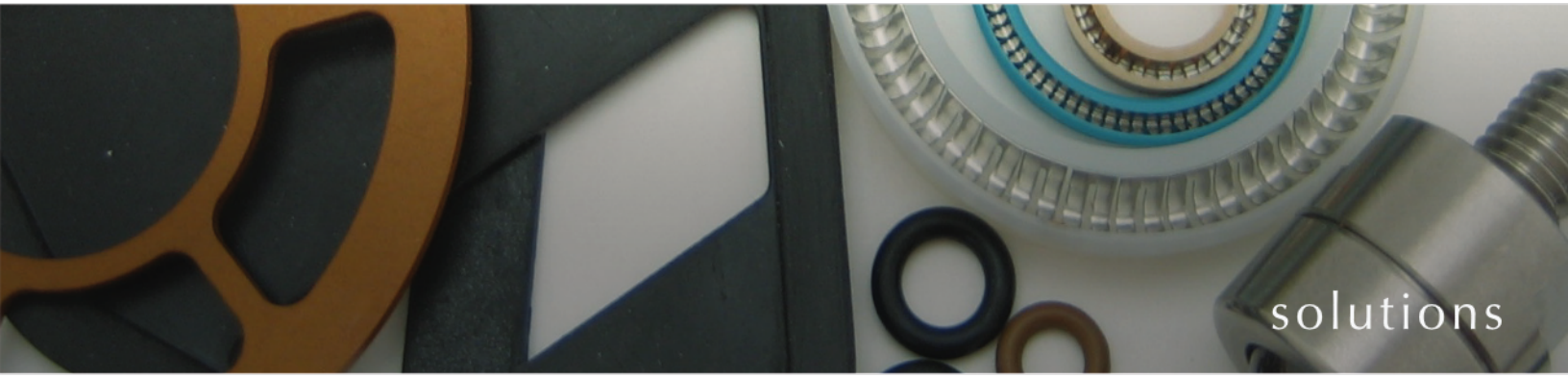
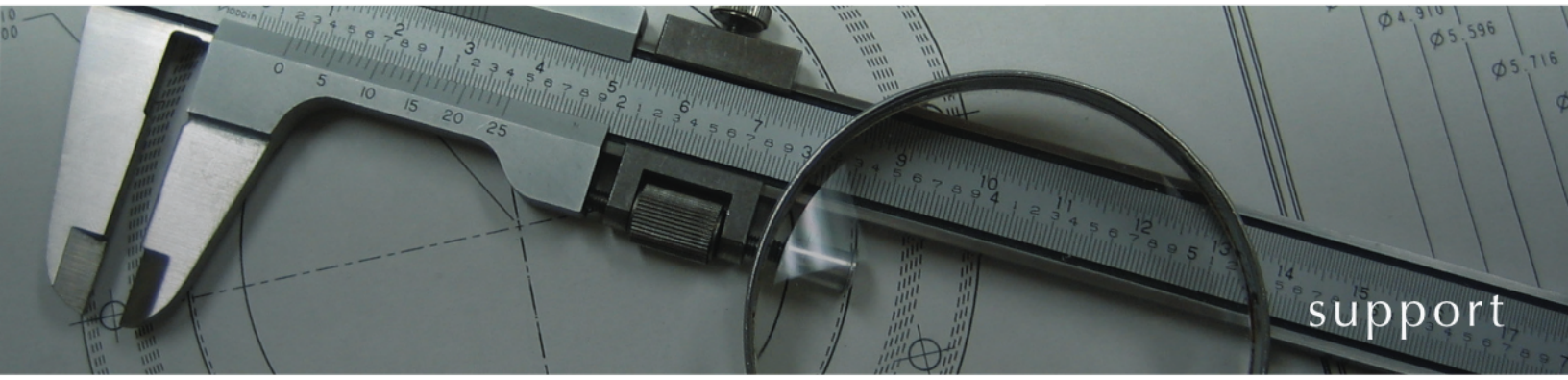
bay seal company, inc.

O-Ring Reference Guide





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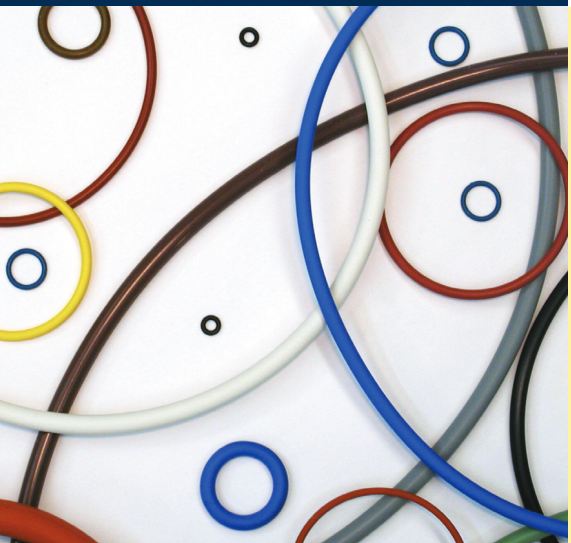
Bay Seal Company
O-Ring
Reference Guide



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Warning

Improper selection and use of any information described herein can cause death, personal injury and/or property damage.

The user of this guide should analyze all aspects of an application(s) and review the information of the product or system within the current product catalog. The information within this guide has been researched and tested, but it is the users responsibility to conduct their own analysis and testing due to the operating and environmental conditions that may vary. The user is solely responsible for making the final selection of any and all products regarding an application(s).

Introduction

Bay Seal Company has compiled this O-ring reference guide to provide a quick and easy source for all your basic O-ring sizing and material information needs. Also included within this guide are gland design guidelines, elastomer/compound information, and a complete listing of AS568 and JIS O-ring size references.

Although this O-ring reference guide is extensive and informative, please rely on the expertise of Bay Seal Company to assist you with all of your sealing inquiries. If you do not see a size that fits your needs, let us help you with custom sizes and molded products. Remember, the suggested guidelines are for nominal conditions, but minimum and maximum conditions should always be considered when choosing the correct sealing solution. It is highly recommended that the end users conduct their own evaluations and tests when choosing a seal for any application.

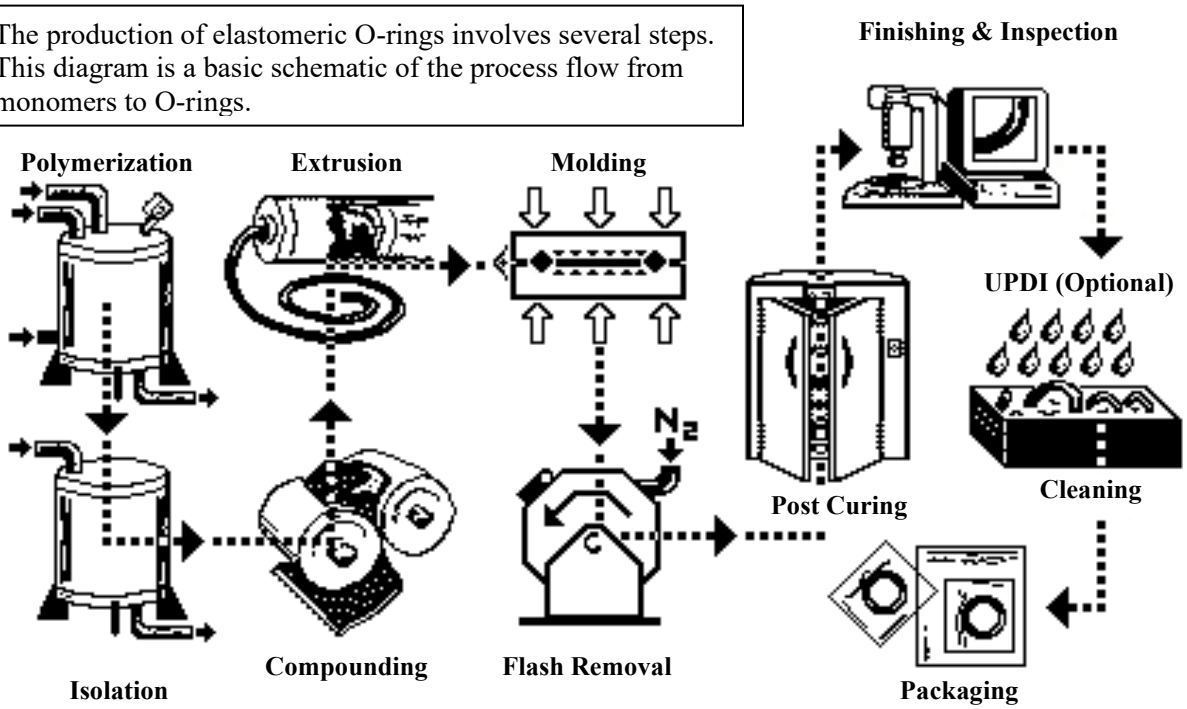
What is an O-ring?

An O-ring is a torus, or doughnut-shaped object, generally made from an hollow or solid elastomer, but can also be made in other plastic materials and in metals, and are used primarily for sealing.

An O-ring is usually needed for closing off a passageway and prevents an unwanted escape or loss of a fluid. The seal consists of an O-ring installed in a gland, which is usually a circular design. The elastomeric material has a cross section that is also a virtual circle. The gland is the cavity (usually machined metal) into which the O-ring is placed. The combination of these two elements comprises an O-ring seal.

How are O-rings made?

The production of elastomeric O-rings involves several steps. This diagram is a basic schematic of the process flow from monomers to O-rings.



Standard O-Ring and Seal Elastomers

Elastomer & Temperature	Applications	Use with These Fluids	Do Not Use with These Fluids
Ethylene Propylene (EPDM) -57°C to +149°C (-70°F to +300°F)	Ethylene Propylene has excellent ozone and chemical resistance characteristics. Generally used in automotive brake systems.	Brake fluids, refrigerants, steam	Petroleum oils, diesel lubricants
Fluoroelastomer (FKM) -26°C to +205°C (-15°F to +400°F)	Featuring excellent resistance to petroleum products and solvents, with good high temperature and low compression set characteristics. For use with wide chemical exposure situations, and with low gas permeability, it is also suited for hard vacuum service.	Petroleum oils, gasoline, transmission fluid	Acetone, H2S, hot water, amines
Fluorosilicone (FVMQ) -73°C to +190°C (-100°F to +375°F)	Fluorosilicone combines the good high and low temperature stability of silicone with the fuel, oil, and solvent resistance of fluorocarbon.	Petroleum oils, gasoline	Acetone, ethyl acetate
Nitrile (Buna-N) (NBR) -34°C to +121°C (-30°F to +250°F) **Nitrile (Low-Temp)** -55°C to +107°C (-65°F to +225°F)	Nitrile combines excellent resistance to petroleum based oils and fuels, silicone greases, hydraulic fluids, water and alcohols. It has a good balance of working properties such as low compression set, high tensile strength, and high abrasion resistance, combined with a low cost.	Petroleum oils, water, hydraulic oils	Brake fluid, ketones, phosphate esters, H2S
Perfluoroelastomer (FFKM) -40°C to 327°C (-40°F to +620.6°F)	Perfluoroelastomers possess outstanding resistance to a broad range of chemicals, excellent heat resistance, and overwhelming outgassing performance within vacuum environments.	Most chemicals	---
Silicone (VMQ) -54°C to +232°C (-65°F to +450°F)	Silicone elastomer is resistant to high, dry heat, in primarily static applications. It has low compression set characteristics and a wide temperature range.	Dry heat, alcohol, vegetable oil	Petroleum oils & fuels

Comparison of properties of Commonly Used Elastomers

P - POOR F - FAIR G -GOOD E - EXCELLENT	**Abrasion Resistance**	**Acid Resistance**	**Chemical Resistance**	**Cold Resistance**	**Dynamic Properties**	**Electrical Properties**	**Flame Resistance**	**Heat Resistance**	**Impermeability**	**Oil Resistance**	**Ozone Resistance**	**Set Resistance**	**Tear Resistance**	**Tensile Strength**	**Water/Steam Resistance**	**Weather Resistance**
Ethylene Propylene (EPDM)	GE	G	E	GE	GE	G	P	E	G	P	E	GE	GE	GE	E	E
Fluoroelastomer (FKM)	G	E	E	FP	GE	F	E	E	G	E	E	GE	F	GE	FG	E
Fluorosilicone (FVMQ)	P	FG	E	GE	P	E	G	E	P	G	E	GE	P	F	F	E
Nitrile or Buna-N (NBR)	G	F	FG	G	GE	F	P	G	G	E	P	GE	FG	GE	FG	F
Perfluoroelastomer (FFKM)	P	E	E	FG	F	E	E	E	G	E	E	G	PF	FG	GE	E
Silicone (VMQ)	P	FG	GE	E	P	E	F	E	P	PG	E	GE	P	P	F	E

Dupont Kalrez®

Kalrez® is a perfluoroelastomer and is supplied in standard O-rings or custom shapes and resists over 1800 different chemicals while offering high temperature stability up to 327c. The advanced properties of Kalrez® help maintain seal integrity, reduce maintenance and operating costs and improve safety while also providing reliable, long-term service with a wide range of aggressive industrial and electronic grade chemicals. Kalrez® is used in multiple markets, including Semiconductor, Biomed/Pharmaceutical, Chemical and Aerospace.

Semiconductor Product Selector Guide – March 2017

	Process Type	Typical Seal Temperature	Typical Process Environment	Suggested Products*	Comments	Typical Applications
Plasma Processes	PECVD/ALD/ HDPCVD	250°C	TMS, DEMS, TEOS, SiH_4, C_3H_6, NH_3, SiF_4, O_2, N_2O, NF_3	9100	9100 – Low erosion rate and ultra-low particle generation 9500 – Excellent resistance to ozone, ammonia, steam and plasma radicals. 8705 – Excellent resistance to UV light 9300 – Excellent resistance to plasma ions and radicals 8002 – Excellent resistance to oxygen plasma	Dynamic: • Door seals • Gate valves • Pendulum valves Static: • Chamber lid seals • Exhaust valves • Gas inlet/outlet/mixing block seals • Window seals • Center ring seals Other: • Seals for heat-traced lines in sub-fab foreline and exhaust systems*
	PECVD Curing Process	200°C	O_3, UV light	8705* Quartz Window Seal 9500* All other seal locations		
	SACVD / FCVD	280°C	TEP, TEBO, TEOS, O_3, NF_3, NH_3	9500		
	Ash/Strip	200°C	O_2, CF_4, CHF_3, NH_3, Water Vapor, Forming Gas	8002		
	Dielectric (Oxide) Etch	200°C	CF_4, C_3F_8, CHF_3, SF_6, O_2, H_2,	9300		
	Conductor (Poly/Metal) Etch	200°C	CF_4, CHF_3, HBr, BCl_3, CCl_4, Cl_2	9100		
Thermal Processes	ALD LPCVD	280°C	SiH_4, HF, F_2, Cl_2, NF_3, H_2O Vapor, O_2	8900	8900 – Excellent thermal stability and very low outgassing properties. 7075UP – Excellent resistance to ClF_3. 8575 – Low IR absorption due to white color.	• Quartz chamber seal • Fittings • Center ring • Plenum seals
	Metal CVD	280°C	Organic precursors, WF_6, $TiCl_4$, ClF_3, NF_3	7075UP		
	Oxidation Diffusion	300°C	N_2, O_2, H_2O, HCl, Cl_2, O_3	8900 8575/8475		
	Lamp Anneal RTP	300°C	Infrared light	8575		
Wet Processes	Wafer Prep	125°C	UPDI, Piranha, SC-1, SC-2, O_3, HF (49%)	6375UP	6375UP – General purpose product for all wet process applications.	• Door/lid seals • Drain seals • Seals for chemical containers • Fittings • Seals for filters/ connectors • Flow meters
	Etching	180°C	HNO_3, HF, H_2O, H_3PO_4, HNO_3			
	Photolithography	125°C	H_2SO_4 + Oxidant, Organic Acids, nMP			
	Stripping	125°C	nMP/Alkanolamine Hydroxlamine			
	Copper Plating	100°C	$CuSO_4$ Solution H_2SO_4, H_2O_2			

* Please consult a Kalrez® Application Engineer to assess performance fit in your application. Please refer to the Kalrez® Application Guide (www.kalrez.com) for specific chemical compatibility ratings for Kalrez® products.

DuPont™ Kalrez® Parts for the Semiconductor Industry

Kalrez® perfluoroelastomer parts have been used successfully in highly aggressive sealing environments for over 30 years. Kalrez® parts combine the resilience and sealing force characteristics of an elastomer with the chemical inertness and thermal stability of DuPont™ Teflon® fluoropolymer resin. DuPont offers molded O-rings and custom seals using a series of specialty products and ultrapure processing for the semiconductor industry. DuPont™ Kalrez® UltraPure™ parts have excellent chemical and thermal stability and have been specially formulated and processed to meet the unique requirements of wafer processing environments.

Chemical and Thermal Resistance

Kalrez® seals resist attack by over 1,800 chemicals including reactive gases and plasmas, alkalis, acids and solvents. Even in contact with these corrosive chemicals, Kalrez® seals retain their elastomeric properties at temperatures as high as 325 °C. DuPont has over 30 years' experience in perfluoroelastomer research including polymer development, compounding, and parts manufacturing. As the sealing needs of the semiconductor industry have evolved, this experience has enabled DuPont to introduce new products that continue to increase seal life and reduce process contamination levels.

Ultrapure Processing Reduces Residual Contamination

Ultrapure post-cleaning and packaging is performed on Kalrez® parts as a secondary operation in a Class 100 clean room. Parts are cleaned using a proprietary process, followed by multiple rinses in UPDI water, and then dried under a filtered air stream. The parts are sealed in certified-clean, antistatic packaging material and shipped double-bagged, permitting easy clean room use by OEMs and fab lines.

Ultrapure processing is standard for Kalrez® 9100, Kalrez® 9300, Kalrez® 9500, Kalrez® 8002, Kalrez® 8085, Kalrez® 8900, Kalrez® 8475 and Kalrez® 6375UP. It is optional for Kalrez® 1050LF. For these products, ultrapure processing can be specified by adding a "UP" suffix to the product designation (e.g., Kalrez® 1050UP).

Suggested Products for Semiconductor Use

DuPont™ Kalrez® 9100 is an amber translucent product targeted specifically for HDPCVD and PECVD processes. It has also exhibited excellent performance in "select" etch process applications. Kalrez® 9100 has been specifically designed for low erosion and ultra-low particle generation in harsh plasma environments. It offers excellent thermal stability, very low outgassing as well as excellent elastic recovery and good mechanical strength properties and is well suited for both static and "select" dynamic sealing applications. A maximum continuous service temperature of 300 °C is suggested. Ultrapure post-cleaning and packaging is standard for all Kalrez® 9100 parts.

DuPont™ Kalrez® 9300 is a brown product for Dielectric (Oxide) Etch processes. It has been specifically designed for use in applications where the plasma environment is a combination of ions ("physical") and radicals ("chemical"), i.e., where a balance of "physical" and "chemical" plasma erosion resistance is typically required. Kalrez® 9300 exhibits excellent resistance to oxygen and fluorine-based plasma and etch process chemistry. It also offers very low metals content, excellent thermal stability and mechanical strength and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 300 °C is suggested. Ultrapure post-cleaning and packaging is standard for all Kalrez® 9300 parts.

DuPont™ Kalrez® 9500 is a tan product for Deposition, Ash/Strip and Conductor (Poly/Metal) Etch processes. It has been specifically designed for use in applications where ozone is used for processing, e.g. SACVD, PECVD ultra-low K (BLOK™) and where the plasma environment is more "chemical", i.e., where oxygen and fluorine radicals are more dominant. Kalrez® 9500 exhibits excellent resistance to CVD and ash/strip process chemistry, i.e., ozone, ammonia and water vapor. It also offers outstanding thermal stability, very low outgassing and excellent mechanical strength and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 310 °C is suggested. Kalrez® 9500 can also withstand short term excursions up to 325 °C. Ultrapure post-cleaning and packaging is standard for all Kalrez® 9500 parts.

DuPont™ Kalrez® 8900 is a black product for all thermal processes, e.g., oxidation, diffusion furnace, metal CVD, ALD and LPCVD. It offers outstanding thermal stability, very low outgassing and excellent (low) compression set properties. Kalrez® 8900 exhibits excellent retention of physical properties at elevated temperatures, has excellent mechanical strength and is well-suited for both static and dynamic sealing applications. A maximum continuous service temperature of 325 °C is suggested. Short excursions to higher temperatures may also be possible. Ultrapure post-cleaning and packaging is standard for all Kalrez® 8900 parts.

DuPont™ Kalrez® 8085 is a beige, general purpose product for "select" etch, ash/strip and deposition processes, e.g., HDPCVD, PECVD and SACVD. It has been formulated for minimal particle generation in NF3 plasma. Kalrez® 8085 exhibits very low particle generation and low weight loss in oxygen and fluorine-based plasma, has excellent mechanical strength and is well-suited for both static and dynamic sealing applications (e.g., bonded slit valve doors, bonded gate valves, bonded pendulum valves, gas orifice seals, gas feed-through seals, chamber lid seals). A maximum continuous service temperature of 240 °C is suggested. Kalrez® 8085 can also withstand short-term excursions to 275 °C. Ultrapure post-cleaning and packaging is standard for all Kalrez® 8085 parts.

DuPont™ Kalrez® 8475 has been specifically developed to meet the challenging requirements associated with lamp anneal and RTP sealing applications in semiconductor thermal processes. It exhibits excellent thermal stability and long-term sealing performance and has less IR absorption significantly reduced outgassing properties at elevated temperatures. Kalrez® 8475 has good mechanical properties and is well-suited for static and low stress/low sealing force applications (e.g., quartz tube seals, ball joint seals, bell jar seals, plenum seals). A maximum continuous service temperature of 300 °C is suggested. Ultrapure post-cleaning and packaging is standard for all Kalrez® 8475 parts.

DuPont™ Kalrez® 6375UP is a general-purpose black product for all wet process applications. This product exhibits excellent chemical resistance to all different types of wet process chemicals including acids, bases and amine-base strippers. It features low elemental extractables with good mechanical and compression set properties and is well-suited for both static and dynamic wet process seal applications (e.g., filter seals, drain seals and flow meters). A maximum continuous service temperature of 275 °C is suggested. Ultrapure post-cleaning and packaging is standard for Kalrez® 6375UP parts.

DuPont™ Kalrez® Parts for the Chemical Processing Industry
Kalrez® perfluoroelastomer parts provide exceptional service in high-heat, aggressive-chemical processing environments. Kalrez® chemical processing seals are a high-performance, cost-effective choice for demanding manufacturing uses. They provide broad chemical resistance and stability up to 327°C, with a range of grades to match specific applications.

Suggested Products for Chemical Processing Use
DuPont™ Kalrez® 0040 perfluoroelastomer parts are specifically designed for low temperature environments where significant chemical resistance is required. Low temperature sealing performance (-42°C) typically unattainable for perfluoroelastomers parts is achievable with Kalrez® Spectrum™ 0040. Kalrez® Spectrum™ 0040 is an excellent choice in applications such as couplings for the chemical transportation industry or for other applications where chemical resistance and elasticity are required in some of the coldest environments. The volume swell for Kalrez® Spectrum™ 0040 is approximately 10% when exposed to nitric acid at 110°C for 168 hours.

DuPont™ Kalrez® 0090 perfluoroelastomer parts deliver durable, reliable sealing solutions for applications requiring excellent rapid gas decompression (RGD) properties as well as high hardness, high modulus properties, and excellent extrusion resistance (even without backup rings). Potential oil and gas applications include downhole equipment such as drilling and completion tools, as well as industrial equipment including pumps, valves and compressors. Kalrez® 0090 has been certified by two independent laboratories to meet rigorous requirements for resistance to RGD. Kalrez® 0090 retains good physical properties up to temperatures as high as 250 °C (482 °F) and down to –21 °C (–5.8 °F). Under pressurized conditions, in laboratory tests*, Kalrez® 0090 has demonstrated low temperature performance down to –40 °C (–40 °F).

DuPont™ Kalrez® Spectrum™ 6375 is designed to give outstanding performance in the widest possible range of chemicals and temperatures. Mixed streams, once a problem for many chemical processors, can now be handled by 6375, furthermore, the curing system also allows for a maximum service temperature of 275 °C (525 °F) which translates to increased chemical resistance over all temperature ranges, especially if high temperature process excursions occur. This combination of chemical and thermal resistance provides advantages for chemical processors. However, if optimum chemical resistance is required, then applications must be individually reviewed for the optimum compound selection.

DuPont™ Kalrez® Spectrum™ 6380 perfluoroelastomers parts are a non-black product specifically developed for chemical processes involving hot, aggressive amines. In addition, it has excellent overall chemical resistance (see chart below). This cream colored product is easily identifiable when selecting an O-ring material for harsh chemical plant services. This material has excellent mechanical properties and is a top choice for both static and dynamic sealing applications. A maximum service temperature of 225 °C is suggested while short-term excursions to higher temperatures are permissible.

DuPont™ Kalrez® Spectrum™ 7075 is designed for general-purpose use as O-rings or custom sealing components in the chemical and hydrocarbon processing industries. It is a carbon black-filled compound with mechanical properties designed for improved sealing performance in temperature cycling applications. 7075 has improved thermal resistance that extends maximum service temperature to 327 °C (620 °F). It is not suggested for use in severe aqueous and amine applications where Kalrez® Spectrum™ 6375 remains the preferred compound.

DuPont™ Kalrez® Spectrum™ 7090 perfluoroelastomer parts are specifically targeted for use in applications requiring high hardness/higher modulus properties. These specialty black parts have excellent mechanical properties including compression set resistance, seal force retention, response to temperature cycling effects and rapid gas decompression resistance. Kalrez® Spectrum™ 7090 perfluoroelastomer parts are well suited for both static and dynamic sealing applications, especially applications that require extrusion resistance at higher temperatures. They also offer outstanding thermal stability and chemical resistance. A maximum service temperature of 325 °C (617 °F) is suggested. Short excursions to higher temperatures may also be possible.

DuPont™ Kalrez® Spectrum™ 7275 parts are a light brown product based on a proprietary crosslinking system targeted specifically for the chemical processing industry. It exhibits minimal swelling and improved retention of physical properties when exposed to aggressive chemicals, e.g., concentrated nitric acid, organosilanes, chlorosilanes, pure ethylene oxide, butyraldehyde, amines and vinyl and acrylic monomers. It also has excellent compression set resistance and good retention of physical properties after aging at high temperatures. A maximum service temperature of 300 °C is suggested.

DuPont™ Kalrez® Spectrum™ 7390 perfluoroelastomer parts are designed to reliably seal in the most demanding chemical and how water/steam environments. Based on a proprietary crosslinking system, Kalrez® 7390 parts can meet your 90 durometer (Shore A) FFKM specifications in numerous shapes and configurations where higher mechanical strength is needed. Thermally stable up to 300°C, it is an ideal fit for upstream and downstream applications such as oilfield product/completion equipment, wireline and drilling tools, steam-assisted gravity drainage (SAGD), cyclic steam simulation (CSS), mechanical seals, valves, compressors, and process instrumentation.

DuPont™ Kalrez® Parts for the Life Sciences Industry

Kalrez® perfluoroelastomer parts provide the highest levels of chemical resistance, outstanding thermal and steam resistance and low contamination from extractables for demanding applications in the life sciences sector where FDA compliance is required. Kalrez® parts deliver optimal sealing solutions through longer seal life versus lower performing elastomers, cleanliness and high levels of resistance to chemicals and high temperatures. They are resistant to 1800 chemicals and solvents and retain high levels of elasticity and recovery, even after long-term exposure to elevated temperatures. All this results in longer, more effective performance and increased safety and efficiency in production.

Life Sciences Product Selector Guide – October 2018

	Kalrez® 6230	Kalrez® 6221	Kalrez® LS205	Kalrez® LS222	
Available geometries	O-rings & Specialty Shapes	O-rings	Specialty Shapes & O-rings	High Volume Specialty Shapes	
Color	Black	White	White	Black	
APPLICATIONS					
Rotating equipment (mixers, pumps, centrifuges, etc.)	✓	✓	✓		
Filtration and Drying	✓	✓	✓		
Piping					
Flow regulation (valves)				✓	
WFI (water for injection)	✓	✓			
Medical packaging				✓	
CERTIFICATIONS					
US FDA	✓	✓	✓	✓	
USP <87> & <88> Class VI @ 121°C	✓	✓	✓	✓	
3-A	✓	✓	✓		
Japan Pharmacopeia		✓	✓		
EC 1935/2004	Please Contact DuPont for Additional Information				

Suggested Products for Chemical Processing Use

DuPont™ Kalrez® 6230 perfluoroelastomer parts are compliant with the United States' Food and Drug Administration's regulations for repeated use in contact with food as described by 21 CFR177.2600 and Food Contact Notification 000101. Kalrez® parts made from compound 6230 have been tested in accordance with the United States Pharmacopoeia Class VI (USP Class VI) testing protocol and meet the test requirements of a USP Class VI polymer. This isa black product that offers excellent steam cycling resistance and reduces extractables from sealing materials to trace levels.

DuPont™ Kalrez® 6221 perfluoroelastomer parts are compliant with the United States' Food and Drug Administration's regulations for repeated use in contact with food as described by 21 CFR177.2600 and Food Contact Notification 000101. Kalrez® parts made from compound 6221 have been tested in accordance with the United States Pharmacopoeia Class VI (USP Class VI) testing protocol and meet the test requirements of a USP Class VI polymer. This isa white product that offers excellent steam cycling resistance and reduces extractables from sealing materials to trace levels. It is only available in O-ring form; custom geometries are not available.

DuPont™ Kalrez® LS205 perfluoroelastomer parts are a white product for use in food handling and pharmaceutical applications where FDA and/or USP <87> and <88> Class VI compliancy are required. Kalrez® LS205 parts provide superior chemical resistance and low extractables in demanding applications. This product is also well suited for custom parts and other non-O-ring applications. A maximum application temperature of 225°C (437°F) is suggested.

DuPont™ Kalrez® LS222 perfluoroelastomer parts are black product that has been specifically developed for use in high volume medical packaging and disposable devices (e.g., micro-valves, needle covers, serum stoppers, plungers, infusion hangers, etc.). This exciting new development represents an expansion of the Kalrez® product line to meet the demand from OEMs and Life Science Manufacturers who require large quantities of high-quality parts. A wide range of dimensions and select custom shapes are offered.

How are O-rings sized?

O-ring seals have been standardized under the basic industrial standard dimensions of AS568 (Pages 12 through 21), an Aerospace Standard published by the Society of Automotive Engineers, and a multitude of military standards; AN6227 and MS28775 for general use; M25988, M83248, MS9020, MS9355, and MS29512 for straight-thread tube fittings; and MS28900 for electrical connectors.

