GUMAPLAST

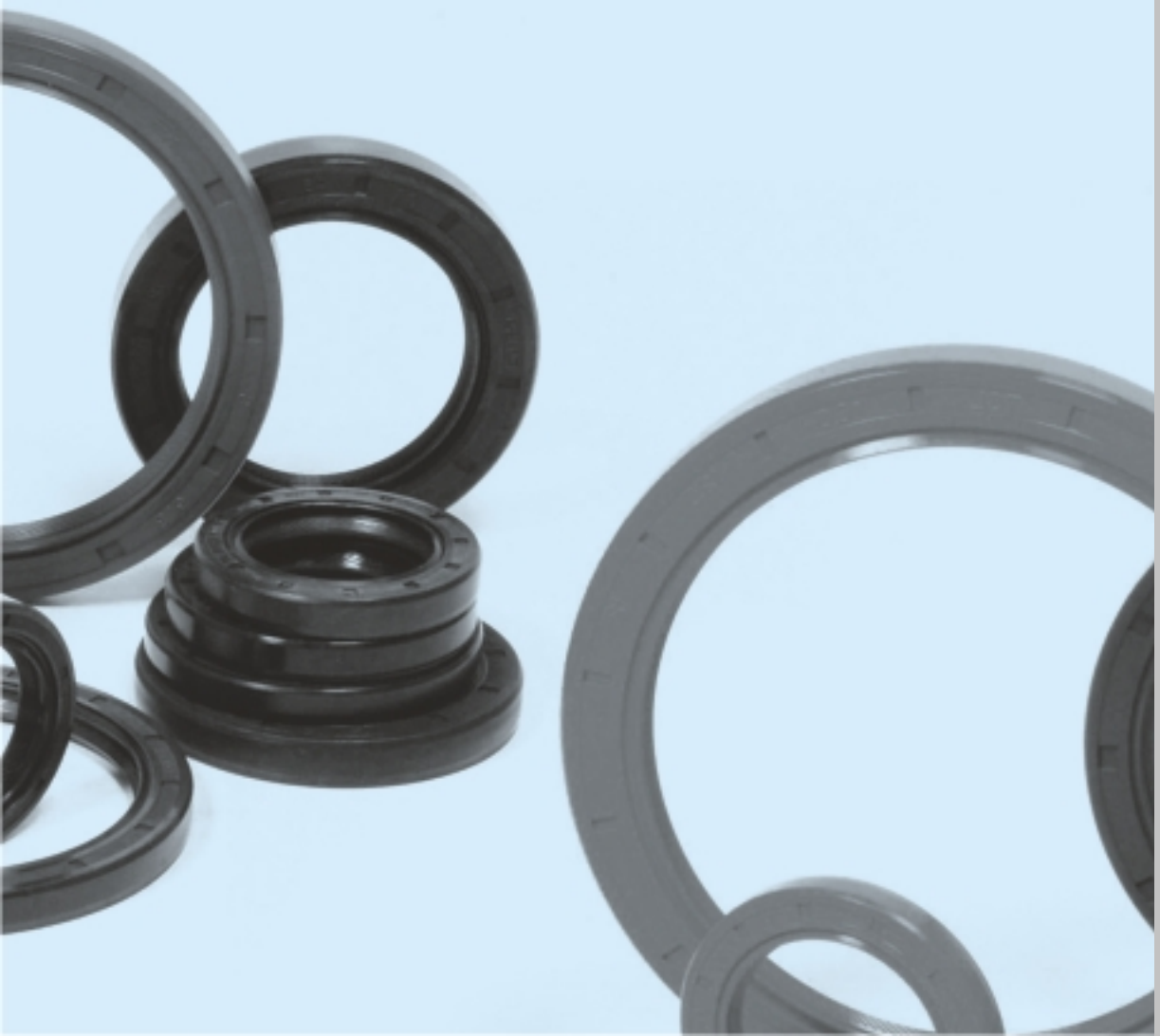
ROTARY SHAFT SEALS

CONTENT:

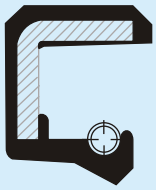
Gumaplast-VP was founded in 1990 like a small craft workshop. It is located in Sr. Karlovci , 10 km from Novi Sad.
During its twenty years of working and existence, it has developed into a very important producer of different kind of seals. There are thirty employees at the moment.

