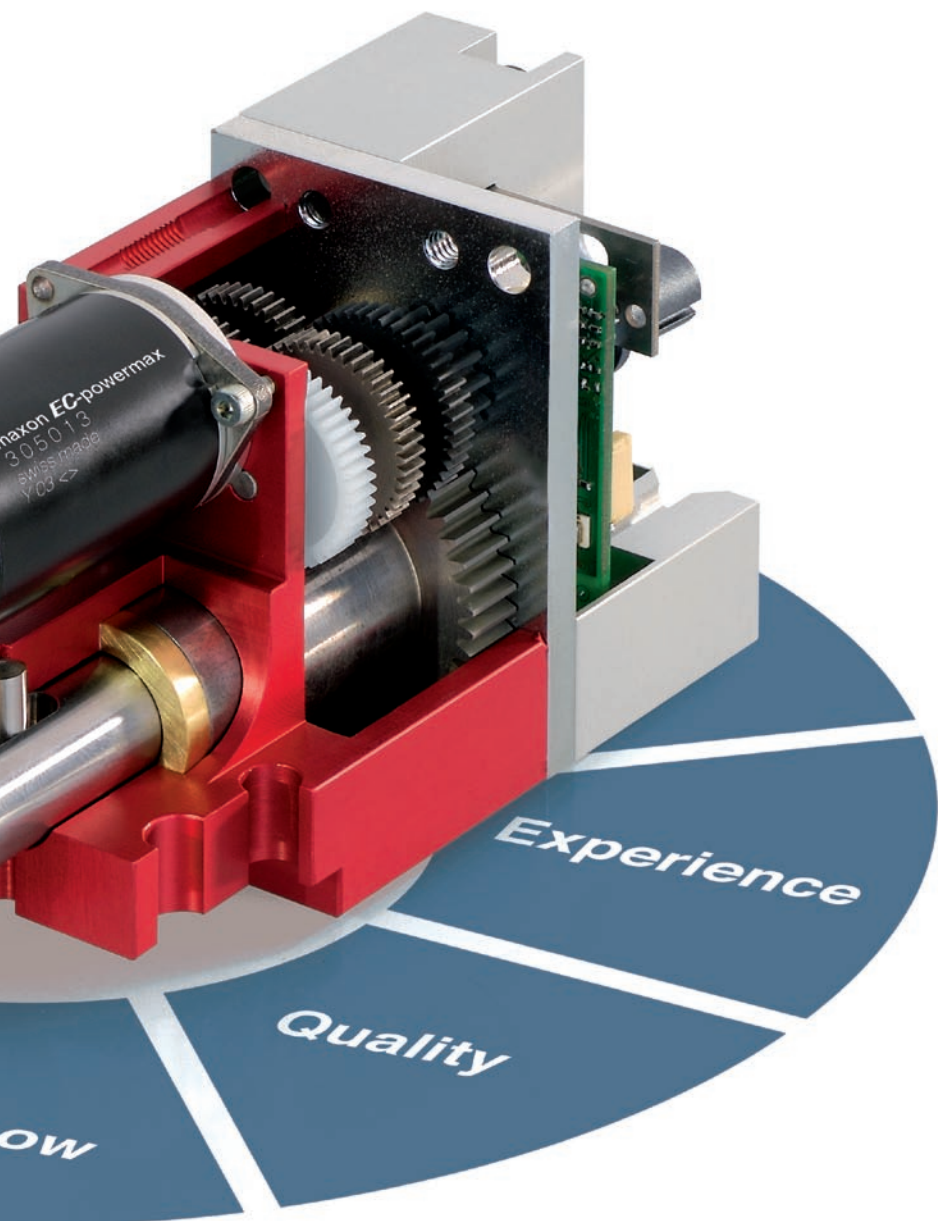
maxon motor develops customized gearhead and drive solutions that reflect the market as closely as possible - from simple gearhead solutions to complex mechatronic drive units. Proven knowledge in maxon standard products is put to careful use for our special solutions.

Quality

For maxon motor, quality begins with the choice of individual components and spans all process levels - from initial contact through sampling to after-sales service. The various standardisation levels achieved illustrate the desire to provide top-quality.

