

KLOZURE[®] Oil Seals

High performance dynamic seals



KLOZURE®: Technology that provides the answer for difficult operating conditions.

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KLOZURE®: Technology that provides the answer for difficult operating conditions.

Coping with Demanding Conditions

With or without a metal case, special garter spring or finger spring and in a broad range of materials ideally adapted to all sorts of operating conditions – the result of decades of experience that Garlock has accumulated in this field – our KLOZURE® oil seals are the preferred choice worldwide.

Garlock's KLOZURE® seals can handle extreme operating conditions – from small devices right through to very heavy machinery. For more than 60 years KLOZURE® seals have been used with great success worldwide in the pulp and paper industry, aluminum and steel industries. KLOZURE® seals, with their carefully selected materials and user-friendly design, combine high functional reliability with long useful life. The extensive KLOZURE® range has repeatedly provided the ideal solution for a wide variety of customer specific applications – not only for new systems but also providing alternatives to plant upgrades.



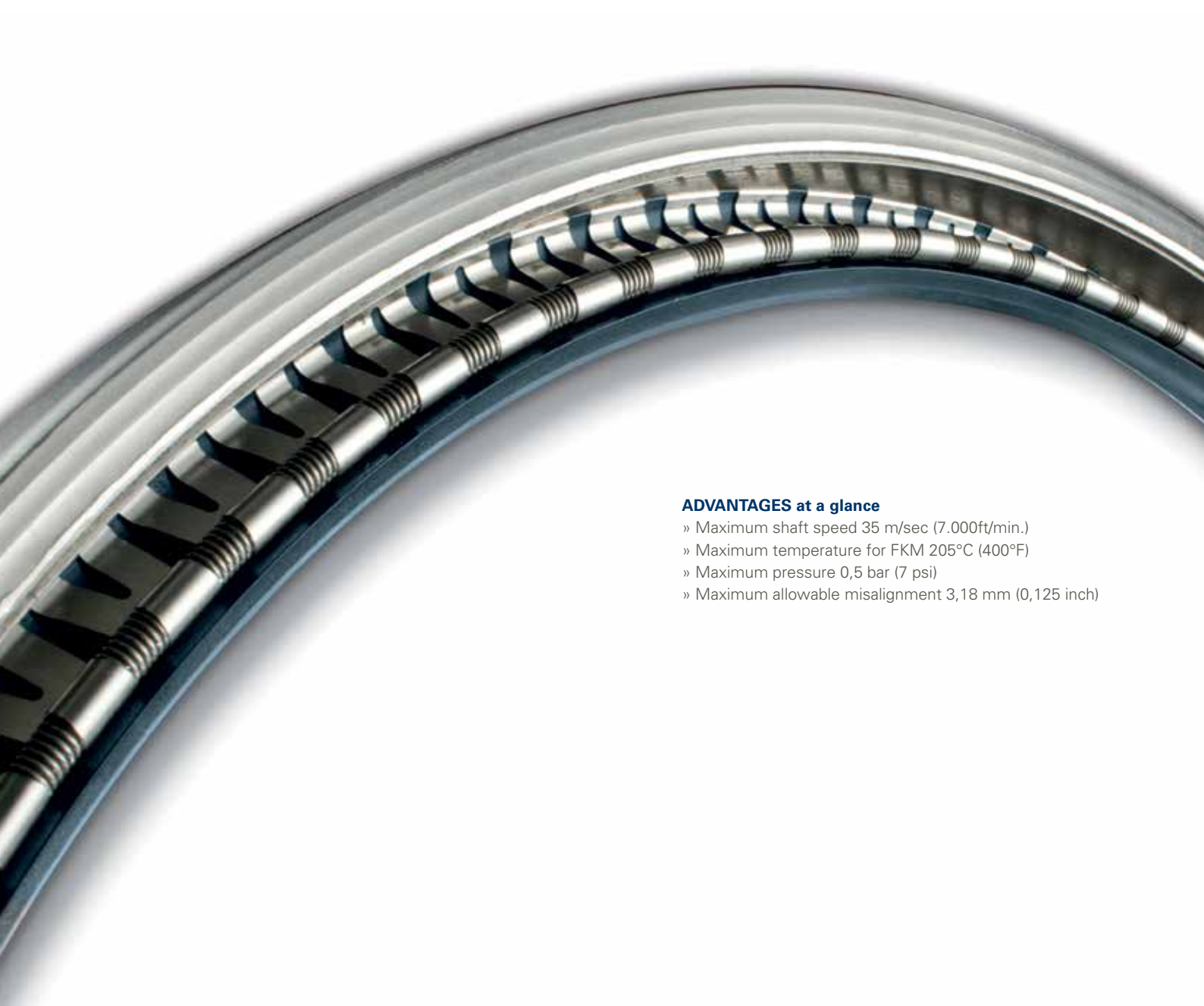
KLOZURE® technology provides the answer for difficult operating conditions.

