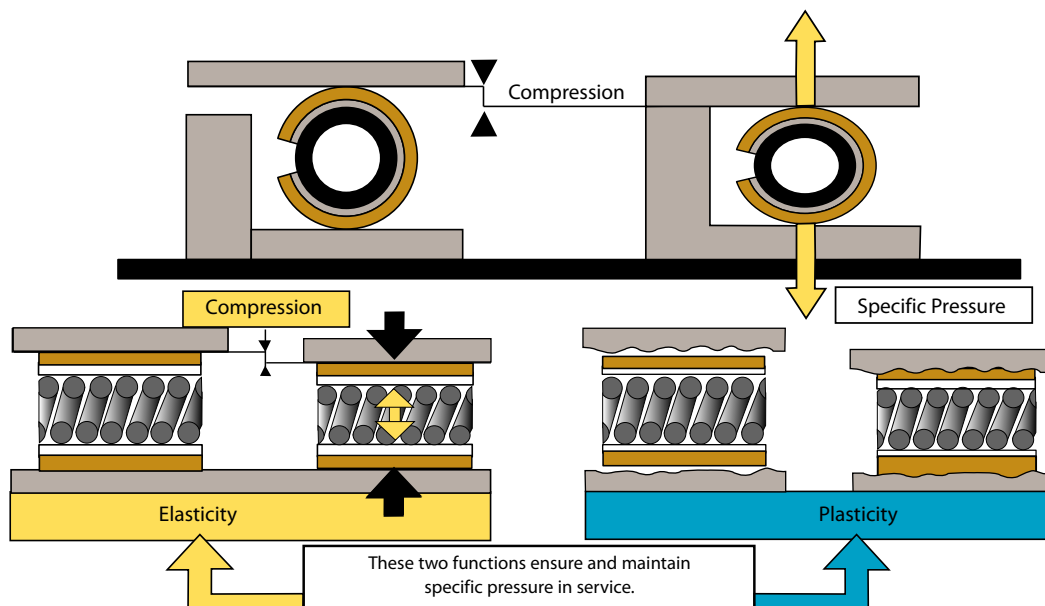
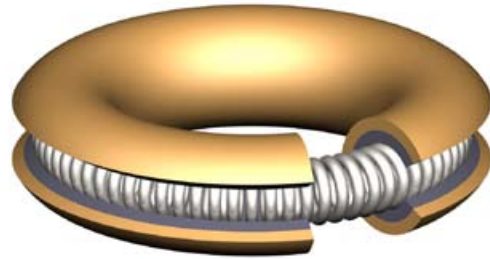
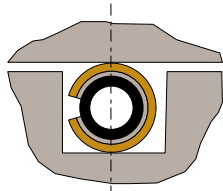


## Sealing Concept

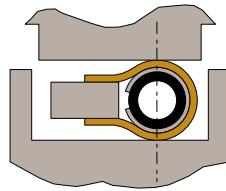
The sealing principle of the Helicoflex® family of seals is based upon the plastic deformation of a jacket of greater ductility than the flange materials. This occurs between the sealing face of a flange and an elastic core composed of a close-wound helical spring. The spring is selected to have a specific compression resistance. During compression, the resulting specific pressure forces the jacket to yield and fill the flange imperfections while ensuring positive contact with the flange sealing faces. Each coil of the helical spring acts independently and allows the seal to conform to surface irregularities on the flange surface. This combination of elasticity and plasticity makes the Helicoflex seal the best overall performing seal in the industry.



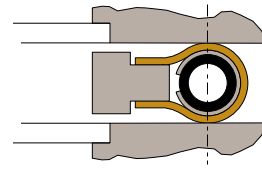
### Typical Configurations



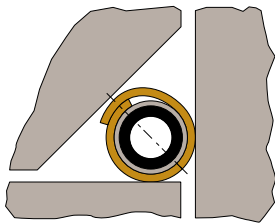
**HN200**  
Groove Assembly



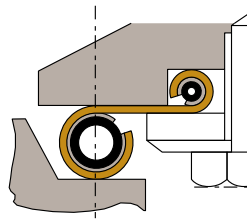
**HN203**  
Tongue & Groove



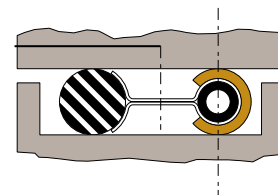
**HN208**  
Raised face flange -  
ANSI B16.5



**HN240**  
3 Face Compression



**HND229**  
Valve Seat



**HNDE290**  
Leak check -  
Insert Gas Purge

### Classification of Seal Type

Cross Section Type	HN HNR HNV HND HNDE	single section ground spring for precise load control (Beta Spring) low load (Delta Seal) tandem Helicoflex seals tandem Helicoflex and elastomer seals note: "L" indicates internal limiter (ex: HLDE)								
Jacket/Lining	1 = jacket only	2 = jacket with inner lining								
Jacket Orientation	0	1	2	3	4	5	6	7	8	9
Section Orientation	0	1	2	3	4	5	6	7	8	9

### Example

<b>HN</b>	<b>2</b>	<b>0</b>	<b>8</b>
Cross Section Type	# Jackets/Lining	Jacket Orientation	Section Orientation

