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Endorsed by Manufacturers Standardization Society of the Valve and Fittings Industry
Used in USDOE-NE Standards

Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service¹

This standard is issued under the fixed designation A 182/A 182M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

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

1. Scope*

1.1 This specification² covers forged low alloy and stainless steel piping components for use in pressure systems. Included are flanges, fittings, valves, and similar parts to specified dimensions or to dimensional standards, such as the ASME specifications that are referenced in Section 2.

1.2 For bars and products machined directly from bar, refer to Specifications A 479/A 479M A 479/A 479M and A 739 A 739 for the similar grades available in those specifications. Products made to this specification are limited to a maximum weight of 10 000 lb [4540 kg]. For larger products and products for other applications, refer to Specification A 336/A 336M A 336/A 336M for the similar grades available in that specification.

1.3 Several grades of low alloy steels and ferritic, martensitic, austenitic, and ferritic-austenitic stainless steels are included in this specification. Selection will depend upon design and service requirements.

1.4 Supplementary requirements are provided for use when additional testing or inspection is desired. These shall apply only when specified individually by the purchaser in the order.

1.5 This specification is expressed in both inch-pound units and in SI units. However, unless the order specifies the applicable “M” specification designation (SI units), the material shall be furnished to inch-pound units.

1.6 The values stated in either inch-pound units or SI units are to be regarded separately as the standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

¹ This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.22 on Steel Forgings and Wrought Fittings for Piping Applications and Bolting Materials for Piping and Special Purpose Applications.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-182 in Section II of that Code.

2. Referenced Documents

2.1 In addition to the referenced documents listed in Specification A 961 A 961, the following list of standards apply to this specification.

2.2 ASTM Standards:³

- A 234/A 234M Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
- A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
- A 275/A 275M Test Method for Magnetic Particle Examination of Steel Forgings
- A 336/A 336M Specification for Alloy Steel Forgings for Pressure and High-Temperature Parts
- A 370 Test Methods and Definitions for Mechanical Testing of Steel Products
- A 403/A 403M Specification for Wrought Austenitic Stainless Steel Piping Fittings
- A 479/A 479M Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
- A 484/A 484M Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings
- A 739 Specification for Steel Bars, Alloy, Hot-Wrought, for Elevated Temperature or Pressure-Containing Parts, or Both
- A 763 Practices for Detecting Susceptibility to Intergranular Attack in Ferritic Stainless Steels
- A 788 Specification for Steel Forgings, General Requirements
- A 961 Specification for Common Requirements for Steel Flanges, Forged Fittings, Valves, and Parts for Piping Applications
- E 112 Test Methods for Determining Average Grain Size
- E 165 Test Method for Liquid Penetrant Examination
- E 340 Test Method for Macroetching Metals and Alloys

³ 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.

*A Summary of Changes section appears at the end of this standard.

2.3 *ASME Boiler and Pressure Vessel Codes:*⁴

Section IX *Welding Qualifications*

SFA-5.4 Specification for Corrosion-Resisting Chromium and Chromium-Nickel Steel Covered Welding Electrodes

SFA-5.5 Specification for Low-Alloy Steel Covered Arc-Welding Electrodes

SFA-5.9 Specification for Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Rods and Bare Electrodes

SFA-5.11 Specification for Nickel and Nickel-Alloy Covered Welding Electrodes

3. Ordering Information

3.1 It is the purchaser's responsibility to specify in the purchase order information necessary to purchase the needed material. In addition to the ordering information guidelines in Specification A 961A 961, orders should include the following information:

3.1.1 Additional requirements (see 6.2.2, Table 2 footnotes, 8.3, and 17.2), and

3.1.2 Requirement, if any, that manufacturer shall submit drawings for approval showing the shape of the rough forging before machining and the exact location of test specimen material (see 8.3.1).

4. General Requirements

4.1 Product furnished to this specification shall conform to the requirements of Specification A 961A 961, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A 961A 961 constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A 961A 961, this specification shall prevail.