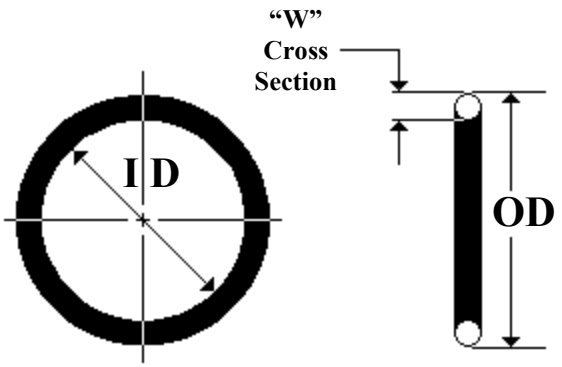
AN6227 is an Air Force-Navy Aeronautical Standard that covers 88 sizes of AS568. MS28775 is the basic standard on which AS568 was developed. M25988, M83248, MS9020, MS9355, and MS29512 cover 31 O-rings of slightly larger diameter cross-sections to be used for sealing straight-thread tube fittings. These O-rings are equivalent to dash numbers 901 through 932 of AS568. They are used in gland designs specified by military standards MS16142, MS33649, and MS33656 for tube fittings.

The Japanese International Standard (JIS B2404) is located on pages 22 through 24.

Other sizes, including metric, please contact Bay Seal Company.

How do I specify and order an O-ring?

If you know the particular O-ring that will help with your application, and you do not need the assistance from Bay Seal Company, please remember a few important measurements when ordering your desired O-ring.



Every O-ring order should be accompanied with the standard size number, the desired compound, and durometer.
Or
The I.D. (Inside Diameter) or O.D. (Outer Diameter), the W (Cross Section), the desired compound, and durometer.

Please Note: If you are unable to find the size you need within the charts located on pages 12 through 24, contact Bay Seal Company at (800) 273-SEAL (7325) to assist you.

Bay Seal Company offers many solutions that are non-standard and can assist you further with you sealing solutions. Other such solutions may include Spliced O-rings, Lathe Cuts, Custom Molded Parts, Rubber to Metal Bonding, and so much more. Contact us for all your sealing needs.

What is durometer?

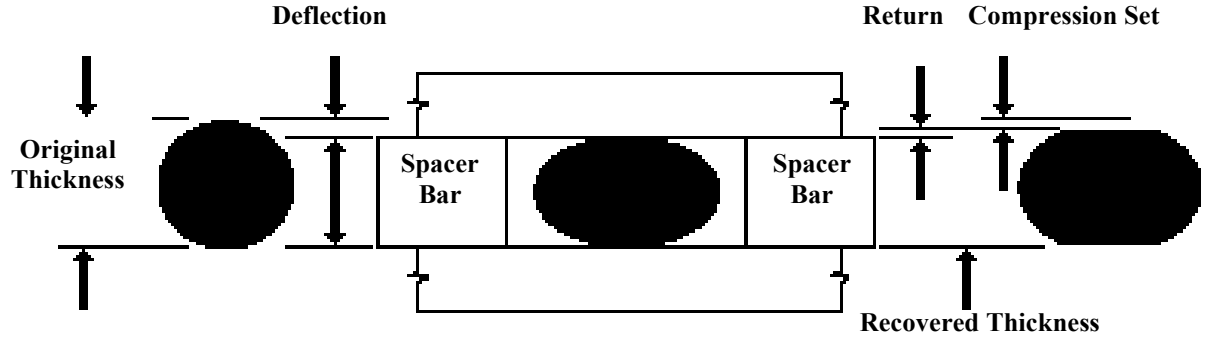
Durometer is the international standard for the hardness measurement of rubber, plastic, and other nonmetallic materials. Type (Shore) A and Type (Shore) M scales are the most commonly used measurement for the hardness of elastomer materials used for seals. Shore A is a measurement made on pellets or plied slabs on specimens that are flat and of a minimum thickness, and therefore should not be used for O-rings. Shore M is a micro hardness gauge and is appropriate for measuring the hardness of items on soft elastomers too thin or too irregular in shape, and with a cross sectional thickness up to 7 mm (0.275 in) that cannot be accurately measured with the Shore A device, such as O-rings. It is also good to note that Shore A measurements cannot be correlated to Shore M.

What is compression set?

Compression Set is the resistance of material to permanent deformation. ASTM D395 is a test in which an O-ring is compressed to 75% of it's original thickness, kept at that compression for 22 hours at 158°F, then released and allowed to return to its original thickness. The conclusion of this test is the percentage of the original compression (25%) which is not recovered.

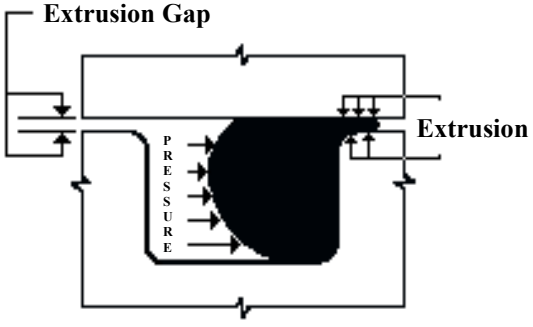
Calculations:

Compression Squeeze
Cross Section – Gland Height
Compression Ratio
Compression Squeeze x 100
Cross Section



What is extrusion?

Extrusion is the distortion, under pressure, of a portion of an O-ring into the clearance between two mating metal parts. In order to reduce extrusion, the extrusion gap must be reduced, or the material durometer must be increased, or a combination of both.



Maximum Recommended Extrusion Gap in Inches (mm)				
Pressure (PSI)	**Elastomer (Shore A) Hardness (Durometer)**			
	60	**70**	**80**	**90**
500	.010 (.25)	.015 (.38)	.020 (.51)	.025 (.64)
750	.005 (.13)	.011 (.28)	.016 (.41)	.023 (.58)
1000	.002 (.05)	.008 (.20)	.012 (.30)	.018 (.46)
1250	.001 (.02)	.004 (.10)	.009 (.23)	.015 (.38)
1500	N/A	.002 (.05)	.007 (.18)	.012 (.30)

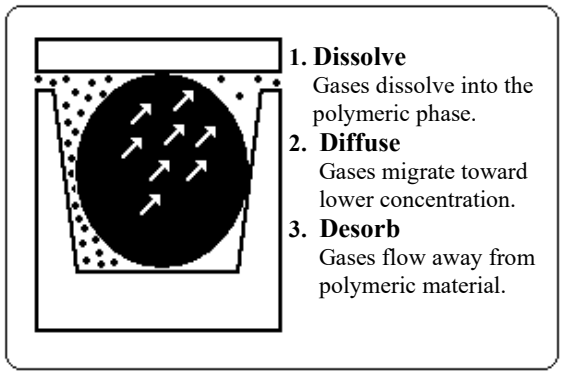
What is vacuum technology?

A vacuum is a space from which air and other gases have been virtually removed. Permeation, Outgassing, and Trapped Gas are three primary sources of residual gas contaminants from elastomeric seals which can enter into an evacuated space.

Permeation is the volumetric flow rate of a gas under steady-state conditions through a unit surface area of unit thickness at unit pressure difference. Permeability is a fundamental property of an elastomer. The solubility and diffusion of a gas through an elastomer affects the pump-down time as well as the vacuum achieved in a vacuum seal.

In General:

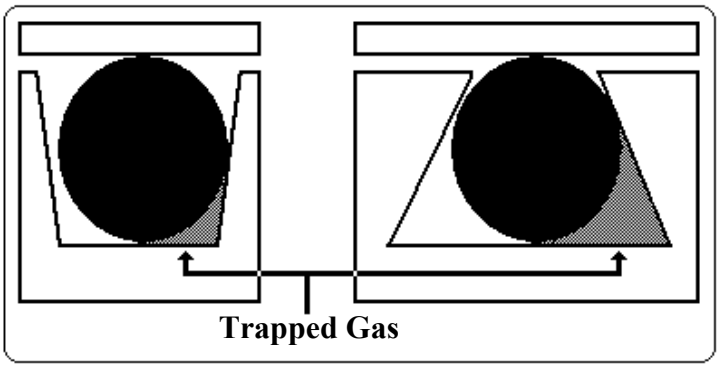
- Swelling decreases permeation rate.
- High pressures decrease permeation rate (reduction of free volume).
- Higher temperatures increase diffusion rate and permeation rate.
- Inorganic fillers eliminate diffusive passages and lower permeability.
- Larger molecules of gas lower the diffusion rate.



Outgassing is the release of volatile materials as an elastomer is heated, which affects vacuum performance. Many traditional seal materials contain small amounts of low-molecular-weight plasticizers, or process aids, that can volatilize under vacuum conditions. To significantly reduce outgassing, you may Heat an O-ring for several hours at 100°C and/or Vacuum bake an O-ring.

Trapped Gas refers to the release of gas trapped by the elastomer in the groove (especially dovetail grooves), which can slowly leak out over time.

Gas Trapped by Seal Design



What is vacuum pressure?

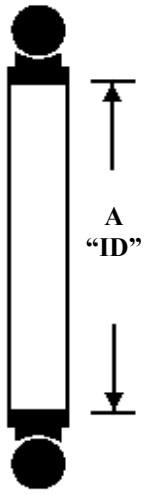
Vacuum is usually specified in terms of absolute pressure, hence, the lower the pressure, the higher the vacuum. Zero pressure would represent the ultimate vacuum, in which there are no gas molecules present in the volume under consideration. This situation is virtually impossible to achieve in practice.
Normal atmospheric pressure represents zero vacuum and is usually expressed in terms of the height of a column of mercury that it will support. A pressure conversion table is located on page 49.

Conversion Formulas:

Atmosphere x 1012.95 = millibar
Atmosphere x 760 = Torr
Atmosphere x 14.696 = lb/in^2 (PSI)
Atmosphere x 29.9213 = in Hg

What is an NW/ISO-type centering ring assembly?

Centering ring assemblies are necessary, when using NW/ISO flanges, to maintain a reliable and effective vacuum seal. The centering ring component is usually manufactured out of stainless steel or aluminum, but is not necessarily limited to those alloys when certain application conditions warrant other metals. The seal component can be any elastomeric compound, but are usually either a fluoroelastomer (FKM) or perfluoroelastomer (FFKM).



Centering Ring Assembly

Flange	O-Ring Size	A
NW-10	NW10X	0.456
NW-16	NW16X	0.625
NW-25	NW25X	0.964
NW-40	NW40X	1.560
NW-50	NW50X	1.967
ISO-63	ISO63X	2.630
ISO-80	ISO80X	3.140
ISO-100	ISO100X	3.890
ISO-160	ISO160X	5.900
ISO-200	ISO200X	8.260
ISO-250	ISO250X	10.140
ISO-320	ISO320X	12.180

X – This identification call-out should be the compound abbreviation. Nitrile = NBR, Fluoroelastomer = FKM, Perfluoroelastomer = FFKM (Call Bay Seal Company for assistance with specific manufacturer's compounds)

What is a spliced O-ring?

A spliced O-ring is made from an extruded cord and then vulcanized to form the O-ring size of need. Spliced O-rings are viable solutions when standard O-rings cannot be used within an application. The procedure of splicing an O-ring includes cutting an extruded elastomer to the desired length, making sure both ends are evenly cut and properly cleaned, applying uncured adhesive material to both ends, and then inserting into a splicing mold where consistent pressure and temperature are applied (pressure, temperature, and time varies with compound and cross section of the elastomer.)

Bay Seal Company has perfected this procedure and does provide this service to all of our customers. Please contact Bay Seal Company for information regarding spliced O-rings.

What is ID stretch and OD interference?

The ID and OD of an O-ring should be chosen to also minimize the chance for installation damage and wear during use. Following are some rules necessary for O-ring choice:

Calculations:

Piston Type Seal (Stretch)
Stretch = $\frac{\text{Gland} - \text{ID}}{\text{ID}}$ Max = 5%, Min = 0 %

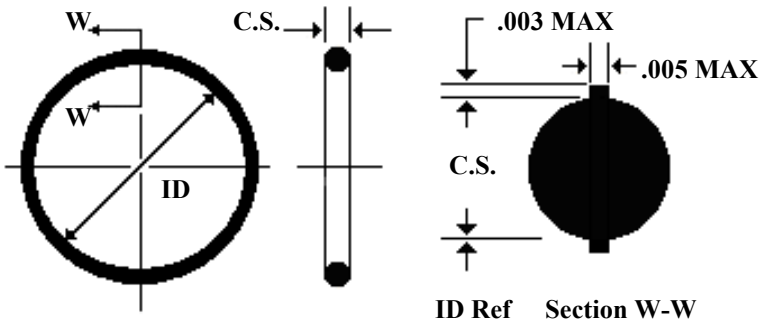
Rod Type Seal (Interference)
Interference = $\frac{\text{OD} - \text{Gland}}{\text{OD}}$ Max = 2 %, Min = 0%

External Pressure Face Type Seal (Stretch)
Stretch = $\frac{\text{In} - \text{ID}}{\text{ID}}$ Max = 5 %, Min = 0 %

Internal Pressure Face Type Seal (Interference)
Interference = $\frac{\text{OD} - \text{Out}}{\text{OD}}$ Max = 3 %, Min = 0 %

- **Piston Type Seals:** ID should be slightly smaller than the gland diameter, so that the installed O-ring is slightly stretched.
- **Rod Type Seals:** OD should be slightly larger than the gland diameter, so that there is always some interference with the installed O-ring.
- **External Pressure Face Seals:** ID should be slightly smaller than the inner diameter of the groove, so when pressure is applied, the O-ring is already in position as a result of the pressure.
- **Internal Pressure Face Seals:** OD should be slightly larger than the outer diameter of the groove, so when pressure is applied, the O-ring is already in position as a result of the pressure.

Cross Section Detail



What is reduction in cross section?

Elastomers are not compressible materials. So, if the ID of an O-Ring is "stretched", the cross section will decrease. Please refer to the following table for resulting ID stretch. The selected cross section should be used for all compression and glad fill calculations for piston type and external pressure face seals.

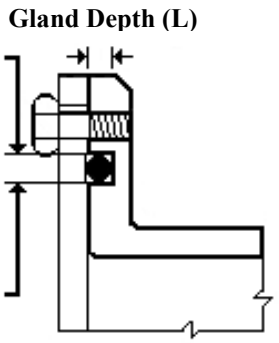
AS568 Series	Original Cross Section (in/ mm)	Reduced Cross Section at % of ID Stretch (in / mm)				
		1%	2%	3%	4%	5%
-0xx	0.070 in	.069	.069	.068	.068	.068
-1xx	0.103 in	.102	.101	.100	.100	.100
-2xx	0.139 in	.138	.137	.136	.135	.134
-3xx	0.210 in	.208	.206	.205	.204	.203
-4xx	0.275 in	.272	.270	.268	.267	.266
-0xx	1.78 mm	1.76	1.75	1.74	1.73	1.72
-1xx	2.62 mm	2.59	2.57	2.56	2.55	2.53
-2xx	3.53 mm	3.49	3.47	3.44	3.43	3.41
-3xx	5.33 mm	5.28	5.24	5.20	5.18	5.15
-4xx	6.99 mm	6.92	6.87	6.82	6.79	6.75

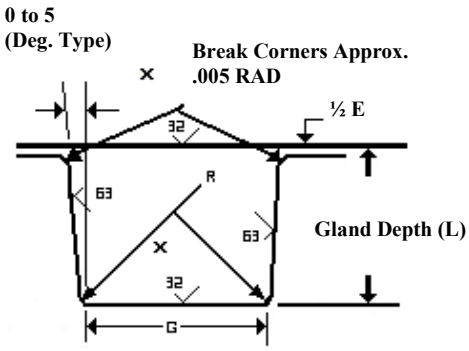
Face Seal Gland Design Chart

Side Wall Angle is to allow for releasing of molded parts. Sidewalls of machined parts should be vertical.

Groove OD (Ho)
For Internal Pressure:
Dimension the groove by it's OD and width.
Ho=Mean OD of O-ring.
Tol=-1% of Mean OD not > -.060

Groove ID (Hi)
For External Pressure:
Dimension the groove by it's ID and width.
Hi=Mean ID of O-ring.
Tol=+1% of Mean ID Not > +.060





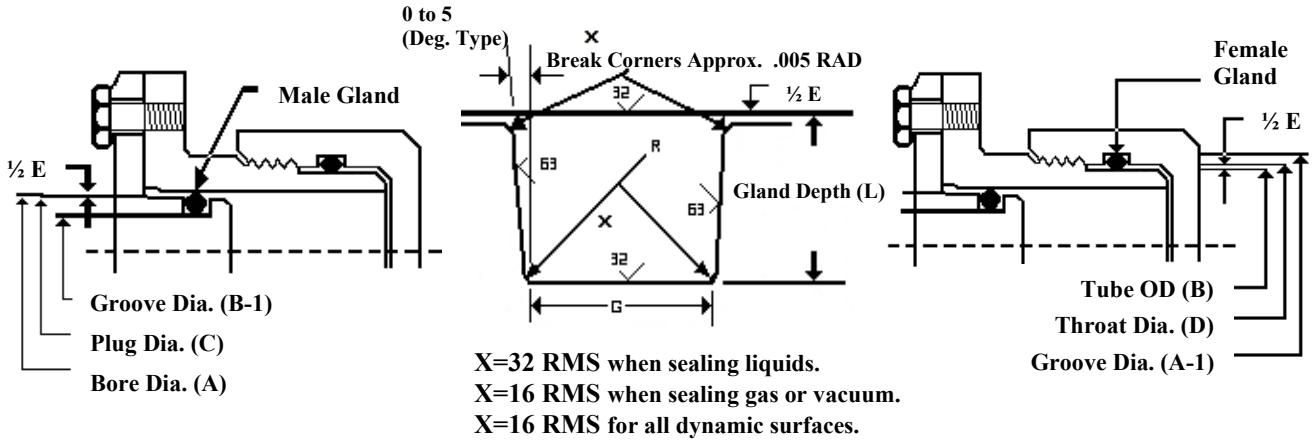
X=32 RMS when sealing liquids.
X=16 RMS when sealing gas or vacuum.
X=16 RMS for all dynamic surfaces.

Face Seal Gland

These dimensions are intended primarily for face type seals and low temperature applications.

O-Ring Size No.	W O-Ring Cross Section		L Gland Depth	Squeeze		G Groove Width		R Groove Radius
	Nominal	Actual		Actual	%	Liquids	Vacuum and Gases	
-004 To -050	1/16	.070 ± .003	.050 to .054	.013 to .023	19 to 32	.101 to .107	.084 to .089	.005 to .015
-102 To -178	3/32	.103 ± .003	.074 to .080	.020 to .032	20 to 30	.136 to .142	.120 to .125	.005 to .015
-201 To -284	1/8	.139 ± .004	.101 to .107	.028 to .042	20 to 30	.177 to .187	.158 to .164	.010 to .025
-309 To -395	3/16	.210 ± .005	.152 to .162	.043 To .063	21 to 30	.270 to .290	.239 to .244	.020 to .035
-425 to -475	1/4	.275 ± .006	.201 to .211	.058 To .080	21 to 29	.342 to .362	.309 to .314	.020 to .035
Special	3/8	.375 ± .007	.276 to .286	.082 To .106	22 to 28	.475 to .485	.419 to .424	.030 to .045
Special	1/2	.500 ± .008	.370 to .380	.112 To .138	22 to 27	.638 to .645	.560 to .565	.030 to .045

Static Seal Gland Design Chart



X=32 RMS when sealing liquids.
X=16 RMS when sealing gas or vacuum.
X=16 RMS for all dynamic surfaces.

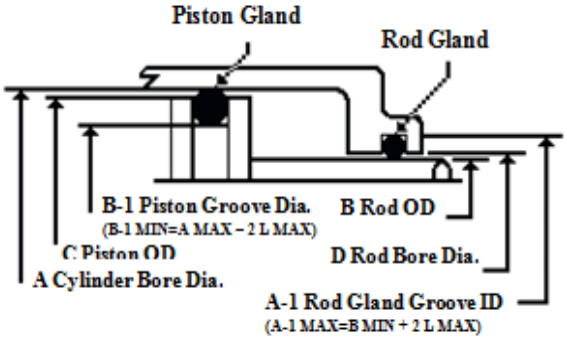
Static Gland - Male

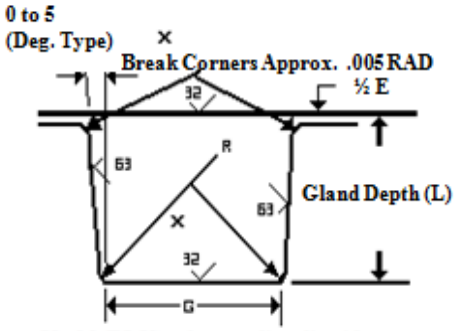
Static Gland – Female

O-ring Size No.	W Cross Section Nominal	W Cross Section Actual	L Gland Depth	Squeeze Actual	Squeeze %	E (a, c) Diametral Clearance	G Groove Width	R Groove Radius	Eccentricity Max. (b)
-004 to -050	1/16	0.070 ± .003	0.050 to 0.052	0.015 to 0.023	22 to 32	0.002 to 0.005	0.093 to 0.098	0.005 to 0.015	0.002
-102 to -178	3/32	0.103 ± .003	0.081 to 0.083	0.017 to 0.025	17 to 24	0.002 to 0.005	0.140 to 0.145	0.005 to 0.015	0.002
-201 to -284	1/8	0.139 ± .004	0.111 to 0.113	0.222 to 0.032	16 to 23	0.003 to 0.006	0.187 to 0.192	0.010 to 0.025	0.003
-309 to -395	3/16	0.210 ± .005	0.170 to 0.173	0.032 to 0.045	15 to 21	0.003 to 0.006	0.281 to 0.286	0.020 to 0.035	0.004
-425 to -475	1/4	0.275 ± .006	0.226 to 0.229	0.040 to 0.055	15 to 20	0.004 to 0.007	0.375 to 0.38	0.020 to 0.035	0.005

(a) Clearance gap must be held to a minimum consistent with design requirements for temperature range variation.
(b) Total Indicator reading between groove and adjacent bearing surface.
(c) Reduce maximum diametral clearance 50% when using silicone or Fluorosilicone O-rings.

Industrial Reciprocating Seal Design Chart





X=32 RMS when sealing liquids.
X=16 RMS when sealing gas or vacuum.
X=16 RMS for all dynamic surfaces.

O-Ring Size No.	W O-Ring Cross Section		L Gland Depth	Squeeze		E (a) Diametral Clearance	R Groove Radius	Max. Ecccen-tricity (b)
	Nominal	Actual		Actual	%			
-006 to -012	1/16	.070 ± .003	.055 to .057	.010 to .018	15 to 25	.002 to .005	.005 to .015	.002
-014 to -116	3/32	.103 ± .003	.088 to .090	.010 to .018	10 to 17	.002 to .005	.005 to .015	.002
-201 to -222	1/8	.139 ± .004	.121 to .123	.012 to .022	9 to 16	.003 to .006	.010 to .025	.003
-309 to -349	3/16	.210 ± .005	.185 to .188	.017 to .030	8 to 14	.003 to .006	.020 to .035	.004
-425 to -460	1/4	.275 ± .006	.237 to .240	.029 to .044	11 to 16	.004 to .007	.020 to .035	.005

(a) Clearance (extrusion gap) must be held to a minimum consistent with design requirements for temperature range variation

(b) Total indicator reading between groove and adjacent bearing surface.

Dovetail Groove Design

Dovetail grooves, or trapezoidal grooves, are used in many applications, often to "capture" O-rings. This is done to prevent the O-ring from coming out of a groove, for example, during equipment installation. Design guides on these grooves often suggests only one sidewall angle, 66°. Unfortunately, as elastomers have evolved for performance at higher temperatures, the "one sidewall angle for all" approach is no longer valid. If followed, this design may result in elastomer extrusion and seal failure. Proper dovetail groove seal design must consider the application temperature and elastomer properties.

By their design, dovetail grooves have limited room to accommodate O-ring thermal expansion. Decreasing the sidewall angle is essentially the only option to increase groove volume. Dovetail grooves also have a practical limitation regarding machining of the sidewall angle. As the sidewall angle is decreased from 66°, it becomes increasingly difficult to machine the groove; a practical limit is a sidewall angle of 45°. Increasing the groove top width will also increase the groove volume, but this approach has limitations since increasing the top width results in less capture of the O-ring in the groove.

Gland Width (G)

Gland width is the critical feature for O-ring capture. The smaller the gland width, compared to the O-ring cross section, the better the O-ring capture in the groove. Unfortunately, decreasing the gland width for better O-ring capture, results in a smaller groove volume. A small gland width, relative to the O-ring cross section, may also result in O-ring installation difficulties, especially with high durometer (high hardness) products. Therefore, gland width may need to be adjusted, depending on the elastomer hardness, to facilitate O-ring installation.

Sidewall Angle

A typical dovetail groove sidewall angle used in industry, for elastomer products, is 66°. However, new high temperature/high performance elastomer products, with high Coefficients of Thermal Expansion (CTE) will not work with this design at elevated temperatures. That is, a sidewall angle of 66° leaves insufficient gland volume to accommodate elastomer thermal expansion. Decreasing the sidewall angle increases the groove volume, making the groove more for elastomers at high temperatures. Selection of the sidewall angle is dependent on the coefficient of thermal expansion for the specific elastomer product, the application temperature, and elastomer chemical swell.

It is often impractical to have a different sidewall angles for every elastomer/temperature combination. However, an equipment producer can choose several sidewall angles, to cover most elastomers, for different temperature ranges. Since perfluoroelastomers (FFKMs) typically have the largest CTEs, designing for these products will cover all other elastomer products as well. The following chart suggests a guide for application temperatures and sidewall angles:

Application temperature	Suggested Sidewall Angle
< 50°C	66°
50°C – 130°C	58°
> 130°C	45

O-ring Stretch

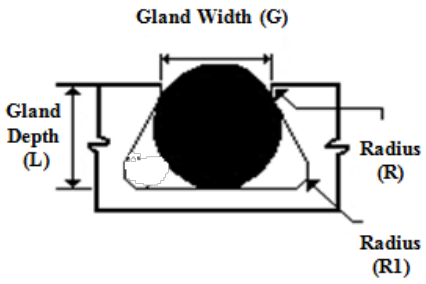
In a dovetail groove, the groove traps the O-ring and ideally there is no need to impart any stretch on the ring. Stretching the ring may reduce the compression on the O-ring, but the effect of this "neck down" is usually minimal. In practice, the O-ring is often stretched to avoid buckling, which could occur if the centroid diameter of the O-ring is larger than the centroid diameter of the groove, for example, due to O-ring or equipment tolerances. Nevertheless, it is advisable to apply an O-ring stretch of approximately 1%, to dovetail grooves, to minimize any reduction in compression. In all cases, it is suggested to keep the O-ring stretch under 5% to minimize overstressing the O-ring while in service, which could lead to premature part failure. ***It is recommended that seal designs be reviewed with Bay Seal to ensure proper performance of the elastomer at the application temperature.***

Dovetail Groove Design Charts

Cross Sectional Dimensions

Full Dovetail Groove Detail

For dovetail grooves, match the centerline of the groove with the centerline of the O-ring. Gland width is to sharp edge of groove.

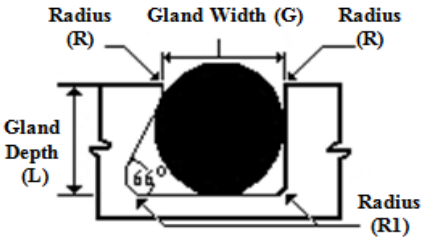


AS568A Series	O-Ring Cross Section		Gland Width	Squeeze	Gland Depth	Gland Corner Radii	
	Actual	Tol +/-	(G)	%	(L)	(R)	(R1)
-004 To -050	0.070	0.003	.057 To .061	23	.053 To .055	0.005	1/64
-102 To -178	0.103	0.003	.083 To .087	21	.081 To .083	0.010	1/64
-201 To -284	0.139	0.004	.113 To .117	20	.111 To .113	0.010	1/32
-309 To -395	0.210	0.005	.171 To .175	18	.171 To .173	0.015	1/32
-425 To -475	0.275	0.006	.231 To .235	16	.231 To .234	0.015	1/16

AS568A Series	O-Ring Cross Section		Gland Width	Squeeze	Gland Depth	Gland Corner Radii	
	Actual	Tol +/-	(G)	%	(L)	(R)	(R1)
-004 To -050	0.070	0.003	.064 To .066	23	.053 To .055	0.005	1/64
-102 To -178	0.103	0.003	.095 To .097	19	.083 To .085	0.010	1/64
-201 To -284	0.139	0.004	.124 To .128	18	.113 To .115	0.010	1/32
-309 To -395	0.210	0.005	.190 To .193	17	.173 To .176	0.015	1/32
-425 To -475	0.275	0.006	.255 To .257	15	.234 To .238	0.015	1/16

Half Dovetail Groove Detail

For dovetail grooves, match the centerline of the groove with the centerline of the O-ring. Gland width is to sharp edge of groove.



AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform Dash No.	(Ref. Only)				Tol.	(Ref. Only)		Basic Volume		Tol.		
	I.D.	O.D.	W.	ID	±	W	±	Cu. In.	I.D.	±	W	±
-001	1/32	3/32	1/32	.029	.004	.040	.003	.0003	0.74	0.10	1.02	0.08
-002	3/64	9/64	3/64	.042	.004	.050	.003	.0006	1.07	0.10	1.27	0.08
-003	1/16	3/16	1/16	.056	.004	.060	.003	.0010	1.42	0.10	1.52	0.08
-004	5/64	13/64	1/16	.070	.005	.070	.003	.0017	1.78	0.13	1.78	0.08
-005	3/32	7/32	1/16	.101	.005	.070	.003	.0021	2.57	0.13	1.78	0.08
-006	1/8	1/4	1/16	.114	.005	.070	.003	.0022	2.90	0.13	1.78	0.08
-007	5/32	9/32	1/16	.145	.005	.070	.003	.0026	3.68	0.13	1.78	0.08
-008	3/16	5/16	1/16	.176	.005	.070	.003	.0030	4.47	0.13	1.78	0.08
-009	7/32	11/32	1/16	.208	.005	.070	.003	.0034	5.28	0.13	1.78	0.08
-010	1/4	3/8	1/16	.239	.005	.070	.003	.0037	6.07	0.13	1.78	0.08
-011	5/16	7/16	1/16	.301	.005	.070	.003	.0045	7.65	0.13	1.78	0.08
-012	3/8	1/2	1/16	.364	.005	.070	.003	.0052	9.25	0.13	1.78	0.08
-013	7/16	9/16	1/16	.426	.005	.070	.003	.0060	10.82	0.13	1.78	0.08
-014	1/2	5/8	1/16	.489	.005	.070	.003	.0068	12.42	0.13	1.78	0.08
-015	9/16	11/16	1/16	.551	.007	.070	.003	.0075	14.00	0.18	1.78	0.08
-016	5/8	3/4	1/16	.614	.009	.070	.003	.0083	15.60	0.23	1.78	0.08
-017	11/16	13/16	1/16	.676	.009	.070	.003	.0090	17.17	0.23	1.78	0.08
-018	3/4	7/8	1/16	.739	.009	.070	.003	.0098	18.77	0.23	1.78	0.08
-019	13/16	15/16	1/16	.801	.009	.070	.003	.0105	20.35	0.23	1.78	0.08
-020	7/8	1	1/16	.864	.009	.070	.003	.0113	21.95	0.23	1.78	0.08
-021	15/16	1 1/16	1/16	.926	.009	.070	.003	.0120	23.52	0.23	1.78	0.08
-022	1	1 1/8	1/16	.989	.010	.070	.003	.0128	25.12	0.25	1.78	0.08
-023	1 1/16	1 3/16	1/16	1.051	.010	.070	.003	.0136	26.70	0.25	1.78	0.08
-024	1 1/8	1 1/4	1/16	1.114	.010	.070	.003	.0143	28.30	0.25	1.78	0.08
-025	1 3/16	1 5/16	1/16	1.176	.011	.070	.003	.0151	29.87	0.28	1.78	0.08
-026	1 1/4	1 3/8	1/16	1.239	.011	.070	.003	.0158	31.47	0.28	1.78	0.08
-027	1 5/16	1 7/16	1/16	1.301	.011	.070	.003	.0166	33.05	0.28	1.78	0.08
-028	1 3/8	1 1/2	1/16	1.364	.013	.070	.003	.0173	34.65	0.33	1.78	0.08
-029	1 1/2	1 5/8	1/16	1.489	.013	.070	.003	.0188	37.82	0.33	1.78	0.08
-030	1 5/8	1 3/4	1/16	1.614	.013	.070	.003	.0204	41.00	0.33	1.78	0.08
-031	1 3/4	1 7/8	1/16	1.739	.015	.070	.003	.0219	44.17	0.38	1.78	0.08
-032	1 7/8	2	1/16	1.864	.015	.070	.003	.0234	47.35	0.38	1.78	0.08
-033	2	2 1/8	1/16	1.989	.018	.070	.003	.0249	50.52	0.46	1.78	0.08
-034	2 1/8	2 1/4	1/16	2.114	.018	.070	.003	.0264	53.70	0.46	1.78	0.08
-035	2 1/4	2 3/8	1/16	2.239	.018	.070	.003	.0279	56.87	0.46	1.78	0.08
-036	2 3/8	2 1/2	1/16	2.364	.018	.070	.003	.0294	60.05	0.46	1.78	0.08
-037	2 1/2	2 5/8	1/16	2.489	.018	.070	.003	.0309	63.22	0.46	1.78	0.08
-038	2 5/8	2 3/4	1/16	2.614	.020	.070	.003	.0324	66.40	0.51	1.78	0.08
-039	2 3/4	2 7/8	1/16	2.739	.020	.070	.003	.0340	69.57	0.51	1.78	0.08
-040	2 7/8	3	1/16	2.864	.020	.070	.003	.0355	72.75	0.51	1.78	0.08

AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform	(Ref. Only)				Tol.	(Ref. Only)		Basic Volume		Tol.	(Ref. Only)	
Dash No.	I.D.	O.D.	W.	ID	±	W	±	Cu. In.	I.D.	±	W	±
-041	3	3 1/8	1/16	2.989	.024	.070	.003	.0370	75.92	0.61	1.78	0.08
-042	3 1/4	3 3/8	1/16	3.239	.024	.070	.003	.0400	82.27	0.61	1.78	0.08
-043	3 1/2	3 5/8	1/16	3.489	.024	.070	.003	.0430	88.62	0.61	1.78	0.08
-044	3 3/4	3 7/8	1/16	3.739	.027	.070	.003	.0460	94.97	0.69	1.78	0.08
-045	4	4 1/8	1/16	3.989	.027	.070	.003	.0491	101.32	0.69	1.78	0.08
-046	4 1/4	4 3/8	1/16	4.239	.030	.070	.003	.0521	107.67	0.76	1.78	0.08
-047	4 1/2	4 5/8	1/16	4.489	.030	.070	.003	.0551	114.02	0.76	1.78	0.08
-048	4 3/4	4 7/8	1/16	4.739	.030	.070	.003	.0581	120.37	0.76	1.78	0.08
-049	5	5 1/8	1/16	4.989	.037	.070	.003	.0612	126.72	0.94	1.78	0.08
-050	5 1/4	5 3/8	1/16	5.239	.037	.070	.003	.0642	133.07	0.94	1.78	0.08
-102	1/16	1/4	3/32	.049	.005	.103	.003	.0040	1.24	0.13	2.62	0.08
-103	3/32	9/32	3/32	.081	.005	.103	.003	.0048	2.06	0.13	2.62	0.08
-104	1/8	5/16	3/32	.112	.005	.103	.003	.0056	2.84	0.13	2.62	0.08
-105	5/32	11/32	3/32	.143	.005	.103	.003	.0064	3.63	0.13	2.62	0.08
-106	3/16	3/8	3/32	.174	.005	.103	.003	.0072	4.42	0.13	2.62	0.08
-107	7/32	13/32	3/32	.206	.005	.103	.003	.0081	5.23	0.13	2.62	0.08
-108	1/4	7/16	3/32	.237	.005	.103	.003	.0089	6.02	0.13	2.62	0.08
-109	5/16	1/2	3/32	.299	.005	.103	.003	.0105	7.59	0.13	2.62	0.08
-110	3/8	9/16	3/32	.362	.005	.103	.003	.0122	9.19	0.13	2.62	0.08
-111	7/16	5/8	3/32	.424	.005	.103	.003	.0138	10.77	0.13	2.62	0.08
-112	1/2	11/16	3/32	.487	.005	.103	.003	.0154	12.37	0.13	2.62	0.08
-113	9/16	3/4	3/32	.549	.007	.103	.003	.0171	13.94	0.18	2.62	0.08
-114	5/8	13/16	3/32	.612	.009	.103	.003	.0187	15.54	0.23	2.62	0.08
-115	11/16	7/8	3/32	.674	.009	.103	.003	.0203	17.12	0.23	2.62	0.08
-116	3/4	15/16	3/32	.737	.009	.103	.003	.0220	18.72	0.23	2.62	0.08
-117	13/16	1	3/32	.799	.010	.103	.003	.0236	20.30	0.25	2.62	0.08
-118	7/8	1 1/6	3/32	.862	.010	.103	.003	.0253	21.89	0.25	2.62	0.08
-119	15/16	1 1/8	3/32	.924	.010	.103	.003	.0269	23.47	0.25	2.62	0.08
-120	1	1 3/16	3/32	.987	.010	.103	.003	.0285	25.07	0.25	2.62	0.08
-121	1 1/16	1 1/4	3/32	1.049	.010	.103	.003	.0302	26.64	0.25	2.62	0.08
-122	1 1/8	1 5/16	3/32	1.112	.010	.103	.003	.0318	28.24	0.25	2.62	0.08
-123	1 3/16	1 3/8	3/32	1.174	.012	.103	.003	.0334	29.82	0.30	2.62	0.08
-124	1 1/4	1 7/16	3/32	1.237	.012	.103	.003	.0351	31.42	0.30	2.62	0.08
-125	1 5/16	1 1/2	3/32	1.299	.012	.103	.003	.0367	32.99	0.30	2.62	0.08
-126	1 3/8	1 9/16	3/32	1.362	.012	.103	.003	.0383	34.59	0.30	2.62	0.08
-127	1 7/16	1 5/8	3/32	1.424	.012	.103	.003	.0400	36.17	0.30	2.62	0.08
-128	1 1/2	1 11/16	3/32	1.487	.012	.103	.003	.0416	37.77	0.30	2.62	0.08
-129	1 9/16	1 3/4	3/32	1.549	.015	.103	.003	.0432	39.34	0.38	2.62	0.08
-130	1 5/8	1 13/16	3/32	1.612	.015	.103	.003	.0449	40.94	0.38	2.62	0.08
-131	1 11/16	1 7/8	3/32	1.674	.015	.103	.003	.0465	42.52	0.38	2.62	0.08

AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform Dash No.	(Ref. Only)				Tol.	(Ref. Only)		Basic Volume		Tol.		
	I.D.	O.D.	W.	ID	±	W	±	Cu. In.	I.D.	±	W	±
-132	1 3/4	1 15/16	3/32	1.737	.015	.103	.003	.0482	44.12	0.38	2.62	0.08
-133	1 13/16	2	3/32	1.799	.015	.103	.003	.0498	45.69	0.38	2.62	0.08
-134	1 7/8	2 1/16	3/32	1.862	.015	.103	.003	.0514	47.29	0.38	2.62	0.08
-135	1 15/16	2 1/8	3/32	1.925	.017	.103	.003	.0531	48.90	0.43	2.62	0.08
-136	2	2 3/16	3/32	1.987	.017	.103	.003	.0547	50.47	0.43	2.62	0.08
-137	2 1/16	2 1/4	3/32	2.050	.017	.103	.003	.0564	52.07	0.43	2.62	0.08
-138	2 1/8	2 5/16	3/32	2.112	.017	.103	.003	.0580	53.64	0.43	2.62	0.08
-139	2 3/16	2 3/8	3/32	2.175	.017	.103	.003	.0596	55.25	0.43	2.62	0.08
-140	2 1/4	2 7/16	3/32	2.237	.017	.103	.003	.0612	56.82	0.43	2.62	0.08
-141	2 5/16	2 1/2	3/32	2.300	.020	.103	.003	.0629	58.42	0.51	2.62	0.08
-142	2 3/8	2 9/16	3/32	2.362	.020	.103	.003	.0645	59.99	0.51	2.62	0.08
-143	2 7/16	2 5/8	3/32	2.425	.020	.103	.003	.0662	61.60	0.51	2.62	0.08
-144	2 1/2	2 11/16	3/32	2.487	.020	.103	.003	.0678	63.17	0.51	2.62	0.08
-145	2 9/16	2 3/4	3/32	2.550	.020	.103	.003	.0694	64.77	0.51	2.62	0.08
-146	2 5/8	2 13/16	3/32	2.612	.020	.103	.003	.0711	66.34	0.51	2.62	0.08
-147	2 11/16	2 7/8	3/32	2.675	.022	.103	.003	.0727	67.95	0.56	2.62	0.08
-148	2 3/4	2 15/16	3/32	2.737	.022	.103	.003	.0743	69.52	0.56	2.62	0.08
-149	2 13/16	3	3/32	2.800	.022	.103	.003	.0760	71.12	0.56	2.62	0.08
-150	2 7/8	3 1/16	3/32	2.862	.022	.103	.003	.0776	72.69	0.56	2.62	0.08
-151	3	3 3/16	3/32	2.987	.024	.103	.003	.0809	75.87	0.61	2.62	0.08
-152	3 1/4	3 7/16	3/32	3.237	.024	.103	.003	.0874	82.22	0.61	2.62	0.08
-153	3 1/2	3 11/16	3/32	3.487	.024	.103	.003	.0940	88.57	0.61	2.62	0.08
-154	3 3/4	3 15/16	3/32	3.737	.028	.103	.003	.1005	94.92	0.71	2.62	0.08
-155	4	4 3/16	3/32	3.987	.028	.103	.003	.1071	101.27	0.71	2.62	0.08
-156	4 1/4	4 7/16	3/32	4.237	.030	.103	.003	.1136	107.62	0.76	2.62	0.08
-157	4 1/2	4 11/16	3/32	4.487	.030	.103	.003	.1202	113.97	0.76	2.62	0.08
-158	4 3/4	4 15/16	3/32	4.737	.030	.103	.003	.1267	120.32	0.76	2.62	0.08
-159	5	5 3/16	3/32	4.987	.035	.103	.003	.1332	126.67	0.89	2.62	0.08
-160	5 1/4	5 7/16	3/32	5.237	.035	.103	.003	.1398	133.02	0.89	2.62	0.08
-161	5 1/2	5 11/16	3/32	5.487	.035	.103	.003	.1463	139.37	0.89	2.62	0.08
-162	5 3/4	5 15/16	3/32	5.737	.035	.103	.003	.1529	145.72	0.89	2.62	0.08
-163	6	6 3/16	3/32	5.987	.035	.103	.003	.1594	152.07	0.89	2.62	0.08
-164	6 1/4	6 7/16	3/32	6.237	.040	.103	.003	.1660	158.42	1.02	2.62	0.08
-165	6 1/2	6 11/16	3/32	6.487	.040	.103	.003	.1725	164.77	1.02	2.62	0.08
-166	6 3/4	6 15/16	3/32	6.737	.040	.103	.003	.1790	171.12	1.02	2.62	0.08
-167	7	7 3/16	3/32	6.987	.040	.103	.003	.1856	177.47	1.02	2.62	0.08
-168	7 1/4	7 7/16	3/32	7.237	.045	.103	.003	.1921	183.82	1.14	2.62	0.08
-169	7 1/2	7 11/16	3/32	7.487	.045	.103	.003	.1987	190.17	1.14	2.62	0.08
-170	7 3/4	7 15/16	3/32	7.737	.045	.103	.003	.2052	196.52	1.14	2.62	0.08
-171	8	8 3/16	3/32	7.987	.045	.103	.003	.2118	202.87	1.14	2.62	0.08

AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform Dash No.	(Ref. Only)				Tol.	(Ref. Only)		Basic Volume		Tol.		
	I.D.	O.D.	W.	ID	±	W	±	Cu. In.	I.D.	±	W	±
-172	8 1/4	8 7/16	3/32	8.237	.050	.103	.003	.2183	209.22	1.27	2.62	0.08
-173	8 1/2	8 11/16	3/32	8.487	.050	.103	.003	.2249	215.57	1.27	2.62	0.08
-174	8 3/4	8 15/16	3/32	8.737	.050	.103	.003	.2314	221.92	1.27	2.62	0.08
-175	9	9 3/16	3/32	8.987	.050	.103	.003	.2379	228.27	1.27	2.62	0.08
-176	9 1/4	9 7/16	3/32	9.237	.055	.103	.003	.2445	234.62	1.40	2.62	0.08
-177	9 1/2	9 11/16	3/32	9.487	.055	.103	.003	.2510	240.97	1.40	2.62	0.08
-178	9 3/4	9 15/16	3/32	9.737	.055	.103	.003	.2576	247.32	1.40	2.62	0.08
-201	3/16	7/16	1/8	.171	.005	.139	.004	.0148	4.34	0.13	3.53	0.10
-202	1/4	1/2	1/8	.234	.005	.139	.004	.0178	5.94	0.13	3.53	0.10
-203	5/16	9/16	1/8	.296	.005	.139	.004	.0207	7.52	0.13	3.53	0.10
-204	3/8	5/8	1/8	.359	.005	.139	.004	.0237	9.12	0.13	3.53	0.10
-205	7/16	11/16	1/8	.421	.005	.139	.004	.0267	10.69	0.13	3.53	0.10
-206	1/2	3/4	1/8	.484	.005	.139	.004	.0297	12.29	0.13	3.53	0.10
-207	9/16	13/16	1/8	.546	.007	.139	.004	.0327	13.87	0.18	3.53	0.10
-208	5/8	7/8	1/8	.609	.009	.139	.004	.0357	15.47	0.23	3.53	0.10
-209	11/16	15/16	1/8	.671	.010	.139	.004	.0386	17.04	0.23	3.53	0.10
-210	3/4	1	1/8	.734	.010	.139	.004	.0416	18.64	0.25	3.53	0.10
-211	13/16	1 1/16	1/8	.796	.010	.139	.004	.0446	20.22	0.25	3.53	0.10
-212	7/8	1 1/8	1/8	.859	.010	.139	.004	.0476	21.82	0.25	3.53	0.10
-213	15/16	1 3/16	1/8	.921	.010	.139	.004	.0505	23.39	0.25	3.53	0.10
-214	1	1 1/4	1/8	.984	.010	.139	.004	.0535	24.99	0.25	3.53	0.10
-215	1 1/16	1 5/16	1/8	1.046	.010	.139	.004	.0565	26.57	0.25	3.53	0.10
-216	1 1/8	1 3/8	1/8	1.109	.012	.139	.004	.0595	28.17	0.30	3.53	0.10
-217	1 3/16	1 7/16	1/8	1.171	.012	.139	.004	.0624	29.74	0.30	3.53	0.10
-218	1 1/4	1 1/2	1/8	1.234	.012	.139	.004	.0654	31.34	0.30	3.53	0.10
-219	1 5/16	1 9/16	1/8	1.296	.012	.139	.004	.0684	32.92	0.30	3.53	0.10
-220	1 3/8	1 5/8	1/8	1.359	.012	.139	.004	.0714	34.52	0.30	3.53	0.10
-221	1 7/16	1 11/16	1/8	1.421	.012	.139	.004	.0744	36.09	0.30	3.53	0.10
-222	1 1/2	1 3/4	1/8	1.484	.015	.139	.004	.0774	37.69	0.38	3.53	0.10
-223	1 5/8	1 7/8	1/8	1.609	.015	.139	.004	.0833	40.87	0.38	3.53	0.10
-224	1 3/4	2	1/8	1.734	.015	.139	.004	.0893	44.04	0.38	3.53	0.10
-225	1 7/8	2 1/8	1/8	1.859	.018	.139	.004	.0952	47.22	0.46	3.53	0.10
-226	2	2 1/4	1/8	1.984	.018	.139	.004	.1012	50.39	0.46	3.53	0.10
-227	2 1/8	2 3/8	1/8	2.109	.018	.139	.004	.1072	53.57	0.46	3.53	0.10
-228	2 1/4	2 1/2	1/8	2.234	.020	.139	.004	.1131	56.74	0.51	3.53	0.10
-229	2 3/8	2 5/8	1/8	2.359	.020	.139	.004	.1191	59.92	0.51	3.53	0.10
-230	2 1/2	2 3/4	1/8	2.484	.020	.139	.004	.1250	63.09	0.51	3.53	0.10
-231	2 5/8	2 7/8	1/8	2.609	.020	.139	.004	.1310	66.27	0.51	3.53	0.10
-232	2 3/4	3	1/8	2.734	.024	.139	.004	.1370	69.44	0.61	3.53	0.10
-233	2 7/8	3 1/8	1/8	2.859	.024	.139	.004	.1429	72.62	0.61	3.53	0.10

AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform Dash No.	(Ref. Only)				Tol.	(Ref. Only)		Basic Volume		Tol.		
	I.D.	O.D.	W.	ID	±	W	±	Cu. In.	I.D.	±	W	±
-234	3	3 1/4	1/8	2.984	.024	.139	.004	.1489	75.79	0.61	3.53	0.10
-235	3 1/8	3 3/8	1/8	3.109	.024	.139	.004	.1548	78.97	0.61	3.53	0.10
-236	3 1/4	3 1/2	1/8	3.234	.024	.139	.004	.1608	82.14	0.61	3.53	0.10
-237	3 3/8	3 5/8	1/8	3.359	.024	.139	.004	.1668	85.32	0.61	3.53	0.10
-238	3 1/2	3 3/4	1/8	3.484	.024	.139	.004	.1727	88.49	0.61	3.53	0.10
-239	3 5/8	3 7/8	1/8	3.609	.028	.139	.004	.1787	91.67	0.71	3.53	0.10
-240	3 3/4	4	1/8	3.734	.028	.139	.004	.1846	94.84	0.71	3.53	0.10
-241	3 7/8	4 1/8	1/8	3.859	.028	.139	.004	.1906	98.02	0.71	3.53	0.10
-242	4	4 1/4	1/8	3.984	.028	.139	.004	.1966	101.19	0.71	3.53	0.10
-243	4 1/8	4 3/8	1/8	4.109	.028	.139	.004	.2025	104.37	0.71	3.53	0.10
-244	4 1/4	4 1/2	1/8	4.234	.030	.139	.004	.2085	107.54	0.76	3.53	0.10
-245	4 3/8	4 5/8	1/8	4.359	.030	.139	.004	.2144	110.72	0.76	3.53	0.10
-246	4 1/2	4 3/4	1/8	4.484	.030	.139	.004	.2204	113.89	0.76	3.53	0.10
-247	4 5/8	4 7/8	1/8	4.609	.030	.139	.004	.2264	117.07	0.76	3.53	0.10
-248	4 3/4	5	1/8	4.734	.030	.139	.004	.2323	120.24	0.76	3.53	0.10
-249	4 7/8	5 1/8	1/8	4.859	.035	.139	.004	.2383	123.42	0.89	3.53	0.10
-250	5	5 1/4	1/8	4.984	.035	.139	.004	.2442	126.59	0.89	3.53	0.10
-251	5 1/8	5 3/8	1/8	5.109	.035	.139	.004	.2502	129.77	0.89	3.53	0.10
-252	5 1/4	5 1/2	1/8	5.234	.035	.139	.004	.2561	132.94	0.89	3.53	0.10
-253	5 3/8	5 5/8	1/8	5.359	.035	.139	.004	.2621	136.12	0.89	3.53	0.10
-254	5 1/2	5 3/4	1/8	5.484	.035	.139	.004	.2681	139.29	0.89	3.53	0.10
-255	5 5/8	5 7/8	1/8	5.609	.035	.139	.004	.2740	142.47	0.89	3.53	0.10
-256	5 3/4	6	1/8	5.734	.035	.139	.004	.2800	145.64	0.89	3.53	0.10
-257	5 7/8	6 1/8	1/8	5.859	.035	.139	.004	.2859	148.82	0.89	3.53	0.10
-258	6	6 1/4	1/8	5.984	.035	.139	.004	.2919	151.99	0.89	3.53	0.10
-259	6 1/4	6 1/2	1/8	6.234	.040	.139	.004	.3038	158.34	1.02	3.53	0.10
-260	6 1/2	6 3/4	1/8	6.484	.040	.139	.004	.3157	164.69	1.02	3.53	0.10
-261	6 3/4	7	1/8	6.734	.040	.139	.004	.3277	171.04	1.02	3.53	0.10
-262	7	7 1/4	1/8	6.984	.040	.139	.004	.3396	177.39	1.02	3.53	0.10
-263	7 1/4	7 1/2	1/8	7.234	.045	.139	.004	.3515	183.74	1.14	3.53	0.10
-264	7 1/2	7 3/4	1/8	7.484	.045	.139	.004	.3634	190.09	1.14	3.53	0.10
-265	7 3/4	8	1/8	7.734	.045	.139	.004	.3753	196.44	1.14	3.53	0.10
-266	8	8 1/4	1/8	7.984	.045	.139	.004	.3872	202.79	1.14	3.53	0.10
-267	8 1/4	8 1/2	1/8	8.234	.050	.139	.004	.3992	209.14	1.27	3.53	0.10
-268	8 1/2	8 3/4	1/8	8.484	.050	.139	.004	.4111	215.49	1.27	3.53	0.10
-269	8 3/4	9	1/8	8.734	.050	.139	.004	.4230	221.84	1.27	3.53	0.10
-270	9	9 1/4	1/8	8.984	.050	.139	.004	.4349	228.19	1.27	3.53	0.10
-271	9 1/4	9 1/2	1/8	9.234	.055	.139	.004	.4468	234.54	1.40	3.53	0.10
-272	9 1/2	9 3/4	1/8	9.484	.055	.139	.004	.4588	240.89	1.40	3.53	0.10
-273	9 3/4	10	1/8	9.734	.055	.139	.004	.4707	247.24	1.40	3.53	0.10

AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform Dash No.	(Ref. Only) I.D.	O.D.	W.	ID	Tol. ±	(Ref. Only) W	±	Basic Volume Cu. In.	I.D.	Tol. ±	W	±
-274	10	10 1/4	1/8	9.984	.055	.139	.004	.4826	253.59	1.40	3.53	0.10
-275	10 1/2	10 3/4	1/8	10.484	.055	.139	.004	.5064	266.29	1.40	3.53	0.10
-276	11	11 1/4	1/8	10.984	.065	.139	.004	.5303	278.99	1.65	3.53	0.10
-277	11 1/2	11 3/4	1/8	11.484	.065	.139	.004	.5541	291.69	1.65	3.53	0.10
-278	12	12 1/4	1/8	11.984	.065	.139	.004	.5779	304.39	1.65	3.53	0.10
-279	13	13 1/4	1/8	12.984	.065	.139	.004	.6256	329.79	1.65	3.53	0.10
-280	14	14 1/4	1/8	13.984	.065	.139	.004	.6733	355.19	1.65	3.53	0.10
-281	15	15 1/4	1/8	14.984	.065	.139	.004	.7210	380.59	1.65	3.53	0.10
-282	16	16 1/4	1/8	15.955	.075	.139	.004	.7672	405.26	1.91	3.53	0.10
-283	17	17 1/4	1/8	16.955	.080	.139	.004	.8149	430.66	2.03	3.53	0.10
-284	18	18 1/4	1/8	17.955	.085	.139	.004	.8626	456.06	2.16	3.53	0.10
-309	7/16	13/16	3/16	.412	.005	.210	.005	.0677	10.46	0.13	5.33	0.13
-310	1/2	7/8	3/16	.475	.005	.210	.005	.0745	12.07	0.13	5.33	0.13
-311	9/16	15/16	3/16	.537	.007	.210	.005	.0813	13.64	0.18	5.33	0.13
-312	5/8	1	3/16	.600	.009	.210	.005	.0881	15.24	0.23	5.33	0.13
-313	11/16	1 1/16	3/16	.662	.009	.210	.005	.0949	16.81	0.23	5.33	0.13
-314	3/4	1 1/8	3/16	.725	.010	.210	.005	.1017	18.42	0.25	5.33	0.13
-315	13/16	1 3/16	3/16	.787	.010	.210	.005	.1085	19.99	0.25	5.33	0.13
-316	7/8	1 1/4	3/16	.850	.010	.210	.005	.1153	21.59	0.25	5.33	0.13
-317	15/16	1 5/16	3/16	.912	.010	.210	.005	.1221	23.16	0.25	5.33	0.13
-318	1	1 3/8	3/16	.975	.010	.210	.005	.1289	24.77	0.25	5.33	0.13
-319	1 1/16	1 7/16	3/16	1.037	.010	.210	.005	.1357	26.34	0.25	5.33	0.13
-320	1 1/8	1 1/2	3/16	1.100	.012	.210	.005	.1425	27.94	0.30	5.33	0.13
-321	1 3/16	1 9/16	3/16	1.162	.012	.210	.005	.1493	29.51	0.30	5.33	0.13
-322	1 1/4	1 5/8	3/16	1.225	.012	.210	.005	.1561	31.12	0.30	5.33	0.13
-323	1 5/16	1 11/16	3/16	1.287	.012	.210	.005	.1629	32.69	0.30	5.33	0.13
-324	1 3/8	1 3/4	3/16	1.350	.012	.210	.005	.1697	34.29	0.30	5.33	0.13
-325	1 1/2	1 7/8	3/16	1.475	.015	.210	.005	.1833	37.47	0.38	5.33	0.13
-326	1 5/8	2	3/16	1.600	.015	.210	.005	.1970	40.64	0.38	5.33	0.13
-327	1 3/4	2 1/8	3/16	1.725	.015	.210	.005	.2106	43.82	0.38	5.33	0.13
-328	1 7/8	2 1/4	3/16	1.850	.015	.210	.005	.2242	46.99	0.38	5.33	0.13
-329	2	2 3/8	3/16	1.975	.018	.210	.005	.2378	50.17	0.46	5.33	0.13
-330	2 1/8	2 1/2	3/16	2.100	.018	.210	.005	.2514	53.34	0.46	5.33	0.13
-331	2 1/4	2 5/8	3/16	2.225	.018	.210	.005	.2650	56.52	0.46	5.33	0.13
-332	2 3/8	2 3/4	3/16	2.350	.018	.210	.005	.2786	59.69	0.46	5.33	0.13
-333	2 1/2	2 7/8	3/16	2.475	.020	.210	.005	.2922	62.87	0.51	5.33	0.13
-334	2 5/8	3	3/16	2.600	.020	.210	.005	.3058	66.04	0.51	5.33	0.13
-335	2 3/4	3 1/8	3/16	2.725	.020	.210	.005	.3194	69.22	0.51	5.33	0.13
-336	2 7/8	3 1/4	3/16	2.850	.020	.210	.005	.3330	72.39	0.51	5.33	0.13
-337	3	3 3/8	3/16	2.975	.024	.210	.005	.3466	75.57	0.61	5.33	0.13

AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform	(Ref. Only)				Tol.	(Ref. Only)		Basic Volume		Tol.		
Dash No.	I.D.	O.D.	W.	ID	±	W	±	Cu. In.	I.D.	±	W	±
-338	3 1/8	3 1/2	3/16	3.100	.024	.210	.005	.3602	78.74	0.61	5.33	0.13
-339	3 1/4	3 5/8	3/16	3.225	.024	.210	.005	.3738	81.92	0.61	5.33	0.13
-340	3 3/8	3 3/4	3/16	3.350	.024	.210	.005	.3874	85.09	0.61	5.33	0.13
-341	3 1/2	3 7/8	3/16	3.475	.024	.210	.005	.4010	88.27	0.61	5.33	0.13
-342	3 5/8	4	3/16	3.600	.028	.210	.005	.4146	91.44	0.71	5.33	0.13
-343	3 3/4	4 1/8	3/16	3.725	.028	.210	.005	.4282	94.62	0.71	5.33	0.13
-344	3 7/8	4 1/4	3/16	3.850	.028	.210	.005	.4418	97.79	0.71	5.33	0.13
-345	4	4 3/8	3/16	3.975	.028	.210	.005	.4554	100.97	0.71	5.33	0.13
-346	4 1/8	4 1/2	3/16	4.100	.028	.210	.005	.4690	104.14	0.71	5.33	0.13
-347	4 1/4	4 5/8	3/16	4.225	.030	.210	.005	.4826	107.32	0.76	5.33	0.13
-348	4 3/8	4 3/4	3/16	4.350	.030	.210	.005	.4962	110.49	0.76	5.33	0.13
-349	4 1/2	4 7/8	3/16	4.475	.030	.210	.005	.5098	113.67	0.76	5.33	0.13
-350	4 5/8	5	3/16	4.600	.030	.210	.005	.5234	116.84	0.76	5.33	0.13
-351	4 3/4	5 1/8	3/16	4.725	.030	.210	.005	.5370	120.02	0.76	5.33	0.13
-352	4 7/8	5 1/4	3/16	4.850	.030	.210	.005	.5506	123.19	0.76	5.33	0.13
-353	5	5 3/8	3/16	4.975	.037	.210	.005	.5642	126.37	0.94	5.33	0.13
-354	5 1/8	5 1/2	3/16	5.100	.037	.210	.005	.5778	129.54	0.94	5.33	0.13
-355	5 1/4	5 5/8	3/16	5.225	.037	.210	.005	.5914	132.72	0.94	5.33	0.13
-356	5 3/8	5 3/4	3/16	5.350	.037	.210	.005	.6050	135.89	0.94	5.33	0.13
-357	5 1/2	5 7/8	3/16	5.475	.037	.210	.005	.6186	139.07	0.94	5.33	0.13
-358	5 5/8	6	3/16	5.600	.037	.210	.005	.6322	142.24	0.94	5.33	0.13
-359	5 3/4	6 1/8	3/16	5.725	.037	.210	.005	.6458	145.42	0.94	5.33	0.13
-360	5 7/8	6 1/4	3/16	5.850	.037	.210	.005	.6594	148.59	0.94	5.33	0.13
-361	6	6 3/8	3/16	5.975	.037	.210	.005	.6730	151.77	0.94	5.33	0.13
-362	6 1/4	6 5/8	3/16	6.225	.040	.210	.005	.7002	158.12	1.02	5.33	0.13
-363	6 1/2	6 7/8	3/16	6.475	.040	.210	.005	.7274	164.47	1.02	5.33	0.13
-364	6 3/4	7 1/8	3/16	6.725	.040	.210	.005	.7546	170.82	1.02	5.33	0.13
-365	7	7 3/8	3/16	6.975	.040	.210	.005	.7818	177.17	1.02	5.33	0.13
-366	7 1/4	7 5/8	3/16	7.225	.045	.210	.005	.8090	183.52	1.14	5.33	0.13
-367	7 1/2	7 7/8	3/16	7.475	.045	.210	.005	.8362	189.87	1.14	5.33	0.13
-368	7 3/4	8 1/8	3/16	7.725	.045	.210	.005	.8634	196.22	1.14	5.33	0.13
-369	8	8 3/8	3/16	7.975	.045	.210	.005	.8906	202.57	1.14	5.33	0.13
-370	8 1/4	8 5/8	3/16	8.225	.050	.210	.005	.9178	208.92	1.27	5.33	0.13
-371	8 1/2	8 7/8	3/16	8.475	.050	.210	.005	.9450	215.27	1.27	5.33	0.13
-372	8 3/4	9 1/8	3/16	8.725	.050	.210	.005	.9722	221.62	1.27	5.33	0.13
-373	9	9 3/8	3/16	8.975	.050	.210	.005	.9994	227.97	1.27	5.33	0.13
-374	9 1/4	9 5/8	3/16	9.225	.055	.210	.005	1.0266	234.32	1.40	5.33	0.13
-375	9 1/2	9 7/8	3/16	9.475	.055	.210	.005	1.0538	240.67	1.40	5.33	0.13
-376	9 3/4	10 1/8	3/16	9.725	.055	.210	.005	1.0810	247.02	1.40	5.33	0.13
-377	10	10 3/8	3/16	9.975	.055	.210	.005	1.1083	253.37	1.40	5.33	0.13

AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform Dash No.	(Ref. Only) I.D.	(Ref. Only) O.D.	W.	ID	Tol. ±	(Ref. Only) W	Tol. ±	Basic Volume Cu. In.	I.D.	Tol. ±	W	±
-378	10 1/2	10 7/8	3/16	10.475	.060	.210	.005	1.1627	266.07	1.52	5.33	0.13
-379	11	11 3/8	3/16	10.975	.060	.210	.005	1.2171	278.77	1.52	5.33	0.13
-380	11 1/2	11 7/8	3/16	11.475	.065	.210	.005	1.2715	291.47	1.65	5.33	0.13
-381	12	12 3/8	3/16	11.975	.065	.210	.005	1.3259	304.17	1.65	5.33	0.13
-382	13	13 3/8	3/16	12.975	.065	.210	.005	1.4347	329.57	1.65	5.33	0.13
-383	14	14 3/8	3/16	13.975	.070	.210	.005	1.5435	354.97	1.78	5.33	0.13
-384	15	15 3/8	3/16	14.975	.070	.210	.005	1.6523	380.37	1.78	5.33	0.13
-385	16	16 3/8	3/16	15.955	.075	.210	.005	1.7590	405.26	1.91	5.33	0.13
-386	17	17 3/8	3/16	16.955	.080	.210	.005	1.8678	430.66	2.03	5.33	0.13
-387	18	18 3/8	3/16	17.955	.085	.210	.005	1.9766	456.06	2.16	5.33	0.13
-388	19	19 3/8	3/16	18.955	.090	.210	.005	2.0854	481.41	2.29	5.33	0.13
-389	20	20 3/8	3/16	19.955	.095	.210	.005	2.1942	506.81	2.41	5.33	0.13
-390	21	21 3/8	3/16	20.955	.095	.210	.005	2.3030	532.21	2.41	5.33	0.13
-391	22	22 3/8	3/16	21.955	.100	.210	.005	2.4118	557.61	2.54	5.33	0.13
-392	23	23 3/8	3/16	22.940	.105	.210	.005	2.5190	582.68	2.67	5.33	0.13
-393	24	24 3/8	3/16	23.940	.110	.210	.005	2.6278	608.08	2.79	5.33	0.13
-394	25	25 3/8	3/16	24.940	.115	.210	.005	2.7366	633.48	2.92	5.33	0.13
-395	26	26 3/8	3/16	25.940	.120	.210	.005	2.8454	658.88	3.05	5.33	0.13
-425	4 1/2	5	1/4	4.475	.033	.275	.006	.8863	113.67	0.84	6.99	0.15
-426	4 5/8	5 1/8	1/4	4.600	.033	.275	.006	.9097	116.84	0.84	6.99	0.15
-427	4 3/4	5 1/4	1/4	4.725	.033	.275	.006	.9330	120.02	0.84	6.99	0.15
-428	4 7/8	5 3/8	1/4	4.850	.033	.275	.006	.9563	123.19	0.84	6.99	0.15
-429	5	5 1/2	1/4	4.975	.037	.275	.006	.9796	126.37	0.94	6.99	0.15
-430	5 1/8	5 5/8	1/4	5.100	.037	.275	.006	1.0030	129.54	0.94	6.99	0.15
-431	5 1/4	5 3/4	1/4	5.225	.037	.275	.006	1.0263	132.72	0.94	6.99	0.15
-432	5 3/8	5 7/8	1/4	5.350	.037	.275	.006	1.0496	135.89	0.94	6.99	0.15
-433	5 1/2	6	1/4	5.475	.037	.275	.006	1.0729	139.07	0.94	6.99	0.15
-434	5 5/8	6 1/8	1/4	5.600	.037	.275	.006	1.0963	142.24	0.94	6.99	0.15
-435	5 3/4	6 1/4	1/4	5.725	.037	.275	.006	1.1196	145.42	0.94	6.99	0.15
-436	5 7/8	6 3/8	1/4	5.850	.037	.275	.006	1.1429	148.59	0.94	6.99	0.15
-437	6	6 1/2	1/4	5.975	.037	.275	.006	1.1662	151.77	0.94	6.99	0.15
-438	6 1/4	6 3/4	1/4	6.225	.040	.275	.006	1.2129	158.12	1.02	6.99	0.15
-439	6 1/2	7	1/4	6.475	.040	.275	.006	1.2595	164.47	1.02	6.99	0.15
-440	6 3/4	7 1/4	1/4	6.725	.040	.275	.006	1.3062	170.82	1.02	6.99	0.15
-441	7	7 1/2	1/4	6.975	.040	.275	.006	1.3528	177.17	1.02	6.99	0.15
-442	7 1/4	7 3/4	1/4	7.225	.045	.275	.006	1.3995	183.52	1.14	6.99	0.15
-443	7 1/2	8	1/4	7.475	.045	.275	.006	1.4461	189.87	1.14	6.99	0.15
-444	7 3/4	8 1/4	1/4	7.725	.045	.275	.006	1.4928	196.22	1.14	6.99	0.15
-445	8	8 1/2	1/4	7.975	.045	.275	.006	1.5394	202.57	1.14	6.99	0.15
-446	8 1/2	9	1/4	8.475	.055	.275	.006	1.6327	215.27	1.40	6.99	0.15

AS568 O-Ring Sizes

1	2			3				4	5			
Size Only	Nominal Size			Standard O-Ring Size (Units are in inches)					Metric O-Ring Size Units are in Millimeters			
	(Inches)			Actual (b) Per AS 568A					Actual (b) Per AS 568A			
AS 568A Uniform	(Ref. Only)				Tol.	(Ref. Only)		Basic Volume		Tol.		
Dash No.	I.D.	O.D.	W.	ID	±	W	±	Cu. In.	I.D.	±	W	±
-447	9	9 1/2	1/4	8.975	.055	.275	.006	1.7260	227.97	1.40	6.99	0.15
-448	9 1/2	10	1/4	9.475	.055	.275	.006	1.8193	240.67	1.40	6.99	0.15
-449	10	10 1/2	1/4	9.975	.055	.275	.006	1.9126	253.37	1.40	6.99	0.15
-450	10 1/2	11	1/4	10.475	.060	.275	.006	2.0059	266.07	1.52	6.99	0.15
-451	11	11 1/2	1/4	10.975	.060	.275	.006	2.0992	278.77	1.52	6.99	0.15
-452	11 1/2	12	1/4	11.475	.060	.275	.006	2.1925	291.47	1.52	6.99	0.15
-453	12	12 1/2	1/4	11.975	.060	.275	.006	2.2858	304.17	1.52	6.99	0.15
-454	12 1/2	13	1/4	12.475	.060	.275	.006	2.3791	316.87	1.52	6.99	0.15
-455	13	13 1/2	1/4	12.975	.060	.275	.006	2.4724	329.57	1.52	6.99	0.15
-456	13 1/2	14	1/4	13.475	.070	.275	.006	2.5657	342.27	1.78	6.99	0.15
-457	14	14 1/2	1/4	13.975	.070	.275	.006	2.6590	354.97	1.78	6.99	0.15
-458	14 1/2	15	1/4	14.475	.070	.275	.006	2.7523	367.67	1.78	6.99	0.15
-459	15	15 1/2	1/4	14.975	.070	.275	.006	2.8456	380.37	1.78	6.99	0.15
-460	15 1/2	16	1/4	15.475	.070	.275	.006	2.9389	393.07	1.78	6.99	0.15
-461	16	16 1/2	1/4	15.955	.075	.275	.006	3.0285	405.26	1.91	6.99	0.15
-462	16 1/2	17	1/4	16.455	.075	.275	.006	3.1218	417.96	1.91	6.99	0.15
-463	17	17 1/2	1/4	16.955	.080	.275	.006	3.2151	430.66	2.03	6.99	0.15
-464	17 1/2	18	1/4	17.455	.085	.275	.006	3.3084	443,36	2,16	6,99	0,15
-465	18	18 1/2	1/4	17.955	.085	.275	.006	3.4017	456,06	2,16	6,99	0,15
-466	18 1/2	19	1/4	18.455	.085	.275	.006	3.4950	468,76	2,16	6,99	0,15
-467	19	19 1/2	1/4	18.955	.090	.275	.006	3.5883	481,46	2,29	6,99	0,15
-468	19 1/2	20	1/4	19.455	.090	.275	.006	3.6816	494,16	2,29	6,99	0,15
-469	20	20 1/2	1/4	19.955	.095	.275	.006	3.7749	506,86	2,41	6,99	0,15
-470	21	21 1/2	1/4	20.955	.095	.275	.006	3.9615	532,26	2,41	6,99	0,15
-471	22	22 1/2	1/4	21.955	.100	.275	.006	4.1481	557,66	2,54	6,99	0,15
-472	23	23 1/2	1/4	22.940	.105	.275	.006	4.3319	582,68	2,67	6,99	0,15
-473	24	24 1/2	1/4	23.940	.110	.275	.006	4.5185	608,08	2,79	6,99	0,15
-474	25	25 1/2	1/4	24.940	.115	.275	.006	4.7051	633,48	2,92	6,99	0,15
-475	26	26 1/2	1/4	25.940	.120	.275	.006	4.8917	658,88	3,05	6,99	0,15

AS568 O-Ring Sizes

These O-Rings are intended for use with internal straight thread fluid connection bosses and tube fittings. Ref. AND10049, AND10050, MS33656, MS33657, SAE straight thread O-Ring boss and mating swivel and adjustable style fittings.

AS568A Dash No.	Tube O.D. (Ref.)	O-ring Size - Actual (b) per AS568A (Units are in inches) I.D.	Tol. ±	W	±	Cross Section Area In²	Metric O-ring Size per AS568A (b) (Units are in millimeters) I.D.	Tol. ±	W	±
-901	3/32	.185	.005	.056	.003	.00246	4.70	0.13	1.42	0.08
-902	1/8	.239	.005	.064	.003	.00322	6.07	0.13	1.63	0.08
-903	3/16	.301	.005	.064	.003	.00322	7.65	0.13	1.63	0.08
-904	1/4	.351	.005	.072	.003	.00407	8.92	0.13	1.83	0.08
-905	5/16	.414	.005	.072	.003	.00407	10.52	0.13	1.83	0.08
-906	3/8	.468	.005	.078	.003	.00478	11.89	0.13	1.98	0.08
-907	7/16	.530	.007	.082	.003	.00528	13.46	0.18	2.08	0.08
-908	1/2	.644	.009	.087	.003	.00594	16.36	0.23	2.21	0.08
-909	9/16	.706	.009	.097	.003	.00739	17.93	0.23	2.46	0.08
-910	5/8	.755	.009	.097	.003	.00739	19.18	0.23	2.46	0.08
-911	11/16	.863	.009	.116	.004	.01057	21.92	0.23	2.95	0.10
-912	3/4	.924	.009	.116	.004	.01057	23.47	0.23	2.95	0.10
-913	13/16	.986	.010	.116	.004	.01057	25.04	0.26	2.95	0.10
-914	7/8	1.047	.010	.116	.004	.01057	26.59	0.26	2.95	0.10
-916	1	1.171	.010	.116	.004	.01057	29.74	0.26	2.95	0.10
-918	1 1/8	1.355	.012	.116	.004	.01057	34.42	0.30	2.95	0.10
-920	1 1/4	1.475	.014	.118	.004	.01094	37.47	0.36	3.00	0.10
-924	1 1/2	1.720	.014	.118	.004	.01094	43.69	0.36	3.00	0.10
-928	1 3/4	2.090	.018	.118	.004	.01094	53.09	0.46	3.00	0.10
-932	2	2.337	.018	.118	.004	.01094	59.36	0.46	3.00	0.10

(a) The rubber compound must be added when ordering by these numbers.
(b) Material with unusual shrinkage during molding will give slightly different dimensions.

JIS B2404 Sizes

JIS	ID		CSD		ID		CSD	JIS	ID		CSD		ID		CSD
Size	in	±	in	±	mm	±	mm	Size	in	±	in	±	mm	±	mm
S-3	.098	.006	.059	.004	2.5	.15	1.5	**S-135**	5.295	.024	.079	.004	134.5	.60	2.0
S-4	.138	.006	.059	.004	3.5	.15	1.5	**S-140**	5.492	.024	.079	.004	139.5	.60	2.0
S-5	.177	.006	.059	.004	4.5	.15	1.5	**S-145**	5.689	.024	.079	.004	144.5	.60	2.0
S-6	.217	.006	.059	.004	5.5	.15	1.5	**S-150**	5.886	.024	.079	.004	149.5	.60	2.0
S-7	.256	.006	.059	.004	6.5	.15	1.5	**P-3**	0.110	.005	.075	.003	2.8	.12	1.9
S-8	.295	.006	.059	.004	7.5	.15	1.5	**P-4**	0.150	.005	.075	.003	3.8	.12	1.9
S-9	.335	.006	.059	.004	8.5	.15	1.5	**P-5**	0.189	.005	.075	.003	4.8	.12	1.9
S-10	.374	.006	.059	.004	9.5	.15	1.5	**P-6**	0.228	.005	.075	.003	5.8	.12	1.9
S-11.2	.421	.006	.059	.004	10.7	.15	1.5	**P-7**	0.268	.005	.075	.003	6.8	.12	1.9
S-12	.453	.006	.059	.004	11.5	.15	1.5	**P-8**	0.307	.005	.075	.003	7.8	.12	1.9
S-12.5	.472	.006	.059	.004	12.0	.15	1.5	**P-9**	0.346	.005	.075	.003	8.8	.12	1.9
S-14	.531	.006	.059	.004	13.5	.15	1.5	**P-10**	0.386	.005	.075	.003	9.8	.12	1.9
S-15	.571	.006	.059	.004	14.5	.15	1.5	**P-10A**	0.386	.005	.094	.003	9.8	.12	2.4
S-16	.610	.006	.059	.004	15.5	.15	1.5	**P-11**	0.425	.005	.094	.003	10.8	.12	2.4
S-18	.689	.006	.059	.004	17.5	.15	1.5	**P-11.2**	0.433	.005	.094	.003	11.0	.12	2.4
S-20	.768	.006	.059	.004	19.5	.15	1.5	**P-12**	0.465	.005	.094	.003	11.8	.12	2.4
S-22	.846	.006	.059	.004	21.5	.15	1.5	**P-12.5**	0.484	.005	.094	.003	12.3	.12	2.4
S-22.4	.862	.006	.079	.004	21.9	.15	2.0	**P-14**	0.543	.005	.094	.003	13.8	.12	2.4
S-24	.925	.006	.079	.004	23.5	.15	2.0	**P-15**	0.583	.005	.094	.003	14.8	.12	2.4
S-25	.965	.006	.079	.004	24.5	.15	2.0	**P-16**	0.622	.005	.094	.003	15.8	.12	2.4
S-26	1.004	.006	.079	.004	25.5	.15	2.0	**P-18**	0.701	.005	.094	.003	17.8	.12	2.4
S-28	1.083	.006	.079	.004	27.5	.15	2.0	**P-20**	0.780	.006	.094	.003	19.8	.15	2.4
S-29	1.122	.006	.079	.004	28.5	.15	2.0	**P-21**	0.819	.006	.094	.003	20.8	.15	2.4
S-30	1.161	.006	.079	.004	29.5	.15	2.0	**P-22**	0.858	.006	.094	.003	21.8	.15	2.4
S-31.5	1.220	.006	.079	.004	31.0	.15	2.0	**P-22A**	0.854	.006	.138	.004	21.7	.15	3.5
S-32	1.240	.006	.079	.004	31.5	.15	2.0	**P-22.4**	0.870	.006	.138	.004	22.1	.15	3.5
S-34	1.319	.006	.079	.004	33.5	.15	2.0	**P-24**	0.933	.006	.138	.004	23.7	.15	3.5
S-35	1.358	.006	.079	.004	34.5	.15	2.0	**P-25**	0.972	.006	.138	.004	24.7	.15	3.5
S-35.5	1.378	.006	.079	.004	35.0	.15	2.0	**P-25.5**	0.992	.006	.138	.004	25.2	.15	3.5
S-36	1.398	.006	.079	.004	35.5	.15	2.0	**P-26**	1.012	.006	.138	.004	25.7	.15	3.5
S-38	1.476	.006	.079	.004	37.5	.15	2.0	**P-28**	1.091	.006	.138	.004	27.7	.15	3.5
S-39	1.516	.006	.079	.004	38.5	.15	2.0	**P-29**	1.130	.006	.138	.004	28.7	.15	3.5
S-40	1.555	.006	.079	.004	39.5	.25	2.0	**P-29.5**	1.150	.006	.138	.004	29.2	.15	3.5
S-42	1.634	.010	.079	.004	41.5	.25	2.0	**P30**	1.169	.006	.138	.004	29.7	.15	3.5
S-44	1.713	.010	.079	.004	43.5	.25	2.0	**P-31**	1.209	.006	.138	.004	30.7	.15	3.5
S-45	1.752	.010	.079	.004	44.5	.25	2.0	**P-31.5**	1.228	.006	.138	.004	31.2	.15	3.5
S-46	1.791	.010	.079	.004	45.5	.25	2.0	**P-32**	1.248	.006	.138	.004	31.7	.15	3.5
S-48	1.870	.010	.079	.004	47.5	.25	2.0	**P-34**	1.327	.006	.138	.004	33.7	.15	3.5
S-50	1.949	.010	.079	.004	49.5	.25	2.0	**P-35**	1.366	.006	.138	.004	34.7	.15	3.5
S-53	2.067	.010	.079	.004	52.5	.25	2.0	**P-35.5**	1.386	.006	.138	.004	35.2	.15	3.5
S-55	2.146	.010	.079	.004	54.5	.25	2.0	**P-36**	1.406	.006	.138	.004	35.7	.15	3.5
S-56	2.185	.010	.079	.004	55.5	.25	2.0	**P-38**	1.484	.006	.138	.004	37.7	.15	3.5
S-60	2.343	.010	.079	.004	59.5	.25	2.0	**P-39**	1.524	.006	.138	.004	38.7	.15	3.5
S-63	2.461	.010	.079	.004	62.5	.25	2.0	**P-40**	1.563	.006	.138	.004	39.7	.15	3.5
S-65	2.539	.010	.079	.004	64.5	.25	2.0	**P-41**	1.602	.010	.138	.004	40.7	.25	3.5
S-67	2.618	.010	.079	.004	66.5	.25	2.0	**P-42**	1.642	.010	.138	.004	41.7	.25	3.5
S-70	2.736	.010	.079	.004	69.5	.25	2.0	**P-44**	1.720	.010	.138	.004	43.7	.25	3.5
S-71	2.776	.016	.079	.004	70.5	.40	2.0	**P-45**	1.760	.010	.138	.004	44.7	.25	3.5
S-75	2.933	.016	.079	.004	74.5	.40	2.0	**P-46**	1.799	.010	.138	.004	45.7	.25	3.5
S-80	3.130	.016	.079	.004	79.5	.40	2.0	**P-48**	1.878	.010	.138	.004	47.7	.25	3.5
S-85	3.327	.016	.079	.004	84.5	.40	2.0	**P-49**	1.917	.010	.138	.004	48.7	.25	3.5
S-90	3.524	.016	.079	.004	89.5	.40	2.0	**P-50**	1.957	.010	.138	.004	49.7	.25	3.5
S-95	3.720	.016	.079	.004	94.5	.40	2.0	**P-48A**	1.874	.010	.224	.006	47.6	.25	5.7
S-100	3.917	.016	.079	.004	99.5	.40	2.0	**P-50A**	1.953	.010	.224	.006	49.6	.25	5.7
S-105	4.114	.016	.079	.004	104.5	.40	2.0	**P-52**	2.031	.010	.224	.006	51.6	.25	5.7
S-110	4.311	.016	.079	.004	109.5	.40	2.0	**P-53**	2.071	.010	.224	.006	52.6	.25	5.7
S-112	4.390	.016	.079	.004	111.5	.40	2.0	**P-55**	2.150	.010	.224	.006	54.6	.25	5.7
S-115	4.508	.016	.079	.004	114.5	.40	2.0	**P-56**	2.189	.010	.224	.006	55.6	.25	5.7
S-120	4.705	.016	.079	.004	119.5	.40	2.0	**P-58**	2.268	.010	.224	.006	57.6	.25	5.7
S-125	4.902	.016	.079	.004	124.5	.40	2.0	**P-60**	2.346	.010	.224	.006	59.6	.25	5.7
S-130	5.098	.024	.079	.004	129.5	.60	2.0	**P-62**	2.425	.010	.224	.006	61.6	.25	5.7
S-132	5.177	.024	.079	.004	131.5	.60	2.0	**P-63**	2.465	.010	.224	.006	62.6	.25	5.7

JIS B2404 Sizes

JIS	ID		CSD		ID		CSD	JIS	ID		CSD		ID		CSD
Size	in	±	in	±	mm	±	mm	Size	in	±	in	±	mm	±	mm
P-65	2.543	.010	.224	.006	64.6	.25	5.7	**P-385**	15.138	.039	.331	.006	384.5	1.0	8.4
P-67	2.622	.010	.224	.006	66.6	.25	5.7	**P-400**	15.728	.039	.331	.006	399.5	1.0	8.4
P-70	2.740	.010	.224	.006	69.6	.25	5.7	**G-25**	0.961	.006	.122	.004	24.4	.15	3.1
P-71	2.780	.016	.224	.006	70.6	.40	5.7	**G-30**	1.157	.006	.122	.004	29.4	.15	3.1
P-75	2.937	.016	.224	.006	74.6	.40	5.7	**G-35**	1.354	.006	.122	.004	34.4	.15	3.1
P-80	3.134	.016	.224	.006	79.6	.40	5.7	**G-40**	1.551	.006	.122	.004	39.4	.15	3.1
P-85	3.331	.016	.224	.006	84.6	.40	5.7	**G-45**	1.748	.010	.122	.004	44.4	.25	3.1
P-90	3.528	.016	.224	.006	89.6	.40	5.7	**G-50**	1.945	.010	.122	.004	49.4	.25	3.1
P-95	3.724	.016	.224	.006	94.6	.40	5.7	**G-55**	2.142	.010	.122	.004	54.4	.25	3.1
P-100	3.921	.016	.224	.006	99.6	.40	5.7	**G-60**	2.339	.010	.122	.004	59.4	.25	3.1
P-102	4.000	.016	.224	.006	101.6	.40	5.7	**G-65**	2.535	.010	.122	.004	64.4	.25	3.1
P-105	4.118	.016	.224	.006	104.6	.40	5.7	**G-70**	2.732	.010	.122	.004	69.4	.25	3.1
P-110	4.315	.016	.224	.006	109.6	.40	5.7	**G-75**	2.929	.016	.122	.004	74.4	.40	3.1
P-112	4.394	.016	.224	.006	111.6	.40	5.7	**G-80**	3.126	.016	.122	.004	79.4	.40	3.1
P-115	4.512	.016	.224	.006	114.6	.40	5.7	**G-85**	3.323	.016	.122	.004	84.4	.40	3.1
P-120	4.709	.016	.224	.006	119.6	.40	5.7	**G-90**	3.520	.016	.122	.004	89.4	.40	3.1
P-125	4.906	.016	.224	.006	124.6	.40	5.7	**G-95**	3.717	.016	.122	.004	94.4	.40	3.1
P-130	5.102	.024	.224	.006	129.6	.60	5.7	**G-100**	3.913	.016	.122	.004	99.4	.40	3.1
P-132	5.181	.024	.224	.006	131.6	.60	5.7	**G-105**	4.110	.016	.122	.004	104.4	.40	3.1
P-135	5.299	.024	.224	.006	134.6	.60	5.7	**G-110**	4.307	.016	.122	.004	109.4	.40	3.1
P-140	5.496	.024	.224	.006	139.6	.60	5.7	**G-115**	4.504	.016	.122	.004	114.4	.40	3.1
P-145	5.693	.024	.224	.006	144.6	.60	5.7	**G-120**	4.701	.016	.122	.004	119.4	.40	3.1
P-150	5.890	.024	.224	.006	149.6	.60	5.7	**G-125**	4.898	.016	.122	.004	124.4	.40	3.1
P-150A	5.886	.024	.331	.006	149.5	.60	8.4	**G-130**	5.094	.024	.122	.004	129.4	.60	3.1
P-155	6.083	.024	.331	.006	154.5	.60	8.4	**G-135**	5.291	.024	.122	.004	134.4	.60	3.1
P-160	6.280	.024	.331	.006	159.5	.60	8.4	**G-140**	5.488	.024	.122	.004	139.4	.60	3.1
P-165	6.476	.024	.331	.006	164.5	.60	8.4	**G-145**	5.685	.024	.122	.004	144.4	.60	3.1
P-170	6.673	.024	.331	.006	169.5	.60	8.4	**G-150**	5.878	.024	.224	.006	149.3	.60	5.7
P-175	6.870	.024	.331	.006	174.5	.60	8.4	**G-155**	6.075	.024	.224	.006	154.3	.60	5.7
P-180	7.067	.024	.331	.006	179.5	.60	8.4	**G-160**	6.272	.024	.224	.006	159.3	.60	5.7
P-185	7.264	.031	.331	.006	184.5	.80	8.4	**G-165**	6.469	.024	.224	.006	164.3	.60	5.7
P-190	7.461	.031	.331	.006	189.5	.80	8.4	**G-170**	6.665	.024	.224	.006	169.3	.60	5.7
P-195	7.657	.031	.331	.006	194.5	.80	8.4	**G-175**	6.862	.024	.224	.006	174.3	.60	5.7
P-200	7.854	.031	.331	.006	199.5	.80	8.4	**G-180**	7.059	.024	.224	.006	179.3	.60	5.7
P-205	8.051	.031	.331	.006	204.5	.80	8.4	**G-185**	7.256	.031	.224	.006	184.3	.80	5.7
P-209	8.209	.031	.331	.006	208.5	.80	8.4	**G-190**	7.453	.031	.224	.006	189.3	.80	5.7
P-210	8.248	.031	.331	.006	209.5	.80	8.4	**G-195**	7.650	.031	.224	.006	194.3	.80	5.7
P-215	8.445	.031	.331	.006	214.5	.80	8.4	**G-200**	7.846	.031	.224	.006	199.3	.80	5.7
P-220	8.642	.031	.331	.006	219.5	.80	8.4	**G-210**	8.240	.031	.224	.006	209.3	.80	5.7
P-225	8.839	.031	.331	.006	224.5	.80	8.4	**G-220**	8.634	.031	.224	.006	219.3	.80	5.7
P-230	9.035	.031	.331	.006	229.5	.80	8.4	**G-230**	9.028	.031	.224	.006	229.3	.80	5.7
P-235	9.232	.031	.331	.006	234.5	.80	8.4	**G-240**	9.421	.031	.224	.006	239.3	.80	5.7
P-240	9.429	.031	.331	.006	239.5	.80	8.4	**G-250**	9.815	.031	.224	.006	249.3	.80	5.7
P-245	9.626	.031	.331	.006	244.5	.80	8.4	**G-255**	10.012	.031	.224	.006	254.3	.80	5.7
P-250	9.823	.031	.331	.006	249.5	.80	8.4	**G-260**	10.209	.031	.224	.006	259.3	.80	5.7
P-255	10.020	.031	.331	.006	254.5	.80	8.4	**G-270**	10.602	.031	.224	.006	269.3	.80	5.7
P-260	10.217	.031	.331	.006	259.5	.80	8.4	**G-280**	10.996	.031	.224	.006	279.3	.80	5.7
P-265	10.413	.031	.331	.006	264.5	.80	8.4	**G-290**	11.390	.031	.224	.006	289.3	.80	5.7
P-270	10.610	.031	.331	.006	269.5	.80	8.4	**G-300**	11.783	.031	.224	.006	299.3	.80	5.7
P-275	10.807	.031	.331	.006	274.5	.80	8.4	**V-15**	0.571	.006	.157	.004	14.5	.15	4.0
P-280	11.004	.031	.331	.006	279.5	.80	8.4	**V-24**	0.925	.006	.157	.004	23.5	.15	4.0
P-285	11.201	.031	.331	.006	284.5	.80	8.4	**V-34**	1.319	.006	.157	.004	33.5	.15	4.0
P-290	11.398	.031	.331	.006	289.5	.80	8.4	**V-40**	1.555	.006	.157	.004	39.5	.15	4.0
P-295	11.594	.031	.331	.006	294.5	.80	8.4	**V-55**	2.146	.010	.157	.004	54.5	.25	4.0
P-300	11.791	.031	.331	.006	299.5	.80	8.4	**V-70**	2.717	.010	.157	.004	69.0	.25	4.0
P-315	12.382	.039	.331	.006	314.5	1.0	8.4	**V-85**	3.307	.016	.157	.004	84.0	.40	4.0
P-320	12.579	.039	.331	.006	319.5	1.0	8.4	**V-100**	3.898	.016	.157	.004	99.0	.40	4.0
P-335	13.169	.039	.331	.006	334.5	1.0	8.4	**V-120**	4.685	.016	.157	.004	119.0	.40	4.0
P-340	13.366	.039	.331	.006	339.5	1.0	8.4	**V-150**	5.846	.024	.157	.004	148.5	.60	4.0
P-355	13.957	.039	.331	.006	354.5	1.0	8.4	**V-175**	6.811	.024	.157	.004	173.0	.60	4.0
P-360	14.154	.039	.331	.006	359.5	1.0	8.4	**V-225**	8.760	.031	.236	.006	222.5	.80	6.0
P-375	14.744	.039	.331	.006	374.5	1.0	8.4	**V-275**	10.709	.031	.236	.006	272.0	.80	6.0

JIS B2404 Sizes

JIS	ID		CSD		ID		CSD	JIS	ID		CSD		ID		CSD
Size	in	±	in	±	mm	±	mm	Size	in	±	in	±	mm	±	mm
V-325	12.657	.039	.236	.006	321.5	1.00	6.0	V-690	26.890	.063	.394	.012	683.0	1.60	10.0
V-380	14.803	.039	.236	.006	376.0	1.00	6.0	V-740	28.839	.079	.394	.012	732.5	2.00	10.0
V-430	16.752	.047	.236	.006	425.5	1.20	6.0	V-790	30.787	.079	.394	.012	782.0	2.00	10.0
V-480	18.701	.047	.394	.012	475.0	1.20	10.0	V-845	32.933	.079	.394	.012	836.5	2.00	10.0
V-530	20.650	.063	.394	.012	524.5	1.60	10.0	V-950	37.028	.098	.394	.012	940.5	2.50	10.0
V-585	22.795	.063	.394	.012	579.0	1.60	10.0	V-1055	41.102	.118	.394	.012	1044.0	3.00	10.0
V-640	24.941	.063	.394	.012	633.5	1.60	10.0								

Fraction, Decimal, and Millimeter conversion

Millimeters (mm) divide by 25.4 = Inches (in) Inches (in) times 25.4 = Millimeters (mm)			1 Millimeter (mm) = .03937 Inches (in) .001 Inch (in) = .0254 Millimeter (mm)		
Fraction	Decimal (in)	mm	Fraction	Decimal (in)	mm
1/64	.0156	0.3968	33/64	.5156	13.0967
1/32	.0312	0.7937	17/32	.5312	13.4963
3/64	.0468	1.1906	35/64	.5468	13.8904
1/16	.0625	1.5874	9/16	.5625	14.2873
5/64	.0781	1.9843	37/64	.5781	14.6841
3/32	.0937	2.3812	19/32	.5937	15.0811
7/64	.1093	2.7780	39/64	.6093	15.4779
1/8	.1250	3.1749	5/8	.6250	15.8748
9/64	.1406	3.5718	41/64	.6406	16.2716
5/32	.1562	3.9687	21/32	.6562	16.6685
11/64	.1718	4.3655	43/64	.6718	17.0654
3/16	.1875	4.7624	11/16	.6875	17.4623
13/64	.2031	5.1593	45/64	.7031	17.8591
7/32	.2187	5.5562	23/32	.7187	18.2560
15/64	.2343	5.9530	47/64	.7343	18.6528
¼	.2500	6.3499	¾	.7500	19.0498
17/64	.2656	6.7467	49/64	.7656	19.4466
9/32	.2812	7.1436	25/32	.7812	19.8435
19/64	.2968	7.5405	51/64	.7968	20.2403
5/16	.3125	7.9374	13/16	.8125	20.6373
21/64	.3281	8.3342	53/64	.8281	21.0341
11/32	.3437	8.7311	27/32	.8437	21.4310
23/64	.3593	9.1280	55/64	.8593	21.8278
3/8	.3750	9.5249	7/8	.8750	22.2247
25/64	.3906	9.9217	57/64	.8906	22.6215
13/32	.4062	10.3186	29/32	.9062	23.0185
27/64	.4218	10.7154	59/64	.9218	23.4153
7/16	.4375	11.1124	15/16	.9375	23.8122
29/64	.4531	11.5092	61/64	.9531	24.2090
15/32	.4687	11.9061	31/32	.9687	24.6060
31/64	.4843	12.3029	63/64	.9843	25.0028
1/2	.5000	12.6998	1	1.000	25.3997

Chemical Compatibility Table

1 = recommended
2 = marginal
3 = unsatisfactory
X = insufficient data

Compound	Temperature Range	Compound	Temperature Range
Fluoroelastomer (FKM)	-26°C to 205°C (-15°F to 400°F)	Nitrile (NBR)	-34°C to 121°C (-30°F to 250°F)
Fluorosilicone (FVMQ)	-73°C to 190°C (-100°F to 375°F)	Ethylene Propylene (EPDM)	-57°C to 149°C (-70°F to 300°F)
Perfluoroelastomer (FFKM)	-26°C to 316°C (-15°F to 600°F)	Silicone (VMQ)	-54°C to 232°C (-65°F to 450°F)

ALWAYS TEST UNDER ACTUAL SERVICE CONDITIONS.

