

maxon ceramic

Harder than steel.

Innovative high-tech ceramic components.



www.maxonceramic.com

maxon motor

driven by precision

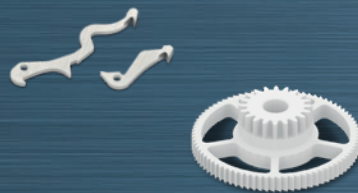
Smooth-running and wearproof.
Ceramic precision spindles.



Resilient and long-lasting.
Ceramic axles for power tools.



Complex shapes for microtechnology.
Ceramic components for miniaturized applications.



**Protection against high temperatures
and aggressive media.**
Ceramic sensor housing for measuring equipment.



Shiny, scratch-resistant surfaces.
Earphone housing made of black ceramic.





Experience and innovation.

maxon ceramic.

maxon ceramic in Sexau, Germany, is part of maxon motor, the global leading provider of high-precision drive systems, based in Switzerland. maxon ceramic has extensive knowledge and more than 20 years of experience in the field of powder injection molding. Customized ceramic and metallic components are produced by CIM (Ceramic Injection Molding) and MIM (Metal Injection Molding) technology.

In addition to our extensive standard program, we also offer components manufactured to customer specifications. We not only develop components for drive technology and the watch industry, but also high-precision spindles made of high-performance ceramic. Our development and engineering department use cutting-edge CAD technology and make use of the finite element calculation method.

For additional information, contact your local maxon representative found at:
[contact.maxonmotor.com](https://www.maxonmotor.com)



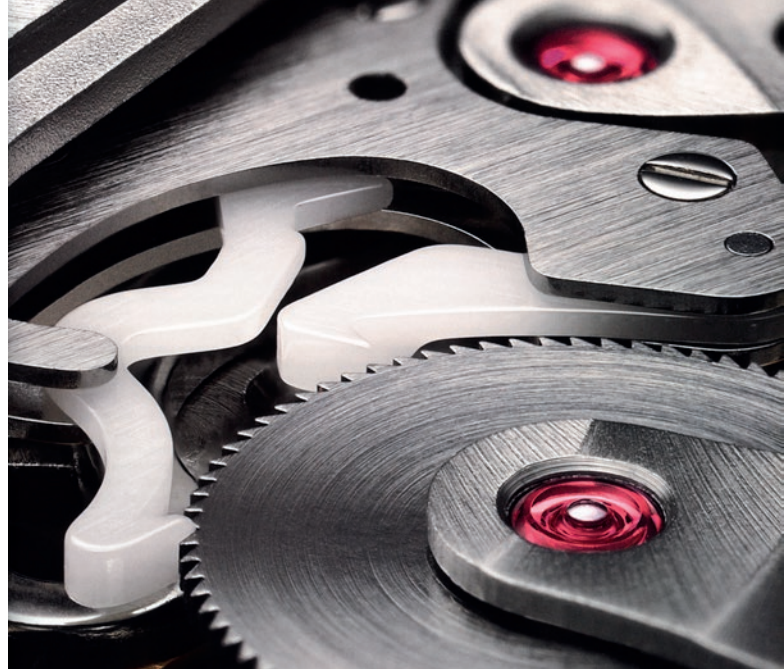
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Complex shapes for microtechnology.

Ceramic pawls in automatic watches.

