BS ISO 23269-2:2011

BSI Standards Publication

Ships and marine technology — Breathing apparatus for ships

Part 2: Self-contained breathing apparatus for shipboard firefighters

National foreword

This British Standard is the UK implementation of ISO 23269-2:2011.

The UK participation in its preparation was entrusted to Technical Committee SME/32/-/1, Lifesaving and fire protection.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Ships and marine technology — Breathing apparatus for ships —

Part 2: Self-contained breathing apparatus for shipboard firefighters

Navires et technologie maritime — Appareils respiratoires pour les navires —

Partie 2: Appareils respiratoires autonomes pour les pompiers à bord de navires

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 23269-2 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 1, *Lifesaving and fire protection*.

ISO 23269 consists of the following parts, under the general title *Ships and marine technology — Breathing apparatus for ships*:

— *Part 1: Emergency escape breathing devices (EEBD) for shipboard use*

— *Part 2: Self-contained breathing apparatus for shipboard firefighters*

— *Part 3: Self-contained breathing apparatus (safety equipment) required by the IMO IBC and IGC Codes*

— *Part 4: Self-contained breathing apparatus for emergency escape required by the IMO IBC and IGC Codes*

Introduction

Chapter II-2 of the International Convention of Safety of Life at Sea 1974 (SOLAS 74), as amended, requires carriage by ships of breathing devices for firefighting purposes. The International Maritime Organization (IMO) International Code for Fire Safety Systems (FSS Code) specifies basic performance requirements for these devices. However, neither SOLAS 74 nor the FSS Code provides specifications in sufficient detail to ensure an adequate level of safety for users.

This part of ISO 23269 provides detailed technical specifications for shipboard breathing apparatus, to supplement the basic requirements in the FSS Code. It takes into account existing European standards for firefighter's outfits for use by professional firefighters, such as EN 136 and EN 137. However, it also takes into account that ships' crews are generally not professional firefighters, and require a more user-friendly ensemble than that specified in the EN standards.

INTERNATIONAL STANDARD **ISO 23269-2:2011(E)**

Ships and marine technology — Breathing apparatus for ships —

Part 2: Self-contained breathing apparatus for shipboard firefighters

1 Scope

This part of ISO 23269 specifies self-contained breathing apparatus for firefighters on board ships, which are required to be carried on ships by Part C (Suppression of Fire) of chapter II-2 of the 1974 International Convention of Safety of Life at Sea (SOLAS 74), as amended, and chapter 3 of the International Code for Fire Safety Systems (FSS Code).

Although the breathing apparatus manufactured in accordance with this part of ISO 23269 are intended for use in fighting small to medium magnitude fires before the operation of any installed fixed firefighting systems, they are not intended or suitable for direct entry into flames.

2 Normative references

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

International Convention of Safety of Life at Sea 1974 (SOLAS 74), Chapter II-2, as amended

IMO International Code for Fire Safety Systems (FSS Code)

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 23269-1, *Ships and marine technology — Breathing apparatus for ships — Part 1: Emergency escape breathing devices (EEBD) for shipboard use*

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

EN 137:2006, *Respiratory protective devices — Self-contained open-circuit compressed air breathing apparatus with full face mask — Requirements, testing, marking*

EN 469:2005, *Protective clothing for firefighters — Performance requirements for protective clothing for firefighting*

EN 837-1:1996, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

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*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
face blank
main body of a facepiece to which the functional components of the breathing apparatus are attached

3.2
facepiece
part of a breathing device which connects the wearer's respiratory tract to the other parts of the device and isolates the respiratory tract from ambient atmosphere

3.3
visor
part of the facepiece which meets the field of vision requirement of this part of ISO 23269 and can in addition provide eye protection

3.4
cavity
space between the visor and the inner mask adjacent to the face seal

4 General design requirements

Breathing devices shall comply with the following requirements and be tested in accordance with Clauses 5 and 7.

4.1 Breathing apparatus shall be of the self-contained compressed air-operated type for which the volume of air contained in the cylinders shall be at least 1 200 l.

4.2 The breathing apparatus shall be of simple and reliable construction and as compact as possible. The design of the breathing apparatus shall be such as to allow its reliable inspection.

4.3 The breathing apparatus shall be sufficiently robust to withstand the rough usage it is likely to receive in service.

4.4 The breathing apparatus shall be designed so that there are no protruding parts likely to be caught on projections in narrow passages.

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

4.6 The breathing apparatus shall be designed so that the wearer can remove it and, while still wearing the facepiece, continue to breathe from the apparatus.

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

4.8 The main valve(s) of compressed air cylinder(s) shall be arranged so that the wearer can operate it (them) while wearing the breathing apparatus and protective firefighters' gloves, see Reference [1].

4.9 The breathing apparatus shall have a suitable audible warning device that operates when the air remaining in the cylinder reaches a predetermined level. Either the warning device shall be activated automatically when the cylinder valve is opened, or if manually activated it shall not be possible to use the apparatus before the device is activated.

4.10 The total mass of the breathing apparatus ready for use with facepiece and fully charged compressed air cylinder(s) shall not exceed 18 kg.

