TECHNICAL HANDBOOK

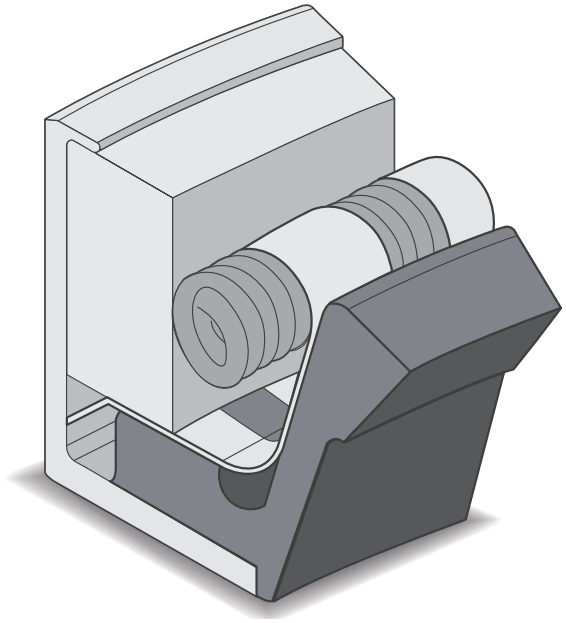
FP®

ATS® SPECIAL OIL SEALS

Think Sealing

Rev. 01 07-10-2016

OIL SEALS TYPE L2M®

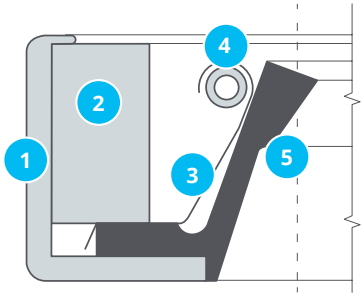


- Developed specifically for severe operating conditions with great misalignments and high speeds where rigidity and strength are necessary.
- Recovery of misalignment up to 5 mm (radial up to 2,5 mm).
- A groove on the external diameter allows the operator to center the oil seal in the housing bore, easing the assembly.
- The outer metal case of the oil seal is conceived in one single piece without welding points.
- Available on demand with rubber or iron spacers.
- The sealing lip is vulcanized onto the metal casing.

Applications:
Paper mill industry, Primary metals industry, Wind mill industry, Mining industry, Power generation and supply, General industry

Dimensions: Minimum I.D. 180 mm; Maximum O.D. 2.000 mm
Working speed: up to 40 m/s
Pressure: up to 0.5 BAR
Operating temperature range: - 40°C / + 220°C
Remarks: All working parameters vary, considering the different type of materials and elastomer used.

L2M®



Technical features

1. Metal outer casing with ground surface
2. Stiffening ring
3. Finger spring
4. Garter spring
5. Rubber sealing ring vulcanized on the metal case

Materials

1. Metal body: **Fe-DC04**
2. Stiffening ring: **Fe 37**
3. Finger spring: **AISI 301**
4. Garter spring: **AISI 316**
5. Elastomer: **NBR; HNBR; FKM; VMQ**

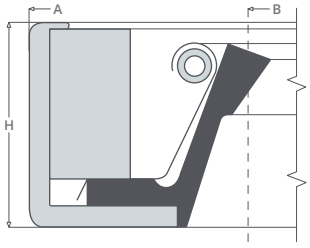
For further information on all our seals, please check our web page or contact our offices.

F.lli Paris S.r.l. a socio unico

fpparis.com

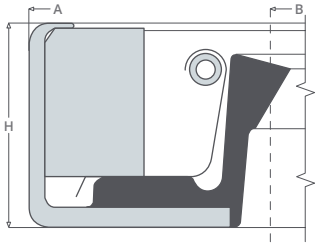
via Marconi 142/144, 24060 Castelli Calepio (BG) ITALY
+39 035 442 5511 | +39 035 442 5478 | info@fpparis.com

L2M® TYPES



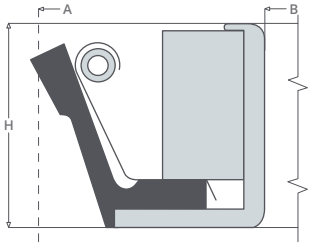
L2M-PL

Oil seal with a reduced interference of the lip to solve overheating issues caused by friction in high-speed applications. Only available in self-lubricating FKM material.



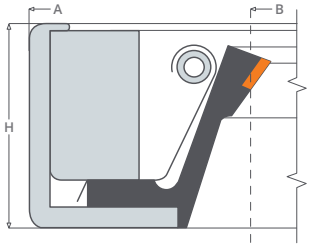
L2M-BP

Oils seals produced to withstand pressures above 0.5 BAR up to 1 BAR. Special profiles can be produced to withstand higher pressures.



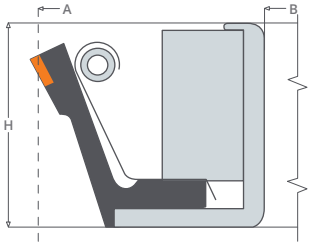
L2M-TE

External lip oil seal. Only available in self-lubricating FKM material.



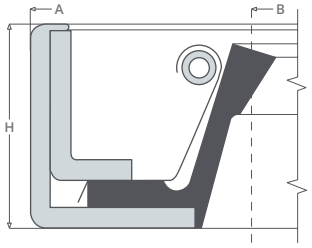
L2M-VF

Oil seals produced with self-lubricating FKM material and vulcanized PTFE insert for a resistance to abrasion and for applications up to 40 m/s.



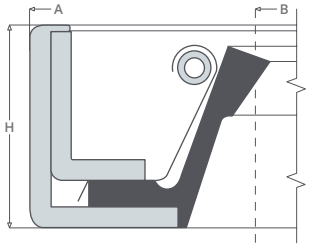
L2M-TE-VF

External lip oil seal. Only available in self-lubricating FKM material with a vulcanized PTFE insert.



L2ML

Similar to L2M® but with a reversed metal insert. This solution has been engineered for rings with narrow housing, which does not allow the presence of the stiffening rings.

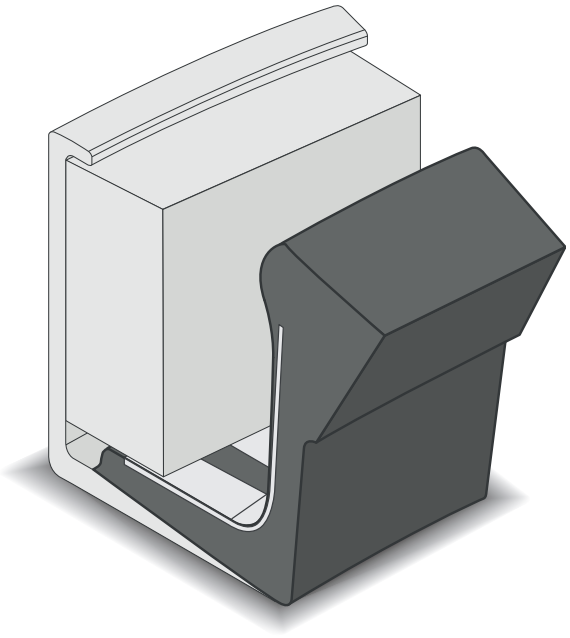


L2ML-PL

Like L2ML but with a reduced interference of the lip to solve overheating issues caused by friction in high-speed applications.

All the profiles are also available with dust lip "P"

OIL SEALS TYPE L1M

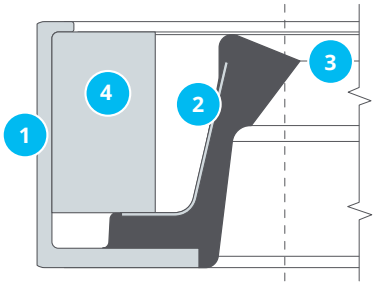


- These shaft oil seals are similar to the L2M® type, and have been developed for small diameter cylinders, starting from 100 mm. For smaller diameters, please contact us to evaluate our production capacity.
- Made with a strong external metal casing ground according to FP's internal specification, onto which is vulcanized the sealing element. Available in various elastomers.
- The presence of a forged steel ring bound to the external metal casing, and a finger spring in stainless steel vulcanized with the sealing lip ensure the correct sealing performance, even when shock loads arise.
- This oil seal is recommended for applications with grease and low speeds.
- An additional dust lip is available upon request.

Applications
General industry, Heavy-duty industry, Mining industry, Primary metals industry

Working speed: up to 25 m/s
Pressure: up to 0.5 BAR
Operating temperature range: - 40°C / + 220°C
Remarks: All working parameters vary, considering the different type of materials and elastomer used.

