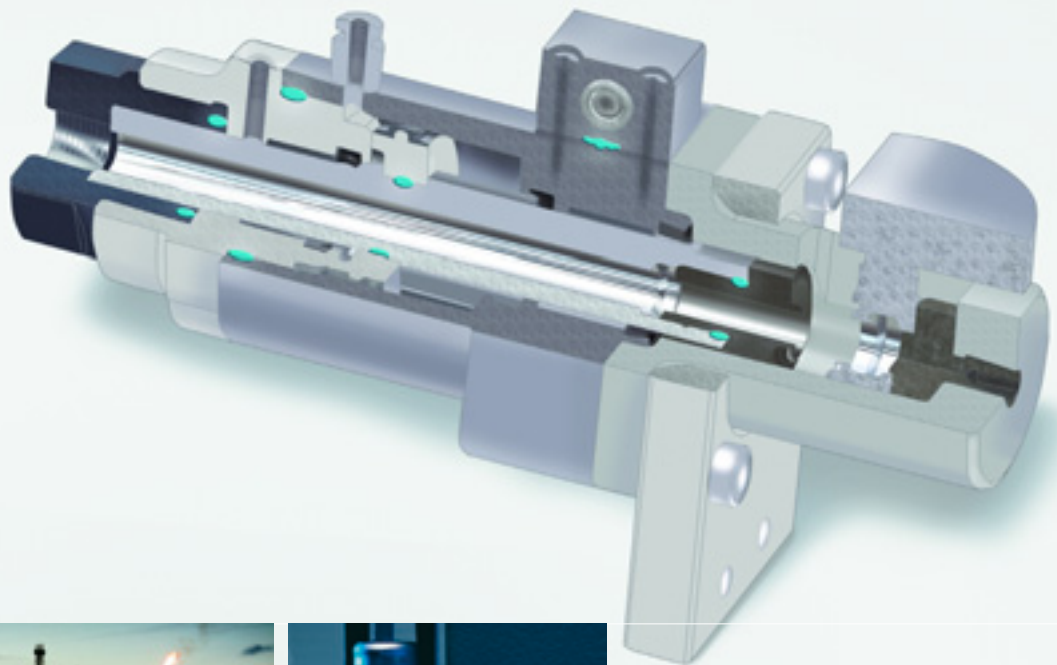


Isolast[®]

perfluoroelastomer seals



Your Partner for Sealing Technology



Introduction

Material performance and seal design are both critical to effective sealing. Equipment manufacturers and end users expect a sealing system to operate leak-free and maintain long service life. Reliability is crucial to effective low maintenance cost operations.

Isolast® is used in process industries such as chemical, semiconductor, pharmaceutical and hydrocarbon and is offered in a full range of products including O-Rings, gaskets and custom parts.

General perfluoroelastomer properties

Isolast® is a member of the perfluoroelastomer family (ASTM D1418: FFKM). Perfluoroelastomers are terpolymers of monomers in which all hydrogen atoms have been replaced by fluorine. The absence of hydrogen in the molecular chain dramatically increases both the chemical and thermal resistance of perfluoroelastomers. The cross-linked molecular chains enable perfluoroelastomers to combine the resilience and sealing force of an elastomer with the chemical inertness and thermal stability of PTFE.

The range of **Isolast®** perfluoroelastomer compounds developed by our specialists offers exceptional chemical resistance over a wide range of temperatures from -25 °C/ -13 °F up to +325 °C/ +617 °F.



Benefits

The **Isolast®** combination of high performance and quality with state-of-the-art sealing design provides a wide range of customer advantages:

- Superior reliability, cutting planned and unplanned maintenance costs
- Longer service life, reducing costs and driving up productivity
- Greater safety and reliability, reducing waste and contamination
- More opportunities for standardization and inventory reduction
- Optimized seal solutions cutting the risk of failure

To meet these demands in extremely hostile environments, with temperatures often in excess of 300 °C / 572 °F, **Isolast®** perfluoroelastomers offer exceptional chemical and thermal resistance without sacrificing the essential performance of elastomeric seals.



Applications

Isolast® perfluoroelastomer sealing products bring all these benefits to a wide range of applications for equipment manufacturers and end users in many industries:

- Chemical processing
- Pharmaceutical and food industries
- Oil & gas
- Hydrocarbon processing
- Semiconductor and nanotechnology
- Lacquer, print and coatings
- Aerospace
- Power generation

The Isolast® product range

O-Rings

O-Rings offer engineers a high-performance sealing element in a wide range of static and dynamic applications.

- AS 568A American standard
- DIN 3701 German standard
- BS 1806 / BS 4518 British standard
- JIS B2401 Japanese standard
- NFT47-501 French standard
- SMS 1586 Swedish standard
- ISO 3601 International standard
- Molded O-Rings to non-standard sizes – available to customer specification



Custom parts

Specific parts can be designed, developed and produced in conjunction with customers to ensure that all requirements are satisfied. The physical characteristics of perfluoroelastomers require careful design input from Trelleborg Sealing Solutions engineers. Inflatable seals, diaphragms and composite material products are typical areas of proven success in even the most hostile environments.

