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**WEBINAR**



# ISO 16890 - THE GLOBAL AIR FILTRATION STANDARD

Meeting your energy efficiency  
and IAQ requirements

09 JUNE 2021

10:00H (GST) | 11:30H (IST) | 14:00H (SST)



# Moderator



**Markus Lattner**

Managing Director, Eurovent  
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# Organisers



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# Knowledge Partners



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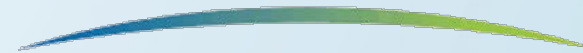


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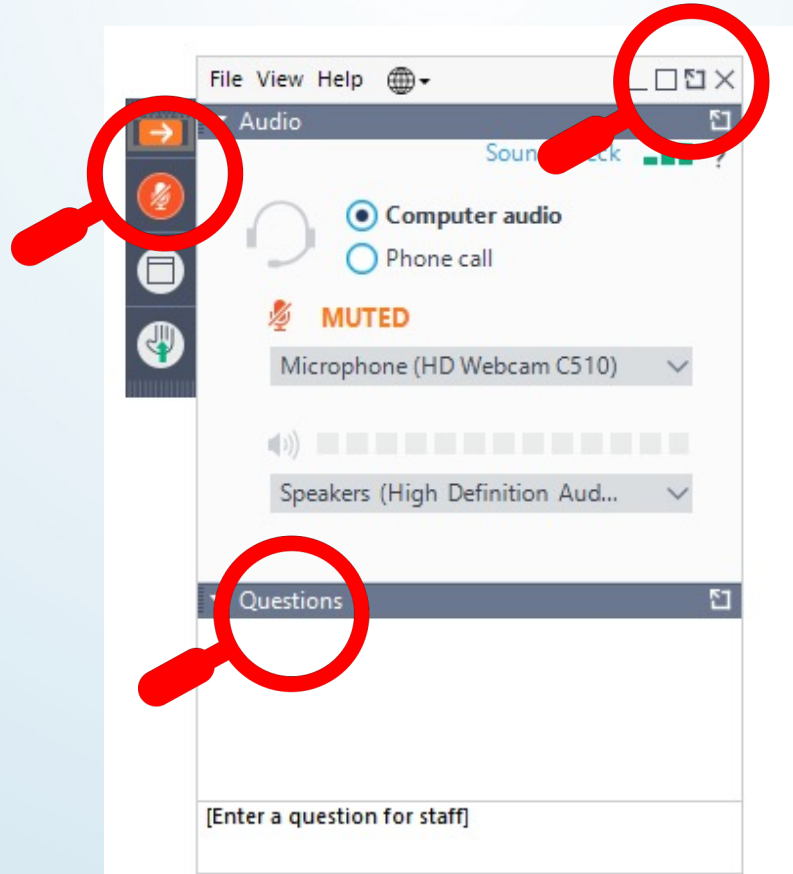
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# climate control <sup>MIDDLE EAST</sup>

KEY PERSPECTIVES ON THE REGION'S HVACR INDUSTRY

# Technicalities



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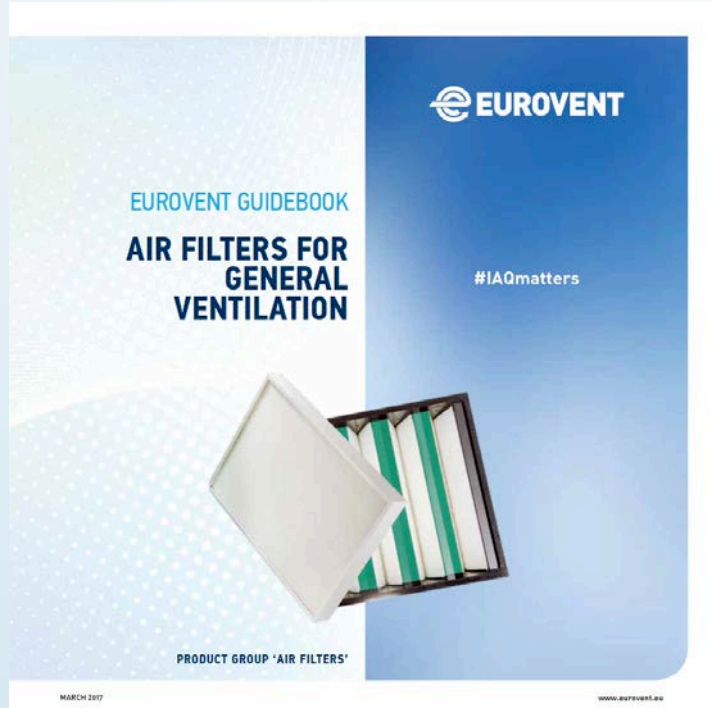
# Handouts



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## Eurovent Air Filters Guidebook



## Eurovent Recommendation 4/23





# Roadmap

1. **Welcome remarks and introduction**
2. ISO 16890: The global air filtration standard
3. Eurovent 4/23: Guidance to the application of ISO 16890
4. Energy efficiency and filter certification
5. Summary of key takeaways
6. Panel discussion and Q&A



# Speakers



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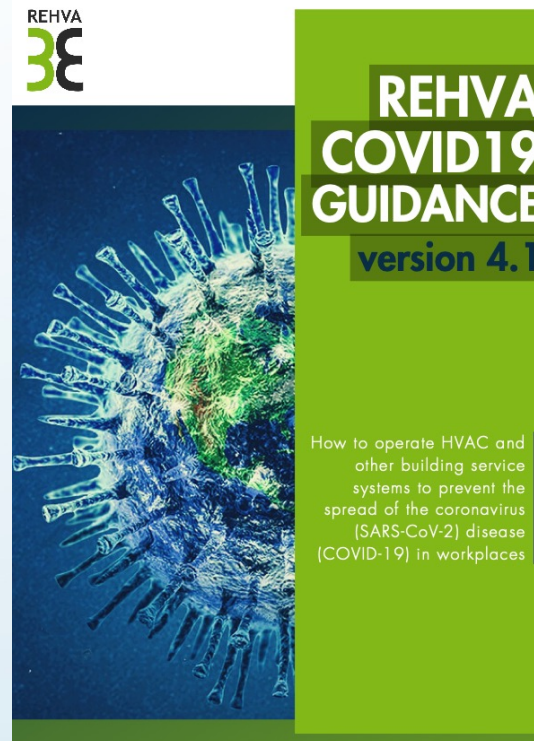


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**Ilinca Nastase**

Associate Professor, Director of  
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Recommendation from the Nordic Ventilation Group

## Criteria for room air cleaners for particulate matter



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### Introduction

Portable air cleaners can be used to reduce the concentration of particulate matter in room air. They may also reduce the risk of infections due to pathogens in the indoor air, as a significant amount of viral material is spread as small droplets or dried droplets which behave like small airborne particles. These viral particles can be removed from room air using portable air cleaners, by circulating the air through the unit. To be safe and effective the cleaner must fulfill certain performance criteria. If they produce ozone or hydrogen peroxide then they may pose safety concerns.

For this, the following parameters must be considered:

- Clean air delivery rate (CADR)
- Noise
- Energy efficiency
- Placement of the air cleaner
- Service and maintenance
- Generation of pollutants (the possible negative effect of the air cleaner on the indoor air quality, such as ozone generation).
- Operation
- Service

### General information

The air purifier must meet all regulatory requirements and be approved from an electrical safety point of view by the European Union or national authorities.

Data which demonstrates the safe and effective performance of the unit must be obtained from third party testing and presented by a third-party certification body. An example of a certification program that operated by Eurovent Certita Certification [1] and [2].

### Clean air delivery rate (CADR)

"Clean air delivery rate-CADR" is the air flow, free of specific pollutant, which is supplied to the room by the cleaner. It can be estimated as a product of air flow through the unit and the removal efficiency of the unit for a specific pollutant (usually particulate matter). Regarding the removal efficiency of the cleaner, the most critical size for particulate matter is 0.3-0.5 µm.

Particle removal efficiency is calculated by subtracting the measured average ratio of downstream-to-upstream particle concentrations from unity.

CADR can be expressed for any other pollutant as well. Eurovent Certita Certification has identified [2] the following pollutants: particles of 0.3 µm to 0.5 µm, particles of 1.0 µm to 2.0 µm, particles of 3.0 µm to 5.0 µm size; Acetone, Acetaldehyde, Heptane, Toluene, Formaldehyde, *Staphylococcus epidermidis*, *Aspergillus niger* and *Pseudomonas* cat. allergen.

