AEROSPACE MATERIAL SPECIFICATION

AMS3158™	REV. E

Issued 1964-06
Reaffirmed 2014-12
Revised 2023-06

Superseding AMS3158D

Solution, Fluorescent Penetrant Water Base for LOX (Liquid Oxygen) Compatibility

RATIONALE

AMS3158E is the result of a Five-Year Review and update of the specification. The revision addresses classification (see 3.2) and updates approval (see 4.4.1).

1. SCOPE

1.1 Form

This specification covers a stable, noncorrosive, water-soluble, highly-penetrating, fluorescent solution which may, but need not, be diluted with an appropriate amount of water for use.

1.2 Application

This product has been used typically for use in fluorescent penetrant inspection of parts and assemblies for detection of surface discontinuities and imperfections, particularly on parts such as those in oxygen systems, which must not be exposed to oils, but usage is not limited to such applications.

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.

AMS2644 Inspection Material, Penetrant

AMS4045 Aluminum Alloy Sheet and Plate, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, 7075: (-T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated

AMS4377 Magnesium Alloy, Sheet and Plate, 3.0Al - 1.0Zn – 0.20Mn (AZ31B-H24), Cold Rolled, Partially Annealed

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For more information on this standard, visit
https://www.sae.org/standards/content/AMS3158E

AMS6350 Steel Sheet, Strip, and Plate, 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)

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 D130 Corrosiveness to Copper from Petroleum Products by Copper Strip Test

ASTM D445 Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)

ASTM D1298 Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

ASTM D2512 Compatibility of Materials with Liquid Oxygen (Impact Sensitivity Threshold and Pass-Fail Techniques)

ASTM D3828 Flash Point by Small Scale Closed Cup Tester

ASTM E1135 Comparing the Brightness of Fluorescent Penetrants

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Material

The product shall be composed of suitable vehicles (including water), dyes, and additives necessary to provide a product having the properties specified in 3.2.

3.2 Properties

The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with the specified test method. A penetrant's classification is not addressed in this specification. AMS2644 defines penetrant classifications including sensitivity and should be specified when a particular sensitivity level is required.

3.2.1 Flash Point

Shall be a minimum of 200 °F (93 °C), determined in accordance with ASTM D3828 Method A Flash/No Flash Test.

3.2.2 Color

Shall be predominantly green or yellow when examined by reflected white light, yellow by transmitted white light, and yellowish-green under black light.

3.2.3 Toxicity

The product shall contain no materials of known toxicity. The vapor shall not cause discomfort or injury to persons using the product.

3.2.4 Water Solubility

The product shall be completely soluble in water in all proportions and, when diluted with water, shall form a clear, yellow solution with no visible cloudiness. No scum or separate layer shall form on the surface or on the bottom.

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3.2.5 Specific Gravity

Shall be within ±5% of the qualification value established as in 4.4.1, determined in accordance with ASTM D1298.

3.2.6 Kinematic Viscosity

Shall be within ±10% of the qualification value established as in 4.4.1, determined in accordance with ASTM D445 at 100 °F ± 2 °F (38 °C ± 1 °C).

3.2.7 Corrosiveness

Specimens of AMS4045 aluminum alloy, AMS4377 magnesium alloy, and AMS6350 steel shall reveal no evidence of etching, pitting, or corrosion products after being exposed to a sample of the penetrant solution at 122 °F ± 2 °F (50 °C ± 1 °C) in accordance with the test procedures of ASTM D130. Tarnishing shall be no greater than that found by conducting similar tests using tap water.

3.2.8 Impact Sensitivity

The product shall show no adverse reactions to 20 test drops at 72 ft-lb (97.6 J), determined in accordance with ASTM D2512.

3.2.9 Fluorescent Brightness

Shall be not less than 85% of the qualification value established as in 4.4.1, determined in accordance with ASTM E1135. Other test methods may be used when agreed upon by the purchaser and producer.

3.2.10 Storage Stability

The product shall meet the requirements of 3.2.1 through 3.2.9 after being stored in a closed, filled container at 60 to 100 °F (16 to 37 °C) for 1 year from date of receipt by the purchaser.

3.3 Quality

The product, as received by the purchaser, shall be uniform in quality and condition, homogeneous, and free from contaminants and foreign material detrimental to its use or function.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples and shall be responsible for the performance of all required tests, except for impact sensitivity test (see 3.2.8) which may be performed by the purchaser. The purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Flash point (see 3.2.1), specific gravity (see 3.2.5), and viscosity (see 3.2.6) are acceptance tests and shall be performed on each lot.

4.2.2 Qualification Tests

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

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4.3 Sampling

Each lot of fluorescent penetrant solution shall be sampled to provide sufficient material to perform required testing. The number of specimens for each test shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1 A lot shall be all product produced in a single production run from the same batches of raw materials under the same fixed conditions, or all material subjected to the same unit chemical or physical process intended to make the final product homogeneous, and submitted for the producer's inspection at one time.

4.4 Approval

4.4.1 Sample solution shall be approved by the purchaser before solution for production use is supplied, unless such approval be waived. Results of tests on production solution shall be essentially equivalent to those on the approved sample. When approval has been waived, production solutions shall meet all the requirements of this specification (see 3.2.1-3.2.10). When approval of one of the requirements has been waived, production solutions shall meet all of the remaining requirements of this specification (see 3.2.1-3.2.10).

4.4.2 The producer shall use ingredients, manufacturing procedures and processes, and methods of inspection on production solution which are essentially the same as those used on the approved sample solution. If any change is necessary in ingredients, in type of equipment for processing, or in manufacturing procedures, the producer shall submit for reapproval a statement of the proposed changes in material and processing and, when requested, sample solution. Production solution made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports

The producer of the product shall furnish with each shipment a copy of the 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, AMS3158E, the producer's material designation, lot number, date of manufacture, and quantity.

4.6 Resampling and Retesting

If any specimen 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 specimens for each original nonconforming specimen. Failure of any retest specimen 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 Solution shall be packaged in containers of a type and size agreed upon by the purchaser and producer.

5.1.2 Unless otherwise specified by the purchaser, each container shall be identified with a durable label that is legible on receipt with not less than the following information: product designation, batch number (date of manufacture shall be coded in the batch number), quantity, the manufacturer's instructions for use (may be on a separate sheet), appropriate warnings or precautionary notices, and purchase order number (on outside container only).

5.1.3 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. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

6. ACKNOWLEDGMENT

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

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