
HUNGER **Dichtungen**

EIN UNTERNEHMEN DER HUNGER-GRUPPE

**New developments and
new materials**



Your partner for complete solutions

A-EIS-SL

Although ice scrapers are named after their original field of application, i.e. for the removal of ice or layers of frost from extended piston rods during low-temperature use, further challenges are increasingly being placed on these components today.

The type A-EIS-SL scraper, which is being used successfully today, has been further improved by optimising the design of individual components in terms of their performance and function, thereby complementing the well-known A-EIS and A-EIS-S series.

Its main areas of application are found in steel or aluminium plants, scrap metal or recycling systems, as well as in waste compactors and the field of steel hydraulic engineering. The primary scraper lip, which is designed with radial play and consists of solid brass bronze, is able to follow a piston rod which is deflected while bending and being subjected to a transverse load and reliably removes viscoplastic or firmly adhering impurities such as slag splashes and welding beads – or even limestone layers – from the surface of the rod.

An elastic secondary lip attached behind this, which is made of materials such as PUR, NBR and FKM, prevents the penetration of dust, fine residual dirt films or moisture and reliably protects the system located behind it, consisting of guide mechanisms and seals, against damage from foreign particles.

The A-EIS-SL is available in a stainless steel version for particularly demanding applications such as chemical plant construction, the food industry or offshore use. Depending on the composition and materials used, applications and temperature ranges from -60 to $+200^{\circ}\text{C}$ can be covered.

The A-EIS-SL can also be produced universally in larger diameters, with its mounting and securing in the installation space being provided by a press fit of the outer retaining ring.



DMD-Tandem 2000

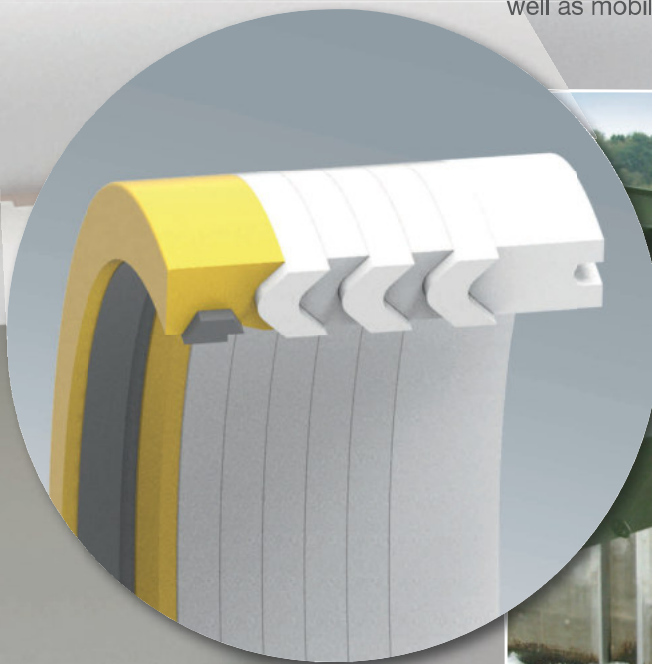
The HUNGER V-packing system DMD Tandem 2000 consists of a special groove ring as the actual sealing element and a number – dependent on the width of the installation space – of sleeves made of low-friction and wear-resistant plastic which are connected upstream of the groove ring as pressure reducers.

The HUNGER V-packing system DMD Tandem 2000 consists of a special grooved ring as the actual sealing element and a number – dependent on the width of the installation space – of lip seals made of low-friction and wear-resistant plastic which are connected upstream of the grooved ring as pressure reducers.

These enable low-friction and stick-slip-free operation of the system at high and low travel speeds. The support ring of the system pretensions the sealing element in a defined manner and can be designed for existing installation spaces.

The sliding ring, which is integrated into the grooved ring and is made of a low-friction and low-wear PTFE compound, ensures that the system runs smoothly even under high operating pressures and prevents the seal from sticking during prolonged interruptions to operations. The set height generally corresponds to the width of the installation space. The DMD Tandem 2000 can only be used for interior sealing purposes.

It fits into all standard V-packing installation spaces and ensures maximum tightness even without axial pre-stressing. Furthermore, the DMD Tandem 2000 can also be used with reworked piston rods. The use of a wide range of material combinations makes DMD Tandem a universally applicable seal (areas of application: steel hydraulic engineering, casting cylinders in continuous casting plants, heavy hydraulics, hydraulic presses, pull cylinders, punching and drawing systems as well as mobile hydraulics).



