

INCH-POUND

MIL-PRF-52666F

23 September 1998

SUPERSEDING

(See 6.6)

PERFORMANCE SPECIFICATION

FILTER/SEPARATORS, LIQUID FUEL

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

1 SCOPE

1.1 Scope. This specification covers 15-, 50-, 100-, and 350-gallon-per-minute (gpm) filter/separators for use in removing undissolved water and solid contaminants from petroleum fuels.

1.2 Classification. Filter/separators (F/S) covered by this specification are of the following types and classes as specified (see 6.2):

- Type I - 15 gpm (57 liters/min) F/S, frame mounted.
- Type II - 50 gpm (189 liters/min) F/S.
 - Class A - Frame mounted.
 - Class B - Unmounted.
- Type III - 100 gpm (379 liters/min) F/S, frame mounted.
- Type IV - 350 gpm (1325 liters/min) F/S, frame mounted.

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 requirement 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 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 4330

Distribution Statement A. Approved for public release, distribution is unlimited.

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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

DEPARTMENT OF DEFENSE

MIL-PRF-52308 - Filter Element, Fluid Pressure.

STANDARDS

FEDERAL

FED-STD-595 - Colors used in Government Procurement.

DEPARTMENT OF DEFENSE

MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Documents 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 FOR TESTING AND MATERIALS (ASTM)

ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
 ASTM D 1655 - Standard Specification for Aviation Turbine Fuel.
 ASTM D 2276 - Standard Test Method for Particulate Contaminant in Aviation Fuel by Line Sampling.
 ASTM D 3240 - Standard Test Method for Undissolved Water in Aviation Turbine Fuels.
 ASTM F 1122 - Standard Specification for Quick Disconnect Couplings

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

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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), complete F/S unit(s) shall be subjected to first article inspection in accordance with 4.2.

3.2 Materials. The manufacturer shall select materials for F/S capable of meeting all the operational and environmental requirements specified herein. All metal parts in contact with the fuel shall be free of zinc, cadmium, copper and their alloys. The use of lightweight materials, such as composites, should be considered. Materials used shall be compatible with petroleum fuels containing water and inhibitors as specified in MIL-PRF-52308 with no evidence of deleterious effect. The materials specified herein are recommended, but are not mandatory. Recycled, recovered or environmentally preferable materials shall be used to the maximum extent possible (see 6.7). The F/S should have a minimum useful life of 15 years.

3.2.1 Material deterioration, prevention and control. The F/S shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide corrosion and deterioration protection for the F/S's expected service life in any operating and storage environment.

3.2.2 Dissimilar metals. Dissimilar metals shall not be used in intimate contact with each other unless protected against galvanic corrosion.

3.2.3 Identification of materials and finishes. The contractor shall identify the specific material, material finish or treatment for use with component and subcomponent and shall make information available upon request to the contracting officer or designated representative.

3.3 Operational requirements. The F/S shall be lightweight, portable, durable and capable of being assembled/disassembled in 30 minutes or less to replace expendable components.

3.3.1 Military fuels and additives. The F/S specified herein shall satisfactorily process all aviation, diesel and motor fuels, for ground and shipboard use, containing the maximum allowable concentrations of all required and allowed fuel additives at the prescribed flow rates.

3.3.2 Water removal. The F/S shall remove water at the maximum water injection rate of 5 percent (%) at 115 % of rated flow. The effluent fuel samples shall contain not greater than 5 parts per million (ppm) by volume of undissolved water when measured with a type II or type III Aqua-Glo water detector, in accordance with ASTM D 3240. (Results to the nearest whole number as ppm of undissolved water in fuel.)

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3.3.3 Flow conditions. The F/S shall meet the performance requirements as specified herein on an intermittent and continuous flow basis. The F/S shall continue to perform satisfactorily when subjected to pressure surges resulting from supply pump start and stop, and the opening and closing of dispensing nozzles and system valves.

3.3.4 Chemical and biological threats. The F/S shall survive chemical or biological attack and be capable of being decontaminated using standard agents and procedures. There is no requirement for nuclear hardening.

3.3.5 Hydrostatic pressure. Each F/S, as a minimum, shall be capable of withstanding the hydrostatic test pressure specified for a period of 10 minutes:

Type I	60 psi (4.14 bars)
Type II (both classes)	115 psi (7.93 bars)
Type III	115 psi (7.93 bars)
Type IV	225 psi (15.52 bars)

The maximum working pressure shall be equal to 2/3 of the hydrostatic pressure.

3.3.6 Differential pressure. The differential pressure measure across the inlet and outlet couplings of the F/S, with the filter-coalescer element(s) and separator stages installed, shall not exceed 10 psi at any flow rate up to 115 % of rated flow. The differential pressure without the filter-coalescer element(s) and separator stages installed shall not exceed 5 psi.

3.3.7 Differential pressure dial gauge. Each F/S shall be provided with a differential pressure dial gauge or device that shall provide the actual reading of differential pressure across the F/S without manipulation of valves or subtraction of pressure readings. Accuracy of the gauge or device shall be plus or minus 2 psi ($\pm .138$ bars).

3.3.8 Adapter and sampling probe. When specified (see 6.2), each of the F/S, except the Type I F/S, shall be furnished with an adapter and sampling probe that can be used on the outlet side of the F/S. Figure 1 is an example of a suitable adapter. The sampling probe shown in the figure shall be as specified in ASTM D 2276 and ASTM D 3240. See 3.5.3 for the coupling interface size.

3.3.9 Controls.

3.3.9.1 Water drain valve. Each F/S shall be provided with a device to drain the water before it reaches the bottom of the element(s). There shall be no leakage when the device is not functioning to discharge water.

3.3.9.2 Water level sight gauge. Each F/S shall be provided with a device that shall show the amount of water within the F/S. A mark on this device shall be provided to indicate when the water should be discharged.

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3.3.9.3 Air relief valve. Each F/S shall be provided with a device to manually vent trapped air from the top of the F/S.

