



AEROSPACE MATERIAL SPECIFICATION

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Superseding AMS-QQ-S-763C

Steel, Corrosion Resistant, Bars, Wire, Shapes, and Forgings

RATIONALE

AMS-QQ-S-763D stabilizes this document because newer technology exists in similar documents.

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FIGURE A - SIMILAR SPECIFICATIONS FOR PRODUCTS COVERED BY AMS-QQ-S-763

Product Form	Bar		Wire		Shapes		Forgings	
Class	ASTM	AMS	ASTM	AMS	ASTM	AMS	ASTM	AMS
Annealed								
202	A 276	(2)	(1)	(1)	A 276	(2)	A 473	(2)
302	A 276	5636	A 684/A 684M	5636	A 276	(2)	A 473	(2)
S30430	A 493	(2)	A 493	(2)	(3)	(3)	(3)	(3)
304	A 276	5639	A 580/A 580M	5639	A 276	5639	A 473	5639
304L	A 276	5647	A 580/A 580M	5647	A 276	5647	A 473	5647
305	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	A 473	(2)
309	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	A 473	(2)
310	A 276	5651	A 580/A 580M	5651	A 276	5651	A 473	5651
316	A 276	5648	A 580/A 580M	5648	A 276	5648	A 473	5648
316L	A 276	5653	A 580/A 580M	5653	A 276	5653	A 473	5653
317	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	A 473	(2)
321	A 276	5645	A 580/A 580M	5645	A 276	5645	A 473	5645
347	A 276	5646	A 580/A 580M	5646	A 276	5646	A 473	5646
384	A 493	(2)	A 493	(2)	(3)	(3)	(3)	(3)
403	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	A 473	(2)
405	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	A 473	(2)
410	A 276	5613	A 580/A 580M	5613	A 276	5613	A 473	5613
414	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	A 473	(2)
420	A 276	5621	A 580/A 580M	5621	A 276	5621	A 473	5621
430	A 276	5627	A 580/A 580M	5627	A 276	5627	A 473	5627
440A	A 276	5631	A 580/A 580M	(2)	A 276	(2)	A 473	5631
440B	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	A 473	(2)
440C	A 276	5630	A 580/A 580M	5630	A 276	5630	A 473	5630
446	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	A 473	(2)
High Tensile								
202	A 276	(2)	(1)	(1)	(3)	(3)	(3)	(3)
302	A 276	5637	A 313/A 313M	5637	(3)	(3)	(3)	(3)
304	A 276	5857	A 313/A 313M	5857	(3)	(3)	(3)	(3)
316	A 276	(2)	A 313/A 313M	(2)	(3)	(3)	(3)	(3)
317	(1)	(1)	A 478	(2)	(3)	(3)	(3)	(3)
403	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	(1)	(1)
410	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	(1)	(1)
Hard Temper								
403	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	(1)	(1)
410	A 276	(2)	A 580/A 580M	(2)	A 276	(2)	(1)	(1)
414	A 276	(2)	(1)	(1)	A 276	(2)	A 473	(2)

(1) Not covered by either an ASTM or an AMS.

(2) Not covered by an AMS.

(3) Product form and/or temper not applicable to this alloy.

NOTICE

The initial SAE publication of this document was taken directly from U.S. Military Standard QQ-S-763F. This SAE Standard may retain the same part numbers established by the original military document.

Any requirements associated with Qualified Products Lists (QPL) may continue to be mandatory for DoD contracts. Requirements relating to QPLs have not been adopted by the SAE for this standard and are not part of this SAE document.

1. SCOPE AND CLASSIFICATION

1.1 Scope

This specification covers corrosion-resistant steel bars, wire, shapes, and forgings.

1.2 Classification

1.2.1 Corrosion-resistant steel shall be furnished in the following classes, conditions, forms, and finishes, as specified (See 6.3).

1.2.1.1 Classes and Conditions

The material shall be furnished in the classes and conditions shown in Table 2.

1.2.1.2 Forms

1.2.1.2.1 Bars

Any size that is round, square, rectangular (excluding plate), hexagon, or octagon, furnished in straight lengths regardless of finish that is produced by rolling, extruding, forging, etc. Flat rolled product up to 10 inches inclusive in width and 0.125 inches and over in thickness is classified as bar. (All cold reduced flat material under 0.1875 inches in thickness is classified as strip if it is over 0.375 inches in width.)

