5.31.2 O-Ring Glands for Industrial Reciprocating Seals

Design Chart 5-2 provides a reasonable basis for calculating reciprocating O-ring seal glands. Design Table 5-2, which follows it, contains recommended gland dimensions for the standard AS568A O-ring sizes. The major difference from the military gland dimensions (Design Table 5-1) is the use of standard cylinder bore and standard rod dimensions.

Although these dimensions are suitable for most reciprocating designs, it is often desirable, or even necessary, to deviate from them. Other portions of this handbook on Basic O-Ring Elastomers (Section II) and O-Ring Applications (Section III) are helpful in determining when such special designs are indicated and provide useful data for such modified designs.

Procedures for using Design Table 5-2 are outlined in Design Guide 5-2. See Section X, Table 10-6 for installation guidelines.

Gland Dimensions for Industrial Reciprocating O-Ring Seals
Groove Diameter (Rod Gland) Tolerance
- .000 for all sizes
+ .002 for sizes 2-006 through 2-324
+ .004 for sizes 2-325 through 2-460
Groove Diameter (Piston) Tolerance
+ .000 for all sizes
- .002 for sizes 2-006 through 2-324
- .004 for sizes 2-325 through 2-460

Design Guide 5-2a: Gland Dimensions for Industrial Reciprocating O-Ring Seals

Guide for Design Table 5-2

If Desired Dimension is Known for	Select Closest Dimension in Column	Read Horizontally in Column	To Determine Dimension for
Bore Dia of cylinder	A	B-1	Groove Dia of piston
		C	OD of piston
		G	Groove width
OD of piston	C	A	Bore Dia of cylinder
		B-1	Groove Dia of piston
		G	Groove width
OD of rod	B	A-1	Groove Dia for rod
		D	Bore ID for rod
		G	Groove width
Bore Dia for rod	D	A-1	Groove Dia for rod
		B	OD of rod
		G	Groove width

Design Guide 5-2b: Guide For Design Table 5-2

After selecting gland dimensions, read horizontally to determine proper O-ring size number. Specify compound.

Industrial Reciprocating O-Ring Packing Glands

O-Ring 2-Size AS568A-	W Cross-Section Nominal	W Cross-Section Actual	L Gland Depth	Squeeze Actual	Squeeze %	E(a) Diametral Clearance	G-GrooveWidth No Parbak Ring(G)	G-GrooveWidth One Parbak Ring(G_1)	G-GrooveWidth Two Parbak Rings(G_2)	R Groove Radius	Max. Eccentricity (b)
006 through 012	1/16	.070 ± .003	.055 to .057	.010 to .018	15 to 25	.002 to .005	.093 to .098	.138 to .143	.205 to .210	.005 to .015	.002
104 through 116	3/32	.103 ± .003	.088 to .090	.010 to .018	10 to 17	.002 to .005	.140 to .145	.171 to .176	.238 to .243	.005 to .015	.002
201 through 222	1/8	.139 ± .004	.121 to .123	.012 to .022	9 to 16	.003 to .006	.187 to .192	.208 to .213	.275 to .280	.010 to .025	.003
309 through 349	3/16	.210 ± .005	.185 to .188	.017 to .030	8 to 14	.003 to .006	.281 to .286	.311 to .316	.410 to .415	.020 to .035	.004
425 through 460	1/4	.275 ± .006	.237 to .240	.029 to .044	11 to 16	.004 to .007	.375 to .380	.408 to .413	.538 to .543	.020 to .035	.005

(a) Clearance (extrusion gap) must be held to a minimum consistent with design requirements for temperature range variation.
(b) Total indicator reading between groove and adjacent bearing surface.

Design Chart 5-2-a: Design Chart for Industrial Reciprocating O-Ring Packing Glands