3.4 Environmental requirements.

3.4.1 Operational temperatures. The F/S shall permit rated flow during and after exposure to ambient temperatures ranging from minus 25°F (-32°C) to plus 140°F (60°C).

3.4.2 Storage temperatures. The F/S shall withstand storage in temperatures ranging from minus 50°F (-46°C) to plus 160°F (71°C), after which they shall perform as specified herein.

3.4.3 Sand and dust. The F/S shall permit rated flow during and after exposure to a desert environment.

3.4.4 Salt Spray. The F/S shall permit rated flow during and after exposure to a salty sea atmosphere.

3.4.5 Vibration and shock. The F/S shall withstand the vibration of being transported by a 5-ton cargo truck, over cross-country tactical terrain, at an average speed of 8 mph (13 kph) for a total of 100 miles. The F/S shall withstand the dynamic shock of being dropped on an 8 inches (20 cm) thick bed of dry sand, from a height of 60 inches (152.4 cm). Breakage of the frame or damage to the F/S or components shall constitute a failure.

3.5 Interface Requirements. The F/S shall conform to the following interface requirements.

3.5.1 Filter-coalescer element. The F/S shall incorporate the Government furnished (see 3.8) filter-coalescer element(s) conforming to Figure 2, which have a flow rate of 20 gpm.

3.5.2 Separator stages. The F/S shall incorporate Government furnished (see 3.8) separator stages (see 6.8) for use with elements defined in 3.5.1.

3.5.3 F/S inlet and outlet interfaces. Unless otherwise specified (see 6.2), the inlet fitting for the F/S shall be a female, quick-disconnect, cam-locking coupling in accordance with ASTM F 122, provided with a mating dust plug and connecting chain. The outlet fitting for the F/S shall be a male, quick-disconnect, cam-locking coupling in accordance with ASTM F 1122, provided with a mating dust cap and connecting chain. The inlet and outlet connections' sizes shall be:

- Type I – 1-inch.
- Type II – 1½-inch.
- Type III – 2-inch
- Type IV – 4-inch

F/S that use drybreak, single sex, hose fittings and/or snap-over-center couplings may be considered if previously approved by the contracting officer.

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3.5.4 Dimensions and weights. The F/S shall be configured to present low silhouettes and have low centers of gravity. The F/S shall not exceed the following dimensions or weight, with the filter-coalescer element(s) and separator stages installed, including protective frames that are required.

TABLE I. F/S maximum dimensions and maximum weights.

Type	Dimension (inches) (H x W x L)	Weight (pounds)
I	27 x 14 x 22	37
II, Class A	36 x 17 x 20	74
II, Class B	33 x 17 x 16	74
III	34 x 20 x 24	74
IV	40 x 33 x 47	196

3.5.4.1 Type II, class B F/S. The interface configuration requirements for the Type II, Class B, F/S are shown in Figure 3.

3.6 Treatment and painting. Unless otherwise specified (see 6.2), the exterior of the F/S 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 no. 34094 of FED-STD-595 shall be used as a guide. Camouflage pattern painting may be required (see 6.2).

3.7 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 permanently affixed to the F/S and located on or very near the items that they identify, so as to eliminate confusion with other items and labels. Labels shall be clear, distinct, corrosion resistant; and have a high contrast, foreground to background. Labels shall be easy to read accurately from the operational reading distances and in the anticipated vibration, motion, and illumination environments.

3.7.1 Identification marking. The F/S shall be marked with the item nomenclature, NSN, manufacturer's name, part number, manufacturing date and Commercial and Government Entity Code (CAGEC).

3.7.2 Information markings. The F/S shall be marked with the following information, "DRAIN WATER DAILY OR WHEN FLOAT REACHES MARK", "INLET", "OUTLET", and "WARNING MAXIMUM WORKING PRESSURE (see 3.3.5) PSI".

3.7.3 Instruction markings. The F/S shall be marked with the operation instructions and any other instructions specified (see 6.2).

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3.8 Government-furnished property. The Government shall furnish the number of filter-coalescer elements and separator stages shown in table II for each F/S in the contract or purchase order (see 6.10). Half of the filter-coalescer elements furnished for each F/S shall be installed in the F/S, and half shall be shipped with each F/S as replacements. When a first article inspection is specified (see 6.2), an additional set or sets of filter-coalescer elements shall be furnished by the Government to support testing. If a manufacturer requires a different number of filter-coalescer elements than specified in table II, the contracting officer shall be notified.

TABLE II. Government-furnished property.

Filter/Separator Type	NUMBER OF F-C ELEMENTS FURNISHED	NUMBER OF SEPARATOR STAGES FURNISHED
Type I	2	1
Type II (Both Classes)	8	4
Type III	10	5
Type IV	36	18

3.9 Interchangeability. All components and parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable and shall be replaceable with each other with respect to installation and performance.

3.10 Human engineering. Human engineering criteria, principles and practices (see 6.11) shall be considered as part of the F/S. For example, the F/S shall be capable of being transported and operated by 5th through 95th percentile military personnel wearing gloves or mittens.

3.11 Reliability. When specified (see 6.2), the F/S shall decontaminate military fuels to the cleanliness level specified herein for at least 20 hours per day, with four hours per day allowed for scheduled and unscheduled maintenance and repair.

3.11.1 Mean-time-between-failure. The specified mean-time-between-failure (MTBF) shall be 140 hours when the F/S is operated at rated capacity and tested as specified in 4.5.2.8.

3.12 Maintenance ratio. The F/S should have a maintenance ratio of not greater than 0.03. Maintenance ratio is defined as the ratio of the total active maintenance man-hours required (scheduled and unscheduled) to the total operating time. Man-hours for repair of replaced components, and scheduled before-and-after-operation checks are excluded. A maintenance schedule shall be established prior to start of any testing.

4 VERIFICATION

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

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- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall be performed on complete F/S unit(s), as specified in 6.3, when a first article sample is required (see 3.1). The inspection shall include the examinations of 4.5.1 and the tests in 4.5.2. When specified (see 6.2), first article inspection shall include a user evaluation inspection to include one or more of the examinations and tests included in this document.

