Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10000

AEROSPACE MATERIAL SPECIFICATION

AMS 4225

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Revised

ALUMINUM ALLOY CASTINGS, SAND, MODERATE HEAT RESISTANT
5.0Cu - 1.5Ni - 0.25Mn - 0.25Sb - 0.25Co - 0.20Ti - 0.20Zr
Solution and Precipitation Heat Treated

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. APPLICATION: Primarily for parts requiring moderate strength and good stability at temperatures up to 600 F (316 C).

3. COMPOSITION: Castings shall conform to the following:

	min	max
Copper	4.5	5.5
Nickel	1.3	1.8
Manganese	0.20	0.30
Antimony	0.10	0.40
Cobalt	0.10	0.40
Titanium	0.15	0.25
Zirconium	0.10	0.30
Iron	--	0.30
Silicon	--	0.20
Antimony + Cobalt	--	0.6
Titanium + Zirconium	--	0.50
Other Impurities, each	--	0.05
Other Impurities, total	--	0.30
Aluminum	remainder	

4. CONDITION: Solution and precipitation heat treated.

5. TECHNICAL REQUIREMENTS:

5.1 Casting: Castings shall be produced in lots from metal conforming to Section 3. Metal remelted from previously analyzed ingot may be poured directly into castings. Furnace or ladle additions of grain refining elements are permissible. Unless otherwise agreed upon by purchaser and vendor, molten metal taken from alloying furnaces, with or without additions of foundry operating scrap (gates, sprues, risers, and rejected castings) shall not be poured into castings unless first converted to ingot, analyzed, and remelted or until the composition of a sample taken after the last addition to the melt has been found to conform to Section 3.

5.1.1 A melt shall be the metal withdrawn from a batch furnace charge of 2000 lb or less as melted for pouring castings or, when permitted by purchaser, a melt shall be 4000 lb or less of metal withdrawn from one continuous furnace in not more than eight consecutive hours.

5.1.2 A lot shall consist of castings poured from a single melt in not more than eight consecutive hours.

5.2 Cast Test Specimens: When tensile test specimens and chemical analysis specimens are required, they shall be cast as follows and, when requested, shall be supplied with the castings.

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5.2.1 Tensile Test Specimens: Shall be cast with each lot of castings, shall be standard (0.5 in. diameter at the reduced parallel section), and shall be cast to size in molds representative of the practice used for castings. Metal for the specimens shall be part of the melt used for the castings. If the metal for the castings is given any treatment, such as fluxing or cooling and reheating, the metal for the specimens shall be a portion of the metal so treated and during such treatment shall be heated to the same maximum temperature and held for approximately the same length of time as the molten metal for castings.

5.2.2 Chemical Analysis Specimens: Shall be cast from each melt and shall be of size and shape agreed upon by purchaser and vendor.

5.3 Heat Treatment: All castings and representative test specimens shall be solution and precipitation heat treated as follows:

5.3.1 Solution Heat Treatment: Heat to 1010 F ± 10 (543.3 C ± 5.6), hold at heat for not less than 5 hr, and quench in boiling water. When permitted by purchaser, castings and representative test specimens may be quenched from the solution heat treating temperature into oil maintained at approximately 170 F (77 C).

5.3.2 Precipitation Heat Treatment: Heat to 420 F ± 5 (215.6 C ± 2.8), hold at heat for not less than 16 hr, and cool in air.

5.4 Tensile Properties:

5.4.1 Separately Cast Specimens and Specimens from Specific Locations in Castings: Separately cast tensile test specimens and, when specified on the order, specimens taken from any casting chosen to represent the lot, in locations indicated on the drawing, shall conform to the following:

5.4.1.1 At 75 F ± 10 (23.9 C ± 5.6):

Tensile Strength, psi	32,000 min
Yield Strength at 0.2% Offset, psi	24,000 min
Elongation, % in 2 in. or 4D	1.5 min

5.4.1.2 At 600 F ± 10 (315.6 C ± 5.6):

Tensile Strength, psi	16,000 min
Elongation, % in 2 in. or 4D	4 min

5.4.2 Specimens from Any Area of The Casting: Tensile test specimens taken from any area of a casting shall conform to the following:

5.4.2.1 At 75 F ± 10 (23.9 C ± 5.6):

Tensile Strength, psi	26,000 min
Yield Strength at 0.2% Offset, psi	20,000 min
Elongation, % in 2 in. or 4D	0.5 min

5.4.2.2 At 600 F ± 10 (315.6 C ± 5.6):

Tensile Strength, psi	13,500 min
Elongation, % in 2 in. or 4D	1 min

5.5 Hardness: Except at sprues and risers, castings shall have hardness not lower than Brinell 80 using 500 kg load and 10 mm ball or 1000 kg load and 9/16 in. ball, or not lower than Brinell 85 using 1000 kg load and 10 mm ball.

5.6 Stress Rupture Test at 600 F (315.6): Material shall be capable of meeting the requirements of 5.6.1; tests shall be conducted in accordance with the issue of ASTM E139 listed in the latest issue of AMS 2350.

5.6.1 A tensile test specimen, maintained at 600 F ± 3 (315.6 C ± 1.7) while an axial stress of 11,000 psi is applied continuously, shall not rupture in less than 24 hours. The test shall be continued at the same stress after 24 hr until rupture occurs or until 48 hr have elapsed. If the specimen has not ruptured after 48 hr, the stress may be increased to not more than 14,000 psi and continued to rupture. Elongation of the ruptured test specimen, measured at room temperature, shall be not less than 3% in 4D.

5.6.1.1 The test of 5.6.1 may be conducted at a stress higher than 11,000 psi, but stress shall not be changed while the test is in progress. Time to rupture and elongation requirements shall be as specified in 5.6.1.

6. QUALITY:

6.1 Castings shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts. Castings shall have smooth surfaces and shall be well cleaned.

6.2 Radiographic and other quality standards shall be as agreed upon by purchaser and vendor.

6.3 Unless otherwise specified, castings shall be produced under radiographic control. This shall consist of radiographic examination of castings until proper foundry technique, which will produce castings free from harmful internal imperfections, is established for each part number and of production castings as necessary to ensure maintenance of satisfactory quality.

6.4 Castings shall not be repaired by plugging, welding, or other methods, without written permission from purchaser.

6.5 Castings shall not be impregnated, chemically treated, or coated to prevent leaking, unless specified or allowed by written permission which states the method to be used. Impregnated castings shall be marked IMP.

7. REPORTS:

7.1 Unless otherwise specified, the vendor of castings shall furnish with each shipment three copies of a report of the results of tensile tests on specimens representing castings from each lot and a statement that the chemical composition of the castings conforms to the requirements of this specification. This report shall include the purchase order number, lot number, material specification number, part number, and quantity.

7.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of castings, part number, and quantity. When castings for making parts are produced or purchased by the parts vendor, that vendor shall inspect each shipment or lot of castings to determine conformance to the requirements of this specification, and shall include in the report a statement that the castings conform, or shall include copies of laboratory reports showing the results of tests to determine conformance.

8. IDENTIFICATION: Unless otherwise specified, castings shall be identified in accordance with the latest issue of AMS 2804, including the lot number and heat treatment batch number.