L1M



Technical features

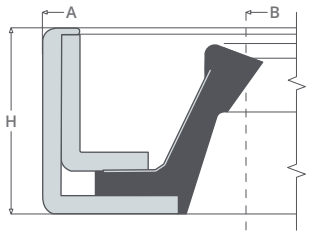
1. Metal outer casing with ground surface
2. Vulcanized finger spring
3. Mould made sealing lip
4. Stiffening ring

Materials

1. Metal casing: **Fe-DC04; AISI 304**
2. Finger spring: **AISI 301**
3. Elastomer: **NBR; FKM; VMQ; HNBR**
4. Stiffening ring: **Fe 37**

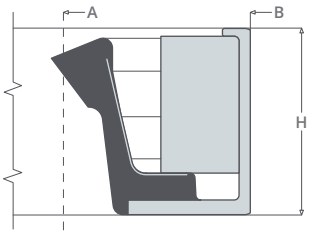
For further information on all our seals, please check our web page or contact our offices.

L1M TYPES



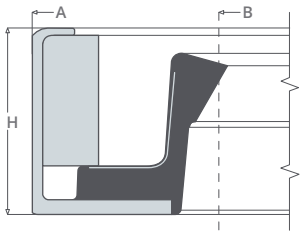
L1ML

Similar to the L1M but with a reversed metal insert. This solution has been engineered for rings with a narrow housing which does not allow the presence of the stiffening ring.



L1M-TE

External lip oil seal. Only available in self-lubricating FKM compound.



L1M-BP

Oil seal made to withstand pressures from 0.5 up to 1 BAR. Special profiles can be made to withstand higher pressures.

All the profiles are also available with dust lip "P"

TECHNICAL SPECIFICATIONS

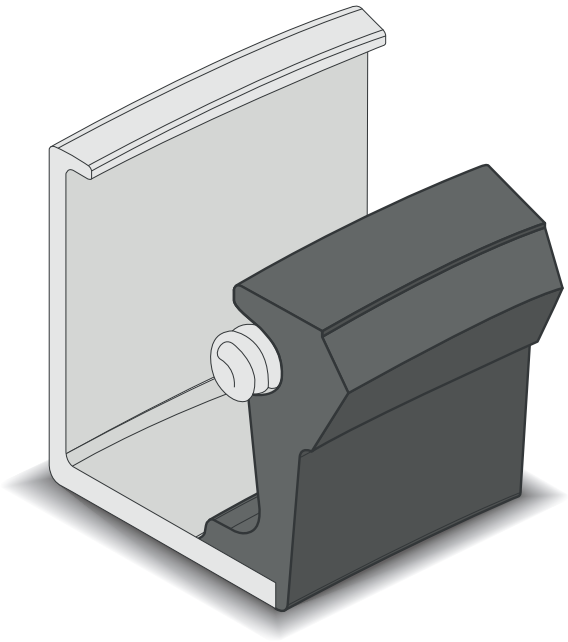
Shaft and housing tollerances for metric (mm) and imperial sizes (inch.)

Shaft Ø (mm)	<= 100	± 0.080
	101 ÷ 150	± 0.100
	151 ÷ 250	± 0.130
	>= 250	± 0.250

Housing Ø (mm)	<= 76	± 0.025
	77 ÷ 150	± 0.040
	151 ÷ 255	± 0.050
	256 ÷ 510	+ 0.05 /-0.10
	511 ÷ 1015	+ 0.05 /-0.15
	>= 1015	+ 0.05 /-0.25

Shaft Ø (mm)	Chamfer "F" (mm)
<= 250	7.00
> 250	12.00

OIL SEALS TYPE L

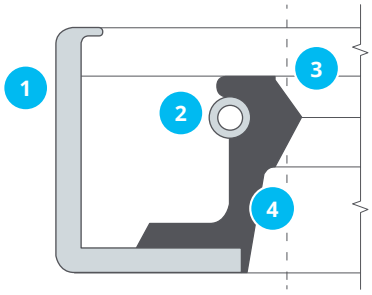


- Oil seals with external metal casing ground according to FP's internal specifications and executed in one single piece without welding points.
- The sealing lip is vulcanized directly onto the metal case.
- The type L1 is particularly indicated when there is limited space between the housing and the shaft.
- Also available with an additional dust lip.

Applications
Primary metals industry, Wind mill Industry, General industry

Dimensions: Minimum I.D. 25 mm; Maximum O.D. 1.900 mm
Working speed: up to 25 m/s
Pressure: up to 0.5 BAR
Operating temperature range: - 40°C / + 220°C
Remarks: All working parameters vary, considering the different type of materials and elastomer used.

L1



Technical features

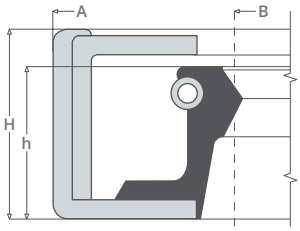
1. Metal outer casing with ground surface
2. Garter spring
3. Mold-made sealing lip

Materials

1. Metal casing: **Fe-DC04; AISI 304**
2. Garter Spring: **AISI 302; AISI 316; C72 phosphased**
4. Elastomer: **NBR; FKM; VMQ; HNBR**

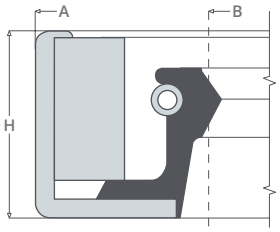
For further information on all our seals, please check our web page or contact our offices.

L TYPES



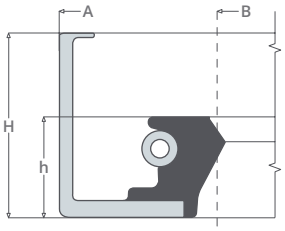
L2

Oil seal with ground metal outer casing and sealing lip vulcanized onto the metal body. The reversed L-shaped metal insert protects the sealing lip and strengthens the ring.



L1A

Oil seals with a strong body due to a stiffening ring mount in the metal casing. Useful in large cylinders and in heavy-duty applications.



L1-BP

Variation of the L1 and L2 type for applications in high-pressure environments.

All the profiles are also available with dust lip "P"

TECHNICAL SPECIFICATIONS

Outside diameter (mm)	Tolerances (mm)	Maximum ovalization (mm)
<= 50	+0.10 +0.20	0.18
50 ÷ 80	+0.13 +0.23	0.25
80 ÷ 120	+0.15 +0.25	0.30
120 ÷ 180	+0.18 +0.28	0.40
180 ÷ 300	+0.20 +0.30	0.8
300 ÷ 400	+0.23 +0.35	1
400 ÷ 500	+0.23 +0.35	1
500 ÷ 630	+0.25 +0.35	1.3
630 ÷ 800	+0.30 +0.40	1.6
800 ÷ 1000	+0.30 +0.40	1.9
1000 ÷ 1250	+0.30 +0.45	2.2
1250 ÷ 1500	+0.40 +0.55	2.5

Thickness or Height (mm)		
	<= 10	± 0.30
	> 10	± 0.40

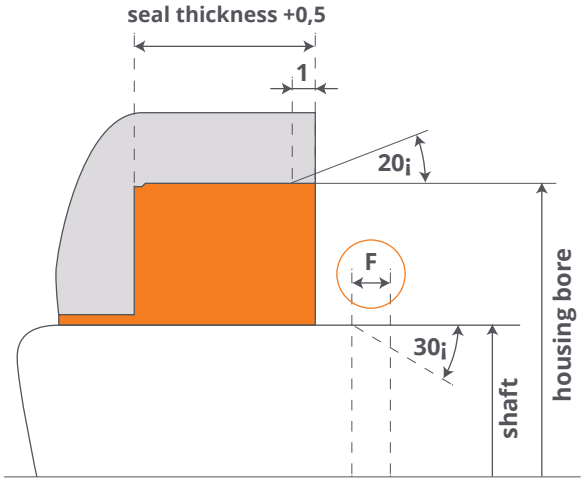
TECHNICAL FEATURES FOR L - L1M - L2M®

Tolerances on shaft and housing for metric (mm) and imperial (inch.)

Shaft size	<= 100	± 0.080
Ø (mm)	101 ÷ 150	± 0.100
	151 ÷ 250	± 0.130
	>= 250	± 0.250
Housing	<= 76	± 0.025
Ø (mm)	77 ÷ 150	± 0.040
	151 ÷ 255	± 0.050
	256 ÷ 510	+ 0.05 /-0.10
	511 ÷ 1015	+ 0.05 /-0.15
	>= 1015	+ 0.05 /-0.15

Maximum misalignment allowed 2,5 mm

Shaft Ø (mm)	Chamfer "F" (mm)
<= 250	7.00
> 250	12.00



"We recommend the use of a conical mounting tool for the installation of the seal"

Finishing of the shaft

A surface finishing of the cylinders done with chromium carbide has shown excellent results. Finishes made with chromium oxides have the disadvantage of reducing the heat dissipation capacity through the cylinder and should not be used with high-speed installations (<10 m/s). It is recommended to apply sleeves on the cylinders in the sealing areas of the ring and finished with hardness 58-62 HRC.