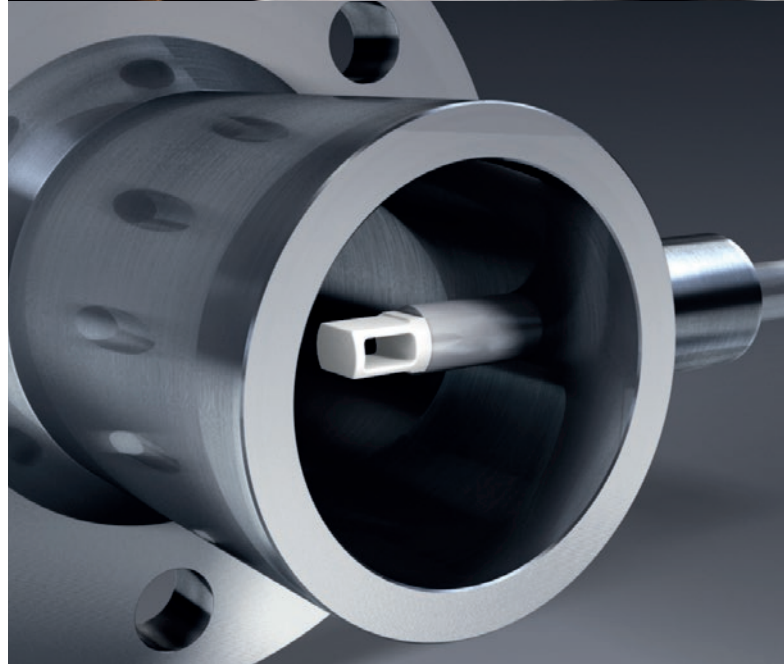
In clockwork, the tiny mechanical parts have to be machined with utmost precision for the clockwork to run reliably. With ceramic components, the meshing parts maintain precision over life spans never achieved before.



Protection against high temperatures and aggressive media.

Ceramic sensor housing in a flow meter.

Ceramic resists harsh conditions. A sensor housing, it shows resistance against high temperatures, abrasive dust in the mass flow and chemically aggressive condensate. The low heat conductance protects the electronics inside of the sensor. This passive behavior towards electric and magnetic fields make it possible to use electronic sensors.



Shiny, scratch-resistant surfaces.

Ceramic housing for earphones.

Ceramic surfaces feature scratch-resistance and shine. The continuous development of our polishing and shaping processes combines aesthetic design and functionality in a very special way. Ceramic housings protect the high-quality technical components inside and give the products a long-lasting high-quality exterior.





Zirconia.

Zirconia is a high-performance industrial ceramic. It is used primarily for applications where customary materials would fail. These applications include wear optimization, as well as non-magnetic applications in a vacuum and in medical applications. Zirconia measures up to these tasks even while meeting high requirements for chemical and thermal stability as well as thermal and electrical insulation.

Furthermore zirconia shares many of the properties of steel (elasticity modulus of approx. 200 000 N/mm², bending strength of >800 N/mm², expansion co-efficient of 10 x 10⁻⁶ 1/K). However, at 1350 HV, it is many times harder than steel and surfaces are virtually wearproof.

General material properties.

Bending strength	>800 N/mm ²
Elasticity modulus	2 x 10 ⁵ N/mm ²
Density	≥6.03 g/cm ³
Hardness	1350 HV
Heat expansion coefficient	10 x 10 ⁻⁶ 1/K
Thermal conductivity	2 W/mK
Dielectric constant	22 []
Electrical resistance	10 ⁸ Ωm



Precision spindles made of ceramic.

