



Designation: F 51 – 00

Standard Test Method for Sizing and Counting Particulate Contaminant In and On Clean Room Garments¹

This standard is issued under the fixed designation F 51; 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 covers the determination of detachable particulate contaminant 5 μm or larger, in and on the fabric of clean room garments.

1.2 This test method does not apply to nonporous fabrics such as Tyvek® or Gortex®. It only applies to fabrics that are porous such as cotton or polyester.

1.3 The values stated in SI units are to be regarded as the standard. The inch-pound values given in parentheses are for information only.

1.4 This procedure provides not only the traditional optical microscopic analysis but also a size distribution and surface obscuration analysis for particles on a fine-textured membrane filter or in a tape lift sample. It utilizes transmitted illumination to render all particles darker than the background for gray level detection. Particles collected on opaque plates must be transferred to a suitable membrane filter.

1.5 *This standard may involve hazardous materials, operations, and equipment. 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:

E 1216 Practice for Sampling for Surface Particulate Contamination by Tape Lift²

F 25 Test Method for Sizing and Counting Airborne Particulate Contamination in Clean Rooms and Other Dust-Controlled Areas Designed for Electronic and Similar Applications²

2.2 Institute of Environmental Sciences and Technology (IEST) Document:³

IEST-RP-CC003.2, Garment System Considerations for Cleanrooms and Other Controlled Environments

3. Terminology

3.1 Definitions:

3.1.1 *fiber, n*—particle longer than 100 μm and with a length-to-width ratio exceeding 10:1.

3.1.2 *micrometre (μm), n*—SI unit of length which is 10⁻⁶ of a metre or approximately 0.000 04 in.

3.1.3 *particle size (L) (μm)*—major projected dimension of a particle.

4. Summary of Test Method

4.1 Filtered air is drawn through five designated 0.01-m² (1.5-in.² or approximately 0.01-ft²) areas of a single thickness of the garment fabric at a rate of 14 L/min (0.5 cfm) for a period of 1 min for each area.

4.2 The air drawn through the garment subsequently passes through a membrane filter disk, impinging the entrained particles upon the filter surface.

4.3 The filter disk is then examined microscopically for particles removed from the garment.

4.4 For particles larger than 5 μm, use optical analysis. For particles smaller than 5 μm, use automated image analysis.

4.5 Cleaning and counting techniques are in accordance with those established in Section 10.

5. Significance and Use

The test for particulate sizing and numbers on garments is nondestructive and may be used to evaluate the contamination levels of fibers and particles on and in clean room garments. The test may be used for evaluating the cleanliness levels of new or newly cleaned garments. It also may be used to evaluate the extent of fiber and particulate contamination on garments that have been worn, if necessary. For this application, it is necessary to sample representative areas of the garment fabric.

6. Apparatus

6.1 *Filter Assembly and Adapter*⁴, see Fig. 1 and Fig. 2.

⁴ The following equipment is satisfactory for this test method except where mentioned otherwise. The following part numbers refer to equipment available from Millipore Filter Corp.

(1) Fabric Particle Monitoring Assembly, #XX50 047 40, Millipore Filter Corp., Bedford, MA 01730, Gelman 1200A with 1207 Adapter available from Gelman Co., Chelsea, MI or equivalent.

(2) Adapter No. XX50 047 45, or equivalent.

(3) Limiting Orifice XX50 000 00.

¹ This test method is under the jurisdiction of ASTM Committee E-21 on Space Simulation and Applications of Space Technology and is the direct responsibility of Subcommittee E21.05 on Contamination.

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² *Annual Book of ASTM Standards*, Vol 15.03.

³ Available from IEST, 940 E. Northwest Highway, Mount Prospect, IL 60056.