UL 586

STANDARD FOR SAFETY

High-Efficiency, Particulate, Air Filter Units

UL Standard for Safety for High-Efficiency, Particulate, Air Filter Units, UL 586

Ninth Edition, Dated August 14, 2009

Summary of Topics

This revision of UL 586 dated September 7, 2022 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The requirements are substantially in accordance with Proposal(s) on this subject dated May 6, 2022.

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Standard for Safety for High-Efficiency, Particulate, Air Filter Units

The first and second editions were titled “High Efficiency Air Filter Units”
The third and fourth editions were titled “High Efficiency, Particulate, Air Filter Units”
The fifth edition was titled “Test Performance of High Efficiency Particulate, Air Filter Units”

First Edition – September, 1959
Second Edition – June, 1964
Third Edition – July, 1971
Fourth Edition – November, 1975
Fifth Edition – June, 1977
Sixth Edition – July, 1985
Seventh Edition – October, 1990
Eighth Edition – December, 1996

Ninth Edition

August 14, 2009

This ANSI/UL Standard for Safety consists of the Ninth Edition including revisions through September 7, 2022..

The most recent designation of ANSI/UL 586 as a Reaffirmed American National Standard (ANS) occurred on September 7, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

The Department of Defense (DoD) has adopted UL 586 on September 30, 1991. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover high-efficiency, particulate, air-filter units intended for the removal of very fine particulate matter (not less than 99.97 percent of 0.3 micron diameter particles) from the air of industrial and laboratory exhaust and ventilating systems.

1.2 These requirements cover single air filter units.

1.3 These requirements do not cover multiple assembly air filter units.

2 General

2.1 When a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

CONSTRUCTION

3 Frames and Separators

3.1 The frame of a filter unit shall be of metal or other inorganic material, or of wood treated to reduce combustibility by pressure impregnation or the equivalent (a coating is not acceptable as a means to reduce combustibility).

3.2 Treated wood, when employed, shall be not less than 3/4 inch (19 mm) thick and shall have a flame-spread index of 25 or less, determined in accordance with the requirements in the Standard for Test for Surface Burning Characteristics of Building Materials, UL 723.

3.3 A wood frame shall be assembled with butted or rabbeted corner joints that are fastened with screws or double-nailed.

3.4 Frame joints and the abutments of frame with the filter pack shall be impermeable to air flowing at or below the manufacturer's air-flow rating.

4 Filter Media

4.1 The filter medium shall be glass fiber or other equivalent inorganic material and may include an organic binder material.

4.2 The filter medium shall not contain unbonded asbestos fiber materials.

5 Gaskets

5.1 A gasket, when provided on a unit, shall be securely attached to the frame and shall provide a continuous seal about the face.

PERFORMANCE

6 General

6.1 Tests for efficiency and resistance are to be conducted by the manufacturer independently of other tests described herein, employing samples specified in 6.5, following test procedures, and at locations described in Efficiency and Resistance Tests, Section 7.

6.2 Tests for aerosol penetration under ambient conditions and after exposure to heated air, moist air, and low temperatures are to be conducted as described in Penetration Tests, Section 8.

6.3 The Efficiency and Resistance Tests, Section 7, and the Penetration Tests, Section 8, are to be conducted with the aerosol of Poly-alpha-olefin (PAO) synthetic hydrocarbon with a viscosity of 4 centistokes or a suitable alternative.

6.4 A test for flame propagation is to be conducted as described in Spot Flame Test, Section 9.

6.5 One set of six samples is to be tested by the manufacturer in accordance with the Efficiency and Resistance Tests, Section 7, and one set of six samples is to be provided for conducting the Penetration Tests, Section 8, and Spot Flame Test, Section 9. An additional three samples are to be provided for confirmation testing, see 7.2. Each sample is to be 24 by 24 inches (610 by 610 mm) by maximum depth available and is representative of smaller units of the same construction.

7 Efficiency and Resistance Tests

7.1 General

7.1.1 When tested as described in 7.1.2 – 7.2.1, the efficiency of a filter unit shall be not less than 99.97 percent (the maximum penetration through the filter shall be not more than 0.03 percent of the particles introduced in the air upstream of the test sample) and the resistance (pressure differential) across the filter unit at the specified air flow rate shall be not more than 1.3 inch water column (324 Pa) for units rated 25, 50, 125, 1500, and 2000 cfm. For units rated 500 and 1000 cfm, the resistance shall not be more than 1.0 inch water column (249 Pa).

7.1.2 Samples of the filter unit are to be tested by the manufacturer in accordance with the Test Method in Section FC of the ASME AG-1, Code on Nuclear and Gas Treatment. For this test, a “penetrometer” is to be used.

7.1.3 In the penetrometer, air of controlled temperature and humidity is to be circulated through a heated container of liquid PAO or a suitable alternative at a rate controlled to produce a constant number of uniform aerosol particles, 0.3 micron in diameter, per unit volume. The resultant aerosol is to be blown through the filter unit under test and the density of the aerosol downstream of the filter is to be measured by a light beam-photocell combination. A comparison of the downstream density readings with the known aerosol density upstream of the filter unit then is to serve as the basis for calculating the efficiency of the filter unit.

