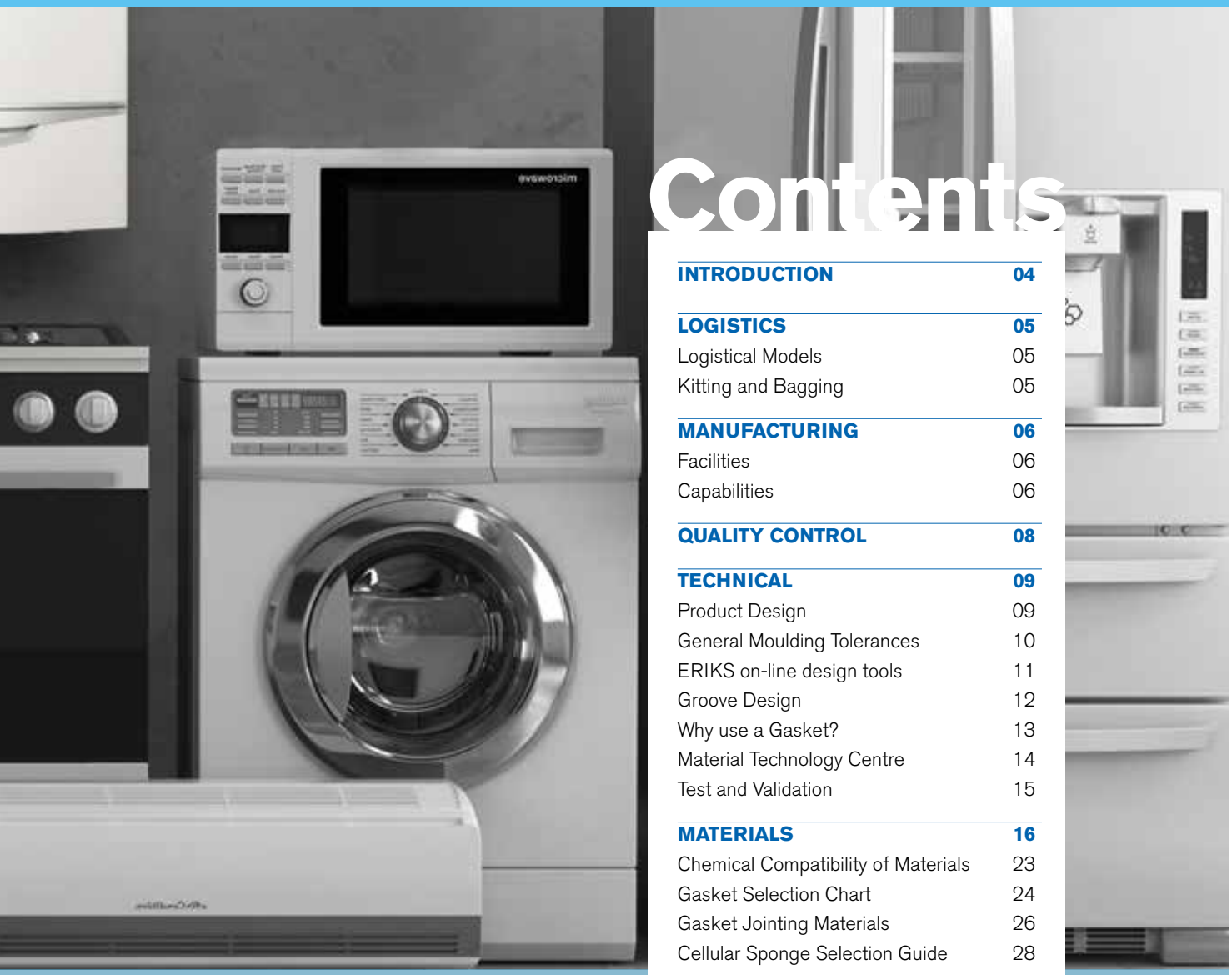
# Sealing & Polymer

## HVAC and Domestic

Let's make industry work better

ERIKS

> **Product design, innovation and material science is our passion at ERIKS Sealing and Polymer, but it doesn't stop there. We combine effective project management with flexible and efficient manufacturing solutions to produce products to the highest quality levels with tailor made logistical solutions to suit our customer's operations.**
>
> **Edward Hart**
> **Business Development Manager**
> **ERIKS Sealing and Polymer**



# Contents

# Solutions designed to add value

**ERIKS Sealing and Polymer believe in making our customers feel that we are easy to do business with. We have established a highly skilled organisation with business processes, manufacturing and logistics capabilities able to offer high levels of customer service, underpinned by the quality assurance and control demanded by high-volume serial manufacture. We pride ourselves on being experts in the supply of a range of sealing, polymer and thermal solutions tailored to meet the needs of Heating, Ventilation, Air Conditioning (HVAC) and Domestic Appliance OEM's.**

The modern consumer demands ever increasing levels of value, performance and consistency and we understand the importance of protecting the reputation of our customers. Our materials and design engineering teams draw upon a wealth of knowledge and tool-sets to help our customers engineer robust performance into their applications, whilst our quality assurance team control our manufacturing operations and supply chains to deliver capable products that meet current regulatory requirements.

Our experienced design engineers draw upon in-depth technical knowledge to ensure that the optimal component is impartially specified for your application whether this is a standard product from our premium manufacturing facilities, or as a bespoke supply solution tailored to your needs.

ERIKS' design teams work closely with our material scientists to produce accurate materials data upon which our non-linear finite element analyses (FEA) are based. This minimises design iterations in successfully satisfying your application. We use the latest 3D CAD to capture design intent, which is verified using our contact and non-contact coordinate measurement machines (CMM).

For complex multi-parameter systems we can also draw upon Design for Six Sigma to provide quantitative inputs into FMEA techniques at the design stage.

The flexible manufacture culture at our volume manufacturing site, supported by a machined / moulded products development cell and 3D TPE printing combines to help our customers introduce new products to market in the shortest possible time.

ERIKS Sealing and Polymer is a world leader in high-performance seals, technical rubber components, cut foam, thermal and thermoplastic components. We hold ISO 9001: 2015 certification across our UK sites. Our quality management system embraces the process approach of TS16949 and our Quality Control Engineers work closely with our supply chain to ensure process control and product consistency through formal PPAP (Production Part Approval Process) methodologies.

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

## Continuity of Supply

Customer specific stock holding is our speciality. This maintains continuity of supply, including specific qualified products that we would not otherwise hold. Our advanced logistics software helps us optimise customer specific stock to maximise availability yet minimise your capital exposure. We are able to deliver product through various supply models, including customer call-off, schedule agreements and Kanban delivery.

## Support

- Dedicated office based technical support staff and customer service
- Field based product specialists
- Excellent technical support from skilled materials and design engineers
- Logistical solutions
- Quality control professionals highly versed in our product mix.

# Logistical Models

Our business processes are designed to ensure continuity of supply of specifically qualified products for our customers. Our advanced logistics software helps us optimise customer specific stock, being capable of combining historic usage data, short and long term forecasts, maximising availability yet minimising your capital exposure.

ERIKS Sealing and Polymer are happy to accommodate most demand trigger mechanisms, including purchase schedules, purchase orders, customer portals, discrete call-off, customer Kanban and vendor managed Kanban serviced directly from our UK supply chain centre using our fleet of large capacity vehicles.

# Kitting and Bagging

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

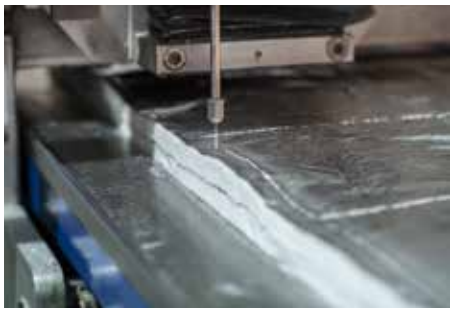
Our specially tailored kits are assembled and packaged with clearly marked part numbering and can be supplied with our own brand, or alternatively, customer specific branding.

We are able to offer kits that include a variety of our core products, ranging from rotary seals and O-rings to hydraulic seals, washers and gaskets.

# Facilities

**Our highly versatile and flexible manufacturing facility is able to service high volume serial OEM clients in the white goods appliance and transportation sectors. We have continuously invested in manufacturing technology at this facility adding increased capability and capacity to support our growing demand for diverse, high volume production.**

Our range of high speed, **precision die-cutting press** technology can support serial OEM schedule orders to cut seals and gaskets that offer both high quality and excellent manufacturing efficiencies to our clients. We have recently added additional capability to supply large dimension kiss-cut parts that offer you an improved assembly process.



Our **water-jet work cell** is capable of precision profile cutting a wide range of materials from insulation blanket or boards, cellular foam to metals. This CNC driven equipment is ideal for quick response to individual orders or mid-high volume manufacture.

**Oscillating knife cutters** give maximum flexibility, quick turn-around and a high quality production finish. The equipment is excellent for prototypes or serial production orders on a wide range of sealing or insulation materials.

The **CNC machining work cell** is equipped with 3 axis machining centres, or routers, to profile cut three dimensional insulation board for the appliance sector.

The **Technology Campus** houses the local design and materials teams. This production cell comprises an impressive range of 5 axis machining centres capable of machining metal, rubber and thermoplastics, working alongside an elastomeric moulding cell that can produce complex component geometry in a broad range of sizes and materials. This facility's primary focus is to support new product development, prototype manufacturing, low volume production of highly specialised components and materials. This unique combination offers you reduced time to market on new products, resulting in a competitive advantage for your business.

## Capabilities

- 2D shape cutting
- High volume gasket cutting
- Foam converting/foam kiss cutting
- Lamination
- Water jet cutting
- Abrasive water jet cutting
- High frequency welding
- 4 axis sheet machining
- 3 axis turning
- 5 axis machining
- CNC oscillating knife cutting
- Compression moulding

# Production Part Approval Process - PPAP

Serial product volumes require the use of PPAP to provide the evidence that all customer engineering design records and specification requirements are properly understood by the supplier, while demonstrating that the process has the potential to produce product consistently meeting the requirements during an actual production run, at the quoted production rate.

Typically HVAC or domestic appliance applications require the submission of either a Level 2 or Level 3 PPAP report.

- Level 1
  Warrant only (and for designated appearance items, an appearance approval report) submitted to customer.
- Level 2
  Warrant with production samples and limited supporting data submitted to customer. Typically: initial sample inspection report, drawings, material data-sheets, part submission warrant.
- Level 3
  Warrant with product samples and complete supporting data submitted to customer. Typically; gauge repeatability and reproducibility, process failure mode effect analyses (FMEA), control plan, process flow diagram, process capability report, drawings, material data-sheets, part submission warrant.

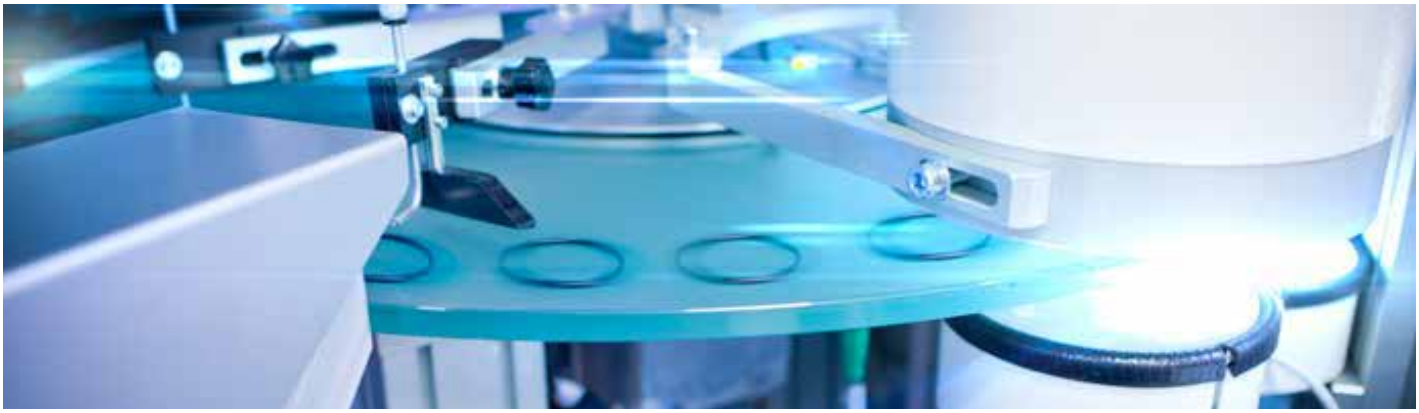
The use of PPAP drives consistency within the supply chain, minimising enterprise risk.