4.3 Conformance inspection.

4.3.1 Examination. The F/S shall be examined for the defects specified in 4.5.1. The presence of one or more defects shall be cause for rejection.

4.3.2 Testing. The F/S shall be tested as specified in 4.5.2.3. Failure of this test shall be cause for rejection.

4.4 Inspection conditions. The appendix describes an acceptable facility and general requirements for testing the F/S. The manufacturers testing facility shall be subject to approval by the Government. The facility shall contain calibrated and certified measuring equipment.

4.4.1 Test fuel. The test fuel shall be Jet A or Jet A-1 fuel conforming to ASTM D 1655 or equivalent.

4.4.2 Test fuel temperature. Unless otherwise specified (see 6.2), the test fuel temperature for each test shall be in the range of plus 40°F (5°C) to plus 86°F (30°C). The temperature shall not vary greater than plus or minus 5°F ($\pm 3^\circ\text{C}$) from the starting temperature of any individual test set or test series.

4.4.3 Test contaminants. Fresh tap water with an undissolved solids content of less than 1.0 mg/L, and having a surface tension of not less than 65 dynes/cm at 24°C, shall be used. The acidity-alkalinity value (pH) shall be between 5 and 8.

4.4.4 Test sampling procedures and data. The test sampling procedures shall be in accordance with the first article and conformance inspection instructions provided by the Government. Figure 4 is an example of a typical test report form.

4.5 Inspection procedures.

4.5.1 Examinations. The F/S shall be examined as specified for the defects cited in table III.

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TABLE III. Examination schedule.

EXAM NO.	EXAMINATION DESCRIPTION	METHOD
101	Materials not as specified (see 3.2).	Visual, Doc
102	Material not resistant to corrosion and deterioration or treated to be made resistant to corrosion and deterioration (see 3.2.1).	Visual, Doc
103	Dissimilar metals (see 3.2.2).	Visual, Doc
104	The F/S does not interface with the filter-coalescer element(s) or separator stages specified (see 3.5.1 and 3.5.2).	Visual
105	F/S inlet and outlet fittings are not as specified (see 3.5.3).	Visual
106	The F/S does not present low silhouettes or low centers of gravity as specified, dimensions and/or weight limits exceeded (see 3.5.4).	Visual, SIE
107	Differential pressure dial gauge not as specified (see 3.3.7).	Visual
108	Adapter and sampling probe unsatisfactory or not as specified (see 3.3.8).	Visual, SIE
109	Water drain valve not as specified (see 3.3.9.1).	Visual
110	Water level sight gauge not as specified (see 3.3.9.2).	Visual
111	Air relief valve not as specified (see 3.3.9.3).	Visual, SIE
112	F/S not painted with chemical agent resistant coating (see 3.6).	Visual, Doc
113	Color of F/S not as specified (see 3.6).	Visual
114	Labeling incorrect, illegible, or missing (see 3.7).	Visual
115	Filter-coalescers and separator stages are missing or not as specified (see 3.8).	Visual
116	Components and parts of any one F/S not interchangeable with like components or parts from any other F/S of the same type and class (see 3.9).	Visual

SIE = Standard Inspection Equipment Doc = Documentation

4.5.2 Tests.

4.5.2.1 Water removal. This testing shall follow the differential pressure tests (see 4.5.2.3). At 15 minute intervals, the fuel flow shall be stopped by closing a quick-closing valve located downstream from the effluent sampling connection. The fuel flow shall be immediately reestablished and the test continued after each stop. The water shall be injected at a rate of 5 % by volume at 115 % of rated flow for 60 minutes. Nonconformance to 3.3.2 and 3.3.3 shall constitute failure of this test.

4.5.2.2 Hydrostatic pressure. Each F/S shall be subjected to a hydrostatic pressure test as specified in 3.3.5. The air relief valve shall be closed during this test. Evidence of leakage, permanent deformation, or other defects that harmfully affect the performance and serviceability of the F/S, shall constitute failure of this test.

4.5.2.3 Differential pressure. Differential pressure across the test F/S shall be measured prior to the start of the water removal test specified in 4.5.2.1. Nonconformance to 3.3.6 shall constitute failure of this test.

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4.5.2.4 Differential pressure dial gauge. Subject the gauge to a hydrostatic pressure equal to the maximum scale pressure, hold at this pressure for a minimum of 30 minutes, then release the pressure. Within 10 minutes after the pressure is released, and without re-calibration or adjustment, readings shall be taken at three intervals on the scale: the maximum inlet or operating pressure obtained on the test F/S during the differential pressure test specified in 4.5.2.3, the pressure at which the filter-coalescer element(s) is required to be changed, and the maximum scale pressure. A dead-weight tester, or mercury manometer with air pressure or calibrated check gauge shall be used in calibrating the gauge, if required. Testing of the gauge shall be in an ambient temperature of 68°F (20°C) plus or minus 10°F (6°C). Nonconformance to 3.3.7 shall constitute failure of this test.

4.5.2.5 Environmental verification requirements.

4.5.2.5.1 High temperature tests. The F/S shall be tested for high temperature storage and operation in accordance with MIL-STD-810, method 501.3, procedure I and II. The maximum test temperature for storage shall be 160°F (71°C) and the maximum operating temperature shall be 125°F (52°C). The operating period for this test shall be one hour at the constant maximum temperature. Nonconformance of the F/S to the requirements specified in 3.4.1 and 3.4.2 during and after exposure to high temperatures shall constitute failure of either temperature test.

4.5.2.5.2 Low temperature tests. The F/S shall be tested for low temperature storage and operation in accordance with MIL-STD-810, method 502.3, procedure I and II. The lowest test temperature for storage shall be minus 50°F (-46°C), and the lowest operating temperature shall be minus 25°F (-32°C). The operating period for this test shall be one hour at the constant minimum temperature. Nonconformance of the F/S to the requirements specified in 3.4.1 and 3.4.2 during and after exposure to low temperatures shall constitute failure of either temperature test.