Published Temperature ranges will apply to majority of media for which the material is recommended.

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Abietic Acid	1	X	X	X	X	X
Acetaldehyde	2	3	1	1	3	3
Acetamide	1	1	1	2	3	1
Acetanilide	1	3	1	2	3	1
Acetic Acid	X	2	1	1	3	3
Acetic Acid, 30%	1	2	1	1	2	2
Acetic Acid, 5%	X	2	1	1	1	2
Acetic Acid, Glacial	1	2	1	1	2	2
Acetic Acid, Hot, High Pressure	X	3	3	3	3	3
Acetic Anhydride	1	3	2	2	3	3
Acetophenetidine	1	2	3	X	1	2
Acetotoluidide	1	2	3	X	1	2
Acetoacetic Acid	1	3	1	2	3	1
Acetone	1	3	1	2	3	3
Acetone Cyanohydrin	1	3	1	2	3	1
Acetonitrile	1	3	1	X	1	X
Acetophenone	1	3	1	3	3	3
Acetyl Acetone	1	3	1	3	3	3
Acetyl Bromide	1	3	1	3	1	3
Acetyl Chloride	1	3	3	3	1	1
Acetylene	1	1	1	1	1	X
Acetylene (Tetrabromide & Tetrachloride)	1	3	1	X	1	X
Acetyl-o-Toluidine	1	X	X	X	X	X
Acetylsalicylic Acid	1	2	3	X	1	2
Aconitic Acid	1	X	X	X	X	X
Acridine	1	X	X	X	X	X
Acrolein	1	3	1	2	3	1
Acrylic Acid	1	2	3	X	1	2
Acrylonitrile	1	3	3	3	3	3
Adipic Acid	1	1	2	X	X	X
Aero Lubriplate	1	1	3	2	1	1
Aero Shell 17 Grease	1	1	3	2	1	1
Aero Shell 750	1	2	3	3	1	2
Aero Shell 7A Grease	1	2	3	2	1	1
Aero Shell IAC	1	1	3	2	1	1
Aerosafe (2300 & 2300W)	1	3	1	3	3	3
Aerozene 50 (50% Hydrazine 50% UDMH)	2	3	1	3	3	3

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Air Below 200° F	1	2	1	1	1	1
Air, 200 - 300° F	X	3	2	1	1	1
Air, 300 - 400° F	X	3	3	1	1	2
Air, 400 - 500° F	X	3	3	2	3	3
Aliphatic Dicarboxylic Acid	X	2	3	X	1	2
Alkanesulfonic Acid	1	1	3	2	1	1
Alkazene	1	3	3	3	2	2
Alkenes (Olefin Hydrocarbons)	1	2	3	X	1	2
Alkenes (Paraffin Hydrocarbons)	X	1	3	2	1	1
Alkyl (Alcohol, Arylsulfonates, & Arylsulfonics)	1	1	3	2	1	1
Alkyl Amine	1	1	3	2	1	1
Alkyl (Benzene, Chloride, & Sulfide)	1	2	3	X	1	2
Alkyl Acetone	1	3	1	2	3	1
Alkyl naphthalene Sulfonic Acid	1	1	3	2	1	1
Allyl Chloride	1	2	3	X	1	X
Allylidene Diacetate	1	3	1	2	3	1
Alpha Picoline	1	3	1	2	3	1
Aluminum Acetate	1	2	1	3	3	3
Aluminum Bromide	1	1	1	1	1	1
Aluminum (Chlorate & Formate)	1	3	1	2	3	1
Aluminum (Chloride & Fluoride)	1	1	1	2	1	1
Aluminum Ethylate	1	X	X	X	X	X
Aluminum Hydroxide	1	2	1	2	2	X
Aluminum Linoleate	1	1	3	2	1	1
Aluminum Nitrate	1	1	1	2	1	X
Aluminum Oxalate	1	3	1	2	3	1
Aluminum Phosphate	1	1	1	2	1	X
Aluminum (Potassium Sulfate & Sodium Sulfate)	1	3	1	2	3	1
Aluminum (Salts & Sulfate)	1	1	1	1	1	1
Alums-NH3 -Cr -K	1	1	1	1	3	3
Ambrex 33 (Mobil)	1	1	3	3	1	3
Ambrex 830 (Mobil)	1	1	3	2	1	1
Amines-Mixed	1	3	2	2	3	3
Aminoantraquinone	1	X	X	X	X	X
p-Aminoazobenzene	1	X	X	X	X	X
p-Aminobenzoic Acid (PABA)	1	3	2	X	2	X
p-Aminophenol	1	X	X	X	X	X

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Perfluoroelastomer (FFKM)	-26°C to 316°C (-15°F to 600°F)	Silicone (VMQ)	-54°C to 232°C (-65°F to 450°F)

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Ammonia	3	1	1	1	3	3
Ammonia and Lithium Metal in Solution	3	2	2	3	3	3
Ammonia (Anhydrous & Liquid)	1	2	1	2	3	3
Ammonia Gas, Cold	1	1	1	1	3	3
Ammonia Gas, Hot	1	3	2	X	3	3
Ammonium (Acetate, Arsenate, Bicarbonate)	1	3	1	2	3	1
Ammonium Bifluoride	1	X	X	X	X	X
Ammonium (Bisulfite, Carbamate, & Citrate)	1	3	1	2	3	1
Ammonium (Carbonate & Chloride (2N))	1	3	1	X	1	X
Ammonium (Bromide, Fluoride, & Iodide)	1	1	1	X	1	X
Ammonium (Dichromate & Diphosphate)	1	3	1	2	3	1
Ammonium Fluorosilicate	1	X	X	X	X	X
Ammonium Hydroxide, 3 Molar	X	1	1	1	3	1
Ammonium Hydroxide, Concentrated	1	3	1	1	3	1
Ammonium Hydrozide	X	1	1	1	1	1
Ammonium (Metaphosphate, & Molybdenate)	1	3	1	2	3	1
Ammonium (Lactate, Oxalate, & Perchlorate)	1	3	1	2	3	1
Ammonium Nitrate, 2N	1	1	1	X	X	X
Ammonium (Nitrite & Mono-Basic)	1	1	1	2	X	X
Ammonium Persulfate 10%	X	3	1	X	X	X
Ammonium Persulfate Solution	1	3	1	X	X	X
Ammonium Phosphate	1	1	1	1	3	X
Ammonium Phosphate (Dibasic & Tribasic)	1	1	1	1	X	X
Ammonium (Phosphite, Picrate, & Polysulfide)	1	3	1	2	3	1
Ammonium (Salicylate, Sulfamate, & Sulfite)	1	3	1	2	3	1
Ammonium (Sulfate, Sulfate Nitrate, Sulfide)	1	1	1	X	3	X
Ammonium Salts	1	1	1	1	3	3
Ammonium (Thiocyanate & Thioglycolate)	1	3	1	2	3	1
Ammonium (Thiosulfate & Tungstate)	1	3	1	2	3	1
Amyl Acetate	1	1	2	3	3	3
Amyl Alcohol	1	2	1	3	2	1
Amyl Borate	1	1	3	X	1	X
Amyl (Butyrate & Propionate)	1	1	3	2	1	1
Amyl Chloride	1	X	3	3	1	2
Amyl Chloronaphthalene	1	3	3	3	1	2
Amyl (Cinnamic Aldehyde & Laurate)	1	2	3	X	1	2
Amyl Mercaptan	1	2	3	X	1	2

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
tert-Amyl Methyl Ether (TAME)	1	X	X	X	X	X
Amyl Naphthalene	1	3	3	3	1	1
Amyl (Nitrate & Nitrite)	1	3	1	2	3	1
o-sec-Amylphenol	1	X	X	X	X	X
Anderol di-ester (L-826, L-829, & L-774)	1	2	3	3	1	2
ANG-25 (Di-ester Base) (TG749)	1	2	3	2	1	2
ANG-25 (Glycerol Ester)	1	2	1	2	1	2
Aniline	1	3	1	3	2	2
Aniline Dyes	1	3	2	3	2	2
Aniline Hydrochloride	1	2	1	2	2	1
Aniline Oil	1	3	2	3	3	3
Aniline (Sulfate & Sulfite)	1	3	1	2	3	1
Animal Fats	1	1	2	X	1	X
Animal Oil (Lard Oil)	1	1	2	2	1	1
Anisole	1	X	X	X	X	X
Anisoyl Chloride	1	X	X	X	X	X
AN-O-3 Grade M	1	1	3	2	1	1
AN-O-366	1	1	3	3	1	1
AN-O-6	1	1	3	3	1	1
Ansul Ether	1	2	2	3	3	2
Ansul Ether 161 or 181	1	3	3	3	3	3
Anthracene	1	2	3	X	1	2
Anthranilic Acid	1	X	X	X	X	X
Anthraquinone	1	X	X	X	X	X
Antifreeze	1	1	1	1	1	X
Antimony (Chloride, Pentachloride, Tribromide)	1	1	3	3	1	1
Antimony (Trichloride, Trifluoride, & Trioxide)	1	1	3	3	1	1
Antimony Pentafluoride	2	X	X	X	X	X
Antimony Sulfate	1	X	X	X	X	X
AN-VV-O-366b Hydr. Fluid	1	1	3	3	1	1
Aqua Regia	1	3	3	X	2	X
Arachidic Acid	1	X	X	X	X	X
Argon	1	1	1	1	1	1
Aroclor, 1248	1	3	2	2	1	2
Aroclor, 1254	1	3	2	3	1	2
Aroclor, 1260	1	1	X	1	1	1
Aroclors	1	2	1	2	1	2

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Aromatic Fuel -50%	1	2	3	3	1	2
Arsenic (Trichloride, Trioxide, & Trisulfide)	1	1	3	X	3	X
Arsenic Acid	1	1	1	1	1	1
Arsine	1	X	X	X	X	X
Ascorbic Acid	1	3	1	2	3	1
Askarel Transformer Oil	1	1	3	3	1	2
Aspartic Acid	1	3	1	2	3	1
Asphalt	1	2	3	3	1	2
Aspirin	1	X	X	X	X	X
ASTM Fuel (A & B)	1	1	3	3	1	1
ASTM Fuel C	1	1	3	3	1	2
ASTM Fuel D	1	2	3	3	1	X
ASTM Oil, No.1	1	1	3	1	1	1
ASTM Oil, No. (2 & 3)	1	1	3	3	1	1
ASTM Oil, No.4	1	2	3	3	1	2
ASTM Oil, No.5	1	1	3	X	1	X
ATL-857	X	2	3	3	1	2
Atlantic (Dominion F & Utro Gear-EP Lube)	X	1	3	3	1	1
Atlantic Utro Gear-e	X	1	3	X	1	X
Aurex 903R (Mobil)	1	1	3	3	1	3
Automatic Transmission Fluid	1	1	3	3	1	X
Automotive Brake Fluid	1	3	1	3	3	3
Azobenzene	1	X	X	X	X	X
Bardol B	1	3	3	3	1	2
Barium (Carbonate, Chlorate, & Nitrate)	1	3	1	2	3	1
Barium (Peroxide, & Polysulfide)	1	3	1	2	3	1
Barium (Chloride, Cyanide, Iodide, & Sulfide)	1	1	1	1	1	1
Barium (Hydroxide & Oxide)	1	1	1	1	1	1
Barium Sulfate	1	1	1	X	1	X
Bayol (35 & D)	1	1	3	3	1	1
Beer	X	1	1	1	1	1
Beet Sugar Liquids	X	1	1	X	1	X
Beet Sugar Liquors	1	1	1	1	1	1
Benz- (amide & anthrone)	1	2	3	X	1	2
Benzaldehyde	2	1	1	1	1	1
Benzene	1	3	1	3	1	3
Benzene Hexachloride (BHC)	1	X	X	X	X	X

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Benzenesulfonic Acid 10%	1	3	3	3	1	2
Benzidine	1	2	3	X	1	2
Benzidine 3 Sulfonic Acid	1	2	3	X	1	2
Benzil	1	2	3	X	1	2
Benzilic Acid	1	2	3	X	1	2
Benzine	X	1	3	3	1	1
Benzine (Ligroin)	1	1	3	3	1	1
Benzocatechol	X	2	3	X	1	2
Benzochloride	X	3	1	X	1	1
Benzoic Acid	1	3	3	3	1	2
Benzoin	1	2	3	X	1	2
Benzonitrile	1	3	1	2	3	1
Benzophenenone	X	3	1	3	1	1
Benzophenone	1	X	2	X	1	1
Benzoquinone	1	X	2	X	1	X
Benzotri- (chloride & fluoride)	1	3	1	X	1	X
Benzoyl Chloride	1	X	X	X	1	2
Benzoylsulfonilic Acid	1	2	3	X	1	2
Benzyl Alcohol	1	3	2	2	1	2
Benzyl (Acetate & Butyl Phthalate)	1	3	1	2	3	1
Benzylamine	1	X	X	X	X	X
Benzyl (Benzoate, Bromide, & Chloride)	1	3	3	3	1	1
Benzyl (Phenol, p-phenol, & Salicylate)	1	2	3	X	1	2
Beryllium (Chloride, Fluoride, & Oxide)	1	1	1	3	1	3
Beryllium Sulfate	1	3	1	2	3	1
Bezyl Alcohol	1	3	1	X	1	2
Bismuth (Carbonate, Nitrate, & Oxychloride)	1	3	1	2	3	1
Bittern	1	X	X	X	X	X
Black Liquor	3	2	1	X	1	X
Black Point 77	1	1	1	3	1	3
Blast Furnace Gas	1	3	3	1	1	2
Bleach	X	1	1	3	1	2
Bleach Liquor	1	3	1	2	1	2
Bleach Solutions	1	X	1	X	1	X
Bone Oil	1	1	2	X	1	X
Borane	1	X	X	X	X	X
Borax	1	2	1	2	1	2

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Compound	Temperature Range	Compound	Temperature Range
Fluoroelastomer (FKM)	-26°C to 205°C (-15°F to 400°F)	Nitrile (NBR)	-34°C to 121°C (-30°F to 250°F)
Fluorosilicone (FVMQ)	-73°C to 190°C (-100°F to 375°F)	Ethylene Propylene (EPDM)	-57°C to 149°C (-70°F to 300°F)
Perfluoroelastomer (FFKM)	-26°C to 316°C (-15°F to 600°F)	Silicone (VMQ)	-54°C to 232°C (-65°F to 450°F)

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Borax Solutions	1	X	1	X	1	X
Bordeaux Mixture	1	2	1	2	1	2
Boric Acid	1	1	1	1	1	1
Boric Oxide	1	3	1	2	3	1
Borneol	1	2	3	X	1	2
Bornyl (Acetate, Chloride, & Formate)	1	2	3	X	1	2
Boron Fluids (HEF)	1	2	3	3	1	2
Boron (Phosphate, Tribromide, & Trichloride)	1	X	X	X	X	X
Boron (Trifluoride, & Trioxide)	1	X	X	X	X	X
Brake Fluid (non-Petroleum)	X	3	1	1	3	3
Brake Fluid DOT3 (Glycol Type)	X	3	1	3	3	3
Bray GG-130	X	2	3	3	1	2
Brayco 719-R (VV-H-910)	1	3	1	2	3	2
Brayco 885 (MIL-L-6085A)	X	2	3	3	1	2
Brayco 910	1	2	1	3	3	3
Bret 710	X	2	1	3	3	3
Brine	1	1	1	X	1	X
Brom - 113	X	3	3	3	X	X
Brom - 114	X	2	3	3	2	X
Bromic Acid	1	3	1	2	3	1
Bromine	1	3	3	3	1	2
Bromine (Pentafluoride & Trifluoride)	2	3	3	3	3	3
Bromine Water	1	3	2	3	1	2
Bromobenzene	1	3	3	3	1	1
Bromobenzene Cyanide	1	3	1	2	3	1
Bromochloro Trifluoroethane (Halothane)	1	3	3	3	1	2
Bromochloromethane	1	3	2	3	1	2
Bromochloropropane	1	X	X	X	X	X
Bromoform	1	2	3	X	1	2
Bromomethane (Methyl Bromide)	1	2	3	X	1	1
Bromotrifluoroethylene (BFE)	1	X	X	X	X	X
Bromotrifluoromethane (FC 13B1)	2	1	1	3	1	2
Brucine Sulfate	1	3	1	2	3	1
Buffered Oxide Etchants (BOE)	1	X	X	X	X	X
Bunker	X	1	3	3	1	1
Bunker Oil	X	1	3	2	1	1
Bunker's C (Fuel Oil)	1	1	X	X	1	X

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Butadiene (Monomer)	1	3	3	3	1	1
Butane	1	1	1	3	1	1
Butane (2-Dimethyl & 3-Dimethyl)	X	1	3	3	1	3
Butanedial	1	3	1	2	3	1
Butanol (Butyl Alcohol)	X	1	2	2	1	1
Butene 2-Ethyl (1-Butene 2-Ethyl)	X	1	3	3	1	3
Butler	X	1	1	1	1	1
Butter-Animal Fat	X	1	1	2	1	1
Butyl Acetate or n-Butyl Acetate	1	3	2	3	3	3
Butyl Acetyl Ricinoleate	1	2	1	X	1	2
Butyl Acrylate or n-Butyl Acrylate	1	3	1	2	3	3
Butyl Alcohol or n-Butyl Alcohol	1	1	1	1	1	1
Butyl Alcohol (Secondary & Tertiary)	1	2	2	2	1	2
Butyl Amine or N-Butyl Amine	1	1	3	1	3	3
Butyl Benzoate or n-Butyl Benzoate	1	3	1	X	1	1
Butyl Butyrate or n-Butyl Butyrate	1	3	1	X	1	1
Butyl Benzoate	1	3	1	2	3	1
Butyl Benzyl Phthalate (BBP)	1	X	X	X	X	X
Butyl Carbitol	1	3	2	3	2	3
p-tert-Butylcatechol	1	3	2	X	1	1
Butyl Cellosolve	1	2	2	X	3	3
Butyl Cellosolve Acetate	1	3	1	2	3	1
Butyl Cellosolve Adipate	X	3	2	2	2	2
Butyl Chloride or n-Butyl Chloride	1	1	3	2	1	1
Butyl Ether or n-Butyl Ether	1	3	3	3	3	3
Butyl (Glycolate, Lactate, Laurate, & Oxalate)	1	3	1	2	3	1
Butyl Methracrylate (n-Butyl Methracrylate)	1	3	1	2	3	1
Butyl Mercaptan (Tertiary)	1	3	3	3	1	X
p-tert-Butylphenol	1	X	X	X	X	X
Butyl Oleate	1	3	2	X	1	2
Butyl Stearate	1	2	3	X	1	2
Butylbenzoic Acid	1	2	3	X	1	2
Butylene	1	2	3	3	1	2
Butyraldehyde	2	3	2	3	3	3
Butyric Acid	1	3	2	X	2	X
Butyric Anhydride	1	3	1	2	3	1
Butyrolacetone	1	3	1	2	3	1

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Butyryl Chloride	1	2	3	X	1	2
Cadmium (Chloride, Cyanide, Nitrate, Oxide)	1	3	1	2	3	1
Cadmium (Sulfate, Sulfide, & Hydrosulfide)	1	3	1	2	3	1
Calcine Liquors	1	1	1	X	1	1
Calcium Acetate	1	2	1	3	3	3
Calcium (Arsenate, Bicarbonate, & Bisulfide)	1	3	1	2	3	1
Calcium Bisulfite	1	2	1	3	2	3
Calcium (Benzoate, Stearate, & Sulfamate)	1	2	3	X	1	2
Calcium (Bromide, Chloride, & Fluoride)	1	1	1	1	1	1
Calcium (Hydride, Oxide, Sulfide, & Sulfite)	1	1	1	1	1	1
Calcium Carbide	1	X	X	X	X	X
Calcium Carbonate	1	1	1	1	1	1
Calcium Cyanamide	1	X	X	X	X	X
Calcium Cyanide	1	1	1	1	X	X
Calcium (Chlorate, Chromate, & Gluconate)	1	3	1	2	3	1
Calcium Hydrogen Sulfite	1	3	3	1	1	1
Calcium Hydroxide	1	1	1	1	1	1
Calcium Hypochlorite	1	2	1	2	1	2
Calcium (Hypophosphite, Lactate, & Oxalate)	1	3	1	2	3	1
Calcium Nitrate	1	1	1	2	1	1
Calcium (Permanganate & Peroxide)	1	X	X	X	X	X
Calcium Phosphate	1	1	1	1	1	X
Calcium (Phenolsulfonate, & Phosphate Acid)	1	3	1	2	3	1
Calcium (Propionate, Sulfate, & Thiocyanate)	1	3	1	2	3	1
Calcium Salts	1	1	1	2	1	1
Calcium Silicate	1	1	1	X	1	X
Calcium Thiosulfate	1	2	1	1	1	1
Calcium Tungstate	1	3	1	2	3	1
Caliche Liquors	1	1	1	2	1	1
Camphene	1	2	3	X	1	2
Camphor	1	2	3	X	1	2
Camphoric Acid	1	2	3	X	1	2
Cane Sugar Liquors	1	1	1	1	1	1
Capric & Caproic Acid	1	1	3	2	1	1
Caproic Aldehyde	1	X	2	2	3	3
Caprolactam	1	1	3	2	1	1
Capronaldehyde	1	1	3	2	1	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Carbamate	1	3	2	X	1	1
Carbitol	1	1	1	1	1	2
Carbitol Acetate	X	3	3	3	1	X
Carbolic Acid (Phenol)	1	3	2	3	1	1
Carbon (Bisulfide & Disulfide)	1	3	3	3	1	1
Carbon Dioxide (Explosive Decompression Use)	1	1	1	1	1	1
Carbon Fluorides	1	2	3	3	1	2
Carbon Monoxide	1	1	1	1	1	2
Carbon (Tetrachloride & Tetrafluoride)	1	2	3	3	1	2
Carbon Tetrabromide	1	X	X	X	X	X
Carbonic Acid	1	1	1	1	1	1
Casein	1	3	1	2	3	1
Castor Oil	1	1	1	1	1	1
Caustic (Lime, Potash, & (Sodium Hydroxide))	1	3	1	2	3	1
Cellosolve	1	3	2	3	3	3
Cellosolve (Butyl & Acetate)	1	3	2	3	3	3
Celluguard	1	1	1	1	1	1
Cellulose (Acetate & Acetate Butyrate)	1	3	1	2	3	1
Cellulose (Ether, Nitrate, & Tripropionate)	1	3	1	2	3	1
CELLULUBE (Phosphate Esters)	1	3	1	1	1	3
CELLULUBE A60	1	3	2	2	3	3
Cellutherm 2505A	1	2	3	3	1	2
Cement, Portland	1	1	1	X	1	X
Ceric Sulfate	1	X	X	X	X	X
Cerium Sulfate	1	3	1	2	3	1
Cerous (Chloride, Fluoride, & Nitrate)	1	3	1	2	3	1
Cetane (Hexadecane or n-Hexadecane)	1	1	3	3	1	3
Cetyl Alcohol	1	1	3	2	1	1
Chassis Grease	X	1	2	3	1	X
Chaulmoogric Acid	1	X	X	X	X	X
China Wood Oil (Tung Oil)	1	1	3	3	1	2
Chloracetic Acid	X	3	3	X	3	3
Chloracetone	X	3	2	3	1	X
Chloral	1	3	1	2	3	1
Cloramine	1	X	X	X	X	X
Chloranthraquinone	1	2	3	X	1	2
Chlordane	1	1	2	3	1	2

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Chlorextol	1	2	3	3	1	2
Chloric Acid	1	3	1	2	3	1
Chlorinated Solvents (Dry & Wet)	1	3	3	3	1	1
Chlorine	1	3	3	X	1	1
Chlorine Dioxide	2	3	3	X	1	2
Chlorine Dioxide 8% Cl as NaClO2	X	3	3	X	1	2
Chlorine Trifluoride	2	3	3	3	3	3
Chlorine Water	1	3	2	X	1	X
Chlorine, Dry	1	3	X	3	2	X
Chlorine, Wet	1	3	X	3	2	X
Chloro- (picrin, prene, & toluidine)	1	2	3	X	1	2
Chloro (1-Nitro Ethane 1-Chloro-1-Nitro Ethane)	1	3	3	3	3	3
Chloro Xylenols	1	2	3	X	1	2
Chloroacetaldehyde	2	3	1	2	3	1
Chloroacetic Acid	1	3	2	X	3	3
Chloroacetone	1	3	1	3	3	3
Chloroacetyl Chloride	1	X	X	X	X	X
Chloroamino Benzoic Acid	1	3	1	2	3	1
Chloroaniline	1	3	1	2	3	1
Chlorobenzaldehyde	1	3	1	2	3	1
Chlorobenzene (Chlorobenzene (Mono))	1	3	3	3	1	2
Chlorobenzene (Chloride & Trifluoride)	1	2	3	X	1	2
Chlorobenzo- (chloride & trifluoride)	1	2	3	X	1	2
Chlorobenzol	X	3	3	3	1	X
Chlorobromomethane	1	3	2	3	1	2
Chlorobromopropane	1	2	3	X	1	2
Chlorobutadiene	X	3	3	3	1	2
Chlorobutane (Butyl Chloride)	1	1	3	2	1	1
Chlorodifluoroethane (FC 142b)	2	X	1	X	3	X
Chlorodifluoromethane (FC 22)	1	3	2	3	3	3
Chlorododecane	1	3	3	3	1	1
Chloroethane	1	1	3	2	1	1
Chloroethane Sulfonic Acid	1	3	1	2	3	1
Chloroethylbenzene	1	2	3	X	1	2
Chloroform	1	3	3	3	1	2
Chlorohydrin	1	3	1	2	3	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Chloronaphthalene or o-Chloronaphthalene	1	3	3	3	1	2
Chloronitrobenzene	1	3	1	2	3	1
Chloronitroethane	1	3	3	3	3	3
Chloropentafluoroethane (FC 115)	2	1	1	X	1	X
Chlorophenol (o-Chlorophenol & p-Chlorophenol)	1	3	3	3	1	2
Chloropicrin	1	X	X	X	X	X
Chloroprene	1	3	3	3	1	2
Chlorosulfonic Acid	1	3	3	3	3	3
Chlorotetrafluoroethane (FC 124)	2	X	X	X	X	X
Chlorotoluene or p-Chlorotoluene	1	3	3	3	1	2
Chlorotoluene Sulfonic Acid	1	3	1	2	3	1
Chlorotrifluoromethane (FC 13)	2	X	1	3	1	3
Chlorotritluoroethylene (CTFE)	2	X	X	X	X	X
Chlorox	1	2	2	X	1	1
Chloroxylenol	1	X	X	X	X	X
Cholesterol	1	2	3	X	1	2
Choline	1	X	X	X	X	X
Chrome Alum	1	1	1	1	1	X
Chrome Plating Solutions	1	3	2	2	1	2
Chromic Acid	1	3	2	X	1	2
Chromic (Chloride, Fluoride, Hydroxide)	1	X	X	X	X	X
Chromic Oxide	1	3	2	X	1	X
Chromic (Nitrate, Phosphate & Sulfate)	1	X	X	X	X	X
Chromium Potassium Sulfate (Alum)	1	2	2	X	1	X
Chromyl Chloride	1	X	X	X	X	X
Cinnamic (Acid, Alcohol, & Aldehyde)	1	2	3	X	1	2
Circo Light Process Oil	1	1	3	3	1	1
Citric Acid	1	1	1	1	1	1
City Service (#65, #120, #250, Pacemaker #2)	1	1	3	3	1	1
City Service (Koolmoter AP Gear Oil 140-EP)	1	1	3	3	1	1
Clorox	1	2	2	X	1	X
Coal Tar	1	1	X	X	1	X
Cobalt Chloride	X	1	1	2	1	1
Cobalt Chloride, 2N	X	1	1	1	1	1
Cobaltous (Acetate & Sulfate)	1	3	1	2	3	1
Cobaltous Bromide	1	1	1	1	1	1