Shaft hardness and surface finishing

Speed	Maximum roughness		Hardness
(m/s)	Ra (mm)	Rmax (mm)	HRC
<= 10	0.5-0.6	2.0-3.0	30
11 ÷ 16	0.3-0.5	1.0-2.0	40
> 16	0.2-0.3	0.8-1.0	50

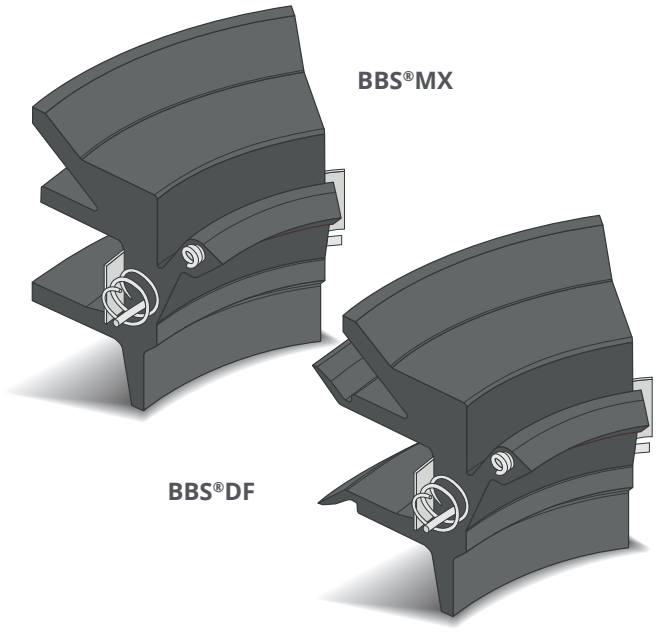
Selecting the sealing elastomers

Elastomers	Applications
Nitrile NBR	Lubricating oils, hydraulic oils and mineral fats, water, HFA and HFB fluids, caustic cleaners.
Hydrogenated Nitrile HNBR	Lubricating oils, hydraulic oils and mineral fats, water, HFA and HFB fluids, caustic cleaners. It guarantees an excellent resistance to abrasion and a good thermal behavior.
Fluoroelastomer FKM	Mineral based liquids and fats, HFA, HFB, HFC and HFD fluids, water, chemicals and solutions. Not applicable with highly flammable liquids based on phosphoric acid. Recommended for use with flammable oils.
Silicon VQM	Organic oils and oils with high aniline content. Engine and gearbox oil. Excellent characteristics for mineral oils and fats. It can be used with aliphatic and aromatic hydrocarbons. This material is resistant to high and low temperatures.

Description		NBR	FKM	VQM	HNBR
Working temperature	C (± 2)	-20 ÷ +100	-20 ÷ +220	-60 ÷ +180	-40+150
Standard Hardness	Shore A (±5)	70	70	70	70
Maximum working speed	m/s	12	25 ÷ 35	25	15

The above data has been obtained through tests that •FP• considers to be reliable. •FP• does not guarantee that the same results with be replicated in other laboratories with different preparation conditions and laboratory sample evaluation. For more details, please contact our technical office.

OIL SEALS TYPE BBS® DF and MX



BBS®MX

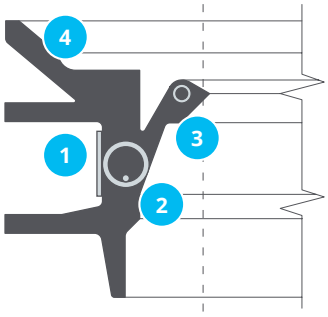
BBS®DF

- Primary shaft oil seals for oil film bearings.
- The BBS® oil seals are available in both DF and MX style to fit every customers' requirement.
- Used in steel mill: back-up rolls (hot and cold rolling mills).
- The BBS® oil seals can be supplied together with the corresponding Water Seal, or with specific V-Rings (secondary seal).

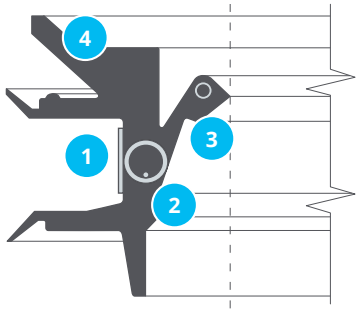
Applications
Primary metals industry

Dimensions: Please contact our sales office
Operating temperature range: - 40°C / + 160°C

BBS®MX



BBS®DF



Technical features

1. External metal band
2. Garter spring with internal wire, vulcanized in the body of the seal
3. Garter spring vulcanized in the sealing lip
4. Rubber body

Materials

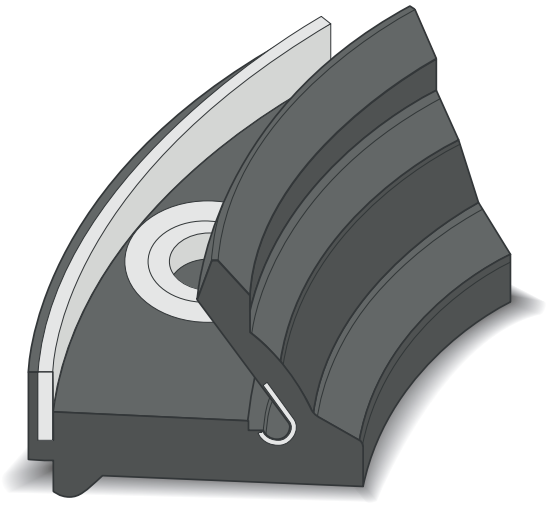
1. Metal band: **AISI 301**
2. Garter spring with internal wire: **AISI 302**
3. Garter spring: **C72 phosphated**
4. Elastomer: **NBR; HNBR**

For further information on all our seals, please check our web page or contact our offices.

via Marconi 142/144, 24060 Castelli Calepio (BG) ITALY
+39 035 442 5511 | +39 035 442 5478 | info@fpparis.com

Rev. 01 03-11-2016

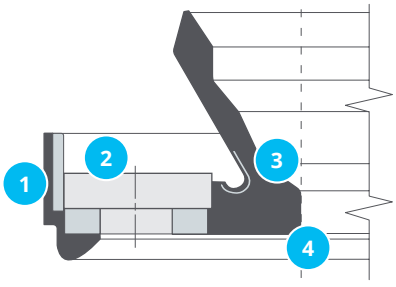
OIL SEALS TYPE WATER SEAL



- Secondary seal for oil film bearings installed as a protection from the cooling media. Available also with a finger spring vulcanized in the sealing lip.
- The finger spring has the function to constantly maintain the lip preloaded, even after the rubber loses its flexibility with time. The finger spring also enables the sealing lip to better copy the axial movement of the shaft.
- The Water Seal is available also without finger spring.
- Also available with its corresponding BBS® seal type (primary seal).

Applications
Primary metals industry

Dimensions: Minimum I.D. 200mm; Maximum O.D. 1.800 mm
Operating temperature range: - 40°C / + 160°C



Technical features

1. Fastening external metal band vulcanized in the seal
2. Vulcanized metal bushings to fix the seal to the retaining plate
3. Rubber lip w/ or without the vulcanized finger spring
4. Rubber body

Materials

1. Vulcanized metal band: **C67 tempered**
2. Fastening metal bushing vulcanized in the seal: **Fe 37**
3. Vulcanized finger spring: **AISI 301**
4. Elastomer: **NBR**

For further information on all our seals, please check our web page or contact our offices.

