

QQ-A-200/9D
23 August 1983
SUPERSEDING
QQ-A-200/9C
August 19, 1970

FEDERAL SPECIFICATION SHEET

ALUMINUM ALLOY 6063, BAR, ROD, SHAPES, TUBE AND WIRE, EXTRUDED

This specification was approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal agencies.

The complete requirements for procuring the aluminum alloy 6063, bar, rod, shapes, tube and wire, extruded described herein shall consist of this document and the latest issue of QQ-A-200/GEN.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the specific requirements for aluminum alloy 6063 bar, rod, shapes, tube and wire produced by extrusion.

1.2 Classification.

1.2.1 Tempers. The bar, rod, shapes, tube and wire shall be of the following tempers, as specified (see 6.2). The definitions of these tempers shall be as specified in QQ-A-200/GEN.

0	-	Annealed
T1	-	Solution heat-treated and quenched at the extrusion press
T4	-	Solution heat-treated and naturally aged to a substantially stable condition
T5	-	Artificially aged T1
T6	-	Solution heat-treated and artificially aged
T52	-	Temper T1 with special artificial aging to control formability

1.2.2 Tubing. Tubing shall be additionally classified as follows:

FSC 9530, 9525,
4710, 9540

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Type		Description
I	-	Tubing extruded from hollow billets using die and mandrel (see QQ-A-200/GEN).
II	-	Tubing extruded from solid billets using a port-hole or spider die or similar tooling (see QQ-A-200/GEN).

2. APPLICABLE DOCUMENTS

2.1 Government publications. The issues of the following documents, in effect on date of invitation for bids or solicitation for offers, form a part of this specification to the extent specified herein.

Federal Specifications

QQ-AA-200/GEN - Aluminum Alloy, Bar, Rod, Shapes, Structural Shapes, Tube and Wire, Extruded; General Specification for

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions, as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office Washington, DC 20370.)

(Single copies of this specification, and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; AND Seattle, MA.)

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specification, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

3. REQUIREMENTS

3.1 Chemical composition. The chemical composition shall conform to the requirements specified in table I.

3.2 Mechanical properties.

TABLE I Chemical composition ^{L1}

Element	Percent	
	Minimum	Maximum
Magnesium	0.45	0.9
Silicon	0.20	0.6
Iron	--	0.35
Copper	--	0.10
Titanium	--	0.10
Manganese	--	0.10
Zinc	--	0.10
Chromium	--	0.10
Other elements, each	--	0.05
Other elements, total ^{L2}	--	0.15
Aluminum	Reminder	

^{L1} Analysis shall routinely be made only for the elements specifically mentioned in table I. If, however, the presence of other elements is indicated or suspected in amounts greater than the specified limits, further analysis shall be made to determine that these elements are not present in excess of specified limits

^{L2} The sum of those "Others" metallic elements 0.010 percent or more each, expressed to the second decimal before determining the sum.

3.2.1 Mechanical properties of materials as supplied. The mechanical properties in the direction of extrusion shall conform to the requirements specified in table II. (See QQ-A-200/GEN for exceptions to elongation requirements).

3.2.2 Mechanical properties after heat treatment. In addition to conforming to the requirements of 3.2.1. Materials identified in the following paragraphs shall, after having been heat-treated to over tempers also identified therein, have properties in the extrusion direction conforming to those specified in table II, as applicable.

3.2.2.1 Material in the O temper. Material in the O temper, without the subsequent imposition of cold work or forming operations shall, after proper solution heat treatment and artificial aging, develop the properties specified in table II for the T62 temper. Material solution heat treated as specified in the foregoing sentence shall after natural aging demonstrate conformance to the requirements of table II with respect to the T42 temper when such demonstration is specified (see 6.2).

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Table II. Mechanical Properties

Temper	Thickness, (bar and shapes); diameter, (rod and wire); wall thickness, (tube); inches	Area square inches	Tensile strength, Minimum, ksi	Yield strength at 0.2 percent offset $\sigma_{0.2}$ at extension indicated		Elongation in 2 inches or 4 times D <u>1/</u> , Minimum, percent
				Minimum ksi	Extension under load, inch per inch	
0	All	All	<u>2/</u>	---	--	18
T1	Up thru 0.500 0.501 - 1.000	All	17.0 16.0	9.0 8.0	0.0029 0.0028	12 12
T4 and T42, <u>4/</u>	Up thru 0.500 0.501 - 1.000	All	19.0 18.0	10.0 9.0	0.0030 0.0029	14 14
T5	Up thru 0.500 0.501 - 1.000	All	22.0 21.0	16.0 15.0	0.0036 0.0035	8 8
T6 and T62, <u>4/</u>	Up thru 0.124 0.125 - 1.000	All	30.0 30.0	25.0 25.0	0.0045 0.0045	8 10
T52	Up thru 1.000	All	22.0 <u>3/</u>	16.0 <u>3/</u>	0.0036	8

1/ D represents specimen diameter2/ No minimum. Maximum tensile strength is 19.0 ksi3/ Maximum tensile strength is 30.0 ksi and maximum yield strength is 25.0 ksi4/ Material in the T42 and T62 tempers is not available from the materials producers

3.2.2.2 Material in the T1 and T4 tempers. Material in the T1 and T4 tempers shall be artificially ageable to the properties specified for the T5 and T6 tempers, respectively. Such capability shall be demonstrated when specified (see 6.2).

