

MIL-F-47174A(MI)
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SUPERSEDING
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MILITARY SPECIFICATION

FLUID, HYDRAULIC, PETROLEUM BASE, INTERMEDIATE VISCOSITY

This specification is approved for use by US Army Missile Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for a petroleum base hydraulic fluid for use in the Missile System deployed in areas having temperature range from minus 17.8 degrees C to 37.8 degrees C (0 degree F to 100 degrees F).

2. APPLICABLE DOCUMENTS

2.1 The following Documents of the issue in effect on date of invitation for bids or request for proposal form a part of the specification to the extent specified herein.

SPECIFICATIONS

Federal

TT-T-656

Tricresyl Phosphate

PPP-C-96

Can, Metal, 28 Gage and Lighter

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Missile Research & Development Command, ATTN: DRDMI-ESD, Redstone Arsenal, AL 35809 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 9150

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STANDARDS

Federal

FED-STD-595	Colors
FED-STD-791	Lubricant, Liquid Fuel, and Related Products, Methods of Testing

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attrition
MIL-STD-290	Packaging, Packing and Marking of Petroleum and Related Products

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM	Standards on Copper Corrosion
ASTM	Standards on Petroleum Products and Lubricants
ASTM	Manual on Measurements and Sampling of Petroleum and Petroleum Products

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using federal agencies.

3. REQUIREMENTS

3.1 Hydraulic fluid. The hydraulic fluid furnished under this specification shall be prepared directly from refined petroleum base stocks having those physical properties listed in Table I prior to the addition of any other ingredients required herein.

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TABLE I

PROPERTIES OF PETROLEUM BASE STOCK	
Pour Point (Max)	-59.4°C (-75.0°F)
Flash Point (Min)	93.3°C (200.0°F)
Acid or Base No. (Max)	0.10
Color ASTM Std (Max)	No. 1

3.1.1 Specific gravity. The specific gravity of the base stock shall be determined as in 4.5.1 but shall not be limited. Samples of the base stock submitted for acceptance tests shall not vary by more than ± 0.008 at 15.6/15.6°C (60/60°F) from the specific gravity of the original samples submitted for qualification tests.

3.2 Materials. The hydraulic fluid shall consist of products of refined petroleum with additive materials to improve oxidation resistance, viscosity - temperature characteristics, and wear. Tricresyl phosphate shall be used as an anti-wear agent. (See 5.2.1 precautionary marking). The hydraulic fluid shall contain no pour point depressants, admixture of resins, rubber, soaps, gums, fatty oils, oxidized hydrocarbons or other additives unless specifically approved by the procuring activity or listed in the following paragraphs.

3.3 Additive materials.

3.3.1 Viscosity temperature coefficient improvers. Polymeric materials may be added to the base petroleum products in quantities not to exceed 10 percent by weight of active ingredient in order to adjust the viscosity of the finished fluid to the values specified in 3.4.

3.3.2 Oxidation inhibitors. Oxidation inhibitors shall be present in the hydraulic fluid in quantities not to exceed two (2) percent by weight.

3.3.3 Anti-wear agent. The hydraulic fluid shall contain 0.5 plus or minus 0.1 percent by weight of tricresyl phosphate, conforming to Specification TT-T-656.

3.4 Finished fluid. The properties of the finished fluid shall be as specified in Table II and 3.4.1 through 3.4.9.

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TABLE II

PROPERTIES OF FINISHED FLUID	
Property	
Viscosity, Centistokes 37.8 degrees C (100 degrees F) minus 17.8 degrees (0 degrees F)	7.5 plus or minus 0.5 50.0 plus or minus 5.0
Pour Point, (Max)	minus 59.4 degrees C (Minus 75.0 degrees F)
Flash Point, (Min)	93.3 degrees C (200 degrees F)
Acid or Base No. (Max)	0.20
Water Content, Percent Max	0.015

3.4.1 Color. The fluid shall be dyed to distinguish it from other hydraulic fluids. An acceptable color can be obtained by use of Sudan Green Dye in a concentration of 0.060 plus or minus 0.005 grams per gallon. The resultant color will be a blue.

