

MIL-D-22612C(AS)
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SUPERSEDING
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19 December 1975

MILITARY SPECIFICATION

DETECTOR, CONTAMINATED FUEL

This specification is approved for use by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification establishes the requirements for three types of contaminated fuel detectors.

1.2 Classification. The contaminated fuel detectors covered by this specification shall be classified as follows:

- Type I - Hand operated pump
- Type II - Motorized pump
- Type III - Motorized pump with free water detection capability

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 this specification to the extent specified herein.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, New Jersey 08733, by using the self addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or letter.

FSC 6630

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SPECIFICATIONS

MILITARY

- MIL-T-5624 -Turbine Fuel, Aviation, Grades JP-4 and JP-5
- MIL-D-81248 -Detector Pad, Free Water
- MIL-S-81282 -Standard, Free Water Detector

STANDARDS

- MIL-STD-130 -Identification Marking of U.S. Military Property
- MIL-STD-794 -Parts and Equipment, Procedures For Packaging and Packing of
- DOD-STD-1399/300 -Interface Standard For Shipboard Systems Section 300 Electrical Power, Alternating Current (Metric)

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

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

THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA Publication 70-1978 -National Electrical Code

(Application for copies should be addressed to the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02110.)

(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 First Article. The detectors furnished under this specification shall be products which have been inspected and have passed the first article inspection specified herein (see 4.3).

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3.2 Materials. Materials shall be of the best quality, of the lightest practical weight and suitable for the purpose intended.

3.2.1 Metals. Metals used in the manufacture of the detectors covered by this specification shall be resistant to corrosion due to fuels, salt spray or atmospheric conditions to which the detectors may be subjected when in storage or during normal service life.

3.2.2 Fungus proof materials. Materials which are nutrients for fungi shall not be used in the detectors where it is practical to avoid them. Where used and not hermetically sealed, they shall be treated with a fungicidal agent acceptable to the acquiring activity.

3.3 Construction. Each type detector shall be a portable unit capable of determining the amount of contaminants or free or undissolved water suspended in fuels. The detectors shall be capable of being hand-carried by personnel to a fueling site for the purpose of analyzing fuel for contamination or water content. The detectors shall withstand the normal strains, jars, vibrations and any other conditions incident to service use. Types II and III shall utilize an explosion proof motor.

3.3.1 Weight. The weight of the completely assembled detectors with attachments, components and case, shall be as follows:

Type I - 13.5 kilograms max.
Type II - 20.5 kilograms max.
Type III - 27.0 kilograms max.

3.3.2 Dimensions. The external dimensions of the detectors shall be as follows:

Height - 0.50 meter max.
Width - 0.50 meter max.
Depth - 0.30 meter max.

3.3.3 Drawer. Types II and III detectors shall have a drawer for storage of accessory items such as, membrane filters, forceps, calibration filters, spare fuses, and spare lamps.

3.3.4 Filter receptacle. The filter receptacle shall be of sufficient size to accommodate 47 millimeter diameter membrane filters and shall be of such design as to slide into a stationary photocell housing.

3.3.5 Switches.

3.3.5.1 The photocell light switch shall be designed such that it must be in the "on" position before the pump switch can be activated.

3.3.5.2 The type III detector shall have a momentary switch (toggle type preferred) for the ultraviolet light source which shall require a maximum of 13.8N (3.1 lbf) pressure for activation.

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3.3.6 Light sensitive cell. The light sensitive cell shall be hermetically sealed against moisture and contact with jet fuel. The cell shall be mounted stationary within the filter receptacle housing. Wires entering the light sensitive cell housing shall enter the cell housing through a horizontal side surface of the housing.

3.3.7 Test pad (type III only). The type III detector shall be constructed so that a 47 millimeter diameter test pad can be viewed for comparison with the free water standards under ultraviolet light (3660~~n~~).

3.3.8 Vacuum receivers. The vacuum receivers shall be large enough to contain 800 milliliters of filtered fuel at one time. The drain line of the receiver shall permit complete drainage of the receiver.

3.3.9 Electrical.

3.3.9.1 Power requirements. The detector shall be designed to operate on ungrounded 115 volts AC, 60 Hz and type I shipboard power as defined by DOD-STD-1399/300.

3.3.9.2 Wiring. The external and internal wiring shall be orderly and assembled in such a manner that individual wires may be easily traced.

