



SLOVENSKI STANDARD SIST EN 143:2001

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Respiratory protective devices - Particle filters - Requirements, testing, marking

Atenschutzgeräte - Partikelfilter - Anforderungen, Prüfung, Kennzeichnung

Appareils de protection respiratoire - Filtrés à particules - Exigences, essais, marquage

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English version

Respiratory protective devices - Particle filters - Requirements, testing, marking

Appareils de protection respiratoire - Filtres à particules -
Exigences, essais, marquage

Atemschutzgeräte - Partikelfilter - Anforderungen, Prüfung,
Kennzeichnung

This European Standard was approved by CEN on 7 January 2000.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 79, Respiratory protective devices, the secretariat of which is held by DIN.

This European Standard replaces EN 143:1990.

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of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

A given respiratory protective device can only be approved when the individual components satisfy the requirements of the test specification which may be a complete standard or part of a standard, and practical performance tests have been carried out successfully on complete apparatus where specified in the appropriate standard. If for any reason a complete apparatus is not tested then simulation of the apparatus is permitted provided the respiratory characteristics and weight distribution are similar to those of the complete apparatus.

1 Scope

This European Standard specifies particle filters for use as components in unassisted respiratory protective devices with the exception of escape apparatus and filtering facepieces.

Laboratory tests are included for the assessment of compliance with the requirements.

Some filters complying with this European Standard may also be suitable for use with other types of respiratory protective devices and, if so, shall be tested and marked according to the appropriate European Standard.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- EN 132 *Respiratory protective devices – Definitions of terms and pictograms.*
- EN 134 *Respiratory protective devices - Nomenclature of components.*
- EN 148-1 *Respiratory protective devices - Threads for facepieces – Part 1: Standard thread connection.*

3 Definitions

For the purposes of this European Standard the definitions in EN 132 and the nomenclature given in EN 134 apply.

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4 Description

Air enters the particle filter(s) and passes to the facepiece after removal of particles.

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5 Classification

Particle filters are classified according to their filtering efficiency. There are three classes of particle filters: P1, P2 and P3 in ascending order of the filtering efficiency.

The protection provided by a P2- or P3-filter includes that provided by the filter of lower class or classes.

6 Designation

Particle filters meeting the requirements of this European Standard shall be designated in the following manner:

- Particle filter EN 143, filter type, class e.g. particle filter EN 143 P3

7 Requirements

7.1 General

In all tests, all test samples shall meet the requirements.

7.2 Nominal values and tolerances

Unless otherwise specified, the values stated in this European Standard are expressed as nominal values. Except for temperature limits, values which are not stated as maximum or minimum shall be subject to a tolerance of $\pm 5\%$. Unless otherwise specified, the ambient temperature for testing shall generally be $(24 \pm 8)^\circ\text{C}$ but for the mechanical tests $(20 \pm 10)^\circ\text{C}$. Other temperature limits shall be subject to an accuracy of $\pm 1^\circ\text{C}$.

7.3 Visual inspection

The visual inspection shall be carried out prior to laboratory tests and as specified elsewhere in this standard.

Testing shall be done in accordance with 8.2.

7.4 Connection

The connection between filter(s) and facepiece or other device(s) with which it is intended to be used shall be robust and leaktight.

The connection between filter and facepiece may be achieved by a permanent or special connector or by a screw thread including a thread conforming to EN 148-1.

Threads conforming to EN 148-2 or EN 148-3 shall not be used.

If the filter is designated to be used on a multiple filter facepiece or has any other thread, it shall not be possible to connect it to a thread conforming to EN 148-1, EN 148-2 or EN 148-3.

The filter shall be readily replaceable without use of special tools and shall be designed or marked to prevent incorrect assembly.

Testing shall be done in accordance with 8.2.

7.5 Mass

The maximum mass of filter(s) designated to be used directly connected to a half mask is 300 g.

