# ERIKS Sealing Technology

## Engineered Seals for Defence & Aerospace

know-how makes the difference

ERIKS


# Leader in Sealing Technology

## It is not our 80 year heritage in supplying seals into the UK's Defence and Aerospace industries, but our cutting edge materials and design capabilities combined with our advanced supply chain solutions that makes ERIKS Sealing Technology your partner of choice for seals and polymers products.

The UK boasts the second largest defence market in the world. Despite trends to utilise commercial grade product whenever appropriate, the majority of defence applications demand specific material and product qualifications. By offering impartial technical solutions and partnering with the most appropriate UK and US based manufacturing partners for specific applications, ERIKS Sealing Technology is the ideal partner to both impartially co-engineer the right solution for your application and manage your production and legacy sealing supply chains.

Our Materials Technology Centre offers you access to fundamental understanding of polymer technology, helping you identify the appropriate material specification for your application to maximise both performance and life. Our experts can also assist you to overcome obsolescence problems, by identifying the current equivalent standard or creating custom specifications to ensure the consistent function of your equipment.

Our Design and Test teams draw upon extensive qualifications, experience and analytical techniques to provide you design validation and verification reports that assist you to correctly specify design intent with industry standard safety factors. We employ comprehensive configuration management procedures to ensure that any change to fit, form or function drives change to part numbering, maintaining source control.

Our supply chain expertise drives compliance to NATO Stock Number (NSN), SAE or UK MOD specifications.

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

## Stock Availability

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

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

Customer stocking programmes are available to maintain continuity and supply.

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

## Design Assistance

### Custom Design Capabilities

- 3D CAD to capture design intent
- Change control and configuration management

### Finite Element Analysis (FEA)

Advanced mechanical simulation using non-linear finite element analysis helps our customers:

- Be first to market
- Identify and mitigate against failure modes, maximising operating life
- Confirm both fit and function
- Assists in tailoring design for demanding, bespoke applications

## Material Technology Centre

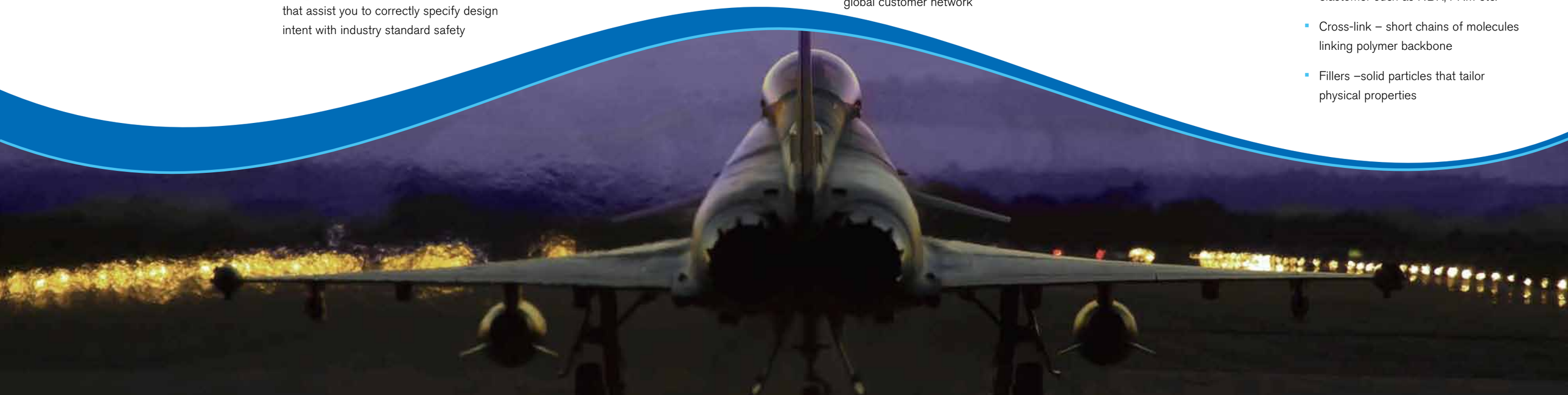
Our Materials Technology Centre ensures our high quality standards are maintained and develops new compounds and technical solutions for your applications.

### Elastomers

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

Compounds typically comprise:

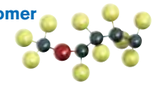
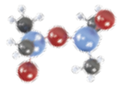
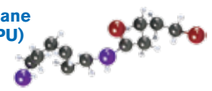
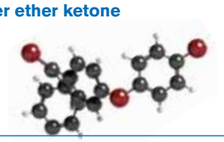
- Polymer backbone – a long chain of molecules made up of one or more monomeric units, this governs the basic thermal, chemical and physical properties of a compound. ISO/ ASTM classifications define families of elastomer such as NBR, FKM etc.
- Cross-link – short chains of molecules linking polymer backbone
- Fillers –solid particles that tailor physical properties







# Elastomers

| Type | Description |
|---|---|
| **Nitrile (NBR)**  | NBR is a copolymer of two monomers; acrylonitrile (ACN) and butadiene. The properties of this elastomer are ruled by the ACN content : High Nitrile: >45%, Medium Nitrile: 30 – 45% and Low Nitrile: <30%. The higher the ACN content, the better the hydrocarbon oil resistance. With lower ACN content, the material offers better flexibility at low temperatures. |
| **Hydrogenated Nitrile (HNBR)**  | The properties of HNBR are dependent upon the acrylonitrile content and the degree of hydrogenation of the butadiene copolymer. It has better hydrocarbon oil and chemical resistance than nitrile rubber and can withstand much higher temperatures. Physical properties are also excellent. |
| **Hydrorocarbon Rubber (FKM)**  | 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, 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. |
| **Perfluoroelastomer (FFKM)**  | FFKM has a fully fluorinated polymer backbone resulting in fluorine content of over 71%. As all of the bonds on the backbone are carbon-fluorine then FFKM materials offer the ultimate thermo-chemical resistance shown by good long-term, high-temperature compression-set resistance. |
| **TFE/P & FEPM**  | TFE/P (FEPM) Aflas®/Viton® Extreme® Tetrafluoroethylene and propylene (FEPM) is a copolymer with a fluorine content of approximately 54%. Aflas® is often preferred over FKM in steam and amine applications as it does not contain the VF2 monomer, the point of chemical attack. Viton® Extreme® offers superior ketone resistance than standard FKMs. |
| **Flurosilicone (FVMQ) / Silicone (VMQ)**  | Silicone elastomers are commonly used for extreme temperature ranges (-90°C to +230°C) and offer good low temperature flexibility. They also offer good resistance to ultra violet radiation (UV), oxygen and ozone. Silicone is best suited to non-dynamic applications, as this elastomer type possess relatively low tear strength and abrasion resistance, although higher strength grades are available.. |
| **Polyurethane (AU, EU, PU)**  | Polyurethane demonstrates excellent resistance to weathering and oxidation. They resist hydrocarbon fuels and mineral oils, however some grades degrade (hydrolyse) in hot water. Polyurethane offers some of the best resistance to abrasion, therefore is often specified for use in reciprocating seals. |
| **Polyether ether ketone (PEEK)**  | Polyether ether ketone (PEEK) is an organic, semi-crystalline, thermoplastic polymer used in demanding engineering applications. PEEK offers excellent mechanical properties, which are maintained at high temperatures. Its resistance to thermal attack and its dimensional stability at high temperatures, along with broad chemical resistance, allows PEEK to be used in applications such as bearings, sealing back-up rings etc. PEEK is available as non-filled ('virgin') grades, and as various filled grades which modify its physical and mechanical characteristics. |
| **Ethylene Propylene Rubbers (EPR, EPDM)**  | Ethylene Propylene is available as a copolymer (EPR) or as a terpolymer (EPDM). These elastomers have excellent resistance to heat, water, phosphate esters, steam, weathering and ozone. Ethylene Propylene based compounds are not recommended for use with mineral or phosphate esters, petroleum based fluids. |
| **Polytetrafluoroethylene (PTFE)**  | PTFE is a synthetic, thermoplastic polymer which offers exceptional chemical resistance over a wide range of temperatures and offers extremely low levels of friction. PTFE lacks elasticity which prevents its use as an elastomeric-type sealing ring, however it is commonly used for anti-extrusion as a back-up ring, and for non-stick requirements. Owing to its low friction and excellent chemical resistance, it is also commonly used for applications such as bearings, gears, rotary seals etc. Non-filled (virgin) grades are stable up to +260°C and are quite flexible and resistant to breaking under tensile and compressive stresses. Modified backbone grades of PTFE are available which offer higher temperature (+315°C) and deformation resistance. PTFE is also available with fillers to enhance its physical characteristics. |

