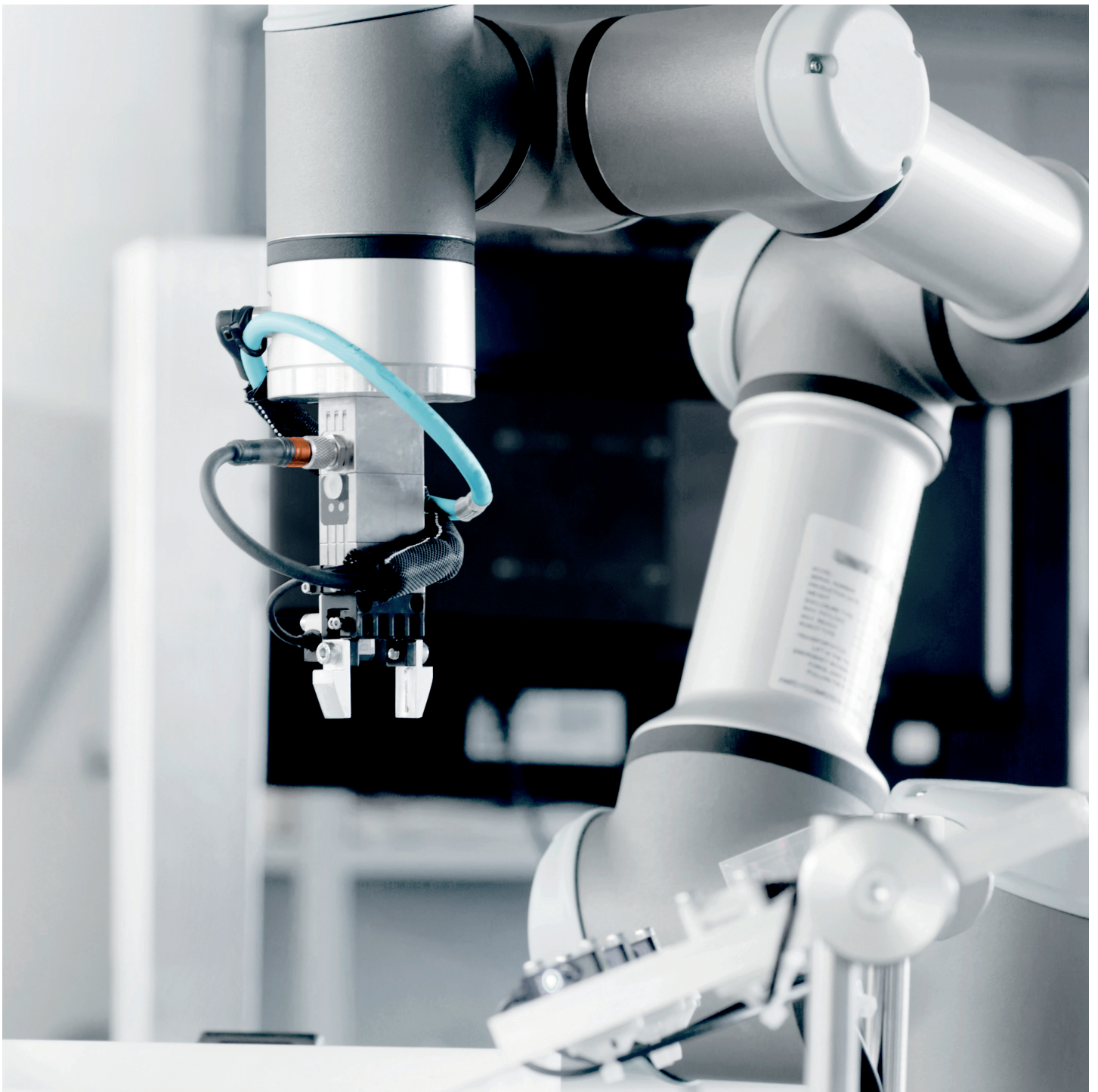


Drive systems for robotics.
High torque, compact and efficient.



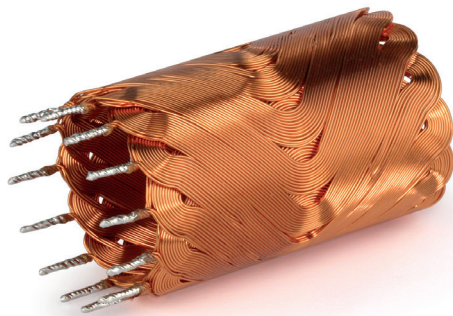
Founded in Switzerland. Available worldwide.

maxon – a strong global brand

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

Precision Drive Systems

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



What makes a robot unique?

