



Foremost in Air Filtration

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## HEPA FILTERS

The Institute of Environmental Sciences and Technologies have created several Recommended Practices related to cleanrooms. IEST Recommended Practice 001.3 is for the design, construction and certification of HEPA filters. Currently there are six performance levels identified four of which pertain to HEPA filters and the other two pertain to ULPA filters. Following is a summary of the four HEPA performance levels.

### Flanders Industrial Grade

**Type A Filter** A filter that has been tested at rated airflow in accordance with section 9.1.1. The minimum filter efficiency of the encapsulated filter for this type of filter is 99.97% on 0.3 $\mu$ m particles.

### Flanders Nuclear Grade

**Type B Filter** A filter that has been tested for overall penetration at rated flow and at 20% of rated flow, in accordance with section 9.1.1. The minimum filter efficiency of the encapsulated filter in this type 99.97% on 0.3 $\mu$ m particles.

### Flanders Laminar Flow Grade

**Type C Filter** A filter that has been tested for overall penetration in accordance with section 9.1.1 and, in addition, has been leak tested in accordance with section 9.2.1. The minimum filter efficiency of the encapsulated filter in this type is 99.99% on 0.3 $\mu$ m particles.

### Flanders Biological Grade

**Type E Filter** A filter that has been designed constructed and tested in strict accordance with *MIL-F-51477* or *MIL F-51068*.

Additional details for the performance testing is provided on page 2.

## HEPA Filters Cont. Testing

### IEST RP 001.3 Section 9 Testing

All of the aforementioned filter types reference section 9.1.1 of the Recommended Practice for penetration testing of the filters.

Section 9.1.1 is Aerosol challenge and photometer measurements, which is traditionally known as the DOP test and is fully defined in *MIL-STD-282*. This method of filter testing requires a test apparatus known as the Q 107. In this test thermally generated DOP aerosol with a medium size of approximately 0.3µm is used as the challenge aerosol. The upstream and downstream concentration of the aerosol is measured by an aerosol photometer, and the ratio of the two indicates the rate of penetration of the filter.

Filter Type C and E reference in addition to Section 9.1.1 Section 9.2.1, Photometer Scanning.

Section 9.2.1 requires that the filter be tested at an average air velocity of 90 ±10 linear ft/min through the filter to check for media and frame leaks. The challenge aerosol is polydisperse DOP or a specified alternative, which is typically thermally generated PAO. The test aerosol should have a concentration of 10 –20 µg / m<sup>3</sup> of air. An unacceptable leak is identified as a reading greater than 0.01% for linear read out photometers.

### HEPA Filter Type Summary

Filter Type	Penetration Test		Scan Test		Comments	Minimum Efficiency
	Method	Aerosol	Method	Aerosol		
A	MIL-STD-282	Thermal DOP	None	None		99.97% @ 0.3µm
B	MIL-STD-282	Thermal DOP	None	None	Two Flow Test	99.97% @ 0.3µm
C	MIL-STD-282	Thermal DOP	Photometer	Polydisperse DOP		99.99% @ 0.3µm
E	MIL-STD-282	Thermal DOP	Photometer	Polydisperse DOP	Two Flow Test and Scan Test	99.97% @ 0.3µm