1.2.1.2.2 Wire

Any size round or shaped cold finished product that is supplied in coils.

1.2.1.2.3 Forgings

Parts produced by hot mechanical shaping of such products as bars, billets or other semifinished materials, using hammers presses and forging machines.

1.2.1.2.4 Shapes

A solid section other than bar or wire, furnished in straight lengths (includes structural angles, channels, tees, and zeos).

1.2.1.3 Finish

1.2.1.3.1 Hot Finished (conditions A, T, and H only, bar only)

Bars in the hot-finished condition can be ordered with one of the following finishes:

- a. Hot finished, scale not removed (excluding spot conditioning)
- b. Pickled or blast cleaned and pickled
- c. Rough turned (round bars only)

1.2.1.3.2 Cold Finished (bars only)

Bars in the cold-finished condition can be ordered with one of the following finishes:

- a. Cold drawn or cold rolled (conditions A and B only)
- b. Centerless ground or smooth turned (all conditions, round bars only)
- c. Polished (all conditions, round bars only)

1.2.1.3.3 Wire

Wire is usually furnished with a cold drawn finish, any exceptions need to be specified in the purchase order.

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.

2.1 U.S. Government Publications

Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6396, <http://quicksearch.dla.mil/>.

MIL-H-6875 Heat Treatment of Steel, Process for

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

FED-STD-123 Marking for Domestic Shipment (Civilian Agencies)

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

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 A 262 Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

ASTM A 342 Permeability of Feebly Magnetic Materials

ASTM A 370 Mechanical Testing of Steel Products

ASTM A 484/484M General Requirements for Stainless and Heat-Resisting, Bars, Billets, and Forgings

ASTM A 555 General Requirements for Stainless and Heat-Resisting Steel Wire and Wire Rods

ASTM A 751 Standards Test Methods, Practices, and Terminology for the Chemical Analysis of Steel Products

ASTM D 3951 Commercial Packaging

3. REQUIREMENTS

3.1 Material

The material may be made by one or more of the following processes: electric furnace, electric-induction, vacuum furnace or other suitable commercial processes. If a specific melting practice is required by the purchaser, it shall be specified on the purchase order (See 6.3).

3.2 Non-finishing Surface Processing

3.2.1 Grinding

Bars and forgings may be ground to remove surface defects, provided such grinding does not reduce the thickness or width at any point below the allowable dimensional tolerances. An abrasive wheel shall be used for such grinding and shall be operated at a speed proper to insure that defective areas are cleanly cut out. Grinding shall not be so severe as to change the metallurgical condition of the material.

3.2.2 Cleaning

Unless otherwise specified in the contract or order, structural changes shall be subjected to a final cleaning treatment for the removal of scale, by the use of an appropriate cleaning solution such as nitric or nitric and hydrofluoric acid (See 6.3).

3.3 Rough Forgings

Rough forgings shall have sufficient excess stock to permit finishing to required dimensions without excessive waste. Allowances for machining shall be specified (See 6.3).

3.4 Chemical Composition

The material shall conform to the chemical composition shown in Table 3 and shall be within the check analysis tolerances shown in ASTM A 484 or ASTM A 555 as applicable.

3.5 Mechanical Properties

The material shall conform to the mechanical properties shown in Table 4 for the respective conditions. Heat treatable grades (400 series) shall develop the properties specified for the T or H conditions when subjected to thermal treatment in accordance with MIL-H-6875 and as specified or recommended by the purchaser.

3.6 Macrostructure

For classes 410, 420, 440A, 440B, and 440C, the macrostructure of the material shall be sound, free from pipes, fissures, gas cavities, sponginess, abnormal inclusions or segregations, or unusually numerous pin-holes when tested in accordance with 4.5.3. This requirement applies only to the classes specified in this paragraph.

3.6.1 Forging Grain Flow

The selection of forging blank size and orientation and forging technique shall provide a grain flow pattern essentially parallel to major-stressed surface areas of the finished part as indicated by design information (See 6.3). The grain flow pattern shall be free from re-entrant and sharply folded flow lines.

3.7 Magnetic Permeability

When low magnetic permeability is specified (See 6.2), class 304, in the annealed condition, shall show a magnetic permeability not higher than 1.02 at 200 oersteds (air equal to 1.00). When low magnetic permeability is specified for classes other than 304, the acceptable magnetic permeability values shall be as specified (See 6.3) and the inspection procedure shall be in accordance with ASTM A 342.

