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

EUROVENT
EUROPEAN INDUSTRY ASSOCIATION

DOCUMENT HISTORY

This Eurovent Industry Recommendation / Code of Good Practice supersedes all of its previous editions, which automatically become obsolete with the publication of this document.

MODIFICATIONS

This Eurovent publication was modified as against previous editions in the following manner:

Modifications as against	Key changes
1st edition	Correction of a mistake in Table 3 (efficiency ePM_{10} for SUP 4).
1st edition (Update 1)	Amendment of recommended minimum efficiencies (Table 3). Adding specification of filter classes matching min. efficiency (Table 7).
2nd edition	Amendment of filter classes for ODA 2/SUP 1, ODA 3/SUP 1 and ODA 3/SUP 2 categories (Table 7).
3rd edition	Present document.

PREFACE

IN A NUTSHELL

The purpose of this recommendation is to:

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

AUTHORS

This document was published by the Eurovent Association and prepared in a joint effort by participants of the Product Group 'Air Filters' (PG-FIL), which represents a vast majority of all manufacturers of these products active on the EMEA market.

COPYRIGHT

SUGGESTED CITATION

Eurovent AISBL / IVZW / INPA. (2020). Eurovent 4/23 - 2020 - Selection of EN ISO 16890 rated air filter classes - Third edition. Brussels: Eurovent.

IMPORTANT REMARKS

The Eurovent Association does not grant any certification based on this document. All certification-related issues are managed by the association's independent subunit Eurovent Certita Certification. For more information, visit www.eurovent-certification.com.

CONTENTS

DOCUMENT HISTORY 2
Modifications 2

PREFACE 2
In a nutshell 2
Authors 2
Copyright 2
Important remarks 2

CONTENTS 4

1. INTRODUCTION 6
1.1 Importance of filtration 6
1.1.1 Impact on health 6
1.1.2 Burden of diseases 7
1.2 Relevance of fine particulate matter 8

2. COMPARISON OF EN ISO 16890 AND EN 779 FILTER EFFICIENCY CLASSIFICATION 9

3. COMPARISON OF EN 779 AND EN ISO 16890 RATED CLASSES OF THE SAME FILTERS 9

4. RECOMMENDATION ON EN ISO 16890 FILTER CLASS SELECTION 10
4.1 WHO thresholds 10
4.2 Ambient air pollution database 10
4.3 Particulate Matter emission indoors 10
4.4 Recommended filtration efficiency depending on outdoor and supply air category 10
4.4.1 Outdoor air categories 11
4.4.2 Supply air categories 12
4.5 Recommended minimum efficiencies 13
4.6 Additional recommendations concerning the protection of HVAC systems 14

5. ESTIMATION OF MULTI-STAGE FILTRATION CUMULATED EFFICIENCY 16

6. ENERGY EFFICIENCY OF FILTERS 16

7. SUMMARY 17

8. LITERATURE 17

9. ANNEX 18
9.1 Comparison of EN 779 and EN ISO 16890 rated filter classes 18
9.2 Additional recommendation on application of optional gas filtration 18
9.3 EN ISO 16890 rated filter classes meeting recommended minimum efficiency 19

1. INTRODUCTION

Published at the end of 2016, the new EN ISO 16890 standard has established an efficiency classification system of air filters for general ventilation based upon particulate matter (PM). This new classification introducing efficiency for various particle size ranges (ePM_1, $ePM_{2,5}$, ePM_{10}) provides completely new, so far unavailable opportunities for designing Indoor Air Quality (IAQ). Yet, it differs considerably from the old classification defined in the well-known and commonly applied EN 779 standard.

Although the ISO 16890 classification establishes an effective IAQ design tool for engineers and maintenance staff, at the time of publication of this document, there are no available corresponding European guidelines on correct filter class selection for various applications taking a sufficient IAQ into account.

The new EN 16798-3:2017 standard, which supersedes the globally known EN 13779, is perceived as the main guidance for HVAC consultants on how to design filtration in ventilation systems. It still refers to EN 779. The coexistence period for both standards is expected to end in the middle of 2018. Afterwards, EN 779:2012 will become obsolete.