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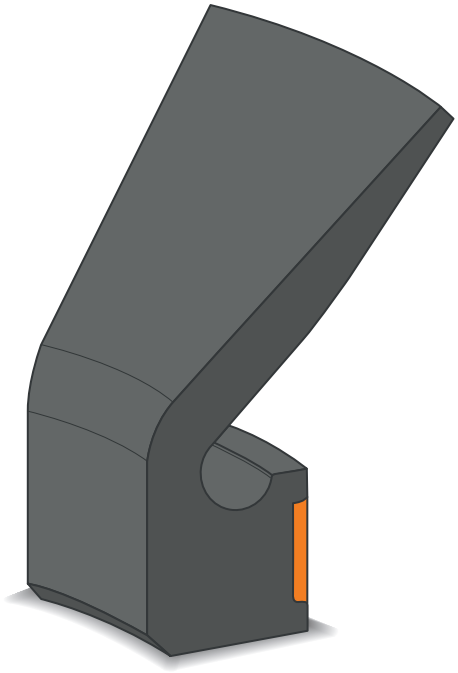
via Marconi 142/144, 24060 Castelli Calepio (BG) ITALY
+39 035 442 5511 | +39 035 442 5478 | info@fpparis.com

V-RINGS

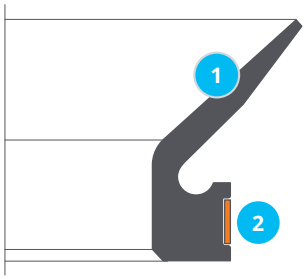


- Endless all-rubber face seal produced up to 2.100 mm in one single piece and joint-vulcanized for larger diameters. It works as a front seal and it is the perfect solution to prevent contamination from dirt, dust, or water. It can be used as a secondary seal to protect the primary seals.
- The V-Ring is a seal of easy use and assembly since it is self-retaining on the shaft and does not need a special finishing grade and tolerance. The contact area can have a roughness from Ra 0.5 to Ra 1.6 according to the speed, and the fluids to be sealed.
- It can be used without a metal band for peripheral speed up to 10/12 m/sec.
- Fastening metal band available upon request.

Applications
Any type of industry

Dimensions: Minimum I.D. 3,2 mm; Maximum O.D. 2.100 mm in one single piece; over 2.100 mm by hot-vulcanizing jointing technique
Working speed: Rotating V-Ring: 12 m/s - Stationary V-Ring: 20 m/s
Pressure: No pressure
Operating temperature range: - 60°C / + 220°C
Remarks: All working parameters vary, considering the different type of materials and elastomer used.

VRME



Technical features

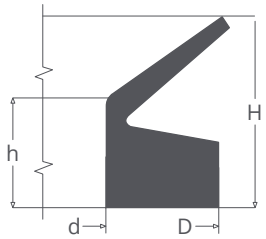
1. Rubber body
2. Fastening metal band (on request for the types VRME, VA and VAX)

Materials

1. Elastomer:
   NBR; HNBR; FKM; EPDM; CR; VMQ
2. Fastening metal band:
   301 stainless steel

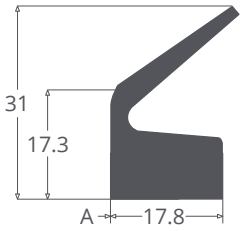
For further information on all our seals, please check our web page or contact our offices.

V-RINGS TYPES



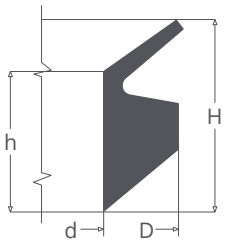
VA

V-Ring with standard cross section proportional to the diameter of the shaft. On demand, fastening metal band with clips.



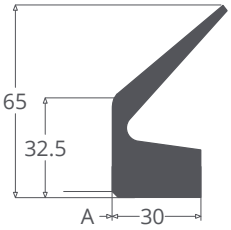
VAX

V-Ring with longer lip and Cross section with fixed dimensions. Suggested for heavy duty applications. On demand, fastening metal band with clips.



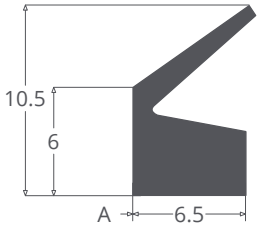
VS

V-Ring with a wider cross section for a better hold, and with proportional dimensions to the diameter of the shaft.



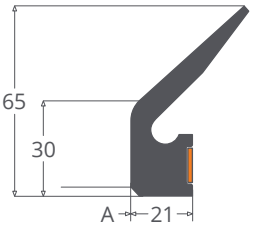
VE

V-Ring with special lip profile for higher elasticity. Cross section with fixed dimensions.



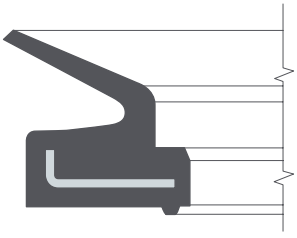
VL

V-Ring with narrow axial cross section suitable for compact arrangements. Cross section with fixed dimensions.



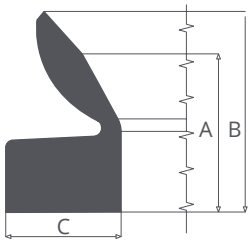
VRME

V-Ring with a built-in housing for a fastening metal band. Cross section with fixed dimensions.



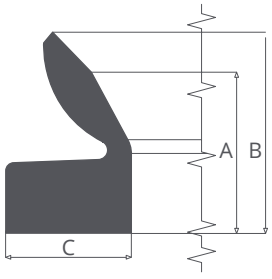
VAM

V-Ring with a reinforcing metal insert at the bottom. Suggested for applications in the primary metals industry. Cross section with fixed sizes.



VEAX

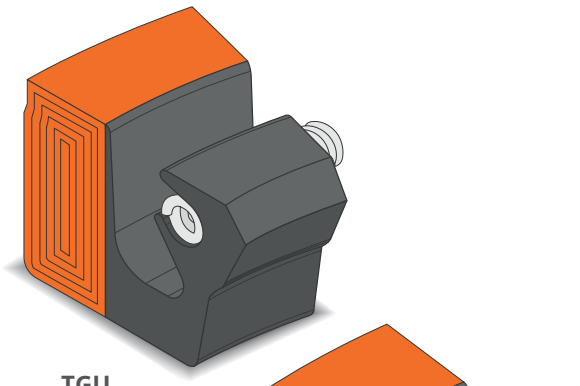
Special version of the VAX type with a stronger and defined sealing lip, with higher mechanical properties.



VEA

Special version of the VA type with a stronger and defined sealing lip, with higher mechanical properties.

TEXTILE RUBBER OIL SEALS TYPE TGU - TGA - TGR



TGU

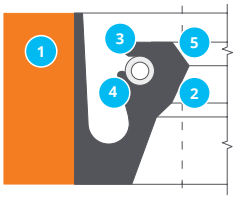
TGA

- Oil seal with flexible reinforced textile-rubber back and rubber sealing lip with garter spring.
- A clamping plate is required.
- The seat of the garter spring (stainless steel) is designed to prevent its accidental loss during assembly. Particularly useful for "blind" installations on site.
- Garter spring also available encapsulated in resin or other materials, for protection from chemicals and dirt.
- TGA type provided with axial (A) and radial (R) lubrication groves.
- TGR type provided with radial (R) lubrication grooves.

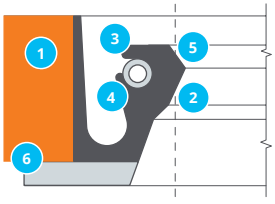
Applications
Any industrial sector

Dimensions: Minimum I.D. 150 mm; Maximum O.D. 2.000 mm in one single piece; larger than 2.000 mm by hot-vulcanizing jointing technique
Working speed: up to 25 m/s
Pressure: 0 BAR ("split") - 0.5 BAR ("endless")
Operating temperature range: - 40°C / + 220°C
Remarks: All working parameters vary, considering the different type of materials and elastomer used.

TGU



TGA



Technical features

1. Textile-rubber reinforced back
2. Rubber sealing lip
3. Spring housing with engineered seat to prevent its accidental loss during assembly
4. Garter spring
5. Sealing edge made through cutting process
6. Lubrication grooves

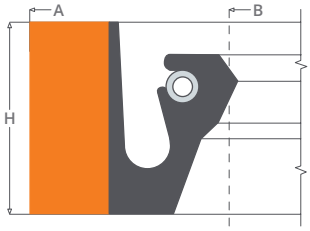
Materials

1. Textile-rubber reinforced back: **NBR; FKM; HNBR**
2. Elastomer: **NBR; FKM; HNBR**
4. Garter spring: **AISI 302; AISI 316**

For further information on all our seals, please check our web page or contact our offices.

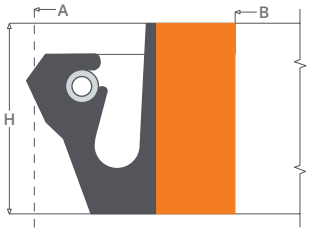
via Marconi 142/144, 24060 Castelli Calepio (BG) ITALY
+39 035 442 5511 | +39 035 442 5478 | info@fpparis.com

TGU TYPES



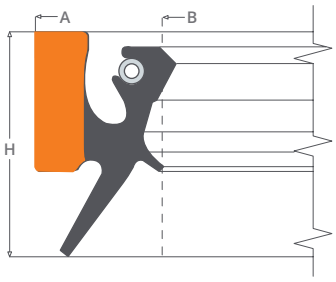
TGU

Oil seal with a flexible reinforced textile-rubber back, and a rubber sealing lip with a garter spring.