3.3.9.3 Electrical components safety. Voltage and or amperage regulating devices, transformers and capacitors shall be sealed with a fuel resistant material to prevent contact of fuel or vapors with internal components of the devices. All other electrical components and connections shall be insulated to protect against shock to personnel.

3.3.9.4 Motor (types II and III). The motor shall be an explosion proof type with a current limiting device to prevent overheating in the event of pump malfunction. The motor shall comply with the National Fire Protection Association (NFPA) Publication: 70-1978 National Electric Code Article 500 for group D, class I, division 1 locations.

3.3.9.5 Ammeter. The ammeter shall be capable of being read, without interpolation, in increments of 0.001 milliamperes between zero and one milliampere.

3.3.9.6 Power cord. The external power supply cord shall be a minimum 18-3 grounded cable, at least 5 feet long, with a male "U" ground attachment. The cord shall be capable of being removed from the cabinet for internal storage.

3.3.9.7 Circuit protection. Circuit protection shall consist of panel mounted fuses, which can be replaced from the exterior of the cabinet, or mechanical type circuit breakers, which can be reset from the exterior of the cabinet.

3.3.10 Finish. Unless otherwise specified, painting and finishing of the detectors shall be in accordance with the supplier's standard practice,

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provided the following minimum criteria are met or exceeded: All surfaces to be painted shall have been cleaned so as to be free of all foreign matter detrimental to painting. At least one coat of primer and one top coat or equivalent shall be applied.

3.3.10.1 Color. Unless otherwise specified by the acquiring activity, the detectors shall be furnished in the manufacturer's standard color.

3.3.11 Accessory items.

3.3.11.1 General. All components necessary for filtration and measuring of transmitted light shall be incorporated into each detector. Compartments, holders, and a drawer shall be provided for storage of accessories, such as membrane filters, sampling bottle, squeeze bottle receiver assembly, forceps, tygon plastic drain tubing, two calibration (Wratten) filters, spare fuses, and spare lamp.

3.3.11.2 Bottle receiver assembly. The bottle receiver assembly, provided with each unit, shall consist of a bottle receiver, membrane filter holder, and a ground cable.

3.3.11.3 Sample bottle. A sample bottle with a one-liter capacity shall be provided. The bottle shall be constructed of a shatterproof material which shall be resistant to kerosene. The mouth of the bottle shall be capable of being inserted into the mouth of the vacuum receiver without leakage and shall also be provided with a screw-type cap.

3.3.11.4 Wash bottle. A wash bottle with a 0.5 liter capacity shall be provided. The bottle shall be constructed of a flexible shatterproof material which shall be resistant to kerosene. A fixed dispensing tube type shall be included with the wash bottle.

3.3.11.5 Miscellaneous. Each detector shall also be equipped with forceps (flat tipped), 100 filters (Millipore Corporation catalog number DAWP 04700 or equal), 4 feet of tubing for drainage of receiver, 1 spare lamp, 1 spare frosted glass and 2 spare fuses (except if mechanical circuit breakers are employed). Type III detectors shall be equipped with 100 free water detector pads (47 mm) conforming to MIL-D-81248. The pads shall be supplied to the contractor as Government furnished material (see 6.4).

3.4 Performance.

3.4.1 Current output. The light sensitive cell shall have a current output of 4.8 ± 0.3 microamperes per 10.8 LUX with a linearity factor of 0.80 minimum.

3.4.2 Light source.

3.4.2.1 Light bulb. The light bulb shall be easily accessible for field replacement without the use of tools.

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3.4.2.2 Light intensity. The intensity of the light shall be mechanically or electrically adjustable from the exterior of the cabinet top, so as to provide a meter reading over the range of 0.55 to 0.80 milliamperes.

3.4.2.3 Stability. After a warmup period of three minutes, when set at a meter reading of 0.6, the meter reading shall not drift by more than 0.005 milliamperes in a period of three minutes and shall not fluctuate by more than ± 0.002 milliamperes.

3.4.3 Filtration time. The filtration system of the detectors shall be capable of filtering an 800 milliliter sample of JP-5 fuel conforming to MIL-T-5624 through two 0.65 micron membrane filters in series in a maximum of two and one-half minutes using a minimum vacuum of 25 inches of mercury (see 4.5.2.2).

3.4.4 Free water standard (type III only). There shall be no decrease in fluorescence at the edges of the standard (as a result of positioning of the free water standard) when the type III detector is tested as described in 4.5.2.1.2 and 4.5.2.4. The standard shall conform to MIL-S-81282 and shall be Government furnished (see 6.4).