4.11 Air cylinders and their valves shall comply with appropriate national regulations.

4.12 The breathing apparatus shall be equipped with a class 3 full facepiece according to EN 136.

4.13 The air provided in the cylinder shall be clean, dry, and free of contaminants. The compressed air shall comply with the specifications given in relevant national or International Standards.

NOTE EN 12021[4] is a suitable standard for air for this purpose.

4.14 The connection between the breathing apparatus and the facepiece may be achieved by a permanent, special or thread type connector. Dismountable connections shall be readily connected and secured, preferably by hand and any means of sealing used shall be retained in position when the connection(s) is (are) disconnected.

4.15 Where the facepiece includes a speech diaphragm, the speech diaphragm shall be protected against mechanical damage.

4.16 Visors shall be attached in a reliable and gastight manner to the face blank.

4.17 Visors shall not distort vision and shall not mist to the extent that operation of the apparatus is hampered.

4.18 Where anti-fogging compounds are used as specified by the manufacturer, they shall be known not to cause irritation or other adverse effects to health.

4.19 All adjusting devices of the body harness shall be so constructed that once adjusted they will not slip inadvertently.

4.20 The apparatus shall be equipped with a reliable pressure gauge which will read the pressure in the cylinder(s) on opening the valve and be positioned to enable the pressure to be read conveniently by the wearer. The gauge shall be provided with a suitable safety system to protect the wearer of the apparatus in the event of explosion or fracture of the pressure elements of the gauge. If a window is incorporated in the pressure gauge, it shall be of non-splintering clear material. The information given by the pressure gauge and the warning device shall be complementary in every case.

4.21 Breathing hoses shall be flexible and non-kinking. The breathing hoses shall permit free head movement and shall not restrict or close off the supply under chin or arm pressure. The hose shall not collapse.

4.22 The pressure reducer safety valve shall be designed to pass an air flow at a medium pressure not exceeding 3 MPa in accordance with EN 137:2006, 7.5.1 and 7.5.2. When the pressure reducer safety valve opens, the inhalation peak pressure shall be a positive pressure, and the exhalation peak pressure shall be a positive pressure of not more than 2,5 kPa.

4.23 The demand valve shall provide positive pressure and shall be fitted with a manual or an automatic means to stop the flow of air when the mask is not being worn.

4.24 The head harness shall be designed so that the full facepiece can be donned and removed easily. The head harness shall be adjustable or self-adjusting and shall hold the full facepiece firmly and comfortably in position.

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

4.26 It shall not be possible to fit a low pressure tube or hose directly to a high pressure part of the circuit.

4.27 All components requiring manipulation by the wearer shall be readily accessible and easily distinguishable from one another by touch. All adjustable parts and controls shall be constructed so that their adjustment is not liable to accidental alteration during use.

4.28 The apparatus shall be fitted with a fireproof lifeline of at least 30 m length. The lifeline shall have a minimum nominal breaking load of at least 10 kN, and shall be able to withstand a static proof load of at least 3,5 kN for 5 min without failure. The lifeline shall be capable of attachment by means of a snaphook to the harness of the apparatus or to a separate belt. Lifelines and associated fittings shall be of materials unlikely to create sparks.

5 Resistance to environmental damage tests

5.1 General

5.1.1 The tests in 5.2 to 5.5 shall be conducted in the specified sequence with four sample breathing apparatus. After each of the tests, each breathing apparatus shall be visually inspected, and shall not break or develop deformation, corrosion, or any other defects which may render it unsuitable for use.

5.1.2 At the completion of the test sequence, the four sample breathing apparatus shall then be evaluated and tested against the requirements of Clause 6.

Note that

a) all four devices shall perform according to 6.9.1.2 and 6.9.1.3,

b) one device out of the four shall be tested according to 6.9.2,

c) one out of the remaining three shall be tested according to 6.9.3,

d) the remaining two devices shall be undertaken by the practical performance test according to 7.7.3.

5.2 High temperature, high humidity test

The breathing apparatus shall be subjected to a high temperature of 65 °C in an atmosphere with relative humidity of 90 % for 48 hours and then left in the environment between 20 °C and 25 °C with relative humidity of 65 % for 48 hours.

5.3 Temperature cycling test

The breathing apparatus shall be subjected to a low temperature of −30 °C for eight hours and then to a high temperature of 65 °C for eight hours, the cycle repeated ten times.

5.4 Corrosion test

The breathing apparatus shall be exposed to a 5 % solution of neutral salt-water spray in accordance with ISO 9227 for eight hours, then left for 16 hours in an environment between 20 °C to 25 °C with relative humidity of 65 %. This procedure shall be carried out three times within a 72 hour period.

5.5 Resonance and vibration tests

The breathing apparatus shall undergo the resonance tests and then the vibration resistance tests specified in Table 1. After the tests, the sample apparatus shall continue to function properly.

Table 1 — Resonance and vibration tests

		Total amplitude		Frequency	Sweep period	Direction of vibration	Number of tests	Total hours of tests
Resonance tests	(i)	2 mm	—	5-16 Hz continuous change	10 min	In each of the three planes	Three times in each direction	1,5 hours
	(ii)	—	±1 G	16-60 Hz continuous change	As above	As above	As above	As above
Vibration resistance test	Where resonant	Amplitude or acceleration used for vibration tests		Resonant	—	As above	Once in each direction	4,5 hours (1,5 hours in each of the three planes)
	No resonant frequency within the vibration test frequencies	2 mm	—	16 Hz	—	As above	As above	As above

6 Performance requirements

6.1 Demand valve

If a by-pass valve is incorporated in the demand valve, it shall pass at least 60 l/min, at all air cylinder pressures above 5 MPa.

