



# SLOVENSKI STANDARD

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Respiratory protective devices - Lung governed demand self-contained open-circuit compressed air breathing apparatus with full face mask or mouthpiece assembly for escape - Requirements, testing, marking

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Atenschutzgeräte - Lungenautomatische Behältergeräte mit Druckluft (Pressluftatmer) mit Vollmaske oder Mundstückgarnitur für Selbstrettung - Anforderungen, Prüfung, Kennzeichnung

Appareils de protection respiratoire - Appareils de protection respiratoire isolants autonomes a circuit ouvert, a air comprimé, a air soupape a la demande avec masque complet ou ensemble embout buccal pour l'évacuation - Exigences, essais, marquage

**Ta slovenski standard je istoveten z: EN 402:2003**

### ICS:

13.340.30 Varovalne dihalne naprave Respiratory protective devices

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English version

Respiratory protective devices - Lung governed demand self-contained open-circuit compressed air breathing apparatus with full face mask or mouthpiece assembly for escape - Requirements, testing, marking

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This European Standard was approved by CEN on 17 January 2003.

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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 Management Centre has the same status as the official versions.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This document (EN 402:2003) has been prepared by Technical Committee CEN/TC 79 "Respiratory protective devices", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by November 2003, and conflicting national standards shall be withdrawn at the latest by November 2003.

This document supersedes EN 402:1993.

This document 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 document.

Annex A is normative and Annexes B and C are informative.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, 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 minimum requirements for lung governed demand self-contained open-circuit compressed air breathing apparatus for escape.

This European Standard does not apply to apparatus for work and rescue or to diving apparatus.

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

## 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 (including amendments).

EN 132:1998, *Respiratory protective devices – Definitions of terms and pictograms*

EN 134:1998, *Respiratory protective devices - Nomenclature of components*

EN 136:1998, *Respiratory protective devices - Full face masks - Requirements, testing, marking*

EN 142, *Respiratory protective devices - Mouthpiece assemblies - Requirements, testing, marking*

EN 166:2001, *Personal eye-protection - Specifications*

EN 168:2001, *Personal eye-protection - Non-optical test methods*

EN 12021, *Respiratory protective devices - Compressed air for breathing apparatus*

EN 13274-2:2001, *Respiratory protective devices - Methods of test - Part 2: Practical performance tests*

EN 13274-3:2001, *Respiratory protective devices - Methods of test - Part 3: Determination of breathing resistance*

EN 13274-4:2001, *Respiratory protective devices - Methods of test - Part 4: Flame tests*

EN 13274-5, *Respiratory protective devices - Methods of test - Part 5: Climatic conditions*

EN 13274-6, *Respiratory protective devices - Methods of test - Part 6: Determination of carbon dioxide content of the inhalation air*

### 3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 132:1998 and the nomenclature given in EN 134:1998 apply.

### 4 Description

Lung governed demand compressed air escape apparatus are designed and constructed to enable the wearer to breathe air on demand from a pressure vessel(s) either via a pressure reducer and a lung governed demand valve or a lung governed demand valve connected to the facepiece. The exhaled air passes without re-circulation from the facepiece via the exhalation valve to the ambient atmosphere.

### 5 Classification

Lung governed demand compressed air escape apparatus are classified according to the rated working duration (see 6.24.1) which is defined by performing a breathing machine test in accordance with 7.5.5 with a minute volume of 35 l/min (20 cycles/min, 1,75 l/stroke).

Rated working duration is expressed in minutes and is defined in steps of 5 minutes.

It should be recognized that the effective duration may vary according to the work rate.

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### 6 Requirements

#### 6.1 General

In all tests all test samples shall meet the requirements.

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#### 6.2 Ergonomics

The requirements of this standard are intended to take account of the interaction between the wearer, the apparatus, and where possible the working environment in which the apparatus is likely to be used. See Annex ZA.

#### 6.3 Design

The apparatus shall be of simple and reliable construction and as compact as possible.

The apparatus shall be designed so as not to interfere with work activities when carried in accordance with the manufacturers instructions.

The apparatus shall be so designed that there are no protruding parts or sharp edges likely to be caught on projections in narrow passages or that may hurt the wearer.

The apparatus shall be designed to ensure its full function in any orientation.

