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Ships and marine technology — Gas inflation systems for inflatable life-saving appliances

Navires et technologie maritime — Systèmes de gonflage au gaz pour dispositifs de sauvetage

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15738 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 1, *Lifesaving and fire protection*.

It is intended to supplement International Maritime Organization (IMO) requirements for inflatable lifesaving appliances.

Ships and marine technology — Gas inflation systems for inflatable life-saving appliances

1 Scope

This International Standard specifies performance and testing requirements for the gas inflation systems for inflatable life-saving appliances complying with the requirements of the 1974 Safety of Life at Sea Convention (SOLAS 74), as amended, and the IMO International Life-Saving Appliance Code (LSA Code), adopted by IMO Resolution MSC.48(66).

For the purposes of this International Standard, the gas inflation system consists of inflation gas, cylinder valve, cylinder operating head, high-pressure hoses, and pressure-relief, inflate/deflate, non-return and transfer valves. This International Standard addresses only systems in which compressed inflation gas in cylinders is used as the inflation medium.

Because national requirements for qualification, use, and testing of gas-cylinders vary widely, requirements for gas-cylinders are not addressed in this International Standard, but should meet the requirements of the applicable regulatory bodies. The systems addressed in this International Standard are of the type generally used in primary life-saving appliances such as survival craft, marine evacuation systems, and means of rescue; systems used in personal life-saving appliances, such as inflatable lifejackets, are addressed elsewhere.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974), as amended in 1996

International Life-Saving Appliance Code (LSA Code), adopted by IMO Resolution MSC.48(66)

IMO Resolution A.689(17) (as amended), *Recommendation on Testing and Evaluation of Life-Saving Appliances*

3 Term and definition

For the purposes of this International Standard, the following term and definition applies.

3.1

approved cylinder

cylinder which has been approved by a competent authority as complying with an appropriate recognized national or international standard

4 Inflation gas

4.1 Type and quantity

The gas used for inflation shall be non-toxic, for example carbon dioxide. The type and quantity shall provide a sufficient rate of inflation to allow the complete system to meet the specified inflation performance requirements for the equipment in which it is installed.

4.2 Dryness

If the gas used is carbon dioxide, its moisture content shall be no more than 150 parts water per 1 million parts of gas by mass.

5 Gas-cylinder valve

5.1 General

5.1.1 The cylinder valve shall be fitted with a safety relief device which will vent gas prior to damage to the cylinder from overpressurization.

5.1.2 Means shall be provided to protect the threads on the cylinder valve for attachment of the high-pressure hoses and operating head from damage during storage and transit.

5.1.3 A cylinder valve constructed from aluminium alloy shall be anodized and may only be used with an aluminium cylinder, unless it is galvanically isolated from the cylinder.

5.1.4 Each combination of cylinder valve and cylinder which are of differing materials, or any aluminium alloy cylinder valve used with an aluminium cylinder, shall be subjected to the salt water exposure test as described in 5.2.9.

5.1.5 If the cylinder valve is for use with carbon dioxide, a syphon tube shall be used. It shall be ensured that, in all operational positions of the cylinder, the syphon tube's open end remains submerged in the liquid gas.

5.2 Testing

5.2.1 Safety relief test

It shall be demonstrated that the safety relief device on the gas-cylinder valve, when fitted to an approved cylinder in accordance with the instructions of the cylinder valve manufacturer, will operate at a pressure not greater than the highest cylinder test pressure for which it is rated.

5.2.2 Proof-load test

The bodies of six cylinder valves shall be subjected to an internal hydraulic pressure of the greater of 28 MPa, or the highest cylinder test pressure for which the valve is rated, for a period of 60 s.

On completion, there shall not be any signs of leakage or damage.

5.2.3 Temperature cycling test

5.2.3.1 Test procedure

Two gas-cylinder valves fitted to approved cylinders, with a gas capacity of not less than 5 litres, shall be charged with CO_2/N_2 gas in the ratio 96 %/4 % by mass, weighed and then alternately subjected to surrounding temperatures of − 30 °C and + 65 °C. These alternating exposures need not follow immediately after each other and the following procedure is acceptable.

Complete an 8 h half-cycle exposure at + 65 °C in one day.

Remove specimens from the hot chamber and leave them exposed to ordinary room temperature until the following day.

Complete an 8 h half-cycle exposure at − 30 °C the next day.

Remove specimens from the cold chamber and leave them exposed to ordinary room temperature until the following day.

Repeat the above procedure a further nine times.

5.2.3.2 Acceptance criterion

On completion, the cylinders shall be allowed to return to room temperature before being reweighed. The loss of mass, if any, shall not be greater than 2 % of the original mass of the gas.

5.2.4 Cold inflation test

Gas-cylinder valves fitted to two approved cylinders, with a gas capacity of not less than 5 litres, one charged with 3,17 kg of CO_2 and the other charged with 3,17 kg of CO_2/N_2 in the ratio 96 %/4 % by mass, shall be placed in a cold chamber at a temperature of − 30 °C for 3 h.

On completion, the gas shall be capable of being completely and continuously discharged through a nozzle containing four holes of diameter 3,3 mm within the following times:

— CO_2: 20 s;
— CO_2/N_2: 14 s.

NOTE The cylinder may be rotated during the test to demonstrate the efficacy of the syphon in various operational positions.

5.2.5 Fatigue test

Two valve bodies shall be hydraulically pressure-cycled internally in a laboratory from 0 MPa to 20 MPa for 33 000 cycles.