The effect of CADR for the unit(s) placed in the room on the overall level of pollutants present in the room depends on the size and ventilation rate (outdoor air) of the room.

To achieve a meaningful additional reduction of viral particles in the indoor air CADR (measured for particle size of 0.3-0.5 µm) should be two times greater than the outdoor air flow by the ventilation system [2] in rooms with a ventilation rate more than 1 ACH. This CADR reduces the concentration of a pollutant by 70%. In rooms with a lower ventilation rate (lower than 1 ACH) the CADR must be at least 2 ACH.

REHVA Journal - April 2021 37



## Safe operation of buildings and HVAC systems during the COVID-19 pandemic (v1 autumn 2020)

### Module 1

The first module of the course aims at familiarising the participants with the scientific concepts of SARS-CoV-2 transmission, risk mitigation and the key role of air quality, air distribution solutions and adequate ventilation in infection control.

#### 1.1 Boost your IQ on IAQ & COVID-19

1.1 provides a general overview of the fundamentals and definitions of Indoor Air Quality (IAQ) and Indoor Environmental Quality (IEQ), along with its relevance to the COVID-19 pandemic, highlighting some real-life examples.

#### 1.2 COVID-19 in the light of IAQ concepts

1.2 goes deeper in the nature of the virus and its physics, such as the relation between the size of the droplet and its behaviour in space.

#### 1.3 COVID-19 transmission routes, airborne transmission and infection control pyramid

1.3 explains the different transmission routes of the virus, providing a further analysis on the airborne route and virus kinetics in indoor environments, underlining the important role of adequate ventilation.

#### 1.3.1 Fecal-Oral Transmission

1.3.1 sheds light on the less known fecal-oral route of the virus and its unique characteristics, providing some evidence from anecdotal cases and practical recommendations to minimise transmission risk.

#### 1.4 The role of HVAC systems during COVID-19

1.4 analyses evidence of the significant role of source control of the virus, illustrating the impact of HVAC systems on reducing the risk of aerosol infection.

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# Roadmap

1. Welcome remarks and introduction
2. **ISO 16890: The global air filtration standard**
3. Eurovent 4/23: Guidance to the application of ISO 16890
4. Energy efficiency and filter certification
5. Summary of key takeaways
6. Panel discussion and Q&A



# ISO 16890:

## The global air filtration standard



**Prabhat PK Goel**

Technical and Industry Advisor,  
Eurovent Certita Certification

Lecturer at ISHRAE Institute of  
Excellence



# Background



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International  
Organization for  
Standardization



World Health  
Organization



**EPA**

United States  
Environmental Protection  
Agency



Federation of Environmental Trade Associations

**BIS IS 7613 : 1975(R2017)**



METHOD OF TESTING PANEL TYPE AIR FILTERS FOR  
AIR CONDITIONING AND VENTILATION PURPOSES

**Published date:** 12-01-2013

**Publisher:** Bureau of Indian Standards



**NAFA<sup>®</sup>**  
National Air  
Filtration  
Association

# Basics



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Let's first understand some basics

**ISO 16890-1:2016**  
**What is it all about?**

And why is it so necessary to change!



# Reasons for global preference for ISO 16890



## Greater emphasis on Indoor Air Quality

- **New medical findings**
- **Particulate matter**
- **Fine dust**
- New medical findings – Different approach to testing and classification
- Issued by ISO to improve IAQ with fine particulate matter
- Increased focus on 1 & 2.5 Microns particle size effects
- Comprehensive test procedure and classification method

**Led to change in approach to ‘Method of Air Filter Testing’**

# Reasons for global preference for ISO 16890

## Greater emphasis on what we breathe

- **New Medical Findings**



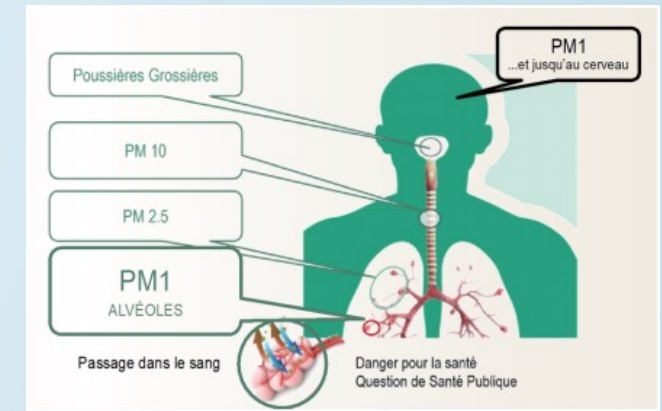
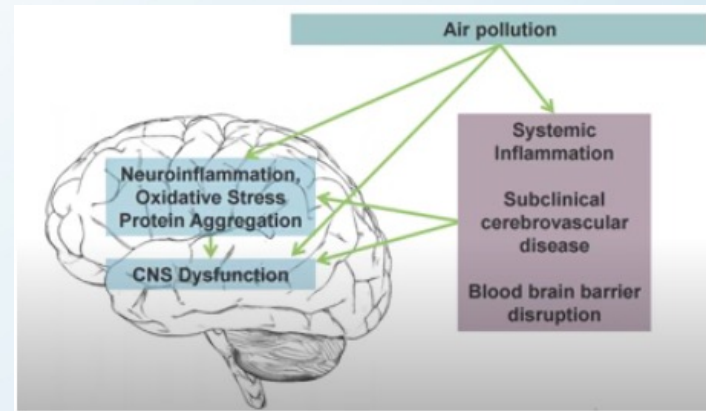
International  
Organization for  
Standardization



- Cardiovascular issues due to small particles
- Effect on nervous system due to small fine dust
- ISO standard take notice of this
- New regulations by WHO in keeping with Standards

# Reasons for global preference for ISO 16890

## Greater emphasis on Indoor Air Quality



PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>1</sub>
Particles 10 µm in diameter or smaller can reach the respiratory ducts and potentially cause decreased lung function.	Particles 2.5 µm in diameter or smaller can penetrate the lungs and cause decreased lung function, skin and eye problems.	Particles 1 µm in diameter or smaller are most dangerous. They are tiny enough to enter the bloodstream and lead to cancer, cardiovascular diseases and dementia.

