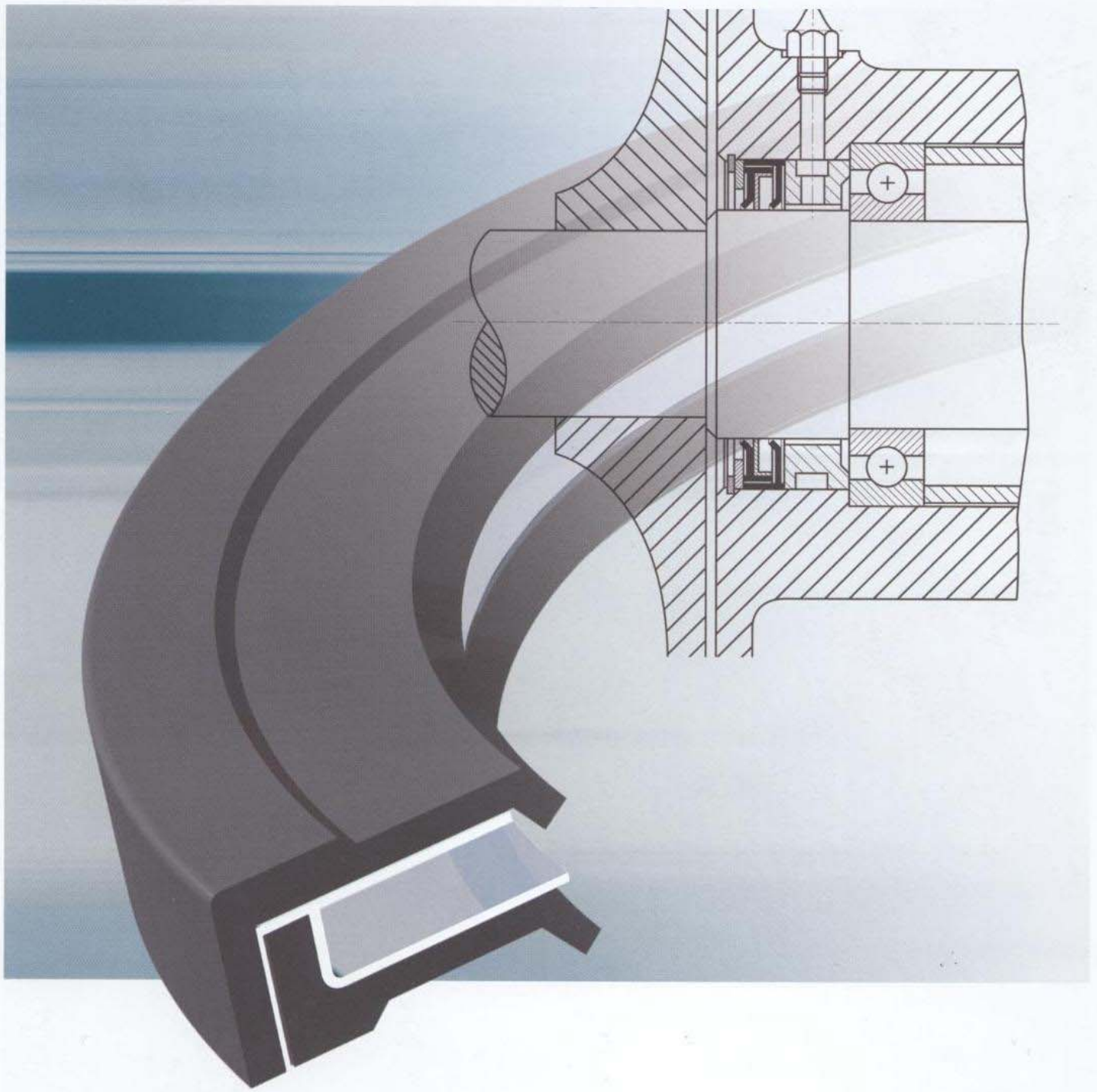


# DESIGN CONFIGURATION



# FIELD OF APPLICATION

## VR-RWDR

Radial shaft sealing rings with pretensioned diaphragm elements

## VR-RWDR "Safe Sealing"

Circumferential (rotating) speeds	up to 40 m/s
Pressure range: from vacuum	up to 1.5 MPa
Temperature range:	from - 50°C to + 300°C
Deviation from true running:	up to 0.4 mm
(Data not applicable simultaneously)	