This factory constructs and makes tools for its production which provides excellent quality of products and fast delivery.
Gumaplast exports all of its products mostly to Germany and Austria.

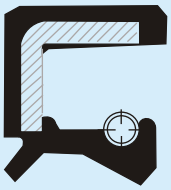
The factory had ISO 9001: 2008 certificate since 2005 and constantly invests all knowledge and experience in the development of the factory.



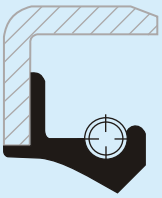
Description of standard shaft seal types (in accordance with DIN 3760)



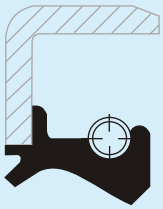
A Rubber covered O.D.,,metal insert, sealing lip with garter spring



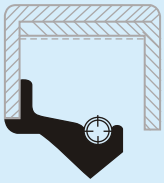
AUP Rubber covered O.D., metat insert, sealing lip with garter spring and additional dust lip



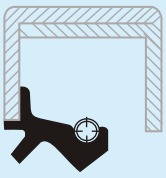
B Outer metal case, sealing lip with garter spring



BUP Outer metal case, sealing lip with garter spring and additional dust lip

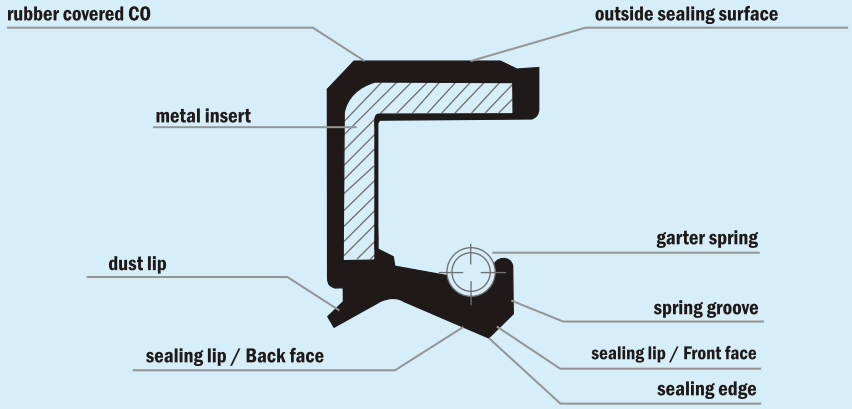


C Outer metal case with reinforcing metal inner ring, seating lip with garter spring



CUP Outer metal case with reinforcing metai inner ring, sealing lip with garter spring end additional dust lip

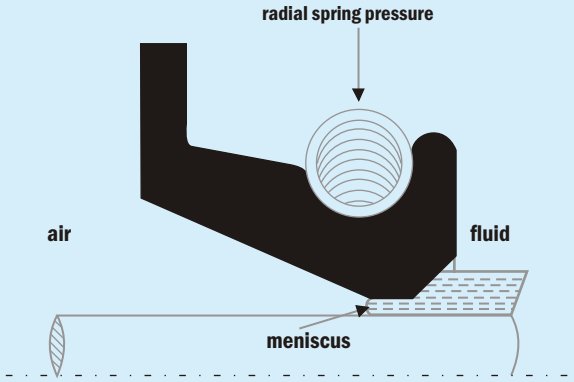
Description of rotary shaft seal



Working Principle

The area between the sealing edge and the shaft is the most Important. The sealing effect is achieved by preloading the sealing lip, making its internal diameter slightly smaller than the shaft diameter The garter spring ensures constant mechanical pressure and maintains the radial force to the shaft, flattening the sealing edge to a defined width. Sealing is provided by the surface tension of the hydrodynamic oil film between the seal flattened area and the shaft.

Oil thickness must be between 1 and 3 fim to avoid leakage. The meniscus acts as an interface between the outside air and the fluid. Any break in the meniscus will result in a· leakage. This can occur if the shaft contains scratches along the seal path.



