NOT MEASUREMENT SENSITIVE

MIL-DTL-17111D
10 January 2006
SUPERSEDING
MIL-DTL-17111C
21 January 1998

DETAIL SPECIFICATION

FLUID, POWER TRANSMISSION

This specification is approved for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers a class of fluid for use in the hydraulic transmission of power.

1.2 International standardization agreement.

STANAG 1135

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 of the documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Richmond, ATTN: DSCR-VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616 or e-mailed to STDZNMGT@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST database at http://assist.daps.dla.mil.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards 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 (see 6.2).

FEDERAL SPECIFICATIONS

A-A-59551	- Wire, Electrical, Copper (Uninsulated).
TT-T-656	- Tricresyl Phosphate.

FEDERAL STANDARDS

FED-STD-791	- Lubricants, Liquid Fuels, and Related Products; Methods of Testing.

(Copies of these documents are available online at http://assist.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 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 (see 6.2).

ASTM INTERNATIONAL

ASTM A 108	- Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
ASTM B 272	- Standard Specification for Copper Flat Products with Finished (Rolled or Drawn) Edges (Flat Wire and Strip).
ASTM D 91	- Standard Test Method for Precipitation Number of Lubricating Oils.
ASTM D 92	- Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester.
ASTM D 95	- Standard Test Method for Water in Petroleum Products and Bituminous Materials by Distillation.
ASTM D 97	- Standard Test Method for Pour Point of Petroleum Products.
ASTM D 445	- Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity).
ASTM D 611	- Standard Test Methods for Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents.
ASTM D 665	- Standard Test Method for Rust-Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water.

ASTM INTERNATIONAL (Continued)

ASTM D 972	- Standard Test Method for Evaporation Loss of Lubricating Greases and Oils.
ASTM D 974	- Standard Test Method for Acid and Base Number by Color-Indicator Titration.
ASTM D 1500	- Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale).
ASTM D 2266	- Standard Test Method for Wear Preventive Characteristics of Lubricating Grease (Four-Ball Method).
ASTM D 4057	- Standard Practice for Manual Sampling of Petroleum and Petroleum Products.
ASTM D 4177	- Standard Practice for Automatic Sampling of Petroleum and Petroleum Products.
ASTM D 5621	- Standard Test Method for Sonic Shear Stability of Hydraulic Fluids.

(Copies of these documents are available online at http://www.astm.org/ or from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. 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 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.6.

3.2 Performance requirements. The power transmission fluid shall satisfy the following performance requirements.

3.2.1 Materials. The fluid shall consist of mineral oil products plus 1.0 ± 0.1 weight percent of tricresyl phosphate conforming to TT-T-656 and approved additive materials for improving the finished product with respect to the viscosity-temperature and lubricating characteristics, resistance to oxidation, and protection of metal parts against corrosion.

3.2.2 Suitability. The fluid shall be suitable for use in hydraulic systems involving mechanical or fibrous type filters or centrifugal purification. It shall be noncorrosive to bearings and hydraulic systems and shall not cause clogging of oil screens or valves. The fluid shall remain homogeneous over the temperature range of -34 °C to 4 °C.

3.2.3 Physical and chemical requirements of base stock. The properties of the petroleum base stock used in compounding the finished fluid shall conform to physical and chemical requirements as shown in table I.

TABLE I. Physical and chemical requirements of base stock.

Property	Value
Neutralization number, maximum	0.05
Aniline point, minimum (see 3.2.3.1)	77 °C
Aniline point change, maximum (see 3.2.3.2)	2.8 °C
Precipitation number, maximum	0.05

3.2.3.1 Aniline point. The aniline point of the base stock submitted for inspection tests shall not be more than 2 °C below the aniline point of the original sample submitted for acceptability tests. The aniline point shall not be less than 77 °C.

3.2.3.2 Aniline point change. The aniline point of the base stock remaining shall not be more than 2.8 °C higher than that of the original base stock.

3.2.4 Physical and chemical requirements of finished fluid. The finished power transmission fluid shall conform to the physical and chemical requirements as shown in table II and 3.2.4.1 through 3.2.4.7.

TABLE II. Physical and chemical requirements of finished fluid.

