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SUPERSEDING
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MILITARY SPECIFICATION

ENGINE COLD STARTING AIDS, ETHER FUEL PRIMERS

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

1. SCOPE

1.1 Scope. This specification covers primer equipment for adding controlled quantities of engine priming fuel to internal combustion engines of commercial equipment as an aid in starting at low temperatures.

1.2 Classification. The primer equipment shall be one of the following types, sizes, and styles, as specified (see 6.2):

Type I - Breech-loading, 5cc cartridge, primer equipment system.

Style 1 - Single breech primer.

Style 2 - Twin breech primer.

Style 3 - Three unit manifold, breech primer.

Style 4 - Four unit manifold, breech primer.

Style 5 - Five unit manifold, breech primer.

Type II - Aerosol propellant primer equipment system, 12 oz aerosol can.

Size 3 - 3cc discharge.

Size 5 - 5cc discharge.

Size 10 - 10cc discharge.

Type III - Gas propellant primer equipment system, 20 oz cylinder.

Size 2 - 2-1/2cc discharge.

Size 4 - 4cc discharge.

Size 5 - 5cc discharge.

Size 6 - 6cc discharge.

Size 12 - 12cc discharge.

Type IV - Manually pumped primer equipment system.

Size 3 - 3cc discharge.

Size 5 - 5cc discharge.

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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:

SPECIFICATIONS

Federal

- | | |
|-----------|---|
| O-F-1044 | - Fuel, Engine Primer: Cold Starting, in Pressurized and Nonpressurized Containers. |
| QQ-P-416 | - Plating, Cadmium (Electrodeposited). |
| QQ-S-781 | - Strapping, Steel, and Seals. |
| QQ-Z-325 | - Zinc Coating, Electrodeposited, Requirements for. |
| PPP-B-601 | - Boxes, Wood, Cleated-Plywood. |
| PPP-B-636 | - Boxes, Shipping, Fiberboard. |

Military

- | | |
|-----------|---------------------------------------|
| MIL-P-116 | - Preservation-Packaging Methods of. |
| MIL-E-199 | - Ether, Diethyl, Technical. |
| MIL-T-704 | - Treatment and Painting of Materiel. |

STANDARDS

Military

- | | |
|-------------|--|
| MIL-STD-105 | - Sampling Procedures and Tables for Inspection by Attributes. |
| MIL-STD-129 | - Marking for Shipment and Storage. |
| MS39254 | - Cylinder, Engine Starting (Engine Cold-Starting Aid). |
| MS51325 | - Cartridge, Engine Starting (Engine Cold-Starting Aid). |

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

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

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UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, ATTN: Tariff Publishing Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., ATTN: Tariff Order Section, 1616 P Street, NW, Washington, DC 20036.)

NATIONAL BUREAU OF STANDARDS

Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

DEPARTMENT OF TRANSPORTATION

49 CFR 100-199 and 171-190 - Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

3. REQUIREMENTS

3.1 Description. The primer equipment shall consist of a permanently mounted frame accepting one of the engine primer fuel containers, or pump and reservoir assembly, utilizing bulk primer fuel as specified in O-F-1044, a remote controlled device for metering the discharge through safety accessories, a discharge tube, and intake manifold dispensing nozzles.

3.2 First article (preproduction model). The supplier shall furnish one primer equipment for examination and testing within the time frame specified

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(see 6.2) to prove prior to starting production that his production methods and choice of design detail will produce primer equipment that comply with the requirements of this specification. Examination and tests shall be as specified in Section 4 and shall be subject to surveillance and approval by the Government (see 6.3).

3.3 Material. Material shall be as specified herein. Material not specified shall be selected by the supplier and shall be subject to all provisions of this specification. Mounting frames and metering devices shall be made from corrosion-resisting metals, nylon, or steel either cadmium plated in accordance with QQ-P-416, Type III, Class 3 or zinc-coated in accordance with QQ-Z-325, Type III, Class 3. The remote control cables, when applicable, shall be of corrosion-resisting steel or lubricated and encased in plastic sleeves.