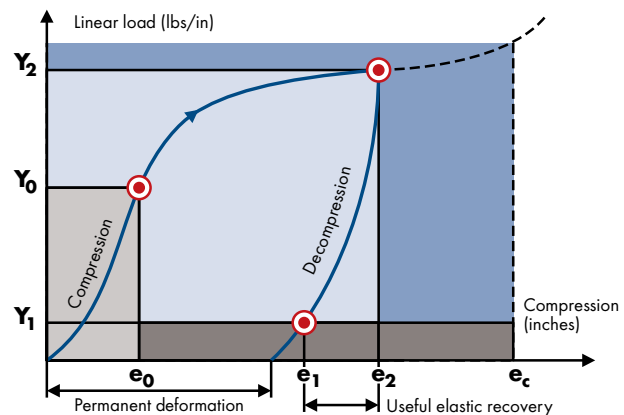
## Characteristic Curve

The resilient characteristic of the Helicoflex<sup>®</sup> seal ensures useful elastic recovery during service. This elastic recovery permits the Helicoflex<sup>®</sup> seal to accommodate minor distortions in the flange assembly due to temperature and pressure cycling. For most sealing applications the  $Y_0$  value will occur early in the compression curve and the  $Y_1$  value will occur near the end of the decompression curve.

The compression and decompression cycle of the Helicoflex<sup>®</sup> seal is characterized by the gradual flattening of the compression curve. The decompression curve, which is distinct from the compression curve, is the result of a hysteresis effect and permanent deformation of the spring and jacket.

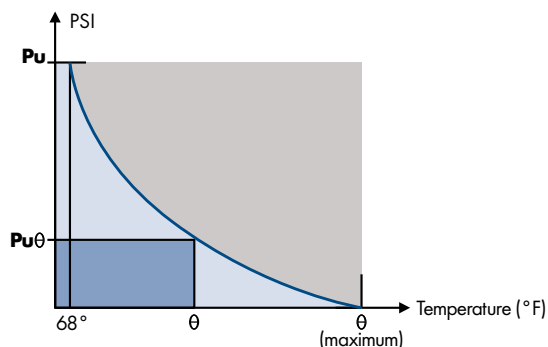
## Definition of Terms

- $Y_0$  = load on the compression curve above which leak rate is at required level
- $Y_2$  = load required to reach optimum compression  $e_2$
- $Y_1$  = load on the decompression curve below which leak rate exceeds required level
- $e_2$  = optimum compression
- $e_c$  = compression limit beyond which there is risk of damaging the spring



## The Intrinsic Power of the Seal

The intrinsic power of the Helicoflex seal reflects its ability to maintain and hold system pressure for a given temperature at  $Y_2$  and  $e_2$ . This value is expressed as a specific pressure and is noted by the symbols  $P_u$  (room temperature) and  $P_{u\theta}$  (at operating temperature). The influence of temperature on  $P_u$  is shown in the graph below. The table on page 4 gives the values of  $P_u$  at 68°F (20°C),  $P_{u\theta}$  at a given temperature and the maximum temperature where  $P_{u\theta} = 0$ .