The ready for use state of the apparatus shall identify the pressure in the pressure vessel(s) prior to use and during storage. In the ready for use state the facepiece shall be securely attached to the apparatus. The pressure vessel has to be opened easily by hand or automatically when starting the apparatus. In the case of a permanent installation of the apparatus in a storage container the apparatus shall be activated automatically upon removal from the storage container. In all cases the apparatus shall be locked in the open position against inadvertent shutting.

If a breathing apparatus for working, e.g. "air line equipment" is used in connection with an escape apparatus the escape apparatus design shall be such as to prevent air loss from the escape apparatus in the event of malfunction or disconnection of the breathing apparatus for working.



Testing shall be done in accordance with 7.3 and 7.8.

#### 6.4 Materials

The carrying container and the locking device, where present, shall be adequately protected against corrosion. The materials used shall be able to withstand temperatures and mechanical stress expected whilst being carried on the man as well as on machines and vehicles.

Testing shall be done in accordance with 7.3, 7.5.1 and 7.8.

Exposed parts i.e. those which may be subjected to impact during use of the apparatus shall not be made of aluminium, magnesium, titanium or alloys.

To prevent electrostatic charges on non-metal carrying containers, the surface resistance shall not exceed  $10^9 \Omega$ . Where the apparatus is required to be anti-static during escape materials used shall be anti-static as far as it is practicable.

Testing shall be done in accordance with 7.5.7.

Materials which come into direct contact with the wearer's skin and the breathable gas shall not be known to be likely to cause irritation or any other adverse effect to health.

The finish of any part of the apparatus likely to be in contact with the wearer shall be free from edges and burrs.

Testing shall be done in accordance with 7.3 and 7.8.

#### 6.5 Cleaning and disinfecting (standards.iteh.ai)

All material used shall withstand the cleaning and disinfecting agents and procedures recommended by the manufacturer.

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Testing shall be done in accordance with 7.3 and 7.8.

#### 6.6 Mass

The mass of the complete apparatus including carrying container shall not exceed 5 kg when designed to be carried on the man for at least 8 h.

Testing shall be done in accordance with 7.3.

#### 6.7 Connections

The design and construction of the apparatus shall permit its components to be readily separated for cleaning, inspecting and testing. Demountable connections to achieve this shall be readily connected and secured, preferably by hand.

Any means for sealing used shall be retained in position when the connection(s) is (are) disconnected during normal use and maintenance.

Testing shall be done in accordance with 7.3 and 7.8.

#### 6.8 Harness

The apparatus shall have a harness or other means of carrying so that the wearers hands are left free, when the apparatus is in use.

Any harness shall be designed to allow quick, easy and correct donning of the apparatus without assistance.

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Testing shall be done in accordance with 7.3 and 7.8.

### 6.9 Handling

The apparatus shall be capable of being donned and put into operation simply and without undue exertion under difficult conditions e.g. in the dark and in restricted spaces.

If the apparatus is fitted with a special lock, the design shall be such that it cannot be opened inadvertently.

If the apparatus has been opened, this shall be obvious by visual inspection.

Testing shall be done in accordance with 7.3 and 7.8.

### 6.10 Leak tightness

The ready for use apparatus shall be leak tight so that the pressure change does not exceed 0,3 mbar in 1 min.

Testing shall be done in accordance with 7.5.4.

### 6.11 Facepiece

The facepiece shall be a full face mask or a mouthpiece assembly and shall be attached securely to the apparatus.

If a mouthpiece assembly is used it shall meet the requirements of EN 142.

If a full face mask is used it shall meet the requirements of EN 136:1998, except 7.18, at least class 2.

### 6.12 Goggles

If the device shall be used with goggles, then the lenses of the goggles shall be protected against fogging. The head straps of the goggles shall be flexible and easily adjustable or self-adjusting.

The goggles shall be attached to the apparatus to prevent loss. The goggles shall not interfere with the donning of the apparatus.

Testing shall be done in accordance with 7.3 and 7.8.

After the test for mechanical strength of the eyepiece(s) in accordance with 8.11 of EN 136:1998 the goggles shall not be damaged in any way that may make it ineffective or cause injury to the wearer.

Testing shall be done in accordance with 7.3 and 7.8.

The leaktightness of the goggles shall meet the requirements of 7.2.5 of EN 166:2001.

Testing shall be done in accordance with clause 13 of EN 168:2001.

