



ERIKS Sealing Technology

Engineered Seals for Agriculture and Earth Moving Applications

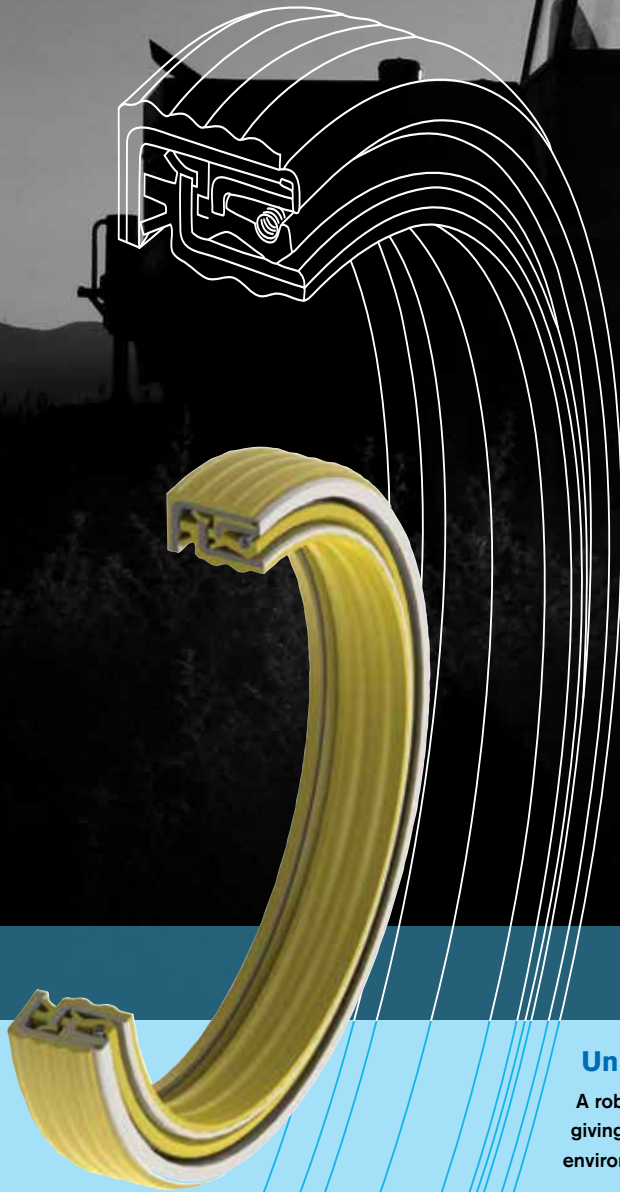


know-how makes the difference

ERIKS

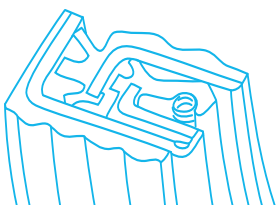
“ Harsh abrasive environments present some of the toughest challenges for sealing applications. Pioneer Weston offer a comprehensive range of engineered seals able to exclude debris that offer excellent sealing efficiency and life.”

Daniel Castle
Business Development Manager
ERIKS Sealing Technology



Unitised Seal

A robust seal for heavy-duty applications, giving optimised protection against environmental contaminants.



Contents

INTRODUCTION	04
LOGISTICS	05
TECHNICAL	06
MATERIALS	08
Elastomers	08
Thermoplastics	12
Chemical Compatibility Chart	14
ROTARY PRODUCTS	16
Elastomeric Rotary Lip Seals	16
PTFE Rotary Lip Seals	20
Unitised Seals	24
Metal Face Seals	34
ROTARY CASE STUDIES	43
OTHER PRODUCTS	46
O-ring	46
X-ring	48
Capped O-ring	50
Double Acting Cap Seal	52
Typical Applications	54
T-seal	56
Energised Lip Seal	58
Asymmetric U-Cup	60
Single Acting Cap Seal	62
Exclusion Devices/Wiper Rings	64
Machined Wear Ring/Bearing Strip	66
Back-up Rings (Anti-extrusion Ring)	72
ADDITIONAL PRODUCTS & SERVICES	76

All information in this documentation has been compiled with care to ensure accuracy. Despite this we can bear no liability for error and/or changes in legislation that may affect content. Recommendations are intended as guidelines only, for further information and technical assistance, please consult your ERIKS representative.

Freon, Viton and Vamac are trademarks of Dupont.
Stellite is a trademark of Deloro Stellite Company Inc.
Aflas is a trademark of Asahi Glass



Leader in Sealing Technology

Pioneer Weston is a premium brand of ERIKS Sealing Technology, after more than 80 years Pioneer Weston remains at the forefront of sealing technology offering continued innovation in the sealing of heavy duty applications.

Pioneer Weston originated from the partnership of two British manufacturers, Charles Weston, a supplier of Elastomer and Leather seals into high performance industries, and the prominent Pioneer Oilseals, supplier of Static and Rotary seals into the automotive industry.

This strong collaboration helped to make Pioneer Weston a global leader in both the Automotive and General Industrial markets, offering a wide range of sealing products. Whilst the product portfolio has evolved, the core principals of the business remain the same, offering engineered sealing systems that have gained an enviable reputation for quality and performance in some of the world's most arduous applications.

Pioneer Weston's core product range consists of Elastomer and PTFE Rotary Lip Seals, along with bespoke Mechanical seals. Significant developments with materials and designs have enabled us to continually meet the most demanding needs of the customer.

The Pioneer Weston Rotary seal style suffixes of R4, R6, R21 and R23 have become a recognised standard to engineers specifying rotary seals - a true testament to the impact the company has made on global industry.

These products are supported by advanced technical and logistics services that form the link between our know-how and your delivery.

The global ERIKS group of companies are product driven industrial service providers, focussing on five core activities:

- Sealing technology
- Power transmission
- Flow technology
- Industrial plastics
- Tools and maintenance products



ERIKS Sealing Technology is a world leader in high-performance O-rings, elastomeric and polymer seals. We hold ISO 9001:2008 certification across both of the UK sealing core competence centres and throughout our distribution network for your peace of mind. Whether your requirement is for individual products, small batches or production volumes, ERIKS Sealing Technology's manufacturing, logistics and quality systems ensure delivery of the highest levels of service. We are the preferred partner of the key global seal manufacturing companies, giving ERIKS an unrivalled insight into their capabilities and the resources available, allowing us to add value to your business and the products that you produce by selecting the optimal technical and logistical solution for your application.

Stock Availability Support

As one of the worlds largest stockholders of sealing and associated products, you are assured of the highest levels of availability to keep your plant working.

Our expertise will also help you select the correct item from our range or specify the optimal customised solution.

Customer stocking programmes are available to maintain continuity and supply.

- Dedicated technical support staff / customer service
- Field based Sealing Technology application engineers and specialists
- Skilled research and development engineers
- 24 hour call out service available
- Multi national locations to support our global customer network



Product Design

In an environment dedicated to innovation and free thought, our highly talented design team, work with the latest 3D Computer Aided Design tools to capture design intent with your engineers.

This technology proves an invaluable tool in communicating and developing conceptual solutions involved in co-engineering partnerships as we can share 3D data in many standard formats including IGES and STEP.

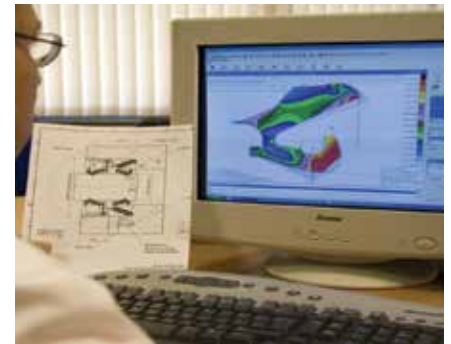
Change control and configuration management techniques are used to ensure that the design intent is fully embodied into the finished product;

with our combined visual and CMM dimensional measurement system being programmed from the original 3D CAD model.

Finite Element Analysis (FEA)

Using FEA as a mathematical technique to predict deflection (strain), stress, reaction force and contact pressure based on dimensional information, physical constraints and material properties improves design integrity and speed. Our Materials Technology Centre can generate temperature specific,

validated, hyper-elastic material models on which to base these analyses. FEA allows our engineers to rapidly iterate to optimal design solutions, minimising product development time and cost.



Test and Validation

We run test programmes to SAE standard specifications, our own demanding internal validation standards, customer specific requirements and special test programmes for development projects or competitor benchmarking.

Summary of standard test capability

Maximum Seal OD:	250mm
Speed:	20,000 r.p.m. (max), Cycles up to 7,000 r.p.m. (max)
Rotation:	Clockwise/Anti-clockwise
Orientation:	Shaft or housing rotation
Pressure:	0-10 bar (water, oil, air)
Temperature:	-40°C up to 200°C
Shaft Eccentricity:	Adjustable up to 1 mm
Housing Offset:	Adjustable up to 2 mm
Torque Measurement:	Max 20 Nm
Data Logging:	Speed, temperatures and pressures
Environmental:	Slurry, dust, water



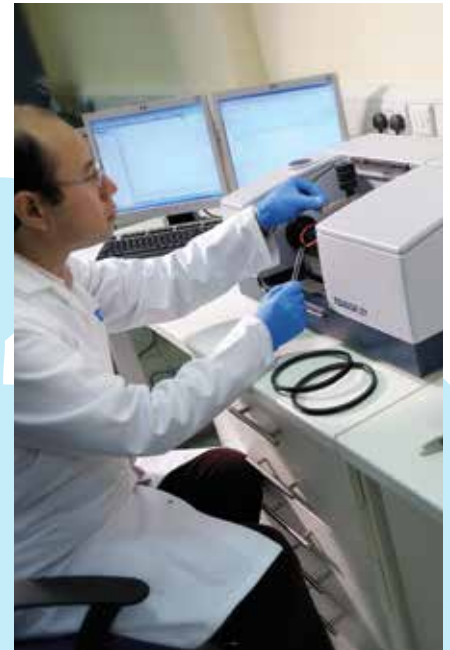
Material Technology Centre

ERIKS Material Technology Centre is a testimony to our commitment to the highest level of product quality and customer satisfaction possible.

Situated in Warrington this facility benefits from continuous investment in technology and people and is one of the major factors in ERIKS Sealing Technology's success. The Material Technology Centre's principal activities are to ensure our high quality standards are maintained and to develop new compounds or technical solutions for your applications.

Capabilities:

- Hardness (°IRHD/Shore A)
- Compression-set
- Mechanical property testing
- Chemical and heat aging
- Ozone resistance
- Material composition
- Dimensional measurements
- Surface defects
- Material properties at temperatures from -70°C to 300°C
- Wet bench analysis
- Extraction testing
- Failure analysis
- Hyper elastic material characterisation
- Immersion testing



Fourier Transform Infra-red Spectroscopy (FTIR)

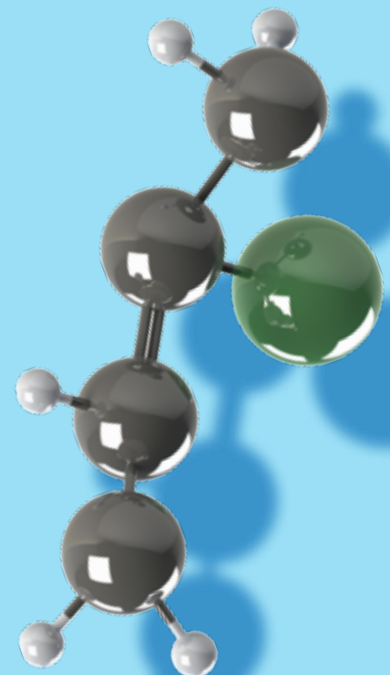
Molecules have specific frequencies at which they naturally rotate or vibrate. By exposing a material sample to a spectrum of infra-red frequencies the equipment can identify which molecules are present by detecting which frequencies are absorbed. This technique is used to identify the base polymers material type in quality control and to identify thermo-chemical decomposition.

Thermo-Gravimetric Analysis (TGA)

TGA is used to identify weight loss of a compound either isothermally over time or over a ramped temperature range. The relative composition of compounds can be identified, to quantify polymer, organic and inorganic filler contents and types.

Differential Scanning Calorimetry (DSC)

DSC analysis measures changes in enthalpy (exothermic or endothermic energy changes) over time, or, with changes in temperature. DSC analysis can be used as a quality tool (residual cure), an analytical tool (failure analysis), or in development of new materials (glass transition, oxidation etc).



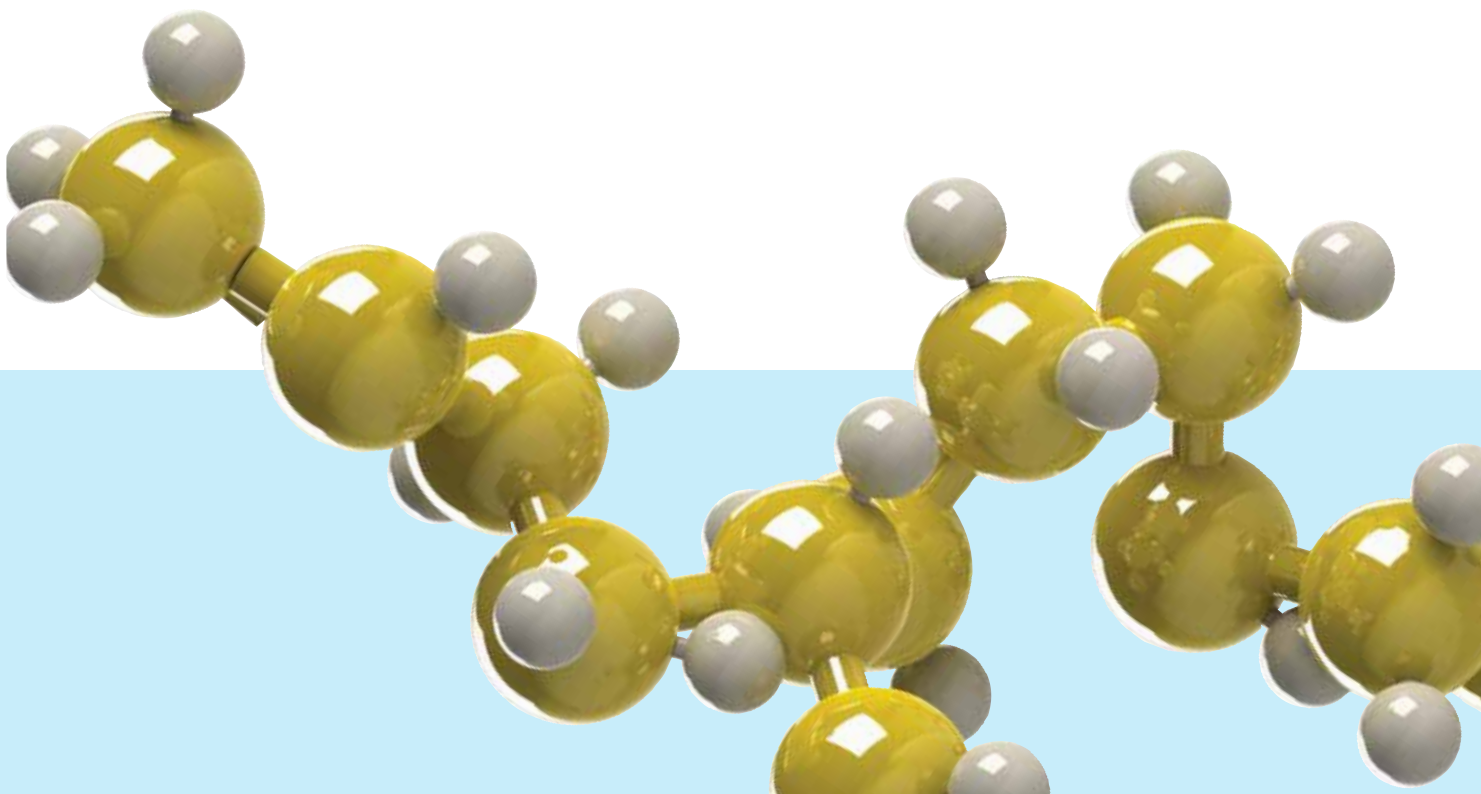
Elastomers

Elastomeric materials are described as having non-linear, viscoelastic behaviour, this means that they exhibit elastic recovery, time dependent behaviour and the relationship between load and deflection is not linear.

Elastomers used in sealing are often described as compounds, meaning that they are a mixture of ingredients manufactured under specific conditions. A compound typically comprises:

- **Polymer backbone** – a long chain of molecules made up of one or more monomeric units, this governs the basic thermal, chemical and physical properties of a compound. ISO and ASTM classifications define families of elastomer such as NBR, FKM etc.
- **Cross-link** – polymer chains are tied together by cross links, short chains of molecules e.g. sulphur, to prevent chain slippage and create elastic behaviour. Different cross link systems will fundamentally change thermo-chemical or physical properties
- **Fillers** – organic or inorganic solid particles with specific shapes and chemistries that tailor physical properties such as tensile strength, hardness, elongation at break, modulus and compression-set
- Other ingredients used to achieve specific manufacturing, application or cost requirements

A typical HNBR 70 Shore A compound may have 20 ingredients and may contain only 30% polymer by weight. Therefore it is important not just to specify the family of polymer backbone and hardness, but to specify an individual compound/grade in order to achieve consistent performance.



Nitrile (NBR)



Nitrile (often referred to as Buna-N) is the most commonly used elastomer in the seal industry and is a copolymer of two monomers; acrylonitrile (ACN) and butadiene. The properties of this elastomer are ruled by the ACN content which is broken down into three classifications:

- High Nitrile:** >45% ACN content
- Medium Nitrile:** 30 – 45% ACN content
- Low Nitrile:** <30% ACN content

The higher the ACN content, the better the elastomers resistance to hydrocarbon oils. With lower ACN content, the material offers better flexibility at low temperatures. Medium nitrile is, therefore, the most widely specified due to its good overall balance in most applications. Typically, nitrile rubber can be compounded to work over a temperature range of -35°C to +120°C and is superior to most other elastomers in regard to compression set, tear and abrasion resistance. Nitrile rubbers possess excellent resistance to oil-based fluids, vegetable oils, greases, water and air.

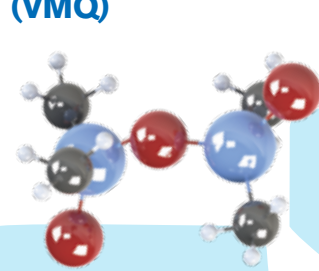
Hydrogenated Nitrile (HNBR)



The properties of Hydrogenated Nitrile Rubber (HNBR) are dependent upon the acrylonitrile content and the degree of hydrogenation of the butadiene copolymer. They have a better oil and chemical resistance than nitrile rubber and can withstand much higher temperatures. HNBR has excellent resistance to glycol based coolants, hot water and ozone. Physical properties (e.g. tensile and tear strength, elongation, abrasion resistance, compression set, etc.) are also excellent and compounds display strong dynamic behaviour at elevated temperatures.

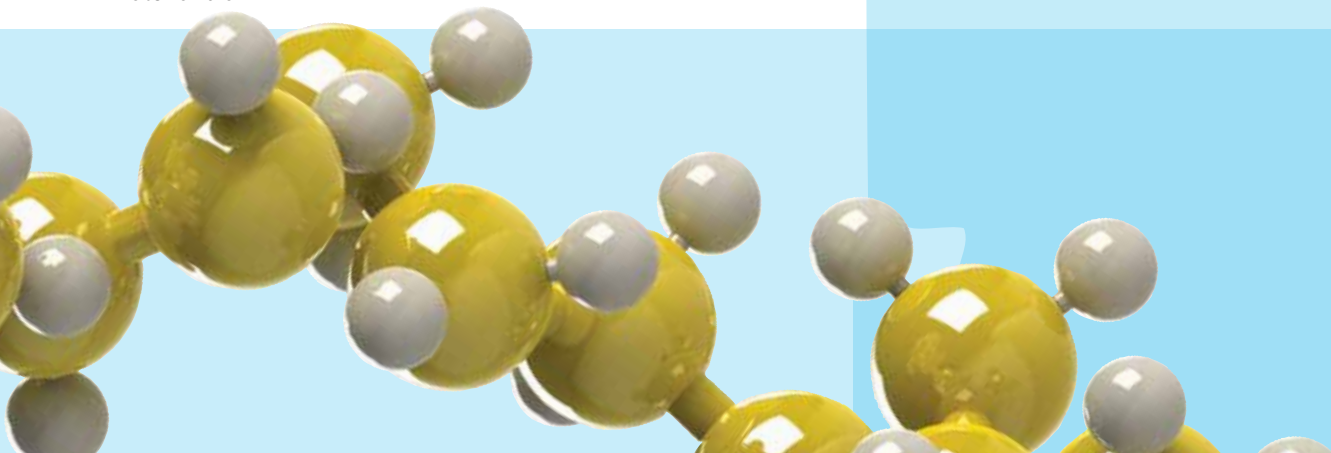
HNBR can either be cured with sulphur or peroxide, depending upon which properties are the most important. Typical applications include accumulator bladders, diaphragms, gaskets and seals. Limitations include poor electrical properties, poor flame resistance and attack by aromatic oils..

Silicone (VMQ)



Silicone elastomers are commonly used for extreme temperature ranges (-90°C to +230°C) and offer good low temperature flexibility. They also offer good resistance to ultra violet radiation (UV), oxygen and ozone.

Silicone is best suited to non-dynamic applications, as this elastomer type possess relatively low tear strength and abrasion resistance, although higher strength grades are available. They are also compliant with engine and transmission oils, vegetable oils and some brake fluids.



Fluorocarbon Rubber (FKM, Viton®)



FKMs (sometimes known as FPMs in Europe) are frequently used to resist extreme temperatures and harsh chemicals. The strong carbon-fluorine bonds that make up the polymer structure provide high thermo-chemical resistance,

giving excellent ageing characteristics shown by low compression set at elevated temperatures.

FKMs offer excellent resistance to mineral oils and greases, aliphatic, aromatic and some chlorinated hydrocarbons, petrol and diesel fuels, silicone oils and greases. However FKMs show poor resistance to ethers, esters and amines.

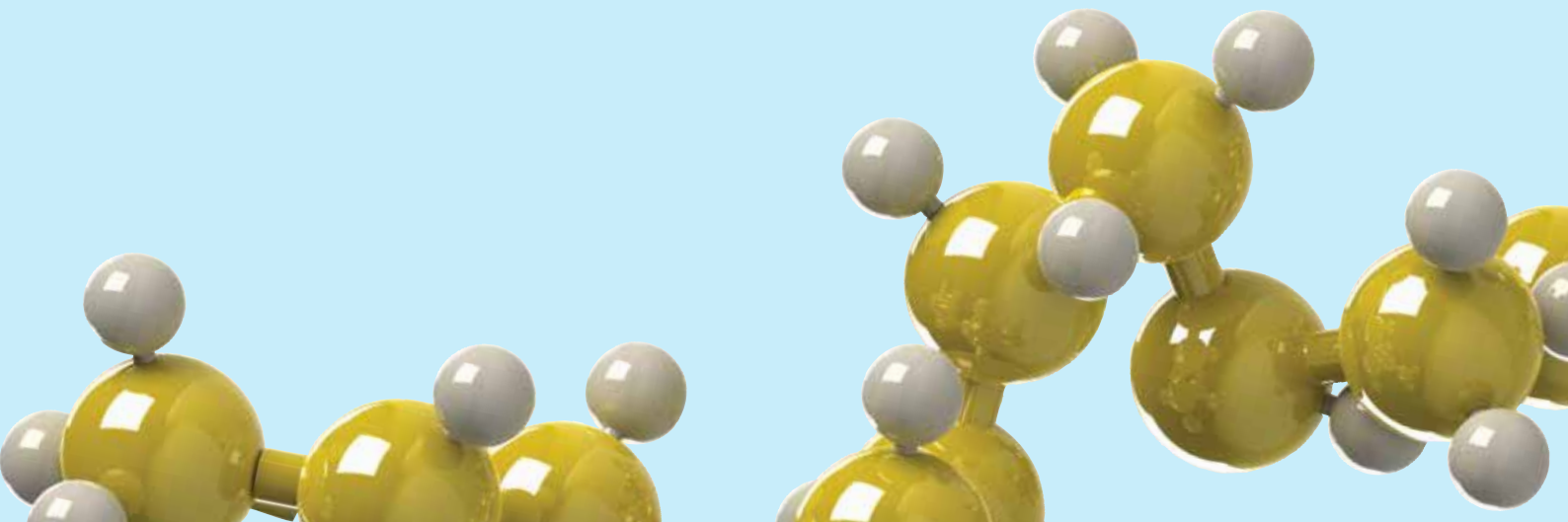
FKMs are available as a copolymer (two monomers), terpolymer (three monomers) or as a tetrapolymer (four

monomers). Each type determines both fluorine content and chemical structure which in turn significantly impact the chemical resistance and temperature performance of the polymer.

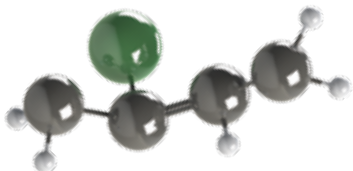
More recent innovations include the development of FKM materials for use in low temperature applications, where with a glass transition of -40°C , it is possible to use FKMs down to -51°C in service. ERIKS 514322 brings true low temperature capabilities to chemically demanding and high temperature applications.

Types of Fluorocarbon Rubber

ASTM D1418 Designation	Common Name	Typical Cure system	Typical Fluorine Content	Description
Type 1	Viton® A	Bisphenol or amine	66%	General purpose with excellent mechanical properties
Type 2	Viton® B, F or GF	Bisphenol, amine or peroxide	66 - 70%	Improved fluid and oil/solvent resistance, including improved fuel resistance. Peroxide cured materials offer improvements in coolant and water resistance
Type 3	Viton® GLT	Peroxide	64 - 67%	Improved low temperature resistance but reduced chemical resistance
Type 4	Aflas®	Peroxide	55%	Excellent resistance to lubricating oils, corrosion inhibitors and coolants.
Type 5	Viton® ETP	Peroxide	67%	Speciality grade, excellent chemical resistance, including increased resistance to amines and fuel additives.
Ultra-low temp	Ultra-low temp	Peroxide	66%	Speciality polymers are available that further extend the low temperature performance of FKMs.

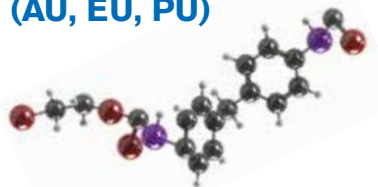


Polychloroprene (Neoprene Rubber, CR)



Polychloroprene rubbers are homopolymers of chloroprene (chlorobutadiene), and were among the earliest synthetic rubbers used to produce seals. CR has good ageing characteristics in ozone and weather environments, along with abrasion and flex-cracking resistance. Most elastomers are either resistant to deterioration from exposure to petroleum based lubricants, or, to oxygen; CR is unusual, in offering a degree of resistance to both. CR also offers resistance to refrigerants, ammonia, Freon® (e.g. R12, R13, R21, R113, R114, R115, R134A), silicone oils, water, ozone, vegetable oils and alcohols. This, combined with a broad temperature range and moderate cost, accounts for its desirability in many seal applications. CR is not effective in aromatic oils and offers only limited resistance to mineral oils.

Polyurethane (AU, EU, PU)



Polyurethane is a polymer formed from a chain of organic units joined by urethane links. Polyurethanes are produced by the addition reaction of a polyisocyanate with a polyalcohol (polyol) in the presence of a catalyst and other additives.

Polyurethane demonstrates excellent resistance to weathering and oxidation. They resist hydrocarbon fuels and mineral oils, however some grades degrade (hydrolyse) in hot water. Polyurethane also offers some of the best resistance to abrasion, and are therefore often specified for use in dynamic seals.

