AEROSPACE MATERIAL SPECIFICATION

AMS4481™	REV. A
Issued 2019-03 Revised 2024-12 Superseding AMS4481	

Aluminum Alloy, Extrusions, 4.4Cu - 1.5Mg - 0.60Mn (2024-T8510), Solution Heat Treated, Cold Worked, Stress-Relieved by Stretching, and Precipitation Heat Treated, Unstraightened

(Composition similar to UNS A92024)

RATIONALE

AMS4481A results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (see 3.3.2 and 8.5); update Applicable Documents (see Section 2), Hardness (see 8.2), and Ordering Information (see 8.6); relocate Definitions (see 2.4); remove obsolete weight criteria from ultrasonic testing (see 3.4.1); and allow the use of the immediate prior specification revision (see 8.4).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of extruded bars, rods, wire, profiles, and tubing produced with cross-sectional area of 32 square inches (206 cm^2), maximum (see 8.6).

1.1.1 Tubing shall be additionally classified as follows:

Type	Description
I	Tubing extruded from hollow billets using die and mandrel
II	Tubing extruded from solid billets using porthole or spider die or similar tooling

When no type is specified, Type I shall apply (see 8.6).

1.2 Application

These extrusions have been used typically for parts subject to excessive warpage during machining due to residual stresses and for parts requiring high strength and whose fabrication does not normally involve welding, but usage is not limited to such applications.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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For more information on this standard, visit
https://www.sae.org/standards/content/AMS4481A/

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 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2355	Quality Assurance, Sampling and Testing, Aluminum Alloys and Magnesium Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings
AMS2772	Heat Treatment of Aluminum Alloy Raw Materials
AMS-QQ-A-200/3	Aluminum Alloy 2024, Bar, Rod, Shapes, Tube, and Wire, Extruded
AS7766	Terms Used in Aerospace Metals Specifications

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 B594	Ultrasonic Inspection of Aluminum-Alloy Wrought Products
ASTM B660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B666/B666M	Identification Marking of Aluminum and Magnesium Products
ASTM E10	Brinell Hardness of Metallic Materials

2.3 ANSI Accredited Publications

Copies of these documents are available online at https://webstore.ansi.org/.

ANSI H35.1/H35.1M	Standard Alloy and Temper Designation System For Aluminum
ANSI H35.2	Dimensional Tolerances for Aluminum Mill Products
ANSI H35.2M	Dimensional Tolerances for Aluminum Mill Products (Metric)

2.4 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS2355.

Table 1 - Composition

Element	Min	Max
Silicon	--	0.50
Iron	--	0.50
Copper	3.8	4.9
Manganese	0.30	0.9
Magnesium	1.2	1.8
Chromium	--	0.10
Zinc	--	0.25
Titanium	--	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Solution heat treated, cold worked, stress relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%, and precipitation heat treated to the T8510 temper (refer to ANSI H35.1/H35.1M). Heat treatments shall be performed in accordance with AMS2772.

3.2.1 Extrusions shall receive no straightening after stretching.

3.2.2 Extrusions shall be supplied with an as-extruded surface finish; light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within specified dimensional tolerances.

3.3 Properties

Extrusions shall conform to the following requirements, determined in accordance with AMS2355 on the mill product:

3.3.1 Longitudinal Tensile Properties

Shall be as shown in Tables 2 or 3, as applicable.

3.3.1.1 Bars, Rods, Wire, and Profiles

Table 2A - Minimum longitudinal tensile properties, inch/pound units

Nominal Diameter or Thickness Inches	Nominal Cross-Sectional Area Square Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.050 to 0.249, incl	All	64.0	56.0	4
Over 0.249 to 1.499, incl	All	66.0	58.0	5
Over 1.499	Up to 32, incl	66.0	58.0	5

Note: Properties shown were taken directly from AMS-QQ-A-200/3 and have not been substantiated using SAE AMS statistical procedures.

Table 2B - Minimum longitudinal tensile properties, SI units

Nominal Diameter or Thickness Millimeters	Nominal Cross-Sectional Area Square Centimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
1.27 to 6.32, incl	All areas	441	386	4
Over 6.32 to 38.07, incl	All areas	445	400	5
Over 38.07	Up to 206, incl	445	400	5

Note: Properties shown were taken directly from AMS-QQ-A-200/3 and have not been substantiated using SAE AMS statistical procedures.

3.3.1.2 Round Tubing

Table 3A - Minimum longitudinal tensile properties, inch/pound units

Nominal Wall Thickness Inches	Nominal Cross-Sectional Area Square Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.050 to 0.249, incl	All	64.0	56.0	4
Over 0.249 to 1.499, incl	All	66.0	58.0	5
Over 1.499	Up to 32, incl	66.0	58.0	5

Note: Properties shown were taken directly from AMS-QQ-A-200/3 and have not been substantiated using SAE AMS statistical procedures.

Table 3B - Minimum longitudinal tensile properties, SI units

Nominal Wall Thickness Millimeters	Nominal Cross-Sectional Area Square Centimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
1.27 to 6.32, incl	All areas	441	386	4
Over 6.32 to 38.07, incl	All areas	445	400	5
Over 38.07	Up to 206, incl	445	400	5

Note: Properties shown were taken directly from AMS-QQ-A-200/3 and have not been substantiated using SAE AMS statistical procedures.

3.3.2 Mechanical property requirements for extrusions outside the cross-sectional area limit of 1.1 shall be as agreed upon by the purchaser and producer and reported per 4.4.1 (see 8.6).

3.4 Quality

Extrusions, as received by the purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the extrusions.

3.4.1 When specified, extrusions shall be subjected to ultrasonic inspection in accordance with ASTM B594. Extrusions 0.50 inch (12.7 mm) and over in nominal diameter (wall thickness for tubes) or least distance between parallel sides, not exceeding a 10:1 width-to-thickness ratio, shall meet ultrasonic Class B (see 8.6).

3.4.1.1 Acceptance criteria for extrusions exceeding the size limitations of 3.4.1 shall be as agreed upon by the purchaser and producer.