6.2 System leakage test

The pressure drop shall not be greater than 2 MPa/min when tested in accordance with 7.4.

6.3 Inhalation resistance

The inhalation peak pressure in the cavity of the mask shall be positive at cylinder pressures above

— 1 MPa for the breathing simulator setting of 25 times 2 l/min, and

— 2 MPa for the breathing simulator setting of 40 times 2,5 l/min.

6.4 Exhalation resistance

The exhalation peak pressure shall be positive by not more than 1,0 kPa when testing with the breathing simulator setting of 40 times 2,5 l/min and 0,7 kPa when testing with the breathing simulator setting of 25 times 2 l/min.

6.5 Resistance to pressure

6.5.1 Metallic high pressure tubes, valves and couplings shall be tested to prove that they are capable of withstanding a pressure of 150 % of the maximum filling pressure of the compressed air cylinder. Test in accordance with 7.1 and 7.3.

6.5.2 Non-metallic high pressure components shall be tested to prove that they are capable of withstanding a pressure of twice the maximum filling pressure of the compressed air cylinder. Test in accordance with 7.1 and 7.3.

6.5.3 All medium pressure parts downstream of the pressure reducer shall be capable of withstanding twice their maximum attainable working pressure without damage. Test in accordance with 7.1 and 7.3.

6.6 Equilibrium pressure in the facepiece

Equilibrium pressure in the facepiece, when not breathing, shall not be greater than 500 Pa. No special measuring devices or measuring methods are required; commonly used methods and devices shall be applied.

6.7 Warning device

The warning device must perform within the temperature and humidity range when tested in accordance with 7.6.

6.8 Pressure indicator and tube

The pressure indicator and tube shall have accuracy class 1.6 as defined in Clause 6 of EN 837-1:1996.

6.9 Resistance to temperature and flammability

6.9.1 Temperature performance

6.9.1.1 General

The apparatus shall operate trouble-free over the temperature range of −30 °C to 60 °C.

Apparatus specifically designed for temperatures beyond these limits shall be tested and the temperature(s) shall be marked on the apparatus. Apparatus shall meet the breathing resistance requirements given in 6.9.1.2 and 6.9.1.3 at the extremes of the temperature range given in 7.7.1.1 and 7.7.1.2, respectively.

6.9.1.2 Breathing resistance at low temperatures

A positive pressure shall be maintained in the cavity of the mask adjacent to the face seal. The exhalation resistance shall not exceed 1 kPa. Testing shall be done in accordance with 7.7.1.1.

6.9.1.3 Breathing resistance at high temperatures

A positive pressure shall be maintained in the cavity of the mask adjacent to the face seal. The exhalation resistance shall not exceed 1 kPa. Testing shall be done in accordance with 7.7.1.2.

6.9.2 Flammability

6.9.2.1 Components

The material of the straps and buckles shall not burn or continue to burn for more than 5 s after removal from the flame. Testing shall be done in accordance with 7.7.2. The breathing hose(s) leading to the full face mask, medium pressure tube(s) and lung governed demand valve shall prove to be “self-extinguishing”, i.e. the material shall not be of a highly flammable nature and the parts shall not continue to burn for more than 5 s after removal from the flame. The components shall remain leak tight, fulfil the breathing resistance requirements and the air supply shall not be interrupted after the test although they may be deformed. Testing shall be done in accordance with 7.4.

6.9.2.2 Flame engulfment

No afterflame shall continue for more than 5 s. Additionally, no component that secures the apparatus to the user’s body or that secures the pressure vessel to the apparatus shall separate or be displaced to such an extent that would cause the breathing apparatus to become detached from the wearer’s body or to fail the breathing resistance requirements of 6.3 and 6.4. Testing shall be done in accordance with 7.7.1.3.

6.9.3 Resistance to radiant heat

The breathing hose(s) leading to the full face mask, medium pressure tube(s) and lung governed demand valve shall be tested for resistance to radiant heat.

The components are considered to be resistant to radiant heat if they remain leak tight, fulfil the breathing resistance requirements of 6.3 and 6.4 and if the air supply is not interrupted after a test period of 20 min although they may be deformed. Testing shall be done in accordance with 8.6 of EN 136:1998.

7 Testing

7.1 General

If no special measuring devices or measuring methods are specified, commonly used methods and devices should be applied. Before performing tests involving human subjects, account should be taken of any national regulations concerning the medical history, examination, or supervision of the test subjects. Apparatus shall be tested as complete apparatus including the full face mask as supplied by the applicant. If not otherwise specified, two apparatus shall be tested.

7.2 Nominal values and tolerances

Unless otherwise specified, the values stated in this part of ISO 23269 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 ±5 %. Unless otherwise specified the ambient temperature for testing shall be from 16 °C to 32 °C and the temperature limits shall be subject to an accuracy of ±1 °C.