# Process Capability Index - $C_{pk}$

The $C_{pk}$ of a process defines how centred the output of the process is between its lower and upper specification limits and how variable the output is. It is calculated as the ratio of the delta between the actual process mean and the nearest tolerance limit divided by 3 times the standard deviation.

| $C_{pk}$ | Parts per million defective |
|---|---|
| 1.00 | 2,700.0 |
| 1.10 | 967.0 |
| 1.20 | 318.0 |
| 1.30 | 96.0 |
| 1.40 | 26.0 |

| $C_{pk}$ | Parts per million defective |
|---|---|
| 1.50 | 6.8 |
| 1.60 | 1.6 |
| 1.70 | 0.34 |
| 1.80 | 0.06 |
| 2.00 | 0.0018 |





# 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 teams.

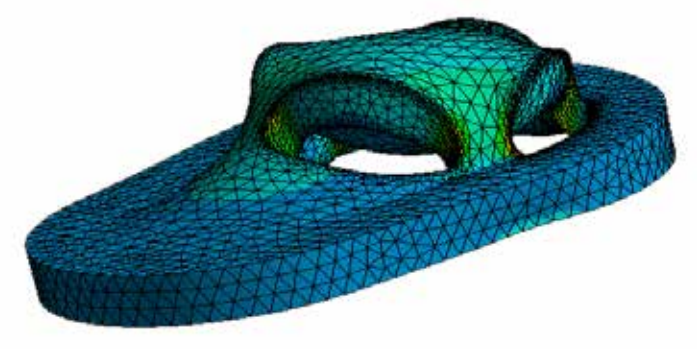
This technology proves an invaluable tool in communicating and developing conceptual solutions involving co-engineering partnerships as we can share 3D data in many standard formats including IGES and STEP.

Comprehensive 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)

To improve design integrity and efficiency, we use FEA as a mathematical technique to predict deflection (strain), stress, reaction force and contact pressure. These are based on dimensional information, physical constraints and material properties.

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, reducing time to market.



# Complex Parts Product Development Cell

Reserved for the development of prototypes, our development cell facility supplements our volume manufacturing facilities to enable ERIKS' customers to bring their products to market in the shortest time possible and maximise their market penetration. This capability exceeds 3D prototype printing capability, suitable for fit only testing, and is able to meet the growing needs of customers that require functional prototypes.


The product development cell incorporates a high-spec twin-spindle, large-diameter 5-axis NC lathe, capable of machining metals, rubber, composites and functional thermoplastics, as well as the latest moulding and mechanical seal assembly facilities, enabling the manufacture of complex shapes in a broad range of sizes.

This innovative business model reserves the capacity of the new product development cell for prototype projects. It also benefits from the know-how of ERIKS' materials team to offer the most appropriate materials for your applications.

We understand our customers are under increasing pressures to bring their products to market in the shortest time possible. Our product development cell removes any unnecessary delays from the production of functional prototypes to ensure prompt and focussed service to our customers precisely when they need a competitive edge.

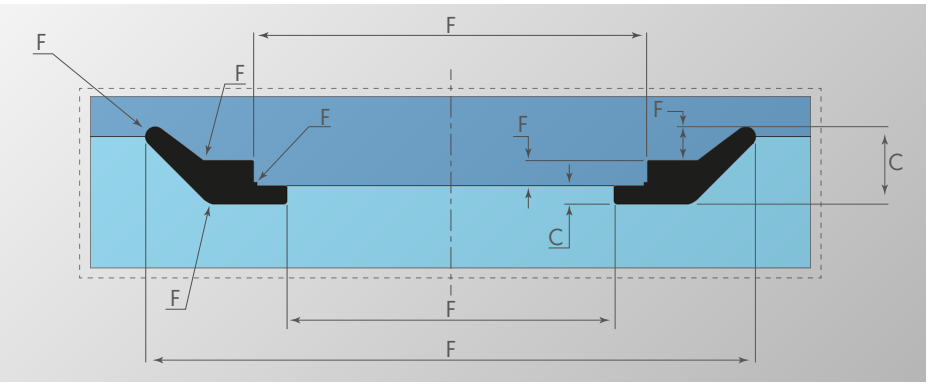
# General Moulding Tolerances

By their very nature, elastomer products can accommodate gross deformation making them an ideal material of construction for many non-rigid engineering applications. This flexibility makes the tolerances achievable in manufacture far larger than rigid materials. In addition the method of manufacture must be considered when applying tolerances as this also affects production capability.

Moulded elastomer products generally conform to ISO 3302-1 class M2 tolerances. When applying these tolerances to designs, engineers must consider whether dimensions will be formed by fixed or closure features within the mould tool.

Mould tools typically comprise two or more segments that are brought together axially to create a cavity that reflects the shape of the desired part.

Features created by a single segment of the tool are termed as “fixed dimensions” (F), those created by two or more segments being aligned and brought together are termed as “closure dimensions” (C)*




- C = Closure features
- F = Fixed features

* Refer to ISO 3302-1 for full details

## Tolerances DIN ISO 3302-1 (BS 3734) Rubber Parts

| Nominal Dimensions (mm) | | Class M1-Precision (±mm) | | Class M2-Commercial (±mm) | |
|---|---|---|---|---|---|
| Above | Upto | Fixed dims | Closure dims | Fixed dims | Closure dims |
| 0 | 4.00 | 0.08 | 0.10 | 0.10 | 0.15 |
| 4.00 | 6.30 | 0.10 | 0.12 | 0.15 | 0.20 |
| 6.30 | 10.00 | 0.10 | 0.15 | 0.20 | 0.20 |
| 10.00 | 16.00 | 0.15 | 0.20 | 0.20 | 0.25 |
| 16.00 | 25.00 | 0.20 | 0.20 | 0.25 | 0.35 |
| 25.00 | 40.00 | 0.20 | 0.25 | 0.35 | 0.40 |
| 40.00 | 63.00 | 0.25 | 0.35 | 0.40 | 0.50 |
| 63.00 | 100.00 | 0.35 | 0.40 | 0.50 | 0.70 |
| 100.00 | 160.00 | 0.40 | 0.50 | 0.70 | 0.80 |
| Above 160.00 | | 0.3% | 0.4% | 0.5% | 0.7% |

# ERIKS on-line design tools

We make available on-line a number of design applications that help you:

- Select a standard O-ring and groove based upon a driving diameter
- Find materials suitable for use in your media
- Analyse an existing groove design.

**These may all be found on the Apps page of:**
**http://oring-groove-wizard.eriks.co.uk**

**Our design team are always eager to assist you in specifying the right standard seal design or in creating a custom solution for your application needs.**



# Groove Design

## O-ring Groove Standards

As experts in seal design we recognise that there are a number of international standards used to specify O-rings into grooves.

AS5857 and AS4716 detail grooves suitable for use with AS568 O-rings for static and dynamic applications, respectively. All three standards are governed by the US Society of Automotive Engineers and are available from www.sae.org. AS4716 supersedes the popular MIL-G-5514 for dynamic applications.

BS1806 and BS4518 are the British Standards for Imperial and Metric sizes respectively. BS1806 has now been withdrawn and has been replaced by ISO3601, however the recommended groove dimensions differ between the two.

ISO3601 is a comprehensive standard for imperial sizes. However care should be taken when specifying dynamic locations as use of this standard may result in unnecessary machining and AS4716 should be considered in its place.

## Groove Design Considerations

Compression (Squeeze) – Compression is applied to an O-ring, which creates an initial seal. As differential pressure increases this is transmitted by the visco-elastic material, with the normal force increasing with pressure, maintaining the seal. There is no single correct initial percentage compression, as this will vary by application. Typically nominal compression levels are:

Face seals - 25%

Static piston / rod seals – 15%

*(Lower at large cross section, higher at small cross section, governed by installation force)*

Dynamic piston / rod seals – 12%

## Groove Fill (Gland Occupancy)

To ensure pressure energisation of the seal for high pressure operation the O-ring should not reach 100% gland occupancy. Typical nominal occupancy levels would be 75-85% and with the standards taking account of differential rates of thermal expansion, chemical swell and tolerance stack-up.

## Stretch

O-rings are typically stretched into piston grooves to overcome tolerance stack-up and ensure correct assembly. Rod applications typically interfere on the outside diameter, although stretch may be applied this is always in a constrained state.



# Why use a Gasket?

Gaskets provide a seal between components of a fluid containing system. The gasket is inserted between the flat mating surfaces of the components, and stress applied, typically by the bolts used to fasten the components together. The reactive force generated by the gasket prevents leakage of the fluid in the system.

## Material Selection

Factors which determine selection of gaskets include:

- Service temperature and pressure
- Media being sealed
- Certification requirements (eg WRAS for potable water)
- Cost

Compatibility of gaskets with media can be a complex question to address; gasket materials, particularly sheet, may be comprised of several ingredients, of which the elastomer is a minor part. For semi-metallic gaskets, the resistance of the metal component to the media also has to be considered. If in doubt, contact ERIKS Sealing and Polymer with details of your particular application.

## Joint Design & Bolting Calculations

The bolts must compress the gasket sufficiently to create and maintain a seal, under the given operating conditions, whilst neither overstressing the bolts nor the gasket. The torque required to do this can be calculated, knowing:

- The type of gasket
- The dimensions of the gasket and the flange (usually a standard size in each case)
- The yield strength of the bolts, and whether thread lubricant is applied (bolts are typically tightened to 50% of yield stress, to allow for additional loading due to flexing of the pipeline and weight of flanges)
- The maximum pressure and temperature of the application

Knowing the gasket area and the typical stress required to maintain a seal (which is never less than the pressure inside the system) the required total force can be calculated, and the torque needed to tighten each bolt to produce this force determined. The gasket stress required to maintain a seal is, in turn, determined by measuring the leakage of a standard gasket under varying loads and internal pressures, for instance using the EN13555 test method.

Whether the application involves standard or non-standard gasket sizes, the basis of these calculations is the same and can highlight any issues that may need to be addressed. This may be that the bolts to be used are not strong enough to stress the gasket sufficiently, which may be remedied (other than by using stronger bolts) by reducing the stressed area of the gasket; for instance, a full-face gasket (with location holes for the bolts) may be substituted with an inner bolt circle gasket, which has a much smaller area to be stressed, but which can still be located by sitting within the bolts.

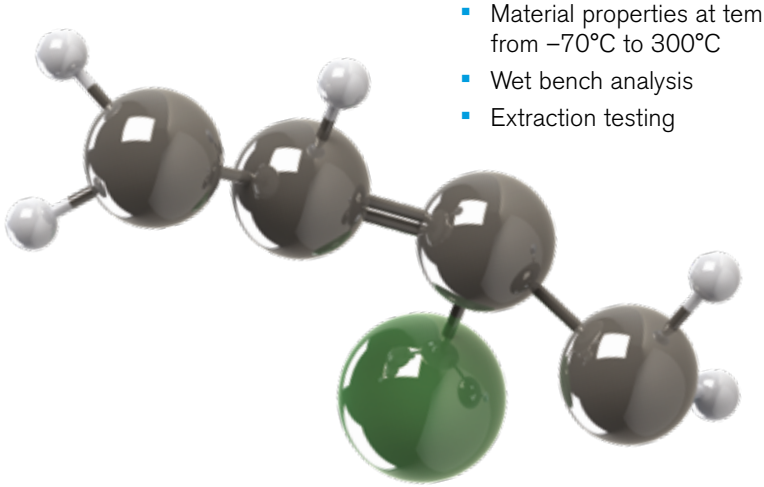
Please contact ERIKS Sealing and Polymer with details of your particular application, for advice on flange assembly and torque calculations. An estimated 90% of gasket failures occur due to incorrect installation of the gasket.



# 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.**

Our Technology Campus benefits from continuous investment in technology and people and is one of the major factors in ERIKS Sealing and Polymer success.



## Capabilities:

- Hardness (°IRHD/Shore A)
- Compression-set
- Mechanical property testing
- Chemical and heat ageing
- Ozone resistance testing
- 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
- Sealing (test load and temperature up to 600°C)
- Compression and recovery
- Stress retention and maximum surface stress
- Blowout resistance 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).

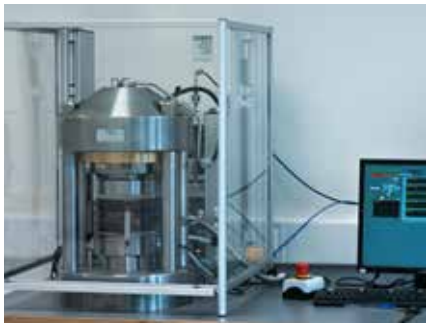
With modulated DSC (MDSC), the samples are subjected to a non-linear heating/cooling regime (i.e. sinusoidal). This non-linear temperature profile allows the measurement of heat-capacity effects simultaneously with the kinetic effect, as well as increasing the sensitivity of the system. With the MDSC,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

# 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.**

Static seals (gaskets) can be tested on our TEMES test apparatus to EN13555, ROTT, HOBT and many other standards or to bespoke requirements.