Metal Case

The metal insert or case is used to give strength and rigidity to the seal. Normally it is made of cold rolled steel in accordance with DIN 1624.

To avoid rust or chemical attack, stainless steel can be used.
Chrome Nickel AISI 304 (DIN 1.4301 - V2A)
Chrome Nickel Molybdenum AISI 316 (DIN 1.4401 - V4A).

Garter spring

The garter spring maintains the radial force exerted by the sealing lip around the shaft surface. NormaSty produced ιn harmonic spring steel wire SAH 1074 (DIN 17223) or stainless steel wire Chrome Nickel AISI 302 (DIN 1.4300)
For special application also stainless steel springs in AISI 316 (DIN 1.4401 - V4A) are available. All our standard shaft seals produced in FPM compound are fitted with stainless steel springs in AISI 302.

Shaft

The shaft hardness and surface finish are of primary importance for efficient sealing and for achieving a useful life. Basically the hardness should increase with increasing peripheral speed. According to DIN 3760 minimum hardness required is 45 HRC. At a peripheral speed of 4 m/s the hardness should be 55 HRC and at 10 wis 60 HRC. Recommended hardness depth: 0.3 mm if shafts are not fully hardened.

Lubrication is also very important.
Surface finish as specified by DIN 3760 must be Ra 0.2 to 0.8µm, R2 1 to 5µm with Rmax = 6.3µm. Rougher surfaces generate higher friction, hence higher temperatures. Machining defects and scratches on the shaft must be avoided.

Even very small defects could be sufficient to increase the film thickness, eventually rupturing the meniscus and causing leakage. It is also important to avoid spiral grinding or marks, because they can cause a pumping effect and leakage.

Recommended machining tolerance is ISO h11 according to DIN 3760 (see table below).

