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**Oprema za varovanje dihal - Dihalni aparat na stisnjeni zrak s trajnim pretokom - Zahteve, preskušanje, označevanje**

Respiratory protective devices - Continuous flow compressed air line breathing apparatus - Requirements, testing, marking

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EUROPEAN STANDARD

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English version

## Respiratory protective devices - Continuous flow compressed air line breathing apparatus - Requirements, testing, marking

Appareils de protection respiratoire - Appareils de protection respiratoire isolants à adduction d'air comprimé à débit continu - Exigences, essais, marquage

Atemschutzgeräte - Druckluft-Schlauchgeräte mit kontinuierlichem Luftstrom - Anforderungen, Prüfung, Kennzeichnung

This European Standard was approved by CEN on 15 March 2005.

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.

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

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

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## Foreword

This European Standard (EN 14594:2005) 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of an identical text or by endorsement, at the latest by October 2005, and conflicting national standards shall be withdrawn at the latest by October 2005.

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 89/686/EEC.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this European Standard.

Together with EN 14593-1 and EN 14593-2, EN 14594 supersedes EN 139:1994, EN 270:1994, EN 271:1995, EN 1835:1999 and EN 12419:1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, 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 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 continuous flow compressed air line breathing apparatus for use with a full face mask, half mask, or incorporating a hood, helmet or suit, and apparatus used in abrasive blasting operations, as a respiratory protective device. Escape and diving apparatus are not covered by this European Standard.

Laboratory and practical performance tests are included for the assessment of conformance to the requirements.

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## 2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- <https://standards.iteh.ai/catalog/standards/sist/17615077-8f21-47fa-89f4-4d21266cb4c6/sist-en-14594-2005>
- EN 132:1998, *Respiratory protective devices — Definitions of terms and pictograms*
- EN 134:1998, *Respiratory protective devices — Nomenclature of components*
- EN 136, *Respiratory protective devices — Full face masks — Requirements, testing, marking*
- EN 140, *Respiratory protective devices — Half masks and quarter masks — Requirements, testing, marking*
- EN 148-1, *Respiratory protective devices — Threads for facepieces — Part 1: Standard thread connection*
- EN 148-2, *Respiratory protective devices — Threads for facepieces — Part 2: Centre thread connection*
- EN 148-3, *Respiratory protective devices — Threads for facepieces — Part 3: Thread connection M45 x 3*
- EN 166:2001, *Personal eye protection – Specifications*
- EN 169, *Personal eye protection — Filters for welding and related techniques — Transmittance requirements and recommended use*
- EN 170, *Personal eye protection — Ultraviolet filters — Transmittance requirements and recommended use*
- EN 171, *Personal eye protection — Infrared filters — Transmittance requirements and recommended use*
- EN 379, *Personal eye-protection — Automatic welding filters*
- EN 397:1995, *Industrial safety helmets*

## EN 14594:2005 (E)

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

EN 12941:1998, *Respiratory protective devices — Powered filtering devices incorporating a helmet or a hood — Requirements, testing, marking*

EN 13274-1:2001, *Respiratory protective devices — Methods of test — Part 1: Determination of inward leakage and total inward leakage*

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

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

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

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

EN ISO 4674 (all parts), *Rubber- or plastics-coated fabrics — Determination of tear resistance*

EN ISO 7854:1997, *Rubber- or plastics-coated fabrics — Determination of resistance to damage by flexing (ISO 7854:1995)*

EN ISO 8031, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance (ISO 8031:1993)*

EN ISO 13934-2, *Textiles — Tensile properties of fabrics — Part 2: Determination of maximum force using the grab method (ISO 13934-2:1999)*

EN ISO 14877:2002, *Protective clothing for abrasive blasting operations using granular abrasives (ISO 14877:2002)*

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### 3 Terms, definitions and pictograms

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

#### 3.1 continuous flow compressed air line breathing apparatus for use with a face mask, half mask, suit, hood or helmet

apparatus which is not self-contained, for use with a facepiece, in which the wearer is supplied with breathable air from a source of compressed air at a maximum pressure of 10 bar

#### 3.2

##### facepiece

facepiece conforming to EN 136, EN 140, or a hood/helmet/suit as appropriate

#### 3.3

##### mobile compressed air supply system

supply system that may include a compressor, filters, compressed air pressure vessels, for use as a mobile source of breathing air

#### 3.4

##### minimum flow condition

those factors appropriate to the design specified by the manufacturer which give rise to the lowest flow rate



NOTE These factors can include the maximum length of compressed air supply tube, maximum number of couplings in the compressed air supply tube, tube internal diameter and supply pressure.

### 3.5

#### maximum flow condition

those factors appropriate to the design specified by the manufacturer which give rise to the highest flow rate

NOTE These factors can include the minimum length of compressed air supply tube, tube internal diameter and supply pressure.

