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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 3042B

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Superseding AMS 3042A

## MAGNETIC PARTICLES, NONFLUORESCENT
Wet Method, Dry Powder



1. SCOPE:

1.1 Form: This specification covers nonfluorescent magnetic particles in the form of dry powder intended to be suspended in oil or conditioned water vehicle.

1.2 Application: Primarily as the inspection medium in a wet magnetic particle inspection system as defined in AMS 2640 or MIL-STD-1949, using either an oil or a conditioned water vehicle.

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 following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2640 - Magnetic Particle Inspection
AMS 2641 - Vehicle, Magnetic Particle Inspection, Petroleum Base
AMS 2825 - Material Safety Data Sheets

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D96 - Water and Sediment in Crude Oils
ASTM E11 - Wire-Cloth Sieves for Testing Purposes

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of
MIL-STD-1949 - Inspection, Magnetic Particle

3. TECHNICAL REQUIREMENTS:

3.1 Material: The powder shall be composed of durable magnetic particles, Ø suitable for long-time use, which may have been treated to attain the color specified. This dry powder is designed for use with an aqueous vehicle or an odorless inspection oil conforming to AMS 2641, or equivalent, 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 and in accordance with specified test procedures, using a test suspension prepared as in 4.3.1.2.

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 4.3.1.2.

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 the tests to determine other characteristics of the product.

3.2.2 Color: The color of the magnetic particles in suspension shall be black, Ø red, gray, or as specified, determined by observing a well-dispersed sample of the test suspension in a glass container under a white light of not less than 100 foot-candles (1075 $lm/m^2$) at the examining surface.

3.2.3 Particle Size: The 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 $\mu$m) sieve, as defined in ASTM E11, determined by passing a 1-quart (1-L) sample of stirred test suspension through the sieve. After the test suspension liquid carrier has completely passed through the sieve, rinse with 1 quart (1 L) of the original liquid carrier. Dry the sieve to remove all of the liquid and determine the dry weight of the residual particulate material not passing through the sieve as related to the original weight of the particulate material in the sample, expressed in percent.

3.2.4 Sensitivity: The product shall show not less than a five-hole indication Ø of the ring test specimen defined in MIL-STD-1949, determined as follows:

3.2.4.1 Place the ring on a 1-inch (25-mm) diameter copper bar and circularly magnetize in a standard magnetic particle inspection unit by passing 2500 A of direct current through the bar immediately before flushing the ring with the agitated test suspension that has passed the concentration and contamination tests. Examine the ring under a white light of not less than 100 foot-candles (1075 lm/$m^2$) at the examining surface.

3.2.5 Mechanical Durability: Magnetic particles shall retain their initial Ø sensitivity, color, and brightness of indication after placing not less than 400 mL of thoroughly mixed suspension, prepared as in 4.3.1.2, 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 during each period between stirring cycles and, at the end of the cumulative 10 minutes blending, conducting the sensitivity tests (3.2.4).

3.2.6 Chemical Durability: Magnetic particles shall retain their initial color (3.2.2), and sensitivity (3.2.4), after allowing a 1.5 quart (1.42 L) volume of freshly prepared, thoroughly mixed suspension to stand undisturbed at room temperature for not less than 14 days. After standing, the suspension shall be stirred and shall meet the requirements of 3.2.2 and 3.2.4.

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 performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for Ø contamination (3.2.1), color (3.2.2), particle size (3.2.3), sensitivity (3.2.4), and mechanical durability (3.2.5) are classifed as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of a product to a purchaser, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For 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 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 vendor's inspection at one time. A lot may be packaged in smaller quantities and delivered under the basic lot approval provided lot identity is maintained.

4.3.1.2 Test Suspension: The test suspension for determining conformance to the technical requirements of this specification shall be prepared by adding sufficient dry powder solids to distilled water or odorless inspection oil, to produce a suspension concentration of 1.0 ± 2.4 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 D96, demagnetization of particles, allowing the tube to stand undisturbed for at least 60 minutes, and reading on the calibrated tube the volume of the particles settled from the suspension.

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

4.4 Approval:

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

4.4.2 Manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production powder that are the same as those used on the approved sample powder. 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 material, processing, or both and, when requested, sample powder. Production powder made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports: The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements of this specification. This report shall include the purchase order number, AMS 3042B, manufacturer's material designation, lot number, date of manufacture, and quantity.