INTERNATIONAL STANDARD

ISO 15736

First edition
2006-01-15

Ships and marine technology — Pyrotechnic life-saving appliances — Testing, inspection and marking of production units

Navires et technologie maritime — Appareils pyrotechniques de sauvetage — Essais, contrôle et marquage des unités de production

Reference number
ISO 15736:2006(E)

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Published in Switzerland

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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 15736 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's (IMO) *Life-Saving Appliance (LSA) Code* and related IMO instruments to assess the conformity of production pyrotechnic life-saving appliances with IMO requirements. Some of the provisions of this standard exceed IMO requirements in that the IMO *Recommendation on testing of life-saving appliances* (IMO Resolution A.689(17), as amended through Resolution MSC.81(70)) does not specifically address sampling, testing, inspection, and marking of production units of pyrotechnic life-saving appliances. It is believed to accurately reflect current best practices among manufacturers of approved pyrotechnic life-saving appliances.

Ships and marine technology — Pyrotechnic life-saving appliances — Testing, inspection and marking of production units

1 Scope

This International Standard specifies production tests, inspections, conformity assessment procedures and marking requirements for life-saving appliances that utilize pyrotechnic devices in functioning. Specifically, it applies to products which have been evaluated and tested in accordance with the International Maritime Organization (IMO) *Recommendation on testing of life-saving appliances*, and type approved by maritime administrations to the requirements of the IMO *Life-Saving Appliance (LSA) Code* for use on ships subject to the requirements of the 1974 Safety of Life at Sea Convention (as amended). The basic principles may be considered suitable for pyrotechnic life-saving appliances manufactured to other than the IMO requirements, however this International Standard applies directly only to products for which it contains specific requirements.

This International Standard does not affect the requirement in part 2, section 4 of the IMO *Recommendation on testing of life-saving appliances* to periodically repeat full prototype testing of pyrotechnic life-saving appliances. However, compliance with this International Standard may be taken into account by administrations in prescribing the frequency of such tests.

2 Normative reference(s)

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.

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ASTM D 1535-97, *Standard Practice for Specifying Colour by the Munsell System*

IMO, *Life-Saving Appliance (LSA) Code*

IMO, *Recommendation on testing of life-saving appliances (Res. A.689(17), as amended through Res. MSC.81(70)*

United Nations Recommendations on the Transport of Dangerous Goods

3 Term(s) and definition(s)

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

3.1
ambient temperature
unregulated outdoor temperature

3.2
batch
unit of production of pyrotechnic chemical composition, manufactured under the same conditions, of the same raw materials, at substantially the same time

3.3
burn time
emission time
period of time measured from when a distinct sustained flame (or smoke for smoke signals) is emitted until it ceases

3.4
lot
unit of production which, as far as is practicable, consists of items of a single type, class, size and type of composition, manufactured under substantially the same conditions, and at substantially the same time

4 General requirements

4.1 Manufacturing standards

Manufacturers shall have in place a manufacturing quality control system sufficient to ensure that series production items are manufactured according to substantially the same production methods, from the same materials and according to the same quality standards as the prototype samples tested for approval by a maritime administration, and are suitable for the purpose for which they are intended.

NOTE 1 This clause is not intended to inhibit refinements of manufacturing processes that do not adversely affect the end product.

NOTE 2 Compliance with a quality management system such as the ISO 9000 series is recommended.

4.1.1 Recommended production testing and inspection procedures constituting an effective manufacturing quality control system are contained in Annex A. The procedures in Annex A are intended to address the requirement in Part 2 of the IMO *Recommendation on testing of life-saving appliances* for statistically adequate sampling of production lots. (The term “lot” as used in this International Standard has the same meaning as “batch” as used in Part 2 of the IMO *Recommendation on testing of life-saving appliances*.)

4.2 Visual appearance and craftsmanship

Pyrotechnic life-saving appliances shall be free from imperfections of manufacture affecting their appearance or that may affect their serviceability.

4.3 Markings

Each production item produced in accordance with the procedures in this International Standard shall be clearly and indelibly marked by the manufacturer with the following information:

a) Item type or model identification;

b) Relevant functional information (altitude, burn time, candela rating, and others as appropriate);

c) “SOLAS 96” or “IMO LSA Code”;

d) “ISO 15736”;

e) Name of manufacturer;

f) Month and year of manufacture; and

g) Approval information (as specified by the approving maritime administration(s)).

