



Standard Specification for Wrought Carbon Steel Sleeve-Type Pipe Couplings¹

This standard is issued under the fixed designation F682; 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 wrought carbon steel sleeve-type pipe couplings suitable for joining carbon steel pipes.

1.2 Type I couplings are intended for use on all schedules of pipe in which the pipe wall thickness does not exceed the wall thickness of standard weight pipe. Type II couplings are intended for use on all schedules of pipe in which the pipe wall thickness does not exceed the wall thickness of extra strong pipe.

1.3 This specification does not cover cast steel couplings.

NOTE 1—The values stated in inch-pound units are to be regarded as the standard.

NOTE 2—See [Appendix X1](#) for rationale used to develop this specification.

2. Referenced Documents

2.1 *ASTM Standards:*²

[A53/A53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless](#)

[A106/A106M Specification for Seamless Carbon Steel Pipe for High-Temperature Service](#)

[A234/A234M Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service](#)

[A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)

[E59 Practice for Sampling Steel and Iron for Determination of Chemical Composition \(Withdrawn 1996\)](#)³

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.

Current edition approved Aug. 1, 2014. Published September 2014. Originally approved in 1980. Last previous edition approved in 2008 as F682 – 82a (2008). DOI: 10.1520/F0682-82AR14.

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 The last approved version of this historical standard is referenced on www.astm.org.

2.2 *MMS Standards:*⁴

[MSS SP-25 Standard Marking System for Valves, Fittings, Flanges, and Unions](#)

2.3 *ASME Boiler and Pressure Vessel Codes:*⁵

[Section VIII Unfired Pressure Vessels](#)

[Section IX Welding Qualifications](#)

2.4 *Federal Regulations:*⁶

[Title 46 Code of Federal Regulations \(CFR\), Shipping, Parts 41 to 69](#)

2.5 *ANSI Standards:*⁷

[B16.5 Pipe Flanges and Flange Fittings](#)

3. Classification

3.1 Couplings are furnished in two types as follows:

3.1.1 *Type I—Couplings* (see [1.2](#)).

3.1.2 *Type II—Couplings* (see [1.2](#)).

NOTE 3—Type II couplings may be used in place of Type I couplings for all schedules of pipe in which the pipe wall thickness does not exceed the wall thickness of standard weight piping through 18 in. or Schedule 40 piping through 16 in.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Quantity (number of couplings of each size and type),

4.1.2 Name of material (sleeve-type pipe couplings),

4.1.3 Size (nominal, see [Table 1](#) and [Table 2](#) and [Fig. 1](#)),

4.1.4 Type (see [3.1](#)),

4.1.5 ASTM designation and date of issue.

5. Materials and Manufacture

5.1 *Materials*—The couplings shall be manufactured from material having a chemical composition conforming to the requirements of [7.1](#) and with the mechanical properties of [Section 9](#).

⁴ Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602, <http://www.mss-hq.org>.

⁵ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁶ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil>.

⁷ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

TABLE 1 Dimensions for Type I Couplings (See Fig. 1)

Nominal Size, in.	Dimension A, Inside Diameter, in. (mm) ^A	Dimension B, Outside Diameter, in. (mm) ^B	Dimension C, Thickness, min, in. (mm)	Dimension D, Length, in. (mm) ^C
¼	0.589 (15.0)	0.875 (22.2)	0.143 (3.6)	1 (25)
⅜	0.724 (18.4)	0.992 (25.2)	0.134 (3.4)	1¼ (32)
½	0.889 (22.6)	1.201 (30.5)	0.156 (4.0)	1¼ (32)
¾	1.099 (27.9)	1.401 (35.6)	0.151 (3.8)	1½ (38)
1	1.364 (34.6)	1.710 (43.4)	0.173 (4.4)	1½ (38)
1¼	1.709 (43.4)	2.057 (52.2)	0.174 (4.4)	1½ (38)
1½	1.949 (49.5)	2.306 (58.6)	0.179 (4.5)	1½ (38)
2	2.424 (61.6)	2.807 (71.3)	0.192 (4.9)	1½ (38)
2½	2.924 (74.3)	3.444 (87.5)	0.260 (6.6)	1½ (38)
3	3.545 (90.0)	4.105 (104.3)	0.280 (7.1)	1½ (38)
3½	4.070 (103.4)	4.633 (117.7)	0.282 (7.2)	2 (51)
4	4.570 (116.1)	5.164 (131.2)	0.297 (7.5)	2 (51)
5	5.660 (143.8)	6.286 (159.7)	0.313 (8.0)	2 (51)
6	6.720 (170.7)	7.409 (188.2)	0.345 (8.8)	2 (51)
8	8.720 (221.5)	9.527 (242.0)	0.404 (10.3)	2½ (64)
10	10.880 (276.4)	11.875 (301.6)	0.498 (12.6)	2½ (64)
12	12.880 (327.2)	13.800 (350.5)	0.460 (11.7)	2½ (64)
14	14.140 (359.2)	15.050 (382.3)	0.455 (11.6)	2½ (64)
16	16.160 (410.5)	17.050 (433.1)	0.445 (11.3)	2½ (64)
18	18.180 (461.8)	19.050 (483.9)	0.435 (11.0)	2½ (64)