# Common Chemical Compatibilities of Materials

| Media | EPDM | NBR | HNBR | FKM (A) | FKM (GF) | VMQ | FVMQ | FFKM | PTFE | PEEK |
|---|---|---|---|---|---|---|---|---|---|---|
| Aerosafe 2300 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 1 | 1 | 1 |
| AeroShell® 1 AC Grease | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| AeroShell® 17 Grease | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| AeroShell® 7 A Grease | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| AeroShell® 750 | 2 | 2 | 2 | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| AeroShell® Fluid 4 | 2 | 1 | 1 | 1 | 1 | 4 | 1 | 1 | 1 | 1 |
| Aliphatic Hydrocarbons | 4 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| Alkanes | 4 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| Ammonia | 1 | 2 | 2 | 4 | 4 | 2 | 3 | 1 | 1 | 1 |
| Aromatic Hydrocarbons | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| AS5780 HPC Class oil* | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| AS5780 SPC Class Oil | 4 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 | 1 |
| Bioethanol | 1 | 2 | 2 | 3 | 1 | 2 | 2 | 1 | 1 | 1 |
| Brake fluid - DOT 3, 4 and 5.1 types | 1 | 3 | 3 | 4 | 3 | 3 | 2 | 1 | 1 | 1 |
| Brake fluid - DOT 5 type | 1 | 1 | 1 | 1 | 1 | 4 | 4 | 1 | 1 | 1 |
| Butanol | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Corrosion inhibitors | 1 | 2 | 2 | 4 | 4 | 2 | 2 | 1 | 1 | 1 |
| Crude oil | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Diesel fuel | 4 | 1 | 1 | 2 | 1 | 4 | 1 | 1 | 1 | 1 |
| Engine lubricating oils | 4 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| Ester based hydraulic fluids | 1 | 4 | 4 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| Ethanol | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Fatty acid methyl ester (FAME) | 3 | 2 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 |
| Glycol-based coolants | 1 | 2 | 1 | 3 | 1 | 3 | 1 | 1 | 1 | 1 |
| Glycol-ether based brake fluids | 1 | 3 | 3 | 4 | 3 | 3 | 2 | 1 | 1 | 1 |
| Heavy fuel oil / bunker fuel | 4 | 3 | 3 | 2 | 1 | 3 | 1 | 1 | 1 | 1 |
| Hydraulic fluid, petroleum based OX-30 | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Hydraulic fluid, silicone based OX-50 | 1 | 1 | 1 | 1 | 1 | 4 | 4 | 1 | 1 | 1 |
| Hydraulic oil | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Hydrogen peroxide | 1 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 |
| HyJet® phosphate esters | 1 | 4 | 4 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| Jet Fuel JP3 | 4 | 1 | 1 | 1 | 1 | 4 | 1 | 1 | 1 | 1 |
| Jet Fuel JP4 | 4 | 1 | 1 | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| Jet Fuel JP5 | 4 | 1 | 1 | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| Jet Fuel JP6 | 4 | 1 | 1 | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| Jet Fuel JPX | 4 | 1 | 1 | 4 | 3 | 4 | 4 | 1 | 1 | 1 |
| Kerosene | 4 | 1 | 1 | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| Liquidified natural gas (LNG) | 4 | 1 | 2 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Low sulpur diesel fuel | 4 | 1 | 1 | 2 | 1 | 4 | 1 | 1 | 1 | 1 |
| Lubricating oils (API CC-type) | 4 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| Lubricating oils (API CD-II-type) | 4 | 3 | 1 | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| Lubricating oils (API CD-type) | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Lubricating oils (API CE-type) | 4 | 1 | 1 | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| Methanol | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 1 |
| Methyltertiarybutylether (MTBE) | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 1 | 1 | 1 |
| MIL-H-5606 Mineral Oil | 4 | 3 | 2 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| MIL-PRF-23699 Class C/I (NATO 0-156/0-152) | 4 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 | 1 |
| MIL-PRF-23699 Class HTS (NATO 0-156/0-154)* | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| MIL-PRF-23699 Class STD (NATO 0-156) | 4 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 | 1 |
| MIL-PRF-7808 Grade 3 (NATO 0-148) | 4 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 | 1 |
| MIL-PRF-7808 Grade 4 (NATO 0-163)* | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| MIL-PRF-83282 Synthetic Mineral Oil, | 4 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| Mineral oil | 4 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 |
| Organophosphate ester | 1 | 4 | 4 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| Ozone | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Paint, solvent based | 2 | 3 | 3 | 2 | 1 | 3 | 3 | 1 | 1 | 1 |
| Paint, water based | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Petroleum fuels | 4 | 2 | 2 | 2 | 1 | 4 | 2 | 1 | 1 | 1 |
| Polyalkylene glycol (PAG) | 2 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 |
| Polyalphaolefin | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Polyethylene glycol | 1 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 |
| Polypropylene glycol | 1 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 |
| Rapeseed (canola) oil | 4 | 1 | 1 | 1 | 1 | 4 | 2 | 1 | 1 | 1 |
| Refridgerant R134a | 1 | 1 | 1 | 4 | 4 | 2 | 4 | 2 | 1 | 1 |
| Silicone oils | 1 | 1 | 1 | 1 | 1 | 4 | 4 | 1 | 1 | 1 |
| Skydrol® 500 series | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 1 | 1 |
| Skydrol® LD-4 | 1 | 4 | 4 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| Skydrol® 5 | 1 | 4 | 4 | 3 | 3 | 3 | 3 | 1 | 1 | 1 |
| Synthetic oil | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Vegetable oils | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| Water / coolant <100degC | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Water / coolant <150degC | 1 | 4 | 3 | 3 | 1 | 2 | 2 | 1 | 1 | 1 |
| Water / coolant <200degC | 3 | 4 | 4 | 4 | 2 | 4 | 4 | 1 | 1 | 1 |
| Weathering | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| OEP-80 Lubricating Oil | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| OM-33 H-576 Hydraulic Fluid | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| OX-28 Lubricating Oil | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| OX-30 Hydraulic Fluid | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| OX-38 (O-149) Lubricating Oil | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |
| OX-40 Hydraulic Fluid, Aqueous Polyglycol | 1 | 2 | 1 | 2 | 1 | 3 | 1 | 1 | 1 | 1 |
| OX-95 Lubricating Oil, Synthetic | 4 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 |

*Refer to: "AMS7379, Rubber: Fluorocarbon Elastomer (FKM), 70 to 80 Hardness, Low Temperature Sealing Tg -40 °F (-40 °C), For Elastomer Seals in Aircraft Engine Oil, Fuel and Hydraulic Systems"

FVMQ: Fluorosilicone is a modified silicone polymer chain having fluorinated side-groups for improved oil and fuel resistance. The mechanical and physical properties are comparable to those of silicone.

