



**SLOVENSKI STANDARD**  
**SIST EN 404:1996**

**01-april-1996**

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**Oprema za varovanje dihal za samoreševanje - Samoreševalni filter - Zahteve, preskušanje, označevanje**

Respiratory protective devices for self-rescue - Filter self-rescuer - Requirements, testing, marking

Atenschutzgeräte für Selbstrettung - Filterselbstretter - Anforderungen, Prüfungen, Kennzeichnung

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Appareils de protection respiratoire pour l'évacuation - Appareil d'évacuation a filtre - Exigences, essais, marquage

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**Ta slovenski standard je istoveten z: EN 404:1993**

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**ICS:**

13.340.30      Varovalne dihalne naprave      Respiratory protective devices

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EUROPEAN STANDARD

EN 404:1993

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 1993

UDC 614.894.41.7:620.1:62-777:614.8

Descriptors: Accident prevention, personal protective equipment, respiratory protective equipment, disposal, filters, carbon monoxide, classifications, specifications, tests, marking

English version

## Respiratory protective devices for self-rescue - Filter self-rescuer - Requirements, testing, marking

Appareils de protection respiratoire pour  
l'évacuation - Appareil d'évacuation à filtre  
- Exigences, essais, marquage

Atemschutzgeräte für Selbstrettung  
Filter selbstretter - Anforderungen, Prüfungen,  
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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.

The European Standards exist 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.

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### CEN

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

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

## Foreword

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

The text has been submitted to the formal vote and has been approved by CEN as a European Standard.

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

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 December 1993, and conflicting national standards shall be withdrawn at the latest by December 1993.

In accordance with the CEN/CENELEC Internal Regulations, following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and 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 on complete device where specified in the appropriate standard. If for any reason a complete device is not tested then simulation of the device is permitted provided the respiratory characteristics and mass distribution are similar to those of the complete device.

### 1 Scope

This European Standard specifies performance requirements, test methods and marking requirements for filtering devices designed for protection against carbon monoxide as respiratory protective devices for personal escape (in short: filter self-rescuer). Such devices are intended for use against carbon monoxide arising from fire or explosion underground.

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

This standard does not include requirements for training devices. However, when such devices are available care should be taken to ensure that only correct parts are fitted to the filter self-rescuer.

### 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

**3**      Definition and description

For the purposes of this European Standard the definitions given in EN 132 apply together with the following.

A filter self-rescuer is a respiratory protective filtering device in a suitable packing for personal escape designed to protect the wearer against carbon monoxide. It is dependent on ambient atmosphere and does not provide protection against oxygen deficient atmospheres (less than 17 % oxygen).

The filtering device consists of a mouthpiece assembly with a filter. The mouthpiece assembly of the filtering device is connected directly or indirectly to the filter(s).

Filter self-rescuers are of various minimum test durations as specified in this standard.

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**4**      Classification

Filter self-rescuers are classified according to the minimum test duration.  
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Table 1 - Classes of filter self-rescuers

Class	Minimum Test Duration
FSR 1 A, FSR 1 B	60 min
FSR 2 A, FSR 2 B	75 min
FSR 3 A, FSR 3 B	90 min
FSR 4 A, FSR 4 B	120 min

Note: The duration achieved in use may be different from the minimum test duration measured under laboratory conditions.

## 5 Requirements

Note: The requirements and test methods are based on experience with existing design of filter self-rescuers incorporating Hopcalite and drier. Consideration should be given to the behavior of designs incorporating other filtering materials.

### 5.1 Design

The device shall be sufficiently robust to withstand the rough usage it is likely to receive when carried on the person or during service.

The device shall be designed such that there are no parts, sharp edges or burrs likely to be caught on projections in narrow passages or that may harm the wearer.

The filter self-rescuer shall be designed such that the outside of carrying container can be cleaned easily.

If the filtering device is fitted with a coarse dust filter bag this filter bag shall be easily detachable.

Testing in accordance with 6.1 and 6.3.