Most parameters now related to PM1, PM2.5, PM10

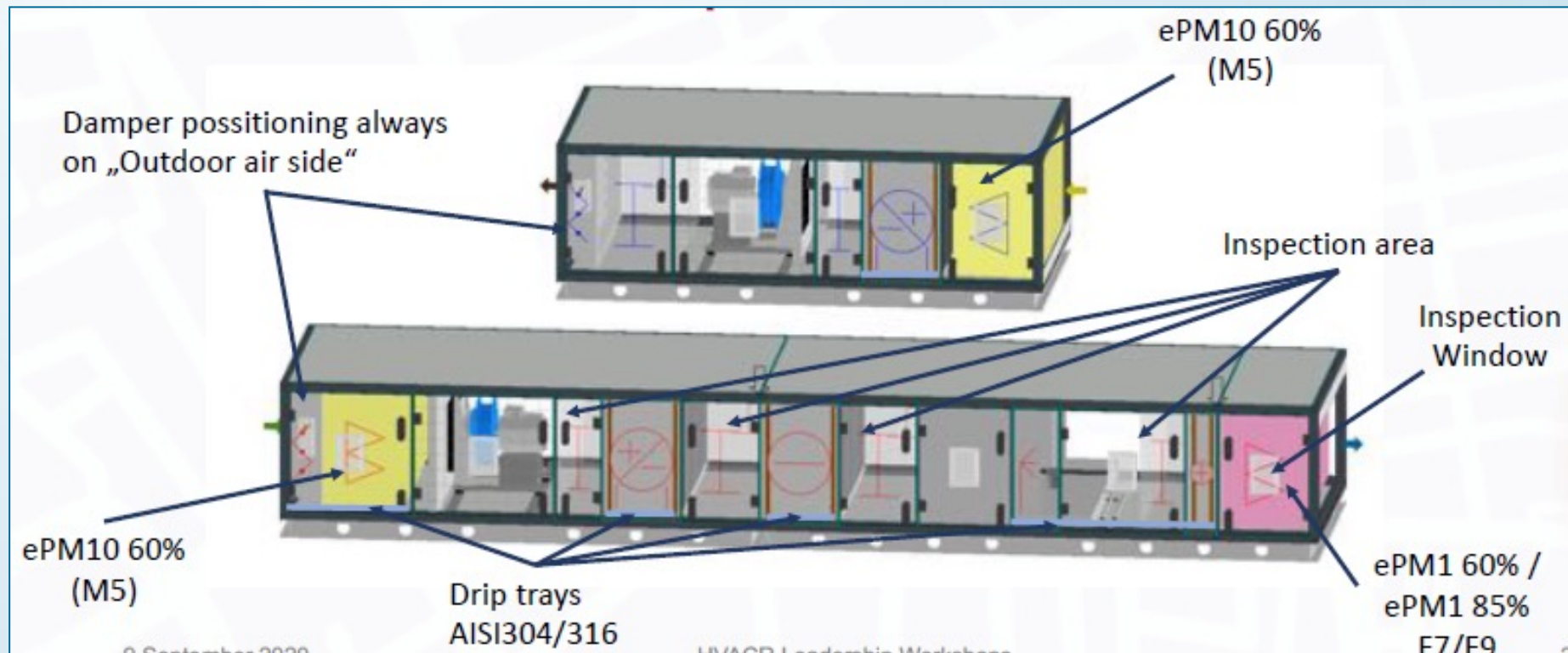
# Deconstructing the nomenclature



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## Filter nomenclature example - ePMxx vv%





# MERV filter ratings ASHRAE 52.1 & 52.2




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## Understanding how air filters work

The MERV (Minimum Efficiency Reporting Value) rating of a filter describes the size of the holes in the filter that allow air to pass through. The higher the Merv rating, the smaller the holes in the filter, the higher the efficiency.

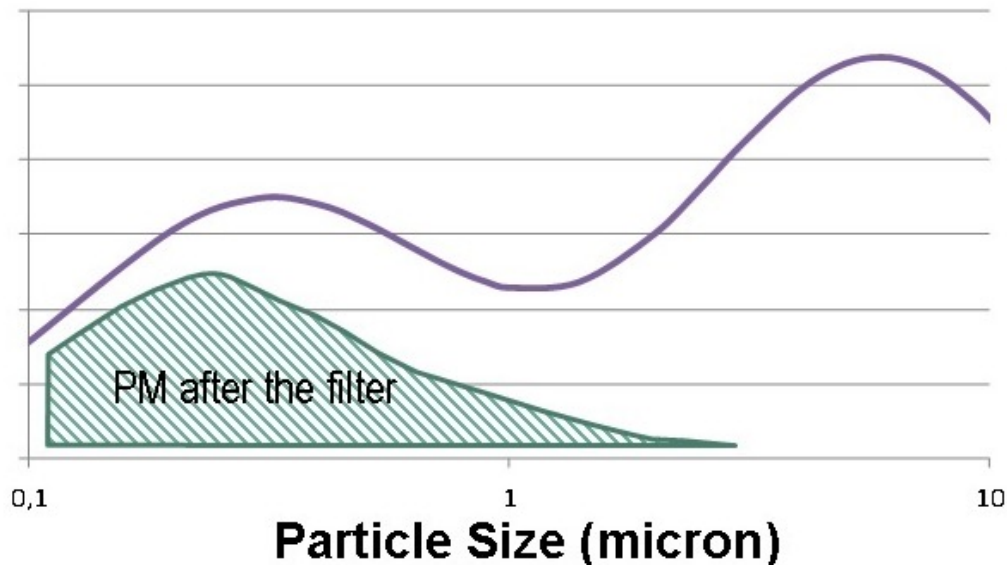
## ASHRAE in the process of modifications based on particle size

Reference:  MERV FILTER TESTING EXPLAINED

# Reasons for global preference for ISO 16890

Most IAQ standards now relate to PM1, PM2.5 and PM10 and their removal requirement

## Particulate Matter (PM) Size Distribution



743

Table 5 Threshold values for indoor air quality parameters

Parameters		Units	Classification		
			Class A	Class B	Class C
Basic IAQ parameters	CO <sub>2</sub>	ppm	Ambient + 350	Ambient + 500	Ambient + 700
	PM 2.5	µg/m <sup>3</sup>	<15	<25	<25
	CO	ppm	<2	<9	< 9
	TVOC (equivalent to isobutylene)	µg/m <sup>3</sup>	<200	<400	<500
Complementary IAQ parameters	PM 10	µg/m <sup>3</sup>	<50	<100	<100
	CH <sub>2</sub> O	µg/m <sup>3</sup>	<30	<100	-
	SO <sub>2</sub>	µg/m <sup>3</sup>	<40	<80	-
	NO <sub>2</sub>	µg/m <sup>3</sup>	<40	<80	-
	O <sub>3</sub>	µg/m <sup>3</sup>	<50	<100	-
	Total Microbial Count	CFU/m <sup>3</sup>	Indoor ≤ ambient	Indoor ≤ ambient	-
Occupant Satisfaction		%	90	80	-

ASHRAE IAQ Standard



# Meeting your energy efficiency and IAQ requirements



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- Provide guidelines on the selection of EN ISO 16890 rated air filter classes
- Outline differences between EN 779 and EN ISO 16890
- Increase awareness on the energy efficiency of air filters




# How to recommend the correct fresh air filter



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## Outdoor Air Quality – Eurovent Recommendation 4/23

Category	Description	Typical environment
ODA 1	<p><b>OUTDOOR AIR, WHICH MAY BE ONLY TEMPORARILY DUSTY</b></p> <p>Applies where the World Health Organisation WHO (2005) guidelines are fulfilled (annual mean for <math>PM_{2,5} \leq 10 \mu g/m^3</math> and <math>PM_{10} \leq 20 \mu g/m^3</math>).</p>	
ODA 2	<p><b>OUTDOOR AIR WITH HIGH CONCENTRATIONS OF PARTICULATE MATTER</b></p> <p>Applies where PM concentrations exceed the WHO guidelines by a factor of up to 1,5 (annual mean for <math>PM_{2,5} \leq 15 \mu g/m^3</math> and <math>PM_{10} \leq 30 \mu g/m^3</math>).</p>	
ODA 3	<p><b>OUTDOOR AIR WITH VERY HIGH CONCENTRATIONS OF PARTICULATE MATTER</b></p> <p>Applies where PM concentrations exceed the WHO guidelines by a factor of greater than 1,5 (annual mean for <math>PM_{2,5} &gt; 15 \mu g/m^3</math> and <math>PM_{10} &gt; 30 \mu g/m^3</math>).</p>	

# How to recommend the correct fresh air filter

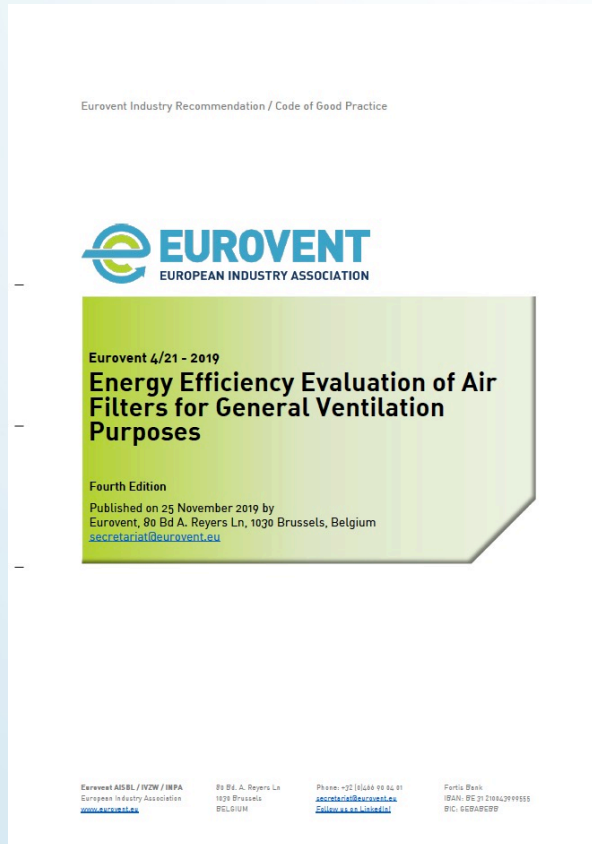
## Indoor Air Quality – Eurovent Recommendation 4/23

SUP 2	<b>Rooms for permanent occupation.</b> Examples: Kindergartens, offices, hotels, residential buildings, meeting rooms, exhibition halls, conference halls, theaters, cinemas, concert halls.	 
SUP 3	<b>Rooms with temporary occupation.</b> Examples: Storage, shopping centers, washing rooms, server rooms, copier rooms.	 
SUP 4	<b>Rooms with short-term occupation.</b> Examples: restrooms, storage rooms stairways.	 
SUP 5	<b>Rooms without occupation.</b> Examples: Garbage room, data centers, underground car parks.	 