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.



Resources

maxon motor manufactures most of the components itself on site, making it very familiar with production processes. It also uses new production processes, such as ceramic / metal injection moulding, to produce competitively priced small series.

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.

Passion

The combination of motivation, innovation and realisation creates an enormous passion for newly created product solutions – solutions that stand out not just because of their function.

A compact reverse gear with thread spindle, journalled to be axially play-free, shifts motion to the required location.



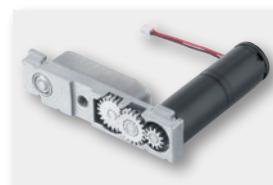
Gearheads and motors with hollow shafts mean that two speeds can be used at the same place and provide an outlet for various media, such as air, vacuum or light.



This microtechnical drive unit comprises motor, gearhead and encoder, and fulfils the diverse requirements of medical technology in exactly the right way.



Well thought-out combinations of motors and assembly mechanics in MIM technology ensure high reliability in security technology.



High-performance spindle drives with various thread profiles shift loads quickly and hold their position when stationary.



maxon special design

The right combination produces the best solution

maxon's accumulated knowledge of different drive areas helps it find the right combination of electronics, sensors, motor and gearheads. Tried and tested knowledge – already implemented in standard products – is incorporated

in complete drive systems. Special versions are used where the combination of standard products is insufficient. They help produce innovative solutions that fulfil their function perfectly in minimal space.

Special combination

Perfectly compatible standard combinations modified for the customer's own requirements – adjusted for the end product's specific use.



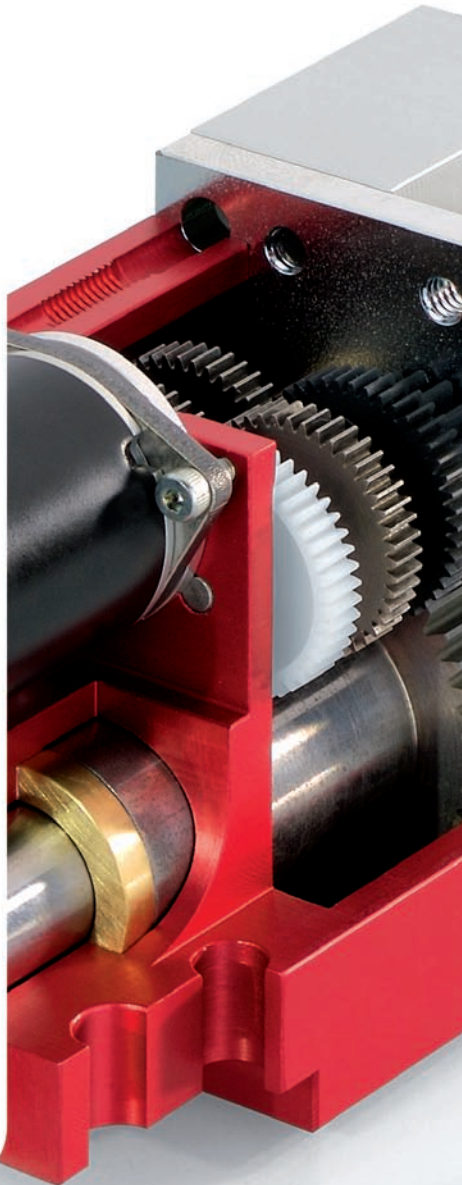
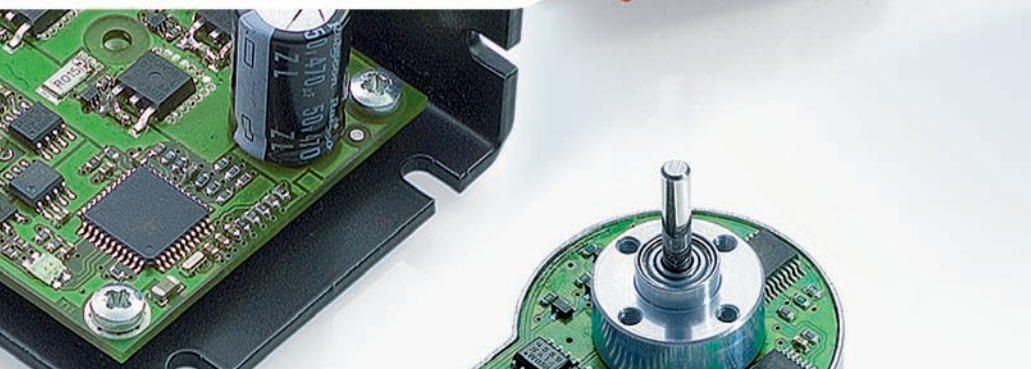
Compact drive unit