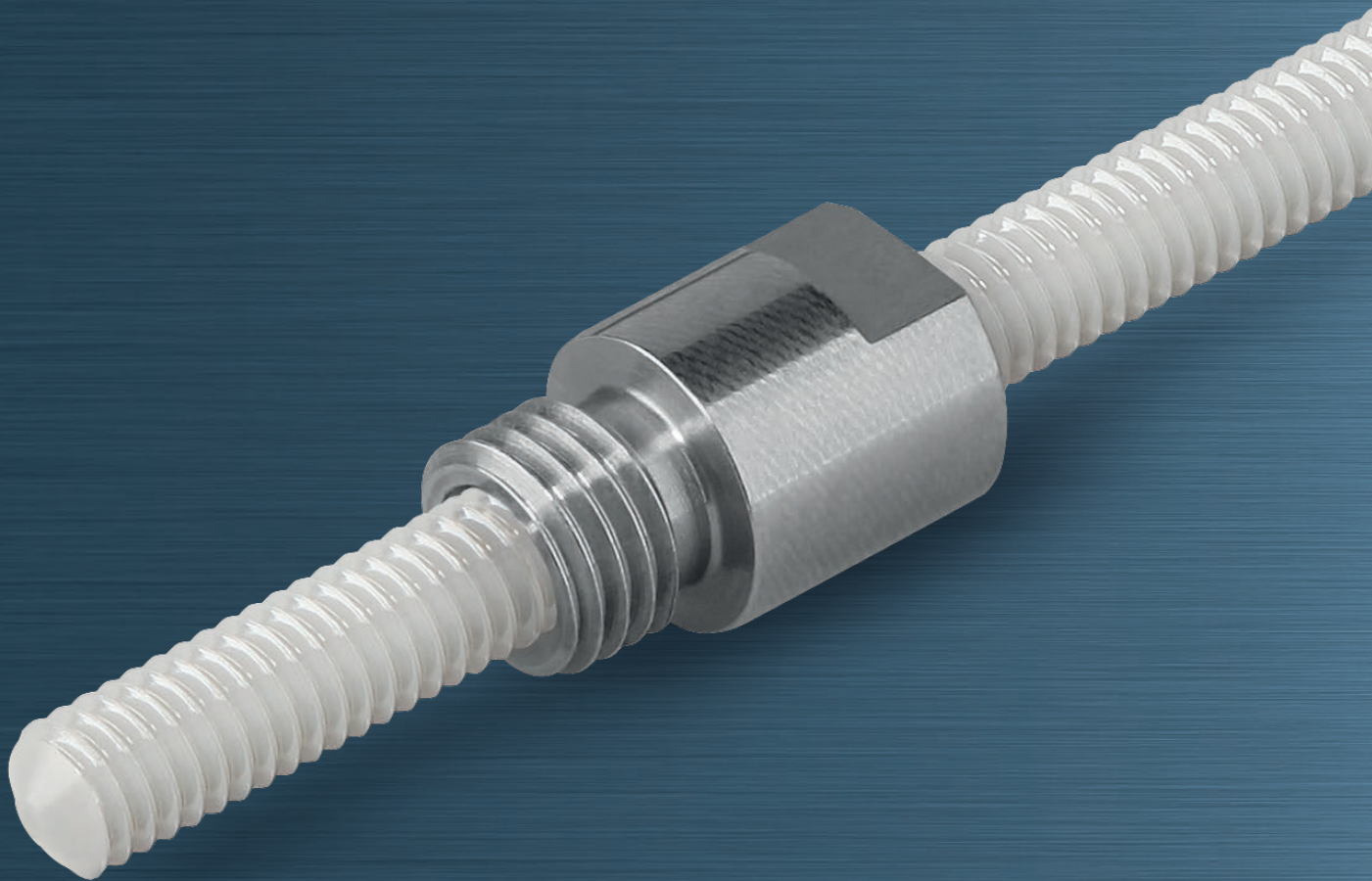
The maxon cgs spindle – Smooth-running and wearproof.

Ground ceramic surfaces are extremely suitable for sliding movements. Our ceramic spindles with specially developed cgs surface (ceramic glide surface) work almost completely without slip-stick effect. Ceramic components can be positioned easily, even in areas with strong electric fields or high vacuum.

Due to the high hardness of the ceramic, the maxon cgs spindles achieve an exceptionally long life span, especially in dynamic operation. All these properties make ceramic spindles a better alternative to customary steel spindles and ball screws.

cgs surface for ceramic spindles.

To use this high-strength material for spindles, maxon ceramic has designed the spindle flanks with a special cgs surface structure. The result is an unprecedented wear resistance and extremely high efficiency.





Ceramic as spindle material makes it possible to use the spindles in:

