SAE Aerospace
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AEROSPACE STANDARD

SAE AS5104 | REV. A

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Superseding AS5104

Plugs, Port Connection, Ring Locked, AS1300 Port, Installation and Removal of

RATIONALE

AS5104A has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

This SAE Aerospace Standard (AS) provides the essential minimum design, installation, and removal standard for AS5103 plugs and is applicable when specified on engineering drawings, or in procurement documents.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AS568	Aerospace Size Standard for O-Rings
AS1300	Port-Ring Locked Fluid Connection Type, Standard Dimensions for
AS5103	Fitting Assembly, Plug, Ring Locked Port Connection, 4000 psi and 5000 psi

3. GENERAL DESIGN INFORMATION:

3.1 These plugs provide a semi-permanent closure primarily for use in fluid systems with operating pressures per Table 1 and compatible with titanium at -65 to +450 °F temperature range:

TABLE 1 - System Working Pressures

Standard Number	System Working Pressure (psi) Operating	System Working Pressure (psi) Burst	Size
AS5103	4,000	16,000	All Sizes
AS5103	5,000	20,000	04, 06, 08, 10, 12, and 16

3.2 Plugs per AS5103 and installed per this document into ports per AS1300 shall have a stand-off per dimension “P”, Figure 1 and Table 2.

3.3 O-ring size per Table 2 and per AS568 must be used. The O-ring compound shall be specified by the using design activity and shall be selected based on system fluid and temperature.

3.4 The lockring is driven into the mating port serrations after the plug has been torqued. This eliminates the necessity of lock wiring the plug.

3.5 Plug removal is accomplished by lifting the lockring out of the port using a removal tool.

4. DESIGN REQUIREMENTS:

4.1 Minimum data to be specified on engineering drawing or specification.

4.1.1 Port diameter to be at least the minimum specified in AS1300.

4.1.2 Location of port.

4.1.3 Specific port size per AS1300. If tap drill depth is not through, then specify control dimensions.

4.1.4 Specific plug size per AS5103.

4.1.5 Specific O-ring size and compound (see 3.3).

4.1.6 Install plug per this document.

4.1.7 Corrosion protection is specified in 5.2.4. If materials or fluids require primer different from zinc chromate primer or if an additional sealant is required, so specify.

4.1.8 Pressure testing of individual units is specified in 6.1. Testing other than that shown shall be specified.

4.1.9 The boss material for a 4,000 and 5,000 psi system must have a minimum shear strength per Table 3 to resist the axial load being generated from a respective burst pressure of 16,000 and 20,000 psi (based on thread minimum shear engagement area shown).