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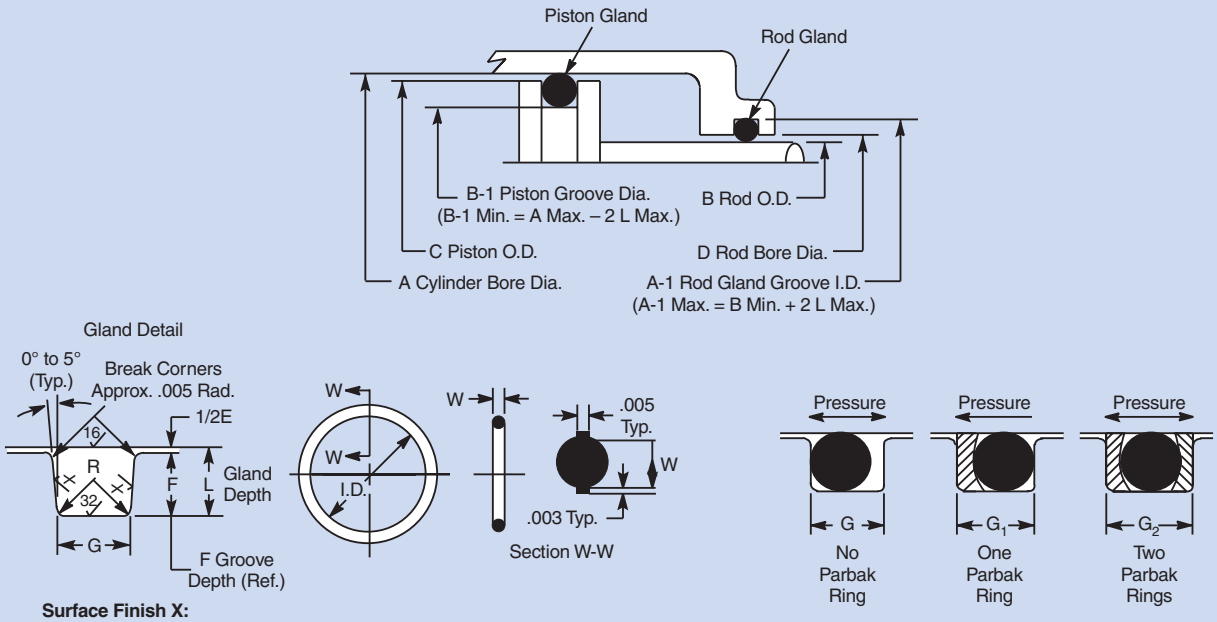
Industrial Reciprocating O-Ring Packing Glands



Surface Finish X:
32 Without Parbak Ring
63 With Parbak Ring

Finishes are RMS values

Refer to Design Chart 5-2 (below) and Design Table 5-2 for dimensions.

Industrial Dynamic Metric Cross-Sections

Industrial Dynamic Metric Cross-Sections

W Cross-Section	L Gland Depth	G-Grove Width No Parbak Ring (G)	R Groove Radius
1.50	1.30	1.90	0.20 to 0.40
1.80	1.45	2.40	0.20 to 0.40
2.00	1.70	2.60	0.20 to 0.40
2.50	2.10	3.30	0.20 to 0.40
2.65	2.20	3.60	0.20 to 0.40
3.00	2.60	3.90	0.40 to 0.80
3.55	3.05	4.80	0.40 to 0.80
4.00	3.50	5.30	0.40 to 0.80
5.00	4.45	6.70	0.40 to 0.80
5.30	4.65	7.10	0.40 to 0.80
6.00	5.40	8.00	0.40 to 0.80
7.00	6.20	9.50	0.40 to 0.80

(a) Dimensions are in mm. The ISO/DIN recommendations are preferred.
(b) Parbaks are not available in standard for metric sizes.

Design Chart 5-2-b: Design Chart for Industrial Dynamic Metric Cross-Sections

Gland Dimensions for Industrial Reciprocating O-Ring Seals, 103.5 Bar (1500 psi) Max.†