4.3.1 Marking of date of expiry

4.3.1.1 In addition to the markings specified above, pyrotechnic life-saving appliances shall be permanently marked with the date of expiry.

4.3.1.2 The date of expiry for pyrotechnic lifesaving appliances shall be 36 months from the date of manufacture, except in cases where a maritime administration has approved a longer service life based upon documented operational experience.

4.3.2 Marking of transportation packaging

The marking of the packaging for transport shall be in accordance with the *United Nations Recommendations on the Transport of Dangerous Goods*.

4.4 Documentation

4.4.1 Complete product documentation, including prototype test records, shall be retained as long as the product is in production and for at least three years after the date of expiry of the last production lot.

4.4.2 Complete lot production documentation including production test records shall be kept on file for at least three years after the date of expiry of the production lot.

5 Performance requirements

5.1 Rocket parachute flare

5.1.1 Altitude of expulsion

The rocket shall, when fired vertically, at or near the peak of its trajectory eject a parachute flare at an altitude of not less than 300 m. The altitude shall be determined by triangulation from two or more points of observation, as specified in 6.3.1.

Alternative methods of establishing the expulsion altitude may be acceptable if approved by the administration as providing equivalent results.

5.1.2 Colour of burning illuminant

The flare shall burn with a vivid red colour, with Commission International de l'Eclairage (CIE) coordinates $x = 0{,}61$ to 0,69 and $y = 0{,}3$ to 0,39, or computed from these coordinates, a wavelength of 608 nanometres (nm) $\pm$ 11 nm, when tested as specified in 6.1.

5.1.3 Luminous intensity

The flare shall exhibit an average luminous intensity of not less than 30 000 candela (cd) over the complete flare burn time when tested as specified in 6.1.

5.1.4 Flare burn time

The flare shall sustain burning for a period of at least 40 s.

5.1.5 Flare descent rate

The flare shall have an average rate of descent of not more than 5 m/s, determined as specified in 6.3.2.

5.1.6 Resistance to parachute damage

The functions of expulsion, deployment, and flare burning shall not damage the parachute, or its attachments, such as results in a descent rate greater than specified.

5.2 Hand flare

5.2.1 Colour of burning illuminant

The flare shall burn with a vivid red colour, with CIE coordinates $x = 0{,}61$ to $0{,}69$ and $y = 0{,}3$ to $0{,}39$, or computed from these coordinates, a wavelength of 608 nm $\pm$ 11 nm, when tested as specified in 6.1.

5.2.2 Luminous intensity

The flare shall exhibit an average luminous intensity of not less than 15 000 cd over the complete flare burn time when tested as specified in 6.1.

5.2.3 Flare burn time

The flare shall burn for a period of not less than 1 min when tested as specified in 6.10.

5.2.4 Delay time

If the flare is designed to be operated from the burning end, it shall incorporate an operational safety delay of 3,0 s $\pm$ 1,0 s.

5.3 Buoyant smoke signal

5.3.1 Smoke colour

Each signal shall emit smoke of a highly visible orange colour when tested as specified in 6.9.

5.3.2 Smoke density

Each signal shall emit smoke such that at least 70 % obscuration is attained throughout the required emission time when tested as specified in 6.8.

5.3.3 Emission time

Each signal shall emit smoke at a uniform rate for not less than 3 min when floating in calm water, when tested as specified in 6.10.

5.3.4 Flameless generator

The signal shall not emit any flame during the entire smoke emission time.

5.4 Lifebuoy self-activating smoke signal

5.4.1 Smoke colour

Each signal shall emit smoke of a highly visible orange colour when tested as specified in 6.9.

5.4.2 Smoke density

Each signal shall emit smoke such that at least 70 % obscuration is attained throughout the required emission time when tested as specified in 6.8.

5.4.3 Emission time

Each signal shall emit smoke at a uniform rate for not less than 15 min when floating in calm water when tested as specified in 6.10.

5.4.4 Flameless generator

The signal shall not emit any flame during the entire smoke emission time.