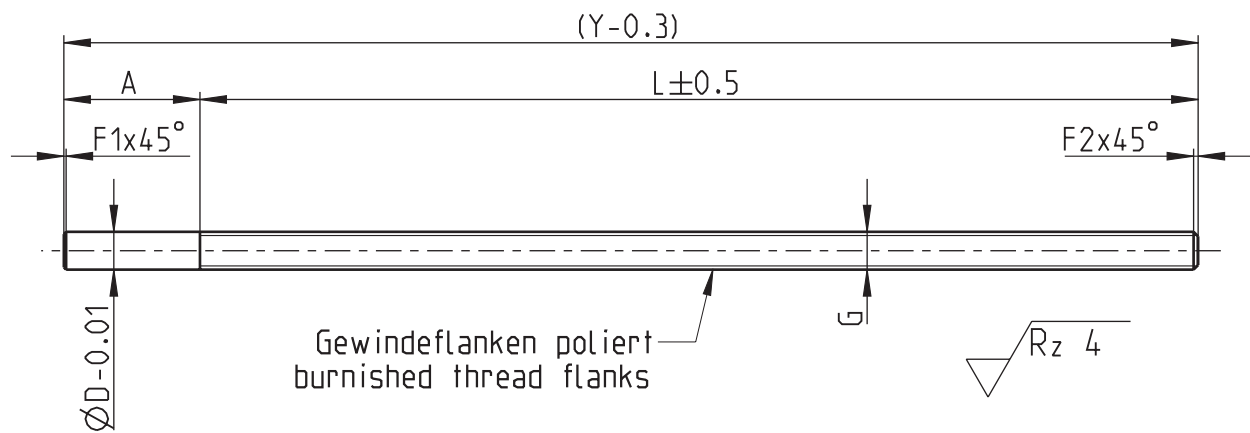
- Applications with high power transmission
- Applications with long life span
- High temperature environments
- Magnetic and electric fields
- Chemically aggressive environments
- Cleanrooms
- High vacuum technologies

Benefits of ceramic spindles:

- Excellent sliding characteristics
- Extreme wear resistance
- Significant increase in life span
- Excellent efficiency
- Almost non-existent stick-slip effect
- Thermally isolating
- Spindles resistant to thermal stress (~800°C)
- Electrically insulating
- No warming up in induction fields
- Chemically stable
- Corrosion-free
- Strength, Elasticity modulus and thermal expansion similar to that of steel

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maxon standard spindles.

Ceramic spindles (in white).

Size	Color	Part no.	D	A max.	L max.	F1	F2	(Y) max.
M2	white	426634	2.0	18	102	0.3	0.3	120
M2.5	white	426707	2.5	18	132	0.3	0.3	150
M3	white	426715	3.0	18	132	0.4	0.4	150
M4	white	426717	4.0	18	132	0.5	0.5	150
M5	white	426730	5.0	18	132	0.6	0.6	150
M6	white	426740	6.0	18	232	0.7	0.7	250
M8	white	426763	8.0	18	232	0.8	0.8	250
M10	white	426783	10.0	18	232	1.0	1.0	250

Ceramic spindles (in black).

Size	Color	Part no.	D	A max.	L max.	F1	F2	(Y) max.
M2	black	427107	2.0	18	102	0.3	0.3	120
M2.5	black	427186	2.5	18	132	0.3	0.3	150
M3	black	427199	3.0	18	132	0.4	0.4	150
M4	black	427209	4.0	18	132	0.5	0.5	150
M5	black	427216	5.0	18	132	0.6	0.6	150
M6	black	427221	6.0	18	232	0.7	0.7	250
M8	black	427231	8.0	18	232	0.8	0.8	250