4.5.2.5.3 Sand and dust. The F/S shall be tested to verify the effects of sand and dust on performance in accordance with MIL-STD-810, method 510.3, procedure I and II. Nonconformance to 3.4.3 shall constitute failure of this test.

4.5.2.5.4 Salt Spray. The F/S shall be subjected to 5 % salt spray test in accordance with ASTM B 117 for 24 hours. Nonconformance to 3.4.4 and the applicable requirements of ASTM B 117 shall constitute failure of this test.

4.5.2.5.5 Vibration. The F/S shall be transported by a 5-ton cargo truck, over cross-country tactical terrain, at an average speed of 8 mph (13 kph) for a total of 100 miles. The F/S shall be tested as specified in 4.5.2.1 upon conclusion of the 100 miles. Breakage of the frame or damage to the F/S or components or nonconformance to 3.4.5 and 4.5.2.1 shall constitute failure of this test.

4.5.2.5.6 Shock. The F/S shall be dropped on an 8 inches (20 cm) thick bed of dry sand, from a height of 60 inches (152.4 cm). All drops shall be made so that the F/S falls freely through the distance specified. The F/S shall be dropped four times on each bottom corner. Upon conclusion

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of the drops, the F/S shall be tested as specified in 4.5.2.1. Breakage of the frame or damage to the F/S or component or nonconformance to 3.4.5 or 4.5.2.1 shall constitute failure of this test.

4.5.2.6 Human factors. The F/S shall be evaluated throughout the entire first article inspection for conformance to the human factors criteria specified in 3.10. Nonconformance shall constitute failure of this test.

4.5.2.7 Reliability. Using the MTBF specified in 3.11.1, the F/S shall be tested as specified in 4.5.2.1, 4.5.2.2, 4.5.2.3 and 4.5.2.4 with “accept” and “reject” criteria in accordance with figure 5. At completion of above testing, continue testing in accordance with 4.5.2.1 until an “accept” or “reject” decision is reached. A failure is defined as any malfunction that causes or may cause:

- a. Failure to commence operation, cessation of operation, or degradation of performance below specified levels.
- b. Damage to the F/S by continuing operation.
- c. Safety hazard to personnel.

Nonconformance to 3.11 shall constitute failure of this test. Dependent failures or malfunctions occurring as a result of improper maintenance or operator error are excluded from consideration as chargeable failures. Replacement of the filter-coalescer element(s) shall not be considered failures.

4.5.2.8 Maintenance ratio. The F/S shall be evaluated during the first article inspection for conformance to the maintenance ratio requirement specified in 3.12. Nonconformance shall constitute failure of this test.

5 PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or purchase 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's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6 NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The types and classes of F/S identified below are intended for the uses indicated, and for other uses that may be specified, for the removal of undissolved water and solid contaminants from aviation, diesel or motor fuels:

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Type I	-	15 gpm intended for use in portable refueling systems.
Type II, class A	-	50 gpm intended for open field installations.
Type II, class B	-	50 gpm intended for use only with the tank and pump units.
Type III.	-	100 gpm intended for use in airfield refueling systems, motor fuel servicing equipment, and military pipeline systems.
Type IV	-	350 gpm intended for use in air field refueling systems, motor fuel servicing equipment, and the inland petroleum distribution system.

The filter/separators cover by this performance specification are military unique because they must be able to operate satisfactorily at temperatures ranging from minus 25 °F to 140 °F and interface with the military standard filter-coalescer element, which is 3.75 inches in diameter. Commercial filter/separators are not designed to withstand such extreme and sudden operating environmental conditions and their filter-coalescer elements are 6 inches in diameter.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type and class of F/S required by the government (see 1.2).
- c. 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).
- d. When a first article is required for inspection and approval, time frame for submission, and the number of units required (see 3.1).
- e. When adapters and sampling probes are required (see 3.3.8).
- f. When the inlet and outlet fittings on the F/S will be other than as specified (see 3.5.3).
- g. For Army procurements, when the use of MIL-C-46168 and FED-STD-595 is mandated (see 3.6).
- h. When camouflage pattern painting is required (see 3.6).
- i. When instruction marking is to be other than as specified (see 3.7.3).
- j. When reliability test is required (see 3.11).
- k. When a user evaluation inspection is required (see 4.2).
- l. When test fuel temperature is to be other than as specified (see 4.4.2).
- m. Packaging requirements (see 5.1).

6.3 First article. When a first article inspection is required, the item(s) to be tested should be an initial production unit(s). When the Government will conduct some of the examinations and tests (see 3.8), the contracting officer should specify which examinations and tests will be conducted by the Government and which examinations and tests will be conducted by the contractor. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, tests, approval, and disposal of the first article (see 3.1).

6.4 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, specifications and standards that have been cleared and listed in DoD 5010.12-L, Acquisition Management Systems

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and Data Requirements Control List (AMSDL), must be listed on a separate Contract Data Requirements List (DD Form 1423), which is included as an exhibit to the contract. The technical manuals should be acquired under a separate contract line item in the contract.

6.5 Provisioning. The requirement for provisioning documentation for spare parts, consumables, and test measurement and diagnostic equipment should also be considered when this specification is applied on a contract.

6.6 Supersession data. This specification supersedes MIL-F-52429F, dated 31 October 1994; MIL-F-52556H, dated 7 October 1994; and MIL-F-52666E, dated 28 July 1986; and MIL-F-52667F, dated 18 October 1994.

6.6.1 Superseded F/S drawing packages. The following list of Government drawing packages documented each F/S formerly used by the military. The drawings referenced are provided as information only. They provide examples of F/S assemblies that have been found to be acceptable in the past. There is, however, no guarantee that these designs meet current requirements. Manufacturers may use these or provide their own design(s). Either must meet the performance requirements specified herein.