5.5 Line-throwing appliances

5.5.1 Accuracy

Lateral deflection from line of firing shall not exceed 10 % of the length of flight of the projectile when tested in accordance with 6.11.

5.5.2 Distance

Each rocket shall carry the line at least 230 m in calm conditions when tested in accordance with 6.11. During firing a maximum wind speed of 4 m/s from any direction is allowed.

5.5.3 Line load capacity

The line shall have a breaking strength of not less than 2 kN when tested in the wet condition with a knot in the centre of the line length.

6 Test procedures

6.1 Luminous intensity measurement

6.1.1 Laboratory testing of the flare material shall establish that it will burn uniformly with the required average luminous intensity and that the colour of the flame is a vivid red.

6.1.2 Measurement of the luminous intensity requires the use of a visual photometer or equivalent photometric device. The specimen shall be supported in position 45° from vertical with the burning end uppermost (hand flare) or with the burning end down (flare of the hand held rocket) with the photometer perpendicular to the axis of the flare. The minimum photometric distance shall be 7 m.

6.1.3 Recording photometers shall have a chart speed of at least 100 mm/min. Computerized recording shall be done with a sampling rate of at least 100 milliseconds.

6.2 Thrust versus time measurement

Laboratory testing of the rocket motor shall establish that the rocket motor is within the manufacturer's defined tolerances, as defined at the type approval tests.

The thrust measurement shall be done with a calibrated strain gauge or piezo type of load cell. As a minimum requirement the peak thrust, the thrust impulse and burn time shall be recorded.

6.3 Altitude measurement

6.3.1 Altitude

The expulsion altitude and the height where the flare of the hand-held rocket burns out shall, when fired vertically, be determined by triangulation from two or more points of observation. The firing of the hand-held rockets shall be done from a rigid apparatus. Alternative methods of establishing the expulsion altitude may be acceptable if approved by the administration as providing equivalent results.

6.3.2 Rate of descent

The rate of descent shall be calculated as follows:

$$r_d = (h_1 - h_2)/\, t_f$$

where

h_1 is the expulsion height in m;

h_2 is the height when flare burns out in m;

r_d is the rate of descent in m/s;

t_f is the burn time of the flare in seconds.

6.4 Temperature cycle test

6.4.1 General

6.4.1.1 The samples shall be visually inspected and any anomaly noted before entry into the temperature chamber.

6.4.1.2 After temperature stabilization, at least 2 h, the samples shall be subjected to 10 temperature cycles, as specified in 6.4.2.

6.4.1.3 The temperature shall be monitored and recorded during the test.

6.4.2 Temperature cycle

The temperature cycle shall comply generally with Figure 1.

6.5 Water immersion test

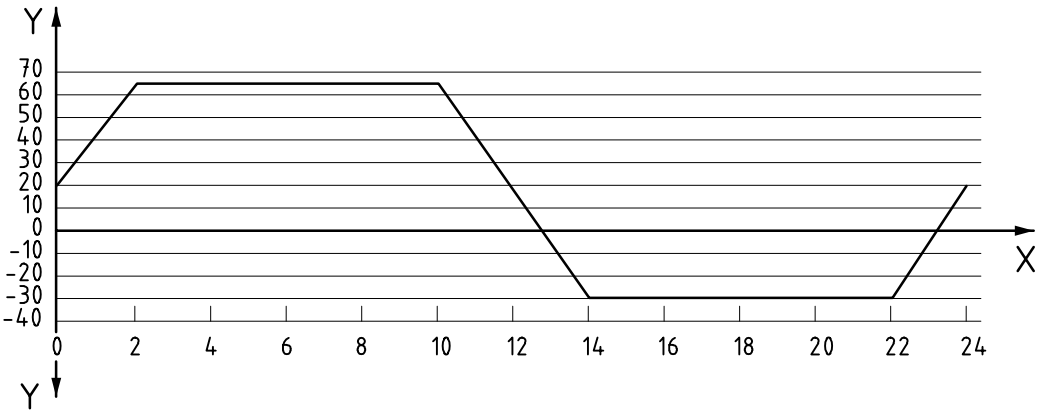
The samples shall be visually inspected and any anomaly noted before subjecting them to the test in 6.5.1 or 6.5.2.