3.3 Marking. (See QQ-A-200/GEN)

4. QUALITY ASSURANCE PROVISIONS (see QQ-A-200/GEN)

4.1 Inspection lot. (See QQ-A-200/GEN for lot definitions)

4.2 Heat treatment.

4.2.1 Aging period before testing. Material solution heat-treated and selected for natural aging may be tested for compliance with 3.2.2 within 4 days after solution heat treatment, if the manufacturer so elects. If these tests fail, the manufacturer may test additional specimens taken after 4 days aging. These specimens shall be taken from the same location in the lot from which the first specimens were taken.

4.3 Mechanical test after heat treatment.

4.3.1 Material in the 0 temper. From material in the 0 temper, an additional number of specimens, equal to those required by QQ-A-200/GEN, shall be taken and tested after solution heat treatment and artificial aging to determine compliance with 3.2.2.1 with respect to the T62 temper. When specified (see 6.2), from material in the 0 temper, an additional number of specimens, equal to those required by QQ-A-200/GEN, shall be taken and tested after solution heat treatment to determine compliance with 3.2.2.1 with respect to the T42 temper.

4.3.2 Material in the T1 and T4 tempers. When specified (see 6.2), from material in the T1 and T4 tempers, an additional number of specimens, equal to those required by QQ-A-200/GEN, shall be taken and tested after the appropriate artificial aging treatments to determine compliance with 3.2.2.2, as applicable.

5. PREPARATION FOR DELIVERY (see QQ-A-200/GEN)

6. NOTES

6.1 Intended use. This alloy is intended for applications requiring a weldable, moderate strength, heat-treatable alloy.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number and date of this specification.
- (b) Form, quantity and temper required (see 1.2.1)
- (c) Dimensions required
- (d) Mechanical properties and dimensional tolerance requirement for sizes not specifically covered

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- (e) Special end use requirements
- (f) Whether type I tubing is required (if type is unspecified on drawings or in related documents, type I should be applied) (see 1.2.2)
- (g) Demonstrations of heat treatability where such demonstrations are optional (see 3.2.2.1 and 3.2.2.2)
- (h) Selection of applicable levels of preservation, packaging and packing required. Also specify marking requirements (see section 5, QQ-A-200/GEN)

6.3 Heat treatment. Solution heat treatment of 6063 bar, rod, shapes, tube and wire is accomplished by quenching in water or air from the extrusion temperature at the extrusion die, or accomplished by heating at a temperature in the range of 970 deg. +/- 10 deg. F and quenching in cold water or air from this temperature. The T6 temper may be obtained by artificial aging for 6 to 10 hours at a temperature of 350 deg. +/- 10 deg. F or for 4 to 6 hours at a temperature of 365 deg. +/- 10 deg. F. The T5 temper may be obtained by artificial aging for 1 to 2 hours at a temperature of 150 deg. +/- 10 deg. or by the same practices listed above for T6 temper. Severe forming operations can be accomplished more readily prior to artificial aging.

6.4 Properties after heat treatment. Mechanical properties are certified for the temper of material supplied. The producers capability demonstration is not evidence that user-treated material conforms to property requirements of a given temper. Frequently, user-heat-treated material may develop a lower level of properties, especially if any cold, warm or hot work is introduced prior to solution heat treatment. The user should be held responsible for demonstrating that his processing will yield properties meeting requirements.

MILITARY INTEREST:

Custodians

Army - MR
Navy - AS
Air Force - 20

Review Activities

Army - AR, EA, MI
Navy - OS, YD

User Activities:

Army - CR
Navy - MC, SH

CIVIL AGENCY COORDINATING ACTIVITIES:

NASA - JFK
DOE - BPA
GSA - FSS

PREPARING ACTIVITY:

NAVY - AS

DOD Project No. 9530-0232

NOTICE
OF VALIDATION

INCH-POUND

QQ-A-200/9D
NOTICE 1
30 October 1991

FEDERAL SPECIFICATION SHEET

ALUMINUM ALLOY 6063, BAR, ROD, SHAPES, TUBE AND WIRE, EXTRUDED

QQ-A-200/9D, dated 23 August 1983, has been reviewed and determined to be valid for use in acquisition.

Custodian

Army - MR

Navy - AS

Air Force - 11

Preparing activity:

Navy - AS

AMSC N/A

FSC 9530

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.