Garlock's KLOZURE® Universal Oil Seals are manufactured without a metal case. They are intended for applications where the use of metal cased shaft seals is not possible. All of these models are available either in split or solid (endless) versions (161 only solid). They are, by virtue of their simple design, universally suitable for various applications and have proved their reliability in all sectors of industry.

KLOZURE®: Technology that provides the answer for difficult operating conditions.

The Secret for Performance: MILL-RIGHT®

At the heart of most of the KLOZURE® oil seals you will find the MILL-RIGHT® family of materials (page 7). Each of the new MILL-RIGHT® elastomers has been especially engineered to provide the highest abrasion resistance, lowest wear and exceptional chemical and temperature resistance. The engineered MILL-RIGHT® materials and seal designs together create the most advanced sealing solutions available in the heavy industrial market. With the KLOZURE® oil seal you can depend on long bearing life, increased productivity and less maintenance.



ADVANTAGES at a glance

- » Maximum shaft speed 35 m/sec (7.000ft/min.)
- » Maximum temperature for FKM 205°C (400°F)
- » Maximum pressure 0,5 bar (7 psi)
- » Maximum allowable misalignment 3,18 mm (0,125 inch)

KLOZURE® with Metal Case



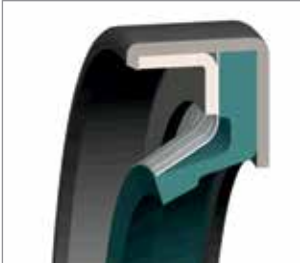
KLOZURE® 53

Garlock's KLOZURE® 53 is a general purpose assembled seal. Within the range of applications for which it is intended (large diameters) this seal offers the best advantages, functionality, reliability and performance. It comes with a heavy-duty metal outer case and is available in single and dual lip configurations.



KLOZURE® 59

Garlock's KLOZURE® 59 successfully combines quality with special assembly and installation advantages. KLOZURE® 59 operates with a vulcanized finger spring only. Thanks to its structural design the KLOZURE® 59 is easy to install – even when blind-mounting is necessary. The KLOZURE® 59 is available for shafts of 152,4 mm diameter up to 1778 mm. The bevel lip design prevents lip rollover.



KLOZURE® 63

Garlock's KLOZURE® 63 is also a general purpose assembled seal. Within the range of applications for which it is intended (smaller diameters) this seal offers the best advantages, functionality, reliability and performance. It comes with a heavy-duty metal outer case and is available in single and dual lip configurations.



KLOZURE® 64

Garlock's KLOZURE® 64 is specially designed for use in particularly difficult operating conditions. It has proven indispensable in the pulp and paper, aluminum and steel industries worldwide. KLOZURE® model 64 has proven its particular value in all applications involving large shaft-to-bore misalignment (STBM) and high peripheral speeds that still require high performance and reliability. The stainless steel finger springs hold the sealing lip uniformly onto the rotating shaft. Shaft-to-bore misalignment (STBM) and dynamic runout are absorbed by the finger spring up to a certain point. The garter spring which is integrated in the finger spring only responds in the event of extreme misalignment or runout. In conjunction with this spring assembly, the sealing lip generates a low radial force. The sealing lip is clamped in position together with the finger spring in a heavy-duty metal case making the sealing ring dimensionally very stable, suitable for large diameter bores and easy to install.