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


# Elastomers

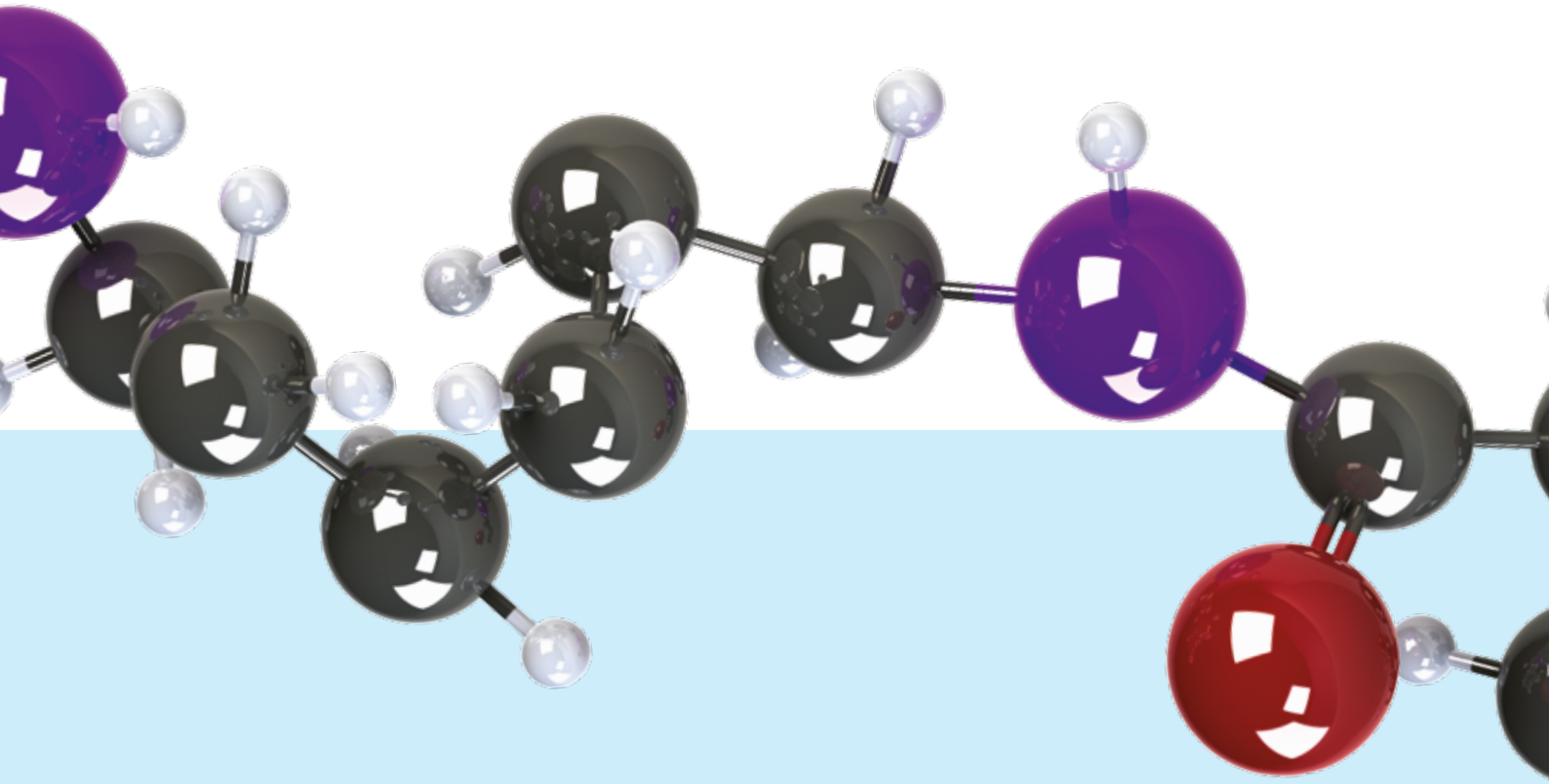
**Elastomeric materials are described as having non-linear, viscoelastic behaviour, this means that they exhibit elastic recovery, time dependent behaviour and the relationship between load and deflection is not linear.**

**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 – long chain 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 90 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.

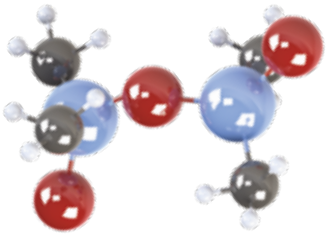
## Hydrogenated Nitrile (HNBR)

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 and compression set etc.) are also excellent and compounds display strong dynamic behaviour at elevated temperatures.

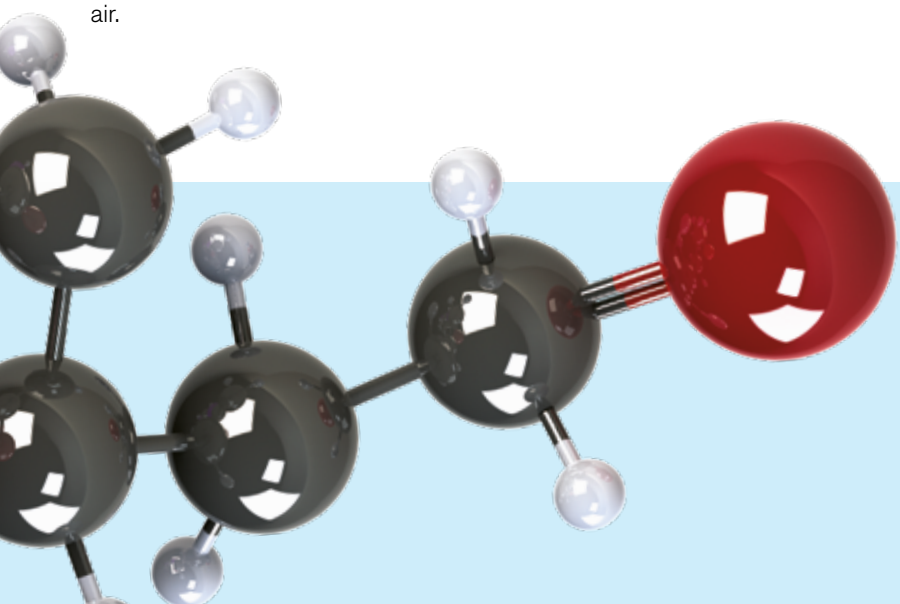
HNBR can either be cured with sulphur or with peroxide, depending on which properties are the most important. Typical applications include O-rings, dynamic seals and gaskets. Limitations include poor electrical properties, poor flame resistance and swelling with aromatic oils.

## 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 )

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.

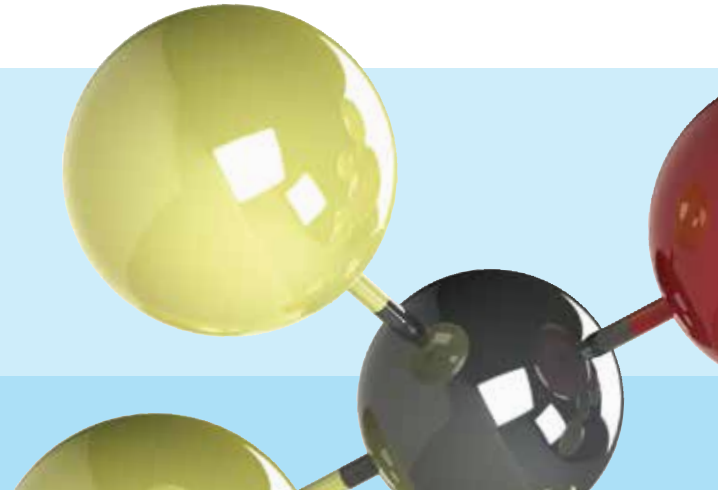
FKMs offer excellent resistance to mineral oils and greases, aliphatic, aromatic and some chlorinated hydrocarbons, fuels, silicone oils and greases. However FKMs show poor resistance to ethers, ketones, esters and amines.

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 | FKM A | Bisphenol or Amine | 66% | General purpose with excellent mechanical properties |
| Type 2 | FKM 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 | FKM GLT | Peroxide | 64 - 67% | Improved low temperature resistance but reduced chemical resistance |
| Type 4 | FEPM | Peroxide | 55% | Excellent resistance to lubricating oils, corrosion inhibitors and coolants. |
| Type 5 | FKM ETP | Peroxide | 67% | Speciality grade, excellent chemical resistance, including increased resistance to amines and fuel additives. |

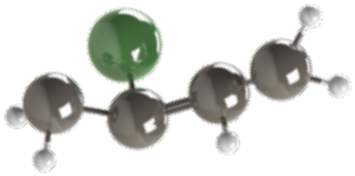


## Ethylenepropylene Rubbers (EPM, EPDM)

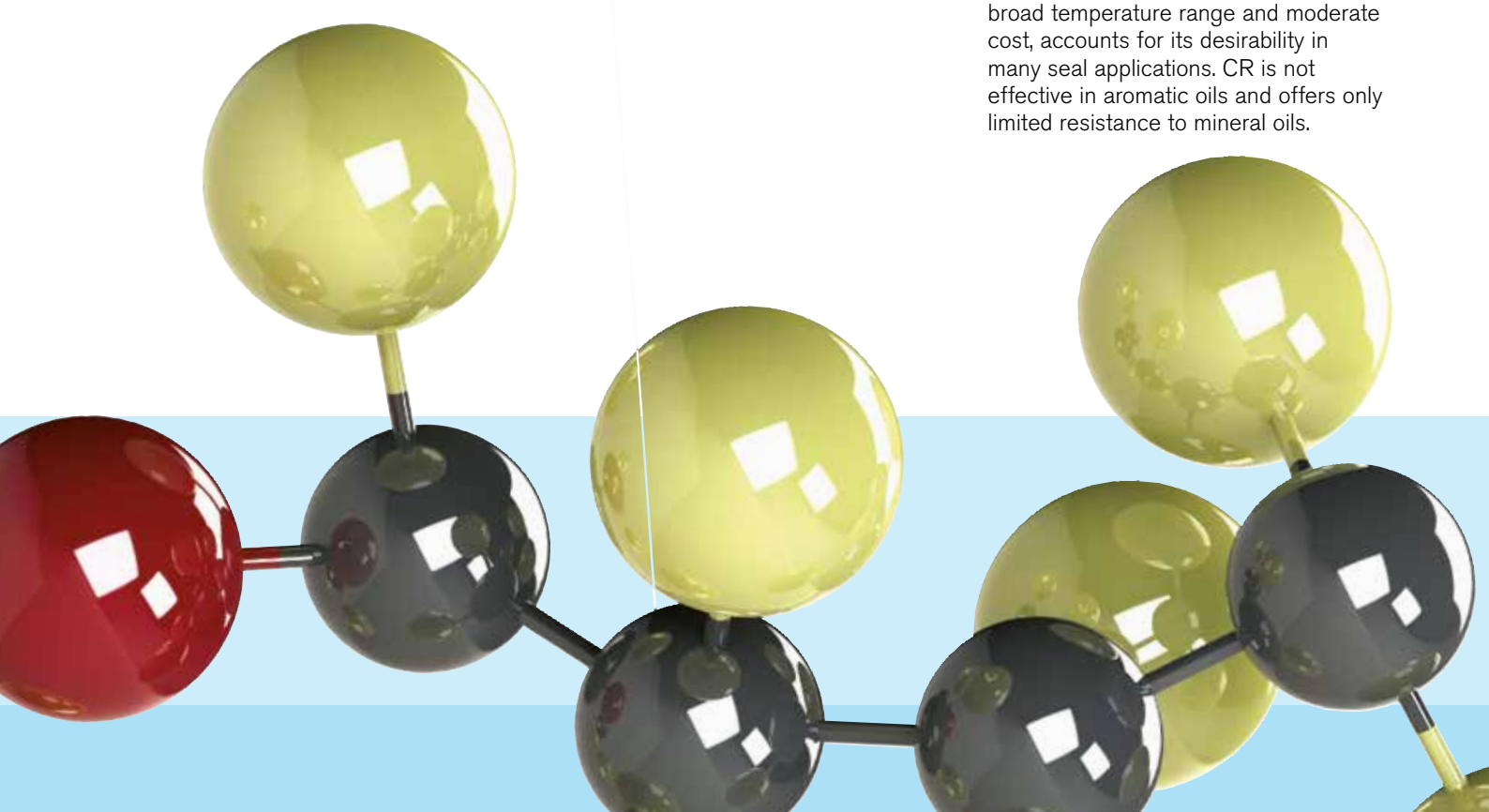
Ethylenepropylene based rubbers are forms of non-polar synthetic rubbers. EPM (sometimes also known as EP) rubber is based on ethylene and propylene monomers, with no unsaturation (carbon-carbon double bonds) present. EPDM is also based on the same constituent monomers, however as no unsaturation is 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 and coolants etc., but perform badly in non-polar fluids such as hydrocarbon oils, lubricants and greases.

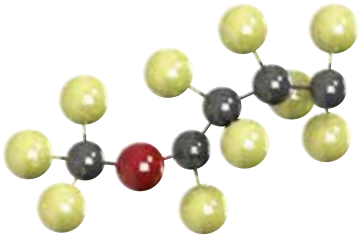
## Polychloroprene (Neoprene Rubber, CR)



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, CFC's amd HFCF's (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.

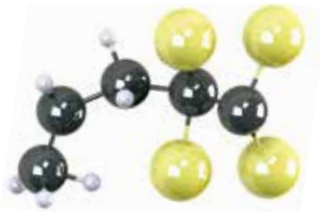
This is demonstrated by the good long-term, high-temperature, compression-set resistance. Chemical resistance is second to none, with good performance in a broad variety of harsh environments: hot amines, steam, solvents, hydrocarbons etc.

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.