The maximum mass of filter(s) designated to be used directly connected to a full face mask is 500 g.

Testing shall be done in accordance with 8.1.

7.6 Multiple filters

Where filtering devices are designed to use more than one filter (i.e. multiple filter device), through which the flow is proportioned, all requirements given in this European Standard are to be met by the complete set of filters (e.g. the total mass of a filter set designated to be used directly connected to a half mask shall not exceed 300 g).

If, however, it is possible that the single filter of a multiple filter device may be used alone, then the requirements at the full flow rate for the tests, as stated in this European Standard, shall be met.

In the information supplied by the manufacturer all necessary information on how to use multiple filters shall be given.

Testing shall be done in accordance with 8.1 and 8.2.

7.7 Material

The filter shall be made of suitable material to withstand normal usage and exposures to those temperatures, humidity and corrosive environments that are likely to be encountered. Internally it shall withstand corrosion by the filtering media.

Any material of the filter media or any gaseous products that may be released by the air flow through the filter shall not be known to constitute a hazard or nuisance for the wearer.

Testing shall be done in accordance with 8.2.

7.8 Packaging

Filters shall be offered for sale packaged in such a way that they are protected against mechanical damage or visual contamination before use.

Where appropriate, filters shall be factory sealed to protect the filter media against environmental influences and in such a way that the breaking of the factory sealing can be identified.

Testing shall be done in accordance with 8.2.

7.9 Mechanical strength (M.S.)

Filters shall be subjected to the mechanical strength test when required by the relevant clauses of this standard.

Testing shall be done in accordance with 8.3.

After the treatment the filters shall show no mechanical defect and shall meet the requirement of the relevant clauses.

Testing shall be done in accordance with 8.2.

7.10 Temperature conditioning (T.C.)

Filters shall be subjected to the temperature conditioning test when required by the relevant clauses of this standard.

Testing shall be done in accordance with 8.4.

After the treatment the filters shall show no signs of damage and shall meet the requirement of the relevant clauses.

Testing shall be done in accordance with 8.2.

7.11 Breathing resistance

The resistance imposed by filter(s) to the flow of air shall be as low as possible and in no case exceed the values shown in Table 1.

Four filters shall be tested, two after the test for mechanical strength according to 8.3 and two after the test for mechanical strength according to 8.3 followed by the temperature conditioning test according to 8.4.

Testing shall be done in accordance with 8.6.

Table 1 — Maximum breathing resistance

Filter class	Maximum breathing resistance in mbar ^{*)}	
	at 30 l/min	at 95 l/min
P1	0,6	2,1
P2	0,7	2,4
P3	1,2	4,2

^{*)} 1 bar = 10⁵ N/m² = 100 kPa

7.12 Filter penetration

The requirements for maximum filter penetration are given in Table 2.

For each aerosol, four filters shall be tested, two after the test for mechanical strength according to 8.3 and two after the test for mechanical strength according to 8.3 followed by the temperature conditioning test according to 8.4.

Testing shall be done in accordance with 8.7.2 and 8.7.3.

Table 2 — Maximum filter penetration

Filter class	Maximum filter penetration of test aerosols (%)	
	Sodium chloride test	Paraffin oil test
	at 95 l/min	at 95 l/min
P1	20	20
P2	6	6
P3	0,05	0,05

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7.13 Clogging

7.13.1 General

If the clogging test is performed for a single filter of a multiple filter device at the proportioned test air flow, the stated requirement for the breathing resistance of the filter after clogging holds for the stated dust loading proportioned by the number of filters of the filter set (e.g. for testing a single filter out of a twin filter, class P2, the clogging is performed at a flow rate of 47,5 l/min, until 5 mbar have been reached or until 263 mg·h·m⁻³ have been deposited, whichever occurs first).

7.13.2 Filter penetration

The filter penetration requirements of 7.12 shall be satisfied for each test aerosol before and after the clogging test with dolomite dust.

