AEROSPACE
MATERIAL SPECIFICATIONS

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

AMS 5328

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Revised

STEEL CASTINGS, INVESTMENT
0.80Cr - 1.8Ni - 0.35Mo (0.28 - 0.36C) (SAE 4330 Modified)

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

2. APPLICATION: Primarily for parts of intricate design which require heat treatment to tensile strengths up to 180,000 psi minimum.

3. COMPOSITION: Castings shall conform to the following:

Carbon	0.28 - 0.36
Manganese	0.60 - 1.00
Silicon	0.50 - 1.00
Phosphorus	0.025 max
Sulfur	0.025 max
Chromium	0.65 - 1.00
Nickel	1.65 - 2.00
Molybdenum	0.30 - 0.45

4. CONDITION: Annealed, 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 Cast Tensile 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 Annealing: Castings and tensile test specimens shall be annealed by heating to 1550 F ± 25 (843.3 C ± 14), holding at heat for not less than 1 hr, and cooling as required.

5.4 Hardness: Castings shall have hardness not higher than Rockwell C 30 or equivalent.

5.5 Carburization and Decarburization: The carbon content shall be within the specification limits throughout the casting, except that within 0.003 in. of the surface the carbon content may be lower than specified in Section 3. Unless otherwise agreed upon by purchaser and vendor, the heat treatment specified in 5.3 shall be performed in a protective atmosphere to accomplish the carbon control required.

5.6 Properties After Hardening and Tempering: Tensile test specimens produced in accordance with 5.2.1 and castings, hardened by heating to 1500 F ± 25 (815.6 C ± 14), holding at heat for not less than 30 min., and oil quenching, and then tempered twice at not lower than 700 F (372 C) for 2 hr, air cooling after each tempering operation, shall be capable of meeting the following requirements. Specimens cut from castings are not required for routine examination; however, properties obtained from such specimens may be basis for acceptance or rejection of castings. Specific location and size of specimens shall be as agreed upon by purchaser and vendor.

5.6.1 Tensile Properties:

Tensile Strength, psi	180,000 min
Yield Strength at 0.2% Offset or at 0.0075 in. in 1 in. Extension Under Load (E = 29,000,000), psi	160,000 min
Elongation, % in 4D	5 min

5.6.2 Hardness: Rockwell C 40 - 45 or equivalent.

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

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