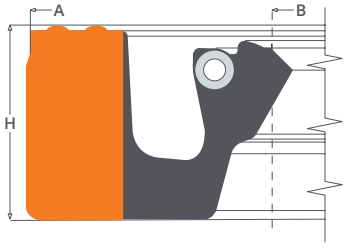
TGU-TE

Sealing lip on the outside diameter.



TGU-VGUARD

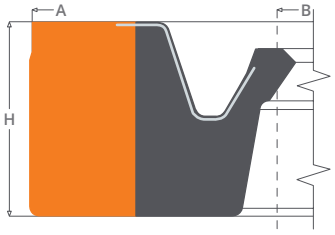
Special profile that combines the characteristics of a rotary shaft seal and a front seal.



TGU-MTV

Special Oil seal with a flexible reinforced textile-rubber back. Garter spring vulcanized into the sealing lip.

All the profiles are also available with dust lip "P"



TGU-GM

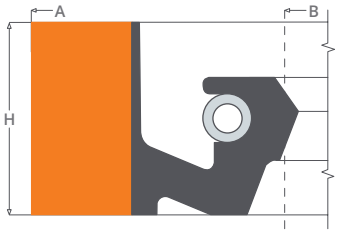
Profile with a special sealing lip to withstand higher pressures

The TGU-GM type is a ring with a reinforced textile-rubber back, produced with a finger spring in stainless steel:

- The finger spring is vulcanized into the sealing lip.
- The assembly requires a clamping plate.
- By special request it can be produced in its "split" (open) shape. In this case, there should be no pressure in the application.

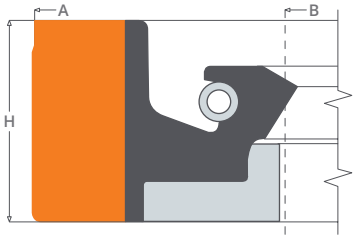
The minimum inside diameter that can be produced is 150 mm. For smaller dimensions, please contact •FP• to verify production capacity.

SPECIAL TEXTILE-RUBBER SEALS FOR HIGH PRESSURES



TGU-BP

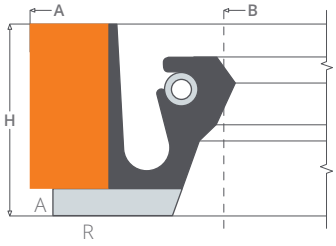
These types of textile-rubber sealing rings are variations of the standard TGU type and are engineered to be used in high-pressure environments.



TGU-BP RANN

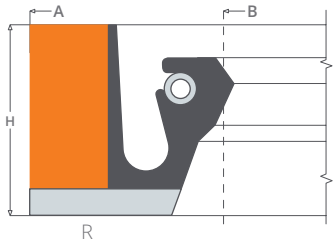
The resistance to pressure varies depending on the profiles of the sealing ring used in the application. These rings are not available in their "split" (open) form.

TGA and TGR TYPES



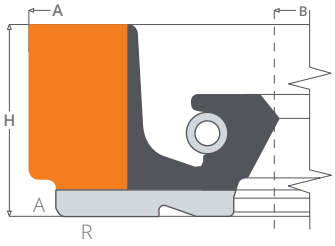
TGA

Provided with axial (A) and radial (R) lubrication grooves; mostly used in "back-to-back" applications.



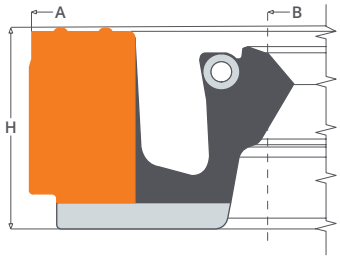
TGR

Provided only with radial (R) lubrication grooves.



TGA-BP

Provided with axial (A) and radial (R) lubrication grooves; mostly used in "back-to-back" applications. Special profile of the sealing lip to withstand pressures up to 4 BAR. Not recommended in its "split" (open) shape.



TGA-MTV

Special Oil seal with textile-rubber back. Garter spring vulcanized into the sealing lip. Provided with axial (A) and radial (R) lubrication grooves.

TECHNICAL DATA-SHEET: All the textile-rubber profiles

Shaft surface finishing	The surface on the shaft should have a roughness: Ra = 0.3 - = 0.5 µm; Rmax = 1-2 µm. Obtained by plunge grinding
Shaft hardness	Recommended: 40 ÷ 50 HRC.
Shaft misaligment	Depending on the speed, should not exceed 1.5 mm.
Housing and shaft tolerances	All types of TGU, TGA and TGR must be axially assembled in the housing, and flanged. **Shaft:** h 11 **Housing:** H 8 **Thickness or height:** nominal dimension of the ring ± 0.1 mm

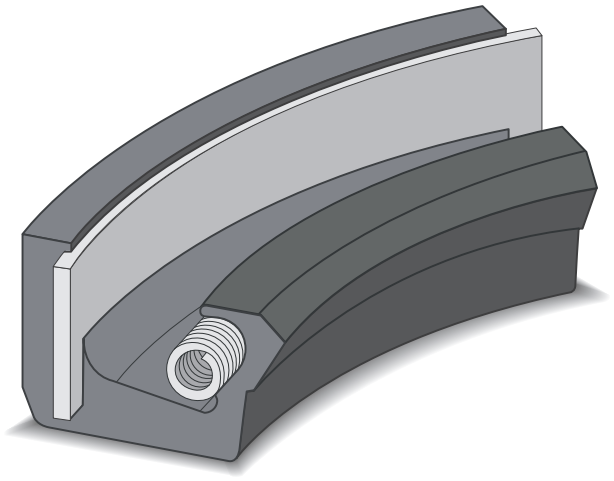
Assembly instruction:
TGU, TGA and TGR

The rings type TGU, TGA, and TGR are always used with a retaining plate, which creates an axial preload, ensuring the static sealing of the ring. To facilitate the mounting of the ring, it would be better to provide the housing with a chamfer.
The ring must be inserted evenly and pressed into the seat. Before tightening the retaining plate, check that the sealing lip and the fabric's back are in the right position and that the spring is in place.

Assembly instruction:
TGU SPLIT, TGA SPLIT, TGR SPLIT (open shape)

Remove the spring and open the joint. Place the spring around the shaft. Join the two ends of the spring together and close. Place the ring on the shaft and push the spring into its seat. Make sure the ring's jointing point is facing the 12 o'clock position. When using two split rings, the jointing points should be facing the 11 o'clock and the 1 o'clock positions. When it is verified that both ends are perfectly aligned, press the ring into the seat and tighten the retaining plate as described above.

OIL SEALS TYPE TGF

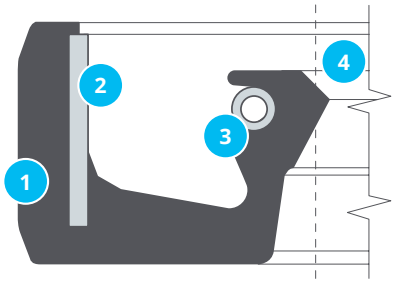


- Self-retaining all-rubber oil seal with a vulcanized flexible metal band to be mounted without clamping plate.
- Available also in "split" (open) form. Mainly used for maintenance in applications without any pressure. In this case the clamping plate is recommended.
- Garter spring available also encapsulated in resin or other materials for protection from chemical aggressions and dirt.

Applications
Primary metals industry, Wind mill industry, Marine industry, Power generation and supply, General Industry

Dimensions: Minimum I.D. 200 mm; Maximum O.D. 2.000 mm
Working speed: up to 25 m/s
Pressure: 0 BAR "split" - 0.5 BAR "endless"
Operating temperature range: - 40°C / + 220°C
Remarks: All working parameters vary, considering the different type of materials and elastomer used.

TGF



Technical features

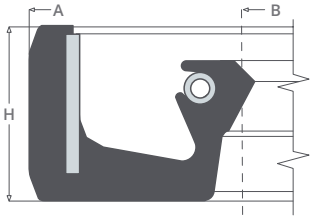
1. Rubber body
2. Flexible metal band
3. Garter spring
4. Sealing edge made through cutting process

Materials

1. Elastomer: **NBR; FKM; HNBR**
2. Metal band: **Fe C67 tempered**
3. Garter spring: **AISI 302; AISI 316**

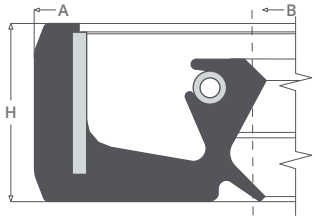
For further information on all our seals, please check our web page or contact our offices.

