

Drive solutions for the oil and gas industry.  
Robust designs for extreme operating conditions.



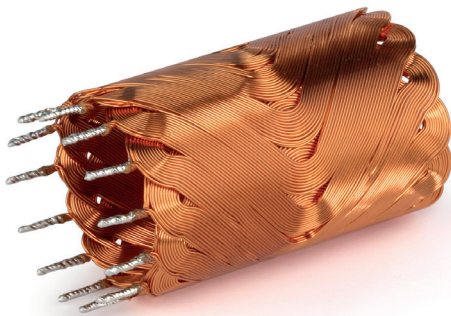
# Founded in Switzerland. Available worldwide.

## maxon – a strong global brand

maxon, with headquarters in Sachseln/Central Switzerland, has production sites in Switzerland, Germany, Hungary, South Korea, USA, France, Netherlands, Great Britain 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.



# When it's about heavy duty drives



Operating temperatures (-55...200°C)



Withstands high shock loads and vibrations:  
1000 g / 25 grms



Highly reliable, even in harsh environments

## New materials and process technologies

The ironless core winding and high performance rotor is the “heart” of maxon heavy duty motors. Together with the powerful gearhead, maxon provides high torque drive solutions. Most parts of heavy duty drives are made of stainless steel. The assembly minimizes the use of adhesives, concentrating instead on the connection of individual components through mechanical fits and secured with laser welding. This results in a reliable and mechanically robust drive system.

## maxon's commitment

Whether you need a standard or customized product, maxon's experienced sales engineers are here to help guide you to the best solution for your application. Contact us:

[hightempdrives.maxongroup.us](http://hightempdrives.maxongroup.us)





Generator – Cutting – Completion  
Plugging – Exploration – MWD  
Packer – Wireline – Valve settings

## **DOWN HOLE DRILLING**

Rotary Steerable System (RSS)  
Inspection & Testing – Pulsar  
Mud Pulsing – Tractor – Drilling  
Fishing – Logging – Intervention

# Measurement while drilling (MWD)

EC 22 HD brushless DC motor with GP 22 HD planetary gearhead.

- Ultra compact (Ø22 mm), highly efficient (>75%) and powerful (240 W) drive solution
- Fully welded stainless steel assembly along with encapsulated samarium-cobalt magnet
- High temperature ironless core winding, proven to withstand temperatures up to 240°C
- Gearhead designed for high torque (12 Nm overload torque capability)



The pulses are generated by the actuator system that is driven by maxon's Heavy Duty assembly.

Measurement While Drilling (MWD) uses a measurement module located behind the drill head in the string. The tool's control system measures variables such as angle, vibration, and drilling speed. The "pulser" unit sends the collected information back to the surface, across several thousand meters, through pulses in the drill mud (MPT – Mud Pulse Telemetry).

The pulses are generated by the actuator system that is driven by maxon's Heavy Duty assembly. Providing reliable data information to the drilling technicians is critical so they can respond quickly and make corrections as needed.

View the entire range of products online  
[shop.maxongroup.com](http://shop.maxongroup.com)



# maxon heavy duty technology. Highly reliable, even in harsh environments.



## Versatile EC-4pole 32 HD, 480 Watt

Brushless DC motor with slotless winding, Ø32 mm. For applications in air or oil. 220...480 Watt.

With or without Hall sensors.

## Customized maxon special design

- The perfect fit for your application
- Based on our standard solutions
- Benefit from our 50 years of experience in configuring drives for extreme applications



## Gearheads and sensors maxon modular system

- Extremely robust HD gearheads available in Ø22 mm, Ø32 mm and Ø42 mm diameters
- Also available with spindle drives, customized gearheads or resolvers

## Compact EC 22 HD, 240 Watt

Brushless DC motor with slotless winding, Ø22 mm. For applications in air or oil. 80...240 Watt.

With or without Hall sensors.





