EMW
filtertechnik

New ISO Standard

ISO 16890 Replaces EN 779

Filter Classes
According to ISO 16890

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New ISO Standard

ISO 16890 Replaces EN 779

ISO 16890 regulates classification of particulate filters for room air.

This new standard, in effect since late 2016, has superseded European standard EN 779 in mid-2018.

For years, industry experts have demanded an improved standard to replace EN 779. Critics of the standard call attention to its highly unrealistic test conditions and test results with limited relevance to real-world performance. ISO 16890 provides lab evaluation procedures which more realistically simulate actu-al operating conditions, repla-cing the old standard's filter classes G1-F9 by a classificati-on system based on particulate groups PM1, PM2.5 and PM10. These same particulate categories are used by the World Health Organization in evaluation of environmental air quality.

*EMW's air filters get tested and classified according ISO 16890. We offer you a huge range of different **ISO 16890 air filters**.*

Filter Classes According to ISO 16890

Unlike EN 779 which specifies **Filter Classes**, ISO 16890 classifies according to **Filter Groups**, evaluating a filter's performance by its **arrestance** of particles from 0.3 to 10 µm in size. Filter Group PM 1 comprises particulate sizes ≤1 µm, PM 2.5 includes particulates sizes ≤2.5 µm and PM 10 covers particulate sizes ≤10 µm.

Filter Group	Particulate Size (µm)	Classification Criterium
ISO ePM_1	0.3 ≤ x ≤ 1	Minimum efficiency ≥ 50 %
ISO $ePM_{2,5}$	0.3 ≤ x ≤ 2.5	Minimum efficiency ≥ 50 %
ISO ePM_{10}	0.3 ≤ x ≤ 10	Average efficiency ≥ 50 %
ISO Coarse	0.3 ≤ x ≤ 10	Average efficiency < 50 %

*ePM = efficiency Particulate Matter

For filter experts, the key difference is clear: The old standard tests arrestance of only one particulate size (0.4 µm). The new standard determines arrestance over a spectrum of particulate sizes.

Example: Pocket Filters and Compact Filters According to ISO 16890

An air filter qualifies for Filter Group **ISO ePM$_1$** or **ISO ePM$_{2,5}$** if it achieves a minimum efficiency of 50% or greater for particulate sizes ≤1 µm or ≤2.5 µm. Along with the Filter Group achieved, the complete ISO 16890 classification also includes the filter's average efficiency . Minimum efficiency is defined as the efficiency achieved following electrostatic discharge of the filter before testing. Average efficiency is calculated by averaging the filter's efficiencies in the untreated state, i.e. before discharging, and in the discharged state. More information in this regard is provided in the section below entitled „Filter Testing According to ISO 16890".

For example: if a filter achieves a minimum efficiency in the PM1 size spectrum and 56% in the PM2.5 size spectrum, it does not qualify for the ISO ePM$_1$ Filter Group – having missed out by 5 % – but does qualify for the ISO ePM$_{2,5}$ Filter Group. Assuming that the average efficiency achieved by this filter for **ISO ePM$_{2,5}$** particulates was 68%, this percentage is rounded down to the nearest 5% increment (i.e. rounded down to 65 %) and the filter's ISO 16890 classification is therefore **ISO ePM$_{2,5}$** 65%.

To be classified in Filter Group **ISO ePM$_{10}$** a filter must achieve an **average efficiency** of ≥ 50 % for particles ≤ 10 µm in size. Filters with an **average efficiency** < 50% for this particle size range are classified in the Filter Group **ISO Coarse**.

Jetzt sind Sie dran! Testen Sie Ihr Wissen zur ISO 16890!

Example 1: **F7 pocket filter** (synthetic filter media)

The following tableau shows results of a pocket filter, which got tested according ISO 16890.

Test Results

Arrestance	Minimum Efficiency	mittlere Effizienz
ePM$_1$	45 %	59 %
ePM$_{2,5}$	56 %	68 %
ePM$_{10}$		89 %

Criterium achieved / not achieved

1a. *Wich ISO Filter Group reaches the filter above?*

☐ ISO ePM$_1$ ☐ ISO ePM$_{2,5}$ ☐ ISO ePM$_{10}$

1b. *With which efficiency rate gets the ISO ePM$_{2,5}$ filter above finally rated?*

☐ 56% ☐ 65% ☐ 68%

You find the correct answers at the side end.

Example 2: **F9 compact filter (glass fibre)**

The following tableau shows results of a compact filter, which got tested according ISO 16890.

Test Results

Arrestance	Minimum Efficiency	mittlere Effizienz
ePM$_1$	84 %	85 %
ePM$_{2,5}$	88 %	89 %
ePM$_{10}$		96 %

Criterium achieved / not achieved

2a. *Wich ISO Filter Group reaches the filter above?*

☐ ISO ePM$_1$ ☐ ISO ePM$_{2,5}$ ☐ ISO ePM$_{10}$

2b. *Wich ISO Filter Group reaches the filter above?*

☐ 56% ☐ 65% ☐ 68%

You find the correct answers at the side end.

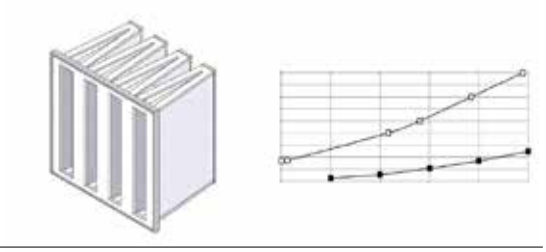
*Solutions: Classification is based on the average efficiency, which is rounded down to the nearest 5% increment. For example no. 1 the correct answer is ISO ePM$_{2,5}$ 65% and for example no. 2 ISO ePM$_1$ 85%

Filter Testing According to ISO 16890

Along with the new filter-group based classification system, ISO 16890 also incorporates changes in test procedures. The new standard specifies two test phases for evaluation of air filters.

