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# AEROSPACE RECOMMENDED PRACTICE

ARP 1233

Society of Automotive Engineers, Inc.  
400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

Issued April 1977  
Revised

## GLAND DESIGN, ELASTOMERIC O-RING SEALS, DYNAMIC RADIAL, 1500 PSI MAX

### 1. PURPOSE

- 1.1 The purpose of this document is to provide the aerospace industry with standardized dimensional criteria for dynamic radial elastomeric O-ring seal glands. It is intended for use in conjunction with ARP 1231, "Gland Design, Elastomeric O-Ring Seals, General Considerations".

### 2. SCOPE

- 2.1 This document establishes standard gland design criteria and dimensions for dynamic radial O-ring seal applications and provides recommendations for modifying these glands in special applications. There are no provisions in this document for anti-extrusion devices.
- 2.2 SI unit conversions for U.S. customary units have been provided for reference purposes.
- 2.3 The criteria set forth here are similar to but not identical with those in MIL-G-5514. This document is not intended to replace MIL-G-5514 for hydraulic applications.

### 3. GENERAL REQUIREMENTS

#### 3.1 Applicable Documents

- 3.1.1 ANSI B46.1-1962 - Surface Texture
- 3.1.2 AS 568 - Aerospace Size Standard for O-Rings
- 3.1.3 ARP 1231 - Gland Design, Elastomeric O-Ring Seals, General Considerations
- 3.1.4 ARP 1232 - Gland Design, Elastomeric O-Ring Seals, Static Radial

#### 3.2 Gland Configuration

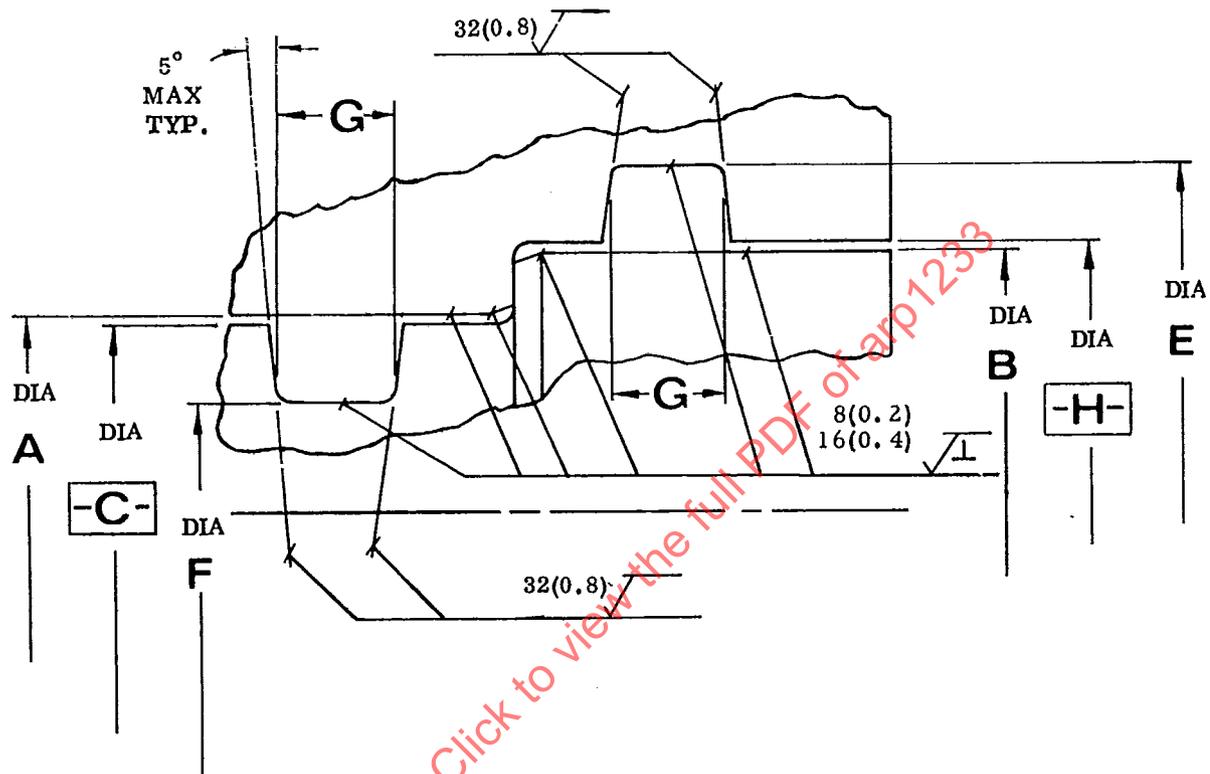
- 3.2.1 **General** - In addition to the considerations in ARP 1231, gland designs for dynamic applications require consideration be given to the frictional forces imparted by O-ring seal compression and swell. Experience has shown that the O-ring seal squeezes employed in static applications result in friction forces which cannot be tolerated in most dynamic applications. In order to achieve an optimum dynamic gland, it is necessary to select gland dimensions which reduce squeeze below the levels used in ARP 1232 and, at the same time, maintain a satisfactory minimum squeeze under all tolerance conditions. It should be noted that with the reduction of squeeze below the ARP 1232 level, a small incidence of seal leakage may be experienced. The actual amount of leakage will depend upon such factors as translational speed, temperature, fluid and elastomeric material choice. However, such leakage is not expected to exceed a few drops per 1,000 cycles.
- 3.2.2 **Standard Glands** - Figure 1 depicts rod-mounted and bore-mounted radial O-ring seal glands. Standard dimensions for these glands are tabulated in Table 3. These dimensions are designed for use with seals conforming to AS 568 tolerances. They are computed in accordance with the criteria defined in paragraph 4 of this document and in ARP 1231.

