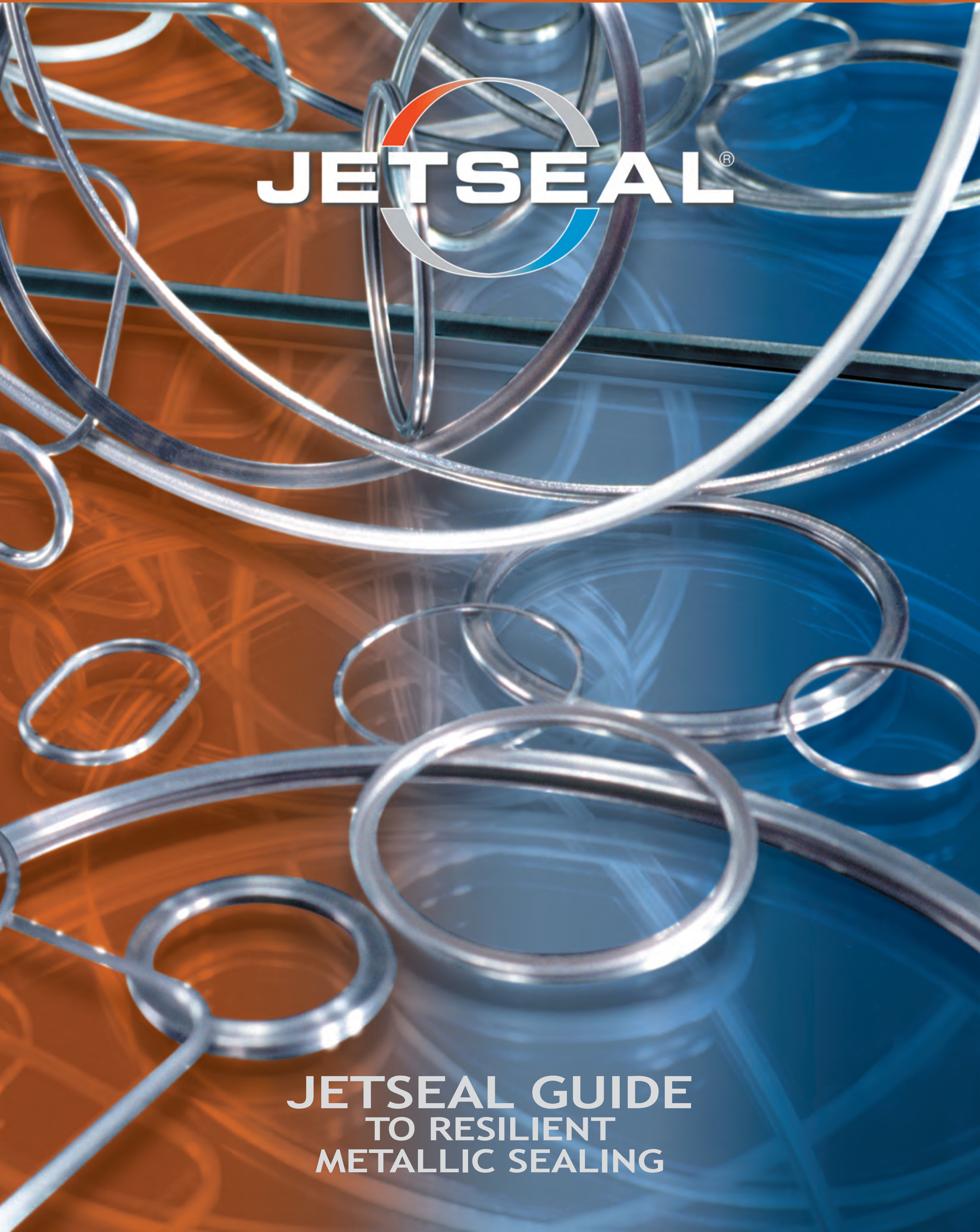
ENGINEERED SEALING SOLUTIONS

JETSEAL®



JETSEAL GUIDE TO RESILIENT METALLIC SEALING

JETSEAL GUIDE TO RESILIENT METALLIC SEALING

Founded in 1988, JETSEAL began in Spokane, Washington as a manufacturer of metallic seals for the aerospace industry. Today, JETSEAL has evolved to become an industry leader providing sealing solutions to many industries requiring absolute dependability, reliability and performance. Our resilient metal seals are found in major industries including Aviation, Space, Automotive, Oil & Gas, Power Generation, Laser and Research & Development.