Property	Value
Viscosity at -35 °C, maximum	1,000 cSt[1]
Viscosity at -20 °C, maximum	500 cSt
Viscosity at +40 °C, minimum	25 cSt
Viscosity at +100 °C, minimum	8 cSt
Pour point, maximum	-40 °C
Flash point, open cup, minimum	104 °C
Fire point, open cup, minimum	113 °C
Neutralization number, maximum	0.3
Precipitation number, maximum	0.05
Water	0.0 percent
Color, ASTM D 1500, maximum	2

[1]cSt represents centistokes.

3.2.4.1 Low temperature turbidity. A dry sample of the fluid shall be stored at a temperature of 37 °C for not less than 72 hours. After that time at the storage temperature, the fluid shall show no evidence of gelling, crystallization, or separation, and shall develop a turbidity not greater than that exhibited by a standard suspension of barium sulfate in water.

3.2.4.2 Rust prevention. The transmission fluid shall prevent the formation of rust.

3.2.4.3 Corrosion and oxidation stability. The finished fluid must encompass both resistance to oxidation and protection of metal parts against corrosion.

3.2.4.3.1 Test duration of 336 hours.

3.2.4.3.1.1 Corrosion. The total loss in weight of the copper when subjected to the action of the finished fluid for 336 hours shall not be greater than 0.2 milligrams (mg) per square centimeter (cm) of the total surface. There shall be no pitting, etching, or visible signs of corrosion on the surface of any of the specimens when viewed under magnification of 20 diameters. Slight discoloration of the surface of the copper will be permitted.

3.2.4.3.1.2 Resistance to oxidation. The percentage change in kinematic viscosity at 99 °C and -18 °C shall be within range of 0 to 25 percent of the viscosity of the original fluid and the neutralization number shall not be greater that 0.5 after the 336 hour test. The amount of oil-insoluble material remaining after the test shall not be greater than 0.5 weight percent of the original quantity of fluid used in the test. The color of the fluid after tests shall not be darker than color 5.0 when tested in accordance with ASTM D 1500.

3.2.4.3.2 Test duration of 72 hours. The percentage change in kinematic viscosity of the fluid at 99 °C and -18 °C shall be within the range of 0 to 15 percent of the viscosity of the original fluid. The neutralization number of the fluid shall not be greater than 0.5 after the test. The acidity of the water layer shall not be greater than 0.5 mg of potassium hydroxide per gram of water, using bromothymol blue as the indicator.

3.2.4.4 Shear stability. The viscosity change of the hydraulic fluid measured in centistokes at 38 °C shall not be more than 5 percent greater than the percentage change of the shear stability reference fluid, nor shall the neutralization number have increased by more than 0.20 over the original neutralization number.

3.2.4.5 Steel-on-steel wear. The average wear scar shall not be more than 1 millimeter (mm) in diameter.

3.2.4.6 Evaporation. For 6 hours at 66 °C, the loss due to evaporation shall not exceed 20 percent.

3.2.4.7 Water sludging. The viscosity of the emulation formed after standing undisturbed for 24 hours at 38 °C shall be within the range of -2 to 10 percent of the original 38 °C kinematic viscosity of the fluid.

3.2.5 Workmanship. The fluid shall be processed in accordance with high grade commercial practice and shall be clear and transparent, entirely homogenous, and free from lumps of undissolved additive, water, dirt, lint, or sediment.

3.3 NATO marking. Unit containers shall be marked with the NATO code number H-575 of STANAG 1135.

3.4 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable 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.

4. VERIFICATION

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

a. First article inspection (see 4.6).
b. Conformance inspection (see 4.7).

4.2 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed in accordance with the test conditions specified in Method 9601 of FED-STD-791.

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

4.4 Packaged lot. A packaged lot is an indefinite number of unit containers of identical size and type, offered for acceptance, and filled with a homogeneous mixture of material from one isolated container or filled with a homogeneous mixture manufactured in a single plant run (not exceeding 24 hours) through the same processing equipment with no change in ingredient material.