Drive solutions from 0.0002 to 120 Nm

The industrial environment is becoming faster, more precise – and safer. This places tough demands on machinery.

- Utmost precision at high speed: For example in PCB placement machines or in the semiconductor industry.
- Rapid but safe motion sequences: For example in robots designed to work with people.
- Advanced dynamics with low heat build-up: Particularly in precision machinery or multiple-axis systems.

Excellent control characteristics

Due to their ironless maxon windings and high-quality rare-earth magnets, our DC and BLDC motors have linear motor characteristics and an extremely high overload capacity. Other excellent characteristics of maxon motors include constant friction and low attenuation.

Highly dynamic with excellent torque density in a very compact package

The multi-pole, brushless EC-i and EC flat motor excel for their high torque and low inertia, and their resulting high dynamics.

High precision from a single source

A wide range of optical, magnetic, and inductive encoders offer resolutions of up to 6400 pulses per turn.

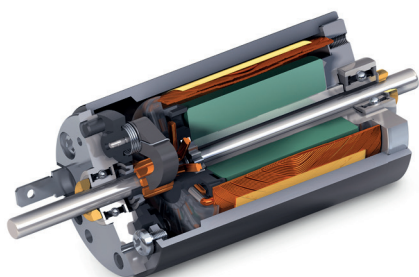
Drive control easily implemented on site

maxon position controllers can be designed as modules that are built directly into the joints of robots. The CANopen standard ensures easy integration.

Our products are as varied as your robot is unique. In addition to a wide range of standard products, we offer modifications on request, quick and convenient.

robotics.maxongroup.com

Powerful performance comes in small packages. Efficiencies of over 90 %.



maxon DC motor

Ironless winding

Brushed DC motors with ironless rotor, in sizes of Ø6–65 mm, with up to 250 W power.

Main characteristics

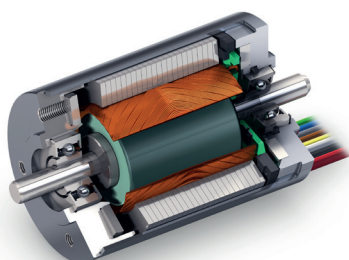
- No magnetic cogging torque
- Withstands high overload for short periods
- Low electromagnetic interference

Product programs

DCX and RE motors provide excellent performance and robust design.

DC-max and A-max motors combine cost-effectiveness with excellent motor performance.

DCX and DC-max motors can be configured online and are ready for shipment within 11 working days.



maxon EC motor

Ironless winding

Brushless DC motors are electronically commutated. They are available in sizes of Ø4–60 mm, with up to 480 W power.

Main characteristics

- Excellent control properties
- High overload capacity
- Very long service life
- Speeds of up to 120 000 rpm
- Autoclavable up to 2000 x

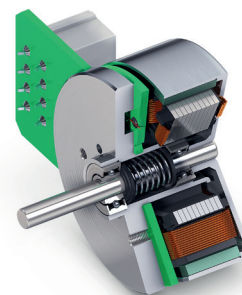
Product programs

ECX and EC motors provide optimum performance with high speeds.

EC-4pole motors offer high torques combined with high power density.

EC-max motors offer an excellent price/performance ratio.

ECX motors can be configured online and are ready for shipment within 11 working days.



maxon EC motor

Iron core winding

Brushless DC external- and internal-rotor motors are electronically commutated. They are available in sizes of Ø9.2–90 mm, with up to 600 W power.

Main characteristics

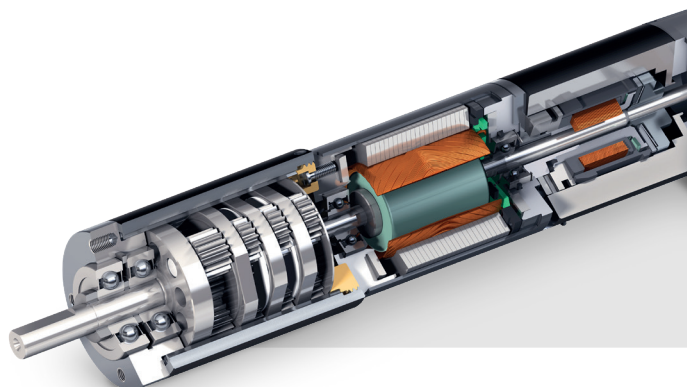
- Flat design
- High torque
- Very long service life
- Excellent price-performance ratios

Product programs

EC-flat motors provide very high torques and are available with integrated electronics.

EC-i motors are characterized by high torques and excellent dynamics.

View the entire range of products online
shop.maxongroup.com





maxon gear

Precision planetary and spur gear-heads as well as customer-specific special gears. Compact spindle drives with steel or ceramic spindles.

