AEROSPACE MATERIAL SPECIFICATION

AMS5643™/H1150	REV. A

Issued 2013-06
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Superseding AMS5643/H1150

Steel, Corrosion Resistant, Bars, Wire, Forgings, Mechanical Tubing, and Rings 16Cr - 4.0Ni - 0.30Cb (Nb) - 4.0Cu Solution and Precipitation Heat Treated (H1150) (Composition similar to UNS S17400)

RATIONALE

AMS5643/H1150A prohibits unauthorized exceptions (1.1, 3.4.1.3.5, 3.8, 4.3.4, 5.1, 8.4); revises title; limits bar from plate (3.2.2, 4.3.3); updates precipitation heat treatment specification and requirement (3.3.1); updates stress relief (3.3.2, 3.6.1, 8.5); adds note to properties (Table 2); adds strain rate (3.4.1.3.1.1); adds conformance to AS6279 (1.1.1, 3.7); updates reporting (4.3); allows prior revisions (8.3); and results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a corrosion-resistant steel product 8 inches (203 mm) and under in nominal diameter, thickness or for hexagons, least distance between parallel sides, and having a maximum cross-sectional area of 64 in^2 (413 cm^2) in the solution and precipitation heat treated (H1150) condition.

1.1.1 The aged product may be supplied directly by a producer or by another entity performing the functions of a producer as defined in AS6279. The latter would be accomplished by precipitation heat treatment of solution treated material previously certified to AMS5643. The entity assuming responsibility for the aging operation is designated the producer of AMS5643/H1150A.

1.2 Application

These products have been used typically for parts requiring corrosion resistance and high strength up to 600 °F (316 °C) but usage is not limited to such applications (see 8.2).

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS5643/H1150A/

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2241 Tolerances, Corrosion and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire

AMS2759/3 Heat Treatment, Precipitation-Hardening Corrosion-Resistant, Maraging, and Secondary Hardening Steel Parts

AMS2761 Heat Treatment of Steel Raw Materials

AMS5643 Steel, Corrosion Resistant, Bars, Wire, Forgings, Mechanical Tubing, and Rings, 16Cr - 4.0Ni - 0.30Cb (Nb) - 4.0Cu, Solution Heat Treated, Percipitation Hardenable

AS6279 Standard Practice for Production, Distribution, and Procurement of Metal Stock

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A370 Mechanical Testing of Steel Products

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall be in accordance with AMS5643.

3.2 Condition

Shall be in accordance with AMS5643, and the following:

3.2.1 The product shall be supplied in the precipitation hardened (H1150) heat treat condition.

3.2.2 Bar shall not be cut from plate (see also 4.3.3).

3.3 Heat Treatment

Shall be in accordance with AMS5643 and the following:

3.3.1 Precipitation Heat Treatment

3.3.1.1 Shall be in accordance with the requirements applicable to either AMS2761 or AMS2759/3 at the producer's option, except acceptance testing and criteria shall be as specified in 3.4.1.3.

3.3.1.2 When product certified as AMS5643 (solution treated material) is precipitation heat treated to meet AMS5643/H1150 by an entity other than the producer of the original product, the heat treatment source shall be accredited by a recognized industry agency for stainless steel heat treatment acceptable to the purchaser.

3.3.2 Stress Relief Heat Treatment

3.3.2.1 A stress relief heat treatment after precipitation heat treatment is optional. When performed stress relief shall be accomplished by heating to 1050 °F (566 °C) and soaking for at least 1 hour plus 1 hour additional for each inch (25 mm) of thickness or fraction thereof greater than 1 inch (25 mm). When load thermocouples are used, the soaking time shall be at least 1 hour.

3.3.2.2 Stress relieving as above may be performed after straightening to meet dimensional tolerances of AMS2241 unless prohibited by purchaser or cognizant engineering organization (see 8.5), but must still meet all properties (see 3.4).

3.4 Properties

3.4.1 All products shall conform to the following requirements:

3.4.1.1 Macrostructure

Shall be in accordance with AMS5643.

3.4.1.2 Microstructure

Shall be in accordance with AMS5643.

3.4.1.3 Tensile Properties

Shall be in accordance with the following:

3.4.1.3.1 Bars

Bars, 8 inches (203 mm) and under in nominal diameter, thickness or for hexagons, least distance between parallel sides, and having a maximum cross-sectional area of 64 in^2 (413 cm^2) shall be as shown in Table 1. Tensile testing shall be performed in accordance with ASTM A370.

3.4.1.3.1.1 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ±0.002 in/in/min (0.002 mm/mm/min) through 0.2% offset yield strain. The strain rate after yield may be increased to any value up to 0.5 in/in/min (or 0.5 mm/mm/min) or equivalent crosshead speed as a function of gage length.

Table 1A - Tensile properties, inch/pound units

Condition	Tensile Strength ksi	Minimum Yield Strength at 0.2% Offset ksi	Minimum Elongation in 2 Inches or 4D %	Minimum Reduction of Area %
H1150	135-170	105	16	50

Note: Properties have been taken from the response to heat treatment requirements of AMS5643 and were not independently substantiated using SAE AMS procedures.

Table 1B - Tensile properties, SI units

Condition	Tensile Strength MPa	Minimum Yield Strength at 0.2% Offset MPa	Minimum Elongation in 50 mm or 4D %	Minimum Reduction of Area %
H1150	931-1172	724	16	50

Note: Properties have been taken from the response to heat treatment requirements of AMS5643 and were not independently substantiated using SAE AMS procedures.

3.4.1.3.2 All Other Product Forms

The property requirements of 3.4.1.3.1 shall apply. Test plans shall be as agreed upon between producer and purchaser.

3.4.1.3.3 When the ultimate tensile strength exceeds 170 ksi (1172 MPa), one additional aging cycle may be performed. The set temperature for the additional aging may be higher than 1150 °F (621 °C), but not more than 25 °F (14 °C) higher. The soaking time shall be not more than the original precipitation heat treatment cycle.

3.4.1.3.4 When the tensile properties as specified in Table 1 are not met, it is permissible to again perform solution heat treatment in accordance with AMS5643 and precipitation heat treatment to the requirements specified in 3.3, and retest.

3.4.1.3.5 Tensile property requirements for product outside of the range covered by 1.1 shall be agreed upon between purchaser and producer (see also 4.3.4).

3.4.1.4 Hardness

Not applicable.

3.5 Quality

Shall be in accordance with AMS5643.

3.6 Tolerances

Shall be in accordance with AMS5643 and the following:

3.6.1 If stress relieved after aging, the straightness tolerance of AMS2241 for heat treated product shall apply.

3.7 Production, distribution, and procurement of metal stock shall comply with AS6279. After production and certification to the specified requirements, cutting in a plane perpendicular to the short transverse dimension is permitted. The requirement for compliance with AS6279 becomes effective 18 months after publication of this document.

3.8 Exceptions

Any exceptions shall be authorized by purchaser and reported as in 4.3.4.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer shall supply all samples for producer's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements. Applicable acceptance test data generated for prior certification to AMS5643 need not be repeated for certification to AMS5643/H1150A.

4.2 Classification of Tests

Shall be in accordance with AMS5643 and the following:

4.2.1 Acceptance Tests

4.2.1.1 Tensile properties (3.4.1.3) and tolerances (3.6) are acceptance tests and shall be performed on each lot.

4.2.2 Sampling and Testing

Shall be in accordance with AMS5643.

4.2.2.1 Resampling and Retesting

Shall be in accordance with AMS5643.