

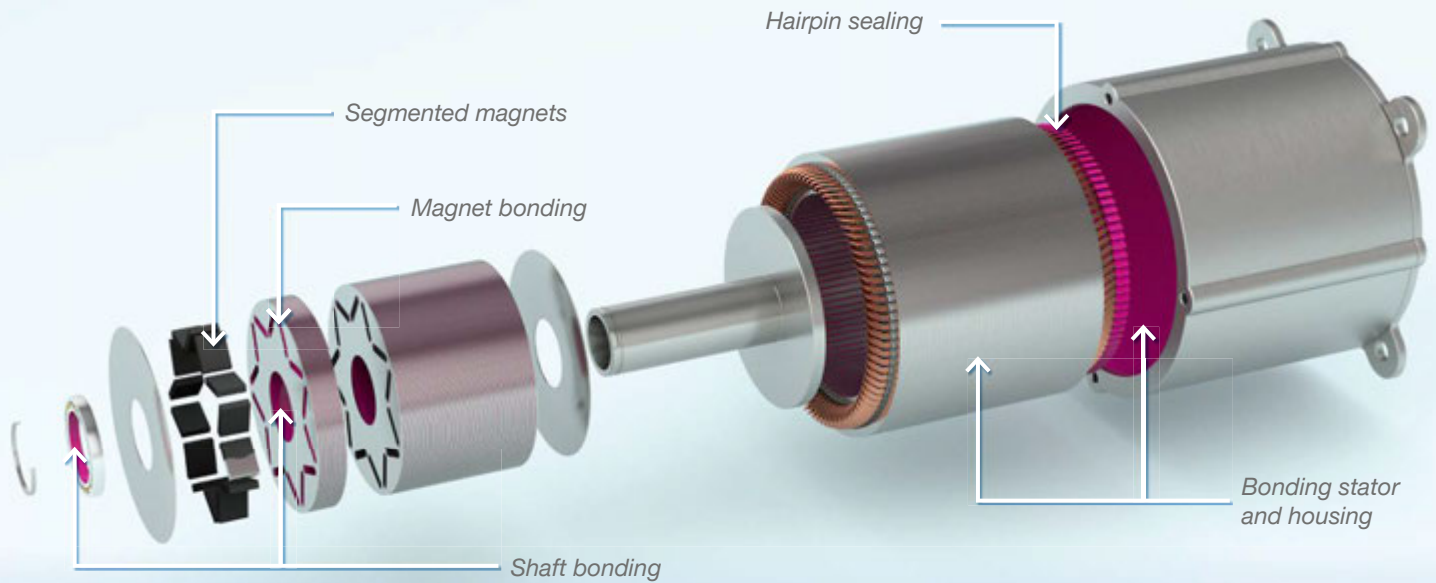
DELO



Versatile bonding options in electric motors



**Adhesives
for E-Motors**



Adhesives for Electric Motors

Electric motors are becoming ever smaller and more powerful, while at the same time their efficiency is expected to increase. At some stages, established joining techniques face various challenges, both with regard to the motor itself and to its production process. The high-tech adhesives developed by DELO® especially for electric motors help you solve these challenges. They feature gap-

filling and tension-equalizing properties and offer maximum strength as well as resistance to temperature, media, and impact. They also enable efficient production processes that are flexible and scalable, especially with dual curing. Contact us and benefit from our diverse and powerful product range! Let our experts help you find the solution that best suits your motor and its application.