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- 3.2.3 Exemption - Standard glands are not provided for all O-ring seals listed in AS 568. This ARP is limited to the AS 568 sizes listed in Table 3. O-Ring seals outside those listed are not recommended for dynamic use.

NOTE

SURFACE TEXTURE: ANSI B46.1-1962. INDICATED SURFACES SHALL BE FREE OF ANY FLAWS EXCEEDING THE ALLOWED SURFACE ROUGHNESS VALUES

GEOMETRIC TOLERANCES, EDGE BREAKS, CORNER RADII, AND LEAD IN RAMP DIMENSIONS: SEE ARP 1231

DIMENSIONS IN ( ) ARE MICROMETRES

FIGURE 1 TYPICAL O-RING SEAL GLANDS

- 3.2.4 Modified Glands - As discussed elsewhere in this standard and in ARP 1231, standard glands are not suitable for all applications. When gland dimensions are modified to accommodate specific conditions, the criteria defined in paragraph 4.0 and in ARP 1231 should be used.
- 3.2.5 Limitations - The design criteria and standard glands set forth in this document are intended for use with dynamic applications involving pressures of 1500 psi (10340 kPa) max. and surface speeds of 12 in. (305 mm)/minute to 600 in. (15000 mm)/minute.
- 3.2.5.1 Dynamic applications utilize lighter squeezes than static applications. This condition increases the likelihood of leakage. Applications involving pressure in excess of 1500 psi (10340 kPa) should utilize anti-extrusion devices such as back-up rings or slipper seals. The use of alternative sealing devices should also be considered.

3.2.5.2 Applications involving surface speeds outside the limits of 3.2.5 introduce special conditions. At very slow speeds, the O-ring seal tends to adhere to the irregularities in the surface, resulting in seal deterioration, high friction and spiraling of the seal. Other types of seals are normally used in these slower applications. At speeds higher than 600 in. (15000 mm)/minute, the heat generated by seal friction becomes significant and must be considered in the gland design. Included in this consideration is the phenomenon known as the "Joule effect". Under this phenomenon, stretched elastomers will contract when heated. To account for this effect, the glands must be designed to avoid stretching the seal in its assembled position. A more detailed handling of higher speed applications is beyond the scope of this document.

3.2.5.3 Normally radial glands will be limited to use with translating applications, but they can be used in rotating and oscillating applications if the surface speeds are within the limits of 3.2.5.

### 3.3 Surface Texture

3.3.1 Figure 1 defines the preferred surface texture to be used with the glands described in this document. It will be noted that a minimum surface texture is specified on the sealing surfaces. This is necessary to provide for fluid to wet the sealing surface so that the O-ring seal is lubricated during dynamic operation.

## 4. DESIGN CRITERIA

### 4.1 O-Ring Seal Stretch

4.1.1 The maximum installed stretch should be held to the lowest value possible, consistent with manufacturing tolerances and with a minimum installed stretch of .2%. The stretch associated with the standard gland dimensions results in a .2% minimum stretch and a maximum stretch of under 5% in 90% of the cases.