KLOZURE® Rubber Backed



Model 23 (Split-only)

Certain situations where installation is particularly difficult may require a split sealing ring. This is where Garlock's KLOZURE® 23 comes into its own. It is manufactured from homogeneous rubber compound and incorporates a stainless steel finger spring vulcanized into the lip. Thanks to this finger spring design the KLOZURE® 23 sealing ring can be easily installed and will operate reliable and trouble-free. Garlock's KLOZURE® 23 has proven its value in the construction of heavy machinery, in rolling mills, paper-making machines, marine motors, earth movers, gear systems and as wipers in hydraulic applications. The KLOZURE® 23 must always be installed with a cover plate. It is suitable for non-pressurized applications only.



Model 26

Garlock's KLOZURE® 26 is a sealing ring without a metal case. Its homogeneous elastomer compound and reinforced heel ensure that the ring is axially stable. Thanks to its structural design the KLOZURE® 26 is easy to use and install. Even in difficult positions where it has to be blind-mounted, the sealing lip cannot flip over and dump the spring. In cases where a split sealing ring is used, a cover plate is required. The KLOZURE® 26 is used predominantly in the pulp and paper, aluminum and steel industries. In steel industry in particular it has proven indispensable for working rollers. Other applications include blowers, pumps, mining machinery, general mechanical engineering and machine construction. When installed together with its cover plate the KLOZURE® 26 can be used with pressures up to 0,5 bar. The bevel lip design prevents lip rollover.

MILL-RIGHT® Lip Material

Lip material selection chart

| Material | Color | Areas of Application | Operating Temperature | Max. Spike Temperature |
|--|-------|--|-----------------------|------------------------|
| MILL-RIGHT® N (NBR based) | BLACK | Lubricants, hydraulic oils, and greases based on mineral oil, water*, HFA-, HFB*-, HFC-fluids, washing liquids. | - 40 °C to + 95 °C | + 125 °C |
| MILL-RIGHT® ES (HNBR based) | BLUE | Lubricants, hydraulic oils, and greases based on mineral oil, water*, HFA*-, HFB*-, HFC*-fluids, washing liquids. Higher temperature stability than nitrile rubber. Excellent resistance to wear. | - 30 °C to + 150 °C | + 180 °C |
| MILL-RIGHT® V (FKM based) | GREEN | Mineral fluids and lubricating greases, HFA-, HFB*-, HFC*-, HFD-fluids, water*, chemicals, solvents. Not suitable for some hardly inflammable, phosphoric-ester-based fluids (e.g. Pydraul 10E) | - 30 °C to + 205 °C | + 235 °C |
| Silicones VMQ | BLUE | Vegetable oils, oils with a high aniline point, motor and engine oils, gear oils. Medium resistance to swelling in mineral oils and greases. Not suitable for aliphatic and aromatic hydrocarbons. Good temperature stability and coldflexibility. FDA possible. | - 60 °C to + 180 °C | + 205 °C |

*Please note: Check application parameters and details. Additional lubrication recommended.



Example for MILL-RIGHT® V, ES and N

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KLOZURE® Universal Oil Seals

Universal Oil Seals can be used nearly anywhere. They can also be supplied out of many different materials and in different profiles. Your Garlock advisor will be pleased to give you further detailed information regarding application possibilities tailor-made for your specific conditions.

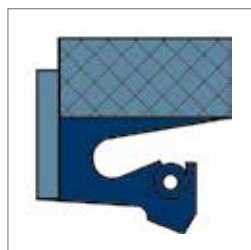


Model 154
Universal Oil Seal can be supplied in either split (154-1) or endless (154-2), and with a new enhanced sealing lip design.