^A Tolerances shall be (1) Sizes through 3 in. incl: +0.000, -0.010 in. (+0.000, -0.254 mm); (2) Sizes 3½ through 10 in. incl: +0.030, -0.000 in. (+0.762, -0.000 mm); and (3) Sizes above 10 in.: +0.060, -0.000 in. (+1.524, -0.000 mm).

^B Tolerances shall be (1) Sizes through 10 in. incl: +0.125, -0.000 in. (+3.175, -0.000 mm) and (2) Sizes above 10 in.: +1.000, -0.000 in. (+25.4, -0.000 mm).

^C Tolerances for all sizes shall be +0.250, -0.000 in. (+6.4, -0.000 mm).

TABLE 2 Dimensions for Type II Couplings (See Fig. 1)

Nominal Size, in.	Dimension A, Inside Diameter, in. (mm) ^A	Dimension B, Outside Diameter, in. (mm) ^B	Dimension C, Thickness, min, in. (mm)	Dimension D, Length, in. (mm) ^C
¼	0.589 (15.0)	1.055 (26.8)	0.233 (5.9)	1 (25)
⅜	0.724 (18.4)	1.156 (29.4)	0.216 (5.5)	1¼ (32)
½	0.889 (22.6)	1.369 (34.8)	0.240 (6.1)	1¼ (32)
¾	1.099 (27.9)	1.557 (39.5)	0.229 (5.8)	1½ (38)
1	1.364 (34.6)	1.876 (47.7)	0.256 (6.5)	1½ (38)
1¼	1.709 (43.4)	2.221 (56.4)	0.256 (6.5)	1½ (38)
1½	1.949 (49.5)	2.469 (62.7)	0.260 (6.6)	1½ (38)
2	2.424 (61.6)	2.986 (75.8)	0.281 (7.1)	1½ (38)
2½	2.924 (74.3)	3.648 (92.7)	0.362 (9.2)	1½ (38)
3	3.545 (90.0)	4.340 (110.2)	0.398 (10.1)	1½ (38)
3½	4.070 (103.4)	4.891 (124.2)	0.411 (10.4)	2 (51)
4	4.570 (116.1)	5.444 (138.3)	0.437 (11.1)	2 (51)
5	5.660 (143.8)	6.613 (168.0)	0.477 (12.1)	2 (51)
6	6.720 (170.7)	7.875 (200.0)	0.578 (14.7)	2 (51)
8	8.720 (221.5)	10.125 (257.2)	0.703 (17.8)	2½ (64)
10	10.880 (276.4)	12.150 (308.6)	0.635 (16.1)	2½ (64)
12	12.880 (327.2)	14.150 (359.4)	0.635 (16.1)	2½ (64)
14	14.140 (359.2)	15.400 (391.2)	0.630 (16.0)	2½ (64)
16	16.160 (410.5)	17.400 (442.0)	0.620 (15.7)	2½ (64)
18	18.180 (461.8)	19.400 (492.8)	0.610 (15.5)	2½ (64)

^A Tolerances shall be (1) Sizes through 3 in. incl: +0.000, -0.010 in. (+0.000, -0.254 mm); (2) Sizes 3½ through 10 in. incl: +0.030, -0.000 in. (+0.762, -0.000 mm); and (3) Sizes above 10 in.: +0.060, -0.000 in. (+1.524, -0.000 mm).