O-Ring Size Parker No. 2-	Dimensions I.D.	±	W	Mean O.D. (Ref)	A Bore Dia. (Cylinder) +.002 -.000	A-1 Groove Dia. (Rod Gland) +.002 -.000	B OD (Rod) +.000 -.002	B-1 Groove Dia. *(Piston) +.000 -.002	C OD (Piston) +.000 -.001	D Bore Dia. (Rod) +.001 -.000	G Width Groove +.005 -.000
006	.114	.005		.254	.249	.234	.124	.139	*.247	.126	
007	.145	.005		.285	.280	.265	.155	.170	*.278	.157	
008	.176	.005		.316	.311	.296	.186	.201	*.309	.188	
009	.208	.005	.070	.348	.343	.328	.218	.233	*.341	.220	.093
010	.239	.005	±.003	.379	.374	.359	.249	.264	*.372	.251	
011	.301	.005		.441	.436	.421	.311	.326	*.434	.313	
012	.364	.005		.504	.499	.484	.374	.389	*.497	.376	
104	.112	.005		.318	.312	.300	.124	.136	*.310	.126	
105	.143	.005		.349	.343	.331	.155	.167	*.341	.157	
106	.174	.005		.380	.374	.362	.186	.198	*.372	.188	
107	.206	.005		.412	.406	.394	.218	.230	*.404	.220	
108	.237	.005		.443	.437	.425	.249	.261	*.435	.251	
109	.299	.005		.505	.499	.487	.311	.323	*.497	.313	
110	.362	.005	.103	.568	.562	.550	.374	.386	*.560	.376	.140
111	.424	.005	±.003	.630	.624	.612	.436	.448	*.622	.438	
112	.487	.005		.693	.687	.675	.499	.511	*.685	.501	
113	.549	.007		.755	.749	.737	.561	.573	*.747	.563	
114	.612	.009		.818	.812	.800	.624	.636	.810	.626	
115	.674	.009		.880	.874	.862	.686	.698	.872	.688	
116	.737	.009		.943	.937	.925	.749	.761	.935	.751	
201	.171	.005		.449	.437	.427	.185	.195	*.434	.188	
202	.234	.005		.512	.500	.490	.248	.258	*.497	.251	
203	.296	.005		.574	.562	.552	.310	.320	*.559	.313	
204	.359	.005		.637	.625	.615	.373	.383	.622	.376	
205	.421	.005		.699	.687	.677	.435	.445	.684	.438	
206	.484	.005		.762	.750	.740	.498	.508	.747	.501	
207	.546	.007		.824	.812	.802	.560	.570	.809	.563	
208	.609	.009		.887	.875	.865	.623	.633	.872	.626	
209	.671	.009		.949	.937	.927	.685	.695	.934	.688	
210	.734	.010		1.012	1.000	.990	.748	.758	.997	.751	
211	.796	.010	.139	1.074	1.062	1.052	.810	.820	1.059	.813	.187
212	.859	.010	±.004	1.137	1.125	1.115	.873	.883	1.122	.876	
213	.921	.010		1.199	1.187	1.177	.935	.945	1.184	.938	
214	.984	.010		1.262	1.250	1.240	.998	1.008	1.247	1.001	
215	1.046	.010		1.324	1.312	1.302	1.060	1.070	1.309	1.063	
216	1.109	.012		1.387	1.375	1.365	1.123	1.133	1.372	1.126	
217	1.171	.012		1.449	1.437	1.427	1.185	1.195	1.434	1.188	
218	1.234	.012		1.512	1.500	1.490	1.248	1.258	1.497	1.251	
219	1.296	.012		1.574	1.562	1.552	1.310	1.320	1.559	1.313	
220	1.359	.012		1.637	1.625	1.615	1.373	1.383	1.622	1.376	
221	1.421	.012		1.699	1.687	1.677	1.435	1.445	1.684	1.438	
222	1.484	.015		1.762	1.750	1.740	1.498	1.508	1.747	1.501	

* These designs require considerable installation stretch. If assembly breakage is incurred use a compound having higher elongation or use a two-piece piston.
† This groove width does not permit the use of Parbak rings. For pressures above 103.5 Bar (1500 psi), consult Design Chart 5-2 for groove widths where Parbak rings must be used.

Design Table 5-2: Gland Dimensions for Industrial Reciprocating O-Ring Seals, 103.5 Bar (1500 psi) Max.†

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Gland Dimensions for Industrial Reciprocating O-Ring Seals, 103.5 Bar (1500 psi) Max.† (Continued)

