INCH-POUND

MIL-DTL-62011D
7 September 1999
SUPERSEDING
MIL-P-62011C(AT)
20 November 1986

DETAIL SPECIFICATION

PUMP, FUEL, ELECTRICALLY-OPERATED: 24-VOLT DC, IN-TANK TYPE

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

1. SCOPE

1.1 Scope. This specification covers electrically-operated 24-volt (V), direct current (dc), in-tank fuel pumps capable of delivering 200 gallons per hour (gph) with outlet pressure at 4 pounds per square inch gauge (psig) (see 6.1).

1.2 Classification. Pumps are classified as the following types (see 3.3.6):

Type I - Top-mounted connector.
Type II - Side-mounted connector.

2. APPLICABLE DOCUMENTS

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be of use in improving this document should be addressed to: Defense Logistics Agency, Defense Supply Center, Columbus (DSCC-VAI), P.O. Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 2910

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 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).

SPECIFICATIONS

FEDERAL

A-A-52557	-	Fuel Oil, Diesel; For Posts, Camps, and Stations
QQ-N-290	-	Nickel Plating (Electro Deposited)
QQ-P-416	-	Plating, Cadmium (Electro Deposited)

DEPARTMENT OF DEFENSE

MIL-G-3056	-	Gasoline, Automotive, Combat

STANDARDS

FEDERAL

FED-STD-H28	-	Screw-Thread Standards for Federal Services

DEPARTMENT OF DEFENSE

MIL-STD-130	-	Identification Marking of US Military Property
MIL-STD-202	-	Test Methods for Electronic and Electrical Component Parts
MIL-STD-461	-	Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility
MIL-STD-462	-	Measurement of Electromagnetic Interference Characteristics
MIL-STD-810	-	Environmental Test Methods and Engineering Guidelines

(Unless otherwise indicated, copies of the above specifications and standards are available from the Defense Automated Printing Service, DODSSP, 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 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 SOCIETY OF TESTING and MATERIALS (ASTM)

ASTM D 471 - Standard Test Method for Rubber Property-Effect of Liquids (DoD adopted)

ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Material to Fungi (DoD adopted)

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

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

ANSI/SAE J962 - Formed Tube Ends for Hose Connection (DoD adopted)

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001, or the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

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 4.3.

3.2 Materials.

3.2.1 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 cost.

3.2.2 Protective treatment. Exposed metal parts other than those made of corrosion resistant steel shall be plated to resist corrosion. Plating shall be based upon the materials selected for the pump parts.

3.2.2.1 Cadmium plating. If cadmium plating is required, it is recommended that it be used only when other platings cannot meet performance requirements. If used, the plating shall be as follows:

a. For cable end connectors, cadmium plate shall conform to type I, class 1 of QQ-P-416.

b. For the cushion retainer, pump cover, and discharge tube fitting, cadmium plate shall conform to type II, class 2 of QQ-P-416.

c. For screws, cadmium plate shall conform to type II, class 3 of QQ-P-416.

3.2.2.2 Nickel plating. If nickel plating is required, it is recommended that it be used only when other platings cannot meet performance requirements. If used for electrical connectors and the motor assembly, the nickel plate shall conform to class 2, grade B of QQ-N-290.

3.3 Design and construction. The pump shall be an electrically-operated 27.5-volt dc in-tank type pump conforming to the envelope dimensions on figure 1. The pump shall be designed to be mounted vertically within a fuel tank.

3.3.1 Motor assembly. The motor assembly shall be hermetically sealed.

3.3.2 Pump cover. The pump cover shall be secured to the pump assembly using positive means (e.g., rivets, staked pins, or screws) at a minimum of two places (see figure 1). The specific method and location is optional.

3.3.3 Threaded parts. All screw threads shall conform to FED-STD-H28.

3.3.4 Dissimilar metals. Except where necessary to complete an electrical circuit, contact between dissimilar metals that would encourage galvanic corrosion shall be avoided. Where such contact is not necessary to complete an electrical circuit, but is otherwise unavoidable, surfaces shall be insulated.

3.3.5 Inlet screen. The inlet area of the pump shall be covered by a screen of either wire fabric industrial grade monel or stainless steel 18 x 18 mesh with 0.017-inch diameter wire (see figure 1).

3.3.6 Cable. The type I pump shall be provided with a top-mounted connector, and the type II pump shall be provided with a side-mounted connector conforming to figure 1. A flexible shielded cable, as defined on figure 1, of a specified length may be provided (see 6.2). The cable shall incorporate a grounding connection for the shielding braid. An independent ground connection shall be used for both types of pumps.