^B Tolerances shall be (1) Sizes through 10 in. incl: +0.125, -0.000 in. (+3.175, -0.000 mm) and (2) Sizes above 10 in.: +1.000, -0.000 in. (+25.4, -0.000 mm).

^C Tolerances for all sizes shall be +0.250, -0.000 in. (+6.4, -0.000 mm).

5.2 Manufacture—The initial form of the raw material shall be at the discretion of the manufacturer except couplings shall not be machined from unformed plate. The material shall be such that the finished couplings conform to all of the specified requirements (see **Appendix X2**).

5.3 Couplings fabricated by welding shall be (a) made by welders, welding operators, and welding procedures qualified under the provisions of ASME Boiler and Pressure Vessel

Code, Section IX; (b) heat treated in accordance with Section 6 of this specification; and (c) nondestructively tested as follows:

5.3.1 Sizes 3-in. NPS and Below—Radiographically examined throughout the entire length of each fabricated weld in accordance with Paragraph UW-51 of ASME Code, Section VIII.

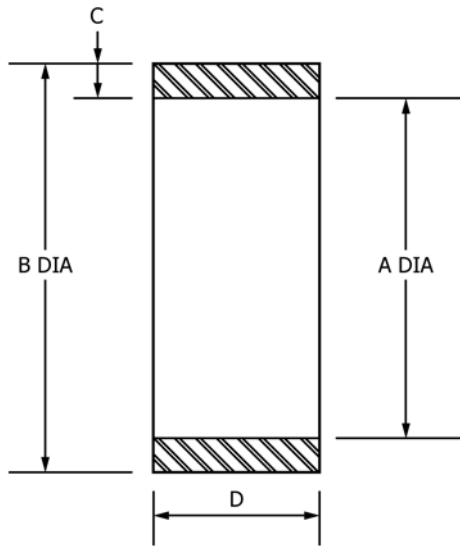


FIG. 1 Sleeve-Type Pipe Coupling

TABLE 3 Chemical Requirements

	Composition, max, %
Carbon	0.30
Manganese	1.20
Phosphorus	0.05
Sulfur	0.06

TABLE 4 Tension Requirements

Tensile strength, min, ksi (MPa)	60 (414)
Yield Point, min, ksi (MPa)	35 (241)
Elongation in 2 in. or 50.8 mm, min, %	23

5.3.2 *Sizes 3½-in. NPS Through 16-in. NPS*— No nondestructive tests required, and

5.3.3 *Sizes 18-in. NPS and Above*—Any method of nondestructive testing may be used provided the tests are conducted in accordance with the applicable parts of ASME Code, Section VIII.

6. Heat Treatment

6.1 *Couplings Made from Plate or Tubular Products:*

6.1.1 Couplings machined from tubular products need not be heat treated.

6.1.2 Hot-formed couplings upon which the final forming operation is completed at a temperature above 1150°F (621°C) and below 1800°F (982°C) need not be heat treated provided they are cooled in still air. If the manufacturer elects to heat treat such couplings it shall be by one of the procedures described in 6.3.

6.1.3 Hot-formed couplings finished at a temperature in excess of 1800°F (982°C) shall subsequently be annealed, normalized, or normalized and tempered.

6.1.4 Cold-formed couplings upon which the final forming operation is completed at a temperature below 1150°F (621°C) shall be normalized or shall be stress-relieved at 1100 to 1250°F (593 to 677°C) for 1 h/in. of thickness.

6.1.5 Couplings produced by fusion welding shall be postweld heat treated at 1100 to 1250°F (593 to 677°C), when the nominal wall thickness at the welded joint is ¾ in. or greater.

6.2 *Carbon Steel Couplings Made from Forgings*—Couplings made from forgings shall subsequently be annealed, normalized, or normalized and tempered.

