ERIKS Sealing Technology

Specialist Seals for Utilities and Power Generation Applications

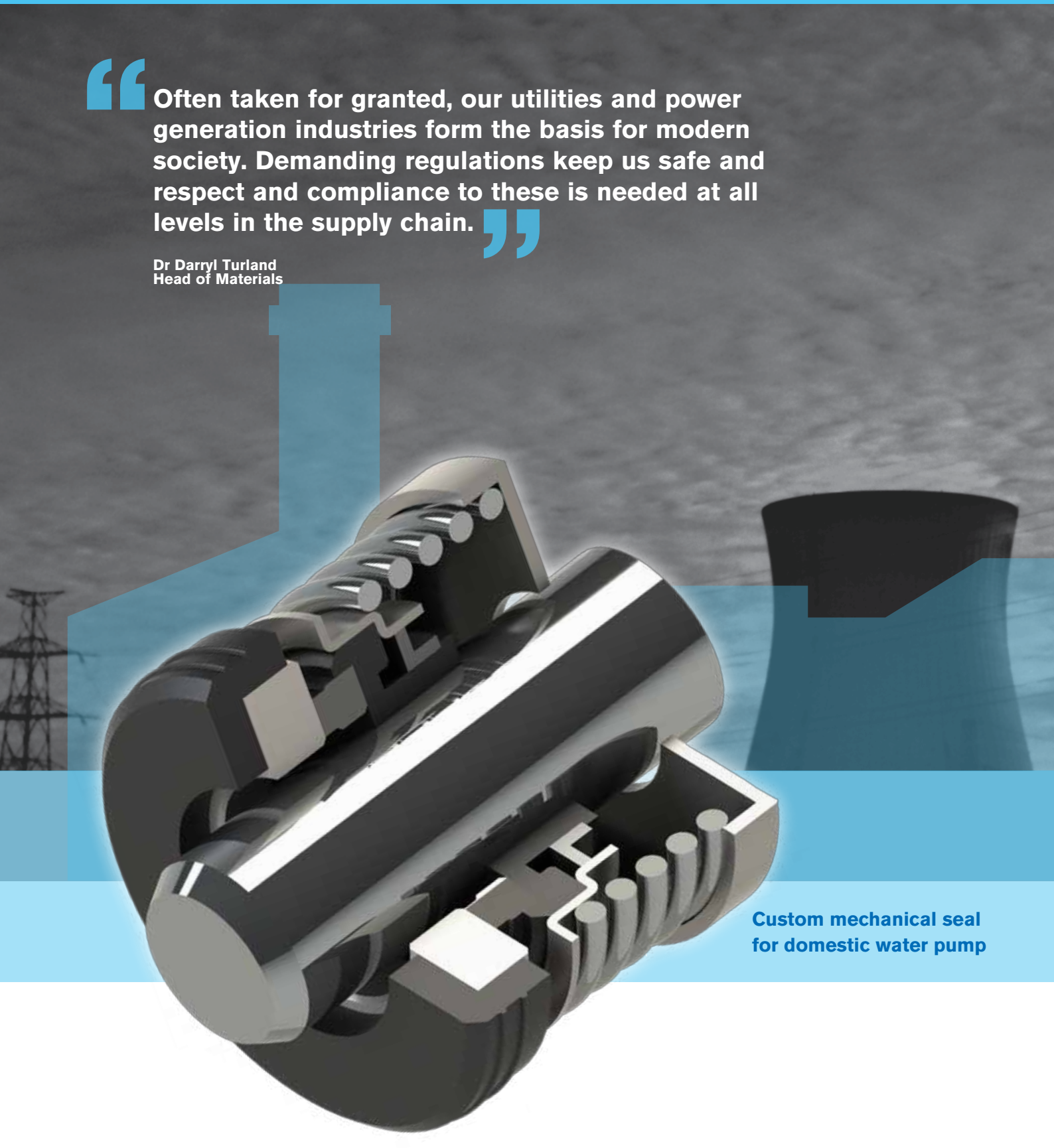
pioneer WESTON

know-how makes the difference

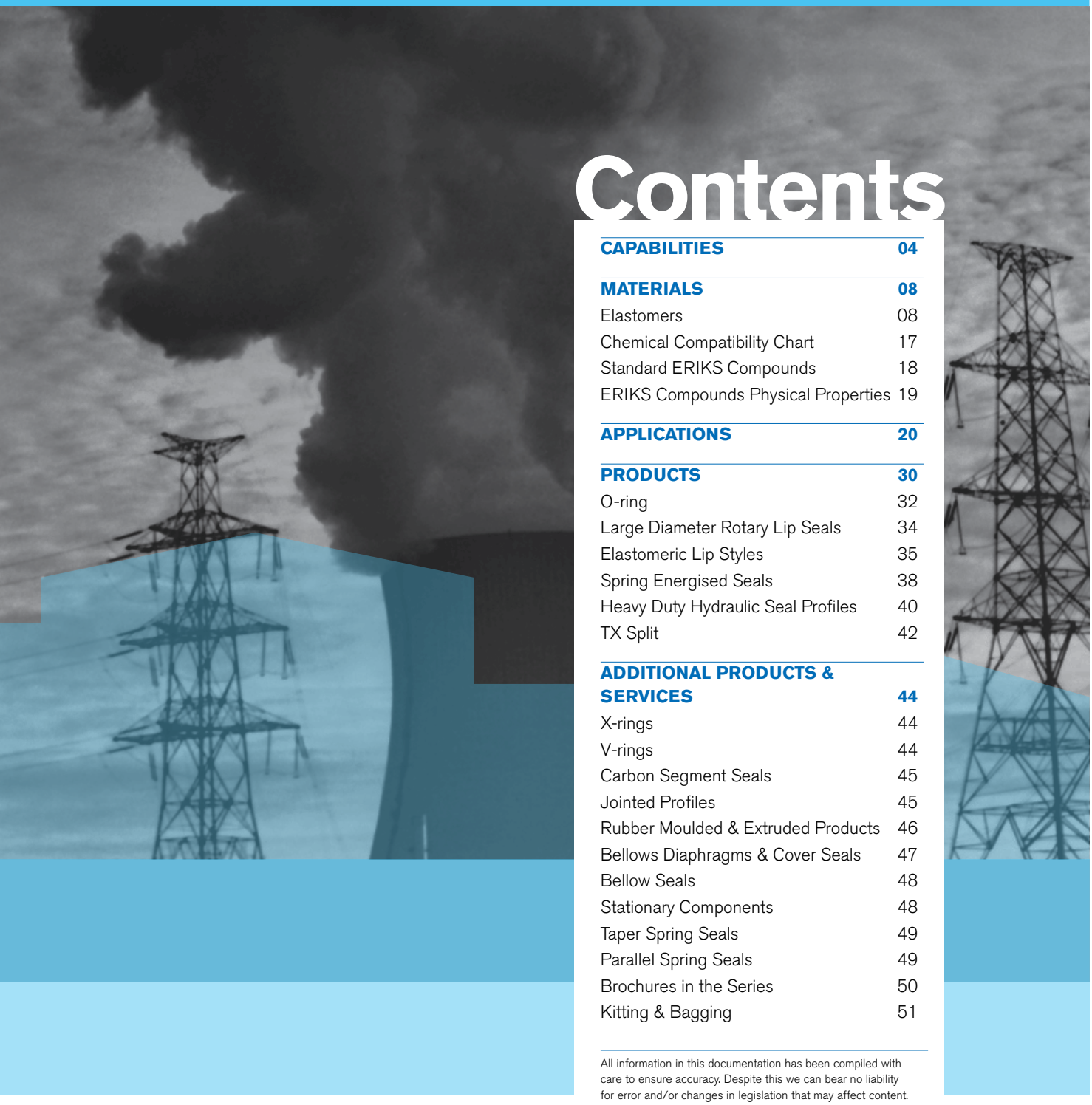
ERIKS

“Often taken for granted, our utilities and power generation industries form the basis for modern society. Demanding regulations keep us safe and respect and compliance to these is needed at all levels in the supply chain.”

Dr Darryl Turland
Head of Materials



Custom mechanical seal for domestic water pump



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Leader in Sealing Technology

The varied demands posed by the unique requirements of applications in the energy and utilities sectors call for specific expertise in selecting appropriate seal designs and materials. ERIKS Sealing Technology can help you specify the optimal seal for your application capable of satisfying both performance and regulatory requirements.

It's hard to imagine a sector with more varied demand of sealing solutions; whether your need is for gamma radiation resistance in the heart of a nuclear reactor, or to pass a taste test in potable water application ERIKS recognise the criticality of each and every application and the need for consistent, reliable product and supply. Our extensive experience in such environments, together with our supply chain capabilities allows us to comprehensively support your requirements.

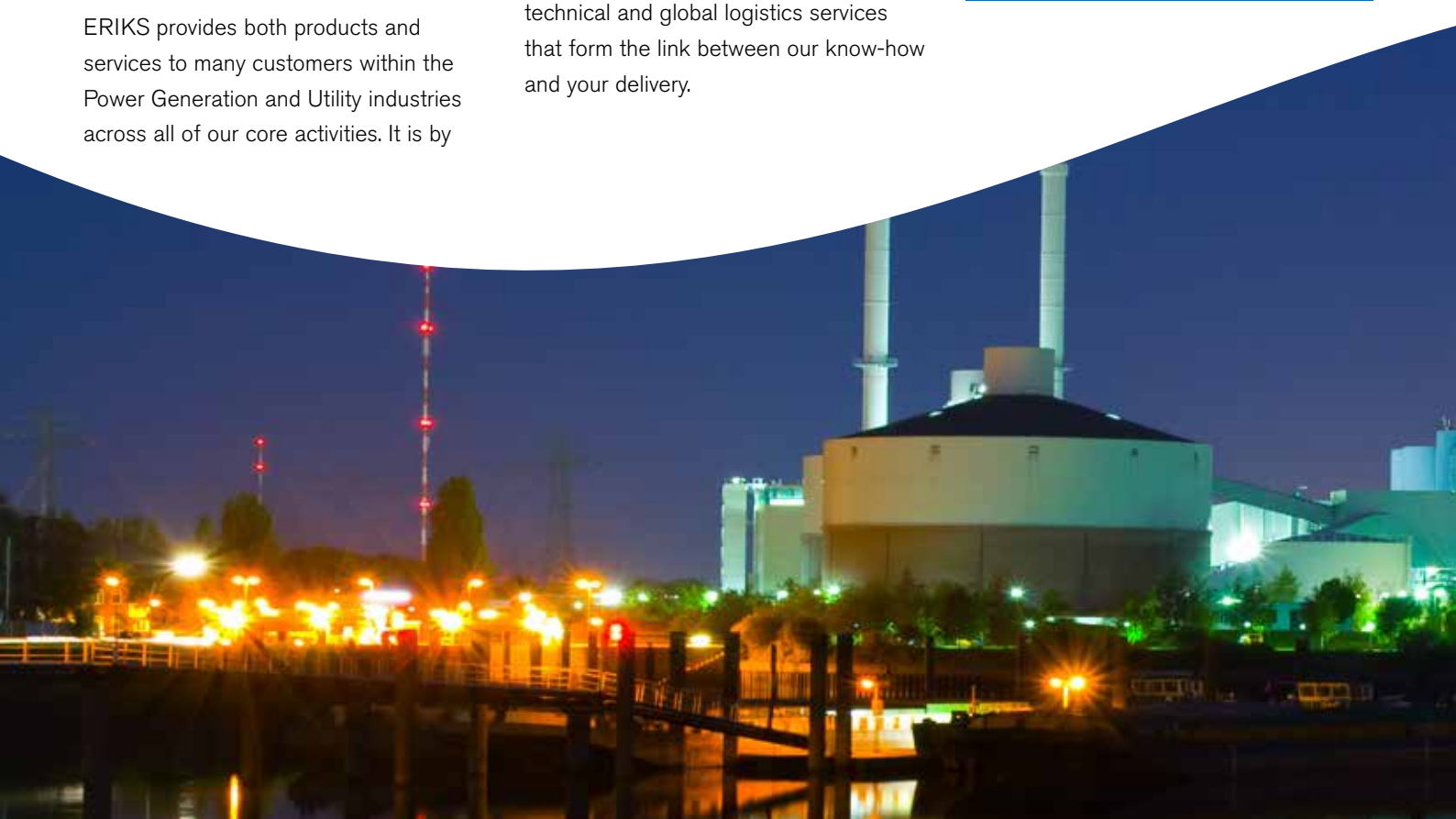
ERIKS provides both products and services to many customers within the Power Generation and Utility industries across all of our core activities. It is by focussing upon developing appropriate products for these large blue-chip customers that has allowed ERIKS Sealing Technology to develop this specific product range dedicated to these industries.

Regulatory compliance is a must and our grades, designed to meet specifications such as EN, WRAS and KTW are listed in specific tables in the applications section of this brochure for your convenience.

Our products are supported by advanced technical and global 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**



Stock Availability

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

ERIKS Sealing Technology is a world leader in high-performance sealing systems. 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.

Product Design

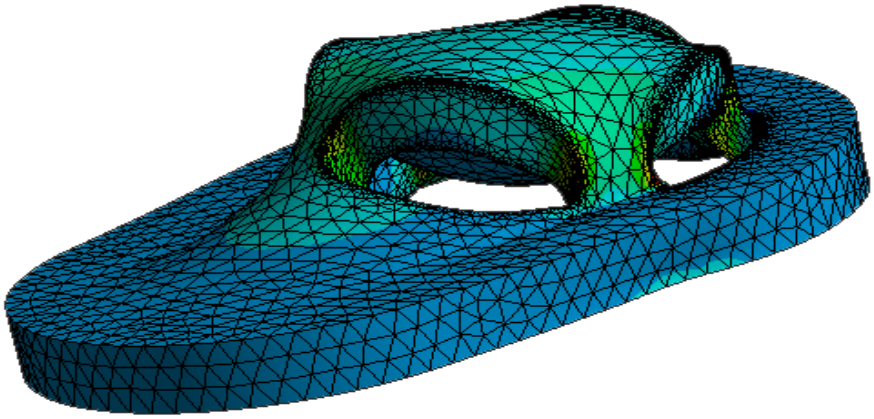
In an environment dedicated to innovation and free thought, our highly talented design team, work with the latest 3D CAD tools to capture design intent with your engineers.