Gaskets: Molded, punched or laser-cut to intricate patterns to suit customers' specific requirements

Bonded Gaskets: For leak-proof flange gaskets with stainless steel or alternative metal compression retainer

Bonded Products: In a variety of geometries, material grades and metals

V Rings: For effective axial dirt sealing in static and dynamic environments, particularly for additional protection in hostile environments

Molded Parts: Custom-molded parts in virtually any shape

Specialty Seals: Homogeneous and layered diaphragms, inflatable seals, bellows, T-Seals and valve seals

Specialty Seals

FlexiMold™: Developed to produce large diameter seals without dedicated tooling

General advice on issues concerning specifications, applications, installations or developments is available through our global organization.

For personal service, consult your local Trelleborg Sealing Solutions Marketing Company (see back cover).



The Isolast® material range

Compound	Hardness	Color	
Grade J8325	75 IRHD	Black	This high-temperature material operates in applications up to +325 °C/+617 °F while maintaining broad chemical resistance and excellent retained sealing force.
Grade J9501	80 IRHD	White	This special material is designed for applications in strong oxidizing media such as halogens, ozone or hot oxidizing acids. Also suitable for applications where cleanliness is required.
Grade J9503	75 IRHD	Black	This classic material offers the most comprehensive chemical resistance including organic and inorganic oxides, amines and steam with an operating temperature range of -25 °C/-13 °F to +240 °C/+464 °F.
Grade J9505	70 IRHD	White	This general purpose, low compression set material is designed for clean applications. Also suitable for strong oxidizing mediums.
Grade J9509	90 IRHD	Black	A material developed from J9503 but with increased hardness for use in high-pressure applications.
Grade J9510	95 IRHD	Black	An approved explosive decompression resistant (EDR) (Shell Test) grade specifically developed for the oil & gas industry, compatible with, oils, steam, sour gas and amine-based corrosion protection chemicals, etc.
Grade J9512	75 IRHD	Black	Heavy duty material suitable for extremely strong acids and bases (e.g. caustic soda) and steam applications while maintaining good compression set characteristics.
Grade J9513	90 IRHD	Black	An explosive decompression resistant (EDR) grade compliant with NORSOK M-710 standard, this material is suited to hostile downhole environments and is resistant to service conditions including sour gas, bases, acids, hot water and steam.

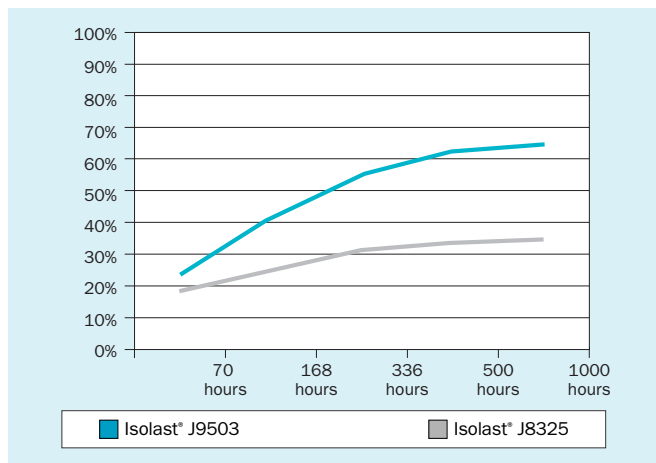
Compound	Hardness	Color	
Grade J9515 plus	75 IRHD	Black	A material compliant with US Food and Drug Administration (FDA) requirements that meets the high cleanliness standards typical in the pharmaceutical, food and bio-technology industries.
Grade J9516 plus	75 IRHD	White	A white material meeting the same qualifications as J9515 plus, including FDA requirements.
Grade J9610 Fab Range™	75 IRHD	Black	A universal compound developed for wet and dry semiconductor processes including wet cleaning, etching, Chemical Mechanical Polishing (CMP) and stripping.
Grade J9630 Fab Range™	85 IRHD	White	A white semiconductor grade developed for dry processes including etching, oxidation, diffusion and metallization.
Grade J9650 Fab Range™	75 IRHD	Black	A high-temperature semiconductor compound for use in Rapid Thermal Processing (RTP), Chemical Vapor Deposition (CVD) and diffusion applications up to +320 °C/+608 °F.
Grade J9670 Fab Range™	75 IRHD	Beige	A high-temperature non-black semiconductor compound for processes including Physical Vapor Deposition (PVD), CVD and etching, with a temperature range from -15 °C/+5 °F to +315 °C/+599 °F.
Grade J9675 Fab Range™	75 IRHD	Cream	Our latest universal semiconductor grade for both wet and dry processes, including fluorine and oxygen-based plasmas.
Grade J9680 Fab Range™	75 IRHD	Translucent	An ultra-clean translucent semiconductor compound for processes including oxidation, CVD, diffusion and etching, with a temperature range from -10 °C/+14 °F to +230 °C/+446 °F.

