



# AEROSPACE MATERIAL SPECIFICATION

**AMS4153™****REV. M**

Issued 1946-11  
Reaffirmed 2008-05  
Revised 2020-08

Superseding AMS4153L

Aluminum Alloy, Extrusions  
4.5Cu - 0.85Si - 0.80Mn - 0.50Mg (2014-T6)  
Solution and Precipitation Heat Treated  
(Composition similar to A92014)

## RATIONALE

AMS4153M prohibits unauthorized exceptions (3.6), revises Condition (3.2), Quality (3.4.1), Reports (4.4.1) and Identification (5.1.1), and results from a Five-Year Review and update of this specification.

### 1. SCOPE

#### 1.1 Form

This specification covers an aluminum alloy in the form of extruded bars, rods, wire, profiles, and tubing up to 32 square inches (206 cm<sup>2</sup>) in area (see 8.5).

#### 1.2 Application

These products have been used typically for parts requiring good strength where fabrication does not usually involve welding, but usage is not limited to such applications.

1.2.1 Certain design and processing procedures may cause these extrusions to become susceptible to stress-corrosion cracking; ARP823 recommends practices to minimize such conditions.

### 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- (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 Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

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 revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2020 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](mailto:CustomerService@sae.org)  
<http://www.sae.org>

SAE WEB ADDRESS:

**For more information on this standard, visit**  
<https://www.sae.org/standards/content/AMS4153M/>

ARP823 Minimizing Stress-Corrosion Cracking in Wrought Heat-Treatable Aluminum Alloy Products

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

## 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 E10 Brinell Hardness of Metallic Materials

## 2.3 ANSI Accredited Publications

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

ANSI H35.1/H35.1M Standard 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               | 0.50      | 1.2  |
| Iron                  | --        | 0.7  |
| Copper                | 3.9       | 5.0  |
| Manganese             | 0.40      | 1.2  |
| Magnesium             | 0.20      | 0.8  |
| Chromium              | --        | 0.10 |
| Zinc                  | --        | 0.25 |
| Titanium              | --        | 0.15 |
| Other Elements, each  | --        | 0.05 |
| Other Elements, total | --        | 0.15 |
| Aluminum              | remainder |      |

### 3.2 Condition

Extruded, and solution and precipitation heat treated to the T6 temper (refer to ANSI H35.1/H35.1M) in accordance with AMS2772.

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 Properties

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

#### 3.3.1 Tensile Properties

##### 3.3.1.1 Longitudinal

Shall be as shown in Table 2.

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

| Nominal Diameter<br>or Least Thickness<br>(Rods, Bars, Wire, Profiles) or<br>Nominal Wall Thickness<br>(Tubing)<br>Inches | Area<br>Square Inches | Tensile<br>Strength<br>ksi | Yield Strength<br>at 0.2% Offset<br>ksi | Elongation in<br>2 Inches or 4D<br>% |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------|-----------------------------------------|--------------------------------------|
| Up to 0.499, incl                                                                                                         | All                   | 60.0                       | 53.0                                    | 7                                    |
| Over 0.499 to 0.749, incl                                                                                                 | All                   | 64.0                       | 58.0                                    | 7                                    |
| Over 0.749                                                                                                                | Up to 25, incl        | 68.0                       | 60.0                                    | 7                                    |
|                                                                                                                           | Over 25 to 32, incl   | 68.0                       | 58.0                                    | 6                                    |

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

| Nominal Diameter<br>or Least Thickness<br>(Rods, Bars, Wire, Profiles) or<br>Nominal Wall Thickness<br>(Tubing)<br>Millimeters | Area<br>Square Centimeters | Tensile<br>Strength<br>MPa | Yield Strength<br>at 0.2% Offset<br>MPa | Elongation in<br>50.8 mm or 4D<br>% |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|-----------------------------------------|-------------------------------------|
| Up to 12.67, incl                                                                                                              | All                        | 414                        | 365                                     | 7                                   |
| Over 12.67 to 19.02, incl                                                                                                      | All                        | 441                        | 400                                     | 7                                   |
| Over 19.02                                                                                                                     | Up to 161, incl            | 469                        | 414                                     | 7                                   |
|                                                                                                                                | Over 161 to 206, incl      | 469                        | 400                                     | 6                                   |

##### 3.3.1.2 Long-Transverse

Shall be as shown in Table 3 for bars, rods, and profiles.