# HELICOFLEX<sup>®</sup>

## Spring Energized Seals

## PERFORMANCE DATA

Jacket Material	HELIUM SEALING							BUBBLE SEALING					Dimensions in inches
	Cross Section	e <sub>2</sub>	e <sub>c</sub>	Y <sub>2</sub> lbs/inch	Y <sub>1</sub> lbs/inch	Pu68°F PSI	Pu@392°F PSI	Y <sub>2</sub> lbs/inch	Y <sub>1</sub> lbs/inch	Pu68°F PSI	Pu@392°F PSI	Max Temp °F	
Aluminum	0.063	0.024	0.028	857	114	7250	N/A	514	114	5075	N/A	302	
	0.075	0.028	0.033	914	114	7540	N/A	571	114	5800	N/A	302	
	0.087	0.028	0.035	942	114	7685	N/A	600	114	5800	N/A	356	
	0.098	0.028	0.035	999	114	7975	725	657	114	6090	725	428	
	0.118	0.031	0.039	1056	143	7975	1450	742	114	6525	1450	482	
	0.138	0.031	0.039	1085	143	7975	2030	799	114	6815	2030	482	
	0.157	0.035	0.043	1142	143	8700	2465	857	114	7250	2465	536	
	0.177	0.035	0.047	1199	143	8700	2900	914	114	7540	2900	536	
	0.197	0.035	0.055	1256	171	9135	3190	971	143	7975	3190	572	
	0.217	0.035	0.063	1313	171	9425	3480	1028	143	8265	3480	608	
	0.236	0.039	0.071	1399	200	9715	3625	1113	171	8700	3625	644	
	0.276	0.039	0.087	1542	228	10150	4060	1171	200	9425	4060	644	
0.315	0.039	0.102	1656	286	10440	4640	1285	228	9860	4495	680		
						Pu@482°F					Pu@482°F		
Silver	0.063	0.020	0.024	1142	171	9425	N/A	857	171	5800	N/A	464	
	0.075	0.024	0.028	1256	171	9425	N/A	857	171	5800	N/A	464	
	0.087	0.024	0.031	1313	200	10150	N/A	914	171	5800	580	536	
	0.098	0.028	0.035	1370	257	10875	1160	971	228	6525	725	536	
	0.118	0.031	0.039	1485	286	12325	2030	1028	257	7250	1305	572	
	0.138	0.031	0.039	1599	286	13775	3190	1085	257	7975	1885	572	
	0.157	0.031	0.043	1713	314	15225	3915	1142	286	8700	2320	662	
	0.177	0.031	0.043	1827	343	16675	4495	1256	286	10150	2755	698	
	0.197	0.031	0.051	1941	343	18125	5220	1313	286	11600	3190	698	
	0.217	0.031	0.055	2056	371	19575	5800	1428	343	13050	3625	752	
	0.236	0.035	0.067	2284	400	21750	6815	1542	343	15950	4350	842	
	0.276	0.035	0.079	2512	457	23200	7830	1713	371	18125	5220	842	
0.315	0.035	0.094	2798	514	24650	8700	1999	400	20300	6090	932		
						Pu@572°F					Pu@572°F		
Copper, Soft Iron, Mild Steels and Annealed Nickel	0.063	0.020	0.024	1485	228	7250	1450	1085	171	5075	725	662	
	0.075	0.024	0.028	1599	286	7250	1595	1142	228	5075	870	662	
	0.087	0.024	0.031	1713	343	7975	1885	1256	286	5075	1160	680	
	0.098	0.028	0.035	1827	400	8700	2465	1313	343	5800	1450	716	
	0.118	0.028	0.039	1999	457	9425	2900	1428	400	5800	1740	716	
	0.138	0.028	0.039	2227	457	10150	3335	1542	400	6525	2175	752	
	0.157	0.031	0.043	2455	514	10150	3915	1656	457	6525	2465	788	
	0.177	0.031	0.043	2684	571	11600	4350	1827	457	6525	2755	842	
	0.197	0.031	0.051	2912	628	12325	4785	1884	514	7250	3045	842	
	0.217	0.031	0.055	3141	685	13050	5220	2056	571	7250	3335	896	
	0.236	0.035	0.067	3597	799	13775	5800	2284	571	7975	3770	968	
	0.276	0.035	0.079	4225	914	14500	6525	2627	628	8700	4205	968	
0.315	0.035	0.094	4911	1085	15950	7105	3026	742	9425	4640	1022		
						Pu@662°F					Pu@662°F		
Nickel, Monel, Tantalum	0.063	0.016	0.020	1827	457	10150	1595	1142	343	5800	1015	716	
	0.075	0.020	0.024	1999	457	10440	2320	1256	343	6090	1305	716	
	0.087	0.020	0.028	2227	514	11020	3045	1313	400	6380	1740	788	
	0.098	0.024	0.031	2512	571	11890	3915	1542	400	6815	2320	842	
	0.118	0.024	0.035	2512	628	12615	4930	1713	457	7250	2900	896	
	0.138	0.024	0.035	2798	685	13485	5800	1941	514	7830	3335	932	
	0.157	0.028	0.039	3312	799	13920	6525	2170	571	8265	3915	1022	
	0.177	0.028	0.039	4111	857	15225	7540	2398	628	8700	4350	1112	
	0.197	0.028	0.043	4454	1028	15950	8265	2627	628	9425	4785	1202	
	0.217	0.028	0.051	4625	1142	16675	8990	2855	685	9715	5365	1202	
	0.236	0.031	0.063	N/A	N/A	N/A	N/A	3198	742	10440	5945	1202	
	0.276	0.031	0.071	N/A	N/A	N/A	N/A	3712	857	11310	6525	1202	
0.315	0.031	0.083	N/A	N/A	N/A	N/A	4168	914	12035	7250	1202		
						Pu@752°F					Pu@752°F		
Stainless Steel, Inconel, Titanium	0.063	0.016	0.020	1999	571	13050	3625	1713	457	6815	870	788	
	0.075	0.020	0.024	2284	571	13195	3915	1827	457	7250	1160	788	
	0.087	0.020	0.028	2570	628	13340	4205	1999	514	7540	1595	896	
	0.098	0.024	0.031	2855	685	14065	4640	2170	571	8265	2175	932	
	0.118	0.024	0.035	3283	742	14500	5220	2427	628	8990	2900	932	
	0.138	0.024	0.035	3769	857	15080	5655	2684	742	9715	3625	1022	
	0.157	0.028	0.039	4283	971	15515	6090	2969	857	10440	4350	1112	
	0.177	0.028	0.039	4711	1256	15950	6525	3198	1028	11165	4930	1202	
	0.197	0.028	0.043	N/A	N/A	N/A	N/A	3426	1085	11890	5365	1292	
	0.217	0.028	0.051	N/A	N/A	N/A	N/A	3712	1142	12615	6090	1292	
	0.236	0.031	0.063	N/A	N/A	N/A	N/A	4111	1256	13630	6815	1292	
	0.276	0.031	0.071	N/A	N/A	N/A	N/A	4568	1485	14790	7540	1292	
0.315	0.031	0.083	N/A	N/A	N/A	N/A	5139	1656	15660	8410	1292		

#### Definition of Characteristic Values

<b>D<sub>j</sub></b>	Mean reaction diameter of the seal. (For a double section seal, $D_j = D_{j1} + D_{j2}$ )	_____ inches
<b>Y<sub>2</sub></b>	Linear load corresponding to e <sub>2</sub> compression	_____ lbs/inch
<b>Y<sub>1</sub></b>	Linear load on the seal to maintain sealing in service at low pressure (=Y <sub>m1</sub> )	_____ lbs/inch
<b>P<sub>u</sub></b>	Intrinsic power of the seal under pressure at 68°F (20°C) when the reaction force of the seal is maintained at Y <sub>2</sub> , regardless of the operating conditions.	_____ PSI
<b>P<sub>uΘ</sub></b>	Value of P <sub>u</sub> at temperature Θ	_____ PSI
<b>P</b>	Operating or proof pressure Note: if $\frac{P}{P_u \text{ or } P_{u\Theta}} > 1$ , the definition of the seal must be modified This ratio must never exceed 1	_____ PSI
<b>Y<sub>m2</sub></b>	Linear tightening load on the seal at room temperature to maintain sealing under pressure. $Y_{m2} = Y_2 \frac{P}{P_u}$	_____ lbs/inch
<b>Y<sub>m2Θ</sub></b>	Value of Y <sub>m2</sub> at temperature Θ. $Y_{m2\Theta} = Y_2 \frac{P}{P_{u\Theta}}$	_____ lbs/inch
<b>E<sub>t</sub></b>	Young's modulus of bolt material at 68°F (20°C)	_____ PSI
<b>E<sub>t_s</sub></b>	Young's modulus of bolt material at operating temperature	_____ PSI

