Mechanical Face Seals

EFFECTIVE ROTARY SEALING FOR HARSH AND CONTAMINATED ENVIRONMENTS

Mechanical Face Seals

Resilient and cost-efficient sealing for the most contaminated environments.

ENGINEERED FOR EXTENDED LIFE

Mechanical Face Seals offer a leak-free solution to extend service life for vehicles that operate under severe conditions in heavily contaminated environments, or to provide maintenance-free lifetime sealing. They effectively retain lubricating fluids and preventing the ingress of external dirt, mud and liquids in slow rotating applications, such as excavators, heavy trucks and mixers.

PROTECTING YOUR OPERATIONS

Effective protection from external contaminants is critical to efficient operations. Our Mechanical Face Seals are designed around real-world experience and are offered in a range of specially selected materials.

PROTECTING YOUR OPERATIONS

Trelleborg Sealing Solutions has decades of engineering experience – sealing, damping and protecting critical applications across nearly every industry. We are globally positioned to support you, with the same consistent quality, wherever in the world your operations are located.

CONSTRUCTION, MINING AND TUNNELING EQUIPMENT

Effectively resists the demanding conditions and viscous muds encountered on construction sites, helping to meet growing demands for infrastructure building and refurbishment. Mechanical Face Seals protect tracked vehicles, such as excavators and bulldozers, as well as conveyor systems.

AGRICULTURAL/FORESTRY MACHINERY

Maintains long hours of operation in fields, forests and farms to move heavy loads and extend replacement intervals. Mechanical Face Seals improve power take-off performance in tractors, harvesters and seeding machines.

OFF-HIGHWAY VEHICLES AND HEAVY TRUCKS

Keeps trucks moving and carrying goods for longer under any operating conditions. Mechanical Face Seals extend service life and effectively prevent leakage in transmissions and gearboxes, final drives, hubs and axles.

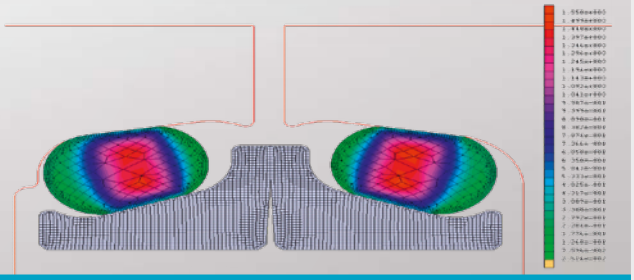
INDUSTRIAL MACHINERY, POWER AND PRODUCTION

Withstands severe wear and conditions in numerous industrial applications. Mechanical Face Seals are robust and can be trusted for maintenance-free sealing in gearboxes, mixers, stirrers and wind-driven power stations, for example.

TAILORED ENGINEERING AND PRODUCTION SERVICES

Trelleborg Sealing Solutions provides manufacturing and design support for Mechanical Face Seals:

- **>99% on-time-delivery** on thousands of products annually
- Manufacturing facilities **certified to ISO 9001, ISO 14001 and BS OHSAS 18001**
- **Specialized R&D and Quality departments** for Mechanical Face Seal development and refinement
- **Full suite of qualification equipment,** including: load, compression, assembly, static cold/hot, rotating and friction testing



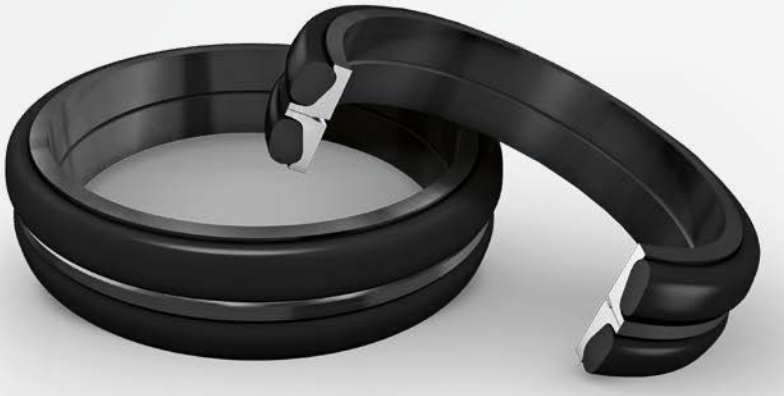
SPECIAL DESIGNS

Contact us: Our engineering teams can assist specifying materials and products or designing custom solutions to meet your requirements.

Reliable and robust sealing

Mechanical Face Seals are engineered to improve performance in slow rotating applications within extremely challenging and dirty environments.

- **Simple reliable design withstands severe wear** in slow-moving rotary applications
- **Prevent the ingress of harsh and abrasive external** media and egress of oil to effectively protect the shaft and inner parts of equipment
- **Resist vibration and misalignment** with self-centering to compensate for shaft eccentricity
- **Maintenance-free** over a long service life
- **Easy-to-install** for simple replacement
- **Cost-effective** with high-volume production



PROVEN PERFORMANCE

Trelleborg Sealing Solutions manufactures its Mechanical Face Seals from high-quality bearing steel (100Cr6) and cast iron, depending on speed and hardness requirements. These metals are tested against comparative materials for contamination, corrosion and mud compression resistance.

After 1,000 hours continuous rotation at 1 m/sec in water and sand, Trelleborg materials showed no leakage, demonstrating their long-life performance.

Specialized dynamic rotary testing equipment qualifies products and proves their performance.