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

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

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





**The majority of designs used in Defence and Aerospace applications have commercially available equivalents. The thermo-chemical, mechanical, envelope or weight saving demands placed upon components used in Defence and Aerospace applications dictate the use of specific materials, compliant to specialist industry standards.**

## ISIS Codification

NATO maintains and codifies items into one central supply-chain database, in the UK this is referred to as ISIS. The supply location of any product is given a CAGE code unique to that facility. Each product is allocated a Nato Stock Number (NSN), comprising a commodity stem and a National Item Identification Number (NIIN) suffix. Against each NSN the compliant suppliers and the suppliers' part numbers are listed.

## Foreign and Commonwealth Office

Up-to-date information regarding the export regulations for military equipment from the UK is published by the Foreign and Commonwealth office at fco.gov.uk. The US equivalent advice is contained within the International Trade of Arms regulations, governed by the US Department of State.

## US Department of State International Trade of Arms (ITAR)

Although some regard dual-use catalogue items not to be subject to ITAR regulations, the product references detailed here-in suggest possible military use and we recommend professional advice be sought regarding regulatory compliance.

Components that are specifically designed for military use are subject to export compliance. The US Bureau of Industry and Security maintains a list of Export Administration Regulations (EAR) beneath which components are classified using a Export Control Classification Number (ECCN).

## EXOSTAR

The EXOSTAR e-Trading platform is commonly used within Defence and Aerospace, however ERIKS support numerous e-business platforms including, but not limited to X12, BASDA, EDIFACT and iDoc.

# Aerospace

Safety critical applications require appropriate quality assurance, dimensional and materials standards to come together affording the design authority confidence to specify seals correctly and in a controlled and repeatable manner. Although prime contractors employ their own standards, four dominant systems of regulatory standards are typically used: SAE (US), AIA (US), DTD (UK) and NFL (Fr).

| Applications | Requirements | Seal Profiles | Sealing Materials |
|---|---|---|---|
| Hydraulic systems:<br>Primary flight control<br>Secondary flight control<br>Utility actuation<br>EBHA's<br>Braking systems | High pressures<br>Mineral (Red) oils<br>Phosphate esters (Skydrol® / Hyjet® Type VI / V)<br>Extended operating temperature envelope down to -56°C | Rod seals<br>Piston seals<br>SE seals<br>Snubber rings<br>O-rings<br>Bonded washers | NBR<br>EPDM<br>FKM<br>HNBR<br>PTFE<br>PEEK |
| Oleo-pneumatic damping systems | High pressures<br>Mineral (Red) oils<br>Extended operating temperature envelope down to -56°C | Rod seals<br>Piston seals<br>SE seals<br>O-rings | NBR<br>FKM<br>HNBR<br>PTFE<br>PEEK |
| Engine Systems<br>Static sealing<br>Fueldraulic systems<br>(VAVBNA / VIGVA) | HTS Oils<br>High temperatures<br>Aviation fuel | O-rings<br>Rod seals<br>Piston seals<br>SE seals<br>Fire seals | FKM<br>FFKM<br>PTFE<br>PEEK |
| Cabin | Flame resistance<br>Electro Magnetic Interference (EMI) / Radio Frequency (RF) Shielding<br>Weight density<br>Low smoke | Grommets<br>Special mouldings<br>Extrusions<br>O-rings<br>Hatch seals<br>Void filling seals<br>Machined shapes | TPE<br>Closed cell foams<br>PVDF<br>VMQ |

## Governing UK Bodies and Standards

**UK Defence Procurement Agency**

**Society of British Aerospace Companies (SBAC)**

**SBAC TS49** – Manufacturing and inspection

**BS F69** – Packaging and identification

## Governing US Bodies and Standards

**Society of Automotive Engineers (www.sae.org)**

**Aerospace Industries Association (www.global.ihs.com)**

**US Department of Defence**

**Performance Review Institute QPL**

**AS9100** – Aerospace and Defence Quality Management System Approval

**AS7115** – Additional NADCAP requirements for processing elastomers including "special processes", i.e. those that do not visibly alter the components