Model 154-DL
Universal Oil Seal 154-DL incorporates a dust lip.



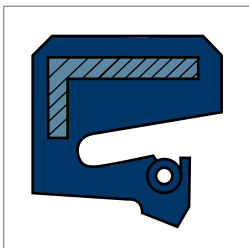
Model 154-PG
Universal Oil Seal 154-PG incorporates radial and peripheral lubrication grooves.



Model 154-M
Universal Oil Seal 154-M incorporates a metallic reinforcement ring molded into the heel and can be installed without a cover plate.



Model 154-ML
Universal Oil Seal 154-ML incorporates a more stiff metallic reinforcement ring molded into the heel and can be installed without a cover plate.



Model 154-P
Universal Oil Seal 154-P incorporates radial lubrication grooves.



Model 161-0
Universal Oil Seal 161-0 is available in an endless version only, with PTFE backup ring.*



*suitable also for pressurized applications of up to 6 bar.

Technical Data: KLOZURE® with Metal Case

| Model | Case | Spring | Shaft Diameters (mm) | Maximum Shaft Speed (m/s) | Maximum Shaft Misalignment and Runout (mm) | Available Lip Material | Installation |
|-------|--------|--|----------------------|---------------------------|--|---|--------------|
| 53 | steel* | Stainless steel finger spring | 76,2 - 1524,0 | 5,0 10,2 15,2 | 0,38 0,25 0,13 | MILL-RIGHT® N, MILL-RIGHT® ES, MILL-RIGHT® V, Silicone | press-fit |
| 59 | steel* | Bonded in stainless steel finger spring | 152,4 - 1778,0 | 12,7 25,4 | 2,36 1,19 | | |
| 63 | steel* | Stainless steel finger spring | 6,35 - 76,2 | 5,0 10,2 15,2 | 0,38 0,25 0,13 | | |
| 64 | steel* | Stainless steel garter and finger spring | 203,2 - 1890,0 | 25,4 35,6 | 3,18 2,36 | | |

*other materials are available on request (Plunge grinding required).

all up to 0,5 bar

Tolerances and Assembling Dimensions

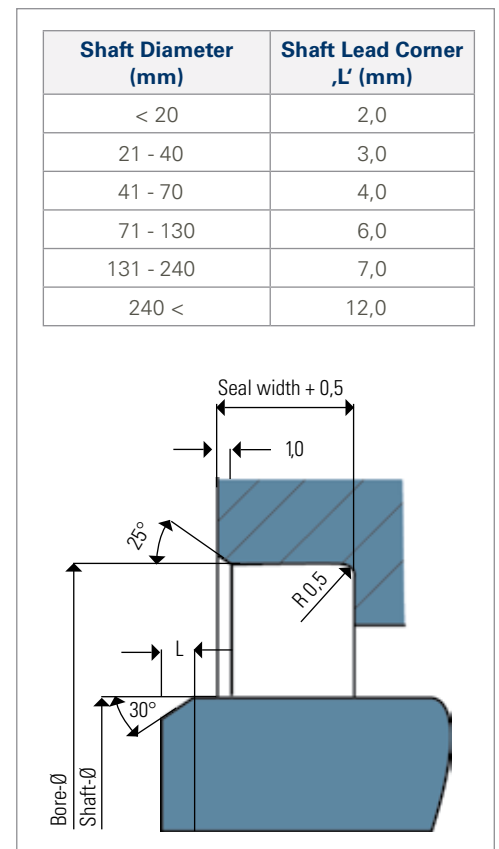
| Shaft Diameter (mm) | Tolerances (mm) |
|---------------------|-----------------|
| < 100 | ± 0,08 |
| 101 - 150 | ± 0,10 |
| 151 - 250 | ± 0,13 |
| 250 < | ± 0,15 |