For each aerosol, four filters shall be tested, two after the test for mechanical strength in accordance with 8.3 and two after the test for mechanical strength in accordance with 8.3 followed by the temperature conditioning test in accordance with 8.4.

Testing shall be done in accordance with 8.7.2, 8.7.3 and 8.8.

7.13.3 Breathing resistance

The breathing resistance after clogging shall not exceed

Filter class P1	4 mbar
Filter class P2	5 mbar
Filter class P3	7 mbar

Four filters shall be tested, two after the test for mechanical strength according to 8.3 and two after the test for mechanical strength according to 8.3 followed by the temperature conditioning test according to 8.4.

Testing shall be done in accordance with 8.6 and 8.8.

8 Testing

8.1 General

Performance tests for the filters not having a connector in accordance with EN 148-1 shall be performed in the filter holder where it will be used in practice.

If no special measuring devices or measuring methods are specified, commonly used devices and methods shall be used.

8.2 Visual inspection

A visual inspection of the filters shall be carried out and the appropriate results reported. The visual inspection includes marking and informations supplied by the manufacturer.

8.3 Mechanical strength (M.S.)

8.3.1 Test equipment

The apparatus as shown schematically in Figure 1, consists of a steel case (K) which is fixed on a vertically moving piston (S), capable of being lifted up 20 mm by a rotating cam (N) and dropping down onto a steel plate (P) under its own mass as the cam rotates. The mass of the steel case shall be more than 10 kg.

The weight of the steel plate onto which the steel case falls should be (at least) 10 times the weight of the steel case. This may be achieved by bolting the base plate to a hard solid floor.

8.3.2 Test procedure

The filters shall be tested as received, removed from their packing but still sealed.

Unencapsulated filter(s) shall be tested in the smallest commercially available package.

The filters shall be placed on their sides in the steel case (K) so that they do not touch each other during the test, allowing 6 mm horizontal movement and free vertical movement. After the test any loose material that may have been released from the filter shall be removed prior to the performance testing.

The test rig shall be operated at the rate of approximately 100 rotations/min for approximately 20 min and a total of 2 000 rotations.

8.4 Temperature conditioning (T.C.)

The filter in its packaging if appropriate, shall be subjected to the following thermal cycle:

- a) to a dry atmosphere at (70 ± 3) °C for 24 h;
- b) to a temperature of (-30 ± 3) °C for 24 h;

and allowed to return to room temperature for at least 4 h between exposures and prior to subsequent testing.

The conditioning shall be carried out in a manner which ensures no thermal shock occurs.

8.5 Test flow conditions

8.5.1 General

All performance tests shall be conducted so that the test air or test aerosol will pass through the filter horizontally, except where the test procedure specifies otherwise.

8.5.2 Multiple filters

When one filter of a multiple filter device is tested separately, the air flow specified for a test shall be divided by the number of filters through which the air flow is proportioned. If, however, it is possible that one filter of a multiple filter device may be used alone, then the full air flow shall be used for testing.

If the filters' resistances meet the following equation

$$\frac{|\Delta \text{ flow resistance }|_{\max}}{\text{mean flow resistance}} \leq 0,2$$

then the filter may be tested as a single filter with a proportioned flow. If the filters' breathing resistances do not meet that equation, the filters shall be tested in a complete unit at the full flow rate.

When testing one filter of a multiple filter device with the proportioned test air flow, the appropriate performance requirements of this standard are to be met.

8.6 Breathing resistance

The filter shall be connected in a leaktight manner to the test equipment by means of a suitable adaptor.

Testing shall be carried out at two flow rates (30 and 95 l/min continuous flow or proportioned as appropriate) with air at room temperature, ambient atmospheric pressure and of such humidity that condensation does not occur.

The resistance values shall be corrected for the resistive value introduced by the adaptor. The flow rate at which the resistance is measured, shall be corrected to 23 °C and 1 bar absolute.