4.5 Sampling for conformance inspection. A representative sample of material shall be selected at random in accordance with the sampling method of ASTM D 4057 (manual) or ASTM D 4177 (automatic). Failure of any conformance test shall result in rejection of the lot. In addition, a random sample of base stock shall be selected for each lot of the finished fluid and subjected to all the applicable conformance tests for base stock.

4.6 First article inspection. A first article inspection shall be performed on the initial production-representative unit of order or when required in the acquisition order. When a first article inspection is required (see 6.2), it includes all verifications listed in table III.

TABLE III. Verification methods.

Verification item	Requirement paragraph	Verification paragraph
Performance requirements	3.2	4.8
Neutralization number, maximum (base stock)	3.2.3, table I	4.8.3, table IV
Neutralization number, maximum (finished fluid)	3.2.4, table II	4.8.3, table IV
Aniline point, minimum	3.2.3.1	4.8.3, table IV
Aniline point change, maximum	3.2.3.2	4.8.3.1
Precipitation number, maximum (base stock)	3.2.3, table I	4.8.3, table IV
Precipitation number, maximum (finished fluid)	3.2.4, table II	4.8.3, table IV
Viscosity	3.2.4, table II	4.8.3, table IV
Pour point, maximum	3.2.4, table II	4.8.3, table IV
Flash point and fire point, open cup, minimum	3.2.4, table II	4.8.3, table IV
Water	3.2.4, table II	4.8.3, table IV
Color	3.2.4, table II	4.8.3, table IV
Low temperature turbidity	3.2.4.1	4.8.3.2
Rust prevention	3.2.4.2	4.8.3.3
Corrosion and oxidation stability (336 hours)	3.2.4.3.1	4.8.3.4.1
Corrosion and oxidation stability (72 hours)	3.2.4.3.2	4.8.3.4.2
Shear stability	3.2.4.4	4.8.3, table IV
Steel-on-steel wear	3.2.4.5	4.8.3, table IV
Evaporation	3.2.4.6	4.8.3, table IV
Water sludging	3.2.4.7	4.8.3.5

4.7 Conformance inspection. Conformance inspection includes all examinations and tests listed in table III with the following exceptions: shear stability, steel-on-steel wear and 336-hour corrosion and oxidation stability. The procuring activity reserves the right to conduct any of the tests of this specification, including the three listed exceptions.

4.8 Performance requirements verification. Complete each verification in section 4.8.

4.8.1 Verification methods. Acceptable verification methods included in this section are visual inspection, measurement, sample test, full-scale demonstration test, simulation, modeling, engineering evaluation, component properties analysis, and similarity to previously approved or previously qualified designs.

4.8.2 Verification alternatives. The manufacturer may propose alternative test methods, techniques, or equipment, including the application of statistical process control, tool control, or cost-effective sampling procedures to verify performance. Consult with the contracting official for alternatives that replace verifications required by this specification.

4.8.3 Test procedures. The transmission oil tested in accordance with the applicable methods specified in table IV. Physical and chemical values specified in section 3 apply to the average of the determinations made on the samples for values which fall within any stated repeatability of the applicable test method.

TABLE IV. Test procedures.

Test	Test document
Neutralization number	ASTM D 974
Aniline point	ASTM D 611
Precipitation number	ASTM D 91
Viscosity	ASTM D 445
Pour point	ASTM D 97
Flash point and fire point	ASTM D 92
Water	ASTM D 95
Color	ASTM D 1500
Shear stability	ASTM D 5621
Steel-on-steel wear	ASTM D 2266
Evaporation at 66 °C	ASTM D 972

