



Standard Test Method for Determining Initial, Fractional, Filtration Efficiency of a Vacuum Cleaner System¹

This standard is issued under the fixed designation F1977; 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.

1. Scope

1.1 This test method may be used to determine the initial, fractional, filtration efficiency of household and commercial canister (tank-type), stick, hand-held, upright, and utility vacuum cleaner systems.

1.1.1 Water-filtration vacuum cleaners which do not utilize a replaceable dry media filter located between the water-based filter and cleaning air exhaust are not included in this test method. It has been determined that the exhaust of these vacuum cleaners is not compatible with the specified discrete particle counter (DPC) procedure.

1.2 The initial, fractional, filtration efficiencies of the entire vacuum cleaner system, at six discrete particle sizes (0.3, 0.5, 0.7, 1.0, 2.0, and $>3 \mu\text{m}$), is derived by counting upstream challenge particles and the constituent of downstream particles while the vacuum cleaner system is being operated in a stationary test condition.

1.3 The vacuum cleaner system is tested at the nozzle with the normal airflow rate produced by restricting the inlet to the nozzle adapter with the 1/4-in. orifice.

1.4 The vacuum cleaner system is tested with a new filter(s) installed, and with no preliminary dust loading. The fractional efficiencies determined by this test method shall be considered initial system filtration efficiencies. The filters are not changed between test runs on the same cleaner.

1.5 Neutralized potassium chloride (KCl) is used as the challenge media in this test method.

1.6 One or two particle counters may be used to satisfy the requirements of this test method. If using one counter, flow control is required to switch between sampling the upstream and downstream air sampling probes.

1.7 To efficiently utilize this test method, automated test equipment and computer automation is recommended.

1.8 Different sampling parameters, flow rates, and so forth, for the specific applications of the equipment and test procedure may provide equivalent results. It is beyond the scope of this test method to define those various possibilities.

1.9 This test method is limited to the test apparatus, or its equivalent, as described in this document.

1.10 This test method is not intended or designed to provide any measure of the health effects or medical aspects of vacuum cleaning.

1.11 This test method is not intended or designed to determine the integrity of HEPA filtration assemblies used in vacuum cleaner systems employed in nuclear and defense facilities.

1.12 The inch-pound system of units is used in this test method, except for the common usage of the micrometer, μm , for the description of particle size which is a SI unit.

1.13 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

D1193 Specification for Reagent Water

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D3154 Test Method for Average Velocity in a Duct (Pitot Tube Method)

F50 Practice for Continuous Sizing and Counting of Airborne Particles in Dust-Controlled Areas and Clean Rooms Using Instruments Capable of Detecting Single Sub-Micrometre and Larger Particles

F395 Terminology Relating to Vacuum Cleaners

F558 Test Method for Measuring Air Performance Characteristics of Vacuum Cleaners

¹ This test method is under the jurisdiction of ASTM Committee F11 on Vacuum Cleaners and is the direct responsibility of Subcommittee F11.23 on Filtration.

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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.