O-Ring Size Parker No. 2-	Dimensions I.D.	±	W	Mean O.D. (Ref)	A Bore Dia. (Cylinder) +.002 -.000	A-1 Groove Dia. (Rod Gland) +.002 -.000	B OD (Rod) +.000 -.002	B-1 Groove Dia. *(Piston) +.000 -.002	C OD (Piston) +.000 -.001	D Bore Dia. (Rod) +.001 -.000	G Width Groove +.005 -.000
309	.412	.005		.832	.812	.805	.435	.442	*.809	.438	
310	.475	.005		.895	.875	.868	.498	.505	*.872	.501	
311	.537	.007		.957	.937	.930	.560	.567	*.943	.563	
312	.600	.009		1.020	1.000	.993	.623	.630	.997	.626	
313	.662	.009		1.082	1.062	1.055	.685	.692	1.059	.688	
314	.725	.010		1.145	1.125	1.118	.748	.755	1.122	.751	
315	.787	.010		1.207	1.187	1.180	.810	.817	1.184	.813	
316	.850	.010		1.270	1.250	1.243	.873	.880	1.247	.876	
317	.912	.010		1.332	1.312	1.305	.935	.942	1.309	.938	
318	.975	.010		1.395	1.375	1.368	.998	1.005	1.372	1.001	
319	1.037	.010		1.457	1.437	1.430	1.060	1.067	1.434	1.063	
320	1.100	.012		1.520	1.500	1.493	1.123	1.130	1.497	1.126	
321	1.162	.012		1.582	1.562	1.555	1.185	1.192	1.559	1.188	
322	1.225	.012		1.645	1.625	1.618	1.248	1.255	1.622	1.251	
323	1.287	.012		1.707	1.687	1.680	1.310	1.317	1.648	1.313	
324	1.350	.012		1.770	1.750	1.743 **+.004 -.000**	1.373	1.380 **+.000 -.004**	1.747	1.376	
325	1.475	.015		1.895	1.875	1.868	1.498	1.505	1.872	1.501	
326	1.600	.015		2.020	2.000	1.993	1.623	1.630	1.997	1.626	
327	1.725	.015		2.145	2.125	2.118	1.748	1.755	2.122	1.751	
328	1.850	.015		2.270	2.250	2.243	1.873	1.880	2.247	1.876	
329	1.975	.018	.210	2.395	2.375	2.368	1.998	2.005	2.372	2.001	.281
330	2.100	.018	±.005	2.520	2.500	2.493	2.123	2.130	2.497	2.126	
331	2.225	.018		2.645	2.625	2.618	2.248	2.255	2.622	2.251	
332	2.350	.018		2.770	2.750	2.743	2.373	2.380	2.747	2.376	
333	2.475	.020		2.895	2.875	2.868	2.498	2.505	2.872	2.501	
334	2.600	.020		3.020	3.000	2.993	2.623	2.630	2.997	2.626	
335	2.725	.020		3.145	3.125	3.118	2.748	2.755	3.122	2.751	
336	2.850	.020		3.270	3.250	3.243	2.873	2.880	3.247	2.876	
337	2.975	.024		3.395	3.375	3.368	2.998	3.005	3.372	3.001	
338	3.100	.024		3.520	3.500	3.493	3.123	3.130	3.497	3.126	
339	3.225	.024		3.645	3.625	3.618	3.248	3.255	3.622	3.251	
340	3.350	.024		3.770	3.750	3.743	3.373	3.380	3.747	3.376	
341	3.475	.024		3.895	3.875	3.868	3.498	3.505	3.872	3.501	
342	3.600	.028		4.020	4.000	3.993	3.623	3.630	3.997	3.626	
343	3.725	.028		4.145	4.125	4.118	3.748	3.755	4.122	3.751	
344	3.850	.028		4.270	4.250	4.243	3.873	3.880	4.247	3.876	
345	3.975	.028		4.395	4.375	4.368	3.998	4.005	4.372	4.001	
346	4.100	.028		4.520	4.500	4.493	4.123	4.130	4.497	4.126	
347	4.225	.030		4.645	4.625	4.618	4.248	4.255	4.622	4.251	
348	4.350	.030		4.773	4.750	4.743	4.373	4.380	4.747	4.376	
349	4.475	.030		4.895	4.875	4.868	4.498	4.505	4.872	4.501	

* These designs require considerable installation stretch. If assembly breakage is incurred use a compound having higher elongation or use a two-piece piston.
† This groove width does not permit the use of Parbak rings. For pressures above 103.5 Bar (1500 psi), consult Design Chart 5-2 for groove widths where Parbak rings must be used.