Product programs

GP and GPX planetary gearhead

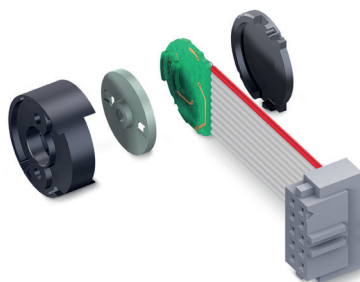
- For transmission of high torques
- High power
- High reduction ratio
- Autoclavable, with shaft seal
- Can be configured online (GPX only)

GS spur gearhead

- Economically priced
- For low torques
- High efficiency

GP S spindle drive

- Steel or ceramic spindle
- Metric spindle, ball screw and trapezoidal screw



maxon sensor

High-resolution encoders and digital encoders.

- Relative or absolute position signal, suitable for positioning tasks
- Direction detection
- Speed information from number of pulses per time unit

Product programs

Magnetic encoder

- Minimal space requirement
- Resistant against dirt
- Interpolated

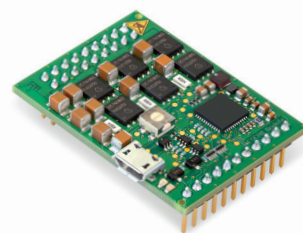
Optical encoder

- High counts per turn
- Very high accuracy

Inductive encoder

- Robust against magnetic fields and dirt
- Integrated into EC flat motors

DC tacho, resolver



maxon control

4-Q servo controllers and position controllers for controlling quick-response brushed and brushless DC motors up to 1 kW continuous power. Available as OEM module for installation on a motherboard or ready for connection with housing.

Product programs

ESCON

Compact and powerful servo controller. Commanded by an analog set value.

EPOS4

Position controllers with CANopen, EtherCAT, RS232 oder USB.

MAXPOS

Highly dynamic positioning controller with EtherCAT.

Master controller available at
www.zub.ch



maxon modular system

The motors, gearheads, encoders, brakes and controllers from maxon are perfectly matched to each other and can be combined to meet specific requirements.

Max out your motor



maxon EC motors designed for you as a frameless kit.

In order to achieve the optimum of high torque density and minimum installation volume, maxon offers the EC flat motors in a frameless kit version. Rotor and stator are delivered separate without bearings or motor shaft. This allows the motor to be integrated optimally in the structure of the robot.

High torque density

The EC flat motors are part of our BLDC series of motors with iron windings. Due to their large number of pole pairs, they have a very high torque.

Compact, with plenty of space inside

Due to their flat construction, EC flat motors can be integrated into robot joints in a way that is very economical in terms of space. With outer diameters of 32–90 mm, the brushless DC motors are extremely compact. Designed as external rotor motors, they offer plenty of space inside for cable glands.

Low operating voltage

maxon BLDC motors typically operate at voltages from 12 to 48 V, easily fulfilling applicable safety regulations. Take full advantage of the great selection of available windings for the standard versions.

Complete control

To easily control the motors, maxon offers frameless kits with and without Hall sensors. To monitor motor temperature, a heat-sensitive NTC resistor can also be installed on the circuit board.

Proven design

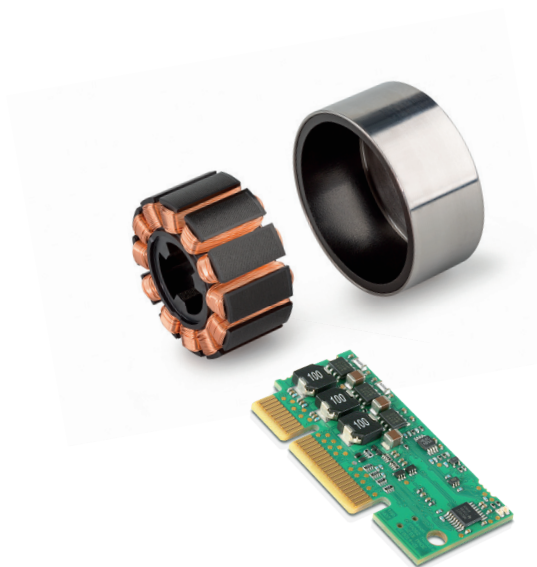
maxon EC flat motors are used daily in thousands of applications with excellent reliability. High production quantities and automated manufacturing lines guarantee consistently high quality. Get the best out of your robots. We look forward to working with you to find the perfect frameless kit for your application.

Frameless motors in robotics



Stator and the rotor are delivered individually without housings, to be connected only when the limbs are assembled.