EVD – now also available in NBR!

A revolution in the sealing sector is the externally pre-stressable EVD sealing system. Thanks to its patented technology, it is now possible for the first time to influence the sealing and friction behaviour of the seal from the outside during operation.

For normal applications it is possible through the use of the EVD to compensate for operational wear on the rod seal by increasing the external pre-load. Costly disassembly, production system downtimes and the need for spare parts are reduced by an extreme amount as a result of the extended maintenance intervals. The EVD system consists of a sealing element which is similar to the TDI tandem seal set, with an integrated pressure chamber, in which the preload pressure of the seal is generated. Additionally, it has a pre-tensioning device which can be used to increase the pressure in the sealing element from the outside.

This system is suitable for new designs as well as for existing cylinders that were previously sealed by TDI, as the pre-stressing technology can be universally adapted and retrofitted to the existing installation conditions.

After further development of the manufacturing technology, the established and proven EVD system is now also available in a vulcanised NBR version. Owing to customer requirements and market demands, it was necessary to enable the use of this product with water-based fluids as well. In the field of flame-retardant media in particular, the use of a PUR base body was considered critical.

With the NBR version, the durability requirement is no longer a problem. In the new process which has been specially adapted for this product, the tubeless base body is produced according to the lost core process.



TRO-I

In addition to the fundamental approach of influencing the friction behaviour of seals by changing the material or introducing fillers, it is also possible to increase the level of efficiency and performance of a system by optimising the design and changing the seal geometry as well as the sealing components.

Thanks to the elements of the TRO-I sealing ring, which have been specially re-adjusted to one another and which in the standard version consist of a PTFE-bronze sliding ring and a polyurethane base body, it was possible to significantly improve the performance characteristics in terms of friction during the test. In this extremely smooth-running refinement, a grooved ring and mechanical seal are also combined to form one element. Due to the new mechanical seal geometry, it is no longer possible to establish any contact between the elastomer seal back and the rod during the application of pressure and compression of the system.

In the area of the back of the seal which is turned away from the pressure, the sliding ring is equipped with an additional modified step profile edge which, due to its special contour, has a positive influence on the return capacity of the seal under a load and also offers improved protection against extrusion.

In this way, steep pressure gradients in the direction of action on the one hand and flat pressure gradients towards the side which is turned away from the pressure are produced on the other hand, so that fluid films extracted under the pressure of the system can collect in these chambers and be returned to the system during the return stroke. Hydraulic cylinders, for which there are special requirements with respect to tightness and reliability, should always be equipped in a redundant manner with this sealing system, i.e. in a tandem arrangement consisting of a primary and secondary seal.



AI-OD

The AI-OD scraper version should be considered a supplement to the standard AI scraper. Since the AI is installed in its groove with radial play in order to be able to follow the deflection of the rod in the event that there are lateral forces present, this play can cause the finest dirt or contaminated liquid media to enter the hydraulic system past the scraper via the bottom of the groove.

Sealing elements, guide mechanisms and the rod surface behind it can also be affected and are then subject to premature wear. Furthermore, the radial movement of the scraper can be considerably impaired by the continuous accumulation of dirt on the bottom of the groove.

This situation is remedied by the new scraper variant AI-OD, which has an additional axial seal provided by an O-ring pressed in a defined manner. As a result, a dirt barrier is created on the outer contour of the installation space which retains any media and extremely fine particles, so that the formation of obstructive dirt deposits towards the bottom of the groove is prevented. In spite of this axial sealing system, the AI-OD is nevertheless still able to follow radial deflections of the rod.

This scraper version is particularly suitable for fields of application in which hydraulic cylinders, e.g. vertically upright ones, are used and exposed to environmental influences such as fine dust or contaminated liquids, etc. The AI-OD is available in the same installation form as the AI type and can be replaced without any changes to the installation dimensions.

The material properties can be adapted to the application (e.g. high temperatures as a result of radiant heat, aggressive dirt or media, etc.)