**ARP 5613** - Storage and shelf life

**AS568** Revision B – Toroidal O-ring dimensions and tolerances.

**AS4716** – Dimensions and tolerances for O-ring / Seal grooves for dynamic applications

**AS5857** - Dimensions and tolerances for O-ring / Seal grooves for static applications

# UK Aerospace Standards

| ASTM Family | Description | SBAC Drawing | DTD O-Ring Standard | DTD Material Standard | Description | Hardness Shore A | Operating Temperature °C (°F) | Datasheet Reference Number | Colour / Marking | Compound Description |
|---|---|---|---|---|---|---|---|---|---|---|
| EPDM | Fluid Resistant Ethylene-Propylene | BS M48 | DTD 5608A | DTD 5597A | Elastomeric toroidal sealing rings (O-rings) fluid resistant ethylene-propylene type | 70 | -45 to +150°C (-49 to +320°F) | 559542 | Black | Ethylene-Propylene Diene Monomer, peroxide cured, phosphate ester resistant |
| | | BS M48 | DTD 5608A | DTD 5597A | Elastomeric toroidal sealing rings (O-rings) fluid resistant ethylene-propylene type | 80 | | 559543 | Black | |
| | | BS M48 | DTD 5608A | DTD 5597A | Elastomeric toroidal sealing rings (O-rings) fluid resistant ethylene-propylene type | 90 | | 559544 | Black | |
| FKM | Low Compression Set Fluorocarbon Type | BS M48 | DTD 5613A | DTD 5612A | Elastomeric toroidal sealing rings, (O-rings) low compression set fluorocarbon type | 50 | -20 to +200°C (-4 to +392°F) | 514568 | Black | |
| | | BS M48 | DTD 5613A | DTD 5612A | Elastomeric toroidal sealing rings, (O-rings) low compression set fluorocarbon type | 60 | | 514569 | Black | Low compression set, FKM copolymer |
| | | BS M48 | DTD 5613A | DTD 5612A | Elastomeric toroidal sealing rings, (O-rings) low compression set fluorocarbon type | 70 | | 514570 | Black | Low compression set, FKM copolymer |
| | | AS43013-###, AS43003-9## | DTD 5613A | DTD 5612A | Elastomeric toroidal sealing rings, (O-rings) low compression set fluorocarbon type | 80 | | 514571 | Black | Low compression set, FKM copolymer |
| | | BS M48 | DTD 5613A | DTD 5612A | Elastomeric toroidal sealing rings, (O-rings) low compression set fluorocarbon type | 90 | | 514572 | Black | Low compression set, FKM copolymer |
| | Fluorocarbon Type | BS M48 | DTD 5603B | DTD 5543 | Elastomeric toroidal sealing rings (O-rings) fluorocarbon type | 60 | -20 to +200°C (-4 to +392°F) | 514573 | Black | FKM copolymer |
| | | BS M48 | DTD 5603B | DTD 5543 | Elastomeric toroidal sealing rings (O-rings) fluorocarbon type | 70 | | 514574 | Black | FKM copolymer |
| | | BS M48 | DTD 5603B | DTD 5543 | Elastomeric toroidal sealing rings (O-rings) fluorocarbon type | 80 | | 514575 | Black | FKM copolymer |
| | | BS M48 | DTD 5603B | DTD 5543 | Elastomeric toroidal sealing rings (O-rings) fluorocarbon type | 90 | | 514576 | Black | FKM copolymer |
| FVMQ | Fluorosilicone, Oil-And-Fuel-Resistant Elastomer | BS M48 | DTD 5616 | DTD 5583 | Elastomeric toroidal sealing rings (O-rings) fluorosilicone type | 60 | -60 to +225°C (-76 to +437°F) | 614512 | Black | Fluorosilicone, oil-and-fuel-resistant elastomer |
| | | BS M48 | DTD 5616 | DTD 5583 | Elastomeric toroidal sealing rings (O-rings) fluorosilicone type | 70 | | 614513 | Black | Fluorosilicone, oil-and-fuel-resistant elastomer |
| | | BS M48 | DTD 5616 | DTD 5583 | Elastomeric toroidal sealing rings (O-rings) fluorosilicone type | 80 | | 614514 | Black | Fluorosilicone, oil-and-fuel-resistant elastomer |
| NBR | Butadiene-Acrylonitrile Type (Mineral Oil Resistant) | BS M48 | DTD 5606A | DTD 5594 | Elastomeric toroidal sealing rings (O-rings) butadiene-acrylonitrile type (mineral oil resistant) | 60 | '-35 to +110°C (-31 to +230°F) | 366582 | Black | Mineral oil resistant NBR |
| | | BS M48 | DTD 5606A | DTD 5594 | Elastomeric toroidal sealing rings (O-rings) butadiene-acrylonitrile type (mineral oil resistant) | 70 | | 366583 | Black | Mineral oil resistant NBR |
| | | BS M48 | DTD 5606A | DTD 5594 | Elastomeric toroidal sealing rings (O-rings) butadiene-acrylonitrile type (mineral oil resistant) | 80 | | 366584 | Black | Mineral oil resistant NBR |
| | | BS M48 | DTD 5606A | DTD 5594 | Elastomeric toroidal sealing rings (O-rings) butadiene-acrylonitrile type (mineral oil resistant) | 90 | | 366585 | Black | Mineral oil resistant NBR |
| | Butadiene-Acrylonitrile Type (Fuel And Synthetic Oil Resistant) | BS M48 | DTD 5607A | DTD 5595 | Elastomeric toroidal sealing rings (O-rings) butadiene-acrylonitrile type (fuel and synthetic oil resistant) | 70 | | 366586 | Black | Fuel and synthetic oil resistant NBR |
| | | BS M48 | DTD 5607A | DTD 5595 | Elastomeric toroidal sealing rings (O-rings) butadiene-acrylonitrile type (fuel and synthetic oil resistant) | 80 | | 366587 | Black | Fuel and synthetic oil resistant NBR |
| | | BS M48 | DTD 5607A | DTD 5595 | Elastomeric toroidal sealing rings (O-rings) butadiene-acrylonitrile type (fuel and synthetic oil resistant) | 90 | | 366588 | Black | Fuel and synthetic oil resistant NBR |
| | Synthetic Elastomer, Lubricant Resistant. | BS M48 | | DTD 5509 Grade A | Synthetic rubber resistant to engine lubricating oils, greases and fuels | 84-96 | | 366589 | Black | Oil resistant NBR |
| | | BS M48 | | DTD 5509 Grade B | Synthetic rubber resistant to engine lubricating oils, greases and fuels | 73-83 | | 366590 | Black | Oil resistant NBR |
| | | BS M48 | | DTD 5509 Grade C | Synthetic rubber resistant to engine lubricating oils, greases and fuels | 62-72 | | 366591 | Black | Oil resistant NBR |
| | | BS M48 | | DTD 5509 Grade D | Synthetic rubber resistant to engine lubricating oils, greases and fuels | 50-61 | | 366592 | Black | Oil resistant NBR |
| VMQ | Oil Resistant Silicone Type | BS M48 | DTD 5605A | DTD 5582 | Elastomeric toroidal sealing rings (O-rings) oil resistant silicone type | 50 | -60 to +225°C (-76 to +437°F) | 714538 | Red | Oil resistant silicone |
| | | BS M48 | DTD 5605A | DTD 5582 | Elastomeric toroidal sealing rings (O-rings) oil resistant silicone type | 60 | | 714539 | Red | Oil resistant silicone |
| | | BS M48 | DTD 5605A | DTD 5582 | Elastomeric toroidal sealing rings (O-rings) oil resistant silicone type | 70 | | 714540 | Red | Oil resistant silicone |
| | | BS M48 | DTD 5605A | DTD 5582 | Elastomeric toroidal sealing rings (O-rings) oil resistant silicone type | 80 | | 714541 | Red | Oil resistant silicone |

