AEROSPACE MATERIAL SPECIFICATION

AMS5629/H1000

Issued 2014-12

Steel, Corrosion-Resistant, Bars, Wire, Forgings, Rings, and Extrusions
13Cr - 8.0Ni - 2.2Mo - 1.1Al
Vacuum Induction Plus Consumable Electrode Melted
Solution Heat Treated, Precipitation Hardened (H1000)
(Composition similar to UNS S13800)

RATIONALE

AMS5629/H1000 is a new specification for purchase of corrosion-resistant steel product in the solution and precipitation heat treated condition.

1. SCOPE

1.1 Form

This specification covers a corrosion-resistant steel product in the solution and precipitation heat treated (H1000) condition.

1.1.1 The aged product may be supplied directly by a mill or by a producer other than the mill. The latter would be accomplished by precipitation heat treatment of solution treated material previously certified to AMS5629. The entity assuming responsibility for the aging operation is designated the producer of AMS5629/H1000.

1.1.2 This specification covers products up to 12 inches (305 mm) and under in nominal diameter, thickness or for hexagons, least distance between parallel sides. (See 8.2)

1.2 Application

These products have been used typically for parts requiring corrosion resistance and high strength up to 600 °F (316 °C) with good ductility and strength in the transverse direction in large section sizes, but usage is not limited to such applications (See 8.1).

1.3 Classification

Melting practice classification shall be in accordance with AMS5629.

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

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5629/H1000

2.1 SAE Publications

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

AMS2750 Pyrometry

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

AMS5629 Steel, Corrosion-Resistant, Bars, Wire, Forgings, Rings, and Extrusions 13Cr - 8.0Ni - 2.2Mo - 1.1Al, Vacuum Induction Plus Consumable Electrode Melted, Solution Heat Treated, Precipitation Hardenable

AMS-H-6875 Heat Treatment of Steel Raw Materials

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall be in accordance with AMS5629.

3.2 Melting Practice and Delta Ferrite Class

Shall be in accordance with AMS5629.

3.3 Condition

Shall be in accordance with AMS5629, and the following:

3.3.1 The product shall be supplied in the precipitation hardened (H1000) heat treat condition.

3.3.1.1 If stress relieving is requested by the purchaser, heat treatment shall be performed by heating to 900 °F ± 25 °F (482 °C ± 14 °C) and soaking for at least one hour plus one 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 one hour. Heat treated tolerances stated in AMS2241 will be applied if stress relieving after aging is requested.

3.3.1.2 Bar shall not be cut from plate (See also 4.3.1).

3.4 Heat Treatment

Shall be in accordance with AMS5629 and the following:

3.4.1 Precipitation Heat Treatment

Shall be in accordance with the requirements applicable to either AMS-H-6875 and AMS2750, or AMS2759/3 at the vendor's option, except acceptance testing and criteria shall be as specified in 3.5.1.3. Precipitation heat treatment processed in batch-type furnaces shall have Type B instrumentation. Continuous-type furnaces shall comply with the pyrometry requirements of AMS2750. When the product is precipitation heat treated by an entity other than the mill producer of the AMS5629 certified product, the heat treatment source shall be accredited by a recognized industry agency for stainless steel heat treatment acceptable to the purchaser.

3.5 Properties

3.5.1 All products shall conform to the following requirements:

3.5.1.1 Macrostructure

Shall be in accordance with AMS5629.

3.5.1.2 Microstructure

Shall be in accordance with AMS5629.

3.5.1.3 Tensile Properties

Shall be in accordance with the following:

3.5.1.3.1 Product, 12 inches (305 mm) and under in nominal diameter, thickness or for hexagons, least distance between parallel sides, shall be as shown in Table 3. Properties for larger sizes shall be as agreed upon between purchaser and vendor. Tensile testing shall be performed in accordance with ASTM A 370.

