SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-B-20148 | REV. B

Issued 1998-07
Revised 2011-05

Superseding AMS-B-20148A

Brazing Sheet, Aluminum Alloy

RATIONALE

AMS-B-20148B results from an update of the previously cancelled AMS-B-20148A to recognize technical equivalency for two recently published specifications; brazing sheet #23-F is superseded by AMS4465, brazing sheet #24-F is superseded by AMS4460. Paragraph 3.1 provides the complete list of superseding requirements applicable to #11-0, #12-0, #21-F, #22-F, #23-F, and #24-F.

NOTICE

The initial SAE publication of this document was taken directly from U.S. Military Standard MIL-B-20148D, Amendment 1. This SAE Standard may retain the same part numbers established by the original military document. Any requirements associated with Qualified Products Lists (QPL) may continue to be mandatory for DoD contracts. Requirements relating to QPLs have not been adopted by the SAE for this standard and are not part of this SAE document.

1. SCOPE

1.1 Scope

This specification covers aluminum alloy brazing sheet for use in brazed aluminum joints.

1.2 Classification

Aluminum brazing sheet shall be supplied in the following alloys and tempers (See 6.5 for cross reference information). Information pertaining to classes #21 and #22 is contained in Appendix A – See 6.5.1:

TABLE 1

Class	Alloy	Tempers
#11	Brazing sheet (3003 Core, 4343 Cladding)	0, H12, H14
#12	Brazing sheet (3003 Core, 4343 Cladding)	0, H12, H14
#21	Brazing sheet (6951 Core, 4343 Clad) (formerly class 3)	Tempers 0, F
#22	Brazing sheet (6951 Core, 4343 Clad) (formerly class 4)	Tempers 0, F
#23	Brazing sheet (6951 Core, 4045 Cladding)	0, F
#24	Brazing sheet (6951 Core, 4045 Cladding)	0, F

Odd numbered sheet is supplied with cladding on one side and even numbered sheet is supplied with cladding on both sides (See Table 6).

1.2.1 Form

Brazing sheet is available in either coil or sheet form.

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
SAE WEB ADDRESS: http://www.sae.org

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 Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

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 557 Tension Testing Wrought and Cast Aluminum and Magnesium Alloy Products

ASTM B 660 Standard Practice for Packaging/Packing of Aluminum and Magnesium Products

ASTM E 34 Standard Test Methods for Chemical Analysis of Aluminum and Aluminum Base Alloy

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

MIL-STD-129 Marking for Shipment and Storage

2.4 ANSI Publication

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI H35.2 American National Standard Dimensional Tolerances for Aluminum Mill Products

2.5 AWS Publication

Available from American Welding Society, 550 NW LeJeune Road, Miami, FL 33126, Tel: 1-800-443-9353, www.aws.org.

AWS A5.8 Specification for Brazing Filler Metal

3. REQUIREMENTS

3.1 Superseding Requirements

The requirements of the latest issue of the superseding specifications listed in Table 2 shall be fulfilled when reference is made to the applicable AMS-B-20148 class and temper. The requirements of AMS-B-20148 shall apply for other class and temper designations.

TABLE 2 - SUPERSEDING SPECIFICATIONS

AMS-B-20148 Class	Temper	Superseding Specification
#11	0	AMS4063
#12	0	AMS4064
#21	F	AMS4255
#22	F	AMS4256
#23	F	AMS4465
#24	F	AMS4460

3.2 Chemical Composition

Material shall conform to the chemical composition detailed in Table 3 determined in accordance with AMS2355.

3.3 Mechanical Properties

Mechanical properties shall conform with those detailed in Table 4 for the alloy and temper specified. There are no mechanical tests required for the “F” temper.

3.4 Cladding Thickness

The cladding bonded to the aluminum core shall have a thickness that meets the requirements of Table 6.

3.5 Dimensional Tolerances

Sheet shall not vary from specified dimensions by an amount greater than those tolerances specified in ANSI H35.2 for flatness, thickness, width, length and lateral bow for aluminum alloys.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for Compliance

All items must meet all requirements of Sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor’s overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Sampling

4.2.1 Lot

A lot shall consist of an identifiable quantity of sheet of the same alloy, temper and nominal thickness submitted for inspection at one time.

4.2.2 Sampling for Chemical Analysis

4.2.2.1 Ingot Analysis

At least one sample shall be taken from each group of ingots of the same alloy, poured simultaneously from the same source of molten metal by the producer and analyzed to determine conformance with 3.2. Ingots not conforming to the requirements of 3.2 shall be rejected. Complete ingot analysis shall be maintained at the producer's facility and shall be available to the procuring activity for review upon request.

