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Luftfilter för allmän ventilation – Del 1: Tekniska specifikationer, krav och klassificeringssystem för partikelavskiljningsgrad (ePM) (ISO 16890-1:2016)

Air filters for general ventilation – Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM) (ISO 16890-1:2016)



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Denna standard ersätter SS-EN 779:2012, utgåva 3.

The European Standard EN ISO 16890-1:2016 has the status of a Swedish Standard. This document contains the official English version of EN ISO 16890-1:2016.

This standard supersedes the Swedish Standard SS-EN 779:2012, edition 3.

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EUROPEAN STANDARD

EN ISO 16890-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2016

ICS 91.140.30

Supersedes EN 779:2012

English Version

Air filters for general ventilation - Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM) (ISO 16890-1:2016)

Filtres à air de ventilation générale - Partie 1:
Spécifications techniques, exigences et système de
classification fondé sur l'efficacité des particules en
suspension (ePM) (ISO 16890-1:2016)

Luftfilter für die allgemeine Raumlufttechnik - Teil 1:
Technische Bestimmungen, Anforderungen und
Effizienzklassifizierungssystem basierend auf
Feinstaub (PM) (ISO 16890-1:2016)

This European Standard was approved by CEN on 19 September 2016.

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SS-EN ISO 16890-1:2017 (E)**European foreword**

This document (EN ISO 16890-1:2016) has been prepared by Technical Committee ISO/TC 142 "Cleaning equipment for air and other gases" in collaboration with Technical Committee CEN/TC 195 "Air filters for general air cleaning" the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2017, and conflicting national standards shall be withdrawn at the latest by June 2017.

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Endorsement notice

The text of ISO 16890-1:2016 has been approved by CEN as EN ISO 16890-1:2016 without any modification.

Introduction

The effects of particulate matter (PM) on human health have been extensively studied in the past decades. The results are that fine dust can be a serious health hazard, contributing to or even causing respiratory and cardiovascular diseases. Different classes of particulate matter can be defined according to the particle size range. The most important ones are PM₁₀, PM_{2,5} and PM₁. The U.S. Environmental Protection Agency (EPA), the World Health Organization (WHO) and the European Union define PM₁₀ as particulate matter which passes through a size-selective inlet with a 50 % efficiency cut-off at 10 µm aerodynamic diameter. PM_{2,5} and PM₁ are similarly defined. However, this definition is not precise if there is no further characterization of the sampling method and the sampling inlet with a clearly defined separation curve. In Europe, the reference method for the sampling and measurement of PM₁₀ is described in EN 12341. The measurement principle is based on the collection on a filter of the PM₁₀ fraction of ambient particulate matter and the gravimetric mass determination (see EU Council Directive 1999/30/EC of 22 April 1999).

As the precise definition of PM₁₀, PM_{2,5} and PM₁ is quite complex and not simple to measure, public authorities, like the U.S. EPA or the German Federal Environmental Agency (Umweltbundesamt), increasingly use in their publications the more simple denotation of PM₁₀ as being the particle size fraction less or equal to 10 µm. Since this deviation to the above mentioned complex “official” definition does not have a significant impact on a filter element’s particle removal efficiency, the ISO 16890 series refers to this simplified definition of PM₁₀, PM_{2,5} and PM₁.

Particulate matter in the context of the ISO 16890 series describes a size fraction of the natural aerosol (liquid and solid particles) suspended in ambient air. The symbol ePM_x describes the efficiency of an air cleaning device to particles with an optical diameter between 0,3 µm and x µm. The following particle size ranges are used in the ISO 16890 series for the listed efficiency values.