This technology proves an invaluable tool in communicating and developing conceptual solutions involved in co-engineering partnerships; 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.

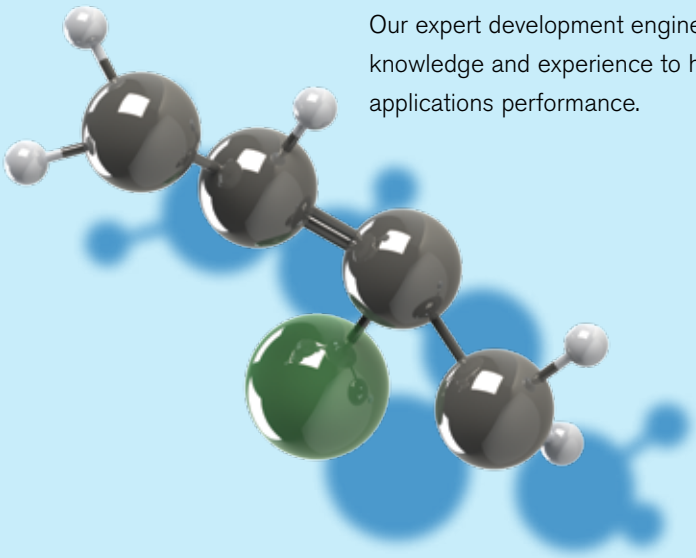
Finite Element Analysis (FEA)

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

Our application test laboratory can perform application specific testing services, such as performance and life-time testing of mechanical component and rotary seals, reducing risk when introducing new products to market.



Our expert development engineers can offer practical knowledge and experience to help optimise your applications performance.

Material Technology Centre

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.

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.

Capabilities:

- Hardness (°IRHD/Shore A)
- Compression-set
- Mechanical property testing
- Chemical and heat ageing
- 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
- UV resistance
- DMTA – Dynamic Mechanical Thermal Analysis
- Abrasion resistance
- Compression Stress Relaxation
- Internal mixers
- Compression moulding
- 2-Roll mills

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).

With modulated DSC (MDSC), the samples are subjected to a non-linear heating/cooling regime (i.e. sinusoidal). This non-linear temperature profile allows the measurement of heat-capacity effects simultaneously with the kinetic effect, as well as increasing the sensitivity of the system. With the MDSC, overlapping events can also be separated, i.e. measurement of the Tg and molecular relaxation.

Elastomers

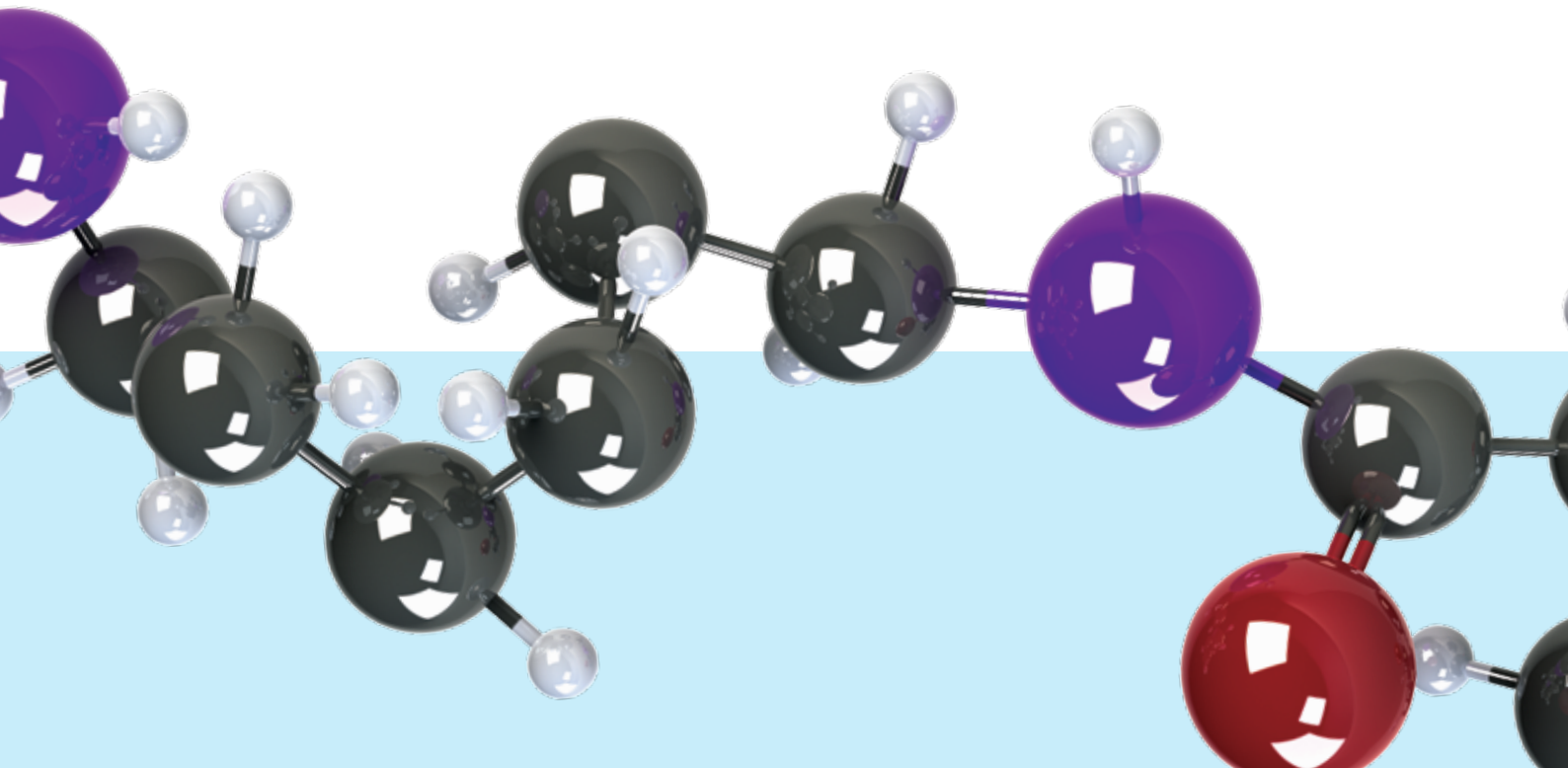
Elastomeric materials are described as having non-linear, viscoelastic behaviour, this means that they exhibit elastic recovery, time dependent behaviour and the relationship between load and deflection is not linear.

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

Compounds typically comprise of:

- 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 or 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.

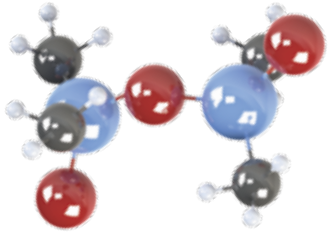
Hydrogenated Nitrile (HNBR)

Hydrogenated nitrile rubber (HNBR) is a highly saturated copolymer of acrylonitrile (ACN) and butadiene.

The properties of HNBR are dependent upon the acrylonitrile content and degree of hydrogenation (saturation) of the butadiene copolymer. They have better oil and chemical resistance than nitrile rubber and withstand higher temperatures. HNBR has excellent resistance to hot water, steam and ozone. Mechanical 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.

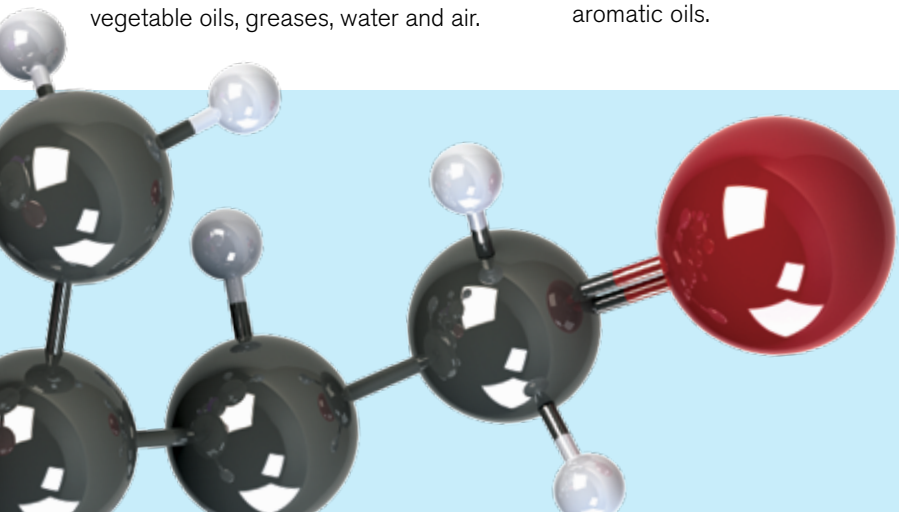
HNBR can either be cured with sulphur or with peroxide, depending on which properties are the most important. Typical applications include O-rings, dynamic seals and gaskets. Limitations include poor electrical properties, poor flame resistance and swelling with aromatic oils.

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 resistance to ultra violet radiation (UV), oxygen and ozone.

Silicone is best suited to non-dynamic applications, as these elastomer types possess relatively low tear strength and abrasion resistance, although higher strength grades are available. They are also resistant to many mineral oils.



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, fuels, silicone oils and greases. However FKMs show poor resistance to ethers, ketones, 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.

Also related to the chemical resistance of the different types of fluoroelastomer is the cure system utilised. Bisphenol cure systems are common with the copolymer family; this system is a condensation reaction, which can be reversed when exposed to steam, hot water etc. Terpolymers or tetrapolymers are most commonly cured using peroxide based systems, which offer significant improvements in steam and water resistance.

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.

Epichlorohydrin (CO, GCO, ECO, GECO, Hydrin®)

Epichlorohydrin rubber is a synthetic elastomer which The American Society for Testing and Materials (ASTM) has designated as:

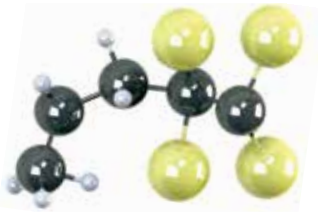
- CO - Homopolymer of epichlorohydrin (ECH)
- GCO - Copolymer of epichlorohydrin/ allyl glycidyl ether (ECH/AGE)
- ECO - Copolymer of epichlorohydrin/ ethylene oxide (ECH/EO)
- GECO - Terpolymer of epichlorohydrin/ethylene oxide/allyl glycidyl ether (ECH/EO/AGE)

The saturated polymer chain provides excellent ozone resistance. Levels of each of the different monomers can be optimized to improve permeation, fuel and ozone resistance.

In sealing applications, epichlorohydrin rubber compounds are noted for their superior gas impermeability and physical properties over a wide temperature range while maintaining excellent resistance to petroleum oils. It has a stable cycling capability from low to high temperature. Resistance to ozone, oxidation, weathering, and sunlight are other typical ECO qualities. Service temperatures are -51°C to +150°C (-60°F to +300°F).

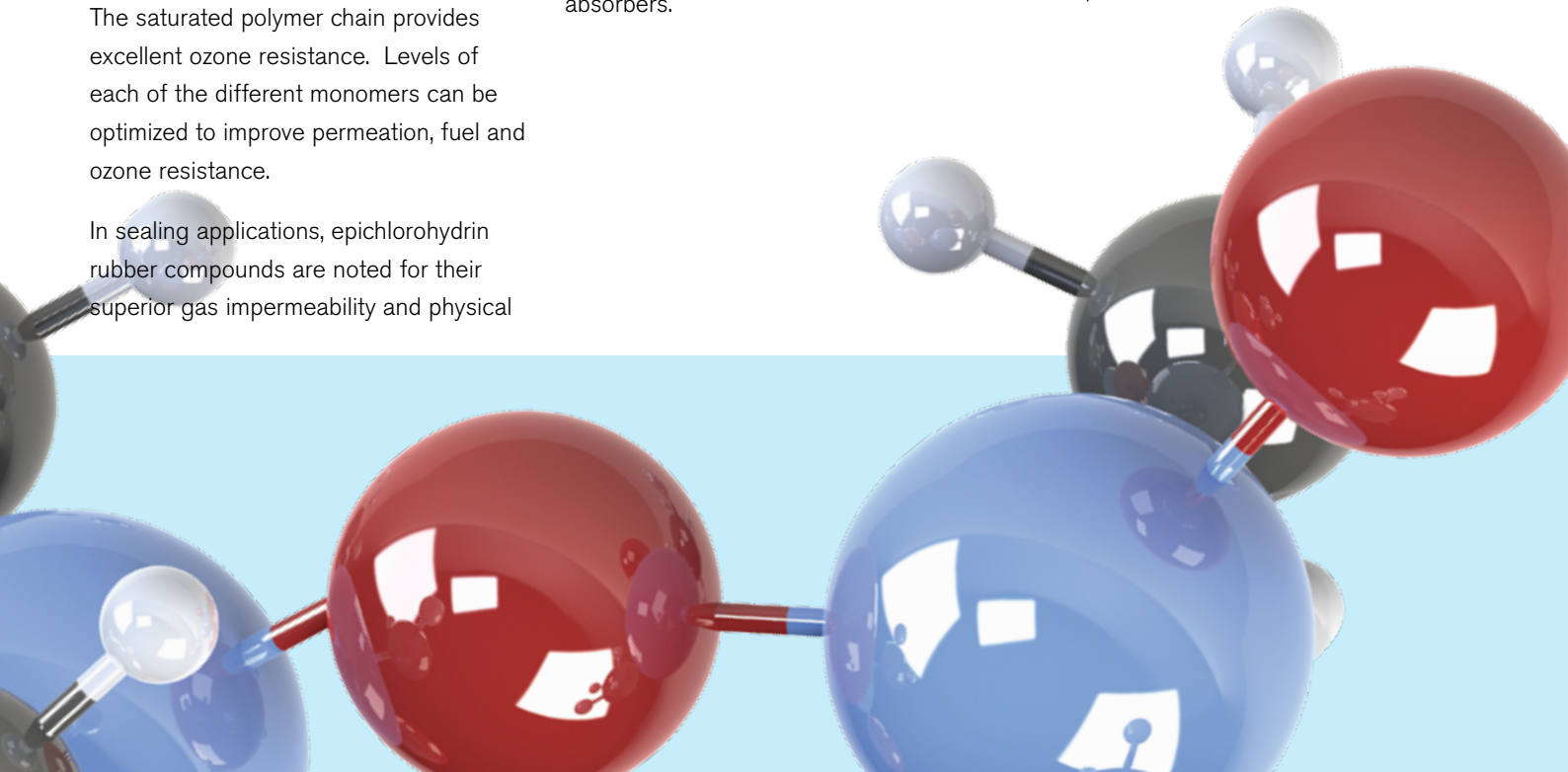
Epichlorohydrin compounds can also provide vibration dampening comparable to natural rubber (NR). This characteristic makes epichlorohydrin compounds a good technical candidate for suspension mounts and impact absorbers.