6.3 *Heat Treatment Procedures*—Couplings after forming at an elevated temperature shall be cooled to a temperature below the critical range under suitable conditions to prevent injuries by too rapid cooling, but in no case more rapidly than the cooling rate in still air. Couplings that are to be heat treated shall be treated as follows:

6.3.1 *Full Annealing*—Couplings shall be uniformly reheated to a temperature above the transformation range and, after being held for a sufficient time at this temperature, cooled slowly to a temperature below the transformation range.

6.3.2 *Normalizing*—Couplings shall be uniformly reheated to a temperature above the transformation range and subsequently cooled in air at room temperature.

6.3.3 *Tempering and Postweld Heat Treatment*—Couplings shall be reheated to the prescribed temperature below the transformation range, held at temperature for not less than 1 h/in. of thickness at the thickest section, and cooled in the furnace or in still air.

7. Chemical Requirements

7.1 The couplings shall conform to the requirements as to chemical composition prescribed in Table 3.

7.2 Weld metal used in the construction of the couplings shall be mild steel analysis No. A1 of Table QW-442, Section IX of the ASME Boiler and Pressure Vessel Code.

8. Product Analysis

8.1 Product analyses may be made by the purchaser from finished products representing each lot. The chemical composition thus determined shall conform to the requirements specified in Table 3.

8.2 In the event the couplings do not conform to the requirements specified in Table 3, referee analyses shall be made on additional couplings from the same lot in accordance with Practice E59.

9. Mechanical Properties

9.1 The steel shall conform to the requirements as to tensile properties prescribed in Table 4.

9.2 The yield strength corresponding to a permanent offset of 0.2 % of the gage length of the specimen under load shall be determined.

9.3 Tension tests shall be made on material representative of and in the same condition of heat treatment as the finished coupling.

9.3.1 Records of the tension tests shall be certification that the material of the coupling meets the requirements of this specification provided the heat treatments are the same. If the

raw material was not tested, the coupling manufacturer shall perform the required test on material representative of the finished coupling.

9.4 The tests required by this specification shall conform to those described in the latest issue of Test Methods and Definitions **A370**.

10. Dimensions and Permissible Variations

10.1 The dimensions and permissible variations for sleeve couplings to this specification are prescribed in **Table 1** and **Table 2**.

11. Workmanship, Finish, and Appearance

11.1 Sleeve couplings shall have a workmanlike finish, free of scale and injurious defects. Ends shall be finished square and without burrs.

12. Hydrostatic Testing

12.1 Hydrostatic testing is not required by this specification.

12.2 All couplings shall be capable of withstanding, without failure, leakage, or impairment of serviceability, a test pressure equal to that prescribed in the specification for the pipe with which the fitting is recommended to be used.

13. Product Marking

13.1 Identification marks consisting of the manufacturer's symbol or name, the ASTM designation number, type, and size shall be legibly stamped on each fitting, and in such a position as not to injure the usefulness of the fitting. SP-25 may be followed except the word "steel" shall not be substituted for the ASTM designation.

13.2 Where couplings are manufactured by an activity for its own use, the marking requirements of **13.1** do not pertain.

14. Keywords

14.1 carbon steel sleeve-type pipe couplings; couplings; pipe couplings; Type I couplings; Type II couplings

APPENDIXES

(Nonmandatory Information)

X1. RATIONALE USED FOR DEVELOPMENT OF SPECIFICATION F682

X1.1 This specification has been developed to provide two types of couplings. Type I is for use on all schedules of pipe in which the pipe wall thickness does not exceed the wall thickness of standard weight pipe. Type II is for use on all schedules of pipe in which the pipe wall thickness does not exceed the wall thickness of extra strong pipe. **Note 3** provides an option that allows the use of Type II couplings in place of Type I couplings, if desired.

X1.2 The design criteria for the couplings is based on CFR Title 46, Subpart 56.70-15(d)3 and 4 as follows:

X1.2.1 For couplings through 3-in. IPS, the clearance between the system pipe outside diameter and the sleeve coupling inside diameter has been held to a maximum of 0.080 in. when considering tolerances to allow these couplings to be used in Class I piping through 3 in. when not subjected to full radiography as allowed by CFR Title 46. The inside diameter of the coupling is therefore equal to the minimum outside diameter of the pipe to be joined +0.080 in. with a tolerance of +0.000, -0.010 in. This provides for a maximum diametral clearance of 0.080 in.

