INTERNATIONAL STANDARD

ISO 9650-1

Second edition
2022-05

Small craft — Inflatable liferafts —

Part 1: Type 1 and type 2

Petits navires — Radeaux de survie gonflables —

Partie 1: Type 1 et type 2

Reference number
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 188, *Small craft*.

This second edition of ISO 9650-1 cancels and replaces ISO 9650-1:2005 and ISO 9650-2:2005, which have been technically revised.

The main changes are as follows:

— ISO 9650-1 and ISO 9650-2 have been merged;

— the Scope has been modified to align with meteorological conditions;

— the types and groups of liferafts have been rationalized (see 4.2);

— a new float free launching status has been added (see 5.2.1.1.2), with requirements added in 5.2.9, and test requirements added in 6.1 and 6.16;

— a reference standard for gas inflation systems has been added (see 5.2.2.2);

— requirements for the initial inflation system have been added (see 5.2.2.2);

— the requirements for the canopy have been modified (see 5.2.6.2);

— the requirements for boarding systems have been modified (see 5.2.8.2.1);

— the reference standard for sea anchors has been updated (see 5.2.8.2.2);

— requirements for marking products have been increased (see 5.2.9);

— a testing schedule for prototypes, manufacturing and servicing has been added (see Clause 6);

— the testing requirements have been modified (see Clause 6);

— terminology of painter/towing line has been reviewed throughout the document.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is intended for inflatable liferafts for small craft used for leisure activities. It does not apply to liferafts required for ships under the International Convention for the Safety of Life at Sea (SOLAS), 1974[3]. A liferaft manufactured and maintained in accordance with this document should provide:

— a reasonably safe refuge for a shipwrecked person awaiting rescue;

— a reasonable service lifetime, provided the user meets the manufacturer's clearly specified recommendations on stowage and maintenance.

Conformity to this document does not imply that a liferaft will be suitable in all circumstances.

Users are responsible for selecting a liferaft appropriate to the intended circumstances of use. Liferaft manufacturers and vendors should inform potential purchasers of the properties of the product, including possible choices (e.g. different equipment packs), limits on normal usage, and recommendations on stowage and maintenance.

The tests in this document have been designed to simulate reality as closely as possible. Conformity to a test does not guarantee similar performance in service. For example, conformity to the re-righting tests does not guarantee that a liferaft can be righted at sea by an exhausted person in all circumstances.

Small craft — Inflatable liferafts —

Part 1:
Type 1 and type 2

1 Scope

This document specifies the minimum requirements for design, performance and marking, and gives the test methods for inflatable liferafts of type 1 and type 2:

— having a carrying capacity of 4 persons to 16 persons;

— intended for small craft of a hull length of up to 24 m;

— intended for launching overboard from a height not exceeding 6 m.

NOTE Type 1 and type 2 liferafts are defined in 4.2.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 12402 (all parts), *Personal flotation devices*

ISO 15738:2019, *Ships and marine technology — Maritime safety — Gas inflation systems for inflatable life-saving appliances*

ISO 17339, *Ships and marine technology — Life saving and fire protection — Sea anchors for survival craft and rescue boats*

International Maritime Organization (IMO) SOLAS 83, Chapter III, Resolution A.658(16), Annex 2

IMO. SOLAS International Life-Saving Appliance (LSA) Code

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
operating pressure
pressure determined by the designed reseat pressure of the relief valves, except that, if the actual reseat pressure of the relief valves, determined by testing, exceeds the designed reseat pressure by more than 15 %, the higher figure is used

3.2
full load
load of the number of persons corresponding to the *carrying capacity* (3.7) of the liferaft, each weighing 82,5 kg, seated at their normal place, or, unless otherwise specified, load of the number of uniformly distributed equivalent masses weighing 82,5 kg (e.g. bags of sand) and all required equipment

Note 1 to entry: See 5.2.3.2 and 5.2.3.3 for the carrying capacity.