3.4.5 Viewer assembly (type III only). The viewer assembly on the type III detector shall have the capability of indicating water content of fuel samples in parts per million when tested in accordance with 4.5.2.4. The viewer shall indicate the water content by comparing the detector pad with the four fluorescing standards. If water droplets are present in the sample, they will disperse on the pad and cause the treated pads to fluoresce under an ultraviolet light.

3.5 Identification.

3.5.1 Identification of product. The switches, viewers, accessory slots and other functional external parts of the detectors shall be legibly and durably marked in accordance with MIL-STD-130.

3.6 Service data package. The service data package consisting of materials and manuals, as described below, shall be furnished, in an envelope, with each unit.

3.6.1 Standards (type III only). A total of 3 sets of standards conforming to MIL-S-81282 shall be provided with each type III unit. The standards shall be included in the envelope. Instructions for attaching the standard to the unit shall be included. The standards shall be supplied to the contractor as Government furnished material (see 6.4).

3.6.2 Technical manual. Each data package shall contain two copies of an approved technical manual (see 4.3.1.1). The manual shall include a list of component parts, complete instructions for installation, operation, replacement and maintenance of the unit.

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3.6.3 Calibration curves. Each detector shall have its own calibration curve. This curve shall show the relationship between the difference in the detector milliammeter reading and the actual amount of contaminant in the fuel over the entire scale, expressed in mg/liter or mg/gal. This curve shall appear in the manual accompanying the unit and shall bear the same serial number as the unit. The calibration curve shall be checked in accordance with 4.5.2.3.

3.6.4 Wratten filters. Two Kodak Wratten gelatin neutral density filters (N.D. 0.10 and N.D. 0.20) shall be provided with each unit. All Wratten filters shall be calibrated by the detector manufacturer in accordance with 4.5.2.3 and shall be assigned a number equivalent to a given contamination level. The filters will then be included with the detectors.

3.7 Workmanship. The detectors, including all parts and accessories, shall be fabricated and finished in a workmanlike manner and shall be free from blemishes, defects, burrs, sharp edges and incorrect dimensions and markings of parts and assemblies.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor 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 inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection of the detectors shall consist of all tests and examinations of 4.5.1 through 4.5.2.4 (see 6.2.1).

4.3.1 First article sample. The first article sample shall be one (1) complete unit for test, including the service data package as specified in 3.6. The first article sample shall be a representative production item. The sample shall be plainly identified by a securely attached durably marked tag containing the following information:

FIRST ARTICLE SAMPLE

DETECTOR Contaminated Fuel Types I, II or III, as applicable
Manufacturer's Designation or Number
Name of Manufacturer

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FIRST ARTICLE SAMPLE (cont'd)

Part Number

Submitted by (Name) (Date) for First Article Inspection
in accordance with the requirements of MIL-D-22612C(AS)
under authorization (reference letter authorizing test)

4.3.1.1 Technical manual. As soon as practical, after the award of the contract, the supplier shall forward two (2) copies of the proposed technical manual (see 3.6.2) for review by representatives of the contracting officer. The manuals shall be reviewed, corrected and approved without any delay in delivery of the items. In addition, the supplier shall furnish 15 copies of the approved technical manual to the contracting officer.

4.3.1.1.1 Previously approved manuals. When the supplier has furnished an approved manual for the item within the previous two (2) years, the provision of 4.3.1.1 may be waived upon written request by the supplier to the contracting officer.

4.3.2 Manufacturer's data. The manufacturer shall maintain a file consisting of all test and examination results performed by or for the supplier. The file shall be readily accessible to cognizant Government personnel during the contract term and for a period of three (3) years after delivery of the last item.

4.4. Quality conformance inspection.

4.4.1 Lot. a lot shall consist of all the detectors forming a part of one contract or order and submitted for acceptance at one time.

4.4.2 End item. Each detector shall be subjected to the applicable inspections and tests of 4.5.1 through 4.5.2.4. Any defect or test failure shall be cause to reject the individual detectors.

4.4.3 Packaging. Each package and shipping container shall be examined for conformance to the requirements of section 5 and table I. Any defect shall be cause for rejection.

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TABLE I. Packaging inspection.

