

# AERONAUTICAL MATERIAL SPECIFICATIONS

AMS 5353

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

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Revised

## STEEL CASTINGS, PRECISION INVESTMENT, CORROSION RESISTANT 16Cr - 1.85Ni

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. APPLICATION: Primarily for small parts, such as rotors, requiring moderate corrosion resistance and strength up to 800 F.
3. COMPOSITION: Castings shall conform to the following:

|                   |             |
|-------------------|-------------|
| Carbon            | 0.08 - 0.15 |
| Manganese         | 1.0 max     |
| Silicon           | 1.0 max     |
| Phosphorus        | 0.04 max    |
| Sulfur            | 0.04 max    |
| Chromium          | 15.0 - 17.0 |
| Nickel            | 1.5 - 2.2   |
| Nitrogen          | 0.03 - 0.12 |
| Carbon + Nitrogen | 0.22 max    |

4. CONDITION: As cast, unless otherwise specified.

### 5. TECHNICAL REQUIREMENTS:

- 5.1 Casting: Castings shall be poured either from remelted master heat metal or directly from a master heat. A master heat is previously refined metal of a single furnace charge. Gates, sprues, risers, and rejected castings shall not be remelted directly, without refining, for pouring of castings; they may be used in preparation of master heats. When permitted by purchaser, metal in the form of shot from more than one master heat may be uniformly blended together to form a master heat lot; the total weight of metal in a master heat lot shall not exceed 7000 pounds.
- 5.2 Test Specimens:
  - 5.2.1 Tensile Test Specimens: Unless otherwise specified, tensile test specimens shall be cast to represent each master heat or master heat lot of metal in castings and, when requested, shall be supplied with the castings. The specimens shall be of standard proportions with 0.25 in. diameter at the reduced parallel section, shall be cast to size in molds made of the same refractory and heated to the same temperature as the molds for castings, and shall be cooled at approximately the same rate as the castings. Center gating may be used, but if specimens are so gated, the gate shall be completely removed before testing. If the metal for castings is given any treatment such as fluxing or cooling and reheating, metal for the specimens shall be so treated.

### 5.3 Heat Treatment:

- 5.3.1 Normalizing and Tempering: When normalizing and tempering is specified, castings and tensile test specimens shall be normalized by heating to  $1875\text{ F} \pm 25$ , holding at heat for not less than 1 hr per in. of maximum section but in no case less than 30 min., air cooling to room temperature, and cooling to not higher than  $-90\text{ F}$  for not less than 1 hr, and tempered at not lower than  $1100\text{ F}$  for 2 - 4 hours.
- 5.3.2 Hardening and Tempering: When hardening and tempering is specified, castings and tensile test specimens shall, after normalizing and tempering as in 5.3.1, be hardened by heating to  $1850\text{ F} \pm 25$ , holding at heat for not less than 1 hr per in. of maximum section, but in no case less than 30 min., oil quenching, and cooling to not higher than  $-90\text{ F}$  for 1 hr, tempered at  $600 - 700\text{ F}$  for 2 hr, cooled to not higher than  $-90\text{ F}$  for 1 hr, and tempered at  $600 - 700\text{ F}$  for 2 hours.
- 5.4 Properties After Heat Treatment: Tensile test specimens produced in accordance with 5.2 shall be capable of meeting the following requirements after heat treatment in accordance with 5.3.2.

#### 5.4.1 Tensile Properties:

|                                    |         |     |
|------------------------------------|---------|-----|
| Tensile Strength, psi              | 170,000 | min |
| Yield Strength at 0.2% Offset, psi | 130,000 | min |
| Elongation, % in 4D                | 2.0     | min |

#### 5.4.2 Hardness: Shall be Rockwell C 38 - 49 or equivalent.

- 5.5 Hardness of Castings: Castings shall be capable of developing hardness of Rockwell C 24 - 34 after heat treatment in accordance with 5.3.1, and hardness of Rockwell C 38 - 49 after heat treatment in accordance with 5.3.2.

### 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. Unless otherwise permitted, metallic shot or grit shall not be used for final cleaning.
- 6.2 When castings are broken for fracture test, the fracture shall have uniform color and be substantially free from oxides and other imperfections.
- 6.3 Radiographic and other quality standards shall be as agreed upon by purchaser and vendor.
- 6.4 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.
- 6.5 Castings shall not be repaired by plugging, welding, or other methods, without written permission from purchaser.