7.3 Visual inspection

The visual inspection shall be made by the test house prior to laboratory or practical performance tests. This may entail a certain amount of dismantling in accordance with the manufacturer's instructions for maintenance. The visual inspection shall include the assessment of the device marking and information supplied by the manufacturer and any safety data sheets (if applicable) or declarations relevant to the materials used in its construction.

7.4 System leakage

With the facepiece seal completely sealed using a dummy head or similar, and with a fully charged air cylinder fitted, open the cylinder valve. When the breathing apparatus is completely pressurized, close the cylinder valve and measure the pressure drop.

7.5 Breathing resistance

7.5.1 Inhalation resistance

With the breathing apparatus connected to a breathing machine as specified in Annex A, the inhalation peak pressure in the cavity of the mask shall be measured with the breathing machine set to sinusoidal flows of 25 cycle/min × 2,0 l/stroke and 40 cycle/min × 2,5 l/stroke.

7.5.2 Exhalation resistance

With the breathing apparatus connected to the breathing machine as specified in Annex A, the exhalation peak pressure shall be measured with the breathing machine set to sinusoidal flows of 25 cycle/min × 2,0 l/stroke and 40 cycle/min × 2,5 l/stroke.

7.6 Warning device

The performance of the warning device is measured during a breathing machine test at 25 cycles/min × 2 l/stroke. To test the warning device at temperatures between 0 °C and 10 °C, air shall be passed through the apparatus in a climatic test chamber using a breathing machine (adjusted to 25 cycles/min × 2 l/stroke) outside the climatic chamber at room temperature.

The environment during the test of the apparatus shall have a temperature of (3 ± 1) °C and a relative humidity of >90 %. Every 5 min water shall be sprayed on for 3 s using a spray gun directed at the warning device from a distance of 200 mm.

7.7 Resistance to temperature and flammability

7.7.1 Laboratory tests with a breathing machine

7.7.1.1 Tests at low temperature

The apparatus including the cylinder(s) and full face mask shall be cooled in an ambient temperature of (−30 ± 3) °C for (4 ± 1) h. In the case of wrapped composite pressure vessels the time shall be at least 12 h. Subsequently, the apparatus shall be connected to a breathing machine placed outside the cooling system and shall be tested in accordance with EN 13274-3, method 2, setting E. The breathing machine shall then be operated until the compressed air supply is exhausted (20 bar). The test shall be repeated with the same cooled apparatus after having replaced the empty pressure vessel(s) by a fully charged pressure vessel(s) previously stored at room temperature.

7.7.1.2 Tests at high temperature

The apparatus including cylinder(s) (filling pressure: 100 bar) and a full face mask is stored in a chamber at a temperature of (60 ± 3) °C and a relative humidity of not more than 50 % for (4 ± 1) h. In the case of wrapped composite pressure vessels the time shall be at least 12 h.

The apparatus shall be tested in accordance with EN 13274-3, method 2, setting H until the compressed air supply is exhausted (20 bar).

7.7.1.3 Flame engulfment

7.7.1.3.1 General

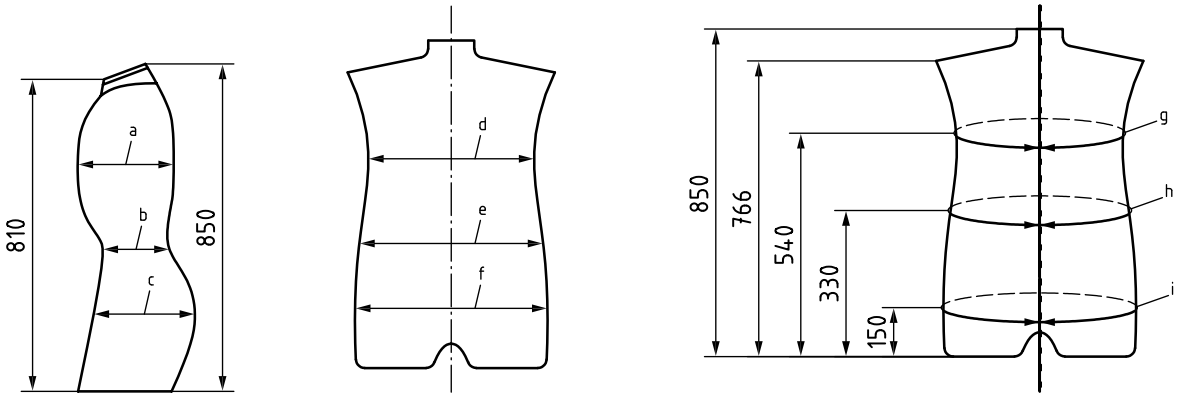
The apparatus, mounted on a manikin, is preheated in an oven then engulfed in flame and subsequently subjected to a drop test. During the whole test, the apparatus is connected to a machine which simulates breathing. Details of the related test equipment, the burner and the manikin are given in Figures 1, 2 and 3. The manikin shall wear a firefighter's jacket according to EN 469 during the testing. The complete protective covering shall be discarded and shall not be used after three flame exposures of the flame and heat test. During this test, no helmet shall be fitted to the manikin's head. One apparatus shall be tested.

