



AEROSPACE MATERIAL SPECIFICATION

AMS4133™

REV. F

Issued 1972-05
Reaffirmed 2014-05
Revised 2022-06

Superseding AMS4133E

Aluminum Alloy Forgings and Rolled Rings
4.4Cu - 0.85Si - 0.80Mn - 0.50Mg (2014-T6)
Solution and Precipitation Heat Treated
(Composition similar to UNS A92014)

RATIONALE

AMS4133F is the result of a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (3.3.1.1.4, 3.6, 4.4.2, 8.5), update form (1.1), applicable documents (Section 2, 3.2.1, 3.4.3), ordering information (8.6), and to allow the use of the immediate prior specification revision (8.4).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of die forgings up to 4 inches in nominal thickness, hand forgings up to 8 inches in nominal thickness, rolled rings up to 3 inches in nominal thickness, and forging stock (see 8.6).

1.2 Application

These products have been used typically for aircraft structural members requiring moderately high strength. Certain design and processing procedures may cause these forgings and rolled rings to become susceptible to stress-corrosion cracking; ARP823 recommends practices to minimize such conditions.

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 Alloys, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

AMS2808 Identification, Forgings

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<https://www.sae.org/standards/content/AMS4133F/>

ARP823 Minimizing Stress-Corrosion Cracking in Wrought High-Strength Aluminum Alloy Products

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 E1417/E1417M Liquid Penetrant Testing

2.3 ANSI Accredited Publications

Copies of these documents are available online at <http://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)

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	1.2
Iron	--	0.7
Copper	3.9	5.0
Manganese	0.40	1.2
Magnesium	0.20	0.8
Chromium	--	0.10
Zinc	--	0.25
Titanium	--	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Die Forgings, Hand Forgings, and Rolled Rings

Solution and precipitation heat treated in accordance with AMS2772 to the T6 temper (refer to ANSI H35.1/H35.1M).

3.2.2 Forging Stock

As ordered by the forging manufacturer.

3.3 Properties

The product shall conform to the following requirements, determined in accordance with AMS2355 on the mill produced size.

3.3.1 Die Forgings, Hand Forgings, and Rolled Rings

3.3.1.1 Tensile Properties

Shall be as follows:

3.3.1.1.1 Die Forgings

3.3.1.1.1.1 Parallel with Grain Flow

Specimens, machined from heat treated forgings 4 inches (102 mm) and under in nominal thickness at time of heat treatment or from prolongations on such forgings, with axis of specimen in the area of gage length varying not more than 15 degrees from parallel to the forging flow lines shall have the properties shown in Table 2 provided the as-forged thickness is not more than twice the heat treated thickness. Test results may be identified as longitudinal tensile properties.

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

Nominal Thickness at Time of Heat Treatment Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 2, incl	65.0	56.0	6
Over 2 to 3, incl	65.0	55.0	6
Over 3 to 4, incl	63.0	55.0	6

Table 2B - Minimum tensile properties, SI units

Nominal Thickness at Time of Heat Treatment Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 51, incl	448	386	6
Over 51 to 76, incl	448	379	6
Over 76 to 102, incl	434	379	6

3.3.1.1.1.2 Perpendicular to Grain Flow

Specimens, machined from heat treated forgings 4 inches (102 mm) and under in nominal thickness at time of heat treatment or from prolongations on such forgings, with axis of specimen in the area of gage length varying not more than 15 degrees from perpendicular to the forging flow lines, shall have the properties shown in Table 3 provided the as-forged thickness is not more than twice the heat treated thickness. If configuration of the forging or prolongation cannot accommodate the transverse specimen described, acceptance of the forging shall be based on testing as in 3.3.1.1.1.3. Test results may be identified as transverse tensile properties.

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

Nominal Thickness at Time of Heat Treatment Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 1, incl	64.0	55.0	3
Over 1 to 2, incl	64.0	55.0	2
Over 2 to 4, incl	63.0	54.0	2