

Respiratory protective devices — Compressed air line breathing apparatus for use with a full face mask, half mask or a mouthpiece assembly — Requirements, testing, marking

The European Standard EN 139:1994 including its amendment A1:1999 has the status of a British Standard

ICS 13.340.30

Cooperating organizations

The European Committee for Standardization (CEN), under whose supervision this European Standard was prepared, comprises the national standards organizations of the following countries:

Austria	Oesterreichisches Normungsinstitut
Belgium	Institut belge de normalisation
Denmark	Dansk Standard
Finland	Suomen Standardisoimisliitto, r.y.
France	Association française de normalisation
Germany	Deutsches Institut für Normung e.V.
Greece	Hellenic Organization for Standardization
Iceland	Technological Institute of Iceland
Ireland	National Standards Authority of Ireland
Italy	Ente Nazionale Italiano di Unificazione
Luxembourg	Inspection du Travail et des Mines
Netherlands	Nederlands Normalisatie-instituut
Norway	Norges Standardiseringsforbund
Portugal	Instituto Português da Qualidade
Spain	Asociación Española de Normalización y Certificación
Sweden	Standardiseringskommissionen i Sverige
Switzerland	Association suisse de normalisation
United Kingdom	British Standards Institution

This British Standard, having been prepared under the direction of the Personal Safety Equipment Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 January 1995

© BSI 01-2000

The following BSI references relate to the work on this standard:
Committee reference PSM/14
Draft for comment 89/37755 DC

ISBN 0 580 22236 5

Amendments issued since publication

Amd. No.	Date	Comments
8811	September 1995	Correction to Figure 1
10774	January 2000	Indicated by a sideline

Contents

	Page
Cooperating organizations	Inside front cover
National foreword	ii
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Definitions and nomenclature	3
4 Description	3
5 Designation	4
6 Requirements	4
7 Testing	9
8 Marking	23
9 Instructions for use	23
Annex A Recommendations for static and dynamic pressure for apparatus with thread connector in accordance with EN 148-3	26
National annex NA (informative) Committees responsible	Inside back cover
National annex NB (informative) Cross-references	Inside back cover
Figure 1 — Test device used in the measurement of breathing resistance of apparatus fitted with an overflow valve (applies to apparatus with a standard thread)	10
Figure 2 — Measurement of strength of breathing hose connections	15
Figure 3 — Arrangement for testing strength of body harness or belt, compressed air supply tube and couplings	16
Figure 4 — Wooden blocks as used in practical performance test	17
Figure 5a — Typical arrangement for testing flammability	18
Figure 5b — Scheme for harness material single burner test	19
Figure 6 — Arrangement for testing kinking of compressed air supply tube	20
Figure 7 — Arrangement for testing kinking of compressed air supply tube	21
Figure 8 — Arrangement for testing collapse of compressed air supply tube	22
Figure 9 — Box for testing exhalation valve leakage	23
Figure 10 — Arrangement for testing exhalation valve leakage using a single cylinder breathing machine	24
Figure 11 — Arrangement for testing exhalation valve leakage using a twin cylinder breathing machine	25
Figure A.1 — Scheme of test rig for dynamic pressure	26
Table 1 — Testing schedule	11

National foreword

This British Standard has been prepared under the direction of the Personal Safety Equipment Standards Policy Committee and is the English language version of EN 139:1994 *Respiratory protective devices — Compressed air line breathing apparatus for use with a full face mask, half mask or a mouthpiece assembly — Requirements, testing, marking*, including amendment A1:1999 published by the European Committee for Standardization (CEN). Together with BS EN 138, BS EN 269 and BS EN 270 it supersedes BS 4667-3:1974 which is withdrawn.

EN 139 was produced as a result of international discussions in which the United Kingdom took an active part.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 27 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Sidelining in this document indicates the most recent changes by amendment.

