

Aluminum Alloy, Die Forgings
4.4Cu - 0.85Si - 0.80Mn - 0.50Mg (2014-T4)
Solution Heat Treated

(Composition similar to UNS A92014)

RATIONALE

AMS4134F revises the temper designation for forgings (3.2.1), and is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of die forgings and forging stock.

1.2 Application

These forgings have been used typically for parts, requiring strength similar to that of parts machined from AMS4118 bars, but usage is not limited to such applications. Higher strength can be obtained by precipitation hardening to the T6 temper.

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 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
- AMS2808 Identification, Forgings
- AMS4118 Aluminum Alloy, Rolled or Cold Finished Bars, Rods, and Wire, 4.0Cu - 0.70Mn - 0.60Mg - 0.50Si (2017, -T4, -T451), Solution Heat Treated
- AS1990 Aluminum Alloy Tempers

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<http://www.sae.org/technical/standards/AMS4134F>

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 B 594 Ultrasonic Inspection of Aluminum-Alloy Wrought Products for Aerospace Applications

ASTM B 660 Packaging/Packing of Aluminum and Magnesium Products

ASTM E 1417 Liquid Penetrant Testing

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

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

Shall be as follows:

3.2.1 Forgings

Solution heat treated to the T4 temper (See AS1990) in accordance with AMS2772.

3.2.2 Forging Stock

Composition shall be in accordance with Table 1 and shall be free of discontinuities that are unacceptable in the final forged product (See 3.4).

3.3 Properties

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

3.3.1 Forgings

3.3.1.1 Tensile Properties

Shall be as follows:

3.3.1.1.1 Test Specimens

Specimens, machined from separately-forged coupons or from forging stock representing the forgings and, in either case, heat treated with the forgings or machined from prolongations on heat treated forgings, shall have the properties shown in Table 2.

TABLE 2 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	55.0 ksi (379 MPa)
Yield Strength at 0.2% Offset	30.0 ksi (207 MPa)
Elongation in 2 inches (50.8 mm) or 4D	16%

3.3.1.1.2 Forgings, With Grain Flow

Specimens, machined from forgings 4 inches (102 mm) and under in nominal thickness, with axis of the specimen in area of gage length varying not more than 15 degrees from parallel to forging flow lines, shall have properties shown in Table 2 except that elongation may be as low as 11%.

3.3.1.2 Response to Heat Treatment

Forgings, after precipitation heat treatment to the T62 temper in accordance with the time and temperature parameters of AMS2772, shall meet the following requirements:

3.3.1.2.1 Test Specimens

Specimens, machined from separately-forged coupons or from forging stock representing the forgings and, in either case, heat treated with the forgings or machined from prolongations on heat treated forgings, shall have the properties shown in Table 3.

TABLE 3 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	65.0 ksi (448 MPa)
Yield Strength at 0.2% Offset	55.0 ksi (379 MPa)
Elongation in 2 inches (50.8 mm) or 4D	10%

3.3.1.2.2 Forgings, With Grain Flow

Specimens machined from forgings with axis of the specimen in area of gage length varying not more than 15 degrees from parallel to the forging flow lines, shall have properties shown in Table 3 except that elongation may be as low as 7%.

3.3.1.2.3 Forgings, Across Grain Flow

Specimens, machined from forgings with axis of the specimen in area of gage length varying not more than 15 degrees from perpendicular to the forging flow lines, shall have the properties shown in Table 4.

TABLE 4 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	62.0 ksi (427 MPa)
Yield Strength at 0.2% Offset	52.0 ksi (359 MPa)
Elongation in 2 inches (50.8 mm) or 4D	3%

3.3.1.2.3.1 Elongation requirement applies only to specimens having a gage-length diameter not less than 0.250 inch (6.35 mm) and cut so that the length of the specimen is in a plane parallel to the parting plane.

3.3.2 Forging Stock

When a sample of stock is forged to a test coupon and heat treated in the same manner as forgings, tensile specimens taken from the heat treated coupon shall conform to the requirements of 3.3.1.2.1. If specimens taken from the stock after heat treatment in the same manner as forgings conform to the requirements of 3.3.1.2.1, the tests shall be accepted as equivalent to tests of a forged coupon. The forging stock supplier, however, shall not be required to use un-forged coupons when performing lot conformance testing.

3.4 Quality

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

3.4.1 When specified, forgings shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417 or to ultrasonic inspection in accordance with ASTM B 594, or to both. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.4.2 Unless otherwise specified, grain flow of die forgings, except in areas which contain flash-line end grain, shall follow the general contour of the forgings showing no evidence of reentrant grain flow.

3.5 Tolerances

3.5.1 Forging stock shall conform to all applicable requirements of ANSI H35.2 or ANSI H35.2M.

3.5.2 Forged product shall conform to part drawing requirements.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

The following requirements are acceptance tests and, except for composition, shall be performed on each inspection lot:

4.2.1.1 Composition (3.1) of the product.

4.2.1.2 Tensile properties of each inspection lot of forgings as solution heat treated (3.3.1.1) and after precipitation heat treatment (3.3.1.2).