



Designation: F1040 – 87 (Reapproved 2007)

Standard Specification for Filter Units, Air Conditioning: Viscous-Impingement and Dry Types, Replaceable¹

This standard is issued under the fixed designation F1040; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers throw-away, flat panel-type filter units for use in air conditioning, heating, and ventilating systems. This specification also includes panel-type filters with pleated media.

1.2 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

D3951 Practice for Commercial Packaging

2.2 *ASHRAE Standard*:

52 Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter³

2.3 *Federal Standard*:

Fed. Std. No. 123 Military Standard for Marking for Shipment and Storage⁴

2.4 *Military Standard*:

MIL-STD-129 Marking for Shipment and Storage⁴

2.5 *UL Standard*:

UL900 Test Performance of Air Filter Units⁵

3. Descriptions of Term Specific to This Standard

3.1 *net face area*—the net upstream area of the medium exposed to air flow measured in the plane or planes of the media, excluding sealing flanges, framing supports, etc.

¹ This specification is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.05 on Indoor Air.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329, <http://www.ashrae.org>.

⁴ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

⁵ Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, <http://www.ul.com>.

4. Classification

4.1 The filters are furnished in two types as follows:

4.1.1 *Type 1*—Throw-away frames and media, and

4.1.2 *Type 2*—Permanent frames with replaceable media.

4.2 The filters are furnished in three grades as follows:

4.2.1 *Grade A*—Standard dust-holding capacity,

4.2.2 *Grade B*—High dust-holding capacity, and

4.2.3 *Grade C*—High arrestance.

5. Ordering Information

5.1 Contracts or orders for the units under this specification shall include the following information:

5.1.1 Quantity,

5.1.2 Material for media frame for Type 2 filter, (see section 6.4.4),

5.1.3 Size, (See 7.1),

5.1.4 Certification of the filter units by the producer or supplier, if required, (see Section 10).

6. Materials and Manufacture

6.1 Filters shall be the manufacturer's standard commercial product with any added features needed to comply with the specified requirements.

7. Physical Properties

7.1 The filter units shall be the flat panel type, with or without pleated media. They shall be designed and fabricated for disposal when, because of accumulated dust loading, the dust-load limit is reached. In Type 2 filters, the media frames shall be permanent and the media pad *only* shall be disposable. The filter media shall be dry or adhesive-coated in accordance with the manufacturer's recommendations.

7.2 *Filter Construction*—Filters shall be constructed with 90° corners. Frame edges shall be parallel to within 1/16 in. Media pad reinforcement in the form of grilles, retaining grids, fabric netting, or the equivalent shall be installed on both faces of the filter in accordance with the manufacturer's recommendations. The media shall be attached to the frame of Type 1 filters, and supported in the frame of Type 2 filters, in such a manner that the media pad will not slump or otherwise be

permanently displaced under the conditions of maximum air velocity (350 ft/min (1.78 m/s)) and filter resistance specified herein.

7.2.1 Filter Media—Filter media shall be suitable for the intended use and shall be composed of natural, synthetic, or inorganic fibers, or any combination of such fibers. The media shall be nontoxic. The media shall be suitable for continuous use at temperatures up to at least 150°F (65.5°C). Media for filters normally requiring adhesive shall be furnished with the adhesive applied.

7.2.2 Media Frames—Frames for Type 1 filters shall be suitably formed to provide positive support for the media pad and sufficient structural rigidity for normal handling and installation. Wood-pulp products used for frame construction shall be sized to reduce moisture absorptivity. Frames for Type 2 filters shall be aluminum or steel, as specified (see 4.1.2), and shall be designed to permit ready removal of the soiled media pad and replacement with a clean pad. Metal used for Type 2 frames shall be corrosion-resistant or shall be suitably plated to resist corrosion.

8. Performance Requirements

8.1 Performance Test—Determination of conformance with the performance requirements specified in 8.2 and Table 1 shall be made in accordance with ASHRAE Standard 52.

8.2 Adhesive Oil—Adhesive oil shall be of suitable viscosity to affect filtration at temperatures up to 150°F (65.5°C). Adhesive oil shall meet the requirements of UL900, Class 2 (see 8.1).

