

# SVENSK STANDARD

## SS-EN 1822-1:2019

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### **Högeffektiva luftfilter (EPA, HEPA och ULPA) – Del 1: Klassificering, funktionsprovning, märkning**

### **High efficiency air filters (EPA, HEPA and ULPA) – Part 1: Classification, performance testing, marking**

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Europastandarden EN 1822-1:2019 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 1822-1:2019.

Denna standard ersätter SS-EN 1822-1:2009, utgåva 2.

The European Standard EN 1822-1:2019 has the status of a Swedish Standard. This document contains the official version of EN 1822-1:2019.

This standard supersedes the SS-EN 1822-1:2009, edition 2.

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EUROPEAN STANDARD

**EN 1822-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2019

ICS 13.040.40

Supersedes EN 1822-1:2009

English Version

## High efficiency air filters (EPA, HEPA and ULPA) - Part 1: Classification, performance testing, marking

Filtres à air à haute efficacité (EPA, HEPA et ULPA) -  
Partie 1 : Classification, essais de performance et  
marquage

Schwebstofffilter (EPA, HEPA und ULPA) - Teil 1:  
Klassifikation, Leistungsprüfung, Kennzeichnung

This European Standard was approved by CEN on 14 January 2019.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

**SS-EN 1822-1:2019 (E)**

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## European foreword

This document (EN 1822-1:2019) has been prepared by 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 October 2019, and conflicting national standards shall be withdrawn at the latest by October 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1822-1:2009.

It is dealing with the performance testing of efficient particulate air filters (EPA), high efficiency particulate air filters (HEPA) and ultra-low penetration air filters (ULPA) at the manufacturers site.

EN 1822, *High efficiency air filters (EPA, HEPA and ULPA)*, currently consists of the following parts:

— *Part 1: Classification, performance testing, marking*

EN 1822 *Part 2* to *Part 5* have been replaced by the corresponding parts of EN ISO 29463.

This standard is intended to be used in conjunction with:

— EN ISO 29463-2, *High-efficiency filters and filter media for removing particles in air — Part 2: Aerosol production, measuring equipment and particle-counting statistics*

— EN ISO 29463-3, *High-efficiency filters and filter media for removing particles in air — Part 3: Testing flat sheet filter media*

— EN ISO 29463-4, *High-efficiency filters and filter media for removing particles in air — Part 4: Test method for determining leakage of filter element — Scan method*

— EN ISO 29463-5, *High-efficiency filters and filter media for removing particles in air — Part 5: Test method for filter elements*

When reference is made to ISO 29463-1 in EN ISO 29463-2 to -5, at European level EN 1822-1 applies.

This document is based on particle counting methods which actually cover most needs of different applications. The differences between this European Standard and its previous edition lie in:

— the addition of references to the existing EN ISO 29463-2, EN ISO 29463-3, EN ISO 29463-4 and EN ISO 29463-5;

— the exclusion of the use of an aerosol photometer filter scan leak test;

— various editorial corrections implemented in this document.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## SS-EN 1822-1:2019 (E)

### 1 Scope

This document applies to high efficiency particulate and ultra-low penetration air filters (EPA, HEPA and ULPA) used in the field of ventilation and air conditioning and for technical processes, e.g. for applications in clean room technology or pharmaceutical industry.

It establishes a procedure for the determination of the efficiency on the basis of a particle counting method using a liquid (or alternatively a solid) test aerosol and allows a standardized classification of these filters in terms of their efficiency, both local and integral efficiency.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 29463-2:2018, *High-efficiency filters and filter media for removing particles in air — Part 2: Aerosol production, measuring equipment and particle-counting statistics (ISO 29463-2:2011)*

EN ISO 29463-3, *High-efficiency filters and filter media for removing particles in air — Part 3: Testing flat sheet filter media (ISO 29463-3)*

EN ISO 29463-4:2018, *High-efficiency filters and filter media for removing particles in air — Part 4: Test method for determining leakage of filter elements-Scan method (ISO 29463-4:2011)*

EN ISO 29463-5:2018, *High-efficiency filters and filter media for removing particles in air — Part 5: Test method for filter elements (ISO 29463-5:2011)*

EN 14799, *Air filters for general air cleaning - Terminology*

EN ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements (ISO 5167-1)*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14799 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1

##### **nominal air volume flow rate**

air volume flow rate specified by the manufacturer, at which the filter element has to be tested

#### 3.2

##### **superficial face area**

cross-sectional area of the filter element which is passed by the air flow

#### 3.3

##### **nominal filter medium face velocity**

nominal air volume flow rate divided by the effective filter medium area



## 4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply:

$d_p$	Particle diameter
E	Efficiency
P	Penetration
p	Pressure
RH	Relative humidity
T	Temperature
$\sigma_g$	Geometric standard deviation
CNC	Condensation nucleus counter
DEHS	Sebacic acid-bis (2 ethyl hexyl-) ester (trivial name: di-ethyl-hexyl-sebacate)
DMA	Differential electric mobility analyser
DMPS	Differential mobility particle sizer
DOP	Phthalic acid-bis (2-ethyl hexyl-) ester (trivial name: di-octyl-phthalate)
MPPS	Most penetrating particle size (= particle size, for which the filtration efficiency is a minimum)
OPC	Optical particle counter
PAO	Polyalphaolefin
PSL	Poly-Styrol Latex (solid spheres)

## 5 Classification

### 5.1 General

Filter elements are classified in groups and classes according to their filtration performance (efficiency or penetration).