3.4 Performance. The primer equipment shall operate to discharge a repeatable volume of fuel within 0.5cc of the specified volume, without leakage, in temperatures ranging from minus 65° F to plus 100° F for 1,000 cycles. Plastics, rubbers, and fibers utilized in the fabrication of primer equipment shall remain functional after immersion in diethyl ether at 73° F plus or minus 2.5° F for 14 days.

3.5 Type I, breech-loading, 5cc cartridge primer equipment. Type I, breech-loading primer equipment, shall receive a cartridge conforming to MS51325 of 9cc volume charged with 5gm of engine primer fuel with propellant in accordance with O-F-1044. The breech-receiver shall seal the shoulder of the enclosed cartridge on a plastic grommet and simultaneously puncture the metal sealed orifice as the cantilever cap is closed. The cartridge shall discharge the engine primer fuel through an atomizer by using a flexible copper or nylon tube. The primer equipment shall be wall mountable in single or multiple units, spaced for operator accessibility.

3.5.1 Style 1. Single-breech primer equipment shall apply to single-unit applications.

3.5.2 Style 2. Twin-breech primer equipment shall apply to twin-unit applications with each unit equipped with a check valve allowing one primer to be opened for recharging while the second primer is discharging engine primer fuel.

3.5.3 Style 3. Three unit breech primer equipment shall apply to manifold application of primer units and shall include a check valve for each primer unit, allowing primer to be opened for recharging while remaining primers are discharging engine primer fuel.

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3.5.4 Style 4. Four unit breech primer equipment shall apply to manifold application of primer units and shall include a check valve for each primer unit, allowing primer to be opened for recharging while remaining primers are discharging engine primer fuel.

3.5.5 Style 5. Five unit breech primer equipment shall apply to manifold application of primer units and shall include a check valve for each primer unit, allowing primer to be opened for recharging while remaining primers are discharging engine primer fuel.

3.6 Type II, aerosol propellant primer equipment. Type II priming equipment shall utilize 12-ounce aerosol cans conforming to DOT 49 CFR 171-190, Specification 2P or 2Q, charged with engine primer fuel with propellant as specified in O-F-1044, Type II. The primer fuel container shall be attached to the mounting by a friction, over-center type, or screw-type clamping device providing a leak-free connection. The primer mounting shall fix and support the fuel container vertically, and shall stabilize the container. The clamping device shall permit changing of the fuel container by an operator wearing arctic mittens. Control shall be by mechanical or electro-mechanical linkage. The metering device shall be double acting. The primary action shall open the container valve to allow the fuel and propellant gas to flow into an isolated chamber in the volume specified by the applicable size. The secondary action of the metering valve shall allow the container valve to close to prevent continued flow, and at the same time the chamber outlet valve shall open, allowing the accumulated gas to propel the charge of fuel through flexible copper or nylon tubing to the atomizer.

3.6.1 Size 3. Size 3 primer shall deliver 3cc plus or minus 0.5cc of primer fuel at the atomizer during one operating cycle.

3.6.2 Size 5. Size 5 primer shall deliver 5cc plus or minus 0.5cc of primer fuel at the atomizer during one operating cycle.

3.6.3 Size 10. Size 10 primer shall deliver 10cc plus or minus 0.5cc of primer fuel at the atomizer during one operating cycle.

3.7 Type III, gas propellant priming equipment. Type III priming equipment shall utilize a 20-ounce cylinder conforming to MS39254 charged with engine primer fuel with propellant as specified in O-F-1044, Type III. The primer equipment shall be attached to the primer fuel container by screw threads conforming to Handbook H28 and a gasket shall be provided for a leak-free connection. The primer equipment mounting shall fix and support the fuel container vertically and shall prohibit movement horizontally. The mount shall hold the container by a friction, over-center type, or screw-type

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clamping device. The clamping device shall permit changing of the fuel container by an operator wearing arctic mittens. Control shall be by mechanical or electro-mechanical linkage. The metering device shall be double acting. The primary action shall open the container valve to allow the fuel and propellant gas to flow into an isolated chamber in the volume specified by the applicable size. The secondary action of the metering valve shall allow the container valve to close to prevent continued flow, and at the same time the chamber outlet valve shall open allowing the accumulated gas to propel the charge of primer fuel through flexible copper or nylon tubing to the atomizer.

