INTERNATIONAL STANDARD

ISO 24408

First edition
2005-11-15

Ships and marine technology — Position-indicating lights for life-saving appliances — Testing, inspection and marking of production units

Navires et technologie maritime — Feux de localisation pour engins de sauvetage — Essais, inspection et marquage des unités produites

Reference number
ISO 24408:2005(E)

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Published in Switzerland

Contents

Page

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 24408 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 1, *Lifesaving and fire protection*.

Introduction

This International Standard is intended for use in conjunction with the International Maritime Organization (IMO) Life-Saving Appliances (LSA) Code, and related IMO instruments, to assess the conformity of the production of various types of approved position-indicating lights with the relevant IMO requirements.

Some of the provisions of this International Standard exceed the IMO requirements, in that the IMO *Recommendation on Testing of Life-Saving Appliances* [Resolution A.689(17), as amended through Res. MSC.81(70)], does not provide any specific requirements for testing and inspection of production units. However, Part 2 of that document does require manufacturers to institute a quality control procedure to ensure that life-saving appliances are produced to the same standard as the prototype approved by the maritime safety administration, and to keep records of any production tests carried out.

This International Standard specifies procedures that meet the above requirements; thus by following these, manufacturers will be able to demonstrate compliance with the IMO recommendation.

Ships and marine technology — Position-indicating lights for life-saving appliances — Testing, inspection and marking of production units

1 Scope

This International Standard specifies production tests and inspections, and marking requirements for position-indicating lights used in conjunction with various items of life-saving equipment, including survival craft interior lights. Specifically, it applies to position-indicating lights which have been type approved by or on behalf of a national maritime safety administration, to the requirements of the International Maritime Organization LSA Code, for use in ships subject to the requirements of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (as amended). The basic principles may also be considered suitable for position-indicating lights manufactured to other than the IMO requirements.

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.

IMO Res. A.689(17), as amended through IMO Res. MSC.81(70), *Revised Recommendation on Testing of Life-Saving Appliances*, International Maritime Organization

3 Terms and definitions

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

3.1

lot

unit of production that, as far as practicable, consists of production units of a single type, class, size and composition, manufactured under the same conditions, and at substantially the same time

3.2

ambient temperature

temperature of 20 °C ± 5 °C

3.3

fresh water

water with a conductivity not greater than 1 800 μS

3.4

seawater

artificial seawater made up to a dilution of 3,5 % by volume of dissolved sodium chloride and fresh water

4 General

4.1 Manufacturing standards

4.1.1 Manufacturers shall have in place a manufacturing quality control system sufficient to ensure that series production units are manufactured according to substantially the same production methods, from the same materials and according to the same quality standards as the prototypes tested for approval by or on behalf of a national maritime safety administration.

NOTE 1 Clause 4 is not intended to inhibit refinements of manufacturing processes, which do not adversely affect the end product.

NOTE 2 Compliance with a quality management system such as ISO 9001:2000 is recommended.

4.1.2 Recommended production testing and inspection procedures constituting an effective manufacturing quality control system are contained in Annex A.

4.1.3 The maximum number of production units in a production lot shall be 1 000 units or one week's production, whichever is less. In the case that the manufacturing process/system is in accordance with ISO 9001:2000, the maximum production lot quantity may be raised to 5 000 units or one week's production, whichever is less.

4.2 Visual appearance and craftsmanship

Position-indicating lights used as life-saving appliances shall be free from imperfections of manufacture that affect their appearance, or that may affect their serviceability.

4.3 Marking

4.3.1 General

Each production unit shall be clearly and indelibly marked by the manufacturer with the following information:

a) type or model identification, including intended use;

b) identification and relevant approval mark of approving administration(s), and any operational restrictions;

c) date of manufacture;

d) date of expiry;

e) manufacturer's name or trademark;

f) lot number, or other means of identifying the production lot from which the unit was taken;

g) clear operating instructions in word or diagram form;

h) if the power source is a lithium battery, the words 'LITHIUM BATTERY' in block capitals, followed by

DO NOT INCINERATE / DO NOT RECHARGE / DO NOT TAMPER

NOTE Lights containing lithium or other batteries that have not undergone special testing for designation as "Non-Hazardous" may require additional special markings for transportation.