Aflas® (FEPM)



The most common forms of Aflas® (100 or 150 series) are categorized within ASTM D 1418-01 as FEPM. These grades are alternating copolymers of tetrafluoroethylene and propylene, with a fluorine content of ~54%. Such chemical structures offer excellent heat resistance, exceptional chemical resistance (significantly to alkalis and amines), along with high electrical resistivity.

Aflas® compounds are resistant to a wide range of chemicals such as acids, alkalis and steam, offering superior resistance to strong bases in comparison with FKM.

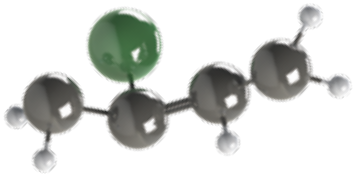


Ethylenepropylene Rubbers (EPM, EPDM)

Ethylenepropylene based rubbers are forms of non-polar synthetic rubbers. EPM (sometimes also known as EP) rubber is based on ethylene and propylene monomers, with no unsaturation (carbon-carbon double bonds) present. EPDM is also based on the same constituent monomers, however as no unsaturation is present in the backbone, it is added as a third monomer, pendent to the main chain. EPDM materials can be cured with either sulphur or peroxide; sulphur offers improved mechanical properties and peroxide enhanced heat stability. EPM rubber can only be cured using free-radicals (peroxide or radiation curing). As the polymer chains of both EPM and EPDM have completely saturated hydrocarbon backbones, excellent ozone resistance and very good resistance to heat and oxidation are achieved.

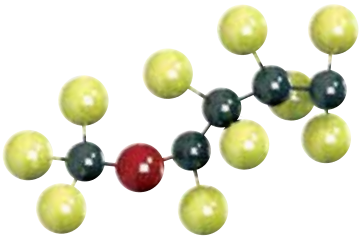
Being non-polar elastomers, EPM and EPDM offer good performance in polar fluids such as alcohols, water, steam, coolants etc., but perform badly in non-polar fluids such as hydrocarbon oils, lubricants and greases.

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.

Perfluoroelastomers (FFKM)



Perfluoroelastomers (FFKM) have a fully fluorinated polymer backbone resulting in a fluorine content >71%. As the material is free from carbon-hydrogen bonds in the polymer chain, the FFKM materials offer the ultimate thermo-chemical resistance.

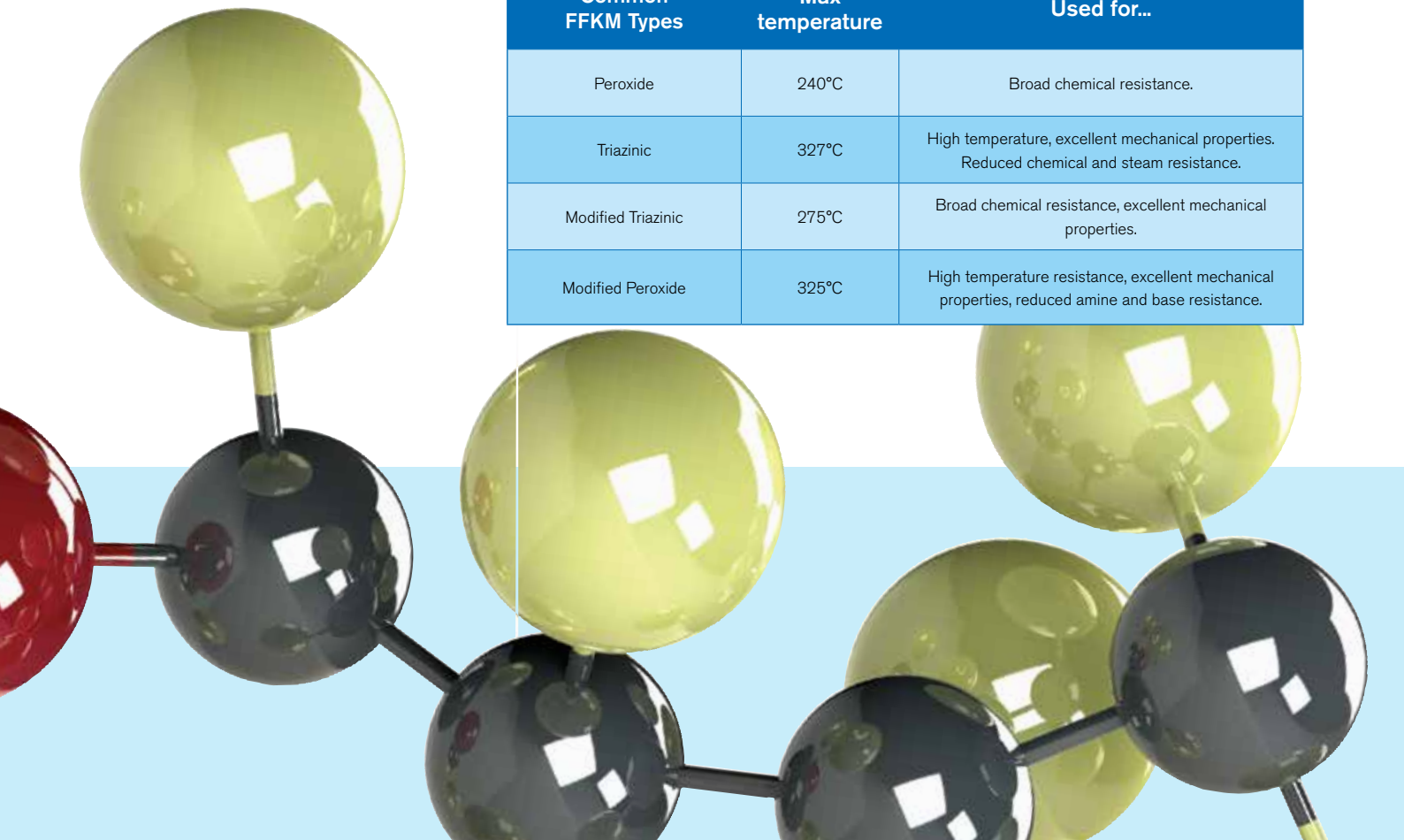
This is demonstrated by the good long-term, high-temperature, compression-set resistance. Chemical resistance is second to none, with good performance in a broad variety of harsh environments: hot amines, steam, solvents, hydrocarbons etc.

Traditionally, FFKM polymers have offered limited resistance to low temperatures, however, new polymer chemistry now offers FFKM grades capable of sealing at temperatures down to -40°C.

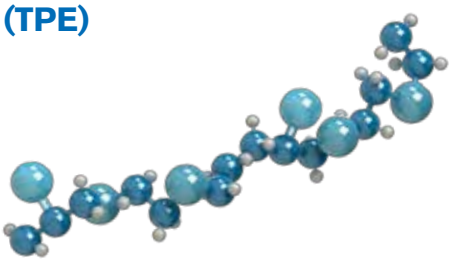
Although all FFKM polymer backbones are fully fluorinated, the cross-linking systems used to join the polymer chains together differ significantly, resulting in varied temperature and chemical resistance.

Types of perfluoroelastomers

Common FFKM Types	Max temperature	Used for...
Peroxide	240°C	Broad chemical resistance.
Triazinic	327°C	High temperature, excellent mechanical properties. Reduced chemical and steam resistance.
Modified Triazinic	275°C	Broad chemical resistance, excellent mechanical properties.
Modified Peroxide	325°C	High temperature resistance, excellent mechanical properties, reduced amine and base resistance.



Thermoplastic Elastomers (TPE)



Thermoplastic elastomers (TPE) are a range of copolymers or a physical mix of polymers (usually a plastic and a rubber). Those based on mixed polymer systems consist of polymers with both plastic and elastic properties. Traditional elastomers are thermosetting materials with covalent crosslinks between the polymer chains (formed during the 'vulcanisation process'), but require processing using different methods to higher-volume thermoplastics, e.g. higher temperatures, longer processing times etc.

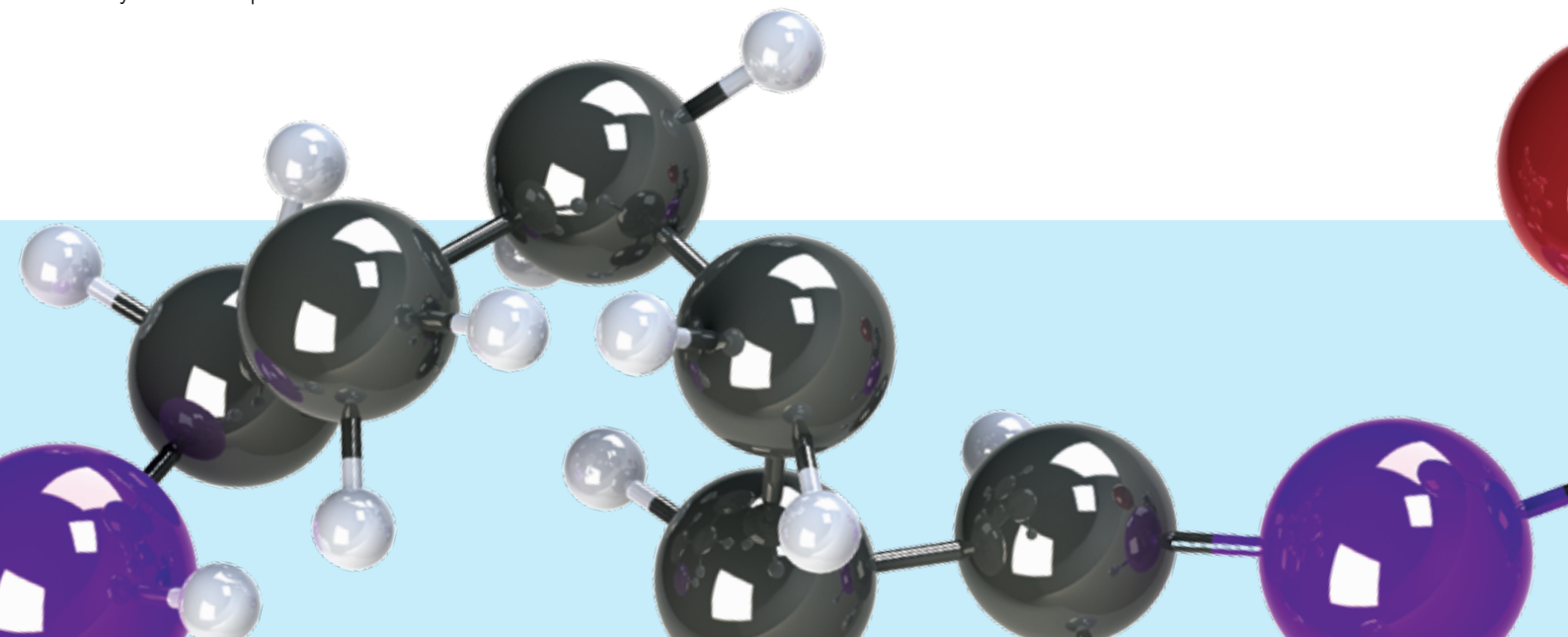
The major difference between thermosetting elastomers and TPEs is the type of crosslink utilized. In TPEs, the crosslink is a covalent bond; the crosslinking in TPEs is a weaker dipole, hydrogen bond, or a covalent bond within only one of the phases of the material.

TPEs are advantageous in that they have elastomeric properties, yet can be processed using methods more common in plastics processing (TPEs can be processed by blow molding, thermoforming, and heat welding). TPEs also have advantages with respect to environmental impact when compared to traditional thermosetting rubbers: TPEs have the potential to be recycled since they can be molded, extruded and re-used like plastics, but also require less energy during processing.

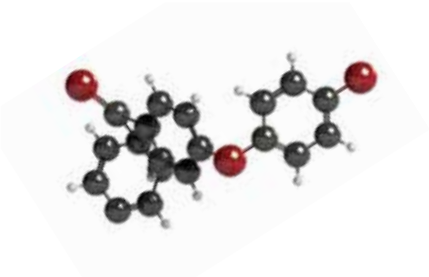
The most common types of commercial TPEs include:

- Elastomeric alloys (TPE-v or TPV)
- Thermoplastic polyurethanes
- Styrenic block copolymers
- Polyolefin blends
- Thermoplastic copolyester
- Thermoplastic polyamides

Due to the variety of materials available, each family will offer different chemical and thermal resistance. Related to the differences in crosslinking, TPEs have relatively poor heat resistance and can show high compression set at elevated temperatures when compared to thermosetting elastomers. Therefore, TPEs are often used in less demanding applications such as door seals, bumpers, extruded profiles etc.