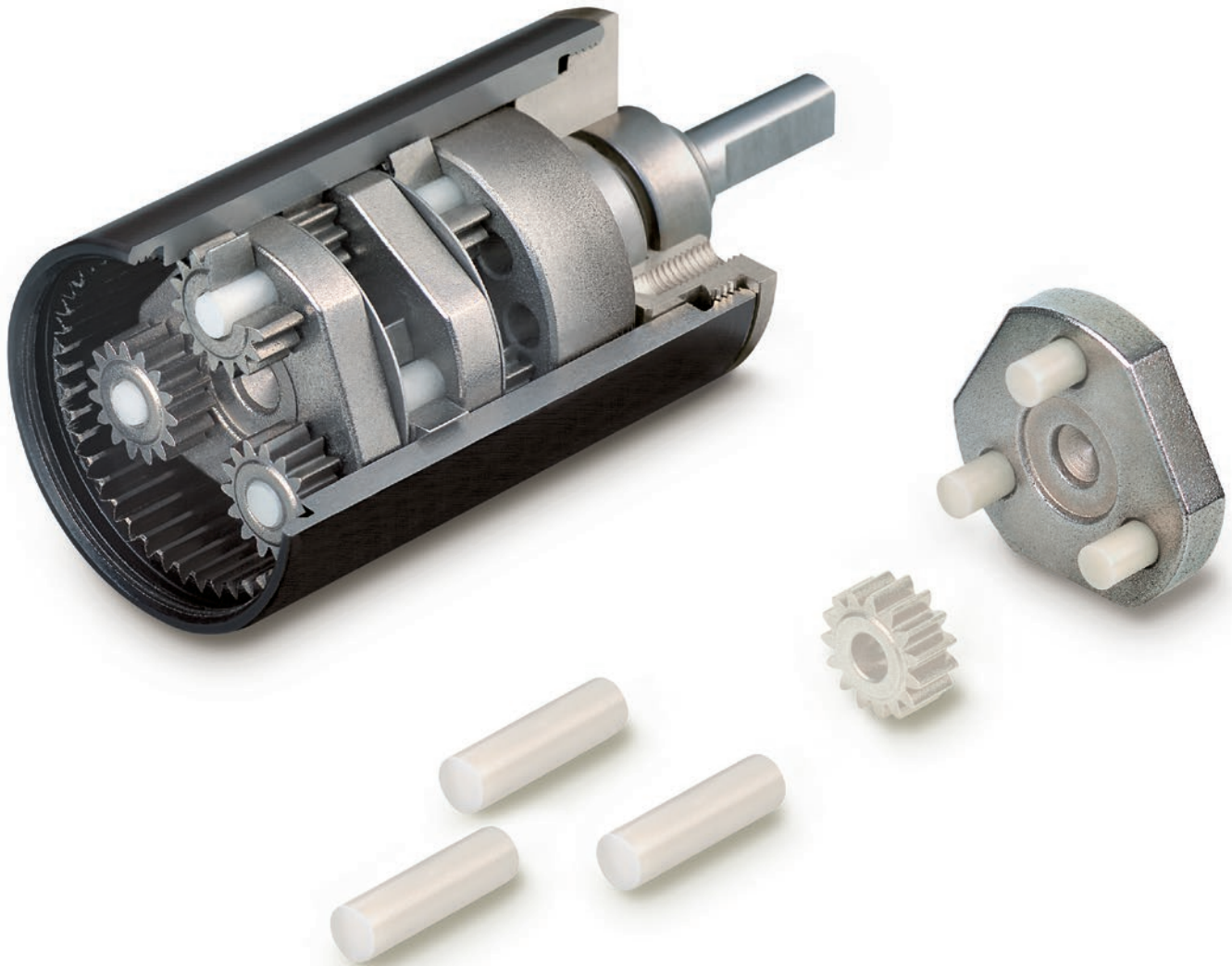
System-specific nuts.

The right nut for each application.

In combination with ceramic spindles, nuts are available in steel, brass, bronze or plastic. For applications with very high demands to the life span, we use CVD-coated steel nuts. The nuts profit from the special maxon cgs surface of the spindles, this results in significantly longer life spans than those offered by metal spindles. For backlash-free applications, we offer preloaded nuts. For applications with strong magnetic or electric fields, plastic nuts are preferred. In applications involving movements with little load, the nuts may be operated without the lubricant

Individual solutions.

In addition to our standard program, we of course also offer spindles and nuts tailored to match your application. We also provide spindles with fine thread, special leads, as well as double-thread spindles. A customer-specific integration with your bearing system is also possible. Please contact us if you are interested in learning more.

