METRIC

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PERFORMANCE SPECIFICATION

PETROLEUM TESTING KIT, GROUND FUELS

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 petroleum testing kit for ground fuels. The equipment is used to perform American Petroleum Institute (API) and American Society for Testing and Materials (ASTM) tests for temperature determination, distillation, flash point, specific gravity, free water and particulate contamination.

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 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 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Tank Automotive and Armaments Command, ATTN: AMSTA-TR-D/210, Warren, MI 48397–5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 6630

STANDARDS

FEDERAL

FED-STD-595 – Colors Used in Government Procurement

DEPARTMENT OF DEFENSE

MIL-STD-130 – Identification Marking of U. S. Military Property

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, 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 the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN PETROLEUM INSTITUTE (API)

API-MPMS Chapter 7 Section 1 – Static Temperature Determination Using Mercury-In-Glass Tank Thermometers

(Application for copies should be addressed to the American Petroleum Institute, 1220 L Street, Northwest Washington, D. C. 20005-4070.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 86 – Standard Method for Distillation of Petroleum Products
ASTM D 93 – Standard Methods for Flash Point by Pensky-Martens Closed Cup Tester
ASTM D 1298 – Standard Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
ASTM D 4057 – Standard Practice for Manual Sampling of Petroleum and Petroleum Products
ASTM D 4176 – Standard Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures)

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA Z535.2 – Environmental and Facility Safety Signs

(Application for copies should be addressed to the National Electrical Manufacturers Association 1300 N 17th St., Suite 1847, Rosslyn, VA 22209.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 – National Electrical Code

(Application for copies should be addressed to the National Fire Protection Association, One Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.)

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 Description. The petroleum-based ground fuels testing kit shall consist of the components described herein and be fitted in a transportable container.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.3 Materials. The contractor shall select materials capable of meeting all the operational and environmental requirements specified herein. Test kit components shall be resistant to fuel and fuel esters, ultraviolet radiation and ozone deterioration. Unbreakable, or break resistant, materials shall be used as practicable.

3.3.1 Material deterioration and control. The kit and its components shall be fabricated from compatible materials, inherently corrosion and deterioration resistant or treated to provide protection against the various forms of corrosion and deterioration to which they are susceptible.

3.3.2 Dissimilar metals. Dissimilar materials shall be electrically isolated from one another to minimize or prevent galvanic corrosion.

3.3.3 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials shall 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. Used, rebuilt, or remanufactured components, pieces and parts shall not be incorporated in the test kit.

3.4 Operating parameters.

3.4.1 Major components. The kit shall be provided with all components and accessories required to perform initial sampling and at least 10 (each) of the listed tests, on individual samples, without replenishment. Tools necessary to open and/or remove the drum or barrel bung shall be included. The kit shall include instruction plate(s), or booklet(s) on how to perform the procedures for testing of fuel. The sampling and testing accomplished with this set shall be as follows:

a. Fuel sampling per ASTM D 4057 (Tube sampling procedure ; 0.9 L ± 0.1 L)
b. Distillation of petroleum products per ASTM D 86
c. Flash point by Pensky-Martens closed cap tester per ASTM D 93

d. Free water and particulate contamination in distillate fuels per ASTM D 4176 (Procedure1)

e. Fuel temperature per API-MPMS Chapter 7 Section 1

3.4.2 Government furnished property. The following item, one per kit, will be furnished by the Government.

Sampling and Gaging Kit, Petroleum: Portable–NSN 6680-00-151-5310

The sampling and gaging kit (23 cm x 23 cm x 39.4 cm; 10 kg) shall fit within and be an integral component of the ground fuels test kit.

3.4.3 Power connection. The electrically operated components of the kit shall use 115Vac, ± 10%, 60 Hz, ± 2% and shall conform to the requirements of the National Electrical Code, NFPA 70. All electrically operated components shall be UL approved.