# US Aerospace Standards

| ASTM Family | Description | O-Ring Part Numbering Format | Current Dimensional / Naming Standard | Current Material Standard (Previous Material Standard) | Comments | Hardness Shore A | Operating Temperature °C (°F) | Recommended for new design | AS9100 Required | AS7115 Required | QPL Required (PRI / WP) | Datasheet Reference Number | Compound Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDM | Ethylene-Propylene Diene Monomer, Phosphate ester resistant | NAS1611-### | NAS1611 Revision 2 | NAS1613 Rev 2 | | 80 | -54 to +121/149°C (-65°F to 250/300°F) | | | | | 559541 | Peroxide cured EPDM |
| | | NAS1611-###A | NAS1611 Revision 5 | NAS1613 Rev 6 | | 80 | | Y | | | | 559541 | Peroxide cured EPDM |
| | | NAS1612-## | NAS1612 Revision 2 | NAS1613 Rev 2 | Straight thread tube fitting boss sizes | 80 | | | | | | 559541 | Peroxide cured EPDM |
| | | NAS1612-##A | NAS1612 Revision 5 | NAS1613 Rev 6 | Straight thread tube fitting boss sizes | 80 | | Y | | | | 559541 | Peroxide cured EPDM |
| FKM | Fluorocarbon, High-Temperature, Fluid Resistant, Low Compression Set for Seals in Fuel systems and Specific Engine Oil Systems. | AS3084-## | AS3084 | AMS7276 (AMS 7280) | Straight thread tube fitting boss sizes | 75 | -25 to +200°C (-13 to +392°F) | | ✓ | ✓ | ✓ | 514561 | Fluoroelastomer copolymer, bisphenol cured |
| | | AS3085-### | AS3085 | AMS7276 (AMS 7280) | | 75 | | | ✓ | ✓ | ✓ | 514561 | Fluoroelastomer copolymer, bisphenol cured |
| | | AS3208-## | AS3208 | AMS 7276 | Straight thread tube fitting boss sizes | 75 | | Y | ✓ | ✓ | ✓ | 514562 | Fluoroelastomer copolymer, bisphenol cured |
| | | AS3209-### | AS3209 | AMS 7276 | | 75 | | Y | ✓ | ✓ | ✓ | 514562 | Fluoroelastomer copolymer, bisphenol cured |
| | | M83248/1-### | AMS-R-83248/1 | AMS 7276 (AMS-R-83248/MIL-R-83248 Type 1 Class 1) | Refer to AS3209 & AS3208 | 75 | | | ✓ | ✓ | ✓ | 514563 | Fluoroelastomer copolymer, bisphenol cured |
| | | MA3352 | MA3352 | AMS 7276 | Metric | 75 | | | ✓ | ✓ | ✓ | 514562 | Fluoroelastomer copolymer, bisphenol cured |
| | | MS17413-### | AMS-R-83248/1 | AMS 7276 (AMS 7278/MIL-R-83248 Type 1 Class 1) | | 75 | | | ✓ | ✓ | ✓ | 514565 | Fluoroelastomer copolymer, bisphenol cured |
| | | MS9387-## | AMS-R-83248/1 | AMS 7276 (AMS 7278/MIL-R-83248 Type 1 Class 1) | Straight thread tube fitting boss sizes | 75 | | | ✓ | ✓ | ✓ | 514565 | Fluoroelastomer copolymer, bisphenol cured |
| | | MS9388-### | AMS-R-83248/1 | AMS 7276 ( AMS 7278/MIL-R-83248 Type 1 Class 1) | | 75 | | | ✓ | ✓ | ✓ | 514565 | Fluoroelastomer copolymer, bisphenol cured |
| | | NAS1593-### | AMS-R-83248/1 | AMS 7276 (MIL-R-25897/MIL-R-83248 Type 1 Class 1) | | 75 | | | ✓ | ✓ | ✓ | 514564 | Fluoroelastomer copolymer, bisphenol cured |
| | | NAS1595-9XX | AMS-R-83248/1 | AMS 7276 (MIL-R-25897/MIL-R-83248 Type 1 Class 1) | Straight thread tube fitting boss sizes | 75 | | | ✓ | ✓ | ✓ | 514564 | Fluoroelastomer copolymer, bisphenol cured |
| | Fluorocarbon, High Temperature, Fluid Resistant, Low Compression Set, 85 to 95 Hardness, For Seals in Fuel Systems and Specific Engine Oil Systems | AS3581-### | AS3581 | AMS 7259 | | 90 | | Y | ✓ | ✓ | ✓ | 514578 | Fluoroelastomer copolymer, bisphenol cured |
| | | M83248/2-### | AMS-R-83248/2 | AMS 7259 (AMS-R-83248/MIL-R-83248 Type 1 Class 2) | Refer to AS3581 | 90 | | | ✓ | ✓ | ✓ | 514577 | Fluoroelastomer copolymer, bisphenol cured |
| | | MS9970-### | AS3581 | AMS 7259 | | 90 | | | ✓ | ✓ | ✓ | 514578 | Fluoroelastomer copolymer, bisphenol cured |
| | | NAS1594-### | AMS-R-83248/2 | AMS 7259 (MIL-R-25897/MIL-R-83248 Type 1 Class 2) | | 90 | | | ✓ | ✓ | ✓ | 514579 | Fluoroelastomer copolymer, bisphenol cured |
| | | NAS1596-9XX | AMS-R-83248/2 | AMS 7259 (MIL-R-25897/MIL-R-83248 Type 1 Class 2) | Straight thread tube fitting boss sizes | 90 | | | ✓ | ✓ | ✓ | 514579 | Fluoroelastomer copolymer, bisphenol cured |
| | Fluorocarbon 70 to 80 Hardness, Low Temperature Sealing Tg -40 °F (-40 °C) For Elastomeric Seals in Aircraft Engine Oil, Fuel and Hydraulics Systems | AS5729-### | AS5729 | AMS7379 | | 75 | -51 to +203°C (-60 to +400°F) | Y | ✓ | ✓ | ✓ | 514566 | Fluoroelastomer copolymer, peroxide cured |
| | Fluorocarbon elastomer, improved performance at low temperatures. | M83485-### | AMS-R-83485/1 | AMS-R-83485/MIL-R-83485 | | 75 | -40 to +204°C (-40 to +400°F) | | | | ✓ | 514567 | Fluoroelastomer GL Type |
| | | AS83485-### | AMS-R-83485/1 | AMS-R-83485/MIL-R-83485 | | 75 | | Y | | | ✓ | 514567 | Fluoroelastomer GL Type |
| | | MA3445 | MA3445 | AMS-R-83485/MIL-R-83485 | Metric | 75 | | | ✓ | ✓ | ✓ | 514567 | Fluoroelastomer GL Type |
| FVMQ | Fluorosilicone, oil-and-fuel-resistant elastomer | M25988/1-### | MIL-R-25988/1A | MIL-DTL-25988/AMS-R-25988/ MIL-R-25988 | Class 1 | 70 | -57 to +200°C (-70 to +392°F) | Y | | | ✓ | 614507 | Fluorosilicone elastomer |
| | | M25988/3-### | MIL-R-25988/3 | MIL-DTL-25988/AMS-R-25988/MIL-R-25988 | Class 1 | 60 | | | | | ✓ | 614508 | Fluorosilicone elastomer |
| | | M25988/4-### | MIL-R-25988/4 | MIL-DTL-25988/AMS-R-25988/MIL-R-25988 | Class 1 | 80 | | | | | ✓ | 614509 | Fluorosilicone elastomer |
| | | M25988/2-### | MIL-R-25988/2 | MIL-DTL-25988/AMS-R-25988/MIL-R-25988 | Class 3 | 75 | | | | | ✓ | 614510 | Fluorosilicone elastomer |
| | Fluorosilicone rubber | AS9966-## | AS9966 | AMS 7273 | Straight thread tube fitting boss sizes | 75 | | | ✓ | ✓ | ✓ | 614511 | Fluorosilicone elastomer |
| | | AS9967-### | AS9967 | AMS 7273 | | 75 | | | ✓ | ✓ | ✓ | 614511 | Fluorosilicone elastomer |
| | | MS9966-## | MS9966 | AMS 7273 | Refer to AS9966 | 75 | | | ✓ | ✓ | ✓ | 614511 | Fluorosilicone elastomer |
| | | MS9967-### | MS9967 | AMS 7273 | Refer to AS9967 | 75 | | | ✓ | ✓ | ✓ | 614511 | Fluorosilicone elastomer |
| NBR | Butadiene-Acrylonitrile Rubber Fuel and Low Temperature Resistant 60-70 Shore A | AS3578-## | AS3578 | AMS 7271 | | 65 | -54 to +125°C (-65 to +257°F) | Y | ✓ | ✓ | ✓ | 366575 | Low temperature NBR elastomer |
| | | AS3578-### | AS3578 | AMS 7271 | | 65 | | Y | ✓ | ✓ | ✓ | 366575 | Low temperature NBR elastomer |
| | | MS9020-## | AS3578 | AMS 7271 | Refer to AS3578 | 65 | | | ✓ | ✓ | ✓ | 366575 | Low temperature NBR elastomer |
| | | MS9021-### | AS3578 | AMS 7271 | Refer to AS3578 | 65 | | | ✓ | ✓ | ✓ | 366575 | Low temperature NBR elastomer |
| | Butadiene-Acrylonitrile Rubber Fuel Resistant 65-75 Shore A | AS3569-### | AS3569 | AMS 7270 | Packing, preformed - o-ring seal, AMS 7270 | 70 | | | ✓ | ✓ | ✓ | 366576 | NBR elastomer |
| | Butadiene - Acrylonitrile Rubber for Hydrocarbon Fuel-Resistant Seals 60 to 70 Shore A | AS29512-## | AS29512 | AMS-P-5315/MIL-P-5315 | Straight thread tube fitting boss sizes | 70 | | Y | ✓ | ✓ | ✓ | 366577 | NBR elastomer |
| | | AS29513-### | AS29513 | AMS-P-5315/MIL-P-5315 | | 70 | | Y | ✓ | ✓ | ✓ | 366577 | NBR elastomer |
| | | MS29512-## | AS29512 | AMS-P-5315/MIL-P-5315 | Straight thread tube fitting boss sizes | 70 | | | ✓ | ✓ | ✓ | 366577 | NBR elastomer |
| | | MS29513-### | AS29513 | AMS-P-5315/MIL-P-5315 | | 70 | | | ✓ | ✓ | ✓ | 366577 | NBR elastomer |
| | Synthetic lubricant resistant. | AS29561-### | AS29561 | AMS-R-7362/MIL-R-7362 | | 70 | | | | | ✓ | 366578 | NBR elastomer |
| | | MS29561-### | AS29561 | AMS-R-7362/MIL-R-7362 | | 70 | | | | | ✓ | 366578 | NBR elastomer |
| | | NAS617-## | NAS617 | AMS-R-7362/MIL-R-7362 | Straight thread tube fitting boss sizes | 70 | | | | | ✓ | 366578 | NBR elastomer |
| | Petroleum Hydraulic Fluid Resistant, Limited Service at 275°F (135°C) | AS28775-### | AS28775 | AMS-P-25732/MIL-P-25732 | | 75 | -35 to +135°C (-31 to +275°F) | Y | | | ✓ | 366579 | NBR elastomer |
| | | MS28775-### | AS28775 | AMS-P-25732/MIL-P-25732 | | 75 | | | | | ✓ | 366579 | NBR elastomer |
| | | MS28784-### | AS28775 | AMS-P-25732/MIL-P-25732 | | 75 | | | | | ✓ | 366579 | NBR elastomer |
| | | AN6227 | AS28775 | AMS-P-25732/MIL-P-25732 | | 75 | | | | | | 366579 | NBR elastomer |
| | Petroleum Hydraulic Fluid Resistant, Improved Performanace at 275°F, (135°C) | AMS-P-83461/1-### | AMS-P-83461/1 | AMS-P-83461/MIL-P-83461 | | 75 | | Y | | | ✓ | 366580 | NBR elastomer |
| | | AMS-P-83461/2-## | AMS-P-83461/2 | AMS-P-83461/MIL-P-83461 | | 75 | | | | | ✓ | 366580 | NBR elastomer |
| | | M83461/1-### | AMS-P-83461/1 | AMS-P-83461/MIL-P-83461 | | 75 | | | | | ✓ | 366580 | NBR elastomer |
| | | M83461/2-## | AMS-P-83461/2 | AMS-P-83461/MIL-P-83461 | Straight thread tube fitting boss sizes | 75 | | | | | ✓ | 366580 | NBR elastomer |
| | Type I Hydraulic | AS28778-## | AS28778 | AMS-P-5510/MIL-P-5510 | Straight thread tube fitting boss sizes | 90 | -55 to +71°C (-67 to +160°F) | Y | ✓ | ✓ | ✓ | 366581 | NBR elastomer |
| | | MS28778-## | AS28778 | AMS-P-5510/MIL-P-5510 | Straight thread tube fitting boss sizes | 90 | | | ✓ | ✓ | ✓ | 366581 | NBR elastomer |
| VMQ | Silicone Rubber, General Purpose, 70 Durometer | AS3582-### | AS3582 | AMS 3304 | | 70 | -65°C to +205°C (-85 to +401°F)* | | | | ✓ | 714536 | Silicone elastomer |
| | | MS9068-### | AS3582 | AMS 3304 | Refer to AS3582) ✓ | 70 | | | | | ✓ | 714536 | Silicone elastomer |
| | Silicone (Vsi) Rubber, Heat-Resistant, Low Compression Set, 70-80. | AS9385-## | AS9385 | AMS 7267 | | 75 | -65°C to +260°C (-85°F to +500°F)* | Y | | | ✓ | 714537 | Silicone elastomer, high temperature grade |
| | | AS9386-### | AS9386 | AMS 7267 | | 75 | | | | | ✓ | 714537 | Silicone elastomer, high temperature grade |
| | | MA3442 | MA3442 | AMS 7267 | Metric | 75 | | | | | ✓ | 714537 | Silicone elastomer, high temperature grade |
| | | MS9385-## | AS9385 | AMS 7267 | Refer to AS9385) | 75 | | | | | ✓ | 714537 | Silicone elastomer, high temperature grade |
| | | MS9386-### | AS9386 | AMS 7267 | Refer to AS9386) | 75 | | | | | ✓ | 714537 | Silicone elastomer, high temperature grade |
| FFO | Perfluoroether | AS6058-### | AS6058 | AMS 7254 | | 70 | -54 to +203°C (-65 to +400°F) | | | | | 900552 | Perfluoroether elastomer |
| FFKM | Perfluorocarbon elastomer, high temperature, fluid resistant | | | AMS7257 | | 75 | -15°C to +290°C (+5°F to +554°F) | | ✓ | ✓ | ✓ | FFKM-75-325 | Perfluoroelastomer, high temperature grade |

