



AEROSPACE MATERIAL SPECIFICATION

AMS5387™**REV. F**

Issued 1947-09
Reaffirmed 2015-12
Revised 2022-02

Superseding AMS5387E

Alloy, Corrosion and Heat Resistant, Investment Castings
60Co - 29Cr - 4.5W
As Cast

(Composition similar to UNS R30006)

RATIONALE

AMS5387F prohibits unauthorized exceptions (3.8, 4.5.1, 8.4), updates composition testing (3.1), cast bars removed as not applicable (3.4), hardness conversion requirements revised (3.6.1), adds radiographic quality requirements (3.7.4.1), makes casting procedures approval an option (4.4.2), adds country of origin (4.5), removes redundant definitions (2.3), allows prior revisions (8.3), updates ordering data (8.5), and is the result of a Five-Year Review and update of the specification.

1. SCOPE

1.1 Form

This specification covers a corrosion and heat resistant cobalt alloy in the form of investment castings.

1.2 Application

These castings have been used typically for parts such as nozzles, rubbing seals, rollers, guides and supports requiring wear and/or erosion resistance in combination with corrosion and oxidation resistance for use up to 1600 °F (870 °C), but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2175	Castings, Classification and Inspection of
AMS2269	Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys
AMS2694	In-Process Welding of Castings

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For more information on this standard, visit
<https://www.sae.org/standards/content/AMS5387F/>

AMS2804	Identification, Castings
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E18	Rockwell Hardness of Metallic Materials
ASTM E354	Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel and Cobalt Alloys
ASTM E1417/E1417M	Liquid Penetrant Testing
ASTM E1742/E1742M	Radiographic Examination

2.3 Definitions

Terms used in this AMS are defined as follows. Other terms not specifically defined are clarified in ARP1917.

2.3.1 PURCHASER

The cognizant engineering organization responsible for casting design and fitness for use, or the designee of this engineering organization.

2.3.2 MELT

All castings poured from a single furnace charge. Also referred to as remelt, submelt, heat, or subheat.

2.3.3 MASTER HEAT

Refined metal (see 2.3.5) of a single furnace charge, poured directly into castings and/or converted into ingot for remelting in accordance with 3.2. One or more melts can be poured from a single master heat.

2.3.4 LOT

For hardness testing, a lot shall consist of all castings of the same part number, poured from consecutive melts of a single master heat, and processed through all applicable heat treatment operations in the same equipment at the same time. For visual and nondestructive testing, an inspection lot shall consist of castings of the same part number, manufactured under the same process control parameters of 4.4.2.2, and submitted for those tests in a single group.

2.3.5 REFINED METAL

Metal derived from raw materials in the form of virgin elements, master alloy, and/or revert melted in any combination, replenished as needed, fluxed for nonmetallics, and degassed as necessary. Melting of revert creates a new master heat.

2.3.6 REPLENISHMENT

Virgin element and/or master alloy additions introduced to the furnace during the final stage of melting, as necessary to bring the melt or master heat into conformance with the specified composition.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Castings shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM E354 or by other analytical methods acceptable to purchaser (see 2.3).

Table 1 - Composition

Element	Min	Max
Carbon	0.90	1.40
Manganese	--	1.00
Silicon	--	1.50
Phosphorus	--	0.04
Sulfur	--	0.04
Chromium	27.00	31.00
Tungsten	3.50	5.50
Nickel	--	3.00
Molybdenum	--	1.50
Iron	--	3.00
Cobalt	remainder	

3.1.1 Producer may test for any element not listed in Table 1 and include this analysis in the report of 4.5. Limits of acceptability may be specified by purchaser.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

3.2 Melting Practice

Castings and specimens shall be poured at casting producer's facility either from a melt of a master heat, or directly from a master heat (see 2.3).

3.2.1 Revert (gates, sprues, risers, and rejected castings) may be used only in the preparation of master heats; revert shall not be remelted directly, without refining, for pouring of castings. Melting of revert creates a new master heat.

3.2.2 Portions of two or more qualified master heats (see 3.4.2) may be melted together and poured into castings using a procedure authorized by purchaser (see 2.3).

3.2.3 If modifications such as alloy additions or replenishments (see 2.3) are made by the producer at remelt, producer shall have a written procedure acceptable to purchaser which defines the controls, tests, and traceability criteria for both castings and separately cast specimens. Control factors of 4.4.2.2 shall apply.

3.3 Condition

Castings shall be delivered in the as cast condition.

3.4 Test Specimens

Specimens shall conform to 3.2.

3.4.1 Each master heat shall be qualified by evaluation of chemical specimens.

3.4.1.1 If alloy additions or replenishments are made at remelt as in 3.2.3, the frequency of sampling and testing used by the producer for qualification to 3.4.2 shall be acceptable to purchaser.

