

PS-SEAL®

PTFE based high performance seal



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PS-SEAL®

The PS-SEAL® product line stands for reliable sealing of rotating shafts at high circumferential speed, high pressure and extreme temperatures. Abrasive media is sealed as good as aggressive media. Usual radial shaft seals are only partially or even not usable at all under these conditions, as their seal lips are made of elastomeric materials.

PS-SEAL®s are usable in many different applications and can also be an alternative to mechanical seals and braided packings.

The product line PS-SEAL® offers cost-effective and practical solutions to a wide range of applications. The portfolio of Garlock shaft seals offers standardized as well as special customized seals.

The high performance seals PS-SEAL® work with a sealing lip made of GYLON® or other modified PTFEs. Garlock produces GYLON® in a process that has been specially developed.

ADVANTAGES AT A GLANCE

- » Useable under high pressure and in extreme vacuum
- » Very suitable for high circumferential speed
- » Temperature resistant from -90 °C up to +260 °C
- » Excellent chemical resistance
- » Useable in food and pharma applications (FDA)
- » EN 1935/2004 certificate
- » SIP/CIP compatible
- » Good dry running capability
- » Wear resistant and low friction



PS-SEAL® Standard

PS-SEAL® Standard* is a Garlock shaft seal consisting of a stainless steel (1.4571) case, a GYLON® Black seal lip and a static sealing element made of FKM. Products with measurements listed in the table below are in stock and can be delivered immediately.

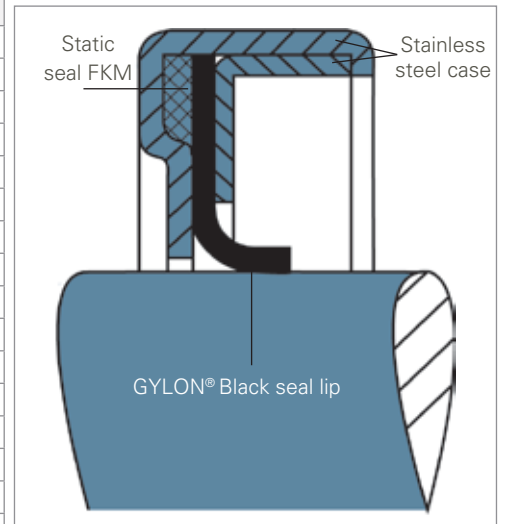
Mounting Dimensions 1)

Item code	d1 [mm]	d2 [mm]	B [mm]
MEC03-10005	8,0	18,0	5,0
MEC03-10048	10,0	22,0	6,0
MEC03-10006	12,0	28,0	8,0
MEC03-10007	15,0	30,0	8,0
MEC03-10008	16,0	30,0	8,0
MEC03-10010	17,0	28,0	8,0
MEC03-10009	17,0	35,0	8,0
MEC03-10011	20,0	35,0	8,0
MEC03-10012	22,0	40,0	8,0
MEC03-10014	25,0	35,0	8,0
MEC03-10013	25,0	42,0	8,0
MEC03-10050	25,0	52,0	7,0
MEC03-10015	28,0	47,0	10,0
MEC03-10016	30,0	47,0	10,0
MEC03-10055	30,0	52,0	10,0
MEC03-10017	32,0	47,0	8,0
MEC03-10018	32,0	47,0	10,0
MEC03-10019	35,0	47,0	8,0
MEC03-10020	35,0	50,0	10,0
MEC03-10004	38,1	63,5	12,7
MEC03-10021	40,0	55,0	10,0
MEC03-10022	40,0	60,0	10,0
MEC03-10023	40,0	62,0	10,0
MEC03-10049	40,0	68,0	10,0
MEC03-10025	42,0	62,0	8,0
MEC03-10024	42,0	60,0	10,0