7.7.1.3.2 Procedure

The complete apparatus shall be mounted on the test manikin to simulate the normal wearing position. The breathing machine shall be set to operate at a rate of 25 cycles/min and 2 l/stroke. The apparatus mounted on the test manikin shall be placed in the oven which has been preheated to (90 ± 5) °C. After the oven door is closed and the temperature recovers to (90 ± 5) °C, the test exposure time of (15 ± 1) min shall begin. The test oven recovery time shall not exceed 1 min. At the completion of the (15 ± 1) min exposure, the apparatus mounted on the test manikin shall be moved out of the oven and into the centre of the burner array. The complete apparatus shall then be exposed to direct flame contact for 10 s. The flame temperature at a distance of 250 mm from the burner tip shall be (950 ± 50) °C. The exposure shall begin at (30 ± 5) s after removal of the apparatus from the test oven. The apparatus shall be observed for any afterflame and the afterflame duration shall be recorded to determine pass or fail as specified in 6.9.2.2. (20 ± 5) s after completing the direct flame exposure, the test manikin with the apparatus mounted on the manikin shall be raised to (150 ± 5) mm

and dropped freely. The apparatus shall then be observed to determine pass/fail as specified in 6.9.2.2. The breathing resistance during the entire test shall be recorded. Any pressure spike exceeding the limits specified in 6.3 and 6.4 caused by the impact of the drop test and measured within three cycles of the breathing machine after the apparatus is dropped shall be disregarded.

Dimensions in millimetres



Key

a Horizontal chest depth: 260 mm.
b Horizontal depth of waist: 250 mm.
c Horizontal depth of buttocks: 260 mm.
d Horizontal breadth of chest: 380 mm.
e Horizontal breadth of waist: 330 mm.
f Horizontal breadth of hips: 400 mm.
g Horizontal circumference of chest: 1 030 mm.
h Horizontal circumference of waist: 960 mm.
i Horizontal circumference of hips: 1 100 mm.

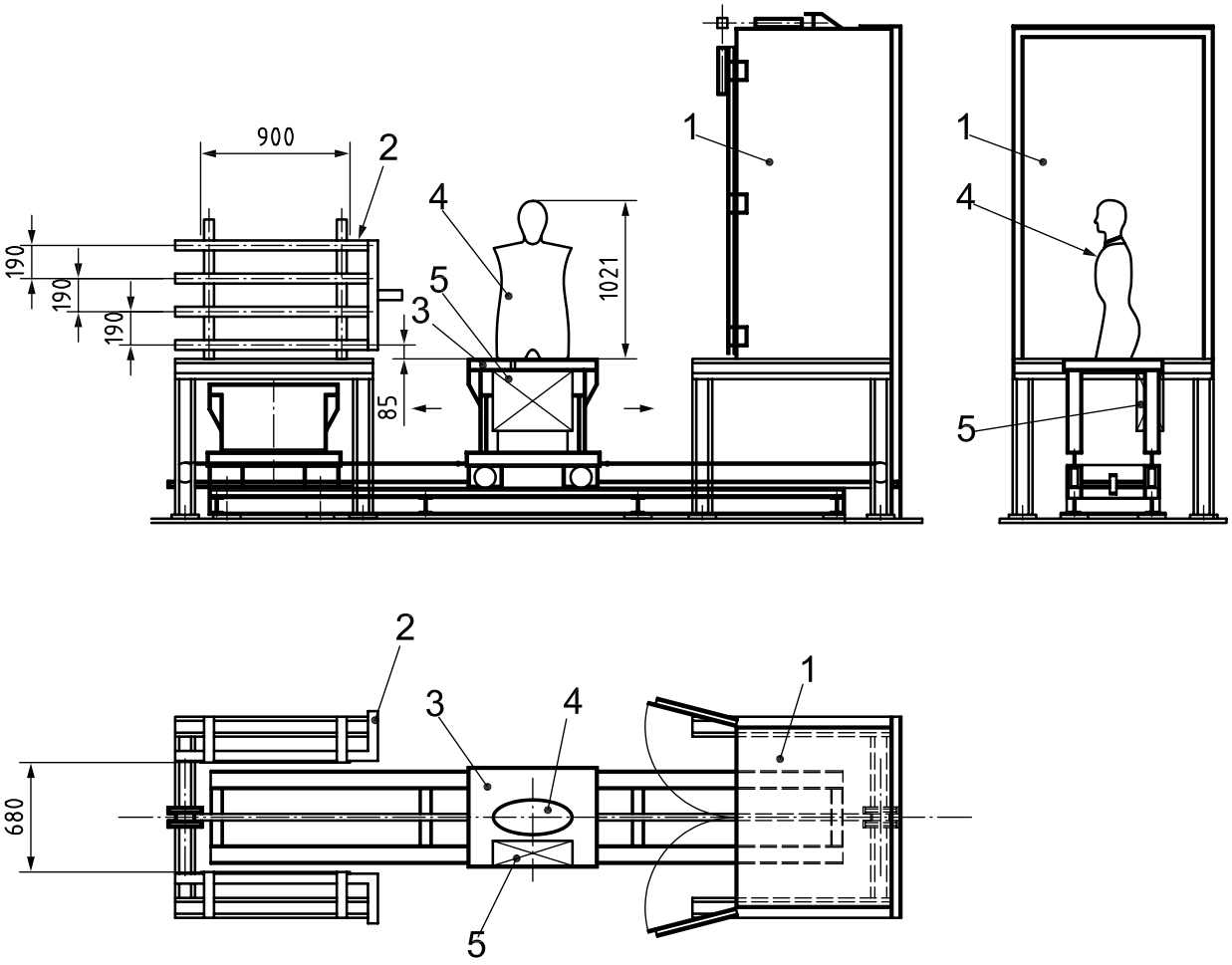
Figure 1 — Details of manikin

7.7.1.3.3 Test rig

7.7.1.3.3.1 General

The general design of the test rig is free of requirements but the following recommendations ensure homogeneous results. See Figure 2.