The main purpose of this Eurovent Recommendation is to fill this gap and provide comprehensive guidance on the selection of EN ISO 16890 rated filters in general ventilation applications. The recommendation could also constitute a contribution to the next revision of EN 16798-3 regarding consideration of EN ISO 16890.

The publication is addressed to all HVAC professionals dealing with ventilation systems, particularly design consultants, facility managers and manufacturers of equipment including air filters.

1.1 IMPORTANCE OF FILTRATION

People spend on average up to 90% of their life indoors. Not only at home, but in various places such as offices, schools, restaurants, shopping malls or cinemas. It goes without saying that having a clean air indoors is crucial for the health of the population as a whole and in particular vulnerable groups such as babies, children or elderly people.

1.1.1 IMPACT ON HEALTH

Numerous studies have proven a close correlation between IAQ and our health. These also show that particular matter (PM) affects more people than any other pollutant.

The major components of PM are sulphate, nitrates, ammonia, sodium chloride, black carbon, mineral dust, combustion particles and water. It consists of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air.

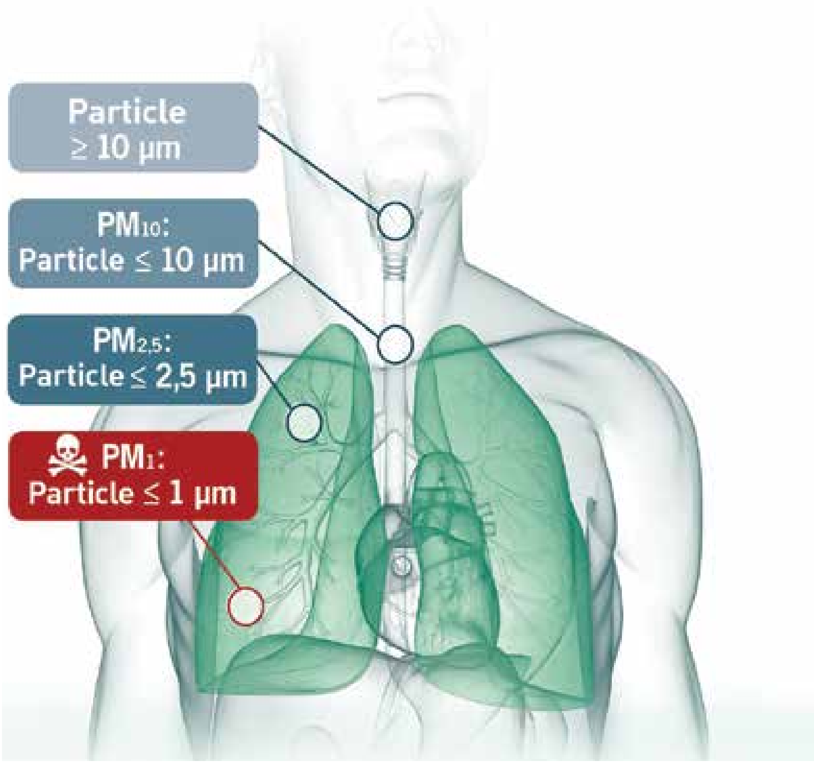
The effects of particulate matter on human health have been extensively studied in the past. The results are that fine dust can be a serious health hazard. The most important diseases which have been associated with (caused or aggravated by) indoor air exposures due to PM contamination are:

- Allergy & Asthma
- Lung cancer
- Cardiovascular diseases (CVD)
- Chronic obstructive lung disease (COPD)
- Dementia

Moreover, there is good evidence of the effects of exposure to various particle size ranges[1]:

[1] It must be observed that the larger faction always includes the smaller one.

PM_{10}	$PM_{2,5}$	PM_1
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.



© Camfil AB

1.1.2 BURDEN OF DISEASES

Conducted researches determined an impact of IAQ on the burden of diseases (BoD). The burden of diseases is measured by the means of a so-called disability-adjusted-life-year (DALY). This time-based measure combines years of life lost due to premature mortality and years of life lost due to time lived in states of less than full health and was originally developed in 1990.