ZSDA

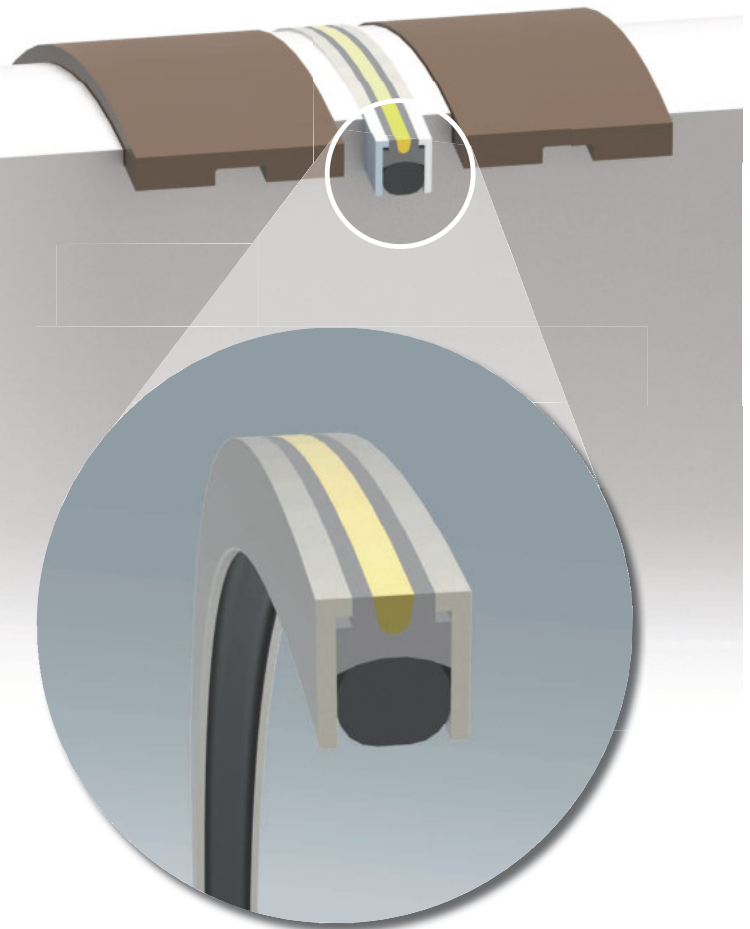
The HUNGER ZSDA set of seals for cylinders with pilot bores is a sealing element for the sealing of pistons and can be used to cover boreholes up to 3 mm in diameter.

In the case of sealing surfaces without boreholes or grooves, the seal can be used both dynamically and statically for pressures of up to 2000 bar. The ZSDA consists of 5 parts. Two lateral metallic chamber rings and a metal race between them support a sliding ring made of a PTFE compound which has narrow sealing lips on its external diameter.

An O-ring serves as an elastic base body and also ensures the desired sealing effect even in a pressureless state. Due to its chambered construction with supporting rings in both the axial and radial directions, this set of seals is particularly suitable for extremely high pressures. In conjunction with a surface roughness of the mating surface of $Ra\ 0.1 - 0.3\ \mu m$, minimal friction is generated with a high sealing effect and a long service life of the set of seals.



Individual adaptation
by FEM calculation



Diamonds are formed with sufficient pressure and temperature

Diamond, the hardest naturally occurring substance on earth. We need it, for example, as an abrasive, in drilling heads and for cutting glass. In the Hunger Group, industrial diamonds are processed by HUNGER Schleifmittel GmbH into special honing stones. With these it is possible to combine and achieve the highest metal cutting performance levels together with a high surface quality. Any potential industrial production of particularly large industrial diamonds is carried out by means of high-pressure presses which - how else could it be? - work with HUNGER seals. The five-part ZSDI and ZSDA used in this application can withstand a pressure of more than 2000 bar over the entire holding time.