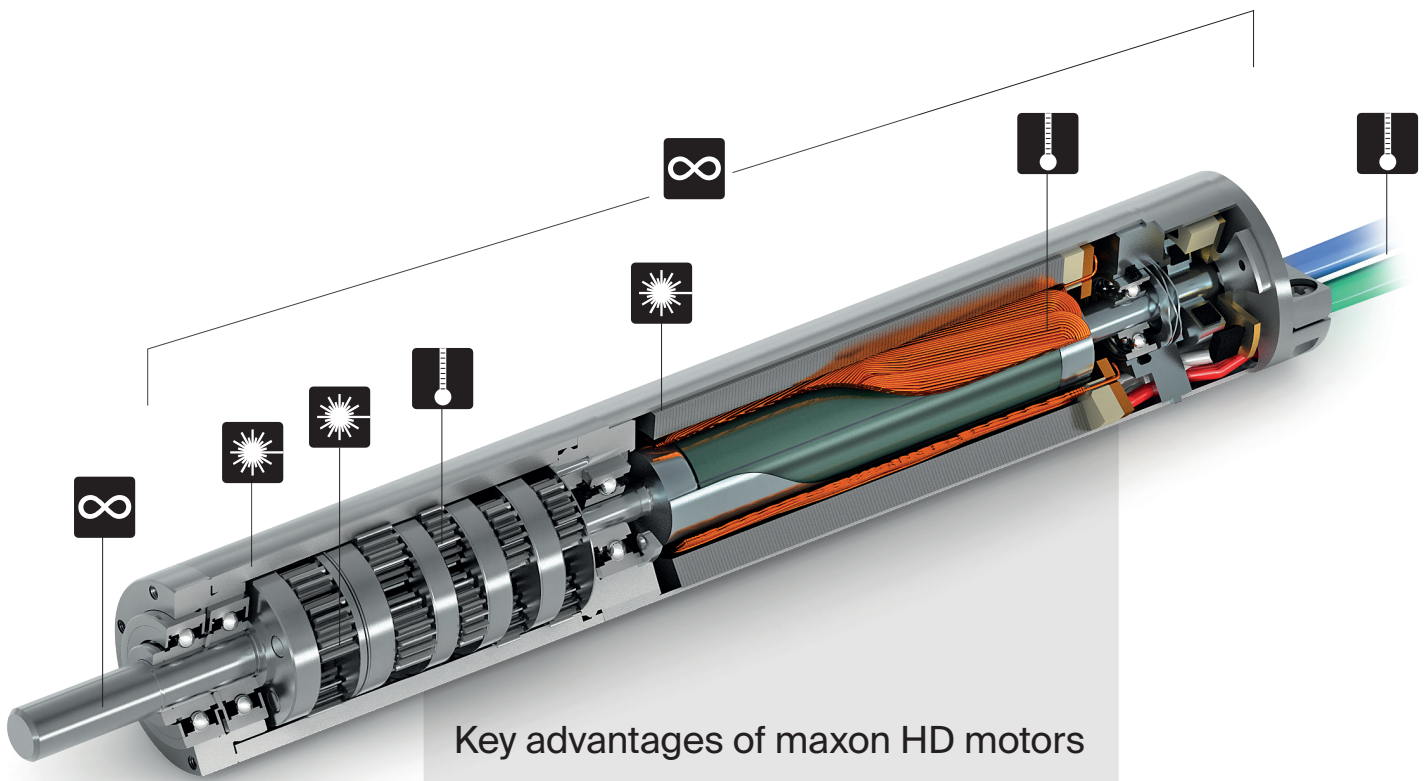
Operating temperatures (-55...200°C)



Withstands high shock loads and vibrations: 1000 g / 25 grms



Highly reliable, even in harsh environments



### Key advantages of maxon HD motors

- **Wide temperature range (-50 ... 200° C)**  
Components tested up to 240°C
- **Robust design**  
Laser welded connections
- **High performance / volume ratio**  
Compact, high power density
- **High quality / reliability**  
Production process controls
- **Low energy consumption**  
High efficiency
- **Excellent control properties**  
Linear motor characteristics
- **Operation in air or in hydraulic oil**
- **Low magnetic interference**

# Downhole Generator

Providing power to measurement devices in the oil and gas exploration industry has always been a challenge. Electrical cabling from the surface to the extreme depths cannot be used during drilling operation and, even though batteries have seen considerable technological advancements, there are still limitations when it comes to their usable life. Replacing depleted batteries leads to delayed drilling while the MWD (Measurement while drilling) is extracted and increasing the overall costs of drilling operation. Therefore, any additional generation of power during drilling operation offers significant advantages.

maxon DC motors are very efficient and due to this are often operated as generators.



maxon DC motors are very efficient and due to this are often operated as generators. The basic calculations are very simple due to the linear behavior of motors with slotless windings. Brushless Heavy Duty motors, suitable for extreme environments, can also be utilized as DC or AC voltage generators using drilling fluids pumped downhole. A Voltage rectifier is needed if a DC voltage is to be obtained, while producing AC voltages it only requires connecting any two out of the three motor phases.

