AEROSPACE MATERIAL SPECIFICATION

AMS2372	REV. G

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Superseding AMS2372F

Quality Assurance Sampling and Testing Carbon and Low-Alloy Steel Forgings

RATIONALE

AMS2372G results from an update of this specification to include testing of other properties that may be required but were not listed in this document (3.3.3.5).

1. SCOPE

This specification covers quality assurance sampling and testing procedures used to determine conformance to applicable specification requirements of carbon and low-alloy steel forgings.

1.1 Quality assurance sampling and testing procedures for forging stock are covered by AMS2370.

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 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2808 Identification, Forgings

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 A 370 Mechanical Testing of Steel Products

ASTM E 8 / E 8M Tension Testing of Metallic Materials

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
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http://www.sae.org/technical/standards/AMS2372G

3. TECHNICAL REQUIREMENTS

3.1 General Requirements

3.1.1 Omission from this specification of confirmatory tests of certain material properties or attributes controlled by the applicable material specifications does not relieve the vendor of responsibility for furnishing forgings that conform in all aspects to the applicable material specification.

3.1.2 In the event of a conflict between requirements specified herein and requirements of a particular material specification, requirements of the material specification shall take precedence.

3.2 Responsibility for Tests

The vendor of forgings shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by the applicable material specification.

3.3 Detail Requirements

3.3.1 Classification

For the purpose of clarifying test requirements, forgings shall be classified as shown in Table 1.

TABLE 1 - CLASSIFICATIONS OF FORGINGS

Class	Description
I	Forgings supplied in the final heat treated condition and requiring destructive testing for verification of specified mechanical properties.
II	Forgings supplied normalized, normalized and tempered, normalized and annealed, or annealed only, that require testing to ensure conformance to specified mechanical properties after subsequent heat treatment.
III	Forgings supplied hardened and tempered to only a specified hardness.
IV	Forgings supplied normalized, normalized and tempered, normalized and annealed, or annealed only, e.g., carburizing grades, not subject to testing for specified mechanical properties, other than hardness, after final heat treatment.

3.3.2 Lot

A lot shall be all forgings of a similar configuration, opposite hand being considered as a single configuration, identifiable to a single heat of steel, forged under the same nominal forging process parameters, and processed by either of the following methods (See 3.3.2.2 and 3.3.2.3):

3.3.2.1 A heat shall be all steel melted in a single furnace charge. For consumable electrode remelted steel, a heat shall be all consumable electrode remelted ingots processed from steel originally melted as a single furnace charge.

3.3.2.2 Sequentially heat treated during a 24-hour period in a continuous furnace with no interruptions in operations and no change in furnace temperature, charge rate, or racking pattern.

3.3.2.3 Sequentially heat treated during a 48-hour period in one or a series of batch-type furnace loads provided the loads are processed in the same furnace or same series of furnaces and there is no change in power, set temperature, soak time, quench parameters, or racking pattern.

3.3.3 Sampling and Testing

Shall be as follows:

3.3.3.1 Class I Forgings

Shall be sectioned and tested for conformance on the basis of at least one forging from each lot for any specified properties other than hardness. If hardness is specified, production forgings shall be sampled for hardness as shown in Table 2.

3.3.3.1.1 Once a valid hardness/tensile property relationship has been established for a given forging and heat treat cycle, the frequency of destructive testing may be reduced, when permitted by purchaser, and hardness used as the conformance criterion.

TABLE 2 - HARDNESS SAMPLING PLAN FOR CLASS I OR CLASS III FORGINGS

Lot Quantity	Sample Size
1 to 44	100%
45 to 65	44
66 to 110	60
111 to 180	67
181 to 300	73
301 to 500	78
501 to 800	80
801 and over	10% or 85 pieces, min

TABLE 3 - HARDNESS SAMPLING PLAN FOR CLASS II OR CLASS IV FORGINGS

Lot Quantity	Sample Size
1 to 20	100%
21 to 100	25% or 20 pieces, min
101 and Over	10% or 25 pieces, min

3.3.3.1.2 Each furnace load or container of forgings shall be included in the selection of samples.

3.3.3.1.3 All samples tested shall conform to the specified hardness or all forgings shall be tested. If all forgings are checked, the vendor may reheat treat nonconforming forgings, submit the nonconformance to purchaser for disposition, or reject the nonconforming forgings.

3.3.3.2 Class II Forgings

Samples shall be taken from each lot, heat treated as specified, sectioned, and tested to demonstrate conformance to specified requirements. In the case of ultra-high-strength alloy steel forgings, specimen blanks may be cut from the proper locations and heat treated in accordance with specification requirements. In addition, if hardness is specified, production forgings shall be sampled for hardness as shown in Table 3.

3.3.3.3 Class III Forgings

Shall be sampled for hardness in accordance with Table 2.

3.3.3.4 Class IV Forgings

If hardness is specified, shall be sampled as shown in Table 3.

3.3.3.5 Forgings shall be sampled and tested for conformance on the basis of at least one forging from each lot for any specified properties other than hardness.

3.3.3.5.1 Tests for properties that are characteristic of the heat, such as composition, hardenability, cleanliness, etc., need not be repeated on forgings from a heat provided that these tests have been performed on the forging stock from that heat and that heat identity of the forgings is maintained.

3.3.4 Testing

Shall be as follows:

3.3.4.1 Test Methods

Shall be in accordance with requirements of the applicable material specification. If a test method is not specified, the method of test shall be acceptable to purchaser.

3.3.4.1.1 Tensile Properties

When tensile testing of a forging is specified, location of the specimens within the part shall be as shown on the drawing or sketch or in the material specification.

3.3.4.1.1.1 Orientation

Longitudinal specimens shall be taken with the axis of specimen within 15 degrees of parallel to the forging flow lines. Transverse specimens shall be taken with the axis of specimen within 15 degrees of perpendicular to the forging flow lines.

3.3.4.1.1.2 Size

Specimens shall conform to ASTM A 370 or ASTM E 8 / E 8M and shall be either 0.500 inch (12.70 mm) diameter at the reduced parallel gage section, 0.250 inch (6.35 mm) diameter at the reduced parallel gage section, standard rectangular specimens, or subsize specimens proportional to the standard when the configuration of the forgings does not permit the use of standard size specimens.

3.3.4.1.2 Grain Flow

When grain flow is specified, a preproduction forging shall be sectioned and macroetched to reveal the grain flow pattern. The pattern shall be in essential agreement with flow lines sketched on the drawing; if such lines are not shown on the drawing, the grain flow, in areas other than those affected by flash-line end grain, shall follow the general contour of the forging and shall not exhibit reentrant folds.

3.3.4.1.3 Decarburization

When depth of decarburization is specified, the location of specimens, frequency of testing, and method of testing shall be selected by the vendor, unless otherwise specified by purchaser, part drawing, or the material specification.

3.3.4.1.4 Nondestructive Testing

When specified, shall be performed to ensure freedom from harmful imperfections. Test methods, frequency of testing and acceptance criteria shall be as specified by purchaser, part drawing, or the material specification.

3.3.4.1.5 Dimensions

Forgings shall be inspected as required to ensure conformance to dimensions shown on the applicable drawing.

3.3.4.1.6 Marking

Each forging shall be examined to determine that all markings are legible and conform to AMS2808 or to purchaser's requirements.