3.3
buoyancy chamber
buoyancy compartment
inflatable compartment (3.5) contributing to the buoyancy of the liferaft

3.4
small craft
recreational boat, and other watercraft using similar equipment, of up to 24 m length of hull (L_H)

[SOURCE: ISO 8666:2020, 3.15, modified — "small craft" has replaced "craft" as the preferred term.]

3.5
inflatable compartment
compartment that inflates to provide insulation, buoyancy or structure

3.6
calm water
water conditions at or below meteorological condition Beaufort force 3

3.7
carrying capacity
number of persons that a liferaft is permitted to accommodate

4 General provisions

4.1 General

4.1.1 An inflatable liferaft is comprised of:

— a structure;

— an inflation system;

— fittings;

— equipment;

— instructions;

— a protective outer container.

4.1.2 The structure of a liferaft is comprised of:

— at least two independent buoyancy chambers;

— a floor;

— a canopy and a canopy support;

— stabilization means.

4.1.3 The inflation system is comprised of:

— an initial inflation system;

— a manual back-up inflation system.

4.1.4 The fittings shall include:

— external lighting;

— a painter/mooring line;

— a painter/towing attachment point;

— external and internal lifelines;

— a righting system;

— means of boarding;

— a sea anchor;

— a rescue quoit and line;

— a safety knife.

Further fittings may be included, provided the tests of Clause 6 are completed.

4.2 Types of liferaft

This document defines two types of liferaft:

— type 1:

  — designed for extended voyages, where high wind and significant wave heights can be experienced, but excluding abnormal conditions such as hurricanes;

  — prepared to meet serious emergencies without expectation of outside assistance;

  — not for voyaging in extreme zones;

— type 2:

  — designed for conditions up to significant wave height of 2 m, and up to and including a wind speed of Beaufort force 6;

  — designed for conditions with an ambient air temperature of above 10 °C.

5 Requirements

5.1 General requirements

Inflatable liferafts serviced in accordance with the manufacturer's instructions shall satisfy the requirements described in this document.

Table 1 summarizes the subclause(s) to consider for each main characteristic.

Table 1 — General requirements

Characteristics	Requirements in	Tests methods in
Launching	5.2.1.1	6.2, 6.16
Inflation	5.2.2	6.3
Buoyancy	5.2.3	6.15
Stability and performance at sea	5.2.4	6.4, 6.5, 6.6, 6.7, 6.15
Solidity, watertightness, materials	5.2.5	6.8, 6.9, 6.15
Habitability	5.2.6	—
Visibility to rescuers	5.2.7	6.14
Fittings and equipment	5.2.8	6.12, 6.13, 6.14
Instructions and marking	5.2.9	6.10
Packaging	5.2.10	6.10

5.2 Detailed requirements

5.2.1 Deployment

5.2.1.1 Launching

5.2.1.1.1 Manual launching

The liferaft shall be capable of being dropped into the water from a minimum height of 6 m above the water level or the liferaft storage position, whichever is the greater, without damage, in accordance with 6.2.

5.2.1.1.2 Float free launching

In addition to the manual launching capability, if the liferaft is designed to also be suitable for float free stowage and release:

— it shall be labelled “float free release”;

— the liferaft as stowed shall have a buoyancy of twice the actuation force necessary to activate the inflation system (see 5.2.2);

— the liferaft shall be tested in accordance with 6.16.

5.2.1.2 Properties of the painter

The painter/towing attachment point shall be accessible from the entrance to the liferaft.

The length of the painter shall be at least 9 m and no longer than 15 m.

A contrasting coloured indication shall be visible at 1 m from the firing point ±0,1 m. The painter shall be easy to handle and to pull.

The painter breaking load shall not be less than:

— 7,5 kN for capacities of 4 to 12 persons;

— 10 kN for capacities of 13 to 16 persons.

The breaking load of the painter’s attachment/towing system to the liferaft shall be greater than the painter by at least 0,5 kN.