NOTE: The O-ring part numbering formats listed above should be used when ordering to ensure compliance to materials, dimensional and quality assurance standards. Parametric part numbering specifying specific compound numbers should be used to adhere to ERIKS Sealing Technology quality assurance standards with increased source change control.





# Land Systems

The mechanical extremes placed upon fighting vehicles and large guns, combined with strict weight limitations conspire to create extreme operating environments that demand high performance seals that are vital for effective function of mission critical equipment.

| Applications | Requirements | Seal Profiles | Sealing Materials |
|---|---|---|---|
| Hydraulic systems:<br>Position Systems<br>Actuation<br>Guidence control | High pressures<br>Mineral (Red) oils<br>Extended operating temperature envelope down to -56°C | Rod seals<br>Piston seals<br>SE seals<br>O-rings<br>Bonded washers | NBR<br>EPDM<br>FKM<br>HNBR<br>PTFE<br>PEEK |
| Oleo-pneumatic recoil/clamping systems | High pressures 15000psi.<br>Mineral (Red) oils<br>Extended operating temperature envelope down to -56°C<br>Rapid gas decompression resistance | Rod seals<br>Piston seals<br>SE seals<br>O-rings | NBR<br>FKM<br>HNBR<br>PTFE<br>PEEK |
| Munitions / electronics | Electro-Magnetic shielding<br>Automated assembly capable | O-rings<br>Formed gaskets | FKM<br>FFKM<br>PTFE<br>PEEK<br>NBR |
| NBC systems | Nuclear radiation resistance<br>Bacteriological resistance<br>Chemical resistance | O-rings | FEPM<br>PEEK |
| Air systems | Extended operating temperatures<br>Ambient compression set resistance ISO815 method B | O-rings | NBR<br>EPDM<br>FKM<br>HNBR |
| Tracked Vehicles Bearing protection | Abrasion resistance<br>Corrosion resistance<br>Grease / oil containment | Metal face seals | Metal<br>NBR<br>HNBR<br>FKM |
| Fuel Systems; Avaition/ Marine/Land/Handling | Chemical resistance, low/high temperature capability<br>Mil-Std Compliance | Rod seals<br>Piston seals<br>SE seals<br>O-rings<br>Bonded washers | FKM<br>FVMQ<br>FFKM |
| Ground Support Equipment | Service Fluid Resistant<br>Extended operating temperatures<br>Technical support for obsolete items | O-rings<br>Rotary seals<br>Hydraulic seals<br>Special mouldings<br>Extrusions<br>Pneumatic seals | PTFE<br>VMQ<br>TPE<br>NBR<br>FKM<br>FFKM |