Tested Metals	Zero Leakage	Resistance to Contamination	Resistance to Corrosion	Resistance to External Mud Pressure
Trelleborg Cast Iron	✓	A	A	B
Trelleborg Bearing Steel	✓	A	B	A
Nexus	✓	A	B	A
US Comparative Cast Iron	X	C	B	C
Asian Comparative Cast Iron	X	D	B	C

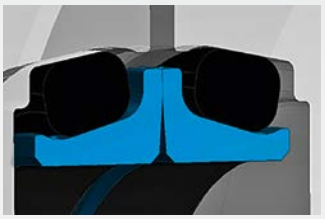
A = Excellent, B = Good, C = Adequate, D = Inadequate

METHOD OF OPERATION

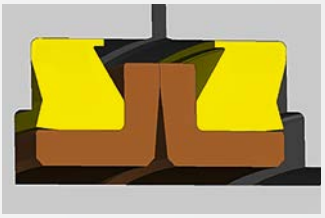
Two main designs of Mechanical Face Seal exist. Type DO is the most commonly used, characterized by an O-Ring as the secondary sealing element. Type DF instead uses an elastomer element with a diamond shaped cross-section in place of the O-Ring.

The secondary element serves to provide a uniform axial load, to transmit torque to the static half and to protect against misalignment.

Both types feature two identical metal seal rings, mounted face-to-face in separate housings, sealing against each other on a lapped seal face. One half of the Mechanical Face Seal remains static in the housing, while the other rotates with its counter face, forming a reliable and leak-proof seal.



Type DO
Duo-Cone Mechanical Face Seal



Type DF
L-Shaped Mechanical Face Seal

ELASTOMERIC RING MATERIALS AVAILABLE

Trelleborg Sealing Solutions have developed a selection of the optimal materials for Mechanical Face Seals based on decades of experience.

Material	Temperature Range	Hardness Shore	Mechanical Resistance	Oil and Additive Resistance
NBR	-20 °C – +110 °C	50 to 70	Good	Good
NBR LT	-50 °C – +100 °C	60 to 70	Good	Good
HNBR	-30 °C – +150 °C	60	Very Good	Very Good
HNBR LT	-40 °C – +150 °C	60	Very Good	Very Good
Silicone	-55 °C – +180 °C	65	Quite Good	Quite Good
FKM	-10 °C – +180 °C	65	Good	Good

Trelleborg Sealing Solutions has developed a selection of the optimal materials for Mechanical Face Seals based on decades of experience.

MORE RESOURCES

Discover additional tools and resources for Mechanical Face Seals
www.trelleborg.com/seals/mfs

Nexus Face Seal

Effective sealing for low-speed rotating applications in construction and tunneling equipment.

Nexus Face Seal is an alternative to Mechanical Face Seals that provides extended service life. It offers a light and flexible barrier against external dirt and mud compression in slow-rotating applications, such as the excavators it was originally developed for. It can also improve longevity and total cost of ownership of gear boxes, undercarriages and axles in nearly any construction or mining machinery.

Nexus Face Seal is proven to withstand the extreme environments of construction and mining operations.

Key Benefits:

- With its innovative cold stamp process and new material technology it is **more cost-effective** than comparative products at high volumes
- **High sealing performance** at low peripheral speeds, such as encountered in construction machinery and tunnelling, boring and mining operations
- **Good flexibility against mud compression** for longer-lasting performance on construction and excavation sites
- **Consistent quality with shortened lead times** from stable and efficient manufacturing process

Operating Conditions	
Peripheral speed	Up to 1.5 m/sec
Temperature	Up to +200 °C based on O-Ring material (as previous page)
Differential pressure	Up to 3 bar as differential pressure
External diameter	From 50 mm to 460 mm

MUD COMPRESSION

Nexus Face Seal has a higher flexibility to manage the effects of mud compression, extending service life, particularly for vehicles operating in aggressive and viscous muds encountered on construction sites.

In heavily contaminated environments, mud can compress between the housing and seal, creating pressure that reduces efficiency and leads to failure.

	Nexus Face Seal Test 1	Nexus Face Seal Test 2	Competitor Material 1	Competitor Material 2
Piston stroke length	28 mm	24 mm	5 mm	6 mm
Breaking load	169.0 kg	144.4 kg	87.6 kg	97.6 kg

CONTAMINATION OF OIL

When an axial seal fails, lubricating fluids become contaminated. This causes excess wear to sensitive components and reduces machine lifespan.

Clean oil after testing with Nexus Face Seal

Contaminated oil after testing with competitor

After 600 hours of testing in mud, at rotational speeds of 1 m/s, systems using comparative products showed soot and water contamination, characteristics of seal failure. Nexus Face Seal continued to protect the system and deliver long-life performance.

	Nexus Face Seal Test 1	Nexus Face Seal Test 2	Competitor Seal 1	Competitor Seal 2
Wear Elements and Contamination, mg/kg (ASTM D 5185)				
Iron (Fe)	53	19	19	62
Copper (Cu)	< 1	< 1	< 1	< 1
Chromium (Cr)	< 1	< 1	2	10
Aluminum (Al)	< 1	< 1	3	< 1
Silicone (Si)	3	3	45	8
Lead (Pb)	< 1	< 1	< 1	< 1
FT-IR J.O.A.P. Relative Index				
Soot (Abs/cm)	<0.02	<0.02	<0.02	65.55
Water (%)	0.06	<0.02	0.06	2.56
Glycol (%)	<0.02	<0.02	<0.02	<0.02
Oxidation (Abs/cm)	0.22	0.69	0.64	10.94
Nitration (Abs/cm)	<0.02	<0.02	<0.02	22.70
Sulfate (Abs/cm)	<0.02	<0.02	<0.02	<0.02

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

Trelleborg Sealing Solutions is a leading developer, manufacturer and supplier of precision seals, bearings and custom-molded polymer components. It focuses on meeting the most demanding needs of aerospace, automotive and general industrial customers with innovative solutions.

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If you'd like to talk to Trelleborg Sealing Solutions, find your local contact at: www.trelleborg.com/seals/worldwide

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