



Designation: A985/A985M – 20

# Standard Specification for Steel Investment Castings General Requirements, for Pressure-Containing Parts<sup>1</sup>

This standard is issued under the fixed designation A985/A985M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This specification covers a group of common requirements that are mandatory for steel castings produced by the investment casting process for pressure-containing parts under each of the following ASTM Specifications:

Title of Specification	ASTM Designation
Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service	A216/A216M
Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service	A217/A217M
Castings, Austenitic, for Pressure-Containing Parts	A351/A351M
Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service	A352/A352M
Steel Castings, Alloy, Specially Heat-Treated, for Pressure-Containing Parts, Suitable for High-Temperature Service	A389/A389M
Steel Castings Suitable for Pressure Service	A487/A487M
Castings, Iron-Nickel-Chromium and Nickel Alloys, Specially Controlled for Pressure-Retaining Parts for Corrosive Service	A990/A990M
Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts	A995/A995M

1.2 This specification also covers a group of supplementary requirements, which may be applied to the above specifications as indicated therein. These requirements are provided for use when additional testing or inspection is desired, and apply only when specified individually by the purchaser in the order.

1.3 When investment casting is ordered, the requirements of this specification shall take precedence over the individual material specification requirements.

1.4 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 nonconformance with the standard.

<sup>1</sup> 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.

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1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- A216/A216M Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
- A217/A217M Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service
- A351/A351M Specification for Castings, Austenitic, for Pressure-Containing Parts
- A352/A352M Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service
- A370 Test Methods and Definitions for Mechanical Testing of Steel Products
- A380/A380M Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
- A389/A389M Specification for Steel Castings, Alloy, Specially Heat Treated, for Pressure-Containing Parts, Suitable for High-Temperature Service
- A487/A487M Specification for Steel Castings Suitable for Pressure Service
- A488/A488M Practice for Steel Castings, Welding, Qualifications of Procedures and Personnel
- A609/A609M Practice for Castings, Carbon, Low-Alloy, and Martensitic Stainless Steel, Ultrasonic Examination Thereof

<sup>2</sup> 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

**A751** Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

**A800/A800M** Practice for Estimating Ferrite Content of Stainless Steel Castings Containing Both Ferrite and Austenite

**A903/A903M** Specification for Steel Castings, Surface Acceptance Standards, Magnetic Particle and Liquid Penetrant Inspection

**A941** Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

**A967/A967M** Specification for Chemical Passivation Treatments for Stainless Steel Parts

**A990/A990M** Specification for Castings, Iron-Nickel-Chromium and Nickel Alloys, Specially Controlled for Pressure-Retaining Parts for Corrosive Service

**A991/A991M** Test Method for Conducting Temperature Uniformity Surveys of Furnaces Used to Heat Treat Steel Products

**A995/A995M** Specification for Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts

**A1058** Test Methods for Mechanical Testing of Steel Products—Metric

**A1067/A1067M** Specification for Test Coupons for Steel Castings

**A1080/A1080M** Practice for Hot Isostatic Pressing of Steel, Stainless Steel, and Related Alloy Castings

**E29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

**E94/E94M** Guide for Radiographic Examination Using Industrial Radiographic Film

**E125** Reference Photographs for Magnetic Particle Indications on Ferrous Castings

**E165/E165M** Practice for Liquid Penetrant Testing for General Industry

**E186** Reference Radiographs for Heavy-Walled (2 to 4½ in. (50.8 to 114 mm)) Steel Castings

**E192** Reference Radiographs of Investment Steel Castings for Aerospace Applications

**E208** Test Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels

**E280** Reference Radiographs for Heavy-Walled (4½ to 12 in. (114 to 305 mm)) Steel Castings

**E340** Practice for Macroetching Metals and Alloys

**E353** Test Methods for Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

**E354** Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

**E446** Reference Radiographs for Steel Castings Up to 2 in. (50.8 mm) in Thickness

**E709** Guide for Magnetic Particle Testing

**E2660** Digital Reference Images for Investment Steel Castings for Aerospace Applications

2.2 *ANSI Standard*:<sup>3</sup>

**B16.5** Pipe Flanges and Flanged Fittings

2.3 *ASME Standard*:<sup>4</sup>

ASME Boiler and Pressure Vessel Code, Section III, NB-2546

2.4 *Standards of the Manufacturers Standardization Society of the Valve and Fitting Industry*:<sup>5</sup>

**MSS SP 53** Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components (Magnetic Particle Exam Method)

**MSS SP 54** Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components (Radiographic Examination Method)

2.5 *SAE Standards*:<sup>6</sup>

**AMS 2750** Pyrometry

**ARP 1341** Determining Decarburization and Carburization in Finished Parts of Carbon and Low-Alloy Steels

### 3. Terminology

3.1 *Definitions*—The definitions in Test Methods and Definitions **A370**, Terminology **A941**, and Test Methods **A1058** are applicable to this specification and to those listed in 1.1.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *heat, n*—all the molten metal poured from a single furnace, or all of the molten metal from two or more furnaces, poured into a single ladle or casting prior to the replenishing of the furnace(s).

3.2.2 *investment casting, n*—a metal casting that is produced in a mold obtained by investing (surrounding) an expendable pattern with a ceramic slurry, which is allowed to solidify. The expendable pattern may consist of wax, plastic, or other material, and is removed prior to filling the mold with liquid metal.

3.2.3 *master heat, n*—a single furnace charge of alloy that may be either poured directly into castings or into remelt alloy for individual melts.

3.2.4 *sub-heat, n*—a portion of master heat remelted with only minor additions for deoxidation for pouring into castings. Synonyms—*melt, production heat*.

### 4. Materials and Manufacture

4.1 When the purchaser imposes the requirements of this specification, the manufacturer is responsible for compliance

<sup>3</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

<sup>4</sup> Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

<sup>5</sup> 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>.

<sup>6</sup> Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.