JETSEAL produces all of its products to the certified quality requirements of **ISO 9001:2015** and **AS 9100 Rev D** and is **NADCAP** approved for welding and Fluid Distribution. JETSEAL is **ISO 14001** certified. We have implemented standards for environmental management by complying with applicable laws and regulations to minimize our operations' affect on the environment.

Management Policy - ISO 9001:2015 AS9100D

JETSEAL's Management Policy is to engineer, safely manufacture, and deliver products on-time that are consistent with Customers' requirements and fulfill its environmental compliance obligations.

JETSEAL management seeks ways in which to continuously improve, streamline and enhance all aspects of its Integrated Quality and Environmental Management System. JETSEAL management is committed to the protection of the environment, including prevention of pollution and sustainable resource use.

Environmental Commitment - ISO 14001

JETSEAL is committed to protecting our employees, customers, and the environment through complete compliance with applicable laws and regulations while conducting our operations. JETSEAL recognizes that its operations impact the environment and believes it is important to have an effective environmental management system.

JETSEAL RESILIENT METALLIC SEALS

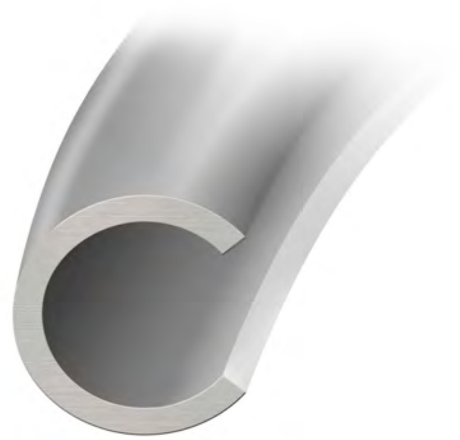
JETSEAL resilient metallic seals comprise a complete selection of cross-sections, capable of satisfying a vast variety of sealing applications. Whether your project needs seals for high-pressure or deep-vacuum, cryogenics or extremely high temperatures, large deflections or light loadings, JETSEAL can design a seal to meet your sealing system requirements.

JETSEAL METAL SEALING RING SELECTION

C-Seal E-Seal V-Seal Omega Seal Lever Seal

C-Seal

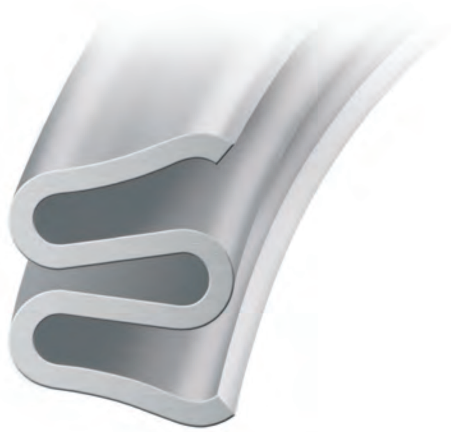
JETCAT No. 2



C-Seals are the most frequently used resilient metal seal profile in demanding sealing system applications worldwide. JETSEAL's C-Seals are designed to ensure continuous sealing contact and appropriate sealing line loads to ensure that optimum sealing performance is consistently obtained. These seals may be plated to further reduce leak rates with a defect-free ductile material. C-Seals concentrate a substantial load on the sealing contact area to force plating material into the surface finish grooves on the cavity surface forming a solid barrier to gasses and liquids.

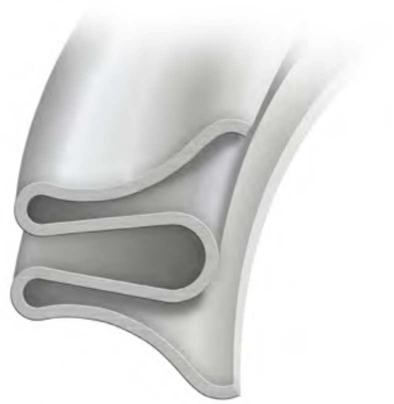
E-Seal

JETCAT No. 3



E-Seals are used in many aerospace and ground power sealing systems requiring high-performance when sealing hot high-pressure gasses. JETSEAL's E-Seals are effective high deflection seals designed for low to moderate force conditions with high spring back. Current applications include usage in high cyclic deflection, extreme temperature, and moderate pressure environments. These seals may be plated to further reduce leak rates with a defect-free ductile material. E-Seals concentrate a substantial load on the sealing contact area to force plating material into the surface finish grooves on the cavity surface forming a solid barrier to gasses and liquids.

