

AEROSPACE MATERIAL SPECIFICATION

SAE AMS4166

REV. G

Issued 1968-11
Revised 2003-07
Reaffirmed 2008-05
Cancelled 2012-01

Superseded by AMS4617

Aluminum Alloy, Extrusions
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T73)
Solution Heat Treated and Overaged

(Composition similar to A97075)

RATIONALE

AMS4166G has been designated Cancelled and Superseded because equivalent technical requirements are provided by other specifications.

CANCELLATION NOTICE

This specification has been declared "CANCELLED" by the Aerospace Materials Division, SAE, as of January 2012 and has been superseded by the specification listed below. The requirements of the latest issue of the specification listed below shall be fulfilled whenever reference is made to the cancelled AMS4166. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications, noting that it has been superseded by the specification listed below.

Cancelled specifications are available from SAE.

Temper	Superseding Material and Specification
T73	7075-T73511 or -T73 in accordance with AMS4617 Aluminum Alloy, Extrusions, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T73, 7075-T73511, 7075-T73510) Solution Heat Treated, Stress Relieved by Stretching When Required, and Overaged

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<http://www.sae.org/technical/standards/AMS4166G>**

1. SCOPE:

1.1 Form:

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

1.2 Application:

These products have been used typically for parts requiring high strength and resistance to stress-corrosion cracking, 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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or 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 Materials

AS1990 Aluminum Alloy Tempers

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/B 666M	Identification Marking of Aluminum and Magnesium Products
ASTM G 47	Determining Susceptibility to Stress Corrosion Cracking of 2XXX and 7XXX Aluminum Alloys

2.3 ANSI Publications:

Available from ANSI, 25 West 43rd Street, New York, NY 10036 or www.ansi.org.

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 AMS 2355.

TABLE 1—Composition

Element	min	max
Silicon	--	0.40
Iron	--	0.50
Copper	1.2	2.0
Manganese	--	0.30
Magnesium	2.1	2.9
Chromium	0.18	0.28
Zinc	5.1	6.1
Titanium	--	0.20
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition:

Solution heat treated and overaged, to the T73 temper (see AS1990). Heat treatment shall be performed in accordance with AMS 2772.

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

3.3 Properties:

Extrusions shall conform to the following requirements, determined in accordance with AMS 2355 on the mill product size (See 8.2):

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 or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Inches	Nominal Cross- Sectional Area Square Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.062 to 0.249, incl	Up to 20, incl	68.0	58.0	7
Over 0.249 to 1.499, incl	Up to 25, incl	70.0	61.0	8
Over 1.499 to 2.999, incl	Up to 25, incl	69.0	59.0	8
Over 2.999 to 4.499, incl	Up to 20, incl	68.0	57.0	7
Over 2.999 to 4.499, incl	Over 20 to 32, incl	65.0	55.0	7

TABLE 2B - Minimum Longitudinal Tensile Properties, SI Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Millimeters	Nominal Cross- Sectional Area Square Centimeters	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 50.8 mm %	Elongation in 5D %
1.57 to 6.32, incl	Up to 129, incl	469	400	7	
Over 6.32 to 38.07, incl	Up to 161, incl	483	421	8	7
Over 38.07 to 76.17, incl	Up to 161, incl	476	407	8	6
Over 76.17 to 126.97, incl	Up to 129, incl	469	393	7	6
Over 76.17 to 126.97, incl	Over 129 to 206, incl	448	379	7	6

- 3.3.1.2 Long-Transverse: Rectangular bars and profiles, tested in the long-transverse direction, shall meet the requirements of Table 3.