8.3 Filter Performance—Filter performance shall be in accordance with the requirements of Table 1 applicable to the grade and thickness of the filter unit being furnished (see 8.1).

8.3.1 Initial Resistance—Initial resistance for clean filters shall not exceed the applicable values specified in Table 1 at minimum face velocity of 350 fpm (1.78 m/s).

8.3.2 Average Arrestance—The average arrestance shall be not less than the applicable values specified in Table 1 when the filter is operated to the final resistance at 350 fpm (1.78 m/s) face velocity. Final resistance for Grade A and B filters with 1 in. thickness shall be 0.5 in. (12.7 mm), 125 (Pa) water gage (wg); maximum final resistance for Grade A and B filters with 2 in. thickness, and all Grade C filters shall be 1.0 in. wg (25.4 mm) (250 Pa).

8.3.3 Dust Holding Capacity—The minimum dust holding capacity for Grades A, B, and C filters shall be not less than the applicable values specified in Table 1. The capacity shall equal the amount of the test dust fed per net face area times its average arrestance. The dust holding capacity shall be obtained

at 350 fpm (1.78 m/s) face velocity. The results of Table 1 shall be obtained at the maximum final pressure drop specified in 7.2.2.

8.3.4 Dissimilar Metals—Joints between dissimilar metals, including bolts, nuts, rivets, and other fastenings and fittings shall be protected against galvanic corrosion by the proper selection of materials, plating isolation, insulation, area relationships, or other means providing equivalent protection.

9. Other Requirements

9.1 Fire and Casualty Hazard—The filter shall meet the fire-resistant requirements of UL900, Class 2. Evidence of compliance shall be UL listing, UL label, or a certified test report from a recognized independent testing laboratory acceptable to the purchaser.

10. Dimensions, Mass, and Permissible Variations

10.1 Size—The size of the filter shall be as specified in 4.1.3.

10.1.1 Height and Width—Height and width of the filter media and media frame shall be given in inches (mm) and shall be as specified as actual or nominal.

10.1.2 Thickness—The thickness of the filter media and media frame shall be 2 in. (50 mm), or 1 in. (25 mm), as specified.

10.2 Nominal Dimensions—The actual dimensions shall not differ from the nominal dimensions specified by more than the following:

10.2.1 Height—+0 to $-\frac{5}{8}$ in. (+0 to -16 mm).

10.2.2 Width—+0 to $-\frac{5}{8}$ in. (+0 to -16 mm).

10.2.3 Thickness:

A10.2.3.1 1 in.—+0 to $-\frac{1}{8}$ in. (+0 to -3 mm).

10.2.3.1 2 in.—+0 to $-\frac{1}{4}$ in. (+0 to -6 mm).

10.3 Tolerances—Tolerances on dimensions, actual or nominal, shall not exceed $\pm \frac{1}{16}$ in. (± 1.5 mm).

11. Inspection

11.1 The manufacturer shall inspect and perform the tests necessary to verify that the product furnished conforms to the requirements of this specification.

11.2 If, in addition, source inspection of the units by the purchaser is agreed upon between the manufacturer and the purchaser as part of the purchase contract, the nature of the facilities needed to satisfy the inspector representing the purchaser that the product is being furnished in accordance with this specification and the inspection shall be conducted so as not to interfere unnecessarily with the operation of the facilities.

11.3 The manufacturer and the purchaser may, by mutual agreement, conduct the final inspection simultaneously.

12. Rejection and Rehearing

12.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection shall be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the tests, the producer or supplier may make claim for a rehearing.

TABLE 1 Filter Requirements (at 350 fpm face velocity)

Grade	Nominal Thickness in. (mm)	Average Arrestance, % min	Initial Resistance, wg in. (mm) (Pa)	Dust Holding Capacity, in. min. (kg/m ²)
A	1 (25)	65	0.12 (3.0) (30.0)	25 (0.27)
	2 (50)	70	0.17 (4.3) (42.5)	45 (0.48)
B	1 (25)	70	0.15 (3.8) (37.5)	40 (0.43)
	2 (50)	75	0.20 (5.1) (50.0)	70 (0.75)
C	1 (25)	88	0.25 (6.4) (62.5)	20 (0.22)
	2 (50)	88	0.18 (4.6) (45.0)	65 (0.70)