The total estimated burden of disease attributable to IAQ in the European Union is approx. 2m DALYs per year, which means that two million years of healthy life is lost annually. It is worth noticing that, according to latest estimation carried out by French economists, the cost of 1 DALY can amount up to 100.000 EUR. On a global scale, losses resulting from an inadequate IAQ are large.

1.2 RELEVANCE OF FINE PARTICULATE MATTER

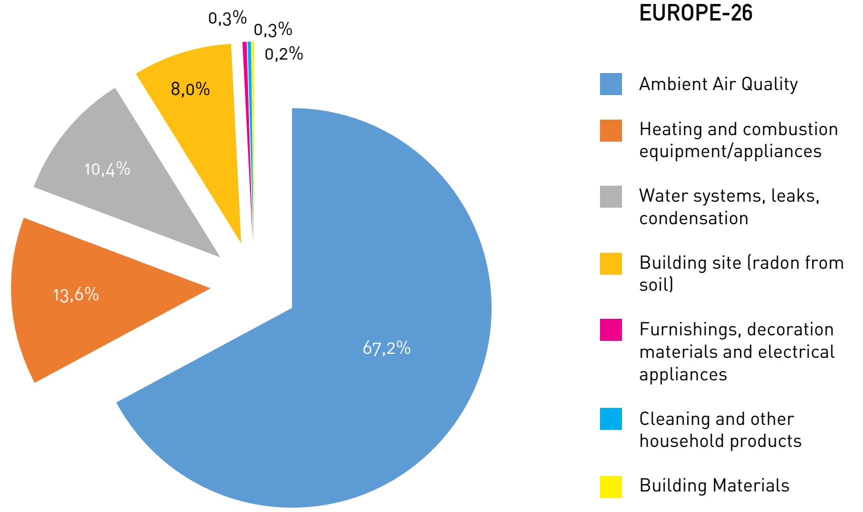
Outdoor air pollution plays a significant role for indoor air exposures. Due to ventilation providing continuous air exchange in buildings, the indoor air exposure to fine PM originates mostly from outdoor air, especially in areas affected by heavy traffic. The second most important source of exposure comes from the indoor combustion of solid fuels for cooking and heating (if present).

The outdoor air fine PM originates mostly from combustion sources, local and distant, in particular where the levels exceed rural background.

What is often not acknowledged is that in strongly polluted areas (e.g. heavy industry zones, city centres with heavy traffic) without air filtration, over 90% of ambient PM levels monitored outdoors, occurs indoors.

Applying correctly selected, efficient air filters in ventilation systems can significantly reduce the impact of PM exposure on the Burden of Disease (BoD).

Bad ambient air quality affects the burden of diseases (BoD) most



2. COMPARISON OF EN ISO 16890 AND EN 779 FILTER EFFICIENCY CLASSIFICATION

As already stated, the efficiency classification established in EN ISO 16890 differs fundamentally from the efficiency definition of EN 779.

Both standards deal with the evaluation of the filtration effect of coarse and fine dust filters used in general ventilation. Yet, in EN 779:2012, the efficiency classification for medium and fine filters is based on 0,4 µm particles, while EN ISO 16890 defines the efficiency for various fractions of particle size, namely: **PM_{10}, $PM_{2,5}$ and PM_1**.

These substantial differences in the approach to the classification definition, but also to test methods, lead to the fact that filter classes rated according to EN ISO 16890 and EN 779 cannot be directly compared or converted by means of any calculation method.

Furthermore, various filters rated in the same EN 779 class can be naturally rated in different EN ISO 16890 classes.

3. COMPARISON OF EN 779 AND EN ISO 16890 RATED CLASSES OF THE SAME FILTERS

To provide a general overview of how both classifications correspond to each other, Eurovent has prepared a comparison of EN 779 and EN ISO 16890 rated classes of the same filters, based on real test data.

The comparison reflects an actual overlapping of respective classes and was developed using information from the 'Eurovent Certified Performance' programme for air filters for general ventilation operated by Eurovent Certita Certification. This programme includes both full EN 779 and EN ISO 16890 tests performed in accredited third-party laboratories.

Manufactures participating in this programme represent a cumulative 70% share of the European market.

The table with comparisons can be found in Annex 1 of this Recommendation. In this version, data used for the comparison includes 91 types of filters.