4.8.3.1 Aniline point change. Five milliliters (mL) of the petroleum base stock shall be placed in a clean, dry Babcock cream test bottle having a capacity of approximately 50 mL with a graduated neck, commonly known as the 9-inch, 9-gram, 50 percent X 1/2 cream bottle. The standard 6-inch, 9-gram, 50 percent X 1/2 cream bottle may be used as an alternative. Then 20 mL of 37 normal sulfuric acid shall be added cautiously but without delay to the test bottle in such a way as to wash down any oil remaining in the neck of the bottle. The test bottle shall then be shaken for at least 10 seconds, swinging the bottle through an arc of approximately 20 degrees so that the bottom of the bottle passes through a distance of 2.5 inches to 3.5 inches. The speed of shaking shall be maintained at 240 cycles to 300 cycles per minute. The temperature of the acid-oil mixture shall not be allowed to approach 100 °C as indicated by the bottle becoming too warm to touch. The bottle may be cooled in cold water if necessary. The bottle containing the acid-oil mixture shall then be placed in a water bath maintained at 98 °C to 100 °C so that the liquid contents are completely immersed. After the test bottle has been in the bath for 10 minutes, it shall be removed and shaken in the manner described above for at least 10 seconds and replaced immediately in the water bath at 98 °C to 100 °C. This procedure shall be repeated for a total of six immersions and shakings except that the bottle shall not be replaced in the bath after the last shaking. Sufficient 37 normal sulfuric acid shall be added to the contents of the test bottle to raise the oil layer into the graduated neck. The bottle and contents shall then be placed in a centrifuge

and spun at a speed of approximately 500 revolutions per minute (rpm) for 10 minutes. The oil layer shall be withdrawn from the bottle by means of a clean, dry pipette. This procedure shall be repeated until a sufficient amount of oil has been recovered for determination of the aniline point. Before the aniline point is determined, the recovered oil shall be shaken thoroughly with a 5 percent solution of sodium carbonate.

4.8.3.2 Low-temperature turbidity. A standard turbidity sample of approximately 75 parts per million (ppm) of barium sulfate shall be prepared by adding 25 mL of distilled water and 5 mL of 0.5 normal sulfuric acid to 5 mL of a 0.0032 molar solution of barium chloride in a 50-mL volumetric flask. The solution shall then be shaken well to ensure complete precipitation. Distilled water shall then be added to give a total volume of 50 mL. The barium sulfate suspension shall be freshly prepared prior to use. The fluid to be tested shall be stored for not less than 72 hours at a temperature not to exceed -37 °C. For visual examination, the fluid shall be stored in round, clear, glass bottles, approximately 1 inch to 1.5 inches in diameter. Four-ounce oil sample bottles or pour point bottles may be used. Where photometric methods are used as a means of comparison, the fluid shall be stored directly in the container used in making the transmission determination. Either visual or photometric methods may be used to compare the test fluid with the standard barium sulfate turbidity sample. In either method, the comparisons shall be carried out in containers of the same size and shape with approximately equal volumes. The standard barium sulfate suspension shall be shaken vigorously within 5 minutes prior to making the comparison. Each test vessel containing the fluid shall be inverted four times and observed within 2 minutes after removal from low-temperature storage. The temperature of the fluid shall not be above -34 °C at the time the turbidity determination is made.

4.8.3.2.1 Visual comparison. The fluid after storage shall be compared directly to the standard barium sulfate suspension against light from a tungsten filament source reflected from a white surface. To prevent condensation of water on the cold fluid container, the bottle shall be dipped in a 50-50 mixture of methanol and glycerol (also maintained at a temperature not above -34 °C). The fluid shall show less turbidity than the barium sulfate suspension.

4.8.3.2.2 Photometric comparison. Transmission measurements shall be carried out on the following:

a. Distilled water.
b. Standard barium sulfate suspension.
c. The fluid at room temperature.
d. The fluid within 2 minutes after removal from low-temperature storage and with the fluid temperature not above -37 °C.

The percentage transmission of the standard barium sulfate suspension as compared to distilled water shall be calculated. The percentage transmission of the fluid after storage as compared to the fluid at room temperature shall also be calculated. The percentage transmission of the fluid after low-temperature storage shall be greater than the percentage transmission of the standard barium sulfate suspension.

4.8.3.3 Rust prevention. Rust prevention shall be determined by procedure A of ASTM D 665 using distilled water, except that the cleaning and preparation of the test specimens shall be as specified in 4.8.3.3.1. The steel specimen shall exhibit no evidence of rust when examined visually.