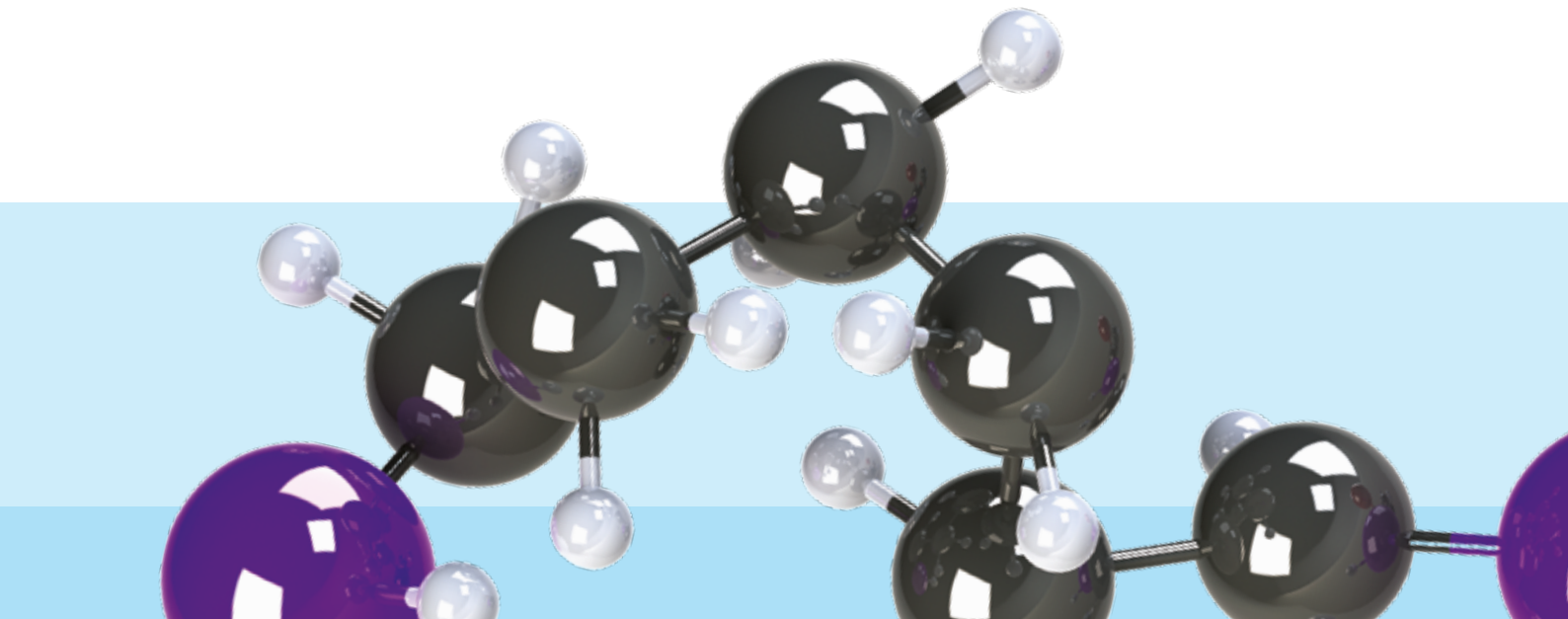
| Common FFKM Types | Max temperature | Used for... |
|---|---|---|
| Peroxide | 240°C | Broad chemical resistance. |
| Triazinic | 327°C | High temperature, excellent mechanical properties. Reduced chemical and steam resistance. |
| Modified Triazinic | 275°C | Broad chemical resistance, excellent mechanical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

## FEPM



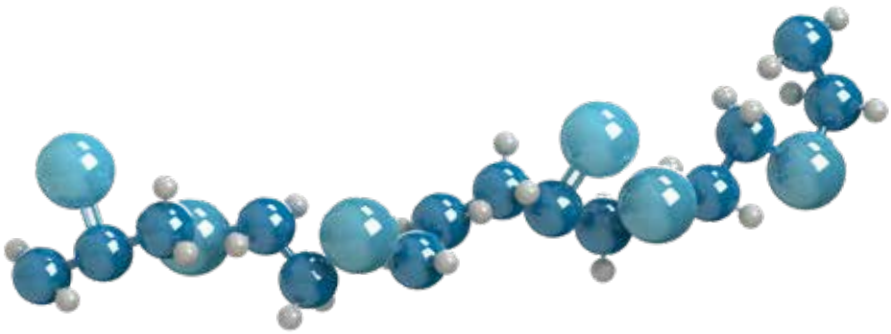
The most common forms of FEPM are categorized within ASTM D 1418-01. These grades are alternating copolymers of tetrafluoroethylene and propylene, with a fluorine content of ~54%. Such chemical structures offer excellent heat resistance, exceptional chemical resistance (significantly to alkalis and amines),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

FEPM 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.





## 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 and longer processing times.

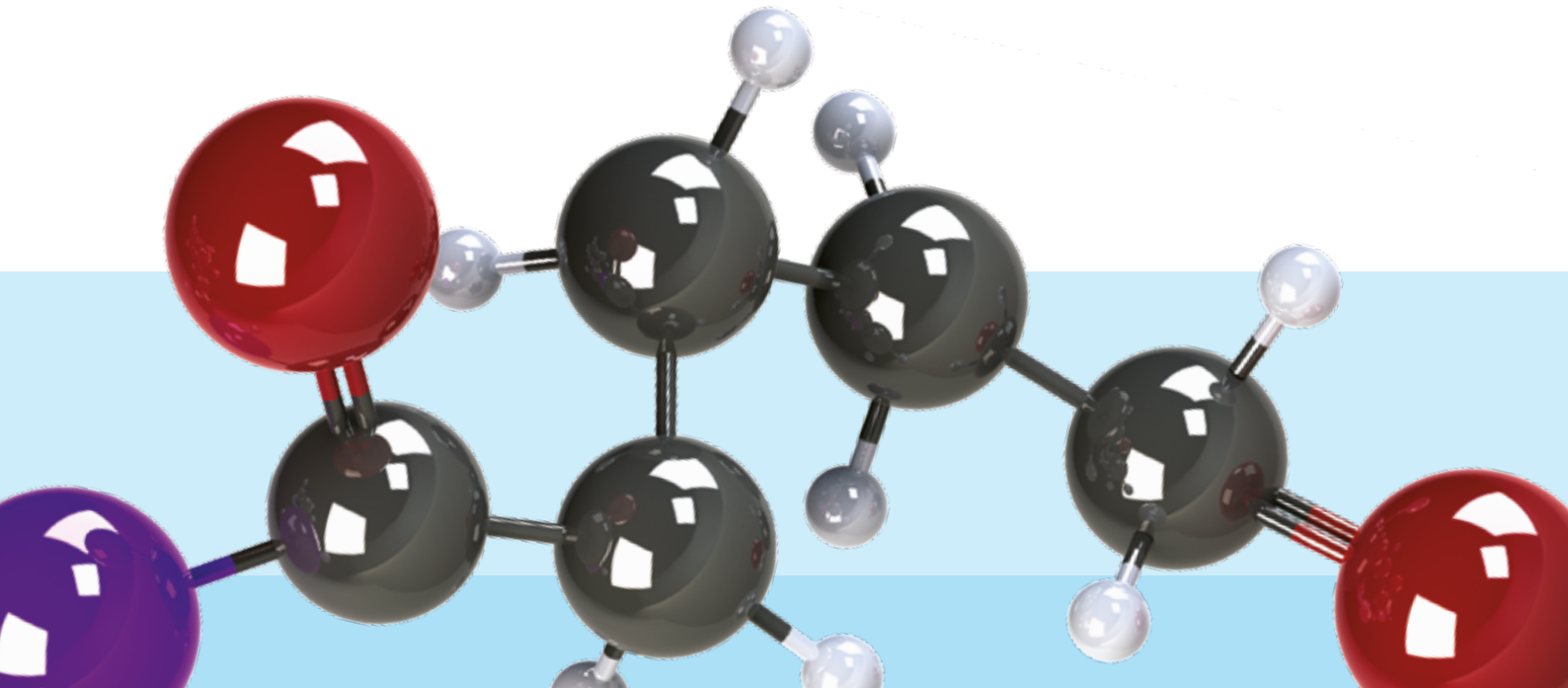
The major difference between thermosetting elastomers and TPE's is the type of crosslink utilised. In thermosetting material elastomers the crosslink is a covalent bond. The crosslinking in TPE's is a weaker dipole, hydrogen bond, or a covalent bond within only one of the phases of the material.

TPE's are advantageous in that they have elastomeric properties, yet can be processed using methods more common in plastics processing (TPE's can be processed by blow molding, thermoforming and heat welding). TPE's also have advantages with respect to environmental impact when compared to traditional thermosetting rubbers. TPE has 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, TPE's have relatively poor heat resistance and can show high compression set at elevated temperatures when compared to thermosetting elastomers. TPE's are often used in less demanding applications such as door seals, bumpers and extruded profiles etc.





## 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.

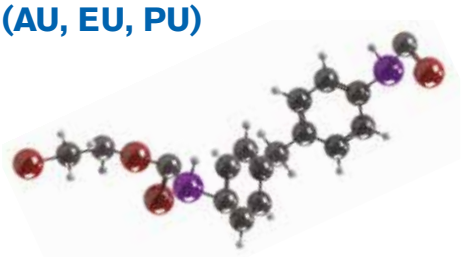
PTFE lacks elasticity which prevents its use as an elastomeric-type sealing ring, however it is commonly used for anti-extrusion as a back-up ring and for non-stick requirements. Owing to its low friction and excellent chemical resistance it is also commonly used for applications such as bearings, gears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

## 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.

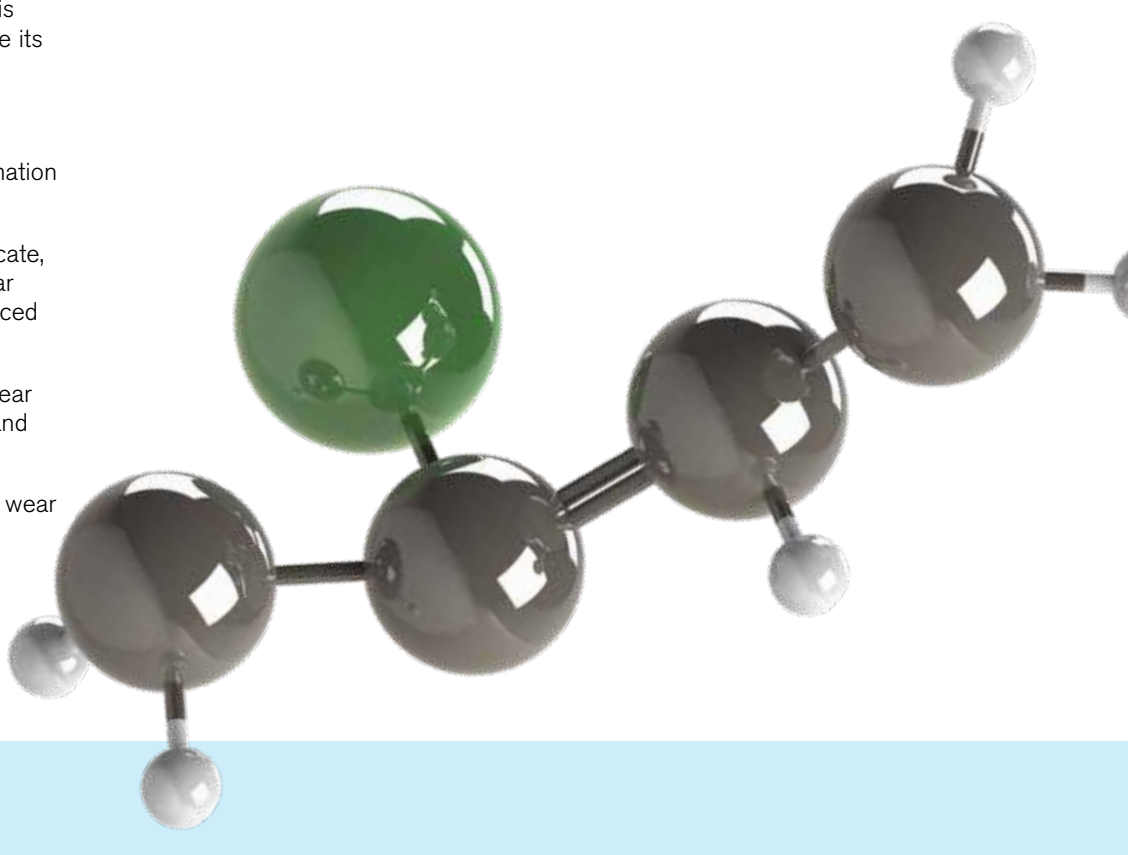
Polyurethane demonstrates excellent resistance to weathering and oxidation. They resist hydrocarbon fuels and mineral oils, however some grades degrade (hydrolyse) in hot water. Polyurethane also offers some of the best resistance to abrasion, and are therefore often specified for use in dynamic seals.

