DEFIL
DEPOLVERAZIONE FILTRAZIONE

JUNE 2018
ENTRY INTO FORCE OF THE NEW UNI EN ISO 16890:2017 STANDARDS

A SINGLE GLOBAL LEGISLATION

In June 2018 the new UNI EN ISO 16890:2017 standard will come into force, which will bring substantial changes in test methods and classification of filters from class G to class F, the old UNI EN 779:2012 standard, used in common ventilation systems.

UNI EN 779:2012 will be permanently replaced in August 2018

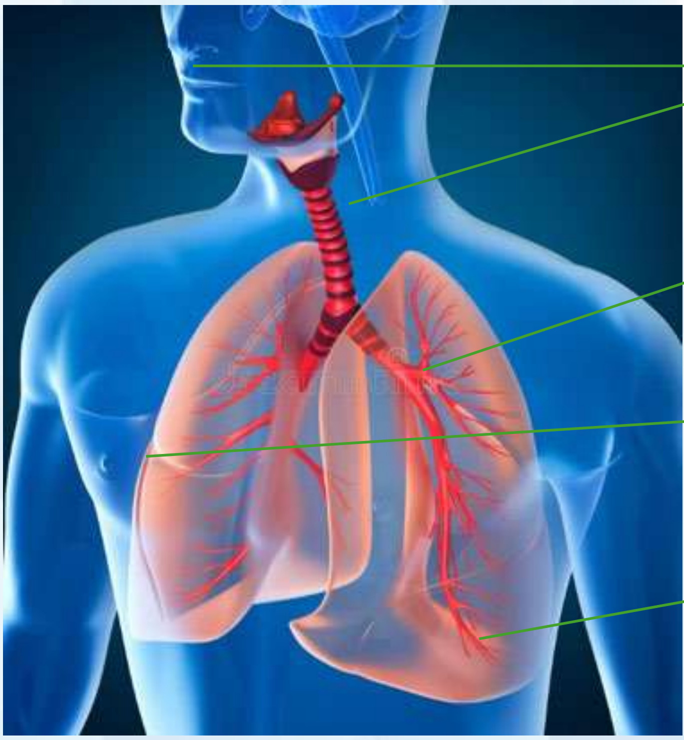
The standard approved with 100% of the votes from the countries participating in the CEN and ISO technical committees will replace the American ASHRAE 52.2 standards and the European UNI EN 779:2012 standards.

In ISO 16890:2017, filters will no longer be divided into Coarse (G), Medium (M) or Fine (F) efficiency classes, but will be divided into 4 classes: ISO Coarse, ISO ePM_{10}, ISO $ePM_{2.5}$ and, lastly, ISO ePM_1.

As can be seen, EN ISO 16890:2017 classifies filters based on atmospheric particulate, following joint studies of scientific and medical communities and the WHO (World Health Organization), which have found and confirmed the ever increasing danger for human health caused by particles less than 1 micron in the environment.

The PM values can be measured locally or, in the absence of the same, data obtained from the monitoring of regional ARPAs can be used, through the control units located in the municipality in which they belong. This will allow you to install the various filtering stages according to the quality of the outdoor air (Outdoor Air Quality – OAQ).

The figure below shows the human respiratory system and where it is attacked by particles of fine dust.



It can therefore be said that the studies on air pollution led to the creation of UNI EN ISO 16890:2017 with stricter tests for filter classification, thus improving indoor air quality (Indoor Air Quality – IAQ) and therefore the health of human beings.

Classification table according to UNI EN ISO 16890:2017

Group	Reference particulate	Class	Classification	Requirements	Final Pressure Drop (Pa)
ePm_{10} <50%	From 0,3 µm To 10 µm	Iso Coarse	Initial gravimetric arrestance	N / d	200
ePm_{10} ≥50%	From 0,3 µm To 10 µm	Iso ePm_{10}	ePm_{10} (50%) ePm_{10} (55%) ePm_{10} (60%) ePm_{10} (65%) ePm_{10} (70%) ePm_{10} (75%) ePm_{10} (80%) ePm_{10} (85%) ePm_{10} (90%) ePm_{10} (95%)	Initial efficiency ≥50%	300
$ePm_{2,5}$ minimo ≥50%	From 0,3 µm To 2,5 µm	Iso $ePm_{2,5}$	$ePm_{2,5}$ (50%) $ePm_{2,5}$ (55%) $ePm_{2,5}$ (60%) $ePm_{2,5}$ (65%) $ePm_{2,5}$ (70%) $ePm_{2,5}$ (75%) $ePm_{2,5}$ (80%) $ePm_{2,5}$ (85%) $ePm_{2,5}$ (90%) $ePm_{2,5}$ (95%)	Initial efficiency ≥50% Efficiency discharged filter ≥50%	
ePm_1 minimo ≥50%	From 0,3 µm To 1 µm	Iso ePm_1	ePm_1 (50%) ePm_1 (55%) ePm_1 (60%) ePm_1 (65%) ePm_1 (70%) ePm_1 (75%) ePm_1 (80%) ePm_1 (85%) ePm_1 (90%) ePm_1 (95%)	Initial efficiency ≥50% Efficiency discharged filter ≥50%	

The filters will be tested with a particular test tunnel with flow rates ranging from 900 m3/h (with 0.25 m3/s speed) to 5400 m3/h (with a speed of 1.5 m3/s). The frontal dimension of the filter that will be tested is 592x592 mm (As required by the UNI EN 15805:2010 standard).

The same filter could fall into several classes, but according to the standard you can classify and then label the filter to a single class

Example of a new label for rigid pocket filters

Below we provide an example of a label that will be applied (until August 2018) to a rigid pocket filter our model DFT / DIE 95 C3.