3.4 Performance.

3.4.1 Pressure and flow. The pump pressure and flow characteristics shall equal or exceed those illustrated by the curves shown on figure 2 with the pump motor current not exceeding 4.5 amperes under any of these operating conditions at 800 feet elevation.

3.4.2 Pumpdown. The pump shall equal or exceed the pressures and flow rates on figure 2 at all fuel levels 1.5 inches or more above the lowest point of the pump. When pump delivery drops to 0 gph, air pressure developed in the fuel line shall not exceed 0.5 psig.

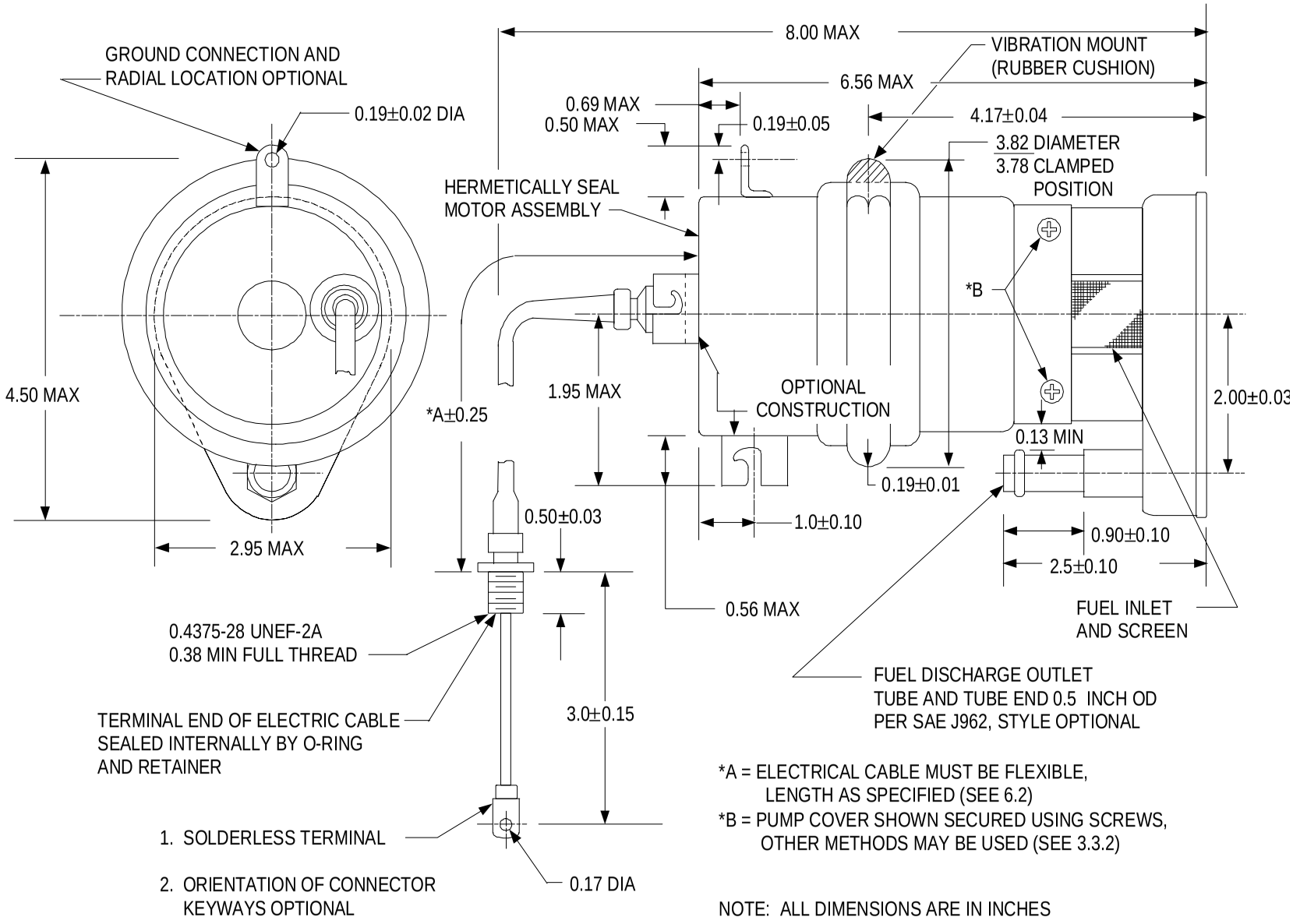

FIGURE 1. Fuel pump envelope dimensions.