| Bore Diameter (mm) | Tolerances (mm) |
|--------------------|-----------------|
| < 76 | ± 0,03 |
| 77 - 150 | ± 0,04 |
| 151 - 255 | ± 0,05 |
| 256 - 510 | + 0,05/- 0,10 |
| 511 - 1015 | + 0,05/- 0,15 |
| 1015 < | + 0,05/- 0,25 |

| Shaft Diameter (mm) | Shaft Lead Corner ,L' (mm) |
|---------------------|----------------------------|
| < 20 | 2,0 |
| 21 - 40 | 3,0 |
| 41 - 70 | 4,0 |
| 71 - 130 | 6,0 |
| 131 - 240 | 7,0 |
| 240 < | 12,0 |

Sealing Surface Requirements

| Shaft Speed (m/s) | Surface Finish | | Minimum Surface Hardness (HRC) |
|-------------------|----------------|-----------|--------------------------------|
| | Ra (µm) | Rmax (µm) | |
| < 15,6 | 0,5 - 0,6 | 2,0 - 3,0 | 40 |
| 15,6 < | 0,2 - 0,4 | 0,8 - 1,5 | 40 |



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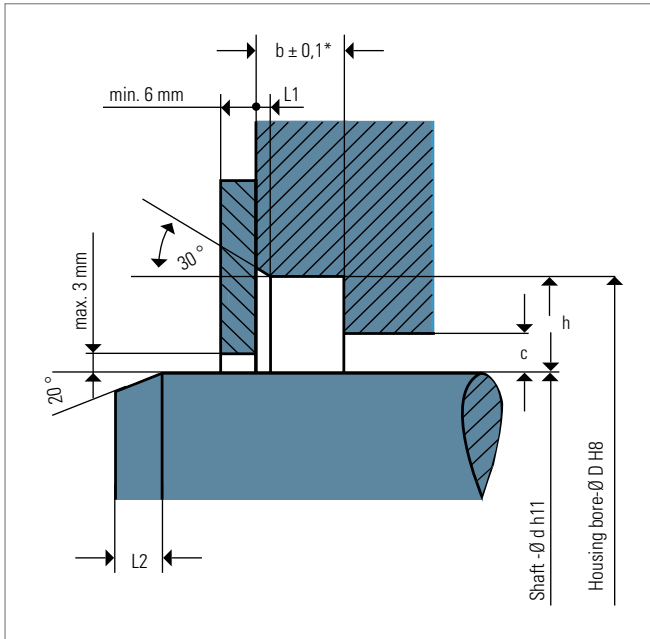
Technical Data: Rubber Backed KLOZURE® Oil Seals

Technical data Model 23, 26, 154, 154-M, 154-ML, 161

| Model | Spring | Shaft Diameters (mm) | Maximum Shaft Speed (m/s) | Maximum Shaft Misalignment and Runout (mm) | Available Lip Material | Installation |
|---------------|---|----------------------|---------------------------|--|---|-------------------------|
| 23 | Molded in stainless steel finger spring | 76,2 - up | 10,2 | 0,25 | MILL-RIGHT® N, MILL-RIGHT® ES, MILL-RIGHT® V Silicone | Cover plate required |
| 26 | Molded in stainless steel finger spring | 19 - 1524 | 25,4 | 0,38 | MILL-RIGHT® N, MILL-RIGHT® ES, MILL-RIGHT® V NBR, HNBR, FKM | Cover plate required* |
| 154 | Stainless steel garter spring | 25,4 - up | 15,2 | 1,0 | NBR, HNBR, FKM | Cover plate required |
| 154-M | Stainless steel garter spring | 72,2 - up | 15,2 | 1,0 | NBR, HNBR, FKM | No cover plate required |
| 154-ML | Stainless steel garter spring | 72,2 - up | 15,2 | 1,0 | NBR, HNBR, FKM | No cover plate required |
| 161 | Stainless steel garter spring | up to 2500 | 25,0 | 0,25 | NBR, HNBR, FKM | Cover plate required |

All other oil seals are available in split and endless version. Model 23 is only available in split version. Model 154-M, 154-ML and 161 only in endless version. Other Lip materials on request! *if split

Technical Data: Rubber Backed KLOZURE® Oil Seals



* This applies for one sealing ring. If two sealing rings are used in one mounting recess, the tolerance has to be chosen +0,1/+0,3.