4.2.2.2 Finished Product Analysis

Specimens of products shall be analyzed when the compliance of an inspection lot with 3.2 is doubtful. The sampling procedure applied shall comply with the most applicable procedure from among the following:

4.2.2.2.1 Ingot Identities Known

When ingot identities of units comprising an inspection lot are known, one specimen from a unit from the products representing the ingot shall be analyzed in accordance with 3.2.

4.2.2.2.2 Ingot Identities Indeterminable

When ingot identities of units comprising an inspection lot can not be determined, the number of specimens taken for analysis in accordance with 3.2 shall comply with the following:

a. From a lot of flat sheet, one specimen from each 2000 pounds or fraction thereof constituting the lot;

b. From a lot of coils, one specimen from each coil.

Not more than one specimen shall be taken from the same unit when more than one unit is available.

4.2.3 Sampling for Mechanical Tests

One tension test specimen shall be taken for each 2000 pounds or less of sheet comprising the lot, except that not more than one specimen shall be taken from the same sheet.

4.2.4 Sampling for Visual and Dimensional Examination

Each sheet shall be examined to determine conformance to this specification with respect to workmanship and markings. Examinations for dimensions shall be made at specified intervals to ensure conformance to the tolerances specified. When approved by the procuring activity, the producer may use a system of statistical quality control for dimensional, marking and workmanship examinations.

TABLE 3 - CHEMICAL COMPOSITION 1/ 2/

Elements	#11 and #12 Brazing Sheet		#23 and #24 Brazing Sheet	
	Core (3003)	Cladding (4343)	Core (6951)	Cladding (4045)
Silicon	0.6	6.8 - 8.2	0.20 - 0.50	9.0 - 11.0
Iron	0.7	0.8	0.8	0.8
Copper	0.05 - 0.20	0.25	0.15 - 0.40	0.30
Manganese	1.0 - 1.5	0.10	0.1	0.05
Magnesium	---	---	0.40 - 0.80	0.05
Zinc	0.10	0.20	0.20	0.10
Titanium	---	---	---	0.20
Other elements				
Each	0.05	0.05	0.05	0.05
Total 3/	0.15	0.15	0.15	0.15
Aluminum	Remainder	Remainder	Remainder	Remainder

1/ Analysis shall routinely be made only for the elements specifically mentioned in Table 3. If, however, the presence of other elements is indicated or suspected in the amounts greater than the specified limits, further analysis shall be made to determine that these elements are not present in excess of specified limits.
2/ Composition is maximum weight percent unless shown as a range.
3/ The sum of those “Other elements” 0.010 percent or more each, expressed to the second decimal before determining the sum.

TABLE 4 - MECHANICAL PROPERTIES

Class	Temper	Thickness (inches)	Tensile strength		Elongation In 2 Inches 1/ Minimum (percent)
			Minimum (lbf/in^2)	Maximum (lbf/in^2)	
#11 and #12 (2)	H12	0.019-0.050	17 000	23 000	4
		0.051-0.249	17 000	23 000	6
	H14	0.019-0.050	20 000	26 000	3
		0.051-0.249	20 000	26 000	5
#23 and #24	0	0.020-0.031	---	21 000	18
		0.032-0.050	---	21 000	20
		0.051-0.249	---	21 000	23

1/ Not required for material 1/2 inch or less in width.
2/ Mechanical properties for #11-0 and #12-0 are defined by AMS4063 and AMS4064, respectively.

4.3 Examination

4.3.1 Visual and Dimensional Examination

Each sample sheet selected in accordance with 4.2.4 shall be examined visually and dimensionally to verify conformance to this specification.

4.3.2 Preservation, Packaging, Packing and Marking for Shipment

The preservation, packaging, packing and marking of shipment shall be examined to determine compliance with the requirements of Section 5.

4.4 Test Procedures

4.4.1 Mechanical Properties

4.4.1.1 Test Specimens

Tension test specimens shall conform to ASTM B 557. Sheet less than 3/4 inch in width shall be tested in full section. Test specimens shall be taken parallel to the direction of finish rolling for #11 and #12 brazing sheet and perpendicular to the direction of finish rolling for #23 and #24 brazing sheet.

4.4.1.2 Tension Test

Tension tests shall conform with the requirements of ASTM B 557.

4.5 Cladding Thickness

If a question arises concerning the uniformity of cladding on the finished product, not fewer than three transverse samples, approximately 3/4 inch in length, shall be mounted to expose an edge perpendicular to the plane of the sample and polished for microscopic examination. After etching with Keller's etch or other suitable etch to differentiate between core and cladding, each specimen shall be examined at a magnification of 100X. The maximum and minimum cladding thickness shall be measured in each of 5 fields approximately 1/10 inch apart along each clad side of the exposed edge of each mounted specimen. The mean of the 10 thickness measurements on each side of the exposed edge of each mounted specimen is the mean cladding thickness for that side.