### 4.2 O-Ring Seal Squeeze

4.2.1 To avoid assembly problems, to achieve low friction levels and to minimize leakage, dynamic O-ring seal glands should be designed to achieve nominal squeeze as listed in Table 1. Resulting minimum squeezes should not be less than those given in Table 1. These values have been used in computing the gland dimensions of Table 3. Minimum squeeze should be calculated by considering the following factors: a) diametral tolerances, b) eccentricities, c) offset, and d) seal cross section reduction due to stretch. Offset refers to the condition when the rod has shifted in the bore to the extent that the rod and bore are in contact.

TABLE 1  
O-Ring Seal Squeeze

<u>Nominal Cross Section Diameter per AS 568 (W)</u>	<u>Nominal Squeeze % of W Nominal</u>	<u>Minimum Squeeze</u>
.070 in. (1.78 mm)	19.0	.003 in. (0.076 mm)
.103 in. (2.62 mm)	15.0	.003 in. (0.076 mm)
.139 in. (3.53 mm)	13.0	.003 in. (0.076 mm)
.210 in. (5.33 mm)	11.5	.004 in. (0.102 mm)
.275 in. (6.98 mm)	10.5	.006 in. (0.152 mm)

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4.3 O-Ring Seal Swell

4.3.1 To accommodate O-ring seal swell, gland widths should be designed to achieve a volume slightly greater than the maximum swollen seal volume. However, the gland width must be limited to reduce O-ring shuttling and spiralling motions which occur during dynamic application. These motions damage the seal and lead to early failures. A suitable gland volume for general usage is 125% of the O-ring seal unsoaked volume. This value has been used to compute the gland widths in Table 3. This value is less than the 130% recommended for static seal applications to reduce O-ring shuttling and spiralling motions.

4.4 Diametral Clearances

4.4.1 The rod to bore diametral clearances must be controlled to prevent O-ring seal extrusion during operation. The diametral clearances listed in Table 2 are suitable for use at operating pressures up to 1500 psi (10340 kPa) and with elastomers of 70 shore hardness or greater. The glands in Table 3 incorporate these diametral clearances. ARP 1231 should be consulted when using these glands with higher pressures or with elastomers with less than 70 shore hardness at operating temperatures.

TABLE 2  
DIAMETRAL CLEARANCES  
INCHES

Seal Cross Section (W)	Bore to Rod Clearances
.070 (I.D. $\leq$ .500)	.001 - .004
.070 (I.D. $>$ .500)	.001 - .005
.103	.001 - .006
.139	.002 - .006
.210	.003 - .007
.275	.004 - .009

TABLE 2 (SI)  
DIAMETRAL CLEARANCES  
mm

Seal Cross Section (W)	Bore to Rod Clearances
1.78 (I.D. $\leq$ 12.7)	0.025 - 0.102
1.78 (I.D. $>$ 12.7)	0.025 - 0.127
2.62	0.025 - 0.152
3.53	0.051 - 0.152
5.33	0.076 - 0.178
6.98	0.102 - 0.229

Prepared by

Committee E21 Design and General Standards for  
Aerospace Propulsion Systems

Committee G4 Elastic Seals



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TABLE 3 - STANDARD GLAND DIMENSIONS IN INCHES (CONTINUED)