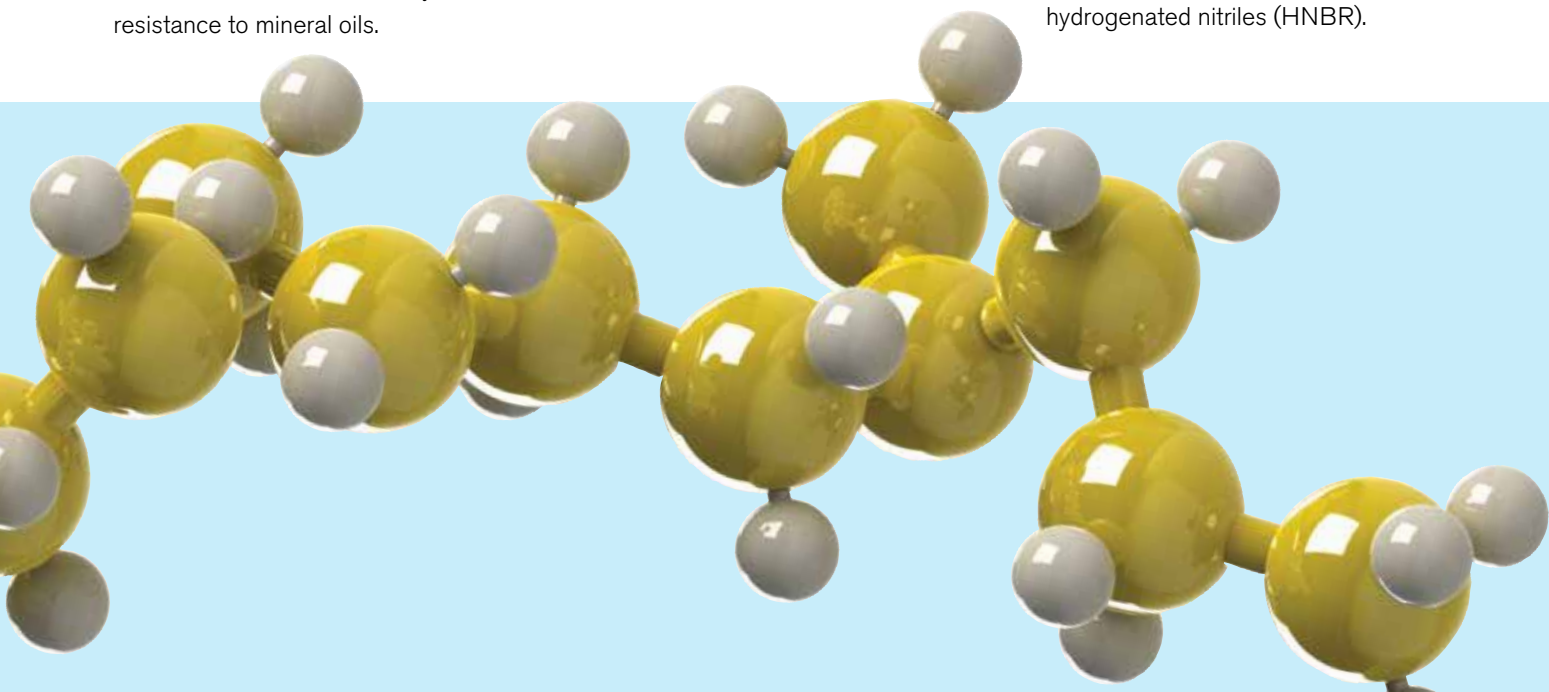
Acrylic Elastomers (ACM, AEM Vamac®)



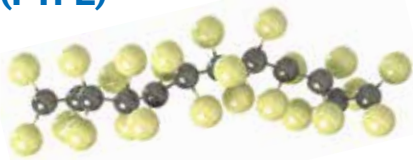
There are generally two forms of acrylic-based elastomer available: Polyacrylates (ACM) and ethylene-acrylates (AEM, Vamac®).

Polyacrylates offer good resistance to lubricating oils and high temperatures, and are commonly used where the two are found in combination. ACM elastomers show excellent resistance to engine oils (semi- and fully-synthetic), petroleum based lubricants, transmission fluids, aliphatic hydrocarbons, ozone and ultraviolet radiation.

Ethylene acrylic elastomers (AEM) are terpolymers of ethylene, acrylic and a cure-site monomer, supplied by DuPont™ under the tradename of Vamac®. AEM elastomers exhibit mechanical properties similar to ACM, although they can operate over a wider temperature range than ACM and hydrogenated nitriles (HNBR).



Polytetrafluoroethylene (PTFE)



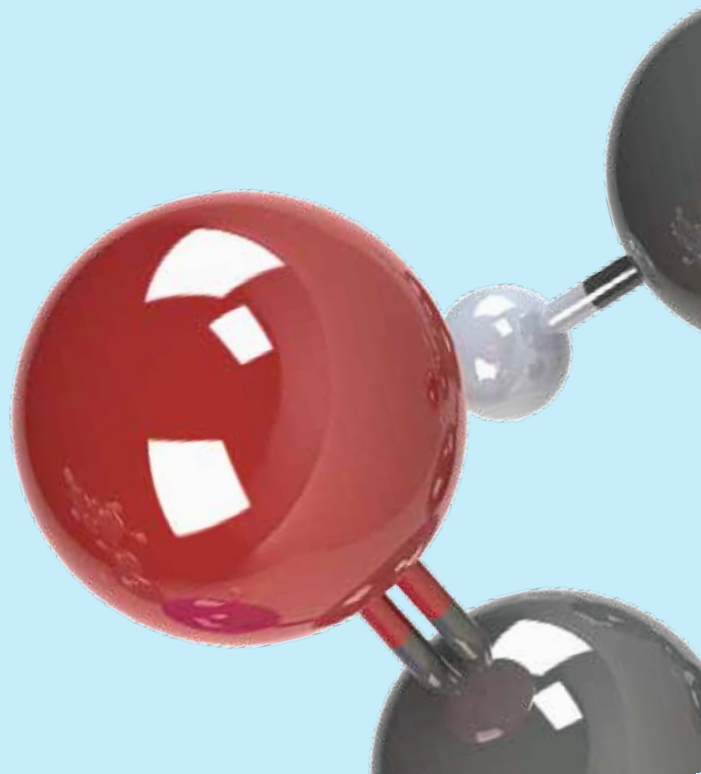
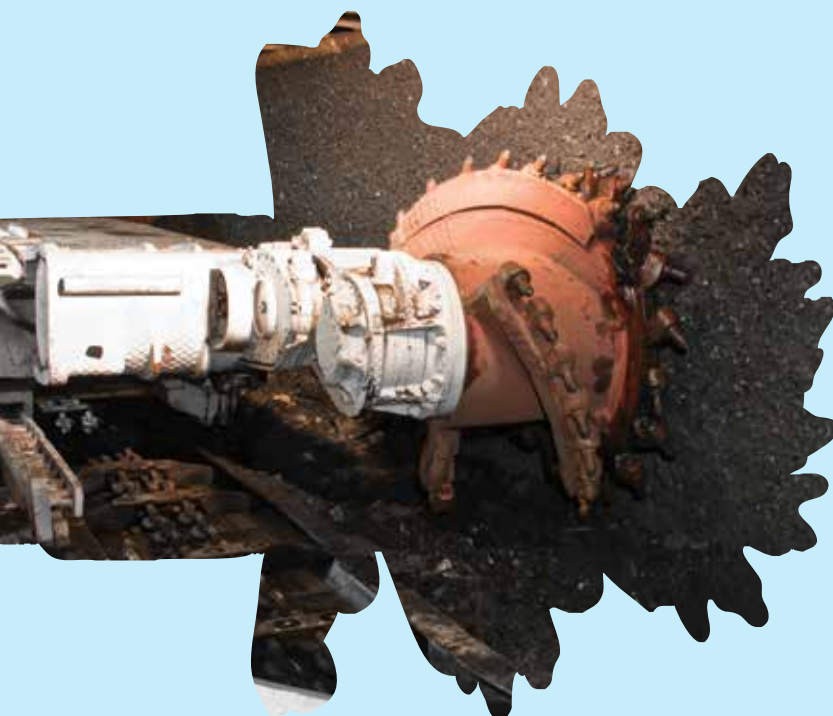
PTFE (polytetrafluoroethylene) is a synthetic, thermoplastic polymer which offers exceptional chemical resistance over a wide range of temperatures, and offers extremely low levels of friction.

PTFE lacks elasticity which prevents its use as an elastomeric-type sealing ring, however, it is commonly used for anti-extrusion as a back-up ring, and for non-stick requirements. Owing to its low friction and excellent chemical resistance, it is also commonly used for applications such as bearings, gears, rotary seals etc.

Non-filled (virgin) grades are stable up to +260°C and are quite flexible and resistant to breaking under tensile and compressive stresses. PTFE is also available with fillers added, to enhance its physical characteristics.

Typical fillers include:

- Glass fillers for improved deformation and wear
- Inorganic fillers (e.g. calcium silicate, wollastonite) are used in a similar manner to glass fillers, with reduced abrasiveness.
- Carbon-filled for considerable wear and deformation improvement, and increased thermal conductivity.
- Graphite or molybdenum disulphide (MoS_2) filled to lower the coefficient of friction.
- Bronze filled for excellent wear, deformation strength, thermal conductivity (reduced chemical resistance)
- Stainless steel fillers are used to increase wear resistance, and increased chemical resistance compared to bronze filled grades.
- Polyester filled for improved high temperature and wear resistance, for applications where running surfaces are non-hardened.
- Polyphenylenesulphide (PPS) filled for improved extrusion and deformation resistance
- Polyimide (PI) fillers are used to increase wear and abrasion resistance, being polymeric, the abrasion of running surfaces is reduced.
- Combinations of some of the above are also often used to offer optimal performance in service.

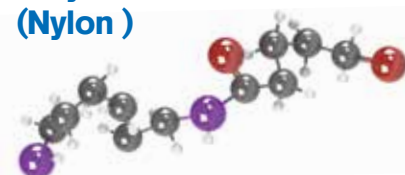


Fabric / Phenolic Resin Composites



Phenolic resins, also known as phenol formaldehyde resins (PF), are synthetic thermosetting resins created by the reaction of phenols with formaldehyde. These thermosets perform well in most engineering applications such as: hydraulic fluids, oil, glycols, phosphate esters, silicone oils and brake fluids etc. Phenolic resins demonstrate high dimensional stability and abrasion resistance, and are commonly used in wear-ring applications as fabric resin composites.

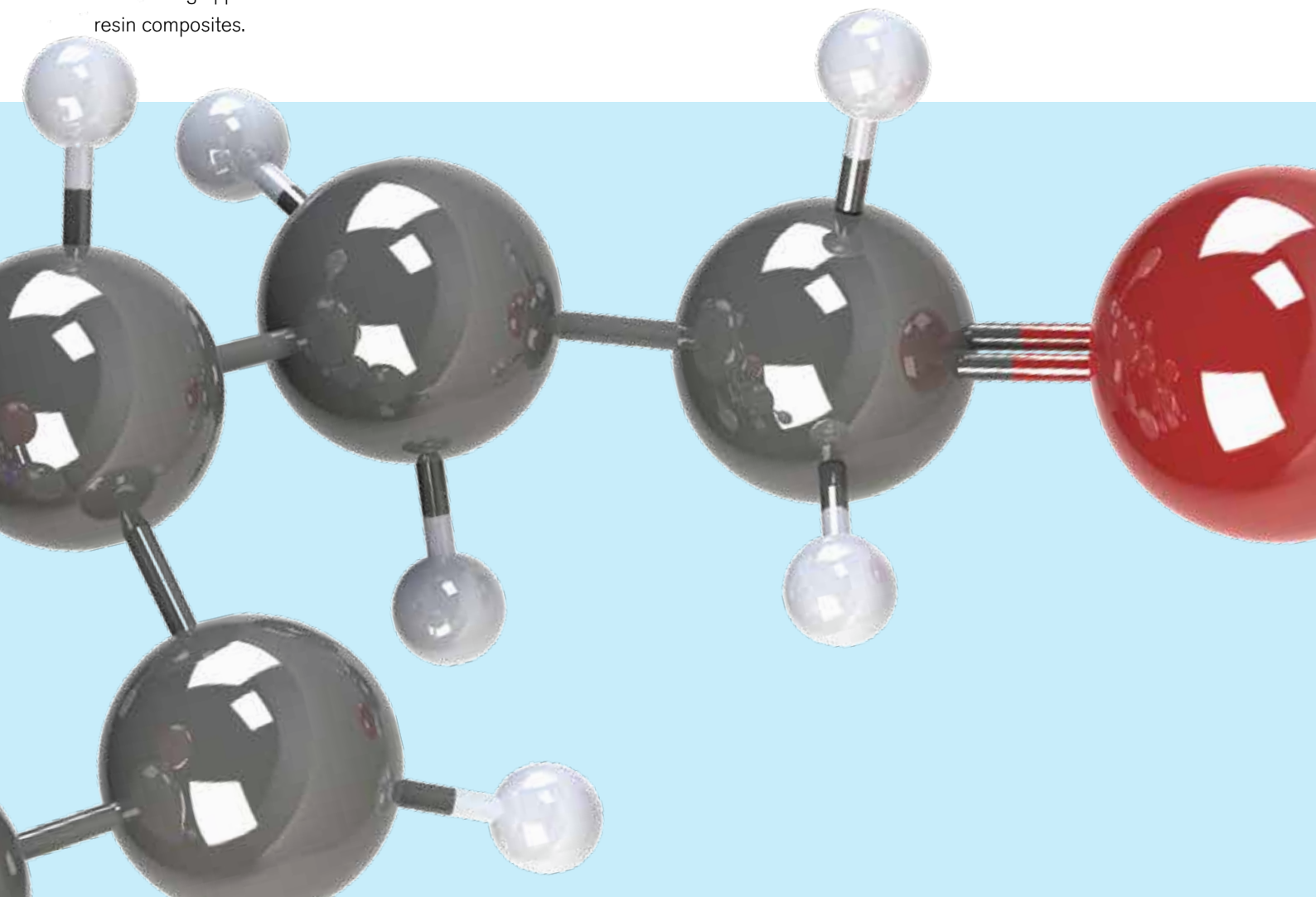
Polyamide (Nylon)



Nylon is a generic designation for a family of synthetic thermoplastic polymers known generically as polyamides, developed in 1938. Nylons are condensation copolymers formed by reacting a diamine and a dicarboxylic acid. Chemical elements included are carbon, hydrogen, nitrogen, and oxygen. The numerical suffix specifies the numbers of carbons donated by the monomers; the diamine first and the diacid second.

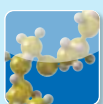
The most common variant is Nylon 6-6 which refers to the fact that the diamine and the diacid each donate 6 carbons to the polymer chain. The levels of these monomers has an influence on the chemical resistance as well as the mechanical properties.

Nylon offers excellent mechanical properties in combination with good shear strength, deformation and wear resistance. Chemical resistance is generally broad, with good resistance to most chemicals, although Nylon can be susceptible to damage when exposed to moisture.



Common Chemical Compatibilities of Materials

Media	Nitrile	Hydrogenated Nitrile Rubber	Polychloroprene	Polyacrylates
Aliphatic Hydrocarbons	1	1	2	1
Aromatic Hydrocarbons	1	1	4	2
Alkanes	1	1	2	1
Mineral oil	1	1	2	1
Synthetic oil	1	1	2	1
Vegetable oil	1	1	3	1
Rapeseed (canola) oil	1	1	3	1
Hydraulic oil	1	1	3	1
Synthetic grease	1	1	2	1
Lithium-complex grease	2	2	2	2
Fluorinated grease	1	1	2	1
Ester based hydraulic fluid	4	4	4	4
Organophosphate ester	4	4	4	4
Poly-a-olefin	1	1	2	1
Engine lubricating oil	1	1	2	1
Lubricating oils (API CC-type)	1	1	2	1
Lubricating oils (API CD-type)	1	1	2	1
Lubricating oils (API CE-type)	1	1	2	1
Lubricating oils (API CD-II-type)	3	1	3	2
Universal Transdraulic fluid	3	1	3	2
Petroleum fuel	2	2	2	2
Diesel fuel	1	1	2	1
Low sulphur diesel fuel	1	1	2	1
Diesel winter additive	2	2	3	3
2-butoxyethanol	3	3	3	4
Paraffin	1	1	1	1
Naptha (solvent, hydrotreated)	2	2	4	2
Kerosine	2	2	3	2
Algae biocide	1	1	1	1
Methanol	2	2	1	4
Ethanol	2	2	1	4
Bioethanol	2	2	1	4
Butanol	2	1	1	4
Fatty acid methyl ester (FAME)	2	2	2	1
Liquidified petroleum gas (LPG)	1	2	2	3
Water / coolant <100°C	2	1	2	4
Water / coolant <150°C	4	3	3	4
Water / coolant <200°C	4	4	4	4
Corrosion inhibitors	2	1	2	3
Glycol-based coolants	2	1	1	4
Polyethylene glycol	2	1	1	4
Polypropylene glycol	2	1	1	4
Polyalkylene glycol (PAG)	2	1	2	4
Glycol-ether based brake fluid	3	3	2	4
Brake fluid - DOT 3, 4 and 5.1 type	3	3	2	4
Brake fluid - DOT 5 type	1	1	1	1
Silicone oil	1	1	1	1
Ozone	2	1	2	1



Material information can also be found on our Chemical Compatibility tool:
<http://oring-groove-wizard.eriks.co.uk/chemicalcompatibility.aspx>



Ethylene-acrylates	Polyurethane	Fluorocarbon Rubber	Fluorocarbon Rubber Peroxide	Silicone
2	1	1	1	3
3	3	1	1	3
2	1	1	1	3
2	1	1	1	3
1	1	1	1	3
1	1	1	1	4
1	1	1	1	4
1	1	1	1	3
2	1	1	1	3
2	2	2	1	3
1	1	4	4	1
4	4	3	3	3
4	4	3	3	3
2	1	1	1	3
2	1	1	1	3
2	1	1	1	3
2	1	1	1	3
2	1	1	1	4
3	2	1	1	4
3	2	1	1	3
2	2	2	1	3
1	2	2	1	4
1	2	2	1	4
3	3	2	2	4
4	4	4	4	4
1	1	1	1	1
4	3	1	1	4
3	2	1	1	4
1	1	1	1	1
1	4	2	1	2
2	4	1	1	1
3	4	3	1	2
1	3	1	1	3
1	2	2	1	3
4	1	1	1	3
1	2	1	1	1
3	3	3	1	2
4	4	4	2	4
3	3	4	4	3
1	3	3	1	3
1	3	3	1	3
1	3	3	1	3
2	3	3	1	3
4	4	4	3	3
4	4	4	3	3
1	1	1	1	4
1	1	1	1	4
1	2	1	1	1

KEY:

1 = Excellent

2 = Good

3 = Poor

4 = Not recommended

Elastomeric Rotary Lip Seals

Product Overview

One of the most frequently used types of seal is the rotary lip seal, generally used for sealing lubricating oil or grease in rotary shaft applications. This is achieved by:

- Providing static sealing between the outer diameter of the seal and its housing.
- Sealing between the shaft and the main sealing lip when either static or dynamic. The radial load exerted by the sealing lip must be sufficient to retain the oil or grease, but not so high that excessive friction losses or wear occurs.

The principal of this can be affected by the following basic parameters and must always be taken into consideration when selecting the correct profile and material to enable the optimum performance

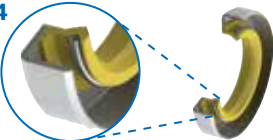
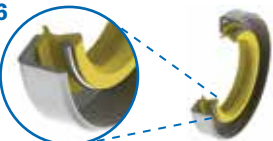
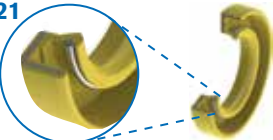
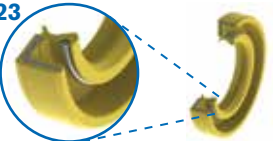

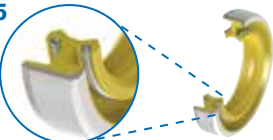
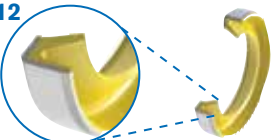
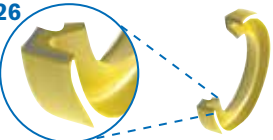
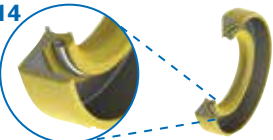
- Shaft rotational speed and direction
- Operating temperature
- Application hardware details
- Medium being sealed both internally and externally
- Pressure seen within sealed unit



The Pioneer Weston range of rotary lip seals, offered through the ERIKS group, comply with a range of standards including DIN 3760/3761 and ISO 6194. Non-standard designs and materials are available on request.

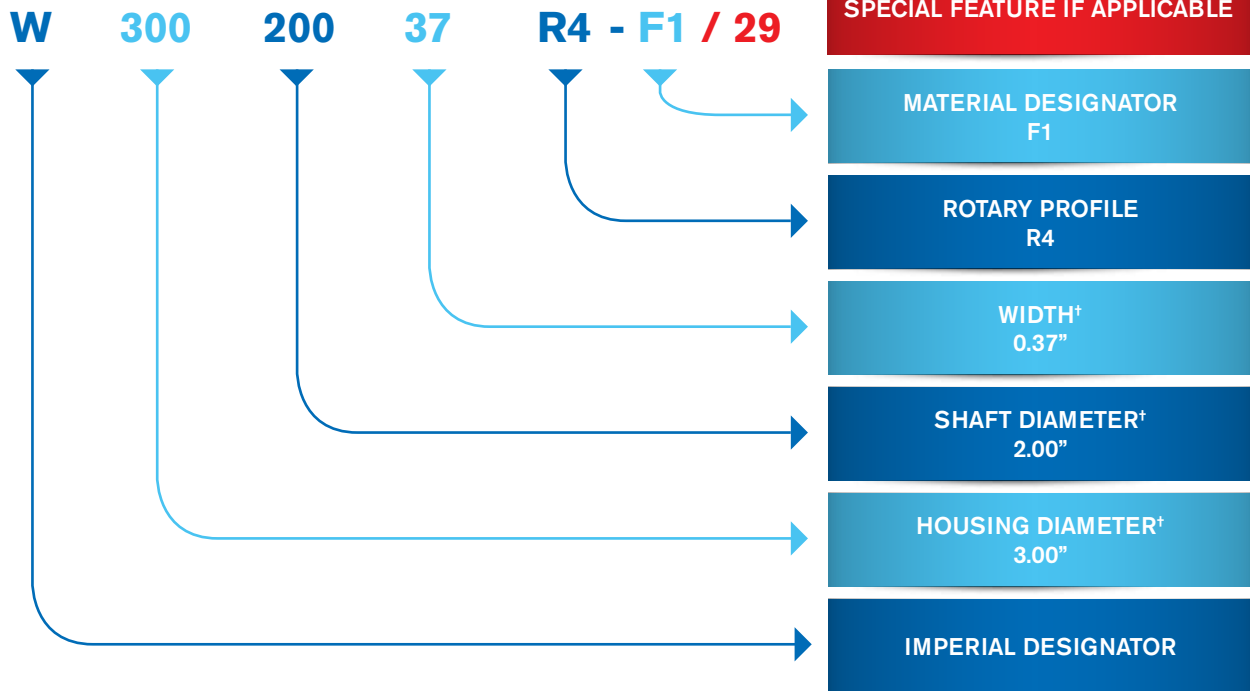


Elastomeric Rotary Lip Styles

Profile	Profile Features	Profile Advantages	Applications
R4 	<ul style="list-style-type: none"> Ground Metal outer diameter Spring-loaded primary seal lip 	<ul style="list-style-type: none"> Press fit metal OD for precise location in housing Used in a wide and varied number of applications 	<ul style="list-style-type: none"> Transmission Gearbox Axles
R6 	<ul style="list-style-type: none"> Ground Metal outer diameter Spring-loaded primary seal lip Additional dust lip 	<ul style="list-style-type: none"> Press fit metal OD for precise location in housing Used in a wide and varied number of applications The addition of a dust lip offers protection against low to medium dust and dirt ingress 	<ul style="list-style-type: none"> Similar to R4 but within environments where contaminants are present
R21 	<ul style="list-style-type: none"> Rubber covered outer diameter Spring-loaded primary seal lip 	<ul style="list-style-type: none"> Rubber OD sealing allows use in housings of increased roughness or with minor surface defects Used in a wide and varied number of applications The addition of a dust lip for R23 style offers protection against low to medium dust and dirt ingress Can accommodate housing materials with high thermal expansion 	<ul style="list-style-type: none"> Transmission Gearbox Axles Crankshafts
R23 	<ul style="list-style-type: none"> Rubber covered outer diameter Spring-loaded primary seal lip Additional dust lip 	<ul style="list-style-type: none"> Rubber OD sealing allows use in housings of increased roughness or with minor surface defects Used in a wide and varied number of applications The addition of a dust lip offers protection against low to medium dust and dirt ingress Can accommodate housing materials with high thermal expansion 	<ul style="list-style-type: none"> Similar to R21 but within environments where contaminants are present
R1 	<ul style="list-style-type: none"> Ground metal outer diameter Spring loaded primary seal lip Additional reinforcing metal insert 	<ul style="list-style-type: none"> Press fit metal OD for precise location in housing Metal insert gives seal more rigidity specifically for larger sizes Can accommodate greater installation errors 	<ul style="list-style-type: none"> Similar to R4
R5 	<ul style="list-style-type: none"> Ground metal outer diameter Two spring loaded seal lips incorporated in to one design 	<ul style="list-style-type: none"> Press fit metal OD for precise location in housing Seal for separation of two media or where liquid or viscous contaminant is present 	<ul style="list-style-type: none"> Axles Power take-off units
R12 	<ul style="list-style-type: none"> Ground metal outer diameter Primary sealing lip without spring 	<ul style="list-style-type: none"> Good solution for grease applications Can be used as a second seal against low to medium dirt and dust ingress Press fit metal OD for precise location in housing 	<ul style="list-style-type: none"> Similar to R4 but in grease filled applications
R26 	<ul style="list-style-type: none"> Rubber covered outer diameter Primary sealing lip without spring 	<ul style="list-style-type: none"> Good solution for grease applications Can be used as a second seal against low to medium dirt and dust ingress Rubber OD sealing allows use in housings of increased roughness or with minor surface defects 	<ul style="list-style-type: none"> Similar to R21 but in grease filled applications
R14 	<ul style="list-style-type: none"> Rubber covered outer diameter Spring-loaded shorter primary seal lip Additional dust lip 	<ul style="list-style-type: none"> For use in pressure rated applications up to 8 bar dependent on rpm Rubber OD sealing allows use in housings of increased roughness or with minor surface defects The addition of a dust lip offers protection against low to medium dust and dirt ingress from application environment Can accommodate housing materials with high thermal expansion 	<ul style="list-style-type: none"> Hydraulic pumps Hydraulic motors



Imperial (English)



†Dimension rounded down to 2 decimal places then multiplied by 100

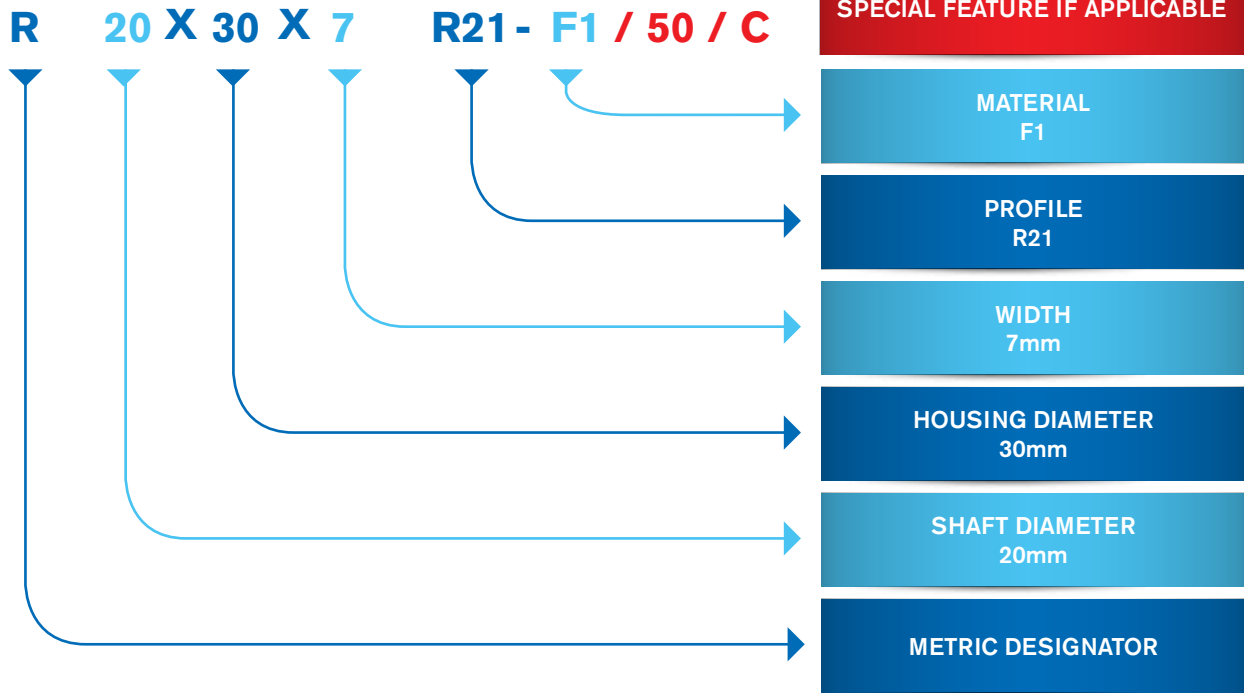
Standard Rotary Lip Seal Elastomeric Compound Reference

Polmer Type	Compound reference	Colour	Hardness (IRHD)	Temperature Range	Select for..	Material Designator
Nitrile rubber (NBR)	N-70-194	Black	70	-35 to +110°C	General purpose	BLANK
Fluorocarbon (FKM, A-type)	V-75-27	Black	75	-20 to +200°C	High temperature performance; high speed applications	F1
	V-85-195	Black	85	-20 to +200°C		F2
	V-75-50	Brown	75	-20 to +200°C		F3
Silicone (VMQ)	S-80-78	Red	80	-55 to +230°C	High and very low temperature; high eccentricity	S1
Polyacrylate (ACM)	A-70-196	Black	70	-30 to +175°C	High and low temperature capabilities; good compatibility with engine oils	A1
Hydrogenated nitrile (HNBR)	H-80-40	Black	80	-40 to +180°C	Abrasion resistance; high temperatures	H1

Other materials are available on request.



