

MAGNETIC PARTICLES
Wet Method, Oil Vehicle

1. SCOPE:

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

1.2 Application: Primarily as the inspection medium in a wet magnetic particle inspection system as defined in AMS 2640 or MIL-I-6868.

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 3161 - Inspection Oil, Odorless, Heavy Solvent

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 Specifications:

MIL-I-6868 - Inspection Process, Magnetic Particle

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AMS 3041A

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material: The product shall be composed of durable magnetic particles, suitable for long time use, which may have been dyed or otherwise treated to attain the color specified. The particles shall be supplied ready-to-use, mixed in the proper proportion with odorless inspection oil conforming to AMS 3161 or equivalent odorless oil.

3.2 Storage Life: The product shall meet the requirements specified in 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 and in accordance with specified test procedures:

3.3.1 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:

3.3.1.1 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 min., and agitating it slightly.

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

3.3.2 Concentration: The concentration of magnetic particles in the vehicle shall be 1.5 - 2.4 mL of magnetic particles in 100 mL of suspension, determined by mixing the sample thoroughly, filling a 100-mL pear-shaped calibrated centrifuge tube as specified in ASTM D96 and allowing to stand undisturbed for at least 30 min., and reading on the calibrated tube the volume of the particles settled from the suspension.

3.3.3 Color: The color of the magnetic particles shall be black, red, or as ordered, determined by observing a well-dispersed sample of the test suspension in a glass container under a white light of not less than 100 ft-candles (1075 lm/m²) at the examining surface.

3.3.4 Particle Size: The magnetic particles shall be of such size that not less than 98% by weight shall pass through a 3-in. (75-mm) diameter U.S. Standard No. 325 (45 μ m) sieve as defined in ASTM E11, determined by passing a 1-qt (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 qt (1 L) of the original liquid carrier. Dry the sieve to remove all of the liquid and determine the dry weight of the

3.3.4 (Continued):

residual particulate material not passing through the sieve as related to the original weight of the particulate material in the sample, expressed in percent.

3.3.5 Magnetic Extraction: The magnetic particles shall be attracted and removed from the vehicle with no more than a trace remaining in the bottom of the container, determined as follows:

3.3.5.1 Prepare an electromagnet consisting of an ingot iron core, 0.312 in. \pm 0.031 (7.80 mm \pm 0.80) diameter and 3.00 in. \pm 0.13 (75.0 mm \pm 3.2) long, with a 2-in. (50-mm) long nonmagnetic handle attached to one end, the core being wrapped with 25 turns of No. 12 (2.052 mm diameter) enameled copper conductor, or use an equivalent electromagnet.

3.3.5.2 Place 100 mL of freshly-stirred suspension obtained as in 4.3.3 into a 150 mL glass container (approximately 2 in. (50 mm) in diameter). Lower the magnet, energized with 15 A of direct current, into the suspension and progressively extract the particles by carefully removing the probe from the sample, shutting off the current, and removing the particles from the electromagnet. Repeat the extraction operation until all possible magnetic particles have been removed from the vehicle. Allow the liquid in the container to stand undisturbed for not less than 30 min. and examine the container over a white surface under a white light of not less than 100 ft-candles (1075 lm/m²) at the examining surface.

3.3.6 Sensitivity: The product shall show a five-hole indication of the ring test specimen defined in MIL-I-6868, determined as follows:

3.3.6.1 Place the ring on a 1-in. (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, contamination, and magnetic extraction tests. Examine the ring under a white light of not less than 100 ft-candles (1075 lm/m²) at the examining surface.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product 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 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:

AMS 3041A

- 4.2.1 Acceptance Tests: Tests to determine conformance to all technical requirements of this specification, except storage life (3.2), are classified 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 the product to a purchaser, when a change in material or 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, the contracting officer, or the request for procurement.
- 4.3 Sampling: Shall be as follows; 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 vendor's inspection at one time. A lot may be packaged in smaller quantities and delivered separately under the basic lot approval provided lot identity is maintained.
- 4.3.1 For Acceptance Tests: Sufficient product shall be taken at random from each lot to perform all required tests in triplicate.
- 4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.
- 4.3.3 Sample Preparation: The product to be sampled shall be mixed thoroughly for not less than 30 min. and a sample of at least 1 gal (4 L) of suspension drawn off while being stirred.
- 4.4 Approval:
- 4.4.1 Sample material shall be approved by purchaser before material for production use is supplied, unless such approval be waived by purchaser. Results of tests on production material shall be essentially equivalent to those on the approved sample.
- 4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production material which are essentially the same as those used on the approved sample material. If necessary to make any change in ingredients, in processing techniques, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material or processing, or both, and, when requested, sample material. Production material 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 and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, AMS 3041A, vendor's material designation, lot number, date of manufacture, and quantity.

4.6 Resampling and Retesting: If any sample used in the above tests fails to meet the 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 the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. 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 agreed upon by purchaser and vendor.

5.1.2 Each container shall be identified by attaching a durable label bearing characters of such size as to be legible and which will not be obliterated by normal handling. Each label shall show not less than the following information:

MAGNETIC PARTICLES, WET METHOD, OIL VEHICLE
AMS 3041A
COLOR _____ *
MANUFACTURER'S IDENTIFICATION _____
PURCHASER ORDER NUMBER _____
LOT NUMBER _____
QUANTITY _____
MANUFACTURER'S INSTRUCTION FOR USE _____ **
APPROPRIATE WARNINGS OR PRECAUTIONARY NOTICES _____

* Enter color, "BLACK", "RED", or as ordered.
** May be on separate sheet.