VIDEOS ON BONDING OF ELECTRIC MOTORS

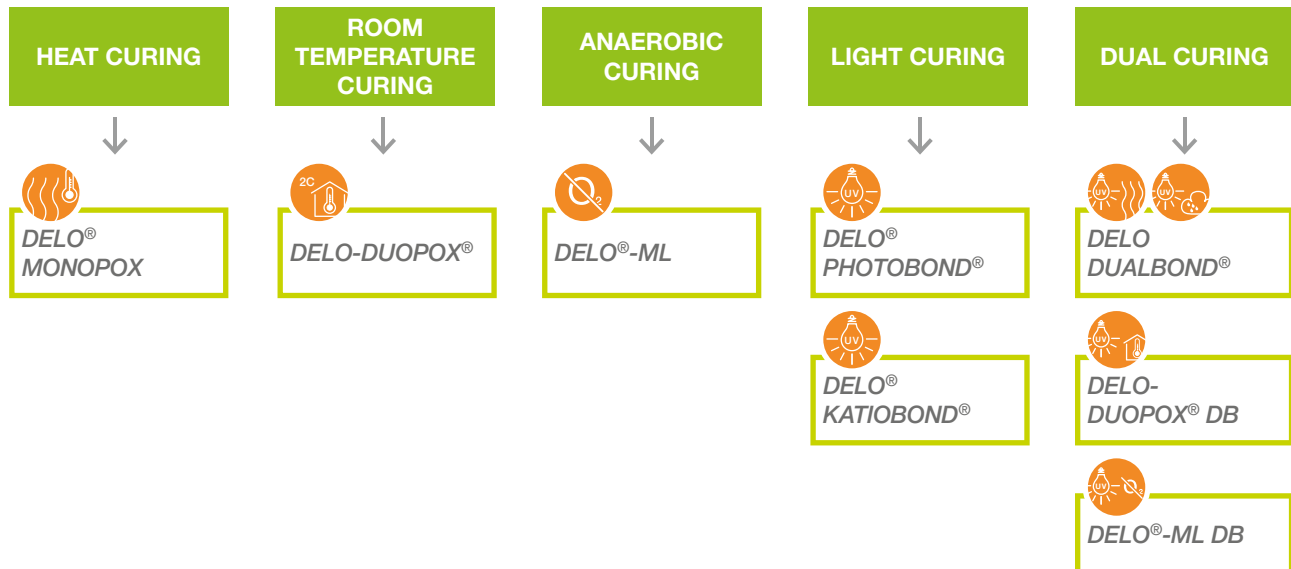
www.youtube.com/DELOadhesives



Discuss your project and your requirements with our experts:

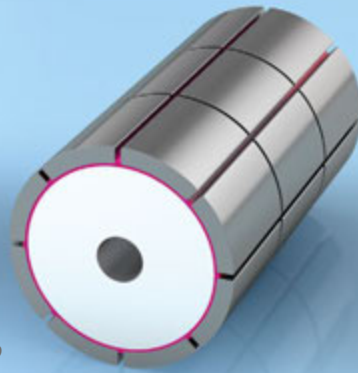
e-motor-experts@DELO.de

DELO® adhesives for electric motor applications

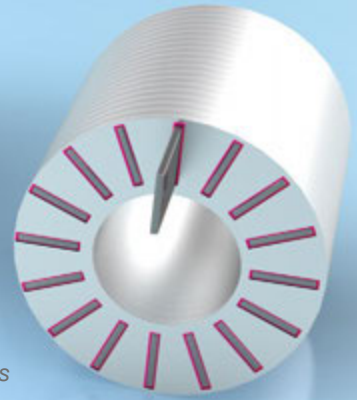




Bonding magnets into the housing



Bonding magnets to rotors



Bonding buried magnets in rotors

Magnet Bonding

Considering the numerous advantages bonding offers over mechanical anchoring or bandaging, more and more motor manufacturers are opting for bonding

magnets (usually ferrite or rare earth magnets) into housings (e.g. made of steel) or electrical lamination stacks.