Standard grades with exceptional performance

The **Isolast®** range consists of two standard grades and a number of specialized grades engineered to meet the demands of specific applications. The standard grades, J9503 *Classic* and J8325 *High-Temperature* have been developed to ensure optimal performance and maximum meantime between failure through:

- Outstanding chemical resistance
- A wide temperature range from -25 °C/-13 °F up to +325 °C/+617 °F
- Very low outgassing at high temperatures and in vacuum applications
- Exceptional hysteresis properties ensuring high elasticity and dynamic recovery
- High quality surface finish further enhancing sealing performance
- Excellent compression set characteristics giving the best possible leak-proof seals (see figure 1)

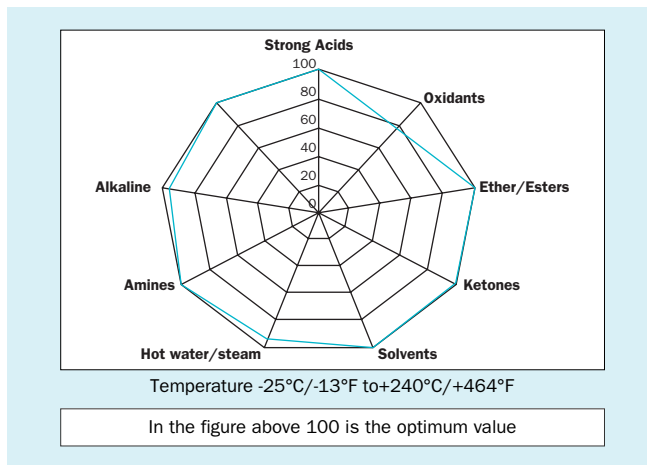
Figure 1: Long term compression set at +204 °C/+399 °F



Aggressive Chemical Environments

In hazardous applications involving aggressive chemicals, high temperatures and long service life, **Isolast® classic** material J9503 covers the widest range of chemicals from acids to alkalis and amines to esters.

Figure 2: Isolast® J9503 radar chart for chemical resistance



In tests, **Isolast® J9503** has shown considerably better compatibility over comparable competitor products, as seen in figures 3 to 5. All tests were carried out on standard O-Rings size 214 (24.99 x 3.53 mm/.984 x .139 inches) and in accordance with test procedure DIN 53521.

Figure 3: Immersion in nitric acid at +98 °C/+208 °F

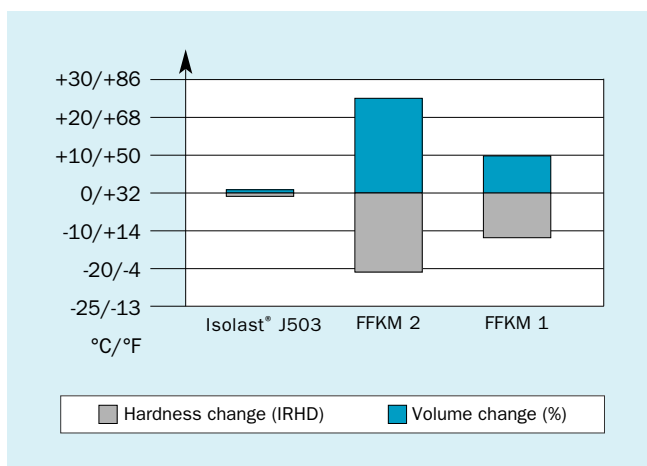


Figure 4: Immersion in acetic acid at +98 °C/+208 °F

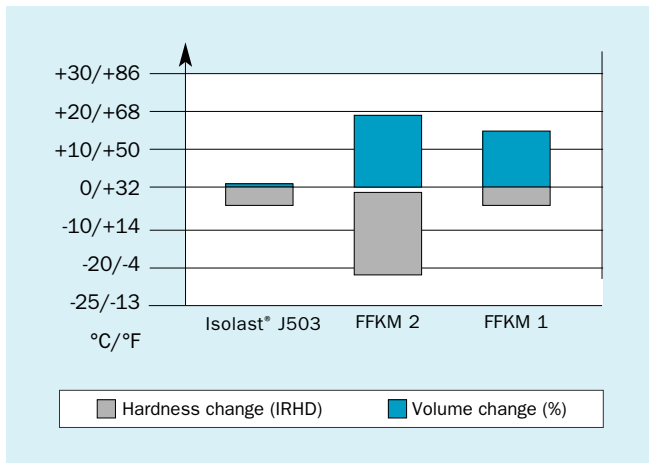
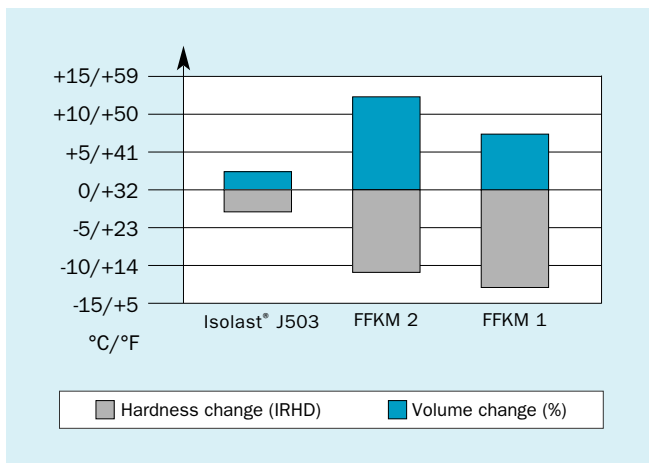