4.8.3.3.1 Specimen cleaning and preparation. Round specimens shall be made from steel conforming to the requirements of ASTM A 108, grade 1020, and when new shall be 0.5 inch in diameter, approximately 5.5 inches long, and rounded at one end. The steel specimens shall be inserted in the chuck of an apparatus capable of rotating the specimen at a speed of 1,700 rpm to 1,800 rpm, so that at least 4.75 inches of the specimen, including the rounded end, can be polished by applying emery cloth to the rotating specimen. No. 00 emery cloth shall be used to remove all irregularities, pits, and scratches as determined by visual examination. If the specimen has been previously used in the test, No. 1/2 emery cloth shall be used to remove completely the previous surface before polishing with the No. 00 emery cloth. After polishing, the specimen shall be boiled in chemically pure toluene for 5 minutes in a chemically clean container, followed by boiling for 1 minute in high grade petroleum ether. During the boiling procedures, the specimen shall be immersed completely in the liquids at all times. After allowing the solvent to drain from the specimen, it shall be immersed immediately in a portion of the oil to be tested. From the start of polishing with the emery cloth, the steel specimens shall not be touched by hand, but shall be handled by wires, glass hooks, or clean, lintless, grease-free cloth, or gloves.

4.8.3.4 Corrosion and oxidation stability. Perform the 336-hour test and the 72-hour test in sections 4.8.3.4.1 and 4.8.3.4.2.

4.8.3.4.1 336-hour test. A large glass tube approximately 38 mm in diameter and at least 300 mm long shall be fitted with a ground glass connection or tightly fitting shellacked cork and a water-cooled reflux condenser, preferably of the Allihn type, 8-mm bore, 300-mm water jacket length (approximate dimensions). Five copper test specimens conforming to ASTM B 272, 90 grams of the fluid to be tested, and 10 grams of distilled water shall be placed in the test tube. The copper test specimens shall be polished, weighed strips, approximately 25 cm in length of 16 Brown & Sharp (B&S) gage to 22 B&S gage thickness with a small hole (1/16 inch diameter) at each end. There shall be at least 258 cm^2 surface area of copper. The copper shall be polished to a clean surface with emery cloth. The final polishing shall be carried out with a grade not coarser than No. 00 emery cloth. The specimens shall be weighed and then washed thoroughly in warm high grade petroleum ether or chemically pure methylethyl ketone (MEK). Following this, the specimens shall be allowed to evaporate dry and immediately be immersed in the fluid to be tested. From the start of polishing with the emery cloth, the specimens shall not be touched by hand, but shall be handled by wires, glass hooks of clean, lintless, grease-free cloth, or gloves. The five specimens shall be tied or wired together at each end using a small copper wire with a small washer or spacer between each specimen so that they are parallel and approximately 1/8 inch apart. The spacers may be copper washers of the desired thickness and 5 mm outside diameter maximum or 1/8-inch lengths of glass tubing of 5 mm outside diameter maximum. The test tube containing the fluid, water, and copper shall be placed in a thermostatically controlled bath maintained at such a temperature that the fluid-water mixture is at a temperature not less than 93 °C as determined by a thermometer or thermocouple in the fluid-water mixture. A glass tube shall be introduced through the condenser in such a manner that it extends to the bottom of the test tube, and dry air shall be

introduced through it at a rate of 12 ± 1 gram per hour. The inside diameter of the air tube at the submerged end shall be 1 mm to 2 mm. With the air supply momentarily discontinued, 10 grams of distilled water shall be added through the condenser during each of the following time periods: 72 ± 4 hours, 168 ± 4 hours, and 240 ± 4 hours. At the end of 336 hours, the oxidation shall be discontinued. The total loss of liquid (90 grams of transmission fluid and 40 grams of water) from the test tube during the test shall not be more than 35 grams. If the total loss exceeds this value, the test shall be disregarded and a duplicate determination shall be made. The liquid contents of the test tube shall be emptied into one or two tared cone-shaped oil centrifuge tubes (100-mL) and spun in a centrifuge for not less than 15 minutes at not less than 1,200 rpm. The clear fluid and water shall be decanted and separated and the viscosities, neutralization number, and color of the fluid shall be determined. The precipitate remaining in the centrifuge tubes shall be washed by adding 50 mL of light naphtha (end point not over 107 °C) and spun in a centrifuge until the naphtha layer is clear. The naphtha shall be decanted and the centrifuge tube containing the insoluble material placed in an oven maintained at a temperature of 66 °C to 93 °C until dry. The centrifuge tube shall be weighed, and the weight of the insoluble material calculated as a weight percent of the original fluid charged to the test tube. The copper test specimens shall be separated and washed successively in light naphtha, warm toluene, and warm chloroform. The copper test specimens shall be brushed with a small short-bristled paint brush or toothbrush while washing in the last two solvents. The specimens shall then be dried, weighed, and examined under 20 diameters magnification for conformance to 3.2.4.3.1.

