Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS4352E
Superseding AMS 4352D
Issued 10-1-51
Revised 1-15-79

MAGNESIUM ALLOY EXTRUSIONS

UNS M16600

5.5Zn - 0.45Zr (ZK60A-T5)
Precipitation Heat Treated

1. SCOPE:

1.1 Form: This specification covers a magnesium alloy in the form of extruded bars, rods, wire, shapes, and tubing.

1.2 Application: Primarily for parts requiring toughness and moderate abrasion resistance.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2205 - Tolerances, Aluminum-Base and Magnesium-Base Alloy Extrusions
AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash Welded Rings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E9 - Compression Testing of Metallic Materials at Room Temperature

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with AMS 2355:

	min	max
Zinc	4.8	6.2
Zirconium	0.45	--
Impurities, total	--	0.30
Magnesium	remainder	

3.2 Condition: Precipitation heat treated.

Printed in U.S.A.

3.2.2 Extrusions shall be supplied with an as-extruded surface finish; light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within the dimensional tolerances.

3.3 Heat Treatment: Extrusions shall be precipitation heat treated by heating to 300° F ± 15 (150° C ± 8), holding at heat for not less than 24 hr, and cooling in air.

3.4 Properties: Extrusions shall conform to the following requirements:

3.4.1 Tensile Properties: Shall be as specified in 3.4.1.1, 3.4.1.2, 3.4.1.3, and 3.4.1.4, determined in accordance with AMS 2355.

3.4.1.1 Bars, Rods, Wire, and Solid Shapes:

TABLE I

Nominal Cross Sectional Area Square Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 4D %, min
Up to 5, excl	45,000	36,000	4
5 to 25, excl	45,000	34,000	6
25 to 40, excl	43,000	31,000	6

TABLE I (SI)

Nominal Cross Sectional Area Square Centimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min
Up to 32, excl	310	248	4
32 to 161, excl	310	234	6
161 to 258, excl	296	214	6

3.4.1.2 Tubing:

TABLE II

Nominal OD Inches	Nominal Wall Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 3.0, incl	0.028 to 0.250, incl	46,000	38,000	4
Over 3.0 to 8.5, incl	0.094 to 1.188, incl	44,000	33,000	4

TABLE II (SI)

Nominal OD Millimetres	Nominal Wall Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm or 4D %, min
Up to 76, incl	0.71 to 6.35, incl	317	262	4
Over 76 to 216, incl	2.39 to 30.18, incl	303	228	4

3.4.1.3 Hollow Shapes:

Tensile Strength, min	46,000 psi (317 MPa)
Yield Strength at 0.2% Offset, min	38,000 psi (262 MPa)
Elongation in 2 in. (50 mm) or 4D, min	4%

3.4.1.4 Tensile property requirements for sizes other than those shown in 3.4.1.1 and 3.4.1.2 shall be as agreed upon by purchaser and vendor.

3.4.2 Compressive Properties: Except for wire, shall be as follows, determined in accordance with ASTM E9 on specimens tested in the longitudinal direction:

3.4.2.1 Bars, Rods, and Solid Shapes:

TABLE III

Nominal Cross Sectional Area Square Inches	Yield Strength at 0.2% Offset psi, min
Up to 2, excl	30,000
2 to 3, excl	28,000
3 to 5, excl	25,000
5 to 10, excl	23,000
10 to 25, excl	22,000
25 to 40, excl	20,000

TABLE III (SI)

Nominal Cross Sectional Area Square Centimetres	Yield Strength at 0.2% Offset MPa, min
Up to 13, excl	207
13 to 19, excl	193
19 to 32, excl	172
32 to 65, excl	159
65 to 161, excl	152
161 to 258, excl	138

3.4.2.2 Tubing:

TABLE IV

Nominal OD Inches	Nominal Wall Thickness Inches	Yield Strength at 0.2% Offset psi, min
Up to 3.0, incl	0.028 to 0.250, incl	26,000
Over 3.0 to 8.5, incl	0.094 to 1.188, incl	21,000

TABLE IV (SI)

Nominal OD Millimetres	Nominal Wall Thickness Millimetres	Yield Strength at 0.2% Offset MPa, min
Up to 76, incl	0.71 to 6.35, incl	179
Over 76 to 216, incl	2.39 to 30.18, incl	145

3.4.2.3 Hollow Shapes:

Yield Strength at 0.2% Offset, min 26,000 psi (179 MPa)

3.4.2.4 Compressive property requirements for sizes other than those shown in 3.4.2.1 and 3.4.2.2 shall be as agreed upon by purchaser and vendor.

3.5 Quality: Extrusions, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the extrusions.

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2205.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of extrusions shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the extrusions conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), tensile properties (3.4.1), and tolerances (3.6) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for compressive properties (3.4.2) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355.

4.4 Reports:

4.4.1 The vendor of extrusions shall furnish with each shipment three copies of a report stating that the extrusions conform to the chemical composition and other technical requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, size or section identification number, and quantity.