SUP 1	<b>Applications with high hygienic demands.</b> Examples: Hospitals, pharmaceuticals, electronic and optical industry, supply air to clean rooms.	
SUP 2	<b>Applications with medium hygienic demands.</b> Examples: Food and beverage production.	
SUP 3	<b>Applications with basic hygienic demands.</b> Examples: Food and beverages production with a basic hygienic demand.	
SUP 4	<b>Applications without hygienic demands.</b> Examples: General production areas in the automotive industry.	



# Energy evaluation of air filters



- Define energy efficiency of air filters for general ventilation purposes
- Define energy efficiency evaluation methods
- Implement the ISO 16890 classification and testing methods in place of EN 779

# Replacement of old filters

## There is no equivalence between EN 779 & ISO filters - Quick guide for replacement

First determine from application your critical particle size

EN 779: 2012	EN ISO 16890 – range of actual measured average efficiencies		
Filter class	ePM <sub>1</sub>	ePM <sub>2,5</sub>	ePM <sub>10</sub>
M5	5% - 35%	10% - 45%	40% - 70%
M6	10% - 40%	20% - 50%	60% - 80%
F7	40% - 65%	65% - 75%	80% - 90%
F8	65% - 90%	75% - 95%	90% - 100%
F9	80% - 90%	85% - 95%	90% - 100%

### Pressemitteilung der Expertengruppe

Filterklasse nach EN 779	Filterklasse nach ISO 16890	Abscheide- leistung
M5	ISO ePM <sub>10</sub>	≥ 50 %
F7	ISO ePM <sub>2.5</sub>	≥ 65 %
oder:	ISO ePM <sub>1</sub>	≥ 50 %
F9	ISO ePM <sub>1</sub>	≥ 80 %

Empfehlung der Expertenarbeitsgruppe Luftfiltration zu Anforderungen an die neuen Luftfilter für Komfort-Raumlüftungsanlagen (Filterklasse nach ISO 16890 verglichen mit Filterklasse nach EN 779). In der letzten Filterstufe muss mindestens ein Filter ISO ePM<sub>1</sub> ≥ 50 % eingesetzt werden.

Luzern, 27.  
Januar  
2021 4. Schweizer Hygienekongress

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# Programme to help provide desired filtration level



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## Consulting engineer decides exact requirements



Identification: ECP 11 FIL

Revision 0 – February 2020

(This version cancels and replaces any previous versions)

Approbation date: 10/02/2020

Comes into effect from: 10/02/2020





# Areas with good filtration requirement

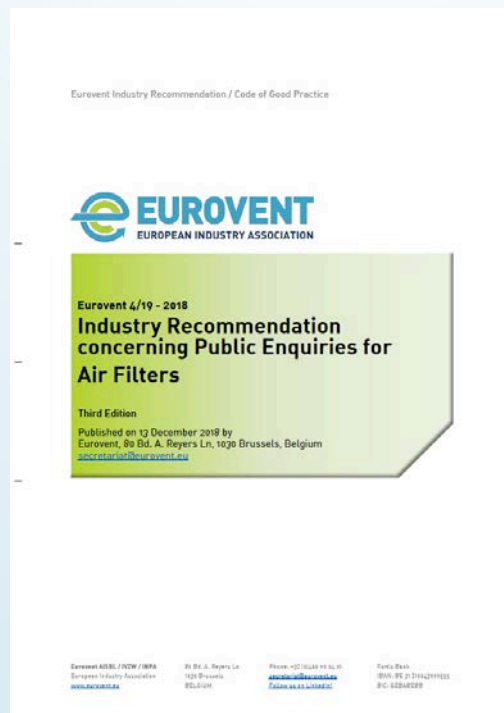


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# Guidance

## Programme to help provide desired filtration level



# Conclusion



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- The WHO findings bring out the importance of fine dust and the medical findings associated with fine dust particles. The ISO 16890 takes this into consideration.
- ISO and WHO findings are based on PM1, PM2.5 and PM10. Environmental and IAQ standards globally refer to PM1, PM2.5 and PM10.
- Filter nomenclature needs to be easy to understand by all involved with IAQ and airside HVAC. Filter nomenclature should relate to particle size and the removal efficiency of the filter.
- With the addition of Eurovent Guidebooks and Recommendations, the programme becomes more holistic and enables engineers to select the correct filters for maintaining desired IAQ levels with data on energy spent annually to achieve the required IAQ.





# Thank you!



## **Prabhat PK Goel**

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# Roadmap

1. Welcome remarks and introduction
2. ISO 16890: The global air filtration standard
3. **Eurovent 4/23: Guidance to the application of ISO 16890**
4. Energy efficiency and filter certification
5. Summary of key takeaways
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# Eurovent 4/23:

## Guidance to the application of ISO 16890



**Marc Schmidt, Ph.D.**

Vice President Technologies  
Europe, AAF

Chairman of the Eurovent Product  
Group 'Air Filters'



# Eurovent Recommendation 4/23

## Third edition, November 2020

EUROVENT 4/23 - 2020

### SELECTION OF EN ISO 16890 RATED AIR FILTER CLASSES FOR GENERAL VENTILATION APPLICATIONS

THIRD EDITION

Published on 1 November 2020 by  
Eurovent, 80 Bd A. Reyers Ln, 1030 Brussels, Belgium  
[secretariat@eurovent.eu](mailto:secretariat@eurovent.eu)

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# ISO 16890 testing and classification



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Step 1

Filter **efficiency is measured** on 0,3 to 10  $\mu\text{m}$  of the clean not conditioned filter.

Step 2

The **filter is conditioned (discharged)** in an isopropanol vapor atmosphere to eliminate particle filtration based on electrostatic forces.

Step 3

Filter **efficiency is measured again** on 0,3 to 10  $\mu\text{m}$  – now of the conditioned (discharged) filter.

Step 4

Actual **efficiency per PM size is calculated** as the average of the conditioned **and** the unconditioned filter.  
**Important:** The filter needs to show a minimum efficiency of 50% for the unconditioned **and** the conditioned filter.

Step 5

Values are allocated to ISO groups.

ISO coarse	> 10 $\mu\text{m}$
ISO ePM <sub>10</sub>	0,3 $\mu\text{m}$ $\leq$ x $\leq$ 10 $\mu\text{m}$
ISO ePM <sub>2,5</sub>	0,3 $\mu\text{m}$ $\leq$ x $\leq$ 2,5 $\mu\text{m}$
ISO ePM <sub>1</sub>	0,3 $\mu\text{m}$ $\leq$ x $\leq$ 1 $\mu\text{m}$

Step 6

**Reporting value is defined. The reporting value for the filter is the highest possible ISO group with at least 50% of efficiency** – always rounded down in 5% steps.

# Example for filter classification

A filter is showing following average efficiency values:

Efficiency class	Value
ISO ePM <sub>10</sub>	89%
ISO ePM <sub>2,5</sub>	63%
ISO ePM <sub>1</sub>	49%

- Minimum efficiency of 50% is achieved for **ISO ePM<sub>10</sub> and ISO ePM<sub>2,5</sub>** – with 49% requirement for **ISO ePM<sub>1</sub> is not fulfilled**
- Highest possible ISO group is therefore **ISO ePM<sub>2,5</sub>**
- **ISO ePM<sub>2,5</sub> value of 63% is rounded down to 60%**

As a result, the filter is classified as

**an ISO ePM<sub>2,5</sub> 60% filter**

Meaning this filter is able to capture 60% of the particles smaller or equal 2,5 micron!