Figure 5: Immersion in pressurized steam at +200 °C/+392 °F

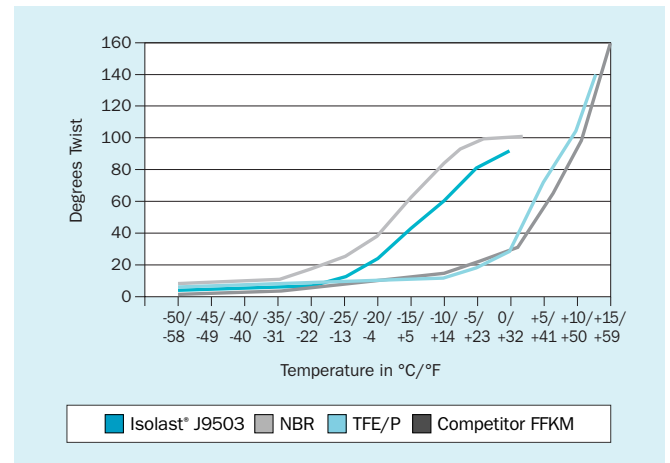


Low-Temperature Applications

At lower temperatures, below -20 °C/-4 °F for example, retained flexibility to maintain sealing force is critical. The glass transition temperature (T_g) of **Isolast®** J9503 is -19 °C/-2 °F, which is key to excellent low-temperature capability as the molecular backbone remains flexible.

Figure 6 reflects the results of a Gehman test conducted with **Isolast®** and three other elastomers. As expected, NBR rubber shows the best low-temperature capabilities, but it is followed by **Isolast®** J9503 which is effective down to -25 °C/-13 °F. Tetrafluoroethylene propylene (TFE/P) and a competitive perfluoroelastomer illustrate the exceptional performance of **Isolast®** J9503.

Figure 6: Low-temperature properties measured using a Gehman torsional test (BS 903: Part A 13, DIN 53548 and ASTM D 1053)

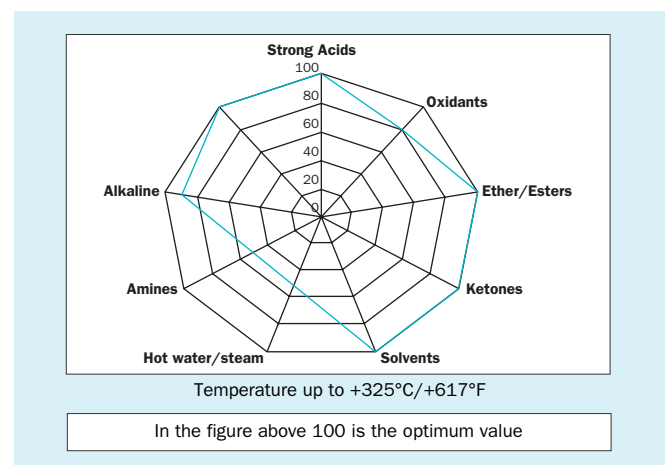


High-Temperature Applications

To meet high temperature requirements in aggressive chemical environments, **Isolast®** J8325 has been designed to run at continuous operating temperatures up to +325 °C/+617 °F. Even at these elevated temperatures, **Isolast®** maintains outstanding chemical resistance, as seen in figure 7.

Additionally, **Isolast®** J8325 high-temperature material has excellent retained sealing force which makes it suitable for applications with high-temperature cycles.

