

DIN EN 14143:2013-10 (E)

Respiratory equipment - Self-contained re-breathing diving apparatus

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