7.1.4 During the test, the air flow through the filter unit is to be maintained at the manufacturer's air-flow rating.

7.2 Confirmation of results

7.2.1 As a confirmation of results of tests by the manufacturer, three samples from each line of filter units having similar design and construction are to be tested at Air Techniques International, 1708 Whitehead Road, Suite 104, Baltimore, Maryland for compliance with the requirements in 7.1.1:

8 Penetration Tests

8.1 Samples

8.1.1 Samples selected for testing are to be representative of other sizes of similar design and construction.

8.1.2 Initially, six samples are to be tested in the as-received condition for percent of aerosol penetration as specified in 8.3.1 and 8.3.2. Of these six samples, three then are to be subjected to the heated air test described in 8.4.1 – 8.4.3, one to the moist air test described in 8.5.1 – 8.5.3, one to the low temperature test described in 8.6.1 – 8.6.3, and one to the Spot Flame Test, Section 9.

8.2 Test equipment

8.2.1 The aerosol penetration tests and the Spot Flame Test, Section 9, are to be conducted in a horizontal duct 27 by 27 inches (686 by 686 mm) in cross section and 13-1/2 feet (4.12 m) long. The duct is to be made of stainless steel reinforced with angle iron. One end of the duct is to be tapered and attached to the discharge of a constant-speed blower that, in turn, has an adjustable air-intake opening preceded by a calibrated venture or similar flow meter.

8.2.2 Instrumentation for measuring the resistance (pressure differential across the test specimen) is to be provided.

8.2.3 A portable air-operated generator for producing an aerosol of PAO, or a suitable alternative, a forward light-scattering cell, and a percent penetration indicator are to be provided for making percent penetration determinations.

8.2.4 This generator is to consist of an unheated container of liquid PAO, or a suitable alternative and a set of aspirator nozzles connected to a building service air line.

8.2.5 The discharge end of the duct is to be unobstructed for all tests except the aerosol penetration test described in 8.3.2. For this test, an adapter and a flexible 18-inch (457-mm) diameter, 25-foot (7.62-m) long duct are to be provided to produce a uniform mixture of air and aerosol particles at the duct exit.

8.2.6 A metal frame is to be provided at the center of the duct to receive the filter unit. The duct is to be provided with tight-fitting doors and windows to permit filter units to be mounted and observed during the test.

8.2.7 *Deleted*

8.2.8 The size of the constant-speed blower and the design of the adjustable air intake are to permit delivery of the required flow of air.

8.2.9 *Deleted*

8.3 Aerosol penetration test

8.3.1 When tested as specified in 8.3.2, the percent aerosol penetration through a filter unit shall be not more than 0.05.

8.3.2 Each sample is to be mounted in the test duct described in 8.2.1 and the air flow is to be adjusted to the manufacturer's air-flow rating. The aerosol portable generator[a] is to be used to introduce aerosol particles into the inlet of the calibrated venturi flow meter. The aerosol penetration is to be measured downstream of the unit by means of the forward light-scattering cell and percent penetration indicator. The test is to be conducted at room temperature [70 ±10°F (25 ±6°C)].

[a] It should be recognized that the percent aerosol penetration value obtained when using this aerosol portable generator is generally lower than that determined at the factory when using the hot aerosol machine.

8.4 Heated air test

8.4.1 When tested as specified in 8.4.2 – 8.4.4, the percent aerosol penetration through a filter unit shall be not more than 3.0.

8.4.2 Each sample (see 8.1.2) is to be installed in the test duct referenced in 8.4.3 and subjected to the flow of heated air for 5 minutes. The average temperature of the heated air is to be 700 ±50°F (371 ±27°C), as measured at a minimum of six points distributed equally across the filter face. No individual temperature measurement should be less than 600°F (316°C) or greater than 800°F (427°C). The rate of air flow is to be not less than 40 percent of the manufacturer's air-flow rating.

8.4.3 The test duct shall be of any arrangement that can provide the airflow and temperature referenced in 8.4.2. The airflow shall be adjusted before the heat is applied. If gas is burned to heat the air, the flames shall not impinge on the filter face.

8.4.4 After the samples have cooled, the test specified in 8.3.2 is to be repeated.

8.5 Moist air test

8.5.1 When tested as specified in 8.5.2 and 8.5.3, the percent aerosol penetration through a filter unit shall not increase more than 0.01 above the as-received value, and shall be not more than 0.05.

8.5.2 The test sample (see 8.1.2) is to be placed, for 24 hours, in a static atmosphere at a relative humidity of 90 ±5 percent and room temperature [77°F (25°C)].

8.5.3 The sample then is to be mounted in the test duct and air passed through it as the manufacturer's air-flow rating until it is dry. The percent aerosol penetration is to be measured, after the drying period, as described in 8.3.2.

8.6 Low temperature test

8.6.1 When tested as specified in 8.6.2 and 8.6.3, the percent aerosol penetration through a filter unit shall not increase more than 0.01 above the as-received value and shall be not more than 0.05.

8.6.2 The sample (see 8.1.2) is to be conditioned for 24 hours in a static atmosphere at a relative humidity of 50 ±5 percent and room temperature [77°F (25°C)]. The conditioned sample then is to be transferred to a static atmosphere at 27 ±4°F (minus 3 ±2°C) for an additional 24 hours.