3.7.1 Size 3. Size 3 primer shall deliver 2-1/2cc plus or minus 0.5cc of primer fuel at the atomizer during each operating cycle.

3.7.2 Size 4. Size 4 primer shall deliver 4cc plus or minus 0.5cc of primer fuel at the atomizer during each operating cycle.

3.7.3 Size 5. Size 5 primer shall deliver 5cc plus or minus 0.5cc of primer fuel at the atomizer during one operating cycle.

3.7.4 Size 6. Size 6 primer shall deliver 6cc plus or minus 0.5cc of primer fuel at the atomizer during one operating cycle.

3.7.5 Size 12. Size 12 primer shall deliver 12cc plus or minus 1.0cc of primer fuel at the atomizer during one operating cycle.

3.8 Type IV, manually pumped primer equipment. The Type IV primer equipment shall include a manual pump assembly of double acting design and a reservoir. Upon multiple activations of the pump, the primer device shall eject contents through flexible copper or nylon tubing to the atomizer. The reservoir shall be not more than 25cc capacity and shall be equipped with a closure preventing escape of fumes and entrance of dirt. The pump and reservoir of the primer equipment shall bolt to the dash-plate and shall be made from one diecasting of aluminum or aluminum alloys.

3.8.1 Size 3. Size 3 manually pumped primer equipment shall be calibrated to propel 3cc plus or minus 0.5cc of engine primer fuel through the atomizer by operating the pump through one cycle.

3.8.2 Size 5. Size 5 manually pumped primer equipment shall be calibrated to propel 5cc plus or minus 0.5cc of engine primer fuel through the atomizer by operating the pump through one cycle.

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3.9 Safety accessories. When specified (see 6.2), thermal controls to protect an engine against ether injection after warmup, and cranking controls to protect against hydraulic block by excessive ether injection prior to cranking shall be furnished.

3.9.1 Temperature control. When a thermal control is specified either of the following types may be furnished.

3.9.1.1 Engine coolant temperature control. The temperature control device shall receive thermal energy from the cooling system. The device shall prevent the flow of ether when the coolant temperature rises above 100° F. Upon cooling, the device shall open to allow ether flow at 50° F or below engine coolant temperature.

3.9.1.2 Engine manifold temperature control. The temperature control device shall receive thermal energy from the exhaust manifold. The device shall receive the flow of ether when the exhaust manifold temperature rises above 140° F. Upon cooling, the device shall allow ether flow at 50° F or below exhaust manifold temperature.

3.9.2 Cranking control. The cranking control shall be a pressure-sensitive valve. The valve shall be normally closed, inhibiting the flow of primer fuel between the metering equipment and the air induction system. The valve shall open at an oil pressure of not more than 5 psi and will close when oil pressure falls below 3 psi. The control design shall be such that primer fuel can only be injected into the manifold when oil pressure due to cranking reaches 5 psi and above. The pressure sensor shall have 1/8-inch pipe threads in accordance with Handbook H28.

3.9.3 Temperature and pressure control combination. When applicable, safety controls may be furnished separately or in combination. For combination use utilizing the pressure-sensitive valve (see 3.9.2), the thermal valve (see 3.9.1) shall be placed in the primer line between the metering device and the oil-pressure sensor plug. This combination will inhibit injection of primer fuel when the oil pressure of the engine is below 3 psi, and when the block temperature of the engine rises above 50° F.

3.10 Painting. Unless otherwise specified (see 6.2), the painting of the primer equipment shall be the supplier's standard. When specified (see 6.2), painting shall be in accordance with MIL-T-704, Type A or B, Color No. 34087.