Special gearheads compactly built in the housing, including a motor which is ingeniously space-saving and low-maintenance.



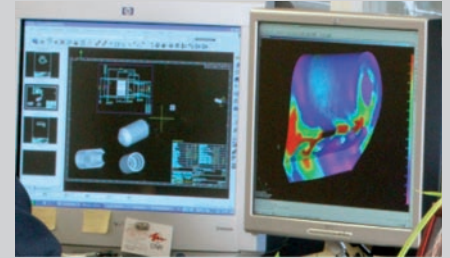
Complete system

Electronics and sensors adjusted directly on site – optimum control and minimum wiring.



CAD / CAE

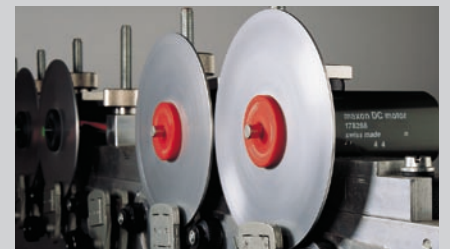
Customer specifications can be quickly recorded and realised using modern 3D modelling systems. Required changes can be incorporated immediately into the development process and their effect shown using 3D simulation.



State-of-the-art electronic simulation tools are the basis for maximised controls that direct the motors. Modern production processes ensure compactness and reliability.

Simulation / tests

Proposed solutions are tested in a wide variety of simulation models. Mechanical long-time tests highlight weaknesses in specific load scenarios for early rectification.



Sample shop

maxon's sample shop is where new solutions can be tested and improved in practice straightaway. Sample production allows early use in prototypes of the end application.





maxon ceramic

Drive with maxon ceramic CIM/MIM components

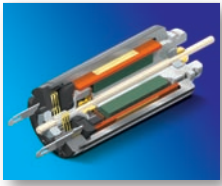
We have been successfully testing them in our motors and gearheads for years: whether ceramic, rust-free metallic or ferromagnetic MIM materials, we offer you customized solutions, even for the most challenging design tasks in all areas of technology.

Summary	334
CIM-Materials	335
MIM-Materials	336
Special and Standard Products	337

maxon ceramic – Innovative CIM / MIM components

Complex components often have to be assembled from different parts and this is an intricate and expensive procedure. With CIM/MIM technology, the shape forming is predetermined using the injection mould.

dimensions and intricate shape structures are unbeatable advantages of this process. Undercutting, cross holing, internal and external-screw threads and gear teeth can be produced.



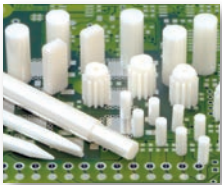
The shaft of this Ø6 mm microdrive is made of high-tech ceramic material which is superior to steel in many respects. At Ø0.8 mm it's as thin as a pencil lead.



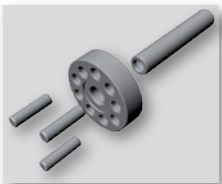
Miniature spindle drives provide linear motion in the smallest equipment. Requiring minimal space, their life expectancy is similar to that of expensive ball screws.



Thread guides and nozzles are temperature-resistant and are highly wear-resistant.



Components made of high-tech ceramic material are excellent insulators and protect key electronic components.



Planet carriers are very complex and tolerance-critical gear parts. Most of them are assembled using several components, an intricate and therefore costly procedure.



It's much easier with MIM technology.



Gear parts produced using MIM technology can be manufactured cost-effectively in large quantities.