Lever Seal



JETSEAL is on the cutting edge of sealing technology with the uniquely designed and patented Lever Seal. This seal can be used in any application where enhanced spring back and excessive flange movement or flange distortion handling is needed. Regardless the requirement, the Lever Seal will outperform any other seal at a competitive cost.

The Lever Seal is superior to other "high deflection" seals available. Due to its unique stress-distributing design, the Lever Seal can handle three times the flange movement of a single-ply standard E-seal with the same sealing capability. This makes it a good choice where thermal relaxation is a factor. Additionally, the Lever Seal meets both AS1895/7 and AS1895/23 E-Seal standards requirements.

Featuring 100% spring back, the Lever Seal's allowable deflection is almost double the industry's next best seal. Why settle for a seal that starts with a free height of 0.121" and compresses to 0.088" when for less cost you can install a Lever Seal with a free height of 0.145" in the same cavity. A two-ply Lever Seal design will allow for substantially greater deflection handling capabilities, and is available for even more demanding applications.

Available to fit any manufacturer's E-Seal cavity, JETSEAL's Lever Seal comes in all common materials, including alloys 718, X-750, Elgiloy and Waspaloy. The Lever Seal's cost is only marginally higher than that of standard E-Seals, and considerably lower than that of any other highly resilient seal.

Multiple-Ply E-Type Seals

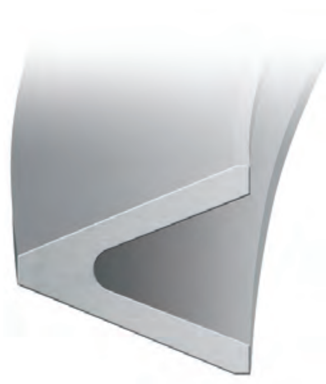
JETSEAL is the first manufacturer to offer all convolution-type seals in multiple-ply configurations, without circumferential welding. These seals have the highest deflection capability of all resilient metallic seals for a given envelope size. A Two-Ply seal can literally double the deflection capability in the same space as the seal you are using, or contemplating using now.

If you have an application where a single-ply seal is just not making it, leading to performance deterioration in your system or engine, JETSEAL is working on just what you need. If you are designing a seal into your application now and the single-ply seal looks marginal, let us propose an alternative which you can keep up your sleeve until the need is confirmed by test. Or you can specify now.

JETSEAL Two-Ply seals cost approximately twice as much as our single-ply seals. Yet their comparatively miniscule price can save hundreds of expensive overhaul hours and many thousands of dollars in lost service revenues and/or extra fuel burn. If your application is for a new engine or system, they can also reduce the risk of qualification test interruptions and save valuable points towards specific fuel consumption guarantees. Two-Ply coated seal costs do not entail as great a premium compared to those of their single-ply counterparts because of the common and important contribution of the coating to the cost of each type.

V-Seal

JETCAT No. 4



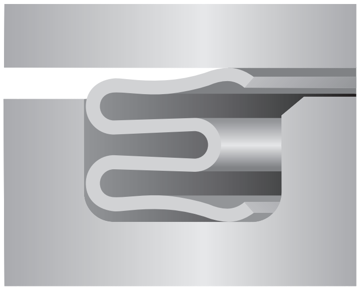
V-Seals are an effective metallic seal for demanding applications. JETSEAL's V-Seals combine the advantages of a compact profile, low leak rate, and high-pressure capability into a high-performance low deflection seal. JETSEAL provides a carefully controlled variable seal wall thickness and a knife-edge seal contact area for a low leak rate. V-Seals are designed to maximize spring back and to optimize the sealing contact force to accommodate different cavity materials. V-Seals are lapped on both sealing faces to a high degree of flatness creating a low leak rate seal. To further reduce leakage rates, these seals may be plated with a defect-free ductile material. V-Seals concentrate a substantial load on the sealing contact area to force plating material into the surface finish grooves on the cavity surface forming a solid barrier to gasses and liquids.

Omega Seals

JETCAT No. 5

Omega Seals provide the lowest leak rate for sealing applications that require high-pressure or deep vacuum. JETSEAL's Omega Seals are currently used in demanding applications for rocket and gas turbine engines. These seals have virtually zero-leakage and feature a clean simple design. Omega Seals are lapped on both sealing faces to a high degree of flatness creating a low leak rate sealing system. To further reduce leakage rates, these seals may be plated with a defect-free ductile material. Omega Seals concentrate a substantial load on the sealing contact area to force plating material into the surface finish grooves on the cavity surface forming a solid barrier to gasses and liquids.