GLAND & AS 568 DASH NO.	* PISTON DIA. *	ROD MOUNTED BORE DIA. A	GLAND DIA. F	* ROD DIA. *	BORE MOUNTED BORE DIA. H	GLAND DIA. E	* GLAND WIDTH G
-206	.728-	.730	.490-	.492	.494-	.732-	.175-.185
-207	.791-	.797	.554-	.556	.558-	.795-	
-208	.859-	.861	.619-	.621	.623-	.859-	
-209	.918-	.924	.681-	.683	.685-	.922-	
-210	.982-	.988	.745-	.747	.749-	.986-	
-211	1.045-	1.051	.808-	.810	.812-	1.049-	
-212	1.108-	1.114	.871-	.873	.875-	1.112-	
-213	1.171-	1.173	.933-	.935	.937-	1.175-	
-214	1.234-	1.236	.996-	.998	1.000-	1.238-	
-215	1.295-	1.297	1.058-	1.060	1.062-	1.299-	
-216	1.361-	1.363	1.123-	1.125	1.127-	1.365-	
-217	1.423-	1.425	1.185-	1.187	1.189-	1.427-	
-218	1.485-	1.487	1.248-	1.250	1.252-	1.489-	
-219	1.548-	1.550	1.311-	1.313	1.315-	1.552-	
-220	1.612-	1.614	1.374-	1.376	1.378-	1.616-	
-221	1.674-	1.676	1.436-	1.438	1.440-	1.676-	
-222	1.740-	1.742	1.502-	1.504	1.506-	1.744-	
-223	1.804-	1.806	1.567-	1.569	1.571-	1.808-	
-224	1.868-	1.870	1.631-	1.633	1.635-	1.870-	
-225	1.930-	1.932	1.694-	1.696	1.698-	1.934-	
-226	1.994-	1.996	1.758-	1.760	1.762-	1.998-	
-227	2.058-	2.060	1.822-	1.824	1.826-	2.062-	
-228	2.122-	2.124	1.886-	1.888	1.890-	2.126-	
-229	2.186-	2.188	1.950-	1.952	1.954-	2.190-	
-230	2.250-	2.252	2.014-	2.016	2.018-	2.258-	
-231	2.314-	2.316	2.078-	2.080	2.082-	2.322-	
-232	2.378-	2.380	2.142-	2.144	2.146-	2.386-	
-233	2.442-	2.444	2.206-	2.208	2.210-	2.450-	
-234	2.506-	2.508	2.270-	2.272	2.274-	2.514-	
-235	2.570-	2.572	2.334-	2.336	2.338-	2.578-	
-236	2.634-	2.636	2.398-	2.400	2.402-	2.642-	
-237	2.698-	2.700	2.462-	2.464	2.466-	2.706-	
-238	2.762-	2.764	2.526-	2.528	2.530-	2.770-	
-239	2.826-	2.828	2.590-	2.592	2.594-	2.834-	
-240	2.890-	2.892	2.654-	2.656	2.658-	2.898-	
-241	2.954-	2.956	2.718-	2.720	2.722-	2.962-	
-242	3.018-	3.020	2.782-	2.784	2.786-	3.026-	
-243	3.082-	3.084	2.846-	2.848	2.850-	3.090-	
-244	3.146-	3.148	2.910-	2.912	2.914-	3.154-	
-245	3.210-	3.212	2.974-	2.976	2.978-	3.218-	
-246	3.274-	3.276	3.038-	3.040	3.042-	3.282-	
-247	3.338-	3.340	3.102-	3.104	3.106-	3.346-	
-248	3.402-	3.404	3.166-	3.168	3.170-	3.410-	
-249	3.466-	3.468	3.230-	3.232	3.234-	3.474-	
-250	3.530-	3.532	3.294-	3.296	3.298-	3.538-	
-251	3.594-	3.596	3.358-	3.360	3.362-	3.602-	
-252	3.658-	3.660	3.422-	3.424	3.426-	3.666-	
-253	3.722-	3.724	3.486-	3.488	3.490-	3.730-	
-254	3.786-	3.788	3.550-	3.552	3.554-	3.794-	
-255	3.850-	3.852	3.614-	3.616	3.618-	3.858-	
-256	3.914-	3.916	3.678-	3.680	3.682-	3.922-	
-257	3.978-	3.980	3.742-	3.744	3.746-	3.986-	
-258	4.042-	4.044	3.806-	3.808	3.810-	4.050-	
-259	4.106-	4.108	3.870-	3.872	3.874-	4.114-	
-260	4.170-	4.172	3.934-	3.936	3.938-	4.178-	
-261	4.234-	4.236	3.998-	4.000	4.002-	4.242-	
-262	4.298-	4.300	4.062-	4.064	4.066-	4.306-	
-263	4.362-	4.364	4.126-	4.128	4.130-	4.370-	
-264	4.426-	4.428	4.190-	4.192	4.194-	4.434-	