Powder + binder = compound



Injection moulding



Debinding

Production with a high vertical range of manufacture

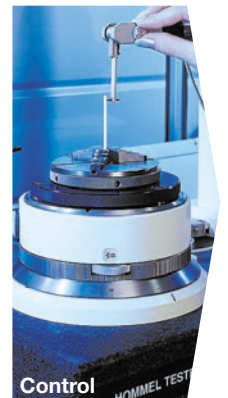
The fine ceramic or metallic powder is mixed with a binder system and granulated to a material that can be injection moulded. This compound can be processed as freely as with injection moulding. After debinding and sintering at very high temperatures, components can, if necessary, be sanded and polished to their final mass. Strict quality controls ensure that the manufactured part conforms to specifications.



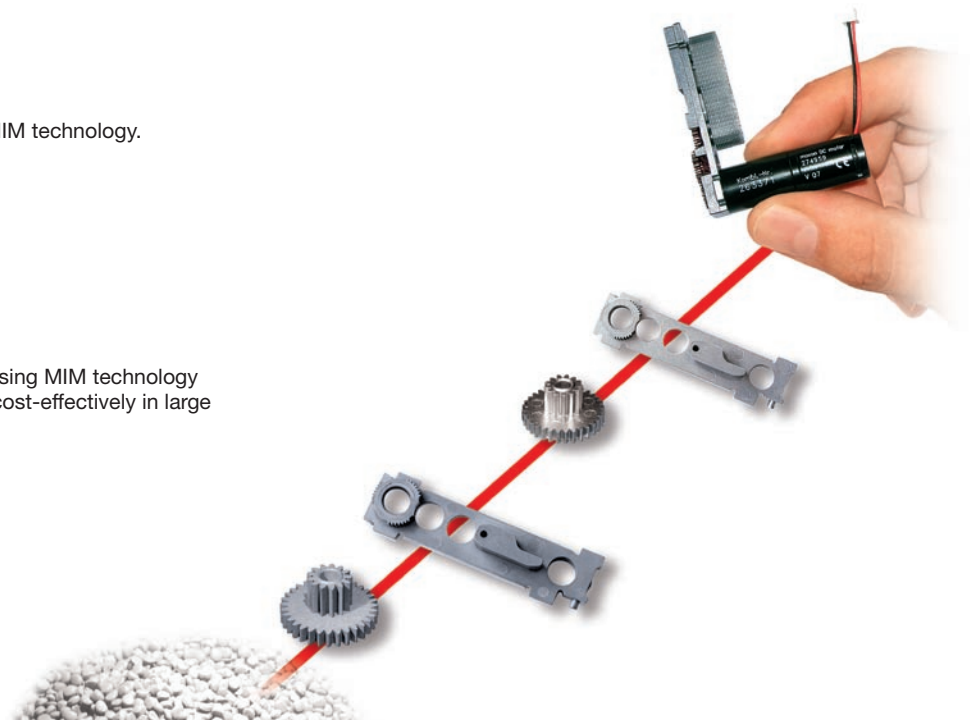
Sintering



Machining



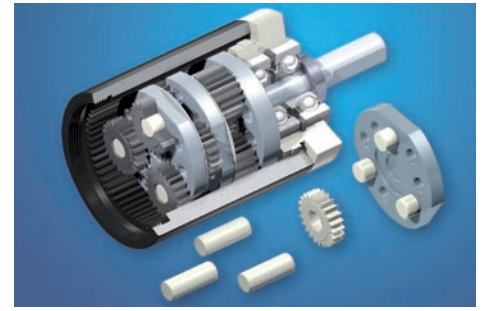
Control



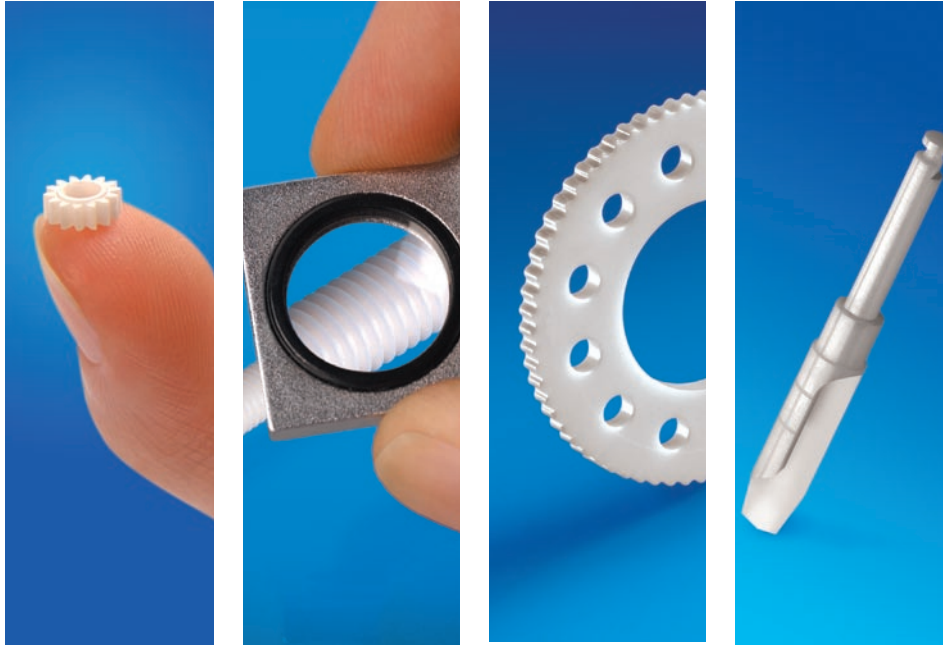
Versatile ceramic materials

High-tech ceramic materials have a wide range of uses. Their extremely high wear-resistance and excellent anti-friction properties significantly increase the service life of components, such as axes, shafts and their friction partners. The elasticity module and heat expansion coefficient are very similar to steel, so the combination of these two materials provides excellent results.

Components made of hightech ceramic materials can also be used as insulators in electro-technology and electronics. The human body accepts implants made of zirconium oxide with almost no side-effects and allergies. The aesthetics of these translucent materials are illustrated perfectly when they are used as dental implants for a natural effect.



maxon ceramic



maxon ceramic – components for maxon motor
