

METRIC

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5 March 2024
SUPERSEDING
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DETAIL SPECIFICATION

INHIBITOR, ICING, FUEL SYSTEM, HIGH FLASH NATO CODE NUMBER S-1745

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for one type and grade of a high flash, fuel system icing inhibitor soluble in aircraft turbine engine fuel. This inhibitor is composed of diethylene glycol monomethyl ether and is commonly referred to as DiEGME.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to Commanding Officer, Naval Air Warfare Center Aircraft Division Lakehurst, System Standardization and PHS&T Branch, Code BL32600, Mail Stop B120-3, Route 547, Joint Base MDL, NJ 08733-5100 or emailed to lke-navairdoccom.fct@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

ASTM INTERNATIONAL

ASTM D56	-	Standard Test Method for Flash Point by Tag Closed Cup Tester
ASTM D93	-	Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
ASTM D891	-	Standard Test Methods for Specific Gravity, Apparent, of Liquid Industrial Chemicals
ASTM D1078	-	Standard Test Method for Distillation Range of Volatile Organic Liquids
ASTM D1364	-	Standard Test Method for Water in Volatile Solvents (Karl Fischer Reagent Titration Method)
ASTM D1613	-	Standard Test Method for Acidity in Volatile Solvents and Chemical Intermediates Used in Paint, Varnish, Lacquer, and Related Products
ASTM D4052	-	Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter
ASTM D4171	-	Standard Specification for Fuel System Icing Inhibitors
ASTM D5386	-	Standard Test Method for Color of Liquids Using Tristimulus Colorimetry
ASTM D6304	-	Standard Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration
ASTM D8005	-	Standard Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)
ASTM E29	-	Standard Practice for Using Significant Digits to Test Data to Determine Conformance with Specifications
ASTM E70	-	Standard Test Method for pH of Aqueous Solutions with the Glass Electrode
ASTM E203	-	Standard Test Method for Water Using Volumetric Karl Fischer Titration
ASTM E300	-	Standard Practice for Sampling Industrial Chemicals
ASTM E1064	-	Standard Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration

(Copies of these documents are available online at <https://www.astm.org>.)

ENERGY INSTITUTE (EI)

IP 170	-	Determination of flash point – Abel Closed-Cup Method
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(Copies of this document are available online at <https://publishing.energyinst.org>.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Materials. The inhibitor shall be composed entirely of diethylene glycol monomethyl ether, except that an antioxidant specified in 3.2 shall be added at a concentration from 50 to 150 mg/kg (50 to 150 parts per million by mass). The antioxidant shall be added immediately after processing and before the inhibitor is exposed to the atmosphere. The inhibitor shall conform to the requirements of table I, when tested in accordance with section 4.

3.2 Antioxidants. The antioxidant added to the inhibitor shall be one of the following:

- a. 2,6-ditertiary butyl, 4-methylphenol
- b. 2,4-dimethyl, 6-tertiary butylphenol
- c. 2,6-ditertiary butylphenol
- d. Mixed tertiary butylphenol composition:
75 percent, minimum, 2,6-ditertiary butylphenol
25 percent, maximum, tertiary and tritertiary butylphenols

3.3 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.4 Workmanship. The inhibitor shall be uniform in quality, clear and bright, and free from suspended and foreign matter and water (see 4.5.1).

3.5 Precautionary markings. The following precautionary marking shall be included on containers of this product:

**"TO BE USED ONLY AS AN ANTI-ICING ADDITIVE
FOR AIRCRAFT TURBINE ENGINE FUELS"**

TABLE I. Properties of the inhibitor and test methods.

<u>Property</u>	<u>Limit</u>	<u>Test Method</u>
Workmanship	Pass	Section 3.3
Acid number, mg KOH per gram (maximum)	0.09	ASTM D1613
Color, platinum cobalt (maximum)	10	ASTM D5386, or ^{1/} ASTM D8005
Distillation: Initial point, °C Dry Point, °C	Report Report	ASTM D1078
Purity, mass % (minimum)	99.0	ASTM D4171 Annex A1
Ethylene glycol, mass % (maximum)	0.5	^{2/}
pH of 25 percent solution in water (25 °C ± 2 °C)	5.5 to 7.5	^{3/} ASTM E70
Relative density (20/20 °C)	1.021 to 1.025	^{1/, 4/} ASTM D891 or ASTM D4052
Water, mass % (maximum)	0.1	^{1/} ASTM D6304, ASTM D1364, ASTM E203, or ASTM E1064
Flash point, °C (°F) (minimum)	85 (185)	^{1/} ASTM D93, ASTM D56, or IP 170

Notes:

^{1/} Referee test method

^{2/} See 4.7.1.1

^{3/} See 4.7.1.2

^{3/} ASTM D891, Test Method A (Hydrometer) or B (Pycnometer). The test method run [Test Method A (Hydrometer) or B (Pycnometer)] shall be reported. Test Method B (Pycnometer) shall be the referee.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as conformance inspection.

4.2 Conformance inspection. The conformance inspection shall consist of all the requirements contained in section 3 and table I.

4.3 Inspection lot. For acceptance purposes, individual lots shall be examined as specified herein and subject to tests for all requirements cited in section 3, section 4, and table I.

4.3.1 Inspection conditions. Requirements contained in table I are absolute, as defined in ASTM E29, and shall not be subject to correction for test tolerances. If multiple determinations are made, results falling within any specified repeatability and reproducibility tolerances may be averaged. For rounding off significant figures, the Rounding Method in ASTM E29 shall apply to all tests required by this specification.

4.4 Sampling.

4.4.1 Sampling of inhibitor. Each bulk lot (see 6.3.1) or packaged lot (see 6.3.2) shall be sampled in accordance with ASTM E300. The samples shall be subjected to the examination of inhibitor specified in 4.5.1 and tested in accordance with 4.7.