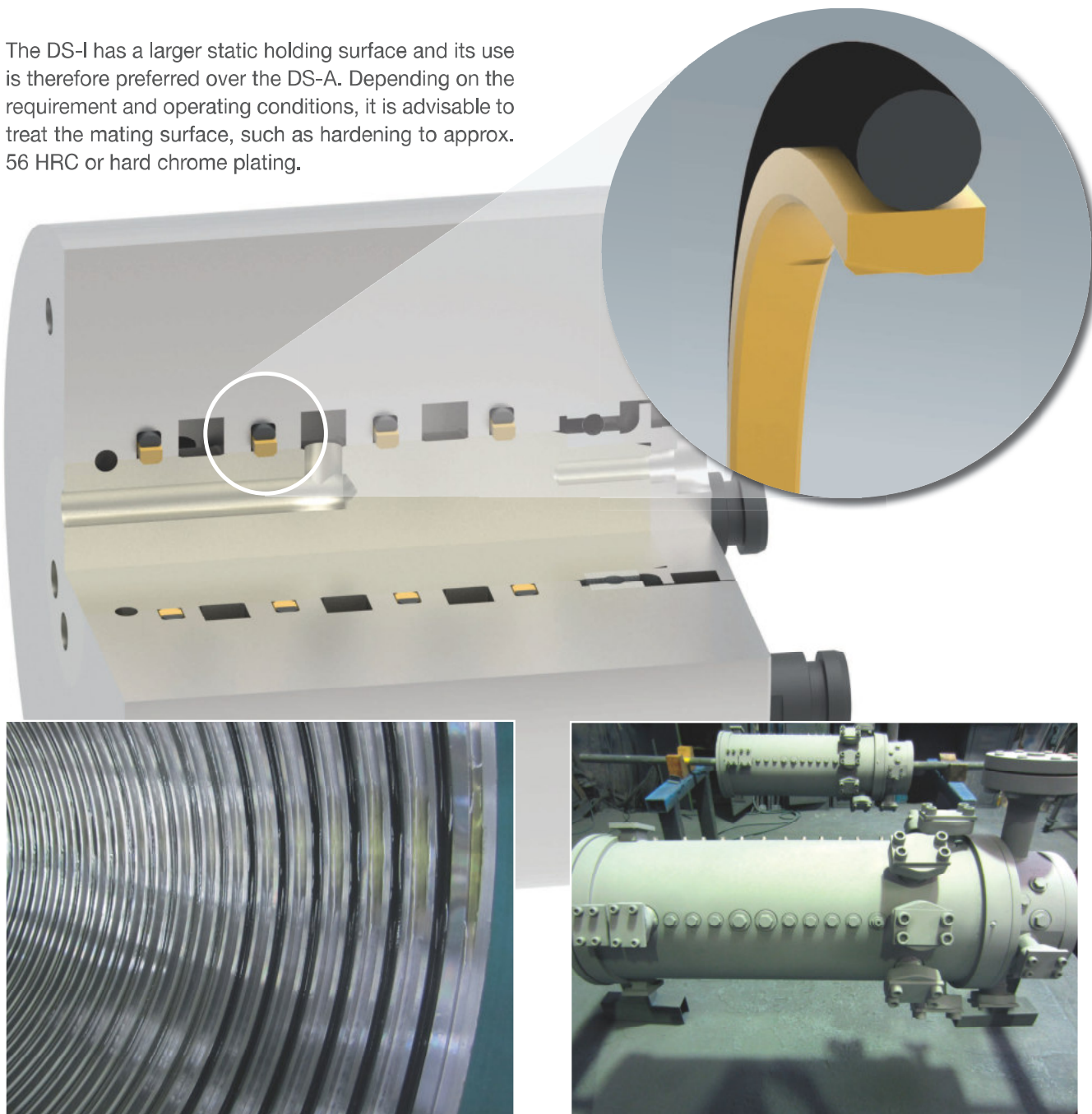
Such pressures take up the entire system. The critical tube widening of cylinders in such systems is taken into account by our project engineers when designing the exact seal geometry for each specific application.



DSI

The DS-1 slimline rotor seal kit is specially designed for sealing hydraulically pressurised, fast-rotating machine parts. It has axial lubrication grooves.

The DS-I has a larger static holding surface and its use is therefore preferred over the DS-A. Depending on the requirement and operating conditions, it is advisable to treat the mating surface, such as hardening to approx. 56 HRC or hard chrome plating.



Like the DS-I, all our seals have a wide range of applications. What has proved its worth in the field of hydraulics is also supplied by us to plant constructors for the beverage and food industry as components with FDA approval for use in food processing. Hunger seals are used in all areas of food production, from milk pro-