3.4.4 Container. The kit components shall be contained in a container. The container shall be fabricated so that it can be raised and locked into working position; and lowered and locked for transit or storage. In its working position, the top of the kit shall provide a flat, horizontal surface with a minimum of 1 sq. meter and a height of 91 ± 10 cm. Partitions or other suitable means to block the wind from the work area shall be provided. Components within the container shall be securely restrained, and adequately cushioned to prevent damage during transit.

3.4.4.1 Envelope. The overall dimensions of the container, in storage or transit configuration, shall not be greater than 91.5 cm (36.0 inches) long × 53.5 cm (21.0 inches) deep × 63.5 cm (25.0 inches) high.

3.4.4.2 Weight. The weight of the kit shall not exceed 89 kg (196 pounds).

3.4.4.3 Stowable handles. The design of the container shall incorporate handles, or other suitable means, for grasping, handling, and carrying by four persons wearing appropriate protective clothing. The handles shall retract or fold within the envelope of the container when not in use.

3.5 Test kit loading diagram. A diagram shall be provided to identify equipment placement in the container. The loading diagram shall be permanently affixed to the inside of the kit's cover to easily identify storage locations. The loading diagram shall be legible for the life of the kit.

3.6 Environmental requirements.

3.6.1 Climatic. The kit shall be capable of performing in any ambient temperature from -25°C to 50°C. When placed in storage, the test kit shall not be damaged in any ambient temperature from -33°C to 63°C (see 4.5.2).

3.6.2 Fungus Resistance. Components susceptible to fungus and moisture damage shall be treated for protection.

3.6.3 Visibility. The kit shall contain a light source for performing tests in poorly lit areas.

3.6.4 Water Resistance. The container shall not allow any water leakage.

3.7 Transportability. The kit shall be capable of withstanding the vibration stress and shock encountered when transported by all modes of transportation.

3.8 Personnel environment.

3.8.1 Human Factors. Compartment access and grasp areas shall reflect compatibility with the Clothing and Personal Equipment (C/PE) of personnel using and maintaining the kit, under the environmental conditions specified herein. Grasp areas shall be located to provide easy accessibility and shall not interfere with installation, removal, operation, or maintenance.

3.8.2 Safety. The construction shall incorporate methods to protect personnel from shock hazards, to include consideration of ground currents and voltage limits (possible arcing) according to NFPA 70. Adequate safe-guards shall be incorporated into the kit and its components so that personnel shall not be exposed to concentrations of toxic or corrosive substances. Equipment that, in normal operation, exposes personnel to surface temperatures greater than 55 ± 1 °C for prolonged contact or handling, or 60 ± 1°C for momentary contact, shall be appropriately guarded. Except where functionally required, exposed surfaces shall be free from burrs, sharp edges and corners, or other features that present a personnel safety hazard; or shall be shielded against contact. Danger or caution signs, labels, and markings shall be used to warn of potential or specific hazards according to NEMA Z535.2.

3.9 Treatment and painting. Unless otherwise specified (see 6.2), the container shall be cleaned, treated, and painted in accordance with the manufacturer's standard commercial practice and MIL-C-46168 shall be used as a guide for coating. The color shall be Army green #383, color #34094 of FED-STD-595.

3.10 Labeling. Labels, legends, placards, signs, markings, or a combination of these shall be provided for personnel to identify, interpret, follow procedures, and to avoid hazards. Label characteristics shall be consistent with the accuracy of identification required, time available for recognition and appropriate response, distance at which the labels must be read, and with label design within and between units. Labels shall be permanent, clear, distinct; and have a high contrast, foreground to background. The weight and appropriate lift restrictions shall be shown on a durable, corrosion resistant plate permanently affixed to the exterior of the container. Guidance on lift restrictions and marking may be found in MIL-HDBK-759. The plate must be legible for the life of the kit.

3.10.1 Identification markings. The kit shall be identified to include item nomenclature, NSN, manufacturer's name, part number, manufacturing date, Commercial and Government Entity (CAGE) code, contract number and serial number following the criteria prescribed in MIL-STD-130.