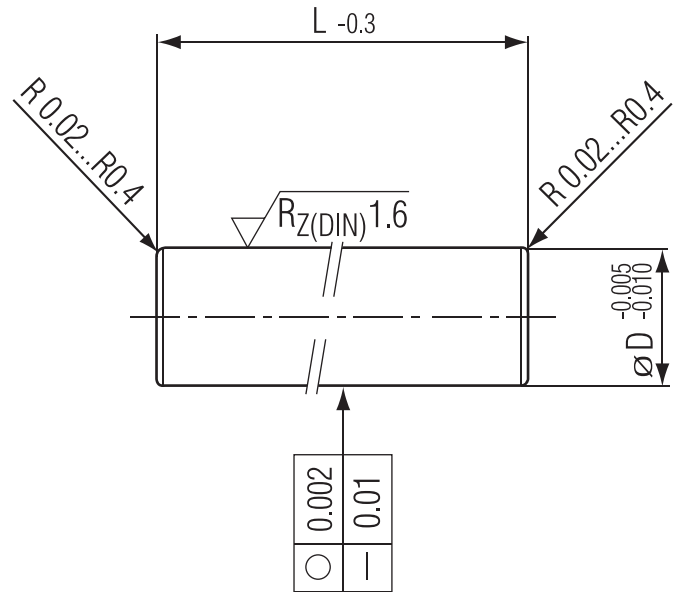


How can the life span of planetary gearheads be increased?

Planetary gearheads have existed for centuries; their simple structure makes it possible to transmit high torque in small spaces. To increase the life span, maxon motor increased the precision of the components and set new benchmarks for efficiency and life span by using a new material.

The use of ceramic axles in our gearheads led to a separate program for ceramic rods. Ceramic axles may be used in:

- Linear guides
- Positioning pins
- Joints
- Rollers



maxon standard axles.

Resilient and long-lasting.

Ceramic is an excellent material for small dynamic systems. When the miniaturization of rolling bearings has reached its limits and milling of complex geometries gets difficult, ceramic as material offers decisive benefits. With its excellent sliding characteristics, the high wear resistance and the ability to shape components by means of injection molding, ceramic outperforms conventional solutions.

Ø D	L = 2.4	L = 6.4	L = 7.4	L = 10.6	L = 13.8	L = 15	L = 35	L = 40	L = 60	L = 70	L = 120
0.8	255899	255900	255901	255902	255903	255904	255905 ⁴⁾	348501 ⁴⁾	348502 ⁵⁾	348503 ⁶⁾	
1.0	255891	255892	255893	255894	255895	255896	255898 ⁴⁾	348498 ⁴⁾	348499 ⁵⁾	348500 ⁶⁾	
1.5	255883	255884	255885	255886	255887	255888	255889 ⁴⁾	255890 ⁴⁾	255792 ⁵⁾	255793 ⁶⁾	
2.0	255872	255873	348693	255875	255876	255877	255879	255880	255881	255882	
2.5	255864	143825 ³⁾⁷⁾	255866	255867	255868	255869	255870	255871	346621	348288	
3.0	255856	255857	255858	255859	255860	255861	255862	255863	346619	346620	
4.0	255845	255846	166875 ¹⁾³⁾⁷⁾	137962 ¹⁾³⁾⁷⁾	255849	255850	255851	255853	255854	255791	255787 ⁹⁾
5.0	255833	255834	255835	255836	255837	255838	255839	255840	255841	255842	255843 ⁹⁾
5.5	255818	255819	255820	255786	205063 ²⁾³⁾⁷⁾	255825	255826	255827	255828	255830	255831 ⁹⁾
6.0	255806	255807	255808	255809	255810	255811	255812	255813	255814	255815	255816 ⁹⁾
8.0	255794	255795	255796	255797	255798	255799	255800	255801	255802	255803	255804 ⁹⁾