TGF TYPES



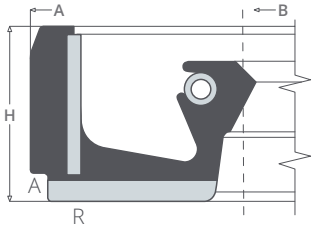
TGF

Profile with flexible metal band which enables the assembly without clamping plate.



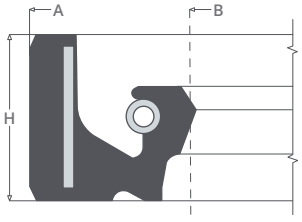
TGFP

Variation of the TGF type, with additional dust lip.



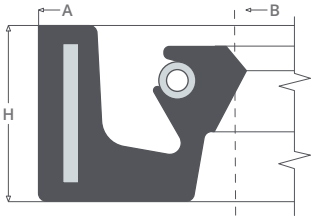
TGF-B

Profile with flexible metal band, with axial (A) and radial (R) lubrication grooves.



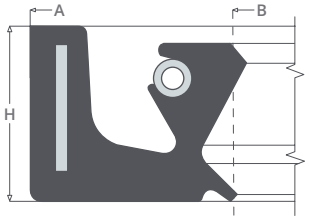
TGF-BP

Special profile of the sealing lip made to withstand high pressures up to 4 BAR. Available only in “endless” (closed) form.



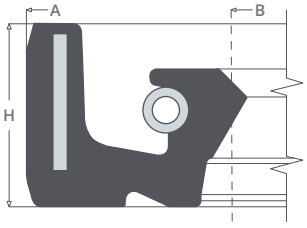
TGFW

Self-retaining seal with flexible metal band completely covered with rubber.



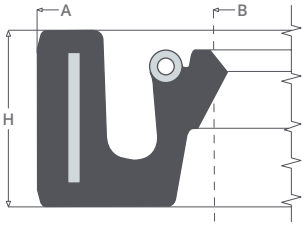
TGFWP

Variation of the TGFW type, with additional dust lip.



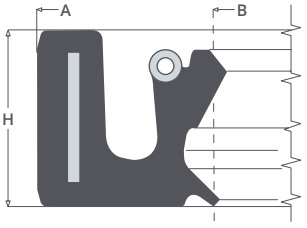
TGFW-BP

Profile with flexible metal band completely covered with rubber, for high pressures up to 4 BAR. Available only in “endless” (closed) form.



TGFW-MTV

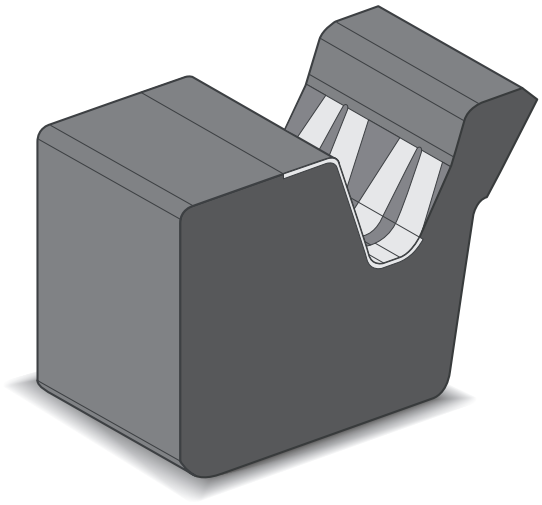
Special upgrade of the design TGFW with the garter spring completely vulcanized into the sealing lip.



TGFWP-MTV

Variation of the TGFW-MTV type, with additional dust lip.

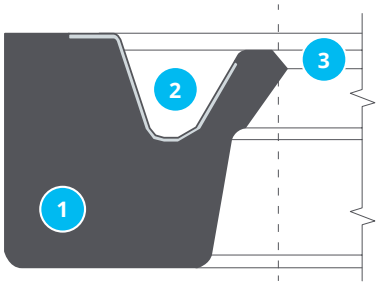
OIL SEALS TYPE GM



- All-rubber oil seal with a vulcanized stainless steel finger spring.
- Recommended for difficult assembly conditions and on-site seal replacements which avoid opening the cylinder. It is mostly used in its "split" (open) shape and supplied with the requested length.
- In its "endless" (closed) shape, the GM type is suitable as a wiper for hydraulic applications.
- Preferably used in applications with grease lubrication and in dusty environments.
- The smallest feasible diameter is 100 mm. For smaller sizes contact our offices.

Applications
Mining industry, Heavy-Duty industry, General industry

Dimensions: Minimum I.D. 100 mm; Maximum O.D. 2.000 mm in one single piece; larger than 2.000 mm by hot-vulcanizing jointing technique
Working speed: up to 25 m/s
Misalignment: up to 0,2 mm
Shaft's hardness: 40 HRC
Surface finishing: Ra = 0,3 - 0,5
Pressure: 0 BAR ("split") - 0.2 BAR ("endless")
Operating temperature range: - 40°C / + 220°C
Remarks: All working parameters vary, considering the different type of materials and elastomer used.



Technical features

1. Rubber body
2. Vulcanized finger spring
3. Sealing edge made by cutting process.

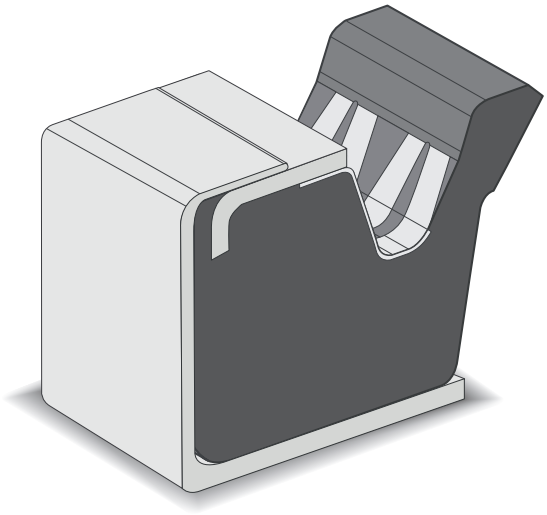
Materials

1. Elastomer:
   NBR; FKM; VMQ; HNBR; EPDM
2. Finger spring:
   AISI 301

For further information on all our seals, please check our web page or contact our offices.

Rev. 00 06-10-2016

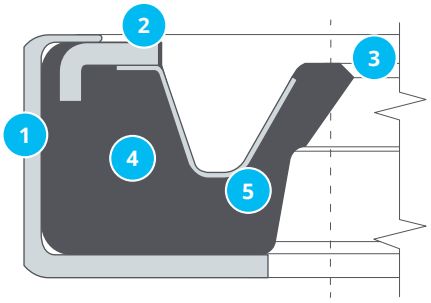
OIL SEALS TYPE GM-L2



- Self-retaining oil seal for severe working conditions, with an external ground finished metal case.
- Lip with a vulcanized stainless steel finger spring.
- Recommended for working conditions with grease in low-speed applications.

Applications
Primary metals industry

Dimensions: Minimum I.D. 100 mm; Maximum O.D. 1.950 mm
Working speed: up to 25 m/s
Pressure: 0.5 BAR
Operating temperature range: - 40°C / + 220°C
Remarks: All working parameters vary, considering the different type of materials and elastomer used.



Technical features

1. Metal reinforced outer diameter
2. Vulcanized finger spring and reinforcing metal insert combo
3. Sealing edge made through cutting process
4. Rubber body
5. Vulcanized finger spring

Materials

1. Metal casing: **Fe-DC04**
2. Vulcanized metal insert: **Fe-DC04**
4. Elastomer: **NBR; HNBR; FKM**
5. Finger spring: **AISI 301**

For further information on all our seals, please check our web page or contact our offices.

F.lli Paris S.r.l. a socio unico

fpparis.com

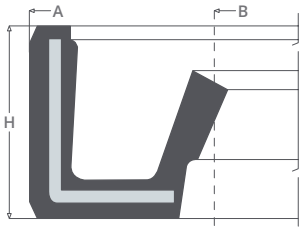
via Marconi 142/144, 24060 Castelli Calepio (BG) ITALY
+39 035 442 5511 | +39 035 442 5478 | info@fpparis.com

OIL SEALS TYPE GSM

These grease sealing profiles are oil seals with a metal support, but without a garter spring in the sealing lip, and ensure a more delicate contact with the shaft.

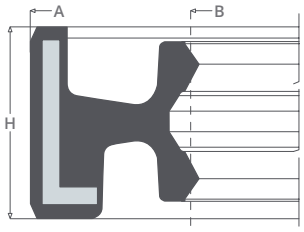
This seal is used against grease and dust and is suitable for shafts with low rotating speeds and narrow housing.