3.4.2 Corrosiveness and Oxidation Stability.

3.4.2.1 Corrosiveness. When tested as specified in 4.5.1 the change in weight of steel, aluminum alloy, magnesium alloy, and cadmium - plated steel subjected to the action of the hydraulic fluid shall be not greater than plus or minus 0.2 milligrams per square centimeter of surface. The change in weight of copper under the same conditions shall be no greater than plus or minus 0.6 milligrams per square centimeter of surface. There shall be no pitting, etching, nor visible corrosion of the surface of the metals when viewed under magnification of 20 diameters. Any corrosion produced on the surface of the copper shall not be greater than No. 3 of the ASTM copper corrosion standards. A slight discoloration of the cadmium shall also be permitted.

3.4.2.2 Resistance of Oxidation. When tested as specified in 4.5.1 the fluid shall not have changed more than minus 5 or plus 20 percent from the original viscosity in centistokes at 37.8 degrees C (100 degrees F) after the oxidation-corrosion test. The acid or base number shall not have increased by more than 0.20 over the acid or base-number of the original sample. There shall be no evidence of separation of insoluble materials nor gumming of the fluid.

3.4.3 Low Temperature Stability. When tested as specified in 4.5.1 for 72 hours at a temperature of minus 54 plus or minus 1 degrees C (minus 65 plus or minus 2 degrees F) there shall be no separation of ingredients. Any turbidity shall not be greater than that shown by the turbidity standard.

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3.4.4 Swelling of synthetic rubber. When tested as specified in 4.5.1 the volume increase of the standard synthetic rubber L by the fluid shall be within the range of 19.0 to 28.0 percent.

3.4.5 Evaporation. The residue after evaporation for 4 hours of 65.6 plus or minus 3 degrees C (150 plus or minus 5 degrees F) shall be oily and neither hard nor tacky when tested as specified in 4.5.1.

3.4.6 Copper strip corrosion. When the fluid is tested as specified in 4.5.3 any corrosion produced shall not be greater than No.2 of the ASTM copper corrosion standards.

3.4.7 Solid particles contamination. When tested in accordance with 4.5.1 in a clean dust-free atmosphere the number of solid contamination particles per 100 milliliter (ml) of the fluid shall not exceed the number specified in Table III nor shall the weight of the residue exceed 0.3 milligrams (mg) when tested as specified in 4.5.1. The filtering time for each determination shall be 15 minutes maximum.

3.4.8 Foaming characteristics. The foaming characteristics of the hydraulic fluid shall not exceed the limits indicated in Table IV when tested as specified in 4.5.1.

3.4.9 Storage stability. The fully blended product shall show no separation of ingredients nor evidence of crystallization, shall be clear and transparent when examined visually, and shall conform to the requirements of Section 3 after 12 months storage as specified in 4.5.1.

TABLE III

SOLID PARTICLES	
Particle Size, Microns (Largest Dimension)	Allowable Number (Max) Each Determination
5 - 15	2500
16 - 25	1000
26 - 50	250
51 - 100	25
Over 100	None *
*For acceptance testing only "None" shall be defined as one less than the total number of samples tested.	

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TABLE IV

FOAMING CHARACTERISTICS		
Test Temp.	Foaming Tendency	Foam Stability
	Foam Volume, ml, at end of 5 min. blowing period.	Foam Volume, ml at end of 10 min. setting period.
75 degrees F	65 ml (Max)	Complete Collapse. (1)

(1) A ring of small bubbles around edge of the graduate shall be considered complete collapse.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The examination and testing of this hydraulic fluid shall be classified as Quality Conformance Inspection.

4.2.1 Lot. An inspection lot shall consist of oil of a single batch or composition, manufactured under essentially the same conditions and presented for inspection at the same time.

