



AEROSPACE MATERIAL SPECIFICATION	AMS3045™	REV. G
	Issued 1974-03 Reaffirmed 2014-08 Revised 2024-01	
Superseding AMS3045F		
Magnetic Particles, Fluorescent Wet Method, Oil Vehicle, Ready-to-Use		

RATIONALE

AMS3045G is the result of a Five-Year Review and update of the specification. The revision adds definitions (see 2.3), adds material strength ranges per standard heat treatments (see 3.3.3.2.1 and 3.3.3.2.2), and establishes SI units as primary (see 8.2 and throughout).

SCOPE

1.1 Form

This specification covers fluorescent magnetic particles in the form of a mixed, ready-to-use suspension in an odorless inspection oil vehicle.

1.2 Application

These particles are typically used as the inspection medium in a wet method, magnetic inspection system as defined in ASTM E1444/E1444M, but usage is not limited to such application.

1.3 Safety - Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

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.

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2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: (877) 606-7323 (inside USA and Canada) or +1 (724) 776-4970 (outside USA), www.sae.org.

AMS2641	Vehicle, Magnetic Particle Inspection, Petroleum Base
AMS3044	Magnetic Particles, Fluorescent, Wet Method, Dry Powder
AMS6350	Steel Sheet, Strip, and Plate, 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
AMS6359	Steel, Sheet, Strip, and Plate, 0.80Cr - 1.8Ni - 0.25Mo (0.38 - 0.43C) (SAE 4340)
AS5282	Tool Steel Ring for Magnetic Particle Inspection
AS5371	Reference Standards, Notched Shims for Magnetic Particle Inspection
AS7766	Terms Used in Aerospace Metal 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 E709	Guide for Magnetic Particle Testing
ASTM E1316	Terminology for Nondestructive Examinations
ASTM E1444/E1444M	Magnetic Particle Examination

2.3 Definitions

Terms used in AMS are defined in AS7766. Refer to ASTM E1316 for terms related to nondestructive inspection.

3. TECHNICAL REQUIREMENTS

3.1 Material

The product shall be composed of durable fluorescent magnetic particles, suitable for long time use, which have been dyed or otherwise treated to attain the fluorescent color specified. The particles shall be supplied ready-to-use, mixed in the proper proportion with an inspection vehicle.

3.1.1 Fluorescent particles shall conform to AMS3044.

3.1.2 Magnetic particle inspection vehicle shall conform to AMS2641.

3.2 Storage Life

The product shall meet the requirements of 3.3 when tested at any time up to 12 months from date of manufacture.

3.3 Properties

The product shall conform to the following requirements; tests shall be performed, on the product supplied, in accordance with specified test methods:

3.3.1 Contamination

The product shall show no evidence of foreign matter, agglomeration, or scum, determined by visual examination of the suspension at the following times:

3.3.1.1 During preparation of the test suspension as in 4.3.3.

3.3.1.2 After mixing the test suspension, allowing it to stand for not less than 30 minutes, and agitating it slightly.

3.3.1.3 During tests to determine conformance with other characteristics of the product.

3.3.2 Concentration

The concentration of magnetic particles in the vehicle shall be 0.10 to 0.40 mL (0.034 to 0.135 ounce) of fluorescent particles in 100 mL (3.4 ounce) of suspension, determined by mixing the test suspension thoroughly, filling a 100-mL (3.4-ounce) graduated, calibrated, pear-shaped centrifuge tube as specified in ASTM E709, allowing it to stand undisturbed for not less than 30 minutes, and reading, on the calibrated tube, the volume of particles settled from the suspension.

3.3.3 Sensitivity

The product shall provide indications of at least the first seven holes of the test ring specimen of 4.3.4 when tested as follows:

3.3.3.1 Place the ring on a 25-mm (1-inch) diameter copper bar and circularly magnetize the ring in a standard magnetic particle inspection unit by passing 2500 A of direct current through the copper bar immediately before flooding the ring with the agitated test suspension that has passed the contamination (see 3.3.1) and concentration (see 3.3.2) tests. Examine the ring in a darkened environment under ultraviolet light with a minimum UV-A intensity of 1000 $\mu\text{W}/\text{cm}^2$ (6452 $\mu\text{W}/\text{in}^2$) at the inspection surface. Visible light shall not exceed 21.5 lx (2 foot-candles) at the inspection surface. UV-A sources shall meet the requirements of ASTM E1444/E1444M.

3.3.3.2 Flaw-to-Background Test

A flaw-to-background test shall be performed and the results documented using either of the test specimens described in 3.3.3.2.1 or 3.3.3.2.2.