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Cobaltous Chloride	1	1	1	2	1	1
Cobaltous Linoleate	1	X	X	X	X	X
Coconut Oil	1	1	3	1	1	1
Cod Liver Oil	1	1	1	1	1	1
Codeine	X	2	3	X	1	2
Coffee	X	1	1	1	1	1
Coke Oven Gas	1	3	3	2	1	2
Coliche Liquors	X	2	2	X	X	X
Convelex 10	1	3	X	3	X	X
Coolanol 20 25R 35R 40& 45A (Monsanto)	1	1	3	3	1	1
Copper Acetate	1	2	1	3	3	3
Copper (Ammonium Acetate, & Carbonate)	1	3	1	2	3	1
Copper Gluconate	1	3	1	2	3	1
Copper (Chloride, Cyanide, Oxide, Sulfate)	1	1	1	1	1	1
Copper Nitrate	1	2	2	X	1	X
Copper Sulfate (10% & 50%)	1	1	1	1	1	1
Corn Oil	1	1	3	1	1	1
Cottonseed Oil	1	1	3	1	1	2
Creosote	X	1	1	3	1	1
Creosote Oil	1	1	2	2	1	X
Creosote (Coal Tar & Wood)	1	1	3	3	1	1
Cresylic Acid	1	3	3	3	1	2
Cresol (Methyl Phenol)	1	X	X	X	1	X
Cresols	X	3	3	3	2	X
Cresylic Acid	1	3	3	3	1	X
Crotonaldehyde	1	2	3	X	1	2
Crotonic Acid	1	2	3	X	1	2
Crude Oil	1	1	3	3	1	2
Cumaldehyde	1	2	3	X	1	2
Cumene	1	3	3	3	1	2
Cumene Hydroperoxide	1	X	X	X	X	X
Cuminic Aldehyde	1	X	X	X	X	X
Cupric Sulfate	1	2	2	X	1	X
Cutting Oil	1	1	3	3	1	1
Cyanamide	1	X	X	X	X	X
Cyanoacetic Acid	1	X	X	X	X	X
Cyanogen Chloride	1	3	3	X	2	X

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Cyanohydrin	1	X	X	X	X	X
Cyanuric Chloride	1	X	X	X	X	X
Cyclo- (hexene & pentadiene)	1	2	3	X	1	2
Cyclohexane	1	1	2	3	1	1
Cyclohexanol	1	1	1	3	1	1
Cyclohexanone	1	3	2	3	3	3
Cyclohexylamine (Cyclohexylamine Laurate)	1	1	3	2	1	1
Cyclo- (pentane & polyolefins)	1	1	3	3	1	1
Cyclopropane	1	X	X	X	X	X
Cymene or p-Cymene	1	3	3	3	1	2
DDT (Dichlorodiphenyltrichloroethane)	1	2	3	X	1	2
Decahydronaphthalene	1	3	3	3	1	1
Decalin	X	3	3	3	1	1
Decane or n-Decane	1	1	3	2	1	1
Deionized Water	1	2	2	X	1	X
Delco Brake Fluid	1	3	1	3	3	3
Denatured Alcohol	1	1	1	1	1	1
Detergent, Water Solution	1	1	1	1	1	1
Developing Fluids (Photo)	1	1	2	1	1	1
Dexron	X	1	3	3	1	2
Dextrin	1	1	3	2	1	1
Dextro Lactic Acid	1	3	1	2	3	1
Dextron	1	1	3	X	1	X
Dextrose	1	3	1	2	3	1
DI Water	X	2	1	2	2	1
Diacetone	1	3	1	3	3	3
Diacetone Alcohol	1	3	1	3	3	3
Dialkyl Sulfates	1	3	1	2	3	1
Diallyl Phthalate (DAP)	1	X	X	X	X	X
Diamylamine	1	1	3	2	1	1
Diazinon	1	3	3	3	2	2
Dibenzyl (sym-Diphenylethane)	1	2	3	X	1	2
Dibenzyl Ether	1	3	2	X	3	X
Dibenzyl Sebacate	1	3	2	3	2	3
Diborane	1	X	X	X	X	X
Dibromodifluoromethane	1	3	2	3	X	X
Dibromoethane	1	2	3	X	1	2

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Dibromoethyl Benzene	1	3	3	3	1	2
Dibromotetrafluoroethane (FC 114B2)	2	2	3	3	2	X
Dibutyl Amine or n-Dibutyl Amine	1	3	2	3	3	3
Dibutyl Cellosolve Adipate	1	3	1	2	3	1
Dibutyl Ether	1	3	3	3	3	3
Dibutyl Phthalate	1	3	2	2	3	3
Dibutyl Sebacate	1	3	2	2	2	2
Dibutyl tert-Peroxide	1	X	X	X	X	X
Dibutyl Methylenedithio Glycolate	1	2	3	X	1	2
Dibutyl (Thioglycolate, & Thiourea)	1	2	3	X	1	2
Dicapryl Phthalate	1	3	2	3	2	2
Dichloroacetic Acid	1	2	3	X	1	2
Dichloroaniline	1	3	1	2	3	1
Dichlorobenzene	1	3	3	3	1	2
o-Dichlorobenzene or p-Dichlorobenzene	1	3	3	3	1	2
Dichlorobutane	1	2	3	3	1	2
Dichlorobutene	1	X	X	X	X	X
Dichlorodiphenyl-Dichloroethane (DDD)	1	2	3	X	1	2
Dichlorodiethyl Sulfide	1	X	1	1	X	X
Dichlorodifluoromethane (FC 12)	2	1	2	3	2	3
Dichlorofluoroethane (FC 141b)	1	X	X	X	X	X
Dichlorofluoromethane (FC 21)	1	3	3	3	3	X
Dichlorohydrin	1	3	1	2	3	1
Dichloroisopropyl Ether	1	3	3	3	3	3
Dichloro- (ethane, ethylene, & methane)	1	2	3	X	1	2
Dichloro- (phenol & phenoxyacetic Acid)	1	2	3	X	1	2
Dichloro- (propane & propene)	1	2	3	X	1	2
Dichlorosilane	1	X	X	X	X	X
Dichlorotetrafluoroethane (FC 114)	2	1	1	3	1	2
Dichlorotrifluoroethane (FC 123)	1	X	X	X	X	X
Dicyclohexylamine	1	1	3	2	3	3
Dicyclohexylammonium Nitrate	1	3	1	2	3	1
Dieldrin (HEOD)	1	2	3	X	1	2
Diesel Oil	1	1	2	3	1	1
Di-ester Lubricant MIL-L-7808	1	2	3	3	1	2
Di-ester Synthetic Lubricants	1	2	3	3	1	2
Diethanolamine (DEA)	1	3	1	2	3	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Diethyl Benzene	1	2	3	X	1	X
Diethyl Carbonate	1	3	1	2	3	1
Diethyl Ether	1	3	3	3	3	3
Diethyl Phthalate	1	2	3	X	1	2
Diethyl Sebacate	1	2	2	2	2	2
Diethyl Sulfate	1	3	1	2	3	X
Diethylamine	1	1	1	1	3	3
Diethylaniline or n-Diethylaniline	1	3	1	2	3	1
Diethylene Glycol	1	1	1	1	1	1
Diethylene Glycol Butyl Ether	1	3	1	3	3	3
Diethylene Glycol Methyl Ether	1	X	X	X	X	X
Diethylenetriamine	1	X	X	X	X	X
Diethylhexyl Phthalate	1	3	2	3	2	2
Diethylhexyl Sebacate	1	3	2	3	2	3
Diethylhexylamine	1	X	X	X	X	X
Difluoro- (ethane & monochloroethane)	1	2	3	X	1	2
Difluorodibromomethane	1	3	2	3	X	X
Diglycol Chloroformate	1	3	1	2	3	1
Diglycolic Acid	1	3	1	2	3	1
Dihydroxydiphenylsulfone	1	3	1	2	3	1
Diisobutyl Ketone	1	X	1	X	X	X
Diisobutylcarbinol	1	1	3	2	1	1
Diisobutylene	1	2	3	3	1	3
Diisooctyl Sebacate (DIOS)	1	3	3	3	2	3
Diisopropyl- (benzene & idene Acetone)	1	2	3	X	1	2
Diisopropyl Ketone	1	3	1	3	3	3
Dimethyl	1	3	1	X	1	X
Dimethyl (Acetamide & Formaldehyde)	1	3	1	2	3	1
Dimethyl Disulfide (DMDS)	1	1	3	2	1	1
Dimethyl Ether	1	1	2	X	2	X
Dimethyl Formamide (DMF)	1	3	1	1	3	X
Dimethyl Aniline (Xylidine)	1	2	3	X	1	2
Dimethyl (Phenyl Carbinol, Phenyl Methanol)	1	2	3	X	1	2
Dimethyl (Hydrazine & Sulfoxide (DMSO))	1	3	1	2	3	1
Dimethyl Phthalate	1	3	2	X	2	2
Dimethyl Terephthalate (DMT)	1	2	3	X	1	2
Dimethylamine (DMA)	2	2	1	2	3	3

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Compound	Temperature Range	Compound	Temperature Range
Fluoroelastomer (FKM)	-26°C to 205°C (-15°F to 400°F)	Nitrile (NBR)	-34°C to 121°C (-30°F to 250°F)
Fluorosilicone (FVMQ)	-73°C to 190°C (-100°F to 375°F)	Ethylene Propylene (EPDM)	-57°C to 149°C (-70°F to 300°F)
Perfluoroelastomer (FFKM)	-26°C to 316°C (-15°F to 600°F)	Silicone (VMQ)	-54°C to 232°C (-65°F to 450°F)

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Dinitrochlorobenzene	1	2	3	X	1	2
Dinitrotoluene (DNT)	1	3	3	3	3	3
Dioctyl Phthalate	1	3	1	2	1	2
Dioctyl Sebacate	1	3	2	3	2	3
Dioctylamine	1	1	3	2	1	1
Dioxane	1	3	1	3	3	3
Dioxolane	1	3	2	3	3	3
Dipentene	1	2	3	3	1	2
Diphenyl (Diphenyl Oxides)	1	3	3	3	1	2
Diphenylamine (DPA)	1	2	3	X	1	2
Diphenylene Oxide	1	X	X	X	X	X
sym-Diphenylethane	1	X	X	X	X	X
Diphenylpropane	1	2	3	X	1	2
Disilane	1	X	X	X	X	X
Dodecylbenzene	1	2	3	X	1	2
n-Dodecyl Mercaptan	1	X	X	X	X	X
Dow Chemical 50-4	2	X	1	X	3	3
Dow Chemical ET378	2	3	X	3	X	X
Dow Chemical ET588	2	3	1	X	3	3
Dow Corning (1208, 4050, 6620, F-60, 61, xF-60, 220)	1	1	1	X	1	X
Dow Corning (-3, -4. & -11)	1	2	1	2	1	1
Dow Corning (-33, -44, -5, -510, & -55)	1	2	1	3	1	2
Dow Corning (-550, -704, -705, & -710)	1	2	1	3	1	2
Dow Corning -1265 Fluorosilicone Fluid	X	2	1	1	1	3
Dow Corning -200	X	2	1	3	1	2
Dow Guard	1	1	1	1	1	1
Dowtherm (A & E)	1	3	3	3	1	2
Dowtherm, 209	1	3	1	3	3	3
Drinking Water	1	1	1	1	1	1
Dry Cleaning Fluids	2	3	3	3	1	2
DTE 20 Series, Mobil	1	2	3	3	1	2
DTE named series, Mobil, light-heavy	1	1	3	3	1	1
Elco 28-EP lubricant	1	1	3	2	1	1
Epichlorohydrin	2	3	2	3	3	3
Epoxy Resins	1	X	1	X	3	X
Erucic Acid	1	X	X	X	X	X

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Esam-6 Fluid	1	X	1	X	3	3
Esso (Fuel 208 & Transmission Fluid (Type A))	1	1	3	3	1	1
Esso Golden Gasoline	1	2	3	3	1	1
Esso (Motor Oil & WS2812 (MIL-L-7808A))	1	1	3	3	1	1
Esso XP90-EP lubricant	1	1	3	3	1	1
Esstic 42, 43	1	1	3	3	1	1
Ethane	1	1	3	3	1	2
Ethanethiol+D30	1	3	3	3	2	X
Ethanol	1	1	1	1	1	1
Ethanol Amine (MEA)	1	2	1	2	3	3
Ethers	1	3	3	3	3	3
Ethoxyethyl Acetate (EGMEEA)	X	3	1	2	3	1
Ethyl Acetate	1	3	1	1	3	3
Ethyl Alcohol	1	3	1	2	3	1
Ethyl Aluminum Dichloride	1	X	X	X	X	X
Ethyl Acetate-Organic Ester	1	3	2	2	3	3
Ethyl (Acetoacetate & Acrylate)	1	3	2	2	3	3
Ethyl (Benzene & Benzoate)	1	3	3	3	1	1
Ethyl Bromide	1	2	3	X	1	1
Ethyl Butyrate	1	X	X	X	X	X
Ethyl (Cellosolve & Chloroformate)	1	3	2	3	3	3
Ethyl Cellulose	1	1	1	1	3	3
Ethyl Chloride	1	1	3	3	1	1
Ethyl Chlorocarbonate	1	3	2	3	1	2
Ethyl Cyanide	1	1	3	X	1	X
Ethyl (Dibromide & Dichloride)	1	3	3	X	1	X
Ethyl Ether	1	2	2	3	3	2
Ethyl Formate	2	3	1	X	1	1
Ethyl Hexanol	1	1	1	2	1	1
Ethyl Isovalerate	1	X	X	X	X	X
Ethyl Mercaptan	1	3	X	3	2	X
Ethyl (Lactate & Nitrite)	1	3	1	2	3	1
Ethyl Oxalate	1	3	1	3	2	2
Ethyl (Pyridine, Stearate, & Valerate)	1	2	3	X	1	2
Ethyl Pentachlorobenzene	1	3	3	3	1	2
Ethyl Silicate (TEOS)	1	1	1	X	1	1

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Ethyl Sulfate	X	X	1	X	3	X
Ethyl Tertiary Butyl Ether	1	3	3	X	2	X
Ethylacrylic Acid	X	3	2	3	X	3
Ethylamine	1	3	1	2	3	1
Ethylcyclopentane	1	1	3	3	1	1
Ethylene (Ethylene Chloride)	1	3	3	3	2	2
Ethylene Chlorohydrin	1	3	2	3	1	2
Ethylene Cyanohydrin	1	2	3	X	1	2
Ethylene (Dibromide & Dichloride)	1	3	3	3	1	3
Ethylene Diamine	2	1	1	1	3	3
Ethylene (Hydrochloride, & Trichloride)	1	3	3	3	1	3
Ethylene Glycol	1	1	1	1	1	1
Ethylene Glycol Butyl Ether	1	3	2	X	3	3
Ethylene Glycol Butyl Ether Acetate	1	3	2	2	2	2
Ethylene Glycol Ethyl Ether Acetate (EGMEEA)	1	3	2	3	3	3
Ethylene Oxide	1	3	1	3	3	X
Ethylene Oxide ((12%) and Freon 12 (80%))	1	3	2	3	3	3
Ethylethoxy-3-Propionate (EEP)	1	X	X	X	X	X
Ethylhexyl Acrylate	1	X	X	X	X	X
Ethylmorpholene Stannous Octotate (50/50 mix)	1	3	2	X	3	X
Ethylmorpholine	1	2	3	X	1	2
Ethylsulfuric Acid	1	3	1	2	3	1
F-60 Fluid (Dow Corning)	1	1	1	3	1	1
F-61 Fluid (Dow Corning)	1	1	1	3	1	1
Fatty Acids	1	2	3	3	1	X
FC-43 Heptacosofluorotri-butylamine	3	1	1	1	1	1
FC75 & FC77 (Fluorocarbon)	3	1	1	1	2	2
Ferric (Acetate & Ammonium Sulfate)	1	3	1	2	3	1
Ferric (Ferrocyanide, & Hydroxide)	1	3	1	2	3	1
Ferric Chloride	1	1	1	2	1	1
Ferric Nitrate	1	1	1	2	1	1
Ferrous Ammonium Citrate	1	3	1	2	3	1
Ferrous (Ammonium Sulfate, & Carbonate)	1	3	1	2	3	1
Ferrous (Iodide, Sulfate, & Tartrate)	1	3	1	2	3	1
Fish Oil	1	2	3	X	1	2
Fisher Reagent	X	X	2	X	X	X

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Fluorinated Cyclic Ethers	1	X	1	X	X	X
Fluorobenzene	1	2	3	X	1	2
Fluoroboric Acid	1	1	1	X	X	X
Fluorocarbon Oils	1	X	1	X	X	X
Fluoroform (FC 23)	1	X	X	X	X	X
Fluorolube	2	1	1	1	2	2
Fluorophosphoric Acid, Anhydrous	1	X	X	X	X	X
Fluorosilicic Acid	1	1	2	X	2	X
Fluorosulfonic Acid	1	X	X	X	X	X
FOMBLIN	1	X	X	X	1	X
Formaldehyde	2	2	1	1	3	3
Formamide	1	3	1	2	3	1
Formic Acid	2	2	1	2	3	X
Freon 12	2	1	1	3	1	3
Freon (218 & C316)	2	1	1	X	1	X
Freon (K-142b & K-152a)	1	1	1	X	3	X
Freon 11	1	3	3	3	2	2
Freon 112	2	2	3	3	1	X
Freon 113 + High and Low Aniline Oil	2	1	X	X	X	X
Freon 114	X	1	1	3	1	X
Freon 114B2	2	2	3	3	2	X
Freon (115 & 116)	2	1	1	X	2	X
Freon (12, ASTM Oil #2(50/50 Mixture))	2	2	3	3	1	2
Freon (Suniso 4G (50/50 Mixture))	2	2	3	3	1	2
Freon 13	2	1	1	3	1	3
Freon 134a (Tetrafluoroethane)	1	X	1	X	X	X
Freon 13B1	2	1	1	3	1	2
Freon 14	1	1	1	3	1	X
Freon 142b	2	2	3	X	2	X
Freon 21	1	3	3	3	3	X
Freon 22 and ASTM Oil #2 (50/50 Mixture)	1	3	3	3	2	2
Freon 31	2	3	1	X	3	X
Freon 32	1	1	1	X	3	X
Freon 502	2	2	1	X	2	X
Freon BF	2	2	3	3	1	X
Freon C318	2	1	1	X	2	X

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Freon MF	X	2	3	3	2	X
Freon PCA	2	1	3	3	2	X
Freon TA	2	1	2	X	3	X
Freon TC	2	1	2	X	1	X
Freon TF	X	1	3	3	2	X
Freon TMC	2	2	3	X	1	X
Freon T-P35	2	1	1	X	1	X
Freon T-WD602	2	2	2	X	1	X
Fuel Oil	1	1	3	3	1	1
Fuel Oil, #6	X	2	3	1	1	1
Fuel Oil (1 & 2)	X	1	3	3	1	1
Fuel Oil, Acidic	X	1	3	1	1	1
Fumaric Acid	1	1	2	2	1	1
Fuming Sulphuric Acid (20/25% Oleum)	1	3	3	3	1	X
Furaldehyde	2	3	2	X	3	X
Furan (Furfuran)	1	3	3	X	1	X
Furfural (Furfuraldehyde)	1	3	1	3	3	X
Furfuryl Alcohol	1	3	2	3	X	3
Furyl Carbinol	1	3	2	3	X	3
Furoic Acid	1	X	X	X	X	X
Fyrquel	1	3	1	1	1	3
Fyrquel (150, 220, 300, & 550)	1	3	1	1	1	2
Fyrquel (90, 100, & 500)	1	3	1	X	1	X
Fyrquel a60	1	3	2	X	3	X
GALDEN	3	X	X	X	1	X
Gallic Acid	1	1	1	X	1	1
Gasoline	1	1	3	3	1	1
Gelatin	1	1	1	1	1	1
Germanium Tetrahydride	1	X	X	X	X	X
Girling Brake Fluid	X	3	1	X	3	3
Glauber's Salt	1	3	2	X	1	1
Gluconic Acid	1	3	1	2	3	1
Glucose	1	1	1	1	1	1
Glutamic Acid	1	3	1	2	3	1
Glycerine (Glycerol)	1	1	1	1	1	1
Glycerol Dichlorohydrin	1	3	1	2	3	1
Glycerol (Monochlroohydrin, & Triacetate)	1	3	1	2	3	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Glycerophosphoric Acid	1	3	1	2	3	1
Glyceryl Phosphate	1	3	1	2	3	1
Glycidol	1	3	1	2	3	1
Glycolic Acid	1	3	1	2	3	1
Glycols	1	1	1	1	1	1
Glycoxylic Acid	1	3	1	2	3	1
Grease Petroleum Base	X	1	3	3	1	1
Green Sulfate Liquor	2	2	1	X	1	2
Gulf (Endurance Oils & FR Fluids (Emulsion))	1	1	3	3	1	1
Gulf Harmony Oils	1	1	3	3	1	1
Gulf (High Temp. Grease, & Legion Oils)	1	1	3	3	1	1
Gulf (Paramount Oils & Security Oils)	1	1	3	3	1	1
Gulf FR G-Fluids	X	1	1	1	1	1
Gulf FR P-Fluids	X	3	2	1	2	2
Gulfcrown Grease	X	1	3	3	1	1
Halothane (Bromochlorotrifluoroethane)	2	3	3	3	1	2
Halowax Oil	2	3	3	3	1	1
Hannifin Lube A	X	1	3	2	1	1
Heavy Water	1	1	1	1	X	1
HEF-2 (High Energy Fuel)	1	2	3	3	1	2
Helium	1	1	1	1	1	1
Heplane	X	1	3	3	1	1
Hepta- (chlor & chlorobutene)	1	2	3	X	1	2
Heptaldehyde (Heptanal)	1	1	3	2	1	1
Heptane or n-Heptane	1	1	3	3	1	3
Heptanoic Acid	1	1	3	2	1	1
Hexachloroacetone	1	3	1	2	3	1
Hexachloro- (butadiene, butene, & ethane)	1	2	3	X	1	2
Hexaldehyde or n-Hexaldehyde	1	3	1	2	3	3
Hexaethyl Tetraphosphate (HETP)	1	X	X	X	X	X
Hexafluoroethane (FC 116)	2	1	1	X	2	X
Hexamethyldisilizane (HMDS)	1	X	X	X	X	X
Hexamethylene (Cyclohexane)	2	1	3	2	1	1
Hexamethylene- (diamine & tetramine)	1	3	1	2	3	1
Hexamethylene Diammonium Adipate	1	2	3	X	1	2
Hexane or n-Hexane	1	1	3	3	1	3
Hexanol	X	1	2	1	1	X

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Hexene-1 or n-Hexene-1	1	2	3	3	1	3
Hexone (Methyl Isobutyl Ketone)	1	3	1	2	3	1
Hexyl Acetate	1	1	3	2	1	1
Hexyl Alcohol	1	1	3	2	1	2
Hexylene Glycol	1	3	1	2	3	1
Hexylresorcinol	1	2	3	X	1	2
High Viscosity Lubricant (H2 & U4)	1	1	1	1	1	2
HiLo MS #1	X	3	1	3	3	3
Home Heating Oil	X	1	3	1	1	X
Houghto-Safe 271 (Water & Glycol Base)	X	1	1	2	2	2
Houghto-Safe 416 & 500 Series	X	1	1	X	X	X
Houghto-Safe 620 Water/Glycol	X	1	1	2	2	2
Houghto-Safe 1010 phosphate ester	X	3	1	3	1	2
Houghto-Safe 1055 phosphate ester	X	3	1	3	1	2
Houghto-Safe 1120 phosphate ester	X	3	2	3	1	2
Houghto-Safe 5040 (Water/Oil emulsion)	X	1	3	3	1	2
Hydraulic Oil (Petroleum Base, Industrial)	1	1	3	2	1	1
Hydraulic Oils (Synthetic Base)	1	2	3	X	1	2
Hydrazine	2	2	1	2	3	3
Hydrazine (Anhydrous)	1	3	2	X	3	3
Hydrazine (Dihydrochloride & Hydrate)	1	3	1	2	3	1
Hydriodic Acid	1	2	3	X	1	2
Hydrobromic (Acid & Acid 40%)	1	3	1	3	1	3
Hydrocarbons, Saturated	1	1	3	3	1	1
Hydrochloric Acid	1	1	1	3	1	3
Hydrochloric Acid (cold) 37%	1	3	3	X	1	X
Hydrochloric Acid (hot) 37%	1	3	3	X	1	2
Hydrochloric Acid, 3 Molar to 158°F	X	2	1	3	1	3
Hydrochloric Acid, (Conc. Room Temp.)	1	2	2	X	1	X
Hydrochloric Acid, Concentrated to 158°F	X	3	3	3	1	3
Hydrocyanic Acid	1	1	1	2	1	3
Hydro-Drive MIH-10 & MIH-50	X	1	3	2	1	1
Hydrofluoric Acid (49%)	1	3	3	3	1	3
Hydrofluoric Acid (conc.) Hot	1	3	3	X	3	X
Hydrofluorosilicic Acid	1	2	1	3	1	3
Hydrogen	1	1	1	3	1	3
Hydrogen Bromide, Anhydrous	1	X	X	X	X	X

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Hydrogen Chloride, Anhydrous	1	3	1	X	1	X
Hydrogen Chloride gas	X	3	1	X	1	X
Hydrogen Fluoride (Anhydrous)	2	3	1	X	3	3
Hydrogen Gas (Cold & Hot)	1	1	1	3	1	3
Hydrogen Iodide, Anhydrous	1	X	X	X	X	X
Hydrogen Peroxide	X	1	1	1	1	1
Hydrogen Peroxide (36%)	1	2	1	2	1	2
Hydrogen Peroxide 90%	1	3	3	2	1	2
Hydrogen Selenide	1	X	X	X	X	X
Hydrogen Sulfide Dry Cold	1	1	1	3	3	3
Hydrogen Sulfide (Dry Hot, Wet Cold & Hot)	1	3	1	3	3	3
Hydrolube-Water/Ethylene Glycol	1	1	1	2	1	2
Hydroxycitronellal	1	X	X	X	1	2
Hydroxyethylenediamine	1	X	X	X	X	X
Hydroquinol	X	3	3	X	1	X
Hydroquinone	2	2	3	X	1	2
Hydroxyacetic Acid	1	3	1	2	3	1
Hydyne	2	2	1	3	3	3
Hyjet (Hyjet (s4 & w)	1	3	1	X	3	X
Hyjet IV and IVA	1	3	1	3	3	3
Hypochlorous Acid	1	3	2	X	1	X
Hypoid Gear Lube	X	1	3	2	1	X
Indole	1	X	X	X	1	2
Industron (FF44, FF48, FF53, & FF80)	1	1	3	3	1	1
Insulin	1	3	1	2	3	1
Iodic Acid	1	3	1	2	3	1
Iodine	1	1	1	X	1	1
Iodine Pentafluoride	2	3	3	3	3	3
Iodoform	1	X	3	X	1	2
Iso Octane	1	1	3	3	1	1
Iso Phorone	1	3	1	3	3	2
Isoamyl (Acetate, Butyrate, & Valerate)	1	3	1	2	3	1
Isoboreol	1	X	X	X	1	2
Isobutane	1	1	3	2	1	1
Isobutene	1	X	X	X	X	X
Isobutyl (Acetate, Methyl Ketone, & Phosphate)	1	3	1	2	3	1
Isobutyl Acrylate	1	X	X	X	X	X

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Compound	Temperature Range	Compound	Temperature Range
Fluoroelastomer (FKM)	-26°C to 205°C (-15°F to 400°F)	Nitrile (NBR)	-34°C to 121°C (-30°F to 250°F)
Fluorosilicone (FVMQ)	-73°C to 190°C (-100°F to 375°F)	Ethylene Propylene (EPDM)	-57°C to 149°C (-70°F to 300°F)
Perfluoroelastomer (FFKM)	-26°C to 316°C (-15°F to 600°F)	Silicone (VMQ)	-54°C to 232°C (-65°F to 450°F)

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Isobutyl Alcohol	1	2	1	1	1	2
Isobutyl Chloride	1	3	3	X	1	X
Isobutyl Ether	1	2	3	X	3	X
Isobutyl n-Butyrate	1	3	1	X	1	1
Isobutylene	1	X	X	X	1	2
Isobutyraldehyde	2	3	2	X	3	X
Isobutyric Acid	1	1	2	2	3	X
Isocrotyl Chloride	1	X	X	X	1	2
Isocyanate	X	X	X	X	1	X
Isodecanol	1	1	3	2	1	1
Isododecane	1	1	3	3	1	1
Isoeugenol	1	1	3	2	1	1
Isooctane	1	1	3	3	1	1
Isopar	X	1	3	3	1	X
Isopentane	1	1	3	2	1	1
Isophorone (Ketone)	1	3	2	3	3	3
Isopropanol	1	1	1	1	1	1
Isopropylacetone	1	3	1	2	3	1
Isopropylamine	1	3	1	2	3	1
Isopropyl Acetate	1	3	2	3	3	2
Isopropyl Alcohol (IPA)	1	2	1	1	1	2
Isopropyl Chloride	1	3	3	3	1	2
Isopropyl Ether	1	2	3	3	3	3
Isovaleric Acid	1	X	X	X	X	X
Jet Fuel A	1	2	3	X	1	2
JIS Lube Oil #1	1	X	X	X	X	X
JP-10	1	3	3	3	1	1
JP-3 (MIL-J-5624)	1	1	3	X	1	X
JP-4 (MIL-J-5624)	1	1	3	3	1	2
JP-5 (MIL-J-5624)	1	1	3	3	1	2
JP-6 (MIL-J-25656)	1	1	3	3	1	2
JP-8 (MIL-T-83133)	1	1	3	3	1	2
JP-9 (MIL-F-81912) & (-11)	1	3	3	3	1	2
JP-10	1	3	3	3	1	1
JPX (MIL-F-25604)	1	1	3	X	3	X
Kel F Liquids	3	1	1	1	2	2
Kerosene (Similar to RP-1 and JP-1)	1	1	3	3	1	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Keystone #87HX-Grease	X	1	3	3	1	1
Lacquer Solvents	1	3	3	3	3	3
Lactams-Amino Acids	1	3	2	X	3	3
Lactic Acid Cold	1	1	1	1	1	1
Lactic Acid Hot	1	3	3	2	1	2
Lactones (Cyclic Esters)	X	3	2	2	3	3
Lard Animal Fat	1	1	2	2	1	1
Lactic Acid	1	1	1	X	1	1
Lauric Acid	1	1	3	2	1	1
Lavender Oil	1	2	3	X	1	X
LB 135	X	1	1	X	1	X
Lead Acetate	1	2	1	3	3	3
Lead Azide	1	X	X	X	X	X
Lead (Arsenate, Bromide, Carbonate, Chloride)	1	3	1	2	3	1
Lead (Chromate, Dioxide, Linoleate, & Oxide)	1	3	1	2	3	1
Lead Naphthenate	1	X	X	X	X	X
Lead Nitrate	1	1	1	2	X	1
Lead Sulfamate	1	2	1	2	1	1
Lehigh (X1169 & X1170)	X	1	3	3	1	1
Light Grease	X	1	3	X	1	X
Ligroin (Petroleum Ether or Benzene)	1	1	3	3	1	1
Lime Bleach	1	1	1	X	1	X
Lime Sulfur	1	X	X	X	1	2
Lindol, Hydraulic Fluid (Phosphate ester type)	1	3	1	3	2	3
Linoleic Acid	1	1	3	1	1	X
Linseed Oil	1	1	2	1	1	1
Liquid Oxygen (LOX)	2	3	3	3	3	3
Liquid Petroleum Gas (LPG)	1	1	3	3	1	3
Liquimoly	X	1	3	3	1	1
Liquor	1	1	1	X	1	X
Lithium (Bromide (Brine), Carbonate, Chloride)	1	3	1	2	3	1
Lithium (Citrate, & Hydroxide)	1	3	1	2	3	1
Lithium (Hypochlorite, Nitrate, & Nitrite)	1	3	1	2	3	1
Lithium (Perchlorate, & Salicylate)	1	3	1	2	3	1
Lithopone	1	3	1	2	3	1
Lubricating Oils (Crude & Refined)	X	2	3	X	1	X
Lubricating Oils (Synthetic base)	1	X	X	X	1	2

