



**A**dvanced  
**C**oncepts in Sealing  
**E**ngineering



## O-Ring Size & Design Reference Guide



**Ace Seal** has more than 20 years experience in manufacturing rubber products such as o-rings, gaskets, & custom molded rubber components. With fully-equipped facilities worldwide, Ace Seal offers quality products at competitive prices.



## Ace Seal Products

### Sheet Material

Black Rubber Sponge Cord (Open Cell)  
Black Rubber Sponge Cord (Closed Cell)  
Buna-N 50, 60, 70, 90 Durometer  
Buna-N (White) 50-65 Durometer  
Buna-N Sponge (Closed Cell)  
Buna-N Nylon Inserted  
Butyl  
Chipboard  
Compressed Non Asbestos  
Cord  
Cork & Buna-N  
Cork & Neoprene  
Cork & Synthetic Rubber Adhesive Backed  
EPDM  
Felt  
Fiber-Cork  
Filled PTFE  
Fish Paper  
Flexible Graphite  
Gum Rubber  
Hypalon  
Neoprene 40, 60 & 70 Durometer  
Nylon  
Plant (Vegetable) Fiber  
Red Rubber  
Silicone 50 & 70 Durometer  
Silicone Sponge  
Viton

### O-Rings (Standard & Metric)

Buna-N  
Back-up Rings (Buna-N 90 Durometer & PTFE)  
Viton (Black & Brown)  
Neoprene 70 & 90 Durometer  
Silicone  
EPDM  
PTFE  
Quad/X-Rings  
Urethane 70 & 90 Durometer  
Aflas 80 Durometer  
Internally Lubed  
PTFE Encapsulated Silicone & Viton  
Perfluoroelastomers (Kalrez, Chemraz, Simriz)  
Military Specifications  
JIS (Japanese Industrial Standard)

### O-Ring Kits

Aflas 80 Durometer  
Buna-N  
Buna-N Back-up Rings  
Viton (Black & Brown)  
Neoprene 70 Durometer  
Silicone  
EPDM  
PTFE  
Quad/X-Rings  
Metric Splicing

Accessories

Measuring Cones & Tapes  
Lubricants  
O-Ring Extrusion Picks

Gaskets

Laser Cut  
Water-Jet  
Die-Cut

O-Ring Cord (Square, Inch, & Metric)

Aflas 80 Durometer  
Buna-N  
Viton (Black & Brown)  
Neoprene 70 Durometer  
Silicone  
EPDM  
Neoprene Closed Cell Sponge  
Quad/X-Ring Cord

Fabrication

Gaskets (Custom Made)  
O-Rings  
Strips  
Sleeves

Custom Molded Rubber & Plastic

Made to your specifications in various materials

O-Rings - Special Sizes w/ a Vulcanized Joint

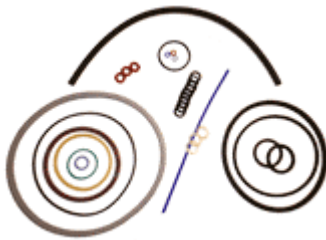
Made to your specifications in  
Inches & Metric

Metal Components

Stamping Metal  
Forming  
Wire EDM Components

Extrusions

EPDM  
Neoprene  
Silicone  
Viton  
PTFE  
Nitrile



## Standard Size O-Ring Chart

### 1/16" Cross-Section (w), actual .070"

No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."
-001*	1/32	0.029	3/32	-018	3/4	0.739	7/8	-035	2-1/4	2.239	2-3/8
-002*	3/64	0.042	9/64	-019	13/16	0.801	15/16	-036	2-3/8	2.364	2-1/2
-003*	1/16	0.056	13/64	-020	7/8	0.864	1	-037	2-1/2	2.489	2-5/8
-004	5/64	0.070	13/64	-021	15/16	0.925	1-1/16	-038	2-5/8	2.614	2-3/4
-005	3/32	0.101	7/32	-022	1	0.989	1-1/8	-039	2-3/4	2.739	2-7/8
-006	1/8	0.114	1/4	-023	1-1/16	1.051	1-3/16	-040	2-7/8	2.864	3
-007	5/32	0.145	9/32	-024	1-1/8	1.114	1-1/4	-041	3	2.989	3-1/8
-008	3/16	0.176	5/16	-025	1-3/16	1.176	1-5/16	-042	3-1/4	3.239	3-3/8
-009	7/32	0.208	11/32	-026	1-1/4	1.239	1-3/8	-043	3-1/2	3.489	3-5/8
-010	1/4	0.239	3/8	-027	1-5/16	1.301	1-7/16	-044	3-3/4	3.739	3-7/8
-011	5/16	0.301	7/16	-028	1-3/8	1.364	1-1/2	-045	4	3.989	4-1/8
-012	3/8	0.364	1/2	-029	1-1/2	1.489	1-5/8	-046	4-1/4	4.239	4-3/8
-013	7/16	0.426	9/16	-030	1-5/8	1.614	1-3/4	-047	4-1/2	4.489	4-5/8
-014	1/2	0.489	5/8	-031	1-3/4	1.739	1-7/8	-048	4-3/4	4.739	4-7/8
-015	9/16	0.551	11/16	-032	1-7/8	1.864	2	-049	5	4.989	5-1/8
-016	5/8	0.614	3/4	-033	2	1.989	2-1/8	-050	5-1/4	5.239	4-3/8
-017	11/16	0.676	13/16	-034	2-1/8	2.114	2-1/4				