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3.11 Marking. Marking shall be as follows:

- (a) The capacity of the metered primer fuel output as specified by given size.
- (b) Supplier's name and model as applicable.
- (c) Other markings as required by DOT (CFR49 parts 100-199) or other Government requirements as specified by other pertinent Government regulatory bodies.

3.12 Workmanship. Components and assemblies of the primer equipment including seals, stampings, and moldings shall be clean and free from fins, sharp edges, pits, or scratches. Each primer shall be complete and function smoothly and to its specified capacity.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Component and material inspection. The supplier is responsible for insuring that components and materials used are manufactured, examined, and tested in accordance with referenced specifications and standards.

4.2 Classification of inspections. Inspections shall be classified as follows:

- (a) Preproduction inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).
- (c) Inspection of preparation for delivery (see 4.6).

4.3 Preproduction inspection.

4.3.1 Examination. The preproduction primer equipment shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

4.3.2 Tests. The preproduction primer equipment shall be tested as specified in 4.5.2. Failure of any test shall be cause for rejection.

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4.4 Quality conformance inspection.

4.4.1 Sampling. Sampling for examination and tests shall be in accordance with MIL-STD-105.

4.4.1.1 Lot. A lot shall consist of primer equipment of the same type, size, or style offered for inspection at one time.

4.4.2 Examination. Samples selected in accordance with 4.4.1 shall be examined as specified in 4.5.1. Inspection level shall be III. AQL shall be 1.5 percent defective for major defects and 4.0 percent defective for minor defects.

4.4.3 Tests. Samples selected in accordance with 4.4.1 shall be tested as specified in 4.5.2. Inspection level shall be S-3. AQL shall be 1.5 percent defective.

4.5 Inspection procedure.

4.5.1 Examination. The primer equipment shall be examined for the following defects:

Major

101. Type, size, and style of primer equipment not as specified.
102. Mounting frame not as specified.
103. Material not as specified.
104. Control cables not as specified.
105. Safety accessories not as specified.

Minor

201. Painting not as specified.
202. Marking not as specified.
203. Handbook of instructions missing.
204. Workmanship not as specified.

4.5.2 Tests. Tests shall be conducted in the following order.

4.5.2.1 Diethyl ether stability. Gaskets, O-rings, moldings, and all non-metallic material utilized in any sample primer equipment shall be tested for stability in ether as follows:

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- (a) Place nonmetallic parts of a sample in a 400 ml glass beaker and immerse with diethyl ether conforming to MIL-E-199. Cover with a watchglass and place in a ventilated space maintained at 73° F plus or minus 2.5° F for 14 days.
- (b) Remove parts from ether and allow to air-dry for 1 hour.
- (c) Reassemble the primer equipment sample and proceed with the endurance test.

Any swelling, hardening, or softening rendering a nonmetallic part as unfit for the endurance test (see 4.5.2.2) shall constitute failure of this test.

4.5.2.2 Endurance. Cold soak the primer equipment at a temperature of not higher than minus 65° F for a minimum of 4 hours. Using primer fuel conforming to O-F-1044, subject the cold soaked primer equipment to 1,000 cycles of simulated use at an ambient temperature not higher than minus 65° F. Non-conformance to 3.4, binding of components, breakage, or inability to complete the test shall constitute failure of this test.

4.5.2.3 Thermal stability and discharge volume. Establish the discharge volume for the type, style, and size of primer equipment to be tested as follows:

- (a) Weigh cylinder and complete primer device.
- (b) Discharge 10 shots (pausing 6 seconds after pulling lever to allow chamber to fill and 6 seconds to allow it to empty).
- (c) Reweigh cylinder and primer device. The difference in weight is the total discharge of primer (or primer and propellant) as appropriate.
- (d) Taking the average weight of the 10 shots, convert to primer volume as follows:

$$\text{Primer Volume} = \frac{(\text{Average shot weight}) (91.3\%)}{\text{Specific gravity ether at discharge temperature}}$$

Average shot weight = From (c) above.