6.5.1 Soak test

The samples shall be immersed horizontally for at least 24 h under 1 m of water. After this test the samples shall be subjected to the functional test.

6.5.2 5 minutes test

The samples shall be immersed in horizontal position in ready-to-fire condition for 5 m under 0,1 m of water. After this test the samples shall be subjected to the functional test.



Key

X Time (hours)

Y Temperature (degree C)

Figure 1 — Temperature cycle

6.6 Cold temperature test

6.6.1 The distress signals shall be visually inspected and any anomaly noted before entry into the temperature chamber.

6.6.2 The temperature chamber shall be at the required temperature of not greater than −30 °C. The samples shall be placed into the chamber for at least 48 h after the temperature in the chamber has been stabilized. The temperature shall be monitored and recorded during this period.

6.7 Hot temperature test

6.7.1 The distress signals shall be visually inspected and any anomaly noted before entry into the temperature chamber.

6.7.2 The temperature chamber shall be at the required temperature of at least +65 °C. The distress signals shall be stored for at least 48 h after the temperature in the chamber has been stabilized. The temperature shall be monitored and recorded during this period.

6.8 Smoke density measurement

6.8.1 The smoke shall be blown through an apparatus consisting of a 190 mm diameter duct with a fan capable of producing an entrance air flow of 18,4 m^3/min. By means of a light source with at least 3,6 cd on one side of the tunnel and a photoelectric cell on the other side, the density of the passing smoke shall be recorded.

6.8.2 If the photocell detects the total emitted light from the light source, then the smoke density is zero %, which means that no smoke is passing through the tunnel. The smoke density is then considered to be 100 % when the photocell is not able to detect any light of the light source through the passing smoke in the tunnel. From the amount of light that the photocell is able to detect, the smoke density is calculated.

6.8.3 Before each measurement the light intensity of the 100 % value shall be checked. Each measurement shall be recorded.

6.9 Smoke colour comparison

6.9.1 The colour of the orange smoke shall be evaluated by means of visual comparison, in daylight, to a colour comparison chart containing the range of acceptable orange colours.

6.9.1.1 The colour comparison chart may have either a matte or gloss finish, and shall consist of a series of at least five orange colour chips, covering the range from reddish orange (Munsell notation 8.75 YR 6/14) to yellowish orange (Munsell notation 5 YR MAX) in gradual steps of hue, chroma, and lightness.

NOTE 1 A typical acceptable progression would be 8.75 YR 6/14 ; 10 R 6/14 ; 1.25 YR 6/14 ; 3.75 YR MAX ; 5 YR MAX.

NOTE 2 ASTM D1535-97 specifies a method to convert between Munsell notation and CIE coordinates.

6.9.1.2 The colour chips shall be secured adjacent to one another, in order of progression from reddish orange to yellowish orange, and shall extend on at least one side to the edge of the chart. Each colour chip shall be at least 50 mm $\times$ 100 mm in size.

6.10 Burn time measurement

6.10.1 Stopwatches shall be used for time measurement of functional tests.

6.10.2 The burn time of flares shall be measured with an accuracy of 0,1 s, the burn time of smoke signals with an accuracy of 1 s.

6.10.3 Time measurements of extremely short duration within microseconds (thrust or pressure against time) shall be performed with a digital storage oscilloscope, or other means with accuracy of $\pm$ 3 % of the scanning rate within the range of 40 Hz to 2 MHz.

6.11 Line throwing appliance function test

Three projectiles should be fired connected to a line and the distance and lateral deflection from the target measured.

Annex A
(informative)

Production testing and inspection procedures

A.1 General sampling and inspection procedures

A.1.1 Sampling procedures

Sampling shall be performed in accordance with ISO 2859-1.

A.1.1.1 Incoming material

For incoming material, the double sampling plan, normal inspection, and inspection level II shall be used, with the AQL as specified in the relevant portions of A.2. The manufacturer's inspection level may be reduced in cases where the material supplier provides certification to a well-documented quality control system with similar requirements.

A.1.1.2 In-process inspection

For in-process inspection, the double sampling plan and normal inspection shall be used, with the AQL and inspection level as specified in the relevant portions of A.2.

A.1.1.3 Inspection of finished units

For inspection of finished units, the double sampling plan and normal inspection shall be used, with the AQL and inspection level as specified in the relevant portions of A.2.

