SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

AMS 4362F

Issued MAR 1954
Reaffirmed AUG 2000
Revised MAY 2007

Superseding AMS 4362E

Forgings, Magnesium Alloy 5.5Zn - 0.45Zr (ZK60A-T5) Precipitation Heat Treated

(Composition similar to UNS M16600)

RATIONALE

AMS 4362F results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a magnesium alloy in the form of die forgings, hand forgings, and forging stock.

1.2 Application

These forgings have been used typically for parts requiring high strength-to-weight ratio for service up to 300 °F (149 °C), 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.

AMS 2201	Tolerances, Aluminum and Aluminum Alloy Bar, Rod, Wire, and Forging Stock, Rolled or Cold Finished
AMS 2475	Protective Treatments, Magnesium Alloys
AMS 2630	Ultrasonic Inspection, Product Over 0.5 Inch (12.5 mm) Thick
AMS 2645	Fluorescent Penetrant Inspection
AMS 2750	Pyrometry
AMS 2808	Identification, Forgings

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@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 557	Tension Testing Wrought and Cast Aluminum and Magnesium-Alloy Products
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM E 35	Chemical Analysis of Magnesium and Magnesium Alloys

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 35, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - COMPOSITION

Element	min	max
Zinc	4.8	6.2
Zirconium	0.45	1.0
Other Elements, each	--	0.10
Other Elements, total	--	0.30
Magnesium	remainder	

3.1.1 Determination not required for routine acceptance.

3.2 Condition

Product shall be supplied in the following condition:

3.2.1 Die and Hand Forgings

Precipitation heat treated without prior solution heat treatment.

3.2.2 Forging Stock

As ordered by the forging manufacturer.

3.3 Heat Treatment

Forgings shall be precipitation heat treated by heating to 300 °F ± 15 (149 °C ± 8), holding at heat for not less than 24 hours, and cooling in air. Pyrometry shall be in accordance with AMS 2750.

3.4 Properties

The product shall conform to the requirements of 3.4.1, determined in accordance with ASTM B 557 or ASTM B 557M.

3.4.1 Tensile Properties

3.4.1.1 Die Forgings

Shall be as shown in Table 2, determined on specimens machined from forgings 3 inches (76 mm) and under in nominal thickness at time of heat treatment with axis of specimen in area of gage length varying not more than 15 degrees from parallel to forging flow lines, on specimens machined from separately-forged coupons or from forging stock representing the forgings and, in either case, heat treated with the forgings, or on specimens machined from prolongations on heat treated forgings.

TABLE 2 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	42.0 ksi (290 MPa)
Yield Strength at 0.2% Offset	26.0 ksi (179 MPa)
Elongation in 2 inches or 4D	7%

3.4.1.1.1 Tensile property requirements for specimens machined from forgings over 3 inches (76 mm) in nominal thickness at time of heat treatment and for specimens with orientation of axis of specimen varying more than 15 degrees from parallel to the forging flow lines shall be as agreed upon by purchaser and vendor.

3.4.1.2 Hand Forgings

Shall be as shown in Table 3, determined on specimens taken from forgings 6 inches (152 mm) and under in nominal thickness with axis of specimen in area of gage length varying not more than 15 degrees from parallel to forging flow lines and in such a manner as to represent the center of the forgings.

TABLE 3 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	38.0 ksi (262 MPa)
Yield Strength at 0.2% Offset	20.0 ksi (138 MPa)
Elongation in 2 inches or 4D	7%

3.4.1.2.1 Tensile property requirements for specimens machined from forgings over 6 inches (152 mm) in nominal thickness and for specimens with orientation of the axis varying not more than 15 degrees from parallel to forging flow lines shall be as agreed upon by purchaser and vendor.

3.4.1.3 Forging Stock

When a sample of stock is forged to a test coupon and heat treated as in 3.3, specimens taken from the heat treated coupon shall conform to the requirements of 3.4.1.1. If specimens taken from the stock after heat treatment as in 3.3 conform to the requirements of 3.4.1.1, the tests shall be accepted as equivalent to tests of a forged coupon.

3.5 Quality

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

3.5.1 When specified, forgings shall be subjected to ultrasonic inspection in accordance with AMS 2630 or other method acceptable to purchaser and shall conform to the following requirements of AMS 2630:

3.5.1.1 Die forgings 0.50 to 3.00 inches (12.7 to 76.2 mm), inclusive, in nominal thickness and weighing not over 300 pounds (136 kg) shall meet Class B.

3.5.1.2 Hand forgings 1.00 to 6.00 inches (25.4 to 152.4 mm), inclusive, in nominal thickness and weighing not over 600 pounds (272 kg) shall meet Class A.

3.5.2 When specified, die forgings shall be subjected to fluorescent penetrant inspection in accordance with AMS 2645 or other method acceptable to purchaser. Acceptance standards shall be as established by purchaser.

3.6 Tolerances

Forging stock shall conform to all applicable requirements of AMS 2201.

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

Tests for the following requirements are acceptance tests and shall be performed on each lot:

4.2.1.1 Composition (3.1) of the product.

4.2.1.2 Tensile properties (3.4.1.1 or 3.4.1.2) of forgings.

4.2.1.3 Ultrasonic (3.5.1) and fluorescent penetrant Inspection (3.5.2) when specified.

4.2.1.4 Tolerances (3.6) of forging stock.

4.2.2 Periodic Tests

Tests of forging stock to determine ability to develop specified properties (3.4.1.3) are periodic tests 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 as follows; a lot shall be all forgings of the same nominal cross-section and configuration heat treated in the same batch-furnace load or in a continuous furnace during an eight-hour period.

4.3.1 Composition

At least one sample shall be taken by the producer from each group of ingots poured simultaneously from the same source of molten metal.

4.3.1.1 Unless compliance with 4.3.1 is established, an analysis shall be made for each 4000 pounds (1814 kg) or less of alloy comprising the lot except that not more than one analysis shall be required per piece.

4.3.2 Tensile Properties

4.3.2.1 Die Forgings

At least one separately-forged coupon or one forging prolongation heat treated with each lot of forgings.

4.3.2.1.1 In lieu of a prolongation or separately-forged coupon, tensile specimens cut from a forging representing each lot from the location designated on the drawing or as specified by purchaser.

4.3.2.2 Hand Forgings

At least two tensile specimens taken from a forging or forging prolongation representing the lot.

4.3.2.3 Forging Stock

As agreed upon by purchaser and vendor.