TYPES



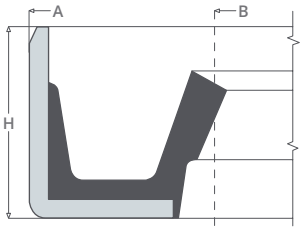
GSM

Oil seal with metal casing completely covered by elastomer without spring. Produced as per DIN 3760.



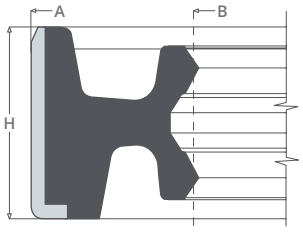
G2SM

Double lip oil seal without springs, which ensures a compact sealing system from two different media and in narrow housing.



MSM

Oil seal with ground or calibrated external metal casing without a spring. Produced as per DIN 3760.

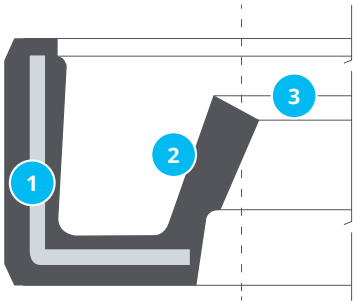


M2SM

Double lip oil seal without springs with ground or calibrated external metal casing. Produced as per DIN 3760.

For the types GSM and MSM are also available the versions with dust lip : GPSM and MPSM

GSM



Technical features

1. Rubber covered metal casing
2. Rubber sealing lip without garter spring
3. Sealing edge made through cutting process

Materials

1. Metal casing:
   DC04; AISI 304; AISI 316
2. Elastomer:
   NBR; FKM; VMQ; HNBR; EPDM

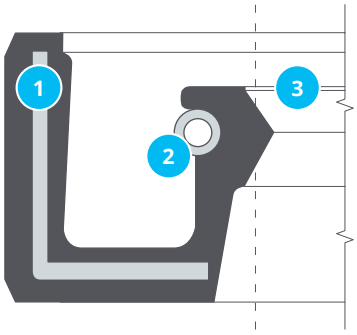
For further information on all our seals, please check our web page or contact our offices.

ROTARY SHAFT OIL SEALS TYPE G and M

The rotary shaft oil seal is an indispensable component in any lubricated rotating equipment. The ·FP· oil seals provide the right solution to every sealing problem.

·FP· rotary shaft oil seals are produced according to modern engineering techniques with high-performing materials, as requested by industry specifications.

G



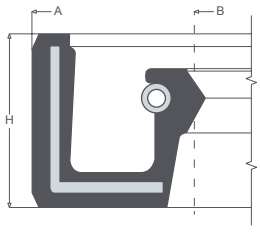
Technical features

1. Metal body covered with elastomer
2. Garter spring
3. Sealing edge made through cutting process

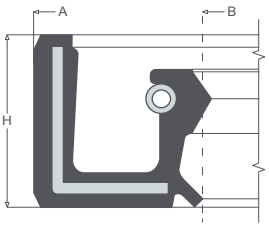
Materials

1. Metal body: **DC04; AISI 304; AISI 316**
2. Garter spring: **AISI 302; AISI 316; C72 phosphated**
3. Elastomer: **NBR; FKM; VMQ; HNBR; EPDM**

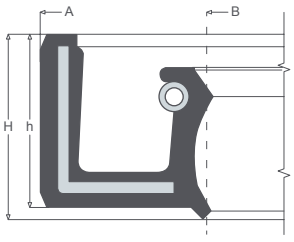
G and M TYPES



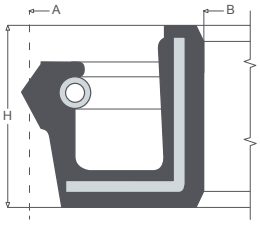
G



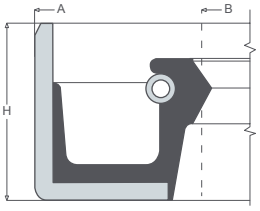
GP



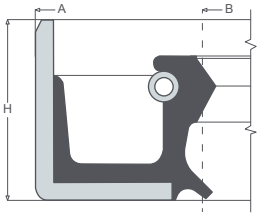
GPA



GTE



M

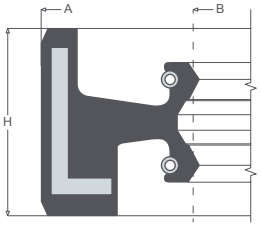


MP

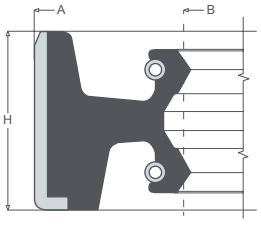
Rotary shaft oil seals in rubber-to-metal produced according to DIN 3760 norm. Supplied with rubber or with metal outer diameter.

The sealing lip is obtained by cutting process to avoid imperfection, and energize with a garter spring.

For further information on all our seals, please check our web page or contact our offices.

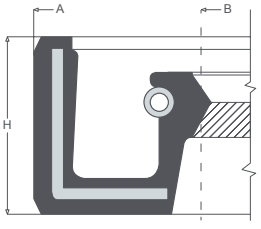


G2

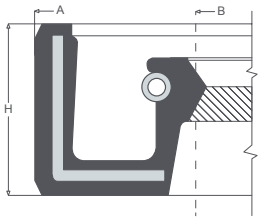


M2

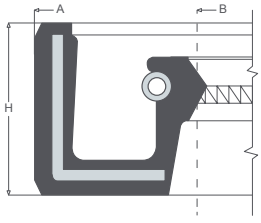
Double lip oil seal with two garter springs, to provide a compact sealing in housings with limited space, and from two different fluids.



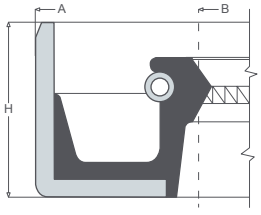
GZS



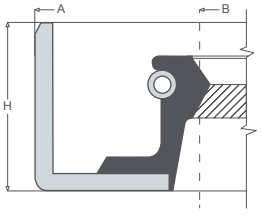
GZD



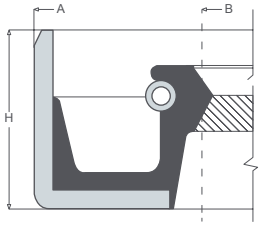
GZT



MZT



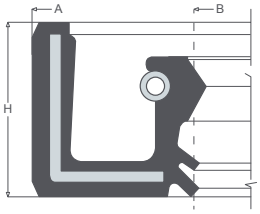
MZS



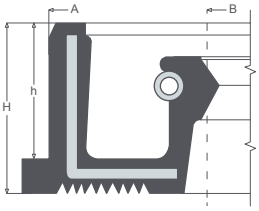
MZD

Oil seals with conical groove on the internal surface of the lip. Usually used in the automotive industry, and particularly for driving shafts. The groove to the right (D) or to the left (S) limits the use of the seals to one direction.

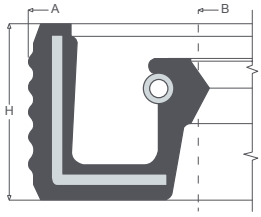
The same groove is available also on oil seals with dust lips (Types GPZS, GPZD, MPZS, MPZD). The profiles GZT and MZT are produced with a bidirectional groove on the inner sealing lip, for alternative directions.



GPP

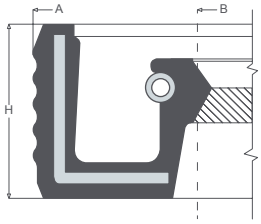


GF



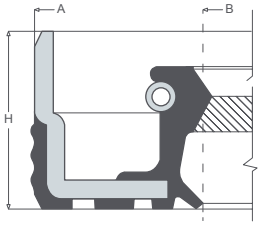
GRE

Rotary shaft oil seals with special performances produced for non-standard applications. The GPP type includes a double dust lip, while the GF type has a flange on the outer diameter.



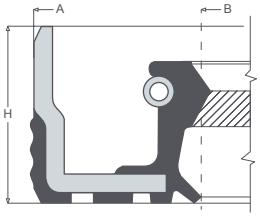
GZDRE

The suffix RE indicates the outer sealing groove profile, which is used to compensate possible imperfections of the housing. These seals are normally used with pressed or non-ground housing surfaces.



MGPZD

The letters M & G together illustrate a metal outer diameter partially covered with elastomer. This type of seal is used for maintenance purposes, while replacing rings with a metal outer diameter (type M). Once the original ring is replaced, the housing may reveal damages caused by removing the ring. The partial rubber covering of the MG type provides the static sealing of the new ring even in housing with those impairments.