Most generators are operated at speeds of 1000 rpm or below. That is considered a low speed for maxon motors. In that case, motor speed can be enhanced using a gearhead. maxon's UP (ultra-performance) planetary gearheads are designed to maximize the efficiency and reduce friction, therefore offering the possibility of back driving.

For more technical information on maxon motors as generators visit [support.maxongroup.com](http://support.maxongroup.com)





# Downhole Inspection and Intervention



The evolution of horizontal drilling has led to an increased complexity of downhole tool deployment. This is true not only for drilling operation, but also for inspection and intervention in completed wells. In addition to gravitational force used during vertical section, conveying is required in order to negotiate challenging inclines and horizontal sections. These sophisticated tools are capable of not only conveying, but performing various inspection tasks. Electromechanical drives are used to extract arms, fingers, shift sleeves and actuate valves.

Whether actuating a wheel assembly to drive a conveyor, extending caliper fingers to inspect the casing, or controlling a valve for fluid sampling, maxon drives offer a reliable and robust solution, capable of withstanding the harshest environments. Brushless DC motors and planetary gearheads rated up to 200°C ambient temperature and 1'700 bar (25'000 PSI) are available off the shelf. For high precision positioning, it is possible to assemble a heavy duty resolver at the back of a motor; and linear actuators with ball screw integrated into the gearhead can accomplish most demanding linear movements. Even customized brushed motors are a possible solution for applications up to 150°C ambient temperature (up to 200°C winding temperature).

Sophisticated tools are capable of not only conveying, but performing various inspection tasks.



# Hydraulic Pumps



Interfaces can be customized to fit individual pump designs.

Hydraulic micro pumps are designed for use in downhole applications with extremely restricted space envelope. These pumps can obtain large amounts of force from a minimum power supply.

Unmatched efficiency, high power density in a small package, and great robustness are some of the features that make maxon Heavy Duty drives a great match with hydraulic pumps. Interfaces can be customized to fit individual pump designs. Motor and gearhead are designed in such a way that oil can pass through, enabling easier integration in the tool and offering additional cooling at the same time.



# Electric Setting Tool

Electric drives offer an alternative to actuating a setting tool, eliminating the need for explosive charge.



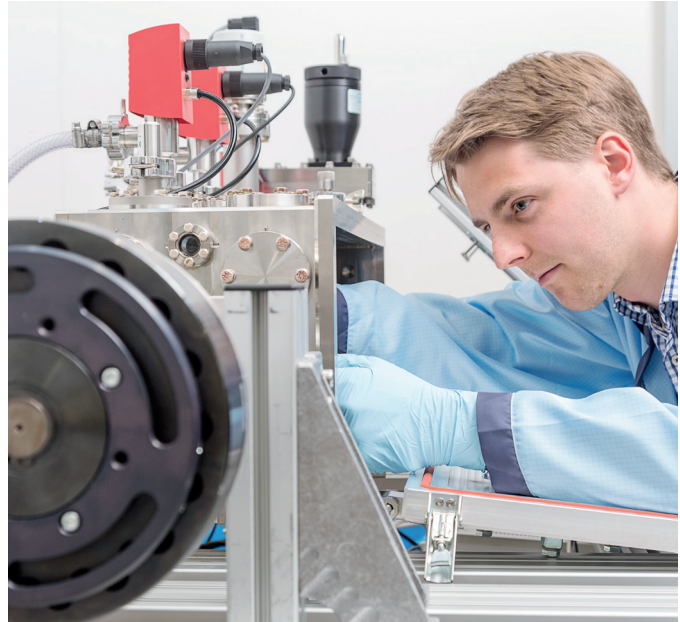
During completion or well intervention, certain parts of wellbore must be isolated from others in order to perform downhole operations while preventing fluid immersion and potential damage to the well formation. This isolation is achieved by setting packers, plugs or similar well tools. Setting tools have traditionally used the method of explosive charge in order to activate isolation tools. However, the explosive-type setting is not always desirable, particularly with new completion technologies. Electric drives offer an alternative to actuating a setting tool, eliminating the need for explosive charge. The drive is often coupled with a hydraulic pump, obtaining high axial forces within a small space and minimum power input.