\* Note - actual cross-section of -001 is 0.040"; -002 is 0.050"; -003 is 0-060"

### 3/32" Cross-Section (w), actual .103"

No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."
-102	1/16	0.049	1/4	-127	1-7/16	1.424	1-5/8	-153	3-1/2	3.487	3-11/16
-103	3/32	0.081	9/32	-128	1-1/2	1.487	1-11/16	-154	3-3/4	3.737	3-15/16
-104	1/8	0.112	5/16	-129	1-9/16	1.549	1-3/4	-155	4	3.987	4-3/16
-105	5/32	0.143	11/32	-130	1-5/8	1.612	1-13/16	-156	4-1/4	4.237	4-7/16
-106	3/16	0.174	3/8	-131	1-11/16	1.674	1-7/8	-157	4-1/2	4.487	4-11/16
-107	7/32	0.206	13/32	-132	1-3/4	1.737	1-15/16	-158	4-3/4	4.737	4-15/16
-108	1/4	0.237	7/16	-133	1-13/16	1.799	2	-159	5	4.987	5-3/16
-109	5/16	0.299	1/2	-134	1-7/8	1.862	2-1/16	-160	5-1/4	5.237	5-7/16
-110	3/8	0.362	9/16	-135	1-15/16	1.925	2-1/8	-161	5-1/2	5.487	5-11/16
-111	7/16	0.424	5/8	-136	2	1.987	2-3/16	-162	5-3/4	5.737	5-15/16
-112	1/2	0.487	11/16	-137	2-1/16	2.050	2-1/4	-163	6	5.987	6-3/16
-113	9/16	0.549	3/4	-138	2-1/8	2.112	2-5/16	-164	6-1/4	6.237	6-7-16
-114	5/8	0.612	13/16	-139	2-3/16	2.175	2-3/8	-165	6-1/2	6.487	6-11/16
-115	11/16	0.674	7/8	-140	2-1/4	2.237	2-7/16	-166	6-3/4	6.737	6-15/16
-116	3/4	0.737	15/16	-141	2-5/16	2.300	2-1/2	-167	7	6.987	7-3/16
-117	13/16	0.799	1	-142	2-3/8	2.362	2-9/16	-168	7-1/4	7.237	7-7/16
-118	7/8	0.862	1-1/16	-143	2-7/16	2.425	2-5/8	-169	7-1/2	7.487	7-11/16
-119	15/16	0.924	1-18	-144	2-1/2	2.487	2-11/16	-170	7-3/4	7.737	7-15/16
-120	1	0.987	1-3/16	-145	2-9/16	2.550	2-3/4	-171	8	7.987	8-3/16
-121	1-1/16	1.0349	1-1/4	-146	2-5/8	2.612	2-13/16	-172	8-1/4	8.237	8-7/16
-122	1-1/8	1.112	1-5/16	-147	2-11/16	2.675	2-7/8	-173	8-1/2	8.487	8-11/16
-123	1-3/16	1.174	1-3/8	-148	2-3/4	2.737	2-15/16	-174	8-3/4	8.737	8-15/16
-124	1-1/4	1.237	1-7/16	-149	2-13/16	2.800	3	-175	9	8.987	9-3/16
-125	1-5/16	1.299	1-1/2	-150	2-7/8	2.862	3-1/16	-176	9-1/4	9.237	9-7/16
-126	1-3/8	1.362	1-9/16	-151	3	2.897	3-3/16	-177	9-1/2	9.487	9-11/16
				-152	3-1/4	3.237	3-7/16	-178	9-3/4	9.737	9-15/16

