AEROSPACE MATERIAL SPECIFICATION

AMS3046™	REV. J

Issued 1974-03
Reaffirmed 2014-12
Revised 2024-12

Superseding AMS3046H

(R) Magnetic Particles, Fluorescent Wet Method, Oil Vehicle, Aerosol Packaged

RATIONALE

AMS3046J is the result of a Five-Year Review and update of the specification. The revision adopts SI units as the primary measurement method, updates references and definitions throughout, provides strength range consistent with similar specifications (see 3.3.3.2), updates the aerosol leakage requirement (see 3.4.1.1), and removes size requirements for aerosols (see 3.4.2).

1. SCOPE

1.1 Form

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

1.2 Application

This product has been used typically as the inspection medium in a wet, fluorescent magnetic particle inspection system as defined in ASTM E1444/E1444M, but usage is not limited to such applications.

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 that 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.

1.3.1 Material Hazards

The hazard characteristics of each material shall be properly identified, and the manufacturer shall provide a safety data sheet (SDS), which contains all relevant safety information for the product.

1.3.2 Physical Hazards

Aerosol cans may have physical hazards (e.g., gas under pressure, flammability) that should be taken into consideration during storage and use. The user should learn of these hazards and take the necessary precautions.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS3046J/

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 +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 Metals 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 D3094 Seepage Rate of Aerosol Products

ASTM E709 Magnetic Particle Testing

ASTM E1316 Standard Terminology for Nondestructive Testing

ASTM E1444/E1444M Magnetic Particle Testing

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, which have been dyed or otherwise treated to attain the color specified. The particles shall be supplied mixed in the proper proportion with an inspection vehicle and packaged in aerosol cans.

3.1.1 Fluorescent magnetic particles shall conform to AMS3044.

3.1.2 Magnetic particle inspection vehicles 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 using a test suspension prepared by spraying the complete contents of several aerosol cans into a clean container to produce at least 1 L (quart) of suspension and agitating the aerosol cans frequently to exhaust all particulate material:

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:

- During preparation of the test suspension as in 3.3.
- After mixing the test suspension, allowing it to stand for not less than 30 minutes, and agitating it slightly.
- During tests to determine other characteristics of the product.

3.3.2 Concentration

The concentration of fluorescent magnetic particles in the freshly sprayed suspension shall be 0.15 to 0.30 mL of fluorescent magnetic particles in 100 mL of suspension, determined by mixing the test suspension thoroughly, filling a 100-mL graduated, calibrated, pear-shaped centrifuge tube as specified in ASTM E709, allowing it to stand undisturbed for at least 30 minutes, and reading, on the calibrated tube, the volume of the particles settled from the suspension.

3.3.3 Sensitivity

3.3.3.1 Ring Test

The product shall provide indications of at least the first seven holes of the test ring specimen defined by AS5282 when tested as follows:

3.3.3.1.1 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 bar immediately before flushing 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 area under UV-A illumination of at least 1000 μW/cm^2 (6452 μW/in^2) at the inspection surface. Visible light shall not exceed 20 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 (AMS6350) or SAE 4340 (AMS6359) steel heat treated to 1240 to 1380 MPa (180 to 200 ksi) with surface finish 0.4 μm (16 microinches) or better. The specimen contains a single fatigue crack (2.54 to 6.35 mm [0.100 to 0.250 inch] in surface length) grown using 3-point bending. 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 x 10^{-4} to 60 x 10^{-4} T (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 that 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 (AMS6350) or SAE 4340 (AMS6359) steel heat treated to 1240 to 1380 MPa (180 to 200 ksi) with surface finish 0.4 µm (16 microinches) or better. A (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 x 10^{-4} to 60 x 10^{-4} T (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 that will neither obscure the flaw indications nor cause difficulty in flaw detection. See Figure 4 for an example indication.

3.4 Aerosol Spray Cans

The aerosol cans selected for the test shall be maintained at room temperature (21 °C ± 3 °C [70 °F ± 5 °F]) for not less than 12 hours prior to testing.