# Naval

## DEF STAN 02-337

**UK MOD Defence Standard DEF STAN 02-337 comprises three parts:**

**PART 1**

Requirements for Elastomeric Toroidal Sealing Rings (´O´ Rings) Part 1 General and Surface Finish Standards Relative to Manufacturer-Issue 1: 04/00; Incorporating NES 337 Category 2; Issue 3: 07/97

**PART 2**

Requirements for Elastomeric Toroidal Sealing Rings (´O´ Rings) Part 2 List of Preferred Elastomeric Toroidal Sealing Rings (´O´ Rings)-Issue 1: 04/00; Incorporating NES 337 Category 2; Issue 2: 07/97

**PART 3**

Requirements for Elastomeric Toroidal Sealing Rings (´O´ Rings) Part 3 Anti-Extrusion Rings (Back Up Rings)-Issue 1: 04/00; Incorporating NES 337 Category 2; Issue 2: 07/97

**Previously referred to as NES 337 elastomers, grades include:**

- FC70 – Fluorocarbon rubber (FKM) 70 °IRHD
- FC90 - Fluorocarbon rubber (FKM) 90 °IRHD
- HN60 – High Nitrile (NBR) 60 °IRHD
- HN70 – High Nitrile (NBR) 70 °IRHD
- HN90 – High Nitrile (NBR) 90 °IRHD
- MN60 – Medium Nitrile (NBR) 60°IRHD
- MN70 – Medium Nitrile (NBR) 70 °IRHD
- MN80 – Medium Nitrile (NBR) 80 °IRHD
- MN90 – Medium Nitrile (NBR) 90 °IRHD

NES337 compliant O-rings are typically supplied against NATO Stock Numbers (NSN).

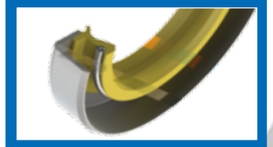
## Pressurised Water Reactors

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

| Applications | Requirements | Seal Profiles | Sealing Materials |
|---|---|---|---|
| Hydraulic and high pressure air systems | High pressures<br>Extended capabilities<br>Compatible with a wide range of hydraulic fluids<br>Rapid gas decompression rsistance | Rod seals<br>Piston seals<br>O-rings<br>Bonded washers<br>Backup seals | NBR<br>FKM<br>EPDM<br>HNBR<br>PTFE<br>PEEK |
| Valves and actuators | Steam Flows<br>Compressed air<br>Fuel to oil systems | O-rings<br>Bonded washers<br>Diaphragms<br>Valve seals<br>Formed gaskets | NBR<br>FKM<br>EPDM<br>HNBR<br>PTFE<br>PEEK |
| Services | Chilled water and refrigerated plants<br>Fresh and distilled water systems<br>Electro magnetic shielding<br>Hatch and water tight doors seals<br>Air circulation | O-rings<br>Special mouldings<br>Extrusions | NBR<br>FKM<br>EPDM<br>HNBR<br>VMQ |





| Profile | Description |
|---|---|
| **O-ring**  | The most common type of static seal is the flexible elastomer O-ring. They provide a versatile 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. |
| **Back-up**  | Back-up rings are used to extend the operating pressure of an O-ring. Back-up rings are co-located within a groove of increased width, on the low-pressure side of the seal. When pressure is applied to the sealing system the back-up ring is axially compressed, increasing its radial width to close the extrusion gap. The high shear strength of the back-up ring material is then able to contain the elevated pressures. |
| **Bonded Washer**  | Bonded Seals were originally designed to replace copper type washers in high pressure systems. The bonded seal comprises a metal washer (square or rectangular in section), to which a trapezoidal elastomeric ring is bonded. The advantages of this system is that the metal washer resists the bursting forces applied and also limits any deformation of the elastomeric element. |
| **Radial Shaft Seal**  | One of the most frequently used types of seal is the rotary lip seal, generally used for sealing lubricating oil or grease in rotary shaft applications. This is achieved by: providing static sealing between the outer diameter of the seal and its housing and sealing between the shaft and the main sealing lip when either static or dynamic. The radial load exerted by the sealing lip must be sufficient to retain the oil or grease, but not so high that excessive friction losses or wear occurs. |
| **Metal Face Seal**  | Metal face seals offer bearing protection and lubricant retention on any relatively slow-moving housing assembly. These seals are constructed from two identical, tapered metal rings, loaded using elastomer seals. Such designs excel under extreme environments, where the exclusion of contaminants such as sand, rock, mud and water is imperative, providing a robust efficient solution, with long service life and low maintenance. |
| **X-ring**  | X-rings can be used in a wide variety of static and dynamic sealing applications. They are available in AS568 standard O-ring sizes. Their four-lobed design provides a larger sealing area in comparison to a standard O-ring. The double seal action requires lower squeeze levels to maintain an effective seal, thus reducing friction level and improving seal life. The four-lobed configuration creates a more stable seal avoiding spiral twisting which can occur in reciprocating applications. |
| **Capped O-ring**  | Capped O-rings are a cost-effective solution for providing cap seals for rod and piston seal applications. The design of the capped O-ring protects the elastomer from extrusion and nibbling. The specially profiled cap element acts as the seal's dynamic interface and prevents spiral failure and reduces stick slip, commonly associated with O-ring seals. |

| Profile | Description |
|---|---|
| **T-Seal**  | Typically used in reciprocating and high pressure static applications, T-Seals comprise a single T-section elastomeric energiser and two thermoplastic back-up rings. Available in both piston and rod geometries, T-Seals can retro-fit into most standard O-ring grooves designed for widths to accommodate 0, 1 or 2 back-ups. |
| **Single Acting Cap Seal**  | Single Acting Cap Seal: A self-actuating, pressure venting, extrusion resistant seal that combines low breakout and running friction with minimal leakage. The seal is constructed of a premium grade PTFE sealing element and an elastomer energiser. The Single Acting Cap Seal is a reliable, compact, design with a long service life and is available in both rod and piston type geometries to retro-fit into ISO7425-2 grooves. |
| **Energised Lip Seal**  | Energised Lip Seal: A symmetrical seal optimised for heavy duty reciprocating applications with unidirectional pressure. The Energised Lip Seal comprises a high modulus, highly durable, wear resistant, elastomeric jacket, energised by a low modulus, split O-ring. The jacket provides superior sealing efficiency and abrasion resistance, whilst the O-ring both transmits system pressure to the contact surfaces and ensures energisation of the seal lips under low pressure or low temperature. |
| **SE Seal**  | The Spring Energised (SE), is a pressure activated seal, with assisted energisation provided by corrosion-resistant metal spring. When the seal is in situ, the spring is under compression and applies force to seal's sealing lips. This, augmented by the system pressure, creates a tight barrier to prevent gas or fluids from leaking. SE Seals can operate down to cryogenic temperature and up to +200°C. |
| **Weston Mechanical**  | If speed, pressure and the working environment are extreme then a Weston Mechanical bespoke sealing arrangement could be the solution. |
| **Split Seals**  | Our GS & TX split seals are used in applications where installation and replacement mandates that the surrounding hardware cannot be fully disassembled. |