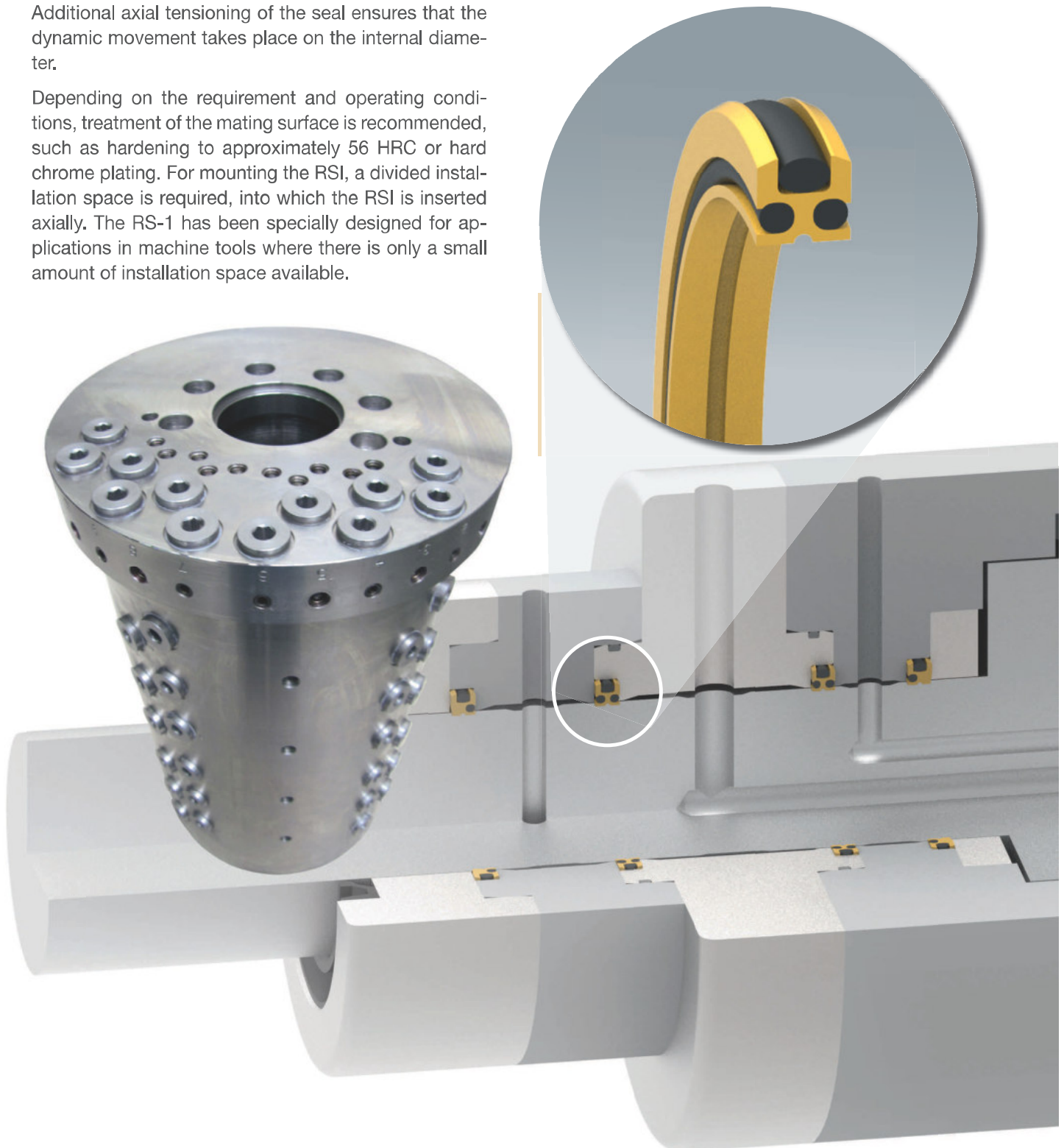
duction and processing to soft drinks. From the hand-crafted beer speciality of the monastery brewery to industrial brewing technology which produces millions of hectolitres with a focus on safety and plant availability - convincing quality in all areas!

RSI

The HUNGER RSI Rotor Seal Set consists of a sliding ring made of a highly wear-resistant PTFE compound and three (double-acting) or two (single-acting) O-rings made of fluorocarbon rubber which are responsible for the pre-tensioning of the sealing lips.

Additional axial tensioning of the seal ensures that the dynamic movement takes place on the internal diameter.

Depending on the requirement and operating conditions, treatment of the mating surface is recommended, such as hardening to approximately 56 HRC or hard chrome plating. For mounting the RSI, a divided installation space is required, into which the RSI is inserted axially. The RS-1 has been specially designed for applications in machine tools where there is only a small amount of installation space available.