Polyether ether ketone (PEEK)

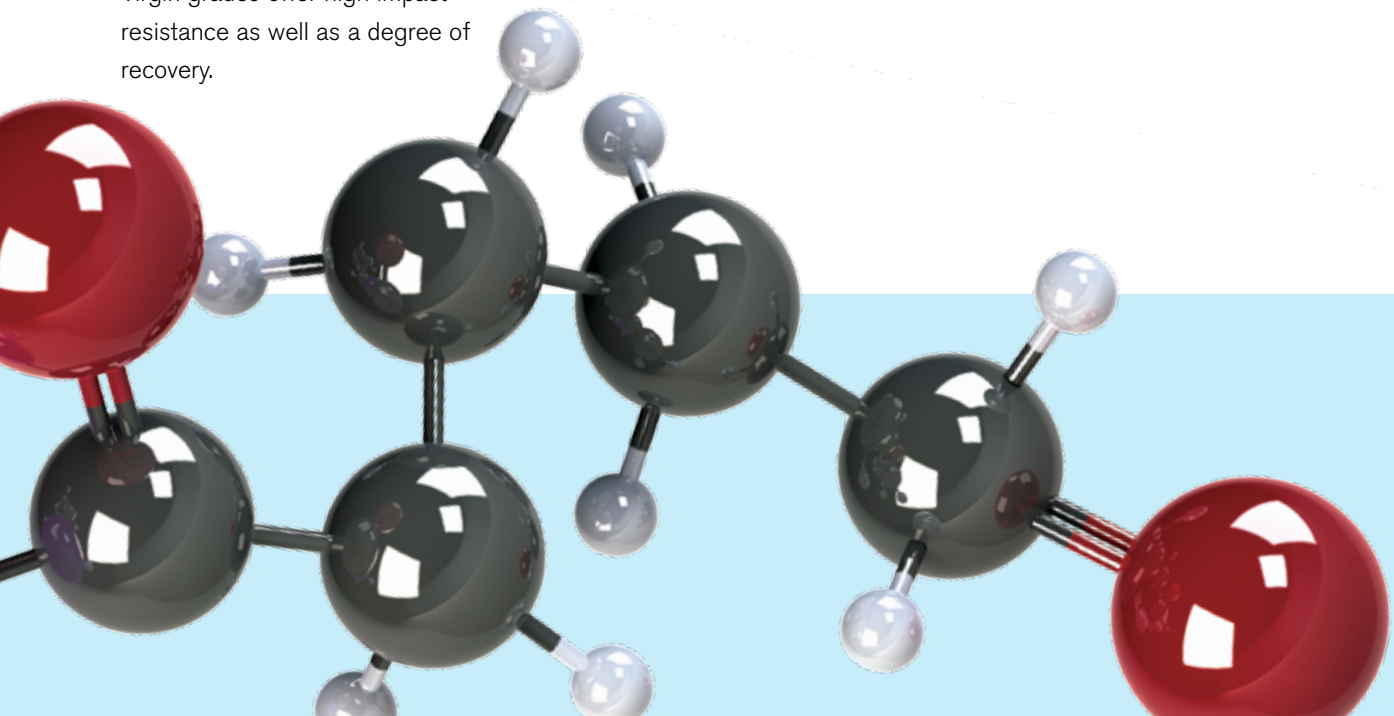


Polyether ether ketone (PEEK) is an organic, semi-crystalline, thermoplastic polymer used in demanding engineering applications. PEEK offers excellent mechanical properties, which are maintained at high temperatures. Its resistance to thermal attack and its dimensional stability at high temperatures, along with broad chemical resistance, allows PEEK to be used in applications such as bearings, sealing back-up rings etc.

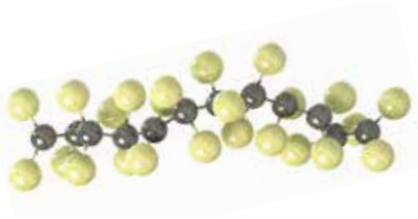
PEEK is available as non-filled ('virgin') grades, and as various filled grades which modify its physical and mechanical characteristics.

- Virgin grades offer high impact resistance as well as a degree of recovery.
- Glass-filled PEEK grades have increased compressive strength and shear strength at elevated temperatures.
- Carbon-filled grades have enhanced compressive strength, tensile strength and wear-resistance.
- PTFE-filled PEEK offers a reduced coefficient of friction.
- Graphite-filled PEEK reduces the friction of the materials, improving the 'glide' properties.

Combinations of some of the above are also often used to offer optimal performance in service.



Polytetrafluoroethylene (PTFE)



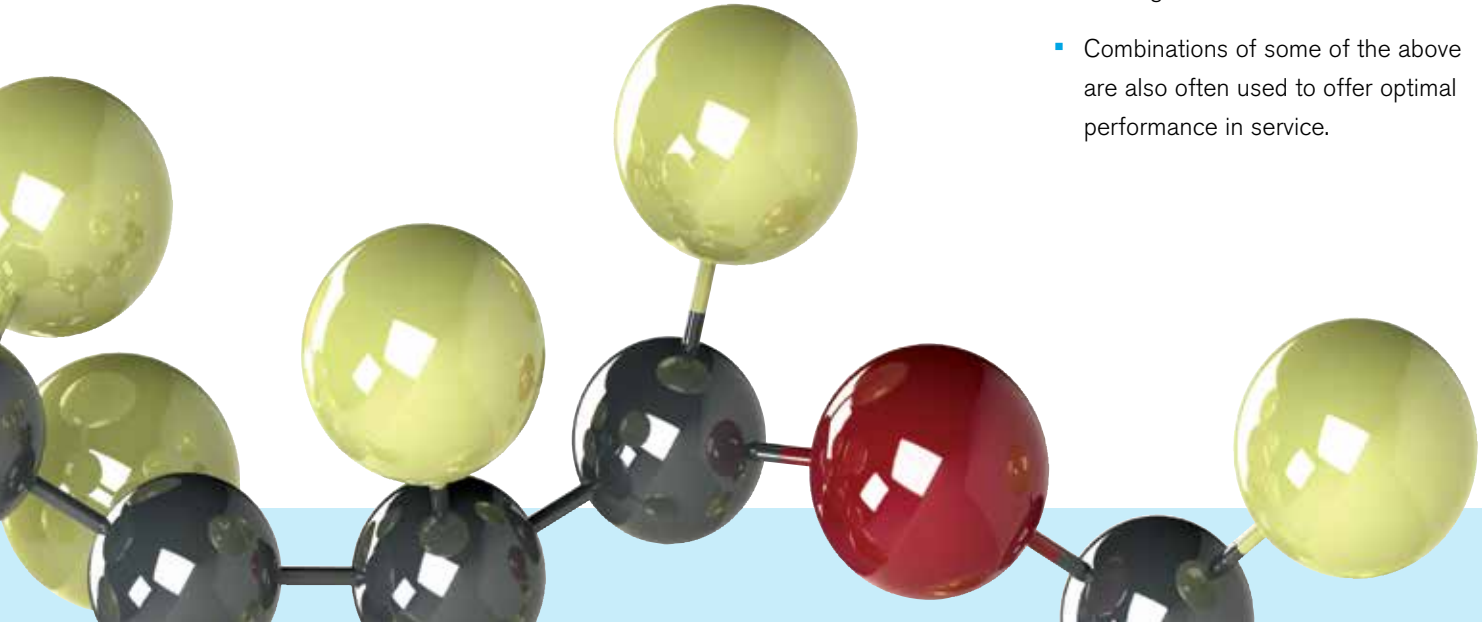
PTFE (polytetrafluoroethylene) is a synthetic, thermoplastic polymer which offers exceptional chemical resistance over a wide range of temperatures and offers extremely low levels of friction.

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. Modified backbone grades of PTFE are available which offer higher temperature (+315°C) and deformation resistance. PTFE is also available with fillers 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.
- Carbon-fibre filled for increased wear resistance and use against non-hardened surfaces.
- 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).
- Polyester filled for improved high temperature and wear resistance, for applications where running surfaces are non-hardened.
- Polyphenylenesulphide (PPS) filled for improved wear 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.



Common Chemical Compatibilities of Materials

Media	NBR	HNBR	CR	ACM	AEM	PU/PE	FKM (A)	FKM (GF)	VMQ	EPDM	TPE	FFKM
AdBlue	2	2	3	2	2	3	1	1	2	1	1	1
Aliphatic Hydrocarbons	1	1	2	1	2	1	1	1	3	4	4	1
Alkanes	1	1	2	1	2	1	1	1	3	4	4	1
Ammonia	2	2	3	4	4	1	4	4	2	1	1	1
Aromatic Hydrocarbons	1	1	4	2	3	3	1	1	3	4	4	1
Bioethanol	2	2	1	4	3	4	3	1	2	1	1	1
Brake fluid - DOT 3, 4 and 5.1 types	3	3	2	4	4	4	4	3	3	1	1	1
Brake fluid - DOT 5 type	1	1	1	1	1	1	1	1	4	1	1	1
Butanol	2	1	1	4	1	3	1	1	3	1	1	1
Corrosion inhibitors	2	1	2	3	3	3	4	4	3	1	1	1
Crude oil	3	3	3	3	3	3	2	1	3	4	4	1
Diesel fuel	1	1	2	1	1	2	2	1	4	4	4	1
Engine lubricating oils	1	1	2	1	2	1	1	1	3	4	4	1
Ester based hydraulic fluids	4	4	4	4	4	4	3	3	3	4	4	1
Ethanol	2	2	1	4	2	4	1	1	1	1	1	1
Fatty acid methyl ester (FAME)	2	2	2	1	1	2	2	1	3	3	3	1
Glycol-based coolants	2	1	1	4	1	3	3	1	3	1	1	1
Glycol-ether based brake fluids	3	3	2	4	4	4	4	3	3	1	1	1
Heavy fuel oil / bunker fuel	3	3	3	3	3	3	2	1	3	4	4	1
Hydraulic oil	1	1	3	1	1	1	1	1	3	4	4	1
IRM 901 fluid (ASTM Oil #1)	1	1	2	1	1	1	1	1	2	4	4	1
IRM 902 fluid (ASTM Oil #2)	1	1	2	1	1	1	1	1	2	4	4	1
IRM 903 fluid (ASTM Oil #3)	2	2	3	3	3	2	1	1	3	4	4	1
Liquidified natural gas (LNG)	1	2	2	3	4	1	1	1	3	4	4	1
Low sulpur diesel fuel	1	1	2	1	1	2	2	1	4	4	4	1
Lubricating oils (API CC-type)	1	1	2	1	2	1	1	1	3	4	4	1
Lubricating oils (API CD-II-type)	3	1	3	2	3	2	1	1	4	4	4	1
Lubricating oils (API CD-type)	1	1	2	1	2	1	1	1	3	4	4	1
Lubricating oils (API CE-type)	1	1	2	1	2	1	1	1	4	4	4	1
Methanol	2	2	1	4	1	4	2	1	2	1	1	1
Methyltertiarybutylether (MTBE)	4	4	4	4	4	4	4	3	4	3	3	1
Mineral oil	1	1	2	1	2	1	1	1	3	4	4	1
Organophosphate ester	4	4	4	4	4	4	3	3	3	3	3	1
Ozone	2	1	2	1	1	2	1	1	1	1	1	1
Petroleum fuels	2	2	2	2	2	2	2	1	3	4	4	1
Polyalkylene glycol (PAG)	2	1	2	4	2	3	3	1	3	2	2	1
Polyalphaolefin	1	1	2	1	2	1	1	1	3	4	4	1
Polyethylene glycol	2	1	1	4	1	3	3	1	3	1	1	1
Polypropylene glycol	2	1	1	4	1	3	3	1	3	1	1	1
Rapeseed (canola) oil	1	1	3	1	1	1	1	1	4	4	4	1
Refridgerant R134a	1	1	2	1	1	1	4	4	2	1	1	2
Silicone oils	1	1	1	1	1	1	1	1	4	1	1	1
Sythetic oil	1	1	2	1	1	1	1	1	3	4	4	1
Universal Transdraulic fluids	3	4	3	2	3	2	1	1	3	4	4	1
Vegetable oils	1	1	3	1	1	1	1	1	4	4	4	1
Water / coolant <100degC	2	1	2	4	1	2	1	1	1	1	2	1
Water / coolant <150degC	4	3	3	4	3	3	3	1	2	1	4	1
Water / coolant <200degC	4	4	4	4	4	4	4	2	4	3	4	1
Weathering	2	1	1	1	1	1	1	1	1	1	1	1

KEY:

1 = Excellent **2 = Good** **3 = Poor** **4 = Not recommended**

Material information can also be found on our Chemical Compatibility tool:

http://oring-groove-wizard.eriks.co.uk/chemicalcompatibility.aspx

Selection of Standard ERIKS Compounds

A range of different ERIKS compounds developed for specific applications

Elastomer	Compound Reference	Colour	Hardness	Temperature	Application
Nitrile, NBR, Buna N	36624	Black	70	–35 to +110°C –31 to +230°F	Standard compound with good compression-set values and medium acrylonitrile content for use with hydraulic oils, vegetable oils, animal fats, acetylene, alcohols, water, air, fuels and many other fluids.
EPDM	55985	Black	70	–45 to +150°C –49 to +320°F	High performance, peroxide cured EPDM compound with excellent compression set. For use with water, steam, solvents, alcohols, ketones, esters etc. Not recommended for vegetable or mineral oils.
Hydrogenated Nitrile, HNBR	886510	Black	70	–40 to +150°C –40 to +320°F	Low temperature HNBR, offering good hydrocarbon resistance and high temperature performance. Good abrasion resistance.
Fluorocarbon FKM, A-Type	51414	Black	75	–20 to +200°C –4 to +392°F	General purpose compound with very low compression-set characteristics at high temperatures and chemical resistance to oils, fats, fuels. Suitable for vacuum applications.
	51414G	Green	75	–20 to +200°C –4 to +392°F	General purpose compound with very low compression-set characteristics at high temperatures and chemical resistance to oils, fats, fuels. Suitable for vacuum applications.
FKM, GF-Type	514141	Black	75	-10 to +200°C +14 to +392°F	FKM GF- Type Terpolymer with improved steam and temperature resistance.