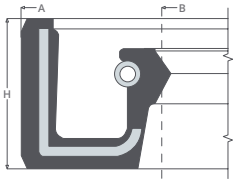


MGPZS

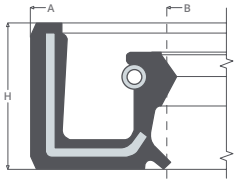
HIGH PRESSURE OIL SEALS TYPE G and M

The rotary shaft oil seal is an indispensable component in lubricated rotating equipment and must be chosen with caution in order to ensure that the correct design and materials are used to provide a long-lasting life for the rotating equipment.

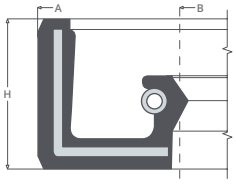
TYPES



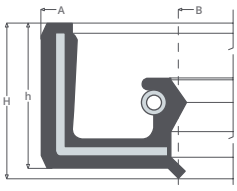
GA



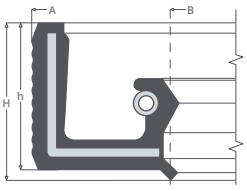
GAP



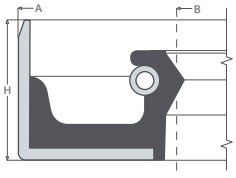
GB



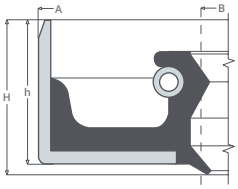
GBP



GBPRE



MB



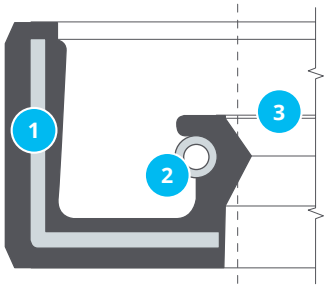
MBP

These variations of the G and M type seals are engineered to withstand pressure up to 10 BAR (1 MPa), although this limit has been exceeded in some applications. These seals are available with or without an additional dust lip. The G type and its high pressure variants show a metal insert covered by rubber, while the M type and its variants offer a bare metal body on the outside diameter.

Rotary oil seal for extreme pressure

•FP• supplies rotary shaft oil seals for applications up to 100 BAR (10 MPa). Our profile GHH-BP has been tested to meet these standards.

GB



Technical features

1. Rubber covered metal body
2. Garter spring
3. Sealing edge made through cutting process

Materials

1. Metal body:
   DC04; AISI 304; AISI 316
2. Garter spring:
   AISI 302; AISI 316; C72 phosphated
3. Elastomer:
   NBR; FKM; VMQ; HNBR; EPDM

For further information on all our seals, please check our web page or contact our offices.

PISTON SEALS TYPE PDE - PDEP

The PDE is a symmetric double-acting piston seal for alternative linear movements. Is it designed for oleodynamic applications made in NBR rubber with a hardness of 85 Shore A. It is fitted with expansion garter springs to ensure the correct pressure on the radial contact.

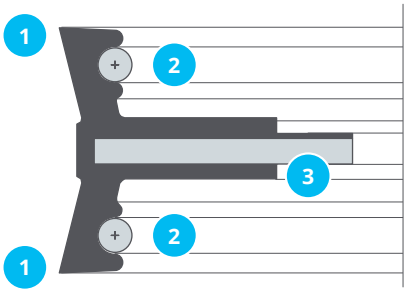
The PDEP is a double-acting piston seal specially designed for pneumatic cylinders. It is made in nitrile rubber (NBR) with a hardness of 70 Shore A with special sealing profiles vulcanized to the central steel plate.

Constructive directions	PDE
Cylinder diameter	According to tolerance ISO H11
Cylinder roughness	Rmax <= 2 µm

Description	PDE	PDEP
Applications	General industry	
Maximum working speed	up to 0,5 m/s	
Maximum pressure	40 BAR	10 BAR
Operating temp. range	-30°C / 100°C	-30°C / 100°C

Constructive directions	PDEP
Cylinder diameter	According to ISO H11 tolerances
Piston diameter	According to ISO H10 tolerances
Surface roughness	Rmax <= 4 µm

PDE



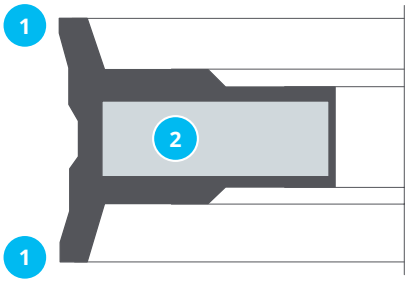
Technical features

1. Rubber body with symmetrical double lip
2. Double garter spring for oleodinamic sealing
3. Sealing edge made by production tool

Materials

1. Elastomer: **NBR; FKM**
2. Garter spring: **AISI 302; AISI 304; AISI 316; C72 phosphated**
3. Metal insert: **Fe-P11**

PDEP



Technical features

1. Rubber body with symmetrical double lip
2. Metal insert

Materials

1. Elastomer: **NBR; FKM**
2. Metal insert: **Fe-P11**

For further information on all our seals, please check our web page or contact our offices.

via Marconi 142/144, 24060 Castelli Calepio (BG) ITALY
+39 035 442 5511 | +39 035 442 5478 | info@fpparis.com

WIPER SEALS

• Rod wipers for alternative linear movements have been designed to give first-class protection to seals and driving bodies in hydraulic and pneumatic cylinder applications.

• The main function of the rod wiper is to keep the rod clean from any possible impurity.

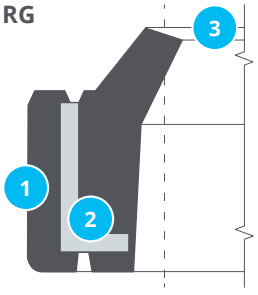
• The •FP• rod wipers have a chamfer on the outside diameter to facilitate the press fitting into the housing. To simplify the installation, the bore should have a chamfer as per DIN 3760.

General condition of use
For the correct use of rod wipers we suggest the following mounting instruction.

Piston
The shaft surface should have a roughness of Rmax <= 2 µm.

Housing
The housing of the wiper has to be machined to ISO H8 norm, and completed with chamfers.

RG



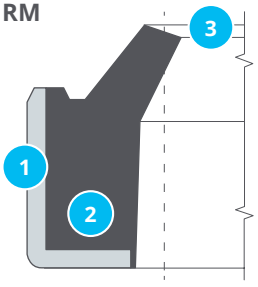
Technical features

1. Rubber covered outer diameter
2. Metal insert
3. Sealing edge made through cutting process

Materials

1. Elastomer: **NBR; FKM**
   NBR Working temperature -25° ÷ +100° C.
   FKM Working temperature -20° ÷ +200° C.
   Linear speed: 2 m/s
2. Metal insert:
   Fe DC04; AISI 304; AISI 316

RM

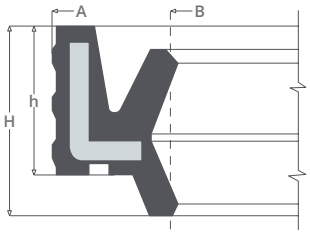


Technical features

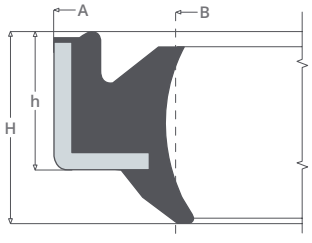
1. Metal outer casing with ground surface
2. Rubber made body and sealing lip
3. Sealing edge made through cutting process

Materials

1. Metal body:
   Fe DC04; AISI 304; AISI 316
2. Elastomer: **NBR; FKM**
   NBR Working temperature -25° ÷ +100° C.
   FKM Working temperature -20°÷ +200° C.
   Linear speed: 2 m/s



RPG



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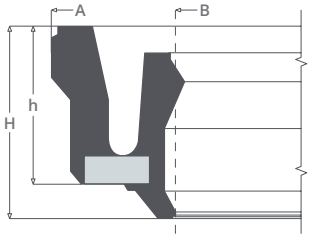

RPGR

For further information on all our seals, please check our web page or contact our offices.

Rev. 06 30-03-2017

Headquarter and sales office

F.lli Paris S.r.l. a socio unico
via Marconi 142/144, 24060 Castelli Calepio (BG) ITALY
phone +39 035 442 5511 | fax +39 035 442 5478
info@fpparis.com

fpparis.com

Production

ATS Special Oil Seals S.r.l.
via Ettore Majorana 18, 20834 Nova Milanese (MB) Italy

atsoilseals.com

Members of:
sealcore network
sealcore.net