



# Suggested Engineering Specifications Cleanroom Filter Equipment

Your Cleanroom Equipment & Filtration Specialists

## CLEANROOM FILTRATION DESIGN GUIDE

Class	Maximum particles/m <sup>3</sup> <sup>a</sup>						FED STD 209E equivalent
	≥0.1 µm	≥0.2 µm	≥0.3 µm	≥0.5 µm	≥1 µm	≥5 µm	
ISO 1	10 <sup>b</sup>	d	d	d	d	e	
ISO 2	100	24 <sup>b</sup>	10 <sup>b</sup>	d	d	e	
ISO 3	1,000	237	102	35 <sup>b</sup>	d	e	Class 1
ISO 4	10,000	2,370	1,020	352	83 <sup>b</sup>	e	Class 10
ISO 5	100,000	23,700	10,200	3,520	832	d,e,f	Class 100
<b>ISO 6</b>	1,000,000	237,000	102,000	35,200	8,320	293	<b>Class 1,000</b>
<b>ISO 7</b>	c	c	c	352,000	83,200	2,930	<b>Class 10,000</b>
<b>ISO 8</b>	c	c	c	3,520,000	832,000	29,300	<b>Class 100,000</b>
ISO 9	c	c	c	35,200,000	8,320,000	293,000	Room air

*ISO Cleanroom Classification Table vs Fed 209E Classification*



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<sup>a</sup> All concentrations in the table are cumulative, e.g. for ISO Class 5, the 10 200 particles shown at 0,3 µm include all particles equal to and greater than this size.

<sup>b</sup> These concentrations will lead to large air sample volumes for classification. Sequential sampling procedure may be applied; see Annex D.

<sup>c</sup> Concentration limits are not applicable in this region of the table due to very high particle concentration.

<sup>d</sup> Sampling and statistical limitations for particles in low concentrations make classification inappropriate.

<sup>e</sup> Sample collection limitations for both particles in low concentrations and sizes greater than 1 µm make classification at this particle size inappropriate, due to potential particle losses in the sampling system.

<sup>f</sup> In order to specify this particle size in association with ISO Class 5, the macroparticle descriptor M may be adapted and used in conjunction with at least one other particle size. (See C.7.)

**Classifications highlighted above in yellow are suitable for Soft-wall Cleanroom (SWCR) construction**

## FILTER EFFICIENCIES

Cleanliness Class	Filter Efficiency
Class 2	99.99999% @ 0.12µm
Class 3	99.9995% @ 0.12µm
Class 4	99.999% @ 0.12µm
Class 5	99.99% @ 0.30µm
Class 6	99.99% @ 0.30µm
Class 7	99.99% @ 0.30µm
Class 8	99.99% @ 0.30µm

## AIR RETURNS

Cleanliness Class	Air Return Design
Class 2	Raised Floor
Class 3	Raised Floor
Class 4	Raised Floor
Class 5	Low Wall Long Axis
Class 6	Low Wall
Class 7	Low Wall or Ceiling
Class 8	Low Wall or Ceiling

## CEILING DESIGN

Cleanliness Class	Ceiling Grid Type
Class 2	Gel Grid
Class 3	Gel Grid
Class 4	Gel Grid
Class 5	1-1/2" T Bar Gasket
Class 6	1-1/2" T Bar Gasket
Class 7	1-1/2" T Bar Gasket
Class 8	Side Access HEPA Hsg.

## FILTERED CEILING COVERAGE

Cleanliness Class	Amount of Filters
Class 2	100% Ceiling Coverage
Class 3	100% Ceiling Coverage
Class 4	100% Ceiling Coverage
Class 5	100% Ceiling Coverage
Class 6	20-60% Ceiling Coverage
Class 7	5-40% Ceiling Coverage
Class 8	5% Remote Filter Bank

## Recommended Air Changes and Ceiling Coverage

ISO Class	Air Changes Per Hour	Ceiling Coverage
ISO 1	500-750	80-100%
ISO 2	500-750	80-100%
ISO 3	500-750	60-100%
ISO 4	400-750	50-90%
ISO 5	240-600	35-70%
ISO 6	150-240	25-40%
ISO 7	60-150	15-25%
ISO 8	5-60	5-15%

Tables courtesy of Filtration Group & Wikipedia

The **Air Changes Per Hour (ACH)** table at left represents *extremely conservative ACH values*. In fact, these ACH values are 2-3 times greater than most filter OEM recommendations for recommended Air Changes per Hour.

Our position is to be as conservative as possible to ensure that even with the most adverse conditions (poor equipment positioning, high room occupancy and traffic, poor room air-seal, abnormally high heat-loads and dust generation) the cleanroom is still able to achieve certification to the desired ISO cleanroom classification.