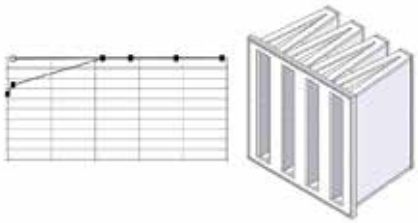
1 Determination of pressure drop

In **Phase 1** of the testing, the pressure drop across the filter is determined as a function of volumetric air throughput.



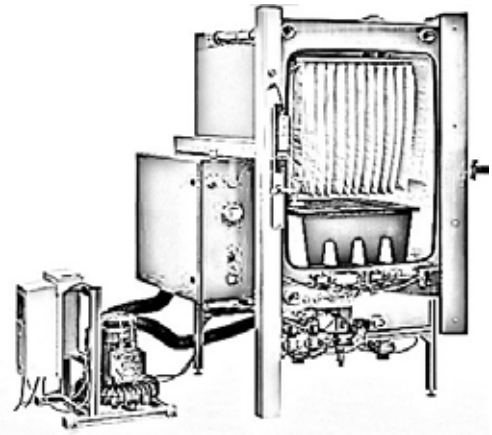
2 Determination of fractional arrestance

Then the filter's fractional arrestance is determined over a particle size spectrum of 0.3 µm - 10 µm. Two different test aerosols are used in the testing: DEHS (di-ethylhexyl sebacate) aerosol for particulate sizes up to 1 µm and, for larger particulate sizes, KCl (potassium chloride) aerosol.



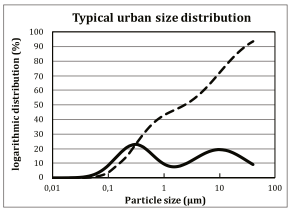
3 Testing of electrostatically discharged filter

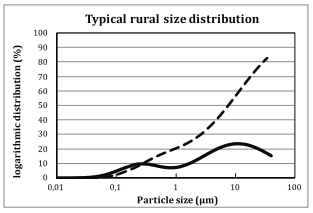
Phase 2 of the testing concentrates on the filter's performance without the distorting effects of electrostatic charge. A filter which is charged with static electricity will achieve increased arrestance – for instance in laboratory testing. In actual field service this increase is only a temporary effect which quickly disappears. For this reason, test data determined on electrostatically charged filters does not truly relate to real-world performance. Therefore, in Phase 2 the filter is electrostatically discharged in a treatment chamber before its arrestance and pressure drop are again determined under more realistic conditions.



4 Weighted evaluation of arrestance results using theoretical particulate distributions

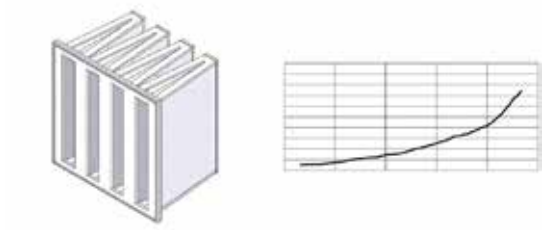
The results of both test phases are then averaged, providing the average arrestance for each of the fractions PM1, PM2.5 and PM10. Before the filter is classified in an ISO Filter Group, its arrestance results are weighted using theoretical particle size distributions for urban and rural air. The ISO Filter Group classification is done in accordance with these weighted arrestance results.





5 Determination of dust retention capacity

In the case of ISO Coarse filters, testing of dust retention capacity is mandatory as stipulated by ISO 16890. For all other Filter Groups this is an optional determination. The testing particulate specified for use in the dust retention test is Test Dust AC Fine.



Is there any way to simply convert EN 779 Filter Classes into ISO Filter Groups?

No, there isn't, we're sorry to say. The testing and evaluation procedures of ISO 16890 and EN 779 differ greatly. We therefore cannot recommend use of tables or calculations which claim to convert G1-F9 Filter Classes into ISO Filter Groups. A number of such conversion tables are available; however there are major differences between them.

Comparison of EN 779 and ISO 16890

	EN 779	ISO 16890
Title	Particulate air filters for general ventilation	Air filters for general ventilation
Validity	up to mid-2018	From late 2016
Evaluation of arrestance	Filter Classes G1-G4: average gravimetric arrestance Filter Classes M5-F9: Only arrestance of particulates 0.4 µm in diameter	Classification is based on arrestance of particulates in the diameter range 0.3-10 µm. This applies for all ISO Filter Groups.
Filter classification	**Filter Classes** G1-G4 M5-M6 F7-F9	**Filter Groups** ISO Coarse ISO ePM_{10} ISO $ePM_{2,5}$ ISO ePM_{1}
Test dust	L1 (ASHRAE)	L2 (A2 / AC Fine)
Important characteristics	1) Average gravimetric arrestance 2) Average efficiency & minimum efficiency for particles 0.4 µm in diameter 3) Dust retention capacity for test particulate 4) Pressure drop as function of volumetric flow rate	1) Initial gravimetric arrestance (compulsory only for ISO Coarse) 2) Average fractional arrestance for particulate groups PM1, PM2.5 and PM10 3) Minimum efficiency ≥50% for the tested PM group 4) Dust retention capacity for test dust (compulsory for ISO Coarse, for other filter groups optional) 5) Pressure drop as function of volumetric throughput

EMW filtertechnik GmbH

EMW® offers air filters and the open celled filter foam Poret® for different sectors like the HVAC industry and air intake systems of gas turbines. Each filter system supplied is optimized for the airborne particles at the intended site, ensuring highly efficient filtration, which prevents problems before they arise.