Batch No: 17/18

Order No: 2018-00049

DE TR9C3

DE TR9C3

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Dimensions (mm): **592*592*592**	
EFFICIENCY	
EN779-2012	**ISO 16890**
F9	**ePM1 80%**
Flow (m3/h): 4250	
Dif. Pressure (Pa): **155**	

As can be seen, according to the UNI EN 779:2012 standards the filter is classified F9, while it is classified ePM_1 80% according to UNI EN ISO 16890:2017.

Classification comparison table according to UNI EN 779:2012 and UNI EN ISO 16890:2017

Differences	UNI EN 779 :2012	UNI EN ISO 16890:2017
Air flow used in the test tunnel	From 850 m^3/h (V= 0,24 m^3/s) To 5400 m^3/h (V= 1,5 m^3/s)	From 900 m^3/h (V= 0,25 m^3/s) To 5400 m^3/h (V= 1,5 m^3/s)
Classes	G1-G2-G3-G4-M5-M6-F7-F8-F9	ISO Coarse - ePM_{10}- $ePM_{2,5}$- ePM_1
Test particle diameter	0,4 µm	From 0,3 µm To 10 µm (depending on class)
Efficiency	Minimum (ME) for classes F7-F8-F9	Average (EA) between initial efficiency (Ei) and discharged efficiency (Ed)
Discharged efficiency (Ed)	Tested on filter media samples in class F7-F8-F9 with liquid isopropanol	Tested on complete filter with isopropanol vapours
Aerosol used for the test	DEHS (Octyl sebacate)	DEHS for dust from 0.3 µm to 1 µm KCL (potassium chloride) for dust from 2.5 µm to 10 µm
Dust accumulation	Classes from G1 to G4 up to final Pressure Drop of 250 Pa Classes from M5 to F9 up to final Pressure Drop of 450 Pa	vPM10 $<$ 50% - Final Pressure Drop of 200 Pa PM10 $\geq$ 50% - Final Pressure Drop of 300 Pa
Dust used for coarse filter tests and energy efficiency	ASHRAE	ISO fine A2/C
Quantity of dust emitted for testing	70 mg/m^3	140 mg/m^3

Group	UNI EN 779:2012	UNI EN ISO 16890:2017			
CLASSIFICATION					
		Iso Coarse	ePM_{10}	$ePM_{2,5}$	ePM_1
Coarse	G1 G2 G3 G4	40% 70% 80% 90%	n/d n/d n/d n/d	n/d n/d n/d n/d	n/d n/d n/d n/d
Medium	M5 M6	n/d n/d	From 50% To 55% From 65% To 70%	From 10% To 35% From 50% To 55%	From 5% To 20% From 20% To 40%
Fine	F7 F8 F9	n/d n/d n/d	From 80% To 85% From 90% To 95% From 95% To 100%	From 70% To 75% From 80% To 85% From 90% To 95%	From 60% To 65% From 75% To 80% From 85% To 90%

Tunnel and test procedure

The test tunnel to test the filters with the new UNI EN ISO 16890:2017 standard is similar to the tunnel used to test the filters with the old UNI EN 779:2012 standard.

The tunnel consists of:

- A chamber where the test aerosol/dust is introduced
- A section where the filter to be tested is installed
- Final section of the tunnel

The aerosol/dust introduction chamber is filtered at the inlet with an absolute polydihedral filter in class H13 according to the UN EN 1822:2010 standards.

The chamber has a mixing inlet, where the aerosol/dust is introduced, and is composed of a perforated plate and a plate with a mixing deflector.
An aerosol generator introduces the DEHS aerosol (from 0.1 μm to 1 μm) and the KCL aerosol (from 1 μm to 10 μm). In the chamber there is also a neutraliser and a dust dispenser, which inject the right amount of aerosol into the circuit.

The section where the filter to be tested is installed consists of a transparent part, in order to observe the filter and its behaviour continuously, and of isokinetic probes, in order to suck the aerosol upstream and downstream of the filter; there are also pressure taps in order to measure the load loss, upstream and downstream of the section.

The final section of the tunnel is composed of a further mixing input, in case a spectral efficiency test is also to be performed (for ePM_{10} >20% and <ePM_{1} 99% classes), or a final efficiency filter ≥ ePM1 65%, if an accumulation test is to be carried out.
In the section there is also a hot-wire anemometer for measuring the flow rate, and in the end another absolute filter in class H13 according to EN 1822:2010 is installed in order to return clean air to the environment.

Once the test is performed, the results will be collected.

At this point the tested filter will be placed in a particular conditioning chamber, where it will be discharged from its electrostatic charge, by introducing into it isopropanol (IPA) vapours for 24 hours.

Once the filter has been discharged, it will be left to rest for 30 minutes (to allow the iso-propanol vapours to evaporate) then the test will be repeated from the beginning and the results will be collected once again at the end of the test.

The results of the two tests will be compared and an average will be calculated to obtain the final filter class

Below is an example of a test result.

<table>
<tr><td>ePM_1, min. 44%</td><td colspan="2">$ePM_{2,5}$, min. 59%</td><td rowspan="2">Iso rating
Iso $ePM_{2,5}$ 55%</td></tr>
<tr><td>ePM_1 48%</td><td>$ePM_{2,5}$ 64%</td><td>ePM_{10} 80%</td></tr>
</table>

Note:

- Always remember that filter classification is the test average with an electrostatic charged and discharged filter
- The 3 classes must always be reported in the test (even if the values do not reach the optimal data for the respective class)
- Minimum efficiency (ME) must always be reported for ePM1 and ePM2.5 classes
- The final value must always be rounded down to multiples of 5%