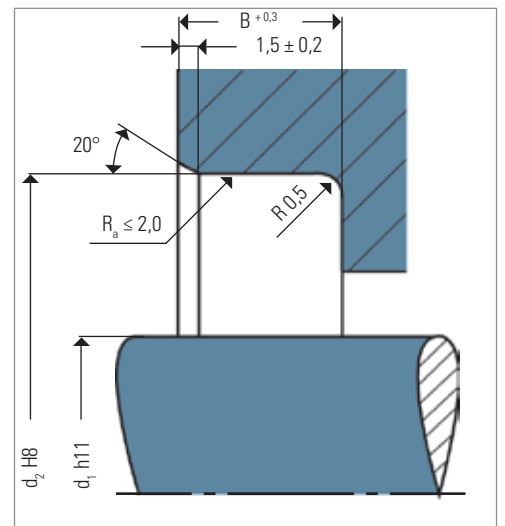
Item code	d1 [mm]	d2 [mm]	B [mm]
MEC03-10026	45,0	62,0	10,0
MEC03-10028	45,0	65,0	10,0
MEC03-10029	48,0	65,0	10,0
MEC03-10030	50,0	65,0	10,0
MEC03-10031	50,0	70,0	10,0
MEC03-10032	50,0	72,0	10,0
MEC03-10033	55,0	72,0	10,0
MEC03-10035	60,0	75,0	8,0
MEC03-10036	60,0	80,0	10,0
MEC03-10037	62,0	80,0	10,0
MEC03-10038	65,0	85,0	10,0
MEC03-10039	70,0	90,0	10,0
MEC03-10040	73,0	100,0	10,0
MEC03-10041	75,0	100,0	10,0
MEC03-10042	75,0	95,0	13,0
MEC03-10043	80,0	100,0	10,0
MEC03-10054	85,0	120,0	12,7
MEC03-10044	90,0	110,0	10,0
MEC03-10056	90,0	120,0	12,0
MEC03-10051	95,0	120,0	12,0
MEC03-10001	100,0	130,0	13,0
MEC03-10002	110,0	140,0	13,0
MEC03-10052	120,0	150,0	12,0
MEC03-10003	140,0	165,0	10,0
MEC03-10053	150,0	180,0	12,0

* PS-SEAL® Standard maximum 10 bar, maximum 205°C, no FDA

Standard configuration



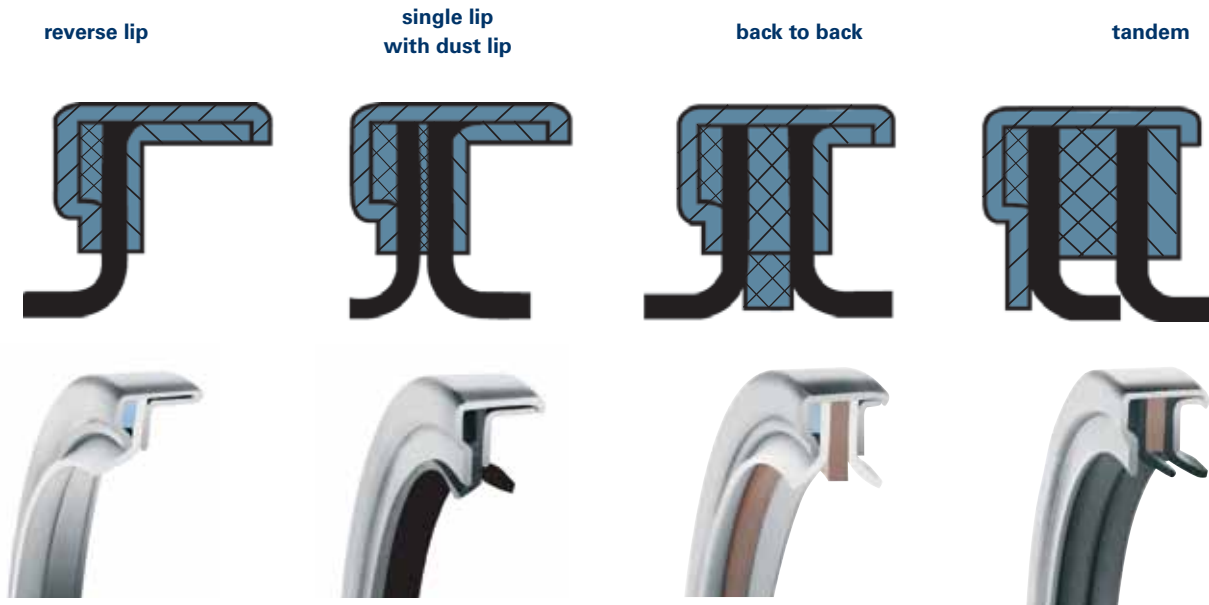
Dimensions



All statements in mm.

PS-SEAL® Non-Standard

Garlock PS-SEAL® Non-Standard are shaft seals in standard sizes with different configurations of their seal lips and different materials (see page 10).



The overview shows the most common configurations. Other configurations are also available.

If your application demands a shaft seal different from the PS-SEAL® Standard version we will manufacture a shaft seal appropriate to your needs. The PS-SEAL® Non-Standard offers an economic way of producing special configurations, as it is based on the standard version. Both the lip material and its configuration can be varied. Even the case can be adjusted within technical limitation. If this is not fulfilling your needs, we also manufacture acustom-made PS-SEAL® based on your drawings/designs.

The PS-SEAL® Non-Standard is in principle available in the same sizes as the PS-SEAL® Standard is, but its dimensions for shaft diameter (d1) and width (B) can be slightly modified.