-265	4.490-	4.492	4.254-	4.256	4.258-	4.498-	
-266	4.554-	4.556	4.318-	4.320	4.322-	4.562-	
-267	4.618-	4.620	4.382-	4.384	4.386-	4.626-	
-268	4.682-	4.684	4.446-	4.448	4.450-	4.690-	
-269	4.746-	4.748	4.510-	4.512	4.514-	4.754-	
-270	4.810-	4.812	4.574-	4.576	4.578-	4.818-	
-271	4.874-	4.876	4.638-	4.640	4.642-	4.882-	
-272	4.938-	4.940	4.702-	4.704	4.706-	4.946-	
-273	5.002-	5.004	4.766-	4.768	4.770-	5.010-	
-274	5.066-	5.068	4.830-	4.832	4.834-	5.074-	
-275	5.130-	5.132	4.894-	4.896	4.898-	5.138-	
-276	5.194-	5.196	4.958-	4.960	4.962-	5.202-	
-277	5.258-	5.260	5.022-	5.024	5.026-	5.266-	
-278	5.322-	5.324	5.086-	5.088	5.090-	5.330-	
-279	5.386-	5.388	5.150-	5.152	5.154-	5.394-	
-280	5.450-	5.452	5.214-	5.216	5.218-	5.458-	
-281	5.514-	5.516	5.278-	5.280	5.282-	5.522-	
-282	5.578-	5.580	5.342-	5.344	5.346-	5.586-	
-283	5.642-	5.644	5.406-	5.408	5.410-	5.650-	
-284	5.706-	5.708	5.470-	5.472	5.474-	5.714-	
-285	5.770-	5.772	5.534-	5.536	5.538-	5.778-	
-286	5.834-	5.836	5.598-	5.600	5.602-	5.842-	
-287	5.898-	5.900	5.662-	5.664	5.666-	5.906-	
-288	5.962-	5.964	5.726-	5.728	5.730-	5.970-	
-289	6.026-	6.028	5.790-	5.792	5.794-	6.034-	
-290	6.090-	6.092	5.854-	5.856	5.858-	6.098-	
-291	6.154-	6.156	5.918-	5.920	5.922-	6.162-	
-292	6.218-	6.220	5.982-	5.984	5.986-	6.226-	
-293	6.282-	6.284	6.046-	6.048	6.050-	6.290-	
-294	6.346-	6.348	6.110-	6.112	6.114-	6.354-	
-295	6.410-	6.412	6.174-	6.176	6.178-	6.418-	
-296	6.474-	6.476	6.238-	6.240	6.242-	6.482-	
-297	6.538-	6.540	6.302-	6.304	6.306-	6.546-	
-298	6.602-	6.604	6.366-	6.368	6.370-	6.610-	
-299	6.666-	6.668	6.430-	6.432	6.434-	6.674-	
-300	6.730-	6.732	6.494-	6.496	6.498-	6.738-	
-301	6.794-	6.796	6.558-	6.560	6.562-	6.802-	
-302	6.858-	6.860	6.622-	6.624	6.626-	6.866-	
-303	6.922-	6.924	6.686-	6.688	6.690-	6.930-	
-304	6.986-	6.988	6.750-	6.752	6.754-	6.994-	
-305	7.050-	7.052	6.814-	6.816	6.818-	7.058-	
-306	7.114-	7.116	6.878-	6.880	6.882-	7.122-	
-307	7.178-	7.180	6.942-	6.944	6.946-	7.186-	
-308	7.242-	7.244	7.006-	7.008	7.010-	7.250-	
-309	7.306-	7.308	7.070-	7.072	7.074-	7.314-	
-310	7.370-	7.372	7.134-	7.136	7.138-	7.378-	
-311	7.434-	7.436	7.198-	7.200	7.202-	7.442-	
-312	7.498-	7.500	7.262-	7.264	7.266-	7.506-	
-313	7.562-	7.564	7.326-	7.328	7.330-	7.570-	
-314	7.626-	7.628	7.390-	7.392	7.394-	7.634-	
-315	7.690-	7.692	7.454-	7.456	7.458-	7.698-	
-316	7.754-	7.756	7.518-	7.520	7.522-	7.762-	
-317	7.818-	7.820	7.582-	7.584	7.586-	7.826-	
-318	7.882-	7.884	7.646-	7.648	7.650-	7.890-	
-319	7.946-	7.948	7.710-	7.712	7.714-	7.954-	
-320	8.010-	8.012	7.774-	7.776	7.778-	8.018-	
-321	8.074-	8.076	7.838-	7.840	7.842-	8.082-	
-322	8.138-	8.140	7.902-	7.904	7.906-	8.146-	
-323	8.202-	8.204	7.966-	7.968	7.970-	8.210-	
-324	8.266-	8.268	8.030-	8.032	8.034-	8.274-	
-325	8.330-	8.332	8.094-	8.096	8.098-	8.338-	