A.1.2 Inspection procedures

Normal inspection shall be used at the commencement of inspections. The inspection switching procedures as specified in ISO 2859-1 shall be applied.

A.2 Production testing and inspections

A.2.1 Rocket parachute flare

A.2.1.1 Incoming material testing

All incoming material shall be inspected for compliance with the manufacturer's specifications as specified in A.1.1.1 with an AQL of 0,25.

A.2.1.2 In-process inspections

A.2.1.2.1 Flare

A.2.1.2.1.1 Burn time

The burn time of flares manufactured from each batch of composition shall be determined as specified in 6.10 using test samples selected in accordance with A.1.1.2, with an inspection level of S-3. The samples may be selected either from finished flares, or from raw composition that is used to produce finished flares for testing. Each of the tested samples shall burn for at least 40 s.

A.2.1.2.1.2 Luminous intensity

From the sample tested for burn time in accordance with A.2.1.2.1.1, a luminous intensity measurement shall be performed on two flares. Each tested flare shall have a luminous intensity of at least 30 kcd, when tested in accordance with 6.1.

A.2.1.2.2 Rocket motor

The thrust versus time performance of each batch of rocket motors shall be inspected using the sampling plan as specified in A.1.1.2, with an inspection level of S-2. Each of the tested rocket motors shall conform to the relevant manufacturer's thrust versus time diagram.

A.2.1.3 Functional tests on finished units

A.2.1.3.1 From each lot of rocket parachute flares, samples shall be selected in accordance with the sampling plan specified in A.1.1.3, with an inspection level of S-4.

A.2.1.3.2 The samples shall be functionally tested at ambient temperature after immersion in water as specified in 6.5.2, and shall comply with Table A.1. At least two of the samples shall be subjected to the luminous intensity test as specified in 6.1, and shall comply with Table A.1.

Table A.1 — Table of defects — Rocket parachute flare

Item	Type of defect	AQL
1	Rocket motor explodes	—
2	Failure to fire/ignite rocket motor	—
3	Ejection of parachute flare less than 50 m from firing point	—
4	Failure to ignite pyrotechnic flare	—
5	Failure to expel parachute/flare assembly	—
6	Altitude less than 270 m	—
7	Markings not in accordance with 4.3	—
8	Burn time less than 40 s	2,5
9	Light intensity less than 30 kcd	2,5
10	Parachute/flare separation or chute destroyed	2,5
11	Altitude between 90 % and 100 % of requirement (270 – 300 m)	2,5
12	Average descent rate greater than 5 but less than 7 m/s	2,5
NOTE	Defects with no AQL listed are critical defects and none are allowed.	

A.2.1.3.3 At every tenth lot, or after a minimum 6 months of production, an additional inspection of 5 units shall be performed, after conditioning as follows:

a) Sample 1: temperature cycle as specified in 6.4.1, and immerse in water as specified in 6.5.1.

b) Samples 2 & 3: Cold temperature exposure as specified in 6.6.

c) Samples 4 & 5: Hot temperature exposure as specified in 6.7.

A.2.1.3.3.1 After conditioning, samples 1, 2, and 4 shall be functionally tested in accordance with 6.3, at ambient temperature and all samples shall comply with Table A.1.

A.2.1.3.3.2 After conditioning, samples 3 and 5 shall be subjected to the luminous intensity test as specified in 6.1 at ambient temperature, and shall comply with Table A.1.

A.2.2 Hand flare

A.2.2.1 Incoming material testing

All incoming material shall be inspected for compliance with the manufacturer's specifications as specified in A.1.1.1 with an AQL of 0,25.

A.2.2.2 In-process inspections

A.2.2.2.1 Flare

A.2.2.2.1.1 Burn time

The burn time of flares manufactured from each batch of composition shall be determined as specified in 6.10 using test samples selected in accordance with A.1.1.2, with an inspection level of S-2. The samples may be selected either from finished flares or from raw composition that is used to produce finished flares. Each of the tested samples shall burn for at least 60 s.

A.2.2.2.1.2 Luminous intensity

From the sample tested for burn time in accordance with A.2.2.2.1.1, a luminous intensity measurement shall be performed on two flares. Each tested flare shall have a luminous intensity of at least 15 kcd, when tested in accordance with 6.1.