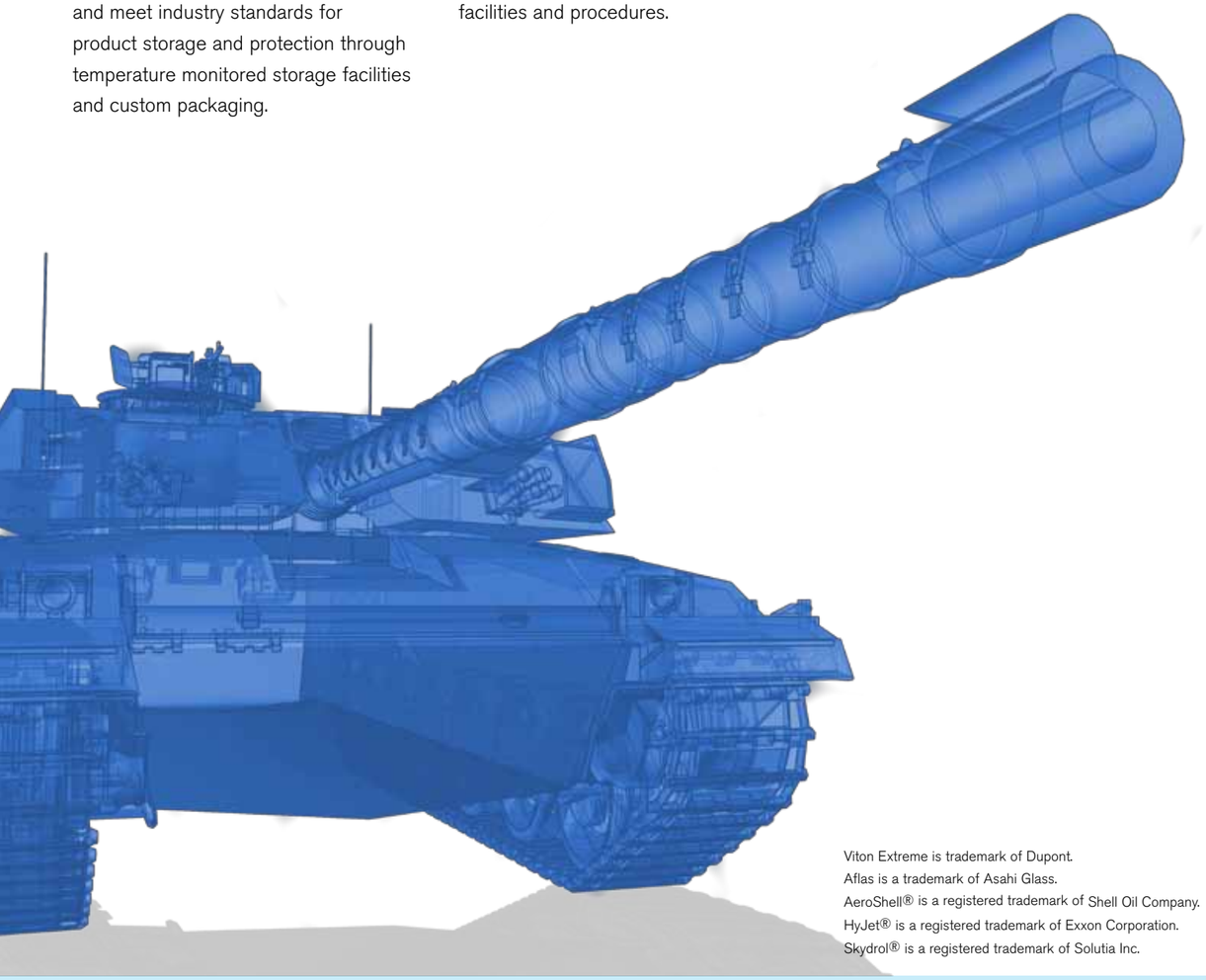
# Quality Assurance

## ERIKS utilise both AS9100 and NADCAP AS7115 qualified supply chains as required by our customer specifications to provide quality assured manufacture, including that of special processes.

We are members of the ADS 21st Century Supply Chains Programme (SC-21), embracing its quality toolsets to deliver continuous improvements. We are able to offer full lot and batch traceability and meet industry standards for product storage and protection through temperature monitored storage facilities and custom packaging.

Quality control is delivered through the use of high volume non-contact vision systems, combined touch / optical CMMs and analytical laboratory equipment e.g. FTIR, TGA, DSC backed up by ISO17025 facilities and procedures.

Our commitment to quality, combined with our advanced logistical services provides our customers with true competitive advantage.





# Kitting, Bagging and Cleaning

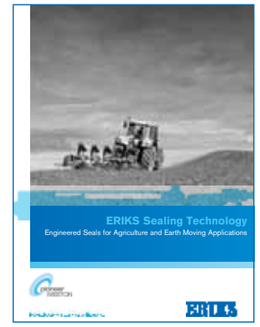
**ERIKS Sealing Technology can provide bespoke kits and aftermarket bagging of individual parts to service your industry requirements.**

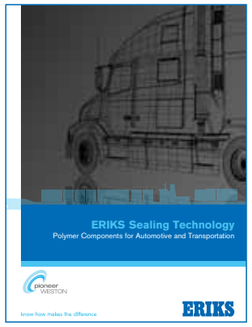
**Our specially tailored kits are assembled and packaged with clearly marked part numbering and can be supplied with our own brand, or alternatively, customer specific branding. We are able to offer kits that include a variety of our core product, ranging from Rotary Seals and O-rings to Hydraulic Seals, Washers and Gaskets.**

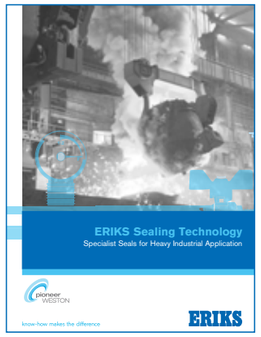
**We can also offer a number of cleaning services for use in clean-room applications or low elutable aqueous environments.**

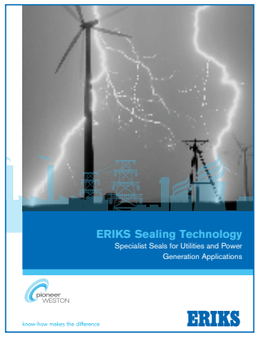

# Other Brochures in this Series

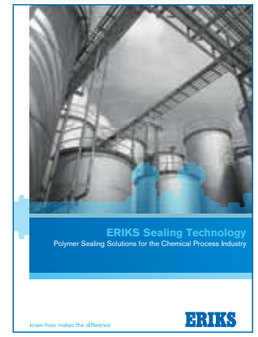
- Chemical Process Industry
- Oil and Gas Applications
- Agriculture and Earth Moving Applications
- Automotive and Transport Applications
- Heavy Industry
- Utilites

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