**1/8" Cross-Section (w), actual .139"**

No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."
-201	3/16	0.171	7/16	-229	2-3/8	2.359	2-5/8	-257	5-7/8	5.859	6-1/8
-202	1/4	0.234	1/2	-230	2-1/2	2.484	2-3/4	-258	6	5.984	6-1/4
-203	5/16	.0296	9/16	-231	2-5/8	2.609	2-7/8	-259	6-1/4	6.234	6-1/2
-204	3/8	0.359	5/8	-232	2-3/4	2.734	3	-260	6-1/2	6.484	6-3/4
-205	7/16	0.421	11/16	-233	2-7/8	2.859	3-1/8	-261	6-3/4	6.734	7
-206	1/2	0.484	3/4	-234	3	2.984	3-1/4	-262	7	6.984	7-1/4
-207	9/16	0.546	13/16	-235	3-1/8	3.109	3-3/8	-263	7-1/4	7.234	7-1/2
-208	5/8	0.609	7/8	-236	3-1/4	3.234	3-1/2	-264	7-1/2	7.484	7-3/4
-209	11/16	0.671	15/16	-237	3-3/8	3.359	3-5/8	-265	7-3/4	7.734	8
-210	3/4	0.734	1	-238	3-1/2	3.484	3-3/4	-266	8	7.984	8-1/4
-211	13/16	0.796	1-1/16	-239	3-5/8	3.609	3-7/8	-267	8-1/4	8.234	8-1/2
-212	7/8	0.859	1-1/8	-240	3-3/4	3.734	4	-268	8-1/2	8.484	8-3/4
-213	15/16	0.921	1-3/16	-241	3-7/8	3.859	4-1/8	-269	8-3/4	8.734	9
-214	1	0.984	1-1/4	-242	4	3.984	4-1/4	-270	9	8.984	9-1/4
-215	1-1/16	1.046	1-5/16	-243	4-1/8	4.109	4-3/8	-271	9-1/4	9.234	9-1/2
-216	1-1/8	1.109	1-3/8	-244	4-1/4	4.234	4-1/2	-272	9-1/2	9.484	9-3/4
-217	1-3/16	1.171	1-7/16	-245	4-3/8	4.359	4-5/8	-273	9-3/4	9.734	10
-218	1-1/4	1.234	1-1/2	-246	4-1/2	4.484	4-3/4	-274	10	9.984	10-1/4
-219	1-5/16	1.296	1-9/16	-247	4-5/8	4.609	4-7/8	-275	10-1/2	10.484	10-3/4
-220	1-3/8	1.359	1-5/8	-248	4-3/4	4.734	5	-276	11	10.984	11-1/4
-221	1-7/16	1.421	1-11/16	-249	4-7/8	4.859	5-1/8	-277	11-1/2	11.484	11-3/4
-222	1-1/2	1.484	1-3/4	-250	5	4.984	5-1/4	-278	12	11.984	12-1/4
-223	1-5/8	1.609	1-7/8	-251	5-1/8	5.109	5-3/8	-279	13	12.984	13-1/4
-224	1-3/4	1.734	2	-252	5-1/4	5.234	5-1/2	-280	14	13.984	14-1/4
-225	1-7/8	1.859	2-1/8	-253	5-3/8	5.359	5-5/8	-281	15	14.984	15-1/4
-226	2	1.984	2-1/4	-254	5-1/2	5.484	5-3/4	-282	16	15.955	16-1/4
-227	2-1/8	2.109	2-3/4	-255	5-5/8	5.609	5-7/8	-283	17	16.955	17-1/4
-228	2-1/4	2.234	2-1/2	-256	5-3/4	5.734	6	-284	18	17.955	18-1/4