## Acrylic Elastomers (ACM, AEM)

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

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. AEM elastomers exhibit mechanical properties similar to ACM, although they can operate over a wider temperature range than ACM and hydrogenated nitriles (HNBR)





# Common Chemical Compatibilities of Materials

| Media | NBR | HNBR | CR | ACM | AEM | PU/PE | FKM (A) | FKM (GF) | VMQ | EPDM | TPE | FFKM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| Boiler flue gas applications* | - | - | - | - | - | - | 1 | 1 | 1 | 1 | - | - |
| Corrosion inhibitors | 2 | 1 | 2 | 3 | 3 | 3 | 4 | 4 | 3 | 1 | 1 | 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 90 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 |
| Liquefied natural gas (LNG) | 1 | 2 | 2 | 3 | 4 | 1 | 1 | 1 | 3 | 4 | 4 | 1 |
| Liquefied petroleum pas (LPG) | 1 | 2 | 2 | 3 | 4 | - | 1 | 1 | 3 | 4 | 4 | 1 |
| Low sulphur 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 |
| Methane | 1 | 1 | 2 | 1 | 2 | - | 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 |
| Sulfur hexafluoride | 2 | 2 | 1 | 4 | 4 | - | 2 | 3 | 2 | 1 | 1 | 2 |
| 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 <100°C | 2 | 1 | 2 | 4 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
| Water / coolant <150°C | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 1 | 2 | 1 | 4 | 1 |
| Water / coolant < 0°C | 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 |

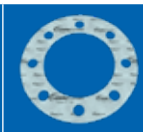
**KEY:** **1 = Excellent** **2 = Good** **3 = Poor** **4 = Not recommended**

*Consult ERIKS for compliant DIN EN 14214-1 compounds

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



# Gasket Selection Chart

| | Material |  Fybar PT20 |  Fybar PT30 |  Fybar PT50 |  Fybar PT60 |  Clipperlon™ 2100 |  Clipperlon™ 2110 |  Clipperlon™ 2115 |  Clipperlon™ 2120 |
|---|---|---|---|---|---|---|---|---|---|
| | **Maximum Operating Temperature (°C)** | **-80 +150** | **-80 +250 +200 (Steam)** | **-100 +200** | **-100 +250** | **-240 +240** | **-240 +240** | **-240 +240** | **-240 +240** |
| | **Maximum Pressure (Bar)** | **60** | **100** | **80** | **100** | **85** | **55** | **55** | **55** |
| OPERATING MEDIUM | Air | Y | Y | Y | Y | Y | Y | Y | Y |
| | Steam | | Y | Y | Y | | | | Y |
| | Oxygen | | | | | Y | | | Y |
| | Oil | Y | Y | Y | | | | Y | Y |
| | Solvent | | | | Y | Y | Y | | Y |
| | Petrochemical Products | | | Y | Y | | | | Y |
| | Potable Water | | Y | Y | Y | Y | Y | | Y |
| | Weak Acid | Y | Y | Y | Y | Y | Y | Y | Y |
| | Strong Acid | | | | | Y | Y | | |
| | Weak Alkali | | Y | Y | Y | Y | Y | Y | Y |
| | Strong Alkali | | | | | Y | Y | Y | Y |
| | Food Stuffs | | | | | | | Y | |
| | Conformability | M | M | M | M | L | H | H | VL |
| | **ASME** | | | | | | | | |
| | **m** | **3.5** | **3.5** | **2.5** | **2.5** | **3.5** | **3.0** | **3.5** | **3.5** |
| | **Y (psi)** | **2000** | **2000** | **3200** | **2600** | **2500** | **1600** | **2450** | **2450** |
| | **ROTT** | | | | | | | | |
| | **Gb (psi)** | **300** | **300** | **2400** | **2400** | **500** | **450** | **432** | **432** |
| | **a** | **0.4** | **0.4** | **0.2** | **0.2** | **0.3** | **0.3** | **0.3** | **0.3** |
| | **Gs (psi)** | **5** | **5** | **50** | **50** | **6** | **5** | **1** | **1** |

Conformability: VL - Very Low
L - Low
M - Medium
H - High
VH - Very High



|  Clipperlon™ 2130 |  Clipperlon™ 2135 |  Virgin PTFE |  Egraflex SPG |  Novaphit® SSTC XP |  S-Graph |  N-Graph |  NovaMica® Thermex |  EPDM E-70-772 |  EPDM E-60-773 |
|---|---|---|---|---|---|---|---|---|---|
| **-240 +240** | **-240 +240** | **-200 +200** | **-200 +450** | **-200 +550** | **-200 +450** | **-200 +450** | **+1000** | **-25 +120** | **-25 +120** |
| **40** | **40** | **50** | **150** | **250** | **100** | **100** | **10** | **20** | **20** |
| Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Y | Y | Y | Y | Y | Y | Y | Y | | |
| Y | Y | Y | Y | | | | | | |
| Y | Y | Y | Y | Y | | | Y | Y | Y |
| Y | Y | Y | Y | Y | Y | Y | Y | | |
| Y | Y | Y | Y | Y | Y | Y | Y | | |
| Y | Y | Y | | | | | | Y | |
| Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | | Y | | | | | | | |
| Y | Y | Y | Y | Y | Y | Y | Y | | |
| Y | | Y | | | | | | | |
| | Y | Y | | | | | | | Y |
| VH | VH | L | H | H | VH | VH | M | H | H |
| **2.5 2900** | **2.5 2900** | **2 3000** | **2.0 2500** | **2.5 1600** | **2.0 900** | **2.0 900** | **2.5 4350** | **1.0 200** | **1.0 200** |
| **1250 0.2 4** | **1250 0.2 4** | | **1400 0.3 1** | | **800 0.4 0.5** | **800 0.4 0.5** | | | |

## Fibre Sheet Jointing

### General Grade Non-Asbestos Gasket Materials

## Fybar PT20

PT20 is a composite of mineral and aramid fibres with NBR binders. Suitable for use in low pressure applications, in a wide range of non-aggressive media.

## Fybar PT50 (BS 7531 Grade Y)

PT50 is an aramid based sheet jointing. Suitable for general purpose low temperature applications.

For use with water, steam and gases at temperatures up to 200ºC

## Fybar PT30 (BS 7531 Grade Y)

PT30 is a high quality, sheet jointing comprising of a mixture of polyaramid and inorganic fibres, bonded with a NBR binder. It is a general purpose gasket material, suitable for hot and cold water, steam, oil, fuel, gases and other general duties.

For use with water, steam and gases at temperatures up to 200ºC and for oil, solvents and inert liquids at temperatures up to 250ºC.

## Fybar PT60 (BS 7531 Grade X)

PT60 is our premium quality, private brand sheet jointing, comprising of glass and aramid fibres, bonded together with a NBR binder. It is a general purpose, medium pressure rated gasket material and an excellent choice for general chemical applications.

For use with water, steam and gases at temperatures up to 200ºC and for oil, solvents and inert liquids at temperatures up to 250ºC.

## EPDM Sheet

## EPDM E-70-772

Compound E-70-772 is a black EPDM sheet of 70 Shore A hardness, suitable for applications involving potable water.

It offers excellent resistance to water, polar solvents and phosphate ester hydraulic fluids. Suitable for potable water contact up to 23ºC (WRAS Approved). The compound is resistant to attack by many of the chemicals used in the treatment and purification of water, which makes it particularly suitable for manufacturing seals for use in such applications.

This product is REACH, RoHS, PAH and CE Compliant.

## EPDM E-60-773

Compound E-60-773 is a white EPDM sheet of 60 Shore A hardness, suitable for applications involving food contact

It offers excellent resistance to water, polar solvents and phosphate ester hydraulic fluids. Suitable for food contact applications, the material is formulated to meet the requirements of FDA 21 CFR 177.2600 and is ADI, therefore BSE/TSE/Porcine free. The compound is resistant to attack by many of the chemicals used in the cleaning and sterilization of food processing equipment, which makes it particularly suitable for manufacturing seals for use in such applications.

This product is REACH, RoHS, PAH and CE Compliant.

## Graphite Laminates

A semi-rigid laminated material manufactured from high purity exfoliated graphite reinforced with nickel or stainless foil or tanged stainless steel. It is suitable for sealing against steam and most other media with the exception of strongly oxidising reagents. General material grades available from ERIKS Sealing & Polymer include:

### Egraflex SPG

Egraflex is a graphite laminate sheeting reinforced with a tanged 316 stainless steel insert. A universal material for (petro) chemicals used in high pressure and high temperature applications. Recommended for applications involving high sealing stresses and where high blowout resistance is required. The inclusion of the steel reinforcing layer gives rise to a robust sheet. Can be used to seal a wide range of media, with the exception of strong oxidising agents, at extremes of temperature and pressure.

### N-Graph

N-Graph is a graphite sheet product, adhesively bound to a nickel – foil core (13 µm). The thin nickel core provides a substantial degree of tear resistance to the relatively fragile graphite facing, and also helps to increase the ability of gaskets to resist blowout

### S-Graph

S-Graph is a graphite sheet product, adhesively bound to a stainless 316 – foil core (50 µm). The thin steel core provides a substantial degree of tear resistance to the relatively fragile graphite facing, and also helps to increase the ability of gaskets to resist blowout

## Composite PTFE Products

### Clipperlon™ 2100

Fawn modified PTFE sheeting. High performance biaxially orientated sheet sealing material containing PTFE with silica filler. Excellent resistance against cold-creep. Universal quality for (petro) chemical applications, acids and gases.

### Clipperlon™ 2110

Blue modified PTFE sheeting. High performance biaxially orientated sheet sealing material containing PTFE with hollow glass micro spheres. Excellent resistance against cold-creep and very gas tight. Seals with low bolt force. Universal chemical resistance and can be used for several flange materials: steel, plastic, glass and ceramic lined.

### Clipperlon™ 2115

Clipperlon 2115 USP is modified PTFE sheet specially designed for high purity applications such as Pharmaceutical, Semicon, Food and beverage. The material is free of any pigment and has a natural white colour and meets the requirements for USP class VI plastics (USP 88) and meets Food & Dairy requirements FDA 21 CFR. 177.1550 and EC 1935/2004, EC10/2011.

Highly recommended for low torque applications, plastic pipe systems and flanges, as well as glass and ceramic lined equipment in a wide variety of high purity applications.

### Clipperlon™ 2120

Leader Clipperlon 2120 has a high density and is very resistant to pressure (vacuum up to 55 bar). It is mechanically very stable and characterised by a low compressibility and a highly optimized creep.

## Expanded PTFE Sheet

### Clipperlon™ 2130

100% multidirectional expanded PTFE sheet, minimum of cold-creep, low gas permeability. Universal chemical resistant, pH 0-14, excellent on rough or damaged flange surfaces.

- Blow-Out-Test VDI 2200
- TA-Luft

### Clipperlon™ 2135

100% multidirectional expanded PTFE sheet, minimum of cold-creep, high gas permeability. Universal chemical resistant, pH 0-14, excellent on rough or damaged flange surfaces. Absence of ink brand (embossed) makes this product highly suited for use with food contact and pharmaceutical applications.

- Blow-Out-Test VDI 2200
- TA-Luft

# Foam – Cellular sponge

We have a wide selection of foam and sponge materials which can be supplied to your requirements using our precision water-jet cutters, oscillating knife machines, HF welder or automatic LC presses.

The table below lists a basic selection of materials within our range. These materials can be supplied with a range of coatings and backings such as adhesive, foil faced or PU coated.

**Cellular sponge products and acoustic solutions.**

- Die-cut components supplied in high volume, custom design parts engineered to offer the highest quality and optimum cost solution.
- Kiss-cut parts, supplied on continuous roll or local features within component design.

**Comprehensive range of materials to suit your application:**

- EPDM, Neoprene, EPDM/Neoprene blended, Nitrile/PVC, Polyethylene, Polyester and PVC all standard grade amongst many other speciality grades.
- Applications range from acoustic and thermal insulation, gaskets, case sealing, general engineering, lighting and domestic applications.

| Product | Material | Density Range (kg/m³) | Temperature Range (°C) | Application |
|---|---|---|---|---|
| FT1 515 | Expanded Silicone Sponge | 256 | -20 to 200 | High temperature sealing, gaskets and insulators, case sealing, lighting, HVAC, and general engineering applications |
| FT2 201 | Expanded Neoprene Sponge | 150 to 190 | -20 to 100 | Gasket sealing, impact pads, closed cell – weather proof material. White goods, and general engineering applications to ASTM D1056 |
| FT3 322 | EPDM/Neoprene / EPDM Blend Sponge | 110 to 130 | -40 to 90 | Gasket sealing, acoustic pads, HVAC, white goods, automotive, lighting, and general industrial / engineering applications to ASTM D1056 |
| FT4 401 | Expanded EPDM Sponge | 130 to 170 | -30 to 100 | Gasket sealing, impact / acoustic pads, white goods, lighting, and general engineering applications to ASTM D1056 |
| FT5 501 | Expanded Nitrile / PVC | 50 to 70 | -40 to 105 | Thermal insulation, sealing, semi-closed cell. HVAC, industrial and general engineering, white goods, lighting, sports & leisure |
| PFF 005 | Crosslinked Polyolefin Foam | NA | -20 to 80 | This soft grade is ideal for sealing gaskets given its semi-closed cell structure, white goods and HVAC applications |
| FT6 633 | Polyethylene | 28 to 38 | -40 to 100 | General sealing, light weight closed cell material, white goods, lighting, and general engineering applications. FMVSS 302 |
| FT7 310 | Polyurethane Foam | 24 to 27 | -40 to 140 | Acoustic, thermal insulation, sealing, white goods, HVAC, filtration, construction, lighting, and general engineering applications. FMVSS 302 |
| FT7 310 Coated | Polyurethane Coated Foam | 24 to 27 | -40 to 140 | The addition of surface film offers aesthetic advantages. Other film grades are available to also offer sealing capabilities |
| FT8 810 | PVC | 100 to 120 | -30 to 60 | Gasket sealing, impact / acoustic pads, white goods, lighting, and general engineering applications |
| FT9 901 | Impregnated Polyurethane | 70 to100 | -25 to 100 | Gasket sealing, impact / acoustic pads, white goods, lighting, and general engineering applications |

# Insulation Materials - Selection Guide

This helpful selection guide will assist you to consider the various bands of material graded by temperature resistance.