## VR-RWDR "Safe Sealing"

Unhardened shafts  
Stainless steel shafts  
Underground shafts

## VR-RWDR "Safe Sealing"

Low friction and low power losses  
Much longer service life





# TECHNICAL DESCRIPTION

## VR Radial Lip Seals for Rotating Shafts

The VR seal is specially designed to withstand high-pressure loads in combination with high shaft rotating speeds.

### Advantages

- Safe sealing on unhardened and stainless steel shafts;
- No damaging scoring of the surface;
- No need for post-treatment of the shaft steel such as hardening, nitriding, hard chromium plating or for additional sliding bushes;
- Absence of the so-called "pump effect" by virtue of the tangential and radial pretensioning of the sealing lip;
- Low friction coefficient;
- Low power loss;
- Long service life.

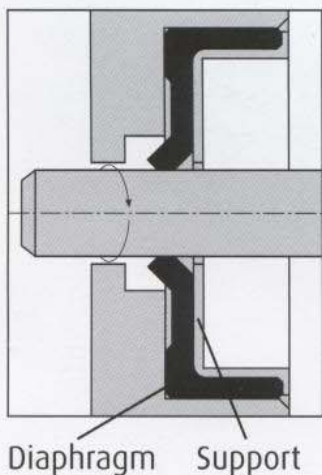
## Sealing Mechanism of VR Seals

The working principle of the spring-free VR radial shaft seal consists in drawing elastomeric (rubber) diaphragms over supports of steel or other materials with a closely controlled amount of pretension. The sealing lip, which is set at an angle to the diaphragm body is set inwards or outwards depending on the assembly direction and the direction of the pressure from the medium to be contained.

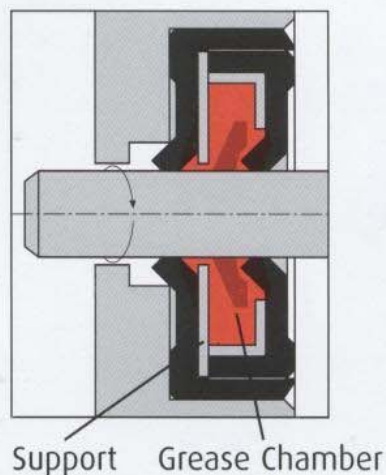
The sealing mechanism is provided by the radially and tangentially pretensioned diaphragm assemblies. There is a spring action between membrane assembly and the sealing lip. The radial and tangential forces of the sealing lip counteract the shear stresses generated during the rotation of shafts. Any vibrations or random static or dynamic eccentricity are directly compensated in the region of the sealing lips. Partial lifting of the sealing lip during rotation of a shaft and the associated "pump effect" rarely occurs with this type of sealing ring.

Numerous comparative measurements have shown that, for identical sealing performance, the radial force needed with a VR sealing ring is only 1/3 to 1/4 of that required for with a helical spring-loaded sealing element. It is therefore possible to use this type of seal on unhardened and stainless shafts without damaging scoring and furrowing of the surface. Even after 1000 hours in service, only polishing traces left on the shaft by the sealing lip are discernible.