Applications in robotics often require high torque in order to not only move joints, but also do so with sufficient force. In some cases, minimizing the weight of each component is also crucial, for example when a robotic arm is mounted on a wheelchair. A frameless solution should be considered in such cases. This means that the stator and the rotor are delivered individually without housings, to be connected only when the limbs are assembled. This saves space and weight. If these are among the primary criteria, then maxon engineers will work with customers to find out whether a frameless solution is suitable.

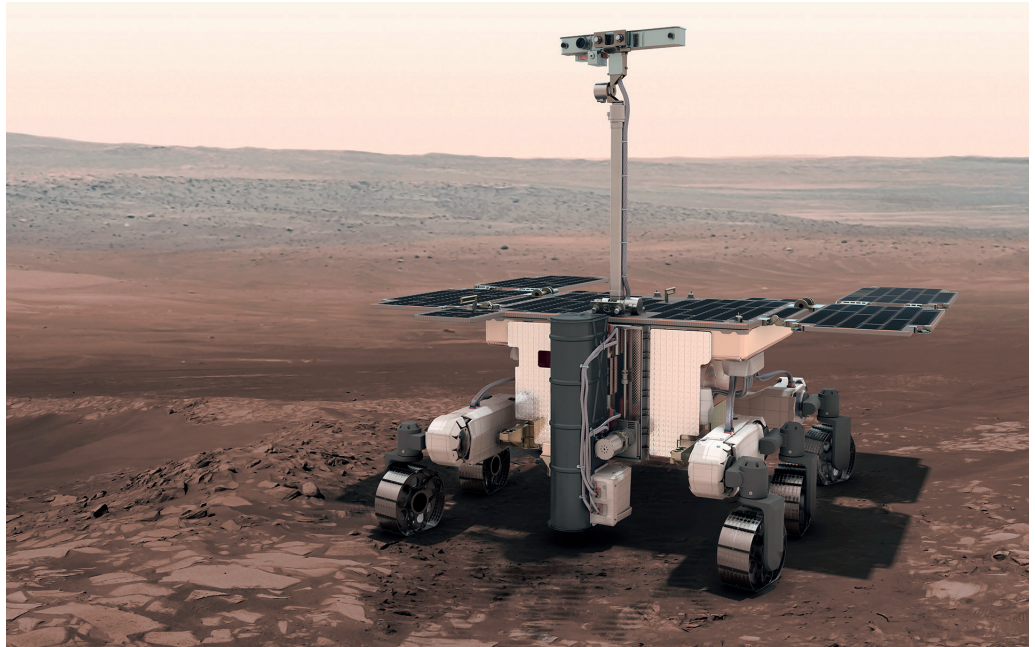


Brushless DC motors from the EC flat series.
EC 45 flat as a frameless kit.

- High level of integration in the structure of the machine
- High torques through multi-pole external rotor
- Plenty of space for cable glands
- High overload capacity
- Hall sensors
- Thermal sensors (NTC)

Unmanned vehicles

Reliable components are indispensable.



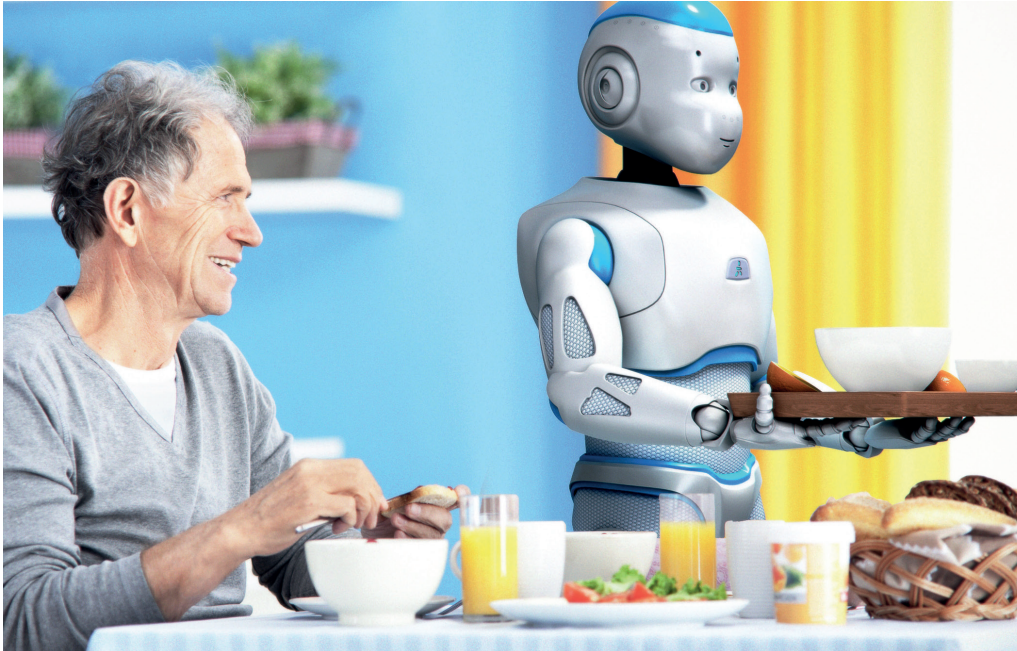
Strange planets, narrow shafts, or dangerous locations: Wherever people can't go, unmanned robotic vehicles stand ready to do the work. They need to maneuver independently, overcome obstacles, and perform a variety of tasks. Reliable components are indispensable because intervention or repair are often impossible. Many engineers prefer maxon drives, because they are robust, lightweight, and durable. The energy efficiency of micromotors is also a decisive factor when running on batteries.