3.3.1.2.1 Long-transverse tensile requirements apply only to extrusions from which a test specimen not less than 2.50 inches (63.5 mm) in length can be taken.

**Table 3A - Minimum long-transverse tensile properties, inch/pound units**

| Nominal Diameter<br>or Thickness<br>Inches | Area<br>Square Inches | Tensile<br>Strength<br>ksi | Yield Strength<br>at 0.2% Offset<br>ksi | Elongation<br>in 4D<br>% |
|--------------------------------------------|-----------------------|----------------------------|-----------------------------------------|--------------------------|
| 0.125 to 0.375, incl                       | Up to 25, incl        | 60.0                       | 53.0                                    | --                       |
| Over 0.375 to 0.499, incl                  | Up to 25, incl        | 60.0                       | 53.0                                    | 5                        |
| Over 0.499 to 0.749, incl                  | Up to 25, incl        | 64.0                       | 55.0                                    | 5                        |
| Over 0.749 to 1.499, incl                  | Up to 25, incl        | 63.0                       | 54.0                                    | 2                        |
| Over 0.749 to 4.499, incl                  | Over 25 to 32, incl   | 56.0                       | 47.0                                    | 1                        |
| Over 1.499 to 2.999, incl                  | Up to 25, incl        | 61.0                       | 52.0                                    | 2                        |
| Over 2.999 to 4.499, incl                  | Up to 25, incl        | 58.0                       | 49.0                                    | 1                        |

**Table 3B - Minimum long-transverse tensile properties, SI units**

| Nominal Diameter<br>or Thickness<br>Millimeters |              | Area<br>Square Centimeters | Tensile<br>Strength<br>MPa | Yield Strength<br>at 0.2% Offset<br>MPa | Elongation<br>in 4D<br>% |
|-------------------------------------------------|--------------|----------------------------|----------------------------|-----------------------------------------|--------------------------|
| 3.18 to                                         | 9.52, incl   | Up to 161, incl            | 414                        | 365                                     | --                       |
| Over 9.52 to                                    | 12.67, incl  | Up to 161, incl            | 414                        | 365                                     | 5                        |
| Over 12.67 to                                   | 19.02, incl  | Up to 161, incl            | 441                        | 379                                     | 5                        |
| Over 19.02 to                                   | 38.07, incl  | Up to 161, incl            | 434                        | 372                                     | 2                        |
| Over 19.02 to                                   | 114.27, incl | Over 161 to 206, incl      | 386                        | 324                                     | 1                        |
| Over 38.07 to                                   | 76.17, incl  | Up to 161, incl            | 421                        | 359                                     | 2                        |
| Over 76.17 to                                   | 114.27, incl | Up to 161, incl            | 400                        | 338                                     | 1                        |

3.3.1.3 Mechanical property requirements for product outside of the range covered by 1.1 shall be agreed upon between purchaser and producer.

### 3.4 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.

3.4.1 When specified, extrusions shall be subjected to ultrasonic inspection in accordance with ASTM B594. Extrusions 0.500 inches (12.70 mm) and over in thickness shall meet ultrasonic class B.

### 3.5 Tolerances

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

### 3.6 Exceptions

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

## 4. QUALITY ASSURANCE PROVISIONS

### 4.1 Responsibility for Inspection

The producer of extrusions 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 extrusions conform to specified requirements.

### 4.2 Classification of Tests

#### 4.2.1 Acceptance Tests

Composition (3.1), longitudinal tensile properties (3.3.1.1), ultrasonic inspection when specified (3.4.1), and tolerances (3.5) are acceptance tests and, except for composition, shall be performed on each inspection lot.

#### 4.2.2 Periodic Tests

Long-transverse tensile properties (3.3.1.2) are periodic tests 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.