4. VERIFICATION

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

a. First article inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 First article inspection. When a first article inspection is required, it shall be performed on one complete test kit. The inspection shall include the examination of 4.4 and the testing of 4.5.

4.3 Conformance inspection. Conformance inspection shall include the examination of 4.4.

4.4 Examination. Each test kit shall be examined for the deficiencies listed in Table I. The presence of one or more defects shall be cause for rejection.

TABLE I. Examination.

No.	Examination Description	Reqt Para	Method
101	Components and consumables not as specified	3.4.1 & 3.4.2	Visual/Doc.
102	Container not as specified	3.4.4, 3.4.4.1, 3.4.4.3	Visual/Doc./SIE
103	Component placement not as specified in loading diagram	3.5	Visual/Doc.
104	Weight not as specified	3.4.4.2	Visual/Doc./SIE
105	Protection devices not as specified	3.4.3 & 3.8.2	Visual/Doc.
106	Accessibility not as specified	3.8, 3.8.1, 3.8.2	Visual/Doc./SIE
107	Labeling not as specified	3.10	Visual/Doc.
108	Identification marking not as specified	3.10.1	Visual/Doc.
109	Materials not as specified	3.3, 3.3.1-3.3.3	Visual/Doc.
110	Deterioration prevention and control not as specified	3.3.2	Visual/Doc.
111	Dissimilar metals not protected against galvanic corrosion as specified	3.3.2	Visual/Doc.
112	Treatment/painting not as specified	3.9	Visual/Doc.
113	Visibility device not as specified	3.6.3	Visual/Doc./SIE

Doc. = Documentation, SIE = Standard Inspection Equipment

4.5 Tests. The tests shall be conducted in the following order: 4.5.1.1 through 4.5.1.5 (Performance), 4.5.3.1 (Transportability), 4.5.3.3 (Shock), 4.5.2.5 (Water Resistance), 4.5.3.2 (Vibration), 4.5.2.1 through 4.5.2.4 (High/Low Temp - Storage/Operational)

4.5.1 Performance. Performance testing shall be conducted at room temperature (20 ± 2 °C) unless otherwise specified.

4.5.1.1 Fuel temperature. The test shall be conducted in accordance with API-MPMS Chapter 7 - Section 1. Missing components or supplies required for the test, failure to complete, or to meet applicable criteria shall constitute failure of this test. The equipment and materials needed to complete this test shall be recorded.

4.5.1.2 Fuel Sampling. Fuel sampling shall be conducted in accordance with ASTM D 4057, using the tube sampling procedure. Missing components or supplies required for the test, failure to complete, or inability to collect sample of specified volume (see 3.3.1a) shall constitute failure of this test. The equipment and materials needed to complete this test shall be recorded.

4.5.1.3 Free water and particulate contamination in distillation fuels. The test shall be conducted in accordance with ASTM D 4176, Procedure 1, with a known test sample. Missing components or supplies required for the test or failure to complete shall constitute failure of this test. The equipment and materials needed to complete this test shall be recorded.

4.5.1.4 Flash point by Pensky-Martens closed tester. The test shall be conducted in accordance with ASTM D 93 with a known test sample. Missing components or supplies required for the test, failure to complete, or deviation of a test value from any other test value greater than that cited in the repeatability section of ASTM D 93 shall constitute failure of this test. The equipment and materials needed to complete this test shall be recorded.

4.5.1.5 Distillation of petroleum products. The test shall be conducted in accordance with ASTM D 86 with a known test sample. Missing components or supplies required for the test, failure to complete, or deviation of a test value from any other test value greater than that cited in the repeatability section of ASTM D 86 shall constitute failure of this test. The equipment and materials needed to complete this test shall be recorded.

4.5.1.6 Consumables. The recorded equipment and materials as a result of the tests from 4.5.1.1 to 4.5.1.5 shall be extrapolated to determine whether it meets the requirements to perform initial sampling and at least 10 repetitions of the required tests (section 3.3.1).