Seal Cavity



The engineering of the cavity for specific applications is critical to optimizing the performance of the sealing system. It is important that the cavity is precisely manufactured to engineering requirements. The cavity faces are required to be flat, parallel, and within the specified depth limits. A machined surface finish of 32 micro-inches or better and concentric to the cavity is recommended. The peaks and valleys of the cavity surface finish create a labyrinth effect between the un-plated or plated seal and cavity.

The product descriptions on the following pages define briefly each of our current products. Our seals are available in various diameters, cross-sections, and noncircular shapes. JETSEAL's cross-sections are not limited to those shown in the following tables. Our application engineers will work with you and your design team to develop a custom seal cross-section and cavity for your specific application.

Introduction to the JETSEAL Intelligent Part Numbering System for Standard Seals

(Non-standard seals are described by numerical part numbers with non-significant digits.)

Example of Intelligent P/N (part number whose characters signify discrete properties of the product).

J	CI	02707	-	08	01	01	-	SSA
1. JETSEAL Signifier	**2.** Seal Section Geometry	**3.** Diameter		**4.** Cross Section Page 8	**5.** Material Codes Page 8	**6.** Heat Treatment Page 8		**7.** Plating/ Coating Page 9

1. **J** Prefix indicates seal P/N defines seal in English units.

2. **Seal Section Geometry:**

CI	=	C-Seal, Internal Pressure
CE	=	C-Seal, External Pressure
CA	=	C-Seal, Coaxial (Radial Interference.)
EI	=	E-Seal, High Deflection, Internal
EE	=	E-Seal, High Deflection, External
HI	=	E-Seal, High Pressure, Internal
HE	=	E-Seal, High Pressure, External
MI	=	Omega Seal, High Performance, Internal
ME	=	Omega Seal, High Performance, External
VI	=	V-Seal, Internal
VE	=	V-Seal, External
WI	=	Two-convolution, E-Seal, Internal
WE	=	Two-convolution, E-Seal, External

3. **Diameter Code: Expressed in one-thousandths of an inch, e.g.**

02707	=	2.707 inches
99500	=	99.500 inches

For internal pressure seals, the maximum external diameter is encoded. For all others, the minimum internal diameter is used.

Example P/N JCI 02707-08 01 01 SSA, above, defines an internal pressure C-Seal, 2.707 outside diameter, .125 free height, material thickness .015, Alloy 718, solution and precipitation heat treated and plated with silver .0005 - .0010 thick.

4. **Cross-Section Codes: Example only. See relevant design manual section for seal type.**

Code	Nominal Section	Free Height	Material Thickness	Cavity Depth	Cavity Corner Radius (max)
01	3/64	.046 - .048	.005	.036 - .038	.015
02	3/64	.046 - .048	.007	.036 - .038	.015
03	1/16	.062 - .064	.007	.049 - .051	.020
04	1/16	.062 - .064	.010	.049 - .051	.020
05	3/32	.093 - .095	.008	.073 - .077	.030
06	3/32	.093 - .095	.012	.073 - .077	.030
07	1/8	.124 - .127	.010	.098 - .102	.045
08	1/8	.124 - .127	.015	.098 - .102	.045
09	3/16	.186 - .190	.015	.149 - .153	.070
10	3/16	.186 - .190	.020	.149 - .153	.070
11	1/4	.248 - .252	.020	.198 - .202	.090
12	1/4	.248 - .252	.025	.198 - .202	.090

5. **Material Codes:**

Code	Material	Specification	Temperature Limit (°F)[1]	Remarks
01	Alloy 718	AMS 5596 AMS 5589 AMS 5662	1200	Superior performance (NACE approved Heat Treat available)
02	Alloy X-750	AMS 5598 AMS 5582 AMS 5667	1100	Excellent performance Lower load
03	Waspaloy	AMS 5544 AMS 5706 AMS 5586	1350	Superior resistance to creep Stress relaxation above 1200°F
04	Cres 304	AMS 5511 AMS 5560 AMS 5639	800	Effective within reduced temp. range. Low spring back
05	Elgiloy	AMS 5876 AMS 5833	900	Excellent H_2 embrittlement resistance
06	Haynes 282	AMS 5951	1600	Superior for high temperature applications
07	Hastelloy X	AMS 5754 AMS 5587 AMS 5530	1500	High temperature oxidation resistance
08	Rene 41	AMS 5545 AMS 5712	1400	High temperature and corrosion resistance

[1] Temperatures may be exceeded for certain applications; especially short duration.