The painter attachment/towing system shall be constructed so as to not damage the liferaft on failure of the attachment system during the liferafts' serviceable life.

The painter shall withstand weathering, so as not to detrimentally effect its intended use for the service interval of the liferaft.

5.2.2 Inflation

5.2.2.1 General

Type 1 liferafts shall be designed to inflate correctly in an air temperature between −15 °C and +65 °C during the course of the launching and temperature inflation tests conducted in accordance with 6.2 and 6.3.

Type 2 liferafts shall be designed to inflate correctly in an air temperature between 0 °C and +65 °C during the course of the launching and temperature inflation tests conducted in accordance with 6.2 and 6.3.

5.2.2.2 Initial inflation system

The initial inflation system shall be actuated by a pull on the painter, thereby allowing the release of pressurized gas. All subsequent force exerted on the painter shall act directly on the painter/towing attachment point, or any other point offering strength characteristics equivalent to the values required for the painter (see 5.2.1.2).

This inflation system may be supplemented by an automatic inflation system, i.e. inflation without pulling on the painter (e.g. hydrostatic pressure-sensitive automatic actuation).

The inflation system including valves shall meet the requirements of ISO 15738:2019 with the following changes:

a) The temperature −30 °C in ISO 15738:2019, 6.2.2.3, 6.2.2.4, 6.2.2.6, 6.3.1, 6.3.2.2 and 6.3.2.5, may be substituted with −15 °C.

b) The cold inflation test in ISO 15738:2019, 6.2.2.4, may be replaced with a test performed on a complete gas inflation system. The gas cylinder's capacity and the charge to be considered shall be the most demanding as designed by the manufacturer. In such condition, the complete and continuous discharge of the gas does not need to be achieved within the 20 s time cap. However, there shall be no interruptions of flow by ice formation.

c) The long-term leak test in ISO 15738:2019, 6.2.2.6, carried out after the test in ISO 15738:2019, 6.2.2.3, may be replaced with a shorter term test in which the leak rate can be demonstrated to be less than 2 % over 18 months.

d) The impact test in ISO 15738:2019, 6.2.2.7, may be performed with a gas inflation valve fitted with its dedicated mean of protection as defined in ISO 15738:2019, 6.2.1.2, if this is normally fitted during production.

e) The height 2 m in the test in ISO 15738:2019, 6.3.2.5, may be substituted with 1 500 mm and the test may be carried out at ambient temperature.

f) For the ingress test in ISO 15738:2019, 6.3.2.6, if the head is always used on a raft packed in watertight containment, this test can be carried out with the head installed in a watertight containment to replicate its normal installation

g) ISO 15738:2019, Clauses 9 and 10, do not apply.

5.2.2.3 Quantity of gas

The quantity of gas shall be sufficient for the liferaft to inflate and achieve working pressure under low temperatures, as required by 6.3.4.

The quantity of gas in the cylinder shall be such that the internal pressure of the cylinder, at the temperature of +65 °C, does not exceed the hydraulic test pressure of the cylinder.

5.2.2.4 Relief valves

The number and location of relief valves shall be such that the pressure is limited in all the inflatable compartments.

Relief valves shall be able to be sealed off according to the manufacturer's instructions. The relevant outlet should not discharge inside the liferaft.

The relief valves shall be positioned so that they can be sealed off from the interior of the raft, the canopy opening or the lookout position, in such a way that this can be achieved without leaving the interior of the raft.

5.2.2.5 Non-return valves

Sufficient non-return valves shall be provided at gas inlets to conform to 5.2.3.1.

5.2.2.6 Topping-up inflation valves

All inflatable compartments, including canopy supports, but excluding, where fitted, boarding ramps, shall be provided with a topping-up non-return valve allowing the compartments to be inflated by a bellows or a pump.

5.2.3 Buoyancy

5.2.3.1 Number of compartments

Buoyancy shall be provided by not less than two separate compartments, each inflated through a non-return inflation valve on each compartment.

