



Standard Specification for Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts¹

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1. Scope*

1.1 This specification covers austenitic-ferritic (duplex) stainless steel castings for valves, flanges, fittings, and other pressure-containing parts.

1.2 The duplex stainless steels offer a combination of enhanced mechanical properties and corrosion resistance when properly balanced in composition and properly heat treated. Ferrite levels are not specified, but these grades will develop a range of approximately 30 to 60 % ferrite with the balance austenite. It is the responsibility of the purchaser to determine which grade shall be furnished depending on design and service conditions, mechanical properties, and corrosion-resistant characteristics.

NOTE 1—Because of the possibility of precipitation of embrittling phases, the grades included in this specification are not recommended for service at temperatures above 600°F [315°C].

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:²

A488/A488M Practice for Steel Castings, Welding, Qualifications of Procedures and Personnel

A703/A703M Specification for Steel Castings, General Requirements, for Pressure-Containing Parts

E125 Reference Photographs for Magnetic Particle Indications on Ferrous Castings

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.

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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.

E165 Practice for Liquid Penetrant Examination for General Industry

E562 Test Method for Determining Volume Fraction by Systematic Manual Point Count

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *duplex stainless steel*—an iron-chromium-nickel-molybdenum alloy which when properly heat treated consists of approximately 30 to 60 % ferrite with the balance austenite.

4. General Conditions for Delivery

4.1 Material furnished to this specification shall conform to the applicable requirements of Specification **A703/A703M**, including the supplementary requirements that are indicated on the purchaser order. Failure to comply with the general requirements of Specification **A703/A703M** constitutes non-conformance with this specification. In case of conflict between the requirements of the specification and Specification **A703/A703M**, this specification shall prevail.

5. Ordering Information

5.1 It is the responsibility of the purchaser to specify all requirements that are necessary for material ordered under this specification. Such requirements may included, but are not limited to, the following:

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

5.1.2 Quantity (weight and number of castings),

5.1.3 Specification designation and date of issue,

5.1.4 Grade of steel,

5.1.5 Supplementary requirements including acceptance criteria, and

5.1.6 Additional requirements.

6. Process

6.1 The steel shall be made by the electric furnace process with or without separate refining.

7. Heat Treatment

7.1 All castings shall be heat treated in accordance with **Table 1**.

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



TABLE 1 Heat Treatment Requirements

| Grade | Heat Treatment |
|-------|---|
| 1B | Heat to 1900°F [1040°C] minimum, hold for sufficient time to heat casting uniformly to temperature, quench in water or rapid cool by other means. |
| 2A | Heat to 2050°F [1120°C] minimum, hold for sufficient time to heat casting uniformly to temperature, quench in water or rapid cool by other means. |
| 3A | Heat to 1950°F [1070°C] minimum, hold for sufficient time to heat casting uniformly to temperature, quench in water or rapid cool by other means. |
| 4A | Heat to 2050°F [1120°C] minimum for sufficient time to heat casting uniformly to temperature and water quench, or the casting may be furnace cooled to 1850°F [1010°C] minimum, hold for 15 min minimum and then water quench. A rapid cool by other means may be employed in lieu of water quench. |
| 5A | Heat to 2050°F [1120°C] minimum, hold for sufficient time to heat casting to temperature, furnace cool to 1910°F [1045°C] minimum, quench in water or rapid cool by other means. |
| 6A | Heat to 2010°F [1100°C] minimum, hold for sufficient time to heat casting uniformly to temperature, quench in water or cool rapidly by other means. |
| 7A | Heat to 2065°F [1130°C] minimum, hold for sufficient time to heat casting to temperature, furnace cool to 1940°F [1060°C] minimum, quench in water or rapid cool by other means. |

8. Chemical Composition

8.1 The steel shall conform to the requirements as to chemical composition prescribed in [Table 2](#).

9. Tensile Properties

9.1 One tension test shall be made from each heat and shall conform to the requirements as to tensile properties prescribed in [Table 3](#).

10. Quality

10.1 When additional inspection is desired, Supplementary Requirements S5, S6, and S10 may be ordered.

11. Repair by Welding

11.1 Repairs shall be made using procedures and welders qualified under Practice [A488/A488M](#).

11.2 The composition of the deposited weld metal may be similar to that of the casting or may be suitably alloyed to achieve the desired corrosion resistance and mechanical properties.

11.3 Weld repairs shall be subject to the same quality standards as used to inspect the castings.

12. Post Weld Heat Treatment After Major Weld Repair

12.1 Weld repairs shall be considered major in the case of a casting that has leaked on hydrostatic testing or when the depth of the cavity after preparation for repair exceeds 20 % of the actual wall thickness, or 1 in. [25 mm], whichever is smaller, or when the extent of the cavity exceeds approximately 10 in.² [65 cm²]. All other weld repairs shall be considered minor.

12.2 Castings shall be heat-treated after major weld repairs. Heat treatment after minor weld repairs is not required unless Supplementary Requirement S11 is included in the purchase order.

12.3 Post weld heat treatment shall be in accordance with [Table 1](#).

13. Keywords

13.1 austenitic-ferritic; duplex stainless steel; pressure-containing; steel castings