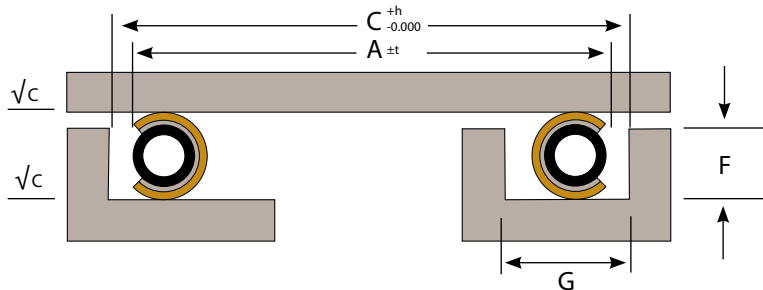
#### Load Calculations

<b>F<sub>j</sub></b>	Total tightening load to compress the seal to the operating point (Y <sub>2</sub> ; e <sub>2</sub> ) $F_j = \pi \times D_j \times Y_2$	_____ lbs
<b>F<sub>F</sub></b>	Total hydrostatic end force $F_F = \pi/4 D_{j1}^2 \times P$ ( $D_{j1} = D_j$ in case of a single section seal)	_____ lbs
<b>F<sub>m</sub></b>	Minimum total load to be maintained on the seal in service to preserve sealing, i.e. $F_m = \pi D_j Y_m$ where: Y <sub>m</sub> = the greater of the two values: Y <sub>m1</sub> or Y <sub>m2Θ</sub> (see note 1 below)	_____ lbs
<b>F<sub>s</sub></b>	Total load to be applied on the bolts to maintain sealing in service $F_s = F_F + F_m$	_____ lbs
<b>F<sub>s*</sub></b>	Increased value of F <sub>s</sub> to compensate for Young's modulus at temperature $F_{s*} = F_s E_t / E_{t_s}$	_____ lbs
<b>F<sub>B</sub></b>	LOAD TO BE APPLIED:    If $F_{s*} > F_j$ then $F_b = F_{s*}$ If $F_j > F_{s*}$ then $F_b = F_j$	_____ lbs

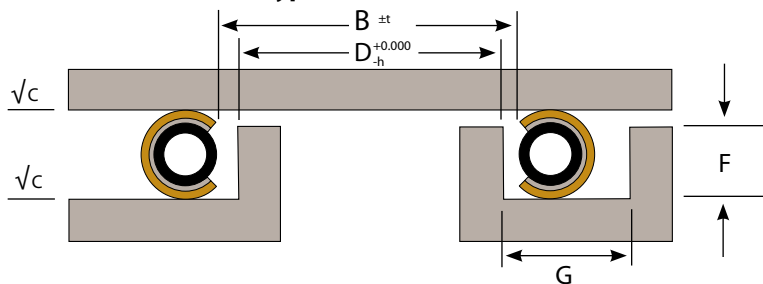
Note 1: wherever the working pressure is high and/or seal diameter is big, to such an extent that  $P \cdot D_j \geq 32 Y_m$ , in order to remain on the safe side, whatever the inaccuracy on the tightening load may be, it is recommended to take the F<sub>j</sub> value in lieu of F<sub>m</sub> for the calculation of F<sub>s</sub> so that  $F_s = F_F + F_j$ .

Note 2: this information is provided as a reference only.

#### Internal Pressure: Seal Type HN200



#### External Pressure: Seal Type HN220



### Seal and Groove Sizing Calculations

The equations below can be used for basic groove calculations. Applications that have significant thermal expansion may require additional clearance. Please contact Applications Engineering for design assistance.

#### Determining Seal Diameter:

##### Internal

$$A = C - X$$

##### External

$$B = D + X$$

**Tolerancing:** See chart

Where: A = Seal Outer Diameter  
 B = Seal Inner Diameter  
 C = Groove Outer Diameter  
 D = Groove Inner Diameter  
 X = Diametrical Clearance (see table)

#### Determining Groove Diameter:

##### Internal

$$C = A + X$$

##### External

$$D = B - X$$

**Groove Finish  $\sqrt{C}$ :** See groove dimensioning chart on page 7

### Seal/Groove Tolerances

Seal Diameter Range	Pressure <300psi (20 bar)		Pressure $\geq$ 300 psi (20 bar)	
	Seal tolerance t	Groove tolerance h	Seal tolerance t	Groove tolerance h
0.350 to 2.000	0.005	0.005	0.004	0.004
2.001 to 12.000	0.010	0.010	0.004	0.004
12.001 to 25.000	0.010	0.010	0.006	0.006
25.001 to 48.000	0.015	0.015	0.008	0.008
48.001 to 72.000	0.020	0.015	0.010	0.008
> 72.000	Contact Applications Engineering			

#### Shaped Seals

**Groove design:** Contact Applications Engineering for assistance in designing non-circular grooves.

**Groove finish:** Most applications will require a finish of 16-32 RMS (0.4 to 0.8 Ra  $\mu$ m). All machining & polishing marks must follow seal circumference.