The buoyancy chamber shall be so arranged that, in the event of any one of the compartments being damaged or failing to inflate, the intact compartments shall be able to support, with positive freeboard over the liferaft's entire periphery, the number of persons which the liferaft is permitted to accommodate, each having a mass of 82,5 kg and seated in their normal positions.

5.2.3.2 Carrying capacity — Type 1 liferaft

The number of persons that a liferaft shall be permitted to accommodate shall be equal to the lesser of:

a) the greatest whole number obtained by dividing by 0,096 the volume, measured in cubic metres, of the main buoyancy tubes (which for this purpose shall not include the arches or the thwarts, if fitted) when inflated; or

b) the greatest whole number obtained by dividing by 0,372 the inner horizontal cross-sectional area of the liferaft, in square metres, measured to the innermost edge of the buoyancy tubes; or

c) the number of persons having an average mass of 82,5 kg, each wearing a personal flotation device (PFD) meeting the requirements of the ISO 12402 series with a minimum buoyancy of 150 N, that can be seated with sufficient comfort and headroom.

If the PFD in c) is inflatable, it shall be inflated during the test.

5.2.3.3 Carrying capacity — Type 2 liferaft

The number of persons that a liferaft shall be permitted to accommodate shall be equal to the lesser of:

a) the greatest whole number obtained by dividing by 0,082 the volume, measured in cubic metres, of the main buoyancy tubes (which for this purpose shall not include the arches or the thwarts, if fitted) when inflated; or

b) the greatest whole number obtained by dividing by 0,250 the inner horizontal cross-sectional area of the liferaft, in square metres, measured to the innermost edge of the buoyancy tubes; or

c) the number of persons having an average mass of 82,5 kg, each wearing a PFD meeting the requirements of the ISO 12402 series with a minimum buoyancy of 150 N, that can be seated with sufficient comfort and headroom.

NOTE If the PFD in c) is inflatable, it shall be inflated during the test.

5.2.3.4 Freeboard

The freeboard, measured at various peripheral points of the liferaft inflated to its design operating pressure, under calm water conditions, with its full load, shall be as given in Table 2.

Table 2 — Liferaft freeboard

Liferaft type	Liferaft capacity persons	Freeboard height mm
2	4	200
2	> 4	250
1	4	250
1	> 4	300

5.2.3.5 Flooding resistance

The liferaft, inflated to its design operating pressure, under calm water conditions, with its full load, shall be able to be filled with water up to the top of the upper buoyancy chamber and shall keep its shape without deterioration or deformation that would impair operation.

5.2.4 Stability and performance at sea

5.2.4.1 Stability — General

The liferaft shall be so constructed that, when fully inflated and floating upright, it is stable in a seaway.

The stability of the liferaft, when loaded with its full complement of persons and equipment, shall be such that it can be towed at speeds of up to 3 kt in calm water.

If the stability is achieved by means of water pocket(s), the water pocket(s) shall conform to the following requirements:

a) the pocket(s) shall be of a highly visible colour;

b) the pocket(s) shall be designed to conform to 6.4;

c) the pocket(s) shall have an aggregate capacity of at least 220 l for liferafts with a capacity of up to 10 persons;

d) the pocket(s) for liferafts certified to carry more than 10 persons up to and including 16 persons shall have an aggregate capacity of not less than $(20 \times N)$ l, where N = number of persons carried;

e) the pocket(s) shall be positioned symmetrically round the circumference of the liferaft, and means shall be provided to enable air to readily escape from underneath the liferaft.

5.2.4.2 Stability under dissymmetrical loading

The liferaft, inflated to its operating pressure, under calm water conditions, shall neither turn over nor be flooded when all the passengers, each wearing a PFD meeting the requirements of the ISO 12402 series with a minimum buoyancy of 150 N, are grouped together first at any point on the liferaft, then at its opposite point.

