

AEROSPACE MATERIAL SPECIFICATION



AMS-S-18732B

Issued OCT 1998
Revised DEC 1998
Cancelled JUL 2000
Superseded by AMS 5628

Steel Bars, Wire, Forging Stock, Forgings,
Tubing (431), Special Quality

CANCELLATION NOTICE

This specification has been "CANCELLED" by the Aerospace Materials Division, SAE, as of July 2000, and has been superseded by AMS 5628. The requirements of the latest issue of AMS 5628 shall be fulfilled whenever reference is made to the cancelled AMS-S-18732. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications noting that it is superseded by AMS 5628.

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1. SCOPE:

1.1 Scope:

This specification presents requirements for a special quality of type 431 corrosion-resistant steel.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2303 Aircraft Quality Steel Cleanliness, Martensitic Corrosion-Resistant Steels, Magnetic Particle Inspection Procedure

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

FED-STD-48 Tolerances for Steel and Iron Wrought Products
FED-STD-151 Metals; Test Methods
FED-STD-183 Continuous Identification Marking of Iron and Steel Products
MIL-H-6875 Heat Treatment of Steels (Aircraft Practice, Process for)
MIL-STD-129 Marking for Shipment and Storage
MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage
MIL-STD-753 Corrosion - Resistant Steel Parts, Sampling, Inspection and Testing for Surface Passivation

2.3 Uniform Classification Committee:

Available from Uniform Classification Committee, 202 Chicago Union Station, Chicago, IL 60606.

Uniform Freight Classification Rules

3. REQUIREMENTS:

3.1 Chemical composition:

The chemical composition shall be as specified in table I.

TABLE I. Chemical Composition

Element	Percent	Check analysis tolerance (percent) ¹
Carbon	-0.13-0.17	0.01
Manganese	-0.30-0.80	.08
Silicon	-0.20-0.60	.05
Phosphorus	-0.040 (max.)	.005
Sulfur	-0.030 (max.)	.005
Chromium	15.50-16.50	.20
Nickel	-2.00- 3.00	.07
Molybdenum	-0.25 (max.)	.03
Nitrogen	-0.10 (max.)	.01
Iron	Balance	-

¹ Individual determinations may vary above or below the specified range to the extent shown in the check analysis column, except that elements in any heat shall not vary both above and below the specified range.

3.2 Quality:

All material supplied under this specification shall be magnetic particle inspected in accordance with the requirements of AMS 2303 and shall comply with the frequency and severity limits specified therein.

3.2.1 Microstructure: After heat treatment to the HT-125 condition, materials shall not exhibit banding or segregation in excess of the limits of 3.2.1.1 or 3.2.1.2, respectively. The limits apply to all fields of longitudinal sections of specimens shown in figures 1 and 2 and when examined at 250 diameters magnification.

3.2.1.1 Free ferrite: Material shall not contain banded free ferrite in excess of that indicated by figure 3. Blocky ferrite, not banded, shall not exceed 4 percent. Unacceptable microstructure containing excessive banded free ferrite is shown on figure 4.

3.2.1.2 Retained austenite: Material shall not contain banded retained austenite in excess of amount shown in figure 5. Figures 6 and 7 represent unacceptable microstructures. Blocky austenite, not banded, is permitted.

3.3 Condition (as supplied):

The material shall be furnished annealed, or otherwise heat treated to a hardness range of Brinell 229-302 (excluding forging stock).

3.3.1 Surface condition:

3.3.1.1 Bar and forging stock, round: Surfaces shall be ground or rough turned.

3.3.1.2 Bar and forging stock, rectangular: Surfaces shall be hot-rolled and free from scale. Slight surface imperfections which are removable within half the specified tolerances will not be cause for rejection.

3.3.1.3 Tubing: Surface imperfections such as handling marks, straightening marks, light mandrel and die or roll marks, shallow pits, and scale pattern will not be cause for rejection, provided the imperfections are removable without reducing the diameter or wall thickness of the tubing below the permissible tolerance limits. Imperfections shall be removed by grinding or buffing, except when the imperfections are open so that the root areas are visible to the unaided eye and the surfaces blend smoothly into the normal surfaces of the tubing.

3.3.1.4 Wire: Surfaces shall be cold drawn, ground, polished or pickled.

3.3.2 Grain size: Grain size shall be No. 3 or finer, as indicated in supplement A, FED-STD-151, when tested in the HT-125 condition (excluding reforcing stock).

3.4 Response to thermal treatment:

When heat treated as specified herein, the material shall develop the properties specified in table II.

3.4.1 HT-200 condition: HT-200 is achieved by (1) quenching in oil at $52^{\circ} \pm 6^{\circ}\text{C}$ ($125^{\circ} \pm 10^{\circ}\text{F}$) from $1,020^{\circ} \pm 14^{\circ}\text{C}$ ($1,875^{\circ} \pm 25^{\circ}\text{F}$); (2) cooling to room temperature in water; (3) soaking at $-73^{\circ} \pm 11^{\circ}\text{C}$ ($-100 \pm 20^{\circ}\text{F}$) in a suitable refrigerant for 2 hours; (4) tempering at $288^{\circ} \pm 14^{\circ}\text{C}$ ($550^{\circ} \pm 25^{\circ}\text{F}$) for 2 hours; and (5) retempering at $288^{\circ} \pm 14^{\circ}\text{C}$ ($550^{\circ} \pm 25^{\circ}\text{F}$) for 2 hours.

3.4.2 HT-125 condition: HT-125 is achieved by quenching in vigorously agitated oil (Houghton #2 or oil of equivalent H value) at $52^{\circ} \pm 6^{\circ}\text{C}$ ($125^{\circ} \pm 10^{\circ}\text{F}$) from $1,024^{\circ} \pm 8^{\circ}\text{C}$ ($1,875^{\circ} \pm 15^{\circ}\text{F}$), cooling to room temperature in water, tempering at $635^{\circ} \pm 14^{\circ}\text{C}$ ($1,175^{\circ} \pm 25^{\circ}\text{F}$) for 3 hours, and air cooling to room temperature. This heat treatment is used to provide maximum contrast for microstructure evaluation (see 3.2.1 and 4.5.2).