4.3.2 Marking of date of expiry

4.3.2.1 The date of expiry marked on the product shall be based on the service life demonstrated or documented by the manufacturer to obtain approval, and shall not exceed the date of expiry of the battery installed in it. In the case of a light with a replaceable battery, the battery shall be marked with a date of expiry, and the unit markings shall include space for a user to mark the date of expiry of the battery when installed.

4.3.2.2 The date of expiry of a battery used in a position-indicating light shall not exceed 50 % of the service life of the battery. The service life of the battery shall be as established by the battery manufacturer, taking the following losses into account at ambient temperature:

a) testing, as recommended by the manufacturer or as required by the regulatory authority, whichever is the more stringent;

b) self-discharge of the battery pack;

c) standby loads, if any.

4.4 Documentation

The manufacturer shall maintain complete product documentation, including as a minimum all prototype and production test reports and production drawings, for a minimum of ten years after each lot production.

5 Performance

5.1 General

Representative samples of production position-indicating lights and/or their components shall comply with the requirements of Clause 5 when tested according to the specified test procedures in Clause 6. Annex A contains guidelines for size and selection of samples.

5.2 Lifejacket lights

5.2.1 Watertightness integrity

When tested in accordance with 6.1.1, each unit shall remain watertight after being submerged under 300 mm of fresh water for 24 h.

5.2.2 Switch operation or pull-off force

When tested in accordance with 6.1.2, the force required to move a manual switch to the ON and OFF positions — or in the case of seawater cell batteries, the pull-off force required to remove the buttons from the case — shall be within the tolerances established by the manufacturer.

5.2.3 Operational life

5.2.3.1 When tested in accordance with 6.1.3 in each of seawater at −1 °C, seawater at +30 °C, and fresh water at ambient temperature, all units shall illuminate within 2 min and reach the minimum required voltage within 5 min, and the lights shall continue to produce sufficient voltage to produce a luminous intensity of greater than 0,75 cd in all directions of the upper hemisphere for 8 h.

5.2.3.2 The testing in fresh water at ambient temperature need not be carried out for dry-activated power sources where the contacts do not come into contact with water.

5.2.3.3 In the case of seawater cell devices, the ambient fresh water samples may be allowed 10 min to attain full voltage.

5.2.3.4 If the light is a flashing light, the flash rate shall be between 50 and 70 flashes per minute during the entire test period.

5.2.4 Luminous intensity

When tested in accordance with 6.1.4, the luminous intensity of the unit displaying the lowest voltage during the operational life test shall be a minimum of 0,75 cd in all directions of the upper hemisphere.

5.3 Survival craft lights

5.3.1 Watertightness integrity

When tested in accordance with 6.2.1, each unit shall remain watertight after being submerged under 300 mm of fresh water for 24 h.

5.3.2 Switch operation or pull-off force

When tested in accordance with 6.2.2, the force required to move a manual switch to the ON and OFF positions — or in the case of seawater cell batteries, the pull-off force required to remove the buttons from the case — shall be within the tolerances established by the manufacturer.

5.3.3 Operational life

5.3.3.1 When tested in accordance with 6.2.3 at air temperatures of −30 °C, +65 °C, and ambient temperature, all units shall illuminate within 2 min and reach the minimum required voltage within 5 min, and the lights shall continue to produce sufficient voltage to produce a luminous intensity of greater than 4,3 cd in all directions of the upper hemisphere for 12 h.

5.3.3.2 In the case of seawater cell devices, the cells shall be immersed in each of seawater at −1 °C, seawater at +30 °C, and fresh water at ambient temperature during the test. The ambient fresh water samples may be allowed 10 min to attain full voltage.

5.3.3.3 If the light is a flashing light, the flash rate shall be between 50 and 70 flashes per minute during the entire test period.