Calculating the bore diameter

The bore diameter D is calculated as follows:

$$D = d + (2 \times h)$$

Clearance C: maximum 0,5 x h
 minimum 0,3 x h

Installation dimensions and tolerances

For the available dimensions of Garlock Universal Oil Seals, please refer to the tool lists. For KLOZURE® 23 and KLOZURE® 26, please inquire separately. Our installation diagrams and the associated tables contain all data required to properly and reliably calculate the dimensions of a shaft seal using Garlock KLOZURE® 23, 26 and KLOZURE® Universal Oil Seals.

Model 23 split

| Shaft Diameter (mm) | Cross Section Radial Height h (mm) | Cross Section Axial Width b (mm) | Clearance C _{minimum} - C _{maximum} (mm) |
|---------------------|------------------------------------|----------------------------------|--|
| 70 - 250 | 12,5 | 12,5 | 3,75 - 6,25 |
| 120 - 350 | 15,0 | 15,0 | 4,5 - 7,5 |
| 250 - 500 | 20,0 | 20,0 | 6,0 - 10,0 |
| 400 - 1500 | 25,0 | 20,0 | 7,5 - 10,0 |

On request the KLOZURE 23 version is also available measured in inch

Modell 23, 26, 154, 161

| Shaft Diameter (mm) | Chamfer L1 (mm) | Chamfer L2 (mm) |
|---------------------|-----------------|-----------------|
| < 50 | 1,1 | 5,0 |
| 51 - 100 | 1,6 | 6,0 |
| 101 - 250 | 2,0 | 7,5 |
| 251 - 400 | 2,2 | 9,0 |
| 401 - 600 | 2,5 | 11,0 |
| 601 - 1800 | 3,2 | 20,0 |

Sealing Surface Requirements

| Shaft Speed (m/s) | Surface Finish | | Minimum Surface Hardness (HRC) |
|-------------------|----------------|-----------------------|--------------------------------|
| | Ra (µm) | R _{max} (µm) | |
| < 15,6 | 0,5 - 0,6 | 2,0 - 3,0 | 40 |
| > 15,6 | 0,2 - 0,4 | 0,8 - 1,5 | 40 |

The shaft surface must be plunge ground without any nicks, gouges, or other surface defects.

Technical Instructions: KLOZURE® Universal Oil Seals

Shaft Speed

KLOZURE® Universal Oil Seals can, in otherwise ideal conditions, be used for peripheral speeds of up to maximum 25 meters per second. With Universal Oil Seal Model 161, the maximum permissible shaft speed depends on the pressure. For further details, please refer to the diagram in the section titled "Pressure".

Pressure

Split Universal Oil Seals are not designed for applications involving exposure to pressure. The maximum permissible pressure is 0,5 bar for all solid versions. The Model 161-0 is designed for higher pressure-applications. It can withstand pressures, depending on shaft speed, as shown in the pressure diagram below.

Shaft-to-bore misalignment and dynamic runout

Thanks to their design and construction KLOZURE® Universal Oil Seals sealing rings can absorb considerable radial shaft-to-bore misalignment and dynamic runout.