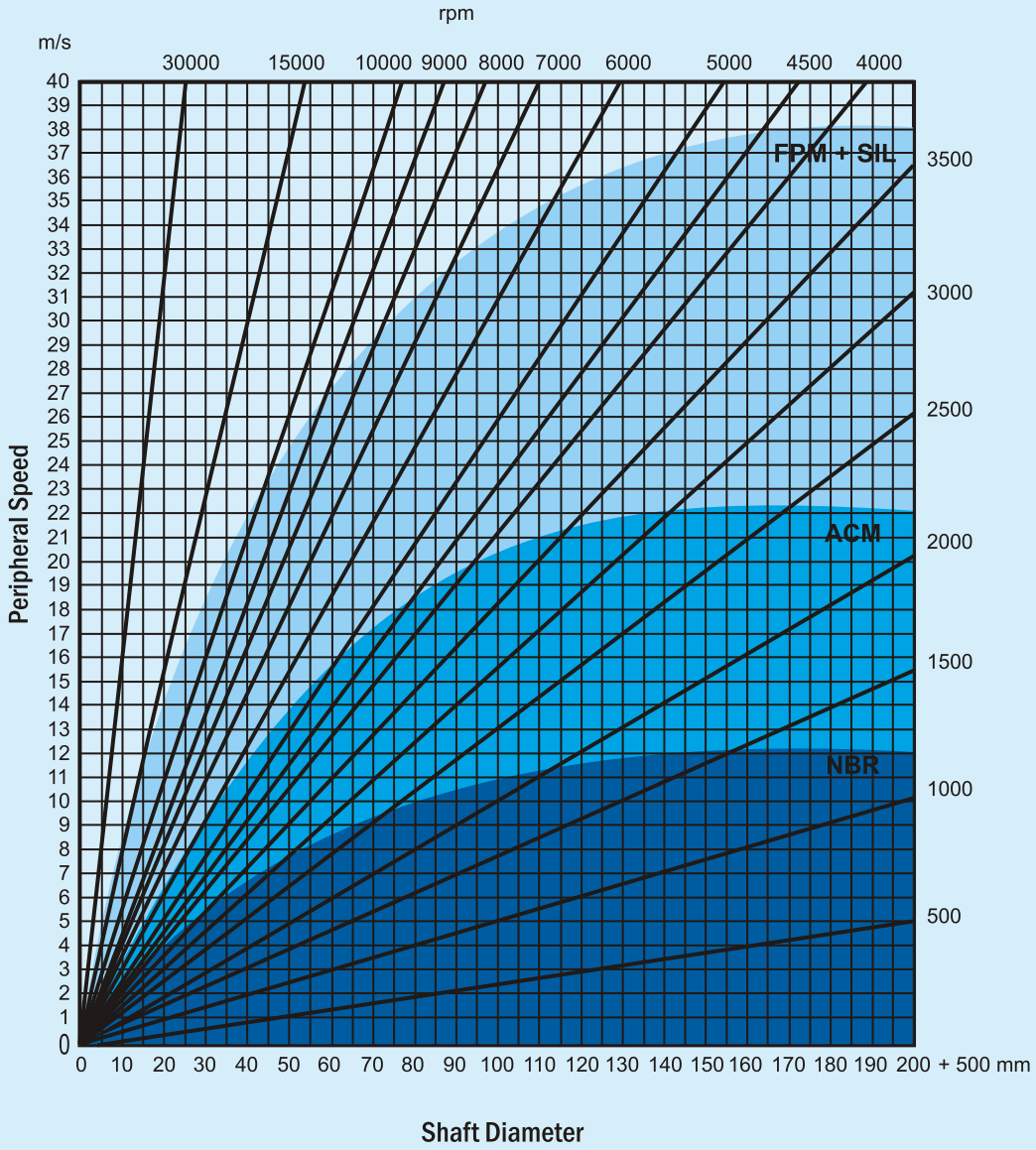
Table 1

Shaft diameter		Tolerance
from	to	h11
6	10	0 -0,090
10	18	0 -0,110
18	30	0 -0,130
30	50	0 -0,160
50	80	0 -0,190

Shaft diameter		Tolerance
from	to	h11
80	120	0 -0,220
120	180	0 -0,250
189	250	0 -0,290
250	315	0 -0,320
310	400	0 -0,360

The temperature on the sealing lip is the medium temperature increased by the temperature caused by frictional heat.
The higher the effective operating temperature is, the faster the ageing of the elastomer will be, thus affecting the performance of the sealing lip and the shaft.
Frictional heat depends on seal design and material, peripheral speed, sealing lip preloading spring force, shaft design and surface finish, lubrication, medium, etc.

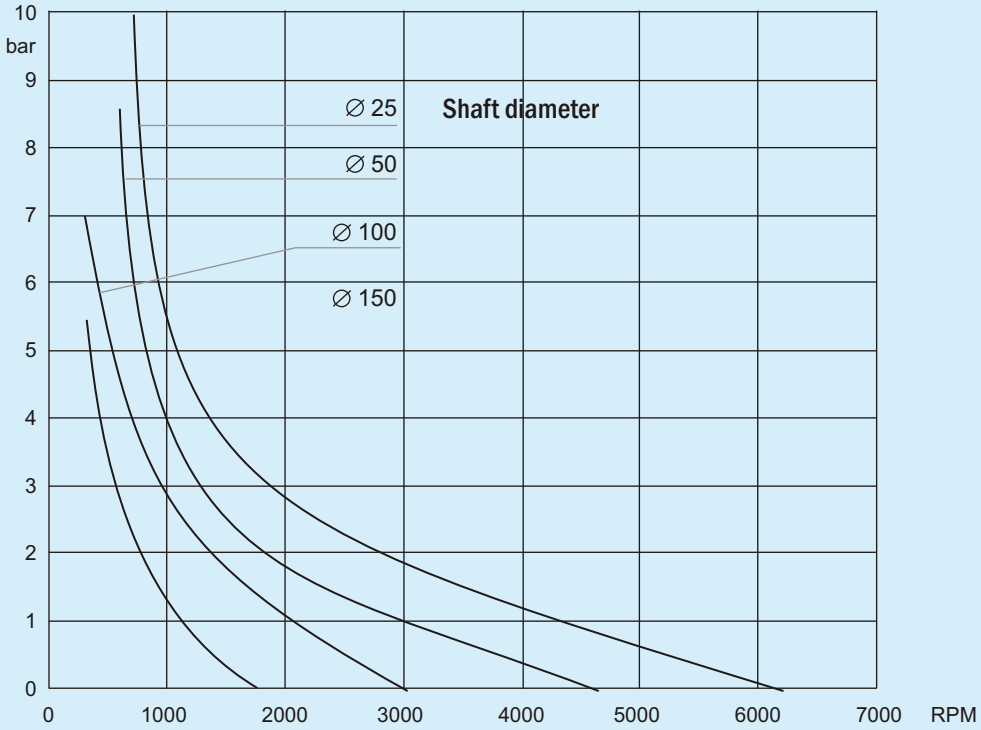
Permissible speeds in pressure-free state to DIN 3760