The table will be updated in upcoming editions of the Recommendation, along with the increasing number of available test data.

4. RECOMMENDATION ON EN ISO 16890 FILTER CLASS SELECTION

4.1 WHO THRESHOLDS

The well-established and generally accepted recommendation on thresholds for PM concentrations in the air we breathe were published by the World Health Organisation (WHO) in the 'Air Quality Guidelines – Global update 2005'. These limits aimed to achieve the lowest concentration of PM possible, since no threshold has been identified below which no damage to health is observed.

The recommended annual mean limits to be observed when selecting filter classes are the following:

- Annual mean for $PM_{2,5}$ < 10 µg/m^3
- Annual mean for PM_{10} < 20 µg/m^3

At the time being, there are no recommendations for PM_1 concentration.

4.2 AMBIENT AIR POLLUTION DATABASE

Information on outdoor air pollution in various location all over the world can be found in the WHO database. The latest release from 2014 contains monitoring results of almost 1.600 cities in 91 countries. Air quality is represented by the annual mean concentration of particulate matter (PM_{10} and $PM_{2,5}$). The entire database can be found on the www.who.int.

4.3 PARTICULATE MATTER EMISSION INDOORS

Knowing only about the PM concentration in outdoor air is not sufficient for the selection of the correct filter class in a ventilation system. Due to existing PM emissions inside premises, basically a concentration of particulate matter in supply air stream should be lower than designed indoor PM level. This allows us to maintain prescribed thresholds by applying so-called dilution principle. Thus, depending on the required PM concentration, supply air can be assigned to different categories (SUP).

The indoor PM emission originates mainly from cooking, combustion activities (including burning of candles, use of fireplaces, use of unvented space heaters or kerosene heaters, cigarette smoking) and hobbies. Indoor PM can also be of biological origin.

Therefore, both outdoor air quality and indoor emissions should be considered when determining filtration efficiency for the desired IAQ.

4.4 RECOMMENDED FILTRATION EFFICIENCY DEPENDING ON OUTDOOR AND SUPPLY AIR CATEGORY

To simplify the selection procedure of the filter class, but still consider all relevant factors, this Eurovent Recommendation introduces a method which matches the recommended minimum filtration efficiency with both the outdoor air and supply air category. To maintain consistency on an international level, the method refers to limit values recommended by WHO.

As it is usually difficult to estimate indoor PM emissions, this Recommendation also indicates examples of typical applications assigned to the respective supply air category.

In this Recommendation, 3 categories of outdoor air (ODA) and 5 categories of supply air (SUP) are defined in the same way as in EN 16798-3 in following way.

4.4.1 OUTDOOR AIR CATEGORIES

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

Table 1: Outdoor air categories

4.4.2 SUPPLY AIR CATEGORIES

SUP 1	Refers to supply air with concentrations of particulate matter which fulfilled the WHO (2005) guidelines limit values multiplied by a factor x 0,25 (annual mean for $PM_{2,5} \leq 2,5$ µg/m^3 and $PM_{10} \leq 5$ µg/m^3).
SUP 2	Refers to supply air with concentrations of particulate matter which fulfilled the WHO (2005) guidelines limit values multiplied by a factor x 0,5 (annual mean for $PM_{2,5} \leq 5$ µg/m^3 and $PM_{10} \leq 10$ µg/m^3).
SUP 3	Refers to supply air with concentrations of particulate matter which fulfilled the WHO (2005) guidelines limit values multiplied by a factor x 0,75 (annual mean for $PM_{2,5} \leq 7,5$ µg/m^3 and $PM_{10} \leq 15$ µg/m^3).
SUP 4	Refers to supply air with concentrations of particulate matter which fulfilled the WHO (2005) guidelines limit values (annual mean for $PM_{2,5} \leq 10$ µg/m^3 and $PM_{10} \leq 20$ µg/m^3).
SUP 5	Refers to supply air with concentrations of particulate matter which fulfilled the WHO (2005) guidelines limit values multiplied by factor x 1,5 (annual mean for $PM_{2,5} \leq 15$ µg/m^3 and $PM_{10} \leq 30$ µg/m^3).

