SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS4409

Issued 2007-10
Reaffirmed 2013-05

Aluminum Alloy, Plate
4.0Zn - 2.0Mg - 0.32Mn (7019-T651)
Solution Heat Treated, Stress Relieved and Artificially Aged
(Composition similar to UNS A97019)

RATIONALE

AMS4409 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of plate.

1.2 Application

This product has been used as a moderate strength engineered plate used also for selected structural applications, but usage is not limited to such applications. Armor plate applications are possible, but specific sampling and testing procedures regarding material properties required for this application shall be mutually agreed by producer and user.

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.

AMS 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings

AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials

AS1990 Aluminum Alloy Tempers

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

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 660 Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/B666M Identification of Aluminum and Magnesium Alloy Products

2.3 ANSI Publications

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

ANSI H 35.2 Dimensional Tolerances for Aluminum Mill Products
ANSI H 35.2M 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 AMS 2355.

TABLE 1 - COMPOSITION

Element	min	max
Silicon	--	0.35
Iron	--	0.45
Copper	--	0.20
Manganese	0.15	0.50
Magnesium	1.5	2.5
Zinc	3.5	4.5
Titanium	--	0.15
Zirconium	0.10	0.25
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 Solution and heat treated, stress-relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%, and artificially aged to the -T651 temper (See AS1990).

3.3 Heat Treatment

Shall be performed in accordance with AMS 2772 and as follows:

Solution Heat Treatment Temperature: 855 - 875 °F (458 - 468 °C)

Aging Heat Treatment: Aging shall be performed at a specific temperature and time as required to meet requirements of 3.4 (See 8.2).

3.4 Properties

The product shall conform to the following requirements determined in accordance with AMS 2355 on the mill produced size.

3.4.1 Tensile Properties

Shall be as shown in Table 2.

TABLE 2A - MINIMUM TENSILE PROPERTIES IN LONG TRaNSVERSE DIRECTION, INCH/POUND UNITS

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 inches or 4D %
0.500 to 1.500, incl	58.0	49.0	12
1.500 to 3.000, incl	57.0	49.0	11
3.000 to 4.500, incl	57.0	48.0	8

TABLE 2B -MINIMUM TENSILE PROPERTIES IN LONG TRANSVERSE DIRECTION, SI UNITS

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 5D %
12.7 to 38.1, incl.	400	338	11
Over 38.1 to 76.2, incl	393	338	10
Over 76.2 to 114.3, incl	393	331	7

3.5 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.

3.6 Tolerances

Shall conform to all applicable requirements of ANSI H35.2 or ANSI H35.2M.

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

Composition (3.1), tensile properties (3.4.1), and tolerances (3.6) are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.3 Sampling and Testing

Shall be in accordance with AMS 2355.

4.4 Reports

The vendor of the product shall furnish with each shipment a report stating that the product conforms to the composition and tolerances and showing the numerical results of tests to determine conformance to the other acceptance tests. This report shall include the purchase order number, producer lot number(s), AMS 4409, product form and size, and quantity. The report shall also identify the producer, the product form, and the mill produced size.