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Lubricating Oils Di-ester	1	2	3	3	1	2
Lubricating Oils (petroleum base)	1	1	3	3	1	1
Lubricating Oils (SAE 10, 20, 30, 40, 50)	1	1	3	3	1	1
Lye Solutions	1	1	1	1	1	2
m-Chloroaniline	1	3	2	X	3	X
m-Chlorobenzotrifluoride	1	3	3	3	1	2
Magnesium (Chloride & Salts)	1	1	1	1	1	1
Magnesium Hydroxide	1	2	1	X	1	X
Magnesium (Sulfite & Sulfate)	1	1	1	1	1	1
Malathion	1	1	3	3	1	2
Maleic Acid	1	3	3	X	1	X
Maleic Anhydride	1	3	2	X	3	X
Maleic Hydrazide	1	3	1	2	3	1
Malic Acid	1	1	2	2	1	1
Mandelic Acid	1	3	1	2	3	1
Manganese (Acetate, Carbonate, Gluconate)	1	3	1	2	3	1
Manganese Chloride	X	3	1	2	3	1
Manganese (Hypophosphite & Linoleate)	1	3	1	2	3	1
Manganese (Phosphate, & Sulfate)	1	3	1	2	3	1
Manganous (Chloride, Phosphate, & Sulfate)	1	3	1	2	3	1
Mannitol	1	3	1	2	3	1
MCS (352 & 463)	X	3	1	3	3	3
MCS 312	X	3	3	1	1	1
MDI (Methylene di-p-phenylene isocyanate)	1	3	1	2	3	1
Mercaptan	1	1	3	2	1	1
Mercaptobenzothiazole (MBT)	1	X	X	X	1	2
Mercuric (Acetate, Cyanide, & Iodide)	1	3	1	2	3	1
Mercuric (Nitrate, Sulfate, & Sulfite)	1	3	1	2	3	1
Mercuric Chloride	1	1	1	X	1	X
Mercurous Nitrate	1	3	1	2	3	1
Mercury	1	1	1	X	1	X
Mercury (Chloride, Fulminate, & Salts)	1	3	1	2	3	1
Mercury Vapors	1	1	1	X	1	X
Mesityl Oxide (Ketone)	1	3	2	3	3	3
Meta- (Cresol & Toluidine)	1	X	X	X	1	2
Meta-Nitroaniline	1	3	1	2	3	1
Metaldehyde	1	3	1	2	3	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Methacrylic Acid	1	3	1	2	3	1
Methallyl Chloride	1	X	X	X	1	2
Methane	1	1	3	3	1	2
Methanethiol	1	X	X	X	X	X
Methanol	1	1	1	1	3	1
Methoxyethanol (DGMMA)	X	3	1	2	3	1
Methoxychlor	1	X	X	X	X	X
Methyl Acetate	1	3	1	3	3	3
Methyl Acetoacetate	1	3	2	2	3	3
Methyl Acrylate	1	3	2	3	3	3
Methyl Abietate	1	X	X	X	1	2
Methyl (Acetophenone, & Anthranilate)	1	X	X	X	1	2
Methyl (amine & amyl Acetate)	X	3	1	2	3	1
Methyl (glycerol, & sulfuric Acid)	X	3	1	2	3	1
Methylal	1	X	X	X	X	X
Methylallyl Chloride	1	X	X	X	X	X
Methyl Alcohol	1	3	1	1	3	1
Methylamine	1	X	X	X	X	X
Methylamyl Acetate	1	X	X	X	X	X
Methyl Amylketone	1	3	1	2	3	1
Methylamyl Alcohol	1	X	X	X	X	X
Methylbenzyl Alcohol	1	X	X	X	X	X
Methyl Benzoate	1	3	3	3	1	1
Methyl Bromide	1	2	3	X	1	1
Methyl Butyl Ketone	1	3	1	3	3	3
Methyl Butyrate (Cellosolve & Chloride)	1	3	1	2	3	1
Methyl (Carbonate, Chloride, & Choroformate)	1	3	3	3	1	2
Methyl Cellosolve	1	2	1	3	3	3
Methyl Cellulose	1	2	2	2	3	3
Methyl Chloroform	1	3	3	X	1	X
Methyl Chlorosilane	1	X	X	X	X	X
Methyl (Chloroacetate & Cyanide (Acetonitrile))	1	3	1	2	3	1
Methyl Cyclohexanone	1	1	3	2	1	1
Methyl Ether	1	1	3	1	1	1
Methyl Ethyl Ketone (MEK)	1	3	1	3	3	3
Methyl Ethyl Ketone Peroxide	1	3	3	2	3	3
Methyl Formate	1	3	2	X	X	X

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone	Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Methyl Iodide	1	1	3	2	1	1	MIL-G-25013	X	1	1	3	1	1
Methyl Isobutyl Ketone (MIBK)	1	3	3	3	3	3	MIL-G-25537	X	1	3	3	1	1
Methyl Isopropyl Ketone	1	3	2	3	3	3	MIL-G-25760	X	2	3	3	1	2
Methyl (Dichloride, Ethyl Oleate, & Isovalerate)	1	X	X	X	1	2	MIL-G-3278	X	2	3	3	1	2
Methyl (Hexyl Ketone 2-Octanone Isocyanate)	1	3	1	2	3	1	MIL-G-3545	X	1	3	3	1	1
Methyl Lactate	1	3	1	2	3	1	MIL-G-4343	X	2	3	3	1	1
Methyl Mercaptan	1	X	1	X	X	X	MIL-G-5572	X	1	3	3	1	1
Methyl Methacrylate	1	3	3	3	3	3	MIL-G-7118	X	2	3	3	1	1
Methyl Oleate	1	3	2	X	1	2	MIL-G-7187	X	1	3	3	1	1
Methyl (Pentadiene, Phenylacetate, & Valerate)	1	X	X	X	1	2	MIL-G-7421	X	2	3	3	1	2
Methyl Salicylate	1	3	2	X	X	X	MIL-G-7711	X	1	3	2	1	1
Methylsulfuric Acid	1	X	X	X	X	X	MIL-H-13910	X	1	1	3	1	2
Methyl Tertiary Butyl Ether (MTBE)	1	3	3	X	3	X	MIL-H-19457	X	3	2	3	1	3
Methyl-2-Pyrrolidone or n-Methyl-2-Pyrrolidone	1	X	2	X	X	X	MIL-H-22251	X	2	1	3	X	X
Methylacrylic Acid	X	3	2	3	3	3	MIL-H-27601	X	1	3	3	1	2
Methylcyclopentane	1	3	3	3	1	2	MIL-H-46170 (-20°F to +275°F)	X	1	3	3	1	1
Methylene (Bromide & Iodide)	1	X	X	X	1	2	MIL-H-46170 (-55°F to +275°F)	X	1	3	3	1	1
Methylene Chloride	1	3	3	3	1	2	MIL-H-5606 (-65°F to +235°F)	X	1	3	3	1	1
Methylisobutyl Carbinol	1	1	3	2	1	1	MIL-H-6083	X	1	3	3	1	1
Methylpyrrolid- (ine & one)	1	X	X	X	1	2	MIL-H-7083	X	1	1	1	2	1
MIL-A-6091	X	2	1	1	1	1	MIL-H-8446 (MLO-8515)	1	2	3	3	1	1
MIL-C-4339	X	1	3	3	1	1	MIL-J-5161	X	2	3	3	1	1
MIL-C-7024	X	1	3	3	1	1	MIL-L- 6085 & 7808	1	2	3	3	1	2
MIL-C-8188	X	2	3	3	2	2	MIL-L-15016 & 15017	X	1	3	3	1	2
MIL-E-9500	X	1	1	1	1	1	MIL-L-17331	X	1	3	3	1	X
MIL-F-16884	X	1	3	3	1	1	MIL-L-2104 & 21260	X	1	3	3	1	1
MIL-F-17111	X	1	3	3	1	2	MIL-L-23699	1	2	3	3	1	2
MIL-F-25558 (RJ-1)	1	1	3	3	1	1	MIL-L-25681	X	2	1	3	1	2
MIL-F-25656 (JP-6)	X	1	3	3	1	2	MIL-L-3150	X	1	3	3	1	1
MIL-F-5566	X	2	1	1	1	1	MIL-L-6081 & 6082	X	1	3	3	1	1
MIL-F-81912 (JP-9)	1	3	3	3	1	2	MIL-L-6387	X	2	3	3	1	2
MIL-F-82522 (RJ-4)	1	2	3	3	1	1	MIL-L-7808 LUBRICANTS	1	2	3	3	1	2
MIL-G-10924	X	1	3	3	1	1	MIL-L-7870	X	1	3	3	1	1
MIL-G-15793	X	1	3	3	1	2	MIL-L-9000	X	1	3	3	1	2
MIL-G-21568	X	1	1	3	1	1	MIL-L-9236	X	2	3	3	1	2

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
MIL-O-3503	X	1	3	3	1	1
MIL-P-27402	X	2	1	3	X	X
MIL-R-25576 (RP-1)	1	1	3	3	1	1
MIL-S-3136, Type I Fuel	1	1	3	3	1	1
MIL-S-3136 (Type II Fuel & Type III Fuel)	1	2	3	3	1	2
MIL-S-3136 Type IV Oil High Swell	1	1	3	2	1	1
MIL-S-3136 Type IV Oil Low Swell	1	1	3	3	1	1
MIL-S-3136 Type V Oil Medium Swell	1	1	3	2	1	1
MIL-S-81087	X	1	1	3	1	2
MIL-T-5624, JP-4, JP-5	1	1	3	3	1	2
MIL-T-83133	1	1	3	3	1	2
Milk	1	1	1	1	1	1
Mineral Oil	1	1	2	1	1	1
Mineral Spirits	X	1	3	3	1	X
Mixed Acids	1	3	1	2	3	1
MLO- (7277 Hydr. & 7557)	1	3	3	3	1	3
MLO-8200 Hydr.	1	2	3	3	1	2
MLO-8515	1	2	3	3	1	1
Mobil (24dte, Delvac 1100, 1110, 1120, 1130)	1	1	3	X	1	X
Mobil (Gas WA200 ATF, Oil SAE 20, & ux)	X	1	3	X	1	X
Mobil (Therm 600 & Velocite c)	1	1	3	X	1	X
Mobil HF	1	1	3	X	1	X
MOBILJET II Lubricant	1	X	X	X	X	X
Mobil Nivac 20, 30	1	1	1	X	1	X
Mobil SHC 500 Series	X	3	3	2	1	2
Mobil SHC 600 Series	X	3	3	3	1	2
Mobilgear 600 Series	X	3	3	1	1	1
Mobilgear SHC ISO Series	X	3	3	1	1	1
Mobilgrease (HP, HTS, & SM)	X	2	3	2	1	1
Mobilith AW Series	X	2	3	2	1	1
Mobilith SHC Series	X	2	3	2	1	1
Mobilmistlube Series	X	3	3	1	1	1
Molybdenum (Oxide & Trioxide)	1	3	1	2	3	1
Molybdenum Disulfide Grease	1	1	3	X	1	X
Molybdic Acid	1	3	1	2	3	1
Mono- (bromobenzene & chlorobenzene)	X	3	3	3	1	2
Mono- (bromotoluene & chlorobutene)	X	X	X	X	1	2

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Monochloroacetic Acid	X	3	1	2	3	1
Monoethanolamine (MEA)	X	3	2	2	3	3
Mono- (ethyl Amine, & isopropylamine)	X	3	1	2	3	1
Mono- (methylamine (MMA) & nitrotoluene)	X	3	1	2	3	1
Monomethyl Aniline	1	3	1	2	2	1
Monomethyl Ether (Methyl Ether)	X	1	3	X	1	X
Monomethyl Hydrazine	2	2	1	3	X	X
Monomethylaniline	X	3	2	X	2	X
Mononitrotoluene (Dinitrotoluene (40/60 Mix)	X	3	1	3	3	3
Monovinyl Acetylene	1	1	1	1	1	X
Mopar Brake Fluid	1	3	1	3	3	3
Morpholine	1	X	X	X	1	2
Motor Oils	1	1	3	2	1	1
Mustard	X	X	1	1	1	X
Myristic Acid	1	X	X	X	1	2
Naphtha	1	1	3	3	1	2
Naphthalene	1	3	3	3	1	1
Naphthalene (Chloride & Sulfonic Acid)	1	X	X	X	1	2
Naphthalenic Acid	1	X	X	X	1	2
Naphthenic Acid	1	1	3	3	1	1
Naphthylamine	1	X	X	X	X	X
Naphtha	1	2	3	3	1	2
Natural Gas	1	1	3	1	1	2
Neatsfoot Oil	1	1	1	1	1	1
Neon	1	1	1	1	1	1
Neville Acid	1	3	2	3	1	2
Niacinamide	1	X	X	X	X	X
Nickel (Acetate, Ammonium Sulfate, & Nitrate)	1	2	1	3	3	3
Nickel (Chloride & Salts)	1	1	1	1	1	1
Nickel Sulfate	1	1	1	1	1	1
Nicotinamide (Niacinamide)	1	X	X	X	1	2
Nicotinamide Hydrochloride	1	3	1	2	3	1
Nicotine	1	X	X	X	1	2
Nicotine Sulfate	1	3	1	2	3	1
Niter Cake	1	1	1	1	1	1
Nitric Acid - Red Fuming	1	3	3	X	2	X
Nitric Acid (50 - 100%)	1	3	3	X	3	X

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Compound	Temperature Range	Compound	Temperature Range
Fluoroelastomer (FKM)	-26°C to 205°C (-15°F to 400°F)	Nitrile (NBR)	-34°C to 121°C (-30°F to 250°F)
Fluorosilicone (FVMQ)	-73°C to 190°C (-100°F to 375°F)	Ethylene Propylene (EPDM)	-57°C to 149°C (-70°F to 300°F)
Perfluoroelastomer (FFKM)	-26°C to 316°C (-15°F to 600°F)	Silicone (VMQ)	-54°C to 232°C (-65°F to 450°F)

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Nitric Acid 3 Molar to 158°F	X	3	2	3	3	3
Nitric Acid Concentrated Room Temp.	X	X	3	X	2	X
Nitric Acid Concentrated to 158°F	X	3	3	3	3	3
Nitroaniline or p-Nitroaniline	1	3	1	2	3	1
Nitrobenzene	1	3	1	3	2	3
Nitro- (benzoic Acid, cellulose, & chlorobenzene)	1	3	1	2	3	1
Nitro- (chloroform, & diethylaniline)	1	3	1	2	3	1
Nitroethane	1	3	2	3	3	3
Nitrofluorobenzene	1	3	1	2	3	1
Nitroisopropylbenzene	X	3	1	2	3	1
Nitrogen Dioxide	1	X	X	X	3	X
Nitrogen Trifluoride	1	X	X	X	X	X
Nitro- (glycerine, gylcerol, thiophene, & toluene)	1	3	1	2	3	1
Nitromethane	1	3	2	3	3	3
Nitrophenol or p-Nitrophenol	1	3	1	2	3	1
Nitropropane	1	3	1	3	3	3
Nitrogen	1	1	1	1	1	1
Nitrogen Oxides	1	3	1	2	3	1
Nitrogen Tetroxide (N2O4)	2	3	3	3	3	3
Nitrosyl Chloride	1	X	X	X	X	X
Nitrosylsulphuric Acid	1	X	X	X	X	X
o-Nitrotoluene or p-Nitrotoluene	1	X	X	X	X	X
Nitrous Acid	1	3	1	2	3	1
Nitrous Oxide	1	1	1	1	1	X
Nonane	1	1	3	2	1	1
Noryl GE Phenolic	X	1	1	X	X	X
Nyvac FR200 Mobil	X	1	1	X	1	X
Octachlorotoluene	1	3	3	3	1	2
Octadecane or n-Octadecane	1	1	3	3	1	1
Octafluorocyclobutane	2	X	1	X	2	X
Octafluoropropane	2	X	X	X	X	X
Octanal (n-Octanaldehyde)	1	1	3	2	1	1
Octane or n-Octane	1	1	3	3	1	2
Octanol	1	1	1	1	1	X
Octyl Acetate or n-Octyl Acetate	1	3	1	2	3	1
Octyl Alcohol or n-Octyl Alcohol	1	2	3	2	1	2

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Octyl Chloride or n-Octyl Chloride	1	1	3	2	1	1
Octyl Phthalate	1	X	X	X	1	2
Olefins	1	X	X	X	1	2
Oleic Acid	1	2	3	3	1	X
Oleum	1	1	3	3	1	X
Oleum (Fuming Sulfuric Acid)	1	3	3	3	1	X
Oleum Spirits	X	2	3	3	1	2
Oleyl Alcohol	1	X	X	X	1	2
Olive Oil	1	1	2	3	1	1
Oronite (8200 & 8515)	X	2	3	3	1	1
Ortho- (Chloro Ethyl Benzene, Dichlorobenzene)	1	3	3	3	1	2
Ortho- (Chloroaniline & Chlorophenol)	1	3	1	2	3	1
Ortho- (Cresol, & Nitrotoluene)	1	3	1	2	3	1
OS 45 (Type III (OS45), Type IV (OS45-1), (OS70)	X	2	3	3	1	2
Oxalic Acid	1	1	1	1	1	1
Oxygen, 200-300°F (Evaluate for specific apps)	1	3	3	X	2	X
Oxygen, 300-400°F (Evaluate for specific apps)	1	3	3	1	2	3
Oxygen, Cold (Evaluate for specific apps)	1	2	1	1	1	1
Oxygen, Liquid	2	3	3	X	3	X
Ozonated Deionized Water	1	3	1	2	3	1
Ozone	1	3	1	1	1	1
Paint Thinner, Duco	1	3	3	3	2	2
Palmitic Acid	1	1	2	3	1	1
Para- (Aminobenzoic & Aminosalicylic Acid)	X	3	1	2	3	1
Para- Chlorophenol	X	3	1	2	3	1
Para Formaldehyde	1	3	1	2	3	1
Para- (Nitroaniline & Nitrobenzoic Acid)	1	3	1	2	3	1
Para- (Nitrophenol, & Toluene Sulfonic Acid)	1	3	1	2	3	1
Paracymene	X	X	X	X	1	2
Para-Dichlorobenzene	1	3	3	3	1	2
Paraffins	1	1	3	2	1	1
Paraldehyde	1	3	1	2	3	1
Par-al-Ketone	2	3	3	3	3	3
Parathion	1	X	X	X	1	2
Parker O Lube	X	1	3	2	1	1
Peanut Oil	1	1	2	1	1	1

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Pectin (Liquor)	1	X	X	X	1	2
Pelargonic Acid	1	X	X	X	X	X
Penicillin (Liquid)	1	X	X	X	1	2
Pentachloroethane	1	X	X	X	1	2
Penta- (chlorophenol & erythritol)	1	3	1	2	3	1
Pentaerythritol Tetranitrate	1	3	1	2	3	1
Pentafluoroethane (FC 125)	2	X	X	X	X	X
Pentane or n-Pentane	1	1	3	3	1	3
Pentane (2 Methyl, 2-4 Dimethyl, & 3 Methyl)	X	1	3	3	1	3
Pentyl Pentanoate	1	1	3	2	1	1
Peracetic Acid	1	3	1	2	3	1
Perchlorethylene	1	1	3	3	1	2
Perchloric Acid - 2N	1	3	1	2	1	1
Perchloroethylene	1	2	3	3	1	2
Petrolatum	1	1	3	3	1	1
Petrolatum Ether	1	1	3	2	1	1
Petroleum Ether	X	3	3	3	1	X
Petroleum Oil, Above 250°F	1	3	3	3	2	3
Petroleum Oil, Below 250°F	1	1	3	2	1	2
Petroleum Oil, Crude	1	1	3	3	1	1
Phenetole	1	3	3	3	3	3
Phenol	1	3	3	3	1	2
Phenol (70%/30% H2O) & (85%/15% H2O)	1	3	3	3	1	2
Phenyl Ethyl Ether	1	3	3	3	3	3
Phenolic Sulfonate	1	3	1	2	3	1
Phenolsulfonic Acid	1	3	1	2	3	1
Phenyl- (acetate, acetic Acid & glycerine)	1	3	1	2	3	1
Phenyl- (hydrazine Hydrochloride, & mercuric Acetate)	1	3	1	2	3	1
Phenylacetamide	1	X	X	X	1	2
Phenylbenzene	1	3	3	3	1	2
Phenylenediamine	1	X	X	X	X	X
Phenylethyl (Alcohol & Malonic Ester)	1	X	X	X	1	2
Phenylethyl Ether	1	3	3	3	3	3
Phenylhydrazine	1	3	2	X	1	X
Phorone	1	3	3	3	3	3
Phosgene	1	X	X	X	X	X

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Phosphine	1	X	X	X	X	X
Phosphoric Acid	1	1	1	1	1	2
Phosphoric Acid 3 Molar to 158°F	1	1	1	2	1	2
Phosphoric Acid Concentrated Room Temp	1	2	1	3	1	3
Phosphoric Acid Concentrated to 158°F	1	3	1	3	1	3
Phosphoric Etchants	1	X	X	X	X	X
Phosphorous, Molten	1	X	X	X	X	X
Phosphorous Oxychloride	1	X	X	X	X	X
Phosphorous Tribromide	1	X	X	X	X	X
Phosphorous Trichloride	1	3	1	X	1	1
Phthalic (Acid & Anhydride)	1	3	1	2	3	1
Pickling Solution	1	3	3	3	2	3
Picric Acid (aq)	1	1	1	X	1	2
Picric Acid Molten	1	2	2	3	1	2
Pine Oil	1	1	3	3	1	1
Pine Tar	1	1	3	2	1	1
Pinene	1	2	3	3	1	1
Piperazine	1	X	X	X	1	2
Piperidine	1	3	3	3	1	2
Piranha	1	X	X	X	X	X
Plating Solution Co,Cu,Au,In,Fe,Pb,Ni,Ag,Sn,Zn	1	1	1	X	1	X
Plating Solutions Chrome	1	3	2	2	1	2
Plating Solutions Others	1	1	1	3	1	X
Pneumatic Service	X	1	1	3	1	3
Polyethylene Glycol	1	2	1	X	3	X
Polyglycerol	1	3	1	2	3	1
Polyglycol	1	3	1	2	3	1
Polyvinyl Acetate Emulsion	1	X	1	X	X	X
Potassium Acetate	1	2	1	3	3	3
Potassium (Acid Sulfate & Alum)	1	3	1	2	3	1
Potassium (Aluminum Sulfate, & Antimonate)	1	3	1	2	3	1
Potassium (Bicarbonate, Bichromate, Bifluoride)	1	3	1	2	3	1
Potassium (Bisulfate, Bisulfite, Bitartrate, Bromide)	1	3	1	2	3	1
Potassium (Carbonate, Chlorate, & Chromates)	1	3	1	2	3	1
Potassium (Citrate, Cyanate, & Diphosphate)	1	3	1	2	3	1
Potassium (Chloride, Cupro Cyanide, & Cyanide)	1	1	1	1	1	1

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Potassium Dichromate	1	1	1	1	1	1
Potassium (Ferricyanide, Fluoride, Glucocyanate)	1	3	1	2	3	1
Potassium Hydroxide	1	1	1	2	3	2
Potassium Hydroxide 50%	X	2	1	3	3	3
Potassium (Hypochlorite, Iodate, & Iodide)	1	3	1	2	3	1
Potassium (Metabisulfate & Metachromate)	1	3	1	2	3	1
Potassium Molten	3	X	X	X	X	X
Potassium Monochromate	1	3	1	2	3	1
Potassium (Nitrate, Salts, Sulfate, & Sulfite)	1	1	1	1	1	1
Potassium (Nitrite, Oxalate, & Perchlorate)	1	3	1	2	3	1
Potassium (Permanganate, & Persulfate)	1	3	1	2	3	1
Potassium Peroxide	1	X	X	X	X	X
Potassium Phosphate (Acid & Alkaline)	1	3	1	2	3	1
Potassium Phosphate (Di/Tri Basic)	1	3	1	2	3	1
Potassium (Pyrosulfate & Sodium Tartrate)	1	3	1	2	3	1
Potassium (Stannate, Stearate, & Sulfide)	1	3	1	2	3	1
Potassium Silicate	1	X	X	X	X	X
Potassium (Tartrate & Thiocyanate)	1	3	1	2	3	1
Potassium (Thiosulfate, & Triphosphate)	1	3	1	2	3	1
Prestone Antifreeze	1	1	1	1	1	1
PRL-High Temp. Hydr. Oil	1	2	3	2	1	1
Producer Gas	1	1	3	2	1	2
Propane	1	1	3	3	1	2
Propanol	X	1	1	1	1	X
Propionaldehyde	1	3	1	2	3	1
Propionic Acid	1	3	1	2	3	1
Propionitrile	1	1	3	X	1	X
Propyl Acetate or n-Propyl Acetate	1	3	2	3	3	3
Propyl Acetone or n-Propyl Acetone	1	3	1	3	3	3
Propyl Alcohol	1	1	1	1	1	1
Propyl Nitrate or n-Propyl Nitrate	1	3	2	3	3	3
Propyl Propionate or n-Propy Propionate	1	3	1	2	3	1
Propylamine or n-Propylamine	2	3	1	2	3	1
Propylbenzene & n- Propylbenzene	1	X	X	X	1	2
Propylene	1	3	3	3	1	3

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Propylene (Chloride, Chlorohydrin, Dichloride)	1	X	X	X	1	2
Propylene Glycol	1	3	1	2	3	1
Propylene Glycol Methyl Ether Acetate	1	X	X	X	X	X
Propylene Oxide	1	3	2	3	3	3
PRS-3000	1	X	2	2	2	2
Pydraul (230C, 312C, 540C, & A200)	2	3	3	3	1	3
Pydraul (29ELT 30E, 50E, & 65E)	1	3	1	1	1	1
Pydraul 115E	2	3	1	3	1	3
Pydraul 90e	1	3	1	X	1	X
Pydraul, 10E	1	3	1	1	3	3
Pyranol	X	1	3	1	1	3
Pyranol Transformer Oil	1	1	3	3	1	1
Pyridine	1	3	2	X	1	2
Pyridine (Sulfate & Sulfonic Acid)	1	3	1	2	3	1
Pyridine Oil	X	3	2	3	3	3
Pyrogallol (Pyrogallic Acid)	1	2	3	X	1	2
Pyrogard 42, 43, 55	1	3	1	X	1	X
Pyrogard 53, Mobil Phosphate Ester	1	3	1	3	1	3
Pyrogard D, Mobil Water-in-Oil Emulsion	X	1	3	3	3	2
Pyroligneous Acid	1	3	2	X	3	3
Pyrolube	1	3	2	2	1	2
Pyrosulfuric Acid	1	3	1	2	3	1
Pyrosulfuryl Chloride	1	2	3	X	1	2
Pyrrole	1	3	3	2	3	3
Pyruvic Acid	1	3	1	2	3	1
Quinidine	1	2	3	X	1	2
Quinine	1	2	3	X	1	2
Quinine (Bisulfate, Hydrochloride, Sulfate, & Tartrate)	1	3	1	2	3	1
Quinizarin & Quinoline	1	2	3	X	1	2
Quinone	1	2	3	X	1	2
Radiation (GAMMA, 1.0 E+07 RADS)	2	3	2	2	3	3
Raffinate	1	2	3	X	1	2
Rapeseed Oil	1	1	3	1	1	3
Red (Line 100 Oil & Oil (MIL-H-5606))	1	1	3	3	1	1
Resorcinol	1	3	1	2	3	1

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Perfluoroelastomer (FFKM)	-26°C to 316°C (-15°F to 600°F)	Silicone (VMQ)	-54°C to 232°C (-65°F to 450°F)

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Rhodium	1	X	X	X	X	X
Riboflavin	1	2	3	X	1	2
Ricinoleic Acid	1	2	3	X	1	2
RJ-1 (MIL-F-25558)	1	1	3	3	1	1
RJ-4 (MIL-F-82522)	1	2	3	3	1	1
Rosin	1	2	3	X	1	2
RP-1 (MIL-R-25576)	1	1	3	3	1	1
Saccharin Solution	1	3	1	2	3	1
SAE 10W30	X	1	3	1	1	1
Sal Ammoniac	1	1	1	2	1	1
Salicylic Acid	1	2	1	X	1	1
Santo Safe 300	1	3	3	1	1	1
Sea (Salt) Water	1	1	1	1	1	1
Seawater	X	1	1	3	3	1
Sebacic, Selenic & Selenous Acid	1	3	1	2	3	1
Sewage	1	1	1	1	1	1
1154 & 96 GE Silicone Fluid	X	2	1	3	1	1
SF 1147 GE Silicone Fluid	X	2	3	3	1	X
Shell 3XF Mine Fluid (Fire resist hydr.)	X	1	3	X	1	1
Shell Alvania Grease #2	X	1	3	2	1	1
Shell Carnea 19 and 29	X	1	3	X	1	1
Shell Diala	X	1	3	3	1	1
Shell Irus 905	X	1	3	3	1	1
Shell (Lo Hydrax 27 and 29 & Macome 72)	X	1	3	3	1	1
Shell Tellus (#32 Pet. Base & #68)	X	1	3	3	1	1
Shell Tellus (27 (Petroleum Base) & 33)	1	1	3	X	1	X
Shell UMF (5% Aromatic)	1	1	3	3	1	1
Shellac	1	3	1	2	3	1
Silane	1	X	X	X	X	X
Silicate Esters	1	2	3	3	1	1
Silicone Grease	1	1	1	1	1	1
Silicone Oils	1	1	1	3	1	3
Silicon Tetrachloride	2	X	X	X	X	X
Silicon Tetrafluoride	2	X	X	X	X	X
Silver (Bromide, Chloride & Cyanide)	1	3	1	2	3	1
Silver Nitrate	1	1	1	1	1	1
Silver Oxide	1	X	X	X	X	X