**Min. Seal Radius:** The minimum seal bending radius is six times the seal cross section (CS).

**Seating Load:** The load (Y2) to seat the seal is approximately 30% higher due to a slightly stiffer spring design.

#### Flatness

Seal Diameter Range	Amplitude	Tangential Slope	Radial Slope
0.350 to 20.000	0.008	1:1000	1:100
20.001 to 80.000	0.016	2:1000	2:100

#### Dimensions in inches

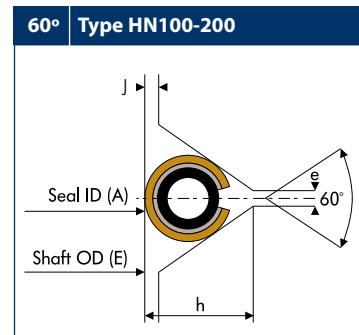
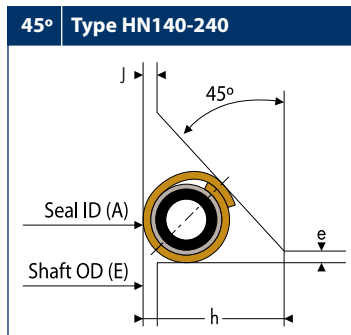
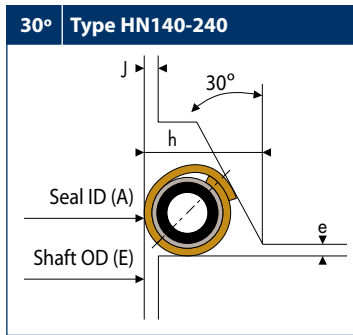
# HELICOFLEX®