A.2.2.3 Functional tests on finished units

A.2.2.3.1 From each lot of flares, a sample shall be selected in accordance with the sampling plan as specified in A.1.1.3 with an inspection level of S-3.

A.2.2.3.2 The samples shall be functionally tested at ambient temperature after immersion in water as specified in 6.5.1, and shall comply with Table A.2. At least two of the samples shall be subjected to the luminous intensity test as specified in 6.1,and shall comply with Table A.2.

Table A.2 — Table of defects — Hand flare

Item	Type of defect	AQL
1	Delay time less than 1 s (where delay time is required)	—
2	Failure to ignite	—
3	Markings not in accordance with 4.3	—
4	Light intensity less than 15 kcd	2,5
5	Burn time less than 60 s	2,5
NOTE	Defects with no AQL listed are critical defects and none are allowed.	

A.2.2.3.3 At least once every 6 months of production, an additional inspection of 5 units shall be performed, after conditioning as follows:

a) Sample 1: temperature cycle as specified in 6.4.1, and immerse in water as specified in 6.5.2.

b) Samples 2 and 3: Cold temperature exposure as specified in 6.6.

c) Samples 4 and 5: Hot temperature exposure as specified in 6.7.

A.2.2.3.4 After conditioning, samples 1, 2, and 4 shall be functionally tested, and samples 3 and 5 shall be subjected to the luminous intensity test as specified in 6.1, at ambient temperature, and all samples shall comply with Table A.2.

A.2.3 Buoyant smoke signal

A.2.3.1 Incoming material testing

All incoming material shall be inspected for compliance with the manufacturer's specifications as specified in A.1.1.1 with an AQL of 0,25.

A.2.3.2 In-process inspections

A.2.3.2.1 Smoke composition

The burn time, smoke emission and smoke colour of each batch of smoke composition shall be inspected as specified in A.1.1.2 with an inspection level of S-2. The samples may be selected either from finished signals, or from raw composition that is used to produce finished signals for testing. Each signal shall comply with 5.3.1, 5.3.2, and 5.3.3, when tested as specified in 6.8, 6.9, and 6.10.

A.2.3.2.2 Ignition system

The assembled ignition systems shall, before assembly to the signal, be inspected as specified in A.1.1.2 for proper ignition and delay time.

A.2.3.3 Functional tests on finished units

A.2.3.3.1 From each lot of signals a sample shall be selected in accordance with the sampling plan as specified in A.1.1.3 with an inspection level of S-3.

A.2.3.3.2 The samples shall be functionally tested at ambient temperature after immersion in water as specified in 6.5.1, and shall comply with Table A.3.

Table A.3 — Table of defects — Buoyant smoke signal

Item	Type of defect	AQL
1	Signal explodes	—
2	Smoke burns	—
3	Smoke density less than 50 %	—
4	Failure to ignite	—
5	Colour of smoke not in accordance with 6.9	—
6	Markings not in accordance with 4.3	—
7	Smoke emission time less than 3 min	2,5
8	Burn rate not uniform	2,5
9	Smoke density less than 70 % but at least 50 %	2,5
NOTE	Defects with no AQL listed are critical defects and none are allowed.	

A.2.3.3.3 At least once every 6 months of production, an additional inspection of 5 smoke signals shall be performed after conditioning as follows:

a) Sample 1: temperature cycle as specified in 6.4.2, and immerse in water as specified in 6.5.2.

b) Samples 2 and 3: Cold temperature exposure as specified in 6.6.

c) Samples 4 and 5: Hot temperature exposure as specified in 6.7.

A.2.3.3.4 After conditioning, samples 1, 2 and 4 shall be functionally tested at the conditioning temperature. Samples 3 and 5 shall be subjected to the smoke density test as specified in 6.8 and all samples shall comply with Table A.3.

A.2.4 Lifebuoy self-activating smoke signal

A.2.4.1 Incoming material testing

All incoming material shall be inspected for conformance with the manufacturer's specifications as specified in A.1.1.1 with an AQL of 0,25.