In most applications there is no or little differential pressure. Where the rotary shaft seal is exposed to pressure, however, the sealing lip is pressed against the shaft, thus increasing temperature. In some cages the pressure can even cases overturning of the sealing lip!

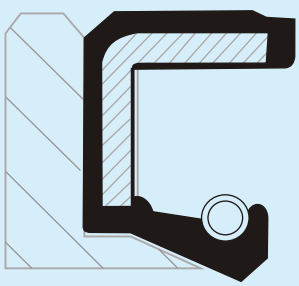
Over 0,2 bar at higher peripheral speeds or over 0,5 bar at low peripheral speeds back up rings or special designed rotary shaft seals with sponger sealing lip and supporting metal Insert must be used. For the latter we refer to PP-types(e.g. AS-P}. Nevertheless permissible overpressures with PP-type shaft seals are limited (see diagram below).

Rotary shaft seals AS-P Permissible Overpressure



On request we can supply shaft seals with special reinforced lip to with stand pressure over the indicated value.

If back up rings are installed, standard rotary shaft seals can be used. However, back up rings Increase costs and often the necessary space for Installation Is not available. Sometimes the use of back up rings is even not possible, since it requires a very accurate fitting as well as very low eccentricity of the shall.



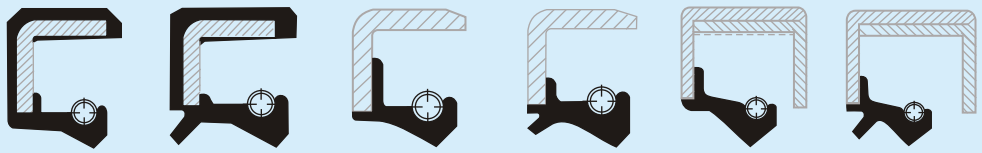
Specially designed rotary shaft seals (PP-types) are therefore preferred, even if more accurate fitting and lower eccentricity of the shaft than normal cases is required.

Our rotary shaft seats are manufactured according to German standard DIN 3760 and Quality assurance standards ISO 9001:2QNo.

Ail production phases are checked and all measurements are recorded and stored for eventual tracing.

Interference allowance and permissible eccentricity

In accordance with German Standard DIN 3760



A AUP B BUP C CUP

Seal outer diameter d_2 preko	do 50	Interference allowance (1) Types A, AUP	Types B, BUP, C, CUP	Tolerance on d_2 (2) Types	A, AUP, B, BUP, C, CUP
up 50	to 80	+ 0,30 + 0,15	+ 0,23 + 0,13	0,25	
up 50	to 80	+ 0,35 + 0,20	+ 0,25 + 0,15	0,35	
up 80	to 120	+ 0,35 + 0,20	+ 0,28 + 0,18	0,50	
up 120	to 180	+ 0,45 + 0,25	+ 0,28 + 0,18	0,65	
up 180	to 300	+ 0,45 + 0,25	+ 0,30 + 0,20	0,80	
up 300	to 500	+ 0,55 + 0,30	+ 0,35 + 0,23	1,80	

1) The average value for d_2 taken from a number of measurements shall not be greater than the value specified for d_2 plus the interference allowance.
2) The tolerance on d_2 (i.e. $d_2$max - $d_2$min) is to be determined by taking three or more measurements equally spaced around the circumference.