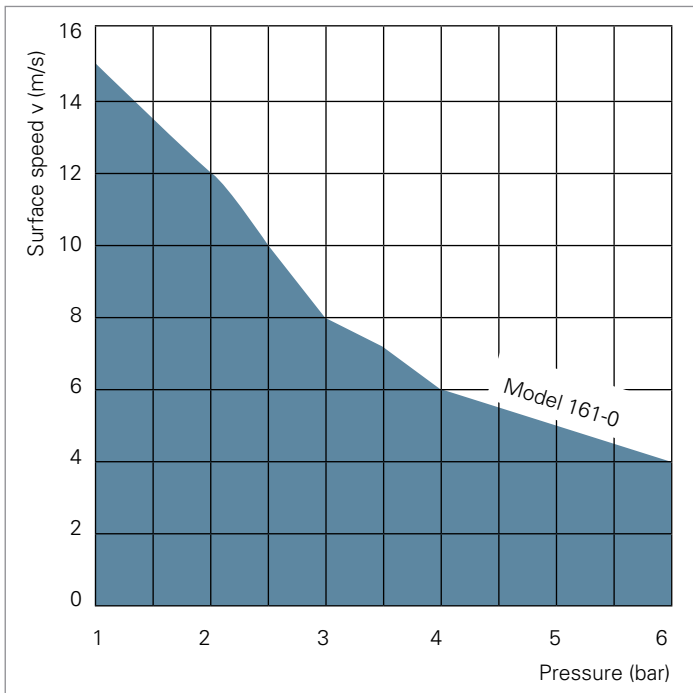


Diagram 1: Model 161-0 pressure handling

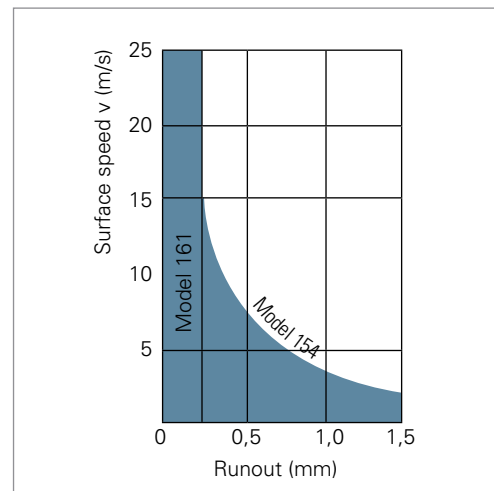


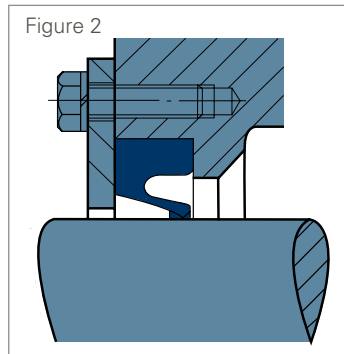
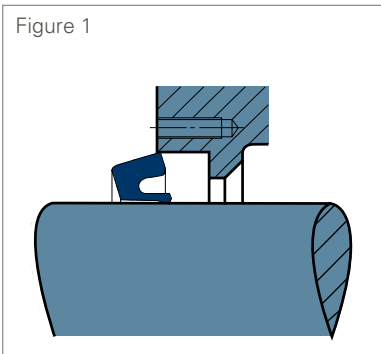
Diagram 2: Runout absorption

Assembly and Installation: Rubber Backed Seals

Model 23, 26, 154 and 161

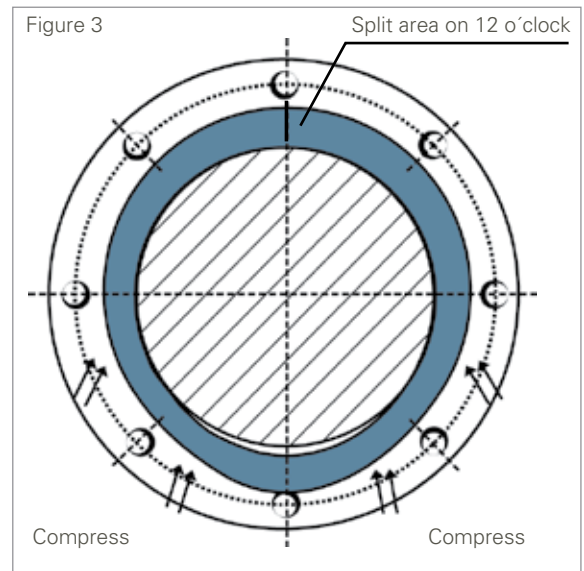
Lubrication

The essential pre-requisite for a long useful life is to ensure that the sealing lip is always adequately lubricated. If lubrication is not provided by the medium itself it must be supplied separately utilizing the radial or peripheral grooves in the seals.