Table 1 — Optical particle diameter size ranges for the definition of the efficiencies, ePM_x

Efficiency	Size range, µm
ePM_{10}	$0,3 \leq x \leq 10$
$ePM_{2,5}$	$0,3 \leq x \leq 2,5$
ePM_1	$0,3 \leq x \leq 1$

Air filters for general ventilation are widely used in heating, ventilation and air-conditioning applications of buildings. In this application, air filters significantly influence the indoor air quality and, hence, the health of people, by reducing the concentration of particulate matter. To enable design engineers and maintenance personnel to choose the correct filter types, there is an interest from international trade and manufacturing for a well-defined, common method of testing and classifying air filters according to their particle efficiencies, especially with respect to the removal of particulate matter. Current regional standards are applying totally different testing and classification methods, which do not allow any comparison with each other, and thus hinder global trade with common products. Additionally, the current industry standards have known limitations by generating results which often are far away from filter performance in service, i.e. overstating the particle removal efficiency of many products. With this new ISO 16890 series, a completely new approach for a classification system is adopted, which gives better and more meaningful results compared to the existing standards.

The ISO 16890 series describes the equipment, materials, technical specifications, requirements, qualifications and procedures to produce the laboratory performance data and efficiency classification based upon the measured fractional efficiency converted into a particulate matter efficiency (ePM) reporting system.

Air filter elements according to the ISO 16890 series are evaluated in the laboratory by their ability to remove aerosol particulate expressed as the efficiency values ePM_1 , $ePM_{2,5}$ and ePM_{10} . The air filter elements can then be classified according to the procedures defined in this part of ISO 16890. The particulate removal efficiency of the filter element is measured as a function of the particle size in the range of 0,3 µm to 10 µm of the unloaded and unconditioned filter element as per the procedures defined in ISO 16890-2. After the initial particulate removal efficiency testing, the air filter element is

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conditioned according to the procedures defined in ISO 16890-4 and the particulate removal efficiency is repeated on the conditioned filter element. This is done to provide information about the intensity of any electrostatic removal mechanism which may or may not be present with the filter element for test. The average efficiency of the filter is determined by calculating the mean between the initial efficiency and the conditioned efficiency for each size range. The average efficiency is used to calculate the ePM_x efficiencies by weighting these values to the standardized and normalized particle size distribution of the related ambient aerosol fraction. When comparing filters tested in accordance with the ISO 16890 series, the fractional efficiency values shall always be compared among the same ePM_x class (ex. ePM_1 of filter A with ePM_1 of filter B). The test dust capacity and the initial arrestance of a filter element are determined as per the test procedures defined in ISO 16890-3.

Air filters for general ventilation —

Part 1:

Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM)

1 Scope

This part of ISO 16890 establishes an efficiency classification system of air filters for general ventilation based upon particulate matter (PM). It also provides an overview of the test procedures, and specifies general requirements for assessing and marking the filters, as well as for documenting the test results. It is intended for use in conjunction with ISO 16890-2, ISO 16890-3 and ISO 16890-4.

The test method described in this part of ISO 16890 is applicable for air flow rates between 0,25 m³/s (900 m³/h, 530 ft³/min) and 1,5 m³/s (5 400 m³/h, 3 178 ft³/min), referring to a test rig with a nominal face area of 610 mm × 610 mm (24 inch × 24 inch).

ISO 16890 (all parts) refers to particulate air filter elements for general ventilation having an ePM₁ efficiency less than or equal to 99 % when tested according to the procedures defined within ISO 16890-1, ISO 16890-2, ISO 16890-3 and ISO 16890-4. Air filter elements with a higher initial efficiency are evaluated by other applicable test methods (see ISO 29463-1, ISO 29463-2, ISO 29463-3, ISO 29463-4 and ISO 29463-5).

Filter elements used in portable room-air cleaners are excluded from the scope of this part of ISO 16890.

The performance results obtained in accordance with ISO 16890 (all parts) cannot by themselves be quantitatively applied to predict performance in service with regard to efficiency and lifetime. Other factors influencing performance to be taken into account are described in [Annex A](#).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15957, *Test dusts for evaluating air cleaning equipment*

ISO 16890-2, *Air filter for general ventilation — Part 2: Measurement of fractional efficiency and air flow resistance*

ISO 16890-3, *Air filter for general ventilation — Part 3: Determination of the gravimetric efficiency and the air flow resistance versus the mass of test dust captured*

ISO 16890-4, *Air filter for general ventilation — Part 4: Conditioning method to determine the minimum fractional test efficiency*

ISO 29464:2011, *Cleaning equipment for air and other gases — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 29464 and the following apply.

3.1 Arrestance and efficiency