NOTE X1.1—The minimum outside diameter of the pipe was determined by subtracting the largest minus tolerance from either Specification **A53/A53M** (ABS Grades 1, 2, and 3) or Specification **A106/A106M** (ABS Grades 4 and 5).

X1.2.2 The coupling inside diameter and tolerance in sizes 3½ in. and above for use in Class II piping has been taken from ANSI B16.5, Table 9, for slip-on flanges.

X1.2.3 The minimum length of the coupling has been set at 1 in. This satisfies the USCG requirement of ¾-in. minimum depth of pipe insertion when used in Class I piping.

X1.2.4 To meet the USCG requirement that "the fillet weld shall have a throat dimension of not less than the nominal thickness of the pipe or tubing being joined," a coupling outside diameter of not less than the nominal outside diameter of the system pipe plus two times 1.4 T has been used. (T = nominal pipe thickness.)

X1.2.5 Hoop stress calculations have been performed to ensure that the strength of the coupling is equal to or greater than that of pipe being joined.

X1.3 A tolerance of +0.125, -0.000 in. was established for the outside diameter of couplings through 10 in. and a tolerance of +1.000, -0.000 in. for couplings 12 in. and larger. This allows the use of commercially available tubular products without machining the outside diameter and limits the maximum outside diameter thereby allowing designers to determine the hole size which would be required to pass a coupling through a penetration.

X1.4 Testing heat treatment requirements have been taken from Specification **A234/A234M** as discussed with USCG G-MMT-2/82 .

X1.4.1 Radiography requirements have been taken from CFR Title 46, Subpart 56.95 as discussed with USCG G-MMT-2/82 .

X1.5 Although marking is not specifically required by USCG, "marking" has been included in the specification to allow for material control and segregation of the couplings in industry.

X2. TUBULAR RAW STOCK MATERIAL SIZES FOR MANUFACTURE OF COUPLINGS
TABLE X2.1 Tubular Products Used for Couplings

Nominal Size, in.	Type I Couplings	Type II Couplings
1/4	0.875 OD × 0.563 ID	1.062 OD × 0.563 ID
3/8	1 in. IPS Sch 160	1.188 OD × 0.688 ID
1/2	1 in. IPS Sch 160	1.375 OD × 0.875 ID
3/4	1.500 OD × 1.062 ID	1 1/4 in. IPS XX Strong
1 1/4	1.750 OD × 1.250 ID	1 1/2 in. IPS Sch 160
1 1/2	2.125 OD × 1.625 ID	2.250 OD × 1.688 ID
1	2 in. IPS Sch 80	2.500 OD × 1.937 ID
2 1/2	2 1/2 in. IPS Sch 80	3.000 OD × 2.375 ID
2	3 in. IPS Sch 80	3.750 OD × 2.875 ID
3 1/2	4.125 OD × 3.500 ID	4.375 OD × 3.500 ID
3	4.750 OD × 4.000 ID	5.000 OD × 4.000 ID
4	5.250 OD × 4.500 ID	5 in. IPS Sch 120
5	6.375 OD × 5.375 ID	6 in. IPS Sch 120
6	7.500 OD × 6.500 ID	8.000 OD × 6.500 ID
8	9.625 OD × 8.625 ID	10.250 OD × 8.500 ID
10	12.000 OD × 10.750 ID	12 in. IPS Sch 120
12	14 in. IPS Sch 60	16 in. IPS Sch 160
14	16 in. IPS Sch 100	16 in. IPS Sch 80
16	18 in. IPS Sch 80	18 in. IPS Sch 80
18	20 in. IPS Sch 80	20 in. IPS Sch 80

X2.1 Tubular products listed in **Table X2.1** may be used for the manufacture of couplings without machining the coupling outside diameter. Other tubular sizes as well as other wrought

materials (that is, forging, bars, billets, plate, and so forth, see **5.2**) may also be used provided all the requirements of this specification are satisfied.

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