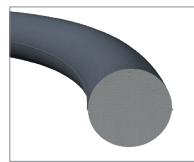


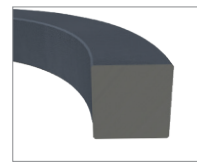
Materials	Temp. Range	
Nitrile (NBR)	-40°C	to 120°C
Low Temp. Nitrile (LTN)	-54°C	to 116°C
Hydrogenated Nitrile (HNBR)	-40°C	to 160°C
Viton™/Fluorocarbon (FKM)	-26°C	to 204°C
Polytetrafluoroethylene (PTFE)	-260°C	to 260°C
Aflas® (FEPM)	-9°C	to 232°C
Chloroprene (CR)	-40°C	to 121°C
Ethylene Propylene (EPDM)	-54°C	to 150°C
Perfluoroelastomer (FFKM)	-32°C	to 350°C
Silicone (VMQ)	-65°C	to 232°C
Fluorosilicone (FVMQ)	-56°C	to 204°C



Material information is not intended for design purposes. Please consult us when designing applications.



O-Ring



Square Cut Ring

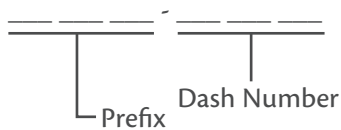


Quad Ring

Product Description

The O-ring is the most widely used seal in history due to its simplicity, low cost, ease of installation, and small space requirements. O-rings are designed for both static and dynamic applications. A properly designed O-ring groove allows the O-ring to be squeezed diametrically out-of-round even before the application of pressure. The O-ring seals by distortion of its resilient elastic compound to fill the leakage path. Quad rings have the same diameters and cross sections as an O-ring, only the profile is different. Square cut rings have the same ID as an O-ring, but have different cross sections. See page 4 for actual square cut ring cross sections.

Part Numbers:



O-Rings

- N70 - NBR
- N90 - NBR
- LTN - Low Temp. NBR
- HS7 - HNBR
- HS8 - HNBR
- HS9 - HNBR
- V75 - Viton™ FKM
- V90 - Viton™ FKM
- LTV - Low Temp. Viton™ FKM

