

Hingamisvahendid. Suletud tsükliga sukeldumisaparaat

**Respiratory equipment - Self-contained re-breathing
diving apparatus**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 14143:2013 sisaldab Euroopa standardi EN 14143:2013 ingliskeelset teksti.	This Estonian standard EVS-EN 14143:2013 consists of the English text of the European standard EN 14143:2013.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kätesaadavaks 10.07.2013.	Date of Availability of the European standard is 10.07.2013.
Standard on kätesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 13.340.30

Võtmesõnad: artificial breathing apparatus, books, instructions, lightweight, maintenance, marking, pamphlets, protective clothing, regeneration apparatus, respirators, safety, safety engineering, safety requirements, specification (approval), specifications, storage, testing,

Standardite reproduutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:
Aru 10, 10317 Tallinn, Eesti; www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:
Aru 10, 10317 Tallinn, Estonia; www.evs.ee; phone 605 5050; e-mail info@evs.ee

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 14143

July 2013

ICS 13.340.30

Supersedes EN 14143:2003

English Version

Respiratory equipment - Self-contained re-breathing diving apparatus

Appareils respiratoire - Appareils de plongée autonome à recyclage de gaz

Atemgeräte - Autonome Regenerationstauchgeräte

This European Standard was approved by CEN on 1 May 2013.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword	6
1 Scope	7
2 Normative references	7
3 Terms and definitions	8
4 Minimum equipment	10
5 Requirements	10
5.1 Design	10
5.2 Materials	12
5.3 Gas cylinder(s)	12
5.4 Cylinder valve(s)	13
5.5 High and medium pressure parts and connections	13
5.5.1 General	13
5.5.2 Pressure reducer (if fitted)	14
5.5.3 Pressure relief system(s)	14
5.6 Breathing circuit	14
5.6.1 Performance requirements	14
5.6.2 Breathable volume	20
5.6.3 Breathing circuit test pressure	20
5.6.4 Exhaust valve	20
5.6.5 Inhalation and exhalation valves	20
5.6.6 Carbon dioxide absorbent canister	21
5.6.7 Inhalation temperature	21
5.6.8 Ingress of water	21
5.7 Gas control or supply system	21
5.7.1 Inspired partial pressure of oxygen	21
5.7.2 Oxygen partial pressure set point maintenance	22
5.7.3 Alphanumeric display for inspired partial pressure of oxygen (if fitted)	22
5.7.4 Gas endurance	22
5.8 Hose assemblies	23
5.8.1 Tensile strength of high and medium pressure hose assemblies subjected to external tensile force	23
5.8.2 Flexibility of high and medium pressure hoses	23
5.8.3 Leakage of high pressure hose assembly	23
5.8.4 Leakage of medium pressure hose assembly	23
5.8.5 Burst pressure of high pressure hose assembly	23
5.8.6 Burst pressure of medium pressure hose assembly	23
5.8.7 Breathing hose	24
5.9 Safety devices	24
5.9.1 General	24
5.9.2 Pressure indicator	24
5.9.3 Monitors for inspired gases	25
5.9.4 Active warning devices	25
5.10 Facepiece	26
5.10.1 General	26
5.10.2 Facepiece harness (if fitted)	26
5.10.3 Connection	27
5.10.4 Eyepiece and visors	27
5.10.5 Head protection against impact (if fitted)	27
5.11 Body harness	28

5.12	Emergency breathing system	28
5.13	Electrical systems	28
5.13.1	Safety of electrical systems	28
5.13.2	Programmable systems	28
5.13.3	Electromagnetic compatibility (EMC)	28
5.13.4	Power source	28
5.14	Resistance to temperature	29
5.14.1	Storage	29
5.14.2	Pre-dive operation	29
5.15	Cleaning and disinfecting	29
5.16	Connectors	29
5.17	Oxygen compatibility and cleanliness	29
5.18	Pressure resistance of casings and monitors	29
5.19	Sea water resistance	29
5.20	Practical performance	30
6	Testing	30
6.1	General	30
6.1.1	Introduction	30
6.1.2	Procedure	30
6.1.3	Nominal values and tolerances	30
6.1.4	Test equipment	30
6.2	Visual Inspection	31
6.3	Breathing circuit	31
6.3.1	General test conditions	31
6.3.2	Breathing performance	32
6.3.3	Volume weighted average inspired carbon dioxide	32
6.3.4	Inspired gas temperature	32
6.3.5	Breathing performance with automatic volume addition system	33
6.4	Hydrostatic imbalance	33
6.5	Breathable volume	33
6.5.1	Volume	33
6.5.2	Breathing circuit pressure test	33
6.5.3	Exhaust valve	34
6.5.4	Inhalation and exhalation valves	34
6.5.5	Ingress of water	34
6.6	Apparatus endurance	34
6.6.1	General	34
6.6.2	Carbon dioxide absorption endurance	35
6.6.3	Gas endurance	35
6.7	Inspired partial pressure of oxygen	35
6.8	Hoses assemblies	36
6.8.1	General	36
6.8.2	Tensile strength of high and medium pressure hose assemblies subjected to external tensile force	36
6.8.3	Flexibility of high and medium pressure hoses	36
6.8.4	Leakage of high pressure hose assembly	36
6.8.5	Leakage of medium pressure hose assembly	36
6.8.6	Burst pressure of high pressure hose assembly	36
6.8.7	Burst pressure of medium pressure hose assembly	36
6.8.8	Tensile load of breathing hose connections	37
6.9	Test pressure of high and medium pressure parts	37
6.10	Safety devices	37
6.10.1	Pressure devices	37
6.10.2	Monitor for inspired partial pressure of oxygen	37
6.10.3	Monitor for inspired partial pressure of carbon dioxide	38
6.10.4	Active warning devices	38
6.10.5	Pressure relief system(s)	38
6.11	Facepiece	38
6.11.1	Mechanical strength of the facepiece (excluding mouthpiece)	38