Some storage precautions must be taken in order to avoid deterioration of the material-Rotary shaft seats should be stored in a dust free and dry atmosphere and they must be kept in their original wrapping which should only be opened just before installation- Samples should be repacked after inspection. Excessive humidity will deteriorate some elastomers as well as cause corrosive damage to metal casing and spring.

Do not drop rotary shaft seats on shelves or boxes, nor hang seals on hooks, wires or nails, since in either case the sealing lip can be damaged. Seals should be stored in a horizontal position.

Seals should be used on a first-In first-out basis to avoid ageing on the shelf. Avoid storage near sources of heat or near electrical equipments that may generate ozone. Also keep away from direct sun light.

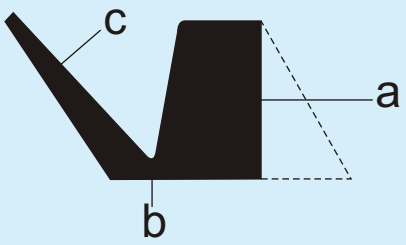
Shaft seals interchange table

VP GUMAPLAST types	A	AUP	AS-P	A-O	A-DUO	B	BUP	C	CUP
Simirit-Freundenberg	BA	BASL	BABSL	BAOF	BADUO	B1	B1SL		B2SL
Goetze	827N	827S	827SK	827NO	827D	822N	822S	824N	824S
Kako	DG	DGS	DGSP	DE	DGD	DF	DFS	DFK	DFSK
Simmerwerke	A	ASL		AOF	ADUO	B	BSL	C	CSL
Stefa	CB	CC	CF	CD	CK	BB	BC	DB	DC
Gaco	A	FA		SA	DUPLEX	AB			
NOK	SC	TC	TCN	VC	DC	SB	TB	SA	TA

Descriptiom

The Frontseal® is an all elastomer axial seal for rotary shafts and bearings. It rotates with the shaft and seals axially against a stationary counterface perpendicular to the shaft. This type of seal has been used widely for several applications and has proved to be reliable and effective against dust, dirt, water and oil splash and other media.

The ring consists of three parts:



a) The seal body, installed with interference to the shaft.

b) The hinge, acting as a sprung connection between the body and the lip.

c) The conical and flexible sealing lip which provides the actual dynamic sealing against the counterface.

Standard Seal Types

The Frontseal® is manufactured in four standard profiles:

VA It's the most common profile. It has a perpendicular rear face. Wide range of sizes, from 3 to over 2000 mm shafts.

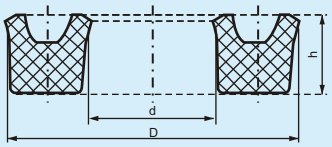
VS Wide body to ensure higher radial force than VA type. Range of sizes from 5 to 199 mm shafts.

VL This seal is intended for applications where available space is narrow. Range of sizes from 110 to over 1200 mm shafts.

Other types, modifications or larger diameters available upon request.

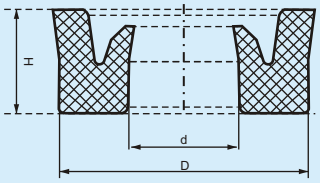
Piston seal is an elastic gasket part which is used for sealing the piston and cylinder in hydraulic and pneumatic mechanisms.
The materials from which they are made are based on NBR Perbunan hardness 80 + 5 Sh.

M03



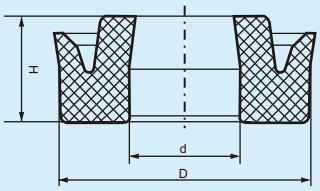
One sided Piston seals are used for sealing up to 160 bar

M02



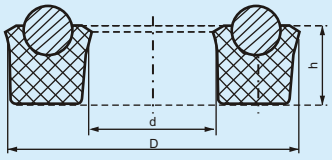
Piston seals piston are used for sealing up to 16 bar

M01



Piston seals for cylinder are used for sealing up to 16 bar

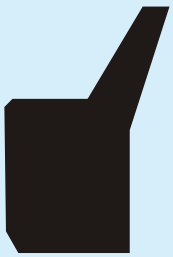
M04



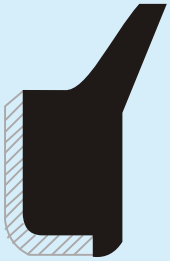
Piston seals with "O" ring are used for sealing up to 200 bar

WIPER SEALS

Wiper rings are used to protect seals in sliding or reciprocating motions, preventing contamination from dirt particles (dust, mud, water, etc.). The lip of the wiper removes even the first dirt from the piston rod. Such dirt partices can cause damage to hydraulic or pneumatic systems during stroke movement. Even if they apper in good condition, wipers should always be replaced when changing seals.