### 3.6

#### suit

garment covering the head and body of the wearer, not necessarily including feet and hands, with ventilation such that the exhaled and excess of air leaves the garment at its boundaries completely, or partly through one or more exhalation valves, to the surrounding air

### 3.7

#### abrasive blasting operation

method for the treatment of surfaces by directing propelled abrasives onto the surface where, during the blasting operation, the abrasive blasting operator and the blasted material are in a confined room or outdoors, the abrasive blasting operator is directly exposed to the abrasive rebounding from the blasted material, and the carrier medium and developing dusts

### 3.8

#### abrasives

granular materials that are directed onto the surface of the blasted material at a high speed for surface treatment

### 3.9

#### breathing apparatus for use in abrasive blasting operations

protective hood fitted with an impact resistant visor and a blouse covering the shoulders and the upper part of the chest where breathable air is supplied to the wearer from a source of air not carried by the wearer

### 3.10

#### abrasive blasting combination

combination of protective clothing, protecting against the risks arising in abrasive blasting operations, and suitable respiratory protective equipment

## 4 Description

This apparatus enables the wearer to be provided with breathable air in accordance with EN 12021 supplied at a continuous air flow to a facepiece via a breathing hose. The apparatus may incorporate an adjustable continuous flow valve which may be carried by the wearer. A compressed air supply tube connects the wearer to a supply of compressed air.

The excess and exhaled air flows into the ambient atmosphere.

NOTE Conformance to EN 12021 can be ensured by a breathable air supply system or an additional device such as a compressed air filter system.

## 5 Classification

Devices shall be classified according to the maximum inward leakage given in Table 1 and the strength requirements shown below.

Class A devices shall meet the lower strength requirements of this European Standard.

Class B devices shall meet the higher strength requirements of this European Standard, and shall be tested for flammability of the compressed air supply tube.

Table 1 — Classification

Class	Maximum Inward Leakage %
1A and 1B	10,00
2A and 2B	2,00
3A and 3B	0,50
4A and 4B	0,05

Class 4A devices shall incorporate either a full face mask in accordance with EN 136 or a hood/helmet/suit.

Class 4B devices shall incorporate a full face mask in accordance with EN 136 or apparatus suitable for use in abrasive blasting operations.

Apparatus for use in abrasive blasting operations shall only conform to Class 4B.

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## 6 Requirements

### 6.1 General

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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 maxima or minima shall be subject to a tolerance of  $\pm 5\%$ . Unless otherwise specified, the ambient temperature for testing shall be between  $16\text{ }^{\circ}\text{C}$  and  $32\text{ }^{\circ}\text{C}$  and the temperature limits shall be subject to an accuracy of  $\pm 1\text{ }^{\circ}\text{C}$ . Wherever a test clause is referenced, all subclauses of the test clause shall apply, unless otherwise stated.

### 6.2 Ergonomics

The requirements of this European Standard are intended to take account of the interaction between the wearer, the respiratory protective device, and where possible the working environment in which the respiratory protective device is likely to be used. The device shall satisfy 6.3, 6.9 and 6.10.

Testing shall be done accordance with 7.3.

### 6.3 Materials

**6.3.1** All materials used in the construction shall have adequate resistance to deterioration by heat and adequate mechanical strength. Testing shall be done in accordance with 7.3, after any pre-conditioning according to 7.7, and any safety data sheet, if applicable, and declaration of the manufacturer related to materials used in the construction of the device.

Testing shall be done accordance with 7.2.

**6.3.2** With the exception of devices for abrasive blasting operations, 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 their alloys.

Testing shall be done in accordance with 7.2.

**6.3.3** Materials that may come into direct contact with the wearer's skin or that may affect the quality of the breathing air shall not be known to be likely to cause skin irritation or any other adverse effects to health.

Testing shall be done in accordance with 7.2.

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

Testing shall be done in accordance with 7.2 and 7.3.

## 6.4 Cleaning and disinfecting

All materials shall be visibly unimpaired after cleaning and disinfection by the agents and procedures specified by the manufacturer.

Testing shall be done in accordance with 7.2.

## 6.5 Practical performance

The apparatus shall be such that it can be worn without avoidable discomfort, the wearers shall show no undue signs of strain attributable to wearing the apparatus, and the apparatus shall impede the wearer as little as possible when in a crouched position or when working in a restricted space.

The complete apparatus shall undergo practical performance tests under realistic conditions. These general tests serve the purpose of checking the apparatus for imperfections that can not be determined by the tests described elsewhere in this European Standard.

If during any activity, by any test subject, the test subject fails to finalise the selected activity due to the apparatus being not fit for the purpose for which it has been designed, the apparatus shall be deemed to have failed.

Testing shall be done in accordance with 7.3.

## 6.6 Connections

### 6.6.1 General

Components of the apparatus shall be readily separated for cleaning, examining and testing. All demountable connections shall be readily connected and secured, where possible by hand. Any means of sealing used shall be retained in position when the joints and couplings are disconnected during normal use and maintenance.

