SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-QQ-A-200/2A

Issued 1997 -07
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Noncurrent 2008-01

Superseding AMS-QQ-A-200/2

Aluminum Alloy 2014, Bar, Rod, Shapes, Tube, and Wire, Extruded

A92014

RATIONALE

AMS-QQ-A-200/2 has been designated NonCurrent because new designs can be adequately addressed by other specifications.

NONCURRENT NOTICE

This specification has been declared “NONCURRENT” by the Aerospace Materials Division, SAE, as of January 2008. It is recommended, therefore, that this specification not be specified for new designs.

“NONCURRENT” refers to those specifications which have previously been widely used and which may be required for production or processing of existing designs in the future. The Aerospace Materials Division, however, does not recommend these specifications for future use in new designs. “NONCURRENT” specifications are available from SAE upon request.

Similar but not necessarily identical products are covered in the following specifications. However, this listing is provided for information only and does not constitute authority to substitute these specifications for the “NONCURRENT” specification.

AMS-QQ-A-200/2	Similar Specification
Type 1 Tubing	ASTM B 241, Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube – *designating alloy 2014 and applicable temper*
Type II Tubing and all other product	AMS 4153, Aluminum Alloy Extrusions 4.5Cu - 0.85Si - 0.80Mn - 0.50Mg (2014 -T6) Solution and Precipitation Heat Treated ASTM B 221, Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes – *designating alloy 2014 and applicable temper*

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NOTICE

This document has been taken directly from Federal Specification QQ-A-200/2F and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards.

The original Federal Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, (b) the use of the existing government specification or standard format, and (c) the exclusion of any qualified product list (QPL) sections.

The complete requirements for procuring aluminum alloy 2014 bar, rod, shapes, tube, and wire extruded described herein shall consist of this document and the latest issue of AMS-QQ-A-200.

1. SCOPE AND CLASSIFICATION:

1.1 Scope:

This specification covers the specific requirements for aluminum alloy 2014 bar, rod, shapes, tube, and wire produced by extrusion.

1.2 Classification:

1.2.1 Tempers: Bar, rod, shapes, tube, and wire are classified in the following tempers as specified (See 6.2): O, T4, T42, T4510, T4511, T6, T62, T6510, or T6511. Definitions of tempers are specified in AMS-QQ-A-200.

1.2.2 Tubing: Tubing shall be additionally classified as follows:

Type	Description
I	- Tubing extruded from hollow billets using die and mandrel (See AMS-QQ-A-200).
II	- Tubing extruded from solid billets using a porthole or spider die or similar tooling (See AMS-QQ-A-200).

1.2.2.1 See AMS-QQ-A-200 for applications of each type.

2. APPLICABLE DOCUMENTS:

See AMS-QQ-A-200.

3. REQUIREMENTS:

3.1 Chemical Composition:

The chemical composition shall conform to the requirements specified in Table I.

TABLE I. Chemical Composition 1/

Element	Percent	
	Minimum	Maximum
Copper	3.9	5.0
Silicon	0.50	1.2
Manganese	0.40	1.2
Magnesium	0.20	0.8
Iron	--	0.7
Zinc	--	0.25
Titanium	--	0.15
Chromium	--	0.10
Other Elements, each	--	0.05
Other Elements, total 2/	--	0.15
Aluminum	Remainder	

1/ 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.

2/ The sum of those "Others" metallic elements 0.010 percent or more each, expressed to the second decimal before determining the sum.

3.2 Mechanical Properties:

3.2.1 Mechanical Properties of Material as Supplied: The mechanical properties in the direction of extrusion shall conform to requirements specified in Table II.

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 or at extension indicated		Elongation in 2 inches or 4 times D 1/, 4/, minimum, percent
				Minimum, ksi	Extension under load, inch per inch	
O	All	All	2/	2/	0.0038	12
T4, T4510, T4511	All	All	50.0	35.0	0.0053	12
T42 3/	All	All	50.0	29.0	0.0048	12
T6, T6510, T6511	Up to 0.499, incl	All	60.0	53.0	0.0071	7
	0.500 to 0.749, incl	All	64.0	58.0	0.0075	7
	0.750 and over	Up thru 25	68.0	60.0	0.0077	7
	0.750 and over	Over 25 thru 32	68.0	58.0	0.0075	6
T62, 3/	Up to 0.749, incl	All	60.0	53.0	0.0071	7
	0.750 and over	Up thru 25	60.0	53.0	0.0071	7
	0.750 and over	Over 25 thru 32	60.0	53.0	0.0071	6

1/ D represents specimen diameter.
2/ No minimum. Maximum tensile and yield strengths shall be 30.0 ksi and 18.0 ksi, respectively.
3/ Material in the T42 or T62 tempers is not available from material producers.
4/ See AMS-QQ-A-200 for elongation requirement exceptions.

3.2.2 Mechanical Properties After Heat Treatment: In addition to conforming to requirements of 3.2.1, materials identified in the following paragraphs shall, after having been heat-treated to other 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 natural aging, develop the properties specified in Table II for the T42 temper (See 6.2 and 6.3).

3.2.2.2 Material in the T4, T4510, T4511, T6, T6510, and T6511 Tempers: Material in the T4, T4510, T4511, T6, T6510, and T6511 tempers, without the subsequent imposition of cold work or forming operations, shall be capable of being re-solution treated and naturally aged to the properties specified for the T42 temper. Such capability shall be demonstrated when specified (See 6.2 and 6.3).

3.2.2.3 Material in the T4, T4510, and T4511 Tempers: Material in the T4, T4510 and T4511 tempers shall be age-hardenable artificially to the properties specified for the T6, T6510, and T6511 tempers, respectively. Such capability shall be demonstrated when specified (See 6.2).

3.2.2.4 Material in the T42 Temper: Material in the T42 temper shall be age-hardenable artificially to the properties specified for the T62 temper. Such capability shall be demonstrated when specified (See 6.2).

3.3 Internal Defects:

When specified (See 6.2), rod, bar and shapes shall be ultrasonically inspected (See AMS-QQ-A-200). Acceptance limits shall be as specified in Table III.

TABLE III. Ultrasonic Discontinuity Acceptance Limits 1/ 3/

Thickness, (bar and shapes) (inches) 4/	Maximum weight of piece (pounds)	Maximum width to thickness ratio	Discontinuity class 2/
0.500 and over	600	10 to 1	B

1/ Discontinuities in excess of those listed in Table III may be allowed subject to approval of the procuring activity, if it is established that they will be removed by machining or that they are in noncritical areas.
2/ See AMS-QQ-A-200.
3/ Requirements for ultrasonic inspection for sizes, maximum weights, and discontinuity classes differing from those shown in Table III and for rod shall be specified in the contract provided the techniques and standards are agreed to by the procuring activity and the producer (See 6.2).
4/ For thickness of a shape, see definition for shape in AMS-QQ-A-200.