Metric



Special Feature Designator

Feature	Function	Selection	Designator
Ribbed Outer Diameter	Helps to reduce press in force and improves static sealing on outer diameter. This function is primarily used for aftermarket requirements and is available only on seals with elastomeric outer diameters.	–	50
Hydrodynamic aid	Helps as a pumping aid to improve functionality of the seal by transferring fluid away from the lip at high speeds to give a positive impact on the life of the seal.	Clockwise Anti-clockwise Bi Directional	C A B
Stainless steel spring	Rust and acid resistant spring	–	29
Sealant Paint	Only available on metal cased seals, this sealant paint helps to seal against any housing imperfections.	RED BLUE	2 3

If multiple special features are required, these should be expressed using multiple suffixes separated by a “/” sequenced as per the above table. Examples below:

A metric sized fluorocarbon R21 with a ribbed outer diameter and clockwise hydrodynamic aid, would be as follows:

R20X30X7R21-F1/50/C

An imperial sized HNBR R23 with an anti-clockwise hydrodynamic aid and stainless steel spring would be as follows:

W30020037R23-H1/A/29

PTFE Rotary Lip Seals

Product Overview

Pioneer Weston's high speed PTFE seal range was first introduced during the 1970s to offer a superior performance than existing rubber seals. This is characterised by the following advantages across this range.

- Low friction
- Aggressive media resistance
- Temperature extremes -100 °C / +250 °C
- Shaft surface speeds up to 30 metres/sec.
- Dry running qualities – reducing breakout friction and stiction
- Low lip wear ensuring prolonged service life
- Extended shelf life – unaffected by ultraviolet & oxidation
- Reduced shaft grooving

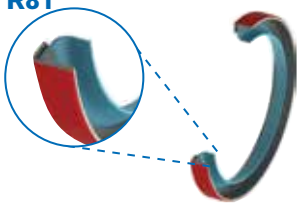
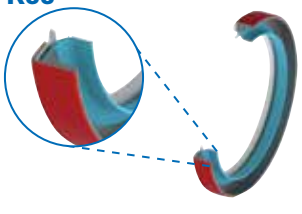
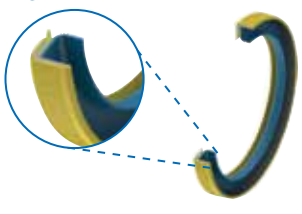
Performance can be optimised through the selection of specific PTFE grades, see pages 12 and 23 for examples of filler packages.

The Pioneer Weston range of PTFE lip seals, offered through the ERIKS group, retro fit into hardware dimensions as defined in standards including DIN 3760/3761 and ISO 6194. Non-standard designs and materials are available on request.



pioneer
WESTON

PTFE Rotary Lip Styles

Profile	Profile Features	Profile Advantages	Applications
R81 	<ul style="list-style-type: none"> Ground metal outer diameter with OD sealant paint Primary PTFE sealing element with hydrodynamic aid Elastomeric gasket 	<ul style="list-style-type: none"> Press fit metal OD for precise location in housing OD sealant paint can help to seal slight housing imperfections. Directional hydrodynamic sealing aid to provide pumping action to increase sealing ability 	<ul style="list-style-type: none"> Fuel pumps Compressors
R88 	<ul style="list-style-type: none"> Ground Metal outer diameter with OD sealant paint Primary PTFE sealing element with hydrodynamic aid Additional PTFE wiper lip for R88 Style Elastomeric gasket 	<ul style="list-style-type: none"> Press fit metal OD for precise location in housing The addition of wiper lip offers protection against low to medium dust and dirt ingress from application environment OD sealant paint can help to seal slight housing imperfections. Directional hydrodynamic sealing aid to provide pumping action to increase sealing ability 	<ul style="list-style-type: none"> Diesel engine crankshafts Transmissions
R82 	<ul style="list-style-type: none"> Ribbed elastomeric covered outer diameter Primary PTFE sealing element with hydrodynamic aid bonded to inner shell Elastomer dust lip 	<ul style="list-style-type: none"> Ribbed Elastomer OD sealing allows use in housings of increased roughness or with minor surface defects. The addition of a dust lip offers protection against low to medium dust and dirt ingress from application environment. Directional hydrodynamic sealing aid to provide pumping action to increase sealing ability 	<ul style="list-style-type: none"> Diesel engine crankshafts Gearboxes



Imperial (English)

W 600 500 50 R81 - M / S2 / E2 / A / 2

SPECIAL FEATURE IF APPLICABLE

PTFE DESIGNATOR
E2

ELASTOMER DESIGNATOR
S2

SHELL MATERIAL DESIGNATOR
M

PROFILE
R81

WIDTH†
0.50"

SHAFT DIAMETER†
5.00"

HOUSING DIAMETER†
6.00"

IMPERIAL DESIGNATOR

†Dimension rounded down to 2 decimal places then multiplied by 100

Shell Materials

Metal	Shell Material Designator
Mild Steel	M
Stainless Steel	S
Aluminium	AL

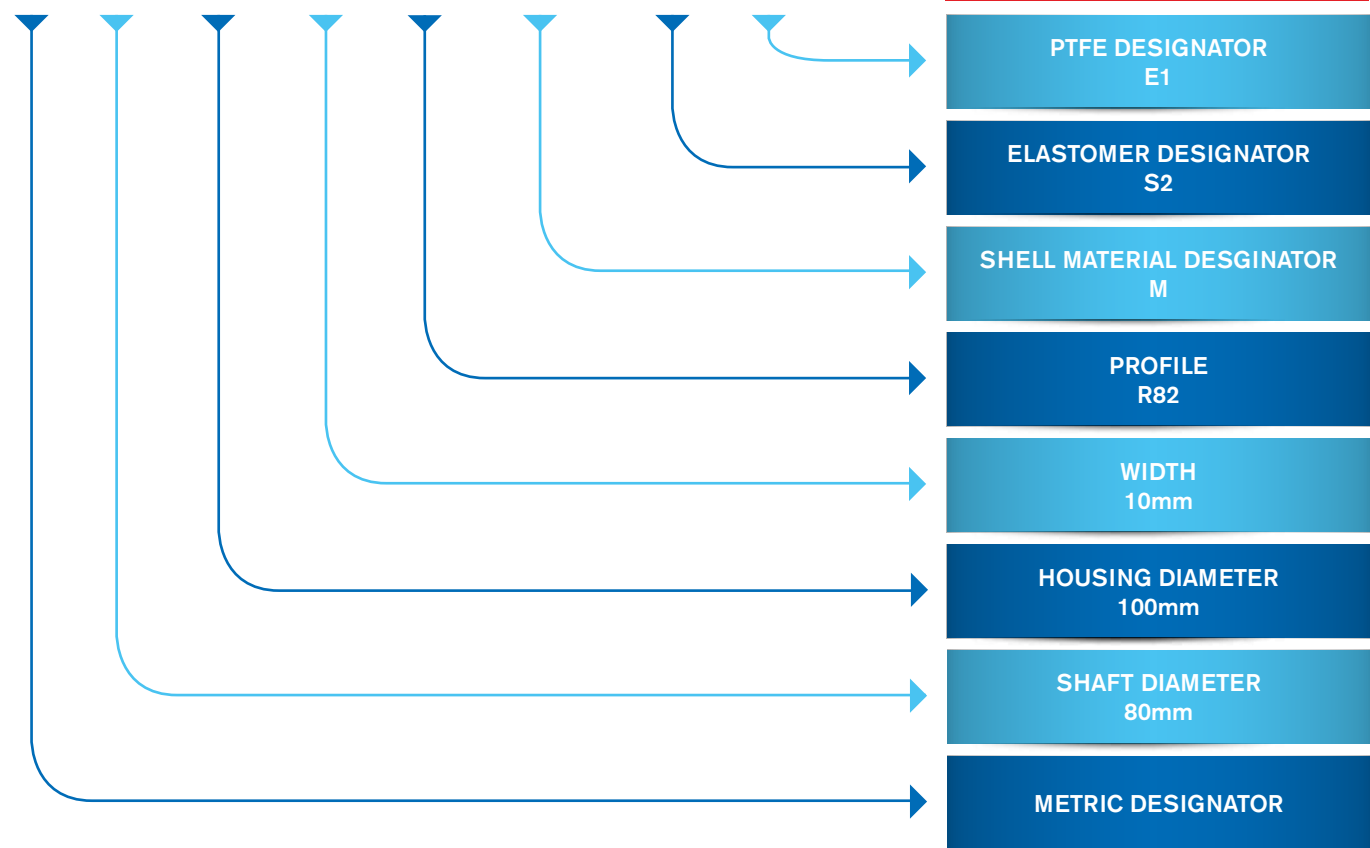
Elastomer Compounds

Polymer Family	Compound reference	Colour	Hardness (IRHD)	Temperature Range	Select for..	Elastomer Designator
Fluorocarbon (FKM, A-type)	V-75-198	Black	75	-20 to +200°C	High temperature performance; high speed applications	F4
Silicone (VMQ)	S-70-197	Red	70	-55 to +230°C	High and very low temperature; high eccentricity	S2
Polyacrylate (ACM)	A-70-196	Black	70	-30 to +175°C	High and low temperature capabilities; good compatibility with engine oils	A1



Metric

R 80 X 100 X 10 R82 - M / S2 / E1 / A / 2



PTFE Grades

Material Composition	Compound reference	Colour	Coefficient of Friction	Temperature Range	Select for..	PTFE Designator
Glass and MoS ₂ reinforced PTFE	PF-200	Grey	0.06 / 0.10	-160 to +290°C	Low wear, high life, reduced friction	E1
Graphite reinforced PTFE	PF-201	Grey / Black	0.06 / 0.10	-200 to 250°C	Soft shafts, reduced friction	E2

Other materials are available on request.

Special Features Designator

Feature	Function	Selection	Designator
Hydrodynamic aid	Helps as a pump aid to improve functionality of the seal by transferring fluid away from the lip at high speeds to give a positive impact on the life of the seal.	Clockwise	C
		Anti-clockwise	A
OD Sealant Paint	Only available on metal cased seals, this sealant paint helps to seal against any housing imperfections.	RED	2
		BLUE	3

If multiple special features are required then these should be expressed using multiple suffixes separated by a "/" sequenced as per the above table e.g. An R81 profile with a clockwise hydrodynamic aid and red sealant paint would be as follows; W60050050R81-M/S2/F4/C/2

Unitised Seals

Product overview

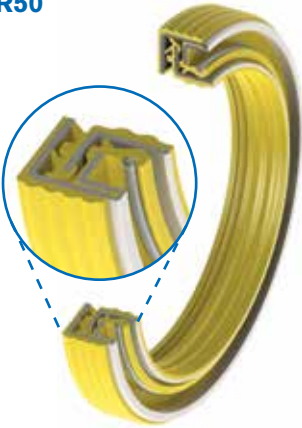


Pioneer Weston's Unitised seal range has been specifically designed for use in the most demanding heavy-duty applications where the exclusion of contaminants such as dirt, dust and slurry is of the greatest importance.

The robust Unitised seal design incorporates a number of excluder lips in addition to the main sealing lip to achieve this requirement, all of which is then contained within its own integral housing which contains an optimal running surface for this primary seal lip.

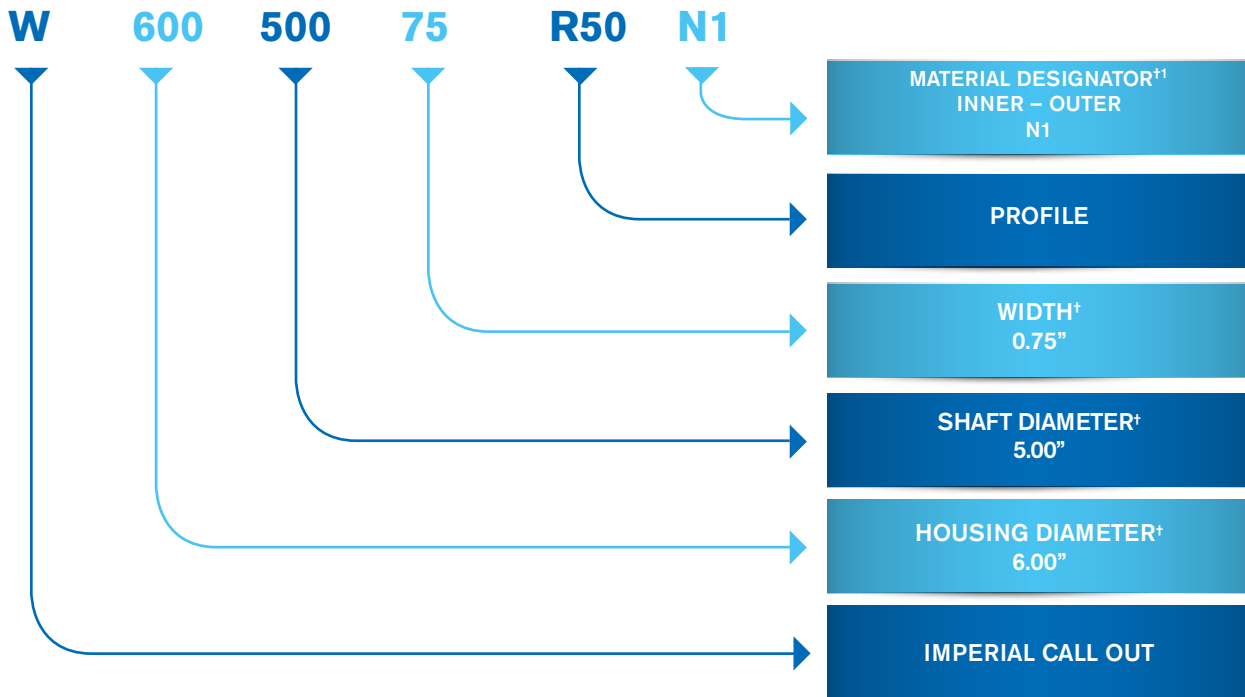
Pioneer Weston offers a number of standard profiles in both metric and imperial sizing, but can also provide custom designs to suit a particular application. The operating conditions and extremes of the environment will determine the selection of the most suitable profile and material combination for both the inner and outer components.



Unitised Seal Styles

Seal Profile	Profile Features	Profile Advantages	Applications
R50 	<ul style="list-style-type: none"> - Three piece construction (Sleeve, Inner + outer) - Ribbed elastomer Inner and Outer diameter - Spring-loaded primary seal lip - Radial and axial excluder lips - Integral running surface - Spring-loaded primary seal lip - Radial and axial excluder lips - Integral running surface 	<ul style="list-style-type: none"> - Elastomer OD sealing allows use in housings of increased roughness or with minor surface defects - Ribbed elastomer ID gives effective static sealing on the shaft surface as well as aiding installation. - The multiple excluder lips of the R50 style offer maximum contamination protection from the environment. - Suitable for speeds up to 6m/s dependent on elastomer material selection - Integral running surface means no shaft grooving and calls for no special shaft preparation requirement. 	<ul style="list-style-type: none"> - Off Road Wheel hubs - Power Take-Off units - Agricultural machinery e.g. cultivators and tillers
R51 	<ul style="list-style-type: none"> - Three piece construction (Sleeve, Inner + outer) - Ribbed elastomer Inner diameter - Ribbed elastomer/metal outer diameter - Spring-loaded primary seal lip - Radial and axial excluder lips - Integral running surface 	<ul style="list-style-type: none"> - Combination of elastomer and metal OD allows for benefit of precise location in housing whilst also accommodating use in housings of increased roughness or with minor surface defects. - Ribbed elastomer ID gives effective static sealing on the shaft surface as well as aiding installation. - The additional excluder lips offer contamination protection from the environment. - Suitable for speeds up to 9m/s dependent on elastomer material selection - Integral running surface means no shaft grooving and calls for no special shaft preparation requirement. 	<ul style="list-style-type: none"> - Wheel hubs - Power Take-Off Units - Pinions - Prop shaft - Industrial gearboxes
R52 	<ul style="list-style-type: none"> - Two piece construction (Inner + outer) - Ground metal outer diameter with sealant paint - Ribbed elastomer Inner diameter - Spring-loaded primary seal lip with hydrodynamic aid - Radial excluder lips - Integral running surface 	<ul style="list-style-type: none"> - Press fit metal OD for precise location in housing, addition of bore sealant paint helps to fill small imperfections in housing - Ribbed elastomer ID gives effective static sealing on the shaft surface as well as aiding installation. - The excluder lips offer contamination protection from the environment. - Suitable for speeds up to 12m/s dependent on elastomer material selection - Integral running surface means no shaft grooving and calls for no special shaft preparation requirement. - Hydrodynamic aid helps as a pumping aid to improve functionality of the seal, by transferring fluid away from the lip at high speeds to give a positive impact on the life of the seal. 	<ul style="list-style-type: none"> - Differential - Pinions - Transmission - Prop shaft

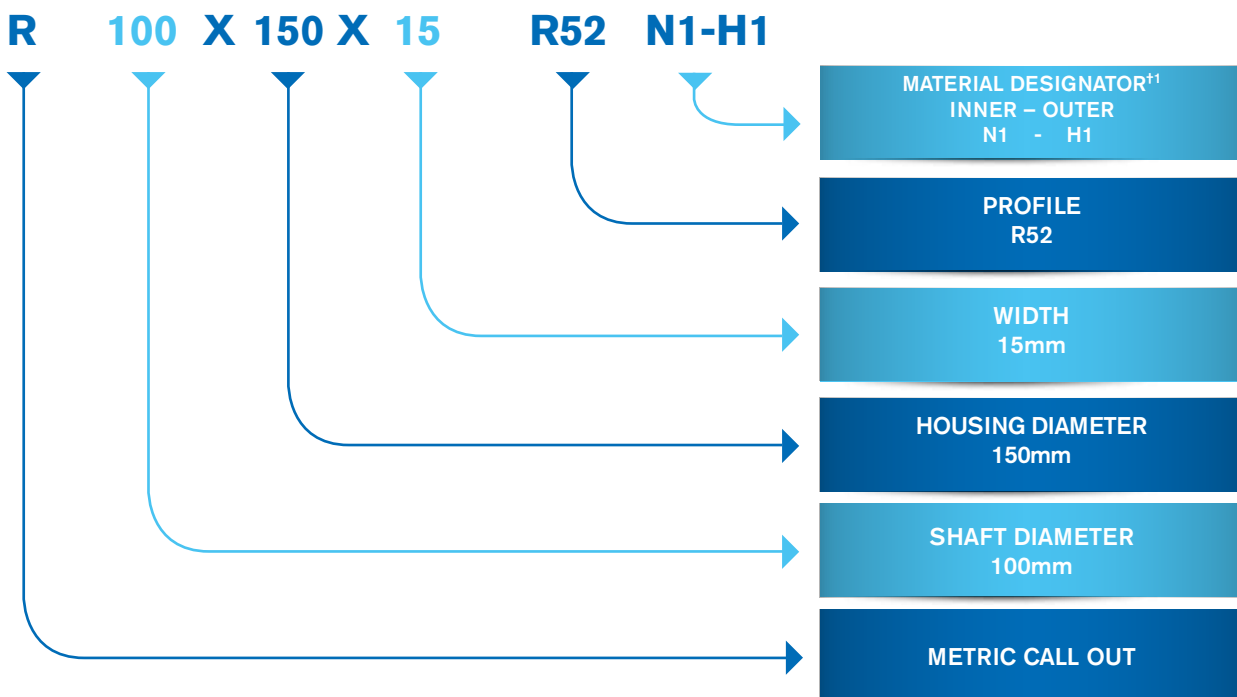
Imperial (English)



[†]Dimension rounded down to 2 decimal places then multiplied by 100

^{†1} If inner and outer components are of the same material, one compound designator is used. For two different materials separate with a dash. Inner first, followed by outer.

Metric



^{†1} If inner and outer components are of the same material, one compound designator is used. For two different materials separate with a dash. Inner first, followed by outer.

Inner and Outer Material Designator

Elastomer	Compound reference	Colour	Hardness (IRHD)	Temperature Range	Select for..	Material Designator
Nitrile rubber (NBR)	N-70-194	Black	70	-35 to +110°C	General purpose	N1
Fluorocarbon (FKM, A-type)	V-75-27	Black	75	-20 to +200°C	High temperature performance; high speed applications	F1
	V-75-50	Brown	75	-20 to +200°C		F2
Silicone (VMO)	S-80-78	Red	80	-55 to +230°C	High and very low temperature; high eccentricity	S1
Polyacrylate (ACM)	A-70-196	Black	70	-30 to +175°C	High and low temperature capabilities; good compatibility with engine oils	A1
Hydrogenated nitrile (HNBR)	H-80-40	Black	80	-40 to +180°C	Abrasion resistance; high temperatures	H1

Other materials are available on request



Technical and Installation Information

Housings

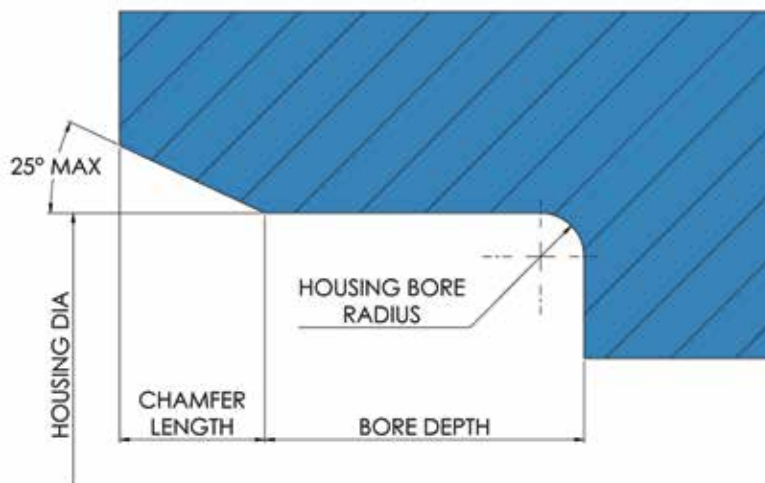
Materials

Most engineering materials can accommodate standard rotary lip seals. All steels and cast iron are suitable providing they are machined in accordance with the standards given, and there are no surface imperfections sufficient to provide a leak path. High thermal expansion materials such as light alloys and plastics are best catered for by rubber covered seals of the R21 and R23 types.

Surface Roughness, Dimensions and Tolerances

Parameter	Seals with Metal Outer Diameter	Seals with Rubber Outer Diameter
Surface Roughness (Ra)	0.2 - 0.8 μm	1.6 - 6.3 μm
Tolerance (ISO 286)	H8	H8

Housing Diameter	Length of Chamfer	Housing Bore Radius
Up to and Including 100mm (4.000")	0.70 to 1.00mm 0.028" to 0.040"	0.75mm max 0.030" max
Over 100mm (4.000")	1.20 to 1.50mm 0.047" to 0.059"	1.00mm max 0.040" max



Shafts

Materials

Most machine grades of steels are suitable as shaft material, providing they are free from flaws and surface impurities. Heat treatment is not usually necessary, but it is often recommended as a means of minimising shaft damage, which may cause substantial leakage. Certain grades of cast iron are suitable providing they are of high quality, with minimal porosity. Hard chrome plating may result in variable wear and should be avoided unless dictated by application conditions. Non-ferrous metals also produce variable performance; should corrosion resistance be required, harder grades of stainless steels are recommended.

Hardness

For optimum conditions and maximum lifetime of the seal, a shaft hardness of 45 – 60HRC is recommended (through hardened to a depth of 0.3mm). A minimum hardness of 60HRC is recommended for higher shaft speeds (>10m/s) and where ingress of abrasive contaminants/media are likely.

Method of Manufacture

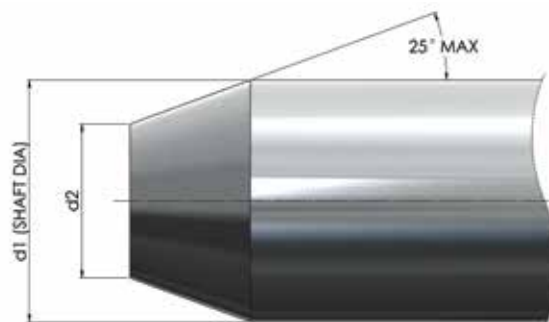
Optimum results are achieved by use of a plunge ground shaft with no lay on the shaft; to prevent oil pumping past the seal.

Surface Roughness, Dimensions and Tolerances

Parameter	Rotary Shaft Seals	PTFE Seals	Unitised Seals
Surface Roughness (Ra)	0.2 - 0.8 μm	0.2 to 0.4 μm	1.6 - 6.3 μm
Tolerance (ISO 286)	h11	h11	h8

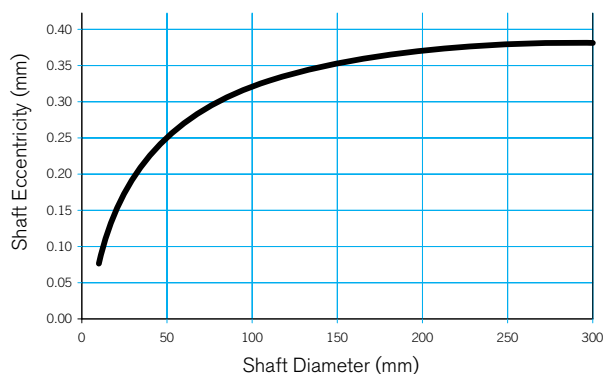
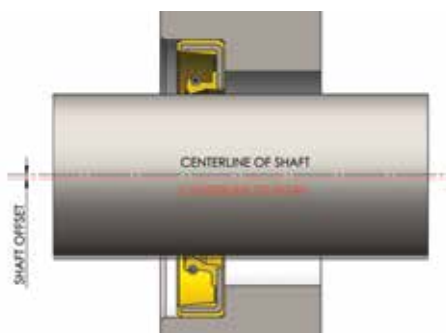
It is important to avoid too smooth and too coarse a surface finish. Too smooth a finish will create insufficient lubrication at the sealing lip, resulting in overheating and eventually cracking of the elastomer. Too coarse a finish and the seal will abrade and wear prematurely.

Lead-in Chamfers											
Shaft Diameter (mm)	0-10	10-20	20-30	30-40	40-50	50-70	70-90	90-110	110-130	130-250	250-500
d1 - d2-mm	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	7.0	11.0



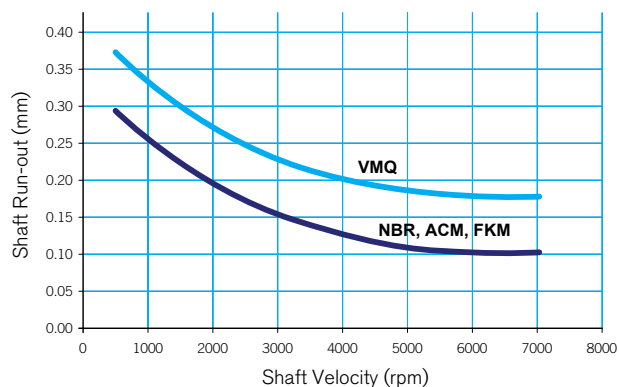
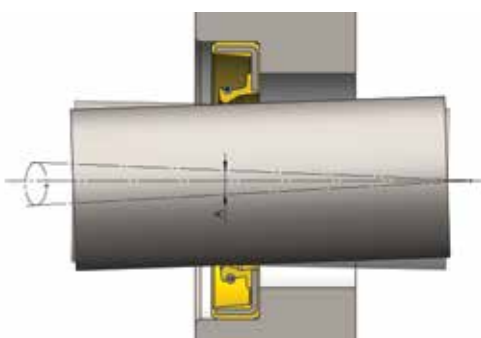
Shaft Misalignment

Eccentricity between the centre line of the shaft and the centre line of the housing bore should be kept to a minimum, if there is a large deviation between the two, a unilateral load will be applied to the sealing edge, thus creating heavier wear on one side of the seal. This will in time affect the performance and the life of the seal. For permissible values see graph.