maxon DC motors can be combined with 22 mm, 32 mm or 42 mm Heavy Duty gearheads, available off the shelf with up to 5 stages and offering torque capability up to 100 Nm (overload torque of GP 42 HD). Balls screws or linear screws can be integrated in the gearheads, turning the drive into a complete linear actuator.



# Quality tests. Reliable and efficient.

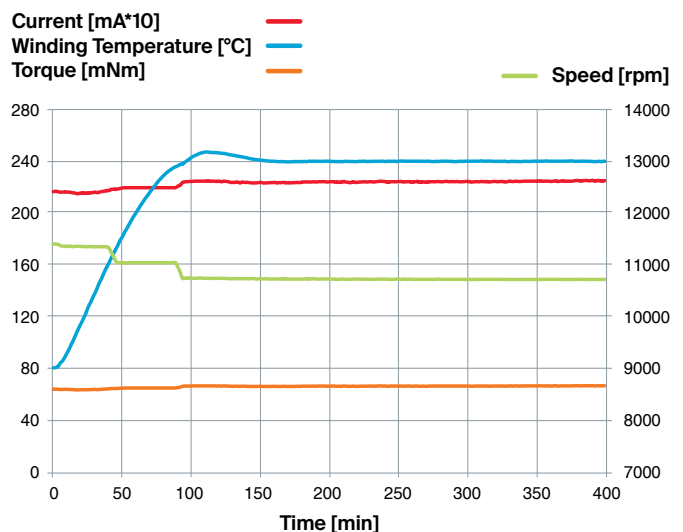
In the development phase, we push our drives to their limits. Our in-house laboratory provides us with the ability to simulate extreme conditions and perform standard maxon tests to ensure that the products we offer our customers are robust and reliable.

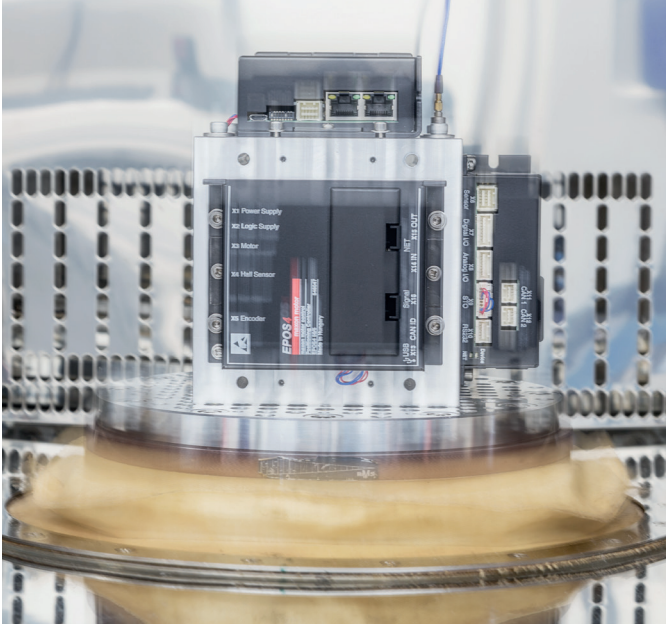


## Internal full load test

We test the motors in hydraulic oil, at extreme temperatures, and under full load during continuous operation. During this load test the winding heats up to its maximum rated temperature. Continuous monitoring provides information on the drive's performance characteristics.