3.4.1 Sprayability and Leakage

3.4.1.1 All aerosol pressure cans shall be equipped with a spray nozzle. The nozzle shall provide a fine, uniform, steady spray and shall deposit the product evenly on a flat, horizontal, or vertical surface. No chunks of solids shall be expelled, and no clogging of the nozzle shall occur. After clearing the nozzle in accordance with the manufacturer's instructions, there shall be no perceptible leakage.

3.4.1.2 The characteristics of the spray pattern and the performance of the spray nozzle shall be evaluated by vigorously shaking the can for not less than 30 seconds with the contained pellet sounding on each shake and by spraying the surface of black craft paper fastened to a vertical surface. The spray shall be performed in a stationary position at a standoff distance of 15 cm (6 inches) for a duration of 5 to 7 seconds. Examine the spray pattern under UV-A illumination. The spray pattern shall be uniform with no fluorescent dead zone in the center of the pattern. Examples of acceptable and unacceptable spray patterns are shown in Figure 5. After spraying several patterns, the nozzle shall be examined for evidence of chunks or solids and clogging. The can shall then be immersed for not less than 15 minutes in water at 52 to 54 °C (126 to 129 °F). Exposure to heat will increase can pressure and failure or bursting is possible; heating in a protected water bath or burst-proof enclosure is recommended. There shall be no visible evidence of leakage from, or distortion of, the pressurized container. The pressurized can shall then be immersed in water at 21 °C ± 3 °C (70 °F ± 5 °F) until the temperature has stabilized and, after vigorous shaking, two more patterns shall be sprayed. The spray characteristics shall have not changed, and there shall be no chunking of particles or clogging of the nozzle. Performance of the heat exposure test by the aerosol packager fulfills the heat exposure test requirement.

CAUTION: DO NOT HEAT THE PRESSURIZED CAN OVER 54 °C (129 °F).

3.4.2 Complete Expulsion

The complete usable portion of the contents shall have been expelled before the propellant is expended. The expelled contents shall be not less than specified on the container, and the particle content shall conform to the aerosol spray requirements. Vigorously shake for not less than 30 seconds each unused can to be tested, with the contained pellet sounding on each shake, and expel the contents in a series of short blasts into a clean glass container graduated in such a manner that the entire contents of the can will be retained in the glass container. The aerosol can may be immersed periodically in water at 21 °C ± 3 °C (70 °F ± 5 °F) to maintain the can and its contents at room temperature. Repeat the vigorous shaking and short blasts until there is no further escape of gas.

3.4.3 Gas Seepage

Gas seepage shall be not greater than 3 cm^3 (3 ml) per 24 hours, determined in accordance with ASTM D3094 or equivalent.

3.4.4 Magnetic particles shall be completely mixed with vehicle, and each can shall contain a pellet to aid in agitation or mixing of the product prior to spraying. The aerosol cans shall be of suitable size for hand application of the product or as otherwise ordered.

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 the product conforms to the specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

All technical requirements of this specification, 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 of this specification are preproduction tests and shall be performed prior to or on the initial shipment of product to a purchaser, when a change in material 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

Sampling and testing 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 batches of raw materials under the same fixed conditions and presented for the producer's inspection at one time. A lot may be packaged in smaller quantities and delivered under the basic lot approval provided lot identification is maintained.

4.3.2 For Preproduction Tests

Preproduction tests shall be as agreed upon by the purchaser and the producer.

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 essentially 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 essentially the same as those used on the approved sample product. 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 showing the results of tests to determine conformance to the acceptance test requirements and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, AMS3046J, producer'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. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY

5.1 Packaging and Identification

5.1.1 The magnetic particles shall be packaged in aerosol cans conforming to the requirements of 3.4 and the following:

5.1.2 Labeling

Containers shall be labeled to show compliance with the Federal Fair Packaging and Labeling Act, Federal Hazardous Substances Act, and state weights and measures laws, as applicable, in addition to markings required by 5.1.3.