Brushed DC motor, planetary gearheads, and X-series encoders. DCX 22 with graphite brushes combined with a GPX 22 HP and ENX 16 EASY. Configurable online. Ready in 11 days: **xdrives.maxongroup.com**

- High energy efficiency
- High power packed into extremely small spaces
- Precise speed or position control
- Very high output torques

Humanoid robots

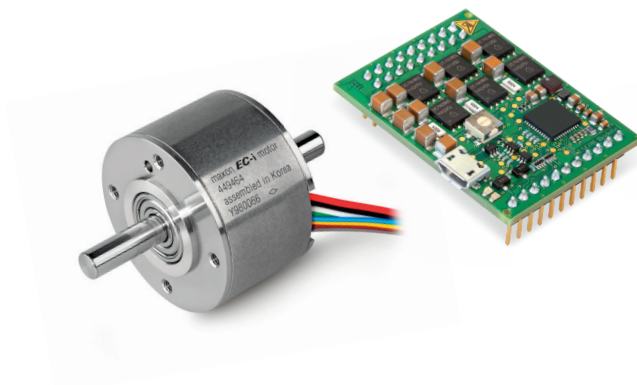


Lightweight, compact, and powerful components.

Brushless DC motor EC-i 40 with Encoder 16 EASY.

- Compact design and high torque density
- Over 10,000 hours of service life
- High precision due to high-resolution encoders with up to 1024 pulses per turn
- Dust and oil resistant

Humanoid robots will soon be part of our daily lives, performing as service or caretaker machines, as teaching aids, or as rescuers in disaster areas. Such robots require lightweight, compact, and powerful components. Especially the legs need high-torque actors. With its brushless DC motors, maxon has just the right solution. Especially the multi-pole motors offer excellent torque-to-size ratios.



You can find additional application stories at
www.maxongroup.com

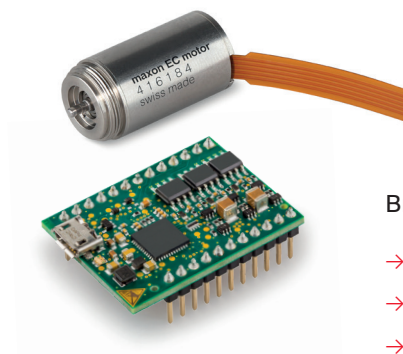
Industrial grippers

Precise interaction between motors and encoders is crucial.



© Schunk

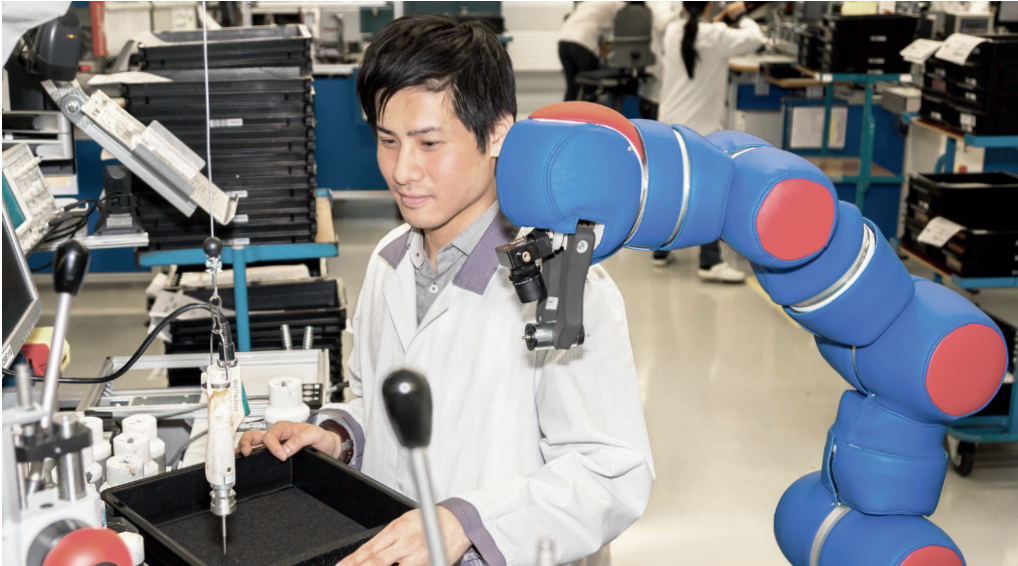
Grip it firmly, don't drop it... and please, please don't crush it! Grippers for industrial apparatus, humanoid robots, or robotic arms have to meet high requirements. Proper gripping is a challenge, not least for the electric motors that have to execute the movement. Precise interaction between motors and encoders is crucial. Moreover, engineers demand drives with a high power density to generate maximum torque in very small installation spaces. With its motors, maxon is offering the right solutions. Their special winding makes maxon motors efficient and precise.