Physical Properties of ERIKS Compounds

Technical Data	36624	55985	886510	51414	51414G	514141
Colour	Black	Black	Black	Black	Green (RAL 6011)	Black
Hardness (ISO 48 Method M) ±5 °IRHD	70	70	70	75	75	75
Specific Gravity	1.25	1.12	1.24	1.85	2.07	1.88
Minimum operating temperature °C	–30	–45	–40	–20	–20	–10
TR-10 °C	–22	–40	–33	–16	–16	–16
Maximum operating temperature °C	120	150	150	200	200	200
Tensile strength MPa	13	15.2	20	13	12	19.3
Elongation %	250	188	340	170	170	328
Compression-set (ISO 815 method A)						
Test time (hours)	22	22	22	24	24	22
Test temperature °C	100	150	150	200	200	175
Result – Slab %	12	14	12	12	14	14
Result – O-ring 3.53 mm %	20	15	16	18	19	–
Heat Ageing (ISO 88)						
Test time (hours)	70	70	20	70	70	70
Test temperature °C	100	125	150	200	200	250
Hardness change °IRHD	6	2	-2	4	5	4

Potable Water

Global markets for household and commercial water products and systems require products be certified to a wide range of specifications, we are able to supply product certified to many of these global standards, including:

USA and Canada

NSF is the American Foundation carries out different types of certifications for drinking water, foodstuff etc. where each type of certificate being identified by a standard; in relation to potable water, NSF / ANSI Standard 61 applies. NSF / ANSI 61: Drinking Water System Components – Health Effects by most governmental agencies that regulate drinking water supplies.

European

EN 681-1 is a European standard which specifies a series of requirements for elastomeric seals used in: cold drinking water, hot drinking water and water up to 110°C as well as waste-water (sewers and rain water systems). This regulation distinguishes different sealing categories depending on a number of different factors.

Germany

The German Federal Environment Agency (Umweltbundesamt, UBA) issues a series of guidelines for materials in contact with potable water:

- Water, Drinking Water, and Water Protection Testing Guidelinie for Organic Materials (KTW)
- Guideline for hygienic assessment of elastomers in contact with drinking water (Elastomer Guideline)

These KTW Guidelines detail testing procedures and health standards for organic materials (including elastomers) for contact with drinking water. In conjunction with these testing according to "Deutsche Vereinigung des Gas- und Wasserfaches Cert. GmbH (DVGW) worksheet W 270" is required. This approval is based on a test of moulded components, where samples are positioned in running water for a period of three months. The results are based upon an analysis of bacterial growth over the test period.

DVGW-W534 is a standard issued by DVGW that applies in particular to seals which are to be used in contact with hot drinking water.

Netherlands

Regulation BRL 2013 is issued by KIWA. KIWA is responsible for drinking water legislation within The Netherlands. This standard includes a list of ingredients which can be used in the compounding of elastomers. Samples must also be subjected to a series of laboratory tests. Certification depends upon the working temperatures.

France

ACS (Attestation de Conformite Sanitaire) is issued by test laboratories based upon test standards issued by the French Health Department. These standards are:

- DSG/VS4 number 2000/232 (issued April 2000) which relates to a list of allowed ingredients
- DSG/VS4 number 99/217 (issued April 1999) which specifies migration testing (conditions as per standard XP P 41-250)

The testing required is dependent upon the surface area of the proposed components. Smaller components require only DSG/VS4 2000/232. Larger components will require testing against both standards.

Italy

Within Italy, The Ministerial Decree 174 (issued April 2007) lists the requirements of materials intended to be used in contact with drinking water. This "DM-174" provides a positive list of substances that can be used in the compounding of elastomer components. Further testing is also required relating to: immersion in distilled water, migration tests, peroxides migration tests and colour/smell/taste tests.

Austria

TGM (Technologisches Gewerbemuseum) is the Austrian Institute responsible for the certification of components in drinking water applications. Testing is performed according to the ÖNORM B 5014-1standard. Certification will vary depending on the working temperature (cold and/or hot drinking water).

United Kingdom

WRAS (Water Regulations Advisory Scheme) is the British Body that carries out the approvals for the drinking water

applications according to the Standard BS6920. To be acceptable to WRAS products and materials must comply with BS 6920: "Suitability of non-metallic products for use in contact with water intended for human consumption with regards to their effect on the quality of the water". BS 6920 consists of five separate tests:

- Odour and Flavour of water (14 day test)
- Appearance of water (14 day test)
- Growth of microorganisms (7 to 9 week test)
- Extraction of Substances that may be of Concern to Public Health (7 day test)

Extraction of metals (4 week test)

Other

Australia QAS (AS 4020)

Japan Japanese Food Contact Approval

Applications	Requirements	Seal Profiles	Sealing Materials
Taps/ mixers	WRAS, FDA, DVGW, EN549, EN682	O-rings Cut or moulded washers Diaphrams	NBR EPDM
Toilet cisterns	Easy installation and replacement	O-rings Cut or moulded washers Diaphrams Special moulings	NBR EPDM
Showers	Resistence to chloraminated water Low compression set Wide range of service temps	O-rings Diaphrams Special mouldings Cut or moulded rings	VMQ EPDM
Valves		O-rings Diaphrams Stem seals, 4-lobe	NBR EPDM FKM
Water pumps		Mechanical seals Diaphrams Special mouldings O-rings	Carbon/Ceramic NBR EPDM FKM
Filters		O-rings	EPDM NBR VMQ

Elastomer	Compound reference	Colour	Hardness	Temperature Range	Select for..						Material Family Designator
					KTW	DVGW-W270	WRAS BS 6920	NSF/ ANSI 61	EN 681-1	CLP	
NBR	36610	Black	70	-30 to +120°C	X	X	X	X			NBR
EPDM	55985	Black	70	-55 to +150°C	X	X	X	X	Compliant		EPDM
VMQ	714526	Red	70	-60 to +225°C	X	X	X	X		X	VMQ
FKM (A)	514527	Black	70	-20 to +200°C			X				FPM
FKM (A)	514002	Green	75	-20 to +200°C	X	X					FPM

Waste Water

Purification of waste is vital to a community's ecosystem. Since this process is strictly regulated and monitored, municipal water authorities, Industrial treatment plants, and equipment manufacturers must comply with increasingly involved and costly government-mandated water quality regulations.

ERIKS can offer materials designed for use in line with many of these regulations, for example:

- NSF/ANSI Standard 61, this standard regulates drinking water supplies and set health effects criteria for many water system components
- ISO 1431-1:2004 which specifies procedures intended for use in estimating the resistance of vulcanized or thermoplastic rubbers to cracking when exposed, under static or dynamic tensile strain, to air containing a definite concentration of ozone and at a definite temperature in circumstances that exclude the effects of direct light

Applications	Requirements	Seal Profiles	Sealing Materials
Houshold waste	Chemical resistance UV and ozone stable Plant comliancy	O-rings Cut or moulded rings Special mouldings Mech seals	NBR EPDM
Industrial waste	Good compression set characteristics Resistant to general use chemicals	Valve seals O-rings	NBR EPDM FKM FFKM VMQ

Elastomer	Compound reference	Colour	Hardness	Temperature Range	Select for..		Material Family Designator
					NSF/ANSI Standard 61	ISO 1431	
NBR	36610	Black	70	-30 to +120°C	X		NBR
EPDM	55985	Black	70	-55 to +150°C	X		EPDM
VMQ	714526	Red	70	-60 to +225°C	X		VMQ
TPE	900550	Black	70	-40 to +80°C		X	TPE
TPE-Hydrophillic	900551	Black	70	-40 to +80°C		X	TPE-H

Electricity Power Transmission

Sulphur hexafluoride's high dielectric breakdown strength makes it the gas of choice for isolation of high voltage switch gear, however its highly toxic nature makes it critical that the sealing materials used to contain it are capable of withstanding its chemical attack, to which many are prone, and achieving long reliable service life.

Applications	Requirements	Seal Profiles	Sealing Materials
HV Switch Gear	SF_6 resistance	O-rings Moulded Covers	EPDM (Special Formulations) TPE
Transformers & meters	Custom geometries Environmental resistance	O-rings Extruded and moulded profiles	CR EPDM

Elastomer	Compound reference	Colour	Hardness	Temperature Range	Select for..	Material Family Designator
EPDM	559537	Violet	70	-50 to +150°C	Suitable for sulphur hexafluoride (SF_6) exposure	EPDM
EPDM	55985	Black	70	-55 to +150°C	Good resistance to solvents and coolants	EPDM
CR	32906	Black	70	-35 to +110°C	Good ageing characteristics in ozone	CR
TPE	900550	Black	70	-40 to +80°C	Good ageing characteristics in ozone	TPE

Gas Transmission

Plasticisers used in the manufacture of many elastomer seals can be extracted from the compound by natural gas, resulting in loss of volume and sealing integrity.

DIN EN 682:2006-10:

Material requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids. This European Standard specifies requirements for elastomeric materials used in seals for supply pipes and fittings, ancillaries and valves at operating temperatures in general from –5 °C up to 50 °C and in special cases from –15 °C up to 50 °C. This European Standard is based on ISO 6447 and ISO 6448, bringing together the requirements for seals used in gas and hydrocarbon fluid applications. Within DIN EN 682, elastomeric seals are designated by type, application and operating temperature; these are summarized as:

Type	Application	Operating Temperature (°C)
GA	Gaseous fuel	-5 to +50°C
GAL	Gaseous fuel	-15 to +50°C
GB	Hydrocarbon fluids and gaseous fuel	-5 to +50°C
GBL	Hydrocarbon fluids and gaseous fuel	-15 to +50°C
H	Aromatic hydrocarbon fluids and gaseous fuels containing condensates	-5 to +50°C

DIN EN 549:1995

Rubber materials for seals and diaphragms for gas appliances and gas equipment. This standard specifies the requirements and associated test methods for vulcanized rubber materials used in gas applications and equipment in contact with 1st, 2nd and 3rd family combustible gases. It also establishes a classification based on temperature range and hardness:

Temperature classes:

Class		A1	B1	C1	D1	E1	A2	B2	C2	D2	E2
Range of operating temps. (°C)	From	0	0	0	0	0	-20	-20	-20	-20	-20
	To	-	60	80	125	150	60	80	100	125	150

Note: Seals can be manufactured from materials of Class A1 to E1 and A2 to E2 whilst diaphragms are prepared from materials of A1 to B1 and A2 to B2.

Hardness classes

Class	H1	H2	H3
Nominal hardness range (°IRHD)	<45	45 to 60	>60

Applications	Requirements	Seal Profiles	Sealing Materials
Pipe systems	Small to large diameters Approvals Low compression set	Pipe Seals Special mouldings Large O-rings O-rings	EPDM NBR
Metering	Low temperature capabilities Compounds suitable for natural gas and liquid Propylene applications Temp range from -60°C to 200°C	Special mouldings Diaphrams Bonded seals	EPDM NBR VMQ PTFE

Elastomer	Compound reference	Colour	Hardness	Temperature Range	Select for.. DIN EN 682	Select for.. DIN EN 549	Material Family Designator
NBR	366213	Black	70	-30 to +120°C	EN682 GBL		NBR
NBR	366221	Black	70	-30 to +120°C	EN682 GAL		NBR
NBR	36625	Black	70	-30 to +120°C		DIN EN 549 B1/H3	NBR
NBR	366300	Black	70	-30 to +120°C		DIN EN 549 B2/H3	NBR
VMQ	714526	Red	70	-60 to +225°C		DIN EN 549 E2/H3	VMQ

Fossil Fuel Generation

Forming the backbone of our energy supply security ERIKS is committed to supporting the continuing operations of existing and next generation fossil fuel reactors.

New environmental demands placed upon these plants call for new solutions. Carbon capture can result in the storage of CO_2 under pressurised conditions. Under certain combinations of temperature and pressure CO_2 exists in a super-critical phase. This phase is extremely damaging to elastomers as it permeates into solution like a gas, but leaches out ingredients like a liquid. See the below table for specific EPDM and FEPM able to withstand this media. Other carbon capture techniques are reliant upon the use of amines. These amines are again very damaging to many elastomers and our range of FEPM and FFKM materials may be the solution you need.

Our sealing technology can equally apply to Combined Heat and Power (CHP) and micro CHP plants.

Applications	Requirements	Seal Profiles	Sealing Materials
Pumping/cooling	ASTM D2000 for elastomers	Mechanical seals	PEEK PTFE Graphite
Containment	Ability to develop high performance elastomers Total tracebility of all products and materials Testing of material propeties after moulding Total cleanliness control High temp materials	O-rings Metal O and C section rings Valve stem packings Bonded seals	NBR HNBR EPDM & ETP FEPM AU FKM

Elastomer	Compound reference	Colour	Hardness	Temperature Range	Select for..	Material Family Designator
NBR	36624	Black	70	-30 to +120°C	General purpose all-round grade	NBR
EPDM	55985	Black	70	-55 to +150°C	Good resistance to solvents and coolants	EPDM
AU	900270	Black	70	-40 to +95°C	Excellent performance in dynamic applications	AU
HNBR	886510	Black	70	-40 to +150°C	Good resistance to hydrocarbons	HNBR
FEPM	223301	Black	80	-15 to +230°C	Resistance to alkalis	FEPM
FKM	51414	Black	75	-20 to +200°C	Excellent resistance to hydrocarbons	FPM
FEP/PFA	Teflex-FKM	Clear/ Black	75	-20 to 200°C	Resistance to SC CO_2	FEP/PFA /FPM

Diesel Gen-Set

Stringent environmental and efficiency demands upon large diesel engines necessitate the use of elevated temperatures, requiring increased thermal resistance of sealing materials. Specialist FKM and FFKM technologies are frequently used to resist steam and corrosion inhibitors.