Shaft Run-out (T.I.R.)

Shaft run-out is to be avoided as much as possible, at higher shaft surface speeds it is increasingly difficult (due to its inertia) for the sealing lip to follow the shaft if there is any run-out present. If the lip cannot follow the shaft, the edge will lift from the shaft allowing a leak path through the inside diameter of the seal. This can be kept to a minimum by locating the seal in close proximity to the bearing, permissible run-out values are shown below.



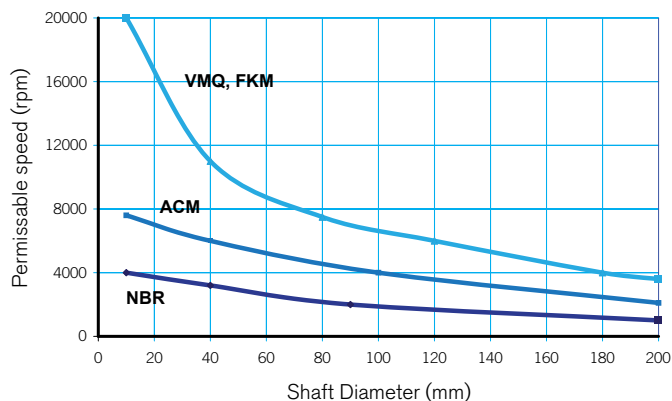


Shaft Surface Speed

The shaft surface speed (V) is defined by the number of revolutions per min (r.p.m.) and the shaft diameter (d1) this is one of the most critical inputs when selecting the type and material of a rotary shaft seal.

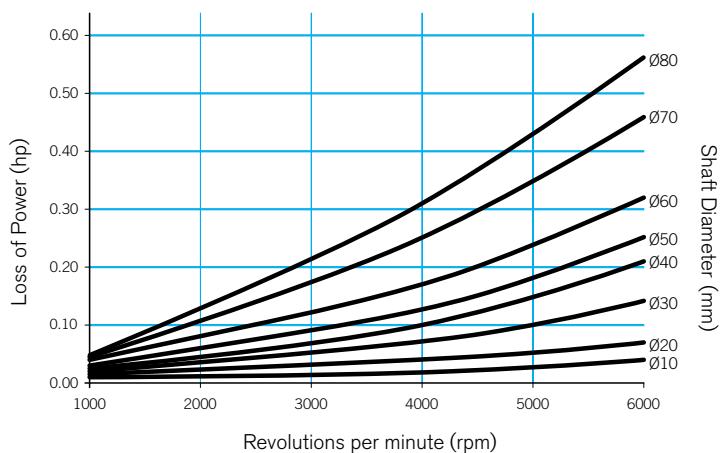
$$V \text{ (m/s)} = \frac{d1 \text{ (mm)} \times \pi \times \text{r.p.m.}}{60,000}$$

Different designs of rotary lip seals allow for different surface speeds. Below is shown approximate permissible surface speeds for R4 & R21 type seals, based on the materials NBR, ACM, FKM (FPM) & VMQ (when provided with adequate lubrication and good heat dissipation by the sealed media under no differential pressure).



Lubrication and Frictional Losses

The graph below approximates friction losses of a rotary lip seal used in standard SAE-30 oil (conducted at 100°C on a correctly prepared shaft, after a short time of running-in). The chart demonstrates the relationships between power loss, shaft diameter and shaft surface speed (V).

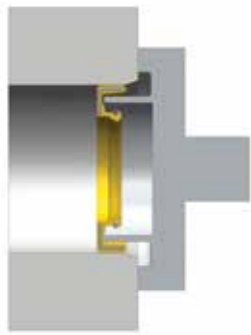


Seal Installation

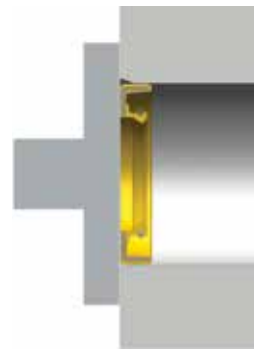
The rotary lip seal, shaft and housing must be clean prior to installation. Contaminants i.e. dirt, grit etc, which may enter the system during assembly can lead to leakage.

The inside diameter of the rotary lip seal has to be stretched during assembly, thus it is necessary that the shaft has a chamfer. The chamfer angle should be between 15 - 25°. If there is a spline present on the shaft there is a danger that the inside diameter of the seal could be damaged, resulting in immediate leakage. Therefore the sealing lip must be protected on installation by the use of a fitting sleeve.

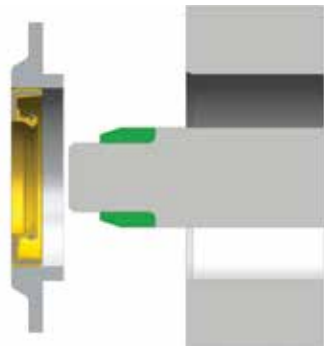
Insertion of the rotary lip seal into the housing must be done evenly; an adapted fitting tool should be used to ensure force is transferred through to the metal part of the rotary lip seal.



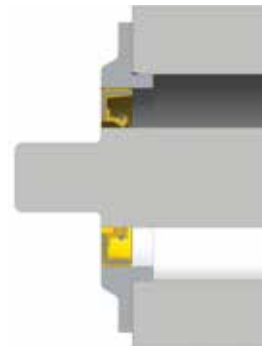
Design of tool to fit a seal partway down a bore.



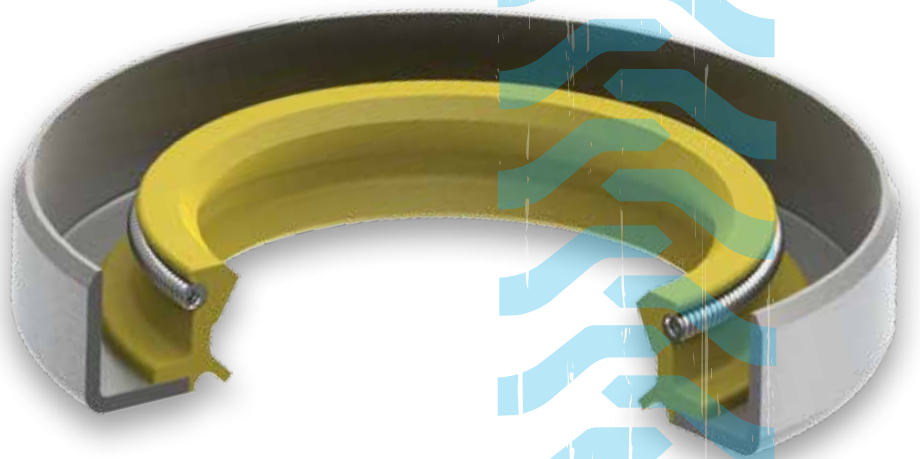
Tool designed to fit a seal flush with the housing. Plate pressed to face of housing gives square location of seal.



Use of sleeve for assembly over a sharp corner.



Use of spigot to ensure concentricity of seal to shaft.



Metal Face Seals

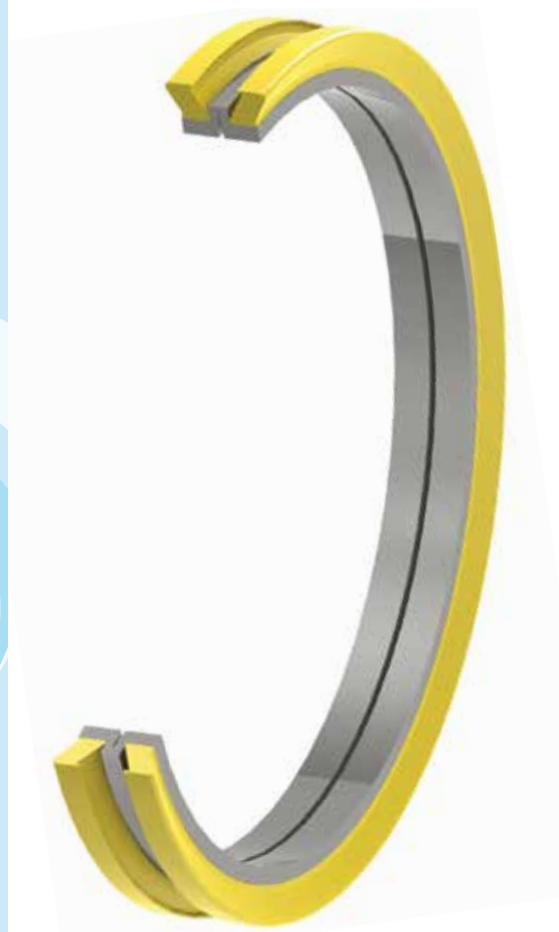
Product Overview

Pioneer Weston's range of metal face seals offer bearing protection and lubricant retention on any relatively slow-moving housing assembly. These seals are constructed from two identical, tapered metal rings, loaded using elastomer seals. Such designs excel under extreme environments, where the exclusion of contaminants such as sand, rock, mud and water is imperative, providing a robust efficient solution, with long service life and low maintenance.

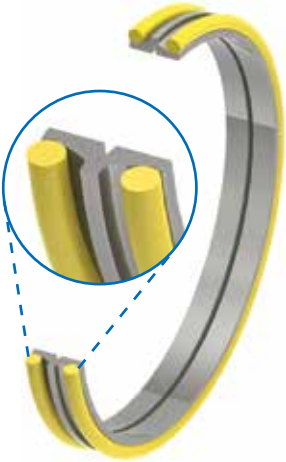
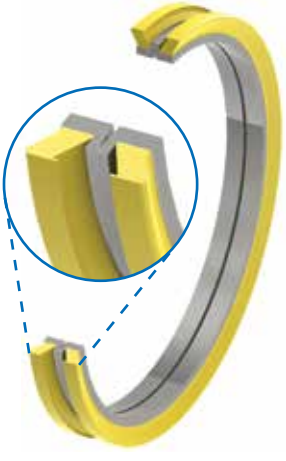
Advantages & Benefits

- Corrosion and abrasion resistant seal rings
- Special seals and load ring materials to match application requirements
- Self-centering to compensate for eccentricity or misalignment
- Cost savings from extended machinery life
- Easy to assemble and minimal maintenance
- Broad operational temperature range from -40°C to 200°C, dependent upon material selections

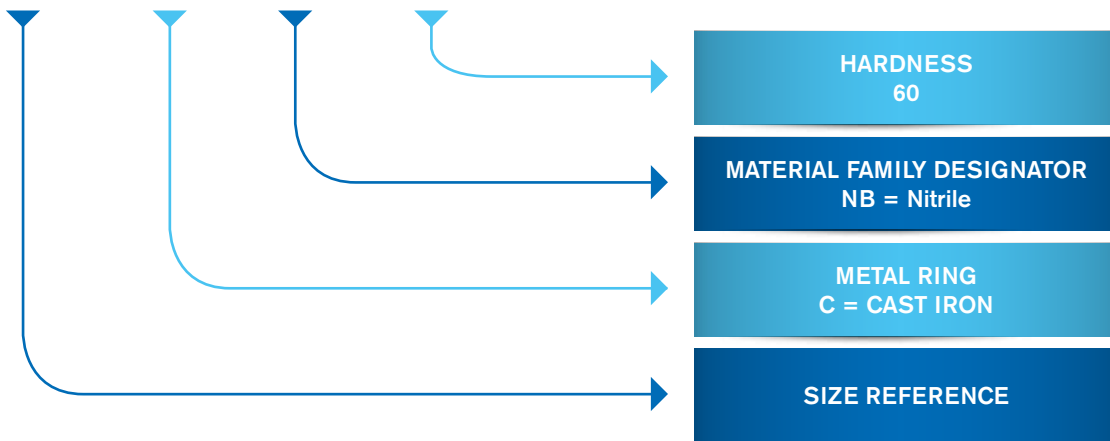
Pioneer Weston can provide a comprehensive range of sizes that are common in the market place. Non standard sizes are available on request.



Metal Face Seal Profiles

Seal Profile	Profile Features	Advantages and Benefits	Applications
5000 Series 	<ul style="list-style-type: none"> Two identical tapered metal rings with precision lapped opposing faces (One rotating and the other stationary). Elastomer O-rings 	<ul style="list-style-type: none"> The most common design of a metal face seal, available in a large range of sizes. O-rings are used as secondary sealing elements providing: static sealing on housing and ID, uniform axial pressure on metal rings, transmits torque to the rotating face. Tapered surfaces allow lubrication to get to the precision-lapped metal faces via centrifugal action 	<ul style="list-style-type: none"> Large rigid axles Rock drill bits Conveyor equipment (e.g. rollers) Mixers and grinders Road-rolling equipment Cranes Planetary gear box (speed reducer) Idler rollers for tracked vehicles Tunnelling and mining equipment
5500 Series 	<ul style="list-style-type: none"> Two identical tapered metal rings with precision lapped opposing faces (One rotating and the other stationary). Special elastomer washers 	<ul style="list-style-type: none"> Allows for simpler housing design and construction Housing is easier to machine, but more housing space is required Tapered surfaces allow lubrication to get to the precision-lapped metal faces via centrifugal action Special elastomer seals allows higher pressure capability, whilst maintaining the same functions as an O-ring. 	<ul style="list-style-type: none"> Specifically used for undercarriage applications for agricultural and construction vehicles, i.e. bulldozers, excavators Military Vehicles

AM5084 - C - NB 60



See following tables

Selection and Material Specification

Ensuring the correct material composition is paramount. Pioneer Weston can work with the customer to analyse application requirements and recommend the most suitable materials. The main factors in ensuring the correct selection are:

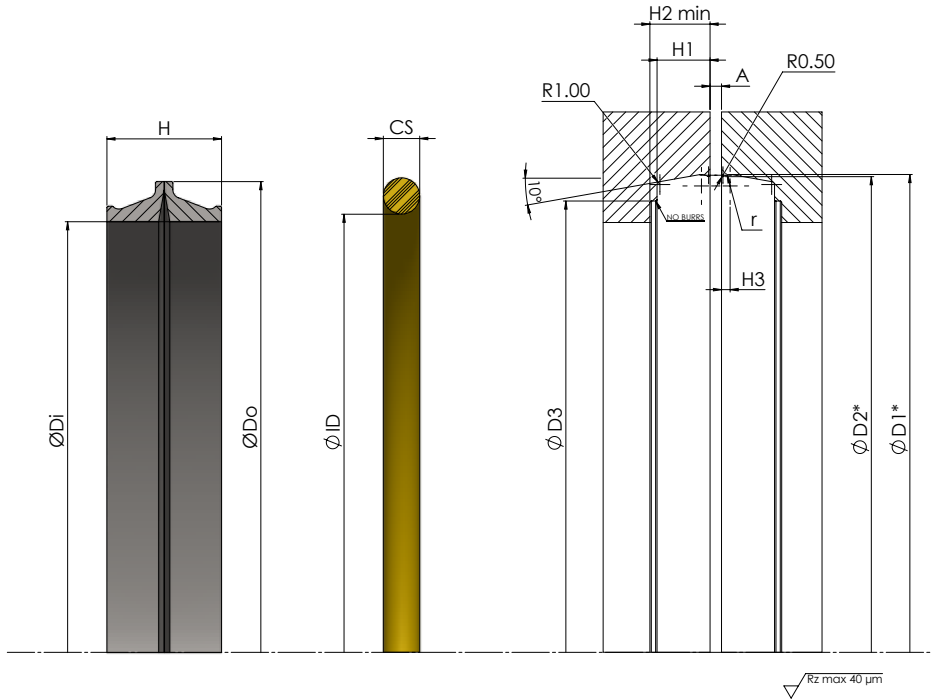
Size, temperature, speed, pressure, media

Metal Face Seals Reference

Polymer Family	Compound Reference	Colour	Hardness (IRHD)	Temperature Range	Select for..	Material Designator
Nitrile rubber (NBR)	N-60-214	Black	60	-35 to +110°C	General purpose	NB
	N-60-148	Black	60	-60 to +110°C	Low temperature, with a degree of resistance to lubricants	LTNB
Fluorocarbon (FKM, A-type)	V-60-190	Black	60	-20 to +200°C	High temperatures, good lubricant resistance.	FKM
Fluorocarbon (FKM, GLT-type)	V-60-181	Black	60	-40 to +200°C		LTF
Silicone (VMQ)	S-60-184	Red	60	-55 to +230°C	High and very low temperatures	VMQ
Hydrogenated nitrile (HNBR)	H-60-123	Green	60	-40 to +180°C	Abrasion resistance; high temperatures	HN

Metal Ring Designator	Metal Type	Description
F	Forged roller bearing steel	<ul style="list-style-type: none"> ■ General purpose ■ Hardness >58 HRc ■ Circumferential speed ≤ 2.0m/s ■ Pressure ≤ 1.5 bar
C	Cast iron	<ul style="list-style-type: none"> ■ Enhanced corrosion and abrasion resistance ■ Hardness 65-72 HRc ■ Circumferential speed ≤ 3.0m/s ■ Pressure ≤ 2.0 bar
X	Cast alloy	<ul style="list-style-type: none"> ■ Superior corrosion and abrasion resistance ■ Hardness 68-72 HRc ■ Circumferential speed ≤ 4.0m/s ■ Pressure ≤ 2.5 bar

5000 Series Specification



Part No.	Seal Set				O-Ring		Housing Dimensions							
	A (+/-0.5)	ØDi	ØDo	H	ID	CS	ØD1*	ØD2*	ØD3	H1	H2 min	H3	r	+/- Tol for *
AM5000	3	38	51	20	41	6	53.7	53	46	9	11	1.8	2	0.1
AM5001	3	38	51	20	40	6.7	53.7	53	46	10	11.5	1.8	2	0.1
AM5002	3	45	58	21	48	6.1	61.6	60.8	53.4	10	12	1.8	2.5	0.1
AM5003	3	46	59	20	47.5	6.5	62.5	61.8	56	8.5	10.5	1.8	2	0.1
AM5004	3	48	62.15	25	50	7.5	68	67.2	58	12	14	2	3	0.1
AM5005	3	55.5	70	22	58	7.5	73.8	73.1	65.5	10	11.5	2.4	5	0.1
AM5006	3	55.5	70	22	58	8	74.8	74.1	65.5	10	11.5	2.4	5	0.1
AM5007	3	60.2	73	20	60	6.5	76.5	75.8	69	8.5	10.5	1.8	2	0.1
AM5008	1	87.5	77.5	14	78	4.3	90.7	90.2	85.5	7	8	1.5	1.5	0.1
AM5009	3	63	80.5	26	66	8	84	83.2	72	11.5	13	2.5	5	0.1
AM5010	3	63.5	82.4	32	66	9.5	87	86	74.5	14.5	17.5	2.8	5	0.1
AM5011	3	64	78	25	66	8.2	84.6	83.8	74	12.5	14.5	2	3	0.1
AM5012	3	67	80	20	68.5	6.5	83.4	82.7	76.8	8.5	10.5	1.8	2	0.1
AM5013	3	67.5	86.5	31.8	71	9.5	91	90	78	14.5	17	2.8	5	0.15
AM5014	3	68	89	24	75	8	92.5	91.5	83	11	13.5	2.8	5	0.1
AM5015	3	71	84	20	72.5	6.5	87.4	86.7	80.8	8.5	10.5	1.8	2	0.1
AM5016	3	71.5	91	29	75	9	95.2	94.2	81	12.6	15	2.8	5	0.15
AM5017	3	73	92	32	75.7	9.5	96.5	95.5	84	14.5	17.5	2.8	5	0.15
AM5018	1	77.5	88.5	15	78	4.3	90.7	90.2	85.5	7	8	1.5	1.5	0.1
AM5019	3	79	100	30	85	9.5	105.2	104.2	92	15	17	2.5	3	0.2
AM5020	3	79.5	92.5	20	81	6.5	96	95.3	88	8.5	10.5	1.8	2	0.1
AM5021	3	80	100	29	83	9	104	103.2	92	14.5	16.5	2	3	0.1
AM5022	3	81	98	28	82	8	102.3	101.3	91	12.5	14.5	2.8	5	0.1

All dimensions in mm

Continued overleaf

5000 Series Specification

Part No.	Seal Set				O-Ring		Housing Dimensions							
	A (+/-0.5)	ØDi	ØDo	H	ID	CS	ØD1*	ØD2*	ØD3	H1	H2 min	H3	r	+/- Tol for *
AM5023	3	83	102	28	87	8.5	105.5	104.5	94	12.5	15	2.8	5	0.1
AM5024	3	88	108	24	93	8	111.5	110.5	102	11	13.5	2.8	5	0.1
AM5025	3	90.5	104.5	26	93	6.3	107.4	106.6	100.4	11.8	14.2	2.9	2.8	0.1
AM5026	3	90.5	109.5	32	93.2	9.5	114	113	101.5	14.5	17.5	2.8	5	0.15
AM5027	3	95	111	24	99	7.7	115.6	114.8	108	11	12.5	1.8	2	0.1
AM5028	3	99	120	28	105	8.5	123.5	122.5	112	12.5	14.5	2.8	5	0.1
AM5029	3	100	119	32	102.8	9.5	123.5	122.5	111	14.5	17.5	2.8	5	0.15
AM5030	3	103	117	20	105	6.5	119.8	119	112.5	9	11	1.8	2	0.1
AM5031	3	104	125	28	110	8.5	128.5	127.5	117	12.5	14	2.8	5	0.1
AM5032	3	107	125	24	110	8.5	130.4	129.4	119.5	11	13.5	2.8	5	0.1
AM5033	3	107	125	24	110	7.7	128.6	127.6	119.5	11	13.5	2.8	5	0.1
AM5034	3	110	128	32	113	9.2	133	132	121	15	17	2.5	3	0.1
AM5035	3	114.5	129	21	117	7	134.1	133.1	126	9.2	10	2.3	3	0.1
AM5036	3	117	140	29	124	8.7	142.5	141.5	132	13	14	2.8	5	0.15
AM5037	3	118.5	139.5	28	124	8.5	143	142	131.5	12.5	15	2.8	5	0.1
AM5038	4	120	142	38	122	11.3	149	148	133	17	19	2.5	3	0.1
AM5039	3	120	138	32	122.5	8.4	142.5	141.5	132	14.5	17	2.8	5	0.1
AM5040	3	120	139	31.8	123.5	9.5	143.8	142.8	132	14.5	17	2.8	5	0.15
AM5041	3	120	138	32	124.3	9	143	142	132	14.5	17	2.8	5	0.15
AM5042	3	125	144	31.8	128.5	9.5	148.5	147.5	136	14.5	17	2.8	5	0.15
AM5043	3	127	146	31	130	9.5	150.2	149.4	137	14.5	16.5	2.6	5	0.15
AM5044	3	127	140.7	25	130	6	144	143.2	135	12.7	15.2	2.7	2.8	0.1
AM5045	3	127	146	32	130	9.5	150.5	149.5	138	14.5	17.5	2.8	5	0.15
AM5046	3	127	141	29	130	6	144	143	136	12	14.5	2.3	3	0.1
AM5047	3	127	141	29	125	8.3	148	147	138	13	15.5	2.8	5	0.1
AM5048	3	127	141	29	124.3	9	148.2	147.2	135	13.2	15.5	2.8	5	0.15
AM5049	3	135.5	154.5	28	139	8.3	158.3	157.3	146.5	12.5	14	2.8	5	0.15
AM5050	4	143	156.6	25	144	7	159.7	158.9	152	11.5	13.5	2.5	3	0.1
AM5051	3	143	160	27	145.7	8.3	164	163	154	12	14.5	2.8	5	0.1
AM5052	3	143	157	27	145	6.3	160	159	152	12	14.5	2.3	3	0.1
AM5053	3	146	172	38	147	12.7	177	176	159	18	20.5	3.1	6.5	0.2
AM5054	4	150	172	40	151	11.2	179	178	165	18	20	2.5	3	0.1
AM5055	3	150	167	28	153.8	8.5	171	170	160	13	15.5	2.8	5	0.1
AM5056	3	153	171.5	28	157	8.3	176.3	175.3	164.5	12.5	14.5	2.8	5	0.1
AM5057	3	154	170	21	158.1	7	175.1	174.1	167	9.2	11	2.3	3	0.1
AM5058	3	154	169	22	158.1	7	174.5	173.5	166	9.5	11	2.3	3	0.1
AM5059	3	154	168	27	150	6.5	170.8	169.8	163	12	14.5	2.3	3	0.1
AM5060	3	154	169	22	158.1	7	174.5	173.5	166	9.2	11	2.3	3	0.1
AM5061	3	154	168	27	158	6	171	170	162.5	12	14.5	2.3	3	0.1
AM5062	3	154	168	27	150	6.5	171	170	163	12	14.5	2.3	3	0.1
AM5063	3	154	173.5	32	155	9.65	178	177	166	14.5	17	2.8	5	0.15
AM5064	3	155	168	27	158	6	170.8	169.8	163	12	14.5	2.3	3	0.1
AM5065	3	163	191.5	38	166	12.7	196.5	195.5	178.5	18	20.5	3.1	6.5	0.2
AM5066	3	164	189	30	170	9.5	193.5	192.5	179	14.5	17	2.8	5	0.15
AM5067	3	165	180.5	27	170	7	185	184	176.5	12	14.5	2.3	3	0.1
AM5068	3	165	181	27	170	7	185	184	176.5	12	14.5	2.3	3	0.1
AM5069	3	171.3	185.3	20	172	6	188	187.3	180	9	11	1.8	2	0.1
AM5070	3	172	194.4	31.8	175	9.5	198.53	197.92	186	14.5	16.5	2.8	2.8	0.2
AM5071	3	176	195	28	182	8.3	199.8	198.8	188	12.5	14.5	2.8	5	0.1
AM5072	3	177	200	30	184	9.5	204.5	203.5	191	14.5	17	2.8	5	0.15
AM5073	3	177	200	30	184	9.5	204.5	203.5	191	14.5	17	2.8	5	0.15
AM5074	4	178	205	38	178	12.7	210.6	209.6	192	19	21	3	4	0.1
AM5075	6.5	178	199	32	184	9.5	203.6	202.6	190	14.5	17	2.8	5	0.15
AM5076	7	182	210.5	38	185	12.7	215.5	214.5	197.5	18	20.5	3.1	6.5	0.2
AM5077	3	191	210	28	190	8.5	214	213	203	12.5	14.5	2.8	5	0.1
AM5078	3	192	209	30	190	9.5	213.5	212.5	200	14.5	17	2.8	5	0.15
AM5079	6	195	216.5	31.8	198	9.5	221	220	207	14.5	17	2.8	5	0.15
AM5080	3	200	228.5	38	205.5	13	233.5	232.5	215.5	18	20.5	3.1	6.5	0.2
AM5081	3	205	227	30	210	9.5	231.5	230.5	219	14.5	17	2.8	5	0.15