Brushless DC motor EC 13 with Hall sensors.

- High overload capacity
- Small diameter
- Highly dynamic
- Excellent control characteristics – linear curve

Collaborative robots

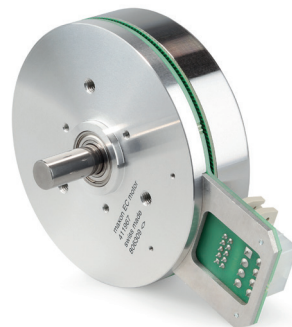


High-torque motors are advantageous.

The times are gone when industrial robots needed to be locked away behind protective barriers. An increasing number of developers is introducing robots that work hand in hand with humans. These collaborative robots (cobots) perceive their environment and “sense”, by means of torque feedback, when they get too close to another robot or a human. High-torque motors are advantageous in such applications, to keep the gearhead units small. With their outstanding power-to-size ratio, maxon flat motors come into their own here.

Brushless DC motor EC-flat 90 with integrated Mile encoder.

- Compact, flat design and high torque density
- Robust design
- High precision due to high-resolution encoders with up to 6400 pulses per turn
- Dust and oil resistant



Surgical robots



What was unimaginable a few decades ago is now reality in operating rooms all over the world: Robots support surgeons during difficult prostate removal surgery or other operations on the torso. During the operation, the surgeons sit at a control console, from where they control the four-arm robot. Its instruments are laparoscopically inserted into the patient through small openings, where they can be maneuvered with more flexibility and precision than would be possible with any human hand. This prevents nerve damage or major bleeding during the operation. Additionally the small incisions make the healing process much faster. To accurately transmit the movements of the surgeon to the robot and have the robot execute them, several dozen maxon DC motors are needed. These have no cogging torque and are therefore ideal for use in surgical robots.

DC motors. No cogging torque and are therefore ideal for use in surgical robots.

Brushed DC motors of the DCX series. DCX 22 with graphite brushes, DCX 10 combined with a GPX 10 planetary gearhead and an ENX encoder. Configurable online. Ready in 11 days: **xdrives.maxongroup.com**

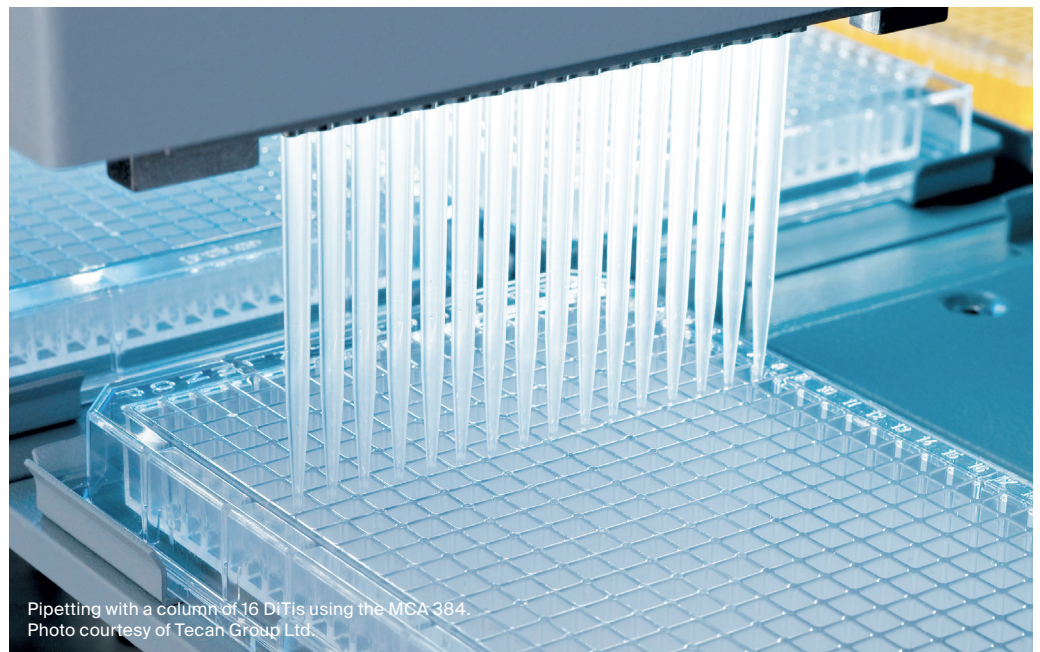
- Ironless maxon winding provides smooth running
- Linear characteristic, excellent control properties
- High energy efficiency
- Minimal heat build-up
- Very quiet
- Backdrivable gearhead