Applications	Requirements	Seal Profiles	Sealing Materials
Cylinder liners	Oil resistance Coolant resistance Compression set resistance	O-rings	FKM FKM-F (Special formulations)
Fuel systems	Chemical resistance Wide temperature range High pressures Heavy Fuel Oil resistance	O-rings Rotary seals	NBR HNBR FKM FFKM
Valve seats	Heat resistance Oil resistance Fuel resistance Coolant resistance	O-rings Custom profiles	FKM FFKM Aflas®

Elastomer	Compound reference	Colour	Hardness	Temperature Range	Select for..	Material Family Designator
NBR	36624	Black	70	-30 to +120°C	General purpose all-round grade	NBR
HNBR	886510	Black	70	-40 to +150°C	Good resistance to hydrocarbons	HNBR
FKM	51414	Black	70	-20 to +200°C	Excellent resistance to hydrocarbons	FPM
FKM (specialist)	514239	Black	75	-15 to +200°C	Excellent resistance to hydrocarbons; increased resistance to coolants	FPM
FKM (specialist)	514248	Black	75	-15 to +200°C	Excellent performance in hydrocarbons; increased resistance to fuels and coolants	FPM
FEPM	223301	Black	80	-15 to +230°C	Resistance to hydrocarbons and corrosion inhibitors	FEPM
FFKM HT	FFKM-75-164	Black	75	-15 to +310°C	Resistant to exposure to high temperatures	FFKM

Renewable Power Generation

Sustainable development can be defined as that which meets the needs of the present without compromising the ability of future generations to meet their own needs. The rate of CO_2 release has now exceeded our planet's ability to absorb it by a factor of 1.4. We are committed to reducing this by supporting the successful development of the renewable energy sector and have numerous specialist products to support such application whether they be for on or offshore wind turbines and grid systems, wave, tidal or hydro-electric.

Large dimensions result in large tolerances and clearance gaps that, combined with pressure or force, may cause elevated stresses within the seal. The sheer scale of this equipment often requires designs that allow in situ servicing, with only partial disassembly, but also fabricated from differing materials that are better suited to such dimensions. Tailored designs are required to mitigate for such requirements.

The remote location and environmental demands placed upon many renewable applications make correct sealing material selection essential in order to maximise reliability and life.

Applications	Requirements	Seal Profiles	Sealing Materials
Wind *Main gear/Main bearing/ Slew bearing/Blade root seals* *Lock cylinder/Pitch cylinder/ Yaw brake/Main brake/ Accumulator seals*	Longevity of service life under severe conditions and reduced scheduled maintenance	Large rotary seals Heavy duty hydraulic seals	NBR FKM PTFE
Wave	Under severe conditions and reduced	V-rings	
Solar	Scheduled maintenance	O-rings	
Geothermal	High levels of resistance to the elemants	Custom mouldings	
Hydro - Hydraulics	Low compression set materials Reduced noise and vibration pollution	Anti-vibration	

Elastomer	Compound reference	Colour	Hardness	Temperature Range	Select for..	Material Family Designator
NBR	36624	Black	70	-30 to +120°C	General purpose all-round grade	NBR
FKM	51414	Black	75	-20 to +200°C	Excellent resistance to hydrocarbons	FPM

Nuclear Power Generation

Nuclear reactors create a number of challenges for elastomer seals, which are typically used as secondary seals in primary circuits. Although pressure vessels must typically meet ASTM or RCCM requirements, correct polymer sealing material selection is not effectively addressed by these standards and we recommend detailed attention be paid to selection of the correct sealing materials. It is not sufficient to rely upon ASTM-D-2000 alone for specifying applications such as these.

Direct exposure to gamma radiation can break the covalent bonds within polymeric materials resulting in embrittlement and excessive compression set, leading to premature failure. Different polymers are able to withstand exposure to gamma radiation to varying degrees. Typical test criteria expose elastomer compounds to a controlled number of rads, and pass/fail criteria are based upon change in tensile strength, elongation at break or compression set.

Technologies utilising carbon-dioxide (CO_2) as a heat transfer medium can, under specific combinations of temperature and pressure, see the CO_2 exist in a super-critical phase. Supercritical CO_2 can go into solution with the elastomer like a gas, but wash out constituent parts like a liquid, acting as a solvent, resulting in bubbling and weight loss in the elastomer, leading to leakage. EPDM and FEPM polymer grades prove more resistant to such attack.

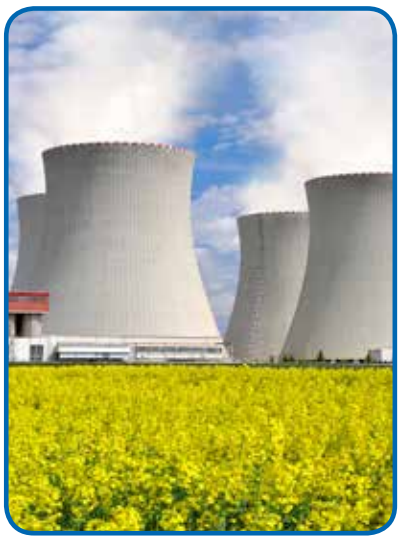
Pressurised water reactors and other aqueous environments demand low elutables to maximise life. Halogens may cause stress corrosion cracking to metals, whilst mobile and low melting point transition metals may result in embrittlement. Our low elutable materials are able to meet the needs of all standards to which they have been tested. Naturally these seals can be supplied with comprehensive testing, certification, and packaged to customer specific requirements.

Legacy grades to meet the CEGB (UK Central Electricity Generation Board) specified formulations such as Daisy 70 FKM Type 1 , Poppy and Lily Grades are available as are grades formulated from Viton® E60C and Peroxide Cured EPDM as assessed by British Nuclear Group for use in Transport Flasks.

Typical Resistance

ASTM Family	Rads
FKM	2×10^6
EPDM	2×10^8
FEPM	2×10^9
AU	2×10^8

Applications	Requirements	Seal Profiles	Sealing Materials
Pumping/cooling	Thermochemical resistance Low elutables Gamma resistance	Mechanical seals	PEEK PTFE Graphite
Containment	Thermochemical resistance Low elutables Gamma resistance	O-rings	NBR HNBR EPDM & ETP FEPM AU FKM
Fan Shaft Systems	Thermochemical resistance Low elutables Gamma resistance	Metal O and C section rings Valve stem packings Bonded seals TX Seals	Metals



Elastomer	Compound reference	Colour	Hardness	Temperature Range	Select for..	Material Family Designator
EPDM	55985	Black	70	-55 to +150°C	Good resistance to solvents and coolants	EPDM
AU	900270	Black	70	-40 to +95°C	Excellent performance in dynamic applications	AU
HNBR	886510	Black	70	-40 to +150°C	Good resistance to hydrocarbons	HNBR
FEPM	223301	Black	80	-15 to +230°C	Resistance to hydrocarbons and corrosion inhibitors	FEPM
FKM ETP	514016	Black	75	-15 to +200°C	Broad chemical resistance	FPM

O-ring

Product Overview

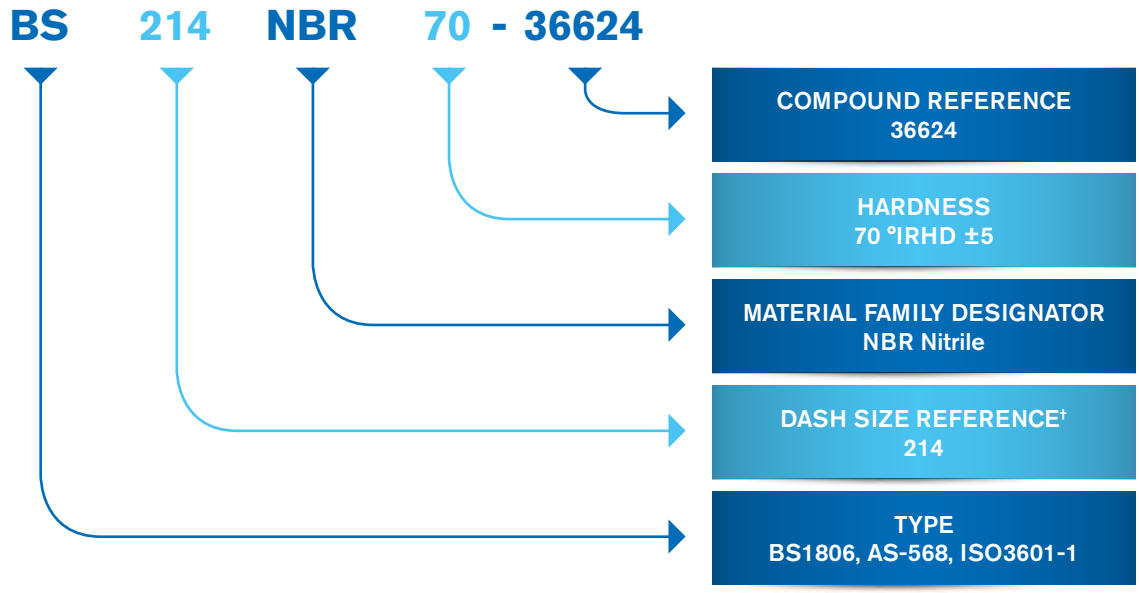
The most common type of static seal is the flexible elastomer O-ring. O-rings provide an affordable seal that in most cases are simple to install and subject to correct material selection, give acceptable life between maintenance checks.

Available in a variety of materials to suit every sealing application, fully moulded O-rings are manufactured to several international size 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

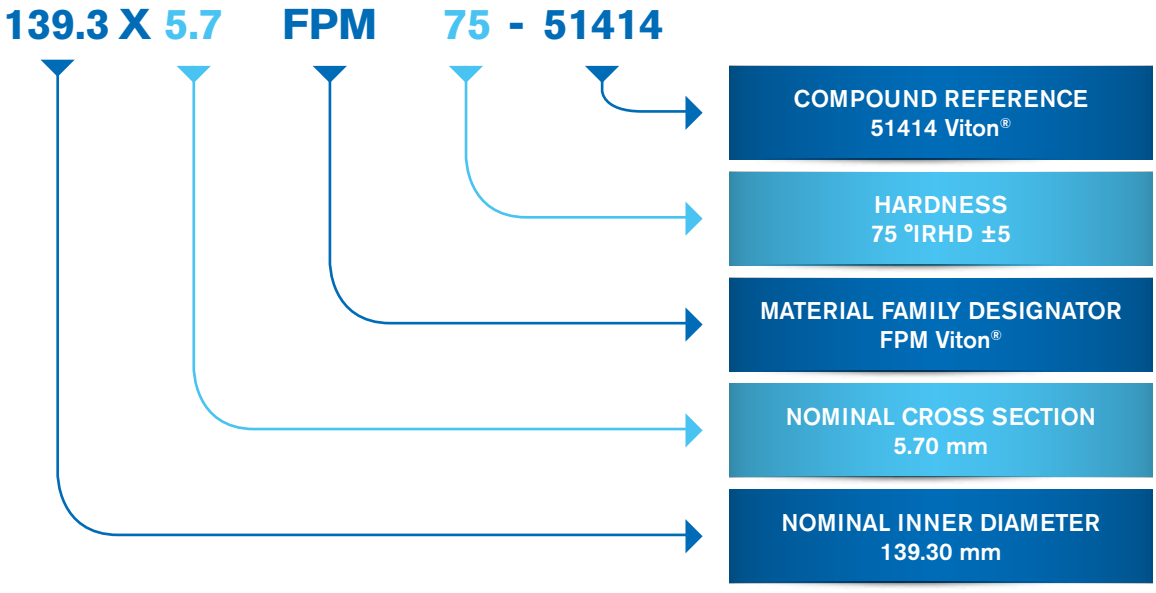
Elastomer	Colour	Hardness (IRHD)	Temperature Range	Select for..	Compound Reference	Material Family Designator
Nitrile rubber (NBR)	Black	70	-30 to +120°C	Standard compound with good compression set values. Medium acrylonitrile content for use with hydraulic oils, alcohols, water, air, fuels and many 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
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

Imperial O-rings



†O-rings are supplied to ISO3601-1 class B tolerances unless otherwise specified.

Metric O-rings



†O-rings are supplied to ISO3601-1 class B tolerances unless otherwise specified.

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

Large Diameter 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 or wear occurs.