Type I	TL-MIL-F-52429/TA13217E6620
Type II, Class A	TL-MIL-F-52667/TA13217E6310
Type II, Class B	TL-MIL-F-52667/TA13217E7140
Type III	TL-MIL-F-52556/TA13217E5350
Type IV	TL-MIL-F-52666/TA13217E9320

6.7 Recovered materials. For the purpose of this requirement, recovered materials are those materials which have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials. The components, pieces and parts incorporated in the element may be newly fabricated from recovered materials to the maximum extent practicable, provided the element produced meets all other requirements of this specification. Used, rebuilt or remanufactured components, pieces and parts should not be incorporated in the element

6.8 Separator stages. The following list of Government drawings and NSNs are used by the military for the separator stages. The drawings referenced are provided for interface use with the filter/separator.

Type I	13217E6631, NSN 4330-00-197-4976
Type II, Both	13217E6316, NSN 4330-00-072-6700
Type III and Type IV	13216E2773, NSN 4330-00-112-0256

6.9 Part Identification Number (PIN). The following part identification numbering procedure is for government purposes and does not constitute a requirement for the contractor.

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This example describes a part numbering system for specification MIL-PRF-52666F:

M52666-21

- | | | |
|--|--|---|
| | | 1 - Class A: Frame mounted (Type II only) |
| | | 2 - Class B: Unmounted (Type II only) |
| | | 1 - Type I: 15 gpm F/S, skid mounted |
| | | 2 - Type II: 50 gpm F/S |
| | | 3 - Type III: 100 gpm F/S, frame mounted |
| | | 4 - Type IV: 350 gpm F/S, frame mounted |

6.10 Government-furnished property. The contracting officer should arrange to furnish the property specified in 3.8.

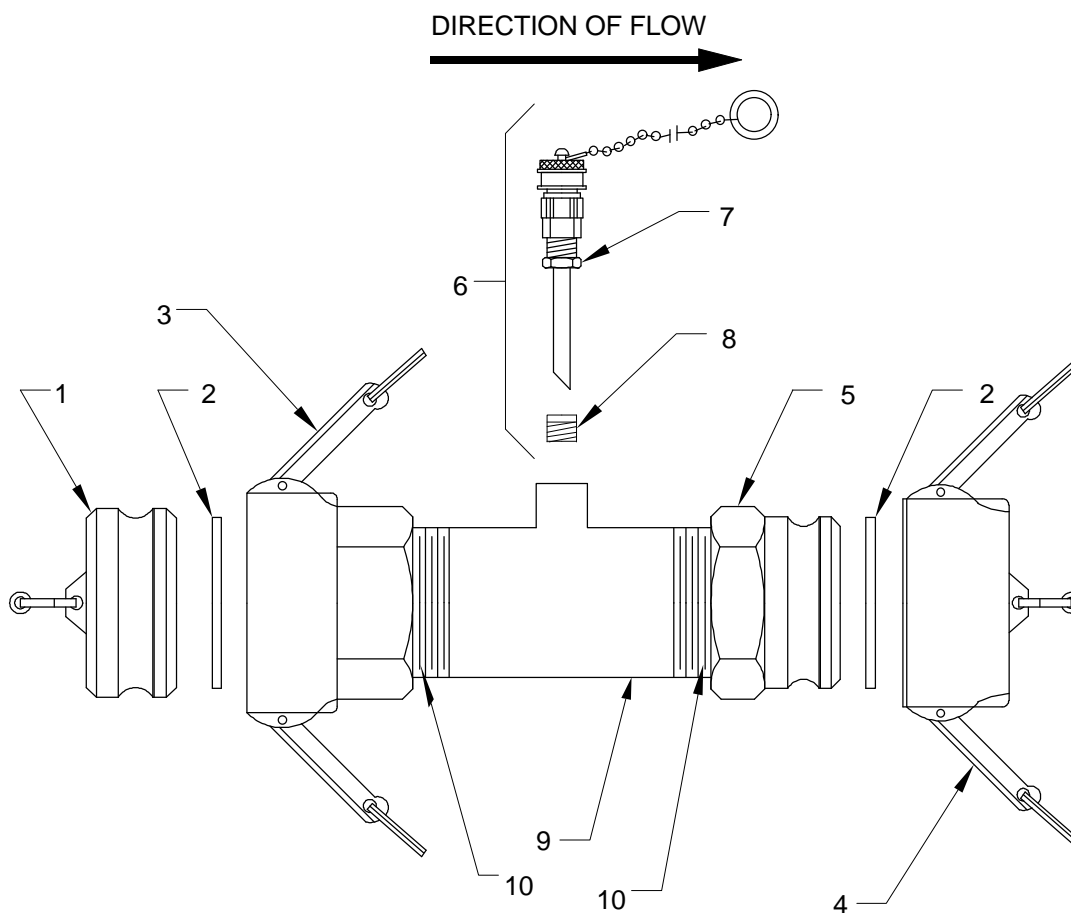
6.11 Human engineering. MIL-STD-1472 may be used as a source for anthropomorphic data on these military personnel, and MIL-HDBK-759 may be used for information and guidance on human factors engineering for Army materiel as specified in 3.10.