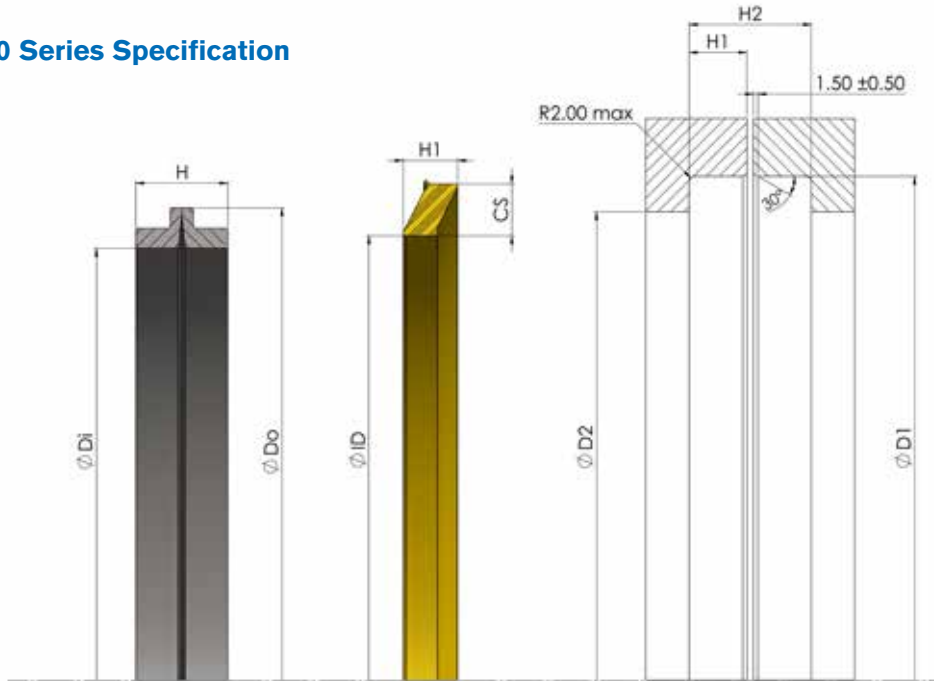
All dimensions in mm

5000 Series Specification

Part No.	Seal Set				O-Ring		Housing Dimensions							
	A (+/-0.5)	ØDi	ØDo	H	ID	CS	ØD1*	ØD2*	ØD3	H1	H2 min	H3	r	+/- Tol for *
AM5082	3	205	227	30	210	9.5	231.5	230.5	219	14.5	17	2.8	5	0.15
AM5083	3	205	227	30	210	10	231.5	230.5	219	14.5	17	2.8	5	0.15
AM5084	3	208.7	222.8	26	208	6.2	225.4	224.4	217	11.5	13.5	2.2	2.5	0.1
AM5085	3	216	237	30	218	9.5	241.5	240.5	229	14.5	17	2.8	5	0.15
AM5086	3	220	241.4	25	226	7.7	244.7	244	233.5	11	13.5	2.2	4	0.1
AM5087	3	220	239.5	31.8	224	9.5	244	243	232	14.5	16.5	2.8	5	0.15
AM5088	3	223	251.5	38	226	12.7	256.5	255.5	238.5	18	20.5	3.1	6.5	0.2
AM5089	3	238	261	31.8	245	9.5	265.5	264.5	254	14.5	17	2.8	5	0.15
AM5090	3	240	262.8	38	243	13	273.5	272.5	255.5	18	20.5	3.1	6.5	0.2
AM5091	3	242	262.8	40	243	13	273.5	272.5	255.5	18	20.5	3.1	6.5	0.2
AM5092	3	250	270	30	250	9.5	274.4	273.7	262	14	15.5	2.8	5	0.2
AM5093	3	252	280.5	38	255	12.7	285.5	284.5	267.5	18	20.5	3.1	6.5	0.2
AM5094	3	265	293	38	268	12.7	298	297	280	18	20.5	3.1	6.5	0.2
AM5095	3	275	303	38	278	12.7	308	307	290	18	20.5	3.1	6.5	0.2
AM5096	4	300	328	38	300	12.7	333	332	315	19.5	22	3	4	0.2
AM5097	3	300	324.65	38	305	12.7	335.5	334.5	318	17.5	20.5	3.1	6.5	0.2
AM5098	3	300	325	38	305	12.7	336.5	335.5	318	17.5	20.5	3.1	6.5	0.2
AM5099	3	318	341	38	315	12.7	351.5	350.5	334	17.5	20.5	3.1	6.5	0.2
AM5100	3	318	346	38	315	12.7	351.5	350.5	334	18	20.5	3.1	6.5	0.2
AM5101	3	318	346	40	320	12.7	351.6	350.7	333.7	18.4	24.1	3.7	6.3	0.13
AM5102	3	350	375	38	355	12.7	385.5	384.5	368	17.5	20.5	3.1	6.5	0.2
AM5103	3	355	375	38	355	12.7	385.5	384.5	368	17.5	20.5	3.1	6.5	0.2
AM5104	3	366	394.4	38	359.5	12.7	399.5	398.6	381	17.5	20.5	3	6.5	0.2
AM5105	6	366	394.4	40	359.5	12.7	399.5	398.6	381	17.5	20.5	3	6.5	0.2
AM5106	3	370	398	38	370	12.7	403.5	402.6	385	17.5	20.5	3	6.5	0.2
AM5107	3	388	415	38	385	12.7	420.3	419.4	402	17.5	20.5	3	6.5	0.25
AM5108	3	388	416.2	38	385	12.7	421.6	420.7	402	17.5	20.5	3	6.5	0.25
AM5109	3	430	457	38	420	12.7	462.3	461.3	444	17.5	20.5	3	6.5	0.25
AM5110	3	430	459.2	38	420	12.7	464.5	463.5	444	17.5	20.5	3	6.5	0.25
AM5111	3	450	480	50	454	16	492.2	490.2	470	23.5	25.5	4	6	0.4
AM5112	3	465	495	43.6	460	12.7	500.7	498.5	482.9	21.2	22.9	4.7	7	0.25
AM5113	3	465	497.2	43.6	460	12.7	503.1	500.9	482.9	21.2	23	4.7	7	0.25
AM5114	3	470	500	50	474	16	512.2	510.2	490	23.5	25.5	4	6	0.4
AM5115	6	505	533.4	43.6	493	12.7	538.4	537.4	521	19.7	21.7	4	6.5	0.25
AM5116	3	505	535.8	43.6	493	12.7	541.8	539.7	521	19.7	21.7	4.2	6.5	0.25
AM5117	3	530	560	50	530	16	572.2	570.2	545	23.5	25.5	4	6	0.4
AM5118	6	538	566.8	43.6	535	12.7	572.2	571.2	554	19.7	21.7	4	6.5	0.25
AM5119	3	559	590	50	560	16	602.2	600.2	575	23.5	25.5	4	6	0.4
AM5120	6	576	608	43.6	582	12.7	613	612	596	19.7	21.7	4	6.5	0.25
AM5121	6	581.5	608	43.6	582	12.7	613	612	596	19.7	21.7	4	6.5	0.25
AM5122	5.25	591	623	50	595	16	635.2	633.2	613	23.5	25.5	4	6	0.4
AM5123	5.25	596	628	50	595	16	640.2	638.2	618	23.5	25.5	4	6	0.4
AM5124	13	660	695	53	660	16	704	702	680	20	22.5	4	6	0.4
AM5125	9	667	700	43.6	660	12.7	705.6	704.3	687	21.3	24	3.7	6.3	0.25
AM5126	6	667	700	50	660	12.7	705.6	704.7	687.7	21.3	26.2	3.7	6.3	0.13
AM5127	3	718	750	50	722	16	762.2	760.2	740	23.5	25.5	4	6	0.4
AM5128	17	770	826	80	780	20.5	831.9	830.9	800	34.5	39.5	4.4	10	0.4
AM5129	17	780	836	80	790	20.5	841.9	840.9	810	34.5	39.5	4.4	10	0.4
AM5130	12	817	865	46.6	830	12.7	870.6	869.7	852.7	21.3	26.2	3.8	6.3	0.13
AM5131	11	825	865.3	48	819	12.7	870.56	869.67	852.68	18.4	23.3	3.7	6.3	0.13
AM5132	17	834	886	80	840	20.5	891.9	890.9	860	34.5	39.5	4.5	10	0.4
AM5133	6	832	865	43.6	830	12.7	870.6	869.7	852.7	21.3	26.2	3.8	6.3	0.13
AM5134	12	832	865	46.6	830	12.7	870.6	869.7	852.7	21.3	26.2	3.8	6.3	0.13
AM5135	16	902	941	60	897	16.25	946.3	945.2	922.4	23.8	25.2	4.65	8	0.4
AM5136	17	920	976	80	930	20.5	981.9	980.9	950	34.5	39.5	4.4	10	0.4
AM5137	17	1030	1085	80	1020	20.5	1090.9	1089.9	1058	34.5	39.5	4.4	10	0.4
AM5138	17	1044	1105	80	1050	20.5	1110.9	1109.9	1078	34.5	39.5	4.4	10	0.4
AM5139	26	1175	1236	80	1170	20.5	1241.9	1240.4	1209	32.5	37.5	4.4	10	0.4
AM5140	26	1372	1425	80	1350	20.5	1430.9	1429.9	1398	32.5	37.5	4.4	10	0.4

All dimensions in mm

5500 Series Specification



Part No.	Seal Set			Washer			Housing Dimensions			
	ØDi	ØDo	H	ID	CS	H1	ØD1	ØD2	H1	H2
AM5500	48.5	62.5	25.6	52	11.2	10.3	76.26	62.86	10.57	22.66
AM5501	56	76	21	60.5	10.5	10.25	82.55	70.08	10.62	22.86
AM5502	60	80	24	65.5	9.4	13.2	85	70	10.5	28
AM5503	73.5	93	20	80	10.2	10.8	102.35	88.4	10.8	23.3
AM5504	76	90	17	80.5	6.25	8.5	95	83	8	18
AM5505	88	104	18	92	9.5	9.5	113	98	8	20
AM5506	94	120	25	99.5	12.5	12.7	125.81	109.12	12.98	27.84
AM5507	115	141	28	120.5	14.7	15.3	152.4	131.4	15.88	33.53
AM5508	132	158	31	138	15.4	14.7	171.45	151.8	15.4	34
AM5509	142.5	161	24	147	11.7	12.9	173	139.7	11.1	27.7
AM5510	148	172	29	154.5	13.5	15	184.5	164.7	16.51	34.7
AM5511	177	197	22	179	11	10.75	204.77	190.5	10.67	22.86
AM5512	201	238	36	210	20.7	20.3	254	235.5	21.2	44.45
AM5513	213.5	238	27.4	219	16	15	254	203.2	13.72	32
AM5514	235.7	265	30	244.5	12.75	14.6	273.05	230	15.62	33.77
AM5515	239	264	34	244.5	15.8	16	279.4	261.87	17.45	36.5
AM5516	283	319	34	290	17.7	16.7	329.4	307.34	18.54	39.12
AM5517	319	353	36	322	17.7	17.8	365.12	343.7	20.02	42.06
AM5518	354	392	38	362	18	20.5	401.75	380.6	23.01	47.62
AM5519	48.75	62.5	22	53	11.25	11.5	76.25	62.86	10.57	22.66
AM5520	84.25	106	26	90	11.1	11.4	114.3	97.36	12.06	25.81
AM5521	104	126	26	112	10.5	12.2	135.08	118	11.8	27.8
AM5522	124	143	34	128	15.5	18.7	162.56	141.8	18.34	38.74
AM5523	167.25	192.5	34	174	15.1	14.6	206.25	191.9	15.19	32.13
AM5524	194	222	34	200	18	18.9	238.76	214.15	20.14	42.06
AM5525	238.5	256	22	240	12.95	12	269.88	256	10.67	22.86
AM5526	239	264	38	244.5	15.8	16	279.4	261.87	17.45	36.5
AM5527	256.25	282	35	262	13.4	13.8	292.1	276.23	15.62	32.77
AM5528	354.5	392	42	362	18	20.5	401.75	380.6	23.01	47.62
AM5529	378.25	414	42	384	18	21	424.05	402.9	23.01	47.62
AM5530	441.25	478	42	447	17.25	16.7	488.7	467.4	18.39	38.89
AM5531	500	534	42	503	18.1	18	546.1	532.13	19.91	41.66
AM5532	617.25	670	52	620	26.5	23.5	682.5	649	25.86	53.98

All dimensions in mm

Installation and Maintenance

Installation Method

1. Ensure that the inside of the housing is clean, free of burrs, scratches and dust. The load ring must be correctly fitted on the seal and be free from distortion (see Figure A).
2. Install the seal with load ring in the housing (Figure B). At this time, confirm that the end of the housing (1) will be parallel to the lapped surface of the seal (2). If the seal becomes out of alignment, even partially (Figure C) the seal shall have abnormal wear the o-ring will become distorted and will eventually fail prematurely.
3. After insertion, make sure that the precision lapped surfaces are absolutely free of foreign matter, then lightly apply lubricant oil to the mating surfaces. Upon completion of the seal installation, reassemble the housings to the correct setting gap (see below) and fill with lubricating oil.

When properly installed, the two mated metal surfaces seal against each other, a thin film of lubrication between these two surfaces minimises wear, and the load rings provide pressure to ensure positive sealing.

Figure A



Setting gap

The setting gap (A) determines the amount of axial pressure on the sealing faces and the compression applied to the elastomeric rings. Pioneer Weston seals are designed so a setting gap A of 3.0-0.5mm will provide adequate sealing force for the majority of applications. However if the seals are required to work at a continuous high peripheral speed the setting gap should be adjusted in order to prevent an excessive loading of the lubricating oil.

This will reduce surface pressures and can be done by increasing the setting gap A. In this case tests should be conducted to find the most suitable setting.

Lubrication

Correct installation will count for very little if the lubrication regime is overlooked or incorrectly administered. The seals will have a far greater operating life when provided with good lubricating and heat dissipating qualities when oil is used as opposed to grease.

Oil

Transmission oils, grade SAE 80 and SAE 90 are recommended. If necessary, lower viscosity lubricants such as engine oil 20W 20 can also be used. In cases where hydraulic fluids / Bio-oils are to be used, please contact Pioneer Weston direct for advice. The oil level should be between the axis centre line and 2/3 of the seal diameter. When filled to the correct level, the oil will generally suffice for the lifetime of the seal.

Grease

Although grease can be used as a lubricator it is not recommended due to the fact it will not centrifuge to the wedge gaps in the seal faces during dynamic conditions. If grease is used it will result in higher wear, shorter lifetime and can only run at slower sliding speeds.

The seal should, on no account, be regreased with a grease gun, as the high pressure of the gun can dislodge the o-rings and ultimately destroy them.

Figure B



Figure C



Weston Mechanical Seals

If speed, pressure and the working environment are above the norm then a Weston bespoke sealing arrangement could be the solution.

Pioneer Weston's expertise in face seal technology is built on a foundation of materials and production capability, combined with design and development expertise gained over the last 80 years. These skills converge to offer a product range that is engineered to the highest quality levels, utilising premium materials technology for optimal performance. Pioneer Weston's professional engineers collaborate with customers, providing reliable sealing solutions.

Features

- Extremely flat precision lapped faces pressed together creating a primary seal. One rotating with the shaft and one stationary within a housing.
- Secondary seal (elastomeric compound or gasket material)
- Mechanical loading device (e.g. spring)
- Balanced sealing arrangement

Advantages / Benefits

- Contamination exclusion and media retention is achieved via precision lapped faces.
- Maximum seal life is achieved by the balanced sealing arrangement, controlling closing force, reducing wear and temperature.
- Improved shock load resistance from balanced seals arrangements preventing separation of mating faces.
- Face seal arrangements can cope better than Labyrinth type arrangements with higher pressures and more aggressive environments.
- Weston Mechanical Seals can be fully submerged unlike Labyrinth seals, which generally only operate in splash environments.

Applications

- Industrial gearboxes
- Longwall mining equipment
- Power Take Off units used on specialist tractor applications

Common face combinations are as follows

Material Combinations	Select for...
Phosphor Bronze Vs Carbon	Good in aqueous solutions
Stellite® face Vs Carbon	Good for grease/oil applications on large diameters
Carbon Vs Hardened Steel	General and cost effective combination, not suitable for water sealing applications
Silicon Carbide Vs Silicon Carbide	Special arrangements at higher speeds/ pressures and more aggressive environments



Case Study

Summary

Industry

Agricultural machinery

Application

Power take-off unit for rice field cultivation



“Paddi” Seals

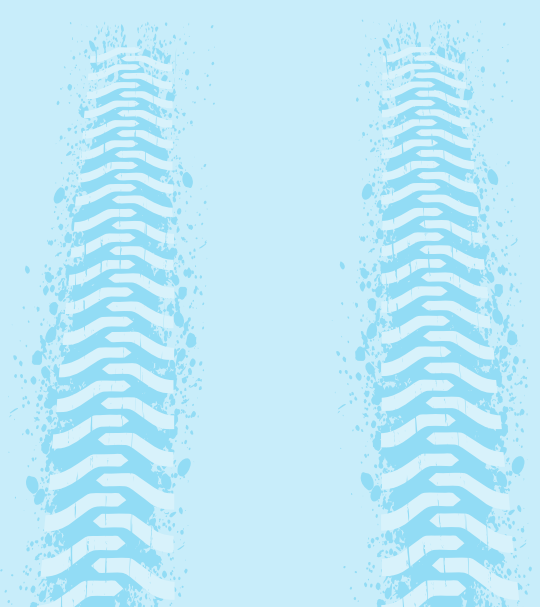
Paddy fields are a particularly hostile environment for seals: axles and Power Take-Off Units (PTO) are typically running in an aggressive rice water medium.

Even with multiple wiper lips, elastomer seals may not be able to achieve a satisfactory lifespan, and with the slightest oil leakage potentially ruining the crop, a tougher and more effective sealing solution was required.

Outcome

To combat these conditions, Pioneer Weston designed “Paddi” Seals which are unitised mechanical face seals that can withstand the harshest conditions. These seals do not wear the shaft and with rubber OD and ID are simple to install.

A further benefit of these seals is that they can tolerate greater radial displacement than standard rotary lip seals or elastomeric Unitised seal arrangements.



Case Study

Summary

Industry Agricultural machinery

Application Rear Axle hub Seal

Unitised sealing arrangement

Pioneer Weston were approached by a leading tractor manufacturer, concerning an issue with a competitors seal used on their rear axle application. The seal in question was failing prematurely and was causing a number of warranty claims. The customer was using an NBR standard rotary lip seal initially and then moved to an FKM material, but was still experiencing excessive heat and failure in application.

On inspection of one of the failed seals, it became clear to see that it was not the seal that was generating heat and contributing to failure. Due to the severe slurry-filled environment, the standard lip seal arrangement was allowing ingress, resulting in excessive wear to the main sealing lip and heavy grooving to the shaft. The change to FKM did not alleviate this problem as there was still ingress due to the profile selection. It was quite clear that the customer needed a new design.



Outcome

Pioneer Weston chose the R50 unitised seal due to its robust design and superior contaminant preventative wiper arrangement. This helped to solve the customers issues in service and eliminate warranty issues.



Case Study

Summary

Industry
Application

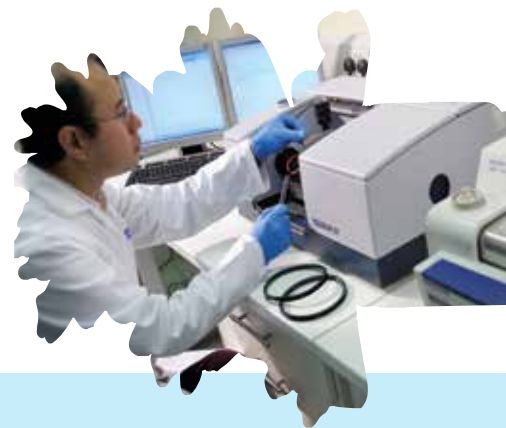
Mining
Continuous Miners



Tough Legislation

New legislation has recently been introduced in the USA that requires a drastic reduction in dust levels. As a result, equipment manufacturers have had to introduce water jets directed at the Continuous Miners' drill bits as they operate.

Although this has proved effective in reducing the amount of dust in the atmosphere, it is not an entirely successful solution as it can also result in water entering the cutter head, which then causes corrosion, possible premature machine failure, and lost production. One manufacturer of the Continuous Miners contacted Pioneer Weston to engineer a custom sealing solution.



Outcome

Following a meeting to view the application and discuss a possible specification for the seal, Pioneer Weston went on to design and manufacture a prototype rotary joint for evaluation under normal operating conditions in a mine. The prototype performed well and, following a further engineer's visit, a final specification with only minor adjustments from the prototype was drawn up, and the new

joint went into production allowing the customer to meet the new legislation and still maintain their exceptional equipment reliability levels.

O-ring

Product Overview

The most common type of static seal is the flexible elastomer O-ring. O-rings provide an affordable seal that in most cases are simple to install and subject to correct material selection, give acceptable life between maintenance checks.

Available in a variety of materials to suit every sealing application, fully moulded O-rings are manufactured to several international sizes standards, including BS1806, BS4518, AS568 and ISO 3601. Alternatively non-standard custom sizes, up to 2.5m (8ft) diameter can be produced to specific requirements.

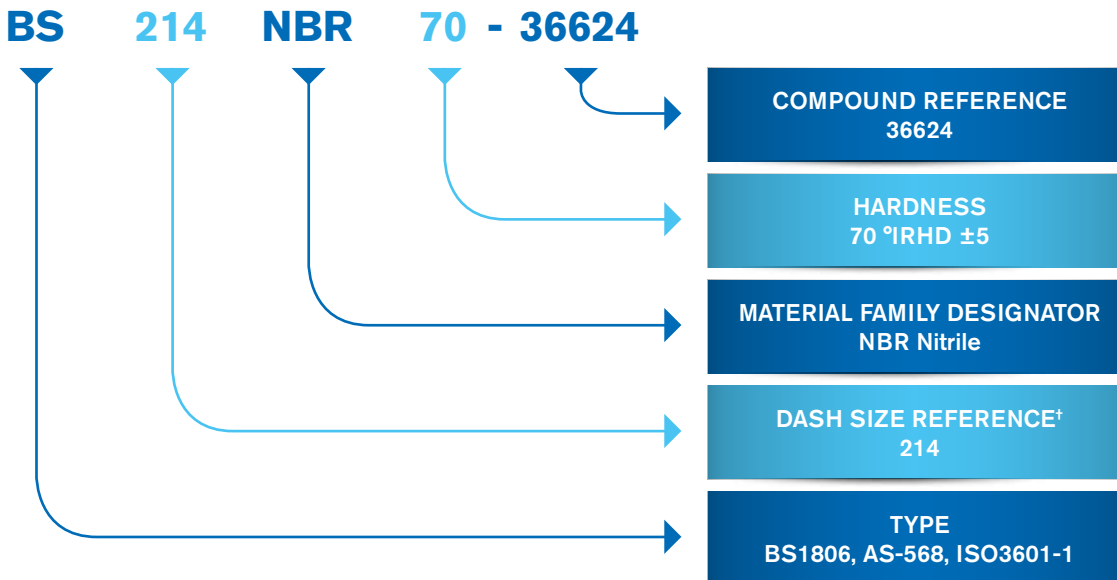


O-ring Standard Compounds

Elastomer	Colour	Hardness (IRHD)	Temperature Range	Select for..	Compound Reference	Material Family Designator
Nitrile rubber (NBR)	Black	70	-30 to +120°C	Standard compound with good compression set values. Medium acrylonitrile content for use with hydraulic oils, alcohols, water, air, fuels and many other fluids.	36624	NBR
Fluorocarbon (FKM, A-type)	Black	75	-20 to +200°C	General purpose compound with very low compression set characteristics at high temperatures. Chemically resistant to oils, greases and fuels.	51414	FPM
Silicone (VMQ)	Red	70	-60 to +220°C	High and very low temperature	714177	SIL
Polyacrylate (ACM)	Black	70	-10 to +150°C	High and low temperature capabilities; good compatibility with engine oils	335001	ACM
Polychloroprene (CR, Neoprene)	Black	70	-35 to +110°C	Good ageing characteristics in ozone and weather environments, along with abrasion and flex-cracking resistance. Offers resistance to fluorine-based refrigerants.	32906	CR
Polyurethane (AU)	Black	70	-40 to +95°C	Standard compound offering excellent performance in dynamic applications due to the materials inherent excellent wear resistance.	900270	AU
Hydrogenated nitrile (HNBR)	Black	70	-30 to +180°C	General purpose compound offering improved temperature resistance over NBR grades. Good oil, coolant and hydrocarbon resistance, with excellent abrasion resistance.	88625	HNBR

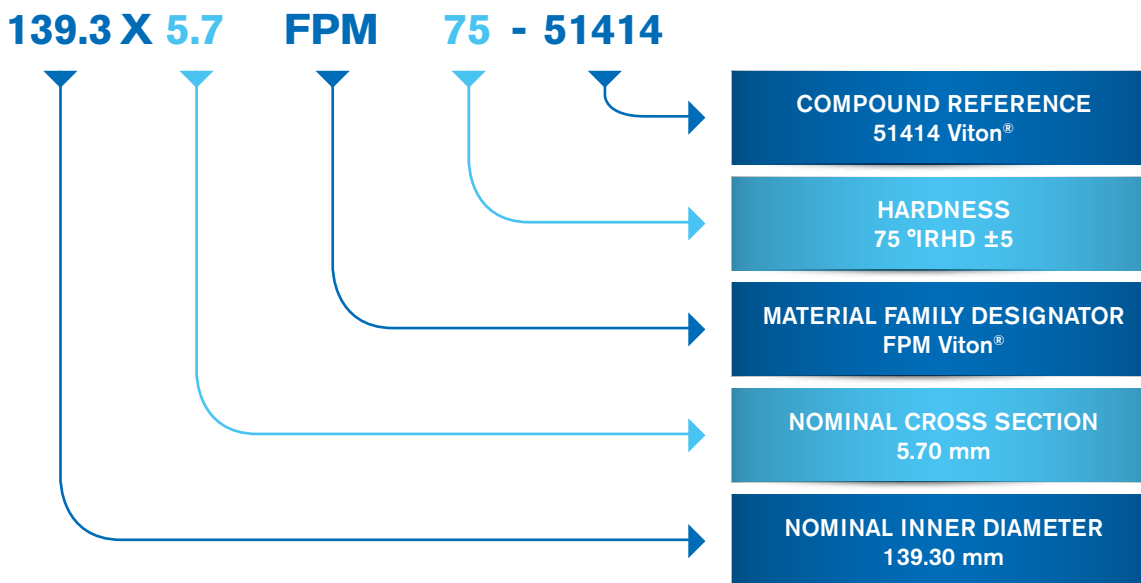
Many more materials available on request.

Imperial O-rings



[†]O-rings are supplied to ISO3601-1 class 2 tolerances unless otherwise specified.

Metric O-rings



[†]O-rings are supplied to ISO3601-1 class 2 tolerances unless otherwise specified.



*O-ring and hardware dimensional details are available at:

<http://oring-groove-wizard.eriks.co.uk/DiameterGrooves.aspx>

X-ring

Product Overview

X-rings can be used in a wide variety of static and dynamic sealing applications. They are available in standard O-ring sizes.

Their four-lobed design provides a larger sealing area in comparison to a standard O-ring. The double seal action requires lower squeeze levels to maintain an effective seal, thus reducing friction level and improving seal life.

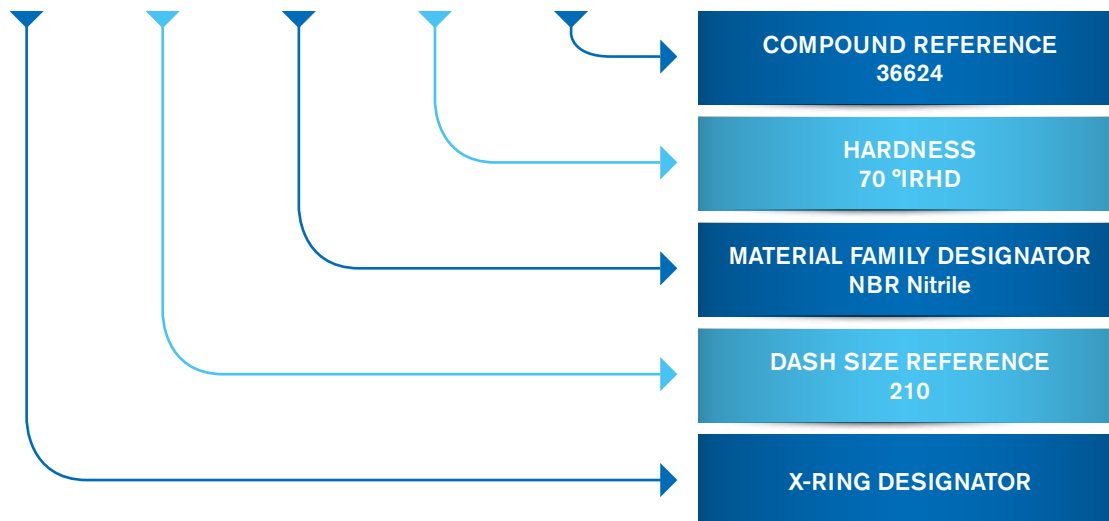
X-ring parting lines are between the lobes, away from the sealing surface, therefore eliminating the problems of leakage often resulting from a parting lines irregular surface as found on an O-ring.

X-rings are designed to out perform a standard O-ring in rotary seal applications. The four lobed configuration creates a more stable seal avoiding spiral twisting which can occur in reciprocating applications.