UDC 614.894.72:620.1

Descriptors: Respiratory protective equipment, compressed air, accident prevention, specifications, tests, marking

English version

Respiratory protective devices — Compressed air line breathing apparatus for use with a full face mask, half mask or a mouthpiece assembly — Requirements, testing, marking

(includes amendment A1:1999)

Appareils de protection respiratoire —
Appareils de protection respiratoire à adduction
d'air comprimé avec masque complet,
demi-masque ou ensemble embout buccal —
Exigences, essais, marquage
(inclut l'amendement A1:1999)

Atemschutzgeräte —
Druckluft-Schlauchgeräte in Verbindung mit
Vollmaske, Halbmaske oder
Mundstückgarnitur — Anforderungen,
Prüfung, Kennzeichnung
(enthält Änderung A1:1999)

This European Standard was approved by CEN on 1994-10-14. 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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, the Secretariat of which is held by DIN.

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 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 April 1995 and conflicting national standards shall be withdrawn at the latest by April 1995.

According to the CEN/CENELEC Internal Regulations, the 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, United Kingdom.

Foreword to amendment A1

This amendment EN 139:1994/A1:1999 to EN 139:1994 has been prepared by Technical Committee CEN/TC 79, Respiratory protective devices, the Secretariat of which is held by DIN.

This amendment to the European Standard EN 139:1994 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 1999, and conflicting national standards shall be withdrawn at the latest by November 1999.

This amendment to the European Standard EN 139:1994 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).

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, United Kingdom.

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 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 compressed air line breathing apparatus for use with a full face mask, a half mask or a mouthpiece assembly as a respiratory protective device. Escape and diving apparatus and that used in abrasive blasting operations are not covered by this standard.

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.

EN 132:1990, *Respiratory protective devices — Definitions.*

EN 134:1990, *Respiratory protective devices — Nomenclature of components.*

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

EN 140:1989, *Respiratory protective devices — Half masks and quarter masks — Requirements, testing, marking.*

EN 142:1989, *Respiratory protective devices — Mouthpiece assemblies — Requirements, testing, marking.*

EN 148-1:1987, *Respiratory protective devices — Threads for facepieces — Standard thread connection.*

EN 148-2:1987, *Respiratory protective devices — Threads for facepieces — Centre thread connection.*

EN 148-3:1992, *Respiratory protective devices — Threads for facepieces — Thread connection $M45 \times 3$.*

EN 28031:1993, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance (ISO 8031:1987).*

ISO 6941:1987 AMD 1:1992, *Textile fabrics — Burning behaviour — Measurement of flame speed properties of vertically oriented specimens.*

3 Definitions and nomenclature

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

3.1

compressed air line breathing apparatus for use with a full face mask, a half mask or a mouthpiece assembly

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

3.2

overflow valve

a non-return valve, fitted to the breathing hose, that is specifically designed to allow the excess air supply to escape to atmosphere

3.3

breathing bag

a device which compensates for variation in the air supply and provides for peak inhalation flow requirements

3.4

compressed air supply tube

a tube which delivers breathable air at a maximum pressure of 10 bar from a source of compressed air

4 Description

NOTE The term "suitable facepiece" means a facepiece complying with EN 136, EN 140 or EN 142 as appropriate.

4.1 Compressed air line breathing apparatus (continuous flow type)

This apparatus enables the wearer to be provided with breathable air (as defined in the relevant European Standard¹⁾) supplied at a continuous air flow to a suitable 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. An overflow valve may be fitted to the breathing hose. The excess and exhaled air flows into the ambient atmosphere.

¹⁾ This can be ensured by a breathable air supply system or an additional device (e.g. a filtering device).

In certain circumstances a breathing bag or similar device may be necessary to compensate for variations of the air supply and to provide for peak inhalation flow requirements.

4.2 Compressed air line breathing apparatus (demand type)

4.2.1 Apparatus without positive pressure

This apparatus enables the wearer to be provided with breathable air (as defined in the relevant European Standard²⁾) which flows through a lung governed demand valve to a suitable facepiece on inhalation. A compressed air supply tube connects the wearer to a supply of compressed air. The excess and exhaled air flows into the ambient atmosphere.

4.2.2 Apparatus with positive pressure

This apparatus enables the wearer to be provided with breathable air (as defined in the relevant European Standard²⁾) which flows through a lung governed demand valve operating at positive pressure to a suitable facepiece on inhalation. A compressed air supply tube connects the wearer to a supply of compressed air. The excess and exhaled air flows into the ambient atmosphere.

