Designation: F721 – 81 (Reapproved 2014)

An American National Standard

Standard Specification for Gage Piping Assemblies[1]

This standard is issued under the fixed designation F721; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers details of gage piping assemblies for pressure gages with optional provisions for additional gages, pressure switches, transmitters, and so forth, for use with steam, steam drains, feed water, condensate, fresh water, salt water, compressed air, fuel oil, and lubricating oil systems.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A105/A105M Specification for Carbon Steel Forgings for Piping Applications

A106/A106M Specification for Seamless Carbon Steel Pipe for High-Temperature Service

A108 Specification for Steel Bar, Carbon and Alloy, Cold-Finished

A182/A182M Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

A276 Specification for Stainless Steel Bars and Shapes

A335/A335M Specification for Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service

A576 Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality

B16/B16M Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines

B61 Specification for Steam or Valve Bronze Castings

B62 Specification for Composition Bronze or Ounce Metal Castings

B75 Specification for Seamless Copper Tube

B124/B124M Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes

B453/B453M Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Rod, Bar, and Shapes

B466/B466M Specification for Seamless Copper-Nickel Pipe and Tube

2.2 *ANSI Standards:*[3]

B16.11 Forged Steel Fittings, Socket Weld, and Threaded

B16.15 Cast Bronze Threaded Fittings

2.3 *Federal Specifications:*[4]

QQ-S-637 Steel Bar, Carbon, Cold Finished (Standard Quality, Free Machining)

QQ-S-763 Steel Bars, Wire, Shapes, and Forgings, Corrosion-Resisting

3. List of Assemblies

3.1 This specification incorporates 13 gage piping assemblies as described in Table 1.

4. General Requirements and Guidelines

4.1 Fig. 1 shows a typical piping assembly for bottom-connected gages and Fig. 2 a typical piping assembly for back-connected gages.

4.2 A siphon shall be used as shown in all gage applications for steam systems to maintain a protective water seal between the gage and the steam supply.

4.3 Each assembly includes a test connection beyond the gage valve which consists of a tee with a ¼-in. NPT threaded plug in the branch. The plug is removable for the purpose of installing a test gage for calibration. As an alternative, a gage valve that incorporates a built-in test connection integral with the valve may be substituted for the gage valve and test tee.

4.4 Root connections should be kept to a minimum by connecting other instruments at the tee between the root and gage valves. There is no limit to the number of dead-end-type instruments that can be served from a single root connection.

[1] This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.11 on Machinery and Piping Systems.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

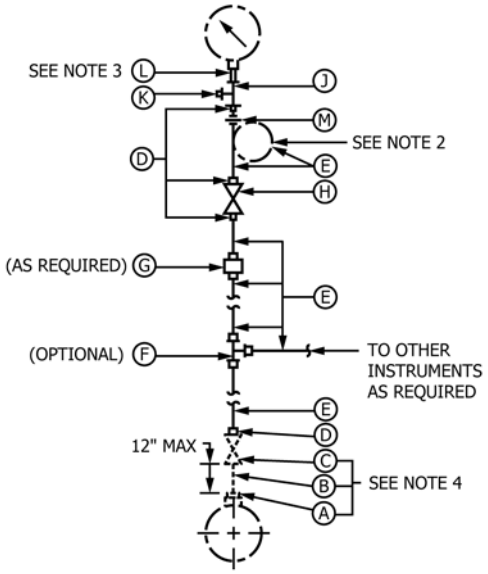
[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

[4] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

TABLE 1 Gage Piping Assemblies[A,B]

Assembly No.	Service	Maximum Pressure, psi (kPa)	Maximum Temperature, °F (°C)
1	Superheated steam	1125 (7757)	960 (516)
2	High-pressure desuperheated steam and high-pressure extractions	1100 (7584)	580 (304)
3	Low-pressure extractions, gland seal, auxiliary exhaust, and 150-psig (1034-MPa) steam	900 (6205)	563 (295)
4	Low-pressure steam	125 (861)	353 (178)
5	Boiler feed discharge	1500 (10 342)	450 (232)
6	Feed suction and condensate	165 (1138)	300 (149)
7	Compressed air above 165 psi (1.14 MPa)	900 (6205)	563 (295)
8	Compressed air	165 (1138)	300 (149)
9	Fresh and potable water	200 (1379)	150 (66)
10	Main and auxiliary salt water circulating, salt water service, and wet firemain	200 (1379)	150 (66)
11	Dry firemain and deck washdown	200 (1379)	150 (66)
12	Fuel oil and lube oil	900 (6205)	250 (121)
13	Diesel oil	900 (6205)	563 (295)

[A] For typical piping assemblies see Fig. 1 and Fig. 2.
[B] For materials required see Table 2 and Table 3.