Laboratory robots

DC motors are especially suitable for this type of positioning task.

Pipetting robots perform an increasing variety of tasks while taking up less and less space. They are used for active ingredient screening by large pharmaceutical companies, as well as by small molecular biology labs that require flexible liquid handlers. These robots are able to handle hundreds of samples simultaneously and can be equipped with multiple pipetting heads. Their speed is ever increasing as they dispense smaller and smaller fluid quantities. However, all this only works with highly dynamic and precise drives. maxon DC motors are especially suitable for this type of positioning task. These motors have a very low moment of inertia, and their ironless windings provide stutter-free movements. Together with encoders and a matching controller, perfect drive combinations become possible.



Brushed DC motor DCX 12 with encoder ENX 10 EASY and planetary gearhead GPX 12. Configurable online. Ready in 11 days: xdrives.maxongroup.com

- High overload capacity
- Small diameter
- Highly dynamic
- Excellent control characteristics – linear curve
- High precision with up to 1024 pulses per turn



You can find additional application stories at www.maxongroup.com

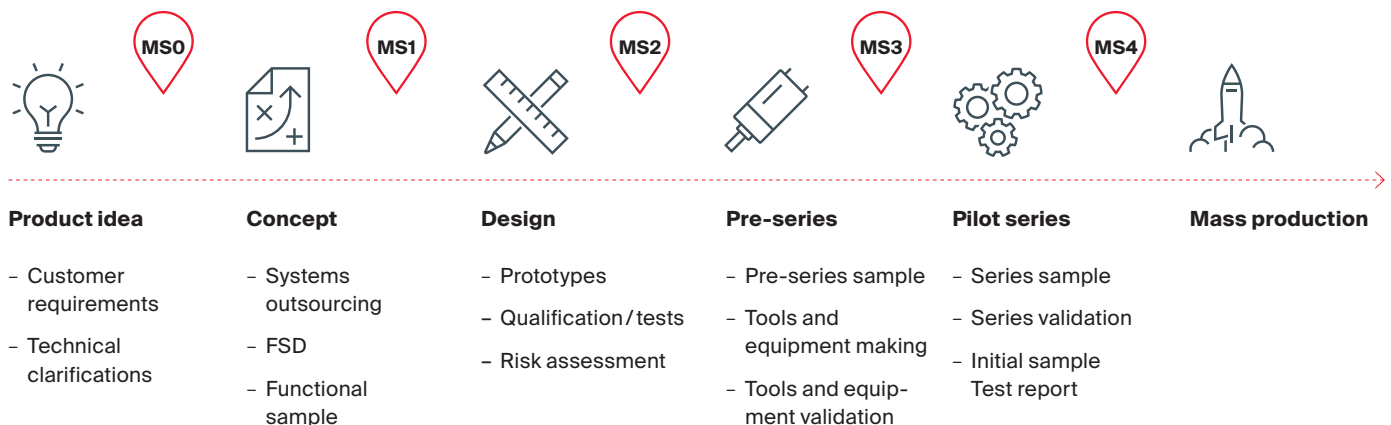
There is always a solution

From our mechatronics specialists

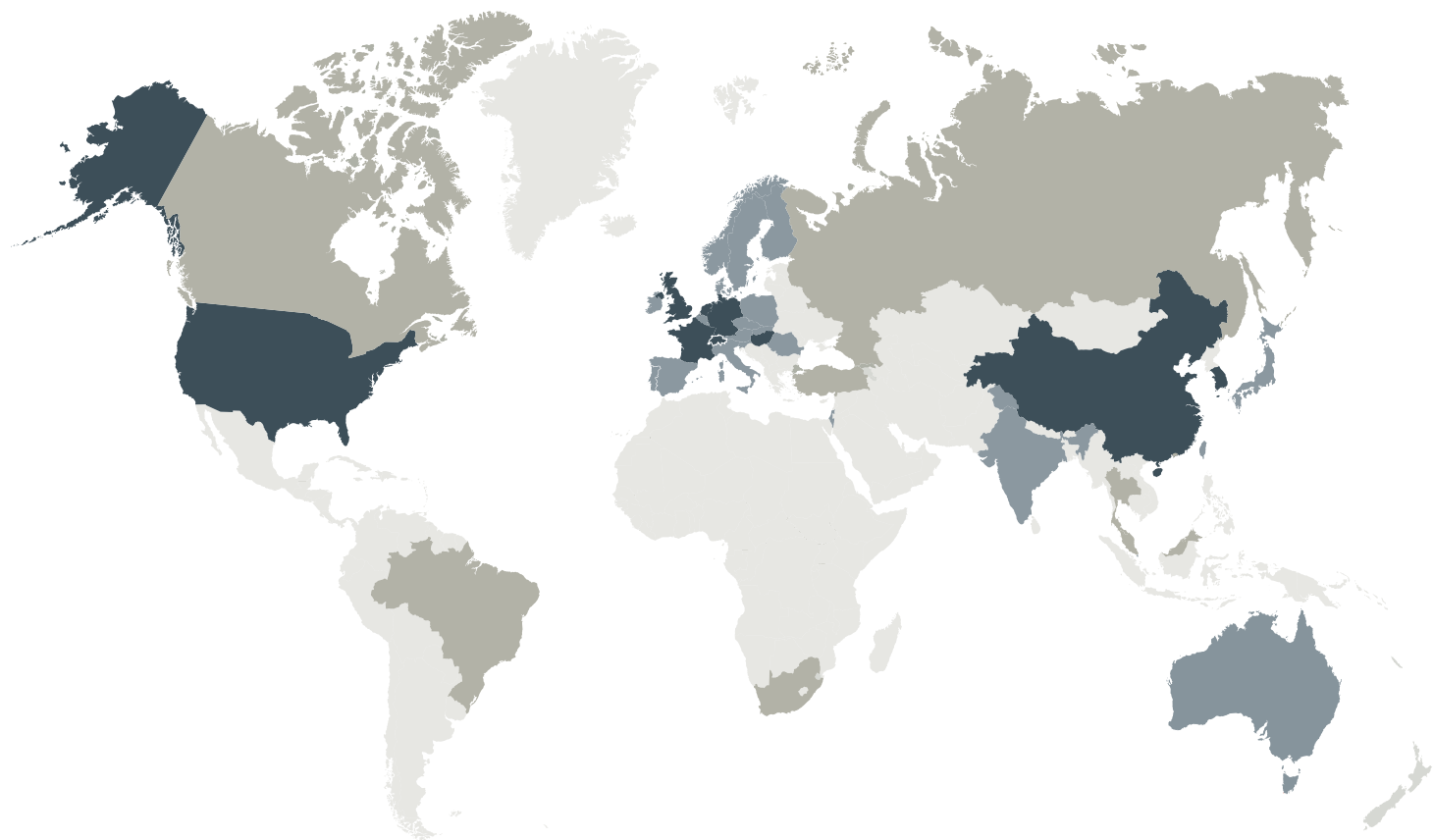