6.12 Subject term (key word) listing.

Airfield refueling system
 Aviation fuel
 Diesel fuel
 Fuel decontamination equipment
 Inland petroleum distribution system
 Jet turbine fuel
 Marine diesel fuel
 Water separation

6.13 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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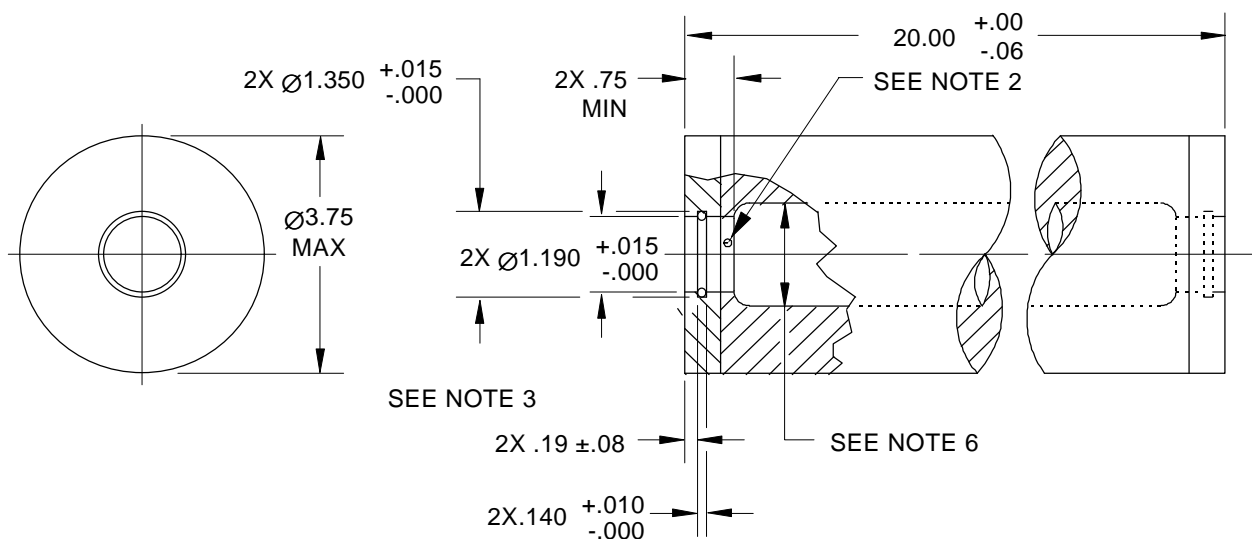


FIND NO.	NOMENCLATURE	REFERENCE
1	Dust Plug	ASTM F 1122
2	Gasket	ASTM F 1122
3	Coupling Half, Female	ASTM F 1122
4	Dust Cap	ASTM F 1122
5	Coupling Half, Male	ASTM F 1122
6	Probe Assembly, Detector Kit	ASTM D 2276 and ASTM D 3240
7	Hexagonal Nut	ASME B18.2.2
8	Pipe Coupling	SAE AS 4859
9	Pipe Nipple	SAE AS 4860
10	Antiseize Tape	A-A-58092

Reference: NSN 6640-00-244-9478

FIGURE 1. Detector kit adapter. – Example

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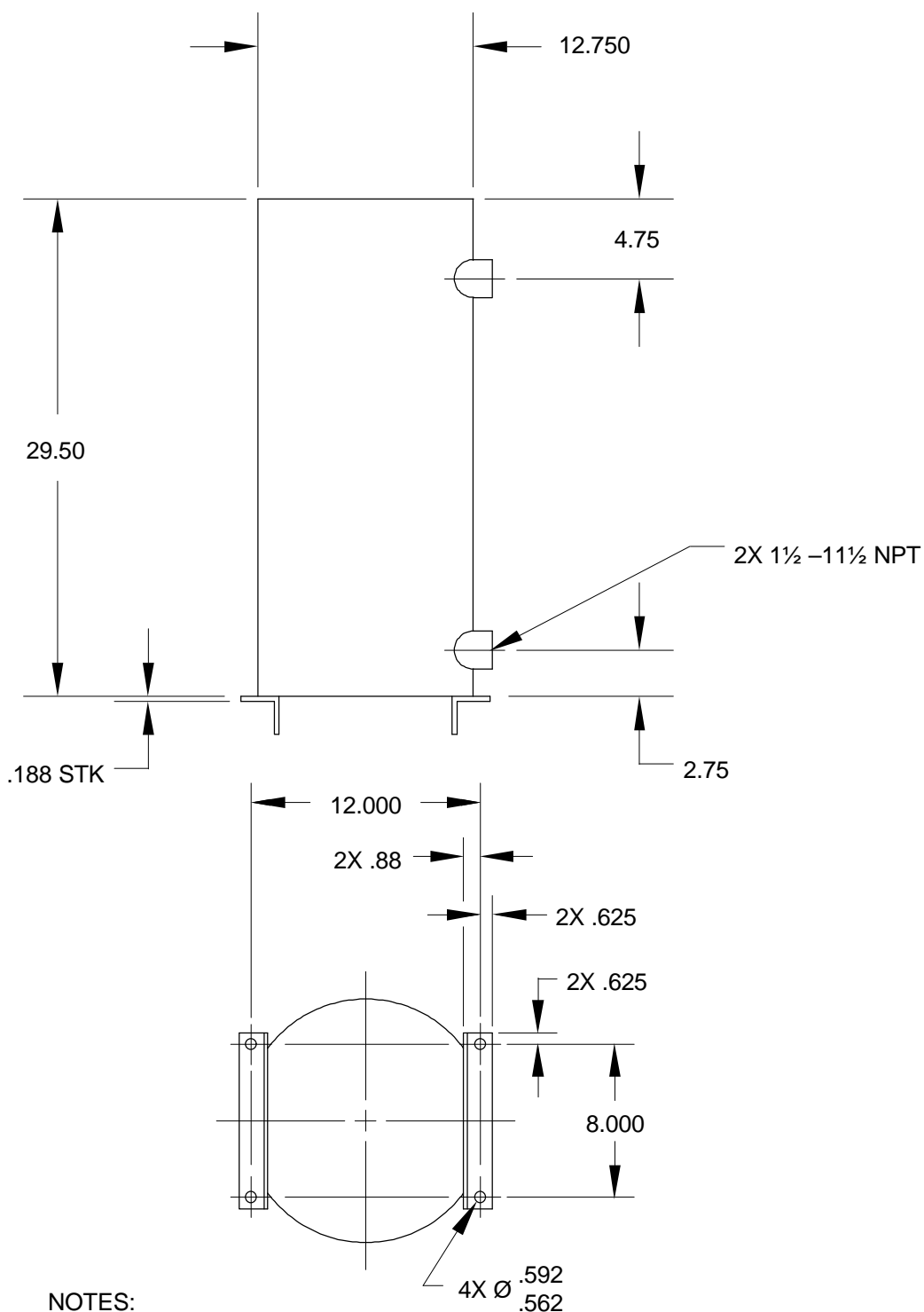