### 5.2 Materials

The carrying container and the locking device shall be adequately protected against corrosion. The materials used shall be able to withstand temperatures and mechanical stress expected when carried on the person or stored on machines and vehicles.

Exposed parts, i.e., those which may be subjected to impact during use of the device, shall not be made of aluminium, magnesium, titanium or alloys containing such proportions of these metals as will, on impact,

give rise to frictional sparks capable of igniting flammable gas mixtures.

Testing in accordance with 6.3.

To prevent electrostatic charges on non-metallic carrying containers the insulation resistance shall not exceed  $10^9 \Omega$ .

Testing in accordance with 6.4.6.

### 5.3 Compatibility with skin

Materials that may come into contact with the wearer's skin and the inhaled air shall not be known to be likely to cause irritation or any other adverse effect to health.

Testing in accordance with 6.1 and 6.3.

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### 5.4 Cleaning and disinfection

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All parts requiring cleaning and disinfecting shall be able to withstand cleaning and disinfecting agents recommended by the manufacturer.

### 5.5 Mass

That part of the mass of the filtering device supported by the head, ready for use, shall not exceed 800 g.

The determination of the mass shall be carried out where appropriate.



## 5.6 Means for carrying

The carrying container shall be provided with a carrying means, which ensures comfortable, safe and - if required - continuous carrying on the person. This may also be achieved by additional measures, e.g. a carrying bag.

Testing in accordance with 6.3.2.

When the device is designed to be carried on the person the tear-off force of the carrying means shall be not less than 400 N and shall not exceed 800 N.

Testing in accordance with 6.4.10.3.

## 5.7 Harness

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The filtering device shall have a harness which ensures comfortable and safe wearing of the device when donned. The harness shall be adjustable or elastic or a suitable combination of both.

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Testing in accordance with 6.3.

Each strap of the harness shall withstand a pull of 50 N applied as a shock and then maintained for 10 s in the direction in which the harness is pulled when the device is donned.

Testing in accordance with 6.4.10.2.

## 5.8 Handling

The filter self-rescuer shall be capable of being donned in accordance with the manufacturer's instructions for use in a quick and simple manner without undue exertion. The locking device shall be protected against

being opened inadvertently. It shall be apparent whether or not the device has been opened and therefore requires inspection.

Testing in accordance with 6.3.

Any part of the filter self-rescuer used to pull the filtering device from its carrying or storage container shall withstand a force of 400 N applied for 10 s in the direction in which the part is subjected to such force during normal withdrawal of the filtering device.

Testing in accordance with 6.4.10.2.

#### 5.9 Leak tightness

Leakages into any container designed to protect the device from exposure to contamination shall be detectable by a means specified by the manufacturer.

Testing in accordance with 6.4.4.

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#### 5.10 Facepiece

##### 5.10.1 Mouthpiece assembly

The facepiece shall be a mouthpiece assembly, held by the teeth, sealing against the lips, and through which air is inhaled and exhaled while the nose is blocked by a nose clip. The mouthpiece shall ensure reliable sealing and shall not inadvertently be able to block the airways when in operation.

The nose clip shall provide an airtight seal of the nose. It shall be flexibly attached to the filtering device such that when fitting the mouthpiece the wearer's attention is automatically drawn to the nose clip.

Testing in accordance with 6.1 and 6.3.

### 5.10.2 Breathing hose

If applicable, breathing hoses shall permit free head movement and shall not restrict or close off the air supply under chin or arm pressure. The hose may be extensible or compressible. The hose shall not collapse and the temporary elongation shall be at least 20 %, while the permanent linear deformation of the hose shall not exceed 10 %.

Testing in accordance with 6.4.9.

### 5.10.3 Connections

All connections of the filtering device shall be gastight and sufficiently robust.

All connections of the filtering device shall withstand a force of 50 N applied for 10 s. Connections of unprotected breathing hoses shall withstand a force of 250 N applied for 10 s.

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Testing in accordance with 6.1, 6.3 and 6.4.10.2.

### 5.11 Inhalation and exhalation valves

If valves are fitted, they shall function in all orientations. When tested in accordance with 6.4.7 the requirements of 5.16.1, 5.16.2, and 5.16.4 shall be met.