IPM bonding for the automotive industry

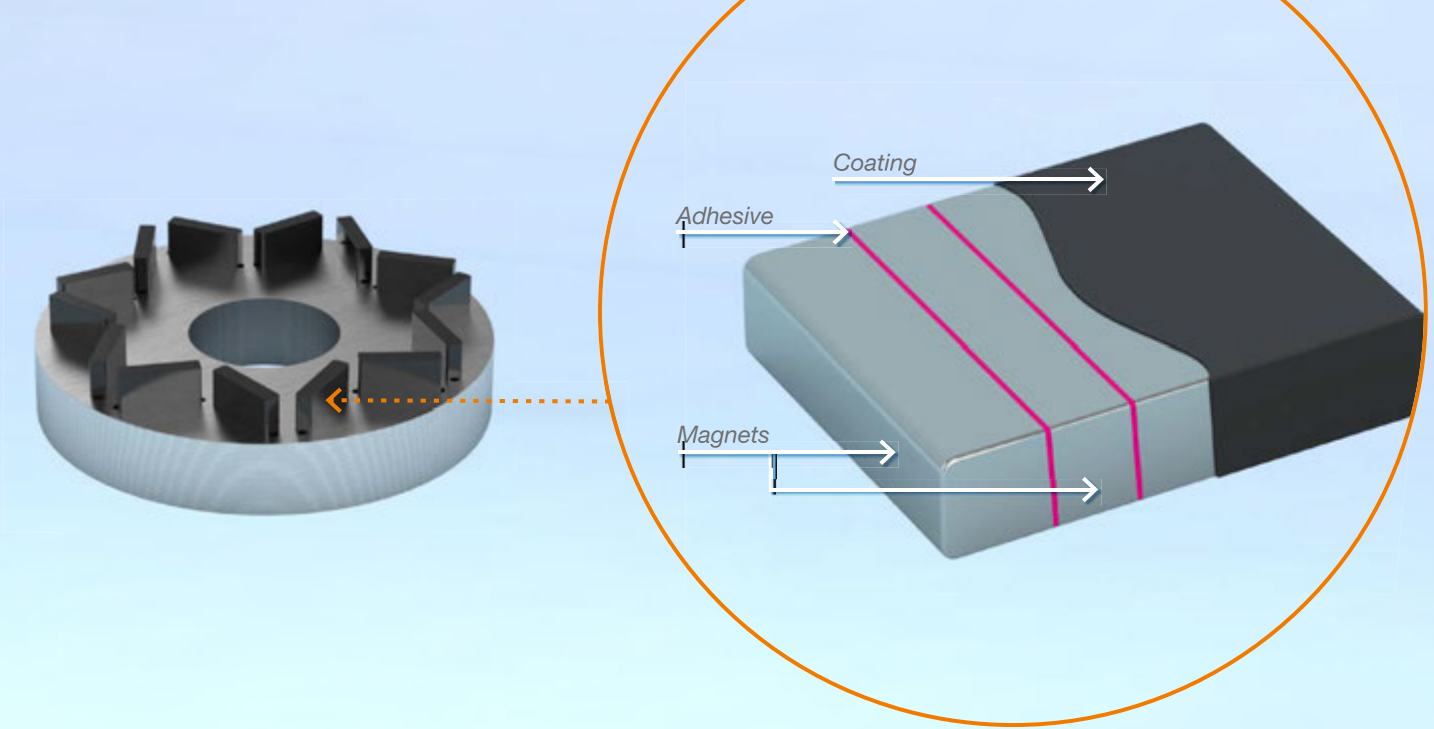


Adhesive dispensing next to the IPM (Interior Permanent Magnet)

Optional light fixation in seconds with DELOLUX® curing lamps

Final curing with heat

Properties of DELO® adhesives	Your benefits
<ul style="list-style-type: none"> Light fixation within seconds (< 10 s) Curing at room temperature 	Fast and automated process; large components do not need to be heated
<ul style="list-style-type: none"> Very good flowability Damping effect 	Improved functionality: Reliable protection of components against corrosion and vibrations; acoustic improvement
<ul style="list-style-type: none"> High temperature stability up to +428 °F (+220 °C) Very high media resistance 	Reliable function of components even at maximum operating temperatures and in contact with cooling liquid or oil
<ul style="list-style-type: none"> Tension-equalizing Impact-resistant 	Reliable function throughout the components' lifetime even under the most demanding conditions
<ul style="list-style-type: none"> Good gap-filling properties 	Larger manufacturing tolerances for magnets and lamination stacks

