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

AEROSPACE MATERIAL SPECIFICATION

AMS 5388C
Superseding AMS 5388B
Issued 6-15-52
Revised 5-1-69

ALLOY CASTINGS, INVESTMENT, CORROSION AND HEAT RESISTANT
Nickel Base - 16.5Cr - 17Mo - 4.5W - 6.8Fe - 0.40V

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 small parts, such as nozzle guide vanes, requiring high strength up to approximately 1500 F (816 C) and oxidation resistance up to 1800 F (982 C). Exposure to high temperatures may cause hardening of this alloy; e.g., exposure at approximately 1475 F (802 C) for 50 hr may result in hardness as high as Rockwell C 42.

3. COMPOSITION: Castings shall conform to the following:

	min	max
Carbon	--	0.15
Manganese	--	1.0
Silicon	--	1.0
Ø Phosphorus	--	0.03
Sulfur	--	0.03
Chromium	15.5	17.5
Molybdenum	16.0	18.0
Tungsten	3.75	5.25
Iron	4.5	7.0
Vanadium	0.20	0.60
Nickel + Cobalt	remainder	
Cobalt (1)	--	2.5

(1) Determination not required for routine acceptance.

4. CONDITION: As cast, unless otherwise specified.

5. TECHNICAL REQUIREMENTS:

5.1 Casting: Castings shall be poured either from remelted metal from a master heat or master heat lot or directly from a master heat. In either case, metal for casting shall be qualified as in 5.2.

Ø A master heat is refined metal of a single furnace charge. Gates, sprues, risers, and rejected castings shall be used only in preparation of master heats; they shall not be remelted directly, without refining, for pouring of castings.

5.1.1 Unless prohibited by purchaser, metal from two or more master heats may be blended to form a master heat lot provided that the composition of each master heat to be blended is within the

Ø limits of Section 3 above and that the total weight of metal in the master heat lot does not exceed 10,000 pounds. Ingot and pig may be blended together, shot may be blended, but shot shall not be blended with ingot or pig.

5.2 Master Heat Qualification: Each master heat and master heat lot shall be qualified by evaluation of chemical analysis and tensile test specimens conforming to 5.2.1 and 5.2.2, respectively. A master heat or master heat lot may be considered conditionally qualified if vendor's test results show conformance to all applicable requirements of this specification. However, except when purchaser waives confirmatory testing, final qualification shall be based on purchaser's test results. Conditional qualification of a master heat or master heat lot shall not be construed as a guarantee of acceptance of castings poured therefrom.

5.2.1 Chemical Analysis Specimens: Shall be of any convenient size, shape, and form for vendor's tests; when chemical analysis specimens are required by purchaser, specimens shall be cast to a size, shape, and form agreed upon by purchaser and vendor. Composition of specimens shall conform to Section 3.

5.2.2 Tensile Test Specimens: Shall be cast from remelted metal from each master heat or master heat lot except that when castings are poured directly from a master heat, the tensile test specimens shall also be poured directly from the master heat. Tensile test specimens shall be of standard proportions with 0.25 in. diameter at the reduced parallel section. They shall be cast to size or shall be cast oversize and subsequently machined to 0.25 in. diameter. Center gating may be used. When requested, representative specimens shall be supplied to the purchaser for confirmatory evaluation. Tensile test specimens shall conform to the following requirements:

5.2.2.1 Tensile Properties at 1500 F 815.6 C): Tensile test specimens heated to 1500 F ± 10 (815.6 C ± 5.6), held at 1500 F ± 10 (815.6 C ± 5.6) for 30 min. before testing, and tested at 1500 F ± 10 (815.6 ± 5.6) at a strain rate of 0.045 - 0.062 in. per in. per min. shall have the following properties:

Tensile Strength, psi	50,000 min
Elongation, % in 1 in.	10 min

5.2.2.2 Hardness: Tensile test specimens as cast shall have hardness not higher than Rockwell C 21 or equivalent.

5.3 Properties of Castings:

5.3.1 Tensile Properties: When specified on the drawing or when agreed upon by purchaser and vendor, tensile test specimens may be machined from castings selected at random from the shipment. Size and location of such specimens and tensile properties required shall be as shown on the drawing or as agreed upon by purchaser and vendor.

5.3.2 Hardness: Castings as cast shall have hardness not higher than Rockwell C 21 or equivalent.

5.3.3 Bend Test: When carbon arc melting is used for producing castings, three bend test specimens at least 0.090 in. in diameter or thickness and approximately 2 in. in length shall be cast in each mold along with each cast part or parts. At least two of the three specimens cast in each mold shall withstand, without cracking, bending at room temperature through an angle of 20 deg around a 0.5 in. diameter.

5.3.3.1 If more than one test specimen from a mold fails to pass the bend test, disposition of the castings from that mold may be determined either by applying a bend test to an actual casting or to specimens cut from castings, gates, or runners, or by establishing that the carbon content of the metal in the mold conforms to the requirements of Section 3. Failure of any such additional test will be cause for rejection of the castings from that mold.

5.3.3.2 If actual castings or specimens cut from castings, gates, or runners are used, such specimens shall be at least 0.090 in. in diameter or thickness.

5.3.3.3 Unless otherwise specified, bend test shall be performed by the producer of castings.

5.4 Resampling and Retesting: In event any test specimen fails to meet the specified requirements, at least two additional test specimens shall be tested for each non-conforming specimen. All such additional test specimens shall conform to specified requirements. Failure of any retest specimen to conform to specified requirements shall be cause for rejection of the master heat or master heat lot in the case of qualification test specimens, or of the castings from that shipment in the case of tests on castings or specimens cut from castings. Results of all tests shall be reported.

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 defects.

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 insure maintenance of satisfactory quality.

6.4 Inspection standards and procedures 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.

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 tests for chemical composition of at least one casting from each master heat or master heat lot represented and the results of tests on each master heat or master heat lot to determine conformance to the technical requirements of this specification. When properties of test specimens cut from castings are specified, the report shall include the results of tests to determine conformance to such requirements. This report shall include the purchase order number, master heat or master heat lot number (and code symbol if used), material specification number and its revision letter, part number, and quantity from each master heat or master heat lot.

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 and its revision letter, 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 castings from each master heat or master heat lot represented 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, each casting shall be identified as to part number and master heat or master heat lot number or code symbol. Methods of applying identifying characters shall be as agreed upon by purchaser and vendor. Marking materials shall have no deleterious effect on the castings or their performance.

9. APPROVAL:

9.1 Sample castings from new or reworked master patterns and the casting procedure shall be approved by purchaser before castings for production use are supplied, unless such approval be waived.