Mounting Dimensions

d1 [mm]	d2 [mm]	B [mm]	d1 [mm]	d2 [mm]	B [mm]
8,0	18,0	5,0	45,0	62,0	10,0
10,0	22,0	6,0	45,0	65,0	10,0
12,0	28,0	8,0	48,0	65,0	10,0
15,0	30,0	8,0	50,0	65,0	10,0
16,0	30,0	8,0	50,0	70,0	10,0
17,0	28,0	8,0	50,0	72,0	10,0
17,0	35,0	8,0	55,0	72,0	10,0
20,0	32,0	7,0	60,0	75,0	8,0
20,0	35,0	8,0	60,0	80,0	10,0
22,0	40,0	8,0	62,0	80,0	10,0
25,0	35,0	8,0	65,0	85,0	10,0
25,0	42,0	8,0	70,0	90,0	10,0
28,0	47,0	10,0	73,0	100,0	10,0
30,0	47,0	10,0	75,0	100,0	10,0
30,0	52,0	10,0	75,0	95,0	13,0
32,0	47,0	8,0	80,0	100,0	10,0
32,0	47,0	10,0	90,0	120,0	12,0
35,0	47,0	8,0	90,0	110,0	10,0
35,0	50,0	10,0	95,0	120,0	12,0
38,1	63,5	12,7	100,0	130,0	13,0
40,0	55,0	10,0	110,0	140,0	13,0
40,0	60,0	10,0	120,0	150,0	12,0
40,0	62,0	10,0	135,0	160,0	12,0
40,0	68,0	10,0	140,0	165,0	10,0
42,0	62,0	8,0	140,0	170,0	15,0
42,0	60,0	10,0	150,0	180,0	12,0

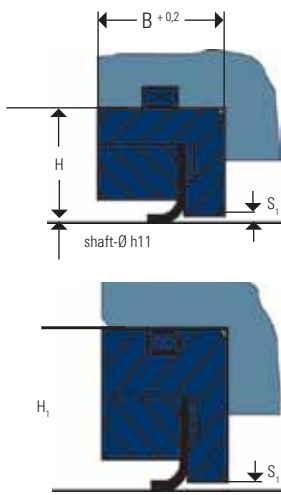
Shaft diameter (d1) and width (B) are slightly adjustable.

PS-SEAL® Special

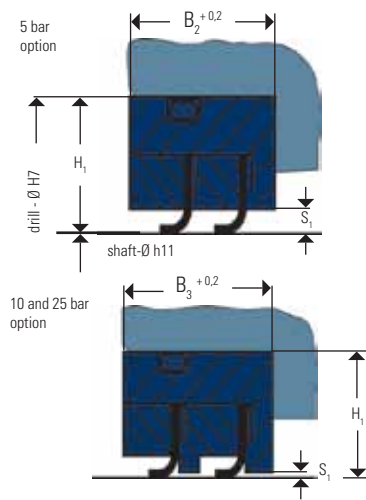
Due to the complex application of high performance seals, PS-SEAL® Standard and PS-SEAL® Non-Standard may not always provide the best solution for application-specific needs. That is why Garlock offers other sealing options with single and multiple lip assemblies. As far as practicable these seals are standardized to supply our customers with cost-efficient special solutions.

We recommend consulting our specialists for the usage of these PS-SEAL® configuration options. PS-SEAL® Special is available in many different lip and housing materials.

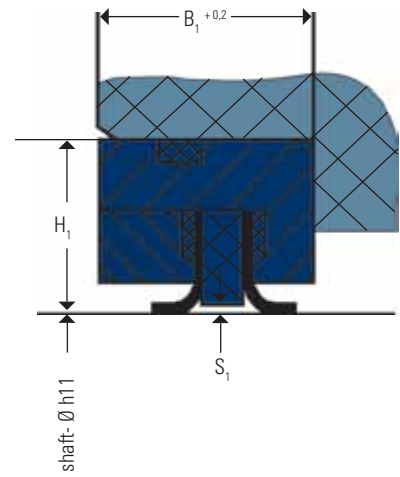
PS-SEAL® Special, single lip



PS-SEAL® Special, tandem



PS-SEAL® Special, back to back



The overview shows the most common configurations. Other configurations are also available. All statements in mm.