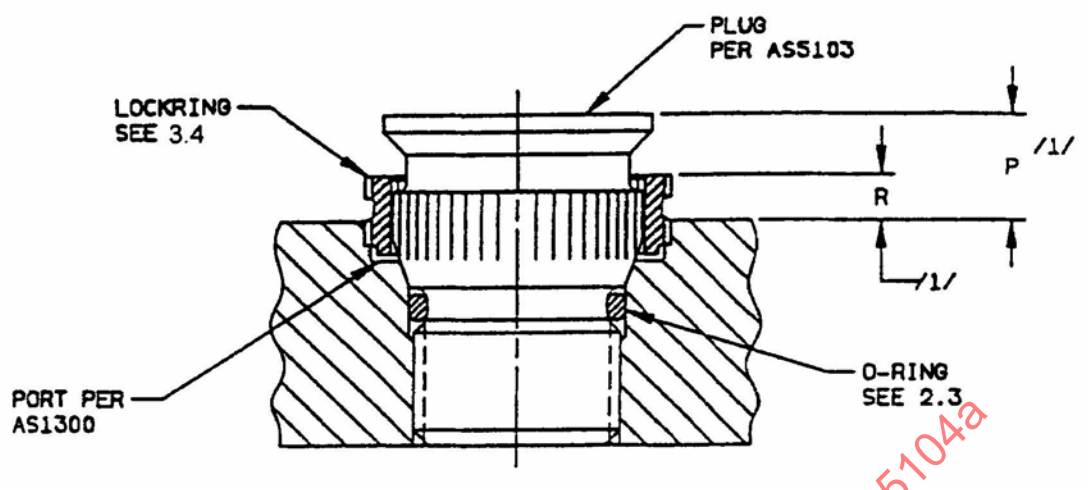

FIGURE 1 - Installed Plug

TABLE 2 - Installation Dimensions and Torque Values

AS1300 Port Dash Number	AS5103 Plug Dash Number	O-ring Size See 3.3	P /1/ ±.020	R /1/ Max	Installation Torque lbf in
02	02	AS568-007	.253	.124	16- 21
03	03	AS568-008	.253	.124	38- 45
04	04	AS568-010	.253	.124	60- 100
05	05	AS568-011	.261	.124	100- 120
06	06	AS568-012	.279	.130	180- 245
08	08	AS568-014	.279	.130	430- 510
10	10	AS568-016	.279	.130	600- 680
12	12	AS568-116	.279	.140	855- 945
14	14	AS568-118	.289	.140	995-1105
16	16	AS568-120	.289	.140	1140-1260
20	20	AS568-123	.269	.140	1520-1680
24	24	AS568-128	.290	.140	1900-2100
32	32	AS568-137	.389	.140	2660-2940

/1/ "P" and "R" dimensions are for design purposes only and represent final stand-off dimensions. Do not use as installation dimensions.

2. These plugs require special installation tools. These tools are available from Alcoa Fastening Systems, Fullerton, CA – Cage Code: 66776 or Equivalent alternate sources (Faber Enterprises, Canoga Park, CA - Cage Code: 14397, and McKinnon Industries, a Shur-Lok Company, Irvine, CA – Cage Code: 65085).

TABLE 3 - Axial Loads and Minimum Shear Strength of Boss Material

Port Number	L /1/ Total Thread Minimum Shear Engagement Area in^2	Port "D" Max Per AS1300 in	M /2/ Axial Load on Plug Developed by 16,00 psi Burst Pressure lbf 4,000 psi System	N /3/ Boss Material Minimum Fsu Required to Resist Axial Load (psi) for 16,000 psi 4,000 psi System	M /2/ Axial Load on Plug Developed by 20,000 psi Burst Pressure lbf 5,000 psi System	N /3/ Boss Material Minimum Fsu Required to Resist Axial Load (psi) for 20,000 psi 5,000 psi System
AS1300-02	.0417	.256	824	19,760	---	---
AS1300-03	.0802	.288	1,042	13,005	---	---
AS1300-04	.0989	.341	1,461	14,773	1,827	18,473
AS1300-05	.1406	.403	2,041	14,517	---	---
AS1300-06	.1734	.466	2,729	15,739	3,411	19,671
AS1300-08	.2610	.584	4,286	16,422	5,357	20,525
AS1300-10	.3807	.727	6,642	17,447	8,302	21,807
AS1300-12	.4550	.901	10,201	22,420	12,752	28,026
AS1300-14	.6132	1.032	13,384	21,827	---	---
AS1300-16	.7312	1.164	17,026	23,285	21,283	29,107
AS1300-20	.8559	1.389	24,245	28,327	---	---
AS1300-24	1.2328	1.666	34,879	28,293	---	---
AS1300-32	2.1634	2.204	61,043	28,216	---	---

/1/ Minimum shear engagement area shown is the assembled dimensional value for the overall engaged area of mating port threads (port threads full depth of plug). It does not represent a dimension of either of the members in an unassembled condition.

/2/ Axial Load = Area x Burst Pressure = $((\pi D^2) \div 4)$ x Burst Pressure

/3/ Fsu MIN = Axial Load ÷ Area = M ÷ L

5. INSTALLATION OF PLUG AS5103 INTO PORT AS1300:

5.1 O-ring Installation:

5.1.1 Place the O-ring tool over the thread of the plug. Submerge the plug, O-ring tool, and O-ring in the fluid to be used in the working system, or a lubricant compatible with the system fluid and all components. Slide the O-ring over the O-ring tool and onto the plug. Be sure that the O-ring is not twisted and is properly seated in the groove of the plug. See Figure 2.

5.1.2 Remove the O-ring tool.

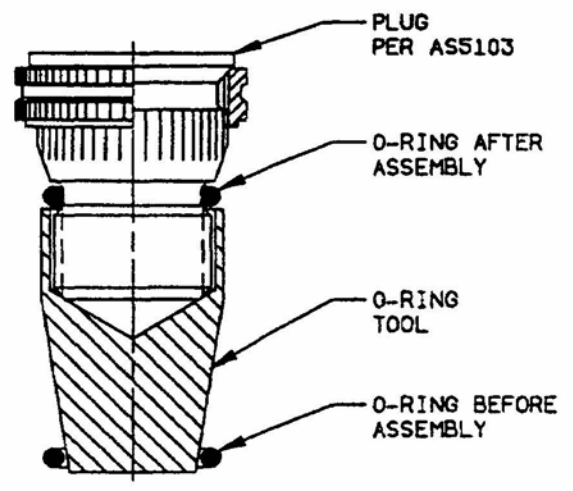

FIGURE 2 - O-ring Installation

5.2 Installation of Plug Assembly Into Port:

5.2.1 Lubricate the internal surfaces of the port and the entire plug assembly using the same fluid or lubricant as specified in 5.1.1. Scratches, dings, or rough spots are not allowed in O-ring contact area on the plug or in the port.

