



AEROSPACE MATERIAL SPECIFICATION

AMS4471

REV. A

Issued 2012-07
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Superseding AMS4471

Cast Aluminum Alloy Composite
4.6Cu - 3.4Ti - 1.4B - 0.75Ag - 0.27Mg (205.0/TiB₂/3p-T7P)
Investment Cast, Solution and Precipitation Heat Treated

RATIONALE

AMS4471A revises the Title (Also see 8.3) and Tensile Properties (Table 2).

1. SCOPE

1.1 Form

This specification covers a dilute aluminum/TiB₂ metal matrix composite in the form of investment castings.

1.2 Application

These castings have been used typically for components requiring high strength and/or elevated temperature performance, but usage is not limited to such applications.

1.3 Safety - Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

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.

AMS2175 Casting, Classification and Inspection of

AMS2360 Room Temperature Tensile Properties of Castings

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AMS2694	In-Process Welding of Castings
AMS2771	Heat Treatment of Aluminum Alloy Castings
AMS2804	Identification, Castings
AS1990	Aluminum Alloy Tempers

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 557M	Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products (Metric)
ASTM E 29	Using Significant Digits in Test Data to Determine Conformance with Specifications
ASTM E 34	Chemical Analysis of Aluminum and Aluminum-Base Alloys
ASTM E 155	Reference Radiographs for Inspection of Aluminum and Magnesium Castings
ASTM E 716	Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spectrochemical Analysis
ASTM E 1251	Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry
ASTM E 1417	Liquid Penetrant Testing
ASTM E 1742	Radiographic Examination

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 34, by spectrochemical methods in accordance with ASTM E 1251, or by other analytical methods acceptable to purchaser (See 3.4.1).

TABLE 1 – COMPOSITION

Element	min	max
Iron	--	0.08
Copper	4.2	5.0
Magnesium	0.20	0.33
Titanium ⁽¹⁾	3.0	3.85
Boron ⁽¹⁾	1.25	1.55
Silicon	--	0.10
Silver	0.6	0.9
Other Elements, each		0.08
Other Elements, total	--	0.17
Aluminum	remainder	

(1)—Titanium and Boron are present as TiB₂ reinforcement in the cast alloy matrix.

3.1.1 Test results may be rounded by the “rounding off” method of ASTM E 29.

3.2 Condition

Solution and precipitation heat treated to the T7 temper (See AS1990).

3.3 Castings

Castings shall be produced from metal conforming to 3.1, determined by analysis of specimens cast as in 3.4.1.

3.4 Cast Test Specimens

Chemical analysis specimens and tensile specimens shall be cast as follows:

3.4.1 Chemical Analysis Specimens

Two specimens shall be cast from each melt. The first shall be taken after the last melt addition and the second shall be after the last casting has been poured. Both specimens shall be tested to qualify the melt as in 3.1. Spectrochemical samples shall be prepared in accordance with ASTM E 716.

3.4.2 Tensile Specimens

Shall be produced as follows:

3.4.2.1 Specimens Cut from a Casting and Specimens from Integrally Cast Coupons

Shall be removed after heat treatment, shall conform to ASTM B 557 or ASTM B 557M and shall be either 0.500 inch (12.70 mm) diameter at the reduced parallel gage section, standard sheet type specimens, or subsize specimens proportional to the standard as required by 3.6.1.

3.4.2.2 Separately Cast Specimens

Shall conform to ASTM B 557 or ASTM B 557M and shall be cast from each melt after the last melt additions. Specimens shall be cast in molds representing the mold used for castings. Chills are not permitted on test specimen cavity, except on the end face of the specimen when approved in accordance with 4.4.2.

3.5 Heat Treatment

Heat treatment shall conform to the requirements of AMS2771. Heat treatment parameters are proprietary.

3.6 Properties

Castings and representative tensile specimens produced in accordance with 3.4.2 shall conform to the following requirements:

3.6.1 Tensile Properties

Shall be as follows, determined in accordance with ASTM B 557 or ASTM B 557M; conformance to the requirements of 3.6.1.1 shall be used as basis for acceptance of castings except when purchaser specifies that the requirements of 3.6.1.2 or 3.6.1.3 apply.

3.6.1.1 Specimens Cut From Castings

Specimens as in 4.3.3 shall have the properties shown in Table 2.