Dimensions in millimetres



Key

1 preheating oven
2 burners
3 transport trolley with drop device
4 manikin
5 breathing machine

Figure 2 — General design of a flame engulfment test rig

7.7.1.3.3.2 Preheating oven

The preheating oven shall be designed to receive the manikin equipped with the device and to maintain a homogeneous temperature around it. This can be achieved by circulating air heating. The power has to be determined such that the reheating time does not exceed 1 min to be in the range of the requirement.

7.7.1.3.3.3 Burners

The flame engulfment is achieved by means of a two burner array at the front and the back of the manikin. Each burner array is made by four rows of linear burners spaced 190 mm apart from one another. The length of each burner is 900 mm. Details of the burner are given in Figure 3.

Dimensions in millimetres

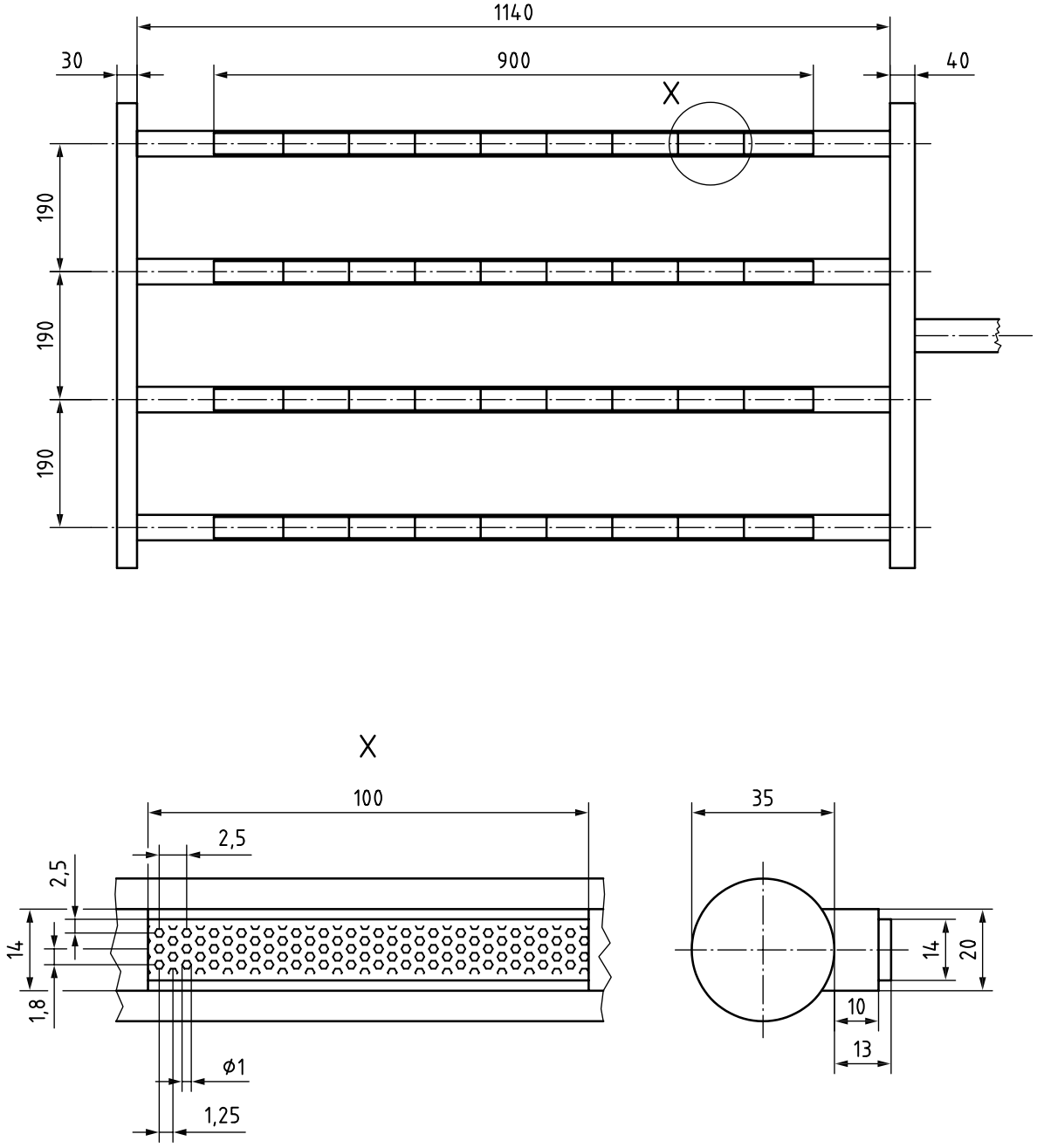


Figure 3 — Details of the burner arrangement

7.7.1.3.3.4 Gas mixture

Each burner array is supplied with a gas mixture of at least 99,5 % by volume of propane in ambient air injected at a pressure of 1,5 bar through a jet size of 4,5 mm and additionally mixed with compressed air at 5 bar through a jet size of 6 mm. Gas mixture and compressed air shall be set in dynamic conditions.