5.2.4.3 Boarding stability

Two persons on board, each wearing a PFD meeting the requirements of the ISO 12402 series with a minimum buoyancy of 150 N, shall be able to take on board, under calm water conditions, a third person wearing a PFD meeting the requirements of the ISO 12402 series with a minimum buoyancy of 150 N, and floating on his/her back, completely immobile, without the liferaft capsizing or being flooded.

5.2.4.4 Towing performance

The painter/towing attachment point shall be suitable for a towing line of a diameter up to 18 mm (or as an alternative, tubular tape of up to 16 mm width).

The liferaft, inflated to its design operating pressure, under calm water conditions, with its full load, shall not be damaged and shall not capsize or be swamped when towed by the towing line at a speed of 3 kt, for a distance of at least 1 km, the sea anchor not being streamed.

5.2.4.5 Righting

Each capsized liferaft shall be able to be righted by a single person. This requirement is considered to be fulfilled if the righting test described in 6.5 is performed with success.

5.2.4.6 Boarding

The liferaft shall be designed so that the persons are able to board the liferaft alone from the water.

Four adults of differing physiques and with at least one of each gender, each wearing a shirt, trousers, an offshore foul-weather suit and a PFD meeting the requirements of the ISO 12402 series with a minimum buoyancy of 150 N, shall be able to climb aboard, in accordance with 6.6.

5.2.4.7 Performance with sea anchor deployed

The liferaft at full load shall not be damaged and shall not capsize or be flooded when the test with the sea anchor deployed is carried out in accordance with 6.7.

5.2.4.8 Manoeuvrability

The liferaft at full load, in calm water conditions and fully inflated, shall be able to move forward under the action of the passengers, each wearing a PFD meeting the requirements of the ISO 12402 series with a minimum buoyancy of 150 N, with the supplied paddles, over a distance of 20 m in less than 2 min.

5.2.5 Solidity, watertightness, materials

5.2.5.1 Resistance to excess pressure

The liferaft shall be capable of resisting a pressure equal to three times the operating pressure in accordance with 6.8.1.2.

5.2.5.2 Pressure retention of the buoyancy chambers and of the canopy support

The buoyancy chambers, the canopy support and, if fitted, the inflatable floor shall be sufficiently airtight, in order to conserve the operating pressure during use.

This requirement is considered to be fulfilled with conformity to the pressure conservation test in 6.8.1.

5.2.5.3 Watertightness of the canopy

The canopy shall be sufficiently watertight, in order to prevent any significant entry of water into the liferaft during rough weather.

This requirement is considered to be fulfilled with conformity to the watertightness test in 6.9.

Canopy entrances shall be designed to be easily and quickly closed and opened.

5.2.5.4 Boarding from a height

The liferaft, inflated to its operating pressure, under calm water conditions, shall be able to withstand, without any visible damage, the falling onto the canopy and in the liferaft entrance of a bag of sand weighing 82,5 kg from a height of 3 m above the water level, and this as many times as its carrying capacity.

5.2.5.5 Cordages and lifelines

The liferaft shall be equipped with internal and external lifelines allowing shipwrecked persons to cling onto them.

All cordages and webbing shall be rot-proof and resistant to weathering, oils and petroleum products.

Cordage shall be of a colour contrasting with the main body of the liferaft.

Cordage and webbing shall be attached to the liferaft in such a manner that, if forcibly detached, the liferaft structure shall conform to the other requirements.

The breaking load of a lifeline shall be at least 2 kN.

The breaking load of the lifelines' fastening points shall be greater than the lifeline by 0,2 kN.

The lifeline attachment system shall be constructed so as to not damage the liferaft on failure of the attachment system during the liferafts' serviceable life.

The lifelines shall be able to be grabbed without injuring the hand or slipping. Rope-type lifelines shall have a diameter of at least 8 mm. Webbing-type lifelines shall be at least 25 mm wide.

5.2.6 Habitability

5.2.6.1 Floor

The liferaft floor shall be watertight.