5 Designation

Respiratory protective devices meeting the requirements of this standard shall be designated as follows:

Compressed air line BA/EN 139/(Options).

Example: Compressed air line BA EN 139.

6 Requirements

6.1 Materials

6.1.1 All materials used in the construction shall have adequate mechanical strength, durability and resistance to deterioration by heat.

6.1.2 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 containing such proportions of these metals as will, on impact, give rise to frictional sparks capable of igniting flammable gas mixtures.

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

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

Compliance with **6.1.1**, **6.1.2**, and **6.1.4** shall be assessed in accordance with **7.3**.

²⁾ This can be ensured by a breathable air supply system or an additional device (e.g. a filtering device).

6.2 Water immersion

The apparatus shall continue to function satisfactorily after being submerged in water and shall meet the requirements of **6.20**.

WARNING. The apparatus is not designed for use under water.

Testing in accordance with **7.2**.

6.3 Cleaning and disinfecting

The materials used shall withstand the cleaning and disinfection agents and procedures recommended by the manufacturer.

Testing in accordance with **7.3**.

6.4 Practical performance test

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 it shall impede the wearer as little as possible when in a crouched position or when working in a confined space.

These tests serve the purpose of checking the equipment for imperfections that cannot be determined by the tests described elsewhere in this standard.

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

Testing in accordance with **7.4**.

6.5 Connectors

6.5.1 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 maintenance.

6.5.2 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 in accordance with **7.3** and **7.4**.

6.5.3 *Strength of breathing hose connections*

Couplings of the breathing hose at the equipment connector and waist belt shall withstand a force of 250 N. Where however a half mask with a non-standard thread is used in the apparatus the requirement for coupling strength shall be 50 N.

Testing in accordance with 7.5.

6.5.4 *Connection between apparatus and facepiece*

The connection between the breathing apparatus and the facepiece may be achieved by a permanent, special or thread type connector.

If a thread connector is used it shall comply with the requirements of one of the following standards:

- EN 148-1 for breathing apparatus without positive pressure;
- EN 148-2 for closed-circuit breathing apparatus;
- EN 148-3 for breathing apparatus with positive pressure.

If any other thread type connector is used it shall not be possible to connect it with the above mentioned threads.

The standard thread according to EN 148-1 shall not be used for apparatus with positive pressure, closed-circuit apparatus and diving apparatus.

The thread according to EN 148-2 shall not be used for open-circuit devices and diving apparatus.

The thread according to EN 148-3 shall not be used for apparatus without positive pressure, closed-circuit apparatus and diving apparatus.

6.6 *Compressed air line breathing apparatus used with self-contained breathing apparatus*

If compressed air line breathing apparatus is used in conjunction with self-contained breathing apparatus, the design of the combined system shall be such as to prevent air loss from the breathing apparatus in the event of a malfunction or disconnection of the airline. The connection of the compressed air supply tube to the self-contained breathing apparatus shall withstand an axial force of 1 000 N.

Testing in accordance with 7.3 and 7.6.

6.7 *Body harness, belt and breathing bag*

6.7.1 A body harness or belt shall be provided to which the medium pressure connecting tube, breathing hose and breathing bag if fitted shall be attached. Buckles shall not slip

Testing in accordance with 7.3 and 7.4.

6.7.2 It shall not be possible to connect the compressed air supply tube directly to the breathing hose, medium pressure connecting tube or facepiece.

Testing in accordance with 7.3 and 7.4.

6.7.3 Where a breathing bag is fitted it shall be protected against damage.

Testing in accordance with 7.3.

6.8 *Resistance to temperature*

6.8.1 After storage in accordance with 7.7.1 all other performance requirements of this standard shall be met

6.8.2 After storage in accordance with 7.7.1 the apparatus shall comply with 6.20 and shall continue to operate satisfactorily as assessed by the procedures of 7.7.2 and 7.7.3.

6.8.3 Apparatus specifically designed for temperatures beyond the limits for storage or use given in 7.7.1 shall be tested and marked accordingly.

6.9 *Flammability*

When tested in accordance with 7.8.1 all exposed components of the apparatus shall not continue to burn for more than 5 s after passing through the flame.

Testing shall be done in accordance with 7.8.1.