This categorises not only the types of materials available but also the format of raw material such as Board, Blanket, Felt, Needle Matt, Cellular Foam, Rope etc. that may best suit your applications.

Once this is determined we can work alongside your technical team on specific grades reviewing thermal conductivity and material thickness requirements in more detail.

By working together, we will also consider ease of installation, delivery conditions all supported by our material and safety data sheets.

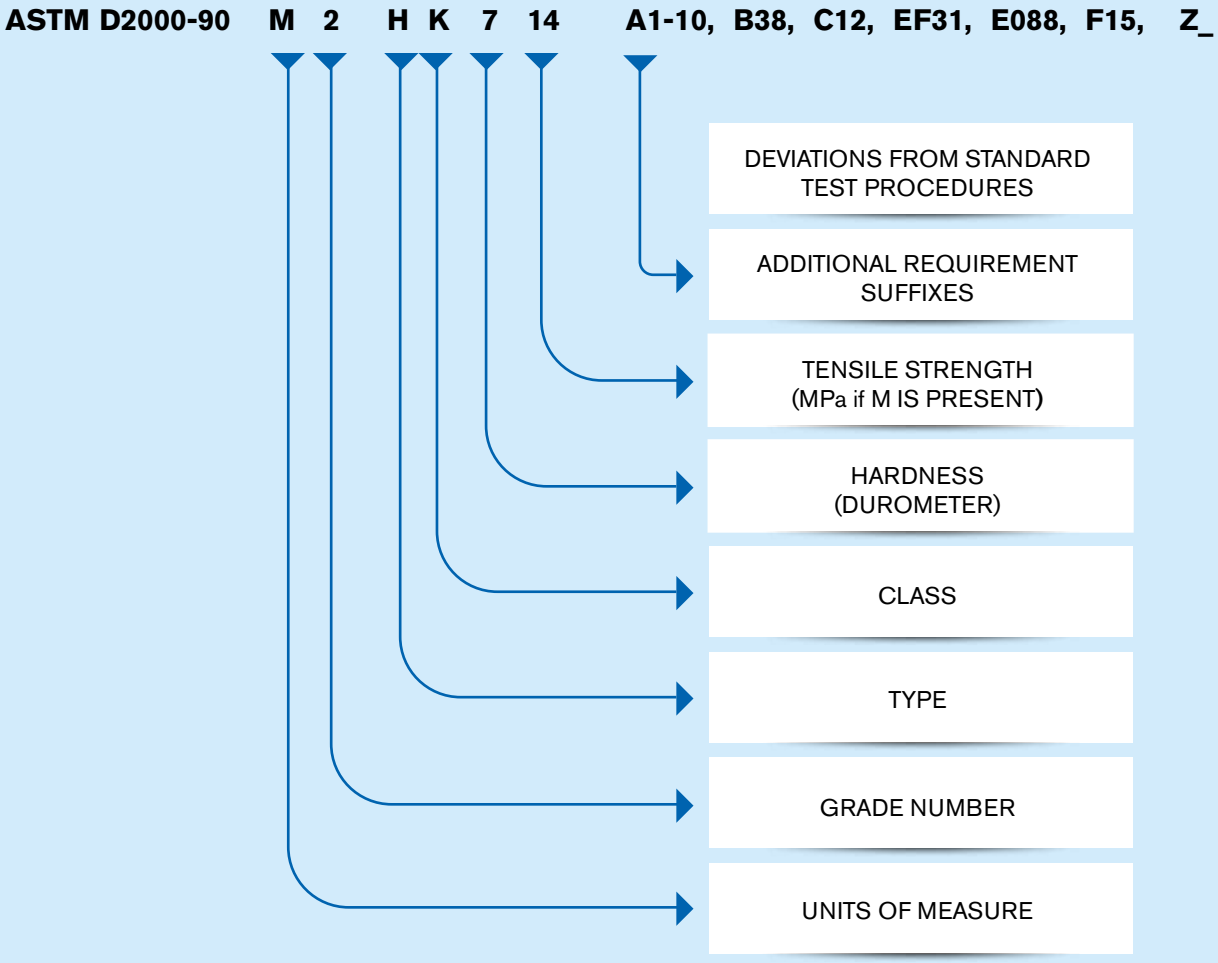
We welcome early collaboration on projects to combine both commercial and technical customisation specific to your application.

Energy efficiency, sustainability, heat protection and service life in HVAC appliances is paramount from these innovative, high-performance products, manufactured using our diverse in-house facility.

| Band | Max Temp (°C) | Material Group | Format |
|---|---|---|---|
| **T6** | 1200 | Silica Magnesia | Board, Paper, Blankets, Machined forms |
| | 900 to 1200 | Alkaline-Earth Silicate | Boards, Paper, Blanket |
| **T5** | 750 | Vermiculite/mica | Board, Formed parts |
| | | | |
| **T4** | 650 | Silica Gel | Blanket |
| | 500 | Glass fibre | Needle mat, Rope |
| | 500 | Cellular glass | Paper, Felt |
| **T3** | 250 | Mineral wool, Glass | Blanket |
| | | | |
| **T2** | 200 | Silicone | Cut component parts |
| | 150 | Melamine polymer foam | Board, Cut parts |
| **T1** | 120 | Polyurethane | Cut & formed shapes |
| | 100 | Elastomeric foam (EPDM) | Cut & formed shapes |
| | 100 | Expanded nitrile/PVC | Cut & formed shapes |

**See page 49 for thermal products**

## American Society for Testing and Materials (ASTM) D-2000 Line call-outs




## Units of measure:

If present an “M” denotes that metric units of measure should be used, i.e. MPa for tensile strength, °C for temperature and kN/m for tear strength.

## Grade number

1 = Basic Requirements

2 to 6 = Different requirements as detailed in table 6 of ASTM D2000 this specifies minimum basic requirements for tensile strength, elongation, heat aging, oil immersion and compression set by Classification (Type-class). Appropriate additional requirements apply to each classification, with the grade determining the allowable results.



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



## Type

The type classifies materials by temperature resistance. ASTM D2000 limits the change in mechanical properties following 70 hours of heat ageing to:

- Tensile strength: ±30%
- Hardness: -50% max
- Hardness: ±15 points

The test temperature used defines the Type, designated by a letter.

| Type | Test Temp, °C |
|---|---|
| A | 70 |
| B | 100 |
| C | 125 |
| D | 150 |
| E | 175 |
| F | 200 |
| G | 225 |
| H | 250 |
| J | 275 |
| K | 300 |

## Class

The Class specifies materials by their resistance to swelling in ASTM Oil Number 3, after 70 hours at the temperature defined by the type, up to 150°C, the temperature limit of the oil. ASTM D2000 limits the maximum allowable volume swell by class.

The allowable volume swell defines the class, designated by a letter.

| Class | Max. Swell, % |
|---|---|
| A | No Requirement |
| B | 140 |
| C | 120 |
| D | 100 |
| E | 80 |
| F | 60 |
| G | 40 |
| H | 30 |
| J | 20 |
| K | 10 |

| Material Designation (type and class) | Type of Polymer Most Often Used |
|---|---|
| AA | Natural, Reclaim, SBR, Butyl, EPDM, Polyisoprene |
| AK | Polysulfides |
| BA | EPDM, High Temp SBR and Butyl Components |
| BC | Chloroprene |
| BE | Chloroprene |
| BF | NBR |
| BG | NBR, Urethanes |
| BK | NBR |
| CA | EPDM |
| CE | Chlorosulfonated Polyethylene (Hypalon®) |
| CH | NBR, Epichlorohydrin |
| DA | EPDM |
| DF | Polyacrylic (Butyl Acrylate type) |
| DH | Polyacrylic |
| DE | CM, CSM |
| EE | AEM |
| EH | ACM |
| FC | Silicones (high temperature) |
| FE | Silicones |
| FK | Fluorocarbons |
| GE | Silicones |
| HK | Fluorocarbons |
| KK | FFKM |

## Hardness (Durometer)

The hardness of the material, measured in Shore® A is detailed as a single number which is the specified hardness / 10 expressed to 0 decimal places. The limit upon variation in hardness is ±5 points.

## Tensile strength

Minimum tensile strength is detailed in MPa, or as PSI / 100 to 0 decimal places if using imperial (English) units.

## Additional requirement suffixes

Each suffix comprises a suffix letter followed by 2 or 3 digits. The first number specifies the duration of the test and the test method to be used. The second number indicates the test temperature. Three digit numbers should be separated by a hyphen.

**With the exception of type/class FC, FE, FK, and GE, all materials are assumed to be black.**



# 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 which carries out different types of certifications for drinking water, foodstuff 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 guideline 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 this 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 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

The Ministerial Decree 174 (issued April 2004) 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 | Common Requirements | Seal Profiles | Sealing Materials |
|---|---|---|---|
| Taps/ mixers | WRAS, FDA, DVGW, EN549, EN682<br>Easy installation and replacement<br>Resistence to chlorinated water<br>Low compression set<br>Wide range of service temperatures | O-rings<br>Cut or moulded washers<br>Diaphragms | NBR<br>EPDM |
| Toilet cisterns | | O-rings<br>Cut or moulded washers<br>Diaphragms<br>Special mouldings | NBR<br>EPDM |
| Showers | | O-rings<br>Diaphragms<br>Special mouldings<br>Cut or moulded rings | VMQ<br>EPDM |
| Valves | | O-rings<br>Diaphragms<br>Stem seals, 4-lobe | NBR<br>EPDM<br>FKM |
| Water pumps | | Mechanical seals<br>Diaphragms<br>Special mouldings<br>O-rings | Carbon/Ceramic<br>NBR<br>EPDM<br>FKM |
| Filters | | O-rings | EPDM<br>NBR<br>VMQ |

## Selection Guide

| Elastomer | Compound reference | Colour | Hardness | Temperature Range (°C) | Select for.. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | KTW | DVGW-W270 | WRAS BS 6920 | NSF/ ANSI 61 | EN 681-1 | CLP |
| NBR | 366540 | Black | 70 | -30 to +125 | ✔ | ✔ | ✔ | Compliant | | |
| EPDM | 55985 | Black | 70 | -45 to +150 | ✔ | ✔ | ✔ | Compliant | Compliant | |
| VMQ | 714991 | Red | 70 | -60 to +220 | ✔ | ✔ | ✔ | Compliant | | ✔ |
| FKM (A) | 514527 | Black | 70 | -20 to +200 | | | ✔ | | | |
| FKM (A) | 514002 | Green | 75 | -20 to +200 | ✔ | ✔ | | | | |

Note: In designing systems take account of electrical fields and galvanic effects.

# Natural Gas

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, therefore, it is essential the correct compound is selected.

| Applications | Common Requirements | Seal Profiles | Sealing Materials |
|---|---|---|---|
| Pipe systems | Small to large diameters<br>Approvals<br>Low compression set<br>Low temperature capabilities | Pipe Seals<br>Special mouldings<br>Large O-rings<br>O-rings | FKM<br>NBR |
| Metering | Compounds suitable for natural gas and liquid<br>Propylene applications<br>Temp range from -40°C to 150°C | Special mouldings<br>Diaphragms<br>Bonded seals | FKM<br>NBR<br>VMQ<br>PTFE |

## Selection Guide

| Elastomer | Compound Reference | Colour | Hardness | Temperature Range (°C) | Select for.. | |
|---|---|---|---|---|---|---|
| | | | | | DIN EN 682 | DIN EN 549 |
| NBR | 366213 | Black | 60 | -30 to +120 | EN682 GBL | |
| NBR | 366221 | Black | 70 | -30 to +120 | EN682 GAL | |
| NBR | 366202 | Black | 60 | -30 to +120 | | DIN EN 549 B2/H2 |
| NBR | 366300 | Black | 70 | -30 to +120 | | DIN EN 549 B2/H3 |

Please contact ERIKS Sealing and Polymer for additional materials compliant to these specifications



## 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 EN549: 2017
## Temperature Class

Rubber materials for seals and diaphragms, for gas applicances and gas equipment. This standard specifies the requirements and associated test methods for vulcanised 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.

| Class | | A1 | B1 | C1 | D1 | E1 | A2 | B2 | C2 | D2 | E2 | A3 | B3 | C3 | D3 | E3 | A4 | B4 | C4 | D4 | E4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Range of operating temps. (°C) | From | 0 | 0 | 0 | 0 | 0 | -20 | -20 | -20 | -20 | -20 | -30 | -30 | -30 | -30 | -30 | -40 | -40 | -40 | -40 | -40 |
| | To | 60 | 80 | 100 | 125 | 150 | 60 | 80 | 100 | 125 | 150 | 60 | 80 | 100 | 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 Classifications

| Class | H1 | H2 | H3 |
|---|---|---|---|
| Nominal hardness range (°IRHD) | <45 | 45 to 60 | >60 to 90 |

# Central Heating Boilers and Water Heaters

## Elastomeric

The design and development of the latest high efficiency boilers for both domestic and commercial sectors continues to demand product innovation, reliable, proven materials and innovative component design for use in some of the most demanding of environments subject to extreme temperatures, cycling load, chemical resistance and supreme product reliability.