## Spring Energized Seals

### SEAL AND GROOVE DIMENSIONS

Jacket Material	SEAL			Pressure < 300psi	Pressure ≥ 300psi	GROOVE		Groove Finish RMS	Dimensions in inches
	Free Height	Installation Compression e2	Seal Diameter Range	Diametrical Clearance X	Diametrical Clearance X	Groove Depth F	Groove Width (Min.) G		
Aluminum	0.063	0.024	0.500 to 4.000	0.024	0.012	0.039 +/- 0.003	0.111	32-125  Contact Applications Engineering for Recommendation	
	0.075	0.028	0.625 to 6.000	0.028	0.012	0.047 +/- 0.003	0.131		
	0.087	0.028	0.750 to 10.000	0.028	0.012	0.059 +/- 0.003	0.143		
	0.098	0.028	0.875 to 15.000	0.028	0.012	0.070 +/- 0.003	0.154		
	0.118	0.031	1.000 to 20.000	0.031	0.012	0.087 +/- 0.004	0.180		
	0.138	0.031	1.250 to 25.000	0.031	0.020	0.107 +/- 0.004	0.200		
	0.157	0.035	1.750 to 30.000	0.035	0.020	0.122 +/- 0.004	0.227		
	0.177	0.035	2.000 to 40.000	0.035	0.020	0.142 +/- 0.004	0.247		
	0.197	0.035	3.000 to 50.000	0.035	0.020	0.162 +/- 0.004	0.267		
	0.217	0.035	4.000 to 50.000 +	0.035	0.020	0.182 +/- 0.004	0.287		
	0.236	0.039	5.000 to 50.000 +	0.039	0.020	0.197 +/- 0.005	0.314		
	0.276	0.039	6.000 to 50.000 +	0.039	0.028	0.237 +/- 0.005	0.354		
0.315	0.039	8.000 to 50.000 +	0.039	0.028	0.276 +/- 0.005	0.393			
Silver	0.063	0.020	0.500 to 4.000	0.020	0.012	0.043 +/- 0.002	0.103	63-125  Contact Applications Engineering for Recommendation	
	0.075	0.024	0.625 to 6.000	0.024	0.012	0.051 +/- 0.003	0.123		
	0.087	0.024	0.750 to 10.000	0.024	0.012	0.063 +/- 0.003	0.135		
	0.098	0.028	0.875 to 15.000	0.028	0.012	0.070 +/- 0.003	0.154		
	0.118	0.031	1.000 to 20.000	0.031	0.012	0.087 +/- 0.004	0.180		
	0.138	0.031	1.250 to 25.000	0.031	0.020	0.107 +/- 0.004	0.200		
	0.157	0.031	1.750 to 30.000	0.031	0.020	0.126 +/- 0.004	0.219		
	0.177	0.031	2.000 to 40.000	0.031	0.020	0.146 +/- 0.004	0.239		
	0.197	0.031	3.000 to 50.000	0.031	0.020	0.166 +/- 0.004	0.259		
	0.217	0.031	4.000 to 50.000 +	0.031	0.020	0.186 +/- 0.004	0.279		
	0.236	0.035	5.000 to 50.000 +	0.035	0.020	0.201 +/- 0.004	0.306		
	0.276	0.035	6.000 to 50.000 +	0.035	0.028	0.241 +/- 0.004	0.346		
0.315	0.035	8.000 to 50.000 +	0.035	0.028	0.280 +/- 0.004	0.385			
Copper, Soft Iron, Mild Steels and Annealed Nickel	0.063	0.020	0.500 to 4.000	0.020	0.012	0.043 +/- 0.002	0.103	63-125  Contact Applications Engineering for Recommendation	
	0.075	0.024	0.625 to 6.000	0.024	0.012	0.051 +/- 0.003	0.123		
	0.087	0.024	0.750 to 10.000	0.024	0.012	0.063 +/- 0.003	0.135		
	0.098	0.028	0.875 to 15.000	0.028	0.012	0.070 +/- 0.003	0.154		
	0.118	0.028	1.000 to 20.000	0.028	0.012	0.090 +/- 0.003	0.174		
	0.138	0.028	1.250 to 25.000	0.028	0.020	0.110 +/- 0.003	0.194		
	0.157	0.031	1.750 to 30.000	0.031	0.020	0.126 +/- 0.004	0.219		
	0.177	0.031	2.000 to 40.000	0.031	0.020	0.146 +/- 0.004	0.239		
	0.197	0.031	3.000 to 50.000	0.031	0.020	0.166 +/- 0.004	0.259		
	0.217	0.031	4.000 to 50.000 +	0.031	0.020	0.186 +/- 0.004	0.279		
	0.236	0.035	5.000 to 50.000 +	0.035	0.020	0.201 +/- 0.004	0.306		
	0.276	0.035	6.000 to 50.000 +	0.035	0.028	0.241 +/- 0.004	0.346		
0.315	0.035	8.000 to 50.000 +	0.035	0.028	0.280 +/- 0.004	0.385			
Nickel, Monel, Tantalum	0.063	0.016	0.500 to 4.000	0.016	0.012	0.047 +/- 0.002	0.095	32-63  Contact Applications Engineering for Recommendation	
	0.075	0.020	0.625 to 6.000	0.020	0.012	0.055 +/- 0.002	0.115		
	0.087	0.020	0.750 to 10.000	0.020	0.012	0.067 +/- 0.002	0.127		
	0.098	0.024	0.875 to 15.000	0.024	0.012	0.074 +/- 0.003	0.146		
	0.118	0.024	1.000 to 20.000	0.024	0.012	0.094 +/- 0.003	0.166		
	0.138	0.024	1.250 to 25.000	0.024	0.020	0.114 +/- 0.003	0.186		
	0.157	0.028	1.750 to 30.000	0.028	0.020	0.129 +/- 0.003	0.213		
	0.177	0.028	2.000 to 40.000	0.028	0.020	0.149 +/- 0.003	0.233		
	0.197	0.028	3.000 to 50.000	0.028	0.020	0.169 +/- 0.003	0.253		
	0.217	0.028	4.000 to 50.000 +	0.028	0.020	0.189 +/- 0.003	0.273		
	0.236	0.031	5.000 to 50.000 +	0.031	0.020	0.205 +/- 0.004	0.298		
	0.276	0.031	6.000 to 50.000 +	0.031	0.028	0.245 +/- 0.004	0.338		
0.315	0.031	8.000 to 50.000 +	0.031	0.028	0.284 +/- 0.004	0.377			
Stainless Steel, Inconel, Titanium	0.063	0.016	0.500 to 4.000	0.016	0.012	0.047 +/- 0.002	0.095	32-63  Contact Applications Engineering for Recommendation	
	0.075	0.020	0.625 to 6.000	0.020	0.012	0.055 +/- 0.002	0.115		
	0.087	0.020	0.750 to 10.000	0.020	0.012	0.067 +/- 0.002	0.127		
	0.098	0.024	0.875 to 15.000	0.024	0.012	0.074 +/- 0.003	0.146		
	0.118	0.024	1.000 to 20.000	0.024	0.012	0.094 +/- 0.003	0.166		
	0.138	0.024	1.250 to 25.000	0.024	0.020	0.114 +/- 0.003	0.186		
	0.157	0.028	1.750 to 30.000	0.028	0.020	0.129 +/- 0.003	0.213		
	0.177	0.028	2.000 to 40.000	0.028	0.020	0.149 +/- 0.003	0.233		
	0.197	0.028	3.000 to 50.000	0.028	0.020	0.169 +/- 0.003	0.253		
	0.217	0.028	4.000 to 50.000 +	0.028	0.020	0.189 +/- 0.003	0.273		
	0.236	0.031	5.000 to 50.000 +	0.031	0.020	0.205 +/- 0.004	0.298		
	0.276	0.031	6.000 to 50.000 +	0.031	0.028	0.245 +/- 0.004	0.338		
0.315	0.031	8.000 to 50.000 +	0.031	0.028	0.284 +/- 0.004	0.377			

### Three Face Compression

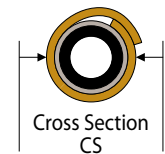


$$E = \text{Shaft OD} \begin{matrix} +0.000 \\ -0.002 \end{matrix}$$

$$A = \text{Seal ID} \begin{matrix} +0.002 \\ -0.000 \end{matrix}$$

CALCULATIONS	
Axial Load (Ya)	= $K \cdot Y_2$
Shaft OD (E)	= Seal ID (A)
Clearance (J)	< $CS / 10$
Axial Compression (e)	= $a \cdot e_2$
Cavity Finish	< 32 RMS

COEFFICIENT VALUES			
Coefficient	30°	45°	60°
a	2.0	1.4	1.15
K	0.9	1.2	1.4



### "h" Values

Seal Cross Section CS	30°		45°		60°	
	Aluminum Jacket	Other Jackets	Aluminum Jacket	Other Jackets	Aluminum Jacket	Other Jackets
0.102	0.130	0.126	0.163	0.157	0.126	0.134
0.126	0.157	0.157	0.199	0.199	0.157	0.165
0.165	0.207	0.207	0.260	0.260	0.213	0.220
0.205	0.260	0.260	0.327	0.327	0.272	0.280
0.252	0.321	0.321	0.402	0.402	0.339	0.346