**3/16" Cross-Section (w), actual .210"**

No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."
-309	7/16	0.412	13/16	-338	3-1/8	3.100	3-1/2	-367	7-1/2	7.475	7-7/8
-310	1/2	0.475	7/8	-339	3-1/4	3.225	3-5/8	-368	7-3/4	7.725	8-1/8
-311	9/16	0.537	15/16	-340	3-3/8	3.350	3-3/4	-369	8	7.975	8-3/8
-312	5/8	0.600	1	-341	3-1/2	3.475	3-7/8	-370	8-1/4	8.225	8-5/8
-313	11/16	0.662	1-1/16	-342	3-5/8	3.600	4	-371	8-1/2	8.475	8-7/8
-314	3/4	0.725	1-1/8	-343	3-3/4	3.725	4-1/8	-372	8-3/4	8.725	9-1/8
-315	13/16	0.787	1-3/16	-344	3-7/8	3.850	4-1/4	-373	9	8.975	9-3/8
-316	7/8	0.850	1-1/4	-345	4	3.975	3-3/8	-374	9-1/4	9.225	9-5/8
-317	15/16	0.912	1-5/16	-346	4-1/8	4.100	4-1/2	-375	9-1/2	9.475	9-7/8
-318	1	0.975	1-3/8	-347	4-1/4	4.225	4-5/8	-376	9-3/4	9.725	10-1/8
-319	1-1/16	1.037	1-7/16	-348	4-3/8	4.350	4-3/4	-377	10	9.975	10-3/8
-320	1-1/8	1.100	1-1/2	-349	4-1/2	4.475	4-7/8	-378	10-1/2	10.475	10-7/8
-321	1-3/16	1.162	1-9/16	-350	4-5/8	4.600	5	-379	11	10.975	11-3/8
-322	1-1/4	1.225	1-5/8	-351	4-3/4	4.725	5-1/8	-380	11-1/2	11.475	11-7/8
-323	1-5/16	1.287	1-11/16	-352	3-7/8	4.850	5-1/4	-381	12	11.975	12-3/8
-324	1-3/8	1.350	1-3/4	-353	5	4.975	5-3/8	-382	13	12.975	13-3/8
-325	1-1/2	1.475	1-7/8	-354	5-1/8	5.100	5-1/2	-383	14	13.975	14-3/8
-326	1-5/8	1.600	2	-355	5-1/4	5.225	5-5/8	-384	15	14.975	15-3/8
-327	1-3/4	1.725	2-1/8	-356	5-3/8	5.350	5-3/4	-385	16	15.955	16-3/8
-328	1-7/8	1.850	2-1/4	-357	5-1/2	5.475	5-7/8	-386	17	16.955	17-3/8
-329	2	1.975	2-3/8	-358	5-5/8	5.600	6	-387	18	17.955	18-3/8
-330	2-1/8	2.100	2-1/2	-359	5-3/4	5.725	6-1/8	-388	19	18.955	19-3/8
-331	2-1/4	2.225	2-5/8	-360	5-7/8	5.850	6-1/4	-389	20	19.955	20-3/8
-332	3-3/8	2.350	2-3/4	-361	6	5.975	3-3/8	-390	21	20.955	21-3/8
-333	2-1/2	2.475	2-7/8	-362	6-1/4	6.225	6-5/8	-391	22	21.955	22-3/8
-334	2-5/8	2.600	3	-363	6-1/2	6.475	6-7/8	-392	23	22.940	23-3/8
-335	2-3/4	2.725	3-1/8	-364	6-3/4	6.725	7-1/8	-393	24	23.940	24-3/8
-336	2-7/8	2.850	3-1/4	-365	7	6.975	7-3/8	-394	25	24.940	25-3/8
-337	3	2.975	3-3/8	-366	7-1/4	7.225	7-5/8	-395	26	25.940	26-3/8

**New Sizes Available (400 Series)**

No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."
-400	1-3/8	1.350	1-7/8	-408	2-3/8	2.350	2-7/8	-416	3-3/8	3.350	3-7/8
-401	1-1/2	1.475	2	-409	2-1/2	2.475	3	-417	3-1/2	3.475	4
-402	1-5/8	1.600	2-1/8	-410	2-5/8	2.600	3-1/8	-418	3-5/8	3.600	4-1/8
-403	1-3/4	1.725	2-1/4	-411	2-3/4	2.725	3-1/4	-419	3-3/4	3.725	4-1/4
-404	1-7/8	1.850	2-3/8	-412	2-7/8	2.850	3-3/8	-420	3-7/8	3.850	4-3/8
-405	2	1.795	2-1/2	-413	3	2.975	3-1/2	-421	4	3.975	4-1/2
-406	2-1/8	2.100	2-5/8	-414	3-1/8	3.100	3-5/8	-422	4-1/8	4.100	4-5/8
-407	2-1/4	2.225	2-3/4	-415	3-1/4	3.225	3-3/4	-423	4-1/4	4.225	4-3/4
								-424	4-3/8	4.350	4-7/8