NOTES:

1. DIMENSIONS ARE INCHES.
2. THIS AREA TO BE LEFT FREE FROM FILTER ELEMENT MATERIAL, BOTH ENDS.
3. PROVIDE O-RING IN EACH END GROOVE.
4. APPLY LIGHT COATING OF SILICONE COMPOUND TO O-RING GROOVES AND O-RING.
5. FLOW SHALL BE FROM INSIDE TO OUTSIDE.
6. INSIDE DIAMETER AND CONFIGURATION ARE OPTIONAL.
7. REFERENCE: FOR USE WITH 1.182-1.187 MALE GLAND AT 100 PSI MIN, BOTH ENDS.
8. NOMINAL RATE OF FLOW IS 20 GPM.
9. REFERENCE: NSN 4330-00-983-0998.

FIGURE 2. Filter-coalescer element.

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NOTES:
 DIMENSIONS ARE IN INCHES.
 TOLERANCES: .XX = .06
 .XXX = .030

FIGURE 3. Filter/separator interface requirements.

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Test:						Test Date:						
Test Unit:						Test Engineer:						
						Witnesses:						
Time (minutes)	Fuel Flow Rate (gpm)	Test Unit ΔP (psi)	Fuel Temp. ($^{\circ}F$)	Conductivity (pS/m)		Water Addition Rate (%)	Solids Addition Rate (mg/gpm)	Pressure Inlet	Pressure Outlet	Free Water (ppm)	Total Solids (mg/L)	Remarks
				Influent	Effluent							

Water Surface Tension:

Corrosion Inhibitor Added:

Water pH Value:

FSII Added:

Fuel in Sump Discharge Water:

Electrical Conductivity Added:

WSIM Before Additives:

WSIM After Additives:

FIGURE 4. Test report form. – Example

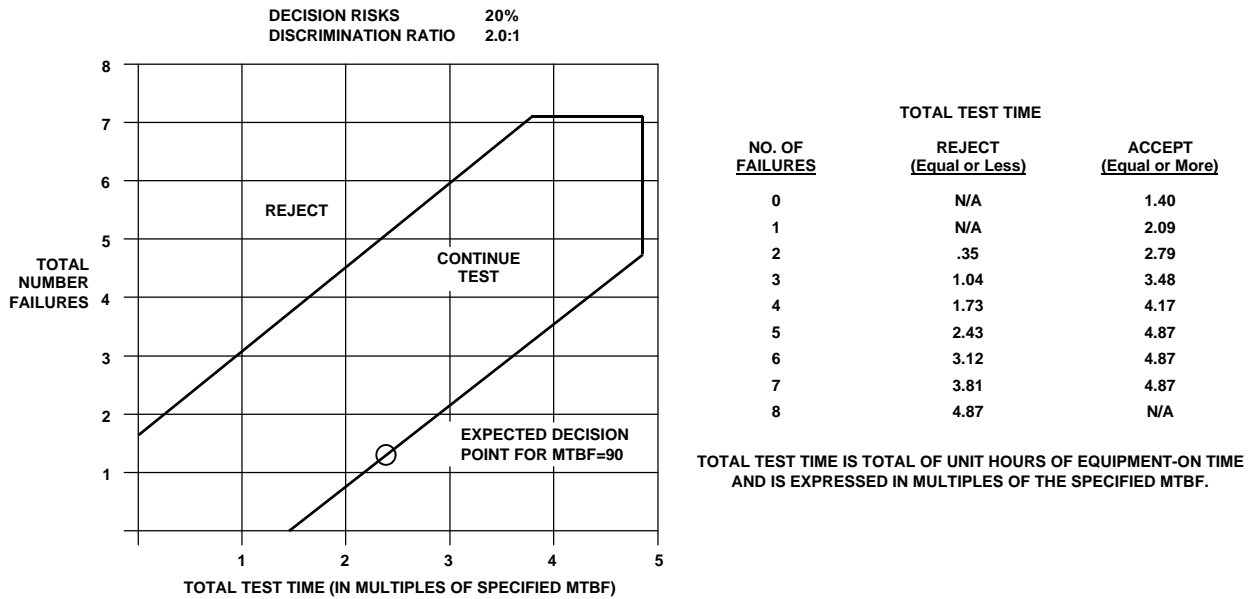


FIGURE 5. Accept/reject criteria.

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APPENDIX

FILTER/SEPARATOR TEST FACILITY AND TEST CONDITIONS

1. SCOPE

1.1 Abstract. This appendix describes an acceptable facility for testing Filter/Separators (F/S) (See Figure 6). The following are general requirements and guidance for the test facility. This appendix is not a mandatory part of this specification.

2. REQUIREMENTS

2.1 For first article and conformance testing of the F/S, the volume of test fuel shall be at least 10 times the rated flow of the F/S under test. If a first article or conformance test requires the presence of additives in the test fuel, there shall be tanks of sufficient volume to allow completion of these tests on a once-through, single-pass basis.

2.3 The pumping unit in the test system shall be a centrifugal type with a capacity matching the F/S under test, and have a minimum shaft speed of 2,950 rpm.

2.4 If necessary, heat exchangers shall be included to maintain the test fuel temperature within specified limits. Location is optional.

2.5 Flow meters shall be installed in the test fuel system and the water supply system with ranges of flow rates compatible with the rated flows of the F/S. Accuracy of flow meters shall be plus or minus 1.0%.

2.6 The test facility shall contain necessary pressure gauges and a means of measuring test fuel temperature. A differential pressure dial gauge conforming to 3.3.7 shall be connected to measure differential pressure across the F/S under test.