### Load test EC 22 HD (60-70 mNm at 180° C in oil)



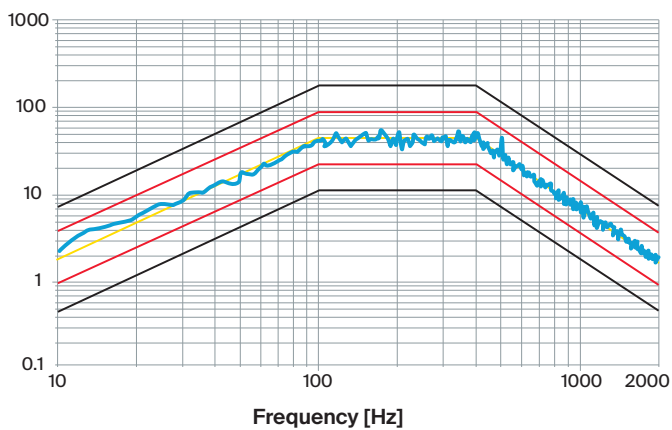


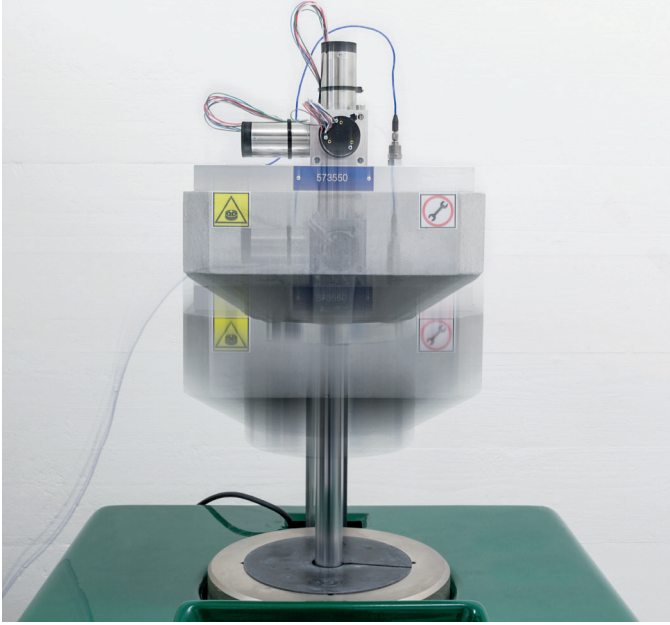
## Vibration and thermal stress test

The drives are placed in a climate controlled cabinet and subjected to high vibration. Testing is carried out with the motors in operation at high temperature. The motors are required to continue functioning within their performance specification while vibrations are applied in all directions.

Random vibration 17.4 grms

Acceleration Spectral Density  $[(m/s^2)^2/Hz]$



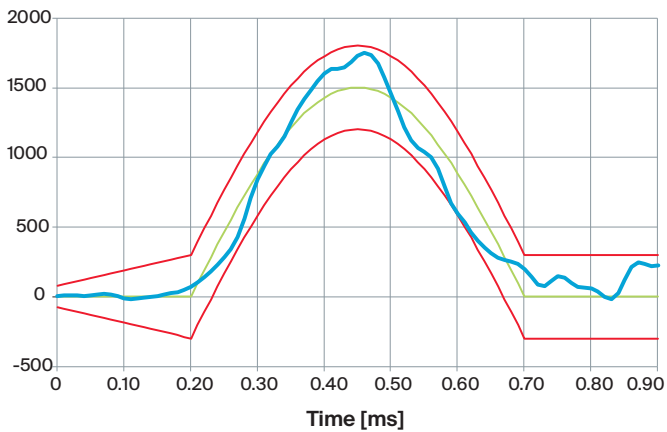


## Shock test

The laboratory system performs a variety of shock loads of more than 1000 g. After the shock test, the drives must be fully functional.

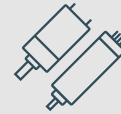
### Half sine pulse (MIL-STD-202G Method 213B)

Acceleration [g]



## Standard test procedure

Prior to delivery to the customer, all of maxon's HD drives have to pass our standard test procedure.