### 5.2 Groups of filters

According to this standard, filter elements fall into one of the following Groups:

- Group E: EPA filters (Efficient Particulate Air filter);
- Group H: HEPA filters (High Efficiency Particulate Air filter);
- Group U: ULPA filters (Ultra Low Penetration Air filter).

### 5.3 Groups and Classes of filters

Filters are classified in Groups and Classes. For each group a slightly different test procedure applies. All filters are classified according to their filtration performance (see 6.5).

## SS-EN 1822-1:2019 (E)

Group E filters are subdivided in three classes:

- Class E10;
- Class E11;
- Class E12.

Group H filters are subdivided in two classes:

- Class H13;
- Class H14.

Group U filters are subdivided in three classes:

- Class U15;
- Class U16;
- Class U17.

## 6 Requirements

### 6.1 General

The filter element shall be designed or marked so as to prevent incorrect mounting.

The filter element shall be designed so that when correctly mounted in the ventilation duct, no leak occurs along the sealing edge.

If, for any reason, dimensions do not allow testing of a filter under standard test conditions, assembly of two or more filters of the same type or model is permitted, provided no leaks occur in the resulting filter.

### 6.2 Material

The filter element shall be made of suitable material to withstand normal usage and exposures to those temperatures, humidities and corrosive environments that are likely to be encountered.

The filter element shall be designed so that it will withstand mechanical constraints that are likely to be encountered during normal use.

Dust or fibres released from the filter media by the air flow through the filter element shall not constitute a hazard or nuisance for the people (or devices) exposed to filtered air.

### 6.3 Nominal air volume flow rate

The filter element shall be tested at its nominal air volume flow rate for which the filter has been designed by the manufacturer.

### 6.4 Pressure difference

The pressure difference across the filter element is recorded at the nominal air volume flow rate.

## 6.5 Filtration performance

The filtration performance is expressed by the efficiency or the penetration of MPPS particles.

After testing in accordance with Clause 7, filter elements are classified according to Table 1, on the bases of their integral (Group E) or their integral and local (Groups H and U) MPPS efficiency or penetration.

Filters with filter media having an electrostatic charge are classified according to Table 1, on the bases of their discharged efficiency or penetration according to EN ISO 29463-5:2018, Annex C.

**Table 1 — Classification of EPA, HEPA and ULPA filters**

Filter Group Filter Class	Integral value		Local value <sup>a b</sup>	
	Efficiency (%)	Penetration (%)	Efficiency (%)	Penetration (%)
E10	≥ 85	≤ 15	--c	--c
E11	≥ 95	≤ 5	--c	--c
E12	≥ 99,5	≤ 0,5	--c	--c
H13	≥ 99,95	≤ 0,05	≥ 99,75	≤ 0,25
H14	≥ 99,995	≤ 0,005	≥ 99,975	≤ 0,025
U15	≥ 99,999 5	≤ 0,000 5	≥ 99,997 5	≤ 0,002 5
U16	≥ 99,999 95	≤ 0,000 05	≥ 99,999 75	≤ 0,000 25
U17	≥ 99,999 995	≤ 0,000 005	≥ 99,999 9	≤ 0,000 1

<sup>a</sup> See 7.5.2 and EN ISO 29463-4.  
<sup>b</sup> Local penetration values lower than those given in the table may be agreed between supplier and purchaser.  
<sup>c</sup> Group E filters (Classes E10, E11 and E12) cannot and shall not be leak tested for classification purposes.

NOTE ISO 29463-1:2017 developed by ISO/TC 142 includes a classification system for high efficiency air filters according to their filtration performance (efficiency or penetration) similar to EN 1822-1. Table A.1 gives a by-side comparison of the classification in EN 1822-1 and ISO 29463-1:2017.

## 7 Test methods

### 7.1 Test rigs

The test rigs are described in detail in EN ISO 29463-3, EN ISO 29463-4 and EN ISO 29463-5. The individual methods of measurement and the measuring instruments are described in EN ISO 29463-2.

### 7.2 Test conditions

The air in the test channel used for testing shall comply with the following requirements:

- Temperature: (23 ± 5) °C;
- Relative humidity < 75 %.

The temperature shall remain constant during the entire test procedure within ± 2 °C the relative humidity within ± 5 %.