4.4.2 Sampling for inspection of filled containers. A random sample of filled containers shall be selected from each lot. The sample containers shall be subjected to the examination of filled containers as specified in 4.5.2.

4.5 Examinations.

4.5.1 Examination of inhibitor. Samples selected in accordance with 4.4.1 shall be visually examined for compliance with 3.3.

4.5.2 Examination of filled containers. Each container selected shall be examined for defects of the container and closure, for evidence of leakage, for markings specified in 3.4, and all other packaging requirements. Each filled container shall also be weighed to determine the amount of contents. Any container in the sample having one or more defects or under the required fill shall be rejected.

4.5.3 Examination of empty containers. Containers shall not contain any foreign material such as solids, corrosion products, water, or other sediments. Container seams shall be inspected for evidence of metal corrosion, flux, solder, and such materials as would contaminate the product. Any container not meeting these criteria shall be rejected.

4.6 Rejection. Failure of any sample of the inhibitor to conform to any one of the requirements to this specification shall be cause for rejection of the lot represented.

4.7 Test methods.

4.7.1 Inhibitor properties. The inhibitor properties shall be tested in accordance with the ASTM test methods listed in table I and as specified in 4.7.1.1 and 4.7.1.2.

4.7.1.1 Purity of the inhibitor (percent by mass)/Ethylene glycol (percent by mass). The purity of the inhibitor shall be determined as specified in ASTM D4171 Annex A1.

4.7.1.2 pH of 25 percent solution in water. 25 mL of the inhibitor shall be pipetted into a 100 mL volumetric flask and filled with freshly boiled and cooled distilled water having a pH of 6.5 to 7.5. The pH value shall be measured with a pH meter calibrated in accordance with ASTM E70. To avoid error caused by carbon dioxide in the air, the gas space over the solution shall be purged with gas as specified in the test method.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that is helpful, but not mandatory.)

6.1 Intended use. The inhibitor is intended for use as an anti-icing agent to be added to military or commercial aircraft turbine engine fuels used by the Military Departments. Products defined by commercial specifications with the same chemical name are only acceptable for use in military equipment if they meet all of the requirements of this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. FSII - DiEGME.
- c. Quantity desired.
- d. Special markings (see 3.4).
- e. Packaging requirements (see 5.1).

6.2.1 Unit of purchase. Unit of purchase is 3.8 liters (1 U.S. gallon) at 15.5 °C (60 °F). When weight is used as the basis for quantity determination, table II should be used to determine the quantity in liters at 15 °C, or gallons at 60 °F.

TABLE II. Conversion factors - weight to liters at 15 °C (or gallons at 60 °F).

If the specific gravity at 20/20 °C is:	To obtain liters at 15 °C, divide kilograms by:	To obtain gallons at 60 °F, divide pounds by:	To obtain gallons at 60 °F, divide kilograms by:
1.020	1.023 kg/L	8.530 lb/gal	3.869 kg/gal
1.021	1.024	8.539	3.873
1.022	1.025	8.547	3.877
1.023	1.026	8.555	3.881
1.024	1.027	8.564	3.885
1.025	1.028	8.572	3.888

6.3 Definitions.

6.3.1 Bulk lot. A bulk lot consists of an indefinite quantity of a homogeneous mixture of material offered for acceptance in a single isolated container; or manufactured by a single plant run (not exceeding 24 hours) through the same processing equipment, with no change in ingredient material.

6.3.2 Packaged lot. A packaged lot consists of an indefinite number of 208-liter (55-gallon) drums or smaller unit packages of identical size and type, offered for acceptance, and filled with a homogeneous mixture from one isolated container, or filled with a homogeneous mixture of material manufactured by a single plant run (not exceeding 24 hours) through the same processing equipment, with no change in ingredient material.

6.4 Shelf-life. This specification covers items where the assignment of a Federal shelf-life code is a consideration. Shelf life does not apply to bulk products. Specific shelf-life requirements should be specified in the contract or purchase order, and should include, as a minimum, shelf-life code, shelf-life package markings in accordance with MIL-STD-129 or FED-STD-123, preparation of a materiel quality storage standard for type II (extendible) shelf-life items, and a minimum of 85 percent shelf-life remaining at time of receipt by the Government. These and other requirements, if necessary, are in DoD 4140.27-M, Shelf-life Management Manual. The shelf-life codes are in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoD 4140.27-M, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points that manage the item and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: <https://www.shelflife.dla.mil/>.

6.5 International standardization agreement implementation. This specification implements NATO STANAG/AFLP-1135 "Interchangeability of Fuels, Lubricants and Associated Products Used by the Armed Forces of the North Atlantic Treaty Nations" and Air Force Interoperability Council (AFIC) AIR STANDARD Fuels, Lubricants and Gases Working Group (FLG) 4024, Interchangeability Chart of Standardized Aviation Fuels, Lubricants, and Associated Products. When amendment, revision, or cancellation of this specification is proposed, the preparing activity must coordinate the action with the U.S. National Point of Contact for the international standardization agreement, as identified in the ASSIST database at <https://assist.dla.mil/>.

6.6 Warning. Undiluted diethylene glycol monomethyl ether (DiEGME) is combustible. Before handling DiEGME, consult appropriate safety and occupational health directives and Safety Data Sheets.

6.7 Subject term (key word) listing.

DiEGME
Diethylene glycol monomethyl ether
FSII
Fuel additive

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:

Army – AT
Air Force – 68

Preparing activity:

Navy – AS
(Project 6850-2024-003)

Review activities:

Army – CR4, AV
Air Force – 11
DLA – GS, PS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information using the ASSIST Online database at <https://assist.dla.mil>.