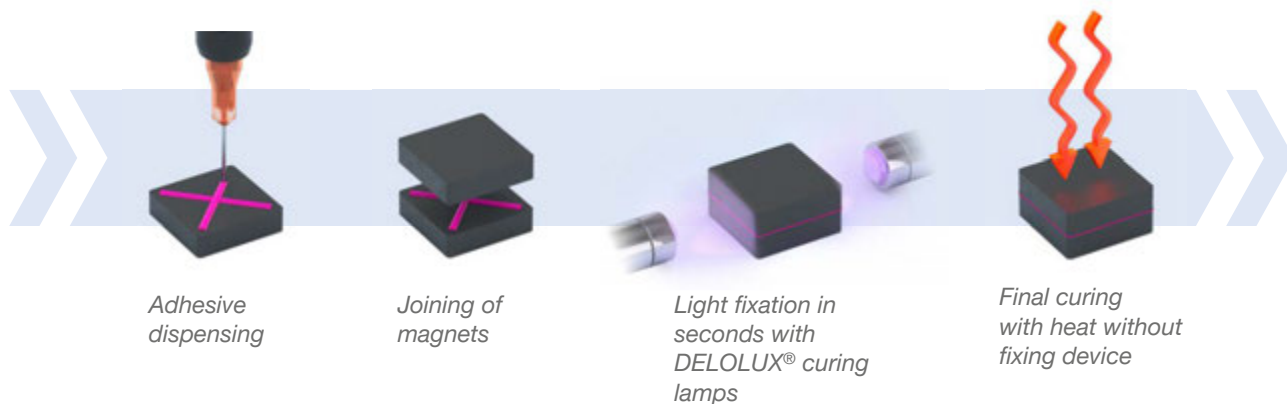


Segmented Magnets

Segmented (“stacked”) magnets – for example, neodymium magnets – are used in electric motors to reduce eddy currents. The resulting lower heat development in the magnets leads to higher efficiency.

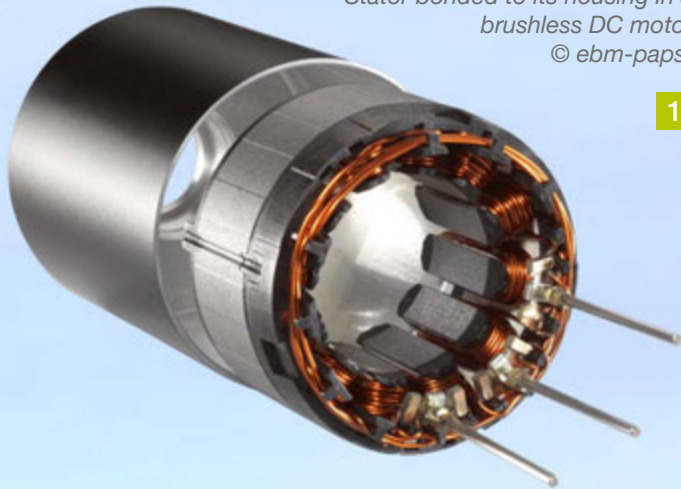
Such applications are mainly found in the automotive sector where it is essential to achieve the best possible performance in the smallest installation space.

Magnet stacking



Properties of DELO® adhesives	Your benefits
<ul style="list-style-type: none"> ▪ Special filler 	Defined layer thicknesses can be produced (e. g. 50 µm)
<ul style="list-style-type: none"> ▪ Electrically insulating 	Reduction of eddy current losses within the magnets
<ul style="list-style-type: none"> ▪ Very high temperature stability up to +428°F (+220 °C) 	Improved functionality: Reliable protection of components during continuous operation at high temperatures
<ul style="list-style-type: none"> ▪ Light fixation within seconds as an option 	Rapid further processing without additional fixing devices; short cycle times

Stator bonded to its housing in a brushless DC motor
© ebm-papst



1

Bonding a collector to a shaft
© metabo



2

Stator-to-housing Bonding, Shaft Bonding

1 Bonding stator to housing: Stators made of electrical sheet are often bonded into their housings (e.g. from cast aluminum or cast magnesium), since even in this

application, bonding has some advantages over conventional joining methods such as pressing or shrinking.

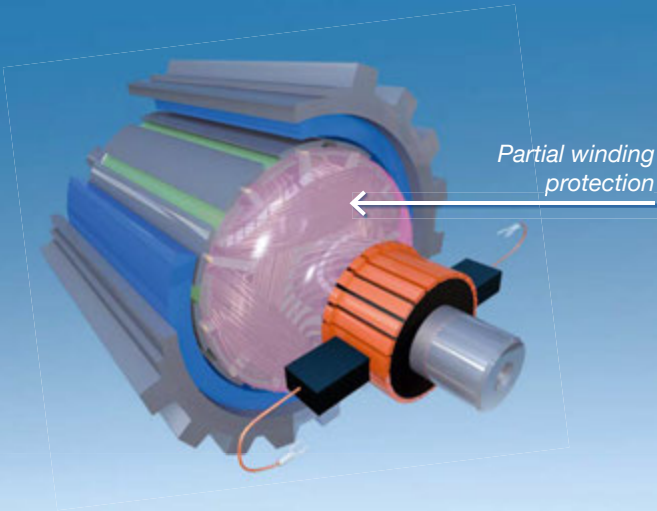
Properties of DELO® adhesives	Your benefits
<ul style="list-style-type: none"> High temperature stability up to +392 °F (+200 °C) Damping effect of the adhesive 	Improved functionality: Reliable protection of components against high temperatures and vibrations; acoustic improvement
<ul style="list-style-type: none"> Good gap-filling properties 	Larger manufacturing tolerances are possible
<ul style="list-style-type: none"> Equalization of tensions between stator and housing with different CTEs 	Different materials of stator and associated housing can be combined; reliable connection over the entire service temperature range
<ul style="list-style-type: none"> Curing at room temperature 	No heating up required; efficient production
<ul style="list-style-type: none"> Fast fixation by light or solvent-free activator 	Fast, automated process