X-Rings

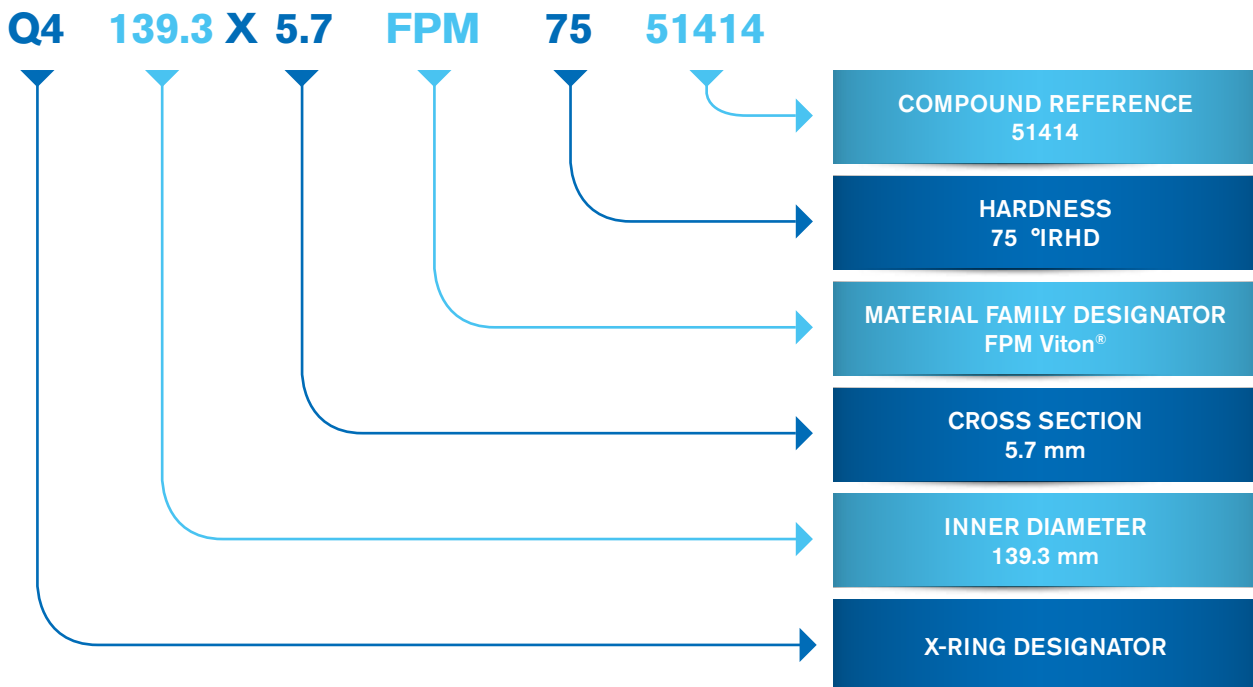
Q4 210 NBR 70 - 36624



X-ring Materials

Elastomer	Colour	Hardness (IRHD)	Temperature Range	Select for..	Compound Reference	Material Family Designator
Nitrile rubber (NBR)	Black	70	-30 to +120°C	Standard compound with good compression set values. Medium acrylonitrile content for use with hydraulic oils, alcohols, water, air, fuels and many other fluids.	36624	NBR
Fluorocarbon (FKM, A-type)	Black	75	-20 to +200°C	General purpose compound with very low compression set characteristics at high temperatures. Chemical resistant to oils, greases and fuels.	51414	FPM

Metric X-Rings



*O-ring and hardware dimensional details are available at:

<http://oring-groove-wizard.eriks.co.uk/DiameterGrooves.aspx>

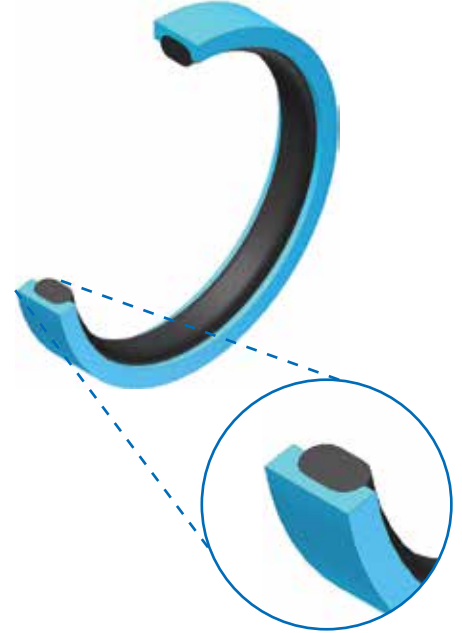
Capped O-ring

Product Overview

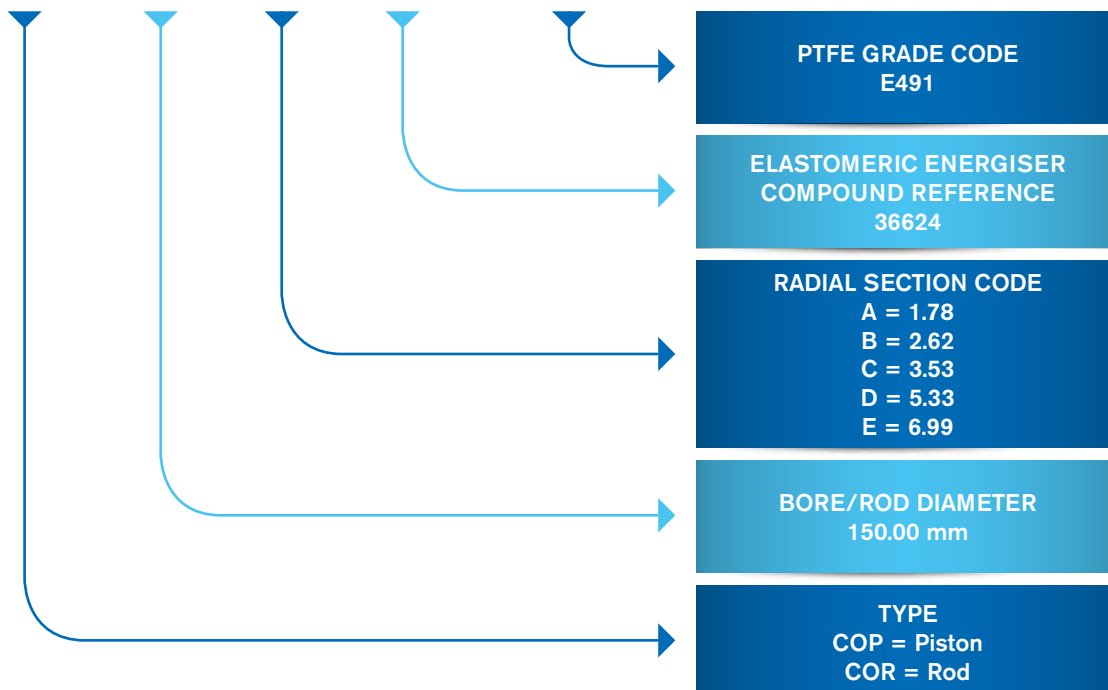
Capped O-rings are a cost-effective solution for providing cap seals for rod and piston seal applications. The seal assembly consists of a cap manufactured from one of ERIKS premier PTFE compounds and an O-ring to act as the seal energiser.

The design of the capped O-ring protects the elastomer from extrusion and nibbling. The specially profiled cap element acts as the seal's dynamic interface and prevents spiral failure and reduces stick slip, commonly associated with O-ring seals.

Our capped O-rings are designed to retrofit existing O-ring grooves, including AS4716 standard housing dimensions. Both metric and imperial sizes are available and can be tailored to fit housing dimensions provided. Our technical team can also advise on how to optimise O-ring squeeze to minimise seal friction.



COP- 10000 - C - 36624 - E491 - PWI



Elastomeric Energiser Materials

Elastomer	Colour	Hardness (IRHD)	Temperature Range	Select for..	Compound Reference
Silicone (VMO)	Red	70	-60 to +220°C	High and very low temperature; high eccentricity	714177
Polyacrylate (ACM)	Black	70	-10 to +150°C	High temperature capabilities; good compatibility with engine oils	335001
Nitrile rubber (NBR)	Black	70	-30 to +120°C	General purpose	36624
Fluorocarbon (FKM, A-type)	Black	75	-20 to +200°C	High temperature performance; high speed applications; 514141 (Viton® GF type) for improved coolant and fuel resistance	51414
	Green	75	-20 to +200°C		51414G
Fluorocarbon (FKM, GF-type)	Black	75	-10 to +200°C		514141
Hydrogenated nitrile (HNBR)	Black	70	-30 to +180°C	High temperatures, moderate fuel resistance	88625

PTFE Grade Codes

Material Composition	Colour	Coefficient of Friction	Temperature Range	Select for..	PTFE Reference
Virgin PTFE	White	0.05 / 0.08	-240 to +200°C	Static or low duty cycles	E400
Glass and MoS ₂ reinforced PTFE	Grey / black	0.06 / 0.10	-160 to +290°C	Dynamic or static, medium duty cycles, hardened metal running surfaces	E431
Graphite reinforced PTFE	Black	0.06 / 0.10	-200 to 250°C	Dynamic, medium duty cycles	E471
Carbon and graphite reinforced PTFE	Black	0.08 / 0.12	-200 to 250°C	Dynamic, medium duty cycles	E462
Polyester reinforced PTFE	Beige	0.08 / 0.12	-130 to +290°C	Dynamic or static, medium to high duty cycles, minimum 45 HRc running surface	E491
Carbon, graphite and PPS reinforced PTFE	Grey/Black	0.08 / 0.12	-130 to +290°C	Dynamic or static, high duty cycles, hardened metal running surfaces	E282Z



*O-ring and hardware dimensional details are available at:

<http://oring-groove-wizard.eriks.co.uk/DiameterGrooves.aspx>

Double Acting Cap Seal

Product Overview

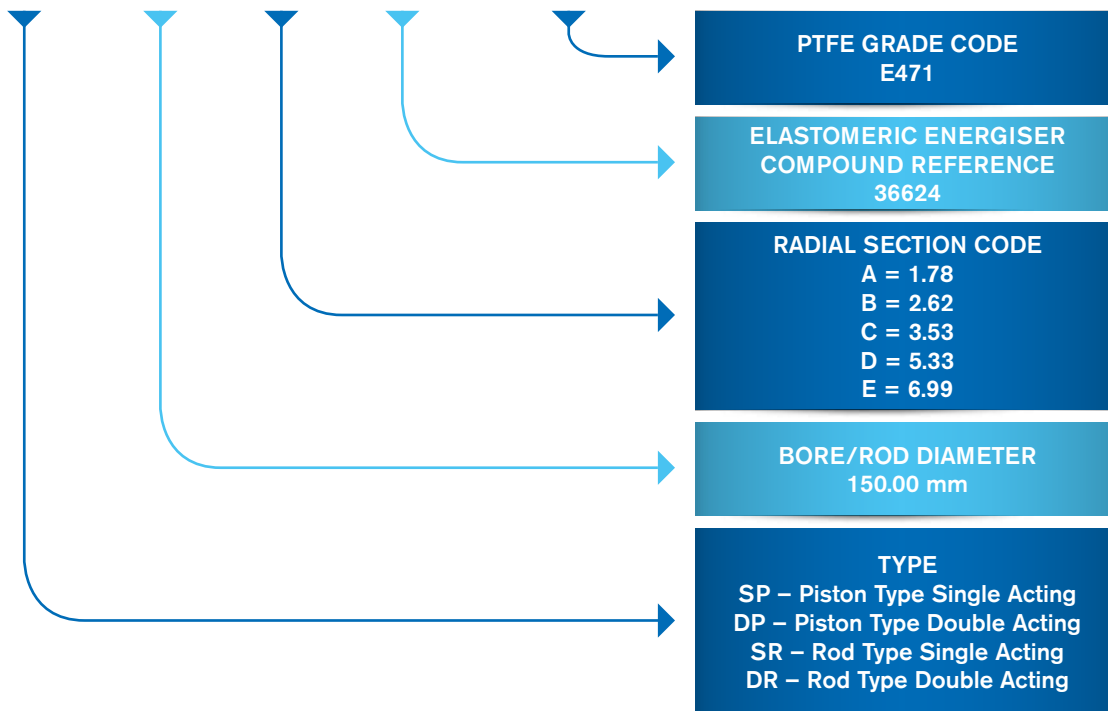
A self-actuating, bi-directional, extrusion resistant seal that combines low breakout and running friction with minimal leakage. The seal is constructed of a premium grade PTFE sealing element and an elastomer energiser.

The Double Acting Cap Seal is a reliable, compact design with a long service life and is available in both rod and piston type geometries to retro-fit into ISO7425-2. Stick-slip is eliminated even after long periods of inactivity whether in a lubricated or non-lubricated environment, giving low breakout friction.

pioneer
WESTON



C SP - 15000 - D - 36624 - E471 - PWI



Standard Radial Sections

Radial Section Code	Standard Bore / Rod diameter (mm)	Piston Groove Diameter (mm)	Rod Groove Diameter (mm)	Groove Width (mm)
A = 1.78	8 – 16.9	Bore \varnothing -4.9	Rod \varnothing +4.9	2.20
B = 2.62	17 – 26.9	Bore \varnothing -7.3	Rod \varnothing +7.3	3.20
C = 3.53	27 – 59.9	Bore \varnothing -10.7	Rod \varnothing +10.7	4.20
D = 5.33	60 – 199.9	Bore \varnothing -15.1	Rod \varnothing +15.1	6.30
E = 6.99	200 – 255.9	Bore \varnothing -20.5	Rod \varnothing +20.5	8.10

Elastomeric Energiser Materials

Elastomer	Colour	Hardness (IRHD)	Temperature Range	Select for..	Compound Reference
Silicone (VMO)	Red	70	-60 to +220°C	High and very low temperature; high eccentricity	714177
Polyacrylate (ACM)	Black	70	-10 to +150°C	High temperature capabilities; good compatibility with engine oils	335001
Nitrile rubber (NBR)	Black	70	-30 to +120°C	General purpose	36624
Fluorocarbon (FKM, A-type)	Black	75	-20 to +200°C	High temperature performance; high speed applications; 514141 (Viton® GF type) for improved coolant and fuel resistance	51414
	Green	75	-20 to +200°C		51414G
Fluorocarbon (FKM, GF-type)	Black	75	-10 to +200°C		514141
Hydrogenated nitrile (HNBR)	Black	70	-30 to +180°C	High temperatures, moderate fuel resistance	88625

PTFE Grade Codes

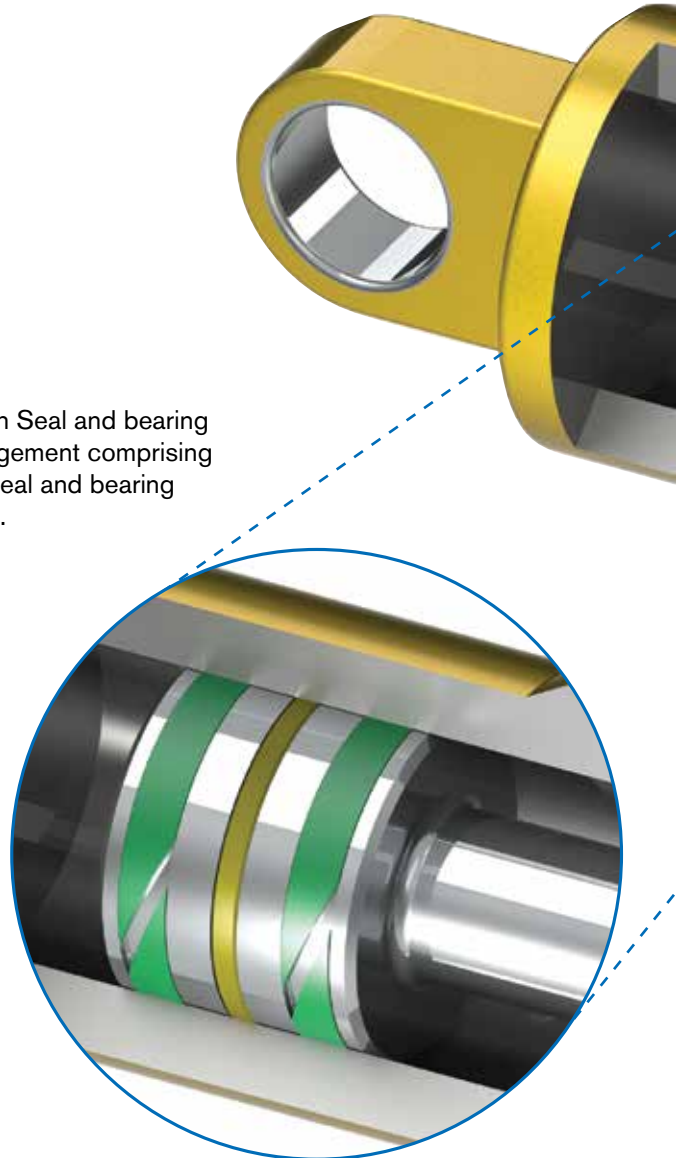
Material Composition	Colour	Coefficient of Friction	Temperature Range	Select for..	PTFE Reference
Virgin PTFE	White	0.05 / 0.08	-240 to +200°C	Static or low duty cycles	E400
Glass and MoS ₂ reinforced PTFE	Grey / black	0.06 / 0.10	-160 to +290°C	Dynamic or static, medium duty cycles, hardened metal running surfaces	E431
Graphite reinforced PTFE	Black	0.06 / 0.10	-200 to 250°C	Dynamic, medium duty cycles	E471
Carbon and graphite reinforced PTFE	Black	0.08 / 0.12	-200 to 250°C	Dynamic, medium duty cycles	E462
Polyester reinforced PTFE	Beige	0.08 / 0.12	-130 to +290°C	Dynamic or static, medium to high duty cycles, minimum 45 HRc running surface	E491
Carbon, graphite and PPS reinforced PTFE	Grey/Black	0.08 / 0.12	-130 to +290°C	Dynamic or static, high duty cycles, hardened metal running surfaces	E282Z

Typical Seal Arrangement for Cylinders

ERIKS Sealing Technology are able to specify and provide complete sealing systems for your application.

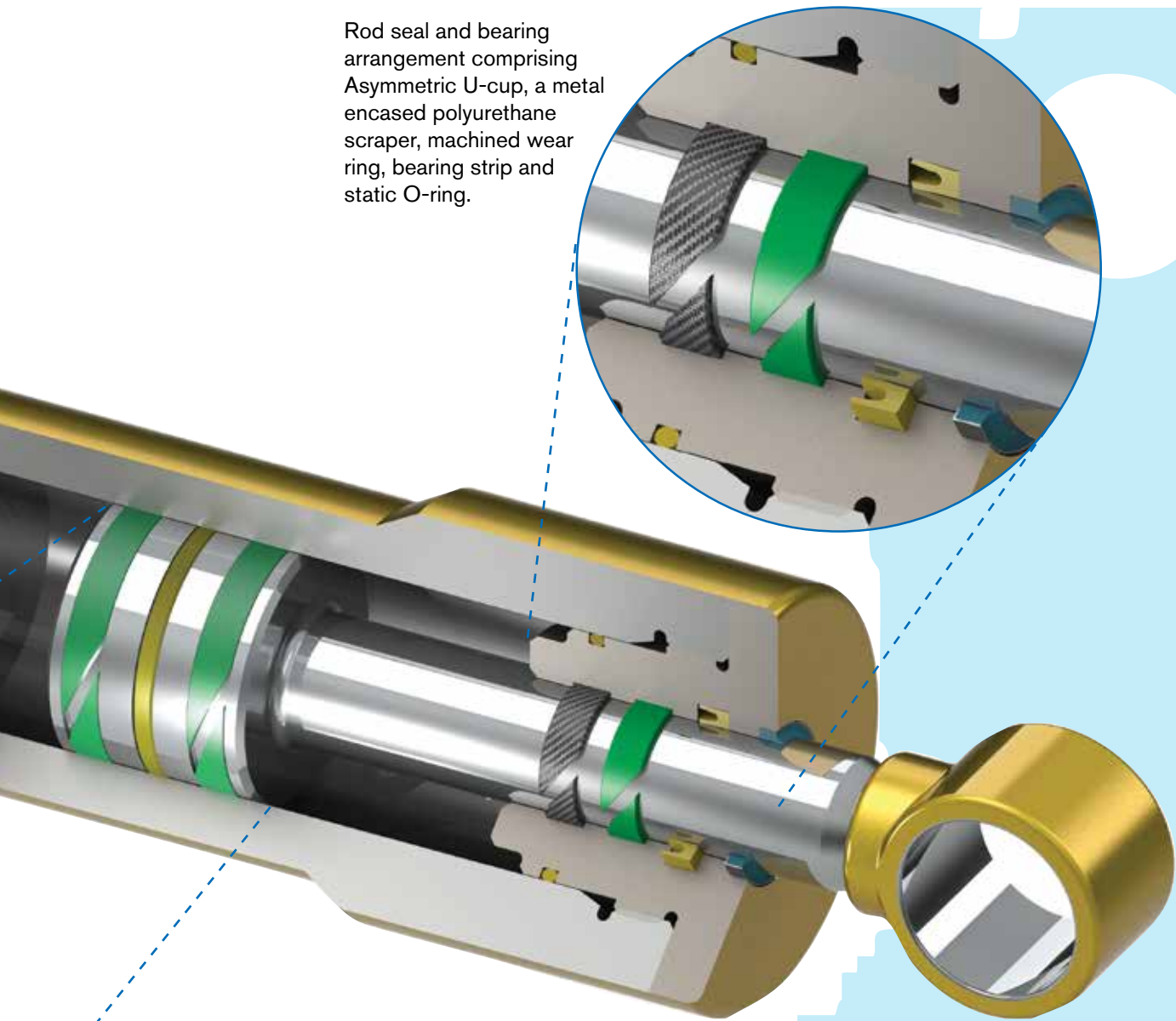


Piston Seal and bearing arrangement comprising cap seal and bearing strips.





Rod seal and bearing arrangement comprising Asymmetric U-cup, a metal encased polyurethane scraper, machined wear ring, bearing strip and static O-ring.



*O-ring and hardware dimensional details are available at:
<http://oring-groove-wizard.eriks.co.uk/DiameterGrooves.aspx>

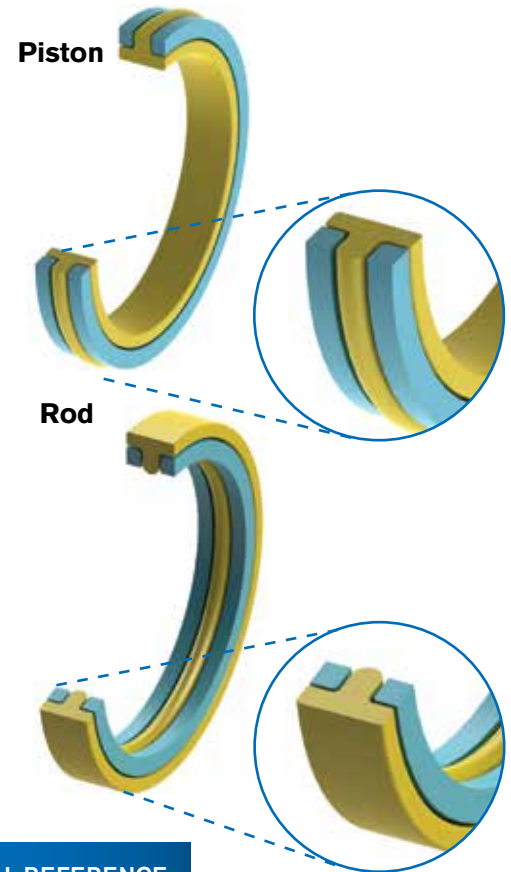
T- Seal

Product Overview

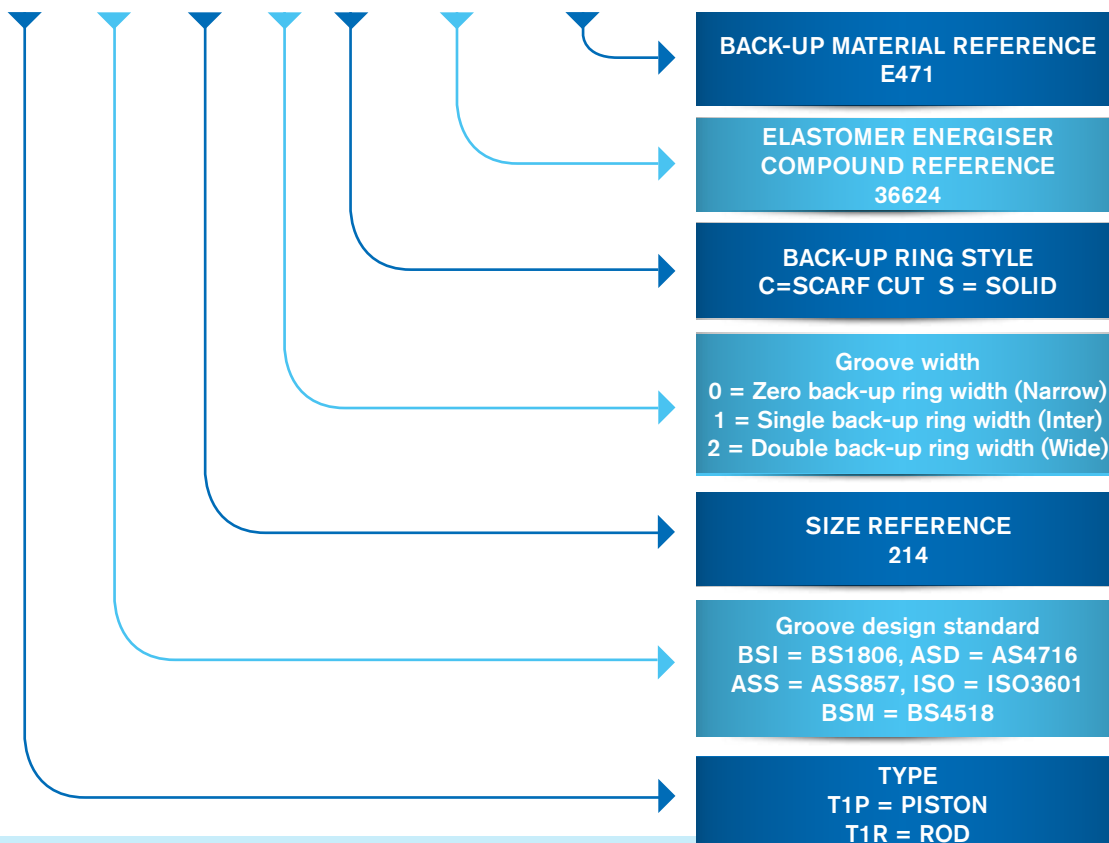
Typically used in reciprocating and high pressure static applications, T-Seals comprise a single T-section elastomeric energiser and two thermoplastic back-up rings. Available in both piston and rod geometries, T-Seals can retro-fit into most standard O-ring grooves designed for widths to accommodate 0, 1 or 2 back-ups.

The shape prevents spiral failure whilst reciprocating. The elastomer component transmits the system pressure under the low pressure back-up ring, forcing it into position, closing the extrusion gap. As an elastomeric contact seal, the T-Seal provides highly efficient sealing and can be used in applications where two fluid types need to be separated e.g. gas, oil separation by an accumulator piston seal.

pioneer
WESTON



T1P-BSI-214- 0 - C- 36624- E471- PWI



Elastomeric Energiser Materials

Elastomer	Colour	Hardness (IRHD)	Temperature Range	Select for..	Compound Reference
Nitrile rubber (NBR)	Black	70	-30 to +120°C	General purpose	36624
Fluorocarbon (FKM, A-type)	Black	75	-20 to +200°C	High temperature performance; high speed applications	51414
	Green	75			51414G

Back-Up Material Reference Codes

Material Composition	Colour	Coefficient of Friction	Temperature Range	Select for..	PTFE Reference
Virgin PTFE	White	0.05 / 0.08	-240 to +200°C	Static or low duty cycles	E400
Glass and MoS ₂ reinforced PTFE	Grey / black	0.06 / 0.10	-160 to +290°C	Dynamic or static, medium duty cycles, hardened metal running surfaces	E431
Graphite reinforced PTFE	Black	0.06 / 0.10	-200 to 250°C	Dynamic, medium duty cycles	E471
Carbon and graphite reinforced PTFE	Black	0.08 / 0.12	-200 to 250°C	Dynamic, medium duty cycles	E462
Polyester reinforced PTFE	Beige	0.08 / 0.12	-130 to +290°C	Dynamic or static, medium to high duty cycles, minimum 45 HRc running surface	E491
Carbon, graphite and PPS reinforced PTFE	Grey/Black	0.08 / 0.12	-130 to +290°C	Dynamic or static, high duty cycles, hardened metal running surfaces	E282Z



*O-ring and hardware dimensional details are available at:

<http://oring-groove-wizard.eriks.co.uk/DiameterGrooves.aspx>

Energised Lip Seals

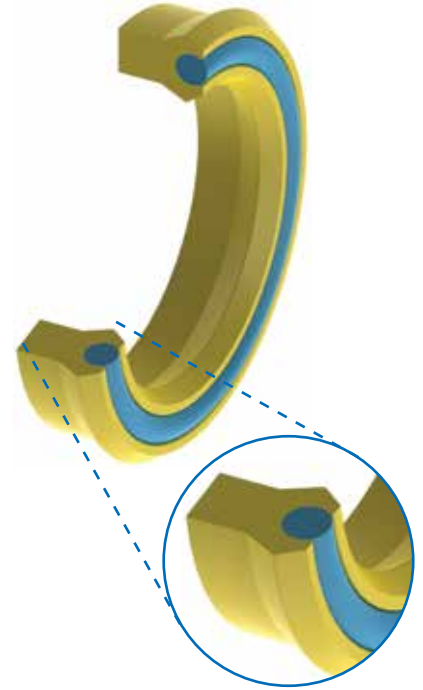
Product overview

Pioneer Weston's Energised Lip Seal is a symmetrical seal optimised for heavy duty reciprocating applications with unidirectional pressure.