Table 2: Supply air categories

4.5 RECOMMENDED MINIMUM EFFICIENCIES

Minimum filtration efficiencies recommended in this document refer to various PM particle size ranges, depending on the application (a type of premises served by a ventilation system).

For the most demanding applications with high and medium hygienic requirements (SUP 1 and SUP 2), ePM_1 efficiencies are shown. For premises with standard and low hygienic requirements (SUP 3), $ePM_{2,5}$ efficiencies are recommended. For applications with very low or without hygienic requirements (SUP 4 and SUP 5), ePM_{10} efficiency is shown.

The recommended minimum efficiencies depending on ODA and SUP categories are summarised in Table 3 below.

OUTDOOR AIR			SUPPLY AIR				
			SUP 1* $PM_{2,5} \leq 2,5$ PM10 ≤ 5	SUP 2* $PM_{2,5} \leq 5$ $PM_{10} \leq 10$	SUP 3** $PM_{2,5} \leq 7,5$ $PM_{10} \leq 15$	SUP 4 $PM_{2,5} \leq 10$ $PM_{10} \leq 20$	SUP 5 $PM_{2,5} \leq 15$ $PM_{10} \leq 30$
Category	$PM_{2,5}$	PM_{10}	ePM_1	ePM_1	$ePM_{2,5}$	ePM_{10}	ePM_{10}
ODA 1	≤ 10	≤ 20	70%	50%	50%	50%	50%
ODA 2	≤ 15	≤ 30	80%	70%	70%	80%	50%
ODA 3	> 15	> 30	90%	80%	80%	90%	80%

Table 3: Recommended min. ePM_x filtration efficiencies depending on ODA and SUP category (annual mean PM_x values in µg/m^3)

* Minimum filtration requirements ISO ePM_1 50% refer to a final filter stage

** Minimum filtration requirements ISO $ePM_{2,5}$ 50% refer to a final filter stage

Presented efficiency values concern both single filter and multi-stage filtration systems with a cumulated efficiency. A method how to estimate the cumulated efficiency is described in the next chapter.

The Table 7 in the Annex shows non-exhaustive examples of filter class specifications meeting the recommended minimum efficiencies for respective SUP/ODA categoriess .

4.6 ADDITIONAL RECOMMENDATIONS CONCERNING THE PROTECTION OF HVAC SYSTEMS

As the task of air filters in HVAC systems is not only to protect ventilated rooms from too severe level of contamination, but also the HVAC system itself, the minimum efficiency of a first stage filter (on fresh air inlet) should be at least ePM_{10} 50%.

Yet, if air humidification is applied in the system, the minimum efficiency of a filter located downstream the humidifier should be at least $ePM_{2,5}$ 65%.

Examples of typical applications corresponding to the respective SUP categories are shown in Table 4:

CATEGORY	GENERAL VENTILATION		
SUP 1	-	-	
SUP 2	**Rooms for permanent occupation.** Examples: Kindergardens, offices, hotels, residential buildings, meeting rooms, exhibition halls, conference halls, theaters, cinemas, concert halls.		
SUP 3	**Rooms with temporary occupation.** Examples: Storage, shopping centers, washing rooms, server rooms, copier rooms.		
SUP 4	**Rooms with short-term occupation.** Examples: restrooms, storage rooms stairways.		
SUP 5	**Rooms without occupation.** Examples: Garbage room, data centers, underground car parks.		

Table 4: General ventilation - indicative examples of application matched to corresponding SUP categories

CATEGORY	INDUSTRIAL VENTILATION	
SUP 1	**Applications with high hygienic demands.** Examples: Hospitals, pharmaceutics, electronic and optical industry, supply air to clean rooms.	
SUP 2	**Applications with medium hygienic demands.** Examples: Food and beverage production.	
SUP 3	**Applications with basic hygienic demands.** Examples: Food and beverages production with a basic hygienic demand.	
SUP 4	**Applications without hygienic demands.** Examples: General production areas in the automotive industry.	
SUP 5	**Production areas of the heavy industry.** Examples: Steel mill, smelters, welding plants.	