**1/4" Cross-Section (w), actual .275"**

No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."	No.	I.D."	Actual	O.D."
-425	4-1/2	4.475	5	-442	7-1/4	7.225	7-3/4	-459	15	14.975	15-1/2
-426	4-5/8	4.600	5-1/8	-443	7-1/2	7.475	8	-460	15-1/2	15.475	16
-427	4-3/4	4.725	5-1/4	-444	7-3/4	7.725	8-1/4	-461	16	15.955	16-1/2
-428	4-7/8	4.850	5-3/8	-445	8	7.975	8-1/2	-462	16-1/2	16.455	17
-429	5	4.975	5-1/2	-446	8-1/2	8.475	9	-463	17	16.955	17-1/2
-430	5-1/8	5.100	5-5/8	-447	9	8.975	9-1/2	-464	17-1/2	17.455	18
-431	5-1/4	5.225	5-3/4	-448	9-1/2	9.475	10	-465	18	17.955	18-1/2
-432	5-3/8	5.350	5-7/8	-449	10	9.975	10-1/2	-466	18-1/2	18.455	19
-433	5-1/2	5.475	6	-450	10-1/2	10.475	11	-467	19	18.955	19-1/2
-434	5-5/8	5.600	6-1/8	-451	11	10.975	11-1/2	-468	19-1/2	19.455	20
-435	5-3/4	5.725	6-1/4	-452	11-1/2	11.475	12	-469	20	19.955	20-1/2
-436	5-7/8	5.850	6-3/8	-453	12	11.975	12-1/2	-470	21	20.955	21-1/2
-437	6	5.975	6-1/2	-454	12-1/2	12.475	13	-471	22	21.955	22-1/2
-438	6-1/4	6.225	6-3/4	-455	13	12.975	13-1/2	-472	23	22.940	23-1/2
-439	6-1/2	6.475	7	-456	13-1/2	13.475	14	-473	24	23.940	24-1/2
-440	6-3/4	6.725	7-1/4	-457	14	13.975	14-1/2	-474	25	24.940	25-1/2
-441	7	6.975	7-1/2	-458	14-1/2	14.475	15	-475	26	25.940	26-1/2

**Tube Fittings Sizes (900 Series)**

No.	Tube O.D."	I.D. Actual	C/S Actual	No.	Tube O.D."	I.D. Actual	C/S Actual
-901	3/32	0.185	0.056	-911	11/16	0.863	.0116
-902	1/8	0.239	0.064	-912	3/4	0.924	.0116
-903	3/16	0.301	0.064	-913	13/16	0.986	.0116
-904	1/4	0.351	0.072	-914	7-8	1.047	.0116
-905	5/16	0.414	0.072	-916	1	1.171	.0116
-906	3/8	0.468	0.078	-918	1-1/8	1.355	.0116
-907	7/16	0.530	0.082	-920	1-1/4	1.475	0.118
-908	1/2	0.644	0.087	-924	1-1/2	1.720	0.118
-909	9/16	0.706	0.097	-928	1-3/4	2.090	0.118
-910	5/8	0.755	0.097	-932	2	2.337	0.118

# Common O-Ring Materials



## Buna/Nitrile (N, NBR, BUNA-N)

Available Durometers:	40 - 90	Temperature Range:	-40 / + 250 F / -40 / + 121 C
Standard Color:	Black	Standard Durometer:	70
Do Not Use With:	Brake Fluids, Aircraft, & Acetone	FDA Compound Available:	Yes
Resistant To:	Oil, Air, Water, Gasoline, Engine Coolant, Silicone Greases, Hydraulic Fluids, & Alcohols.		

## Ethylene-Propylene (EP, EPR, EPDM)

Available Durometers:	40 - 90	Temperature Range:	-60 / + 300 F / -51 / + 150 C
Standard Color:	Black	Standard Durometer:	70
Do Not Use With:	Solvents or aromatic hydrocarbons	FDA Compound Available:	Yes
Resistant To:	Steam (400? F), Hot Water, Sunlight, Silicone Oils & Greases, Dilute Acids, and Auto Brake Fluids.		

## Silicone (S, MQ, VMQ, PVMQ)

Available Durometers:	25 - 80	Temperature Range:	-75 / + 450 F / -59.5 / + 232 C
Standard Color:	Rust/Orange	Standard Durometer:	70
Do Not Use With:	Fuels, Silicone & Petroleum-based Oils, Acids	FDA Compound Available:	Yes
Resistant To:	High/Dry Heat, Fungus, Sunlight, Ozone, and Weathering. Conforms to FDA/sanitary regulations		

## Polyurethane (P)

Available Durometers:	70 & 90	Temperature Range:	-60? / + 225? F / -51? / + 107? C
Standard Color:	Translucent or Black	Standard Durometer:	70
Do Not Use With:	Alcohols, Hot water, steam	FDA Compound Available:	No
Resistant To:	High hydraulic pressure applications. Primarily used for drive belts.		