2 Shaft bonding: For a long time, force-closed or form-closed joining techniques such as shrinking were used for shafts. Now, adhesives are also used in this field, since they not only prevent play and slip, but also

protect against fretting or contact corrosion. Anaerobic-curing, low-viscous adhesives are preferred here, as the joining gap is smaller due to the given dimensions of shaft and hub.

Properties of DELO® adhesives	Your benefits
<ul style="list-style-type: none"> Very high temperature stability up to +428 °F (+220 °C) 	High functionality even at high temperatures
<ul style="list-style-type: none"> Curing at room temperature 	Efficient production
<ul style="list-style-type: none"> Fast fixation by light or solvent-free activator 	Fast, automated process

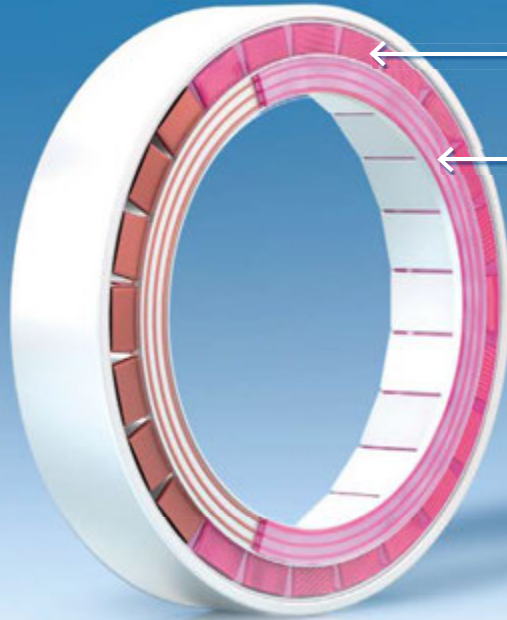
Motor for power tools



Protection of the stator windings

Contact protection

Stator of a drive module for automobiles



Potting & Covering

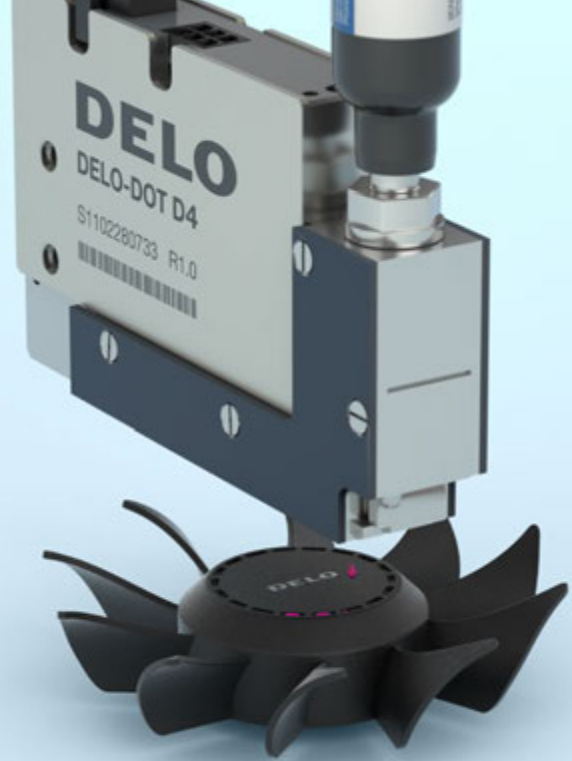
Sensitive motor components often have to be protected against humidity, media, or mechanical load. This is best achieved with potting compounds. The highly reliable potting compounds from DELO® are used especially in the automotive sector to meet the demanding requirements of this industry.