Table 4: Industrial ventilation - indicative examples of application matched to corresponding SUP categories

5. ESTIMATION OF MULTI-STAGE FILTRATION CUMULATED EFFICIENCY

Since the fractional efficiency of an air filter depends on the particle size, the normalised downstream particle size distribution differs significantly to the one upstream of a filter.

The ePMx efficiencies for an individual filter derived from EN ISO 16890-1 have been calculated assuming a standardised particle size distribution. As the distribution downstream of a filter significantly differs from this standardised distribution, the complex methodology presented in Annex C of EN ISO 16890-1 must be applied to precisely estimate multi-stage filtration efficiency.

To facilitate rough estimations, it is recommended to use the following formula to determine the combined filtration efficiency for respective particle size fractions:

$$ePM_{x,\,cum} = 100 \cdot \left(1 - \left(\left(1 - \frac{ePM_{x,\,s1}}{100}\right) \cdot \left(1 - \frac{ePM_{x,\,s2}}{100}\right) \cdot \cdots \left(1 - \frac{ePM_{x,\,sn+1}}{100}\right)\right)\right)$$

Where

$ePM_{x,cum}$ is the total cumulated efficiency for x fraction
$ePM_{x,sn+1}$ is the fractional efficiency for each filter stage

This simplified approach assumes the same particle distribution on the inlet to each of the stages. In most cases, it results in minor deviations compared to the EN ISO 16890 methodology, acceptable for engineering calculations accuracy.

However, if high accuracy is required, it is recommended to contact a filter supplier to perform relevant calculations.

6. ENERGY EFFICIENCY OF FILTERS

Another substantial feature of the air filter, besides the efficiency of particle separation, is its flow resistance which directly translates into an energy consumption. This parameter plays an increasingly important role.

Due to rising Ecodesign requirements for ventilation equipment, pressure drop over filters pertains a significant share of the overall pressure drop in HVAC systems. It has a crucial impact on the total energy consumed by mechanical ventilation. Energy efficiency links the amount of energy required (effort) to the particle filtration efficiency of the filter (benefit).

Understanding this energy efficiency is even more relevant when acknowledging that many end users are not aware of differences in energy consumption related to various filters offering an equal filtration efficiency performance.

The comprehensive methodology to evaluate the energy efficiency of air filters classified according to EN ISO 16890 was developed in a joint effort by participants of the Product Group 'Air Filters' (PG-FIL) and is described within Eurovent Recommendation 4/21 – 2018. This Recommendation can be downloaded from the Eurovent website (www.eurovent.eu).

7. SUMMARY

In a comprehensive way, the Eurovent Recommendation 4/23 merges theoretical and practical aspects of designing Indoor Air Quality in terms of air filtration in spaces served by mechanical ventilation systems.

It reflects a deep technical understanding and experience of the many filtration experts within the Eurovent Association, and particularly its Product Group 'Air Filters'.

This Recommendation provides hands on and effective advice for HVAC planners and manufactures of ventilation equipment to correctly design filtration.

The comparison of the 'new' and 'old' classification is based on real test data. It supports facility managers in switching to EN ISO 16890 rated filters when replacing EN 779 rated filters.

8. LITERATURE

[1] Air Quality Guidelines – Global update 2005, World Health Organization, 2006.

[2] Jantunen M., Oliveira Fernandes E., Carrer P., Kephalopoulos S., Promoting actions for healthy indoor air (IAIAQ), European Commission Directorate General for Health and Consumers, 2011.

[3] https://www.epa.gov/indoor-air-quality-iaq/indoor-particulate-matter#indoor_pm.

[4] Healthvent. Health-based ventilation guidelines for Europe. Work package 8. Impact of the implementation of the ventilation guidelines on burden of disease. Final report 2013-january-31, National Institute for Health and Welfare (THL), Finland, 2012

[5] EN ISO 16890-1:2017: Air filters for general ventilation — Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM), 2017.

[6] EN 13053: 2006+A1:2011: Ventilation for buildings – Air handling units – Rating and performance for units, components and selection, 2011.