Single-Lip Seal



Twin-Lip Seal





# SEALING MATERIALS

Material Sealing Sleeves	Colour	Usable in Temperature Range (Ongoing Temperature at the Sealing Lip)	General Properties	VR No.
NBR (Nitrile Rubber)	black	- 20 to + 100°C	<b>NBR (Perbunan)</b> An acrylonitrile-butadiene polymerizate with excellent swelling resistance in solvents based on aliphatic hydrocarbons, standard benzines and mineral oils. The swelling resistance increases with the acrylonitrile content. Long service temperature: 120°C; Good aging resistance; resistance; low distortion under pressure. <b>For use with:</b> petrol, mineral oil, fuel oil, diluted acids and alkaline lyes. <b>Not to be used with:</b> aromatics, chlorinated hydrocarbons, ketone; sesters and ether and glycol-based brake fluids.	1
FPM	green	- 30 to + 220°C	<b>FPM (Viton) Fluorocarbon Rubber</b> Very good resistance to chemicals and temperature; can withstand temperatures up to 250°C; <b>For use with:</b> oils; low-flammability hydraulic fluids, fuels (premium petrol), aromatics; chlorinated hydrocarbons; concentrated acids and alkaline lyes; (Resistant to foodstuffs) <b>Not to be used with:</b> Amines and liquid ammonia; ketone; sesters, short-chain alcohols and short-chain carboxylic acids	2
FPM/L	anthracite	- 30 to + 220°C		9
FPM/P	grey	- 30 to + 250°C	<b>FPM-Peroxide</b> Same as (2) but can also be used in hot steam and hot water as well as alcohols SF-mineral oils. Extended resistance to chemicals.	7
FPM/T	white	- 30. to + 220°C	<b>FPM - PTFE</b> Same as (2); fluorinated rubber but with a PTFE insertion; low friction coefficient	8
VMQ	red	- 50 to + 300°C	<b>VMQ (Silicone Rubber)</b> Excellent heat resistance; Can be used in dry heat at up to 280°C in long service; stable in mineral oils up to 150°C; highly resistant to oxygen and ozone; does not harden in hypoid lubricants resistant to foodstuffs.	6
HNBR	brown	- 30 to + 150°C	<b>HNBR (Therban/HSN)</b> Very good resistance to hot water and hot steam; also oil resistant at high temperatures; <b>For use with:</b> benzine (petrol) also the so-called sour gasoline; high-additive oils, cooling water, acids and alkaline lyes; <b>Not for use with:</b> synthetic oils and and greases; ketones; esters; ether; aromatics; brake fluids and chlorinated hydrocarbons;	5
EPDM	blue	- 40 to + 180°C	<b>EPDM (Ethylene-Propylene)</b> Very good aging resistance and high strength; <b>For use with:</b> hot water; hot steam (200°C); ketone; sesters; acids; glycol-based hydraulic and brake fluids; <b>Not for use with:</b> benzine (petrol); mineral oil; aromatics; and chlorinated hydrocarbons; use only silicone-based greases;	3
NBR-C	anthracite	- 25 to + 100°C	As for (1), (2) and (5) but with graphite intercalation in the base/matrix material.	C1
HNBR-C	anthracite	- 40 to + 150°C	For applications where lubrication is Permissible (water, petrol/benzine, mineral oil, foodstuffs etc.).	C5
FPM-C	anthracite	- 30 to + 220°C	Extremely low friction coefficients and low loss moments due to integrated lubrication.	C2

## SUPPORT ELEMENT MATERIALS

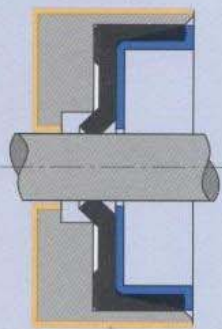
Unalloyed steel to DIN 1624  
Non-magnetic stainless steel (Material No.1.4301)

Special types:  
Aluminium; brass;  
Acid-resisting steel (Material No.1.4571)