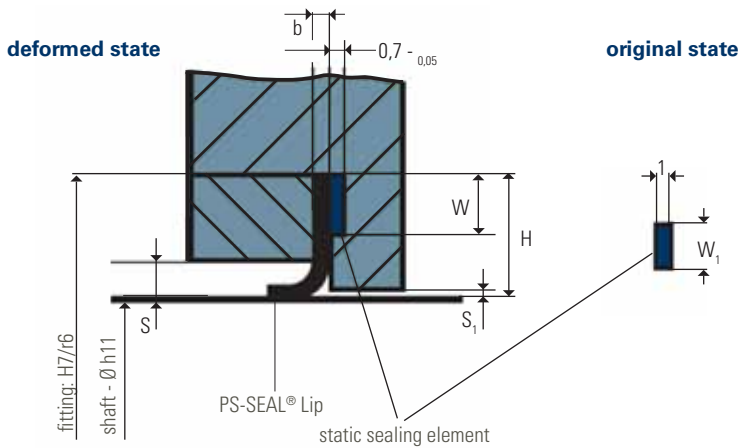
Mounting Dimensions

Shaft - Ø [mm]	H [mm]	H ₁ [mm]	B [mm]	B ₁ [mm]	B ₂ [mm]	B ₃ [mm]	S ₁ [mm]		
							5 bar	10 bar	25 bar
< 19	8	10	8	12	14	16	2,2	0,5	0,2
20-64	11	12,5	10	15	17	19	2,5	0,5	0,2
65-119	14	15	10	17	18	20	3,0	0,5	0,2
120-199	15	17	12	20	20	24	3,0	0,5	0,2
200-299	17,5	20	15	24	23	26	3,0	0,5	0,2
300-450	20	25	20	25	25	30	3,0	0,5	0,2

PS-SEAL® Lip

In shaft sealing constructions with restrictions in mounting space or where other constructional issues argue against the installation of a ready-to-mount PS-SEAL®, the option PS-SEAL® Lip could be a solution. PS-SEAL® Lip is available in different material versions (see page 10).

The installation drawing and the associated table below show our recommended installation measurements. Garlock offers a static sealing element in addition to the PS-SEAL® Lip to provide an optimal fit in the installation space. The standard material for these elements is FKM, alternatively they are available in GYLON® White or GYLON® Blue.



All statements in mm.

Mounting Dimensions

Shaft - \varnothing [mm]	H [mm]	b [mm]	W [mm]	W ₁ [mm]	S [mm]	S ₁ [mm]		
						5 bar	10 bar	25 bar
< 19	6,0	0,8	2,5	2,0	2,0	2,0	0,5	0,2
20-49	7,5	0,8	3,5	2,5	2,5	2,5	0,5	0,2
50-149	10,0	1,0	4,5	3,5	3,0	3,0	0,5	0,2
150-299	12,5	1,0	6,0	4,5	3,0	3,0	0,5	0,2
300-450	15,0	1,0	8,0	6,0	3,0	3,0	0,5	0,2

Example for shaft $\varnothing 100$:

Garlock PS-SEAL® Lip $\varnothing 100 \times 120 \times 1$ mm

Static sealing element $\varnothing 113 \times 120 \times 1$ mm

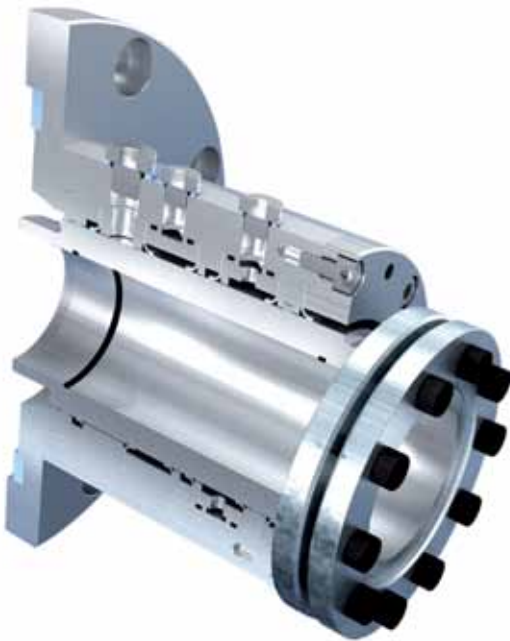
PS-ProSet® (+Flex)

With the PS-ProSet® Garlock offers a sealing unit that serves as the perfect solution for individual cases of applications. Possible applications for this construction are machine parts, where high misalignment occurs and quick service and safety are most important. By using the available all-in-one solution a revision can be carried out fast and secure on site. Typical examples of applications are agitators, mixers, dryers and screw conveyors, which account for only a small part of the possibilities of applications.