O-Rings

- FK7 - FKM
- FK9 - FKM
- T - PTFE
- A80 - Aflas® FEPM
- NEO - CR
- E70 - EPDM
- E80 - EPDM
- PF7 - FFKM
- PF9 - FFKM

O-Rings

- KAL - Kalrez® FFKM
- S70 - VMQ
- FS7 - FVMQ
- U90 - PU

Square Cut Rings

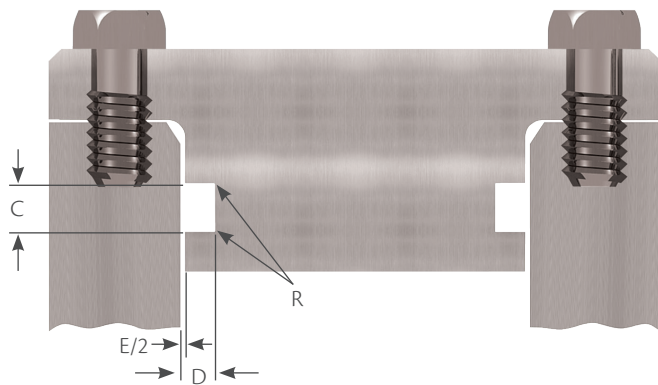
- TS7 - NBR
- TS9 - NBR

Quad Rings

- QN7 - NBR
- QN9 - NBR
- QV7 - Viton™ FKM
- QE7 - EPDM

Example: HS8 224 - HNBR, 80 Durometer, 1 - 3/4" Nominal ID, 1/8" Nominal C/S

Static Radial Applications

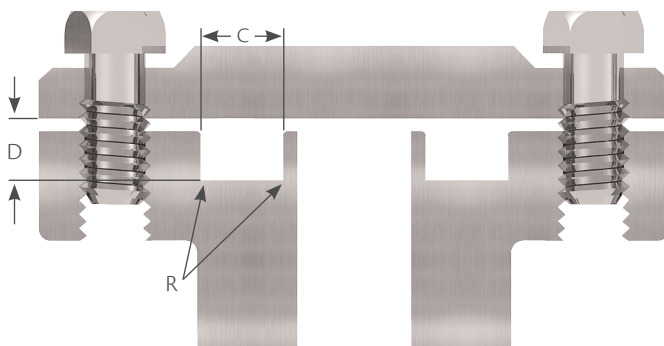


Information is based on ISO 3601

* Pneumatic applications typically do not use a Back-up ring

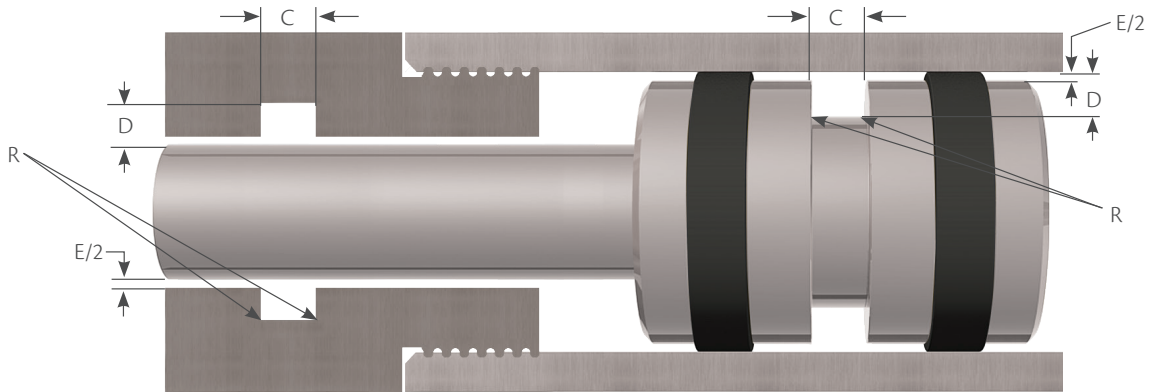
O-Ring C/S	D		E	C			R
	Groove Depth	Squeeze		Groove Width +0.010/-0.000			
		Inches	%	No Back-Up Ring	One Back-Up Ring	Two Back-Up Rings	Groove Radius
0.070	0.049 - 0.057	0.010 - 0.025	14 - 35	0.110	0.165	0.220	0.008 - 0.016
0.103	0.075 - 0.087	0.013 - 0.031	13 - 30	0.150	0.205	0.260	0.008 - 0.016
0.139	0.101 - 0.117	0.018 - 0.042	13 - 30	0.197	0.252	0.307	0.016 - 0.031
0.210	0.156 - 0.180	0.025 - 0.059	12 - 28	0.283	0.354	0.429	0.016 - 0.031
0.275	0.212 - 0.242	0.028 - 0.069	10 - 25	0.374	0.484	0.594	0.031 - 0.047

Static Axial (Face) Applications



Information is based on ISO 3601

O-Ring C/S	D		C	R
	Groove Depth +0.004/-0.000	Squeeze %		
			Hydraulic	Pneumatic
0.070	0.051	21 - 36	0.126	0.114
0.103	0.079	19 - 30	0.157	0.142
0.139	0.106	17 - 26	0.209	0.189
0.210	0.165	15 - 23	0.299	0.276
0.275	0.224	13 - 20	0.354	0.335



