

# Datasheet: Fabric Ducts in Cleanrooms



A cleanroom is a manufacturing environment that requires a low level of environmental pollutants such as dust, airborne microbes, aerosol particles and chemical vapours.

More accurately, a cleanroom has a controlled level of contamination that is specified by the number of particles per m<sup>3</sup> and by the maximum particle size.

In cleanrooms

- the concentration of particles is under control
- the pressure is controlled
- the critical parameters are often monitored
- the critical particles are invisible



## Typical cleanroom applications

### Pharmaceutical industry

- Medicaments must be free of micro organisms
- Medicaments must be the same from batch to batch

### Electronics and semiconductor industry

- Unwanted particles may cause short circuits and catastrophic results

### Food industry

- Foodstuffs must have a long shelf life without preservatives and must be produced without any harmful bacteria

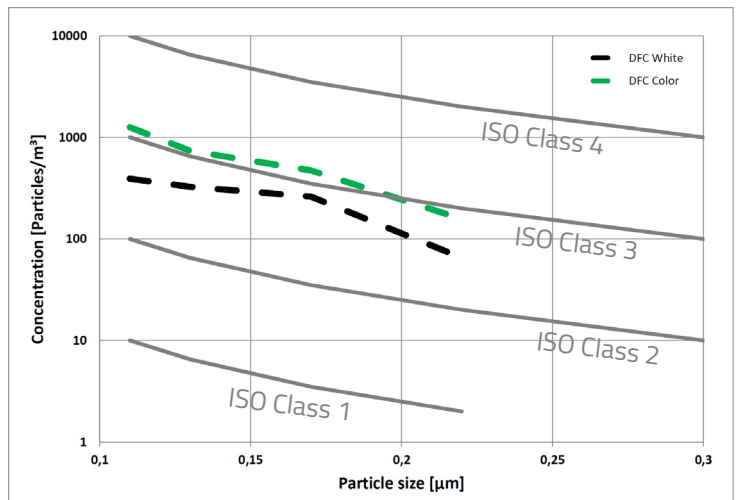
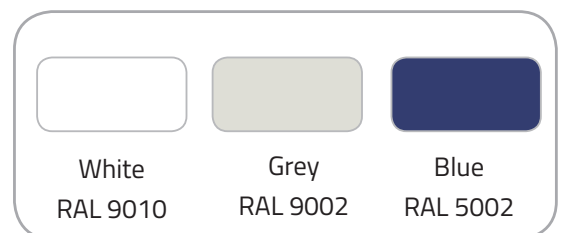


Figure 1: Test results for Euro Air cleanroom fabrics

## Fabric ducts for cleanroom applications

Euro Air offers 4 different permeabilities of the DFC-HT material for cleanrooms. All materials are tested for particular air pollution in use with a laser aerosol spectrometer and have been found applicable for use in ISO class 4 cleanrooms (see figure 1 and overleaf).

Euro Air DFC-HT cleanroom fabrics are available in white, grey, and blue.



## Cleanroom classifications

Cleanrooms are classified by the cleanliness of the air. Cleanliness class is a standard determined by the contamination control industry and other organizations to provide a qualified and standardized method for measuring how clean the air is in a cleanroom.

Classification of cleanrooms is made on the following basis:

- ISO classification (ISO 14644-1)
- EU GMP classification (pharmaceutical industry)

ISO 14644-1 is the worldwide standard for the classification of clean rooms. This standard contains the classification of airborne particulate cleanliness classes for clean rooms and clean zones. Table 1 shows the ISO 14644-1 cleanroom classifications.

Table 1: ISO-14644-1 classification

Class	≥ 0,1 µm	≥ 0,2 µm	≥ 0,3 µm	≥ 0,5 µm	≥ 1 µm	≥ 5 µm
ISO 1	10	2	-	-	-	-
ISO 2	100	24	10	4	-	-
ISO 3	1.000	237	102	35	8	-
ISO 4	10.000	2.370	1.020	352	83	-
ISO 5	100.000	23.700	10.200	3.520	832	29
ISO 6	1.000.000	237.000	102.000	35.200	8.320	293
ISO 7	-	-	-	352.000	83.200	2.930
ISO 8	-	-	-	3.520.000	832.000	29.300
ISO 9	-	-	-	35.200.000	8.320.000	293.000



Table 2: EU GMP classification

Class	At rest		In operation	
	Maximum number of particles per m <sup>3</sup> room-air			
	≥ 0,5 µm	≥ 5 µm	≥ 0,5 µm	≥ 5 µm
A	3.500	< 1	3.500	< 1
B	3.500	< 1	350.000	2.000
C	350.000	2.000	3.500.000	20.000
D	3.500.000	20.000	-	-

Table 3: Comparison of classifications

ISO 14644-1	Standard		EU GMP	
	American federal Metric	American federal Imperial	At rest	In operation
1	-	-	-	-
2	-	-	-	-
3	M1	-	-	-
	M1.5	1	-	-
4	M2	-	-	-
	M2.5	10	-	-
5	M3	-	-	-
	M3.5	100	A/B	A
6	M4	-	-	-
	M4.5	1000	-	-
7	M5	-	-	-
	M5.5	10.000	C	B
8	M6	-	-	-
	M6.5	100.000	D	C
9	M7	-	-	-
	-	-	-	-

The EU GMP (Good Manufacturing Practice) classifications (table 2) are made for pharmaceutical applications for manufacturing of sterile medicinal products. The EU GMP contains requirements for cleanliness in "at rest" state and "in operation" state:

### At rest:

All the services are connected, all the equipment is installed and operating to an agreed manner, but no personnel is present.

### Operational:

All equipment is installed and is functioning to an agreed format, and a specified number of personnel is present, working to an agreed procedure.

To compare the two classifications, see table 3. Also the "old" American federal classification (FD209E) with class 1, 10, 100, 1.000, 10.000 and 100.000 is shown, as many consultants still use these terms.

The cleanliness classification levels defined by FS209E and ISO 14644-1 are approximately equal, except the new ISO standard uses new class designations, a metric measure of air volume and adds three additional classes - two cleaner than class 10 and one beyond class 100,000.