The Energised Lip Seal comprises a high modulus, highly durable, wear resistant, elastomeric jacket, energised by a low modulus split O-ring.

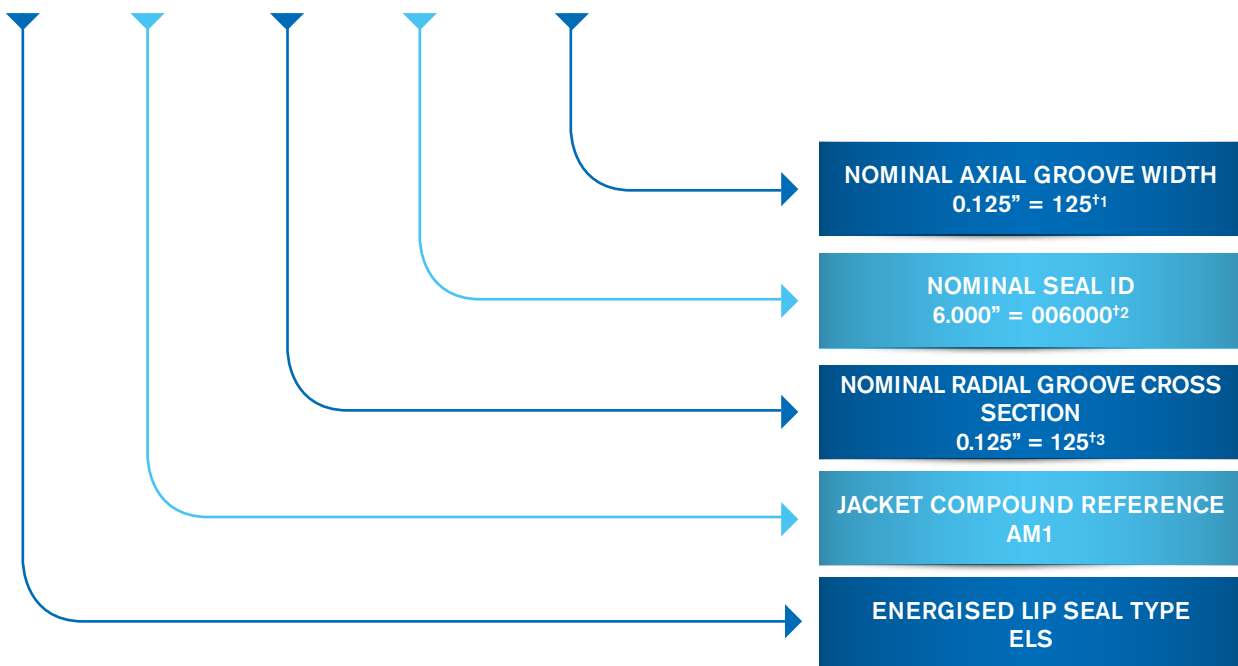
The jacket provides superior sealing efficiency and abrasion resistance, whilst the O-ring both transmits system pressure to the contact surfaces and ensures energisation of the seal lips under low pressure or low temperature. The elongated square heel minimises seal roll and improves seal stability.

By separating the sealing and energising functions, optimal materials may be selected for each. A typical application would include actuator rod seals.



Imperial (English) Sizes

ELS - AM1 - 125 - 006000 - 343 - PWI



^{†1} to 3 decimal places multiplied by 1000

^{†2} (Rod diameter/Piston groove diameter to 3 decimal places) multiplied by 1000

^{†3} to 3 decimal places multiplied by 1000

Compound References

Jacket Material	Compound Reference	Energiser Material	Colour	Hardness (IRHD)	Temperature Range	Select for..	Material Designator
Polyurethane, moulded	PU-90-203	NBR 70	Black	90	-40 to +100°C	Hydraulic ram rod seals for high volume manufacture.	AM1
Polyurethane, machined	PU-90-202	NBR 70	Green	90	-40 to +100°C	Hydraulic ram rod seals for low volume manufacture.	AC1
Polyurethane, hydrolysis resistant	PU-95-166	NBR 70	Red	95	-40 to +100°C	Hydraulic ram rod seals in aqueous environments- low volume manufacture.	AH1
Nitrile rubber (NBR)	N-90-204	NBR 70	Black	90	-35 to +110°C	Piston applications for low – medium pressure	NJ1
Hydrogenated nitrile (HNBR), moulded	H-85-205	HNBR 70	Black	85	-40 to +180°C	Elevated temperatures, high abrasion resistance	HJ1
Hydrogenate nitrile (HNBR), machined	H-85-206	HNBR 70	Black	85	-40 to +180°C	Elevated temperatures, high abrasion resistance, low volume, rapid manufacture	HJ2
Fluorocarbon (FKM, A-type)	V-85-207	FKM 75	Green	85	-20 to +200°C	High temperatures, increased chemical resistance	FJ1

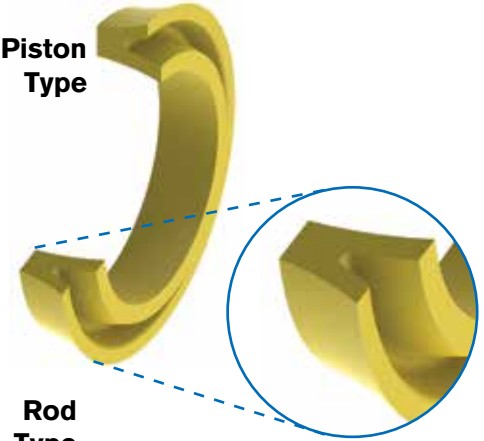
Asymmetric U-Cup

Product Overview

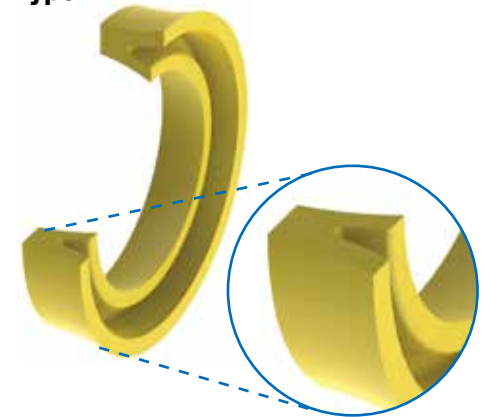
Pioneer Weston's asymmetric U-Cup is available in both piston and rod geometries and offers a stand alone, robust solution for both hydraulic and pneumatic reciprocating applications. The asymmetric U-cup may be used as the primary seal in tandem rod arrangements, or back-to-back in piston applications due to the venting lip design. Under low pressure the asymmetric U-cup exerts low friction upon mating hardware requiring low actuation force. Available in a range of high performance materials, the asymmetric U-cup offers exceptional performance and service life, whilst minimising the required space envelope required.



**Piston
Type**

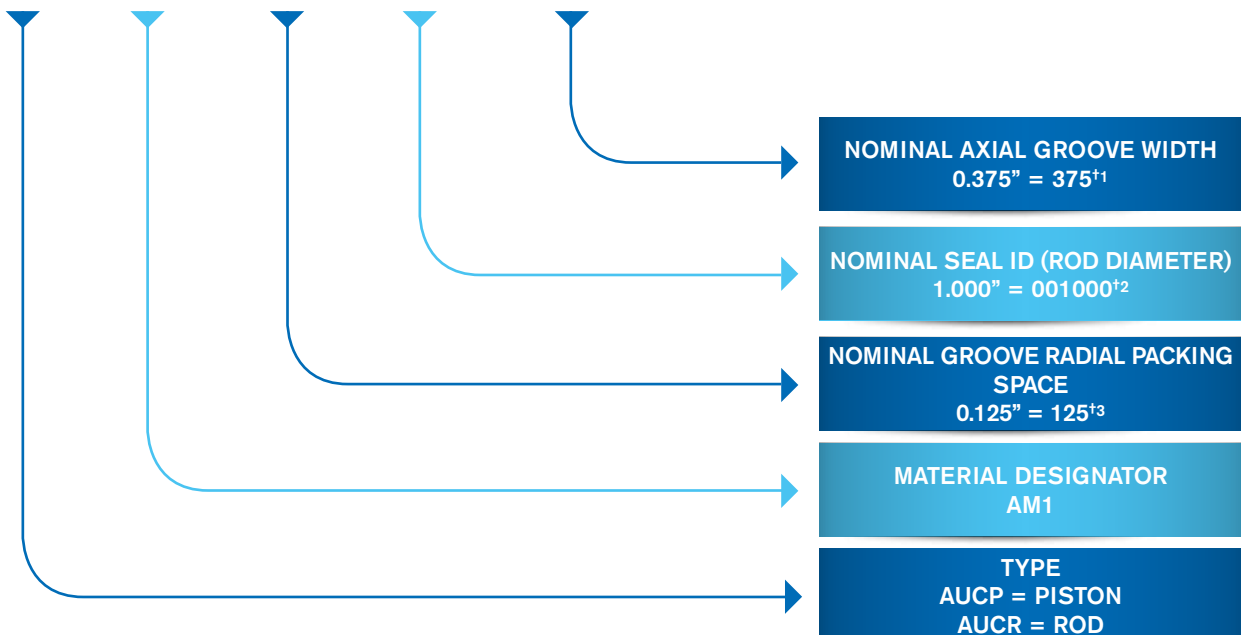


**Rod
Type**



Imperial (English) Sizes

AUCP - AM1 - 125 - 001000 - 375 - PWI



⁺¹ to 3 decimal places multiplied by 1000

⁺² to 3 decimal places multiplied by 1000

⁺³ to 3 decimal places multiplied by 1000

Compound References

Jacket Material	Compound Reference	Colour	Hardness (IRHD)	Temperature Range	Select for..	Material Designator
Polyurethane, moulded	PU-90-203	Black	90	-40 to +100°C	Hydraulic ram rod seals for high volume manufacture.	AM1
Polyurethane, machined	PU-90-202	Green	90	-40 to +100°C	Hydraulic ram rod seals for low volume manufacture.	AC1
Polyurethane, hydrolysis resistant	PU-95-166	Red	95	-40 to +100°C	Hydraulic ram rod seals in aqueous environments- low volume manufacture.	AH1
Nitrile rubber (NBR)	N-90-204	Black	90	-35 to +110°C	Piston applications for low – medium pressure	NJ1
Hydrogenated nitrile (HNBR), moulded	H-85-205	Black	85	-40 to +180°C	Elevated temperatures, high abrasion resistance	HJ1
Hydrogenate nitrile (HNBR), machined	H-85-206	Black	85	-40 to +180°C	Elevated temperatures, high abrasion resistance, low volume, rapid manufacture	HJ2
Fluorocarbon (FKM, A-type)	V-85-207	Green	85	-20 to +200°C	High temperatures, increased chemical resistance	FJ1

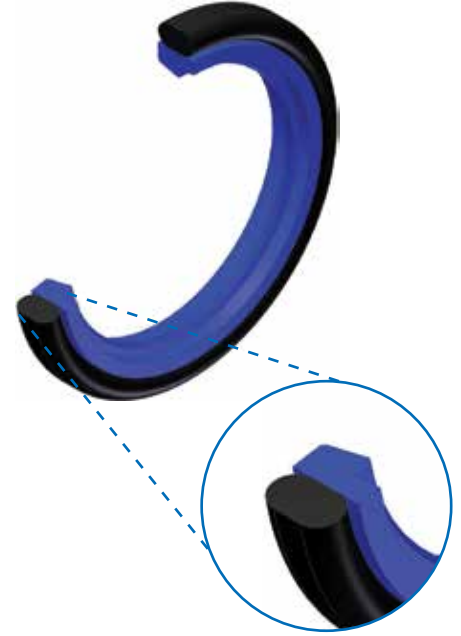
Single Acting Cap Seal

Product Overview

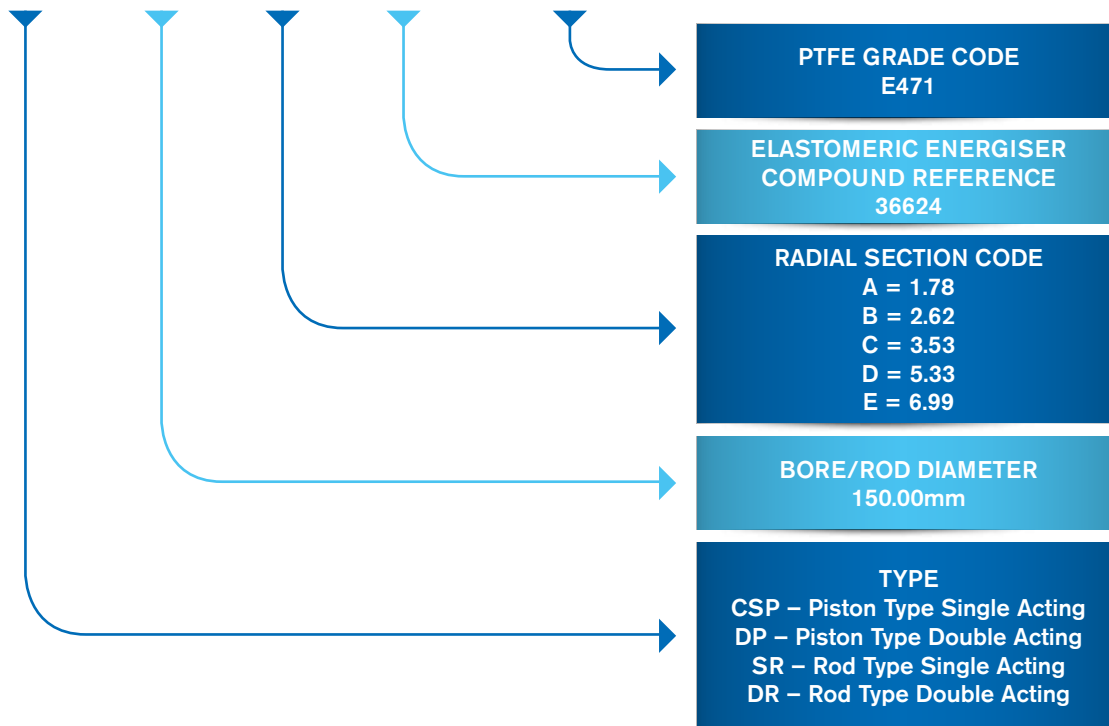
A self-actuating, pressure venting, extrusion resistant seal that combines low breakout and running friction with minimal leakage. The seal is constructed of a premium grade PTFE sealing element and an elastomer energiser.

The Single Acting Cap Seal is a reliable, compact, design with a long service life and is available in both rod and piston type geometries to retro-fit into ISO7425-2. Stick-slip is eliminated even after long periods of inactivity whether in a lubricated or non-lubricated environment, giving low breakout friction.

pioneer
WESTON



CSP- 15000 - D - 36624 - E471 - PWI



Standard Radial Sections

Radial Section Code	Standard Bore / Rod diameter (mm)	Piston Groove Diameter (mm)	Rod Groove Diameter (mm)	Groove Width (mm)
A = 1.78	8 – 16.9	Bore \varnothing -4.9	Rod \varnothing +4.9	2.20
B = 2.62	17 – 26.9	Bore \varnothing -7.3	Rod \varnothing +7.3	3.20
C = 3.53	27 – 59.9	Bore \varnothing -10.7	Rod \varnothing +10.7	4.20
D = 5.33	60 – 199.9	Bore \varnothing -15.1	Rod \varnothing +15.1	6.30
E = 6.99	200 – 255.9	Bore \varnothing -20.5	Rod \varnothing +20.5	8.10

Elastomeric Energiser Materials

Elastomer	Colour	Hardness (IRHD)	Temperature Range	Select for..	Compound Reference
Silicone (VMO)	Red	70	-60 to +220°C	High and very low temperature; high eccentricity	714177
Polyacrylate (ACM)	Black	70	-10 to +150°C	High temperature capabilities; good compatibility with engine oils	335001
Nitrile rubber (NBR)	Black	70	-30 to +120°C	General purpose	36624
Fluorocarbon (FKM, A-type)	Black	75	-20 to +200°C	High temperature performance; high speed applications; 514141 (Viton® GF type) for improved coolant and fuel resistance	51414
	Green	75	-20 to +200°C		51414G
Fluorocarbon (FKM, GF-type)	Black	75	-10 to +200°C		514141
Hydrogenated nitrile (HNBR)	Black	70	-30 to +180°C	High temperatures, moderate fuel resistance	88625

Grade Codes

Material Composition	Colour	Coefficient of Friction	Temperature Range	Select for..	PTFE Reference
Virgin PTFE	White	0.05 / 0.08	-240 to +200°C	Static or low duty cycles	E400
Glass and MoS ₂ reinforced PTFE	Grey / black	0.06 / 0.10	-160 to +290°C	Dynamic or static, medium duty cycles, hardened metal running surfaces	E431
Graphite reinforced PTFE	Black	0.06 / 0.10	-200 to 250°C	Dynamic, medium duty cycles	E471
Carbon and graphite reinforced PTFE	Black	0.08 / 0.12	-200 to 250°C	Dynamic, medium duty cycles	E462
Polyester reinforced PTFE	Beige	0.08 / 0.12	-130 to +290°C	Dynamic or static, medium to high duty cycles, minimum 45 HRc running surface	E491
Carbon, graphite and PPS reinforced PTFE	Grey/Black	0.08 / 0.12	-130 to +290°C	Dynamic or static, high duty cycles, hardened metal running surfaces	E282Z

Exclusion Devices / Wiper Rings

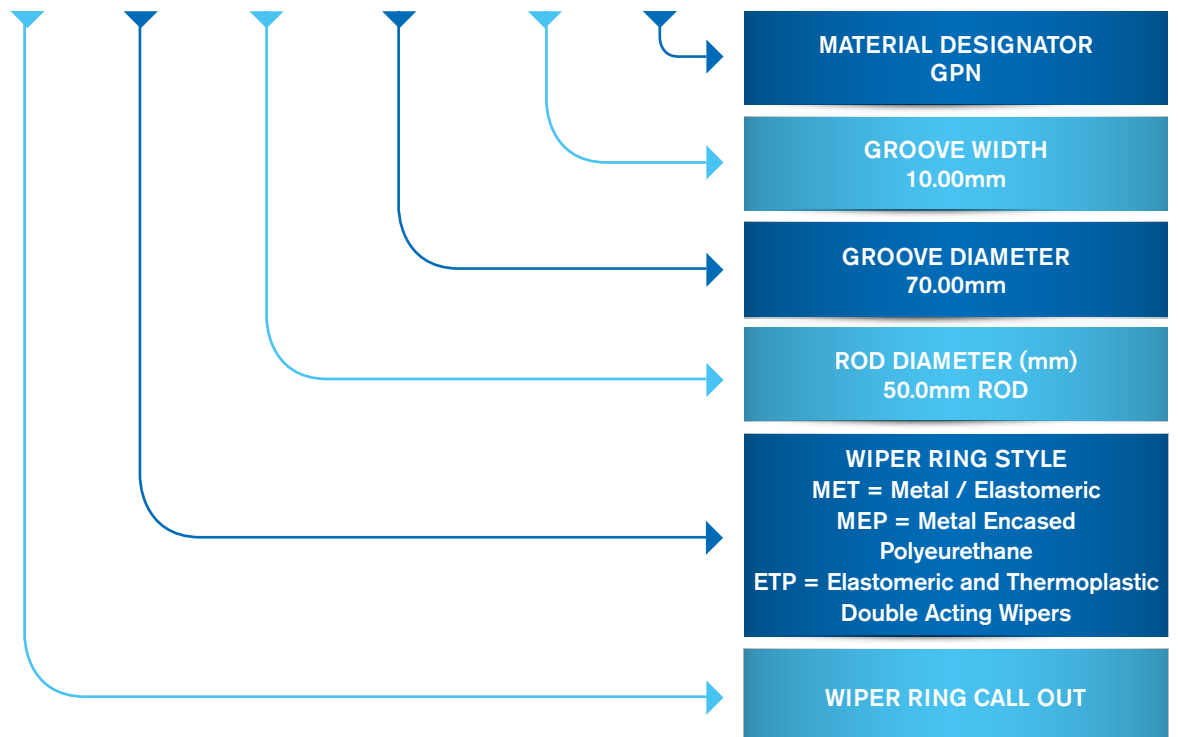
Product Overview

Exclusion devices also known as Wiper Rings or Scrapers are installed in sealing configurations to exclude foreign particles such as sand, grit, dirt, water, abrasive media, etc. They are normally installed in the piston rod gland housing and wipe the piston rod during retraction. They prevent contamination of the hydraulic fluid, which could otherwise damage valves, seals, wear rings and other components.

Eriks Sealing Technology offers a comprehensive range of metallic and polymeric Exclusion devices. These configurations include combinations of elastomeric, metallic and PTFE based material Exclusion/Wiper lips, which are configured to the application requirements. ERIKS also provide both single-acting and double-acting wiper ring designs.



WR - MET - 050.00 - 070.00 - 10.00 - GPN



Different scraper lip material combinations are available upon request.



Metal Scrapers

Metal scrapers consist of a Nitrile (NBR) wiping lip in conjunction with a thin brass scraper lip, encased in a steel shell. The combination is used for arduous environments and is suitable for tar, ice, removing dried or frozen mud and other contaminants from the rod.

Metal Encased Polyurethane Scraper

A Metal Encased Polyurethane scraper can be installed into open grooves. This style of Scraper comprises of a polyurethane (AU) scraper element housed in a metallic casing. The polyurethane scraper element offers highly effective scraping performance and abrasion resistance. This design is commonly used in mobile hydraulic plant and agricultural equipment.

Elastomeric and Thermoplastic Double Acting Wipers

A Double acting wiper has either a sealing and a scraping lip in Nitrile (NBR) or proprietary reinforced PTFE. It is optimised when used with rod seals that have a back pumping capability. The double acting wiper is recommended for light to medium duty and is available in alternative elastomeric/PTFE grades on request.

Material Designator Codes

Material Designator	Description	Temperature Range
BPN	Bronze reinforced PTFE / NBR 70	-30°C to 100°C
BPV	Bronze reinforced PTFE / FKM 70	-20°C to 200°C
GPN	Graphite reinforced PTFE / NBR 70	-30°C to 100°C
GPV	Graphite reinforced PTFE / FKM 70	-20°C to 200°C
UPN	UHMW-PE / NBR 70	-30°C to 80°C
UPV	UHMW-PE / FKM 70	-20°C to 80°C

Machined Wear Ring / Bearing Strip

Product Overview

The design intent of a Bearing Strip or Wear Ring is to guide the piston and/or rod into a pneumatic or hydraulic cylinder. Any potential side or transverse loads applied to the piston rod will be supported by the Wear Ring, thus preventing contact between the static and sliding parts of the cylinder.

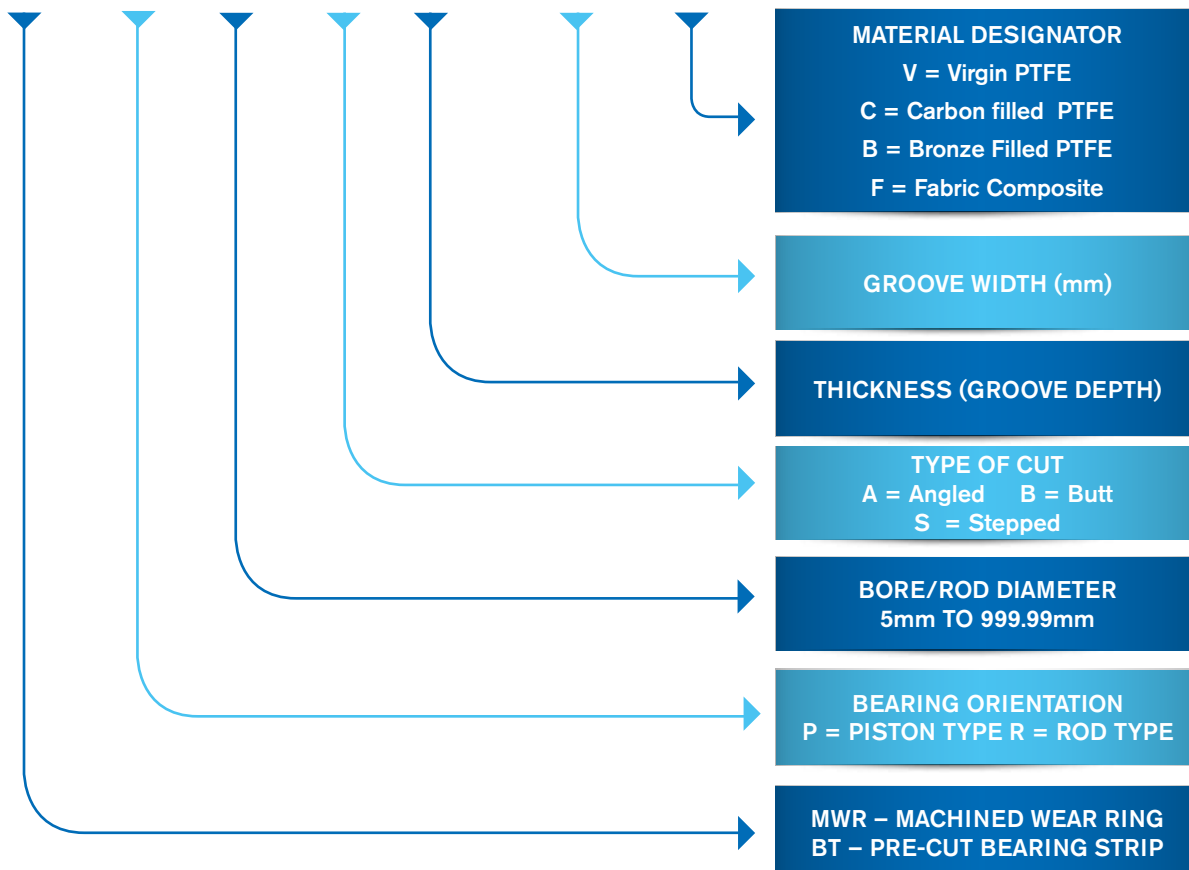
Eriks Wear Rings are non-metallic and offer advantages over traditional metallic bearings. These benefits include improved load distribution, reduced friction, easy installation and lower abrasion.

Different types of materials are available depending upon the application requirements. PTFE based Wear Rings are for use in low to medium loads, fabric composite Wear Rings are to be used under high load conditions.

ERIKS Wear Rings are precision machined to mate with the customers hardware and are available in a range of sizes, as defined by the below part numbering system.



MWR -P -125.00 -B- 2.15 -14.50- B



Machined Wear Ring Dimensions

PISTON BEARINGS			
Bearing Radial Thickness (mm)	Groove Width (+0.25/0.00)	Bearing Groove Diameter	Internal Groove Radii
1.00	6.00	Bore Diameter - 2.00/2.05mm	0.25mm Max
1.50	3.20	Bore Diameter - 3.00/3.05mm	
	10.00		
1.55	2.50	Bore Diameter - 3.10/3.15mm	
	4.00		
2.00	9.70	Bore Diameter - 4.00/4.05mm	
	15.00		
2.50	4.20	Bore Diameter - 5.00/5.05mm	
	5.60		
	6.30		
	8.10		
	9.70		
	15.00		
	20.00		
3.00	20.00	Bore Diameter - 6.00/6.05mm	
	4.00	9.70	Bore Diameter - 8.00/8.05mm
25.00			
ROD BEARINGS			
Bearing Radial Thickness (mm)	Groove Width (+0.25/0.00)	Bearing Groove Diameter	Internal Groove Radii
1.00	6.00	Rod Diameter - 2.00/2.05mm	0.25mm Max
1.50	3.20	Rod Diameter - 3.00/3.05mm	
	10.00		
1.55	2.50	Rod Diameter - 3.10/3.15mm	
	4.00		
2.00	9.70	Rod Diameter - 4.00/4.05mm	
	15.00		
2.50	4.20	Rod Diameter - 5.00/5.05mm	
	5.60		
	6.30		
	8.10		
	9.70		
	15.00		
	20.00		
3.00	20.00	Rod Diameter - 6.00/6.05mm	
	4.00	9.70	Rod Diameter - 8.00/8.05mm
25.00			

Bearing Strip

Product Overview

Bearing Strips are skived from material billets and are available in the standard thicknesses and widths. ERIKS Bearing Strip can be supplied in metre lengths.