4.5.2 Environmental.

4.5.2.1 High Temperature - Storage. The test kit, with the container closed, shall be subjected to a high temperature environment of 63 ± 1 °C for 4 hours, after an initial period of 6 hours at 49 ± 1 °C. Raising and lowering of the temperature shall be accomplished within a period of 1 hour, for a total cycle time of 12 hours. A minimum of seven cycles (84 hours) is required. At completion of the last cycle, adjust chamber air temperature to 20 ± 1 °C and maintain until temperature stabilization of test kit has been achieved. The test procedures outlined in 4.5.1.3 and 4.5.1.4 shall be conducted. In addition to the conformance criteria cited therein, the kit case and packing material shall be examined for deterioration, brittleness, or cracking. Functional failure of the kit components, case, or packing material, or inability to perform tests, or satisfy test precision criteria shall constitute failure of this test.

4.5.2.2 High Temperature - Operational. The test kit, with the container open, shall be subjected to a high temperature of 50 ± 1 ºC for a period of 4 hours. The test procedures outlined in 4.5.1.3 and 4.5.1.4 shall be conducted, while the temperature is maintained at 50 ± 1 °C. In addition to the conformance criteria cited therein, functional failure of the kit components, inability to perform the tests or satisfy test precision criteria shall constitute failure of this test.

4.5.2.3 Low Temperature - Storage. The test kit, with the container closed, shall be subjected to a low temperature environment of -33 ± 1 °C for a period of 48 hours. At the end of this

exposure, adjust the chamber air temperature to 20 ± 1 °C and maintain until temperature stabilization of test kit has been achieved. The test procedures cited in 4.5.1.3 and 4.5.1.4 shall be conducted. In addition to the conformance criteria cited therein, the kit case and packing material shall be examined for deterioration, brittleness, or cracking. Functional failure of the kit components, case, or packing material, or inability to perform tests, or satisfy test precision criteria shall constitute failure of this test.

4.5.2.4 Low Temperature - Operational. The test kit, with the container open, shall be subjected to a low temperature environment of -25 ± 1 °C for a period of 4 hours. At the end of this exposure, while still at -25 ± 1 °C, the test procedures cited in 4.5.1.3 and 4.5.1.4 shall be conducted. In addition to the conformance criteria cited therein, functional failure of the kit components, inability to perform the tests or satisfy test precision criteria shall constitute failure of this test.

4.5.2.5 Water resistance. For the water resistant test, the kit shall be in its transit or storage configuration. A water spray shall be directed through nozzles to cover the parting line between sections of the container, hinge(s), and the carrying handle(s). The spray nozzle shall give uniform water distribution and shall have a flow capacity of not less than 4 liters/minute (1 gallon/minute) at 207 kilopascals to 276 kPa (40 psi) water-line pressure and water temperature between 4±1°C to 24±1°C. Fogging nozzles shall not be used. The spray shall be angled to each of the surfaces so water strikes at an angle between 40° and 90° to the surfaces. Spray time on each container surface shall not be less than 3 minutes continuous. At the conclusion of the test, the container shall be examined visually for water leakage to its interior. Water leakage shall constitute failure of the test.

4.5.3 Transportability.

4.5.3.1 Transportability. The kit shall be put in the transport mode and carried by four persons for a distance of 50 meters (164.0 ft.). The kit shall then be raised, adjusted to level, and locked into position. The contents shall then be examined for damaged items or items not secured. All items shall be removed from their secured position and stacked on the working surface or other convenient area. Components shall be re-packed, using the loading diagram as a guide, the container returned to the transport mode, and carried by four persons for a distance of 50 meters. Upon completion of this test, the kit will be examined for damage to the container and components. The inability to successfully carry the kit the specified distance, inability to repack components per the loading diagram, changes in configuration, or difficulty to repack resulting from improper fit, shall constitute failure of this test. Any permanent deformation, cracks, or damaged items from any cause shall also constitute failure of this test.