6. **Heat Treatment Codes:**

Code	Heat Treatment	Recommended Materials	Remarks
00	None	CRES 304	Strain-hardened condition and non-hardenable materials
01	Solution and Precipitation	Alloy 718 Alloy X750 Rene 41	General applications
02	Solution Only	Hastelloy X	Optimum corrosion resistance and Mechanical Properties
03	Solution and Precipitation (NACE)	Alloy 718	Special heat treat for sour gas (Hydrogen Sulfide) service
04	Solution, Stabilization and Precipitation	Waspaloy Haynes 282	Creep and relaxation resistance
05	Solution and Precipitation (H2)	Alloy 718	High temperature H_2 gas service
06	Precipitation Only	Alloy 718 Alloy X-750	Static applications

7. **Plating and Coating Table:**

Code	Plating/Coating	Thickness
SSA	SILVER	.0005 - .0010
SSB		.0010 - .0015
SSC		.0015 - .0020
SSD		.002 - .003
SSF		.003 - .004
SAA	SILVER W/GOLD UNDERLAY	.0005 - .0010
SAB		.0010 - .0015
SAC		.0015 - .0020
SAD		.002 - .003
SAF		.003 - .004
NIA	NICKEL	.0005 - .0010
NIB		.0010 - .0015
NIC		.0015 - .0020
NID		.002 - .003
NAA	NICKEL W/GOLD UNDERLAY	.0005 - .0010
NAB		.0010 - .0015
NAC		.0015 - .0020
NAD		.002 - .003
AAA	GOLD	.0005 - .0010
AAB		.0010 - .0015
AAC		.0015 - .0020
AAD		.002 - .003
CUA	COPPER	.0005 - .0010
CUB		.0010 - .0015
CUC		.0015 - .0020
CAA	COPPER W/GOLD UNDERLAY	.0005 - .0010
CAB		.0010 - .0015
CAC		.0015 - .0020
TIN	TIN	.002 - .004
TAC	TIN W/ GOLD UNDERLAY	.002 - .004
PBC	LEAD	.0015 - .0025
PBD		.002 - .004
TFB	PTFE	.001 - .002
TFD		.002 - .003
PFB	PFA	.001 - .002
PFD		.002 - .003
TRB	TRIBALOY T-800	.002 - .004

Selection of Plating Materials:

Seals may be plated to further reduce leak rates with a defect-free ductile material. The seals concentrate a substantial load on the sealing contact area to force plating material into the surface finish grooves on the cavity surface forming a solid barrier to gasses and liquids.

Plating/Coating Material	Applications / Limitations	Load Limit (lbf/in. circ.)	Temperature Limit (°F)
Unplated	Pneumatic applications. Leakage not critical.	Depending on substrate and mating materials	Substrate/ mating material use limitations
Silver	General use up to 800°F. Good corrosion resistance. Relatively inexpensive. Soft.	Depending on seal design usually unlimited.	800°F oxidizing atmosphere.
Silver w/gold underlay	General use up to 1300°F. Good corrosion resistance. Moderate cost. Soft.	Depending on seal design usually unlimited.	1300°F
Gold	Excellent corrosion resistance and temperature capability. Expensive when thick &/or applied to large parts.	Depending on seal design usually unlimited.	1500°F*
Soft nickel (annealed)	Replaces silver for very high temps., but is harder. Sealing efficiency not as high.	Depending on seal design usually unlimited.	1500°F*
Copper	Softness between that of silver and soft nickel. Inexpensive. Effective.	Depending on seal design usually unlimited.	1500°F*
PTFE/PFA	Chemically inert. OK for low load seals. Not for use in fire hazard applications	250 lb_f/in. circ.	400°F
Indium (Vendor Spec)	Softest plating	285 lb_f/in.	105°F

Drawing note required: Plating optional and may be incomplete inside seal section and on inward folds (non-sealing contact areas), except where specified as corrosion barrier.

* Consult JETSEAL's technical support staff for higher temperature exceptions.
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Surface Roughness (micro-inches)	Recommended Plating Thickness (inches)
32 or better	.0005 - .0010
64 or better	.0010 - .0015
125 or better	.0015 - .0020
250 or better	.0025 - .0030
500 or better	.0035 - .0040

Performance Data Correction Factors

Performance data for each seal series must be corrected by multiplying by the factors in the table below, when specifying alloys other than Alloy 718 or for service at elevated operating temperatures.