4.8.3.4.2 72-hour test. The same apparatus and thermostatically controlled bath described in 4.8.3.4.1 shall be used. Place 90 grams of the fluid to be tested, 20 grams of distilled water, and copper wire conforming to A-A-59551 in the test tube as described. The wire shall be number 12 to number 16 gage, and a sufficient length shall be selected so that there is a total surface area of at least 500 cm^2. The wire shall be polished in accordance with the procedure given in 4.8.3.4.1 and shall be coiled in two separate sections on round mandrels of approximately 1.1 inches and 0.08 inch in diameter. The coils shall not be weighed but shall be washed in accordance with the procedure given in 4.8.3.4.1. The two coils shall be inserted in the test tube, one inside the other, so they are completely immersed in the test mixture. The test tubes containing the fluid, water, and copper coils shall be placed in a thermostatically controlled bath maintained at such a temperature that the fluid-water mixture is at a temperature of not less than 93 °C as determined by a thermometer or thermocouple in the fluid-water mixture. Air shall be introduced in the same quantity and manner as described in 4.8.3.4.1. At the end of 72 hours, the test shall be discontinued. The total loss of liquid (90 grams of transmission fluid and 20 grams of water) from the test tube during the test shall not be more than 10 grams. If the total loss exceeds this value, the test shall be disregarded and a duplicate determination shall be made. The liquid contents of the test tube shall be emptied into a separatory funnel and the water layer separated. The mixture may first be spun in a centrifuge in case a stable emulsion is present. The viscosities and neutralization number of the fluid shall be determined as required by 3.2.4.4. The acidity of the water layer shall be determined by the same method used for determination of the neutralization number of the fluid layer, except that bromothymol blue shall be used as the indicator. The acidity shall be expressed as milligrams of potassium hydroxide per gram of water.

4.8.3.5 Water sludging. In a 100-mL graduated cylinder, mix 95 mm of the fluid with 5 mL of distilled water. The mixture shall be agitated at 38 °C for 15 minutes by means of the apparatus described in method 3201.6 of FED-STD-791, except that the paddle shall be rotated at a shaft speed of 5,000 ± 200 rpm. At the end of this time, the mixture shall be immediately poured into a suitable container and stored for 24 hours at 38 °C. A suitable convenient container for storage in 38 °C liquid baths is a 125-mL cylindrical graduated separatory funnel with short stem. At the end of the 24-hour storage period, any lower water layer shall be drawn off and discarded. The next 20 mL from the bottom of the emulsion layer shall then be drawn off and a viscosity determination at 38 °C shall be made thereon within 1 hour after withdrawal for compliance with requirements of 3.2.4.7.

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 command. 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 may be helpful, but is not mandatory.)

6.1 Intended use. The fluid covered by this specification is a medium to be used in connection with hydraulic transmission power.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. The specific issue of individual documents referenced (see 2.2.1 and 2.3).
c. First article, if required (see 3.1 and 4.6).
d. NATO marking as required (see 3.3).
e. Inspection test conditions, if different (see 4.2).
f. Packaging requirements (see 5.1).

6.3 International standardization agreement implementation. This specification implements STANAG 1135, "Interchangeability of Fuels, Lubricants, and Associated Products Used by the Armed Forces of the North Atlantic Treaty Nations". 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 http://assist.daps.dla.mil.

6.4 Subject term (key word) listing.

hydraulic
mineral oil
petroleum
tricresyl phosphate

6.5 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.

Custodians:
Army - AI
Navy - OS

Preparing Activity:
DLA - GS3

(Project 9150-1299-000)

Review Activity:
Navy - NI

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 above using the ASSIST database at http://assist.daps.dla.mil.