Information is based on ISO 3601

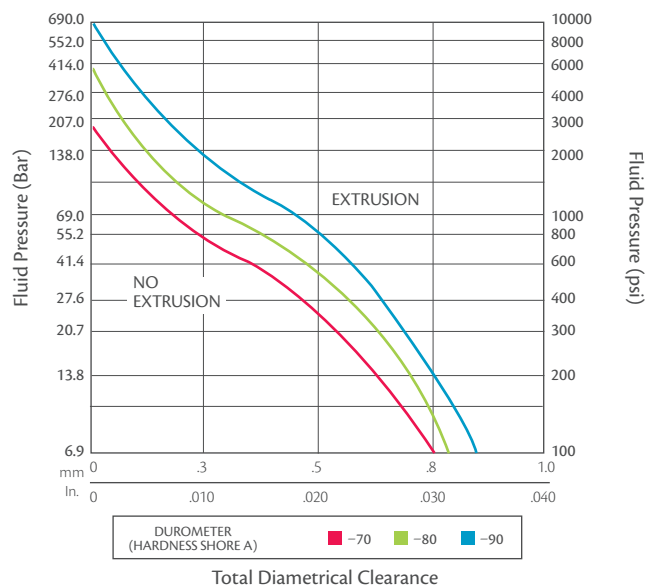
* Pneumatic applications typically do not use a Back-up ring.

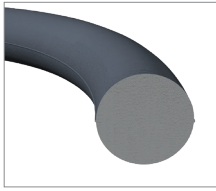
O-Ring C/S	D		Squeeze				E	C			R	
	Groove depth		Hydraulic		Pneumatic			Diametrical Clearance Max.	Groove Width +0.010/-0.000			
	Hydraulic	Pneumatic	Inches	%	Inches	%			No Back- Up Ring	One Back- Up Ring		Two Back- Up Rings
0.070	0.054 - 0.058	0.056 - 0.060	0.009 - 0.019	13 - 27	0.007 - 0.017	10 - 24	0.004	0.110	0.165	0.220	0.008 - 0.016	
0.103	0.081 - 0.088	0.083 - 0.092	0.012 - 0.025	12 - 24	0.008 - 0.023	8 - 22	0.005	0.150	0.205	0.260	0.008 - 0.016	
0.139	0.112 - 0.120	0.115 - 0.125	0.015 - 0.031	11 - 22	0.010 - 0.028	7 - 20	0.006	0.197	0.252	0.307	0.016 - 0.031	
0.210	0.173 - 0.182	0.177 - 0.190	0.023 - 0.042	11 - 20	0.015 - 0.038	7 - 18	0.006	0.283	0.354	0.429	0.016 - 0.031	
0.275	0.229 - 0.244	0.234 - 0.253	0.025 - 0.052	9 - 19	0.017 - 0.047	6 - 17	0.007	0.374	0.484	0.594	0.031 - 0.047	

Limits for Extrusion

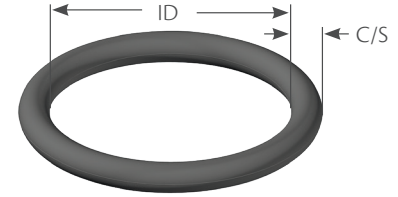
There are different methods to counter O-ring extrusion. One of these methods is to simply increase the durometer rating of the O-ring. However, as the durometer is increased, the O-ring can become less malleable. Another option would be to use back-up rings (see page 12 for back-up rings). These are thin rings made of hard plastic materials such as PTFE, nylon (PA), and KasPex™ PEEK. Once in place these rings will provide essentially zero clearance.

Reduce the clearance shown by 60% when using VMQ or FVMQ elastomers.





Square Cut Rings	Actual C/S
000 Series	0.066
100 Series	0.099
200 Series	0.134
300 Series	0.203
400 Series	0.266