# ISO 16890 test duct and discharge chamber



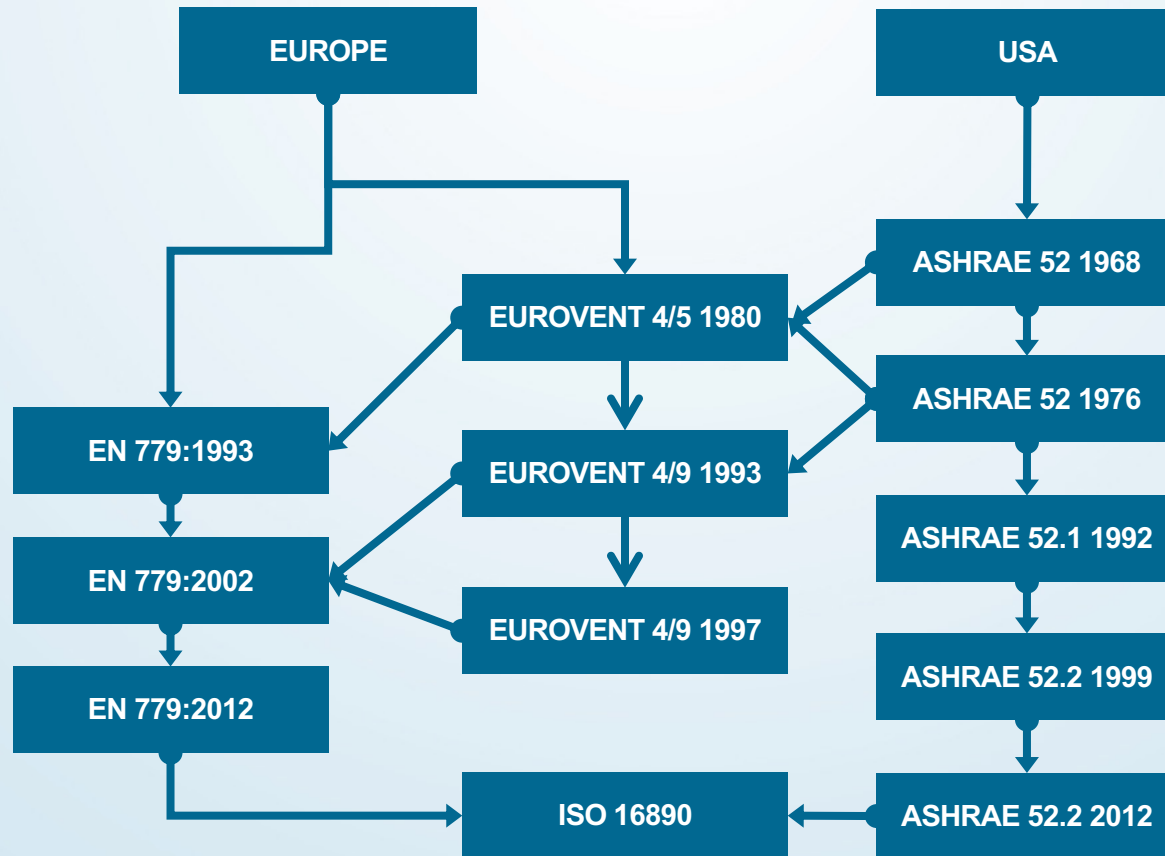
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State-of-the-art ISO16890 test duct and discharge chamber in AAF filter lab in Trencin (Slovakia).



# History of filter standards

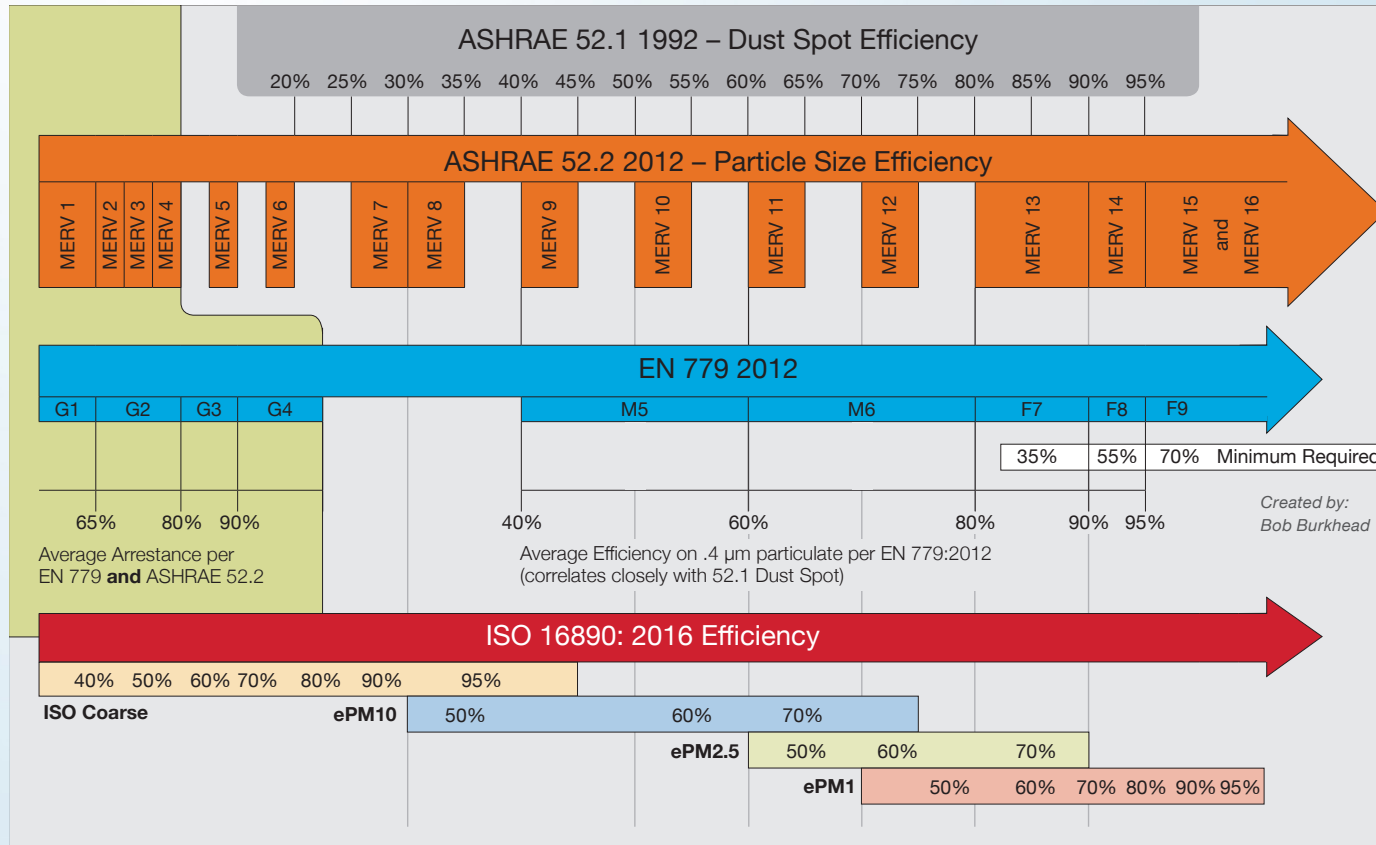


- In 1968, ASHRAE published the first unified standard which measured the arrestance as well as the dust-spot efficiency with artificial test dust.
- In 1976, ASHRAE Standard 52-76 was published introducing the atmospheric dust-spot efficiency.
  - Dust spot efficiency
  - Arrestance
  - Dust holding capacity
- Initial efficiency as function of a particle size (MERV: Minimum Efficiency Reporting Value).
- This standard had many improvements over time. Some of the improvements found in the ANSI/ASHRAE 52.2 standard. The improvement of the 52.2 standard allowed for the 52.1 standard to be retired.