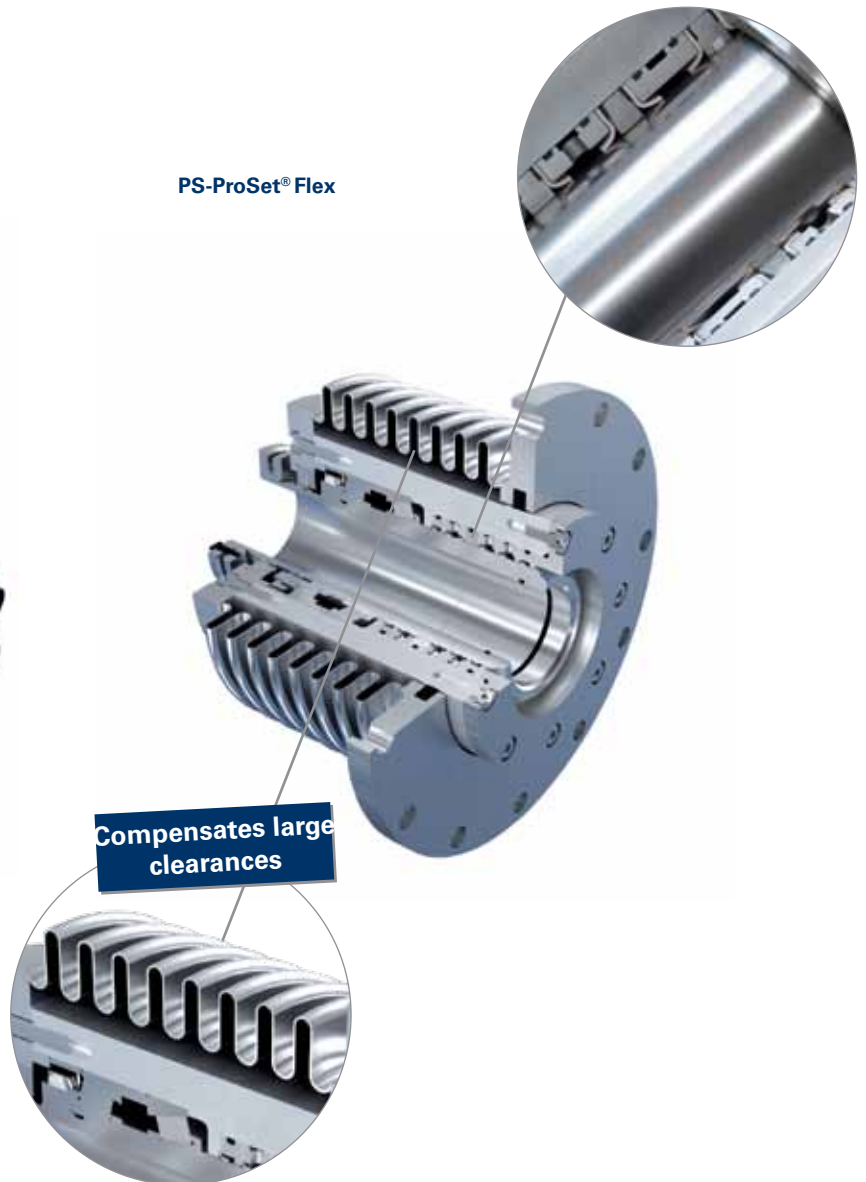
Ready-to-use in just a few seconds - Easy mountable unit

The pre-finished cartridge unit can be mounted onto the shaft without special equipment. In this way mistakes during the assembly can be avoided. The installation of PS-Cartridge could save money and time, because of its advantage being an entirely preassembled unit. It is a so called "swimming seal" meaning that it can cope with high misalignment and runout.

PS-ProSet®



PS-ProSet® Flex



Technical information

Seal case

The standard material for the PS-SEAL® seal case is stainless steel 1.4571. Other materials can be supplied on request.

Operating Pressure

» PS-SEAL® Standard	max. 10 bar
» PS-SEAL® Non-Standard	max. 25 bar (depending on version)
» PS-SEAL® Special	max. 25 bar (depending on version)
» PS-SEAL® Lip	max. 25 bar (depending on version)
» PS-ProSet®	max. 25 bar (depending on version)

For maximum pressure applications please check the $p \times v$ - value. Garlock recommends an axial fixation of the PS-SEAL® when it is used in applications under high pressure.

Temperature Range

The PS-SEAL® lip material can handle temperatures between -90 °C and $+260\text{ °C}$. Please note, that there is a difference between the temperature on the seal and the process-temperature due to the friction which releases additional energy/heat.

Material

GYLON® is being used as lip seal material of PS-SEAL® and significantly responsible for its successful operation. We offer highly diverse seal options and combinations of materials to cope with the very different requirements of many diverse industrial branches. GYLON® is a modified PTFE and is used due to its high chemical resistance, its high temperature range and its low friction.

Counter Surface

As the counter surface has a major impact on the efficiency and life-time of our seals, its configuration needs also to be considered. Garlock can offer an appropriate package of seal and counter surface (protection sleeve) to provide an optimal and durable sealing solution. For an optimal interaction between sealing and abrasion the following surface characteristics should be complied with:

Surface Abrasiveness

Ra =	0,1 – 0,4 μm
Rz =	0,6 – 2,0 μm
Rmax =	4 μm

The running surface may not have a helical spiralling indentations as the arising conveying effect could cause leakage.