Dash #	Nominal			Actual Sizing			
	ID	OD	C/S	ID	C/S		
001	1/32	3/32	1/32	0.029	± 0.004	0.040	± 0.003
002	3/64	9/64	3/64	0.042	± 0.004	0.050	± 0.003
003	1/16	3/16	1/16	0.056	± 0.004	0.060	± 0.003
004	5/64	13/64	1/16	0.070	± 0.005	0.070	± 0.003
005	3/32	7/32	1/16	0.101	± 0.005	0.070	± 0.003
006	1/8	1/4	1/16	0.114	± 0.005	0.070	± 0.003
007	5/32	9/32	1/16	0.145	± 0.005	0.070	± 0.003
008	3/16	5/16	1/16	0.176	± 0.005	0.070	± 0.003
009	7/32	11/32	1/16	0.208	± 0.005	0.070	± 0.003
010	1/4	3/8	1/16	0.239	± 0.005	0.070	± 0.003
011	5/16	7/16	1/16	0.301	± 0.005	0.070	± 0.003
012	3/8	1/2	1/16	0.364	± 0.005	0.070	± 0.003
013	7/16	9/16	1/16	0.426	± 0.005	0.070	± 0.003
014	1/2	5/8	1/16	0.489	± 0.005	0.070	± 0.003
015	9/16	11/16	1/16	0.551	± 0.007	0.070	± 0.003
016	5/8	3/4	1/16	0.614	± 0.009	0.070	± 0.003
017	11/16	13/16	1/16	0.676	± 0.009	0.070	± 0.003
018	3/4	7/8	1/16	0.739	± 0.009	0.070	± 0.003
019	13/16	15/16	1/16	0.801	± 0.009	0.070	± 0.003
020	7/8	1	1/16	0.864	± 0.009	0.070	± 0.003
021	15/16	1 - 1/16	1/16	0.926	± 0.009	0.070	± 0.003
022	1	1 - 1/8	1/16	0.989	± 0.010	0.070	± 0.003
023	1 - 1/16	1 - 3/16	1/16	1.051	± 0.010	0.070	± 0.003
024	1 - 1/8	1 - 1/4	1/16	1.114	± 0.010	0.070	± 0.003
025	1 - 3/16	1 - 5/16	1/16	1.176	± 0.011	0.070	± 0.003
026	1 - 1/4	1 - 3/8	1/16	1.239	± 0.011	0.070	± 0.003
027	1 - 5/16	1 - 7/16	1/16	1.301	± 0.011	0.070	± 0.003
028	1 - 3/8	1 - 1/2	1/16	1.364	± 0.013	0.070	± 0.003
029	1 - 1/2	1 - 5/8	1/16	1.489	± 0.013	0.070	± 0.003
030	1 - 5/8	1 - 3/4	1/16	1.614	± 0.013	0.070	± 0.003
031	1 - 3/4	1 - 7/8	1/16	1.739	± 0.015	0.070	± 0.003
032	1 - 7/8	2	1/16	1.864	± 0.015	0.070	± 0.003
033	2	2 - 1/8	1/16	1.989	± 0.018	0.070	± 0.003
034	2 - 1/8	2 - 1/4	1/16	2.114	± 0.018	0.070	± 0.003
035	2 - 1/4	2 - 3/8	1/16	2.239	± 0.018	0.070	± 0.003
036	2 - 3/8	2 - 1/2	1/16	2.364	± 0.018	0.070	± 0.003
037	2 - 1/2	2 - 5/8	1/16	2.489	± 0.018	0.070	± 0.003
038	2 - 5/8	2 - 3/4	1/16	2.614	± 0.020	0.070	± 0.003
039	2 - 3/4	2 - 7/8	1/16	2.739	± 0.020	0.070	± 0.003
040	2 - 7/8	3	1/16	2.864	± 0.020	0.070	± 0.003
041	3	3 - 1/8	1/16	2.989	± 0.024	0.070	± 0.003
042	3 - 1/4	3 - 3/8	1/16	3.239	± 0.024	0.070	± 0.003
043	3 - 1/2	3 - 5/8	1/16	3.489	± 0.024	0.070	± 0.003