Wherever the manufacturer expects the apparatus to be used in situations with a high flammability risk, the body harness shall additionally be tested in accordance with 7.8.2 and the apparatus shall incorporate a class 2 or class 3 full face mask in accordance with EN 136:1998. The body harness shall not continue to burn for more than 5 s after removal from the flame, and shall be marked in accordance with clause 8.

Testing shall be done in accordance with 7.8.2.

6.10 *Resistance to air pressure*

The compressed air supply tube and the medium pressure connecting tube and their couplings shall be capable of withstanding without damage an air pressure of 30 bar for 15 min.

Testing in accordance with 7.3.

6.11 *Mobile high pressure air supply systems*

6.11.1 *General*

The air supply system shall be fitted with a pressure reducer, a high pressure gauge, medium pressure gauge, safety valve and a warning device in the high pressure system.

Testing in accordance with 7.3.

6.11.2 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 6.20 shall be met.

The required pressure on the outlet side shall be either preset or variable; in the latter case the variable valve shall not be adjustable without the use of special tools and the pressure gauge shall be suitably marked to indicate the pressure range.

Testing in accordance with 7.3 and 7.4.

6.11.3 High pressure warning device for compressed air cylinder systems

The system shall have a warning device that warns the wearer or assistant when the cylinder pressure drops to a predetermined level. The warning device shall operate at a residual pressure of 30 bar minimum. If an audible warning device is incorporated, the sound pressure level shall be a minimum of 85 dB(A) and not greater than 95 dB(A) at a distance of 1 m from the warning device. The duration of the audible warning shall be at least 15 s for a continuous signal and 60 s for an intermittent signal. The frequency range of the signal shall be between 2 000 Hz and 4 000 Hz.

Testing in accordance with 7.3.

6.11.4 Pressure reducer safety valve

A pressure reducer safety valve shall be provided. The pressure reducer safety valve shall be designed to pass an air flow of 400 l/min at a medium pressure not exceeding 30 bar. With the pressure reducer safety valve operational, the inhalation and exhalation breathing resistances shall not exceed 25 mbar.

Testing in accordance with 7.9.

NOTE This requirement only applies to one wearer operating from one pressure reducer; where multiple wearers operate from a single pressure reducer additional safety features will be needed.

6.12 Compressed air supply tube

6.12.1 Resistance to kinking

When tested in accordance with 7.10 the compressed air supply tube shall maintain a uniform near-circular shape and spiral from the loop configuration described and shall not deform to an extent that decreases the flow of air through it by more than 10% compared with that measured when the tube is straight and unstressed.

6.12.2 Resistance to collapse

When tested in accordance with 7.11 using an applied load of 1 000 N the reduction in air flow shall not be greater than 10 %.

6.12.3 Strength

When tested in accordance with 7.6 the compressed air supply tube, couplings and continuous flow valve or demand valve, if fitted, shall not separate from the couplings.

Testing in accordance with 7.3 and 7.6.

6.12.4 Flexibility

When pressurized to the maximum working pressure the compressed air supply tube shall be capable of being wound on to a drum 300 mm in diameter.

Testing in accordance with 7.3.

6.12.5 Heat resistance

Compressed air supply tubes claimed to be resistant to damage from contact with hot surfaces and boiling water shall be tested in accordance with 7.12 and shall show no signs of damage or indications of failure and the air quality shall not be significantly affected.

6.12.6 Electrostatic properties

Compressed air supply tubes claimed to be antistatic when tested in accordance with EN 28031 making connections to the couplings shall have an electrical resistance that is greater than $10^3 \Omega$ and less than $10^8 \Omega$.

6.12.7 Couplings

Where a hand operated connection is fitted to the outlet of the compressed air supply tube it shall incorporate a self-sealing coupling to seal the air supply.

Testing in accordance with 7.3.

6.13 Breathing hose

Breathing hoses shall be flexible and non-kinking. The breathing hoses shall permit free head movement and shall not restrict or close off the air supply under chin or arm pressure during practical performance tests.

Testing in accordance with 7.4.

6.14 Supply regulators

6.14.1 General

The requirements of 6.14.2 and 6.14.3 shall apply simultaneously to every apparatus connected to the air supply system.