## Neoprene/Chloroprene (C, CR)

Available Durometers:	40 - 90	Temperature Range:	-45 / + 225 F / -43 / + 107 C
Standard Color:	Black	Standard Durometer:	70
Do Not Use With:	Aromatic/chlorinated hydrocarbons, acetones	FDA Compound Available:	No
Resistant To:	Ozone, sunlight & oxygen aging. Low Compression Set.		

## Viton/Fluorocarbon (V, FKM)

Available Durometers:	50 - 95	Temperature Range:	-20 / + 400 F / -29 / + 204 C
Standard Color:	Black/Brown	Standard Durometer:	75
Do Not Use With:	Acetone, Ketones, Steam/Hot Water	FDA Compound Available:	No
Resistant To:	High temperature limits, wide chemical compatibility. Petroleum products & solvents.		

## Flourosilicone (L, FVMQ)

Available Durometers:	50 - 80	Temperature Range:	-75 / + 400 F / -59.5 / + 204 C
Standard Color:	Blue	Standard Durometer:	70
Do Not Use With:	Acetone, Amines	FDA Compound Available:	No
Resistant To:	Air, sunlight, ozone, chlorinated & aromatic hydrocarbons. Aerospace fuel systems & auto fuel emission control systems.		

## Additional Materials Available

Aflas	PTFE & PTFE Encapsulated (TFE, PTFE)	Butyl
Kalrez <sup>®</sup> & Simriz <sup>®</sup>	Vegetable Fiber	Chemraz <sup>®</sup>

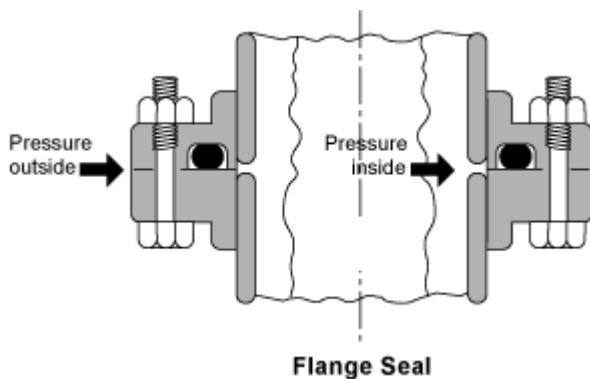


# Technical & Design Information

## Static O-ring Applications

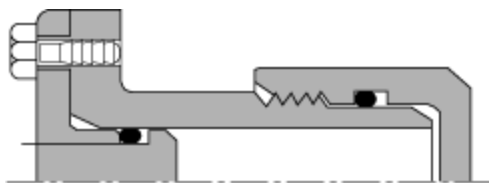
There are five types of static o-ring applications: Flange seal, Radial seal, Dovetail seal, Boss seal and Crush seal.

**Flange Seal** – In flange seal glands, the two flanges are assembled with metal to metal contact. So in fact there is no remarkable gap and no risk for extrusion of the O-ring as long as the construction does not deform under system pressure.



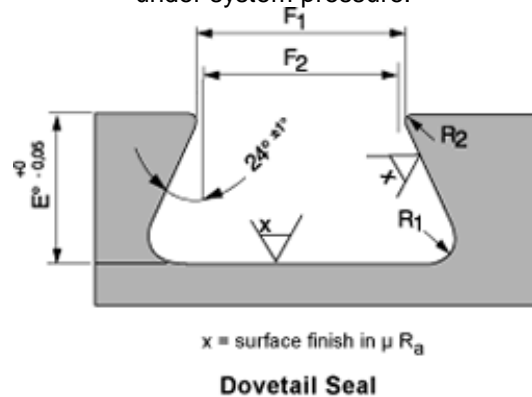
When system pressure is from the outside, the groove inside diameter is of primary importance and the groove width then determines the outside diameter. When system pressure is from the inside the reverse is true.

**Radial Seal** – Because the metal parts are pressed or screwed together there is always a clearance gap with risk for extrusion.



**Radial Seal**

**Dovetail seal** – Also here there is a metal to metal contact as long as the construction will not deform under system pressure.