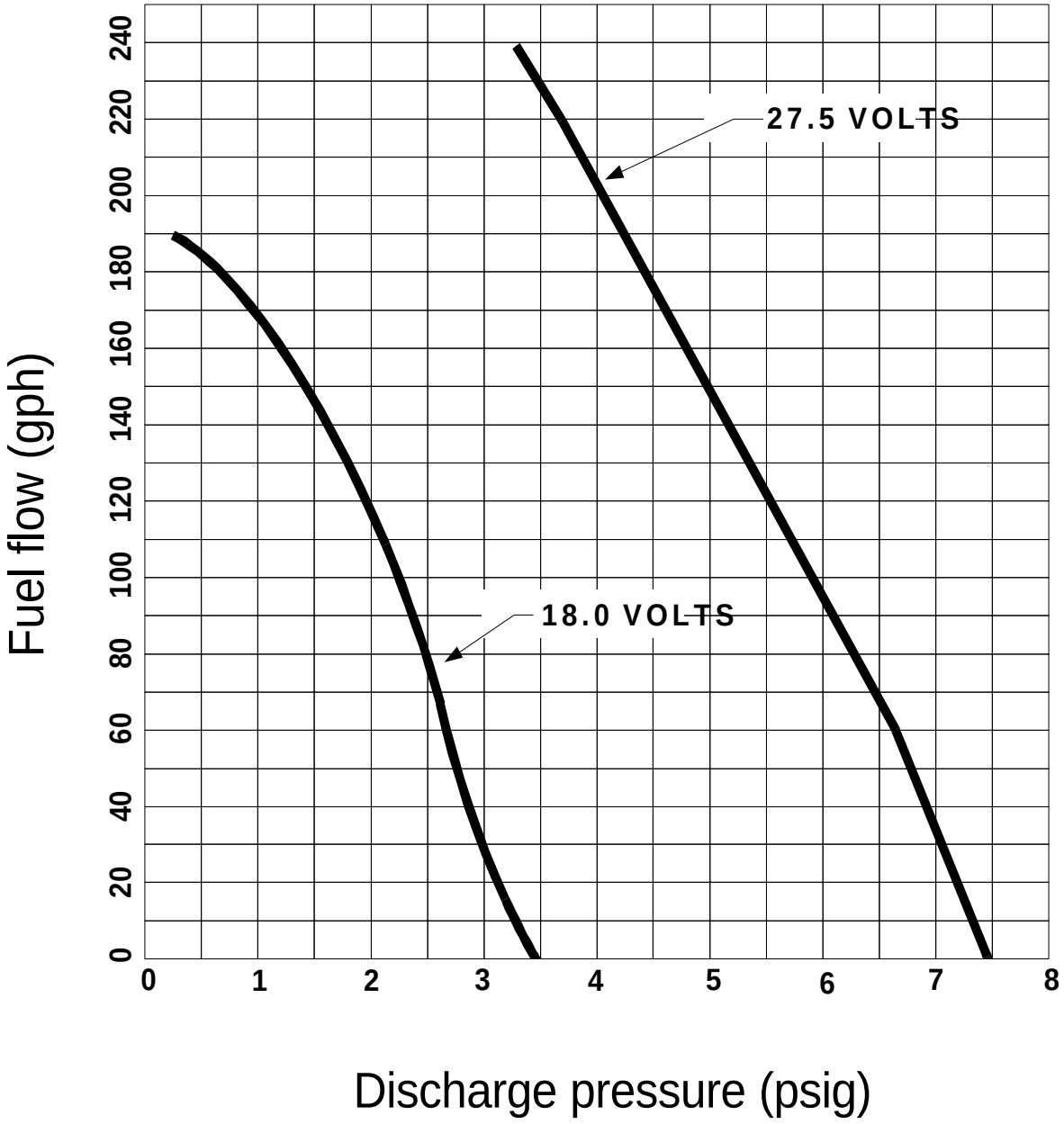

FIGURE 2. Pressure and flow characteristics.

3.4.3 Dry operation. The pump shall be capable of withstanding operation in a dry fuel tank for a period of not less than 4 hours, without evidence of damage or impairment of performance.

3.4.4 Electromagnetic compatibility. The pump shall meet the CE102 requirements of MIL-STD-461 pertaining to military vehicles. If a radio frequency noise filter is required, the radio-frequency noise filter shall be an integral part of the pump.

3.4.5 Dielectric strength. The pump insulation shall show no loosening, cracking, charring, burning, smoking, rupture, or other damage with the internal ground and radio suppressor ground strap(s) disconnected.

3.4.6 Vapor separation. The pump shall equal or exceed the pressures and flow rates on figure 2 with fuel at 155 °F. When the pump inlet is removed from the heated fuel and then re-submerged, the pump shall re-establish that performance within a period of 5 seconds.