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Silver Sulfate	1	3	1	2	3	1
Sinclair Opaline CX-EP Lube	1	1	3	3	1	1
Skelly Solvent	X	1	3	X	X	X
Skelly, Solvent B, C, E	X	1	3	X	1	1
Skydrol (500 B4 & LD-4)	1	3	1	3	3	3
Skydrol 500	1	3	3	3	3	3
Skydrol 7000	1	3	1	X	2	X
Soap Solutions	1	1	1	1	1	1
SoconyMobile Type A	X	1	3	3	1	2
Socony Vacuum AMV AC781 (grease)	X	1	3	3	1	2
Socony Vacuum PD959B	1	1	3	3	1	1
Sodium Abietate	1	X	X	X	X	X
Sodium Acetate	1	2	1	3	3	3
Sodium Acid (Bisulfate, Fluoride, & Sulfate)	1	3	1	2	3	1
Sodium (Aluminate & Aluminate Sulfate)	1	3	1	2	3	1
Sodium Anthraquinone Disulfate	1	3	1	2	3	1
Sodium (Antimonate, Aresenate & Arsenite)	1	3	1	2	3	1
Sodium (Benzoate & Bichromate)	1	3	1	2	3	1
Sodium (Bifluoride, Bisulfide & Bitartrate)	1	3	1	2	3	1
Sodium (Bromate & Bromide)	1	3	1	2	3	1
Sodium Bicarbonate (Baking Soda)	1	1	1	1	1	1
Sodium (Bisulfate, Bisulfite & Borate)	1	1	1	1	1	1
Sodium Carbonate (Soda Ash)	1	1	1	1	1	1
Sodium (Chlorate, Chlorite & Chloroacetate)	1	1	1	1	1	1
Sodium (Chromate, Citrate, Cyanamide, Cyanate)	1	3	1	2	3	1
Sodium Chloride	1	1	1	1	1	X
Sodium Cyanide	1	1	1	1	X	X
Sodium Dichromate	1	X	X	X	X	X
Sodium (Diacetate & Diphenyl Sulfonate)	1	3	1	2	3	1
Sodium (Diphosphate, Disilicate & Ethylate)	1	3	1	2	3	1
Sodium (Ferricyanide, Ferrocyanide & Fluoride)	1	3	1	2	3	1
Sodium (Fluorosilicate & Glutamate)	1	3	1	2	3	1
Sodium Hydride	1	X	X	X	X	X
Sodium (Hydrogen Sulfate, Hydrosulfide-(fite)	1	3	1	2	3	1
Sodium Hydroxide	1	1	1	3	1	1
Sodium Hydroxide, 3 Molar	X	2	1	1	2	2
Sodium Hypochlorite	1	2	1	2	1	2

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Sodium (Hypophosphate & Hypophosphite)	1	3	1	2	3	1
Sodium (Hyposulfite & Iodide)	1	3	1	2	3	1
Sodium (Lactate & Metasilicate)	1	3	1	2	3	1
Sodium (Methylate & Monophosphate)	1	3	1	2	3	1
Sodium Metaphosphate	1	1	1	X	1	1
Sodium Nitrate	1	2	1	3	X	X
Sodium (Oleate, Orthosilicate & Oxalate)	1	3	1	2	3	1
Sodium (Percarbonate, Persulfate, & Phenolate)	1	3	1	2	3	1
Sodium (Phenoxide, Plumbite, & Resinate)	1	3	1	2	3	1
Sodium (Phosphate (Dibasic) & (Mono))	1	1	1	3	1	X
Sodium Perborate	1	2	1	2	1	1
Sodium Peroxide	1	2	1	3	1	1
Sodium Phosphate (Tribasic)	1	1	1	1	1	X
Sodium (Salicylate, Stannate, & Sulfocyanide)	1	3	1	2	3	1
Sodium (Tartrate, & Tetraborate)	1	3	1	2	3	1
Sodium Salts	1	1	1	1	1	1
Sodium Sesquisilicate	3	X	X	X	X	X
Sodium Silicate	1	1	1	X	1	X
Sodium (Sulfate, Sulfide, & Sulfite)	1	1	1	1	1	1
Sodium (Tetraphosphate & Tetrasulfide)	1	3	1	2	3	1
Sodium (Thioarsenate, & Thiocyanate)	1	3	1	2	3	1
Sodium Thiosulfate	1	2	1	1	1	1
Sodium (Trichloroacetate & Triphosphate)	1	3	1	2	3	1
Sorbitol	1	3	1	2	3	1
Sour (Crude Oil & Natural Gas)	1	3	3	3	1	3
Sovasol	X	1	3	1	1	3
Sovasol No. 1, 2, and 3	1	1	3	3	1	1
Sovasol No. 73 and 74	X	2	3	3	1	1
Soy Bean Oil	1	1	3	1	X	1
Spry	X	1	2	1	1	1
SR-10 Fuel	X	1	3	3	1	1
SR-6 Fuel	1	2	3	3	1	1
Standard Clean 1 (SC - 1)	1	X	X	X	X	X
Standard Clean 2 (SC - 2)	1	X	X	3	X	3
Standard Oil Mobilube GX90-EP Lube	X	1	3	3	1	1
Stannic (Ammonium Chloride & Tetrachloride)	1	3	1	2	3	1
Stannic (Chloride & Chloride (50%))	1	1	1	2	1	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Stannous (Bromide, Fluoride, & Sulfate)	1	3	1	2	3	1
Stannous Chloride (15%)	1	1	1	2	1	1
Stauffer 7700	1	2	3	3	1	2
Steam Below 400°F	1	3	1	3	3	3
Steam, 400°-500°F	2	3	3	3	3	3
Stearic Acid	1	1	1	X	X	1
Stoddard Solvent (ASTM D-484-52)	1	1	3	3	1	1
Strontium (Acetate, Carbonate, & Chloride)	1	3	1	2	3	1
Strontium (Hydroxide, & Nitrate)	1	3	1	2	3	1
Styrene (Monomer)	1	3	3	3	2	3
Succinaldehyde	1	X	X	X	X	X
Succinic Acid	1	3	1	2	3	1
Sucrose Solutions	1	1	1	1	1	1
Sulfamic Acid & Sulfanilic Acid	1	3	1	2	3	1
Sulfanilic Chloride	1	2	3	X	1	2
Sulfanilamide	1	2	3	X	1	2
Sulfite Liquors	1	3	1	2	3	1
Sulfolane	1	2	1	X	2	X
Sulfonated Oils	X	2	3	X	1	2
Sulfonic Acid	1	3	1	2	3	1
Sulfonyl Chloride	X	3	1	2	3	1
Sulfur	1	3	1	X	1	1
Sulfur (Molten)	X	3	3	3	1	3
Sulfur Chloride	1	3	3	3	1	1
Sulfur Dioxide (Dry & Liquidified w/ pressure)	1	3	1	2	3	2
Sulfur Dioxide, Wet	1	3	1	2	3	2
Sulfur Hexafluoride	2	2	1	X	3	X
Sulfur Liquors	X	2	2	3	1	2
Sulfur, Molten	1	3	3	3	1	1
Sulfur Monochloride	1	1	3	2	1	1
Sulfur Tetrafluoride	2	X	X	X	X	X
Sulfur Trioxide Dry	1	3	2	2	1	2
Sulfuric Acid (20% Oleum)	1	3	1	2	3	1
Sulfuric Acid	1	1	1	1	3	3
Sulfuric Acid, 3 Molar to 158°F	X	2	1	1	1	1
Sulfuric Acid, Concentrated Room Temp	1	X	3	X	1	X
Sulfuric Acid, Concentrated to 158°F	X	3	3	3	1	3

Chemical Compatibility Table

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Compound	Temperature Range	Compound	Temperature Range
Fluoroelastomer (FKM)	-26°C to 205°C (-15°F to 400°F)	Nitrile (NBR)	-34°C to 121°C (-30°F to 250°F)
Fluorosilicone (FVMQ)	-73°C to 190°C (-100°F to 375°F)	Ethylene Propylene (EPDM)	-57°C to 149°C (-70°F to 300°F)
Perfluoroelastomer (FFKM)	-26°C to 316°C (-15°F to 600°F)	Silicone (VMQ)	-54°C to 232°C (-65°F to 450°F)

ALWAYS TEST UNDER ACTUAL SERVICE CONDITIONS.

Published Temperature ranges will apply to majority of media for which the material is recommended.

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Sulfuric Chlorohydrin (Chlorosulfonic Acid)	1	3	1	2	3	1
Sulfurous Acid	1	2	2	3	1	X
Sunoco (#3661, All-purpose grease, & SAE 10)	1	1	3	3	1	1
Sunsafe (Fire resist. hydr. fluid)	X	1	3	X	1	1
Super Shell Gas	1	1	3	3	1	2
Surfuryl Chloride	1	3	1	2	3	1
Swan Finch EP Lube	1	1	3	3	1	1
Swan Finch Hypoid-90	X	1	3	3	1	1
Tail Oil	X	1	3	1	3	X
Tallow	1	1	3	2	1	1
Tannic Acid	1	1	1	3	X	1
Tannic Acid (10%)	1	1	1	2	1	1
Tar	1	1	3	3	X	1
Tar, bituminous	1	2	3	2	1	1
Tartaric Acid	1	1	1	X	X	1
Terephthalic Acid	1	3	1	2	3	1
Terpineol	1	2	3	X	1	1
Terpinyl Acetate	1	2	3	X	1	2
Tertiary Butyl Catechol (p)	1	3	2	X	1	1
Tertiary Butyl Mercaptan	1	3	3	X	1	X
Tetrabromomethane	1	2	3	X	1	2
Tetrabutyl Titanate	1	2	1	3	1	3
Tetrachloroethylene	1	3	3	3	1	2
Tetrachoroethane	1	3	3	X	1	2
Tetraethyl Lead	1	2	3	X	1	2
Tetraethyl Lead Blend	X	2	3	X	1	2
TEOS (Tetraethylorthosilicate)	1	1	1	3	1	1
Tetrafluoroethane (FC 134a)	1	X	X	X	X	X
Tetrafluoromethane (FC 14)	1	1	1	3	1	X
Tetrahydrofuran (THF)	1	3	2	3	3	3
Tetralin (Tetrahydronaphthalene)	1	3	3	3	1	1
Tetramethyl Ammonium Hydroxide	1	3	1	2	3	1
TMCTS (Tetramethylcyclotetrasiloxane)	1	X	X	X	X	X
Tetramethyldihydropyridine	1	2	3	X	1	2
Tetraphosphoglucosate	1	3	1	2	3	1
Texaco Capella A-AA & Meropa 220-No Lead	X	1	3	3	1	1
Texaco 3450 Gear Oil	1	1	3	3	1	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Texaco Regal B	X	1	3	3	1	1
Texaco Uni-Temp Grease	1	1	3	2	1	1
Texamatic A (1581, 3401 & 3525 Fluid)	1	1	3	3	1	2
Texamatic A ((3528 Fluid) & Transmission Oil)	X	1	3	3	1	2
Texas 1500 Oil	X	1	3	2	1	1
Therminol 44	X	3	3	3	1	X
Therminol 55	1	2	3	3	1	X
Therminol VP-1, 60, 65	X	3	3	2	1	X
Thioamyl Alcohol	1	1	3	2	1	1
Thio- (diacetic Acid, ethanol, & glycolic Acid)	1	3	1	2	3	1
Thiokol (TP-90B & TP-95)	1	3	1	X	1	2
Thionyl Chloride	1	2	3	X	1	2
Thiophene (Thiofuran)	1	2	3	X	1	2
Thiophosphoryl Chloride	1	3	1	2	3	1
Thiourea	1	3	1	2	3	1
Thorium Nitrate	1	3	1	2	3	1
Tidewater Multigear, 140 EP Lube	X	1	3	3	1	1
Tidewater Oil	1	1	3	1	1	1
Tidewater Oil-Beedol	X	1	3	2	1	1
Tin (Chloride & Tetrachloride)	1	1	3	2	1	1
Tin Ammonium Chloride	1	3	1	2	3	1
Titanic Acid	1	3	1	2	3	1
Titanium (Dioxide & Sulfate)	1	3	1	2	3	1
Titanium Tetrachloride	2	2	3	3	1	2
Toluene	1	3	3	3	1	2
Toluene Diisocyanate (TDI)	1	3	2	3	3	3
Toluene Sulfonyl Chloride	1	2	3	X	1	2
Toluenesulfonic Acid	1	3	1	2	3	1
Toluidine or p-Toluidine	1	2	3	X	1	2
Toluol	1	3	1	2	3	1
Toluquinone	1	2	3	X	1	2
Tolylaldehyde or p-Tolylaldehyde	1	3	1	2	3	1
Transformer Oil	1	1	3	2	1	1
Transmission Fluid Type A	1	1	3	2	1	1
Triacetin	1	2	1	X	3	3
Triaryl Phosphate	1	3	1	3	1	2
Tribromomethylbenzene	1	2	3	X	1	2

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ALWAYS TEST UNDER ACTUAL SERVICE CONDITIONS.

Published Temperature ranges will apply to majority of media for which the material is recommended.

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Tributoxyethyl Phosphate	1	3	1	X	1	2
Tributylamine	1	X	X	X	X	X
Tributyl Citrate	1	3	1	2	3	1
Tributyl Mercaptan	1	3	3	3	1	3
Tributyl Phosphate	1	3	1	3	3	3
Trichloroacetic Acid (TCA)	1	2	2	X	3	3
Trichloroacetyl Chloride	1	2	3	X	1	2
Trichlorobenzene	1	2	3	X	1	2
Trichloro- (ethane, ethylene (TCE), & methane)	1	3	3	3	1	2
Trichloro- (propane, & silane)	1	3	3	3	1	2
Trichloroethanolamine	1	3	1	2	3	1
Trichlorofluoromethane (FC 11)	2	2	3	3	2	2
Trichloronitromethane (Chloropicrin)	1	3	1	2	3	1
Trichlorophenylsilane	1	X	X	X	X	X
Trichlorotrifluoroethane (FC 113)	2	2	3	3	2	3
Tricresyl Phosphate	1	3	1	3	2	2
Triethanol Amine (TEA)	2	2	1	3	3	X
Triethylaluminum	1	3	3	X	3	X
Triethylamine	1	X	X	X	X	X
Triethylborane	1	3	3	X	1	X
Triethyl Borate	1	X	X	X	X	X
Triethyl Phosphate	1	2	3	X	1	2
Triethylene Glycol (TEG)	1	3	1	2	3	1
Triethylenetetramine (TETA)	1	3	1	2	3	1
Trifluoroethane FC 143a	1	3	3	3	1	2
Trifluoromethane (Freon 23)	1	3	3	3	1	2
Trifluoroacetic Acid	2	3	1	2	3	1
Trifluorovinylchloride	1	2	3	X	1	2
Triisopropylbenzylchloride	1	2	3	X	1	2
Trimethyl- (benzene & borate (TMB))	1	2	3	X	1	2
TMAl (Trimethylaluminum)	1	X	X	X	X	X
Trimethylamine (TMA)	2	3	1	2	3	1
Trimethylpentane	1	1	3	2	1	1
Trimethylolpropane	1	X	X	X	X	X
TMP (Trimethyl Phosphite)	1	X	X	X	X	X
TMPO (Trimethyl Phosphate)	1	X	X	X	X	X
Trinitrotoluene (TNT)	1	3	3	X	2	2

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Trioctyl Phosphate	1	3	1	3	2	2
Triphenylphosphite	1	3	1	2	3	1
Tripolyphosphate	X	3	1	3	2	1
Tripotassium Phosphate	1	3	1	2	3	1
Trisodium Phosphate	1	3	1	2	3	1
Tritium	1	X	X	X	X	X
Tung Oil (China Wood Oil)	1	1	3	3	1	2
Tungsten Hexafluoride	1	X	X	X	X	X
Tungstic Acid	1	X	X	X	X	X
Turbine Oil	1	1	3	3	1	1
Turbine Oil #15 (MIL-L-7808A)	1	2	3	3	1	2
Turbo Oil #35	X	1	3	3	1	1
Turpentine	1	1	3	1	3	3
Type I Fuel (MIL-S-3136) (ASTM Ref. Fuel A)	X	1	3	3	1	1
Type II Fuel MIL-S-3136	X	2	3	3	1	2
Type III Fuel MIL-S-3136 (ASTM Ref. Fuel B)	X	2	3	3	1	2
UCDN 50HB280X	X	1	1	X	X	1
Ucon Hydrolube J-4	1	1	1	1	1	2
Ucon Lubricant ((50-HB-100) & (50-HB-260))	1	1	1	1	1	1
Ucon Lubricant (50-HB-5100)	1	1	1	1	1	1
Ucon Lubricant ((50-HB-55), & (50-HB-660))	1	1	1	1	1	1
Ucon Lubricant (LB-1145, LB-135, & LB-285)	1	1	1	1	1	1
Ucon Lubricant (LB-300X, LB-625, & LB-65)	1	1	1	1	1	1
Ucon Oil Heat Transfer 500	1	1	1	1	1	1
Ucon Oil (LB-385, & LB400X)	1	1	1	1	1	1
Ucon Oil 50-HB-280x	1	2	1	X	3	X
Undecylenic Acid & Undecylic Acid	1	2	3	X	1	2
Univis 40 (Hydr. Fluid)	1	1	3	3	1	1
Univolt #35 (Mineral Oil)	1	1	3	3	1	1
Univs J-43	X	1	3	1	1	3
Unsymmetrical Dimethyl Hydrazine (UDMH)	2	2	1	3	3	3
UPDI (Ultrapure Deionized Water)	1	3	1	2	3	1
Uranium Hexachloride	2	X	X	X	1	X
Urea	1	X	X	X	X	X
Uric Acid	1	3	1	2	3	1
Valeraldehyde or n-Valeraldehyde	1	3	1	2	3	1
Valeric Acid	1	3	1	2	3	1

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Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Vanadium (Oxide & Pentoxide)	1	1	3	2	1	1
Varnish	1	1	3	3	2	3
Vegetable Oil	1	1	3	1	1	1
Versilube F44, F55	1	1	1	X	1	X
Versilube F-50	1	1	1	3	1	1
Vinegar	1	1	1	3	3	1
Vinyl (Benzene, Benzoate, Chloride, Fluoride)	1	2	3	X	1	2
Vinyl Acetate	1	2	1	X	3	X
Vinylidene Chloride	1	2	3	X	1	2
Vinylpyridine	1	2	3	X	1	2
Vitriol (White)	1	3	1	2	3	1
VV-H-910	1	3	1	2	1	2
Wagner 21B Brake Fluid	1	3	1	3	3	3
Water	1	1	1	3	3	1
Wemco C	1	1	3	3	1	1
Wheat Germ Oil	X	1	3	1	1	1
Whiskey and Wines	1	1	1	1	1	1
White Liquor	X	1	1	X	1	X
White Oil	1	1	3	3	1	1
White Pine Oil	1	2	3	3	1	1

Fluid	Perfluoroelastomer	Nitrile	Ethylene Propylene	Silicone	Fluoroelastomer	Fluorosilicone
Wolmar Salt	1	1	1	1	1	1
Wood Alcohol (Methanol)	1	1	1	1	3	1
Wood Oil	1	1	3	3	1	2
Xenon	1	1	1	1	1	1
Xylene	1	3	3	3	1	1
Xylidenes-Mixed-Aromatic Amines	1	3	1	3	3	3
Xylol	1	3	3	3	1	1
Zeolites	1	1	1	X	1	1
Zinc (Ammonium Chloride, Chromate, Cyanide)	1	3	1	2	3	1
Zinc (Diethyldithiocarbamate & Dihydrogen Phosphate)	1	3	1	2	3	1
Zinc Fluorosilicate	1	X	X	X	X	X
Zinc Naphthenate	1	X	X	X	X	X
Zinc (Hydrosulfite, Phenolsulfonate, Stearate, & Sulfide)	1	3	1	2	3	1
Zinc (Phosphate & Salts)	1	1	1	1	1	1
Zinc Acetate	1	2	1	3	3	3
Zinc Chloride	1	1	1	X	1	1
Zinc (Nitrate & Oxide)	1	1	1	X	1	1
Zinc Sulfate	1	1	1	1	1	1
Zirconium Nitrate	1	1	1	1	1	1

The information provided within the Chemical Compatibility Table has been compiled from several sources and is believed to be reliable, but no representation, guarantees or warranties of any nature are being made to the accuracy or suitability for any purpose. The information is based on laboratory testing and does not indicate end-product performance. It is highly recommended that the end users conduct their own evaluations suitable for the intended application.

Please contact Bay Seal Company to assist with the selection of any compound.

Pressure Conversion Table

Millibar	Torr	Lb/in2 (PSI)	In Hg	atm	% Vacuum
1013	760.00	14.69	30.00	1.000	0.0
1000	750.00	14.50	29.61	0.987	1.3
981	735.75	14.23	29.05	0.968	3.2
900	675.00	13.05	26.65	0.888	11.1
800	600.00	11.60	23.69	0.789	21.0
700	525.00	10.15	20.73	0.691	30.9
600	450.00	8.70	17.77	0.592	40.8
500	375.00	7.25	14.81	0.494	50.6
400	300.00	5.80	11.85	0.395	60.5
300	225.00	4.35	8.884	0.296	70.4
200	150.00	2.90	5.923	0.197	80.2
100	75.00	1.45	2.961	0.099	90.1
90	67.50	1.31	2.665	0.089	91.1
80	60.00	1.16	2.369	0.079	92.1
70	52.50	1.02	2.073	0.069	93.1
60	45.00	0.870	1.777	0.059	94.1
50	37.50	0.725	1.481	0.049	95.1
40	30.00	0.580	1.185	0.040	96.1
30	22.50	0.435	0.8884	0.030	97.0
20	15.00	0.290	0.5923	0.020	98.0
10	7.50	0.145	0.2961	0.010	99.0
5	3.75	0.073	0.1480	5 x 10-3	99.5
1	0.75	0.015	0.0296	1 x 10-3	99.9
0.5	0.375	7.25 x 10-3	0.0148	5 x 10-4	99.99
0.1	0.075	1.45 x 10-3	2.96 x 10-3	1 x 10-4	99.99 +
0.01	7.5 x 10-3	1.45 x 10-4	2.96 x 10-4	1 x 10-5	99.99 +
1 x 10-3	7.5 x 10-4	1.45 x 10-5	2.96 x 10-5	1 x 10-6	99.99 +
1 x 10-4	7.5 x 10-5	1.45 x 10-6	2.96 x 10-6	1 x 10-7	99.99 +
1 x 10-6	7.5 x 10-7	1.45 x 10-8	2.96 x 10-8	1 x 10-9	99.99 +
1 x 10-7	7.5 x 10-8	1.45 x 10-9	2.96 x 10-9	1 x 10-10	99.99 +
1 x 10-8	7.5 x 10-9	1.45 x 10-10	2.96 x 10-10	1 x 10-11	99.99 +
0	0	0	0	0	100

Temperature Conversion Table

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-273	-459.4	-20	-4	75	167	200	392	360	680	550	1022
-260	-436	-10	14	80	176	204	400	370	698	560	1040
-240	-400	0	32	85	185	210	410	380	716	570	1058
-220	-364	1	33.8	90	194	220	428	390	734	580	1076
-200	-328	5	41	95	203	230	446	400	752	590	1094
-180	-292	10	50	100	212	232	450	410	770	600	1112
-160	-256	15	59	107	225	240	464	420	788	610	1130
-140	-220	20	68	110	230	250	482	430	806	620	1148
-120	-184	23	73.4	120	248	260	500	440	824	630	1166
-100	-148	25	77	121	250	270	518	450	842	640	1184
-90	-130	30	86	130	266	280	536	460	860	650	1202
-80	-112	35	95	135	275	290	554	470	878	660	1220
-70	-94	40	104	140	284	300	572	480	896	670	1238
-57	-70	45	113	149	300	310	590	490	914	680	1256
-55	-67	50	122	150	302	316	600	500	932	690	1274
-54	-65	55	131	160	320	320	608	510	950	700	1292
-40	-40	60	140	170	338	330	626	520	968	710	1310
-34	-30	65	149	180	356	340	644	530	986	720	1328
-30	-22	70	158	190	374	350	662	540	1004	730	1346

COMMON SEAL FAILURES

Abrasion

Description: The seal or parts of the seal exhibit a flat surface parallel to the direction or motion. Loose particles and scrapes may be found on the seal surface.

Contributing Factors: Rough sealing surfaces. Excessive temperature. Process environment containing abrasive particles. Dynamic motion. Poor elastomer surface finish.

Suggested Solutions: Use recommended gland surface finish. Consider internally lubed elastomers. Eliminate abrasive components.

Compression Set

Description: The seal exhibits a flat-sided cross-section, the flat sides corresponding to the mating seal surfaces.

Contributing Factors: Excessive compression. Excessive temperature. Incompletely cured elastomer. Elastomer with high compression set. Excessive volume swell in chemical.

Suggested Solutions: Low compression set elastomer. Proper gland design for the specific elastomer. Confirm material compatibility.

Chemical Degradation

Description: The seal may exhibit many signs of degradation including blisters, cracks, voids or discoloration. In some cases, the degradation is observable only by measurement of physical properties.

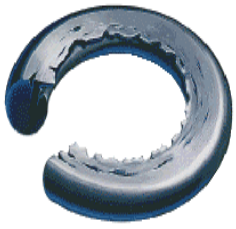
Contributing Factors: Incompatibility with the chemical and/or thermal environment.
Suggested Solutions: Selection of more chemically resistant elastomer.

Explosive Decompression

Description: The seal exhibits blisters, pits or pocks on its surface. Absorption of gas at high pressure and the subsequent rapid decrease in pressure. The absorbed gas blisters and ruptures the elastomer surface as the pressure is rapidly removed.

Contributing Factors: Rapid pressure changes. Low-modulus/hardness elastomer.
Suggested Solutions: Higher-modulus/hardness elastomer. Slower decompression (release of pressure).

Extrusion



Description: The seal develops ragged edges (generally on the low-pressure side), which appear tattered.

Contributing Factors: Excessive clearances. Excessive pressure. Low-modulus/hardness elastomer. Excessive gland fill. Irregular clearance gaps. Sharp gland edges. Improper sizing.

Suggested Solutions: Decrease clearances. Higher-modulus/hard-ness elastomer. Proper gland design. Use of polymer backup rings.

Installation Damage

Description: The seal or parts of the seal may exhibit small cuts, nicks or gashes.

Contributing Factors: Sharp edges on glands or components. Improper sizing of elastomer. Low-modulus/hardness elastomer. Elastomer surface contamination.

Suggested Solutions: Remove all sharp edges. Proper gland design. Proper elastomer sizing. Higher-modulus/hardness elastomer.

COMMON SEAL FAILURES

Outgassing / Extraction

Description: This failure is often very difficult to detect from examination of the seal. The seal may exhibit a decrease in cross-sectional size.

Contributing Factors: Improper or improperly cured elastomer. High vacuum levels. Low hardness/plasticized elastomer.

Suggested Solutions: Avoid plasticized elastomers. Ensure all seals are properly post-cured to minimize Outgassing.

Overcompression

Description: The seal exhibits parallel flat surfaces (corresponding to the contact areas) and may develop circumferential splits within the flattened surfaces.

Contributing Factors: Improper design—failure to account for thermal or chemical volume changes, or excessive compression.

Suggested Solutions: Gland design should take into account material responses to chemical and thermal environments.

Plasma Degradation

Description: The seal often exhibits discoloration, as well as powdered residue on the surface and possible erosion of elastomer in the exposed areas.

Contributing Factors: Chemical reactivity of the plasma. Ion bombardment (sputtering). Electron bombardment (heating). Improper gland design. Incompatible seal material.

Suggested Solutions: Plasma-compatible elastomer and compound. Minimize exposed area. Examine gland design.

Spiral Failure

Description: The seal exhibits cuts or marks which spiral around its circumference.

Contributing Factors: Difficult or tight installation (static). Slow reciprocating speed. Low-modulus/hardness elastomer. Irregular O-ring surface finish (including excessive parting line). Excessive gland width. Irregular or rough gland surface finish. Inadequate lubrication.

Suggested Solutions: Correct installation procedures. Higher-modulus elastomer. Internally lubed elastomers. Proper gland design. Gland surface finish of 8–16 micro inch RMS. Possible use of polymer backup rings.

Thermal Degradation

Description: The seal may exhibit radial cracks located on the highest temperature surfaces. In addition, certain elastomers may exhibit signs of softening—a shiny surface as a result of excessive temperatures.

Contributing Factors: Elastomer thermal properties. Excessive temperature excursions or cycling.

Suggested Solutions: Selection of an elastomer with improved thermal stability. Evaluation of the possibility of cooling sealing surfaces.

Standard Glossary Terms

Abrasion: The wearing a way of a surface in service by mechanical action such as rubbing, scraping, or erosion.
Acid Resistance: Withstands the action of acids.
Adhesion: The tendency of rubber to bond or cling to a contact surface.
Compound: A term applied to a mixture of polymers and other ingredients, to produce a usable rubber material.
Compression Set: The amount by which a rubber specimen fails to return to original shape after release of compressive load.
Cross-Section: A seal as viewed if cut at right angles to the mold parting line showing internal structure.
Durometer: Measure of the hardness of rubber. Measures the resistance to the penetration of an indenter point into the surface of rubber. Numerical scale of rubber hardness.
Dynamic Seal: A seal required to prevent leakage past parts which are in relative motion.
Elastomer: Any synthetic or natural material with resilience or memory sufficient to return to its original shape after major or minor distortion.
Face Seal: A seal between two flat surfaces.
Friction: Resistance to motion due to the contact of surfaces.
Gland: Cavity into which and O-Ring is installed. Includes the groove and mating surface of second part, which together confine the O-Ring.
Hardness: Resistance to a distorting force. Measured by the relative resistance of the material to an indenter point of any one of a number of standard hardness testing instruments.
Memory: The tendency of a material to return to original shape after deformation.
O-Ring: A circle of material with round cross section, which affects a seal through squeeze and pressure.
O-Ring Seal: The combination of a gland and an O-Ring providing a fluid-tight closure.
Outgassing: A vacuum phenomenon wherein a substance spontaneously releases volatile constituents in the form of vapors and/or gases. Some constituents could include water vapor, plasticizers, air, and inhibitors.
Polymer: A material formed by the joining together of many individual units of one or more monomers.
Resilient: Capable of returning to original size and shape after deformation.
Shrinkage: Decreased volume of seal, usually caused by extraction of soluble constituents by fluids followed by air-drying.
Squeeze: Cross-section diametral compression of an O-Ring between surface of the groove bottom and the surface of another mating metal part in the gland assembly.
Static Seal: Part designed to seal between parts having no relative motion.
Swell: Increased volume of a specimen caused by immersion in a fluid (usually a liquid).
Temperature Range: Maximum and minimum temperature limits within which a seal compound will function in a given application.
Thermal Expansion: Expansion caused by increase in temperature. May be linear or volumetric.
Vacuum: A given space that is occupied by a gas at less than atmospheric pressure.
Volume Swell: Increases in physical size caused by the swelling action of a liquid.
Vulcanization: A thermo-setting reaction involving the use of heat and pressure, resulting in greatly increased strength and elasticity of rubber-like materials.

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