

Aluminum Alloy, Alclad Sheet and Plate
4.4Cu - 1.5Mg - 0.60Mn
Alclad 2024 and 1-1/2% Alclad 2024,
-T3 Flat Sheet; 1-1/2% Alclad 2024-T351 Plate

(Composition similar to UNS A82024)

RATIONALE

AMS 4041Q results from a Five Year Review and update of this specification. There were no technical changes.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet and plate clad on both sides with a different aluminum alloy.

1.2 Application

These products have been used typically for structural components requiring good strength and maximum corrosion resistance, but usage is not limited to such applications. Plate is also suitable for structural machined parts where warpage during machining, due to residual stresses must be minimized.

1.2.1 Certain design and processing procedures may cause these products 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 form 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 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 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
ARP823	Minimizing Stress-Corrosion Cracking in Wrought Heat-Treatable Aluminum Alloy Products
AS1990	Aluminum Alloy Tempers

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 © 2007 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: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@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 660 Packaging/Packing of Aluminum and Magnesium Products
 ASTM B 666/B 666M Identification Marking of Aluminum and Magnesium Products

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036, Tel: 212-642-4900, 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 Tables 1 and 2, determined in accordance with AMS 2355.

TABLE 1 - COMPOSITION, CORE (2024)

Element	min	max
Silicon	--	0.50
Iron	--	0.50
Copper	3.8	4.9
Manganese	0.30	0.9
Magnesium	1.2	1.8
Chromium	--	0.10
Zinc	--	0.25
Titanium	--	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

TABLE 2 - COMPOSITION, CLADDING (1230)

Element	min	max
Iron + Silicon	--	0.70
Copper	--	0.10
Manganese	--	0.50
Magnesium	--	0.05
Zinc	--	0.10
Titanium	--	0.03
Vanadium	--	0.05
Other Elements, each	--	0.03
Aluminum, by difference	99.30	--

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Sheet

Solution heat treated in accordance with AMS 2772 and cold worked.

3.2.2 Plate

Solution heat treated in accordance with AMS 2772 and stretched to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%.

3.2.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties

The product shall conform to the following requirements, determined in accordance with AMS 2355 on the mill produced size:

3.3.1 Tensile Properties

Shall be as specified in Table 3.

TABLE 3A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.008 to 0.009, incl	58.0	39.0	10
Over 0.009 to 0.020, incl	59.0	39.0	12
Over 0.020 to 0.062, incl	59.0	39.0	15
Over 0.062 to 0.128, incl	61.0	40.0	15
Over 0.128 to 0.187, incl	62.0	40.0	15
Over 0.187 to 0.249, incl	63.0	41.0	15
Over 0.249 to 0.499, incl	63.0	41.0	12
Over 0.499 to 1.000, incl	63.0	42.0	8
Over 1.000 to 1.500, incl	62.0	42.0	7
Over 1.500 to 2.000, incl	62.0	42.0	6
Over 2.000 to 3.000, incl	60.0	42.0	4
Over 3.000 to 4.000, incl	57.0	41.0	4

TABLE 3B - MINIMUM TENSILE PROPERTIES, SI UNITS

Nominal Thickness mm	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
0.20 to 0.23, incl	400	269	10
Over 0.23 to 0.51, incl	407	269	12
Over 0.51 to 1.57, incl	407	269	15
Over 1.57 to 3.25, incl	421	278	15
Over 3.25 to 4.75, incl	428	278	15
Over 4.75 to 6.32, incl	434	283	15
Over 6.32 to 12.67, incl	434	283	12
Over 12.67 to 25.40, incl	434	290	8
Over 25.40 to 38.10, incl	428	290	7
Over 38.10 to 50.80, incl	428	290	6
Over 50.80 to 76.20, incl	414	290	4
Over 76.20 to 101.60, incl	393	283	4

3.3.2 Bending

Product 0.008 to 0.499 inch (0.20 to 12.67 mm), incl, in nominal thickness shall withstand, without cracking, bending at room temperature through an angle of 180 degrees around a diameter equal to the bend factor shown in Table 4 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 4 - BENDING PARAMETERS

Nominal Thickness Inch	Nominal Thickness mm	Bend Factor
0.008 to 0.040, incl	0.20 to 1.02, incl	4
Over 0.040 to 0.128, incl	Over 1.02 to 3.25, incl	5
Over 0.128 to 0.249, incl	Over 3.25 to 6.32, incl	8
Over 0.249 to 0.499, incl	Over 6.32 to 12.67, incl	10

3.3.3 Cladding Thickness

After rolling, the average cladding thickness shall be as specified in Table 5.

TABLE 5 - CLADDING THICKNESS

Nominal Thickness Inch	Nominal Thickness mm	Average Cladding Thickness Per Side % of Thickness min	Average Cladding Thickness Per Side % of Thickness max
0.008 to 0.062, incl	0.20 to 1.57, incl	4.0	--
Over 0.062 to 0.187, incl	Over 1.57 to 4.75, incl	2.0	--
Over 0.187 to 0.499, incl	Over 4.75 to 12.67, incl	1.2	--
Over 0.499	Over 12.67	1.2	3.0

3.4 Quality

The product, 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 product.

3.5 Tolerances

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

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

Composition (3.1), tensile properties (3.3.1), and tolerances (3.5) are acceptance tests and except for composition, shall be performed on each lot.

4.2.2 Periodic Tests

Bending (3.3.2) and cladding thickness (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.