SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3044E

Issued MAR 1974
Revised FEB 2002

Superseding AMS 3044D

Magnetic Particles, Fluorescent Wet Method, Dry Powder

1. SCOPE:

1.1 Form:

This specification covers fluorescent magnetic particles in the form of a dry powder.

1.2 Application:

These particles have been used typically as the inspection medium in wet, fluorescent magnetic particle inspection system as defined in ASTM E 1444 using either an oil or conditioned-water vehicle, 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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2641 Vehicle, Magnetic Particle Inspection, Petroleum Base

AS5282 Tool Steel Ring for Magnetic Particle Inspection

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM D 1966 Test Method for Foots in Raw Linseed Oil
ASTM E 11 Wire-Cloth Sieves for Testing Purposes
ASTM E 1444 Magnetic Particle Examination

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The product shall be composed of durable fluorescent magnetic particles, suitable for long time use, which have been treated to obtain the fluorescent color specified. This dry powder shall be formulated for use with an aqueous vehicle containing appropriate conditioning agents, a magnetic particle vehicle conforming to AMS 2641, or equivalent odorless oil, and shall disperse evenly and thoroughly in the recommended vehicle.

3.2 Properties:

The product shall conform to the following requirements; tests shall be performed, on the product supplied, in accordance with specified test methods using a test suspension prepared as in 4.3.3.

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

3.2.1.1 During preparation of the test suspension as in 4.3.3.

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

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

3.2.2 Color: The color of the magnetic particles shall be fluorescent in the yellow-green range, unless another color is specified by purchaser. The color shall be determined by observing the indications formed, during the sensitivity test of 3.2.6, in a darkened area where the white light does not exceed 2 foot-candles (20 lx). A mercury-arc ultraviolet (black) light shall be used at a measured intensity of not less than 1,000 µW/cm^2 and a wave length of 320 to 400 nm filtered to peak at 365 nm to activate the fluorescent magnetic particles.

3.2.3 Particle Size: The fluorescent magnetic particles shall be of such size that not less than 98% by weight shall pass through a 3-inch (76-mm) diameter U.S. Standard No. 325 (45 µm) sieve, as defined in ASTM E 11, determined by passing a 1 quart (1 L) sample of thoroughly-mixed test suspension, as in 4.3.3, through the screen/sieve. After the test suspension liquid vehicle has completely passed through the sieve, rinse with 1 quart (1 L) of the original liquid vehicle. Dry the sieve to remove all of the liquid and determine the dry weight of the residual particulate material not passing through the screen/sieve as related to the original weight of the particulate material in the sample, expressed in percentage.

3.2.4 Durability: Fluorescent magnetic particles shall retain their initial sensitivity, color, and brightness of indication after placing not less than 400 mL of thoroughly-mixed test suspension, prepared as in 4.3.3, in a 1 quart (1 L) capacity constant speed blender, operating the blender at approximately 10,000 to 12,000 rpm for a total of 10 minutes, in 2 minute intervals, allowing the suspension to cool for 5 minutes between stirring cycles, and, at the end of the cumulative 10 minute blending, conduct the sensitivity test of 3.2.5.

3.2.5 Sensitivity:

3.2.5.1 Ring Test: The product shall show a seven-hole indication on the ring test specimen defined in 4.3.4, determined by placing the ring on a 1-inch (25-mm) diameter copper bar and circularly magnetizing the ring in a standard magnetic particle inspection unit by passing 2500 amperes of direct current through the copper bar immediately before flooding the ring with agitated test suspension that has passed the contamination (3.2.1) and concentration (4.3.3) tests. Examine the ring in a darkened area under blacklight as defined in 3.2.2. The test shall be repeated using a sample of test suspension that has been subjected to the durability test of 3.2.4.

3.2.5.2 Flaw-to-Background Test: Obtain a test part, or prepare a test specimen, containing flaws of the size expected to be found in production inspection. The surface finish of the test specimen shall be representative of production parts. Magnetize and flood the test specimen as specified in 3.2.5.1, using a sample of agitated test suspension that has passed the contamination (3.2.1) and concentration (4.3.3) tests. View the flaw indications in a darkened area under blacklight as defined in 3.2.2. 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. The test shall be repeated using a sample of test suspension that has been subjected to the durability test of 3.2.4.

3.2.6 Long-Term Durability: Fluorescent magnetic particles shall retain their initial sensitivity, color, and brightness of indication after allowing a 1.5 quarts (1.4 L) of freshly-prepared, thoroughly-mixed test suspension, prepared as in 4.3.3, to stand undisturbed at room temperature for not less than 14 days. Following the dwell, the test suspension shall be well dispersed when stirred and shall meet the requirements of 3.2.1 through 3.2.5.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of the product shall supply all samples for manufacturer'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 product conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Contamination (3.2.1), color (3.2.2), particle size (3.2.3), durability (3.2.4), and sensitivity (3.2.5) 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 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 batch of raw materials under the same fixed conditions and presented for manufacturer's inspection at one time.

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

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.3.3 Test Suspension Preparation: The test suspension shall be prepared in accordance with manufacturer's recommendation by adding sufficient dry powder solids to distilled water containing appropriate conditioning agents or AMS 2641 magnetic particle inspection vehicle, usually 0.025 to 0.18 ounce per gallon (0.19 to 1.3 g/L), to produce a suspension concentration of 0.10 to 0.40 mL of magnetic particles in 100 mL of suspension. The concentration shall be verified by mixing the suspension thoroughly, filling a 100 mL calibrated centrifuge tube as specified in ASTM D 1966, allowing the tube to stand undisturbed for at least 30 minutes, and reading, on the calibrated tube, the volume of the particles settled from the suspension.

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

4.4.2 Manufacturer 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, manufacturer 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 vendor 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, AMS 3044E, manufacturer's material designation, 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 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.