3.4.7 Flow through. The minimum flow at the pump outlet shall be not less than 60 gph when the pump is electrically disconnected and the pump is subjected to either a 1 psig pressure at the pump inlet or, where a pump by-pass system is used, a vacuum of approximately 2 inches of mercury at the pump outlet.

3.4.8 On-off cycling. The pump shall equal or exceed the pressures and flow rates on figure 2 within 3 seconds after power is turned off and then reapplied.

3.4.9 Endurance. The pump shall equal or exceed the pressures and flow rates on figure 2 after not less than 1,500 hours of continuous operation. The pump shall require no maintenance during this time period.

3.4.10 Coupling capability (static). The pump delivery shall reach a minimum of 200 gph at 4 psig within 60 seconds of starting.

3.4.11 Coupling capability (dynamic). An operating pump shall start pumping within 5 seconds after immersion, and the impeller shall not decouple.

3.4.12 Electrical continuity. The electrical resistance between the pump housing and the wire braid on the power cable, and between the 0.4375-28 UNEF-2A thread and the wire braid, shall be less than 1 ohm. See figure 1 for the locations of these items.

3.5 Environmental requirements.

3.5.1 Low and high temperature operation. The pump shall equal or exceed the pressures and flow rates on figure 2 at any temperature between -65 and 130 °F.

3.5.2 Explosion-proofness. The pump shall not cause ignition of an explosive fuel mixture.

3.5.3 Shock resistance. The pump shall withstand, without damage or impairment of performance, a shock of 25 gravity units (g) applied in the direction of each of the three major axes.

3.5.4 Vibration resistance. The pump shall not malfunction and shall equal or exceed the pressures and flow rates on figure 2 when exposed to vibrations between 10 and 55 Hz with an amplitude of 0.03 inches.

3.5.5 Fungus resistance. The pump shall be fungus resistant.

3.5.6 Fuel resistance. Pump elastomeric parts (if used) that contact fuel shall be fuel resistant.

3.5.7 Contaminated fuel. The pump shall equal or exceed the pressures and flow rates on figure 2 after being exposed to or operated with contaminated fuel.

3.5.8 Corrosion resistance. The pump shall be corrosion resistant.

3.5.9 Temperature shock. The pump shall withstand exposure to temperature shock.

3.5.10 Humidity. The pump shall withstand exposure to humid conditions.

3.6 Marking. The pump shall be marked for identification in accordance with MIL-STD-130. Marking shall be permanent with the location optional, and shall include the following information:

a. Operating voltage.

b. Military part or identifying number (PIN).

c. Name or CAGE Code of manufacturer.

d. Date of manufacture.

3.7 Workmanship. The pump shall be free of burrs, rust, scratches, chips, sharp edges, loose or defective connectors, cracked insulation, faulty soldering, or other defects that may adversely affect the operability, serviceability, or appearance of the pump.

4. VERIFICATION

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

a. First article inspection (see 4.3 and 6.2).

b. Conformance inspection (see 4.4).

4.1.1 Requirement - verification cross-reference matrix. Table I provides a cross-reference of each requirement in section 3 with its corresponding verification in section 4.

TABLE I. Requirement - verification cross-reference matrix.

Title	Requirement	Verification
Materials	3.2	4.5.1
Recycled, recovered, or environmentally preferable materials	3.2.1	4.5.1
Protective treatment	3.2.2	4.5.1
Cadmium plating	3.2.2.1	4.5.1
Nickel plating	3.2.2.2	4.5.1
Design and construction	3.3	4.5.1
Motor assembly	3.3.1	4.5.2
Pump cover	3.3.2	4.5.1
Threaded parts	3.3.3	4.5.1
Dissimilar metals	3.3.4	4.5.1
Inlet screen	3.3.5	4.5.1
Cable	3.3.6	4.5.1
Performance	3.4	-
Pressure and flow	3.4.1	4.5.3
Pumpdown	3.4.2	4.5.4
Dry operation	3.4.3	4.5.5
Electromagnetic compatibility	3.4.4	4.5.1 & 4.5.6
Dielectric strength	3.4.5	4.5.7
Vapor separation	3.4.6	4.5.8
Flow through	3.4.7	4.5.9
On-off cycling	3.4.8	4.5.10
Endurance	3.4.9	4.5.11
Coupling capability (static)	3.4.10	4.5.12
Coupling capability (dynamic)	3.4.11	4.5.13
Electrical resistance	3.4.12	4.5.14
Environmental requirements	3.5	-
Low and high temperature	3.5.1	4.5.15.1 & 4.5.15.2
Explosion-proofing	3.5.2	4.5.16
Shock resistance	3.5.3	4.5.17
Vibration resistance	3.5.4	4.5.18
Fungus resistance	3.5.5	4.5.19
Fuel resistance	3.5.6	4.5.20
Contaminated fuel	3.5.7	4.5.21
Corrosion resistance	3.5.8	4.5.22
Temperature shock	3.5.9	4.5.23
Humidity	3.5.10	4.5.24
Marking	3.6	4.5.1
Workmanship	3.7	4.5.1

4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed under the following conditions.