maxon ceramic develops and produces components for maxon motor using high-performance ceramic materials. An in-house development and design department with state-of-the-art CAD technology and the facility for finite element calculation are pre-requisites for producing high-precision, top-quality components for drive systems.

High-performance ceramic components can be found in

- drive technology
- electronics
- textile industry
- medical and dental technology
- analysis technology, MRI analysis
- pneumatics
- microsystem technology
- watch industry
- paper industry
- measuring and control technology
- laser technology
- vacuum technology

CIM – Materials

Aluminium oxide Al_2O_3 – also resists high temperatures

- High temperature stability even when temperature changes
- Good thermal conductivity
- Average mechanical solidity
- Low coefficient of thermal expansion
- High corrosion and chemical resistance, largely acid and alkali-proof
- Very hard
- Low specific weight

Zirconium oxide ZrO_2 – for wear-resistant components

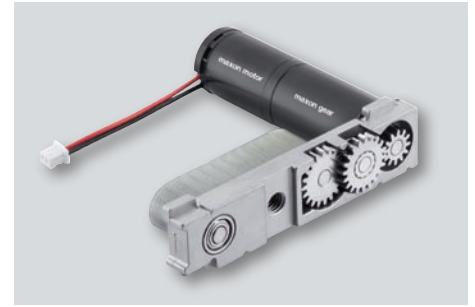
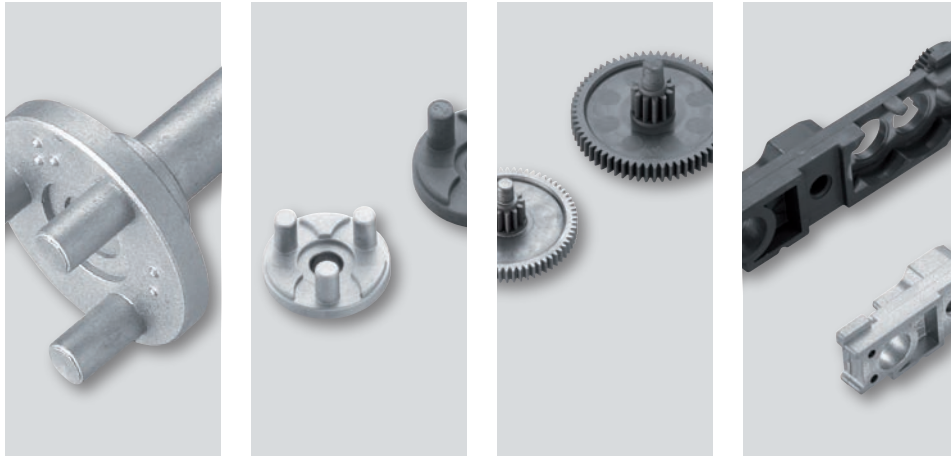
- Extremely wear-resistant and hard
- Excellent antifriction properties
- High mechanical solidity
- High temperature stability even when temperature changes
- Excellent insulation ability against heat and electricity
- High corrosion and chemical resistance, largely acid and alkali-proof
- Elasticity module and thermal expansion coefficient similar to steel
- Biocompatible and allergen-low
- Low specific weight

