

1.0 SCOPE

1.1 Application. This specification presents the material requirements for an austenitic heat treatable corrosion resistant steel, primarily intended for use in parts requiring high strength up to 1200°F and oxidation resistance up to 1800°F.

1.2 Deviation. Unless otherwise authorized in writing by the purchaser, there shall be no deviation from the requirements set forth in this specification.

1.3 Classification. Bars shall be furnished in one of the following physical and surface conditions as specified. (See 5.3)

Physical condition:

- (A) As Forged
- (B) As Rolled
- (C) Annealed
- (D) Solution Heat Treated
- (E) Solution Heat Treated and Aged
- (F) Solution Heat Treated and Double Aged

Surface Condition:

- (1) Black
- (2) Pickled or Vapor Blasted
- (3) Cold Finished
- (4) Rough Turned
- (5) Centerless Ground

2.0 APPLICABLE SPECIFICATIONS

2.1 The following specifications in effect on the date of invitation for bids shall form a part of this specification to the extent specified herein. In the event of conflict between these specifications and the body of the specification, the latter shall govern.

Specifications

Federal

P-S-661

- Solvent, Dry Cleaning

Military

MIL-I-6866
MIL-H-6875

- Inspection, Penetrant Method of
- Heat Treatment of Steels (Aircraft) Process For

Standards

Federal

Fed. Std. No. 48

- Tolerances for Steel and Iron Wrought Products

Fed. Test Meth. No. 151

- Metal; Test Methods

Industry

ARTC-13

- Standard Elevated Temperature Testing

3.0 REQUIREMENTS

3.1 Material. The steel shall be of aircraft quality, satisfactory for the fabrication of parts which may be subject to penetrant inspection by the methods described in Specification MIL-I-6866.

3.1.1 Manufacturing process. The steel shall be manufactured utilizing a vacuum melting process.

3.2 Chemical composition. The chemical composition shall be as specified in Table I.

① INACTIVE FOR DESIGN AFTER 15 SEPT. 1975.
NO SUPERSEDING STANDARD
(FOR DESCRIPTION OF STATUS NOTES, SEE
NAS380)

LIST OF CURRENT SHEETS

NO.	REV.
1	1
2	1
3	1
4	1
5	1

CUSTODIAN: NATIONAL AEROSPACE STANDARDS COMMITTEE

PROCUREMENT
SPECIFICATION

TITLE
STEEL, CORROSION AND HEAT RESISTANT,
BAR, ROD, AND FORGING

CLASSIFICATION
SPECIFICATION

NAS Documents
SHEET 1 OF 5

NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 1725 DE SALES STREET, N. W., WASHINGTON, D. C. 20036

TABLE I

Element	Percentage	Check Analysis 1/ Tolerance (percent)
Chromium	15.00 - 17.00	± 0.20
Nickel	23.00 - 27.00	± 0.15
Titanium	3.70 - 4.20	± 0.05
Aluminum	0.50 max	+ 0.05
Silicon	0.50 max	+ 0.02
Carbon	0.05 - 0.15	± 0.01
Manganese	0.50 max	± 0.02
Sulphur	0.04 max	+ 0.005
Phosphorus	0.04 max	+ 0.005
Boron	0.05 - 0.10	± 0.01
Columbium plus Tantalum	0.35 - 0.65	± 0.05
Zirconium	0.035 - 0.085	± 0.01
Iron	Remainder	-

1/ Individual determinations may vary from 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.

3.3 Grain size. The austenitic grain size shall be predominantly No. 5 or finer with grains as large as No. 3 permissible.

3.4 Macrostructure. Visual examination of deep acid etched specimens shall show no evidence of pipes, internal cracks, excessive segregation, or other injurious defects.

3.5 Surface and physical condition. The steel shall be supplied in the surface condition and physical condition specified on the purchase order.

3.6 Hardness. The hardness for the steel shall be as follows:

Condition C	Rockwell B95 Max
Condition D	Rockwell B80 to B90
Condition E	Rockwell C38 to C44
Condition F	Rockwell C38 to C46

3.7 Heat Treatment

3.7.1 Cleaning. The steel or steel parts shall be thoroughly cleaned prior to any thermal treatment. Parts shall be free of oil, grease forming lubricants, metal particles and other foreign material.

3.7.2 Furnaces. The steel shall be heat treated in controlled muffle type furnaces which conform to the requirements of MIL-H-6875.

3.7.3 Solution Treatment. (Condition D). The steel shall be heated in air to $1850^{\circ}\text{F} \pm 25^{\circ}\text{F}$ and soaked at this temperature for 2 hours followed by a water quench.

3.7.4 Single Aging Treatment. After the solution treatment the steel may be precipitation aged to Condition E by heating in air to $1375^{\circ}\text{F} \pm 25^{\circ}\text{F}$ and soaked at this temperature for 16 hours followed by an air cooling.

3.7.5 Double Aging Treatment. After the solution heat treatment the steel may be double precipitation aged to Condition (F) by first: heating in air to $1425^{\circ}\text{F} \pm 25^{\circ}\text{F}$ and soaking at this temperature for 2 hours, followed by an air cooling; and then second: heating in air to $1250^{\circ}\text{F} \pm 25^{\circ}\text{F}$ and soaking for 16 hours followed by an air cooling.

3.7.6 Descaling. The steel or steel parts shall be descaled by vapor blasting or caustic bath immersion only when specified.

3.8 Mechanical Properties

3.8.1 The room temperature mechanical properties of the condition (D) solution heat treated and water quenched material shall conform to Table II.

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