On type 1 liferafts, the floor shall include thermal insulation.

If the floor is insulated on either type and if the thermal insulation is achieved by a floor having one or more inflatable compartments, the latter shall be able to be deflated and reinflated by the occupants.

5.2.6.2 Canopy

The canopy shall erect automatically on inflation of the liferaft, and shall remain erected even in the case of deflation of any of the buoyancy chambers.

Type 1 liferaft canopies shall be fitted with a device for collecting rainwater.

All liferafts shall be equipped with ventilation means which allow the renewal of the air inside the liferaft.

5.2.6.3 Habitability and lookout means

All liferafts shall be equipped with lookout means.

Provision shall be made for an occupant to make horizontal observations through 360°.

A clear plastic window in the canopy may be included but shall not be substituted for a closable lookout aperture.

A test shall be carried out to ensure that there is adequate headroom for the maximum design complement when all persons are seated.

For this test, the persons shall have an average mass of 82,5 kg, shall include at least two persons of height 1,85 m, and shall each wear sailing clothes with an offshore foul-weather suit and a PFD meeting the requirements of the ISO 12402 series with a minimum buoyancy of 150 N. Seated persons shall not be forced to incline their head or torso forwards from a natural sitting posture.

5.2.6.4 Interior lighting

There shall be interior lighting providing a luminous intensity of a minimum of 0,5 cd for 12 h. The internal lamp shall light automatically when the liferaft inflates in the water and shall incorporate suitable means of manual control to save discharging the battery in daytime.

5.2.7 Visibility to rescuers

5.2.7.1 Canopy colour

The colour of the exposed portions of canopy shall be in the range from yellow to red, excluding components such as cordages, webbing, zips and other fittings.

5.2.7.2 Retro-reflective material

A minimum surface area of 1 500 cm^2 of retro-reflective material shall be fixed to the liferaft, approximately 2/3 to the upper half of the canopy and approximately 1/3 to the outer part of the liferaft bottom.

The retro-reflective material shall conform to IMO SOLAS 83, Chapter III, Resolution A.658 (16), Annex 2.

5.2.7.3 External lighting

5.2.7.3.1 General

The liferaft shall be equipped with an external marker lamp at the top of the canopy.

The external lamp shall light automatically when the liferaft inflates in the water and shall incorporate suitable means of manual control to save discharging the battery in daytime.

The external lamp shall be firmly attached to the canopy and shall provide either a continuous beam of light in accordance with 5.2.7.3.2 or a flashing light in accordance with 5.2.7.3.3.

5.2.7.3.2 Continuous beam

The continuous beam lamp shall provide light in a horizontal beam subtending an angle of at least 10° vertically and 360° horizontally, with a luminous intensity not less than 4,3 cd during a continuous period of at least 12 h.

NOTE Additional areas of light can be provided, such as a vertical cone or a surface extending over the entire hemisphere above the horizontal.

5.2.7.3.3 Flashing light

The flashing light lamp shall emit a flashing light which shall flash at a rate of not less than 50 flashes per minute and not more than 70 flashes per minute for a minimum of 12 h. Each flash shall have an effective luminous intensity of not less than 4,3 cd, measured in any direction above the horizontal.

The effective luminous intensity should be taken as shown in Formula (1):

$$\frac{\int_{t_2}^{t_1} I \times \mathrm{d}t}{0{,}2 + (t_2 - t_1)} \tag{1}$$

where

t_1 is the time, in seconds, at the beginning of the flash;

t_2 is the time, in seconds, at the end of the flash;

I is the instantaneous intensity;

0,2 is the Blondel-Rey constant, in s.

5.2.8 Fittings and equipment

5.2.8.1 General

The means for survival are provided by the proper operation of the liferaft, its fittings and equipment.

5.2.8.2 Fittings

5.2.8.2.1 Boarding means

Liferafts designed to carry eight persons or less shall have at least one entrance.