# Comparison of filter standards

Standard	ASHRAE 52.2:2012	ISO 16890	EN 779:2012
<b>Aerosol</b>	KCl	DEHS/KCL	DEHS
<b>Aerosol Range</b>	0.3 to 10.0 µm	DEHS: 0.3 to 1.0 µm KCL: 1.0 to 10 µm	0.4 µm
<b>Particle sizes for rating</b>	E1: 0.3 – 1.0 µm E2: 1.0 – 3.0 µm E3: 3.0 – 10.0 µm	PM1: 0.3 – 1.0 µm PM2.5: 0.3 – 2.5 µm PM10: 0.3 – 10 µm	0.4 µm
<b>Loading Dust</b>	ASHRAE 52.2 Dust	ISO Fine	ASHRAE 52.2 Dust
<b>Conditioning</b>	Optional: Appendix J (whole filter)	Mandatory: IPA Vapor (whole filter)	Mandatory: IPA Liquid (flat sheet)
<b>Conditioning substance</b>	0.03 µm KCL	IPA Vapor	IPA Liquid
<b>Conditioning Time</b>	Efficiency measured after minimum increments of $6.4 \times 10^7$ particles/cm <sup>3</sup> min. Conditioning stops after no further significant drop in efficiency.	24 h	2 min soak
<b>Classification</b>	MERV 4 – MERV 16	ePM1, ePM2.5, ePM10	G1 – G4, M5 – M6, F7 – F9
<b>Rating</b>	Worst case	Average of initial and discharged condition	Worst case

# Correlation – no conversion!



# Outdoor Air (ODA) categories

Category	Description	Typical environment
ODA1	<b>Outdoor air which maybe only temporarily dusty</b> Applies where the World Health Organization WHO (2005) guidelines are fulfilled:  Annual mean for $PM_{2,5} \leq 10 \mu g/m^3$ and $PM_{10} \leq 20 \mu g/m^3$ .	
ODA2	<b>Outdoor air with high concentrations of particulate matter</b> Applies where PM concentrations exceed the WHO guidelines by a factor of up to 1,5:  Annual mean for $PM_{2,5} \leq 15 \mu g/m^3$ and $PM_{10} \leq 30 \mu g/m^3$ .	
ODA3	<b>Outdoor air with very high concentrations of particulate matter</b> Applies where PM concentrations exceed the WHO guidelines by a factor of more than 1,5:  Annual mean for $PM_{2,5} > 15 \mu g/m^3$ and $PM_{10} > 30 \mu g/m^3$ .	



# Supply Air (SUP) categories



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Category	Description	General Ventilation	Industrial Ventilation
SUP1	WHO (2005) guidelines limit values <b>multiplied by a factor x 0,25</b> (annual mean for $PM_{2.5} \leq 2.5 \mu g/m^3$ and $PM_{10} \leq 5 \mu g/m^3$ ).	-	<b>Applications with high hygienic demands</b> Hospitals, pharmaceuticals, electronic and optical industry, supply air to clean rooms...
SUP2	WHO (2005) guidelines limit values <b>multiplied by a factor x 0,5</b> (annual mean for $PM_{2.5} \leq 5 \mu g/m^3$ and $PM_{10} \leq 10 \mu g/m^3$ ).	<b>Rooms for permanent occupation</b> Kindergardens, offices, hotels, residential buildings, meeting rooms, exhibition halls, conference halls, theaters, cinemas, concert halls...	<b>Applications with medium hygienic demands</b> Food and beverage production...
SUP3	WHO (2005) guidelines limit values <b>multiplied by a factor x 0,75</b> (annual mean for $PM_{2.5} \leq 7.5 \mu g/m^3$ and $PM_{10} \leq 15 \mu g/m^3$ ).	<b>Rooms with temporary occupation</b> Storage, shopping centers, washing rooms, server rooms, copier rooms...	<b>Applications with basic hygienic demands</b> Food and beverages production with a basic hygienic demand...
SUP4	WHO (2005) guidelines limit values (annual mean for $PM_{2.5} \leq 10 \mu g/m^3$ and $PM_{10} \leq 20 \mu g/m^3$ ).	<b>Rooms with short-term occupation</b> Restrooms, storage rooms stairways...	<b>Applications without hygienic demands</b> General production areas in the automotive industry...
SUP5	WHO (2005) guidelines limit values <b>multiplied by a factor x 1.5</b> (annual mean for $PM_{2.5} \leq 15 \mu g/m^3$ and $PM_{10} \leq 30 \mu g/m^3$ ).	<b>Rooms without occupation</b> Garbage room, underground car parks...	<b>production areas of the heavy industry</b> Steel mill, smelters, welding plants...

# Selecting filter efficiency



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Better SUP									
					Supply Air Quality (SUP)				
					SUP1*	SUP2*	SUP3**	SUP4	SUP5
					PM2.5 ≤ 2.5 µg/m <sup>3</sup> PM10 ≤ 5 µg/m <sup>3</sup>	PM2.5 ≤ 5 µg/m <sup>3</sup> PM10 ≤ 10 µg/m <sup>3</sup>	PM2.5 ≤ 7.5 µg/m <sup>3</sup> PM10 ≤ 15 µg/m <sup>3</sup>	PM2.5 ≤ 10 µg/m <sup>3</sup> PM10 ≤ 20 µg/m <sup>3</sup>	PM2.5 ≤ 15 µg/m <sup>3</sup> PM10 ≤ 30 µg/m <sup>3</sup>
		Annual mean			ePM1	ePM1	ePM2.5	ePM10	ePM10
		PM2.5 µg/m3	PM10 µg/m3						
worse ODA	Outdoor Air Quality (ODA)	ODA1	≤ 10	≤ 20	70%	50%	50%	50%	50%
		ODA2	≤ 15	≤ 30	80%	70%	70%	80%	50%
		ODA3	> 15	> 30	90%	80%	80%	90%	80%

\*min. filtration requirement ePM1 50% at final stage | \*\*min. filtration requirement ePM2.5 50% at final stage

# Filter classes meeting recommended minimum efficiency



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		SUP1	SUP2	SUP3	SUP4	SUP5
ODA1	2 stages*	ePM10 50% + ePM1 60%	ePM1 50%	ePM2,5 50%	ePM10 50%	ePM10 50%
	1 stage	ePM1 70%	-	-	-	-
ODA2	2 stages*	ePM1 50% + ePM1 60%	ePM10 50% + ePM1 60%	ePM1 50%	ePM2,5 50%	ePM10 50%
	1 stage	ePM1 80%	ePM1 70%	ePM2,5 70%	ePM10 80%	-
ODA3	2 stages*	ePM1 50% + ePM1 80%	ePM1 50% + ePM1 60%	ePM10 50% + ePM1 60%	ePM1 50%	ePM2,5 50%
	1 stage	ePM1 90%	ePM1 80%	ePM2,5 80%	ePM10 90%	ePM10 80%

# Handouts



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## Eurovent Air Filters Guidebook



## Eurovent Recommendation 4/23







# Thank you!



**Marc Schmidt, Ph.D.**

Vice President Technologies  
Europe, AAF

Chairman of the Eurovent Product  
Group 'Air Filters'

[marc.schmidt@aafeurope.com](mailto:marc.schmidt@aafeurope.com)

# Roadmap

1. Welcome remarks and introduction
2. ISO 16890: The global air filtration standard
3. Eurovent 4/23: Guidance to the application of ISO 16890
- 4. Energy efficiency and filter certification**
5. Summary of key takeaways
6. Panel discussion and Q&A



# Certification

## Energy and filtration efficiency



**Sylvain Courtey**  
Technical Director  
Eurovent Certita Certification

# Why certification

It is not a question of manufacturers' size, country of origin or brand name

**Fair comparison using a  
standard benchmark**

**Increase Consumer confidence**



**Ensures performance before  
purchase!**

**Eliminates over-sizing due to under  
performing uncertainty**

**Eliminates expensive customer  
Verification tests**

**Avoids excessive  
system operating costs**



# Building confidence



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## Filter certification by independent third party\*:

- Reduces risk of inefficient and unsafe ventilation system
- Guarantees original design's energy consumption
- Avoids performance downgrade by maintenance with non-certified spares

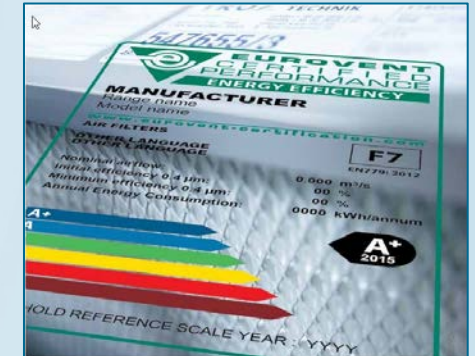
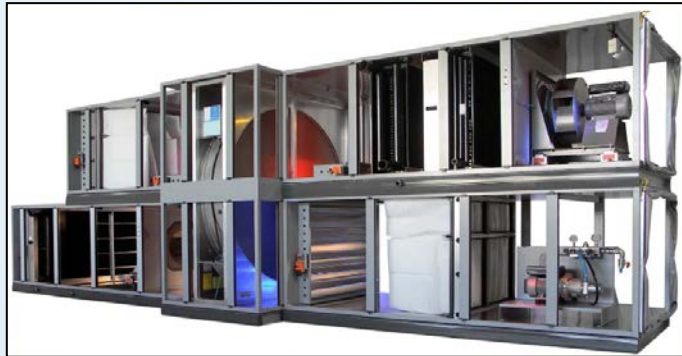
*\*Under ISO 17065 Accreditation*