5.1.3 Each aerosol can shall be identified with not less than the following information on a durable label bearing characters of such size as to be legible and that will not be obliterated by normal handling:

MAGNETIC PARTICLE, FLUORESCENT, WET METHOD, OIL VEHICLE, AEROSOL PACKAGED
AMS3046J
MANUFACTURER'S IDENTIFICATION_____
DATE OF MANUFACTURE*_____
LOT NUMBER**_____
QUANTITY_____
MANUFACTURER'S INSTRUCTIONS FOR USE***_____
APPROPRIATE WARNINGS OR PRECAUTIONARY NOTICES_____

* May be included in the manufacturer's identification or lot number.
** May be stamped on the can.
*** May be on a separate sheet.

5.1.4 The aerosol cans shall be packaged in an exterior shipping container capable of protecting the product, during shipment and storage, against damage from exposure to weather or any other normal hazard.

5.1.5 Containers of the product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A producer shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Product not conforming to this specification, or to modifications authorized by the purchaser, will be subject to rejection.

8. NOTES

8.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

8.2 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.3 Unless otherwise specified, the material producer shall work to the revision of this specification (AMS3046) in effect on the date of order placement. Unless otherwise specified, material manufactured and certified to the immediately previous revision of this specification (AMS3046) may be procured and used until inventory is depleted.

8.4 Purchase orders should specify not less than the following:

AMS3046J
Size of aerosol containers desired (see 5.1.1)
Quantity of product desired

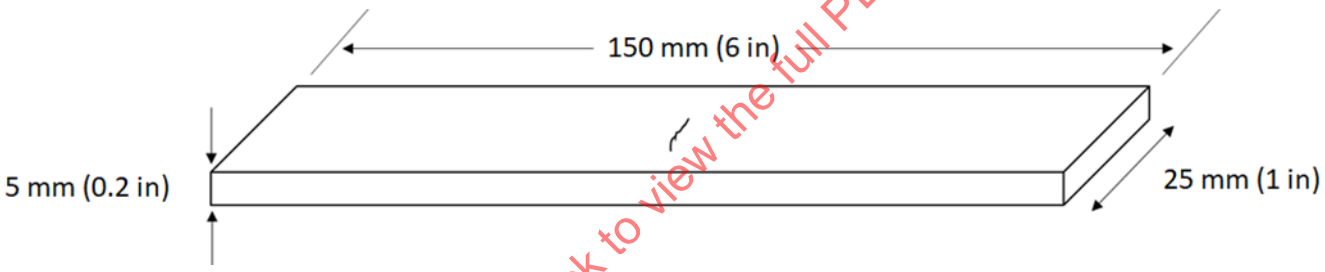

Figure 1 - Fatigue crack specimen for the flaw-to-background test

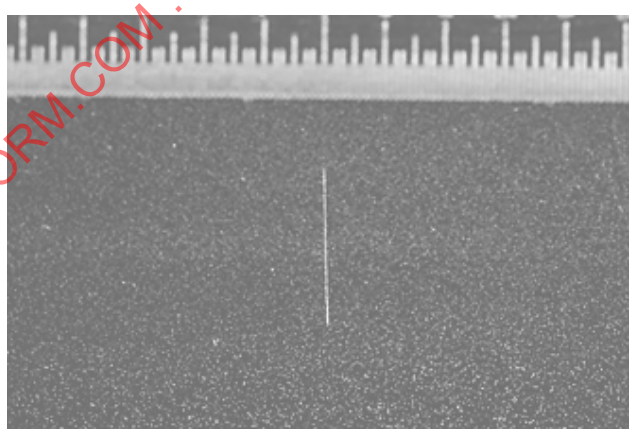

Figure 2 - Example indication from a fatigue crack specimen. The indication is crisp and clearly discernible. Background fluorescence is low. Scale: major divisions: 2.5 mm (0.1 inch).