**Boss seal** – The groove dimensions are incorporated in the standard dimensions.

**Surface Finish Static Grooves** – Straight-sided grooves are best to prevent extrusion or nibbling. Five degree sloping sides are easier to machine and are suitable for lower pressures. Surface finishes up to 64 to 125 RMS with no burrs, nicks, or scratches are recommended. The method used to produce the finish is important. If the finish is produced by machining the part on a lathe, or by some other method that produces scratches and ridges that follow the direction of the machine head, a very rough surface will still seal effectively. Other methods, however, such as end milling, will produce scratches that cut across the o-ring. Even these may have a rather high roughness value if the profile across them shows rounded scratches that the rubber can readily flow into.

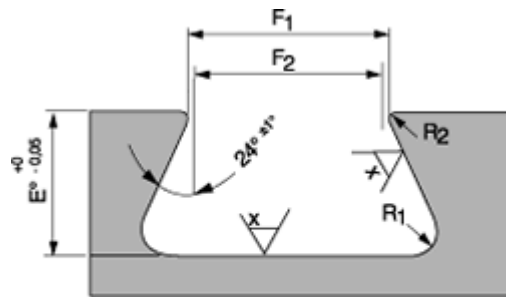
## Gland Design for a Static Application

### O-rings in Dovetail Grooves, INCHES

Dovetail grooves are used to hold the O-ring in place during installation or maintenance. This groove design is relatively uncommon as it is expensive to machine and should not be used unless absolutely required. The dovetail groove construction is only recommended for O-rings with cross sections of .139 inch (3.53 mm) and larger.

Surface Finish X groove  
top and bottom: For liquids  
X = 32 micro inches (0.8  
m Ra)

For vacuum and gases X = 16 micro  
inches (0.4 m Ra) Groove sides: X  
= 63 micro inches (1.6 m Ra)



**Dovetail Seal**

**Gland Dimensions Dovetail Grooves, Inches**

O-ring Cross section W	Gland Depth. E	Squeeze %	Groove Width to Sharp Corner F <sub>2</sub>	Groove Radius	
				R <sub>1</sub>	R <sub>2</sub>
1/16	.070	.050/.052	27	.055/.059	.005 .015
3/32	.103	.081/.083	21	.083/.087	.010 .015
1/8	.139	.111/.113	20	.113/.117	.010 .030
3/16	.210	.171/.173	18	.171/.175	.015 .030
1/4	.275	.231/.234	16	.231/.235	.015 .060
3/8	.375	.315/.319	16	.315/.319	.020 .090

*Radius "R2" is critical. Insufficient radius will cause damage to the seal during installation, while excessive radius may contribute to extrusion. R2 is size radius, R1 is machining radius.*

## Gland Design

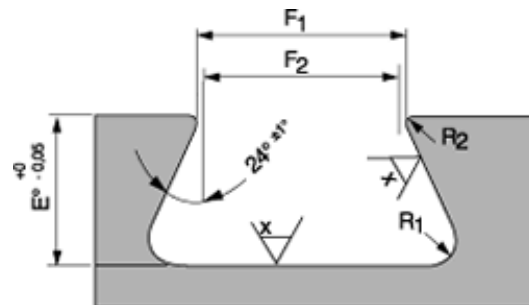
for a Static Application for O-rings in Dovetail Grooves, METRIC

Dovetail grooves are used to hold the O-ring in place during installation or maintenance. This groove design is relatively uncommon as it is expensive to machine and should not be used unless absolutely required. The dovetail groove construction is only recommended for O-rings with bigger cross sections, .139 inch (3,53 mm) and bigger.

Surface Finish X groove top and bottom : for liquids X = 32 micro inches (0.8  $\mu$  m Ra)

for vacuum and gases X = 16 micro inches (0.4  $\mu$  m Ra) 8,4 7,25 6,25 6,80 1,5 0,5

groove sides: X = 63 micro inches (1.6  $\mu$  m Ra)  
9,0 7,80 6,70 7,25 1,5 0,5