2.7 When required, a means of introducing solid contaminants into the test F/S within plus or minus 3.0% of the nominal add rate shall be provided. To further disperse the solid contaminant, it shall pass through a standard globe valve located on the inlet side of the test F/S, and be no further than 10 feet from this vessel. Throughout the injection of solid contaminants, a differential pressure of 20 psi shall be maintained across the valve.

2.8 A means of introducing test water that meets the quality requirements of 4.4.3 shall be provided. A filter in the water supply system is required. Water shall be injected immediately upstream of the supply pump.

2.9 Sampling taps shall be provided on the inlet and outlet of the test F/S at a distance from the test vessel not to exceed 10 pipe diameters.

2.10 The flow system piping between the points at which contaminants are injected and the fuel sampling points shall have a diameter such that the minimum fuel velocity is six feet/second at the rated flow of the test F/S.

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2.11 A clean-up fuel F/S having a rating of at least 115% of the maximum system flow capacity shall be installed. Location downstream from the test F/S is optional.

2.12 A clay treater shall be available to adsorb fuel additives and other surface active agents during a clean-up process. Location downstream of the test F/S is optional. The clay treater shall be bypassed or removed from the test loop during testing unless single pass tests are being conducted with the effluent fuel being returned to a separate storage tank.

2.13 The test system pressure shall not be less than 20 psi at the sampling connection downstream from the test F/S during the tests specified in this document.

2.14 A quick-closing valve capable of being closed and reopened in approximately four seconds shall be installed at a distance of between three and five pipe diameters downstream from the test F/S outlet sampling connection. Rigid piping is required between the test F/S and this valve.

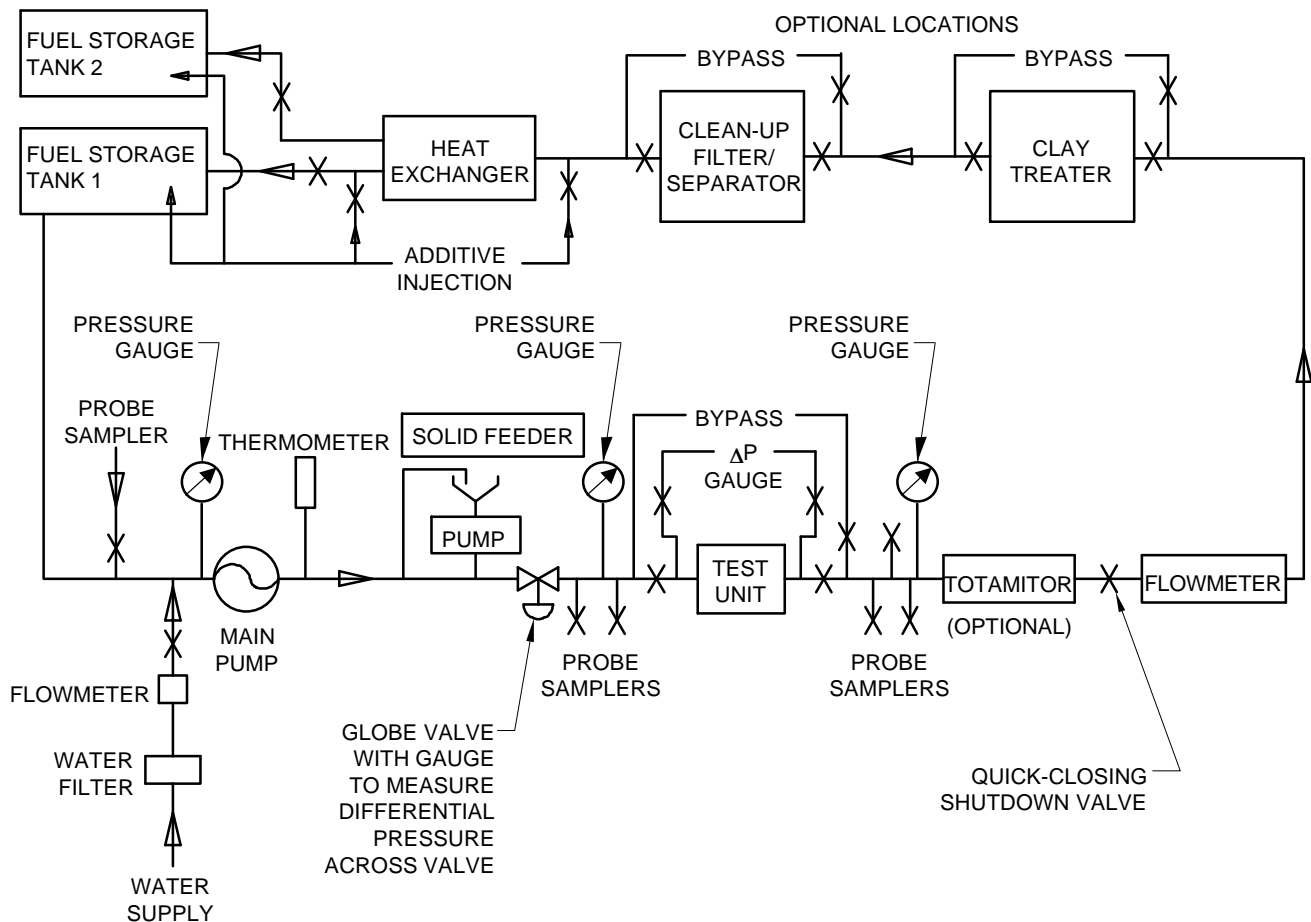


FIGURE 6. Test facility. – Example

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Custodians:

Army - AT
Navy – AS
Air Force – 99

Preparing Activity:

Army - AT

(Project 4330-0145)

Review Activities:

Army - AV
Navy – MC, SH
Air Force – 84
DLA - CC

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-52666F	2. DOCUMENT DATE (YYMMDD) 980923
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3. DOCUMENT TITLE
FILTER/SEPARATORS, LIQUID FUEL

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)

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c. ADDRESS (Include Zip Code) US Army Tank-Automotive and Armaments Command 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 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	