Figure 7: **Isolast®** J8325 radar chart for chemical resistance

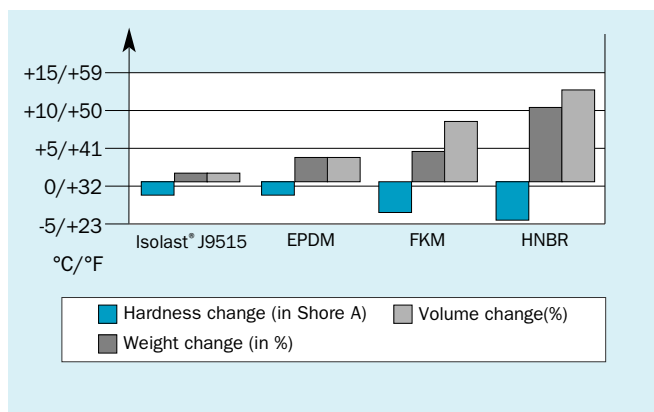


Industry specific grades

Pharmaceutical, Food and Beverage Applications

Sealing solutions in the pharmaceutical industry and also the food, beverage and biotechnology industries require cleanliness and high quality. To meet these special requirements a range of materials has been developed: **Isolast® J9515 plus** and the white **Isolast® J9516 plus**, both conform to the Food and Drug Administration (FDA) regulations set out in references 21 CFR 177.2600 (e,f) and 21 CFR 177.2400 (d) for perfluoroelastomers. **Isolast® J9515** and **Isolast® J9516** are suitable for a wide range of pharmaceutical and food applications. Extensive tests demonstrated that the **Isolast® plus** range has excellent compatibility in the most widely used Clean-in-Place (CIP) cleaning mediums and can also be applied in Water-for-Injection (WFI) and Sterilize-in-Place (SIP).

Figure 8: **Compatibility of Isolast® J9515 plus in a standard CIP medium at +80 °C/+176 °F**



Lacquer and Paint Applications

Meeting the aggressive nature of cleaning solvents and the requirement to be totally silicone-free, **Isolast®** materials are ideally suited for paint, print and lacquer applications.

For example, in automotive paint lines, **Isolast®** has proven compatibility with the new cleaning solvents for hydro-lacquer and maintains the highest quality surface finish from the initial filler coating to the final clear coat.



Oil & Gas Extraction and Processing

(High-Pressure and Explosive Decompression Resistant Applications)

In oil & gas applications, traditional sealing solutions are limited due to extreme environments. Seals are not only in contact with aggressive mediums such as crude oil, natural gas, sour gases, carbon dioxide, acids, seawater, hydrogen sulfide and anti-corrosion chemicals but are also subject to damage caused through explosive decompression.

Isolast® J9510 and **J9513** have been developed specifically to operate in the harsh environment of oil & gas processing. The base polymer provides excellent chemical resistance and the specially developed density of the materials make them ideal in explosive decompression environments. An independent testing institute has certified **Isolast® J9510** against the Shell Test and **Isolast® J9513** to NORSOK M-710 standard.

Explosive decompression: an elastomer under high gas pressure absorbs gas which creates bubbles within the material. By controlled release of pressure, the elastomer expands and then contracts back to its original size as the gas permeates out. A sudden pressure drop within the system can lead to explosive decompression as high-pressure gas expands within the elastomer before escaping, so destroying the surface and potentially the whole seal.

Semiconductor Applications

The semiconductor manufacturing process is extremely aggressive and seals are invariably housed in areas where they need to withstand highly corrosive liquids, gases and plasmas, often at elevated temperatures or in vacuum conditions. The ultimate in elastomer sealing is the ultra-pure **Isolast® Fab Range™**.

These high-performance perfluoroelastomers are virtually inert and demonstrate almost universal chemical compatibility. Suitable for wet processing systems and in aggressive plasma applications at elevated temperatures, they are ideal sealing solutions. For thermal applications,



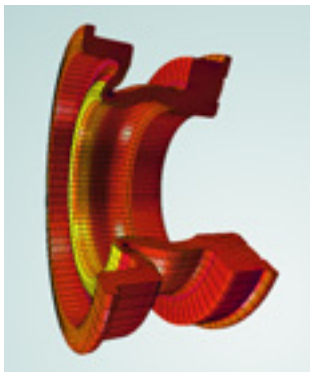
specialized grades have been developed to operate at continuous temperatures up to +325 °C/+617 °F.

This results in increased service life and extended meantime between planned maintenance (MTBM), thereby reducing downtime and maximizing production efficiency, yield and process reliability and minimizing overall cost of ownership.

In-House Testing and Laboratory Capabilities

Material development and analysis in our modern elastomer laboratories, located in the United States and Europe, ensure that the **Isolast®** range meets current and future customer requirements. Tests carried out to DIN, ASTM or other industry standards include:

- Chemical compatibility testing
- High-pressure and high-temperature testing
- Dynamical mechanical analysis (*DMA*) – TR / TR10
- Thermogravimetric analysis (*TGA*)
- Modulus curve
- Low temperature flexibility testing
- Rheometer data



Non-linear finite element analysis (NLFEA) is used to predict and optimize product performance. Taking comprehensive material test data from the material laboratories, accurate coefficients can be fed into the models. The availability of extensive test facilities permits validation of the models and benefits customers.