NOTE 1—For material identification see Table 3.
NOTE 2—Use siphon for Assemblies 1 through 4.
NOTE 3—For pulsation dampener requirements see 4.6 and Table 3.
NOTE 4—Piping through the root valve is normally detailed on the piping arrangement drawings but is shown here as an aid in establishing material requirements.

FIG. 1 Typical Piping Assembly for Bottom-Connected Gages

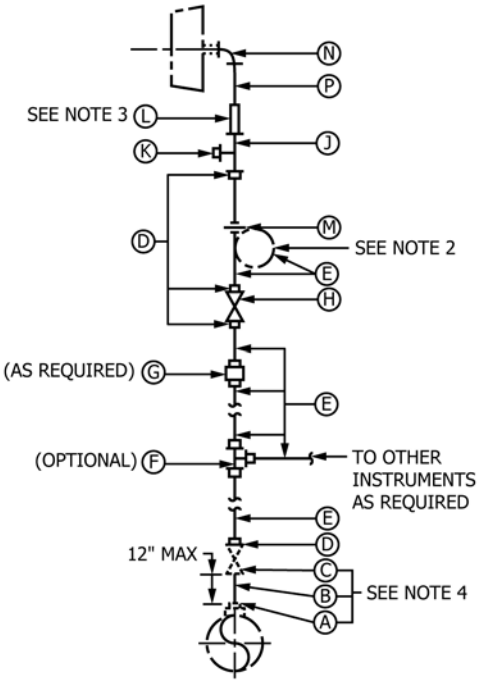


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FIG. 2 Typical Piping Assembly for Back-Connected Gages

However, each instrument should have its own shutoff valve and, if desired, a test tee may be fitted at each instrument.

4.5 Two shutoff valves are generally used in each assembly, a root valve and a gage cutout valve. The gage valve may be eliminated and a single shutoff valve may serve as both a root and gage valve provided the gage is within 6 ft (1.8 m) of the root connection and readily accessible and the single shutoff valve is fitted within 12 in. (300 mm) of the root connection.

4.6 Pulsation dampeners are shown for certain assemblies between the test tee and gage and should be used in other assemblies in which the gage may be subjected to pulsating pressures, as from a reciprocating pump, air compressor, quick-acting solenoid valves, and high-frequency vibrations of high-pressure feed pumps.

4.7 Isolation devices (diaphragm seals) should be installed where system fluid viscosity and fuel isolation is a consideration.

5. Services, Pressure/Temperature Limitations, and Material

5.1 Service and pressure/temperature limitations for each assembly are listed in Table 1 and materials are listed in Table 2 and Table 3. Other services, pressure/temperatures, and materials may be used provided the materials selected are compatible with the intended system media, and the pressure/temperature limitations do not exceed the limitations of the material chosen.