4.2.1 Atmospheric conditions. Unless otherwise specified (see 6.2), all inspections shall be conducted under the following atmospheric conditions:

a. Air temperature: 77±20 °F.

b. Barometric pressure: 28.5+2, -3 inches of mercury (725+50, -75 millimeters of mercury).

c. Relative humidity: 50±30 percent.

4.2.2 Operating voltage. The operating voltage of the pump shall be 27.5±0.1 V dc.

4.2.3 Test fuel. Fuel used for testing shall conform to grade 2-D of A-A-52557.

4.2.4 Test apparatus. The inspection apparatus shall include a fuel tank or tanks suitably equipped to mount the pump within the test fluid with the fuel inlet at least 2 inches below fluid level. Means shall be provided within the apparatus to re-circulate test fuel and to control test fuel temperature at any point between -65 and 160 °F. The apparatus shall include an electrical source, ranging from 0 to 32 V dc, to operate the pump. The electrical source shall maintain any voltage setting and shall not drop more than 0.5 volts in 1 millisecond (measured with an oscilloscope) when the pump is energized. Monitoring devices shall also be included to determine gph flow rate, psig of pressure generated by the pump, and electrical loads. The pressure gauge tap shall be located in a 0.5 inch (nominal) inside diameter discharge line, 6 to 8 inches from the discharge fitting on the pump. The pressure gauge reading shall be 0 psig with pump stopped and fuel lines full.

4.2.5 Tolerances. Unless otherwise specified, all tolerances of the test apparatus shall be ±10 percent.

4.2.6 Mounting position. All tests shall be conducted with the pump in its normal mounting position in which the longitudinal axis of the pump is vertical.

4.3 First article inspection. Unless otherwise specified (see 6.2), five randomly selected pumps, properly marked with identifying information, from the first 20 pumps produced under the production contract shall be subjected to a first article inspection. The pumps shall be inspected and tested as specified and in the order listed in table II. First article sample pumps shall be fully representative of pumps to be supplied from production tooling and facilities.

4.4 Conformance inspection. Conformance inspection shall consist of both the individual inspection of 4.4.1 and the sampling inspection of 4.4.2.

TABLE II. First article inspection.

Article number	Test Title	Paragraph and inspection sequence
1	Coupling capability (static)	4.5.12
	Pressure and flow test	4.5.3
	Flow through	4.5.9
	Pressure and flow test	4.5.3
	Dry operation	4.5.5
	On-off cycling	4.5.10
	Pressure and flow test	4.5.3
	Vibration resistance	4.5.18
	Shock resistance	4.5.17
	Fuel resistance *(See note)*	4.5.20
2	Coupling capability (dynamic)	4.5.13
	Pressure and flow test	4.5.3
	Pumpdown	4.5.4
	Low temperature operation	4.5.15.1
	High temperature operation	4.5.15.2
	Fungus resistance	4.5.19
	Temperature shock	4.5.23
3	Coupling capability (static)	4.5.12
	Pressure and flow test	4.5.3
	Endurance	4.5.11
	Electrical continuity	4.5.14
4	Coupling capability (dynamic)	4.5.13
	Pressure and flow test	4.5.3
	Vapor separation	4.5.8
	Contaminated fuel	4.5.21
	Corrosion resistance	4.5.22
	Humidity	4.5.24
	Explosion-proofness	4.5.16
5	Coupling capability (static)	4.5.12
	Pressure and flow test	4.5.3
	Electromagnetic compatibility	4.5.6
	Dielectric strength	4.5.7
	Hermetic sealing	4.5.2

Note: Applicable only to pumps utilizing elastomeric components in contact with fuel.

4.4.1 Individual inspection. Each pump shall be subjected to the inspections and tests specified, and in the order listed, in table III.

TABLE III. Individual inspection.

Test	Paragraph
Examination of product	4.5.1
Pressure and flow test	4.5.3
Pumpdown	4.5.4
Coupling capability (static)	4.5.12
Coupling capability (dynamic)	4.5.13
Hermetic sealing	4.5.2

4.4.2 Sampling inspection. When a single procurement involves less than 100 pumps, one of the first 10 pumps produced shall be randomly selected and tested. When a single procurement involves 100 pumps or more, one of the first 10 pumps and one of each block of pumps, up to 500 pumps per block, produced thereafter shall be randomly selected and tested. Each pump selected shall be subjected to tests specified, and in the order listed, in table IV.