Material types		ZrO_2	Al_2O_3
Theoretical density	[g / cm ³]	6.08	3.98
Hardness	[HV]	~ 1200	~ 2000
Bending strength (4-point)	[N / mm ²]	800 - 1000	350 - 450
Elasticity module	[10 ³ N / mm ²]	approx. 200	approx. 350
Maximum usage temperature	[°C]	≤ 1000 (dependent on humidity)	1400
Expansion coefficient	[10 ⁻⁶ / K]	approx. 10	approx. 5 - 7
Specific heat (20°C)	[J / kgK]	550	900
Thermal conductivity (100°C)	[W / mK]	approx. 1.5	approx. 25
Spec. resistance (20°C)	[Ohm cm]	10 ¹⁰	10 ¹⁵
Colour		white	white
Special features		very rigid, highly wear-resistant	high temperature applications

MIM technology – Complex Shapes in One Step

No additional machining is required in most cases: MIM components are produced in their final shape and have a high-quality surface finish.

Whether ceramic, stainless metallic or ferromagnetic materials, or materials of high tensile strength, the range of material properties is very broad and is defined by customer requirements.



A well-kept secret: the tools

The injection moulds are designed in our own tool shop or in close cooperation with established, reliable and experienced partners.

We can design a profitable tool concept for the customer. The specification of the tooling design is a very complex procedure that requires precise knowledge about the processing behaviour of raw granulate. The component's eventual application and the general commercial conditions must be considered.

Cost-effective thanks to high quantities and efficient production processes

Production is cost-effective, as the quantities involved are large and almost no machining is required. Intensive utilisation of materials used also helps to keep costs down.

Low tolerance levels and excellent surface quality

CIM/MIM technology yields high-precision components and excellent reproducibility. The surface quality means, in many instances, that no machining is required.

Reliable mechanical and magnetic properties

We only use materials from recognised manufacturers known for their well-developed technolo-

gy. High density materials are produced through the use of fine-grained powder and catalytic debinding. This high density level combined with an homogenous material structure accounts for the excellent mechanical and magnetic properties.

MIM components can be found in

- drive technology
- office machinery
- medical technology
- food technology
- writing utensils
- locks
- watch industry
- aviation
- hydraulics
- electrotechnology

Advantages of MIM materials

- Almost the same excellent mechanical properties as cast or rolled steel
- Components have a 96% – 98% density
- Components have a closed structure and can be gastight and pressurised
- Excellent surface quality, almost no machining required
- Highly corrosion resistant
- Components can be heat-treated, polished, galvanized, welded, soldered and machined

MIM – Materials

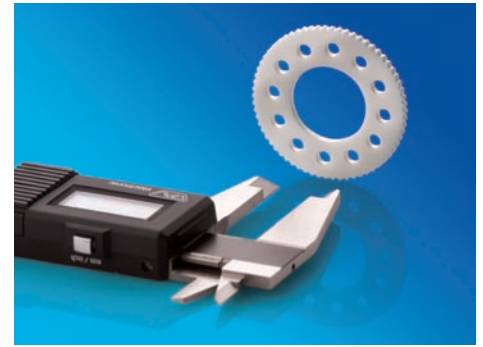
Low alloyed steels for heat treatment				
Description	42CrMo4	FN02	FN08	
Composition	42CrMo4	Carbonyl iron with 2% nickel	Carbonyl iron with 8% nickel	
DIN standard	1.7225	–	–	
Properties	heat-treatable	case-hardened	treatable and case-hardened	
Applications	Toothing parts	simple components		
Yield strength $R_p 0.2$ [MPa]	> 400	> 170	> 210	
Tensile strength R_m [MPa]	> 650	> 380	> 380	
Ultimate strain A [%]	> 3	> 3	> 15	