Surface Hardness

60 HRC

Under high stress ($p \times v$ - value) of more than 20 bar x m/s Garlock recommends an untwisted machined chromium oxide coating. Suitable coatings can be ordered from Garlock. Please consider a hard enough basic material when using micro-coatings.

Technical information

Lip Material

The used GYLON[®] lip materials guarantee a stopped cold flow with brilliant running characteristics when it comes to impermeability, abrasion and frictional heat. Many different compounds can be used for different applications. To deal with rising demands in terms of rotational speed and pressure in lubricated - as well as in dry running conditions. A higher operating safety and a longer service life can be reached by using multiple lip-seals arrangements. Please feel free to contact us for individual consulting.

Lip Material	Ingredients	Properties
GYLON[®] Black	graphite	<ul style="list-style-type: none"> » standard material » perfectly suitable for lubricated applications
GYLON[®] White	barium sulfate	<ul style="list-style-type: none"> » special material » FDA & EN1935 conformity » recommended for food, pharmaceutical and beverage industries » partially capable of dry running
GYLON[®] Blue	glass-microspheres	<ul style="list-style-type: none"> » special material » FDA & EN1935 conformity » very flexible (high recovery capacity) » recommended for food, pharmaceutical and beverage industries » brilliant dry running characteristics
GYLON[®] Brown-White	Brown side: Abrasive-resistant additives White side: Heat dissipating additives	<ul style="list-style-type: none"> » special material » FDA & EN1935 conformity » very flexible (high recovery capacity) » recommended for food, pharmaceutical and beverage industries » suitable for abrasive media
F	econol	<ul style="list-style-type: none"> » special material » FDA & EN1935 conformity » recommended for food, pharmaceutical and beverage industries » suitable for vacuum-applications » brilliant dry running characteristics
MS	molybdenum disulfide	<ul style="list-style-type: none"> » special material » suitable for abrasive media

Please note: Surface finish and shaft hardness are critical in dry running applications.

Technical information

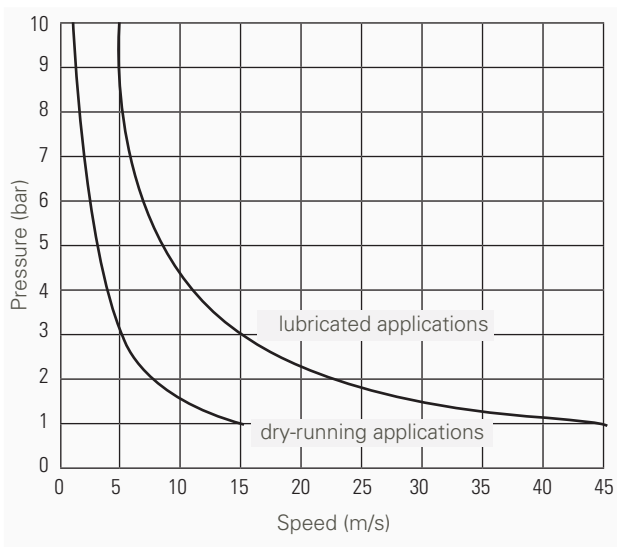
Application Area

With pressure higher than 5 bar and peripheral speed higher than 5 m/s Garlock recommends to check the limitations of use. The p x v-diagram below shows the range of use of lubricated and dry-running applications.

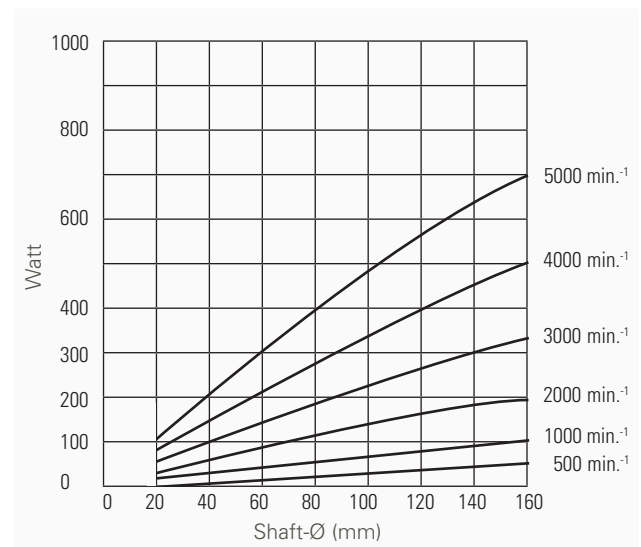
p x v for PS-SEAL®

The p x v - values shown are valid for heavy lubrication at room temperature and for all PS-SEAL® options capable of pressures up to 10 bar. A bad state of lubrication, such as lack of lubricant or even dry running, creates a need for reducing the maximal acceptable p x v - value as well as the necessity for an optimal counter surface.