5.3.4 Luminous intensity

For exterior lights, when tested in accordance with 6.2.4, the luminous intensity of the unit displaying the lowest voltage during the operational life test shall be a minimum of 4,3 cd in all directions of the upper hemisphere. For interior lights, when tested in accordance with 6.2.5, the average luminous intensity measured in all directions of the upper hemisphere of the lamp shall be at least 0,5 cd throughout the required operating period.

5.4 Lifebuoy self-igniting lights

5.4.1 Watertightness integrity

When tested in accordance with 6.3.1, each unit shall remain watertight after being submerged under 300 mm of fresh water for 24 h.

5.4.2 Switch operation or pull-off force

When tested in accordance with 6.3.2, the force required to activate the light switch — or in the case of seawater cell batteries, the pull-off force required to remove the buttons from the case — shall be within the tolerances established by the manufacturer at the time of prototype testing.

5.4.3 Operational life

5.4.3.1 When tested in accordance with 6.3.3 in each of seawater at −1°C and seawater at +30°C, all units shall illuminate within 2 min and reach the minimum required voltage within 5 min, and the lights shall continue to produce sufficient voltage to produce a luminous intensity of greater than 2,0 cd in all directions of the upper hemisphere for 2 h.

5.4.3.2 In the case of seawater cell devices, the ambient fresh water samples may be allowed 10 min to attain full voltage.

5.4.3.3 If the light is a flashing light, the flash rate shall be between 50 and 70 flashes per minute during the entire test period.

5.4.4 Luminous intensity

When tested in accordance with 6.3.4, the luminous intensity of the unit displaying the lowest voltage during the operational life test shall be a minimum of 2,0 cd in all directions of the upper hemisphere.

6 Test procedures

6.1 Lifejacket lights

6.1.1 Watertightness integrity test

6.1.1.1 Each unit shall be immersed under 300 mm of fresh water at ambient temperature for a period of 24 h. After immersion, switch on the units and check for correct operation. The units shall then be subjected to the operational life test in 6.1.3.

An alternative method of testing for leakage may be employed if approved by the approving authority.

6.1.1.2 If the surveillance wires used in one-piece units for the operational life test impair the watertightness integrity, standard production units from the batch shall be used instead for the above test.

6.1.1.3 Automatically activated lights shall be prevented from switching on during this test.

6.1.2 Switch operation or pull-off force test

The force required to switch the unit on and off — or in the case of seawater cell batteries, the pull-off force required to remove the buttons from the case — shall be determined by applying a calibrated tension meter or a dead-weight GO and NOGO device, and recorded.

6.1.3 Operational life test

6.1.3.1 Divide the samples equally between the three temperature values specified in 5.2.3. Connect surveillance wires to the lamp leads (not the battery terminals) to allow the voltage to be monitored.

NOTE If the samples are of a one-piece construction, it may be necessary to connect the surveillance wires during the production of the samples.

6.1.3.2 Connect the surveillance wires to a calibrated voltage recording device. Start the recorder and switch on all units to be tested, with each unit immersed in the relevant water bath.

6.1.3.3 One of the units to be tested in fresh water shall first be dropped from a height of 2 m onto a rigidly mounted steel plate or concrete surface prior to immersing it in the water. If surveillance wires are attached, they shall be arranged so as not to significantly affect the impact of the unit.

6.1.3.4 The voltage of each sample under test shall be monitored between 5 min and 8 h. On completion of the 8-h test, all voltage traces from the recorders shall be examined, and the lamp and dome assembly from the unit displaying the lowest voltage during the test shall be used to complete the luminous intensity test in 6.1.4. The voltage traces shall be retained in accordance with 4.4.

6.1.3.5 Water leakage due to connection of surveillance wires shall not constitute a failure of the test. However, an additional sample shall then be tested.

6.1.3.6 If the light is a flashing light, the flash rate shall be measured and recorded, as a minimum, at the beginning and end of the test.