Testing shall be done in accordance with 7.2 and 7.3.

### 6.6.2 Couplings

The apparatus shall be constructed so that any twisting of the hoses and tubes does not affect the fit or performance of the apparatus, or cause the hoses or tubes to become disconnected. At least one swivelling coupling shall be fitted to the compressed air supply tube adjacent to the wearer. The design of the couplings shall be such as to prevent unintentional interruption of the air supply.

Testing shall be done in accordance with 7.2 and 7.3.

### 6.6.3 Strength of breathing hose connections

The connection of the breathing hose at the facepiece and at the waist belt shall withstand a force of 50 N for Class A devices and 250 N for Class B devices.

Testing shall be done in accordance with 7.4.

### 6.6.4 Connection between apparatus and mask

The connection between the breathing apparatus and the mask shall be achieved by a permanent, special or thread type connector. If a thread connector is used, either it shall conform to EN 148-1, or if any other thread type connector is used, it shall not be possible to connect it with threads conforming to EN 148-1, EN 148-2 or EN 148-3.

Thread connectors conforming to EN 148-2 or EN 148-3 shall not be used with equipment in accordance with this European Standard.

Testing shall be done in accordance with 7.2.

### 6.6.5 Connection between apparatus and hood/helmet/suit

The connection between the apparatus and the hood/helmet/suit shall be achieved by a permanent, special, or thread type connector.

Threads defined in EN 148-1, EN 148-2 and EN 148-3 shall not be used for the hood/helmet/suit connector. If any screw thread is used it shall not be possible to connect it to the threads defined in EN 148-1, EN 148-2 and EN 148-3.

Testing shall be done in accordance with 7.2.

### 6.6.6 Unacceptable connections

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It shall not be possible to connect the compressed air supply tube directly to the breathing hose or facepiece.

Testing shall be done in accordance with 7.2.

### 6.7 Body harness or belt

A body harness or belt shall be provided to which the compressed air supply tube, the medium pressure connecting tube (if fitted), and the breathing hose (if fitted) shall be attached. Buckles shall not slip and the body harness or belt shall not be damaged.

Class A devices shall be subjected to 250 N and Class B devices shall be subjected to 1 000 N.

Testing shall be done in accordance with 7.2, 7.3 and 7.6.

### 6.8 Performance requirements after storage

After performing the tests in accordance with 7.7.1 and 7.7.2, and optionally 7.7.3, and returning to room temperature, all performance requirements of this European Standard shall be met, except for 6.9.

Apparatus specifically designed for storage beyond the limits of storage conditioning given in 7.7.1 shall be conditioned and marked accordingly. Apparatus specifically designed for use at temperatures below 0 °C shall continue to operate satisfactorily at such temperatures.

Testing shall be done in accordance with 7.7.

## 6.9 Flammability

**6.9.1** The requirements of 6.9.2 and 6.9.3 do not apply to the compressed air source, e.g. mobile compressed air supply systems, but do include the compressed air supply tube.

**6.9.2** No exposed components of the apparatus and facepiece shall continue to burn for more than 5 s after removal from the flame.

Testing shall be done in accordance with 7.8.1.

**6.9.3** Wherever the manufacturer designs the apparatus to be used in applications with a high flammability risk, the exposed components shall be tested in accordance with 7.8.2. The exposed components shall not continue to burn for more than 5 s after removal from the flame and the apparatus shall be marked in accordance with Clause 8.

Testing shall be done in accordance with 7.8.2.

## 6.10 Mobile compressed air supply systems

### 6.10.1 General

The requirements of 6.18 shall apply simultaneously to each apparatus connected to a mobile compressed air supply system. Where multiple wearers are supplied from one pressure reducer the tests are conducted with one apparatus connected to a breathing machine and all remaining apparatus operating at a continuous flow of 160 l/min.

The mobile compressed air supply system shall supply breathable air in accordance with EN 12021, and shall be fitted with a pressure reducer, pressure gauges, relief valve and a warning device which may be carried by the wearer.

Testing shall be done in accordance with 7.2.

### 6.10.2 Pressure reducer

The pressure reducer and the characteristics of the compressed air supply system incorporating the compressed air supply tube(s) shall be such that the requirements of 6.14 and 6.18 are met.

If the outlet pressure is variable, the pressure reducer shall not be adjustable without the use of special tools and the pressure gauge shall be marked to indicate the pressure range.

Testing shall be done in accordance with 7.2 and 7.3.

### 6.10.3 Pressure reducer relief valve

A pressure reducer relief valve shall be provided. The pressure reducer relief valve shall be designed to pass the stated maximum output of the supplying system at a medium pressure of 30 bar or less if specified by the manufacturer. With the pressure reducer relief valve operational, the inhalation and exhalation breathing resistances shall not exceed 25 mbar.

Where the equipment is mounted in an enclosure, air flow from the pressure reducer relief valve shall not be significantly restricted.

Testing shall be done in accordance with 7.2 and 7.9.