[7] EN 16798-3:2017: Energy performance of buildings - Part 3: Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems, 2017

9. ANNEX

9.1 COMPARISON OF EN 779 AND EN ISO 16890 RATED FILTER CLASSES

As stated in chapter 3, the direct conversion of EN 779 and EN ISO 16890 classes is not possible. To facilitate an indicative comparison, particularly for the purpose of replacing existing filters, the Eurovent Association has developed a table matching both EN 779 and EN ISO 16890 classes for the same filters.

The comparison shows the actual overlapping of EN 779 and EN ISO 16890 classes and was developed based on real test data of 91 filters provided by Eurovent Certita Certification.

EN 779: 2012	EN ISO 16890 – range of actual measured average efficiencies		
Filter class	ePM_1	$ePM_{2.5}$	ePM_{10}
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%

Table 5: EN 779 – EN ISO 16890 comparison

9.2 ADDITIONAL RECOMMENDATION ON APPLICATION OF OPTIONAL GAS FILTRATION

Following the provisions of EN 16798-3:2017, it is recommended to apply additional gas filters to complement particle filtration for the following combinations of outdoor air quality (gaseous) and supply air quality classes:

Outdoor air quality	Supply air quality				
	SUP 1	SUP 2	SUP 3	SUP 4	SUP 5
ODA (G) 1	Recommended				
ODA (G) 2	Required	Recommended			
ODA (G) 3	Required	Required	Recommended		

Table 6: Recommendation on application of additional gas filter

9.3 EN ISO 16890 RATED FILTER CLASSES MEETING RECOMMENDED MINIMUM EFFICIENCY

The recommended minimum filtration efficiency given in Table 3 can be reached by applying alternative suitable filter classes (1 stage filtration) or various combinations of filter classes (multi-stage filtration).

This provides for the optimisation of a filtration system in terms of different criteria but especially the energy efficiency. Optimisation of the energy efficiency can be easily performed by joint consideration in the selection both the efficiency of particle separation and the Eurovent energy rating of respective filters.

An actual filtration efficiency can be determined directly based on ISO rating of a filter (if considered SUP category refers to the rated ePM group), efficiencies for other than rated ePM fractions, available in the technical data sheet of a filter, and additionally for multi-stage filtration – by means of the formula for combined filtration efficiency presented in chapter 5.

To facilitate tentative selection, in Table 7 below some examples of classes meeting recommended filtration efficiency for respective ODA/SUP categories were presented. It must be stressed this table is not exhaustive and it is recommended to contact a filter supplier for optimal selection.

Outdoor air quality		Supply air quality				
		SUP 1	SUP 2	SUP 3	SUP 4	SUP 5
ODA 1	Example 1	ePM_{10} 50% + ePM_1 60%	ePM_1 50%	$ePM_{2,5}$ 50%	ePM_{10} 50%	ePM_{10} 50%
	Example 2	ePM_1 70%	-	-	-	-
ODA 2	Example 1	ePM_1 50% + ePM_1 60%	ePM_{10} 50% + ePM_1 60%	ePM_1 50%	$ePM_{2,5}$ 50%	ePM_{10} 50%
	Example 2	ePM_1 80%	ePM_1 70%	$ePM_{2,5}$ 70%	ePM_{10} 80%	-
ODA 3	Example 1	ePM_1 50% + ePM_1 80%	ePM_1 50% + ePM_1 60%	ePM_{10} 50% + ePM_1 60%	ePM_1 50%	$ePM_{2,5}$ 50%
	Example 2	ePM_1 90%	ePM_1 80%	$ePM_{2,5}$ 80%	ePM_{10} 90%	ePM_{10} 80%

Table 7: examples of filter classes meeting respective ODA/SUP categories requirements

EUROVENT

EUROPEAN INDUSTRY ASSOCIATION

BECOME A MEMBER

Apply now for membership

apply.eurovent.eu

FOLLOW US ON LINKEDIN

Receive most up-to-date information on Eurovent and our industry.

linkedin.eurovent.eu

ADDRESS

80 Bd A. Reyers Ln

1030 Brussels, Belgium

PHONE

+32 466 90 04 01

EMAIL

secretariat@eurovent.eu

www.eurovent.eu

IAQ matters

Yes to a better Indoor Air Quality

For more information, visit

www.IAQmatters.org