3.4.2 Chemical Analysis Specimens

Shall be of any convenient size and shape.

3.5 Heat Treatment

Not applicable.

3.6 Properties

3.6.1 Hardness of Castings

Shall not be lower than 37 HRC, or equivalent, determined in accordance with ASTM E18. Hardness conversion factors shall be agreed upon between purchaser and producer.

3.7 Quality

3.7.1 Castings, as received by purchaser, shall be uniform in quality and condition, sound and free from foreign materials and from imperfections detrimental to usage of the castings. Castings shall be free of cracks, laps, hot tears, and cold shuts, and free of scale and other process induced surface contamination which would obscure defects.

3.7.2 Castings shall be produced under radiographic control. This control shall consist of radiographic examination of each casting part number until foundry manufacturing controls in accordance with 4.4.2 have been established. Additional radiography shall be conducted in accordance with the frequency of inspection specified by purchaser, or as necessary to ensure continued maintenance of internal quality.

3.7.2.1 Radiographic inspection shall be conducted in accordance with ASTM E1742/E1742M or another method specified by purchaser.

3.7.3 When specified, additional nondestructive testing shall be performed as follows:

3.7.3.1 Fluorescent penetrant inspection in accordance with ASTM E1417/E1417M or another method specified by purchaser.

3.7.4 Acceptance standards for radiographic, fluorescent penetrant, visual, and other inspection methods shall be agreed upon by purchaser and producer (see 2.3). AMS2175 may be used to specify acceptance standards (casting grade) and frequency of inspection (casting class).

3.7.4.1 When acceptance standards are not specified, Grade C of AMS2175 shall apply for each applicable method of inspection. Radiographic indications of gas holes, sand spots, and inclusions shall be cause for rejection when closer to the edge than twice their maximum dimension.

3.7.5 Castings shall not be peened, plugged, impregnated, or welded unless authorized by purchaser.

3.7.5.1 When authorized by purchaser, welding in accordance with AMS2694 or another welding program acceptable to purchaser may be used.

3.8 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.5.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of castings shall supply all samples for producer's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the castings conform to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), hardness of castings (3.6.1), and the applicable requirements of quality (3.7) are acceptance tests and shall be performed as specified in 4.3.

4.2.2 Periodic Tests

Radiographic soundness (3.7.2) is a periodic test and shall be performed as in 3.7.2.

4.2.3 Preproduction Tests

All technical requirements are preproduction tests and shall be performed on specimens or sample castings (4.3.2), when a change in control factors occurs (4.4.2.2), or when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing

The minimum testing performed by producer shall be in accordance with the following:

- 4.3.1 One chemical analysis specimen or a casting from each master heat shall be tested for conformance with Table 1; if 3.4.2.1 applies, test frequency shall be acceptable to purchaser.
- 4.3.2 One preproduction casting in accordance with 4.4 shall be tested to the requirements of the casting drawing and to all applicable technical requirements.
 - 4.3.2.1 Dimensional inspection sample quantity shall be as specified by purchaser.
- 4.3.3 Castings shall be inspected in accordance with 3.7 to the methods, frequency, and acceptance standards specified by purchaser.
- 4.3.4 Castings for delivery shall be tested for hardness to determine conformance to 3.6.1. Unless otherwise specified by purchaser, the number of castings from each lot shall be in accordance with Table 2.

Table 2 - Hardness test schedule

Lot Size	Sample Size
1 to 8	All
9 to 50	8
51 to 90	13
91 to 150	20
151 to 280	32
281 to 500	50
501 to 1200	80
1201 to 3200	125
3201 and over	200

- 4.3.4.1 If a single casting from the inspection lot fails to meet the specified requirement, the entire lot shall be 100% inspected.

4.4 Approval

- 4.4.1 Sample casting(s) from new or reworked master patterns produced under the casting procedure of 4.4.2 shall be approved by purchaser before castings for production use are supplied, unless such approval be waived by purchaser.
- 4.4.2 For each casting part number, producer shall establish parameters for process control factors that will consistently produce castings and test specimens meeting the requirements of the casting drawing and this specification, if required the parameters shall be approved by the purchaser (see 8.5). These parameters shall constitute the approved casting procedure and shall be used for production of subsequent castings and test specimens. If necessary to make any change to these parameters, producer shall submit a statement of the proposed change. Reapproval of the change is required when specified by the purchaser (see 8.5). When requested, producer shall also submit test specimens, sample castings, or both to purchaser for reapproval.

- 4.4.2.1 Production castings produced prior to receipt of purchaser's approval shall be at producer's risk.