Defect	
Packaging	Not level required by contract or purchase order. Material or construction not as specified.
Packing	Not level required by contract or purchase order. Material or construction not as specified. Any nonconforming component, incomplete closures, inadequate strapping, bulged or damaged containers.
Count	Less than specified or indicated quantity per shipping container.
Markings	Warning labels or marking missing. Omitted, illegible, incorrect, incomplete or not in accordance with contract requirements.

4.5 Test methods.

4.5.1 Visual inspection. Each detector shall be examined internally and externally to determine conformance with table II and other requirements of this specification.

TABLE II. Visual inspection.

DEFECT
Unit not complete with all component parts. Unit not free of cracks, tears, dents, or distortion. Unit not free of rocking when placed on a flat surface. Unit not free of sharp edges or burrs. Component parts not properly secured to housing. Type III detector test pad holder not capable of being inserted into housing, or secured within housing, or removed from housing. Line cord not adequately secured within housing. Line cord not free of cuts, tears, or abrasions. Blades of plug (line cord) not properly aligned. Type III detector test pad holder not capable of being held in closed position when viewer assembly is tipped to any angle. Identification marking not complete, legible or permanent. Finish not free of scratches, chips, or blisters. Unit not free of dirt, grease, or foreign matter. Service data package not complete with applicable items in 3.6.

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4.5.2 Operational tests.4.5.2.1 Electrical.

4.5.2.1.1 Light intensity (types I, II and III detectors). When the light intensity is adjusted to its highest value, a reading of 0.80 or higher shall be obtained on the milliammeter. When the adjustment is set to its lowest value, a reading of 0.55 milliamperes or lower shall be obtained.

4.5.2.1.2 Type III detector. Each unit shall be tested to determine proper operation of electrical components and the ultraviolet light (type III only) by providing alternating-current power to the power cord. (see 3.4.4)

4.5.2.2 Filtration time test. The vacuum pump shall be adjusted so that a maximum time of two and one half minutes will be required to complete the filtration process which shall consist of passing 800 ml of clean JP-5 fuel through two 0.65 micron millipore or equal filters. Clean JP-5 fuel is fuel that conforms to MIL-T-5624 and has been filtered through 0.65 micron millipore filters. The flow system should be thoroughly examined to assure no leakage of fuel. (See 3.4.3).

4.5.2.3 Calibration of detector for contaminated fuel.

4.5.2.3.1 Turn the light source switch to the "on" position and allow the light source to warm up for two to three minutes.

4.5.2.3.2 Thoroughly dry the filter receptacle before calibrating. Fuel, which may be on the receptacle surface, could harm the Wratten filters.

4.5.2.3.3 Remove the silver foil-wrapped Wratten calibration filters from their envelopes and unwrap them, leaving the filters exposed in the opened wrapper. The filter should not be exposed any more than necessary to avoid coating the filter with dust. Forceps shall always be used to grasp the filters and the area of contact should be within 1/4 inch of the outer edge of the filter to avoid damaging the effective surface.

4.5.2.3.4 Adjust the light intensity until a steady milliammeter reading of 0.600 is obtained.

4.5.2.3.5 Pick up one of the Wratten filters using the forceps (hold filters only within 1/4 inch of outer edge), insert filter into the filter receptacle, slide the receptacle into the photo cell housing, and record the milliammeter reading. A small chip or crack in the edge of the filter will not affect the reading unless it extends into the illuminated part of the filter, which can be noted, when the filter is in the filter receptacle.

4.5.2.3.6 With forceps, remove the filter from the sliding receptacle and replace in opened wrappings. Replace the sliding receptacle and note milliammeter reading. If the milliammeter reading is not 0.600, readjust light intensity and repeat 4.5.2.3.5.

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4.5.2.3.7 Repeat 4.5.2.3.6 and 4.5.2.3.7 using the second Wratten filter.

4.5.2.3.8 Unless duplicate readings are desired, the light switch should be turned to the "off" position and the Wratten filters wrapped and returned to their envelopes.

4.5.2.3.9 A calibration plot shall be made in which the ordinate shall represent the difference in milliammeter readings from 0.0 to 0.13 milliamps with divisions at every 0.005 milliamps. The abscissa shall represent the amount of contaminant in a fuel from 0.0 to 10.0 milligrams per liter with divisions at every 0.2 milligram per liter and also the equivalent milligrams per gallon with divisions at every 1.0 milligram per gallon.

