

MIL-F-51193C(EA)
16 June 1980

SUPERSEDING

MIL-F-51193B(EA)
26 September 1977

MILITARY SPECIFICATION

FILTER, GAS, 10 CFM, M18

This specification is approved for use by US Army Armament Research and Development Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers one type and one size of toxic gas filter.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. 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

BB-F-1421 - Fluorocarbon Refrigerants.

MILITARY

MIL-C-13724 - Charcoal, Activated, Impregnated, ASC.
MIL-F-46032 - Fungus-Resistant Treatment for Sandbags; Copper Processes.

FSC 4240

: Beneficial comments (recommendations, additions, deletions) and any :
: pertinent data which may be of use in improving this document should :
: be addressed to: Commander, US Army Armament Research and Development :
: Command, Attn: DRDAR-TSC-S, Aberdeen Proving Ground, MD 21010 by :
: using the self-addressed Standardization Document Improvement Proposal :
: (DD Form 1426) appearing at the end of this document or by letter. :

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STANDARD

FEDERAL

FED-STD-191 - Textile Test Methods.

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-414 - Sampling Procedures and Tables for Inspection by Variables for Percent Defective.

MIL-STD-282 - Filter Units, Protective Clothing, Gas-Mask Components and Related Products: Performance Test Methods.

MIL-STD-1168 - Ammunition Lot Numbering.

DRAWINGS AND TECHNICAL DATA PACKAGE LIST (TDPL)

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

CHEMICAL SYSTEMS LABORATORY

TDPL5-19-2350 - Filter, Gas, 10 CFM, M18.

E136-41-1755 - Tester, Filter Life, 12 CFM, Q223, Assembly.

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

3. REQUIREMENTS

3.1 Materials and components.

3.1.1 Materials. All materials cited on TDPL 5-19-2350 and on the subsidiary drawings shall conform to the specifications listed thereon or to the specific characteristics set forth on the drawings.

3.1.1.1 Cotton cloth.

(a) Mildew resistance. The cotton cloth shall be made mildew resistant in accordance with MIL-F-46032, using Type III, method optional process except that leaching shall be omitted. No visible growth of mildew shall be evident when tested in accordance with method 5750 of FED-STD-191.

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(b) Water repellency. The cotton cloth shall have a minimum spray rating of 50.0 when tested in accordance with 5526 of FED-STD-191.

3.1.2 Components. All components of the gas filter shall conform to the specifications and drawings listed on TDPL 5-19-2350 and subsidiary drawings.

3.2 Assembly. The gas filter shall be assembled as specified on Drawing D5-19-2350.

3.3 Moisture content of gas filter. The moisture content of the filter immediately before packaging shall not exceed 2.0 percent when tested as specified in 4.4.4.1.

3.4 Airflow resistance. The airflow resistance of the filter shall not exceed 1.7 inches of water (423 Pa) at a 10 cubic feet per minute (cfm) (4.7 liter per second) airflow when tested as specified in 4.4.4.2.

3.5 Leakage. The filter leakage shall not exceed 1 part per million (ppm) within 2 minutes when subjected to a challenge concentration. The challenge concentration shall be 1000 ppm (5.0 + 0.1 milligram per litre of air) of dichlorodifluoromethane (R-12) conforming to type 12 of BB-F-1421. The challenge concentration shall be introduced at the influent side of the filter at 1/5 the filter rated airflow, at 24° + 8° C and less than 65 percent relative humidity (R.H.). Leakage shall be monitored at the effluent side of the filter in accordance with 4.4.4.3.

3.6 Airflow resistance and R-12 value after rough handling. After the sample filters have been rough handled with the largest dimension in the vertical plane for 15 minutes, 200 cycles per minute, 3/4 inch (19 mm) vertical drop as specified in 4.4.4.4, the airflow resistance shall meet requirements of 3.4; the filter shall not permit penetration of 50 ppm or more of R-12 for a minimum of 15 minutes, at rated airflow, nor shall the penetration exceed 5 ppm until a rapid increase occurs to 50 ppm. A challenge concentration of 5.0 + 0.1 milligrams per litre (1000 ppm) shall be used. The test shall be as specified in 4.4.4.4 and shall be conducted at 24° + 3° C and 27 + 7 or -25 percent relative humidity. Exposure of the filter to the air shall be kept to a minimum to minimize moisture pick-up.

3.7 GB value (Destructive). After meeting requirements of 3.6, the filter shall have a GB gas life of no less than 50 minutes at rated flow when subjected to a GB challenge concentration of 4.0 + 0.4 mg/l, with an air stream at 50 + 5 percent R.H. and air stream temperature of 24° + 5° C. Break concentration shall be 0.04 microgram per litre. This requirement shall be met when tested in accordance with 4.4.4.5.