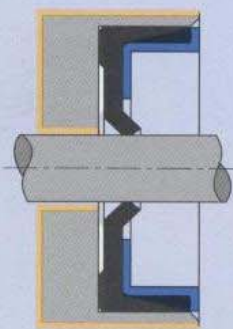


# DESIGN CONFIGURATIONS

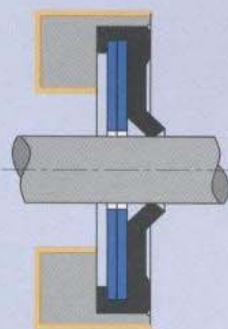
00A



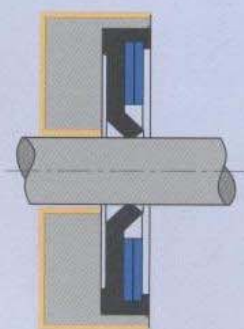
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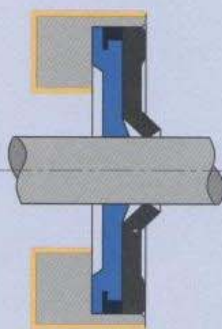
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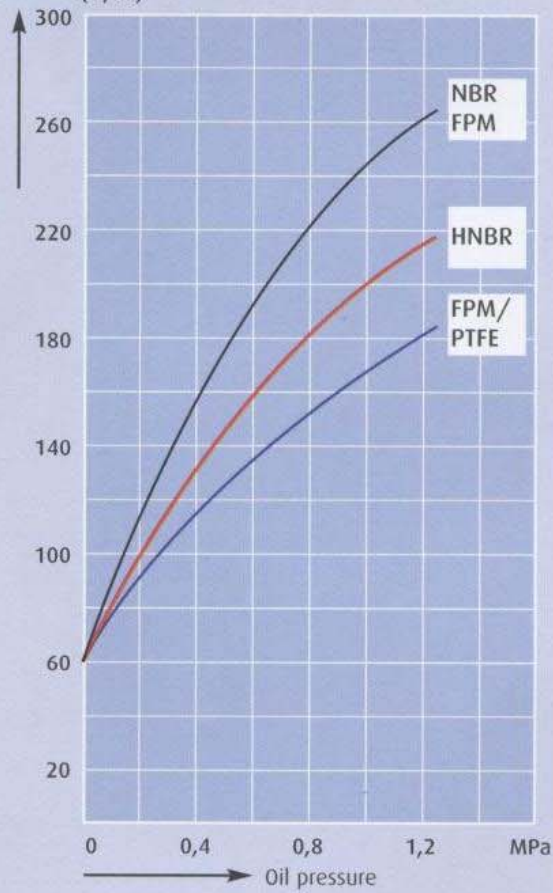
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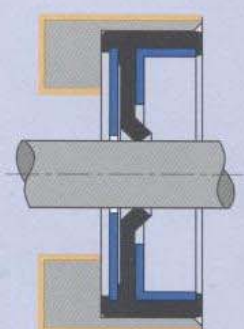
SOA



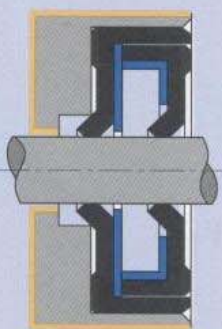
Tangential friction force/Per meter circumference (N/m)



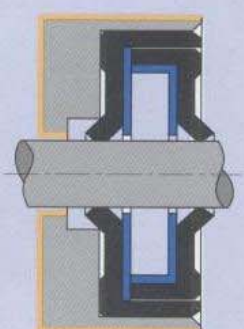
BSB



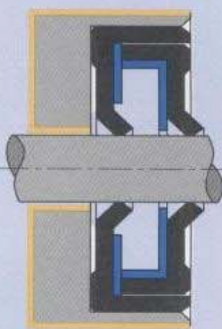
OAB



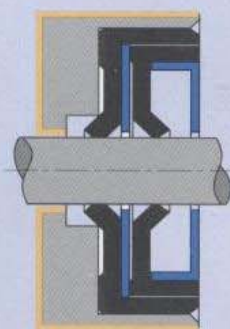
OAC



OBC



MAC



MSC