TABLE 3 - STANDARD GLAND DIMENSIONS IN INCHES (CONTINUED)

GLAND & AS 500 DASH NO.	* * * PISTON DIA. C	ROD MOUNTED BORE DIA. A	GLAND DIA. F	* * * ROD DIA. B	BORE MOUNTED BORE DIA. H	GLAND DIA. I	* * * GLAND WIDTH G
-326	1.985- 1.987	1.990- 1.992	1.618- 1.620	1.618- 1.620	1.623- 1.625	1.990- 1.992	.850-.265
-327	2.109- 2.111	2.114- 2.116	1.743- 1.745	1.743- 1.745	1.743- 1.745	2.114- 2.116	
-328	2.235- 2.237	2.240- 2.242	1.869- 1.871	1.869- 1.871	1.874- 1.876	2.240- 2.242	
-329	2.364- 2.366	2.369- 2.371	1.997- 1.999	1.997- 1.999	2.002- 2.004	2.369- 2.371	
-330	2.488- 2.490	2.493- 2.495	2.122- 2.124	2.122- 2.124	2.127- 2.129	2.493- 2.495	
-331	2.613- 2.615	2.618- 2.620	2.247- 2.249	2.247- 2.249	2.252- 2.254	2.618- 2.620	
-332	2.740- 2.742	2.745- 2.747	2.373- 2.375	2.373- 2.375	2.378- 2.380	2.745- 2.747	
-333	2.866- 2.868	2.871- 2.873	2.500- 2.502	2.500- 2.502	2.505- 2.507	2.871- 2.873	
-334	2.992- 2.994	2.997- 2.999	2.625- 2.627	2.625- 2.627	2.630- 2.632	2.997- 2.999	
-335	3.116- 3.118	3.121- 3.123	2.750- 2.752	2.750- 2.752	2.755- 2.757	3.121- 3.123	
-336	3.242- 3.244	3.247- 3.249	2.876- 2.878	2.876- 2.878	2.881- 2.883	3.247- 3.249	
-337	3.371- 3.373	3.376- 3.378	3.005- 3.007	3.005- 3.007	3.010- 3.012	3.376- 3.378	
-338	3.497- 3.499	3.502- 3.504	3.130- 3.132	3.130- 3.132	3.135- 3.137	3.502- 3.504	
-339	3.621- 3.623	3.626- 3.628	3.255- 3.257	3.255- 3.257	3.260- 3.262	3.626- 3.628	
-340	3.747- 3.749	3.752- 3.754	3.381- 3.383	3.381- 3.383	3.386- 3.388	3.752- 3.754	
-341	3.872- 3.874	3.877- 3.879	3.506- 3.508	3.506- 3.508	3.511- 3.513	3.877- 3.879	
-342	4.002- 4.004	4.007- 4.009	3.635- 3.637	3.635- 3.637	3.640- 3.642	4.007- 4.009	
-343	4.128- 4.130	4.133- 4.135	3.761- 3.763	3.761- 3.763	3.766- 3.768	4.133- 4.135	
-344	4.252- 4.254	4.257- 4.259	3.886- 3.888	3.886- 3.888	3.891- 3.893	4.257- 4.259	
-345	4.377- 4.379	4.382- 4.384	4.011- 4.013	4.011- 4.013	4.016- 4.018	4.382- 4.384	
-346	4.502- 4.504	4.507- 4.509	4.136- 4.138	4.136- 4.138	4.141- 4.143	4.507- 4.509	
-347	4.630- 4.632	4.635- 4.637	4.264- 4.266	4.264- 4.266	4.269- 4.271	4.635- 4.637	
-348	4.755- 4.757	4.760- 4.762	4.389- 4.391	4.389- 4.391	4.394- 4.396	4.760- 4.762	
-349	4.880- 4.882	4.885- 4.887	4.514- 4.516	4.514- 4.516	4.519- 4.521	4.885- 4.887	
-425	5.002- 5.005	5.009- 5.012	4.517- 4.520	4.517- 4.520	4.523- 4.526	5.008- 5.012	.380-.330
-426	5.127- 5.130	5.134- 5.137	4.642- 4.645	4.642- 4.645	4.648- 4.651	5.133- 5.137	
-427	5.253- 5.256	5.260- 5.263	4.768- 4.771	4.768- 4.771	4.774- 4.777	5.259- 5.263	
-428	5.378- 5.381	5.385- 5.388	4.893- 4.896	4.893- 4.896	4.899- 4.902	5.384- 5.388	
-429	5.507- 5.510	5.514- 5.517	5.022- 5.025	5.022- 5.025	5.028- 5.031	5.513- 5.517	
-430	5.632- 5.635	5.639- 5.642	5.147- 5.150	5.147- 5.150	5.153- 5.156	5.638- 5.642	
-431	5.758- 5.761	5.765- 5.768	5.273- 5.276	5.273- 5.276	5.279- 5.282	5.764- 5.768	
-432	5.883- 5.886	5.890- 5.893	5.398- 5.401	5.398- 5.401	5.404- 5.407	5.889- 5.893	
-433	6.008- 6.011	6.015- 6.018	5.523- 5.526	5.523- 5.526	5.529- 5.532	6.014- 6.018	
-434	6.133- 6.136	6.140- 6.143	5.648- 5.651	5.648- 5.651	5.654- 5.657	6.139- 6.143	
-435	6.259- 6.262	6.266- 6.269	5.774- 5.777	5.774- 5.777	5.780- 5.783	6.265- 6.269	
-436	6.384- 6.387	6.391- 6.394	5.899- 5.902	5.899- 5.902	5.905- 5.908	6.390- 6.394	
-437	6.509- 6.512	6.516- 6.519	6.024- 6.027	6.024- 6.027	6.030- 6.033	6.515- 6.519	
-438	6.634- 6.637	6.638- 6.641	6.149- 6.152	6.149- 6.152	6.155- 6.158	6.640- 6.643	
-439	6.759- 6.762	6.763- 6.766	6.274- 6.277	6.274- 6.277	6.280- 6.283	6.769- 6.772	
-440	6.884- 6.887	6.885- 6.888	6.400- 6.403	6.400- 6.403	6.406- 6.409	6.889- 6.892	