p x v - Diagram

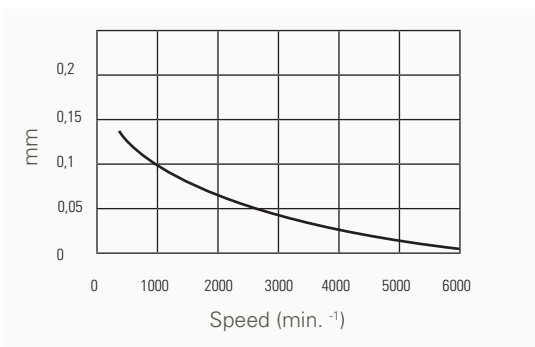


Power loss through friction on seal lip

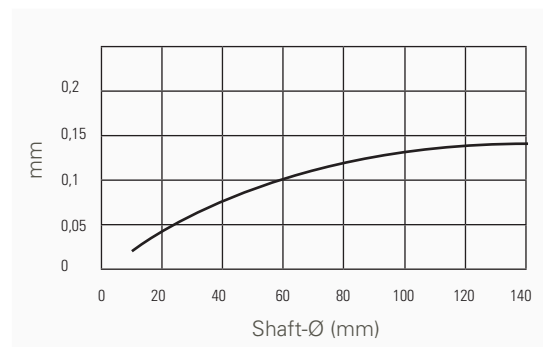


The overview shows the most common configurations. Other configurations are also available.

Acceptable radial runout



Acceptable shaft to bore misalignment

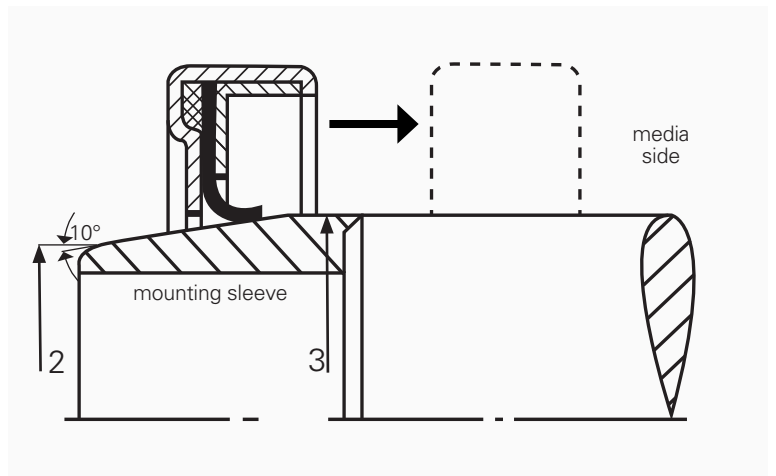
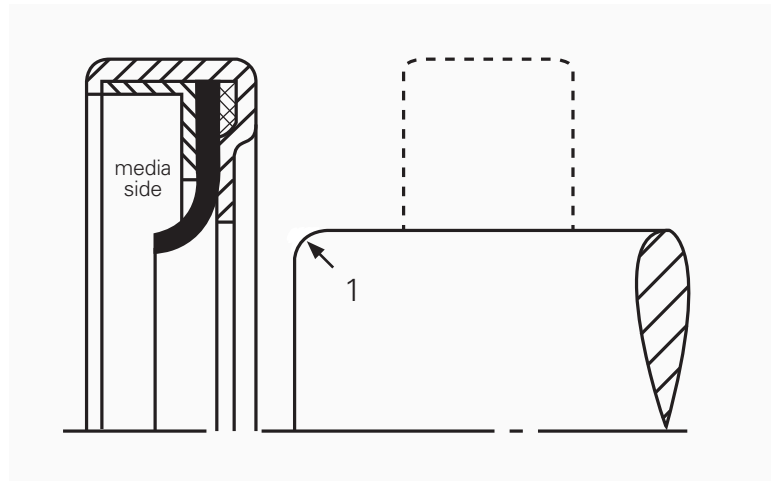


Installation and Assembly Advice

Assembly

PS-SEAL[®] shaft seals must be installed without damage. Therefore never insert over sharp edges! The use of a common mounting paste makes installation easier.

1. R min 1 mm and polished
2. Shaft-Ø minus 5 mm
3. Shaft-Ø plus 0,4 mm



Example Cases

Bulk Handling Systems - PS-SEAL® with GYLON® White

Food & Pharma

Customer caters for reliable automation and handling of raw materials in production processes in the food, pharmaceuticals, cosmetics, chemicals, and plastics sectors. Main activities are in bulk handling systems for raw materials.

