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Superseding AMS 4247A

Aluminum Alloy, Hand Forgings  
7.7Zn - 2.4Mg - 1.6Cu - 0.16Cr (7049-T7352)  
Solution Heat Treated, Stress Relieved by Compression, and  
Precipitation Heat Treated  
(Composition similar to UNS A97049)

#### RATIONALE

This document 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 hand forgings procured to inch/pound dimensions.

##### 1.2 Application

These forgings have been used typically for parts requiring a combination of high strength and resistance to stress-corrosion cracking and for parts requiring stability during machining, 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 724-776-4970 (outside USA), [www.sae.org](http://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 Material
AMS 2808	Identification, Forgings
AS1990	Aluminum Alloy Tempers

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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 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 Inspection

## 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	--	0.25
Iron	--	0.35
Copper	1.2	1.9
Manganese	--	0.20
Magnesium	2.0	2.9
Chromium	0.10	0.22
Zinc	7.2	8.2
Titanium	--	0.10
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

### 3.2 Condition

Solution heat treated, stress relieved by compression to produce 1 to 5% permanent set, and precipitation heat treated to the T7352 condition (See AS1990). Heat treatments shall be performed in accordance with AMS 2772.

### 3.3 Properties

Forgings shall conform to the following requirements, determined in accordance with AMS 2355 on the mill product:

#### 3.3.1 Tensile Properties

Specimens, machined from forgings having an essentially square or rectangular cross-section heat treated in the indicated thickness, shall have the properties shown in Table 2 provided as-forged thickness does not exceed 5 inches (127 mm).

TABLE 2A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness at Time of Heat Treatment Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 4D %
Up to 2, incl	Longitudinal	71.0	59.0	9
	Long-Trans.	71.0	57.0	4
Over 2 to 3, incl	Longitudinal	71.0	59.0	9
	Long-Trans.	71.0	57.0	4
	Short-Trans.	69.0	56.0	3
Over 3 to 4, incl	Longitudinal	69.0	57.0	8
	Long-Trans.	69.0	54.0	3
	Short-Trans.	67.0	53.0	2
Over 4 to 5, incl	Longitudinal	67.0	54.0	7
	Long-Trans.	67.0	53.0	3
	Short-Trans.	66.0	51.0	2

TABLE 2B - MINIMUM TENSILE PROPERTIES, SI UNITS

Nominal Thickness at Time of Heat Treatment Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 51, incl	Longitudinal	490	407	9
	Long-Trans.	490	393	4
Over 51 to 76, incl	Longitudinal	490	407	9
	Long-Trans.	490	393	4
	Short-Trans.	476	386	3
Over 76 to 102, incl	Longitudinal	476	393	8
	Long-Trans.	476	372	3
	Short-Trans.	462	365	2
Over 102 to 127, incl	Longitudinal	462	372	7
	Long-Trans.	462	365	3
	Short-Trans.	455	352	2

3.3.1.1 Tensile specimens cut from special purpose forgings or from forgings beyond the size and configuration limits of 3.3.1 shall have tensile properties as specified on the drawing or as agreed upon by purchaser and vendor.

### 3.3.2 Conductivity

Shall be as follows:

3.3.2.1 If the conductivity is 40.0% IACS (International Annealed Copper Standard) or higher and tensile properties meet specified requirements, forgings are acceptable.

3.3.2.2 If the conductivity is 38.0 to 39.9% IACS, if the tensile properties meet specified requirements, and if the longitudinal yield strength does not exceed the specified minimum value by more than 9.9 ksi (68 MPa), the forgings are acceptable.

3.3.2.3 If the conductivity is below 40.0% IACS and the longitudinal yield strength exceeds the specified minimum value by more than 9.9 ksi (68MPa), the forgings shall be given additional precipitation heat treatment. If, after such treatment, the forgings meet the requirements of 3.3.1 and 3.3.2.1 or 3.3.2.2, the forgings are acceptable.

3.3.2.4 If the conductivity is below 38.0% IACS, the forgings are not acceptable and shall be reprocessed regardless of tensile property level.

### 3.3.3 Stress-Corrosion Resistance

Specimens cut from forgings shall show no evidence of stress-corrosion cracking when stressed to 75% of the specified minimum long-transverse yield strength.

### 3.4 Quality

Forgings, 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 forgings.

3.4.1 All forgings shall be subjected to ultrasonic inspection in accordance with ASTM B 594 and shall meet Class A.

3.4.2 When specified, forgings shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417. Standards for acceptance shall be established by the cognizant engineering organization.

## 4. QUALITY ASSURANCE PROVISIONS

### 4.1 Responsibility for Inspection

The vendor of forgings 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 forgings conform to specified requirements.

### 4.2 Classification of Tests

#### 4.2.1 Acceptance Tests

Composition (3.1), tensile properties (3.3.1), conductivity (3.3.2), ultrasonic soundness (3.4.1), and, when specified, fluorescent penetrant inspection (3.4.2), are acceptance tests and, except for composition, shall be performed on each lot.

#### 4.2.2 Periodic Tests

Stress-corrosion resistance (3.3.3) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

### 4.3 Sampling and Testing

Shall be in accordance with AMS 2355.

### 4.4 Reports

The vendor of forgings shall furnish with each shipment a report stating that the forging conforms to the composition and tolerances and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number, AMS 4247B, size or part number, and quantity.

### 4.5 Resampling and Retesting

Shall be in accordance with AMS 2355.

## 5. PREPARATION FOR DELIVERY

### 5.1 Identification

Shall be in accordance with AMS 2808.

### 5.2 Packaging

Forgings shall be prepared for shipment in accordance with ASTM B 660 and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the forgings to ensure carrier acceptance and safe delivery.