Liferafts designed to carry over eight persons shall possess two entrances, able to be used simultaneously without jeopardising the stability of the liferaft.

On type 1 liferafts, in addition to the grab lines referred to in 5.2.5.5, at least one entrance shall be fitted with a boarding ramp either rigid inflatable or semi-rigid, capable of supporting a person weighing 82,5 kg, to enable a person of not more than average physical ability to board the liferaft unaided from the sea. The system shall be tested according to 6.6.

On type 2 liferafts, in addition to the grab lines referred to in 5.2.5.5, means capable of supporting a person weighing 82,5 kg shall be provided at least at one entrance to facilitate a person boarding the liferaft unaided by another person. Such means shall be so arranged that an untutored person instinctively proceeds in the intended manner. The system shall be tested according to 6.6.

5.2.8.2.2 Sea anchor

At least one sea anchor shall be provided that shall conform to ISO 17339.

5.2.8.2.3 Rescue quoit

Provision shall be made for a buoyant rescue quoit of at least 150 g mass or a throwing sock in the interior of the liferaft near to the boarding entrance. It shall be attached to a floating line at least 30 m in length, the other end of the line being secured to the liferaft. The line shall be located, and suitably arranged in order to allow the rescue quoit to be rapidly thrown to the maximum distance of at least 30 m from the entrance.

The tensile strength of the quoit, floating line and of its attachment system shall not be less than 1,0 kN. The minimum internal diameter of the quoit shall be 100 mm.

5.2.8.2.4 Safety knife

A safety knife shall be securely stowed in a visible manner in the vicinity of the painter attachment.

The knife shall be secured to the liferaft by a line of sufficient length to enable the painter to be cut. The knife shall be stowed, so as not to damage the liferaft on inflation or when the latter is launched. It shall be so designed that it does not damage the liferaft if accidentally dropped. It shall be sufficiently buoyant in order to float in water.

5.2.8.2.5 Equipment stowage

Appropriate stowage for equipment shall be provided.

5.2.8.3 Equipment

Independently of the sea conditions that can be encountered, the pack of equipment for the liferaft shall be chosen according to the time likely to be spent on board before being rescued and the maximum number of persons the liferaft is designed for.

The items in Tables 3, 4 and 5 constitute the minimum packs; other pack types may contain additional items.

Table 3 — Type 1, pack 2, less than 24 h, minimal required equipment

Equipment	Pack 2, < 24 h	In liferaft
Portable buoyant baler easily operable by hand.	1	X
Sponge.	2	X
Pair of buoyant paddles with handles (not mitts) tied into raft adjacent to an entrance.	1	X
Whistle.	1	X
Waterproof torch with 6 h duration and separate battery and bulb or complementary torch.	1	X
Signalling mirror.	1	X
Anti-seasickness pills, per person.	6	X
Waterproof seasickness bag with simple effective closure system, per person.	1	X
Red hand flares in accordance with SOLAS LSA Code, Chapter III, 3.2.	3	X
Red parachute flares in accordance with SOLAS LSA Code, Chapter III, 3.1.	2	X
Thermal protective aids in accordance with SOLAS LSA Code, Chapter III, 2.5.	2	X
Repair outfit to enable occupants to repair leaks in any or all of the inflatable compartments. Repair systems shall work when wet and shall be capable of being applied during violent motion.	1	X

Table 3 *(continued)*

Equipment	Pack 2, < 24 h	In liferaft
Air pump or bellows which shall be simple, robust and complete, with all necessary connections (loose parts shall be captive to the main apparatus) ready for instant use to enable air to be pumped into any or all of the inflatable compartments. The air pump or bellows shall be designed and built specifically for easy operation by hand.	1	X
Drinking water per person, in containers of each not more than 125 ml.	0,5 l	X

Table 4 — Type 1, pack 1, greater than 24 h, minimal required equipment, may be added in a grab bag or included in the liferaft