Dash #	Nominal			Actual Sizing			
	ID	OD	C/S	ID	C/S		
044	3 - 3/4	3 - 7/8	1/16	3.739	± 0.027	0.070	± 0.003
045	4	4 - 1/8	1/16	3.989	± 0.027	0.070	± 0.003
046	4 - 1/4	4 - 3/8	1/16	4.239	± 0.030	0.070	± 0.003
047	4 - 1/2	4 - 5/8	1/16	4.489	± 0.030	0.070	± 0.003
048	4 - 3/4	4 - 7/8	1/16	4.739	± 0.030	0.070	± 0.003
049	5	5 - 1/8	1/16	4.989	± 0.037	0.070	± 0.003
050	5 - 1/4	5 - 3/8	1/16	5.239	± 0.037	0.070	± 0.003
102	1/16	1/4	3/32	0.049	± 0.005	0.103	± 0.003
103	3/32	9/32	3/32	0.081	± 0.005	0.103	± 0.003
104	1/8	5/16	3/32	0.112	± 0.005	0.103	± 0.003
105	5/32	11/32	3/32	0.143	± 0.005	0.103	± 0.003
106	3/16	3/8	3/32	0.174	± 0.005	0.103	± 0.003
107	7/32	13/32	3/32	0.206	± 0.005	0.103	± 0.003
108	1/4	7/16	3/32	0.237	± 0.005	0.103	± 0.003
109	5/16	1/2	3/32	0.299	± 0.005	0.103	± 0.003
110	3/8	9/16	3/32	0.362	± 0.005	0.103	± 0.003
111	7/16	5/8	3/32	0.424	± 0.005	0.103	± 0.003
112	1/2	11/16	3/32	0.487	± 0.005	0.103	± 0.003
113	9/16	3/4	3/32	0.549	± 0.007	0.103	± 0.003
114	5/8	13/16	3/32	0.612	± 0.009	0.103	± 0.003
115	11/16	7/8	3/32	0.674	± 0.009	0.103	± 0.003
116	3/4	15/16	3/32	0.737	± 0.009	0.103	± 0.003
117	13/16	1	3/32	0.799	± 0.010	0.103	± 0.003
118	7/8	1 - 1/16	3/32	0.862	± 0.010	0.103	± 0.003
119	15/16	1 - 1/8	3/32	0.924	± 0.010	0.103	± 0.003
120	1	1 - 3/16	3/32	0.987	± 0.010	0.103	± 0.003
121	1 - 1/16	1 - 1/4	3/32	1.049	± 0.010	0.103	± 0.003
122	1 - 1/8	1 - 5/16	3/32	1.112	± 0.010	0.103	± 0.003
123	1 - 3/16	1 - 3/8	3/32	1.174	± 0.012	0.103	± 0.003
124	1 - 1/4	1 - 7/16	3/32	1.237	± 0.012	0.103	± 0.003
125	1 - 5/16	1 - 1/2	3/32	1.299	± 0.012	0.103	± 0.003
126	1 - 3/8	1 - 9/16	3/32	1.362	± 0.012	0.103	± 0.003
127	1 - 7/16	1 - 5/8	3/32	1.424	± 0.012	0.103	± 0.003
128	1 - 1/2	1 - 11/16	3/32	1.487	± 0.012	0.103	± 0.003
129	1 - 9/16	1 - 3/4	3/32	1.549	± 0.015	0.103	± 0.003
130	1 - 5/8	1 - 13/16	3/32	1.612	± 0.015	0.103	± 0.003
131	1 - 11/16	1 - 7/8	3/32	1.674	± 0.015	0.103	± 0.003
132	1 - 3/4	1 - 15/16	3/32	1.737	± 0.015	0.103	± 0.003
133	1 - 13/16	2	3/32	1.799	± 0.015	0.103	± 0.003
134	1 - 7/8	2 - 1/16	3/32	1.862	± 0.015	0.103	± 0.003
135	1 - 15/16	2 - 1/8	3/32	1.925	± 0.017	0.103	± 0.003
136	2	2 - 3/16	3/32	1.987	± 0.017	0.103	± 0.003

