

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard



AMS-QQ-A-250/21A

Issued
Revised

AUG 1997
SEP 1998

Superseding AMS-QQ-A-250/21

Aluminum Alloy, 7178-T76, Plate and Sheet Improved Exfoliation Resistant

UNS A97178

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The complete requirements for procuring 7178 aluminum alloy plate and sheet for improved exfoliation resistance described herein shall consist of this document and the latest issue of AMS-QQ-A-250.

1. SCOPE AND CLASSIFICATION:

1.1 Scope:

This specification covers the specific requirements for improved exfoliation-resistant aluminum alloy, 7178-T76 sheet and 7178-T7651 plate.

1.2 Classification:

1.2.1 Tempers: Sheet shall be furnished in the T76 temper only and plate in the T7651 temper only, as specified (See 6.2). Definitions of these tempers are in accordance with AMS-QQ-A-250.

2. APPLICABLE DOCUMENTS:

See AMS-QQ-A-250.

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3. REQUIREMENTS:

3.1 Chemical Composition:

The chemical composition of the ingot or slabs used for the manufacture of the plates and sheets shall conform to the requirements specified in Table I.

TABLE I. Chemical Composition 1/

Element	Percent	
	Minimum	Maximum
Silicon	-	0.40
Iron	-	0.50
Copper	1.6	2.4
Manganese	-	0.30
Magnesium	2.4	3.1
Chromium	0.18	0.28
Zinc	6.3	7.3
Titanium	-	0.20
Other Elements, each	-	0.05
Other Elements, total <u>2/</u>	-	0.15
Aluminum	Remainder	

1/ Analysis shall routinely be made only for the elements specifically mentioned in Table I. If, however, the presence of other elements is indicated or suspected in 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/ The sum of those "Others" metallic elements, 0.010 percent or more each, expressed to the second decimal before determining the sum.

3.2 Mechanical Properties:

The mechanical properties perpendicular to the direction of final rolling, except for material under 9 inches in width, shall conform to the requirements of Table II for the temper specified. For material under 9 inches in width, the mechanical properties parallel to the direction of final rolling shall conform to the requirements of Table II for the temper specified.

TABLE II. Mechanical Properties

Temper	Thickness Inches	Tensile Strength, ksi minimum	Yield Strength at 0.2 percent Offset, ksi, minimum	Elongation in 2 inches or 4 times D, percent, <u>1</u> /, <u>2</u> / minimum
T76	0.045-0.249	75.0	64.0	8
T7651	0.250-0.499	74.0	63.0	8
	0.500-1.000	73.0	62.0	6

1/ Not required for material 1/2 inch or less in width.

2/ D represents specimen diameter.

3.3 Resistance to Exfoliation Corrosion and Stress-Corrosion Cracking:

3.3.1 Exfoliation Corrosion: Material in the T76 and T7651 tempers, when tested in accordance with 4.2.3, shall show no exfoliation corrosion equivalent to or in excess of that depicted in Figure 2 of ASTM G34-72 for category B. The frequency of testing shall be in accordance with requirements of AMS-QQ-A-250.

3.3.2 Stress-Corrosion Cracking: Plate, 0.750-inch and over in thickness, shall exhibit no susceptibility to stress-corrosion cracking when tested in accordance with 4.2.4. The frequency of testing shall be in accordance with requirements of AMS-QQ-A-250.

3.3.3 Lot Acceptance Control Criteria: Resistance to exfoliation corrosion and stress-corrosion cracking for each lot of material shall be determined by the following criteria (See 4.1.3 and 4.2.5).

3.3.3.1 Determine electrical conductivity and mechanical properties.

3.3.3.2 If conductivity is 38.0 percent International Annealed Copper Standards (IACS) or higher, and tensile properties meet the minimum limits specified herein, the material is acceptable.

3.3.3.3 If tensile properties meet the minimum limits specified herein, and if conductivity is at least 35.0 percent IACS but less than 38.0 percent IACS, the material shall be tested as specified in 4.2.3 or reprocessed.

3.3.3.4 If conductivity is below 35.0 percent IACS, the material is not acceptable and must be reprocessed.

3.4 Internal Defects:

Unless otherwise specified (See 6.2), plate shall be ultrasonically inspected (See AMS-QQ-A-250). Acceptance limits shall be as specified in Table III.

TABLE III. Ultrasonic Discontinuity Acceptance Limits ^{1/}

Thickness Inches	Maximum Weight per Piece (pounds)	Discontinuity Class ^{2/}
0.500 through 1.000	2,000	B

^{1/} Discontinuities in excess of those listed in Table III may be allowed, subject to approval of the procuring activity, if it is established that they will be removed by machining or that they are in noncritical areas.

^{2/} The discontinuity class limits are defined in MIL-STD-2154.

3.5 Marking:

In addition to marking as required in FED-STD-184, plate and sheet shall be identified by an inspection lot number in at least one location on each piece.

4. QUALITY ASSURANCE PROVISIONS:

See AMS-QQ-A-250 and the following:

4.1 Sampling:

4.1.1 For Chemical Analysis: Samples for chemical analysis shall be selected in accordance with AMS-QQ-A-250.

4.1.2 For Exfoliation and Stress-Corrosion Cracking Tests: Samples for exfoliation and stress-corrosion cracking tests shall be selected in accordance with AMS-QQ-A-250. Thereafter, surveillance testing shall be performed on at least one sample per month and for each size range of sheet and plate produced with acceptable exfoliation resistance. The surveillance test samples shall be taken from an inspection lot which has met the requirements of 3.3.3.2. Samples as above shall be taken for stress-corrosion cracking test when thickness permits (See 3.3.2).

4.1.3 For Mechanical Property and Conductivity Tests: Sampling shall be in accordance with AMS-QQ-A-250 for mechanical property tests. Mechanical properties and conductivities shall be determined on the same samples (See 4.2.3 and 4.2.5). Conductivity shall be determined prior to testing for mechanical properties.