6.1.3.7 If the lowest recorded voltage occurs at the 5-min point (10 min for seawater cell units in fresh water), a new lamp of the same batch and build standard may be used to complete the luminous intensity test.

6.1.4 Luminous intensity test

6.1.4.1 The lamp and dome assembly from the lowest performing unit in the operational life test shall be mounted onto a calibrated photometer, and supplied with a calibrated voltage identical to that recorded in 6.1.3. The minimum luminous intensity over the upper hemisphere shall be measured and recorded. If the point of minimum luminous intensity is known for a given design, the luminous intensity need only be measured at that location.

6.1.4.2 Flashing lights shall be tested in accordance with 6.1.4.2.1 or 6.1.4.2.2.

6.1.4.2.1 For a flashing light which remains on at an intensity of greater than 0,75 cd for greater than 0,3 s during each duty cycle, the luminous intensity test shall be carried out in accordance with 6.1.4.1.

6.1.4.2.2 For a flashing light which does not remain on at an intensity of greater than 0,75 cd for at least 0,3 s, the luminous intensity test shall be carried out in accordance with 6.1.4.1, and the Blondel–Rey formula, as described in IMO Resolution A.689(17) [as amended through Res. MSC.81(70)], shall be applied to determine the effective luminous intensity.

6.2 Survival craft lights

6.2.1 Watertightness integrity test

6.2.1.1 Each unit shall be immersed under 300 mm of fresh water at ambient temperature for a period of 24 h. After immersion, switch on the units and check for correct operation. The units shall then be subjected to the operational life test in 6.2.3.

An alternative method of testing for leakage may be employed if approved by the approving authority.

6.2.1.2 If the surveillance wires used in one-piece units for the operational life test impair the watertightness integrity, standard production units from the batch shall be used instead for the above test.

6.2.1.3 Automatically activated lights shall be prevented from switching on during this test.

6.2.2 Switch operation or pull-off force test

The force required to switch the unit on and off — or in the case of seawater cell batteries, the pull-off force required to remove the buttons from the case — shall be determined by applying a calibrated tension meter or a dead-weight GO and NOGO device, and recorded.

6.2.3 Operational life test

6.2.3.1 Divide the samples equally between the air temperature values specified in 5.3.3. Connect surveillance wires to the lamp leads (not the battery terminals) to allow the voltage to be monitored.

NOTE If the samples are of a one-piece construction, it may be necessary to connect the surveillance wires during the production of the samples.

6.2.3.2 Connect the surveillance wires to a calibrated voltage recording device. Start the recorder and switch on all units to be tested, with each unit at the appropriate air temperature. In the case of seawater cell devices, the cells shall be immersed in water as specified in 5.3.3.2.

6.2.3.3 The voltage of each sample under test shall be monitored between 5 min and 12 h. On completion of the 12-hour test, all voltage traces from the recorders shall be examined, and the lamp and dome assembly from the unit displaying the lowest voltage during the test shall be used to complete the luminous intensity test in 6.2.4. The voltage traces shall be retained in accordance with 4.4.

6.2.3.4 If the light is a flashing light, the flash rate shall be measured and recorded, as a minimum, at the beginning and end of the test.

6.2.3.5 If the lowest recorded voltage occurs at the 5-min point (10 min for seawater cell units), a new lamp of the same batch and build standard may be used to complete the luminous intensity test.

6.2.4 Luminous intensity test (exterior lights)

6.2.4.1 The lamp and dome assembly from the lowest performing unit in the operational life test shall be mounted onto a calibrated photometer, and supplied with a calibrated voltage identical to that recorded in 6.2.3. The minimum luminous intensity over the upper hemisphere shall be measured and recorded. If the point of minimum luminous intensity is known for a given design, the luminous intensity need only be measured at that location.

6.2.4.2 Flashing lights shall be tested in accordance with 6.2.4.2.1 or 6.2.4.2.2.

6.2.4.2.1 For a flashing light which remains on at an intensity of greater than 4,3 cd for greater than 0,3 s during each duty cycle, the luminous intensity test shall be carried out in accordance with 6.2.4.1.

