Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5342A
Superseding AMS 5342
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STEEL CASTINGS, INVESTMENT, CORROSION RESISTANT
16Cr - 4.1Ni - 0.28 (Cb+Ta) - 3.2Cu
Solution and Precipitation Heat Treated
130,000 psi (896 MPa) Tensile Strength

1. SCOPE:

1.1 Form: This specification covers a corrosion-resistant steel in the form of investment castings.

1.2 Application: Primarily for parts requiring good corrosion resistance and strength up to 600°F (315°C).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2635 - Radiographic Inspection
AMS 2640 - Magnetic Particle Inspection
AMS 2645 - Fluorescent Penetrant Inspection
AMS 2804 - Identification, Castings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM A370 - Mechanical Testing of Steel Products
ASTM E192 - Reference Radiographs of Investment Steel Castings for Aerospace Applications
ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Carbon	--	0.06
Manganese	--	0.70
Silicon	0.50	1.00
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	15.50	16.70
Nickel	3.60	4.60
Columbium + Tantalum	0.15	0.40
Copper	2.80	3.50
Nitrogen	--	0.05

3.2 Condition: Homogenization, solution, and precipitation heat treated.

3.3 Casting: Castings shall be poured either from remelted metal from a master heat or directly from a master heat. In either case, metal for casting shall be qualified as in 3.4.

3.3.1 A master heat is refined metal of a single furnace charge or metal blended as in 3.3.2. Gates, sprues, risers, and rejected castings shall be used only in preparation of master heats; they shall not be remelted directly, without refining, for pouring of castings.

3.3.2 Unless prohibited by purchaser, metal from two or more master heats may be blended provided that the composition of each master heat to be blended is within the limits of 3.1 and that the total weight of metal blended does not exceed 10,000 lb (4540 kg). Ingot and pig may be blended together, shot may be blended, but shot shall not be blended with ingot or pig. When two or more master heats are blended, the resultant blend shall be considered a master heat.

3.4 Master Heat Qualification: Each master heat shall be qualified by evaluation of chemical analysis and tensile test specimens conforming to 3.4.1 and 3.4.2, respectively. A master heat may be considered conditionally qualified if vendor's test results show conformance to all applicable requirements of this specification. However, except when purchaser waives confirmatory testing, final qualification shall be based on purchaser's test results. Conditional qualification of a master heat shall not be construed as a guarantee of acceptance of castings poured therefrom.

3.4.1 Chemical Analysis Specimens: Shall be of any convenient size, shape, and form for vendor's tests. When chemical analysis specimens are required by purchaser, specimens shall be cast to a size, shape, and form agreed upon by purchaser and vendor.

3.4.2 Tensile Test Specimens: Shall be cast from remelted metal from each master heat except when castings are poured directly from a master heat, in which case the specimens shall also be poured directly from the master heat. Specimens shall be of standard proportions in accordance with ASTM A370 with 0.250 in. (6.35 mm) diameter at the reduced parallel gage section. They shall be cast to size or shall be cast oversize and subsequently machined to 0.250 in. (6.35 mm) diameter. Center gating may be used.

3.5 Heat Treatment: Castings and representative tensile test specimens shall be heat treated as follows:

3.5.1 Homogenization: Heat to 2100°F ± 25 (1149°C ± 15), hold at heat for not less than 90 min., and cool Ø as required to below 70°F (21°C).

3.5.2 Solution: Heat to 1900°F ± 25 (1038°C ± 15), hold at heat for 60 min. per inch (25 mm) of maximum Ø cross-section but not less than 30 min., and cool as required to below 70°F (21°C).

3.5.3 Precipitation: Heat to a temperature within the range 1085° - 1115°F (585° - 602°C), hold at the Ø selected temperature within ±10°F (±6°C) for not less than 90 min., and cool in air to room temperature.

3.6 Properties: Castings and representative tensile test specimens produced in accordance with 3.4.2 shall Ø conform to the following requirements; hardness and tensile testing shall be performed in accordance with ASTM A370:

3.6.1 Separately-Cast Specimens:

3.6.1.1 Tensile Properties:

Tensile Strength, min	130,000 psi (896 MPa)
Yield Strength at 0.2% Offset, min	120,000 psi (827 MPa)
Elongation in 1 in. (25.4 mm) or 4D, min	8%
Reduction of Area, min	15%

3.6.2 Castings:

3.6.2.1 Tensile Properties:

Tensile Strength, min	130,000 psi (896 MPa)
Yield Strength at 0.2% Offset, min	120,000 psi (827 MPa)
Elongation in 1 in. (25.4 mm) or 4D, min	6%
Reduction of Area, min	15%

3.6.2.2 Hardness: Should be not lower than 30 HRC or equivalent but castings shall not be rejected on the Ø basis of hardness if the tensile property requirements of 3.6.2.1 are met.

3.7 Quality:

3.7.1 Castings, as received by the purchaser, shall be uniform in quality and condition, sound, and free Ø from foreign materials and from internal and external imperfections detrimental to usage of the castings.

3.7.1.1 Castings shall have smooth surfaces and shall be well cleaned. Metallic shot or grit shall not be used for final cleaning, unless otherwise permitted.

3.7.2 Castings shall be produced under radiographic control, unless otherwise specified. This control shall Ø consist of radiographic examination of castings in accordance with AMS 2635 until proper foundry technique, which will produce castings free from harmful internal imperfections, is established for each part number and of production castings as necessary to ensure maintenance of satisfactory quality.

3.7.3 When specified, castings shall be subjected to magnetic particle inspection in accordance with Ø AMS 2640 and/or to fluorescent penetrant inspection in accordance with AMS 2645.

3.7.4 Radiographic, magnetic particle, fluorescent penetrant, and other quality standards shall be as agreed Ø upon by purchaser and vendor. ASTM E192 may be used to define radiographic acceptance standards.

3.7.5 Castings shall not be repaired by peening, plugging, welding, or other methods without written Ø permission from purchaser.

3.7.5.1 When permitted in writing by purchaser, defects in castings may be removed and the castings Ø repaired by welding provided the weld repair area has properties comparable to those of the parent metal. Repair welds shall be subjected to the same inspection procedures and acceptance standards required of the casting. Weld repair areas shall be suitably marked to facilitate inspection. Heat treatment and nondestructive testing specified herein shall be performed after completion of repair welding.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of castings shall supply all samples and shall be responsible Ø for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the castings conform to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specifica- Ø tion are classified as acceptance tests and as preproduction tests; for acceptance tests, when tensile properties are determined on specimens cut from castings, separately-cast test specimens need not be tested.

4.2.1 For direct U. S. Military procurement, substantiating test data and, when requested, preproduction Ø castings shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with the following:

Ø 4.3.1 Two chemical analysis specimens in accordance with 3.4.1 and/or a casting from each master heat.

Ø 4.3.2 Three tensile test specimens in accordance with 3.4.2 from each master heat.

Ø 4.3.3 Two preproduction castings in accordance with 4.4.1 of each part number.

4.3.4 One or more castings from each master heat when properties of specimens machined from castings Ø are required. Size, locations, and number of specimens machined from castings shall be as specified on the drawing or as agreed upon by purchaser and vendor. When size, location, and number of specimens are not specified, not less than two tensile test specimens, one from the thickest section and one from the thinnest section, shall be cut from a casting or castings from each master heat.

4.4 Approval:

4.4.1 Sample castings from new or reworked master patterns and the casting procedure shall be approved Ø by purchaser before castings for production use are supplied, unless such approval be waived.