

AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
29 West 39th Street
New York City

AMS 4222 B

Issued 12-1-42

Revised 2-1-49

ALUMINUM ALLOY CASTINGS, SAND
4Cu - 2Ni - 1.5Mg (142-T77)
Solution Treated and Overaged

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

2. APPLICATION: Primarily for air-cooled cylinder heads.

3. COMPOSITION:

Copper	3.50 - 4.50
Nickel	1.70 - 2.30
Magnesium	1.20 - 1.80
Titanium	0.07 - 0.18
Iron	0.80 max
Silicon	0.60 max
Manganese	0.10 max
Zinc	0.10 max
Other Impurities, each	0.05 max
Other Impurities, total	0.15 max
Aluminum	remainder

4. CONDITION: Solution heat treated and overaged.

5. TECHNICAL REQUIREMENTS:

5.1 Casting:

5.1.1 All metal which is melted for castings shall be ingot conforming in composition to Section 3 above; gates, risers and rejected castings may be used but shall first be converted into such ingot. Furnace or ladle additions of small amounts of grain refining elements or alloys are permissible.

5.1.2 A melt shall be the metal withdrawn from a batch furnace charge of 2000 pounds or less as melted for pouring castings, or when permitted by the purchaser, a melt shall be 3000 pounds or less of metal withdrawn from one continuous furnace in not more than 8 consecutive hours.

5.2 Test Specimens: Unless otherwise specified, tensile test specimens, and chemical analysis specimens when required, shall be cast with each melt of metal for castings and, when requested, shall be supplied with the castings.

tion 7C of the SAE Technical Board rules provides that: "All technical reports, including standards, approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

- 5.2.1 Tensile Test Specimens: Shall be standard (0.5-inch diameter at the reduced parallel section) and shall be cast to size in molds made with the regular foundry mix of green sand, without using chills. Metal for the specimens shall be part of the melt which is used for the castings. If the metal for 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. The temperature of the metal during pouring of the specimens shall be not lower than the temperature of the metal during pouring of the castings.
- 5.2.2 Chemical Analysis Specimens: When required by purchaser, shall be of size and shape agreed upon by purchaser and vendor.
- 5.3 Heat Treatment: All castings and tensile test specimens representing them shall be heat treated as follows:
- 5.3.1 Tensile test specimens from each melt, together with production castings, shall be heated to 960 - 970 F for the proper time for solution treatment and cooled in air. At least one set of tensile test specimens shall be put into a batch-type furnace with each load of castings or into a continuous furnace at intervals of not longer than 3 hours.
- 5.4 Physical Properties:
- 5.4.1 Tensile test specimens shall conform to the following requirements:
- | | | |
|------------------------|--------|-----|
| Tensile Strength, psi | 21,500 | min |
| Elongation, % in 2 in. | 1.0 | min |
- 5.4.2 Hardness of castings, except at sprues and risers, shall be Brinell 65-85 using 500 kg load and 10 mm ball or 1000 kg load and 9/16 in. ball, or Brinell 70-90 using 1000 kg load and 10 mm ball.
- 5.4.3 If castings are cut for examination, not less than four, and preferably ten, tensile test specimens taken from thick and thin sections of castings shall be tested. Average hardness of such specimens shall be as specified in 5.4.2. Average tensile properties shall conform to the following requirement:
- | | | |
|-----------------------|--------|-----|
| Tensile Strength, psi | 16,000 | min |
|-----------------------|--------|-----|
- Note: Conformance to these requirements may be used as basis for acceptance of castings.
6. QUALITY:
- 6.1 Castings shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external defects detrimental to fabrication or to performance of parts. Castings shall have smooth surfaces and shall be well cleaned.

- 6.2 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 defects, is established for each pattern, and of production castings as necessary to ensure maintenance of satisfactory quality.
- 6.3 Radiographic and other quality standards shall be as agreed upon by purchaser and vendor.
- 6.4 Castings shall not be repaired by plugging, welding or other methods, without written permission from the 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 notarized report of the results of tests to determine conformance of the castings to the requirements of this specification. This report shall show the chemical composition of the castings, physical properties of the tensile test specimens, melt numbers, material specification number, purchase order number, part number, and quantity. If the accuracy of control is adequate, each melt need not be analyzed, but the frequency of analysis shall be as agreed upon by purchaser and vendor.
- 7.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a notarized 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 melt of castings to determine conformance to the requirements of this specification, and shall include in the report a certification 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.
9. APPROVAL:
- 9.1 Unless otherwise ordered, sample castings from new or reworked patterns shall be approved by purchaser before production castings are supplied.