Dimensions in inches

### Target Sealing Criteria

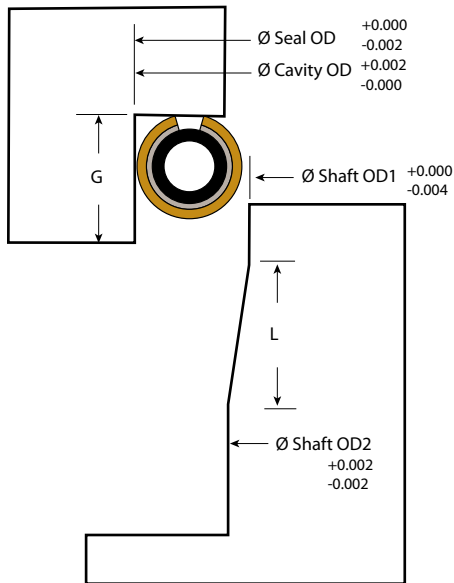
The ultimate leak rate of a joint is a function of the seal design, flange design, bolting, surface finish and other factors. Helicoflex seals are designed to provide two levels of service: Helium Sealing or Bubble Sealing.

**Helium Sealing:** These Helicoflex seals are designed with a target Helium leak rate not to exceed  $1 \times 10^{-9}$  cc/sec.atm under a  $\Delta P$  of 1 atmosphere. The ultimate leak rate will depend on the factors listed above.

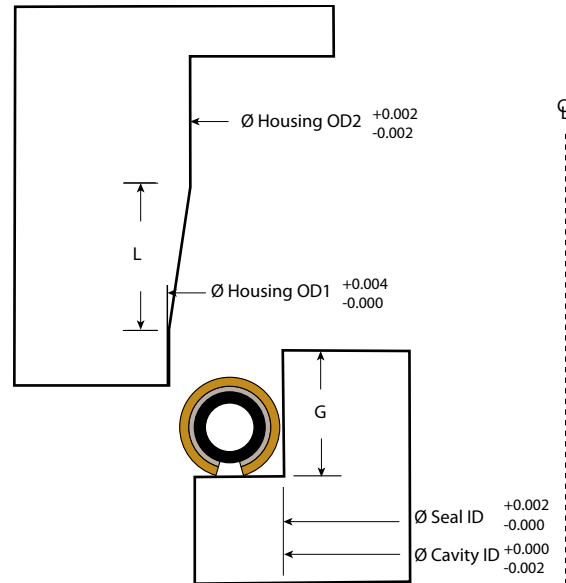
**Bubble Sealing:** These Helicoflex seals are designed with a target air leak rate not to exceed  $1 \times 10^{-4}$  cc/sec.atm under a  $\Delta P$  of 1 atmosphere.



#### Axial Pressure



**Internal Compression**



**External Compression**

#### Seal Configuration = HN110 or HN210

Aluminum			Silver			Copper			Nickel		
Cross Section CS	$e_3$	Ya lbs/in	Cross Section CS	$e_3$	Ya lbs/in	Cross Section CS	$e_3$	Ya lbs/in	Cross Section CS	$e_3$	Ya lbs/in
0.063	0.012	109	0.063	0.010	170	0.067	0.008	217	0.063	0.008	228
0.102	0.014	137	0.102	0.012	195	0.092	0.010	251	0.102	0.010	308
0.118	0.016	154	0.122	0.014	206	0.128	0.012	286	0.126	0.012	343
0.157	0.020	183	0.165	0.018	228	0.171	0.016	332	0.165	0.016	434
0.200	0.020	206	0.205	0.018	263	0.210	0.016	377	0.205	0.016	525
0.260	0.024	235	0.244	0.020	308	0.250	0.018	457	0.252	0.018	640

#### Dimensions in inches

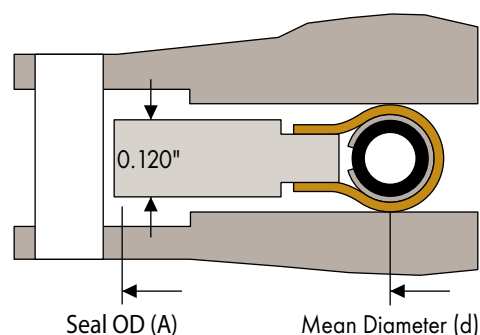
CALCULATIONS	Internal Compression	External Compression
	$G \text{ min} = CS + e_3 + 0.008$	Seal OD = Cavity OD
$L \text{ min} = 10 \times e_3$	Seal ID = Seal OD - 2 CS	Seal OD = Seal ID + 2 CS
Cavity Finish: $\leq 32\text{RMS}$	Shaft OD1 $\leq$ Seal ID	Housing OD1 $\geq$ Seal OD
Ya = Axial Seating Load	Shaft OD2 = Seal ID + $2e_3$	Housing OD2 = SealOD - $2e_3$

### ANSI B16.5 Raised Face Flange

The Helicoflex® HN208 is ideally suited for standard raised face flanges. The resilient nature of the seal allows it to compensate for the extremes of high temperature and pressure where traditional spiral wounds and double jacketed seals fail. The jacket and spring combination can be modified to meet most requirements of temperature and pressure. In addition, a large selection of jacket materials ensures chemical compatibility in corrosive and caustic media.

### Seal Type HN208

Jacket	Availability	Cross Section (inches)	Seating Load (lbs/in)*	Recommended Flange Finish (RMS)
Aluminum	Standard	0.160	1150	63 - 125
Silver	Standard	0.160	1725	63 - 125
Copper	Standard	0.155	2250	63 - 125
Soft Iron	Optional	0.155	2250	32 - 63
Nickel	Standard	0.150	2800	32 - 63
Monel	Optional	0.150	2800	32 - 63
Hastelloy C	Optional	0.150	3800	32 - 63
Stainless Steel	Standard	0.150	3800	32 - 63
Alloy 600	Optional	0.150	3800	32 - 63
Alloy X750	Optional	0.150	4000	32 - 63
Titanium	Optional	0.150	4000	32 - 63



#### Dimensions in inches

\*NOTE: Seating load only! Does not allow for hydrostatic end force.