7.7.1.3.3.5 Flame conditions

All the burners in both arrays shall be ignited simultaneously and stopped simultaneously.

7.7.1.3.3.6 Transport trolley and drop device

A trolley shall be used to move, manually or automatically, the sample in test from the oven to the engulfment part and then, following the flame engulfment test, to raise and to drop the device in test.

7.7.2 Flammability

The material of the straps and of the buckles shall be tested in accordance with EN 13274-4, method 2. The breathing hose(s), medium pressure tube(s) and the lung governed demand valve shall be tested in accordance with EN 13274-4, method 1.

7.7.3 Practical performance test

7.7.3.1 General

Two test subjects, who conducted the donning test, shall don the apparatus as supplied by the manufacturer and make two return trips of the course shown in Annex B at a normal speed and confirm that

a) wearers can perform without difficulty each of the movements specified in the course,

b) wearers do not experience abrasion, cuts, pain, pressure, etc. during the test,

c) wearers do not experience breathing difficulty during the test,

d) the visor does not fog up or move such as to disturb the vision during the test,

e) the self-contained breathing apparatus is not damaged in any way which would affect its operation.

7.7.3.2 Test at low temperature

7.7.3.2.1 Preparation of apparatus to be tested

Two sets of apparatus, as ready for use, shall be cooled at a temperature of (–30 ± 3) °C for a period of (4 ± 1) h.

7.7.3.2.2 Test procedure

Two warmly clothed subjects shall don the cooled apparatus in a cold chamber and perform work at an ambient temperature of (–15 ± 3) °C. The test shall be continuous without removal of the apparatus over a period of 30 min or at least until the warning device starts to operate.

The test shall be conducted according to activity 17 of EN 13274-2 with the exception that the apparatus shall be donned in the cold chamber at an ambient temperature of (–15 ± 3) °C.

At the end of the test, the resistance to breathing shall be measured at room temperature according to EN 13274-3, method 2, settings E and H to determine whether there is any obstruction and the apparatus shall be examined for malfunction due to the low temperature.

7.7.3.3 Test at low temperature after storage at room temperature

7.7.3.3.1 Preparation of apparatus to be tested

Two sets of apparatus, as ready for use, shall be stored at room temperature (from 16 °C to 32 °C) for a period of (4 ± 1) h.

7.7.3.3.2 Test procedure

Two warmly clothed subjects shall don the apparatus at room temperature (from 16 °C to 32 °C) and enter a cold chamber (–6 ± 2) °C. The same test programme as that described in 7.7.3.2.2 shall be carried out for a period of 30 min or at least until the warning device starts to operate.

8 Instructions for use

Each apparatus shall be provided with instructions addressing donning, doffing, operation and maintenance of the apparatus. The instructions shall be in the language or languages required by the competent authority. The instructions shall be provided in a suitable format to include in the ship's training manual.

9 Marking

Each apparatus shall be marked with

e) the model name of the apparatus,

f) the abbreviation "SCBA", or the words "Self-contained breathing apparatus" in the appropriate language or languages,