CORRECTION FACTORS FOR MATERIALS & TEMPERATURES

Temp °F	Alloy 718	Alloy X-750	Waspaloy	Haynes 282	Cres 304	Elgiloy	Hastelloy X
70	1.00	.67	.73	.68	.62	1.00	.30
200	.97	.64	.71	-	.57	-	.29
300	.96	.63	.70	-	.55	-	.28
400	.95	.61	.69	-	.53	.93	.27
500	.94	.59	.68	.66	.53	-	.27
600	.93	.58	.66	-	.52	.90	.26
700	.92	.56	.65	-	.51	-	.26
800	.91	.55	.64	-	.50	.87	.25
900	.90	.54	.63	-	.47	-	.25
1000	.89	.53	.62	.63	.43*	.80	.24
1100	.86	.50	.60	-	.38*	-	.22
1200	.81	.46*	.59	-	.31*	-	.20
1300	.72*	.41*	.57	-	-	-	.17
1400	.55*	.35*	.54*	.57*	-	-	.15
1500	.39*	.28*	.50*	.57*	-	-	.11

*At these temperatures, only short term exposure is recommended. Longer exposures require full analysis, involving concurrent application engineering. Consult JETSEAL's technical support staff. Not all products are available as standard parts in all materials listed. Refer to relevant design manual section for available standard materials.

Elgiloy is a registered trade mark of Elgiloy Limited Partnership, Inc.
Waspaloy is a registered trade mark of United Technologies Corp.
Hastelloy is a registered trademark of Haynes International.

COEFFICIENT OF THERMAL EXPANSION DATA FOR SEAL & CAVITY MATERIALS

Temp °F	Alloy 718	Alloy X- 750	Alloy 625	Waspaloy	Incoloy 909	Cres 300	Alloy 286	Titanium 6-4	Hastelloy X
200	7.10	7.40	7.10	6.80	4.40	8.95	9.20	5.00	7.50
300	7.25	7.60	7.15	7.00	4.50	9.20	9.27	5.10	7.70
400	7.40	7.78	7.20	7.20	4.50	9.43	9.32	5.20	7.80
500	7.58	7.85	7.30	7.38	4.38	9.63	9.40	5.27	8.00
600	7.65	7.95	7.40	7.50	4.30	9.80	9.45	5.35	8.07
700	7.80	8.00	7.50	7.65	4.20	9.97	9.55	5.45	8.20
800	7.85	8.00	7.60	7.78	4.30	10.10	9.62	5.52	8.25
900	7.95	8.05	7.70	7.82	4.63	10.25	9.70	5.58	8.35
1000	8.05	8.10	7.83	7.90	5.11	10.38	9.80	5.62	8.45
1100	8.20	8.20	7.97	8.00	5.38	10.50	9.92	-	8.60
1200	8.30	8.40	8.10	8.10	5.70	10.60	10.05	-	8.70
1300	8.45	8.60	8.25	8.30	-	-	-	-	8.80
1400	8.75	8.80	8.40	8.50	-	-	-	-	8.90
1500	9.00	9.05	8.60	8.80	-	-	-	-	9.00

C.O.E., α: 1E-6 in./in./°F, between 70°F and temperature shown.

Differential thermal expansion between seal and cavity may result in excessive radial interference, giving rise to higher leakage rates. Please advise JETSEAL's technical support staff if this may occur in your application.

ENGINEERING UNITS OF CONVERSION

Pressure Conversion:

To Obtain / Multiply by	P.S.I.	Pa	KPa	MPa	Bar	Torr	Inches of Mercury	Inches of Water	Atmosphere	K.S.I.
Pounds per square inch	1	6.8948E+3	6.8948E+0	6.8948E-3	6.8948E-2	5.1714E+1	2.0360E+0	2.7681E+1	6.8046E-2	1.000E-3
Pa	1.4504E-4	I	1.0000E-3	1.0000E-6	1.0000E-5	7.5006E-3	2.9530E-4	4.0146E-3	9.8692E-6	1.4504E-7
KPa	1.4504E-1	1.0000E+3	1	1.0000E-3	1.0000E-2	7.5006E+0	2.9530E-1	4.0146E+0	9.8692E-3	1.4504E-4
MPa	1.4054E+2	1.0000E+6	1.0000E+3	1	1.0000E+1	7.5006E+3	2.9530E+2	4.0146E+3	9.8692E+0	1.4504E-1
Bar	1.4504E+1	1.0000E+5	1.0000E+2	1.0000E-1	I	7.5006E+2	2.9530E+1	4.0146E+2	9.8692E-1	1.4504E-2
Torr	1.9337E-2	1.3332E+2	1.3332E-1	1.3332E-4	1.3332E-3	1	3.9370E-2	5.3520E-1	1.3158E-3	1.9337E-5
Inches of Mercury	4.9116E-1	3.3864E+3	3.3864E+0	3.3864E-3	3.3864E-2	2.5400E+1	1	1.3595E+1	3.3421E-2	4.9116E-4
Inches of Water	3.6128E-2	2.4910E+2	2.4910E-1	2.4910E-4	2.4840E-3	1.8685E+0	7.3556E-2	I	2.4584E-3	3.6128E-5
Atmosphere	1.4696E+1	1.0133E+5	1.0133E+2	1.0133E-1	1.0133E+0	7.6000E+2	2.9921E+1	4.0678E+2	I	1.4696E-2
K.S.I.	1.0000E+3	6.8948E+6	6.8948E+3	6.8948E+0	6.8948E+l	5.1717E+4	2.0360E+3	2.7681E+4	6.8046E+1	I