Hunger Sealing Material Developments

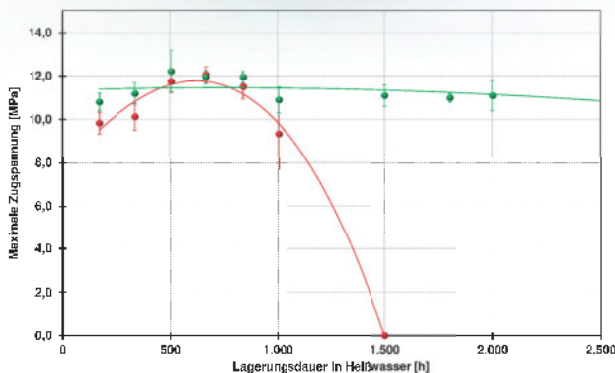
Hydrolysis-resistant polyurethane - PUR-H 85/95

Due to the constantly growing market requirements placed on TPU sealing materials with respect to hydrolysis resistance, the new PUR-H type has been incorporated into the portfolio as a supplement to the tried and tested Hunger DFE standard polyurethanes.

Owing to its properties, this material is particularly suitable for applications in offshore areas which are often climatically critical, in steel hydraulic engineering or in chemical plant and special mechanical engineering and everywhere where hydrolysing fluids such as water or water-based pressurised liquids can become a danger to standard TPUs due to the resulting material degradation.

PUR-H is resistant to microorganisms, possesses excellent cold flexibility properties and is therefore very elastic and easy to install while maintaining good wear resistance. During in-house experiments under extreme conditions (>2000 h / 80°C / 100%) the hydrolysis and oil resistance has been confirmed.

Hunger DFE offers this material in the two hardness grades of 85°ShA (PUR-H85) and 95°ShA (PUR-H95) in addition to the standard TPU product portfolio. This expansion to the product range enables us to respond accordingly to the different requirements of hydraulic systems with regard to the operating conditions and conditions of use.



Resistance to hydrolysis:

- hydrolysis-resistant standard type 85°ShA;
- HUNGER PUR-H 85°ShA

Low-temperature material HLTR

Nowadays, low-temperature applications for elastomer seals in hydraulic cylinders can be found in many areas of mechanical and plant engineering, in aerospace applications or in vehicle construction. The low-temperature material HLTR (Hunger Low Temperature Rubber) developed by Hunger DFE for these applications can be reliably used in the temperature range from -50°C to 100°C without losing the properties that are important for a sealing material such as resilience and elasticity. The cold reference value Tr10, which is important for low-temperature applications of elastomers in the field of sealing technology, is below -50°C for the material, which is available in the hardness range of 70° and 80°ShA.



Locking hook for aviation technology
at the low temperature of -54°C

Special Materials for Guide Mechanisms/Bearings

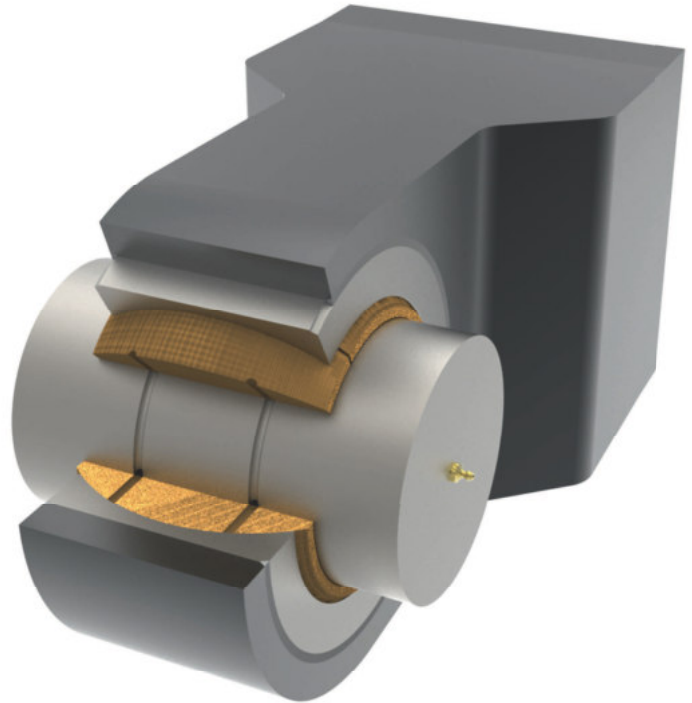
Guide ring material H-Glide

With the glass and PTFE-filled polymer H-Glide for guide rings, spherical plain bearings or bearing shell inserts, Hunger DFE has a particularly efficient, exceptionally pressure- and wear-resistant material in its product range. With minimal dynamic coefficients of friction and excellent dry-running properties, this material achieves high load-bearing capacities, thereby rendering it predestined for extreme loads in applications in the fields of heavy hydraulics, the offshore and marine sector or mobile hydraulics in mining.