- Systems from a single source due to a wide range of in-house competencies: motors, gearheads, electronics, software, sensors, batteries, injection molding technology, and product design.
- In our products, we combine drive components from maxon into customer-specific mechatronic systems, tailor-made to your needs.
- Our battery solutions with intelligent BMS (Battery Management System) are integrated optimally into the application to make your system even more independent.
- You gain a competitive edge with customer-specific software, as well as agile and goal-focused research and development from our experienced mechatronics center.
- The proven maxon project process divides a project in three distinct phases. The milestone concept makes development progress easy to follow.

Milestone diagram

Through clearly defined procedures with milestones, maxon guarantees a smooth-running project and constant transparency for the customer.



A global network



maxon Manufacturing Companies

Switzerland (Headquarters)	South Korea	USA
Germany	France	China
Hungary	Netherlands	Great Britain

maxon Sales Companies

Austria	Great Britain	Serbia
Australia	Hungary	Sweden
Benelux	India	Switzerland
Bulgaria	Ireland	Slovakia
China	Israel	Singapore
Croatia	Italy	Slovenia
Czech Republic	Japan	South Korea
Denmark	Norway	Spain
Finland	Poland	Taiwan
France	Portugal	USA
Germany	Romania	

maxon Sales Agents

Brazil	Malaysia	Thailand
Canada	Russia	Turkey
Hong Kong	South Africa	

For detailed contact information please visit
contact.maxongroup.com