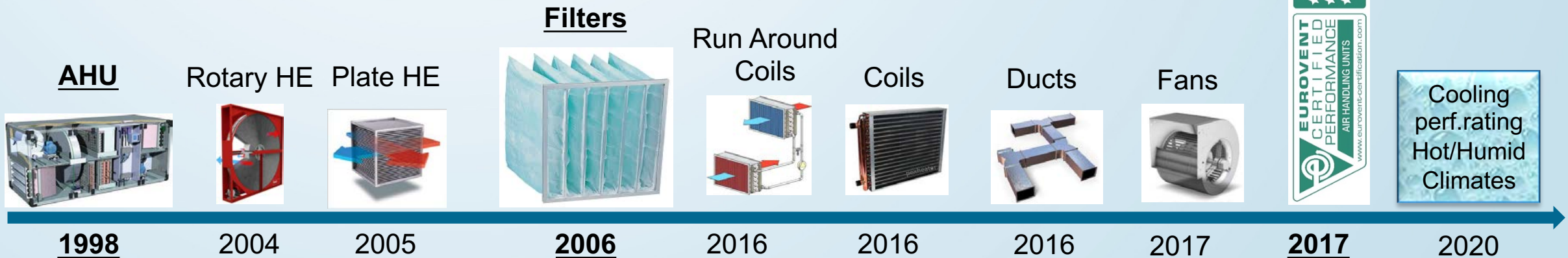
# Filter and AHU Performance



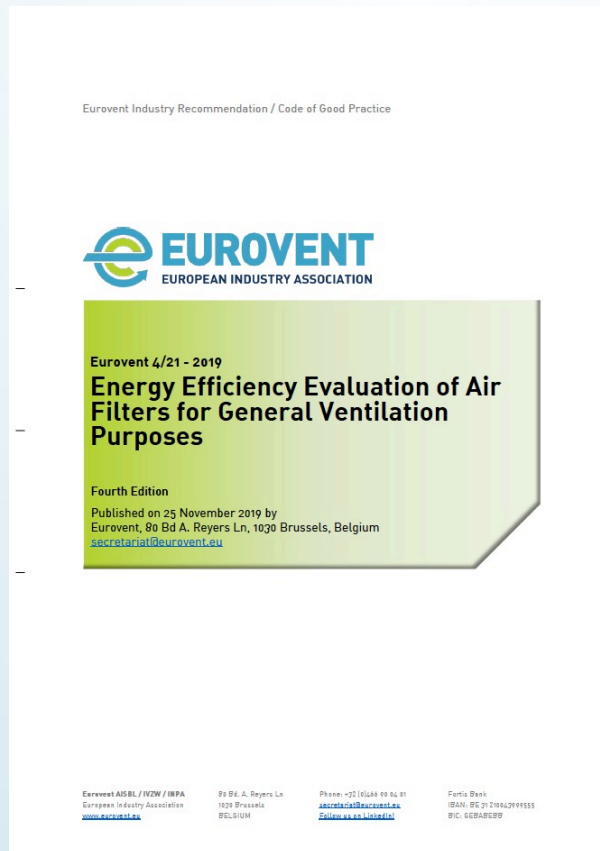
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## Key milestones for holistic AHU certification



# Background



- Eurovent has been the first organisation in the world to propose a method for rating the energy efficiency of air filters **since 2013**
- **Eurovent 4/21** – Energy Efficiency Evaluation of Air Filters for General Ventilation Purposes (2019) is currently the latest version of the document describing the method
- This method can be used in combination with **ISO 16890**

# Principle



- Air filters cause energy consumption (W) due to their pressure drops ( $\Delta p$ )
- Following standard values are considered:
  - Nominal airflow:  $q_v = 0,944 \text{ m}^3/\text{s}$  (3400  $\text{m}^3/\text{h}$ )
  - Operation time:  $t = 6000 \text{ h/a}$
  - Fan efficiency:  $\eta = 0,5$

$$W = \frac{q_v \cdot \overline{\Delta p} \cdot t}{\eta \cdot 1000}$$

$$W = 11.33 \frac{\text{kWh / a}}{\text{Pa}} \cdot \overline{\Delta p}$$



# Testing method



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1. Carry out an ISO 16890-1 test at 0,944 m<sup>3</sup>/s for a full size filter (592mm x 592mm)
2. Load the filter with AC fine dust acc. to ISO 16890-3 until the amount of dust defined in the table on the right is reached
3. Calculate the average pressure drop
4. Calculate the yearly energy consumption W

ISO group	Amount of dust fed $M_x$
ISO ePM <sub>1</sub>	200g
ISO ePM <sub>2,5</sub>	250g
ISO ePM <sub>10</sub>	400g

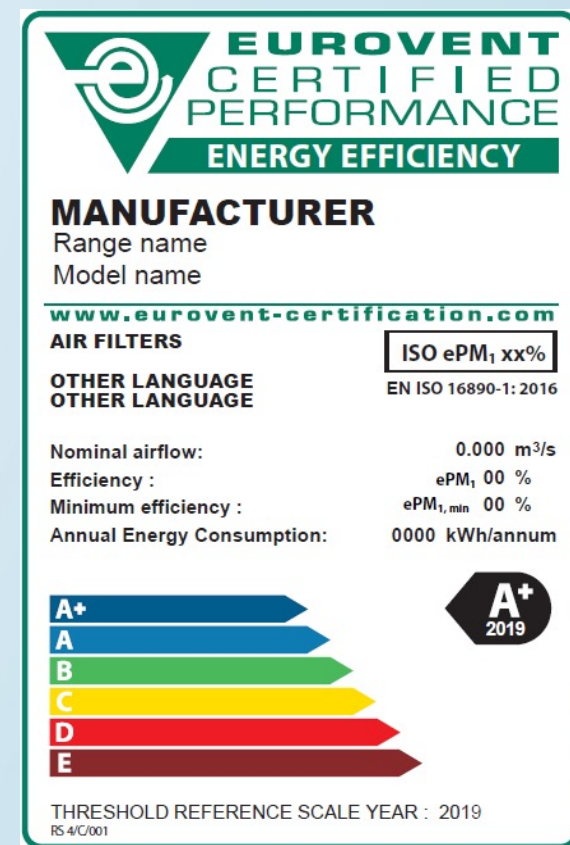
# Energy classification

**Energy efficiency classes are defined in the  
Air Filter Technical Certification Rules:**

AEC in kWh/y for ePM1						
	A+	A	B	C	D	E
50 & 55%	800	900	1050	1400	2000	>2000
60 & 65%	850	950	1100	1450	2050	>2050
70 & 75%	950	1100	1250	1550	2150	>2150
80 & 85%	1050	1250	1450	1800	2400	>2400
> 90%	1200	1400	1550	1900	2500	>2500

AEC in kWh/y for ePM10						
	A+	A	B	C	D	E
50 & 55%	450	550	650	750	1100	>1100
60 & 65%	500	600	700	850	1200	>1200
70 & 75%	600	700	800	900	1300	>1300
80 & 85%	700	800	900	1000	1400	>1400
> 90%	800	900	1050	1400	1500	>1500

AEC in kWh/y for ePM2.5						
	A+	A	B	C	D	E
50 & 55%	700	800	950	1300	1900	>1900
60 & 65%	750	850	1000	1350	1950	>1950
70 & 75%	800	900	1050	1400	2000	>2000
80 & 85%	900	1000	1200	1500	2100	>2100
> 90%	1000	1100	1300	1600	2200	>2200