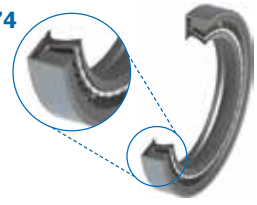
The principal of this can be affected by the following basic parameters and must always be taken into consideration when selecting the correct profile and material to enable the optimum performance:

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

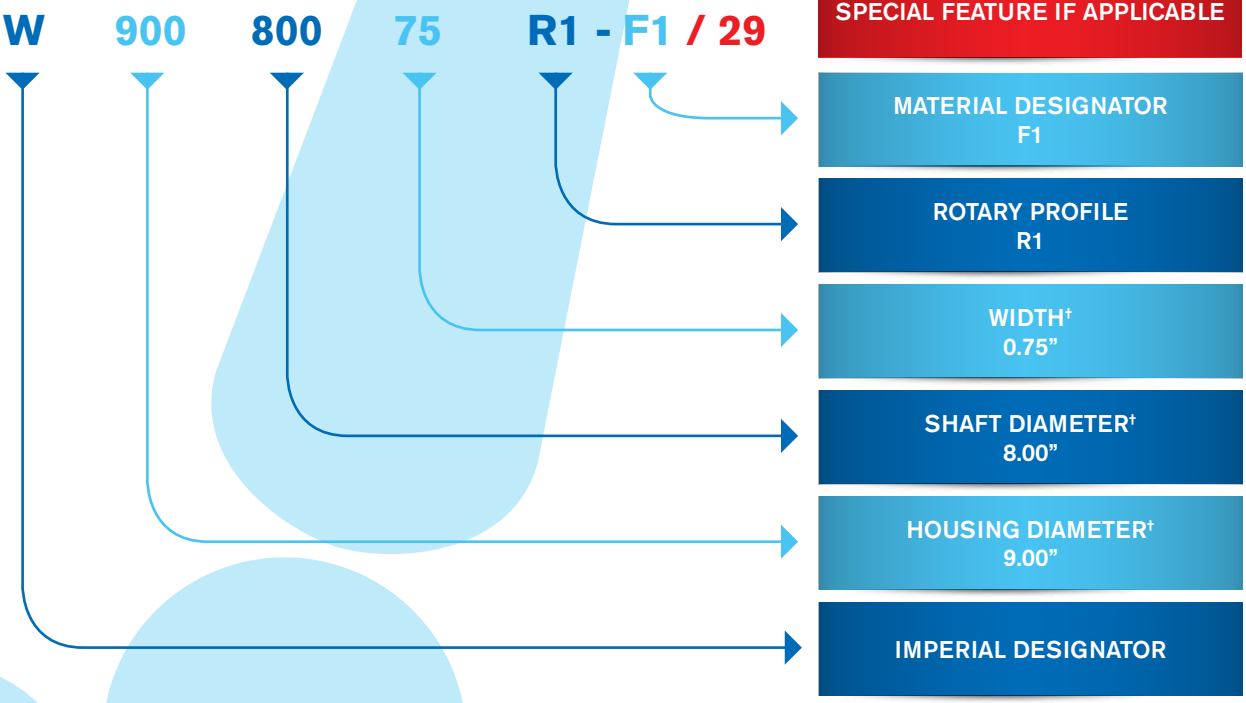
In addition to the large diameter series of rotary seals in this brochure, comprehensive details of our complete rotary seal range may be found at http://www.pioneerweston.com

pioneer WESTON

Elastomeric Lip Styles

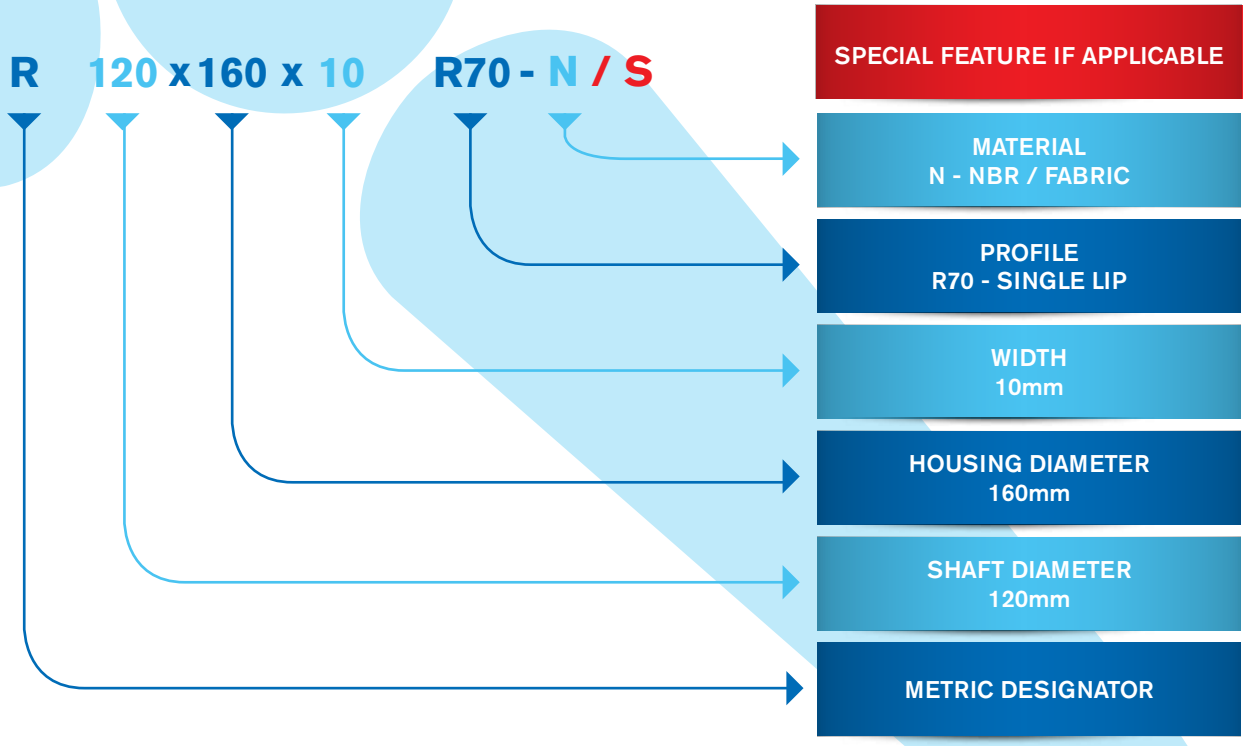
Profile	Profile Features	Profile Advantages	Applications
R1 	- Ground metal outer diameter - Spring loaded primary seal lip - Additional reinforcing metal insert	- Press fit metal OD for precise location in housing - Metal insert gives seal more rigidity, specifically for larger sizes	- Industrial Gearboxes - General Machinery
R2 	- Ground metal outer diameter - Spring loaded primary seal lip - Additional reinforcing metal insert - Additional dust lip	- Press fit metal OD for precise location in housing - Metal insert gives seal more rigidity, specifically for larger sizes - The addition of a dust lip offers protection against low to medium dirt ingress	- As Above
R70 	- Spring loaded primary seal lip - Fabric reinforced outer diameter	- Fabric reinforced outer diameter allows for easy installation and removal - Can be supplied split for in situ replacement - Flexible sealing lip to accommodate shaft eccentricity	- Industrial Gearboxes - Rolling Mills - Cranes / Winches - General Machinery
R71 	- Spring loaded primary seal lip - Fabric reinforced outer diameter - Additional dust lip	- Fabric reinforced outer diameter allows for easy installation and removal - Can be supplied split for in situ replacement - Flexible sealing lip to accommodate shaft eccentricity - The addition of a dust lip offers protection against low to medium dirt ingress	- As Above
R72 	- Machined metal outside diameter - Elastomer sealing lip with moulded-in finger spring	- Robust construction for retaining grease - Low radial sealing force reduces seal wear	- Cement Grinders - Rolling Mills
R73 	- Machined metal outside diameter - Steel reinforcing ring - Spring loaded primary seal lip	- Press fit metal OD for precise location in housing - Metal reinforcing ring gives seal more rigidity - Retained garter spring along with flexible sealing lip copes with high shaft to bore misalignment / run-out	- Work / Back-Up Rolls - Paper Mills
R74 	- Machined metal outside diameter - Steel reinforcing ring - Spring loaded primary seal lip - Additional dust lip	- Press fit metal OD for precise location in housing - Metal reinforcing ring gives seal more rigidity - Retained garter spring along with flexible sealing lip copes with high shaft to bore misalignment / run-out - The addition of a dust lip offers protection against low to medium dirt ingress	- As Above

Imperial (English)



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

Metric



Heavy Duty Seal Elastomeric Compound Reference

Polymer Types	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-85-195	Black	85	-20 to +200°C		F2
	V-75-50	Brown	75	-20 to +200°C		F3
	V-80-271	Black	80	-51 to +200°C	Specialist ultra-low temperature FKM	F4
	V-80-88	Black	80	-15 to +200°C	Specialist FKM terpolymer developed for use with bio-fuels	F5
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
NBR / Fabric	-	Black	-	-35 to +110°C	General purpose / large diameter location	N
FKM / Fabric	-	Black	-	-2 to +200°C	High temperature / large diameter location	F

Other materials are available on request.

Special Features Designator

Feature	Function	Selection	Designator
Stainless steel spring	Rust and acid resistant spring	-	29
Sealant paint	Only available on metal cased seals, this sealant paint helpts to seal against any housing imperfections	Red Blue	2 3
Split (Available only on R70 and R71)	Split to allow in situ installation	-	S

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
Carbon-fibre reinforced PTFE	PF-293	Grey / Black	-	-100 to +250°C	Low wear, improved deformation resistance	E3

Other materials are available on request.

Solid Body Carrier Materials

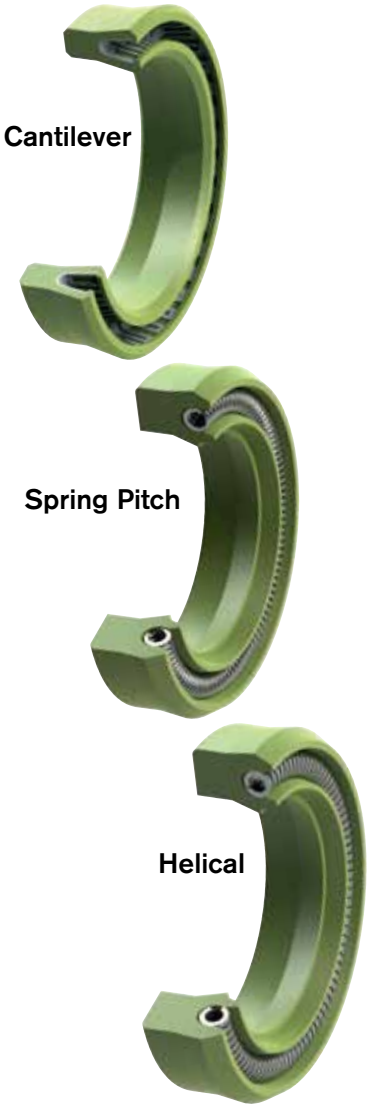
Metal	Shell Material Designator
Mild Steel	M
Stainless Steel	S

Spring Energised Seal

Product overview

The Spring Energised (SE) seal is a pressure activated seal, with assisted energisation provided by corrosion-resistant metal spring. When the seal is in situ, the spring is under compression and applies force to the seal's sealing lips. This creates a tight barrier to the seal to prevent gas or fluids from leaking.

The spring also provides resiliency to compensate for seal wear, gland misalignment or eccentricity. While spring force provides adequate force for sealing at low pressure, at high pressure the system pressure augments the spring force to provide an even tighter seal. SE seals are precision machined from PTFE, filled PTFE and other high performance polymers. SE seals work consistently under a wide array of temperatures and pressures. ERIKS offers over 100 jacket materials, 8 spring materials, and 5 spring designs to meet your sealing needs.



Spring Designation

Spring Type	Material Code	Material Description
Cantilever	1	301 Stainless Steel
	6	316 Stainless Steel
	H	Hastelloy® C-276
	E	Elgiloy®
Spiral Pitch	2	302 Stainless Steel
	6	316 Stainless Steel
	H	Hastelloy® C-276
Helical	2	302 Stainless Steel
	H	Hastelloy® C-276

PTFE Grades

Material Reference	Description	Wear Factor (K)	Application
E431	Glass and Molybdenum Disulphide reinforced PTFE	15	Dynamic / Static, Medium duty cycles Hardened metal running surfaces
E471	Graphite reinforced PTFE	10	Dynamic, Medium duty cycles
E462	Carbon/Graphite reinforced PTFE	15	Dynamic, Medium duty cycles
E491	Polyester reinforced PTFE	2	Dynamic / Static, Medium to high duty cycles, Minimum 45 HRc running surface
E282Z	Carbon/Graphite/PPS reinforced PTFE	1	Dynamic / Static, High duty cycles, Hardened metal running surfaces

E - V - 1 - A - 1 - M - 136 - E431

MATERIAL CODE
E431

DASH SIZE REFERENCE
136

SPRING LOAD
L – Light
M – Medium
H – Hard

SPRING MATERIAL
301 Stainless Steel

LIP CONFIGURATION
ROD AND PISTON SEALS:
A – Standard
B – I.D. Scraper
C – O.D. Scraper
D – Double Scraper
FACE SEALS:
A – Standard

SEAL TYPE
ROD AND PISTON SEALS:
1– Standard heel rod seal
2 – Standard heel piston seal
3 – Extended heel rod seal
4 – Extended heel piston seal
FACE SEALS:
5 – Internal face seal
6 – External face seal

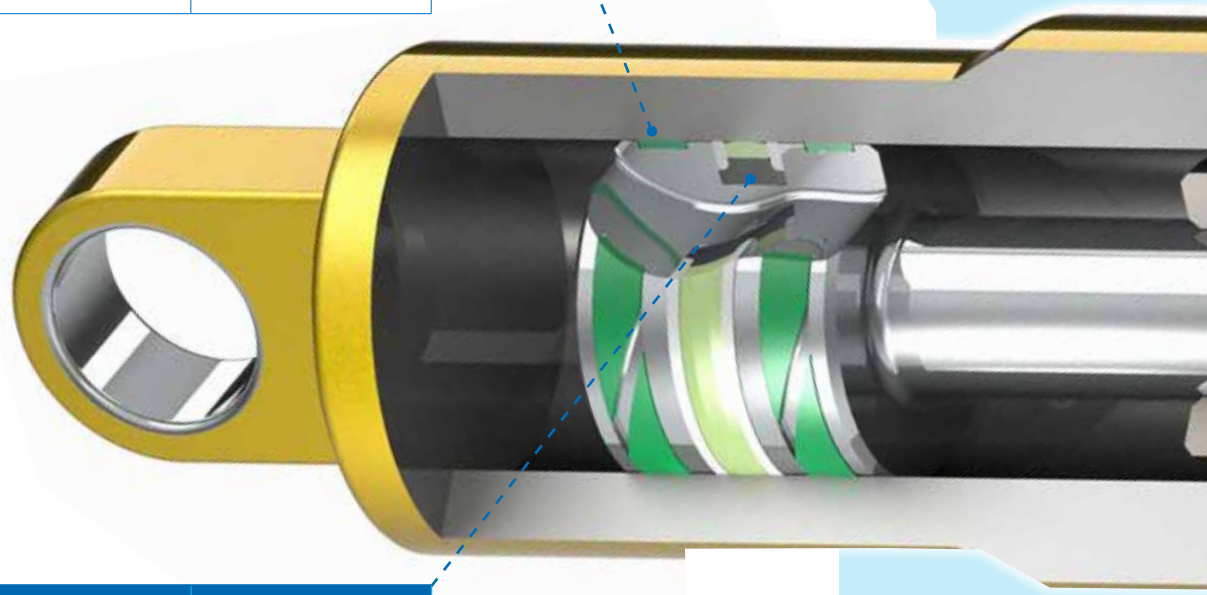
SPRING TYPE
V – Cantilever
S – Spiral pitch
H – Helical