6.2.4.2.2 For a flashing light which does not remain on at an intensity of greater than 4,3 cd for at least 0,3 s, the luminous intensity test shall be carried out in accordance with 6.2.4.1, and the Blondel–Rey formula, as described in IMO Resolution A.689(17) [as amended through Res. MSC.81(70)], shall be applied to determine the effective luminous intensity.

6.2.5 Luminous intensity test (interior lights)

The lamp and dome assembly from the lowest performing unit in the operational life test shall be mounted onto a calibrated photometer, and supplied with a calibrated voltage identical to that recorded in 6.2.3. The mean luminous intensity over the upper hemisphere shall be measured and recorded.

6.3 Lifebuoy self-igniting lights

6.3.1 Watertightness integrity test

6.3.1.1 Each unit shall be immersed under 300 mm of fresh water at ambient temperature for a period of 24 h. The lights shall be prevented from switching on during this period. After immersion, switch on the units and check for correct operation. The units shall then be subjected to the operational life test in 6.3.3.

An alternative method of testing for leakage may be employed if approved by the approving authority.

6.3.1.2 If the surveillance wires used in one-piece units for the operational life test impair the watertightness integrity, standard production units from the batch shall be used instead for the above test.

6.3.2 Switch operation or pull-off force test

The force required to activate the light switch — or in the case of seawater cell batteries, the pull-off force required to remove the buttons from the case — shall be determined by applying a calibrated tension meter or a dead-weight GO and NOGO device, and recorded.

6.3.3 Performance test

6.3.3.1 Divide the samples equally between the temperature values specified in 5.4.3. Connect surveillance wires to the lamp leads (not the battery terminals) to allow the voltage to be monitored.

NOTE If the samples are of a one-piece construction, it may be necessary to connect the surveillance wires during the production of the samples.

6.3.3.2 Connect the surveillance wires to a calibrated voltage recording device. Start the recorder and switch on all units to be tested, with each unit immersed in the relevant water bath.

6.3.3.3 The voltage of each sample under test shall be monitored between 5 min and 2 h. On completion of the 2-h test, all voltage traces from the recorders shall be examined, and the lamp and dome assembly from the unit displaying the lowest voltage during the test shall be used to complete the luminous intensity test in 6.3.4. The voltage traces shall be retained in accordance with 4.4.

6.3.3.4 If the surveillance wires used in one-piece units impair the watertightness integrity, the test shall be conducted in air temperatures of $-1\ ^{\circ}C$, $+30\ ^{\circ}C$ and ambient temperature.

6.3.3.5 If the light is a flashing light, the flash rate shall be measured and recorded, as a minimum, at the beginning and end of the test.

6.3.3.6 If the lowest recorded voltage occurs at the 5-min point (10 min for seawater cell units in fresh water), a new lamp of the same batch and build standard may be used to complete the luminous intensity test.

6.3.4 Luminous intensity test

6.3.4.1 The lamp and dome assembly from the lowest performing unit in the operational life test shall be mounted onto a calibrated photometer, and supplied with a calibrated voltage identical to that recorded in 6.3.3. The minimum luminous intensity over the upper hemisphere shall be measured and recorded. If the point of minimum luminous intensity is known for a given design, the luminous intensity need only be measured at that location.

6.3.4.2 Flashing lights shall be tested in accordance with 6.3.4.2.1 or 6.3.4.2.2.

6.3.4.2.1 For a flashing light which remains on at an intensity of greater than 2,0 cd for greater than 0,3 s during each duty cycle, the luminous intensity test shall be carried out in accordance with 6.3.4.1.

6.3.4.2.2 For a flashing light which does not remain on at an intensity of greater than 2,0 cd for at least 0,3 s, the luminous intensity test shall be carried out in accordance with 6.3.4.1, and the Blondel–Rey formula, as described in IMO Resolution A.689(17) [as amended through Res. MSC.81(70)], shall be applied to determine the effective luminous intensity.