x = surface finish in  $\mu$  Ra

**Dovetail Seal**



**Gland Dimensions Dovetail Grooves, METRIC**

<i>W</i> Cross section mm	<i>E</i> Groove Depth <i>E</i> +0/-0,05	<i>F</i> Groove Width		<i>R</i> Radius	
		<i>F</i> <sub>2</sub> +/-0,05	<i>F</i> <sub>1</sub> +/-0,05	<i>R</i> <sub>1</sub>	<i>R</i> <sub>2</sub>
3,0	2,40	2,45	2,60	0,4	0,25
3,5 - 3,53*	2,80	2,80	3,05	0,8	0,25
4,0	3,20	3,10	3,40	0,8	0,25
4,5	3,65	3,50	3,75	0,8	0,25
5,0	4,15	3,85	4,10	0,8	0,25
5,33*	4,40	4,10	4,35	0,8	0,25
5,5	4,6	4,20	4,60	0,8	0,4
5,7	4,8	4,35	4,75	0,8	0,4
6,0	5,05	4,55	4,95	0,8	0,4
6,5	5,50	4,90	5,30	0,8	0,4
6,99* - 7,0	5,95	5,25	5,65	1,5	0,4
7,5	6,40	5,60	6,00	1,5	0,4
8,0	6,85	6,00	6,50	1,5	0,5
8,4	7,25	6,25	6,80	1,5	0,5
8,5	7,35	6,35	6,90	1,5	0,5
9,0	7,80	6,70	7,25	1,5	0,5
9,5	8,20	7,05	7,60	1,5	0,5
10,0	8,70	7,40	7,95	1,5	0,5

*Dimensions in mm \*US/BS standard AS 568A*

*Radius "R<sub>2</sub>" is critical. Insufficient radius will cause damage to the seal during installation, while excessive radius may contribute to extrusion.*

*R<sub>2</sub> is size radius. R<sub>1</sub> is machining radius.*

*F<sub>1</sub> is groove width to sharp corner. F<sub>2</sub> is groove width to round corner*



## Gland Clearance

The diagram gives a guide to the relation between hardness, pressure, clearance, and extrusion. This figure is based on NBR O-rings with a cross section of .139 inch (3.53 mm) without back up rings. When there is risk for extrusion use contoured hard rubber or plastic back-up rings. The results are based on tests at temperatures up to 70°C.

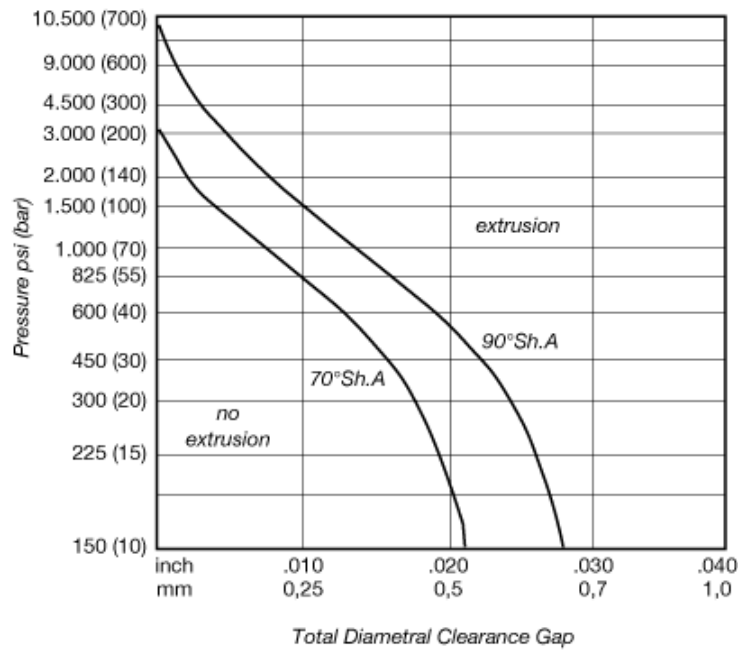
Note: for silicone and fluorosilicone O-rings reduce all the clearances shown by 50%.

The most effective and reliable sealing is generally provided with the diametrical clearance as shown in Table 3.B1a. The maximum allowable gaps are indicated for 70°hardness O-rings with different cross sections without back-ups for reciprocating and static seals. These values correspond to a pressure of ca. 1200 PSI (80 bar) (8 Mpa) at 70°F (21°C). When greater clearances occur, the diagram indicates conditions where O-ring seals may be used - depending on the fluid pressure and O-ring hardness. [See Table]

**Gland clearance in relation to hardness and O-ring cross section**

<i>Cross section</i>		<i>Max. clearance 70 ° Shore A</i>	
<i>inch</i>	<i>mm</i>	<i>inch</i>	<i>mm</i>
.070	1,0-2,0	.002 - .004	0,05 - 0,1
.103	2,0-3,0	.002 - .005	0,05 - 0,13
.139	3,0-4,0	.002 - .006	0,05 - 0,15
.210	4,0-6,0	.003 - .007	0,07 - 0,18
>.275	>6,0	.004 - .010	0,1 - 0,25

**Gland Clearance Table**



**Gland Clearance Graph**