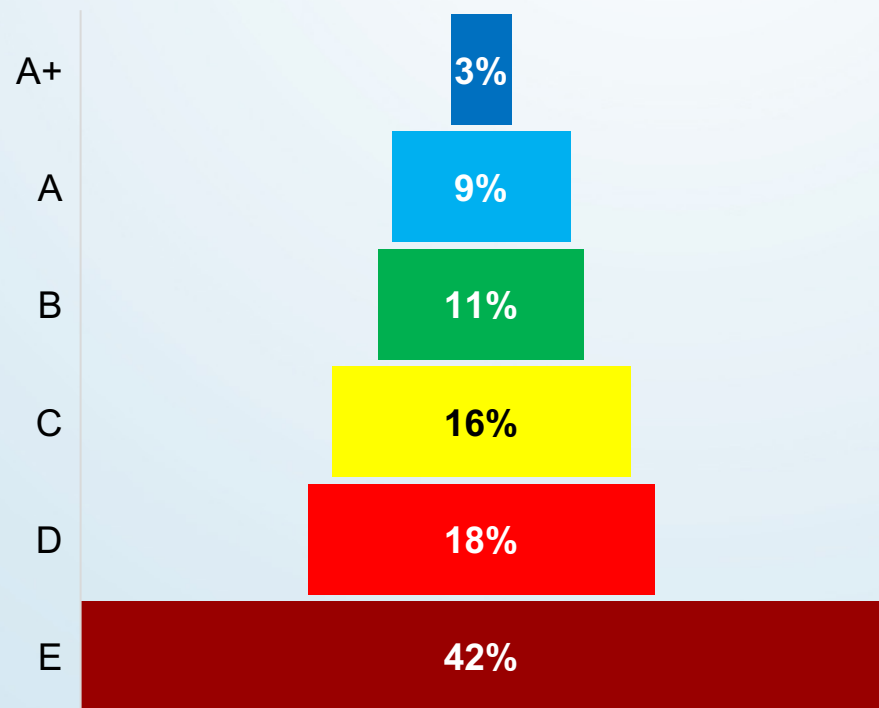
# Analysis



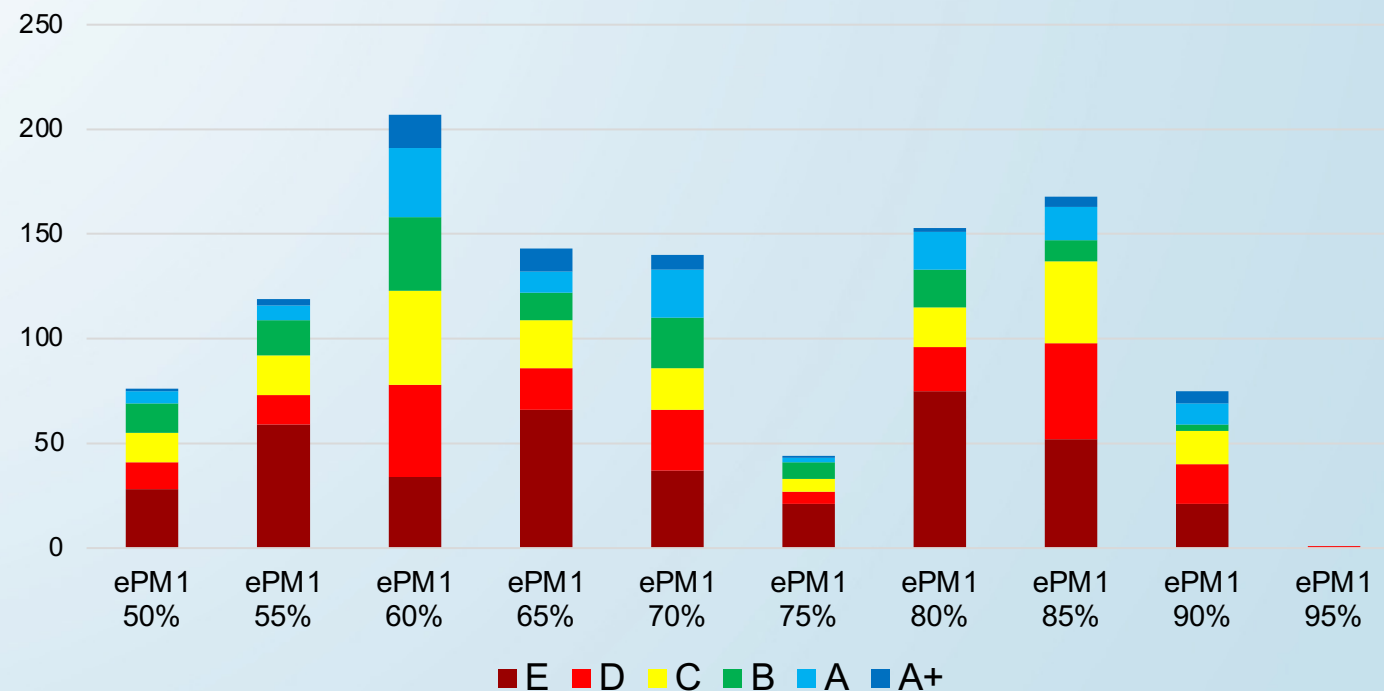
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Distribution of energy efficiency classes



ePM1



# Conclusion

## Selection rules:

1. Define the target filter efficiency group (ePM1, ePM2.5, ePM10) and efficiency value in % (e.g. using Eurovent 4/23)
2. Define the target energy efficiency class (A+, A, B, etc.)
3. Use new [Eurovent Certita Certification online selection tool for certified air filters](#)

The screenshot shows the 'Advanced search criteria' section of the Eurovent Certita Certification online selection tool. The interface is titled 'Close filters ^' and 'Please select one product family and one product type.' It includes a 'New search' button and a 'Let us guide you' link. The search criteria are organized into a table with two columns: 'Criteria' and 'Value'. The criteria listed are: 'Product family' (with a green checkmark), 'Product type' (with a green checkmark), 'Brand', 'Model name / Certificate N°', 'Advanced search criteria' (highlighted in green), 'Help on search criteria?', 'Basic design' (dropdown menu), 'Media' (dropdown menu), 'Nominal airflow rate' (dropdown menu with 'm³/s' unit), 'Filter class according to ISO 16890' (dropdown menu), and 'Energy efficiency class' (dropdown menu). At the bottom right, there are two buttons: 'Clear all filters' and 'Apply (2000)'.





# Thank you!



**Sylvain Courtey**

Technical Director

Eurovent Certita Certification

[s.courtey@eurovent-certification.com](mailto:s.courtey@eurovent-certification.com)

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6. Panel discussion and Q&A



# Key takeaways



**Vanshaj Kaul**

Country Representative India,  
Eurovent Certita Certification

Public Policy professional

# Summary



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- Health concerns have been rising and all stakeholders now recognise the importance of the air we breathe.
- People spend 90% of their time indoors, therefore focus on IAQ and relating to PM levels is important.
- ISO 16890 offers harmonisation which is welcomed by all stakeholders
- Understanding filter nomenclature & efficient tools is important to size and design the right components including filters for both Indoor and Outdoor Air Quality.
- Energy efficiency and filter efficiency do not contradict each other
- **‘ISO 16890 empowers to choose the right filter’**



# Reference documents



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- <https://eurovent.eu/?q=content/eurovent-423-2020-selection-en-iso-16890-rated-air-filter-classes-third-edition-english>
- <https://eurovent.eu/?q=content/eurovent-421-2019-energy-efficiency-evaluation-air-filters-general-ventilation-purposes>
- <https://eurovent.eu/?q=content/eurovent-419-2018-industry-recommendation-concerning-public-enquiries-air-filters-third>
- <https://eurovent.eu/?q=content/eurovent-air-filters-guidebook-first-edition>



# Thank you!



**Vanshaj Kaul**

Country Representative India,  
Eurovent Certita Certification

Public Policy professional

[v.kaul@eurovent-certification.com](mailto:v.kaul@eurovent-certification.com)

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# Panel / Q&A



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**Prabhat PK Goel**



**Dr. Marc Schmidt**



**Ilinca Nastase**



**Sylvain Courtey**



**Vanshaj Kaul**

**Moderator: Markus Lattner**



# Notes



Webinar recordings will be available on the Eurovent and Eurovent Middle East YouTube channels



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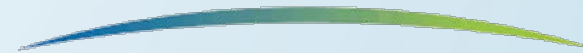


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# climate control <sup>MIDDLE EAST</sup>

## KEY PERSPECTIVES ON THE REGION'S HVACR INDUSTRY



# Thank You!