



Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service¹

This standard is issued under the fixed designation A216/A216M; 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.

^{e1} NOTE—Table 1 and Supplementary Requirements section were editorially corrected in May 2015.

1. Scope*

1.1 This specification² covers carbon steel castings for valves, flanges, fittings, or other pressure-containing parts for high-temperature service and of quality suitable for assembly with other castings or wrought-steel parts by fusion welding.

1.2 Three grades, WCA, WCB, and WCC, are covered in this specification. Selection will depend upon design and service conditions, mechanical properties, and the high temperature characteristics.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards*:³

[A488/A488M Practice for Steel Castings, Welding, Qualifications of Procedures and Personnel](#)

[A703/A703M Specification for Steel Castings, General Requirements, for Pressure-Containing Parts](#)

[A985/A985M Specification for Steel Investment Castings General Requirements, for Pressure-Containing Parts](#)

2.2 *Manufacturers' Standardization Society of the Valve and Fittings Industry Standard*:⁴

[SP 55 Steel Castings for Valve, Flanges, and Fittings, and Other Components \(Visual Method\)](#)

3. General Conditions for Delivery

3.1 Except for investment castings, castings furnished to this specification shall conform to the requirements of Specification [A703/A703M](#), including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification [A703/A703M](#) constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification [A703/A703M](#), this specification shall prevail.

3.2 Steel investment castings furnished to this specification shall conform to the requirements of Specification [A985/A985M](#), including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification [A985/A985M](#) constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification [A985/A985M](#), Specification [A985/A985M](#) shall prevail.

4. Ordering Information

4.1 The inquiry and order should include or indicate the following:

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 A01.18 on Castings.

Current edition approved May 1, 2014 March 1, 2016. Published May 2014 March 2016. Originally approved in 1939. Last previous edition approved in 2012 2014 as [A216/A216M – 12](#); [A216/A216M – 14^{e1}](#). DOI: [10.1520/A0216_A0216M-14E01](#); [10.1520/A0216_A0216M-16](#).

² For ASME Boiler and Pressure Vessel Code applications, see related Specification SA-216/SA-216M in Section II of that code.

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.

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.com](#).

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



4.1.1 A description of the casting by pattern number or drawing (dimensional tolerances shall be included on the casting drawing),

4.1.2 Grade of steel,

4.1.3 Options in the specification,

4.1.4 Whether the castings are to be produced using the investment casting process, and

4.1.5 The supplementary requirements desired including the standards of acceptance.

5. Heat Treatment

5.1 All castings shall receive a heat treatment proper to their design and chemical composition.

5.2 Castings shall be furnished in the annealed, or normalized, or normalized and tempered condition unless Supplementary Requirement S15 is specified.

5.3 Heat treatment shall be performed after castings have been allowed to cool below the transformation range.

6. Temperature Control

6.1 Furnace temperatures for heat treating shall be effectively controlled by pyrometer.

7. Chemical Composition

7.1 The steel shall be in accordance with the requirements as to chemical composition prescribed in Table 1.

8. Tensile Requirements

8.1 Steel used for the castings shall be in accordance with the requirements as to tensile properties prescribed in Table 2.

9. Quality

9.1 The surface of the casting shall be examined visually and shall be free of adhering sand, scale, cracks, and hot tears. Other surface discontinuities shall meet the visual acceptance standards specified in the order. Visual Method SP-55 or other visual standards may be used to define acceptable surface discontinuities and finish. Unacceptable visual surface discontinuities shall be removed and their removal verified by visual examination of the resultant cavities.

TABLE 1 Chemical Requirements

NOTE 1—All values are maximums.

Element	Composition, %		
	Grade WCA UNS J02502	Grade WCB UNS J03002	Grade WCC UNS J02503
Carbon	0.25 ^A	0.30 ^B	0.25 ^C
Manganese	0.70 ^A	1.00 ^B	1.20 ^C
Phosphorus	0.035	0.035	0.035
Sulfur	0.035 ^D	0.035 ^D	0.035 ^D
Silicon	0.60	0.60	0.60
Specified residual elements:			
Copper	0.30	0.30	0.30
Nickel	0.50	0.50	0.50
Chromium	0.50	0.50	0.50
Molybdenum, max	0.20	0.20	0.20
Vanadium	0.03	0.03	0.03
— Total of these specified residual elements ^E †	1.00	1.00	1.00
— Total of these specified residual elements ^E	1.00	1.00	1.00

† Editorially corrected.

^A For each reduction of 0.01 % below the specified maximum carbon content, an increase of 0.04 % manganese above the specified maximum will be permitted up to a maximum of 1.10 %.

^B For each reduction of 0.01 % below the specified maximum carbon content, an increase of 0.04 % Mn above the specified maximum will be permitted up to a maximum of 1.28 %.

^C For each reduction of 0.01 % below the specified maximum carbon content, an increase of 0.04 % manganese above the specified maximum will be permitted to a maximum of 1.40 %.

^D For lower maximum sulfur content, see Supplementary Requirement S52.

^E Not applicable when Supplementary Requirement S11 is specified.