Operating Conditions

1. Produced Media: Food, beverage, pharmaceuticals, cosmetics, chemicals, dairy
2. CIP- and SIP media
3. Temperature: up to 40 °C
4. Pressure: up to 2 bar

Solution

PS-SEAL® reverse lip in GYLON® White with static sealing GYLON® White.

The systems were equipped with dosing screws with vibration support. High-precision dosing of bulk material in batch or continuous processes is now possible. The application has speeds up to 3 m/s in dry operation, at pressures up to 2 bar, and temperatures up to 40°C. The media used are solids from the food sector such as dextrose. The seal meets FDA and EC1935 conformity requirements. The customer has selected a Ra=0.4µm shaft of 55HRC as the mating surface. A flush system with air was integrated to keep down the temperature.



Bulk Handling Systems - PS-SEAL® with GYLON® Blue

Food & Pharma

Customer's product range covers food mixers and meat processing machines, temperature control machines, cooking systems, and fine choppers.

Operating Conditions

1. Produced Media: Food and beverage (meat, fish, convenience, vegetarian, cheese)
2. CIP- and SIP media
3. Speed: up to 2700 rpm
4. Temperature: up to 100 - 180 °C
5. Pressure: -850 mbar up to 1 bar

Solution

PS-SEAL® single lip in GYLON® Blue with a static sealing element GYLON® Blue.

Met requirements regarding FDA and EC1935 compliance for vacuum marinater and for mixer with integrated vacuum pump, CIP/ SIP available and hygienic design. The specific design of the housing, combined with the excellent resistance to the media at the end convinced customer. They set Garlock exclusively in their specs.



Example Cases

Mixer - PS-SEAL® with GYLON® Blue

Food & Pharma, Chemical, O&G, Energy, Water Treatment, Paint Industry, Mining and Ceramic

Customer is specialized in the selection, design and construction of industrial and sanitary mixers for all kinds of liquids.

Operating Conditions

1. Produced Media: Pharmaceuticals, soft drinks, juice, tomato and more
2. Speed: 30 - 140 rpm
3. Temperature: up to 120 °C
4. Pressure: up to 3 bar and vacuum

Solution

PS-SEAL® in all top entry mixers.

This supports the required level of compliance to industry expectations, and the modified PTFE structure provides compatibility to both chemical and mechanical demands of the application.



Snack Production Process - PS-SEAL® with GYLON® Blue

Food & Pharma

This customer's facility processes chocolate and cream filled snacks. The maintenance team struggled to keep up and running the screw pumps for raw materials transportation (chocolate and cream). They used traditional packings to seal the shafts, but they had to be replaced on weekly basis.

Chocolate and cream are extremely critical in rotating pumps due to their tendency to crystallize on the shafts. This with the abrasion of sugar and chocolate particles causes fast and heavy wear of the packings, reducing process line production time due to frequent seals replacements. Plus there is always the risk of contamination of the batch, due to the high wear.

Operating Conditions

1. Produced Media: Chocolate and cream
2. Temperature: 40 - 55 °C
3. Pressure: up to 6 bar

Solution

PS-SEAL® with GYLON® Blue as lip material.

This supports the required level of compliance to industry standards, and the modified PTFE structure provides the elasticity and low friction properties to sustain these conditions. As a result, the PS-SEAL® has significantly decreased the maintenance cycles.



PS-SEAL®

Application Data Sheet

Contact Information

Company _____
 Name _____
 Phone _____
 Email _____
 Country _____
 Demand _____
 Annual Demand _____

Other manufacturers Information

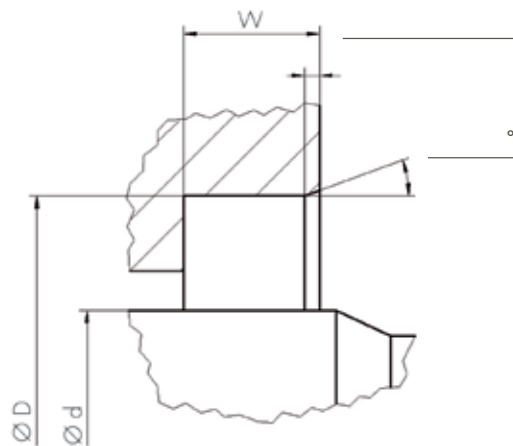
Company _____
 Item Code _____
 Seal Model _____
 Lip Material _____
 Housing Material _____
 Garlock ID _____

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



Surface roughness

Ra _____
 Rz _____
 Rmax _____

Surface hardness

(HCR) _____

Remarks

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Garlock Germany

Garlock India

Garlock de México

Garlock New Zealand

Garlock Singapore

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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Garlock Sealing Technologies

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Garlock China

Garlock Germany

Garlock India

Garlock de México

Garlock New Zealand

Garlock Singapore