TABLE IV. Sampling inspection.

Test	Paragraph
Dry operation	4.5.5
On-off cycling	4.5.10
Pressure and flow test	4.5.3
Vibration resistance	4.5.18

4.5 Examinations and tests.

4.5.1 Examination of product. Each pump and its manufacturing records shall be examined to verify conformance to this specification with respect to materials, design and construction (except for hermetic sealing of the motor assembly), marking, and workmanship.

4.5.2 Hermetic Sealing. The pump shall be totally submerged under water in a test chamber for approximately 5 minutes. A vacuum of not less than 3 psig shall be pulled on the test chamber during this test period. The pump shall be monitored to verify no leakage, as evidenced by no stream of air bubbles.

4.5.3 Pressure and flow test. The pump shall be mounted in the test apparatus, test fuel added, and all fluid and electrical lines connected. The pump shall be operated at 18±0.1 and 27.5±0.1 V dc. Pressure readings at various flow rates shall be made.

4.5.4 Pumpdown. The pump shall be mounted and operated as specified in 4.5.3, with the following exceptions:

a. Test fuel discharged by the pump shall not be allowed to re-enter the tank.

b. The pump shall be operated until performance below that specified on figure 2 recurs consistently.

c. The fuel level shall be observed and the level at which pump delivery and discharge pressure deteriorates shall be noted.

d. After pump delivery drops to 0 gph, the discharge line shall be closed and air pressure developed by the pump shall be measured.

4.5.5 Dry operation. The pump shall be mounted in the test apparatus, test fuel added and all fluid and electrical lines connected. The pump shall be operated at a minimum obtainable discharge pressure. While the pump is operating, the fuel tank shall be drained to a level below the pump inlet. The pump shall be continuously operated without fuel for a period of not less than 4 hours. Thereafter, the test fluid level shall be raised until the pump is again submerged to a fluid level at least 2 inches above the fuel inlet and the pump shall be tested as specified in 4.5.3.

4.5.6 Electromagnetic compatibility. The pump shall be tested for conducted emissions in accordance with method CE102 of MIL-STD-462.

4.5.7 Dielectric strength. The pump motor housing shall be disassembled, or cut open to the extent necessary, to permit the internal ground connection to be disconnected or isolated and to permit observation of internal wiring. The motor shall be observed for a period of 1 minute while being subjected to 500 V root mean square (rms) at a frequency of 60 Hz, applied between conductor and ground.

4.5.8 Vapor separation. The test apparatus in 4.2.4 shall be modified by adding a means to return vaporized fluid to the tank through condensation. A means shall also be provided to lift or tilt the pump to allow the pump inlet to be raised above the fluid level. The pump shall be mounted in the test apparatus tank and fluid and electrical lines connected. The tank shall be filled with fresh gasoline (not previously used in high temperature testing) conforming to type II of MIL-G-3056. The gasoline shall be heated to 155±5 °F and during this heating period the pump shall be operated so as to maintain delivery at 150 gph. After the gasoline reaches the specified temperature, the pump shall be lifted or tilted to the extent necessary to uncover the inlet area. The pump shall be re-submerged and the time necessary to re-establish flow rate shall be monitored. The pump shall be tilted or lifted and time monitored a total of 5 times. The pump's performance shall be measured throughout the test.

4.5.9 Flow through. The pump shall be mounted in the test apparatus, all fluid lines connected, and test fuel added. The electrical lines shall not be connected. While the pump is electrically and mechanically inert, a pressure of 1 psig shall be exerted on the fuel at the pump inlet or, where a pump by-pass system is used, a vacuum of approximately 2 inches of mercury shall be applied at the pump outlet. The flow rate developed at the pump outlet shall be measured and be at least 60 gph.

4.5.10 On-off cycling. The pump shall be mounted in the test apparatus, all fluid and electrical lines connected, and test fuel added. The pump shall be subjected to 1,440 cycles of operation. Each cycle shall consist of 15 seconds of operating and 15 seconds of non-operating time. A time delay of 3 seconds after initiation of each cycle will be allowed prior to measurement, to permit the pump to come up to required values. The pump performance shall be measured throughout the tests.

4.5.11 Endurance. The pump shall be mounted in the test apparatus, all fluid and electrical lines connected, and test fuel added. The pump shall be operated for a total of not less than 1,500 hours in accordance with the schedule and test fuel specified in table V. Throughout the test period, the pump performance shall measured. Following completion of the endurance test, the pump shall be tested as specified in 4.5.3.