3.3.3.2.1 Fatigue Crack Specimen

Prepare a test specimen meeting the requirements of Figure 1. The test specimen consists of SAE 4130 (refer to AMS6350) or SAE 4340 (refer to AMS6359) steel heat treated to 1240 to 1380 MPa (180 to 200 ksi) with a surface finish 0.4 μm (16 μin) or better. The specimen contains a single fatigue crack (2.54 to 6.35 mm [0.100 to 0.250 inch] surface length) grown using three-point bending. Magnetize and flush the specimen using a sample of agitated test suspension that has that has passed the contamination (see 3.3.1) and concentration (see 3.3.2) tests. Using the wet-continuous method, longitudinally magnetize the specimen in an alternating current (AC) field to achieve 30×10^{-4} to 60×10^{-4} Tesla (30 to 60 gauss) tangential field measured in accordance with ASTM E709. View the crack indication in a darkened area under UV-A as defined in 3.3.3.1. Indication shall be sharp and distinct. Background fluorescence around the indication shall be of a level which will neither obscure the indication nor cause difficulty in flaw detection. See Figure 2 for an example indication.

3.3.3.2.2 Shim Specimen

Prepare a test specimen meeting the requirements of Figure 3. The shim test specimen consists of SAE 4130 (refer to AMS6350) or SAE 4340 (refer to AMS6359) steel heat treated to 1240 to 1380 MPa (180 to 200 ksi) with surface finish 0.4 μm (16 μin) or better. A quantitative quality indicator (QQI) type 3C2-234 shim conforming to AS5371 is epoxied to the center of the specimen with notches facing down. Magnetize and flush the specimen using a sample of agitated test suspension that has passed the contamination (see 3.3.1) and concentration (see 3.3.2) tests. Using the wet-continuous method, longitudinally magnetize the specimen in an alternating current (AC) field to achieve 30×10^{-4} to 60×10^{-4} Tesla (30 to 60 gauss) tangential field measured in accordance with ASTM E709. View the flaw indications in a darkened area under UV-A as defined in 3.3.3.1. All three ring Indications shall be sharp and distinct. Background fluorescence around the flaws shall be of a level which will neither obscure the flaw indications nor cause difficulty in flaw detection. See Figure 4 for an example indication.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

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

4.2 Classification of Tests

4.2.1 Acceptance Tests

All technical requirements, except storage life (see 3.2) and flaw-to-background test (see 3.3.3.2) are acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests

All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when a purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 Acceptance Tests

Sufficient product shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 Lot

A lot shall be all product produced in a single production run from the same batches of raw materials under the same fixed conditions and presented for the producer's inspection at one time.

4.3.1.2 A statistical sampling plan, acceptable to the purchaser, may be used in lieu of sampling as in 4.3.1.

4.3.2 For Preproduction Tests

As agreed upon by the purchaser and producer.

4.3.3 Sample Preparation

The product to be sampled shall be mixed thoroughly for not less than 30 minutes and a sample of at least 3.8 L (1 gallon) of suspension drawn off while being stirred.

4.3.4 Tool Steel Test Ring

Shall be in accordance with AS5282.

4.4 Approval

4.4.1 Sample product shall be approved by the purchaser before product for production use is supplied, unless such approval be waived by the purchaser. Results of tests on production product shall be equivalent to those on the approved sample.

4.4.2 The producer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product that are the same as those used on the approved sample. If necessary to make any changes in ingredients, processing techniques, or manufacturing procedures, the producer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample product. Production product shall not be shipped prior to receipt of reapproval.

4.5 Reports

The producer of the product shall furnish with each shipment a report stating that the product conforms to all technical requirements. This report shall include the purchase order number, lot number, AMS3045G, the producer's material designation, lot number, and date of manufacture.

4.6 Resampling and Retesting

If any sample used in the above tests fails to meet specified requirements, disposition of the product may be based on the results of testing three additional samples for each original nonconforming sample. Failure of any retest sample to meet specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY

5.1 Packaging and Identification

5.1.1 The product shall be packaged in containers of a type and size acceptable to the purchaser.

5.1.2 A lot of magnetic particles may be packaged in small quantities and delivered under the basic lot approval provided lot identification is maintained.

5.1.3 Each container shall be identified with a durable label, that is legible on receipt, with not less than the following information:

MAGNETIC PARTICLES, FLUORESCENT, WET METHOD, OIL VEHICLE, READY-TO-USE

AMS3045G

PRODUCER'S IDENTIFICATION _____

DATE OF MANUFACTURE* _____

LOT NUMBER _____

QUANTITY _____

PRODUCER'S INSTRUCTIONS FOR USE** _____

APPROPRIATE WARNINGS OR PRECAUTIONARY NOTICES _____

* May be included in the producer's identification or lot number.

** May be on a separate sheet.

5.1.4 Individual packages or containers shall be packed in an exterior shipping container capable of protecting the product, during shipment and storage, against damage from exposure to moisture, weather, or any other normal hazard.