4.3 Sampling. Each lot of material shall be sampled in accordance with Method 8001 of FED-STD-791.

4.4 Inspection.

4.4.1 Inspection of material. Inspection shall be in accordance with Method 9601 of FED-STD-791.

4.4.2 Acceptance tests. Acceptance tests shall consist of all the tests of this specification with the exception of storage stability test in accordance with 3.4.9.

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4.5 Tests.

4.5.1 Physical and chemical tests. The following tests shall be conducted in accordance with the indicated methods of FED-STD-791.

- a. Flash point, Method 1103.
- b. Pour point, Method 201.
- c. Viscosity, Method 305.
- d. Precipitation No., Method 3101.
- e. Neutralization No., Method 5106.
- f. Specific gravity, Method 401.
- g. Corrosiveness and oxidation stability, Method 5308.
- h. Solid particle contamination, Method 3009.
- i. Water, Method 3253.
- j. Foaming characteristics, Method 3211.
- k. Low temperature stability, Method 3459.
- l. Storage stability, Method 3465.
- m. Evaporation, Method 353.
- n. Swelling of synthetic rubber, Method 3603 (2).
- o. Color, Method 102.

(2) Use standard rubber L (Section 6.3) within six (6) months after date of manufacture.

4.5.2 Color of finished fluid. The color of the finished fluid shall be compared to a standard sample prepared by adding 0.015 grams of Sudan Green dye to one liter of stock fluid.

4.5.3 Copper corrosion. The copper corrosion test shall be conducted in accordance with Method 5325 of FED-STD-791 except that the time of the test shall be increased from 3 to 72 hours.

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5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing, and marking. Unless otherwise specified (see 6.2), preservation, packing, packaging, and marking shall be as specified herein.

5.2 Packaging and packing. The hydraulic fluid shall be furnished only in one gallon metal containers conforming to Type I of PPP-C-96. Unless otherwise specified in the contract, the packaging and packing of the fluid shall be level A or C as specified in MIL-STD-290, except that the tops and bottoms of hermetically sealed containers shall not be painted. The color of the exterior of all metal containers shall be green color 14062 of FED-STD-595. Before filling, all containers shall be thoroughly cleaned and inspected to insure absence of dirt, corrosion products, water or other materials which would contaminate or interfere with satisfactory operation of the hydraulic fluid. The cleanliness of the containers shall be positive and the cleaning and filling procedures shall be consistent with the cleanliness requirements of 3.4.7.

5.3 Marking. The marking of the hydraulic fluid containers shall be in accordance with MIL-STD-290 except that yellow markings Color 23538 or 13538 shall be used. In addition, the unit containers shall also be marked with the following information.

Instructions: This fluid is not interchangeable with hydraulic fluid, castor oil base. This fluid shall not be mixed with but may be substituted for hydraulic fluids, petroleum base (red or yellow color) for intermediate temperature operation as specified.

5.3.1 Precautionary marking. All individual containers shall be marked with the following precautionary marking.

"Contains Tricresyl Phosphate.

Warning: Harmful if swallowed, inhaled, or absorbed by the skin. Keep away from food and food products. Destroy container after use."

6. NOTES

6.1 Intended use. The hydraulic fluid covered by this specification is intended for use in guided missile hydraulic systems at temperature ranges from minus 17.8 degrees C to 37.8 degrees C (0 degrees F to 100 degrees F).

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6.1.1 Storage conditions. Prior to use in the intended equipment the product may be stored under conditions of covered or uncovered storage in geographic areas ranging in temperatures from minus 57 to plus 49 degrees C (minus 70 to plus 120 degrees F).

6.2 Ordering data. Procurement document should specify the following

- a. Title, Number, and date of the specification.
- b. Type and size of containers (see 5.2).
- c. Quantity.
- d. Selection of application levels of packing and packaging with requirement in detail.

6.3 Supersession data. This specification includes the requirements of Missile Interim Specification MIS-10137, dated 18 May 1966.

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