Wiper seal
with metal on the outside



Wiper seal
without metal on the outside

Elestromeric Sealing Materials

NITRILE RUBBER NBR

This elastomer is a copolymer of butadiene and acrylonitrile and is used for the majority of conventional fluid sealing applications.

- Working temperature range: -30°C to +100°C
- Standard colour: black

Advantages:

- Good swelling resistance in mineral oils and greases
- Good swelling resistance in water and radiator fluid

Limitations:

- Poor resistance to high-alloyed hypoid oil
- Poor resistance to ozone, weathering and sunlight
- Not resistant to automotive brake fluid (glycol ether based)
- Poor resistance to polar fluids (ketones, ethers, esters)
- Poor resistance to chlorinated hydrocarbons (carbon tetrachloride, trichiorethytene)
- Poor resistance to aromatic hydro-carbons

FLUORO ELASTOMER FPM

Mostly known under the trade names VITON® from Du Pont, TECNOFLON® from Sotvay and FLUOREL® from 3M. It has good chemical resistance and is recommended tar high temperature applications.

- Working temperature range: -30°C to + 200°C
- Standard colour: brown

Advantages:

- Excellent resistance to mineral oils, greases (also with the majority of additives) and above all high-alloyed hypoid oils
- Excellent acid resistance
- Good resistance to aromatic and chlorinated hydrocarbons
- Excellent resistance to ageing, ozone and weathering

Limitations:

- Limited cold flexibility
- Poor resistance to polar fluids (ketones, ethers, esters)

SILICONE RUBBER SIL

Also referred to as MVQ or VMQ Standard colour red Working temperature range: -50"C to +200°C Standard colour: red

Advantages:

- Retains flexibility down to very low temperatures
- Withstands continuous heating at high temperatures without hardening
- Resistant to mineral oils and greases
- Excellent resistance to ageing, weathering and ozone

Limitations:

- Not recommended for use with aliphate as well as aromatic hydrocarbons such as petrols and paraffin, and lighter mineral oils or steam over 3.5 bar
- Not resistant to hot water water (100"C), acids and non-mineral automotive brake fluids Poor tensile and tear strength Poor wear resistance

CHLOROBUTADIENE RUBBER (CR)

Working temperature range: -40° C to +100° C
Standard colour black

Advantages:
- excellent resistance to ageing, weathering and ozone
- moderate resistance to mineral oils and greases

Limitations:
- tends to harden or stiffen at low temperatures
- not resistant to non-mineral automotive brake fluids

ACRYLATE RUBBER (ACM)

- Working temperature range: -10°C to + 150°C
- Standard colour black

Advantages:
- good resistance to oils and fuels
- good resistance to ozone and weathering

Limitations:
- not resistant to water solutions and steam
- poor resistance to polar fluids (ketones, ethers, esters)
- poor resistance to chlorinated hydrocarbons (carbon tetrachloride, trichtoroethylene)
- poor resistance to aromatic hydrocarbons
- limited cold flexibility
- poor wear resistance

ETHYLENE PROPILENE D1EKE RUBBER (EPDM)

- Working temperature range: -45°C to + 150°C
- Standard colour black

Advantages:
- excellent resistance to ageing, weathering and ozone
- good resistance to water and steam
- good resistance to automotive brake fluid (glycol ether based)
- good resistance to polar fluids

Limitations:
- poor resistance to mineral oils and greases

Temperature values are maximum values and therefore approximate, since they may vary depending on the different operating parameters.

For more detailed information please contact our technical department.

GUMAPLAST

Possible production of various rubber parts based on drawings or samples

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