91.3% = Empirically arrived at percent of ether in total discharge.

Specific gravity ether = Supplied from data published by ether supplier (U.S.I.).

Any breakage, leaking, sticking, or binding of components, or a deviation in the specified discharge of volume of fuel shall constitute failure of this test.

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4.6 Inspection of preparation for delivery.

4.6.1 Quality conformance inspection of pack.

4.6.1.1 Unit of product. For the purpose of inspection, a completed pack prepared for shipment shall be considered a unit of product.

4.6.1.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

4.6.1.3 Examination. Samples selected in accordance with 4.6.1.2 shall be examined for the following defects. AQL shall be 2.5 percent defective.

- 106. Materials, methods, and containers not as specified for Level A or B. Each incorrect material, method, or container shall constitute one defect.
- 107. Boxes not closed and sealed as specified for Level A.
- 108. Primer equipment of unlike description packed together for Level A or B.
- 109. Gross weight or size exceeds the limitation of the box specification for Level A or B.
- 110. Strapping not as specified for Level A.
- 111. Marking illegible, incomplete, incorrect, or missing.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be Level A or C as specified (see 6.2).

5.1.1 Level A. Each primer equipment shall be packaged in accordance with MIL-P-116, Method III. The container shall be a box conforming to PPP-B-636, Grade W6c, style optional. The box shall be closed and sealed as specified for Method V in the appendix to the box specification.

5.1.2 Level C. The primer equipment shall be packaged in containers in a manner to afford protection against damage from the supplier to the initial destination. The supplier's standard practice will be acceptable provided it fulfills these requirements.

5.2 Packing. Packing shall be Level A, B, or C, as specified (see 6.2).

5.2.1 Level A. The primer equipment of like description packaged as specified in 5.1, shall be packed together in a close-fitting box conforming to PPP-B-601, Overseas Type. The box shall be closed and strapped in accordance with the appendix to the box specification. Strapping shall conform

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to QQ-S-781, Class 1, Type I or IV, size as applicable. Unless otherwise specified (see 6.2), strapping shall be Finish B. When specified (see 6.2), strapping shall be Finish A.

5.2.2 Level B. The primer equipment of like description, packaged as specified in 5.1, shall be packed together in a close-fitting box conforming to PPP-B-636, V3c, style optional the gross weight or size shall not exceed the limitations of the box specification.

5.2.3 Level C. The primer equipment shall be packed for shipment in a manner to assure carrier acceptance and safe delivery to destination at lowest rating in compliance with Uniform Freight Classification rules and National Motor Freight Classification rules.

5.3. Marking. Packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The priming equipment is intended as permanent installation for cold starting internal combustion engines, utilizing ether engine primer fuel in accordance with O-F-1044. If type, size, or style is not specified, then Type III, Size 3 or 4 shall be provided.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type, size, or style of primer equipment required (see 1.2).
- (c) Time frame required for submission of preproduction model (see 3.2).
- (d) When thermal or cranking controls are required (see 3.9).
- (e) When military painting is required (see 3.10).
- (f) Level of packaging and level of packing required (see 5.1 and 5.2).
- (g) When other than Finish B strapping is required (see 5.2.1).

6.3 Preproduction model. Any changes or deviations of production primer equipment from the approved preproduction model during production will be subject to the approval of the contracting officer. Approval of the preproduction model will not relieve the supplier of his obligation to furnish primer equipment conforming to this specification.

6.4 Data requirements. The contracting officer should include requirements for such data as technical publications, instructional materials, and supplier's maintenance and operation manual to be furnished with each primer equipment.

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6.5 Classification changes. Changes in classification of the primer equipment between this revision of the specification and the previous edition are as follows:

Old Designation

Type III, Size 3, 3cc

None

None

Custodians:

Army - ME

Air Force - 82

Review activities:

Army - AT

DSA - CS

New Designation

None (deleted)

Type III, Size 2, 2-1/2cc

Type III, Size 12, 12cc

Preparing activity:

Army - ME

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