Testing in accordance with 6.4.1, 6.4.2 and 6.4.7.

## 5.12 Saliva trap

The filtering device shall be designed such that saliva or condensate shall not interfere with the function of the filtering device or cause any harmful effect to the wearer.

Testing in accordance with 6.3.

## 5.13 Integrity of device at high carbon monoxide concentrations

When tested in accordance with 6.4.2 subsequent to 6.1 the device shall maintain its mechanical integrity and shall not present a hazard to the wearer.

## 5.14 Conditioning

## 5.14.1 Vibration test

After conditioning the filter self-rescuer in accordance with 6.2.1 the requirements of 5.13 and 5.16 shall be met.

## 5.14.2 Rough usage test

The test is optional.

For filter self-rescuers expected to be exposed to very severe carrying conditions the following requirement shall be applied: the filter self-rescuer shall be subjected to a cement mixer test.

After conditioning the filter self-rescuer in accordance with 6.2.2 the performance requirements of 5.16 shall be met.

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## 5.14.3 Temperature

After conditioning in accordance with 6.2.3 and return to room temperature the performance requirements of 5.16 shall be met.

## 5.15 Carbon dioxide content of inhalation air (dead space)

The carbon dioxide content of inhalation air (dead space) shall not exceed an average of 2 % by vol.

Testing in accordance with 6.4.8.

## 5.16 Performance requirements

## 5.16.1 Minimum test duration

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The filtering device shall have a minimum test duration laid down for its class when tested at the minute volume given in table 2.

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Table 2 - <https://standards.iteh.ai/catalog/standards/sist/ca924eb2-462c-4aad-948e-64c6a38dd4a3/sist-en-404-1996>  
Minimum Test Duration

Class	Minute Volume for		Minimum Test Duration
	Type A	Type B	
FSR 1	30 l/min	35 l/min	60 min
FSR 2	30 l/min	35 l/min	75 min
FSR 3	30 l/min	35 l/min	90 min
FSR 4	30 l/min	35 l/min	120 min

**Note:** The minute volume for testing filter self-rescuers is based on practical experiences in many countries where such devices are in use for various mining applications.

Testing in accordance with 6.4.1.

## 5.16.2 Carbon monoxide - breakthrough criteria

The total carbon monoxide slip of inhalation air for type A shall not exceed 400 ml during the minimum test duration.

The carbon monoxide concentration of inhalation air for type B shall not exceed 200 ml/m<sup>3</sup> time weighted average in any single 10 min interval or the total carbon monoxide slip shall not exceed 200 ml respectively during the minimum test duration.

Testing in accordance with 6.4.1 and 6.4.2.

## 5.16.3 Temperature and humidity

The temperature of inhalation air shall not exceed 90 °C dry bulb and 50 °C wet bulb during the minimum test duration.

Testing in accordance with 6.4.1 and 6.4.2.

Practical performance tests carried out in accordance with 6.3.1 and 6.3.1.4 shall not cause any intolerable drying out of the respiratory tract.

## 5.16.4 Breathing resistance

The inhalation resistance shall not exceed 8 mbar at the start of the test and 12 mbar during the minimum test duration. The exhalation resistance shall not exceed 3,5 mbar during the minimum test duration.

Testing in accordance with 6.4.1, 6.4.2 and 6.4.3.

## 5.17 Practical performance test

In addition to the machine tests described, the device shall also undergo practical performance tests under realistic conditions. These practical performance tests serve the purpose to check the device for imperfections that cannot be determined by the tests described elsewhere in this European Standard.

Where, in the opinion of the test station, approval is not granted because practical performance tests show the device has imperfections related to wearer's acceptance, the test station shall describe the tests which revealed these imperfections. This will enable other test stations to duplicate the tests and assess the results thereof.

If for any reason practical performance tests underground are not permissible, then the test station shall conduct equivalent tests, describe these tests, and provide the results thereof so that other test stations can duplicate the tests and assess the results.

Testing in accordance with 6.3.

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