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3.8 CK value (Destructive). After meeting requirements of 3.6, the filter shall have a CK gas life of no less than 12 minutes at rated flow when subjected to a CK challenge concentration of 4.0 ± 0.2 mg/l, with an air stream relative humidity of 80 ± 3 percent and air stream temperature of $24^\circ \pm 5^\circ$ C. Break concentration shall be 8 micrograms per litre. Filters shall be equilibrated to 80 percent R.H. prior to test. This requirement shall be met when tested in accordance with 4.4.4.6.

3.9 Preproduction. Prior to the start of regular production, a pre-production sample of gas filters shall be produced in accordance with this specification for examination and test (see 4.3).

3.10 Workmanship. The filter shall be free from foreign matter and damage such as chipped or bent sections, or loose, broken, or frayed gasket material.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.

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

4.1.2 Government responsibility. Unless otherwise specified, the Government will be responsible for the performance of the tests specified in 4.4.4.5 and 4.4.4.6. Samples shall be forwarded to the laboratory designated by the contracting officer (see 6.2).

4.1.3 Objective evidence. The contractor shall provide objective evidence acceptable to the contracting officer that the requirements of 3.1, and section 5 for which specific inspection has not been provided in this specification have been satisfied.

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

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

4.3 Preproduction inspection.

4.3.1 Sample. A preproduction sample of 14 filters shall be manufactured using the same methods, materials, equipment and processes as will be used during regular production.

4.3.2 Inspection procedure.

4.3.2.1 For examination. The sample filters shall be examined for all requirements of the applicable drawing and this specification.

4.3.2.2 For tests. Each preproduction sample filter shall be tested sequentially in accordance with 4.4.4.1, 4.4.4.2, 4.4.4.3, and 4.4.4.4. The samples shall then be forwarded to The Government Laboratory for destructive tests. Seven filters shall be destructively tested in accordance with 4.4.4.5 and the other seven filters shall be destructively tested in accordance with 4.4.4.6.

4.3.3 Acceptance/rejection criteria. The preproduction sample filters shall comply with all the examinations and tests specified in 4.3.2 to be acceptable. Failure of any one sample shall be cause to reject the lot. The supplier shall obtain written approval from the contracting officer prior to proceeding with regular production.

4.4 Quality conformance inspection.

4.4.1 Lotting. A lot shall consist of the filters produced by one manufacturer, at one plant, from the same materials, under essentially the same manufacturing conditions. However, any one lot of filters shall contain no more than one lot of charcoal sorbent. Each lot shall be identified and controlled in accordance with MIL-STD-1168.

4.4.2 Sampling.

4.4.2.1 For examination. Sampling shall be conducted in accordance with MIL-STD-105.

4.4.2.2 For test. Sampling for tests shall be in accordance with MIL-STD-414, level IV, with the exception of gas filters for GB tests (4.4.4.5) and CK (4.4.4.6) which will be level I.

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4.4.3 Inspection procedure.

4.4.3.1 For examination. Sample filters shall be examined in accordance with the classification of defects and MIL-STD-105.

4.4.3.2 For test. Sample filters shall be tested in accordance with and in the sequence 4.4.4.1, 4.4.4.2, 4.4.4.3, and 4.4.4.4. Sample filters shall then be destructively tested in accordance with 4.4.4.5 and 4.4.4.6 (see 4.1.2). The test results of 4.4.4.1, 4.4.4.4, 4.4.4.5, and 4.4.4.6 shall be evaluated in accordance with MIL-STD-414, form 2 at an AQL of 1.0 percent defective. If sample filters fail to meet the moisture requirement, the lot represented by the sample shall be dried in accordance with 4.4.4.1(e) and re-evaluated.

4.4.3.3 For critical defects. Each filter in the lot shall be tested for critical characteristics listed in the classification of defects (4.4.3.4) any filter failing to meet the specified test requirements shall cause the lot to be rejected.

4.4.3.4 Classification of defects.(a) Filter, gas, 10 CFM, M18 (Dwg D5-19-2350)

<u>Categories</u>	<u>Defects</u>	<u>Acceptance standards</u>
<u>Critical:</u>		
1	Airflow resistance	4.4.4.2
2	Leakage	4.4.4.3
<u>Major: AQL 1.0 percent defective</u>		
101	Component missing	
102	Component incorrectly assembled	
103	Marking incorrect	
104	Workmanship (3.10)	
<u>Minor: AQL 2.5 percent defective</u>		
201	Marking illegible	
202	Protective finish missing	

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4.4.4 Tests. Filters shall be tested in the following sequence:

4.4.4.1 Moisture content of gas filter. The filter shall meet the moisture content specified in 3.3 when tested as follows:

(a) The sample filters, immediately before packaging, shall be weighed to ± 0.5 grams and the weight recorded (step 1).

(b) After purging with hot air at $150^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for 3 hours in a forced draft oven, the sample filters shall be weighed to ± 0.5 grams and the weight recorded (step 2).