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TABLE 3 - STANDARD GLAND DIMENSIONS IN INCHES (CONTINUED)

GLAND & AS 568 DASH NO.	* * PISTON DIA. C	* * BORE DIA. A	* * GLAND DIA. F	* * ROD DIA. B	* * BORE MOUNTED BORE DIA. H	* * GLAND DIA. E	* * GLAND WIDTH G
-441	7.514-7.517	7.521-7.524	7.029-7.032	7.029-7.032	7.035-7.038	7.520-7.524	.326-.337
-442	7.770-7.773	7.777-7.780	7.285-7.288	7.285-7.288	7.291-7.294	7.776-7.780	
-443	8.020-8.023	8.027-8.030	7.535-7.538	7.535-7.538	7.541-7.544	8.026-8.030	
-444	8.271-8.274	8.278-8.281	7.786-7.789	7.786-7.789	7.792-7.795	8.277-8.281	
-445	8.521-8.524	8.528-8.531	8.036-8.039	8.036-8.039	8.042-8.045	8.527-8.531	
-446	9.034-9.035	9.039-9.042	8.547-8.550	8.547-8.550	8.553-8.556	9.038-9.042	
-447	9.533-9.536	9.540-9.543	9.048-9.051	9.048-9.051	9.054-9.057	9.539-9.543	
-448	10.034-10.037	10.041-10.044	9.549-9.552	9.549-9.552	9.555-9.558	10.040-10.044	
-449	10.535-10.538	10.542-10.545	10.050-10.053	10.050-10.053	10.056-10.059	10.541-10.545	
-450	11.041-11.044	11.048-11.051	10.556-10.559	10.556-10.559	10.562-10.565	11.047-11.051	
-451	11.542-11.545	11.549-11.552	11.057-11.060	11.057-11.060	11.063-11.066	11.548-11.552	
-452	12.043-12.046	12.050-12.053	11.558-11.561	11.558-11.561	11.564-11.567	12.049-12.053	
-453	12.544-12.547	12.551-12.554	12.059-12.062	12.059-12.062	12.065-12.068	12.550-12.554	
-454	13.045-13.048	13.052-13.055	12.560-12.563	12.560-12.563	12.566-12.569	13.051-13.055	
-455	13.546-13.549	13.553-13.556	13.061-13.064	13.061-13.064	13.067-13.070	13.552-13.556	
-456	14.057-14.060	14.064-14.067	13.572-13.575	13.572-13.575	13.578-13.581	14.063-14.067	
-457	14.558-14.561	14.565-14.568	14.073-14.076	14.073-14.076	14.079-14.082	14.564-14.568	
-458	15.059-15.062	15.066-15.069	14.574-14.577	14.574-14.577	14.580-14.583	15.065-15.069	
-459	15.560-15.563	15.567-15.570	15.075-15.078	15.075-15.078	15.081-15.084	15.566-15.570	
-460	16.061-16.064	16.068-16.071	15.576-15.579	15.576-15.579	15.582-15.585	16.067-16.071	