ERIKS has specialised in this sector for over 20 years having specifically developed a range of elastomeric compounds for the HVAC sector holding WRAS, KTW, EN 549 & IS0 14241-1 certifications to satisfy appliance norms. Our materials have an established pedigree to ensure longevity and reliability, whilst we continue to develop improved compounds to satisfy future requirements in appliance and heat exchanger designs.

| Applications | Requirements | Seal Profiles | Sealing Materials |
|---|---|---|---|
| Flue gas /Exhaust gas<br>Heat exchanger seals | Chemical resistance<br>UV and ozone stable<br>Excellent sealing, compression set characteristic | Lip seal (Bespoke)<br>Specialised moulded<br>O-ring | EPDM<br>Silicone<br>FKM |
| Burner and fan seal | Temperature<br>Chemical resistance<br>Assembly | Specialised moulded<br>O-ring<br>Cellular sponge gasket profile | NBR<br>Silicone<br>FKM |
| Case and pipe grommets | Chemical resistance<br>UV and ozone stable<br>Excellent sealing, compression set characteristic | Specialised moulded | TPE<br>EPDM<br>NBR<br>Silicone |
| Case seals | Ease of compression<br>Good compression set performance | Extrusion<br>Cellular extrusions<br>Cellular sponge /foam<br>Custom-moulding | PU & PUR<br>PE<br>EPDM & Blends<br>PVC<br>PVC/Nitrile |
| Condensate hoses<br>Sump sealing | Chemical resistance<br>Excellent sealing, compression set characteristic | Specialised moulded | EPDM |
| Drain and rain water hoses | Sealing and chemical resistance | Specialised moulded<br>Extruded - moulding | EPDM |
| Heating water pressurised hose | Pressure, thermal cycling chemical resistance, sealing, UV & ozone stable | Specialised moulded | EPDM |
| Air sensing tubes | Flexibility<br>Temperature resistance | Extrusion<br>Moulded part | Silicone<br>EPDM |

ERIKS has extensive experience in co-design and development assisting our customers new product introductions with prototype samples, materials and design support. Our technical team are able to advise on the full scope of materials and products for domestic and commercial boiler design and manufacture.

## Thermal and Acoustic Insulation

Thermal insulation, heat shields, fire protection, noise and acoustic management play a critical role in appliance design. ERIKS has an extensive range of materials available to answer your insulation and acoustic problems. Products can also be custom designed to suit your specific application demands.

| Applications | Requirements | Format | Materials |
|---|---|---|---|
| Heat exchanger – Thermal insulation | High temperature insulation<br>250°C<br>500°C<br>750°C<br>1200°C | Custom press cut<br>Precision machined board<br>Moulded<br>Blankets | Flexible blanket<br>Thermal board<br>Vac-form |
| Thermal jackets | Temperature<br>Chemical resistance<br>Ease of assembly | Custom press cut parts<br>Precision machined | Flexible insulation<br>Blanket + facings / coatings<br>Felts & paper<br>Micro porous |
| Acoustic | Noise reduction<br>High frequency<br>Low frequency | Bespoke cut component parts | Foam: PUR<br>Felt |

# Flue Exhaust Gas Equipment

Flue Gas systems and gas fired appliances require certification to EN14241-1 & EN15502-2-2.

ERIKS is a market leader of specialist sealing solutions for flue gas and central heating boiler systems having an extensive range of certified elastomeric materials that may be tailored to customer specific applications. Material selection is application dependent within the scope of EPDM, Silicone or FKM.

Our proven materials are extensively used within the boiler construction between both aluminium and stainless steel heat exchangers and plastic components such as sump collectors and flue exhaust pipes. Bespoke and standard Lip Seals are classically used in both direct and co-axial flue components.

ERIKS supplies a variety of custom designed associate components that operate within the flue gas environment such as: hoses, air sensing tubes, seals, extrusions, grommets and connectors.

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Appliance sealing<br>Boiler<br>CHP units<br>Flue cells<br>Air heaters<br>Convection heaters | Temperature<br>Chemical resistance<br>Ease of assembly<br>Certification (EN14241-1) | Precision moulded parts<br>Lip Seals<br>O-ring | EPDM<br>Silicone<br>FKM<br>FEPM |
| Boiler component sealing | Temperature<br>Chemical resistance<br>Ease of assembly<br>Certification (EN14241-1) | Precision moulded parts<br>Hoses<br>Grommets<br>Extrusion<br>O-ring | EPDM<br>Silicone<br>FKM |
| Exhaust flue components | Certification to EN 14241-1<br>Material options: EPDM, Silicone, FKM. | Precision moulded parts | EPDM<br>Silicone<br>FKM |

# Fireplaces & Space Heaters

Heat containment, sealing, alongside aesthetics and safety are all critical features in fireplace and space heater design.

ERIKS routinely works with a broad range of materials that withstand high temperature environments. Components may be custom designed to suit your specific application. Typical components are insulation boards for heat exchangers, high temperature sealing applications for burner interface, heat shields for heat containment and appliance efficiency. Our extensive range of thermal materials includes: insulation board and blanket products, vacuum formed shapes, fibre felt and paper sealing gasket materials.

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Cavity thermal insulation | High temperature insulation<br>250°C<br>500°C<br>750°C<br><br>Gas (EN 549) | Machined cut board<br>Vacuum formed fibre<br><br>O-ring<br>Grommets<br>Custom moulded | Board (natural & colour coated)<br><br>NBR<br>HNBR<br>FKM |
| Sealing | Temperature resistance | Gasket | High temperature<br>Paper<br>Felt<br>Graphite |

# Lighting

Modern industrial and domestic lighting needs to perform consistently in widely varying environments and can often need protection from dust ingress, UV & ozone and extreme weather conditions. In common with any electrical device, avoiding water ingress is a primary consideration and all seals must be capable of preventing this for the full operating temperature range of the unit.

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Thermal insulation<br>Heat shield | High temperature insulation<br>>300°C<br>Electrical resistance<br>Chemical resistance<br>Ease of assembly | Custom press cut<br>Custom finish parts<br>Precision machined | Mineral wool<br>Facings: Foil, textile<br>Flexible insulation<br>Blanket + facings / coatings<br>Felts & paper<br>Micro porous |
| Electrical insulation | High temperature<br>Low temperature<br>Chemical resistance<br>Ease of assembly | Custom press cut<br>Custom finish parts<br>Precision machined | |
| Sealing | Temperature resistence<br>Chemical resistance<br>Low outgassing | O-ring<br>Lip seals<br>Specialised mouldings | EPDM<br>NBR |
| Case sealing | UV and ozone stable<br>Excellent sealing<br>Compression set characteristic | Extrusion<br>Precision moulded<br>Foam and cellular elastomers | EPDM<br>Silicone<br>FKM |
| Grommets | Water and moisture | Specialised<br>Moulded | EPDM<br>NBR<br>Silicone |

# Stoves, Cookers & Hobs

Safety and reliability are two critical factors in appliance design closely followed by performance, innovation, efficiency and cost management. ERIKS Sealing and Polymer uniquely offer a system solution approach with capabilities in thermal insulation and sealing. The environmental conditions within stoves, cookers and hobs make the correct material selection essential for durability and reliability.

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Cavity thermal insulation<br>Cavity wraps<br>Heat shield | High temperature insulation<br>250°C<br>500°C<br>750°C | Custom press cut blanket | Mineral wool<br>Facings: Foil, textile blanket |
| Electrical insulation | Gas (EN 549) | O-rings<br>Grommets<br>Custom moulded | NBR<br>HNBR<br>FKM |
| Door - sealing | Temperature resistance, sealing and recovery | Extrusion<br>Precision moulded | Silicone, FKM |
| Sealing | Water / Moisture | Foam | NBR, EPDM, Silicone |

# Cleaning Equipment, Washing Machines, Dishwashers

Domestic and industrial cleaning equipment is expected to work reliably, often for long periods of time, and in demanding environments. It is critical that all parts are specified correctly in terms of performace and durability to avoid costly downtime and customer dissatisfaction. ERIKS can provide a wide variety of components, made from materials that have been approved to the standards required by each industry.

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Thermal insulation<br>Heat retention<br>Heat shield | Medium temperature insulation<br>Electrical resistance<br>Chemical resistance<br>Ease of assembly | Custom press cut<br>Custom finish parts<br>Precision machined | Mineral wool<br>Facings: Foil, textile<br>Flexible insulation<br>Blanket + facings / coatings<br>Felts & paper<br>Micro porous |
| Electrical insulation | High temperature<br>Low temperature | Custom press cut<br>Custom finish parts<br>Precision machined | |
| Hoses | Conveyance of fluids at high and low temperatures | Extruded & formed tubes<br>Compression mouldings | NBR<br>HNBR<br>EPDM<br>PVC<br>Silicone<br>TPE |
| Sealing | Temperature<br>Chemical resistance<br>Assembly<br>Water / moisture | O-rings<br>Lip seals<br>Custom moulded seals<br>Die cut foam sponge | |
| Case and pipe grommets | Chemical resistance<br>UV and ozone stable<br>Excellent sealing, compression set characteristic | Compression moulded<br>Injection moulded<br>Precision machined | |
| Door – sealing | Temperature resistance, sealing and recovery | Extrusion<br>Precision moulded | |

# Air Conditioning Units, Air Source Heat Pumps and Heat Recovery Systems

The conditioning of air within a building or vehicle to provide a more comfortable environment requires robust equipment capable of operating for long periods of time, often in harsh environments.

It is important that materials used within air conditioning units are correctly specified and are able to provide the service durability required by the application.

A refrigeration cycle is often used to moderate the temperature of the air, resulting in the generation of condensate. Dehumidification and cleaning processes are also typically incorporated, requiring the casing and internal structures to be sealed.

| Application | Requirement | Seal Profiles | Sealing Materials |
|---|---|---|---|
| Sealing | Temperature -20°C to 200°C<br>UV and Ozone stable<br>Weather resistant<br>Bespoke design<br>Refrigerant resistance | Rotary Seals<br>Moulded elastomers<br>Extruded rubber<br>Extruded cellular rubber<br>Cut Gaskets<br>O Rings | Silicone<br>NBR, EPDM<br>PVC |
| Case sealing | Weather resistance | Profile cut Seals<br>Kiss-cut foam parts | Silicone<br>NBR, EPDM<br>PVC, Cork |
| Thermal Insulation | Temperature -20°C to 400°C | Custom cut insulation<br>Tube Insulation | Insulation Foam, felt, foil, needle-mat blanket.<br>Glass fibre - Insulation |
| Acoustic Insulation | Noise reduction<br>High / low frequency | Bespoke cut components | Cellular foam, PUR, felt |
| Drain hoses | Sealing and chemical resistance | Extruded, moulded, formed, corrugated | Silicone, EPDM, PP, TPE |

ERIKS has extensive experience in co-design and development supporting our customers new product development with prototype samples, materials and design support. Our technical team are able to advise on the full scope of materials and products.

# Vending Machines and Drinks Dispensers

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Sealing | Temperature<br>Chemical<br>FDA / WRAS<br>UV and Ozone stable<br>Weather resistant<br>Bespoke design | Moulded elastomers<br>Extruded rubber<br>Extruded cellular rubber<br>Cut Gaskets<br>O rings | Silicone<br>NBR, EPDM<br>PVC |
| Case Sealing | UV and Ozone stable<br>Weather resistant | Moulded part<br>Extrusions<br>Cut gaskets | Silicone<br>NBR, EPDM<br>PVC, Cork |
| Hoses | Chemical resistance<br>FDA / WRAS<br>Temperature<br>Sealing<br>FDA<br>WRAS | Moulded<br>Extrusions<br>Bespoke design | Silicone<br>NBR, EPDM<br>PVC |
| Thermal Insulation | Temperature -20°C to 400°C | Custom cut insulation | Insulation paper, felt, foil, blanket |

# Valves & Pumps

Whatever the medium in the pump or valve, each application needs a specific seal to achieve optimum performance. Selection of these seals varies dependant on the application, temperature and pressure.

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Rotation sealing<br><br>Static seals | Water / moisture<br>Temperature<br>Chemical resistance<br>Ease of assembly<br>Low friction<br>High speed<br>Sealing efficiency | O-rings<br>Washers<br>Diaphragms<br>Flange seals<br>Engineered rubber parts<br>Spring energised seals<br>Component mechanical seals | PTFE<br>EPDM<br>NBR<br>HNBR<br>FKM<br>Silicone<br>WRAS approved<br>Ceramic carbon |



# Refrigeration

The refrigeration market covers a broad spectrum of products, application temperatures and environments. These systems typically operate in temperature ranges from -45°C to +5°C.

Typical refrigeration systems include:

- Domestic and commercial refrigerators and freezers
- Chilled delivery vehicles
- Beverage & food dispensers
- Food processing facilities
- Freezing and storage facilities (food storage, morgues & various other unique applications)

All of these applications share common concerns regarding condensation control and long-term reliability. Due to this it is important to correctly specify insulation materials to required thickness for the environmental conditions they will operate.