TABLE 2 Material List

Part No.	Nominal Size, in.	Description	Material	Specification
1	½ NPS by ½ FPT	Globe valve, thread by socket weld	alloy steel (Cr-Mo)	ASTM A182/A182M, F11
2	¼ FPT	Globe needle valve, thread, bar stock type	carbon steel	QQ-S-637, Grades 1213 and 1215
3	¼ NPS by ¼ FPT	Globe needle valve, thread by socket weld, bar stock type	carbon steel	QQ-S-637, 1213 and 1215
4	½ NPS by ½ FPT	Globe needle valve, thread by socket weld, bar stock type	carbon steel	QQ-S-637, 1213 and 1215
5	¼ NPS	Globe needle valve, socket weld, bar stock type	carbon steel	QQ-S-637, 1213 and 1215
6	¼ NPS by ¼ FPT	Globe needle valve, thread by socket weld, bar stock type	316 stainless steel	QQ-S-763
7	¼ FPT	Globe needle valve, thread, bar stock type	316 stainless steel	QQ-S-763
8	¼ NPS by ¼ FPT	Globe needle valve, thread by silbraze	bronze	ASTM B61
9	¼ FPT	Globe needle valve, thread	bronze	ASTM B61
10	½ NPS	Pipe, Schedule 80	alloy steel (Cr-Mo)	ASTM A335/A335M, P11
11	¼ NPS	Pipe, Schedule 80	carbon steel	ASTM A106/A106M, Grade B
12	½ NPS	Pipe, Schedule 80	carbon steel	ASTM A106/A106M, Grade B
13	¼ NPS	Pipe, Schedule 80	copper-nickel 90-10	ASTM B466/B466M, Alloy 706
14	¼ OD	Tubing, 0.065-in. (1.65-mm) wall	carbon steel	ASTM A106/A106M, Grade B
15	¼ OD	Tubing, 0.035-in. (0.89-mm) wall	copper	ASTM B75
16	¼ OD by ½ MPT	Connector, tube by thread, compression type	carbon steel	ASTM A108, Grade 12L14
17	½ by ¼ NPS	Reducing insert, socket weld	carbon steel	ASTM A105/A105M, ANSI B16.11
18	¼ FPT	Tee, thread	carbon steel	ASTM A105/A105M, ANSI B16.11
19	¼ MPT	Plug, thread	carbon steel	ASTM A105/A105M, ANSI B16.11
20	¼ NPS	Tee, socket weld	carbon steel	ASTM A105/A105M, ANSI B16.11
21	¼ NPS	Union, socket weld	carbon steel	ASTM A105/A105M, ANSI B16.11
22	¼ NPS	Coupling	carbon steel	ASTM A105/A105M, ANSI B16.11
23	¼ OD by ¼ MPT	Connector, tube by thread, compression type	carbon steel	ASTM A108, Grade 12L14
24	¼ OD	Tee, tube, compression type	carbon steel	ASTM A576, Grade 12L14
25	¼ OD	Union, tube, compression type	carbon steel	ASTM A108, Grade 12L14
26	¼ FPT	Tee thread	bronze	ASTM B62, ANSI B16.15
27	¼ MPT	Plug, thread	bronze	ASTM B62, ANSI B16.15
28	¼ OD	Union, tube, compression type	brass	ASTM B453/B453M, Alloy 345; ASTM B16/B16M, Alloy 360
29	¼ OD by ¼ MPT	Connector, tube by thread, compression type	brass	ASTM B453/B453M, Alloy 345; ASTM B16/B16M, Alloy 360
30	¼ OD	Tee, tube, compression type	brass	ASTM B124/B124M, Alloy 377
31	¼ OD by ¼ MPT	Connector, tube by thread, compression type	316 stainless steel	ASTM A276
32	¼ OD	Tee, tube, compression type	316 stainless steel	ASTM A276
33	¼ MPT by ¼ FPT	Pulsation dampener, thread	316 stainless steel	commercial
34	¼ FPT	90° elbow, thread	carbon steel	ASTM A105/A105M, ANSI B16.11
35	¼ FPT	90° elbow, thread	bronze	ASTM B62, ANSI B16.15
36	¼ OD	Union, tube, compression type	316 stainless steel	ASTM A276

TABLE 3 Material Part Numbers Used in Gage Piping Assemblies[A]

Assembly[B] No.	Component Identification Letter (See Fig. 1 for Bottom-Connected Gages or Fig. 2 for Back-Connected Gages)													
	A	B	C	D	E	F	G	H	J	K	L	M	N[C]	P[C]
1	...	10	1	16	14	24	25	2	18	19	...	...	34	11
2	...	12	4	16	14	24	25	2	18	19	...	...	34	11
3	...	11	3	23	14	24	25	2	18	19	...	...	34	11
4	...	11	3	23	15	24	25	2	26	27	...	...	34	11
5	17	11	3	23	14	24	25	2	18	19	33	...	34	11
6	...	11	3	23	15	24	25	2	26	27	...	...	34	11
7	...	11	3	23	14	24	25	2	18	19	33	...	34	11
8	...	13	3	23	15	24	25	2	26	27	33	...	34	13
9	...	13	8	29	15	30	28	9	26	27	...	...	35	13
10	...	13	6	31	15	32	36	7	26	27	...	...	35	13
11	...	11	8	31	15	32	36	9	26	27	...	...	35	13
12	...	11	5	...	11	20	22	5	18	19	...	21	34	11
13	...	11	3	23	14	24	25	2	18	19	...	...	34	11

[A] For description of material part numbers see Table 2.
[B] For service and pressure/temperature limitations of each assembly see Table 1.
[C] "N" and "P" are for use with back-connected gages only.