H-Glide is manufactured by injection moulding, is highly dimensionally stable with negligible water absorption and low thermal expansion coefficients. Hunger DFE offers guide mechanisms manufactured from H-Glide of the types FI, FA and FAI, as well as RFI and RFA in a large dimensional range.

As a result, it is possible to specifically adapt the geometry and material to the respective operating conditions of the hydraulic cylinder as a supplement or in combination with the standard material POM compound, which has already proven itself millions of times over.

The result is the best possible performance with regard to functionality and friction, as well as a clear improvement in operational reliability due to the protection it offers against metallic contact.



Guide and bearing material H-Tex (synthetic fibre / phenolic resin / PTFE)

The new fabric composite material H-Tex complements the product range for highly stressed technical components such as bearings, spherical bearings and guide mechanisms. Hunger DFE uses this composite to manufacture complex individual solutions for the oil and gas, heavy and mining industries, as well as highly stressed mobile hydraulics.

Owing to its composition, this phenolic resin-synthetic fibre composite material with integrated PTFE offers excellent and low-friction sliding properties. The extremely high dynamic and static compressive strength with extremely low water absorption, which is far below the measuring limit, makes it particularly suitable for use in maritime applications or in aqueous media.

Due to the material combination with PTFE, almost maintenance-free operating conditions can be achieved and the tribological requirements of materials, especially for bearings or sliding systems, fulfilled.



**We always deliver
customer-oriented
solutions in the best
possible product quality.**

Hunger DFE not only supplies standard elements that have proven themselves millions of times over, but also develops special systems and individual solutions in close cooperation with the customer.

Our highly developed production system guarantees flexible customer support, so that even "customers in need" can be supplied at short notice.

For technical support, please contact the Project Department. A team of qualified engineers is at your disposal for the fast processing of and the provision of support for customer queries.



Die HUNGER-Gruppe - The HUNGER Group

www.hunger-group.com

Hydraulik

Walter Hunger GmbH & Co. KG
Hydraulikzylinderwerk
Rodenbacher Str. 50 · DE-97816 Lohr am Main
Tel. +49-9352-501-0 · Fax +49-9352-501-106
Internet: www.hunger-hydraulik.de
E-mail: info@hunger-hydraulik.de

Maschinen

Hunger Maschinen GmbH
Alfred-Nobel-Str. 26 · DE-97080 Würzburg
Tel. +49-931-90097-0 · Fax +49-931-90097-30
Internet: www.hunger-maschinen-gmbh.de
E-mail: info@hunger-maschinen-gmbh.de

Dichtungen

Hunger DFE GmbH
Dichtungs- und Führungselemente
Alfred-Nobel-Str. 26 · DE-97080 Würzburg
Tel. +49-931-90097-0 · Fax +49-931-90097-30
Internet: www.hunger-dichtungen.de
E-mail: info@hunger-dichtungen.de

Schleifmittel

Hunger Schleifmittel GmbH
Alfred-Nobel-Str. 26 · DE-97080 Würzburg
Tel. +49-931-90097-0 · Fax +49-931-90097-30
Internet: www.hunger-schleifmittel.de
E-mail: info@hunger-schleifmittel.de

Mobilhydraulik/Fahrzeugbau

Hunger GmbH & Co.
Werke für Fahrzeugbau und Mobilhydraulik KG
Chemnitz Strasse 61a · DE-09669 Frankenberg
Tel. +49-37206-6008-0 · Fax +49-37206-6008-10
Internet: www.hunger-automotive.de
E-mail: info@hunger-automotive.de

Hydraulics USA

Hunger Hydraulics C.C., Ltd.
63 Dixie Highway · Rossford (Toledo), OH 43460
Tel. +1-419-866-4510 · Fax +1-419-666-9834
Internet: www.hunger-hydraulics.com
E-mail: info@hunger-hydraulics.com

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Dichtungen

EIN UNTERNEHMEN DER HUNGER-GRUPPE

P.O. Box 5860 · DE-97008 Würzburg
Tel. 0931/90097-0 · Fax 0931/90097-30
Internet: www.hunger-dichtungen.de
E-mail: info@hunger-dichtungen.de