Design Capability

For over 50 years, our design engineers have been producing sealing solutions for industries worldwide. The integration of **Isolast®** materials into the Trelleborg Sealing Solutions product range provides unrivalled capabilities in material performance and seal design.

Our Technology

We can offer the widest product range to meet both standard and specialty requirements with assurance by:

- State-of-the-art Finite Element Analysis (*FEA*) and Non-Linear FEA computer modeling
- Extensive test facilities
- Dedicated in-house tooling facilities
- Manufacturing to zero defect standards in ISO 9001:2000 and ISO/TS 16949:2002 approved factories

Using a team approach, our applications engineers, product designers and material technologists work with the customer to achieve optimum sealing performance with cost-effective solutions.

Our international team of applications engineers and product designers are supported by 30 years experience with computer modeling. The benefits they offer, combined with data from our extensive test facilities, include:

- Opportunity to optimize designs prior to prototyping and reduce lead times
- Indication of potential assembly problems and assessment of seal performance under complex loading profiles
- Assessment of seal performance over time
- Highlighting of tolerance problems
- Insight into operational effects of elastomeric seals

Technical data - Compound overview for Isolast®

Isolast®	Grade	Hardness ± 5 Shore A	Color	Maximum service temperature °C/°F	Minimum service temperature °C/°F
Standard	J9503 – Classic	75	Black	+240/+464	-25/-13
	J8325 – High-Temperature	75	Black	+325/+617	-15/+5
Special	J9501 – Oxidizing media	80	White	+240/+464	-20/-4
	J9505 – Processing	70	White	+240/+464	-20/-4
	J9509 – High-Pressure	90	Black	+240/+464	-25/-13
	J9512 – Processing	75	Black	+260/+500	-15/+5
	J9515 Plus – FDA	75	Black	+250/+482	-15/+5
	J9516 Plus – FDA	75	White	+250/+482	-15/+5
	J9510 – EDR	95	Black	+250/+482	-15/+5
	J9513 – EDR	90	Black	+240/+464	-15/+5
	J9610 – Fab Range™	75	Black	+235/+455	-25/-13
	J9630 – Fab Range™	85	White	+260/+500	-15/+5
	J9650 – Fab Range™	75	Black	+320/+608	-15/+5
	J9670 – Fab Range™	75	Beige	+315/+599	-15/+5
	J9675 – Fab Range™	75	Cream	+300/+572	-15/+5
	J9680 – Fab Range™	75	Translucent	+230/+446	+10/+14

Notes ¹ BS 903 Part A2 ² ASTM D1414 O-Rings

For our range of semiconductor products, please refer to Isolast® semiconductor literature or contact your local Trelleborg Sealing Solutions Marketing Company.

Tensile strength ¹ MPa/psi	Elongation at break %	Compression set ² 70 h at 204 °C/399 °F %	Average linear coefficient of thermal expansion (-25 °C/-13 °F to 200 °C/392 °F)	TR-10 values of Isolast® material °C/°F
12.5/1,813	120	25	$3.31 \times 10^{-4} / ^\circ\text{C}$	-18/-0.4
20/2,900	190	19	$2.82 \times 10^{-4} / ^\circ\text{C}$	-5/+23
6.5/943	150	25	$3.64 \times 10^{-4} / ^\circ\text{C}$	-18/-0.4
6.5/943	200	20	$3.52 \times 10^{-4} / ^\circ\text{C}$	-19/-2.2
12.5/1,813	100	38	$3.04 \times 10^{-4} / ^\circ\text{C}$	-8/+17.6
10/1,450	150	15	$3.38 \times 10^{-4} / ^\circ\text{C}$	-5/+23
11.7/1,697	182	16	$3.48 \times 10^{-4} / ^\circ\text{C}$	-2/+28.4
10/1,450	200	30	$3.31 \times 10^{-4} / ^\circ\text{C}$	-2/+28.4
22/3,190	80	30	$3.01 \times 10^{-4} / ^\circ\text{C}$	-5/+23
18/2,610	65	35	$2.75 \times 10^{-4} / ^\circ\text{C}$	-3/+26.6
12.5/1,813	120	25	$3.31 \times 10^{-4} / ^\circ\text{C}$	-18/+0.4
12/1,740	223	30	$3.00 \times 10^{-4} / ^\circ\text{C}$	-7/+19.4
18.3/2,654	119	14	$2.80 \times 10^{-4} / ^\circ\text{C}$	-5/+23
13.5/1,958	185	30	$2.70 \times 10^{-4} / ^\circ\text{C}$	-6/+21.2
10/1,450	200	20	$3.50 \times 10^{-4} / ^\circ\text{C}$	-5/+23
16/2,320	215	30	$4.50 \times 10^{-4} / ^\circ\text{C}$	-1/+30.2

Key Chemical Resistance:

Isolast® is resistant to the following chemical groups. For more detailed information refer to our Chemical Compatibility Guide which is available from your local Trelleborg Sealing Solutions technical Marketing Company (see back cover) or online at www.tss.trelleborg.com.