SEAL DIMENSIONS								
Nominal Diameter	Mean Diameter (d)	Seal OD (A)						
		150lb	300lb	400lb	600lb	900lb	1500lb	2500lb
1/2	0.827	1.874	2.126	2.126	2.126	2.500	2.500	2.752
3/4	1.102	2.252	2.626	2.626	2.626	2.752	2.752	3.000
1	1.417	2.626	2.874	2.874	2.874	3.122	3.122	3.374
1-1/4	1.890	3.000	3.252	3.252	3.252	3.500	3.500	4.126
1-1/2	2.283	3.374	3.752	3.752	3.752	3.874	3.874	4.626
2	2.913	4.126	4.374	4.374	4.374	5.626	5.626	5.752
2-1/2	3.425	4.874	5.126	5.126	5.126	6.500	6.500	6.626
3	4.173	5.374	5.874	5.874	5.874	6.626	6.874	7.752
3-1/2	4.685	6.374	6.500	6.500	6.374	N/A	N/A	N/A
4	5.256	6.874	7.126	7.000	7.626	8.126	8.252	9.252
5	6.378	7.752	8.500	8.374	9.500	9.752	10.000	11.000
6	7.500	8.752	9.874	9.752	10.500	11.413	11.126	12.500
8	9.567	10.996	12.126	12.000	12.626	14.126	13.874	15.252
10	11.693	13.374	14.252	14.126	15.752	17.126	17.126	18.760
12	13.858	16.126	16.626	16.500	18.000	19.626	20.500	21.626
14	15.098	17.752	19.126	19.000	19.374	20.500	22.752	N/A
16	17.205	20.252	21.252	21.126	22.252	22.626	25.252	N/A
18	19.567	21.626	23.500	23.374	24.126	25.126	27.752	N/A
20	21.575	23.874	25.752	25.500	26.874	27.500	29.752	N/A
24	25.728	28.252	30.500	30.252	31.126	32.996	35.500	N/A

#### Dimensions in inches

NOTE: Contact Applications Engineering for other available sizes and materials

#### Calculations According to Codes

	A.S.M.E. Section VIII Division I	Garlock Helicoflex
Operating load	$W_{m2} = \pi \cdot b \cdot G \cdot y$	$F_j = \pi \cdot D_j \cdot Y_2$
Hydrostatic force	$H = \pi \cdot \frac{G^2}{4} \cdot P$	$F_F = \pi \cdot \frac{(D_j)^2}{4} \cdot P$
Minimum service load	$H_p = 2 \cdot b \cdot \pi \cdot G \cdot m \cdot P$	$F_m = \pi \cdot D_j \cdot Y_m$ $Y_m = Y_{m1} = Y_1$ $Y_{m2} = Y_2 \cdot \frac{P}{P_u \Theta}$ Use the greater of the two
Minimum tightening load to apply on bolts	$W = (1) W_{m2}$ $W = (2) H + H_p = W_{m1}$ Use the greater of the two (1) or (2)	$F_B = (1) F_j$ $F_B = (2) F_F + F_m = F_s$ Use the greater of the two (1) or (2)

#### Equivalent Symbols

	A.S.M.E. Section VIII Division I
Operating load	$W_{m2} = F_j$ $b = 1$ $G = D_j$ $Y = Y_2$ $\downarrow$ $W_{m2} = \pi \cdot D_j \cdot Y_2$
Hydrostatic force	$H = F_F$ $G = D_j$ $\downarrow$ $H = \pi \cdot \frac{(D_j)^2}{4} \cdot P$
Minimum service load	$H_p = F_m$ $b = 1$ $G = D_j$ $2 \cdot m \cdot P = Y_m$ $m = \frac{Y_m}{2 \cdot P}$ $\downarrow$ $H_p = \pi \cdot D_j \cdot Y_m$
Minimum bolt load	$W = F_B$ $W = (1) F_j$ $W = (2) F_F + F_m = F_s$ Use the greater of the two (1) or (2)

Note: Due to its circular section, the Helicoflex seal exhibits a "line" load instead of an "area load" typical of traditional gaskets. As a result, "m", "b" and "y" factors are not pertinent when applied to the Helicoflex seal. These equivalent equations were developed to assist flange designers with their calculations.

The technical data contained herein is by way of example and should not be relied on for any specific application. Garlock Helicoflex will be pleased to provide specific technical data or specifications with respect to any customer's particular applications. Use of the technical data or specifications contained herein without the express written approval of Garlock Helicoflex is at user's risk and Garlock Helicoflex expressly disclaims responsibility for such use and the situations which may result therefrom.

Garlock Helicoflex makes no warranty, express or implied, that utilization of the technology or products disclosed herein will not infringe any industrial or intellectual property rights of third parties.

Garlock Helicoflex is constantly involved in engineering and development. Accordingly, Garlock Helicoflex reserves the right to modify, at any time, the technology and product specifications contained herein.

All technical data, specifications and other information contained herein is deemed to be the proprietary intellectual property of Garlock Helicoflex. No reproduction, copy or use thereof may be made without the express written consent of Garlock Helicoflex.

---

**Garlock Helicoflex<sup>®</sup>**  
P E R F O R M A N C E   M E T A L   S E A L S

an EnPro Industries company