TABLE 3A - Minimum Long-Transverse Tensile Properties, Inch/Pound Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Inches	Nominal Cross- Sectional Area Square Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.062 to 0.249, incl	Up to 20, incl	65.0	55.0	3
Over 0.249 to 0.499, incl	Up to 25, incl	67.0	58.0	4
Over 0.499 to 0.749, incl	Up to 25, incl	66.0	57.0	4
Over 0.749 to 1.499, incl	Up to 25, incl	66.0	56.0	4
Over 1.499 to 2.999, incl	Up to 25, incl	63.0	52.0	4
Over 2.999 to 4.499, incl	Up to 20, incl	60.0	48.0	3
Over 2.999 to 4.499, incl	Over 20 to 32, incl	57.0	46.0	3

TABLE 3B - Minimum Long-Transverse Tensile Properties, SI Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Millimeters	Nominal Cross- Sectional Area Square Centimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm %	Elongation in 5D %
1.57 to 6.32, incl	Up to 129, incl	448	379	3	3
Over 6.32 to 12.67, incl	Up to 161, incl	462	400	4	3
Over 12.67 to 19.02, incl	Up to 161, incl	455	393	4	3
Over 19.02 to 38.07, incl	Up to 161, incl	455	386	4	3
Over 38.07 to 76.17, incl	Up to 161, incl	434	358	4	2
Over 76.17 to 126.97, incl	Up to 129, incl	414	331	3	2
Over 76.17 to 126.97, incl	Over 129 to 206, incl	393	317	3	1

- 3.3.1.3 Short-Transverse: Bars, rods, profiles, and tubing, tested in the short-transverse direction, shall meet the requirements of Table 4.

TABLE 4A - Minimum Short-Transverse Tensile Properties, Inch/Pound Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Inches	Nominal Cross- Sectional Area Square Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
1.500 to 2.999, incl	Up to 25, incl	60.0	48.0	2
Over 2.999 to 4.499, incl	Up to 20, incl	57.0	44.0	2
Over 2.999 to 4.499, incl	Over 20 to 32, incl	54.0	41.0	2

TABLE 4B - Minimum Short-Transverse Tensile Properties, SI Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Millimeters	Nominal Cross- Sectional Area Square Centimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
38.10 to 76.17, incl	Up to 161, incl	414	331	2
Over 76.17 to 114.27, incl	Up to 129, incl	393	303	2
Over 76.17 to 114.27, incl	Over 129 to 206, incl	372	283	2

3.3.2 Corrosion Resistance Indicator Test:

- 3.3.2.1 Electrical conductivity shall be not lower than 38.0% IACS (International Annealed Copper Standard) (22.0 MS/m).

- 3.3.2.1.1 If the conductivity is 40.0% IACS (23.2 MS/m) or higher and longitudinal tensile properties meet the requirements of 3.3.1.1, the extrusions are acceptable.

- 3.3.2.1.2 If the conductivity is 38.0 to 39.9% IACS (22.0 to 23.1 MS/m), inclusive, and the longitudinal tensile properties meet the specified requirements, and if the longitudinal yield strength does not exceed the specified minimum by more than 11.9 ksi (82 MPa), the extrusions are acceptable.

- 3.3.2.1.3 If the conductivity is below 40.0% IACS (23.2 MS/m) and the longitudinal yield strength exceeds the specified minimum value by more than 11.9 ksi (82 MPa), the extrusions shall be given additional aging. If, after such additional treatment, the extrusions meet the requirements of 3.3.1.1 and 3.3.2.1, the extrusions are acceptable.

3.3.3 Stress-Corrosion Resistance: Specimens, cut from extrusions 0.750 inch (19.05 mm) and over in nominal thickness, shall show no evidence of stress-corrosion cracking when stressed in the short-transverse (perpendicular to grain flow) direction to 75% of the specified minimum longitudinal (parallel to grain flow) yield strength, as tested in accordance with ASTM G 47.

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.

3.5 Tolerances:

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

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), longitudinal tensile properties (3.3.1.1), corrosion resistance (3.3.2), and tolerances (3.5) are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.2.2 Periodic Tests: Transverse tensile properties (3.3.1.2 and 3.3.1.3) and stress-corrosion resistance (3.3.3) 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 in accordance with AMS 2355.

4.4 Reports:

The vendor of extrusions shall furnish with each shipment a report stating that the extrusions conform to the chemical 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 4166G, size or section identification number, and quantity.