Length Calculation for Bearing Strip

Once the bearing strip installed it is important that a 'Gap' is present between each end of the bearing strip. This feature is required to ensure :-

- There is sufficient room to allow for expansion which occurs during increases in temperature.
- The prevention on pressure entrapment.
- To ease installation and aid bearing strip removal.
- If you purchase our Bearing Strip by the metre, the length of the strip can be calculated by using the following:

For Bearing Strip used in Piston applications:-

$$LB = (\pi \times (B - TH) / 1.01) - C$$

For Bearing Strip used in Rod applications:-

$$LB = (\pi \times (R + TH) / 1.01) - C$$

Where:-

- LB** = Calculated Bearing Strip Length (mm).
- B** = Bore diameter (mm)
- R** = Rod diameter (mm).
- TH** = Bearing Strip thickness (mm)
- C** = Gap constant: 0.8 (1.8 for PTFE based materials above 120°C)

Wear Ring / Machined Bearing Strip Design Guide

Bearing Design Options

Careful consideration needs to be taken when choosing the correct bearing material. Factors influencing the design are load capacity, friction, temperature, service life and running velocity. As a general guide if wear and load bearing is paramount, then a Phenolic/fabric composite materials are favoured. If low friction is important, PTFE based materials offer the best option.

Load Capability

To ensure minimal wear and optimum performance it is important to maintain the lowest possible unit load over the bearing. The bearing load can be estimated using the below illustrated calculation.

Influencing factors such as rod/piston deflection, bearing deformation and diametrical tolerancing need to be considered when considering bearing design. Other factors including external loads, geometrical tolerances (eccentricity, concentricity, ovality) and component weight also need to be recognised.

It is good practice to minimise bearing radial cross section as for a given load the thinner the radial cross section, the less the deflection. Lifetime requirements may contradict this.

Our experts can assist you in selecting the optimal configuration for your application if required.



BT - 2.50- 15.00 - B

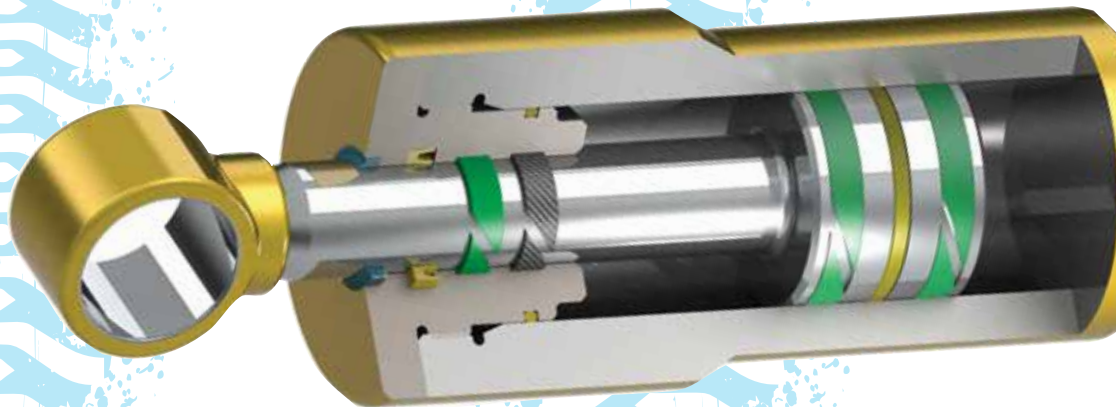
MATERIAL DESIGNATOR
V = Virgin PTFE
C = Carbon filled PTFE
B = Bronze Filled PTFE

GROOVE WIDTH (mm)
2.50
4.00
5.60
9.70
15.00
20.00
25.00

THICKNESS (GROOVE DEPTH)
1.00mm
1.55mm
2.00mm
2.50mm
3.00mm
4.00mm

BT-BEARING STRIP

Note: For small diameters, machined wear rings are recommended to aid installation. Minimum Bearing Strip Diameters: PTFE 8mm, Fabric 60mm.

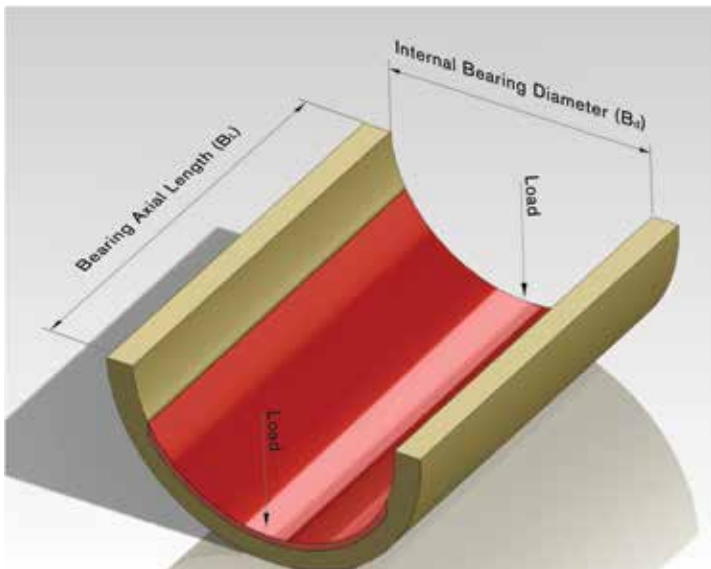


Bearing Calculation

For the Bearing Load Calculation we assume the load distribution is uniform over a projected bearing area. The bearing area may be approximated by using the following calculation.

Projected Bearing Area (Bpa) = Internal Bearing Diameter (Bd) X Bearing Axial Length (BL).

e.g. Internal Bearing Diameter (Bd)	= 50mm
Bearing Axial Length (BL)	= 25mm
Projected Bearing Area (Bpa)	= 1,250mm ²



When the Projected Bearing Area (shaded red) has been approximated, the bearing pressure may be found by dividing the Total Force Load by the Projected Bearing Area. This will determine the minimum compressive strength (Cs) of the bearing material to be utilised. If your design requires the incorporation of a safety factor, it is advisable to multiply the Total Force Load (FL) by the desired factor of safety (FOS), e.g. 2. The required bearing compressive strength can be calculated as follows;

$$Cs = \frac{FOS \times FL}{(Bd \times BL)}$$

$$Cs = \frac{(2 \times 3000N)}{(50mm \times 25mm)}$$

$$Cs = \frac{6000}{1250} = 4.8 \text{ MPa}$$

Material Selection

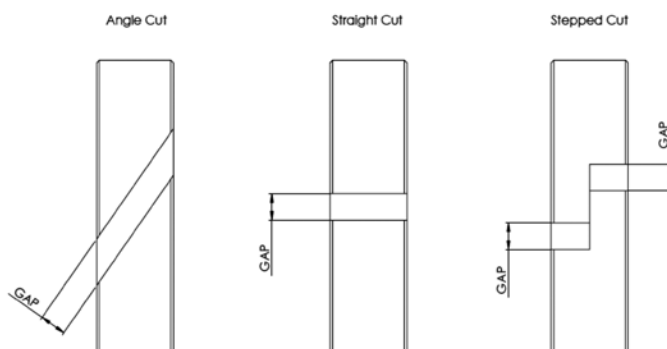
Calculating the required bearing material strength is important in determining the correct material to use. Listed below are additional criteria that need to be considered;

- Is the application rotary, reciprocating or static?
- What surface speed will the bearing see?
- Is lubrication present?
- What are the temperature extremes?
- What is the shaft/bore material, hardness and surface finish?
- Does the bearing have exposure to abrasive, erosive and chemically aggressive media?

The below table defines the properties of the standard materials available.

Material	Compressive Strength (Max)	Max Surface Speed	Mating Surface	Size Availability	General Uses
Bronze filled PTFE	15 MPa at 25 °C 12 MPa at 80 °C 8 MPa at 120 °C	15.0 m/s	Steel Hard Chrome, Steel Hardened	Rings 8mm to 2600mm	Light load, Lubricated environment
Carbon filled PTFE	12 MPa at 25 °C 9 MPa at 80 °C 5 MPa at 120 °C		Stainless Steel, Hard Anodised Aluminium	Up to 4600 in Strip form	Light duty, can run dry
Phenolic (Fabric composite)	300 MPa at 25 °C (Static) 50 MPa at 60°C (Dynamic)	1.0 m/s	Steel Hard Chrome, Steel Hardened	10mm to 1500mm (Rod Dia)	Heavy load, lubricated environment

Type of Cut



Angled cuts are recommended for use in reciprocating applications. Straight cuts are for rotary applications. Stepped cuts are used in special applications, e.g. for flow restriction.

Machined Wear Rings are application specific. Based upon application data, the appropriate dimensions and hardware tolerances will be calculated by our technical team for the entire sealing system.

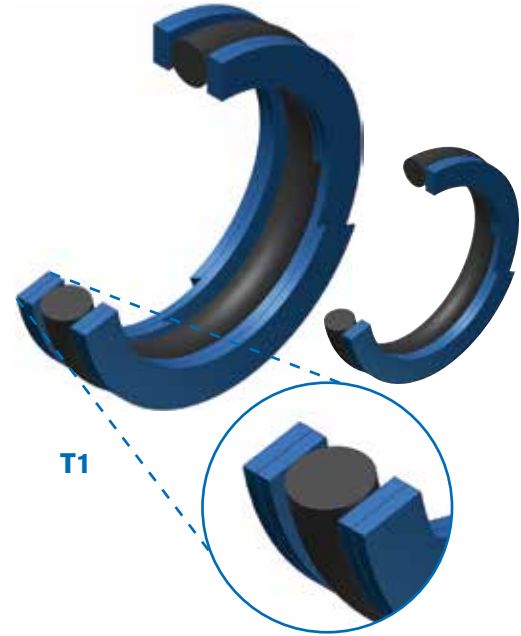
Back-up Rings (Anti-extrusion Ring)

Product Overview

Back-up rings are used to extend the operating pressure of an O-ring. Either one or two back-up rings are co-located within a groove of increased width, on the low-pressure side of the seal. When pressure is applied to the sealing system the back-up ring is axially compressed, increasing its radial width to close the extrusion gap. The high shear strength of the back-up ring material is then able to contain the elevated pressures.

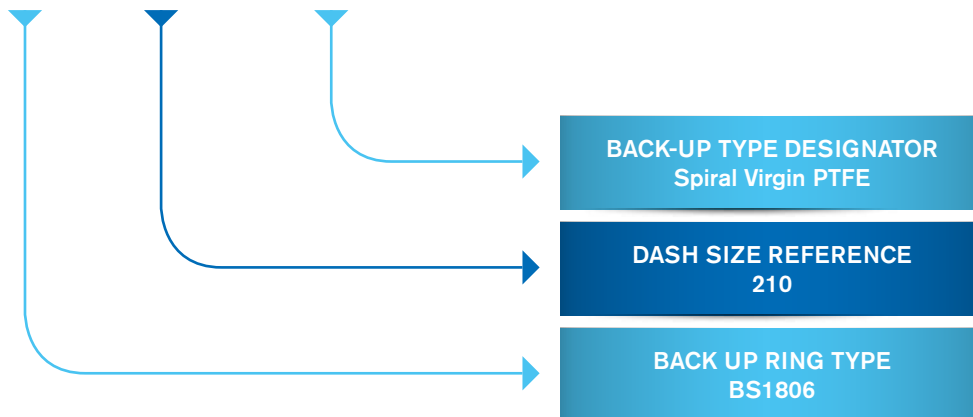
Unlike elastomers, which see visco-elastic extrusion, thermoplastic back-up ring materials fail if the maximum shear stress is greater than the shear strength of the material at the operating temperature.

The graphs and instructions on the following pages can be used to select the correct material.



PTFE Back-up Rings

00 - 210 BUSP



Back-up Type Designator

Designator	Type
BUSP	Spiral Back-up
BUCU	Scarf Cut Back-up
BUEN	Solid Back-up

ISO 3601 Back-up Ring Material

Material Family Designator	Description
A1	Virgin Polytetrafluoroethylene (PTFE)
V1	Virgin PEEK

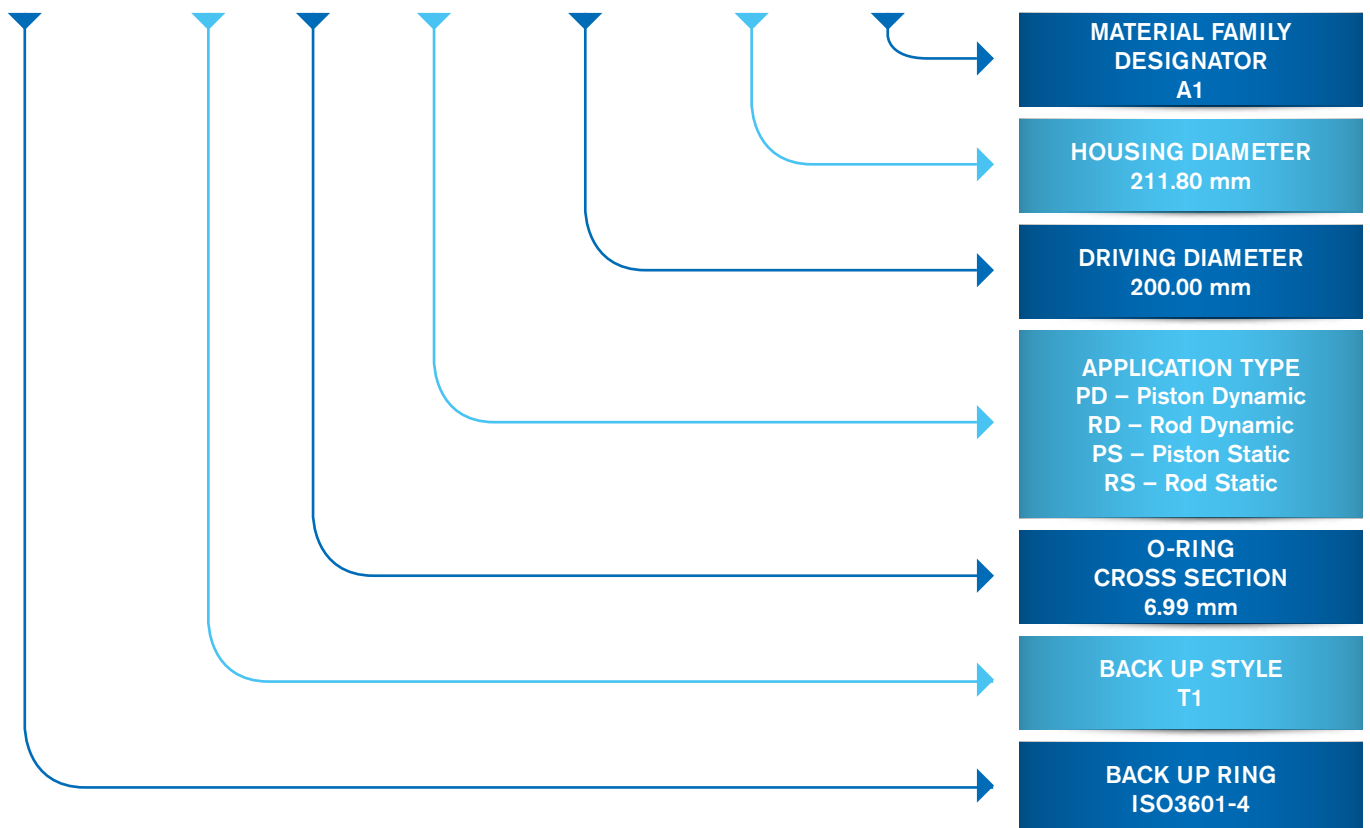
Note: Back-up rings are groove specific, the above part numbering format being only suitable for BS1806 grooves. Hardware dimensional details are available at: <http://oring-groove-wizard.eriks.co.uk/DiameterGrooves.aspx>



	T1 Spiral Turn Anti-Extrusion Ring	T2 Scarf Cut Anti-Extrusion Ring	T3 Solid Anti-Extrusion Ring	T4 Scarf Cut Concaved Anti-Extrusion Ring	T5 Solid Concaved Anti-Extrusion Ring
Single					
Double					
Back-up ring type					
	Spiral	Scarf cut	Solid	Scarf cut	Solid

ISO3601 Back-up Rings

ISO3601-4 - T1 - 699 - PD - 20000 - 21180 - A1



Back-up Ring Material Selection Process

The graphs and instructions on these pages can be used to select the correct material.

Step 1:

Select the correct shear stress 3D plot for your O-ring cross-section. Plot the system's maximum diametral clearance and differential pressure then read off the appropriate shear stress.

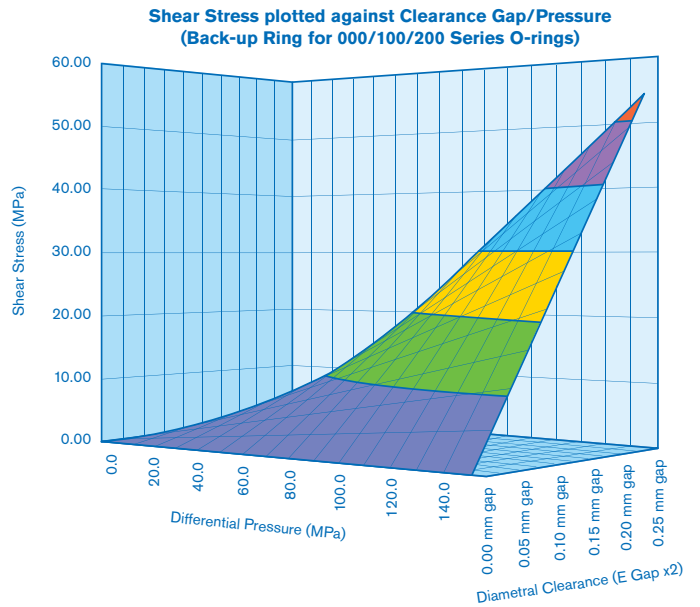
Step 2:

Apply an appropriate safety factor to this value (Minimum 2).

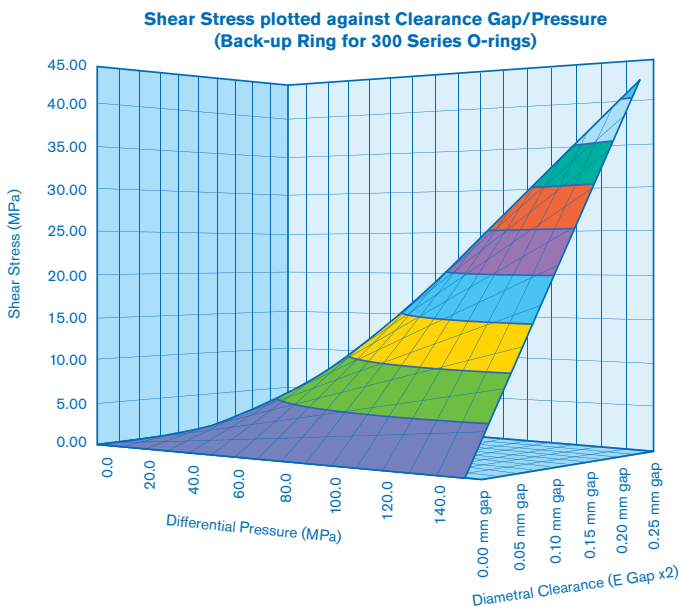
Step 3:

Select a material from the 'Material Shear Strengths' chart where the Shear Strength of the material is greater than the value calculated at Step 2, at the application operating temperature.

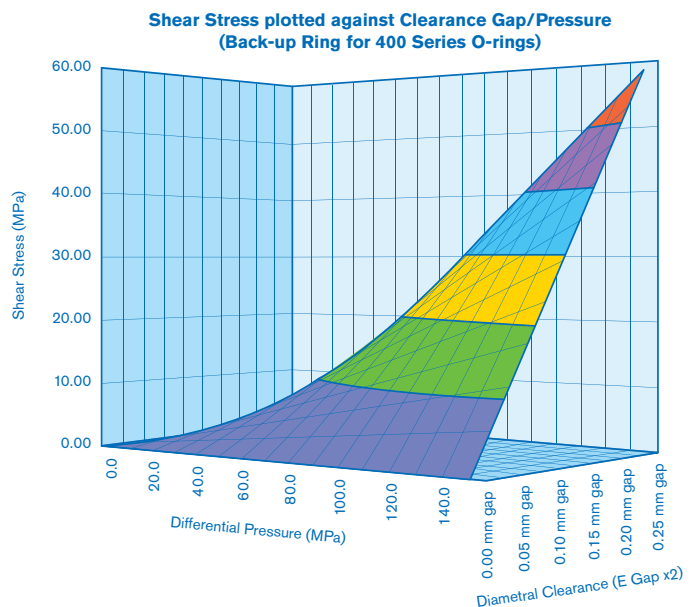
Back-up Ring for 000/100/200 series



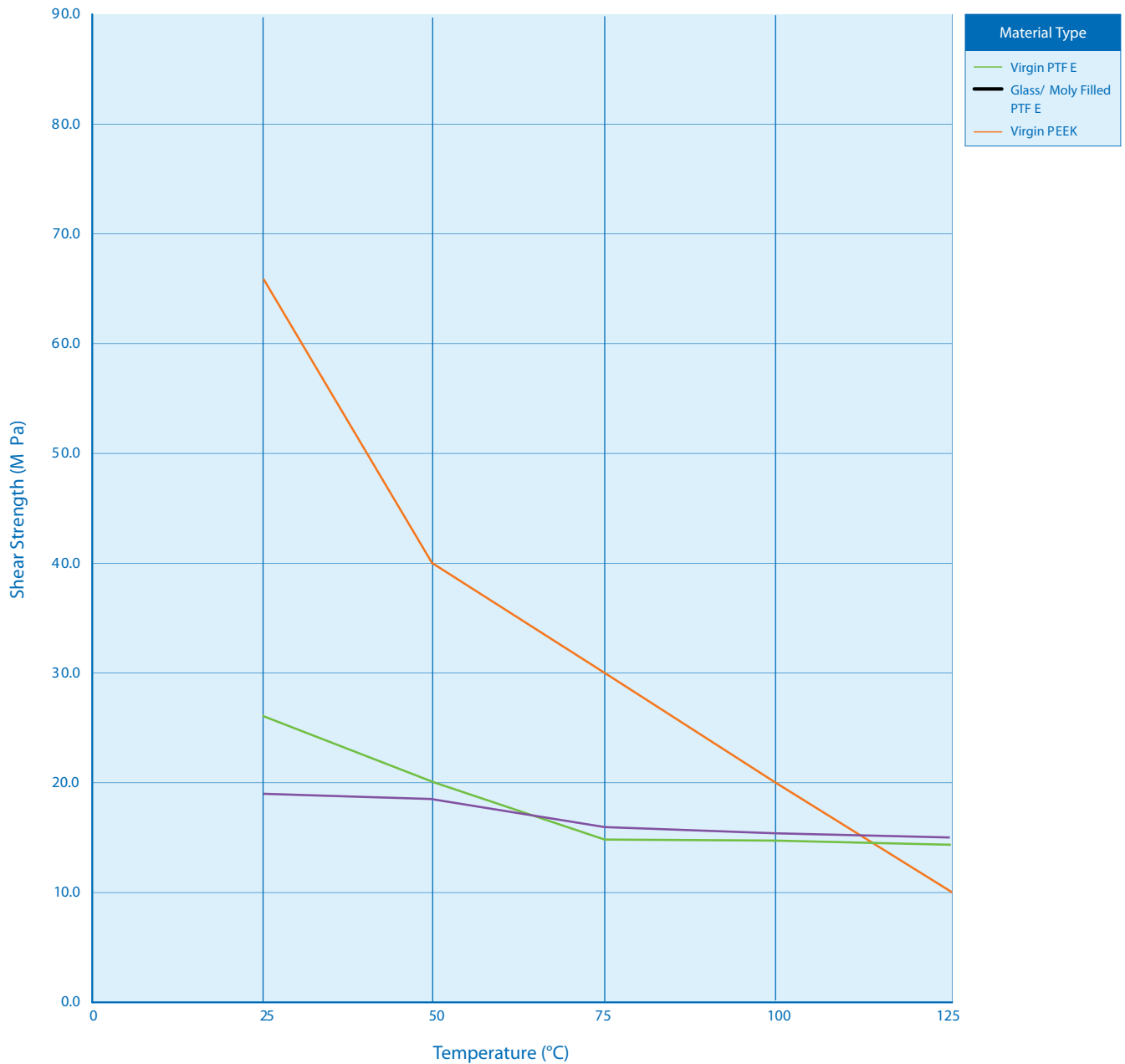
Back-up Ring for 300 series



Back-up Ring for 400 series



Material Shear Strength Vs Temperature



Moulded Parts

ERIKS Sealing Technology can supply a variety of all rubber or rubber-to- metal bonded products.

The moulding of elastomeric compounds is accomplished by forcing the materials into shape using heat and pressure. This can be done by compression, transfer and injection methods.

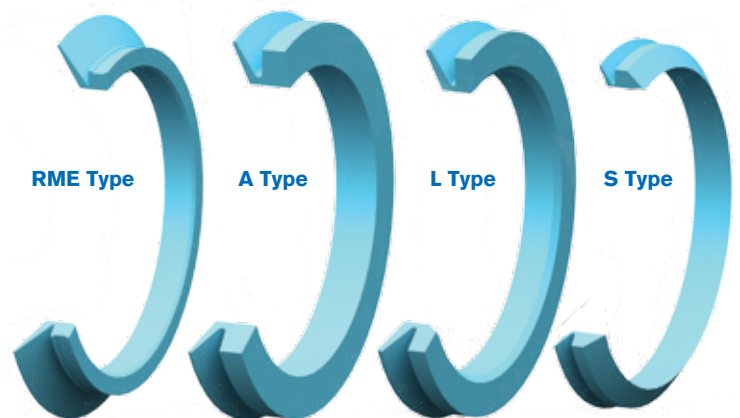
Our engineers will assist with the development of innovative solutions for your particular requirement.

Typical items include dust covers, bushes, plugs, bungs, covers and specialist gaskets.



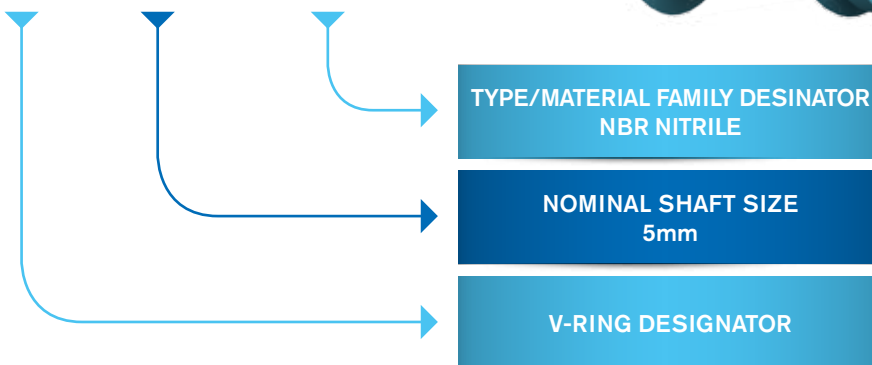
V-rings

V-rings are an all axial elastomer seal for shafts and bearings. It installs onto the shaft or counterface. This type of seal has been used widely for many applications and has proved to be reliable and effective against dust, dirt, water, oil splash and other media.



V-ring part number break down

V - 0050 A - NBR



Bonded Washer Seals

Bonded Seals were originally designed to replace copper type washers in high pressure systems. The bonded seal comprises of a metal washer (square or rectangular in section), to which a trapezoidal elastomeric ring is bonded. The advantages of this system is that the metal washer resists the bursting forces applied and also limits any deformation of the elastomeric element. The metal washer also limits the compression of the seal and eliminates any over torque of the joint.

Bonded Seals



- **Reliable high and low pressure sealing**
- **Wide temperature capability**
- **Over compression prevented by metal outer ring**
- **Wide range of metal and elastomers**
- **Available in a wide range of imperial and metric sizes**

Self-Centering Bonded Seals



The self centering type of bonded seal has the additional benefit of pre-assembling on to threads. The thin seal membrane offers little resistance during assembly.

- **All key benefits of original design**
- **Concentrically located**
- **Positively retained**
- **Ability to pre-assemble**
- **Can be automatically installed**

Kitting and Bagging

ERIKS Sealing Technology can provide bespoke kits and aftermarket bagging of individual parts to service your industry requirements.

Our specially tailored kits are assembled and packaged with clearly marked part numbering and can be supplied with our own brand, or alternatively, customer specific branding.

We are able to offer kits that include a variety of our core product, ranging from Rotary Seals and O-rings to Hydraulic Seals, Washers and Gaskets.





ERIKS Sealing Technology

ERIKS Sealing Technology offers a comprehensive range of high performance sealing products, supported by a world-class technical and logistical service to deliver the right seal on time to your critical applications.



ERIKS Sealing Technology
Unit 5, Yorks Park
Blowers Green Road
Dudley
West Midlands
DY2 8UL

Tel 0845 603 1221
Fax 0845 603 1441
www.eriks.co.uk



ERIKS Technology Campus
Daten Park
Warrington
Cheshire
WA3 6SX

Tel 01925 883 950
Fax 01925 830 843



know-how makes the difference

ERIKS