TABLE V. Endurance test schedule.

Fuel (see note 1)	Temperature	Test period (hours)
Grade 2-D	77±10 °F	1,450
Grade 2-D (see note 2)	-60±5 °F	50

Notes:
1. As specified in A-A-52557.
2. Same as note 1, except that the cloud point shall be -65 °F or lower.

4.5.12 Coupling capability (static). The pump shall be mounted in the test apparatus and the tank filled with test fuel to a level of at least 2 inches above the fuel pump. The operating voltage (see 4.2.2) shall be applied to the pump and pump discharge pressure shall be adjusted to 4 psig. This voltage shall then be removed and the pump delivery allowed to return to zero gph. Within a maximum of 30 seconds after the pump delivery returns to zero, a terminal voltage of 32+0, -0.1 V dc shall be applied and the flow rate and pressure measured.

4.5.13 Coupling capability (dynamic). The pump, without brackets and with a 12-inch (min.) discharge hose attached, shall be installed in the test apparatus. The tank shall be filled with test fuel to a level at least 4 inches above the base of the pump. The pump shall be adjusted to deliver 150 gph at the operating voltage (see 4.2.2). The pump shall be lifted at least 3 inches above the fuel. When the pump stops pumping, it shall be forcefully submerged in the fuel to approximately

the same depth and the time to start pumping measured. The test shall be performed three times. In addition, the test shall be repeated three times with the vertical axis of the pump at 45° to the fuel surface.

4.5.14 Electrical continuity. The electrical resistance between the pump housing and the wire braid on the power cable, and between the 0.4375-28 UNEF-2A thread and the wire braid, shall be measured using an ohmmeter.

4.5.15 Low and high temperature operation.

4.5.15.1 Low temperature operation. The test apparatus tank shall be filled to a level at least 2 inches above the pump. The test fuel shall conform to grade 2-D of A-A-52557, except that the cloud point shall be -65 °F or lower. The temperature of the tank and its contents shall be lowered to -65+5, -0 °F and maintained at that temperature for at least 16 hours. The pump shall then be operated at 18±0.1 and 27.5±0.1 V dc and the pressure and flow rate measured.

4.5.15.2 High temperature operation. A test tank shall be filled to a level at least 2 inches above the pump. The tank and its contents shall be heated to a temperature of 125±5 °F and maintained at that temperature for at least 4 hours. The pump shall then be operated at 18±0.1 and 27.5±0.1 V dc and the pressure and flow rate measured.

4.5.16 Explosion-proofness. An unused dry pump shall be installed in the test chamber of 4.5.16.1 and gasoline conforming to type I of MIL-G-3056 shall be vaporized and drawn into the chamber. The quantity of gasoline used shall be calculated to result in an air fuel ratio within limits of 13:1 to 15:1 (by weight). The pump shall then be operated for a period of 15 minutes. Immediately after the 15 minute pump operation, the mixture in the chamber shall be ignited to verify that an explosive mixture existed during the test period. Withdrawal of the mixture sample for explosive mixture testing in a separate vessel is an allowable alternate procedure.

4.5.16.1 Explosion test chamber. The test shall be conducted in a test chamber having the following features:

a. A pressure release system that operates when an explosion occurs within the chamber.

b. A hinged or removable pressure-sealed door large enough to permit installation of the pump.

c. A means of circulating vapors within the chamber.

d. An observation window.

e. Cable ports with pressure-tight seals.

4.5.17 Shock resistance. The pump shall be subjected to shock testing in accordance with method 516, procedure I, of MIL-STD-810. A half-sine shock pulse of 25g shall be applied, for 18 milliseconds nominal duration, once in the direction of each of the three major axes. The pump shall then be tested as specified in 4.5.3.

4.5.18 Vibration resistance. The pump shall be installed in the test apparatus and the entire system subjected to the vibration test in accordance with method 201 of MIL-STD-202. If resonance is encountered during this test, the pump shall be vibrated at the resonant frequency for a period of 6 hours along each of the three major axes, and the pump pressure and flow rate measured.

4.5.19 Fungus resistance. The pump shall be tested in accordance with class 1, method B of ASTM G21, except that incubation shall be for a single period of 90 days. Subsequently, the pump shall be tested as specified in 4.5.3.

4.5.20 Fuel resistance. Any pump using elastomeric parts that come in contact with fuel shall be subjected to fuel resistance testing. The test shall be as specified in table VI. The pump shall be mounted in the test apparatus and operated for 2 hours per day, except for the first 48 hours of phase I and phase III. Subsequently, the pump shall be tested as specified in 4.5.3.