¹⁾ Diameter tolerance deviation: -0.008/-0.013

²⁾ Diameter tolerance deviation: -0.013/-0.018

³⁾ Rounded edges R 0.3 ± 0.1

⁴⁾ Straightness tolerance deviation: 0.02 mm

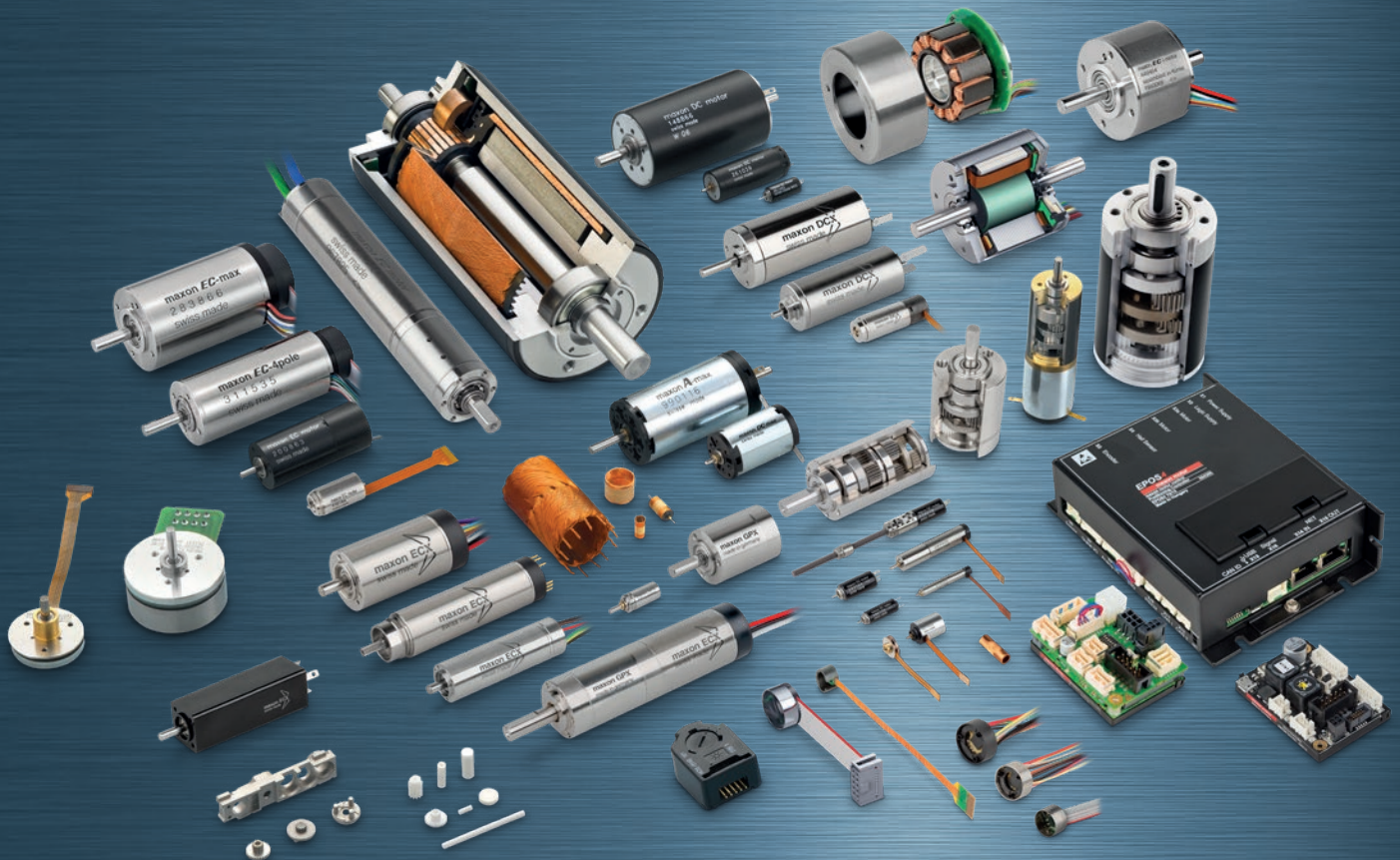
⁵⁾ Straightness tolerance deviation: 0.03 mm

⁶⁾ Straightness tolerance deviation: 0.04 mm

⁷⁾ Roundness tolerance deviation: 0.003 mm

Precise drives since 1961.

maxon motor develops and builds precision drive systems that are among the best in the world. They are used wherever requirements are demanding and engineers cannot afford to compromise: maxon motors drive NASA's Mars rovers. They can also be found in insulin pumps, surgical power tools, humanoid robots, and in precision industrial applications. We not only provide motors, gearheads, encoders, and controllers, but also offer our know-how and many years of experience. Since 1961, maxon's engineers have been true partners in the quest to create the right solution for each customer. Prototypes, custom systems, or large series: Whatever your requirements may be, we are happy to be of assistance with our global sales network, eight production sites, and more than 2,500 employees worldwide.



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