The following are some important functions of the insulation in various refrigeration applications:

- Thermal conductivity, or k-value
- Water vapour transmission (WVT) properties
- Water absorption properties
- Coefficient of thermal expansion
- Moisture wicking
- Fire and smoke performance to meet building codes

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Thermal insulation | Low – medium temperature insulation<br>Electrical resistance<br>Chemical resistance<br>Ease of assembly | Custom press cut<br>Custom finish parts<br>Precision machined | Closed cell foams<br>Facings: Foil, textile<br>Flexible insulation<br>Blanket + facings / coatings<br>Felts & paper |
| Electrical insulation | High temperature<br>Low temperature<br>Chemical resistance | Custom press cut<br>Custom finish parts<br>Precision machined | FR foams<br>EPDM, NBR<br>Silicone |
| Sealing | Temperature<br>Chemical resistance<br>Resistance to refrigerants<br>Water / moisture | O-rings<br>Lip seals<br>Custom moulded seals<br>Die cut Foam sponge | NBR. HNBR<br>FKM, EPDM<br>Silicone<br>PVC Nitrile<br>FEPM |
| Case and pipe grommets | Chemical resistance<br>UV and ozone stable<br>Excellent sealing, compression set characteristic | Compression moulded<br>Injection moulded<br>Precision machined | TPE, EPDM<br>NBR<br>Silicone |
| Door – sealing | Temperature resistance, sealing and recovery | Extrusion<br>Precision moulded | Silicone<br>FKM |



# Drainage and Water Harvesting

The management of rain or waste water in the construction and domestic markets requires seals that are manufactured from carefully specified components and materials. ERIKS has extensive experience in co-design and development, supporting our customers new product development with prototype samples, materials and design expertise. Our technical team are able to advise on the full scope of materials and products.

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Sealing | Chemical resistance<br>UV and Ozone stable<br>Weather resistant<br>Bespoke design<br>Temperature | O-rings<br>Lip Seal<br>Custom Mouldings<br>Extruded rubber<br>Extruded cellular rubber<br>Cut Gaskets<br>Flange Gaskets | Silicone<br>NBR, EPDM<br>PVC<br>TPE |

# Taps, Plumbing and Bathrooms

The internal operation and function of faucets and shower units are highly dependent upon precision moulded diaphragms, O-rings and custom moulded seals. ERIKS supplies a range of certified compounds for this application.

| Application | Requirement | Format | Materials |
|---|---|---|---|
| Sealing | Water / moisture<br>Temperature<br>Chemical resistance<br>Ease of assembly<br>Potable water certification | O-ring<br>Washers<br>Diaphragms<br>Custom mouldings | EPDM<br>NBR<br>TPE |

# O-rings

## 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 (°c) | Applications | Compound Reference | Material Family Designator |
|---|---|---|---|---|---|---|
| Nitrile rubber (NBR) | Black | 70 | -30 to +120 | 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 | 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 | High and very low temperature | 714177 | VMQ |
| Hydrogenated nitrile (HNBR) | Black | 70 | -30 to +150 | General purpose compound offering improved temperature resistance over NBR grades. Good oil, coolant and hydrocarbon resistance, with excellent abrasion resistance. | 88625 | HNBR |
| EPDM | Black | 70 | -45 to +150 | Specialist grade peroxide cured EPDM developed for drinking water applications. Improved chemical and thermal resistance. Compound suitable for potable drinking water, food and beverage applications. | 55985 | EPDM |



# ERIKS material guide

| Material specifications | | | | | Approvals and compliances | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Gas | | Ex'st flue gas | Drinking water | | | | | | | Food | |
| Material Designation | ERIKS Compound | Hardness | Colour | Temperature Range (°C) | EN 682 | EN 549 | EN14241-1 | WRAS | UBA / KTW | KIWA-Watermark | ACS | W270 | EN 681-1 | NSF 61 | FDA Compliant | EC1935 Compliant |
| NBR | 366540 | 70 | Black | -30 to 125 | | | | Y | | | | | | C | | |
| | 366213 | 60 | Black | -30 to 120 | Y | | | | | | | | | | | |
| | 366221 | 70 | Black | -30 to 120 | Y | | | | | | | | | | | |
| | 36624 | 70 | Black | -30 to 120 | | | | | | | | | | | | |
| | 366202 | 60 | Black | -30 to 120 | | Y | | | | | | | | | | |
| | 366300 | 70 | Black | -30 to 120 | | Y | | | | | | | | | | |
| HNBR | 88625 | 70 | Black | -30 to 150 | | | | | | | | | | | | |
| | 886270 | 70 | Black | -30 to 150 | | | | | | | | | | C | Y | Y |
| EPDM | 55985 | 70 | Black | -45 to 150 | | | | Y | Y | Y | Y | Y | Y | Y | | |
| | 559270 | 70 | black | -50 to 150 | | | | | | | | | | | Y | Y |
| | 559843 | 60 | Black | -45 to 150 | | | | Y | Y | Y | | Y | Y | | | |
| | 559865 | 80 | Black | -45 to 150 | | | | Y | Y | Y | | Y | Y | | | |
| | 553172 | 65 | Grey | -40 to 150 | | | Y | | | | | | | | | |
| | 559243 | 65 | Black | -45 to 150 | | | Y | | | | | | | | | |
| | 3665 | 65 | Black | -45 to 150 | | | Y | | | | | | | | | |
| VMQ | 714991 | 70 | Red | -60 to 220 | | | | Y | Y | | | | | | Y | |
| | 714278 | 70 | Red | -60 to 220 | | Y | | | | | | | | | | |
| | 714161 | 60 | Black | -60 to 220 | | | Y | | | | | | | | | |
| | 714177 | 70 | Red | -60 to 220 | | | | | | | | | | | Y | Y |
| | 2711 | 70 | Red | -40 to 220 | | | Y | | | | | | | | | |
| FKM | 514527 | 70 | Black | -20 to 200 | | | | Y | | | | | | | | |
| | 514002 | 65 | Green | -20 to 200 | | | | Y | Y | | | | | | | |
| | 5011 | 70 | Brown | -20 to 200 | | | Y | | | | | | | | | |

Y = Fully certified  C = Compliant to the requirement of properties

**For further detail visit our design and selection tools**

**O ring - Product selector** https://o-ring.info/en/home
**Material Guide** https://o-ring.info/en/materials
**Compound Selection** https://o-ring.info/en/technical-info/elastomer-selection
**Chemical Resistance** https://o-ring.info/en/tools/chemical-resistance-guide

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

# Moulded Rubber Parts

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

### 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 method. 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 EPDM, FKM, NBR, silicone, 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.

# Pipe Extrusions, Moulded & Formed Hoses

The HVAC sector demands a wide range of extruded pipes in materials such as Silicone, EPDM, NBR and FKM. The selection of both material and product type is highly dependent upon application and in some instances you may require specific approvals such as WRAS, FDA or a flammability rating. You may also require a flexible hose or corrugated hose profile with moulded end fittings. The team at ERIKS can assist in material selection and component design.

ERIKS offer a range of mandrel formed and moulded hoses that are ideal for complex geometries that require either generic or premium compounds with certifications such as EN14241-1 or WRAS.

Mandrel formed hoses lend themselves to applications that can accommodate a wider tolerance band and are largely directed towards standard grades of EPDM.

ERIKS has a range of reinforced mandrel formed hoses in EPDM capable of withstanding internal pressures of 10 bar. These products have been life tested under cycling conditions to represent over 10 years lifespan.

## Compression/injection moulded hose

These products are typically used with domestic and commercial boilers for condensate discharge, water, gas and air. Other typical applications are in the general appliance market in dishwashers, washing machines, pumps and sanitary water applications.



# Thermal

Thermal environments present a critical challenge for appliance design and their long term reliability. Testing and validating suitable materials and executing the optimum product design are vital to ensure the quality and reliability of HVAC appliances. Our primary strength is developing tailored designed, customer specific products and solutions. We draw upon a broad range of materials and products to suit each specific application.

Selecting suitable materials is highly dependent upon your application and knowing what design solutions and scope of material options are available. Our Design and Application teams can assist to realise the optimum product and quality solution.

ERIKS Sealing and Polymer has a range of flexible, diverse manufacturing capabilities to suit prototype samples for product development, low volume bespoke orders through to high volume serial production demand in the appliance and automotive sectors.

| Band | Maximum Temperature (°C) | Material Group | Format |
|---|---|---|---|
| T6 | 0 - 1200 | AES/Silica Magnesia | Blanket, felt, board, vac-form parts |
| T5 | 0 - 750 | Vermiculite | Board, moulded parts |
| T4 | 0 - 500 | Glass fibre | Blanket, felt, needle mat, rope, cut parts |
| T3 | 0 - 250 | Mineral Wool | Blanket, cut parts |
| T2 | 0 - 200 | Silicone Foam, Melamine Foam | Cut parts |
| T1 | 0 - 100 | PUR Foam, PVC/Nitrile foam | Cut Parts |

See page 29 for additional information

# Foam and Sponge

A wide selection of foam and sponge materials which can be tailored to your requirements using our precision water jet cutters, oscillating knife, kiss cut machines or automatic presses.

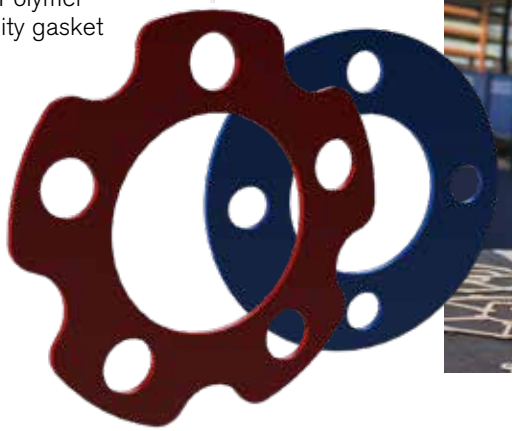
See page 28 for our standard range of materials that are held in stock. If you are unable to see the material you require, do not hesitate to call us and we will make suitable recommendations for you. These materials can be supplied with a range of coatings and backings such as adhesive, foil faced or PU coated.

- Cellular sponge products and acoustic solutions.
- Die-cut components supplied in high volume, custom design part engineered to offer the highest quality and optimum cost solution.
- Comprehensive range of materials to suit your application; EPDM, Neoprene, EPDM/Neoprene blended, Nitrile/PVC, Polyethylene, Polyester and PVC all standard grade amongst many other speciality grades.
- Applications include: Acoustic and thermal insulation, gaskets, case sealing, general engineering, lighting and domestic applications.

# Additional Products

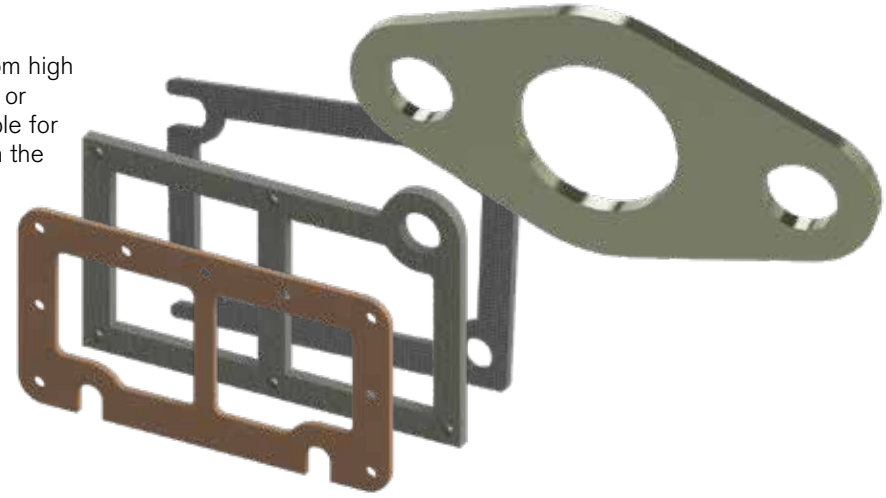
In addition to our general range of gasket sealing materials, ERIKS Sealing and Polymer manufacture a wide range of commodity gasket products in base materials including:

- Rubber
- Cork
- Paper gaskets
- Amongst other materials and products for the HVAC market



## Reinforced Graphite

A semi-rigid laminated material manufactured from high purity exfoliated graphite reinforced with Nickel or Stainless foil or tanged stainless steel. It is suitable for sealing against steam and most other media with the exception of strongly oxidising re-agents. Recommended for use up to 350°C and for pressures up to 2900psi.



## Acoustic Felt

Acoustic performance is becoming an additional measure and demand for the latest HVAC and domestic appliances. ERIKS Sealing and Polymer has offers a range of material options to control and reduce noise emissions. Cellular foam is an effective solution; however, we also offer a range of semi-cured and fully cured textile felts that offer a significant impact to reduce noise with added benefits of low weight.

Textile felts comprise of bonded fibers with phenolic or non-phenolic resins with option of a flame-retardant agents within the felt itself. We can offer additional surface coating of adhesive, stripe and full along with black tissue facing.

# ERIKS Sealing and Polymer

ERIKS Sealing and Polymer 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.


**Barnsley | Warrington**


## 0845 603 1221

**sealingandpolymer@eriks.co.uk**

**www.eriks.co.uk**


Let's make industry work better

ERIKS