g) year and month of manufacture,

h) serial number,

i) manufacturer or trade mark,

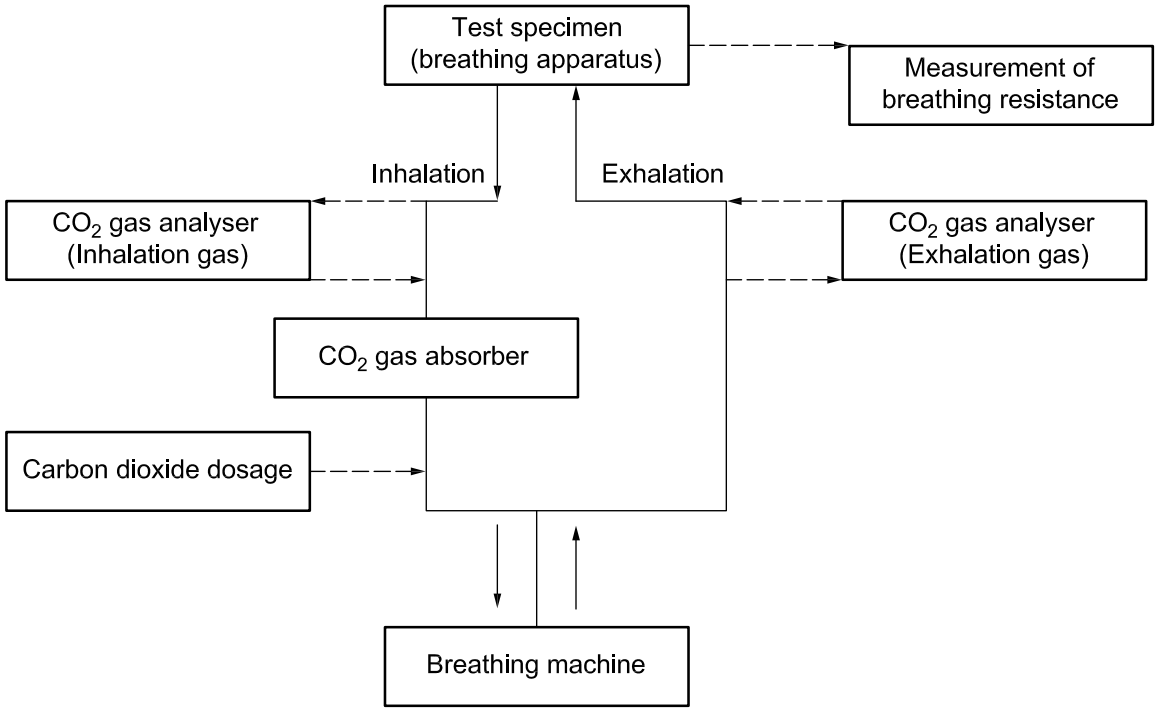
j) ISO 23269-2:[date],

k) expiration date of approval (if any),

l) next date of servicing/retest (if any).

Annex A
(normative)

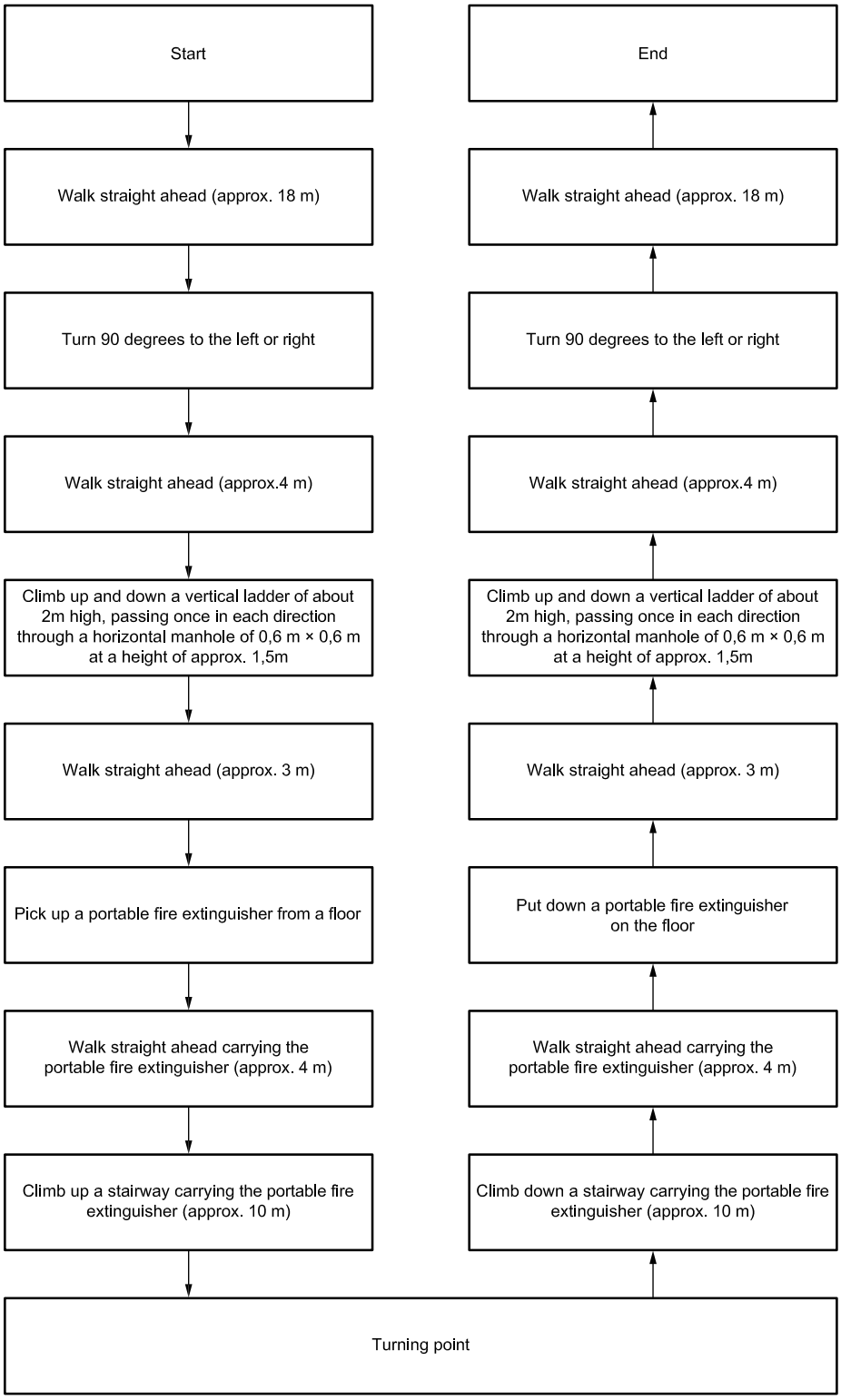
Breathing machine schematic diagram example



NOTE For details of the machine, reference should be made to EN 136-1998, ISO 23269-1, or suitable recognized national standards.

Annex B
(normative)

Standard procedure of the practical performance test



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1) To be published.

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