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TABLE 3 - STANDARD GLAND DIMENSIONS IN MILLIMETRES

GLAND AS 568 DASH NO.	ROD MOUNTED		GLAND DIA.		ROD DIA.		BORE MOUNTED		GLAND DIA.		GLAND WIDTH
	A	B	F	G	E	H	I	J	K	L	
-006	5.791	5.817	3.048	3.073	3.048	3.073	3.124	3.150	5.842	5.867	2.54-2.79
-007	6.004	6.030	3.835	3.861	3.835	3.861	3.912	3.937	6.655	6.680	
-008	7.417	7.442	4.623	4.648	4.623	4.648	4.699	4.724	7.468	7.493	
-009	8.230	8.255	5.436	5.461	5.436	5.461	5.512	5.537	8.280	8.306	
-010	9.042	9.068	6.223	6.248	6.223	6.248	6.299	6.325	9.093	9.119	
-011	10.043	10.068	7.098	7.123	7.098	7.123	7.174	7.200	10.693	10.719	
-012	12.268	12.293	9.398	9.423	9.398	9.423	9.474	9.500	12.294	12.319	
-013	13.843	13.868	10.973	11.000	10.973	11.000	11.051	11.077	13.868	13.894	
-014	15.418	15.443	12.573	12.598	12.573	12.598	12.649	12.675	15.469	15.494	
-015	17.018	17.043	14.199	14.224	14.199	14.224	14.275	14.301	17.069	17.120	
-016	18.644	18.669	15.850	15.900	15.850	15.900	15.926	15.977	18.694	18.745	
-017	20.218	20.244	17.424	17.475	17.424	17.475	17.501	17.551	20.269	20.320	
-018	21.844	21.869	19.025	19.075	19.025	19.075	19.101	19.152	21.895	21.946	
-019	23.444	23.470	20.625	20.676	20.625	20.676	20.701	20.752	23.495	23.546	
-020	25.044	25.070	22.225	22.276	22.225	22.276	22.301	22.352	25.095	25.146	
-106	8.839	8.890	4.572	4.623	4.572	4.623	4.674	4.724	8.915	8.966	3.43-3.68
-107	9.678	9.728	5.365	5.436	5.365	5.436	5.486	5.537	9.754	9.804	
-108	10.465	10.516	6.172	6.223	6.172	6.223	6.274	6.325	10.541	10.592	
-109	12.090	12.141	7.747	7.798	7.747	7.798	7.849	7.899	12.167	12.217	
-110	13.691	13.741	9.347	9.398	9.347	9.398	9.449	9.500	13.767	13.818	
-111	15.291	15.342	10.922	10.973	10.922	10.973	11.024	11.074	15.367	15.418	
-112	16.891	16.942	12.522	12.573	12.522	12.573	12.624	12.675	16.967	17.018	
-113	18.517	18.567	14.148	14.199	14.148	14.199	14.249	14.300	18.593	18.644	
-114	20.142	20.193	15.799	15.850	15.799	15.850	15.900	15.951	20.218	20.269	
-115	21.742	21.793	17.374	17.424	17.374	17.424	17.475	17.526	21.819	21.869	
-116	23.343	23.393	18.974	19.025	18.974	19.025	19.075	19.126	23.419	23.470	
-117	24.968	25.019	20.599	20.650	20.599	20.650	20.701	20.752	25.044	25.095	
-118	26.568	26.619	22.200	22.250	22.200	22.250	22.301	22.352	26.645	26.695	
-119	28.178	28.169	23.774	23.825	23.774	23.825	23.876	23.927	28.194	28.245	
-120	29.743	29.794	25.375	25.425	25.375	25.425	25.476	25.527	29.820	29.870	
-121	31.318	31.369	26.949	27.000	26.949	27.000	27.051	27.102	31.394	31.445	
-122	32.918	32.969	28.550	28.600	28.550	28.600	28.651	28.702	32.995	33.045	
-123	34.544	34.595	30.175	30.226	30.175	30.226	30.277	30.328	34.620	34.671	
-124	36.144	36.195	31.775	31.826	31.775	31.826	31.877	31.928	36.220	36.271	
-125	37.744	37.795	33.376	33.426	33.376	33.426	33.477	33.528	37.821	37.871	
-202	12.040	12.090	6.096	6.147	6.096	6.147	6.198	6.248	12.141	12.192	4.44-4.70
-203	13.640	13.691	7.671	7.722	7.671	7.722	7.773	7.823	13.741	13.792	
-204	15.265	15.316	9.271	9.322	9.271	9.322	9.373	9.423	15.367	15.418	
-205	16.866	16.916	10.846	10.897	10.846	10.897	10.947	10.998	16.967	17.018	

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