Design Table 5-2: Gland Dimensions for Industrial Reciprocating O-Ring Seals, 103.5 Bar (1500 psi) Max.†

Gland Dimensions for Industrial Reciprocating O-Ring Seals, 103.5 Bar (1500 psi) Max.† (Continued)

O-Ring Size Parker No. 2-	I.D.	Dimensions ±	Dimensions W	Mean O.D. (Ref)	A Bore Dia. (Cylinder) +.002 -.000	A-1 Groove Dia. (Rod Gland) +.002 -.000	B OD (Rod) +.000 -.002	B-1 Groove Dia. *(Piston) +.000 -.002	C OD (Piston) +.000 -.001	D Bore Dia. (Rod) +.001 -.000	G Width Groove +.005 -.000
425	4.475	.033		5.025	5.002	4.971	4.497	4.528	4.998	4.501	
426	4.600	.033		5.150	5.127	5.096	4.622	4.653	5.123	4.626	
427	4.725	.033		5.275	5.252	5.221	4.747	4.778	5.248	4.751	
428	4.850	.033		5.400	5.377	5.346	4.872	4.903	5.373	4.876	
429	4.975	.037		5.525	5.502	5.471	4.997	5.028	5.498	5.001	
430	5.100	.037		5.650	5.627	5.596	5.122	5.153	5.623	5.126	
431	5.225	.037		5.775	5.752	5.721	5.247	5.278	5.748	5.251	
432	5.350	.037		5.900	5.877	5.846	5.372	5.403	5.873	5.376	
433	5.475	.037		6.025	6.002	5.971	5.497	5.528	5.998	5.501	
434	5.600	.037		6.150	6.127	6.096	5.622	5.653	6.123	5.626	
435	5.725	.037		6.275	6.252	6.221	5.747	5.778	6.248	5.751	
436	5.850	.037		6.400	6.377	6.346	5.872	5.903	6.373	5.876	
437	5.975	.037		6.525	6.502	6.471	5.997	6.028	6.498	6.001	
438	6.225	.040		6.775	6.752	6.721	6.247	6.278	6.748	6.251	
439	6.475	.040		7.025	7.002	6.971	6.497	6.528	6.998	6.501	
440	6.725	.040		7.275	7.252	7.221	6.747	6.778	7.248	6.751	
441	6.975	.040		7.525	7.502	7.471	6.997	7.028	7.498	7.001	
442	7.225	.045	.275	7.775	7.752	4.721	7.247	7.278	7.748	7.251	.375
443	7.475	.045	±.006	8.025	8.002	7.971	7.497	7.528	7.998	7.501	
444	7.725	.045		8.275	8.252	8.221	7.747	7.778	8.248	7.751	
445	7.975	.045		8.525	8.502	8.471	7.997	8.028	8.498	8.001	
446	8.475	.055		9.025	9.002	8.971	8.497	8.528	8.998	8.501	
447	8.975	.055		9.525	9.502	9.471	8.997	9.028	9.498	9.001	
448	9.475	.055		10.025	10.002	9.971	9.497	9.528	9.998	9.501	
449	9.975	.055		10.525	10.502	10.471	9.997	10.028	10.498	10.001	
450	10.475	.060		11.025	11.002	10.971	10.497	10.528	10.998	10.501	
451	10.975	.060		11.525	11.502	11.471	10.997	11.028	11.498	11.001	
452	11.475	.060		12.025	12.002	11.971	11.497	11.528	11.998	11.501	
453	11.975	.060		12.525	12.502	12.471	11.997	12.028	12.498	12.001	
454	12.475	.060		13.025	13.002	12.971	12.497	12.528	12.998	12.501	
455	12.975	.060		13.525	13.502	13.471	12.997	13.028	13.498	13.001	
456	13.475	.070		14.025	14.002	13.971	13.497	13.528	13.998	13.501	
457	13.975	.070		14.525	14.502	14.471	13.997	14.028	14.498	14.001	
458	14.475	.070		15.025	15.002	14.971	14.497	14.528	14.998	14.501	
459	14.975	.070		15.525	15.502	15.471	14.997	15.028	15.498	15.001	
460	15.475	.070		16.025	16.002	15.971	15.497	15.528	15.998	15.501	

* These designs require considerable installation stretch. If assembly breakage is incurred use a compound having higher elongation or use a two-piece piston.
† This groove width does not permit the use of Parbak rings. For pressures above 103.5 Bar (1500 psi), consult Design Chart 5-2 for groove widths where Parbak rings must be used.

Design Table 5-2: Gland Dimensions for Industrial Reciprocating O-Ring Seals, 103.5 Bar (1500 psi) Max.†

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