TABLE 3A - Tensile Properties, Inch/Pound Units (1)

Condition	Specimen Orientation	Tensile Strength ksi	Minimum Yield Strength at 0.2% Offset ksi	Minimum Elongation in 2 Inches or 4D %	Minimum Reduction of Area %
H1000	Longitudinal	205 – 235	190	10	50
	Transverse	205 – 235	190	10	40

Note 1: Minimum tensile properties have been taken from AMS5629, and have not been substantiated using the procedures of SAE/AMS Metals Division.

TABLE 3B - Tensile Properties, SI Units (1)

Condition	Specimen Orientation	Tensile Strength MPa	Minimum Yield Strength at 0.2% Offset MPa	Minimum Elongation in 50.8mm or 4D %	Minimum Reduction of Area %
H1025	Longitudinal	1413 – 1620	1310	10	50
	Transverse	1413 – 1620	1310	10	40

Note 1: Minimum tensile properties have been taken from AMS5629, and have not been substantiated using the procedures of SAE/AMS Metals Division.

3.5.1.3.1.1 Longitudinal tensile property requirements apply to specimens taken in the longitudinal direction from bars, wire, and extrusions, to specimens taken from forgings with axis of specimen in the area of gage length varying not more than 15 degrees from parallel to the forging flow lines, and to specimens taken in the circumferential direction from flash welded rings.

3.5.1.3.1.2 Transverse tensile property requirements apply to specimens taken approximately perpendicular to the longitudinal direction of bars and extrusions, to specimens taken from forgings with axis of specimen in the area of gage length varying not more than 15 degrees from perpendicular to the forging flow lines, and to specimens taken in either the radial or axial direction from flash welded rings.

3.5.1.3.1.3 Transverse tensile property requirements apply only to products from which a test specimen not less than 2-1/2 inches (63.5 mm) long can be taken. If the cross-sectional dimensions of the product permit, the transverse testing shall be of the short-transverse (ST) direction; otherwise, the orientation shall be long transverse (LT).

3.5.1.3.1.4 Product tested in the transverse direction need not be tested in the longitudinal direction.

3.5.1.3.2 When the ultimate tensile strength exceeds 235 ksi, one additional aging cycle may be performed. The set temperature for the additional aging may be up to 25 °F (11 °C) higher. The soaking time shall be not more than the original precipitation heat treatment cycle.

3.5.1.3.3 When the tensile properties as specified in Table 3 are not met, it is permissible to again perform solution heat treatment in accordance with AMS5629 and precipitation heat treatment to the requirements specified in 3.4, and retest.

3.6 Quality

Shall be in accordance with AMS5629.

3.7 Tolerances

Shall be in accordance with AMS5629 (Also See 3.3.1.1).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor shall supply all samples for vendor'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 AMS5659 need not be repeated for certification to AMS5629/H1000.

4.2 Classification of Tests

Shall be in accordance with AMS5629 and the following.

4.2.1 Acceptance Tests

Tensile properties (3.5.1.3) and tolerances for heat treated product (3.7) are acceptance tests and shall be performed on each lot.

4.2.1.1 Periodic Tests

4.2.1.1.1 Microstructure and frequency-severity cleanliness rating are periodic tests and shall be performed as specified in AMS5629.

4.2.2 Sampling and Testing

Shall be in accordance with AMS5629.

4.2.2.1 Resampling and Retesting

Shall be in accordance with AMS5629.

4.3 Reports

4.3.1 Material provided by a producing mill:

The vendor of product shall furnish with each shipment a report showing the vendor's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), and the results of tests for composition, microstructure (Class A & B only), and macrostructure rating of each heat and for average grain size and tensile properties of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS5629/H1000, type of melting practice used, details of the precipitation heat treatment used (including, if straightened, the subsequent stress relief cycle), size, and quantity. If the product size being shipped is different from the nominal metallurgically worked cross-sectional size, details of how the shipped size was extracted from the larger product shall be reported.

4.3.2 Product from other than a producing mill using material previously certified to AMS5629:

The vendor of product shall furnish with each shipment the original mill certification of the AMS5629 product and the H1000 heat treatment process certification and test report, including traceability to accreditation of the precipitation heat treat facility (See 3.4.1.2).