- Concentrated organic and inorganic acids
- Strong alkalis and bases
- Alcohols, aldehydes
- Ketones, esters, ethers
- Halogens and strong oxidizing media
- Hydraulic and fuel oils, fuels (e.g. Skydrol®, Pydraul®)
- Most organic solvents
- Hot water/steam*
- CIP/SIP cleaning media
- Aliphatic and aromatic amines
- Ethylene oxide and propylene oxide

Storage conditions for Isolast® perfluoroelastomer seals

Isolast® materials have a minimum 18 year storage life provided the products are sealed in the original packaging.

For further information regarding seal storage, please refer to the **Isolast®** Chemical Compatibility Guide.

General design considerations

Some important considerations when designing sealing systems with **Isolast®**:

1. Perfluoroelastomers have a higher volumetric coefficient of expansion than fluoroelastomers or other sealing materials. The volumetric expansion when warming the material from +20 °C/+68 °F to +240 °C/+464 °F is circa 25 percent. At room temperature the groove should be only 75 percent filled to avoid extrusion of the seal at higher temperatures.
2. For static applications the installation pressure should be between 12 – 18 percent. Larger pressures will, over time, increase the compression set and could lead to premature failure of the seal. When the operating temperature is under 0 °C/+32 °F an installation pressure of 15 – 21 percent is recommended.
3. Elastomers will tend to act as a highly viscous fluid under pressure and require support or anti-extrusion devices where high pressures and/or temperatures are experienced. **Isolast®** perfluoroelastomer seals used in pressure applications exceeding 150 MPa/21,755 psi require PTFE back-up rings.
4. When operating at or below TR-10 values, shock loads should be avoided to maintain sealing integrity.
5. Care should be taken during installation of **Isolast®** materials to avoid over-stretching the seal (*max. 50 percent*).

*For further **Isolast®** details or general inquiries concerning the full range of Trelleborg Sealing Solutions products, please refer to your local Trelleborg Sealing Solutions Marketing Company (see back cover).*

Online services

Trelleborg Sealing Solutions is making it easy to design and specify seals, online. Our simple O-Ring calculator, with unique functions, allows you to easily specify the correct O-Ring for your application. With the CAD Online service, at the click of a mouse, you can download seal profiles to use in component designs. These free-of-charge programs are compatible with all commonly-used CAD systems and save users design time.

From the Isolast® Chemical Compatibility Guide

On this page you will find the introductory portion of our **Isolast®** Chemical Compatibility Guide. To download the complete Chemical Compatibility Guide, visit www.tss.trelleborg.com. Please contact your local Trelleborg Sealing Solutions Marketing Company for more information.

Isolast® perfluoroelastomer seals are available in a range of compounds to suit the most demanding applications in the chemical processing industries, food, beverage and pharmaceutical production, semiconductor manufacturing and oil & gas exploration.

The standard **Isolast®** J9503 material is manufactured from a general purpose compound suitable for most chemical processing applications ranging from -25 °C/-13 °F to +240 °C/+464 °F.

Isolast® J9503 seals offer outstanding resistance to most acids, ketones, esters, solvents, amines, hot water/steam, ethylene and propylene oxide.

For temperatures in excess of +240 °C/+464 °F and up to +325 °C/+617 °F, **Isolast®** J8325 is the preferred standard grade. **Isolast®** J8325 shows excellent general chemical resistance and low swelling properties in organic and inorganic acids, aldehydes and ketones. It has outstanding hot air aging properties. This grade is not recommended in hot water/steam or aliphatic amines applications at higher temperatures. It should never be used in applications involving ethylene and propylene oxide.

Specialized materials are available for specific applications. Please refer to the Chemical Compatibility Guide carefully or contact your local marketing company for selection of the preferred grade.

Using this Guide

All elastomer products are made from a basic elastomeric polymer compounded with fillers, additives and curing agents.

The formulation is chosen to provide the best balance of properties for each application. We have developed thousands of compounds to provide our customers with sealing solutions across a broad range of industries. Our world-leading expertise has been applied to the compounds used for **Isolast®** seals.

The effect of immersion in a fluid on an elastomer largely depends on the base polymer. Reaction with the fillers, additives and curing agents is normally of lower significance. However, in certain media the possibility of a reaction has to be considered.

Isolast® perfluoroelastomer parts should always be tested for suitability when used in fluids containing high concentrations of some diamines, nitric acid and basic phenols at temperatures in excess of +100 °C/+212 °F.

It is important to recognize when using this guide that the ratings shown are based on published data and immersion tests. These tests are conducted under laboratory conditions, and may not represent adequately the conditions in the field.

Relative short-term laboratory tests may not pick up all the additives and impurities which may exist in long-term service applications. However, **Isolast®** perfluoroelastomer parts, with their outstanding chemical resistance, are most likely to provide excellent service life.