TABLE VI. Fuel resistance test schedule.

Phase	Hours	Medium	Temperature
I Soak	168	ASTM Reference Fuel B (see note)	75±5 °F
II Dry	4	Air	155±5 °F
III Soak	168	ASTM Reference Fuel B (see note)	75±5 °F
IV Dry	4	Air	155±5 °F

Note: ASTM Reference Fuel B is described in ASTM D 471.

4.5.21 Contaminated fuel. The pump shall be mounted in the test apparatus and the tank filled with contaminated test fluid composed of ASTM Reference Fuel B and the contaminants specified in table VII. The tank shall be filled to a level at least 2 inches above the pump. The pump shall be operated to deliver a minimum of 220 gph for a period of 3 hours and subsequently 25 gph for another period of 3 hours. The pump shall then be flushed out with clear test fluid and tested in accordance with 4.5.3.

4.5.22 Corrosion resistance. The pump shall be tested in accordance with method 101 of MIL-STD-202 for a period of 100 hours, except that a 20 percent salt solution shall be used. Following completion of the corrosion resistance test, the pump shall be tested as specified in 4.5.3.

TABLE VII. Contaminated test fluid.

Contaminant	Particle size	Quantity
Iron oxide	0-5 microns	28.5 gm/400 gal.
Iron oxide	5-10 microns	1.5 gm/400 gal
Sharp silica sand	150-300 microns	1.0 gm/400 gal
Sharp silica sand	300-400 microns	1.0 gm/400 gal
Prepared dirt conforming to coarse Arizona test dust (see 6.3)	Mixture as follows: 0-5 microns (12%) 5-10 microns (12%) 10-12 microns (14%) 20-40 microns (23%) 40-80 microns (30%) 80-200 microns (9%)	8.0 gm/400 gal
Lint *(see note)*	As collected	0.1 gm/400 gal.
Crude naphthenic acid		0.03% by volume
Salt water (solution shall contain 4 parts NaCl to 96 parts H_2O by weight)		0.01% entrained

Note: Obtained by tumbling laundered cotton denim cloth in a tumbling machine (clothes drier).

4.5.23 Temperature shock. The pump shall be tested in accordance with method 503 of MIL-STD-810. Following completion of the temperature shock test, the pump shall be tested as specified in 4.5.3.

4.5.24 Humidity. The pump shall be tested in accordance with method 507 of MIL-STD-810. Following completion of the humidity test, the pump shall be tested as specified in 4.5.3.

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 the Inventory Control Point packaging activity within the Military Department or Defense Agency, or within the Military Department's Systems Command. Packaging data retrieval is available from the managing Military Department or Defense Agency 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. This specification has been retained as a military detail specification because of the unique military requirements for the use of the pump in the fuel systems of military vehicles operating in an environment from -65 to 130 °F.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

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. If first article inspection is required (see 3.1), and if the number of first article samples is other than as specified (see 4.3).

d. If the flexible shielded cable is required and its length (see 3.3.6).

e. If atmospheric conditions for inspection is other than as specified (see 4.2.1).

f. Packaging requirements (see 5.1).

6.3 Contaminated solid. The test dust described in ISO 12103-1, *Road vehicles -- Test dust for filter evaluation -- Part 1; Arizona test dust*, may be used for fuel pump testing (see table VI).

6.4 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. Requirements common to US Army drawings 10946915 and 10947344 have been incorporated into this specification to make this specification a stand-alone document.

CONCLUDING MATERIAL

Custodians:
Army - AT
Air Force - 99
DLA - CC
Navy - AS

Preparing activity:
DLA - CC

(Project 2910-0245)

Review activities:
Air Force - 82

Civil Agency Coordinating Activities:
GSA - FCAE

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-DTL-62011D**	2. DOCUMENT DATE *(YYYYMMDD)* **19990907**

3. DOCUMENT TITLE

Pump, Fuel, Electrically-Operated: 24-Volt DC, In-Tank Type

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) DSN *(if applicable)*	7. DATE SUBMITTED (YYYYMMDD)

8. PREPARING ACTIVITY

a. NAME **Defense Logistics Agency** **Defense Supply Center, Columbus**	b. TELEPHONE *(Include Area Code)* (1) Commercial **(614) 692-0538** (2) DSN **850-0538**
c. ADDRESS *(Include Zip Code)* **DSCC-VAI** **P.O. Box 3990** **Columbus, Ohio 43216-5000**	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** **Defense Standardization Program Office** **8725 John J. Kingman Road, Suite 2533** **Fort Belvoir, Virginia 22060-6621** **Telephone (703) 767-6888 DSN 427-6888**