Stainless steel				Magnetically soft alloys
Description	P.A.N.A.C.E.A.	316 L	17-4PH	FeSi3
Composition	X15 CrMnMoN 17 11 3	X2 CrNiMo 17 13 2	X5 CrNiCuNb 17 4	Carbonyl iron with 3% silicon
DIN standard	–	1.4404	1.4542	1.0884
Properties	non-magnetic nickel-free	non-magnetic can be easily polished	can be hardened ferromagnetic	–
Applications	Medical technology dental technology	Parts that are extremely corrosion-resistant and very tough, medical tech- nology, food technology	corrosion resistant components	–
Yield strength $R_p 0.2$ [MPa]	> 690	≥ 180	> 660	> 300
Tensile strength R_m [MPa]	> 1090	≥ 510	> 950	> 500
Ultimate strain A [%]	> 35	≥ 50	> 6	> 20

maxon CIM/MIM – Customised Products

In Sexau near Freiburg in Breisgau, Germany, over 200 specialist employees develop and produce components for the world-renowned maxon miniature drives. An in-house development and design department with state-of-the-art CAD technology and the facility for finite element calculation are pre-requisites for meeting future market needs. We also give our customers the benefit of our expertise, maintaining dialogue to

develop customer specific solutions. In this way our customers benefit from our many years of expertise with a customised solution manufactured to maxon's high quality standards and our ability to provide prototype samples quickly.



Customised solutions using appropriate materials such as steel and ceramics. Precise management of the shrinkage process requires the expert knowledge.

Construction and Development

- Customised solutions according to the customer requirements
- Co-operative development with our partners
- Ultramodern CAD systems and finite element calculations
- Competent, experienced and customer-oriented team.

Manufacturing

- Flexible production and assembly installations
- High-efficient state of the art technology
- Profound know-how in powder injection moulding
- Precise manufacturing with equally high quality standards
- Short delivery times
- Production samples and small series from 1 pc upwards
- High expertise in the design of injection moulding tools
- Reliable quality controls

Your benefits are

- All-in-one: Customer designed advisory service, development and manufacturing under one roof
- Convincing cost-performance ratio: Optimal solutions at attractive prices
- Service at a high level by competent and solution-orientated partners
- Flexibility with samples -, single and small-batch manufacturing
- Security through high quality standards and quality assurance systems
- Ceramic components increase the efficiency and quality of your products low
- Cost for complex components, even in high quantities

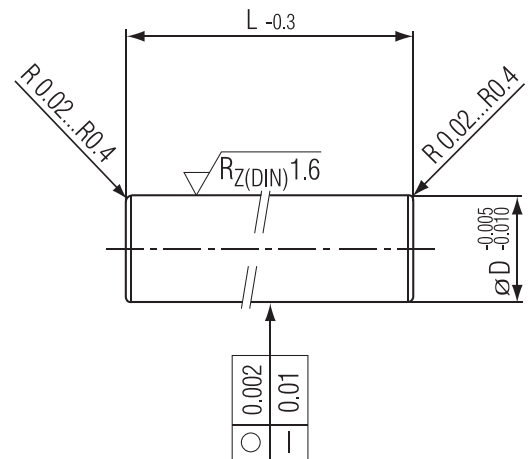


The strengths of the powder injection moulding process stand out in particular in the miniature and micro domain.

For more info, please visit www.maxonceramic.com

maxon ceramic standard components

maxon ceramic offers ceramic shafts within the standard stock program. Ceramic shafts with the dimensions given below are available at short notice.



- 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

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⁾	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)}	137962 ^{1),3)}	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)}	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⁾



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