Care must be taken to ensure that all aspects of the application are considered carefully before a material is selected. For example, at elevated temperatures some aggressive fluids can cause a much greater effect on an elastomer than at room temperature.

Physical properties as well as fluid compatibility need to be considered. Compression set, hardness, abrasion resistance and thermal expansion can influence the suitability of a material for a particular application.

It is recommended that users conduct their own tests to confirm the suitability of **Isolast®** perfluoroelastomer seals for each application. Our experienced technical staff can be consulted for further information on specific applications.

Ratings are shown for four other commonly used elastomers: Ethylene-Propylene-Dien (EPDM), silicone (VMQ), fluorosilicone (FVMQ) and fluorocarbon (FKM). These have been included primarily for comparison and reflect the performance of typical compounds. In practice the performance of actual compounds may differ substantially from what is shown here. Ratings published here for these elastomers should not be used as the basis for choice in any application.

If an elastomer is to be used in contact with foodstuffs or beverages, users should confirm that the elastomer complies with any statutory regulations that might apply. For medical and pharmaceutical applications it is also important that direct advice is gained from the manufacturer.

Contact your local marketing company for further information:

Europe	Telephone	Americas	Telephone
AUSTRIA - Vienna <small>(ALBANIA, BOSNIA AND HERZEGOVINA, MACEDONIA, SERBIA AND MONTENEGRO, SLOVENIA)</small>	+43 (0) 1 406 47 33	AMERICAS - REGIONAL	+1 260 749 9631
BELGIUM - Dion-Valmont <small>(LUXEMBOURG)</small>	+32 (0) 10 22 57 50	BRAZIL - São Paulo	+55 11 3372 4500
BULGARIA - Sofia <small>(ROMANIA)</small>	+359 (0)2 969 95 99	CANADA - Etobicoke, ON	+1 416 213 9444
CROATIA - Zagreb	+385 (0) 1 24 56 387	MEXICO - Mexico City	+52 55 57 19 50 05
CZECH REPUBLIC - Rakovnik <small>(SLOVAKIA)</small>	+420 313 529 111	USA, East - Conshohocken, PA	+1 610 828 3209
DENMARK - Hillerød	+45 48 22 80 80	USA, Great Lakes - Fort Wayne, IN	+1 260 482 4050
FINLAND - Vantaa <small>(ESTONIA, LATVIA)</small>	+358 (0) 207 12 13 50	USA, Midwest - Lombard, IL	+1 630 268 9915
FRANCE - Maisons-Laffitte	+33 (0) 1 30 86 56 00	USA, Mountain - Broomfield, CO	+1 303 469 1357
GERMANY - Stuttgart	+49 (0) 711 7864 0	USA, Northern California - Fresno, CA	+1 559 449 6070
GREECE	+41 (0) 21 631 41 11	USA, Northwest - Portland, OR	+1 503 595 6565
HUNGARY - Budaörs	+36 (0) 23 50 21 21	USA, South - N. Charleston, SC	+1 843 747 7656
ITALY - Livorno	+39 0586 22 6111	USA, Southwest - Houston, TX	+1 713 461 3495
THE NETHERLANDS - Barendrecht	+31 (0) 10 29 22 111	USA, West - Torrance, CA	+1 310 371 1025
NORWAY - Oslo	+47 22 64 60 80		
POLAND - Warsaw <small>(LITHUANIA, UKRAINE, BELARUS)</small>	+48 (0) 22 863 30 11	Asia Pacific	Telephone
RUSSIA - Moscow	+7 495 982 39 21	ASIA PACIFIC REGIONAL	+65 6 577 1778
SPAIN - Madrid <small>(PORTUGAL)</small>	+34 (0) 91 71057 30	CHINA - Hong Kong	+852 2366 9165
SWEDEN - Jönköping	+46 (0) 36 34 15 00	CHINA - Shanghai	+86 (0) 21 6145 1830
SWITZERLAND - Crissier	+41 (0) 21 631 41 11	INDIA - Bangalore	+91 (0) 80 2245 5157
TURKEY	+41 (0) 21 631 41 11	JAPAN - Tokyo	+81 (0) 3 5633 8008
UNITED KINGDOM - Solihull <small>(EIRE)</small>	+44 (0) 121 744 1221	KOREA - Anyang	+82 (0) 31 386 3283
AFRICA REGIONAL	+41 (0) 21 631 41 11	MALAYSIA - Kuala Lumpur	+60 (0) 3 9059 6388
MIDDLE EAST REGIONAL	+41 (0) 21 631 41 11	TAIWAN - Taichung	+886 4 2382 8886
		THAILAND - Bangkok	+66 (0) 2732-2861
		SINGAPORE	
		and all other countries in Asia	+65 6 577 1778

www.tss.trelleborg.com