On completion, the two valve bodies shall be subjected to a hydraulic pressure of the greater of 28 MPa, or the highest cylinder test pressure for which the valve is rated, for a period of 60 s. There shall be no damage to the valve bodies as a result of this test.

5.2.6 Long-term leak test

Cylinder valves shall be fitted to two approved cylinders, with a gas capacity of not less than 5 litres, charged with not less than 3,17 kg of CO_2/N_2 gas in the ratio 96 %/4 % by mass.

The two units shall be weighed carefully and then stowed in a secure stowage place for a period of 18 months at an ambient temperature of 18 °C to 20 °C.

On completion of the 18 month period, the two units shall be reweighed and the loss of gas charge on each cylinder shall not exceed 2 % of the original mass of the gas.

5.2.7 Impact test

One of the gas-cylinders and valves used in the long-term leak test, after being fully discharged of gas, shall be dropped 9 times from a height of 300 mm at an angle of 45° onto a concrete floor covered with hardboard so that the valve receives the full force of the impact.

The test shall be repeated with the cylinder angled in a plane at 90° to the original test.

On completion of the above tests, the cylinder shall be stood vertically on its base, and pushed over so that, as it falls, the cylinder valve strikes a steel stop secured to the floor. The height of the steel stop shall be not less than half the diameter of the cylinder used for the test. The test shall be repeated 12 times.

On completion, the valve shall be carefully examined, if necessary using a flaw detector. There shall not be any signs of flaw or fracture other than superficial surface damage.

An approved gas-cylinder, with a mass of at least 8,165 kg, fitted with the cylinder valve shall be dropped three times from a height of 1,5 m onto an aluminium sheet so that the valve takes the full force of the impact at an angle of 60° to the sheet.

The aluminium sheet shall be removed and the test repeated with a single drop onto a concrete floor.

On completion, the valve shall be removed from the cylinder and carefully examined. There shall not be any signs of flaw or fracture other than superficial surface damage.

5.2.8 Torque test

An approved CO_2 gas-cylinder shall be valved and devalved in accordance with the instructions of the valve manufacturer. Repeat for a total of six cycles.

On completion, carefully examine the valve threads. There shall not be any signs of stripping or damage.

5.2.9 Salt water exposure test

This test is applicable to combinations of cylinder valve and approved cylinder which are of differing materials, or any aluminium-alloy cylinder valve used with an approved aluminium cylinder.

The complete assembly shall be assembled in accordance with the instructions of the cylinder valve manufacturer, and partially immersed in a 3 % sodium chloride solution for a period of 18 months, or alternatively be exposed to a salt water spray (5 % sodium chloride solution) at a temperature of 35 °C ± 3 °C for 160 h without interruption.

On completion of either of these tests, the mass of the gas charge shall not have been reduced by more than 2 %, and both the valve and operating head shall function in a satisfactory manner.

NOTE This test may be performed simultaneously with the test specified in 6.2.4.

6 Gas-cylinder operating head

6.1 General

The connection between the operating head and the painter or operating cable shall be so arranged that the load is wholly taken by the operating mechanism until the valve has operated. For an operating head intended for use in an inflatable survival craft, means shall be provided so that, when the valve has been opened, the load on the painter is transferred to the towing patch or bridle of the survival craft.

The operating head of an approved cylinder, with a gas capacity of not less than 5 litres, charged with 3,17 kg of CO_2, shall fully open with an actuating force not exceeding 150 N and a travel of not more than 200 mm at an ambient temperature of 18 °C to 20 °C.

The operating head shall be made from corrosion-resistant materials.

An operating head constructed from aluminium alloy shall be anodized and shall comply with 5.1.4.

Means shall be provided, as necessary, to prevent kinking of the cable and abrasive damage to the fabric of an inflatable survival craft.

The operating head shall be sealed against the ingress of water.

The operating head shall be of a design that prevents any chafing of the fabric of an inflatable survival craft.

6.2 Testing

6.2.1 Hot actuation-force test

Two operating heads fitted to approved cylinders, with a gas capacity of not less than 5 litres, charged with 3,17 kg of CO_2, shall be placed in a hot chamber at a temperature of + 65 °C for a period of 2 h. On removal from the hot chamber, the force required to activate the heads shall be measured.

The force shall not be greater than 150 N.

6.2.2 Cold actuation-force test

Two operating heads fitted to approved cylinders, with a gas capacity of not less than 5 litres, charged with 3,17 kg of CO_2, shall be placed in a cold chamber at a temperature of − 30 °C for a period of 2 h. On removal from the chamber, the force required to activate the heads shall be measured.

The force shall not be greater than 150 N.

6.2.3 Ambient actuation-force test

Two operating heads fitted to approved cylinders, with a gas capacity of not less than 5 litres, charged with 3,17 kg of CO_2, shall be placed at a temperature of 20 °C ± 3 °C for a period of 2 h. After this period, the force required to activate the heads shall be measured.

The force shall not be greater than 150 N.

6.2.4 Salt water exposure test

Two operating head assemblies, each fitted to an approved type of cylinder valve and cylinder, shall be partially submerged for a period of 18 months in a 3 % salt water solution at an ambient temperature of 18 °C to 20 °C, or alternatively be exposed to a salt water spray (5 % sodium chloride solution) at a temperature of 35 °C ± 3 °C for 160 h without interruption. On completion of either of these tests, the heads shall be carefully examined, then the operating mechanism shall be activated.

There shall not be any signs of excessive pitting or corrosion, and the operating heads shall continue to function in a satisfactory manner.