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400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION



**AMS-S-7720**

Issued

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Submitted for recognition as an American National Standard

## Steel, Corrosion-Resistant (18-8) Bars, Wire and Forging Stock (Aircraft Quality)

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## 1. SCOPE:

## 1.1 Scope:

This specification covers the requirements for compositions of corrosion-resistant (18-8) steel bars, rods, wire and forging stock.

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**1.2 Classification:**

Material shall be furnished in the following compositions and conditions, as specified (see 6.2):

Composition: (see Table I)

302

316

Physical Conditions:

- (A) Heat-treated (annealed)
- (B) Cold finished
- (C) Hot rolled or forged only

Surface Conditions:

- (a) Scale not removed (hot finished)
- (b) Pickled, blast cleaned or otherwise descaled
- (c) Cold drawn
- (d) Cold rolled
- (e) Turned
- (f) Centerless ground
- (g) Polished

**2. APPLICABLE DOCUMENTS:**

The following publications, of the issues in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

**2.1 Government Publications:**

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

QQ-S-764 Steel Bar, Corrosion Resisting, Free Machining

FED-STD-151 Metals, Test Methods

FED-STD-183 Continuous Identification Marking of Iron and Steel Products

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

**2.2 SAE Publications:**

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

AMS 2241 Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy, Bars and Wire

## 3. REQUIREMENTS:

## 3.1 Material:

The steel shall be manufactured by the electric-furnace process. Sufficient discard shall be taken from each ingot to insure freedom from injurious piping and undue segregation.

## 3.2 Chemical composition:

The chemical composition shall conform to the compositions of Table I, as specified (see 6.2).

TABLE I  
Chemical Composition

Designation Composition		302		316	
Element	Composition Limits	Check Analysis Tolerance 1/	Composition Limits	Check Analysis Tolerance 1/	
	Percent	Percent	Percent	Percent	
Carbon	0.12 (max)	+0.01	0.08 (max)	+0.01	
Manganese	2.0 (max)	+0.04	2.0 (max)	+0.04	
Phosphorus	0.04 (max)	+0.005	0.04 (max)	+0.005	
Sulfur	0.03 (max)	+0.005	0.03 (max)	+0.005	
Chromium	17.0 - 19.0	±0.20	16.0 - 18.0	±0.20	
Nickel	8.0 - 10.0	±0.15	10.0 - 14.0	±0.15	
Silicon	1.0 (max)	+0.05	1.0 (max)	+0.05	
Copper 2/	0.50 (max)	+0.03	0.50 (max)	+0.03	
Molybdenum	---	---	1.75 - 3.00	±0.10	

1/ Individual determinations may vary from the specified range to the extent indicated in the check analysis column, except that an element in any-single heat shall not vary both above and below the specified range.

2/ Analysis for copper is ordinarily not required.

## 3.3 Mechanical properties:

The mechanical properties shall be as specified by Table II.

TABLE II  
Mechanical Properties

302 Condition	Diameter or Thickness	Tensile Strength (min)	Yield Strength at 0.2 Percent Set or at Extension Indicated		Elongation in 2 Inches (min)	Reduction of Area (min)
			(min)	Extension Under Load		
	Inches	psi	psi	Inches per 2 Inches	Percent	Percent
(A)	All sizes	1/ 100,000	---	---	35	50
(B)	Up to 3/4 incl	125,000	100,000	0.0114	12	35
(B)	Over 3/4 to 1	115,000	80,000	0.0099	15	35
(B)	Over 1 to 1-1/4 incl	105,000	65,000	0.0088	25	45
(B)	Over 1-1/4 to 1-1/2 incl	100,000	50,000	0.0077	28	45
(B)	Over 1-1/2 to 3 incl	95,000	45,000	0.0073	30	45
(B)	Over 3	80,000	35,000	0.0066	30	45
(C)	All Sizes Mechanical properties not specified.					
316 Condition						
(B)	3/4 and less	110,000	95,000		15	45
(B)	Over 3/4 to 1 incl	100,000	80,000		20	45
(B)	Over 1 to 1-1/4 incl	95,000	65,000		25	45
(B)	Over 1-1/4 to 1-1/2	90,000	50,000		30	45
(B)	Over 1-1/2	85,000	40,000		30	45

1/ Maximum. For materials in physical condition A and surface conditions (c) through (g) incl., or annealed material in straightened and cut lengths, a maximum tensile strength of 125,000 psi is permissible for sizes under 1/4 inch in thickness and 115,000 psi for sizes 1/4 inch and larger.

### 3.4 Condition:

Carbides shall be dispersed and shall not form continuous networks in the structures of materials in physical conditions A and B. The carbide dispersion need not be ascertained in materials in condition C.

3.5 Macrostructure:

Visual examination of deep acid etched material shall show no evidence of abnormal segregation, pipes, cracks, seams, or abnormal change in structure from the surface to the center.

3.6 Tolerances:

Variations from nominal dimensions shall be within the permissible limits of AMS 2241.

3.7 Length:

3.7.1 Exact lengths: When bars of any size are ordered to exact lengths or in lengths expressed as a multiple of a definite unit, the length tolerances shall be as specified in the contract or purchase order.

3.7.2 Mill lengths: When exact or multiple lengths are not ordered, bars will be accepted in mill lengths of 6 to 20 feet, but not more than 10 percent of any order shall be furnished in lengths shorter than 10 feet.

3.8 Identification of product:

When specified or for direct shipment to the Government, each piece shall be identified in accordance with FED. STD. No. 183, and the markings shall include the number of the heat of metal, the composition designator, condition, and designation of this specification.

3.9 Material smaller than 1/2 inch in diameter or 3/8 inch in width of flat shall be bundled and tagged at each end with an extra tag included in the bundle. The identification markings specified in 3.8 shall be legibly inscribed on each tag.

3.10 Workmanship:

Material shall be sound, of uniform quality and condition, free from pipes, laps, cracks, twists, seams, or other defects detrimental to the performance of parts fabricated from the material.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any other commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

## 4.2 Classification inspection:

Inspection of the steel is classified as quality conformance inspection (see 4.3 through 4.8).

## 4.3 Examinations:

## 4.3.1 Sampling for Examination of Dimensions, Finish, Workmanship, Packaging, and Identification

Marking: Units of product shall be randomly selected in accordance with Table III to represent each lot of material of one heat, the same nominal dimensions, and offered for acceptance at one time.

TABLE III  
Sampling for Examination of Product

Lot Size	Sample Size	Acceptance No.
1 to 110	5	0
111 to 500	7	0
501 to 800	10	0
801 to 1200	15	0
Over 1200	25	0

## 4.3.2 Examination of Preparation for Delivery: Preparation for delivery shall be examined for conformance to Section 5.

## 4.4 Chemical Analysis:

## 4.4.1 Sampling: When products are identified as specified in 3.9, and the heats represented have been analyzed by the manufacturer and are in conformance with specified composition limits, the manufacturer's ladle analysis is acceptable.

## 4.4.2 Test method: Chemical analysis shall be made in accordance with standard wet chemical methods, spectrochemical, or other analytical methods of Fed. Test Method Std. No. 151. In the event of dispute, analysis shall be by wet chemical methods.

## 4.5 Tensile test:

(Not applicable to materials in physical condition C.)

## 4.5.1 Sampling: One or more tensile-test samples shall be selected from bars or wire produced under the same processing conditions, from the same heat, of the same physical condition, of the same size, essentially uniform in all respects, and submitted for acceptance at one time.