### Motor + Combination

STP1



### Environmental Stress Screening (ESS)

- High temperature test
- Load test

STP2



### General Electrical Test

- Insulation test
- maxon standard test

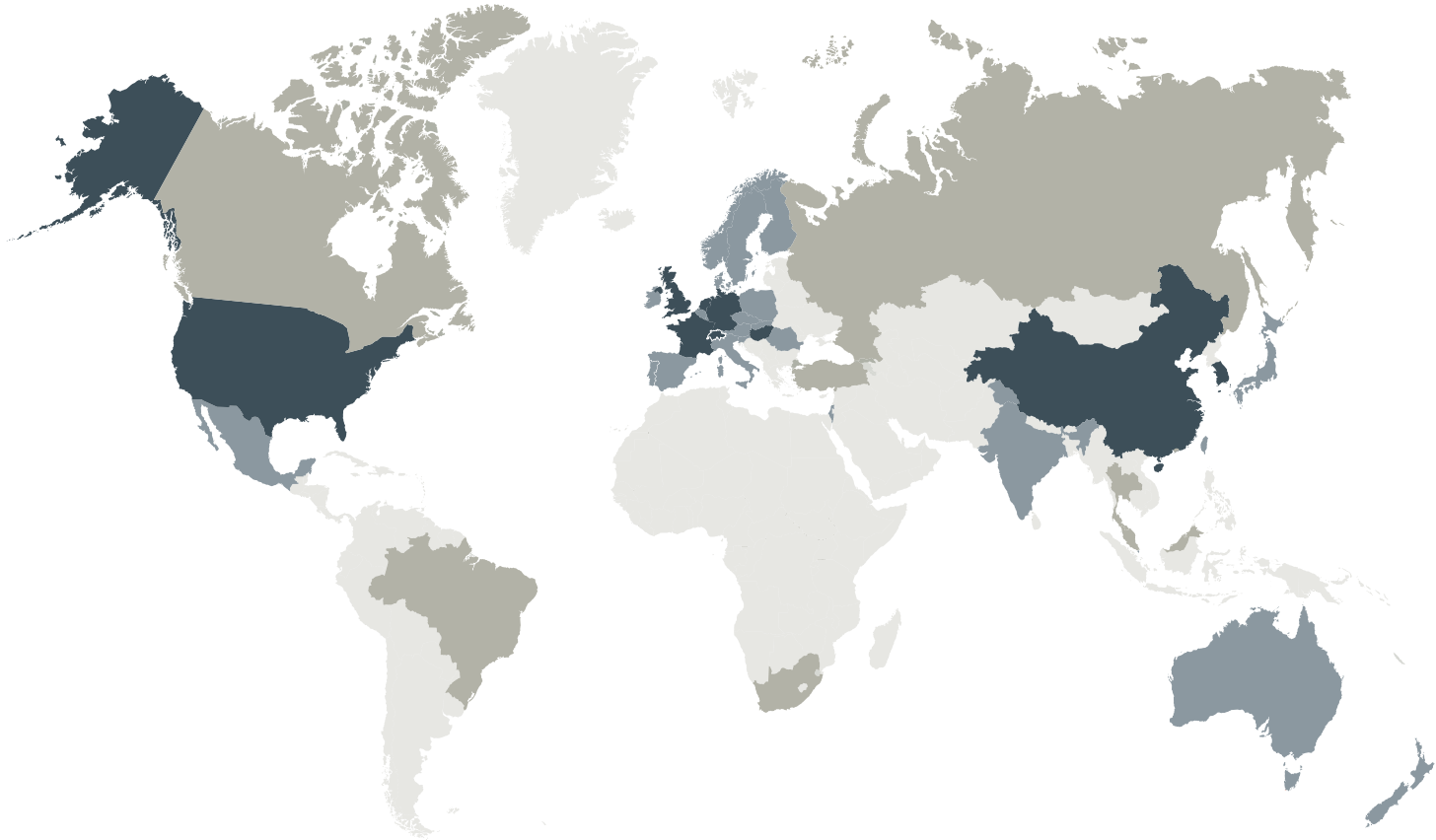
STP3



### Visual & Dimensional Check

- Visual inspection
- Dimension check

# A global network



## maxon Manufacturing Companies

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

## maxon Sales Companies

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

## maxon Sales Agents

Brazil	Malaysia	Thailand
Canada	Russia	Turkey
Hong Kong	South Africa	

For detailed contact information please visit  
[contact.maxongroup.com](http://contact.maxongroup.com)