### 6.13 Temperature performance and flammability resistance

#### 6.13.1 Conditioning

After conditioning in accordance with 7.5.1 and return to  $(20 \pm 3)$  °C the apparatus shall meet the requirements of 6.10 and 6.24 the carrying container shall have no deficiencies that impair its functionality, the materials used shall not show substantial deteriorations (severe deformations, cracks etc.) and the connectors between apparatus and facepiece shall be examined.

For standardized threads a thread gauge shall be used to check dimensions.

For all equipment connectors a pull test as described in 7.12.4.3 and 8.9 of EN 136:1998 shall be applied and no separations shall occur.

After the test the equipment connector shall be dimensionally correct.

Testing shall be done in accordance with 7.3.

### 6.13.2 Temperature performance

#### 6.13.2.1 General

The apparatus shall operate trouble-free over the temperature range -15 °C to 60 °C.

Apparatus specifically designed for temperatures beyond these limits shall be tested and marked accordingly. The apparatus shall meet the breathing resistance requirements given in 6.13.2.2 and 6.13.2.3 at the extremes the temperature given.

#### 6.13.2.2 Breathing resistance at low temperature

For breathing apparatus without positive pressure the inhalation resistance shall not exceed 10 mbar.

For breathing apparatus with positive pressure a positive pressure shall be maintained in the cavity of the mask adjacent to the face seal.

The exhalation resistance of all types of apparatus shall not exceed 10 mbar.

Testing shall be done in accordance with 7.5.2.

#### 6.13.2.3 Breathing resistance at high temperature

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##### 6.13.2.3.1 Apparatus without positive pressure

For breathing apparatus without positive pressure the inhalation resistance shall not exceed 7 mbar.

The exhalation resistance shall not exceed 3 mbar.

Testing shall be done in accordance with 7.5.3.

##### 6.13.2.3.2 Apparatus with positive pressure

For breathing apparatus with positive pressure a positive pressure shall be maintained in the cavity of the mask adjacent to the face seal.

The exhalation resistance shall not exceed 10 mbar.

Testing shall be done in accordance with 7.5.3.

### 6.13.3 Flammability

The breathing hose(s) (leading to facepiece), medium pressure tube(s) and lung governed demand valve shall prove to be "self-extinguishing", i.e. the material shall not be of highly flammable nature and when tested the parts shall not continue to burn for more than 5 s after removal from the flame.

After completing the flammability test the apparatus shall meet the requirements given in 6.10.

Testing shall be done in accordance with 7.5.4 and 7.5.9.

#### 6.14 Protection against particulate matter

The component parts of the apparatus supplying compressed air shall be reliably protected against the penetration of particulate matter that may be contained in the compressed air.

Testing shall be done in accordance with 7.3.

#### 6.15 High and medium pressure parts

Metallic high pressure tubes, valves and couplings shall be tested to prove that they are capable of withstanding a pressure of 50 % above the maximum filling pressure of the pressure vessel without damage.

Non-metallic parts shall be tested to prove that they are capable of withstanding a pressure twice the maximum filling pressure of the pressure vessel without damage.

All medium pressure tubes downstream of the pressure reducer shall be capable of withstanding twice their maximum attainable working pressure without damage.

Testing shall be done in accordance with 7.3.

#### 6.16 High, medium and low pressure connections

High, medium and low pressure connectors shall not be interchangeable.

Testing shall be done in accordance with 7.3.

#### 6.17 Pressure vessel(s)

Pressure vessels shall comply with the relevant regulations. The pressure vessel shall be approved with respect to the appropriate filling pressure.

Only pressure vessels of equal maximum filling pressure shall be connected to an apparatus with more than one pressure vessel.

Testing shall be done in accordance with 7.3 and 7.8.

It shall not be possible to connect pressure vessels with a higher maximum filling pressure (e.g. 300 bar) to an apparatus which is designed only for a lower maximum filling pressure (e.g. 200 bar).

Testing shall be done in accordance with 7.3 and 7.8.

#### 6.18 Pressure vessel seal

There shall be only one pressure vessel seal or other technical provisions to open the total air stored. The pressure vessel seal or its equivalent shall be opened easily by hand or automatically when starting the apparatus.

Where a conventional pressure vessel seal valve is used it shall be so designed that the pressure vessel seal valve spindle cannot be completely unscrewed from the assembly during normal operation of the pressure vessel seal valve.

The opening device shall be designed so that it cannot be closed inadvertently.

Testing shall be done in accordance with 7.3 and 7.8.