A.2.4.2 In-process inspections

A.2.4.2.1 Smoke composition

The burn time, smoke emission and smoke colour of each batch of smoke composition shall be inspected as specified in A.1.1.2 with an inspection level of S-2. The samples may be selected either from finished signals, or from raw composition that is used to produce finished signals for testing. Each signal shall comply with 5.4.1, 5.4.2, and 5.4.3, when tested as specified in 6.8, 6.9, and 6.10.

A.2.4.2.2 Ignition system

The assembled ignition systems shall, before assembly to the floating smoke signal, be inspected as specified in A.1.1.2 with an inspection level of S-3 for proper ignition and delay time.

A.2.4.3 Functional tests on finished units

A.2.4.3.1 From each lot of signals a sample shall be selected in accordance with the sampling plan as specified in A.1.1.3 with an inspection level of S-2.

A.2.4.3.2 The samples shall be tested for all functional requirements in the open air at ambient temperature after immersion in water as specified in 6.5.1 and shall comply with Table A.4.

Table A.4 — Table of defects — Lifebuoy self-activating smoke signal

Item	Type of defect	AQL
1	Signal explodes	—
2	Smoke burns	—
3	Smoke density less than 50 %	—
4	Failure to ignite	—
5	Colour of smoke not in accordance with 6.9	—
6	Markings not in accordance with 4.3	—
7	Smoke emitting time less than 15 min	2,5
8	Burn rate not uniform	10,0
9	Smoke density less than 70 % but at least 50 %	10,0
NOTE	Defects with no AQL listed are critical defects and none are allowed.	

A.2.4.3.3 At every tenth lot, or after a minimum 6 months of production, an additional inspection of 5 smoke signals shall be performed after conditioning as follows:

a) Sample 1: temperature cycle as specified in 6.4.2, and immerse in water as specified in 6.5.2.

b) Samples 2 and 3: Cold temperature exposure as specified in 6.6.

c) Samples 4 and 5: Hot temperature exposure as specified in 6.7.

A.2.4.3.4 After conditioning, samples 1, 2, and 4 shall be functionally tested at the conditioning temperature, samples 3 and 5 shall be subjected to the smoke density test as specified in 6.8, and all samples shall comply with Table A.4.

A.2.5 Line-throwing appliances

A.2.5.1 Incoming material testing

All incoming material shall be inspected for conformance with the manufacturer's specifications as specified in A.1.1.1 with an AQL of 0,25.

A.2.5.2 In-process inspections

A.2.5.2.1 Firing mechanism

The firing mechanism of the appliances shall be inspected 100 % for proper function.

A.2.5.2.2 Rocket

The assembled rocket shall be inspected as specified in 6.2 using samples selected as specified in A.1.1.2 with an inspection level of S-3, for proper function (laboratory test with measurement of thrust and burn time).

A.2.5.3 Functional tests on finished units

A.2.5.3.1 From each lot of line throwing appliances a sample shall be selected as specified in A.1.1.3, with an inspection level of S-4.

A.2.5.3.2 The samples shall be tested for all functional requirements at ambient temperature after immersion of the rocket in water as specified in 6.5.1, and shall comply with Table A.5.

Table A.5 — Table of defects — Line throwing appliances

Item	Type of defect	AQL
1	Failure of launcher to fire	—
2	Cracked barrel or launcher discharge chamber	—
3	Reusable launcher rendered inoperable by firing	
4	Failure of rocket to ignite	—
5	Length less than 230 m	—
6	Line broken during firing	—
7	Deflection from firing line more than 15 %	—
8	Marking not in accordance with 4.3	—
9	Deflection from firing line more than 10 % but less than 15 %	2,5
NOTE	Defects with no AQL listed are critical defects and none are allowed.	

A.2.5.3.3 At least once every 6 months of production, an additional inspection of 5 rockets shall be performed after conditioning as follows:

a) Sample 1: temperature cycle as specified in 6.4.2, and immerse in water as specified in 6.5.2.

b) Samples 2 and 3: Cold temperature exposure as specified in 6.6.

c) Samples 4 and 5: Hot temperature exposure as specified in 6.7.

A.2.5.3.4 After conditioning, samples 1, 2 and 4 shall be functionally tested at the conditioning temperature, samples 3 and 5 shall be subjected to the thrust measurement test as specified in 6.2, and all samples shall comply with Table A.5 as applicable.

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