PRODUCT LINE
E

Heavy Duty Hydraulic Seal Profiles

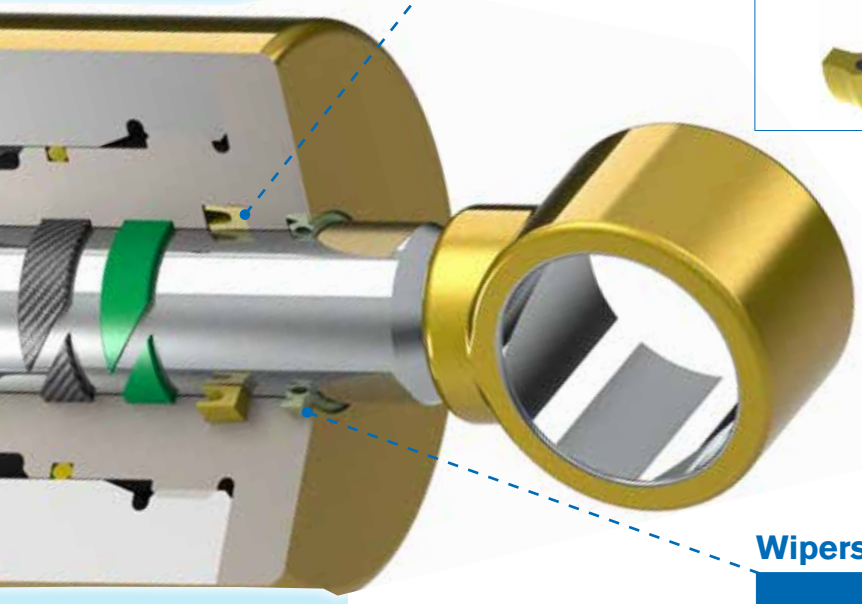
Wear rings / Bearing strip

	Features	Advantages
Fabric Reinforced 	- High compressive strength - High compressive modulus - High pressure velocity rating (PV) factor - Low wear rate	- High side load - Outstanding alignment - Low axial length requirement - Long life
PTFE Styles 	- Low friction - Self lubricating - Low wear	- Energy efficient - Dry running possible - Long life



Piston seals

	Features	Advantages
DOP 	- Elastomeric energiser - Compliant, wear resistant sealing element - High strength anti-extrusion rings	- Low compression set for extended operating life - High sealing efficiency - High pressure operation with large diametral clearances
DWO 	- Elastomeric energiser - Compliant, wear resistant sealing element - High strength anti-extrusion rings - Integral bearing features	- Low compression set for extended operating life - High sealing efficiency - High pressure operation with large diametral clearances - Reduced axial length requirements



Rod Seals

	Features	Advantages
UR 	- Pressure activated - Axially located within groove - Rectangular heal - Cantilever sealing lip	- High sealing efficiency - Low hysteresis - Rotation prevention - Low friction
ELS 	- Pressure activated - Axially located within groove - Rectangular heal - Cantilever sealing lip - Positive energisation by low modulus material - Wear resistant, high modulus jacket	- High sealing efficiency - Low hysteresis - Rotation prevention - Low friction - Low pressure sealing - Long life and high pressure operation

Wipers / Scrapers

	Features	Advantages
WSF 	- Pressure activated - Axially located within groove - Combined scraping and sealing - Cantilever sealing lip	- High sealing efficiency - Low hysteresis - Low axial length requirement, ideal for secondary sealing - Low friction
WSB 	- Metallic insert location - Extended scraping lip	- Press-fit - Excellent contaminant exclusion

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

TX Split

The Pioneer Weston range of TX split seals are designed specifically for the demands of large Industrial fans used in the utilities sector, offering a premium gas tight sealing arrangement that gives extended life and reduces maintenance downtime to a minimum. The TX range conforms fully with B.N.F.L standard N.F.0152/2 Issue 1 Section 4.9.

Effective radial compression of the split elastomer sealing element by the clamp plates ensures that the joints are fully mated when the sealing arrangement is assembled, ensuring no leak paths across the split. The initial arrangement is supplied within its own housing arrangement along with a wear sleeve to suit which has been specifically prepared to offer the best possible running surface to ensure long life in application and sealing performance.

All serviceable components are split thus ensuring costs are kept to a minimum by quick and easy seal replacement, simply remove the split clamp plates leaving the housing adaptor in situ and withdraw the split sealing element and garter spring. Replacement element and spring(s) can then be secured back in to place by means of the existing clamp plates. There is no need to remove any other hardware for maintenance.

ERIKS have a tooled metric range to suit shafts from 25mm – 110mm but we are also able to design a seal around your specific application requirements if needed.

Features

- Split Elastomeric sprung sealing element
- Split half clamp plates
- Housing adaptor
- Wear Sleeve

Benefits

- Easy installation and removal, no tricky on-site jointing techniques required
- Provides radial compression to sealing element
- Machined to suit existing housing arrangement
- Offers the optimum running surface for extended life

Standard materials	
Elastomeric sealing element	FKM
Hook & Eye garter spring	Stainless Steel
Housing Adaptor	Mild / Stainless steel
Clamp Plates	Mild / Stainless steel
Wear sleeve	DLC coated Mild / Stainless steel

Maximum working conditions	
Sliding speed	18 m/sec (Elastomer material dependent)
Pressure	0.35 bar
Temperature	+ 200 °C (Elastomer material dependent)
Shaft Eccentricity	0.1 T.I.R

X-ring

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

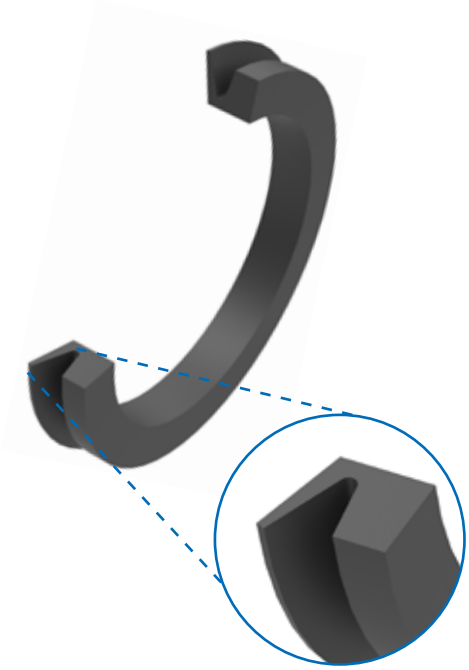
Their four-lobed design provides a larger sealing area in comparison to a standard O-ring. The double seal action requires lower squeeze levels to maintain an effective seal, thus reducing friction levels and improving seal life.

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.

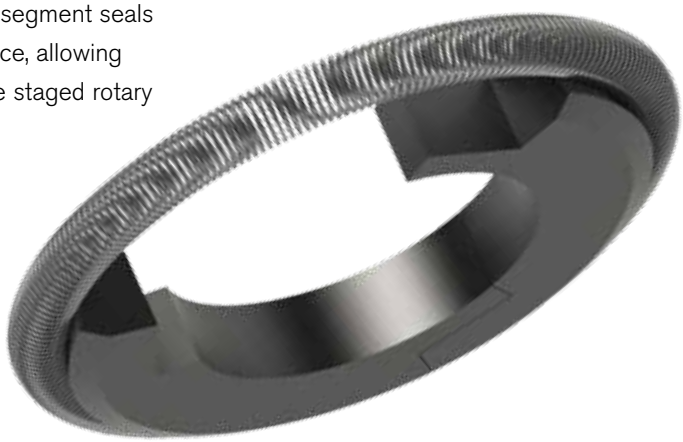
V-rings

V-rings are an elastomer axial seal for shafts and bearings, installed 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.



Carbon Segment Seals

Typically used in series for high speed rotary applications. Carbon segment seals are energised by a garter spring and act as a leakage control device, allowing the generation of differential pressures. Typical uses would include staged rotary compressors and turbines.



Jointed Profiles

By removing the need to manufacture application specific tooling vulcanised jointed extruded profiles can offer cost effective solutions in large diameter applications. Our advanced joint vulcanisation facilities in Alkmaar, NL hold a wide range of standard extruded profiles and jointing tools.

Rubber Moulded and Extruded Products

Rubber Mouldings

The moulding of rubber and elastomeric compounds is accomplished by forcing the material into a shape using heat and pressure. Rubber and elastomers can be moulded by compression, transfer and injection methods. The volume of parts and type of compound required will determine the moulding method used. Our engineers participate with you to develop innovative solutions for your production.

Extruded Rubber Profiles/Inflatables

Our comprehensive product range incorporates not only rubber, but also Thermo Plastic Elastomer (TPE).

Our in-house CAD/CAM capability also enables us to quickly design and accurately manufacture innovative solutions to meet new applications and operating conditions utilising our in-house 3D rubber printing capabilities.

Bellows, Diaphragms and Cover Seals

A wide range of custom moulded diaphragms and bellows are available. We offer expertise when selecting the correct compound, optimising modulus to achieve specified force deflection characteristics and life.

These components are available with fabric reinforcement to provide increased stiffness and pressure capability.

Component Mechanical Seals

Bellow Seals

Bi-directional and extremely versatile, these bellow seals are designed with no loose parts that could be damaged during installation, and feature static sealing that cannot cause shaft wear or fretting. Suitable for a wide range of applications, such as pumps, mixers, agitators and compressors, they can also be used where a previous seal has caused shaft damage.

- Wide range of metric and imperial sizes
- For shafts from 8mm to 100mm
- Faces: carbon, ceramic and silicon carbide

Stationary Components

Generally O-ring mounted stationary components, or seats, are available in various materials to suit application requirements.

- Some designs feature a pin groove, providing positive drive to the seal face. It is important to consider the application conditions and the condition of the equipment when selecting a stationary component
- The stationary component illustrated represents those commonly found in use today

Taper Spring Seals

An extremely popular and effective design featuring positive uni-directional drive via the spring, these seals are available in a wide range of sizes and styles, and are used in many applications, including pumps, mixers, agitators and compressors.
All designs feature O-ring sealing on the shaft and positive spring drive.

- Wide range of metric sizes
- For shafts from 10mm to 100mm
- Faces: carbon, ceramic, stainless steel and silicon carbide

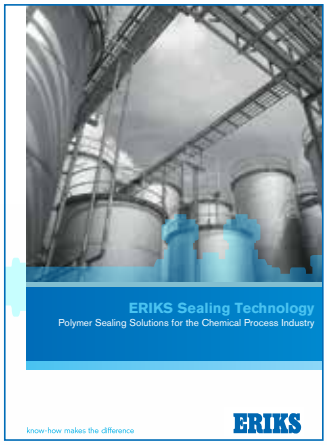
Parallel Spring Seals

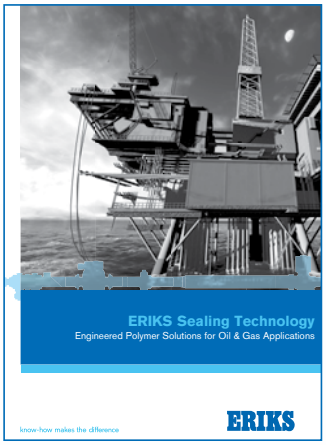
Widely used as the standard upgrade from packing to mechanical seals, parallel spring seals are the mainstay for many industries. Using a rubber bellows to seal against the shaft and provide drive to the face, they are suitable for use in applications such as water, food and chemical processing. Designs are also available with a balanced configuration to reduce heat and friction, extending seal life.

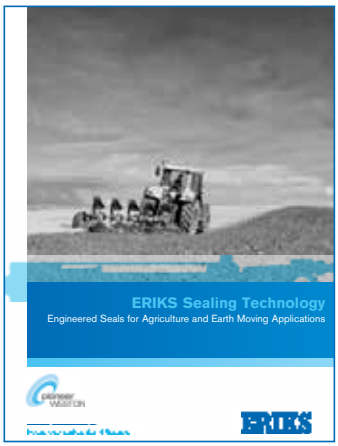
- Wide range of metric and imperial sizes
- For shafts from 10mm to 75mm
- Faces: carbon, ceramic and silicon carbide

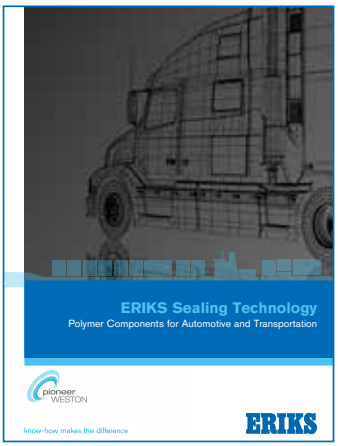
Other Brochures in this Series

- Chemical Process Industry
- Oil and Gas Applications
- Agriculture and Earth Moving Applications
- Automotive and Transport Applications
- Heavy Industry









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.

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know-how makes the difference

ERIKS