Leakage Rates:

SCCS	SCFM	Torr 1/s	Mb-l/s	Approximate Equivalent	Bubbles Observed in Air U/Water Test
1.0E+2	2.12E-1	7.6E-3	1.01E+2	6 liters/minute	Strong flow - water turbulent
1.0E+1	2.12E-2	7.6E-2	1.01E+1	0.6 liters/minute	Strong continuous stream
1.0E+0	2.12E-3	7.6E-1	1.0IE+0	60 ccs/minute	Intermittent strong stream
1.0E-1	2.12E-4	7.6E-2	1.01E-1	6 ccs/minute	Fine stream
1.0E-2	2.12E-5	7.6E-3	1.01E-2	36 ccs/hour	10 small bubbles per second
1.0E-3	2.12E-6	7.6E-4	1.01E-3	3.6 ccs/hour	1 per second
1.0E-4	2.12E-7	7.6E-5	1.01E-4	1 cc in 3 hours	1 in 10 seconds
1.0E-5	2.12E-8	7.6E-6	1.01E-5	1 cc in 30 hours	1 in 100 seconds
1.0E-6	2.12E-9	7.6E-7	1.01E-6	1 cc in 2 weeks	3 in one hour
1.0E-7	2.12E-10	7.6E-8	1.01E-7	3 ccs in 1 year	
1.0E-8	2.12E-11	7.6E-9	1.01E-8	1 cc in 3 years	
1.0E-9	2.12E-12	7.6E-10	1.01E-9	1 cc in 30 years	Observation impractical
1.0E-10	2.12E-13	7.6E-11	1.01E-10	1 cc in 300 years	
1.0E-11	2.12E-14	7.6E-12	1.01E-11	1 cc in 3000 years	

Temperature:

$T_F = 1.8T_C + 32$; $T_R = T_F + 460$; $T_C = (T_F - 32)/1.8$; $T_K = T_C + 273$; $T_R = 1.8\ T_K$
Where F = °Fahrenheit; R = °Rankine; C =°Celcius (Centigrade); K = °Kelvin.

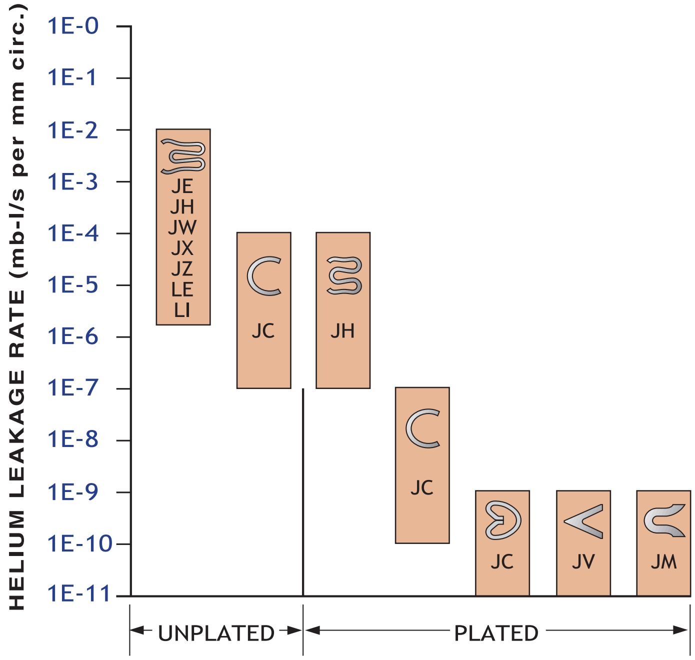
Force:

1 lb_f= 4.448N; Distributed force: 1 lb_f /in = 175 N/M = .175N/mm

Moment & Torque:

1 in - lb_f = .113 N-M

Typical Leakage Rates:



Typical ranges of leakage rates for parts under vacuum and measured by helium leak detection are shown in the bar chart. These ranges are obtained using test flanges with surface finishes and cavity dimensions in accordance with the recommendations in each relevant seal design section.