Dash #	Nominal			Actual Sizing			
	ID	OD	C/S	ID	C/S	ID	C/S
381	12	12 - 3/8	3/16	11.975	± 0.065	0.210	± 0.005
382	13	13 - 3/8	3/16	12.975	± 0.065	0.210	± 0.005
383	14	14 - 3/8	3/16	13.975	± 0.070	0.210	± 0.005
384	15	15 - 3/8	3/16	14.975	± 0.070	0.210	± 0.005
385	16	16 - 3/8	3/16	15.955	± 0.075	0.210	± 0.005
386	17	17 - 3/8	3/16	16.955	± 0.080	0.210	± 0.005
387	18	18 - 3/8	3/16	17.955	± 0.085	0.210	± 0.005
388	19	19 - 3/8	3/16	18.952	± 0.090	0.210	± 0.005
389	20	20 - 3/8	3/16	19.952	± 0.095	0.210	± 0.005
390	21	21 - 3/8	3/16	20.952	± 0.095	0.210	± 0.005
391	22	22 - 3/8	3/16	21.952	± 0.100	0.210	± 0.005
392	23	23 - 3/8	3/16	22.940	± 0.105	0.210	± 0.005
393	24	24 - 3/8	3/16	23.940	± 0.110	0.210	± 0.005
394	25	25 - 3/8	3/16	24.940	± 0.115	0.210	± 0.005
395	26	26 - 3/8	3/16	25.940	± 0.120	0.210	± 0.005
425	4 - 1/2	5	1/4	4.475	± 0.033	0.275	± 0.006
426	4 - 5/8	5 - 1/8	1/4	4.600	± 0.033	0.275	± 0.006
427	4 - 3/4	5 - 1/4	1/4	4.725	± 0.033	0.275	± 0.006
428	4 - 7/8	5 - 3/8	1/4	4.850	± 0.033	0.275	± 0.006
429	5	5 - 1/2	1/4	4.975	± 0.037	0.275	± 0.006
430	5 - 1/8	5 - 5/8	1/4	5.100	± 0.037	0.275	± 0.006
431	5 - 1/4	5 - 3/4	1/4	5.225	± 0.037	0.275	± 0.006
432	5 - 3/8	5 - 7/8	1/4	5.350	± 0.037	0.275	± 0.006
433	5 - 1/2	6	1/4	5.475	± 0.037	0.275	± 0.006
434	5 - 5/8	6 - 1/8	1/4	5.600	± 0.037	0.275	± 0.006
435	5 - 3/4	6 - 1/4	1/4	5.725	± 0.037	0.275	± 0.006
436	5 - 7/8	6 - 3/8	1/4	5.850	± 0.037	0.275	± 0.006
437	6	6 - 1/2	1/4	5.975	± 0.037	0.275	± 0.006
438	6 - 1/4	6 - 3/4	1/4	6.225	± 0.040	0.275	± 0.006
439	6 - 1/2	7	1/4	6.475	± 0.040	0.275	± 0.006
440	6 - 3/4	7 - 1/4	1/4	6.725	± 0.040	0.275	± 0.006
441	7	7 - 1/2	1/4	6.975	± 0.040	0.275	± 0.006
442	7 - 1/4	7 - 3/4	1/4	7.225	± 0.045	0.275	± 0.006
443	7 - 1/2	8	1/4	7.475	± 0.045	0.275	± 0.006
444	7 - 3/4	8 - 1/4	1/4	7.725	± 0.045	0.275	± 0.006
445	8	8 - 1/2	1/4	7.975	± 0.045	0.275	± 0.006
446	8 - 1/2	9	1/4	8.475	± 0.055	0.275	± 0.006
447	9	9 - 1/2	1/4	8.975	± 0.055	0.275	± 0.006
448	9 - 1/2	10	1/4	9.475	± 0.055	0.275	± 0.006
449	10	10 - 1/2	1/4	9.975	± 0.055	0.275	± 0.006
450	10 - 1/2	11	1/4	10.475	± 0.060	0.275	± 0.006
451	11	11 - 1/2	1/4	10.975	± 0.060	0.275	± 0.006
452	11 - 1/2	12	1/4	11.475	± 0.060	0.275	± 0.006
453	12	12 - 1/2	1/4	11.975	± 0.060	0.275	± 0.006
454	12 - 1/2	13	1/4	12.475	± 0.060	0.275	± 0.006
455	13	13 - 1/2	1/4	12.975	± 0.060	0.275	± 0.006
456	13 - 1/2	14	1/4	13.475	± 0.070	0.275	± 0.006
457	14	14 - 1/2	1/4	13.975	± 0.070	0.275	± 0.006
458	14 - 1/2	15	1/4	14.475	± 0.070	0.275	± 0.006