6.11.2 Field of vision	39
6.11.3 Impact resistance of the eyepiece(s) or visor(s)	42
6.11.4 Facepiece harness	42
6.11.5 Mouthpiece	42
6.12 Electrical systems, Electromagnetic compatibility (EMC)	42
6.13 Resistance to temperature	42
6.13.1 General	42
6.13.2 Testing after storage	42
6.13.3 Testing in pre-dive operation	43
6.14 Cleaning and disinfection	43
6.15 Oxygen pressure surge test	43
6.16 Casings and monitors	45
6.17 Sea water resistance	45
6.18 Practical performance	46
6.18.1 General	46
6.18.2 Test subjects	46
6.18.3 Basic testing	46
6.18.4 Functional testing when diving	46
6.18.5 Pass/fail criteria	47
6.18.6 Report	47
7 Marking	47
8 Information supplied by manufacturer	48
Annex A (informative) Requirement clauses and corresponding test clauses of this European Standard	50
Annex B (normative) Safety-critical software	52
B.1 General	52
B.2 Requirements	52
Annex C (informative) Artificial sea water	55
Annex D (informative) Details of significant technical changes between this European Standard and the previous edition	56
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC on Personal Protective Equipment	57
Bibliography	58
Tables	Page
Table 1 — Qualitative likelihood categories	11
Table 2 — Consequence categories	11
Table 3 — Risk criteria	11
Table 4 — Breathing simulator settings	15
Table 5 — Hydrostatic imbalance	17
Table 6 — Accuracy of the displayed partial pressure of oxygen	22
Table 7 — Respiratory volume	33
Table 8 — Breathing simulator respiratory exchange settings	36
Table 9 — Test sequence (if applicable)	45

Table A.1 — Comparison of requirement clauses and test clauses (1 of 2).....	50
Table ZA.1 — Correspondence between this European Standard and Directive 89/686/EEC on Personal Protective Equipment	57
Figures	Page
Figure 1 — Reference points.....	15
Figure 2 — Analysis of pressure volume loop.....	16
Figure 3 — Diver roll	18
Figure 4 — Diver pitch	19
Figure 5 — Test orifice.....	31
Figure 6 — Test arrangement for tensile force.....	38
Figure 7 — Stoll Apertometer	40
Figure 8 — Apertometer diagram (not to scale)	41
Figure 9 — Example of an ignition test installation.....	44
Figure 10 — Pressure cycle specification for oxygen pressure surge test	44

Foreword

This document (EN 14143:2013) 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 January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14143:2003.

Annex D provides details of significant technical changes between this European Standard and the previous edition.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies minimum requirements for self-contained re-breathing diving apparatus to ensure a minimum level of safe operation of the apparatus. It applies to the following:

- a maximum depth of 6 m for apparatus using pure oxygen;
- a maximum depth of 40 m for apparatus using oxygen in nitrogen gas mixtures;
- a maximum depth of 100 m for apparatus using oxygen and helium or oxygen, nitrogen and helium gas mixtures;
- water temperatures from 4 °C to 34 °C or outside these temperatures as specified by the manufacturer.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

EN 144-1, *Respiratory protective devices — Gas cylinder valves — Part 1: Thread connections for insert connector*

EN 144-3, *Respiratory protective devices — Gas cylinder valves — Part 3: Outlet connections for diving gases Nitrox and oxygen*

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 M 45 x 3*

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

EN 15333-1:2008, *Respiratory equipment — Open-circuit umbilical supplied compressed gas diving apparatus — Part 1: Demand apparatus*

EN 61000-6-1, *Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1)*

EN ISO 10297, *Transportable gas cylinders — Cylinder valves — Specification and type testing (ISO 10297)*

EN ISO 12209-1, *Gas cylinders — Outlet connections for gas cylinder valves for compressed breathable air — Part 1: Yoke type connections (ISO 12209-1)*

EN ISO 12209-2, *Gas cylinders — Outlet connections for gas cylinder valves for compressed breathable air — Part 2: Threaded connections (ISO 12209-2)*

EN ISO 12209-3, *Gas cylinders — Outlet connections for gas cylinder valves for compressed breathable air — Part 3: Adapter for 230 bar valves (ISO 12209-3)*