(c) The moisture content of charcoal in the filter is then calculated by use of the following formula:

$$\frac{\text{Weight (step 1)} - \text{Weight (step 2)}}{\text{Weight (step 2)}} \times 100 = \text{Moisture content (\%)}$$

(d) If the moisture content of the sample filters exceeds the specified requirement (3.3) the lot represented by the sample filter does not meet the moisture content requirement.

(e) Filters not meeting the moisture requirement may be dried to meet the specified requirement at a temperature not to exceed 120°C . After drying the filters, the moisture content shall be recalculated.

4.4.4.2 Airflow resistance. The pressure drop across the filter shall be in accordance with 3.4 and shall be determined at the rated airflow, evenly distributed over the face of the filter. The up- and down-stream static pressure measuring tubes shall be as close as possible to the filter, and shall not be on a section of duct having a changing cross sectional area.

4.4.4.3 Leakage. The filter shall be tested for leakage as follows:

(a) Connect the filter to a source of forced air. Also, place a mixing chamber at the influent side of the filter.

(b) Regulate the flow of air from the blower to $1/5$ the rated airflow of the filter being tested.

(c) Introduce R-12 into the intake of the blower; monitor (see 6.5) and maintain a concentration of 1000 ppm by volume of R-12 in air at $1/5$ rated airflow on the influent side of the filter at the proper temperature and relative humidity for the specified period of time (see 3.5).

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(d) Leakage shall be in accordance with 3.5 and shall be determined using a suitable leak detector (see 6.4) for sampling and detecting R-12 at the effluent side of the filter.

(e) Purge the filter by passing fresh air in the reverse direction of that indicated in (c) above through the filter at its rated airflow for 1 minute.

(f) Keep the exposure of the filter to air to a minimum. The airflow time for leakage test should not exceed 3 minutes.

(g) Filters to be used in subsequent R-12 testing shall be purged of R-12 by passing air at 150° to 250°F in the reverse direction of that indicated in (c) above through the filter at its rated airflow or higher until less than one part per million is indicated by the leakage detector.

4.4.4.4 Airflow resistance and R-12 value after rough handling. Unpackaged filters shall be rough handled in the upright position (longest dimension in vertical plane) in accordance with test method T105.10 of MIL-STD-282. After the sample filters have been rough handled, they shall be tested for airflow resistance in accordance with 4.4.4.2 and R-12 value in an apparatus which meets the requirements of the test as follows:

(a) Airflow shall be maintained at the rated flow of the filter until the temperature and relative humidity have become constant and are within the specified limits of 3.6.

(b) R-12 shall be introduced in the influent side of the filter such that a homogeneous concentration of 5.0 ± 0.1 milligrams per liter of air is reached and held constant as indicated by a suitable influent R-12 concentration detector (see 6.5). A timer is started at the same time R-12 flow is begun.

(c) R-12 is allowed to flow into the system until 50 parts per million of R-12 is read on the effluent R-12 concentration detector (see 6.5). The timer is stopped when 50 parts per million R-12 is reached. Record the time as R-12 value. Readings are made at 1 minute intervals; or a continuous recorder is utilized.

(d) Purge tested filters of R-12 by passing air at rated flow or higher, at 150 to 250°F in the reverse direction of test airflow for 30 minutes.

(e) Before and after testing, filters shall be protected against moisture pickup.

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4.4.4.5 GB value (Destructive). The GB value shall be determined by the Government Laboratory in accordance with 3.7 using the Q223 Tester, Filter Life, 12 CFM (Dwg E136-41-1755).

4.4.4.6 CK value (Destructive). The CK value shall be determined by the Government Laboratory in accordance with 3.8 using the Q223 Tester, Filter Life, 12 CFM (Dwg E136-41-1755).

5. PACKAGING

5.1 Preservation, packaging, packing, marking. The preservation packing, and marking for the filter shall be as specified on its repair part packaging data sheet (see 6.3) which is identified by its National Stock Number (NSN).

6. NOTES

6.1 Intended use. The gas filter covered by this specification is intended to be used in air purifiers.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Level of packing required.
- (c) When packaging data sheet is required.
- (d) Preproduction.

(1) Time allowed for contractor submission of samples for Government test and evaluation after award of contract.

(2) Name and address of test facility and shipping instructions when testing is performed by the Government.

(3) Time required for the Government to notify the contractor whether or not to proceed with production.

6.3 Packaging data sheet. The packaging data sheet is identified by the National Stock Number for this item and should be ordered from the Commander, Chemical Systems Laboratory, Attn: DRDAR-CLJ-P, Aberdeen Proving Ground, MD 21010.

6.4 Leak detector. The General Electric Company Type H-2 Halogen Leak Detector can be modified for use as a suitable leakage detector.

6.5 R-12 concentration detector. The Beckman 4B Infrared Analyzer, model 15a, has been found to be a suitable detector for both influent and effluent R-12 concentrations.

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Project No. 4240-A729

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