4.5.3.2 Vibration. The kit shall endure 40 minutes of vibration in each of 3 axes. The test bed shall produce a 2.5 cm (1.0 inch) double amplitude, orbital path, at 5 Hz minimum. Upon completion of this test, each kit shall be examined for damage to the container and each component and accessory. Damage or breakage of the container or any component of the kit shall constitute failure of this test.

4.5.3.3 Shock. The kit shall be dropped on a 20 cm (8 inch) thick bed of dry sand, from a height of 1.0 m (39 inches). The kit shall be dropped on the two edges along the length of the

bottom and the two edges along the width of the bottom. For edgewise drops, the striking edge of kit shall be parallel with the dropping surface at the instant of release and the kit's center of gravity shall be directly above the striking edge of container at instant of release. Drop tests shall be conducted at -32 ±3°C and 49 ±3°C. The kit temperature shall be at the specified ambient temperature prior to the drop tests. The kit shall be subjected to a total of four drops for each temperature specified. All drops shall be made so that the test kit falls freely through the distance of 1 meter. Upon completion of the drop test at each temperature, the kit shall be examined for damage to the container and each component and accessory. Any permanent deformation, cracks, or damaged items from any cause shall also constitute failure of this test. Any items previously restrained that have detached from its storage compartment shall also constitute failure of this test.

5. PACKAGING.

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from 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 which may be helpful, but is not mandatory.)

6.1 Intended use. The kit is intended for use in the field to perform quality surveillance tests on fuel used in ground equipment. The kit covered by this performance specification is military unique because the tests are performed in a field setting with temperatures ranging from -33° C to 63° C. Commercial equipment is not designed to withstand these harsh environmental conditions.

6.2 Acquisition requirements. Acquisition documents will specify the following:

a. Title, number, and date of this publication.
b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
c. When first article is required (see 3.2).
d. When government-furnished property is to be supplied (see 3.3.2).
e. For Army procurements, when the use of MIL-C-46168 is mandated (see 3.9).
f. Packaging requirements (see 5.1).

6.3 First article inspection. When a first article inspection is required, the item should be a first article production kit. The first article should consist of one complete test kit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, tests, and approval of the first article test results and disposition of the first article.

6.4 Government furnished property. The contracting officer should arrange to furnish the property listed in 3.3.2.

6.5 Data Requirements. The contracting officer should include requirements for such data as parts lists, consumable items lists (including source data), etc., to be furnished with each test kit.

6.6 Definitions.

6.6.1 Dissimilar metals. For the purposes of this specification, metals are dissimilar when two metal specimens in contact with each other promote accelerated galvanic corrosion.

6.6.2 Recycled material. For the purpose of this requirement, recycled materials are those that have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials.

6.6.3 Inspection. Inspection, as used in this specification, is defined as both examination such as visual or auditory investigation without the use of special laboratory appliances or procedures of the unit.

6.6.4 Storage/transit configuration. For the purpose of this specification, storage or transit configuration is when the kit case is closed and locked and the kit's handles are retracted or folded within the envelope of the kit.

6.7 Key Words.

Contaminants
Distillation
Flash point
Free water
Fuel

Custodian
Army - AT

Review Activity:
Army - EA
DLA - DM

Preparing activity:
Army - AT

(Project 6630-0571)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** MIL-PRF-12048E	**2. DOCUMENT DATE (YYMMDD)** 980601

DOCUMENT TITLE **PETROLEUM TESTING KIT, GROUND FUELS**

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include Zip Code)*	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON *(if applicable)*	**7.DATE SUBMITTED** (YYMMDD)

8. PREPARING ACTIVITY

a. NAME USA TARDEC, AMSTA-TR-D/210	b. TELEPHONE *Include Area Code)* (1) Commercial (*810) 574-4102 (2) AUTOVON 786-4102
c. ADDRESS *(Include Zip Code)Commander* US ARMY TANK-AUTOMOTIVE RESEARCH D&E CENTER ATTN: AMSTA-TR-D/210 WARREN, MI 48397-5000	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** DEFENSE QUALITY AND STANDARDIZATION OFFICE 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22401-3466 Telephone (703) 756-2340 AUTOVON 289-2340