5. Manufacture

5.1 The low-alloy ferritic steels may be made by the open-hearth, electric-furnace, or basic-oxygen process with separate degassing and refining optional. Unless followed by separate refining, the basic oxygen process shall be limited to steels containing not over 6 % chromium.

5.2 The stainless steels shall be melted by one of the following processes: (1) electric-furnace (with separate degassing and refining optional); (2) vacuum-furnace; or (3) one of the former followed by vacuum or electroslag-consumable remelting. Grade F XM-27Cb may be produced by electron-beam melting. Because of difficulties that may be met in retaining nitrogen, vacuum melting or remelting processes should not be specified for Grades F XM-11, F 304LN, F 316LN, F 304N, F 316N, F XM-19, F 44, F 45, F 48, F 49, F 50, F 51, F 52, F 53, F 54, F 55, F 58, F 59, F 60, F 62, or F 904L.

5.3 A sufficient discard shall be made to secure freedom from injurious piping and undue segregation.

5.4 The material shall be forged as close as practicable to the specified shape and size. Except for flanges of any type, forged or rolled bar may be used without additional hot working for small cylindrically shaped parts within the limits defined by Specification A 234A 234/A 234M/A 234M for low alloy steels and martensitic stainless steels and Specification A 403A 403/A 403M/A 403M for austenitic and ferritic-austenitic stainless steels. Elbows, return bends, tees, and header tees shall not be machined directly from bar stock.

5.5 Except as provided for in 5.4, the finished product shall be a forging as defined in the Terminology section of Specification A 788A 788.

6. Heat Treatment⁵

6.1 After hot working, forgings shall be cooled to a temperature below 1000°F [538°C] prior to heat treating in accordance with the requirements of Table 1.

6.2 *Low Alloy Steels and Ferritic and Martensitic Stainless Steels*—The low alloy steels and ferritic and martensitic stainless steels shall be heat treated in accordance with the requirements of 6.1 and Table 1.

6.2.1 Grade F 22V shall be furnished in the normalized and tempered, or liquid quenched and tempered condition. The minimum austenitizing temperature shall be 1650°F [900°C], and the minimum tempering temperature shall be 1250°F [677°C].

6.2.2 *Liquid Quenching*—When agreed to by the purchaser, liquid quenching followed by tempering shall be permitted provided the temperatures in Table 1 for each grade are utilized.

6.2.2.1 *Marking*—Parts that are liquid quenched and tempered shall be marked “QT.”

6.2.3 Alternatively, Grade F 1, F 2, and F 12, Classes 1 and 2 may be given a heat treatment of 1200°F [650°C] minimum after final hot or cold forming.

6.3 *Austenitic and Ferritic-Austenitic Stainless Steels*—The austenitic and ferritic-austenitic stainless steels shall be heat treated in accordance with the requirements of 6.1 and Table 1.

6.3.1 Alternatively, immediately following hot working, while the temperature of the forging is not less than the minimum solutioning temperature specified in Table 1, forgings made from austenitic grades (except grades F 304H, F 316H, F 321, F 321H, F 347, F 347H, F 348, and F 348H) may be individually rapidly quenched in accordance with the requirements of Table 1.

6.3.2 See Supplementary Requirement S8 if a particular heat treatment method is to be employed.

6.4 *Time of Heat Treatment*—Heat treatment of forgings may be performed before machining.

6.5 *Forged or Rolled Bar*—Forged or rolled austenitic stainless bar from which small cylindrically shaped parts are to be machined, as permitted by 5.4, and the parts machined from

⁴ Available from American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

⁵ A solution annealing temperature above 1950°F [1065°C] may impair the resistance to intergranular corrosion after subsequent exposure to sensitizing conditions in F 321, F 321H, F 347, F 347H, F 348, and F 348H. When specified by the purchaser, a lower temperature stabilization or resolution annealing shall be used subsequent to the initial high temperature solution anneal (see Supplementary Requirement S10).