4.6 Rejection and Retest

Unless otherwise specified, failure of a specimen to meet a test requirement shall be cause for rejection of the lot. A retest consisting of two specimens from the original sample to replace each failed specimen may be performed. If one of the retest specimens fails, the lot shall be rejected with no further testing permitted.

5. PACKAGING

5.1 Preservation, Packaging, Packing and Marking

All sheets shall be preserved, packaged, packed and marked in accordance with the requirements of ASTM B 660. Unless otherwise specified, material shall be preserved, packaged, packed and marked in accordance with Level C.

5.2 Marking

In addition to any special or other identification marking required by the contract (See 6.3), each sheet shall be marked in accordance with MIL-STD-129.

5.3 Packaging Inspection

All packaging requirements shall be inspected in accordance with 4.3.2 to ensure compliance.

6. NOTES

6.1 A change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

6.2 Terms used in AMS are clarified in ARP1917.

6.3 Purchase documents should specify not less than the following:

a. AMS-B-20148B (See 3.1)

b. Alloy, temper and form required (See 1.2)

c. Length, width and thickness required (See 3.5)

d. Levels of preservation, packaging, packing and marking, if other than Level C (See 5.1).

6.4 General Notes

6.4.1 Numbers 11, 12, 21 and 22 brazing sheet, after heating to brazing temperatures, will be fully annealed regardless of the condition in which it was originally supplied. The tensile strength may be expected to vary between 14 500 to 20 000 pounds per square inch. For this reason, brazing sheet should not be ordered in any temper other than annealed unless very little or no forming is necessary and the higher tensile strength of the alloy is of some particular advantage in the use of the material subsequent to brazing.

6.4.2 Numbers 21, 22, 23, 24 brazing sheet have an alloy core that responds to heat treatment. On cooling in still air from the brazing temperature, tensile strengths of approximately 23 000 pounds per square inch may be expected. A more rapid cooling rate, as in as air blast, may produce tensile strengths of approximately 27 000 pounds per square inch. Somewhat higher values are realized for more rapid quenching rates, and aging for 8 hours at 350 °F may be expected to produce further increases in tensile strength to approximately 35 000 pounds per square inch.

6.4.3 Aluminum brazing sheet clad on one side only should be ordered whenever practicable. Brazing sheet clad on both sides should only be used when the joint or part necessitates the flowing of the brazing material into the joint from both sides, or when there are joints on both faces of a plate. It should also be noted that aluminum clad materials conforming to QQ-A-250/3, QQ-A-250/5, QQ-A-250/13, QQ-A-250/15 and QQ-A-250/18 are no intended for nor are suitable as “brazing sheet”.

6.5 Cross Reference Information

TABLE 5

MIL-B-20148C	Class 1	Class 2	Class 5	Class 6
MIL-B-20148D	#11	#12	#23	#24

6.5.1 Classes 3 and 4 of MIL-B-20148C have been deleted from this revision due to the absence of any domestic producers of these particular alloys. The information pertaining to classes 3 and 4 of Revision C has been placed in Appendix A. When classes 3 and 4 (now 21 and 22) are required, the information in Appendix A, or portions thereof, shall be considered additional requirements when so directed by the Contracting Officer.

6.5.2 Classes 7 and 8 of MIL-B-20148C have been deleted from this revision. AWS A5.8 Classes BA1Si-2 and BA1Si-4 may be used in lieu of Class 7 and 8, respectively.

TABLE 6 - CLADDING THICKNESS

Class	Total Thickness of Composite Product (inches) 1/	Number of Sides Clad	Thickness of Each Cladding Plate, Nominal (Percent of Total Thickness)	Minimum Mean Thickness of Cladding on Finished Sheets (Percent of Total Thickness)	Maximum Mean Thickness of Cladding on Finished Sheets (Percent of Total Thickness)
#11	T ≤ 0.063	One	10	8	12
	T ≥ 0.064	One	5	4	8
#12	T ≤ 0.063	Both	10	8	12
	T ≥ 0.064	Both	5	4	8
#23	T ≤ 0.090	One	10	8	12
	T ≥ 0.091	One	5	4	8
#24	T ≤ 0.090	Both	10	8	12
	T ≥ 0.091	Both	5	4	8

1/ T = Total Thickness of Composite Material.

PREPARED BY AMS COMMITTEE “D”