

Magnesium Alloy, Extrusions
4.0Y - 2.25Nd - 0.5Zr (WE43C - T5)
Precipitation Heat Treated
(Composition similar to UNS M18434)

RATIONALE

AMS4485 is a new specification for magnesium alloy WE43C in the form of extrusions.

1. SCOPE

1.1 Form

This specification covers a magnesium alloy in the form of extruded bars, rods, wire, tubing, and profiles.

1.2 Application

These extrusions have been used typically for parts requiring a combination of light weight, high yield strength up to 480 °F (250 °C), relatively high corrosion resistance, and good flammability resistance for magnesium alloys, 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.

AMS2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings

AMS2750 Pyrometry

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2012 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

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
http://www.sae.org

SAE WEB ADDRESS:

**SAE values your input. To provide feedback
on this Technical Report, please visit
<http://www.sae.org/technical/standards/AMS4485>**

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 117	Operating Salt Spray (Fog) Apparatus
ASTM B 557/B 557M	Tension Testing Wrought and Cast Aluminium- and Magnesium- Alloy Products
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/B 666M	Identification Marking of Aluminum and Magnesium Products
ASTM B 953	Sampling Magnesium and Magnesium Alloys for Spectrochemical Analysis
ASTM B 954	Analysis of Magnesium and Magnesium Alloys by Atomic Emission Spectrometry

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by spectrochemical methods in accordance with ASTM B 954, or by other analytical methods acceptable to purchaser.

TABLE 1 - COMPOSITION

Element	min	max
Yttrium	3.7	4.3
Neodymium	2.0	2.5
Zinc	--	0.06
Zirconium	0.2	1.0
Other Rare Earths (3.1.1)	0.3	1.0
Manganese	--	0.03
Copper	--	0.02
Iron	--	0.005
Nickel	--	0.0020
Other Elements, each	--	0.01
Magnesium	remainder	

3.1.1 Other Rare Earths are heavy rare earths, such as Gadolinium, Dysprosium, Erbium, Samarium, and Ytterbium. The total of Gadolinium + Dysprosium + Erbium shall be 0.3-1.0%. Samarium shall not exceed 0.04% and Ytterbium shall not exceed 0.02%

3.2 Condition

Precipitation heat treated.

3.2.1 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 specified dimensional tolerances.

3.3 Heat Treatment

Extrusions shall be precipitation heat treated by heating to a temperature between 392 to 482 °F (200 to 250 °C), and holding at the selected temperature ± 10 °F (± 6 °C) for the proper time for precipitation heat treatment to meet the requirements of 3.4, and air cooling. Pyrometry shall be in accordance with AMS2750.

3.4 Properties

Tensile Properties: Extrusions 0.50 to 4.75 inches, incl. (12.7 to 120.7 mm., incl.) in nominal thickness, shall have tensile properties as specified in Table 2, determined in accordance with ASTM B 557 or ASTM B 557M.

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

Tensile Strength	Yield Strength at 0.2% Offset	Elongation in 4D
ksi	ksi	%
44.0	28.0	6

TABLE 2B - MINIMUM TENSILE PROPERTIES, SI UNITS

Tensile Strength	Yield Strength at 0.2% Offset	Elongation in 4D
MPa	MPa	%
303	195	6

3.4.1 Corrosion Resistance

Corrosion rate of material, tested in accordance with 3.4.2.1, shall be less than 50 mpy.

3.4.1.1 Corrosion rate shall be determined in accordance with ASTM B 117 except that, prior to exposure, specimens shall be accurately weighed to within $\pm 0.01\text{g}$ (W_1). Specimens shall be exposed to the salt spray for not less than 120 hours. Following exposure, specimens shall be rinsed with tap water and cleaned of adherent corrosion product by immersing in a hot (190°F (88°C)) 20% Chromic acid plus 1% silver nitrate solution for 1 to 2 minutes. Cleaned specimens shall be rinsed in hot water, dried in a stream of hot air, and weighed (W_2). The measured weight loss (WL) shall be calculated ($W_1 - W_2$) and used for calculating corrosion rate, using the following equations:

$$\text{CR (mcd)} = \text{WL} / (\text{SA} \times \text{EP})$$

$$\text{CR [mils (0.001 inch) per year]} = (\text{CR (mcd)} / \text{D}) \times 143.7$$

Where:

WL = Measure weight loss in mg

SA = Total surface area of specimen in cm^2

EP = Exposure time in days

D = Density, 1.82 gram/cm^3

mcd = mg/cm^2 per day

3.5 Quality

Extrusions, 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 extrusions.

3.6 Tolerances

Shall conform to all applicable requirements of ANSI H 35.2 or ANSI H 35.2M.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of extrusions 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 extrusions conform 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 shall be performed on each inspection lot.

4.2.2 Periodic Tests

Corrosion resistance (3.4.2) 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 AMS2355

4.4 Reports

The vendor of extrusions shall furnish with each shipment a report showing the results of tests for composition and tensile properties of each inspection lot and stating that the extrusions conform to the periodic test properties when performed and to the other technical requirements. This report shall include the purchase order number, inspection lot number, AMS4485, size or section identification number, and quantity.

4.5 Resampling and Retesting

Shall be in accordance with AMS2355.

5. PREPARATION FOR DELIVERY

5.1 Identification

Shall be in accordance with ASTM B 666/B 666M.

5.2 Packaging

Extrusions 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 extrusions to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Extrusions not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.