Fig. 1. Typical Leakage Rates

Bolt Load Calculation:

$F_{Bolt/Clamp}$, without axial loading or bending moment loads:

In order for each sealing system or joint to attain its maximum sealing efficiency, it is essential that the compressive force applied to the seal, through threaded fasteners or other means (e.g. clamps), exceed the sum of the seal reaction force (F_{Seal}) at full compression and the product of the maximum system pressure (P_{max}) and the projected area (A) enclosed.

$$FT_{Total} = F_{Seal} + F_{Proj\ Area(A)} \cdot \text{Max Sys Pressure (Pmax)}$$

$$F_{Bolt/Clamp} > F_{Total}$$

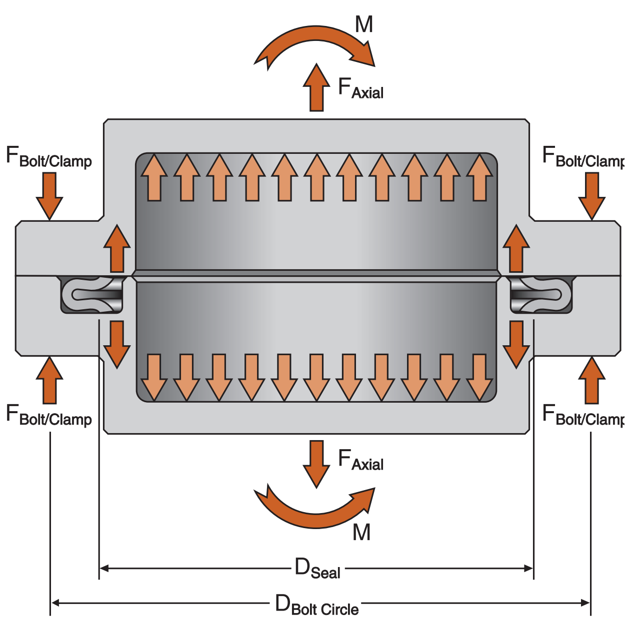


Fig. 2. Axial forces and moments acting on a joint in a closed, pressurized system.

$F_{Bolt/Clamp}$, with axial loading or bending moment loads:

If bending moments and/or axial loads are applied to the joint, their effects must be computed. The calculation of total force (F_{Total}) then becomes;

$F_{Total} =$
$F_{Seal} + F_{Proj\ Area(A)}$. Max Sys Pressure (Pmax) $+ F_{Axial}$
$F_{Bending\ Moment\ Reaction\ Force}$

$$F_{Bolt/Clamp} > F_{Total}$$

If it is not possible to generate the required closing force, or if transitory conditions sometimes reduce it, the seal may be subjected to partial unloading, through static or cyclic deflections. In this case, analysis must be performed to ensure that the unloading of the seal does not result in excess leakage and that if it is cyclic, that the fatigue life of the seal is not exceeded. JETSEAL can provide support and assist with this analysis.

F_{Seal}, Force Applied as a Result of Seal Line Load Distributed over Seal Circumference

$$F_{Seal} = \pi D_{Seal} \cdot L_{Seal\ Line\ Load}$$

D_{Seal} = Diameter of Seal
$L_{Seal\ Line\ Load}$ = Seal Line Load (Table Look Up)

$F_{Proj\ Area(A)\ .\ Max\ Sys\ Pressure\ (Pmax)}$, Force Applied as a Result of Maximum Internal Pressure

$$F_{Proj\ Area(A)\ .\ Max\ Sys\ Pressure\ (Pmax)} = A \cdot P_{Max}$$

$A = \pi \cdot (D_{Seal})^2/4$
D_{Seal} = Diameter of Seal
P_{Max} = Maximum Internal Pressure

F_{Axial}, Force from External Axial Load

$F_{Bending\ Moment\ Reaction\ Force}$, Force Required to React Bending Moment

$$F_{Bending\ Moment\ Reaction\ Force} = 4M/ND_{Bolt\ Circle}$$

N = Number of Bolts, N>3
M = Bending Moment
$D_{Bolt\ Circle}$ = Diameter of Bolt Circle

NOTES

ENGINEERED SEALING SOLUTIONS

JETCAT No. 01 – *Resilient Metallic Seal Design Guide*

JETCAT No. 02 – *C-Seals*

JETCAT No. 03 – *E-Seals*

JETCAT No. 04 – *V-Seals*

JETCAT No. 05 – *Omega Seals*

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