Possible applications:

- Protecting the (enameled) copper coil wire against vibrations
- Covering solder contacts/welding contacts to protect them from corrosion
- Partial winding protection against abrasive media
- Stator potting
- Hairpin sealing

Properties of DELO® adhesives	Your benefits
<ul style="list-style-type: none"> ▪ Excellent resistance to aggressive media (e.g. ATF) 	Reliable function throughout the components' lifetime
<ul style="list-style-type: none"> ▪ Excellent temperature resistance while providing low thermal expansion 	Minimized stresses between potting compound and component ensure the component's reliability over its entire lifetime
<ul style="list-style-type: none"> ▪ Low viscosity 	Optimum flow also between and behind component parts
<ul style="list-style-type: none"> ▪ Thermal conductivity in combination with optimal flow behavior 	Improved heat dissipation in the electric motor
<ul style="list-style-type: none"> ▪ Fluorescent product variants available 	Easy optical application and process control
<ul style="list-style-type: none"> ▪ Very fast light fixation and curing when fixing and covering components Fast heat curing 	Short cycle times (light fixation within seconds, heat curing e.g. in only 20 min at +302 °F [+150 °C])

Using DELO-DOT® for fast and precise dispensing of balancing material onto a fan impeller

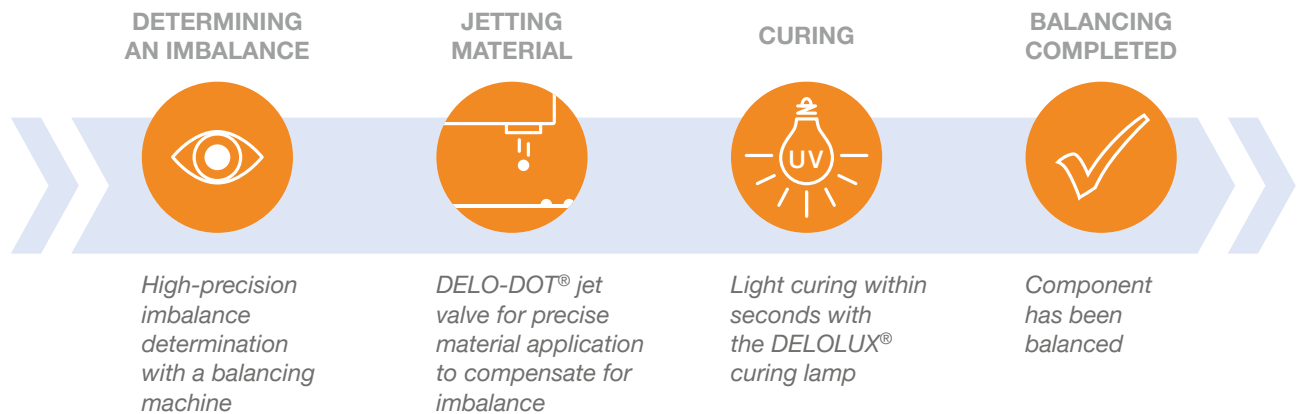


Additive Balancing

Balancing is essential in most applications involving rotating components to reduce vibration and extend service life. For this purpose, mass is added or removed at precisely calculated points. Compared to the conventional methods

of removing material by machining or using balancing putty to add mass, additive balancing with highly filled, light-curing DELO® materials offers several advantages. The scalable process is also suitable for the slightest imbalances.

Balancing process with light-curing DELO® materials



Properties of DELO® materials	Your benefits
<ul style="list-style-type: none"> Fast and precise dispensing with DELO-DOT® jet valve Light curing within seconds < 10 s 	Fast, automated process
<ul style="list-style-type: none"> One-component liquid material 	No need for initial sacrificial material; no mixing required; chip-free balancing saves the disposal of removed material (cleaning)
<ul style="list-style-type: none"> High density 	The required mass per drop of material takes up only little volume; no additional weights are necessary
<ul style="list-style-type: none"> Minimum possible correction accuracy of 0.1 mg 	Highest precision (residual imbalance of 0.001 g·mm)
<ul style="list-style-type: none"> Good adhesion to plastic (e.g. PA, PBT) and metal Good media resistance 	Reliable function throughout a component's lifetime



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