3.8 Resistance to Intergranular Corrosion (precipitated carbides)

Classes 304 - condition A, 304L, 316 - condition A, 316L, 317 - condition A, 321, and 347 shall be free from precipitated grain boundary carbide networks which result in intergranular corrosion. These steels shall be considered acceptable when specimens pass the specified test of 4.5.4. This requirement applies only to the classes and conditions specified in this paragraph.

3.9 Dimensional Tolerances

3.9.1 Bars, Shapes, and Wire

For bars and shapes, the tolerances shall conform to the applicable requirements of ASTM A 484. For wires, the tolerances shall conform to the applicable requirements of ASTM A 555. When exact lengths are not ordered (See 6.3), 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.

3.9.2 Structural Shapes

3.9.2.1 Weight

Structural shapes of 6 pounds per linear-foot or less will be acceptable if the actual weights are not over 7-1/2 percent above or 7-1/2 percent below the ordered weights. Shapes over 6 pounds per linear foot will be accepted if the weights are not over 4-1/2 percent above or 4-1/2 percent below the ordered weights.

3.9.2.2 Size

Sections having legs or flanges up to 6 inches, inclusive, shall not exceed 1/8 inch over or under the ordered length or width of legs or flanges. Sections having legs or flanges over 6 inches shall not exceed 3/16 inch over and 1/8 inch under the ordered length or width of legs and flanges. The maximum depth of grinding for spot conditioning shall not exceed 10 percent of the thickness of the shape at any point of conditioning.

3.9.3 Forgings

All forgings shall conform to the sizes and shapes as specified (See 6.3). When dimensional tolerances are not included in the contract or order, forgings measured on their diameters or between parallel faces shall not vary from the specified dimensions by more than plus 3/32 inch on smooth forgings or plus 1/32 inch on rough machined forgings. Dimensional tolerances for finished forgings shall be as specified on the applicable drawings.

3.10 Identification Marking

3.10.1 Bars (continuous marking)

When specified by the procuring activity, continuous identification marking shall be in accordance with FED-STD-183. Each round, square, and flat bar 1 inch and over, each hexagon, square, and flat 7/8 inch and over, and each octagon 1 inch and over shall be printed in ink with constantly recurring symbols including a coding of the name or trademark of the manufacturer and an identifying designation consisting of the class number and a condition designator selected from FED-STD-183. The symbols shall be repeated at intervals not greater than 3 feet. The identifying designator shall be coded as shown in the following example (See 6.3).

Class number 304

Condition designator A

For rounds, and bars less than 1 inch, hexagons, squares and flats less than 7/8 inch, and octagons less than 1 inch, the same information shall be marked or printed on substantial tags securely affixed to each end of each bundle with a third tag placed inside the bundle near the middle.

3.10.2 Shapes and Shaft Forgings

Shapes and shaft forgings shall be die or rubber stamped or marked with a non-water-soluble ink on one end with the following information:

Class number.

Condition designator.

3.10.3 Forgings (except shaft forgings)

Each forging shall be marked with the manufacturer's name or trademark, drawing or die number, heat and forging number, class number, and a condition designator. Small forgings shipped in bundles, of such size that individual marking is not practical, shall have the above information printed on substantial tags securely affixed to each end of each bundle with a third tag placed inside the bundle near the middle.

3.10.4 Wire

Unless other identification is specified in the contract or purchase order (See 6.3), wire shall be identified by metal tags, impression stamped with the legend specified in FED-STD-183, and shall be attached to each coil.

3.11 Workmanship

The material shall be uniform in quality and condition, free from pipe and flakes or heat checks, and shall contain no welds or defects such as seams, laps, cracks, slag, hard spots, porosity, slivers, scabs, rolled-in scale, fissures, gas cavities, sponginess, nonmetallic inclusions, and undue segregation, which due to the nature, degree, or extent may detrimentally affect the suitability for the service intended.

3.12 Heat Treatment

Heat treatment shall be in accordance with MIL-H-6875. AMS2750 pyrometry requirements do not apply to furnaces used only for heat treating material to condition A. The annealing procedure for S30430 and 384 shall be in accordance with the table below, in addition to the requirements set forth in MIL-H-6875.

TABLE 1

AISI or UNS Designation	Annealing treatment	
	Heating °F	Cooling
S30430	1850 to 2100	Water quench
384	1900 to 2100	Water quench

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 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 that supplies and services conform to prescribed requirements.