Cover plate

The cover plate can be either split or solid. It should have a minimum thickness of 6 mm to ensure that the sealing rings are correctly positioned.



Installation instructions


- » Garlock Oil Seal Models 26, 154, 161 must be installed with a cover plate. To achieve optimal sealing the external diameter of the sealing ring is made slightly larger than that of the housing bore. To facilitate installation the housing bore should be chamfered.
- » Garlock Oil Seal Models 26 and 154 are available in both split and endless versions. Before installing, check the sealing rings for signs of damage, dust and dirt and apply lubricant to the sealing lip.
- » Clean the housing recess.
- » In the case of horizontal shafts the split must be positioned at 12 o'clock. In tandem arrangements the joint must be positioned at 11 o'clock / 1 o'clock. First the split must be placed in the housing recess (see Figure 1). Then the seal must be pressed slowly into the housing recess (see Figure 3). Then the retainer ring must be fitted and tightened (see Figure 2).
- » After installation check that the sealing lip sits snugly in position all around the shaft.

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Application Data Sheet

Service

Of course you can contact Garlock for an application-specific seal construction. To get this service as fast as possible, please order our application data sheet, which you can also find on our website www.garlock.com.



Application Data Sheet: KLOZURE® and PS-SEAL

Contact Information

Company: _____

Name: _____

Phone: _____

Email: _____

Country: _____

Demand: _____

Annual Demand: _____

Other manufacturers Information

Company: _____

Item code: _____

Seal model: _____

Lip material: _____

Housing material: _____

Garlock ID: _____

Application Data

Shaft diameter d [mm]: _____

Housing diameter D [mm]: _____

Depth w [mm]: _____

Shaft speed [m/s]: _____

Shaft deflection [mm]: _____

Shaft misalignment [mm]: _____

Dry running: Yes No

FDA: Yes No

Medium, Side A: _____

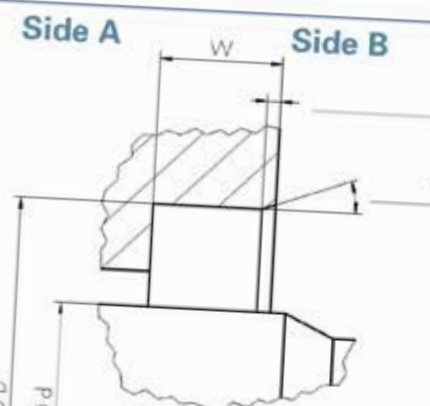
Medium, Side B: _____

Absolute pressure, [bar(a)], Side A: _____
1 bar(a) = ambient pressure

Absolute pressure, [bar(a)], Side B: _____
1 bar(a) = ambient pressure

Temperature [°C], Side A: _____

Temperature [°C], Side B: _____



Side A **Side B**

W D P

Surface roughness Surface hardness

Ra _____ (HRC) _____

Rz _____

Rmax _____

Remarks: _____

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Notes

Note:
Properties/applications shown throughout this brochure are typical. Your specific application should not be undertaken without independent study and evaluation for suitability. For specific application recommendations consult Garlock. Failure to select the proper sealing products could result in property damage and/or serious personal injury. Performance data published in this brochure has been developed from field testing, customer field reports and/or in-house testing. While the utmost care has been used in compiling this brochure, we assume no responsibility for errors. Specifications subject to change without notice. This edition cancels all previous issues. Subject to change without notice GARLOCK is a registered trademark for packings, seals, gaskets, and other products of Garlock.
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