5.2.2 Insert thread of the plug into port by hand using a clockwise rotation until the plug is seated. To avoid possible O-ring damage, the plug should not be rotated in a counterclockwise direction.

5.2.3 Using the applicable wrench, engage the serrations of the tool with the external serrations of the lockring per Figure 3.

Place a torque wrench of the proper size over the hex of the wrench and apply a torque equal to the minimum value specified in Table 2. Note the relationship of the lockring serrations with respect to the prebroached serrations in the port. If they match, proceed to 5.2.4. If the lockring serrations do not match the prebroached serrations in the port, continue to slowly torque the plug toward the maximum value allowed in Table 2 until the serrations match. This will normally take between 3 and 8° of turning, the maximum value need not be reached if the serrations align themselves prior to that value. Do not exceed maximum torque values.

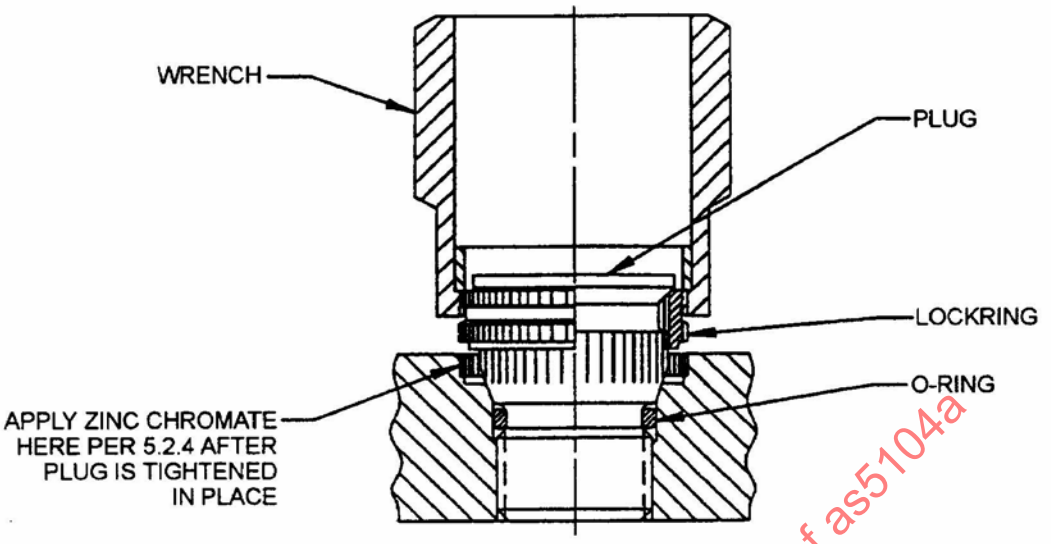

FIGURE 3 - Torquing Plug Assembly

5.2.4 Apply enough zinc chromate primer (TT-P-1757) with a brush or small syringe to the counterbore area of the port and below the plug lockring so primer will be extruded out between external serrations of the lockring and serrations in the port when lockring is installed.

NOTE: Using design activity may specify another primer in place of, or in addition to, zinc chromate (see 4.1.7).

5.2.5 While the zinc chromate (or other primer) applied per 5.2.4 is still wet, place the applicable size drive tool over the upper end of the plug per Figure 4. When it is properly located it will rest on the lockring. A hammer, arbor, or hydraulic press may be used to press the lockring into the boss. Installation is complete when the tool bottoms on the surface of the boss.

CAUTION: When using a press, any sudden increase in pressure prior to bottoming may indicate that the lockring serrations and the port serrations are not aligned. If this occurs, remove the drive tool. Lift the lockring per 7.2. Tighten plug clockwise per 5.2.3 until serrations in port and the external serrations on the lockring are aligned. Reinstall lockring and remove excess primer from surface of port and lockring.

6. PRESSURE TESTING:

6.1 A pressure test of the unit may be conducted at this point. Pressurize the unit to 1.5 times the operating pressure for 3 min. There shall be zero leakage. The test fluid may be water or suitable hydraulic fluid.

NOTE: The using design activity may require testing other than that shown. See 4.1.8.