Dash #	Nominal			Actual Sizing			
	ID	OD	C/S	ID	C/S	ID	C/S
459	15	15 - 1/2	1/4	14.975	± 0.070	0.275	± 0.006
460	15 - 1/2	16	1/4	15.475	± 0.070	0.275	± 0.006
461	16	16 - 1/2	1/4	15.955	± 0.075	0.275	± 0.006
462	16 - 1/2	17	1/4	16.455	± 0.075	0.275	± 0.006
463	17	17 - 1/2	1/4	16.955	± 0.080	0.275	± 0.006
464	17 - 1/2	18	1/4	17.455	± 0.085	0.275	± 0.006
465	18	18 - 1/2	1/4	17.955	± 0.085	0.275	± 0.006
466	18 - 1/2	19	1/4	18.455	± 0.085	0.275	± 0.006
467	19	19 - 1/2	1/4	18.955	± 0.090	0.275	± 0.006
468	19 - 1/2	20	1/4	19.455	± 0.090	0.275	± 0.006
469	20	20 - 1/2	1/4	19.955	± 0.095	0.275	± 0.006
470	21	21 - 1/2	1/4	20.955	± 0.095	0.275	± 0.006
471	22	22 - 1/2	1/4	21.955	± 0.100	0.275	± 0.006
472	23	23 - 1/2	1/4	22.940	± 0.105	0.275	± 0.006
473	24	24 - 1/2	1/4	23.940	± 0.110	0.275	± 0.006
474	25	25 - 1/2	1/4	24.940	± 0.115	0.275	± 0.006
475	26	26 - 1/2	1/4	25.940	± 0.120	0.275	± 0.006

We offer O-rings in sizes ranging from 400-424. These O-ring size dimensions and tolerances are unassigned under ISO 3601. In addition, we stock specific non-standard cross-section O-rings such as 3/8", 1/2" and 3/4".

O-Rings for Tube Fitting Bosses

Dash #	Tube Size OD Inch	Hydraulic MIL-P-5570 MS28778	O-ring Size (Actual)			
			ID	CS	ID	CS
901	3/32		0.185 ± 0.005	0.056 ± 0.003		
902	1/8	2	0.239 ± 0.005	0.064 ± 0.003		
903	3/16	3	0.301 ± 0.005	0.064 ± 0.003		
904	1/4	4	0.351 ± 0.005	0.072 ± 0.003		
905	5/16	5	0.414 ± 0.005	0.072 ± 0.003		
906	3/8	6	0.468 ± 0.005	0.078 ± 0.003		
907	7/16		0.530 ± 0.005	0.082 ± 0.003		
908	1/2	8	0.644 ± 0.009	0.087 ± 0.003		
909	9/16		0.706 ± 0.009	0.097 ± 0.003		
910	5/8	10	0.755 ± 0.009	0.097 ± 0.003		
911	11/16		0.863 ± 0.009	0.116 ± 0.004		
912	3/4	12	0.924 ± 0.009	0.116 ± 0.004		
913	13/16		0.986 ± 0.010	0.116 ± 0.004		
914	7/8	14	1.048 ± 0.010	0.116 ± 0.004		
916	1	16	1.171 ± 0.010	0.116 ± 0.004		
918	1-1/8		1.355 ± 0.012	0.116 ± 0.004		
920	1-1/4	20	1.475 ± 0.014	0.118 ± 0.004		
924	1-1/2	24	1.720 ± 0.014	0.118 ± 0.004		
928	1-3/4	28	2.090 ± 0.018	0.118 ± 0.004		
932	2	32	2.337 ± 0.018	0.118 ± 0.004		