



<b>AEROSPACE MATERIAL SPECIFICATION</b>	<b>AMS4213™</b>	<b>REV. B</b>
	Issued 2005-10 Reaffirmed 2016-09 Revised 2022-06	
Superseding AMS4213A		
Aluminum Alloy Plate (2027-T351) 4.4Cu - 1.2Mg - 0.8Mn - 0.10Zr Solution Heat Treated, Cold Worked and Naturally Aged (Composition similar to UNS A92027)		

### RATIONALE

AMS4213B results from a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (3.4.1.1, 3.7, 4.4.1, 5.1.1, 8.5), update form (1.1), applicable documents (Section 2, 3.2, 8.2), elongation values per AMS guidance (Table 2B), and ordering information (8.6), and 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 plate 0.500 inches (12.7 mm) to 2.250 inches (57.2 mm) in nominal thickness (see 8.6).

##### 1.2 Application

This product has been used typically for structural parts requiring a high level of mechanical properties and good damage tolerance, but usage is not limited to such applications.

#### 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](http://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

**AS7766** Terms Used in Aerospace Metals Specifications

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## 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](http://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 E561	Standard Practice for K-R Curve Determination

## 2.3 ANSI Accredited Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ANSI H35.1/H35.1M	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	--	0.12
Iron	--	0.15
Copper	3.9	4.9
Manganese	0.50	1.2
Magnesium	1.0	1.5
Zinc	--	0.20
Titanium	--	0.08
Zirconium	0.05	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

### 3.2 Condition

Solution heat treated, stretched to produce a permanent set not less than 1.5% nor more than 3%, and aged to the T351 temper (refer to ANSI H35.1/H35.1M).

### 3.3 Heat Treatment

Solution heat treatment shall be in accordance with AMS2772.

### 3.4 Properties

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

## 3.4.1 Tensile Properties

Shall be as specified in Table 2.

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

Nominal Thickness Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.500 to 1.500, incl	Longitudinal	68.0	52.0	14
	Long-Transverse	67.0	46.0	14
1.501 to 2.250, incl	Longitudinal	66.0	50.0	14
	Long-Transverse	65.0	45.0	14
	Short-Transverse	60.0	41.0	4

**Table 2B - Minimum tensile properties, SI units**

Nominal Thickness Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Over 12.7 to 38.1, incl	Longitudinal	469	359	14
	Long-Transverse	462	317	14
Over 38.1 to 57.2, incl	Longitudinal	455	345	14
	Long-Transverse	448	310	14
	Short-Transverse	414	283	4

3.4.1.1 Mechanical property requirements for product outside the range covered by 1.1 shall be agreed upon between purchaser and producer and reported per 4.4.1.

## 3.4.2 Fracture Toughness

Plane stress fracture toughness ( $K_{app}$ ) determined using a 16-inch (406 mm) wide, 0.25 inch (6 mm) thick center-cracked panel in accordance with ASTM B646 shall be not lower than the values specified in Table 3.

**Table 3 - Minimum fracture toughness parameters (tentative)**

Nominal Thickness Inches	Nominal Thickness Millimeters	Specimen Orientation	$K_{app}$ ksi $\sqrt{\text{inch}}$	$K_{app}$ MPa $\sqrt{\text{m}}$
0.500 to 2.250, incl	Over 12.7 to 57.2, incl	L-T	97	107

## 3.5 Quality

Plate, 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.

3.5.1 Each plate 0.500 inch (12.70 mm) and over in nominal thickness shall be ultrasonically inspected in accordance with ASTM B594 and shall meet ultrasonic class A requirements.

## 3.6 Tolerances

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

## 3.7 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.

## 4. QUALITY ASSURANCE PROVISIONS

### 4.1 Responsibility for Inspection

The producer of the product shall supply all samples for producer'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), short transverse, long-transverse and longitudinal tensile properties (3.4.1), ultrasonic soundness (3.5.1), and dimensional tolerances (3.6) are acceptance tests and, except for composition, shall be performed on each inspection lot.

#### 4.2.2 Periodic Tests

Fracture toughness (3.4.2) is a periodic test and shall be performed at a frequency selected by the producer unless frequency of testing is specified by purchaser.

### 4.3 Sampling and Testing

Shall be in accordance with AMS2355 and the following:

4.3.1 Tensile specimens shall be taken with axis of specimens parallel to each applicable grain flow direction specified in Table 2.

### 4.4 Reports

The producer of the product shall furnish with each shipment a report stating that the product conforms to the composition, tolerances and ultrasonic inspection; and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements and to the periodic test, if performed. This report shall include the purchase order number, inspection lot number(s), AMS4213B, size, and quantity. The report shall also identify the mill producer and the size of the mill product.

4.4.1 When material produced to this specification is beyond the sizes allowed in the scope or tables, or other exceptions are taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS4213B(EXC) because of the following exceptions:" and the specific exceptions shall be listed (also see 5.1.1).

### 4.5 Resampling and Retesting

Shall be in accordance with AMS2355.

## 5. PREPARATION FOR DELIVERY

### 5.1 Identification

Shall be in accordance with ASTM B666/B666M.

5.1.1 When technical exceptions are taken (see 4.4.1), the material shall be identified with AMS4213(EXC).

### 5.2 Packaging

The product shall be prepared for shipment in accordance with ASTM B660 and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.