4.5.2.3.10 To obtain the calibration point, subtract the lower of the two milliammeter readings of the Wratten filters from the higher reading. This difference (change in reading) is plotted on the calibration chart versus the weight of contaminant per liter given for the set of filters supplied. A second point is plotted at 0 milligrams per liter and 0.01 milliamps change in light reading. Draw a straight line between the two points and extend the line to the edge of the chart. This line is the calibration line for the detector used.

4.5.2.4 Test of standards (type III detector). The standards shall be positioned in the box so that the forward edge shall be flush with the overhanging edge of the standard retainer strip. The fluorescence shall be observed. In lieu of actual performance of such testing by the contractor, the acceptance of the first article sample (see 4.3) shall be considered as complying with requirements of 3.4.4 and 3.4.5.

5. PACKAGING

5.1 Preservation, packaging, packing and marking. The level of preservation, packaging, packing and marking shall be in accordance with MIL-STD-794 and shall be as specified in the contract or order (see 6.2).

5.1.1 Intermediate packaging. Intermediate packaging is not required.

5.1.2 Unit package. One detector shall constitute a unit of issue and shall be considered a unit package.

5.2 Envelope. An envelope containing the applicable items covered in 3.6 shall be packaged with each detector and shall be legibly and durably marked with the following information:

IMPORTANT

(Types I and II detectors)

This envelope contains technical manuals, calibration curves and Wratten filters.

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(Type III detectors)

This envelope contains technical manuals, calibration curves, Wratten filters and free water standards.

6. NOTES

6.1 Intended use. The detectors covered by this specification are intended for use at Naval shore activities and aboard ships where fuel is dispensed to aircraft. The basic contaminated fuel detector is a portable instrument which is utilized to quickly determine the quantity of solid contamination present in aircraft fuels. The detector processes a sample of an aircraft fuel on site in usually three to four minutes, and establishes the level of contamination in the fuel. The level of contamination is measured by using the principle of differences in light transmission through membrane filters. For greater accuracy and to eliminate any fuel color effect, the two membrane filters are used in series. The first filter traps the solid contaminant, plus any fuel color effect. The second filter is subjected to only fuel color effects. The light transmission through the two filters is measured by a light sensitive cell system. Determining the difference between the amount of light transmitted through the contaminated and clean filters establishes the level of solid contamination in the fuel. The established level is evaluated with the calibration curve supplied with each detector to ascertain if the fuel is contaminated beyond required limits. All components necessary for filtration and measuring of transmitted light are incorporated into this one serviceable instrument.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. Type of instrument (see 1.2).
- c. Total quantity desired.
- d. Selection of applicable levels of preservation, packaging and packing (see 5.1).
- e. Warning and special markings when required.
- f. Finish and color other than manufacturer's standard (see 3.3.8).
- g. Items of data required (see 6.3).
- h. Whether first article is required (see 6.2.1).

6.2.1 First article. When a first article is required for inspection and approval (see 3.1, 4.3, 6.2, 6.2.1 and 6.3), the contract should specify the following provisions for first article inspection. When a contractor is in continuous production of these contaminated fuel detectors from

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contract to contract, consideration should be given to waive the first article inspections. If inspection is required, indicate:

- a. If first article inspections² are conducted at the contractor's plant or at a Government approved laboratory, an inspection report should be forwarded to the acquiring activity for verification.
- b. That the approval of first article samples or the waiving of the first article inspection should not relieve the contractor of his obligation to fulfill all other requirements of the specification and contract.

6.3 Contract data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423 and invokes the provisions of 7-104.9(n) of the Defense Acquisition Regulations (DAR), the data requirements identified below should be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of DAR-7-104.9(n) are not invoked, the data specified below should be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this specification is cited in the following paragraphs:

Paragraph	Data Requirement	Applicable DID
3.6.2 and 3.6.3	Technical manuals and calibration curves	UDI-M-21368 - manuals, technical
4.3	First article inspection reports	DI-T-5329 - inspection test reports
4.4	Quality conformance inspection reports	DI-T-5329 - inspection test reports

(Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the acquiring activity or as directed by the contracting officer.)

6.4 Government furnished parts. To each successful bidder, the Government should furnish the following for each type III unit:

- a. Three sets of standards conforming to MIL-S-81282
- b. One-hundred free water detector pads conforming to MIL-D-81248

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Preparing activity
Navy - AS
Project No. (6630-N329)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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DOCUMENT IDENTIFIER (Number) AND TITLE

MIL-D-22612C(AS) DETECTOR, CONTAMINATED FUEL
NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

1. ☐ HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? ☐ IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

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