Equipment	Pack 1, > 24 h grab bag	In grab bag or liferaft
First-aid kit including at least two tubes of sunscreen. All dressings shall be capable of being effectively used in wet conditions. The first-aid kit shall be clearly marked and shall be re-sealable.	1	X
Waterproof torch with 6 h duration and separate battery and bulb or complementary torch.	1	X
Red hand flares in accordance with SOLAS LSA Code, Chapter III, 3.2.	3	X
Drinking water per person, in containers of each not more than 125 ml.	1,0 l	X
Food per person.	10 000 kJ	X

Table 5 — Type 2, minimal required equipment in liferaft

Equipment	Number
Portable buoyant baler easily operable by hand.	1
Sponge.	2
Pair of buoyant paddles with handles (not mitts) tied into raft adjacent to an entrance.	1
Whistle.	1
Waterproof torch with 6 h duration and spare battery(s) and bulb or second torch.	1
Signalling mirror.	1
Anti-seasickness pills, per person.	6
Waterproof seasickness bag with simple effective closure system, per person.	1
Red hand flares in accordance with SOLAS LSA Code Chapter III, 3.2.	3
Red parachute flares in accordance with SOLAS LSA Code Chapter III, 3.1.	2
Repair outfit to enable occupants to repair leaks in any or all of the inflatable compartments. Repair systems shall work when wet and shall be capable of being applied during violent motion.	1
Air pump or bellows which shall be simple, robust and complete, with all necessary connections (loose parts shall be captive to the main apparatus) ready for instant use to enable air to be pumped into any or all of the inflatable compartments. The air pump or bellows shall be designed and built specifically for easy operation by hand.	1

When the liferaft is inflated, the equipment pack shall be readily accessible.

The equipment pack shall be protected against infiltration of water.

The equipment pack included in the liferaft shall be captive by a line to the inside of the raft.

Every package and closure shall be capable of being opened easily by a person wearing the gloves of an immersion suit (to simulate cold, wet, numbed hands) and without a tool of any kind. All packaging materials shall be impervious to water. All packaging shall have readily resealable closures.

All items shall (except where essential) be without sharp corners, sharp edges and unnecessary protrusions which can injure occupants or cause damage to the liferaft fabric.

5.2.8.4 Grab bags for type 1 liferafts

In conformity with Tables 3 and 4, equipment items for type 1, pack 1 liferafts > 24 h may be supplied separately in a grab bag which shall be stowed on board the parent vessel in a readily accessible location.

This enables type 1 pack 2 < 24 h liferafts to be upgraded to type 1 pack 1 > 24 h through the addition of equipment within a grab bag.

In this case, the liferaft shall have a marking that indicates that the grab bag is required in addition to the liferaft.

The grab bag shall be brightly coloured and able to float for 30 min in the water when fully packed.

When launching in water from a height equal to 6 m, no deterioration of the grab bag or of the equipment it contains shall occur.

The grab bag shall have handles suitable for carrying and means of attaching to the inflated raft.

The grab bag shall have a marking indicating that equipment contained in the bag shall be examined in accordance with the manufacturer's instructions and that dated equipment shall be replaced as required.

5.2.9 Instructions and marking

5.2.9.1 General

All instructions and markings shall be comprehensible to the potential users. The use of pictograms is strongly recommended.

5.2.9.2 Information supplied to the owner

Each liferaft shall be provided with the following information, either on the liferaft and/or in an owner's manual in the liferaft (if in the owner's manual, a second manual not inside the liferaft shall be supplied):

a) carrying capacity, i.e. number of persons;

b) manufacturer's name or trademark;

c) conformity to this document, i.e. ISO 9650-1, with identification of the type and of the pack type according to 5.2.8.3;

d) date of first service required and service intervals;

e) type of onboard equipment or list of the items contained;

f) liferaft serial number;

g) transport and storage advice;

h) description of liferaft;

i) liferaft use instructions, including in particular:

   1) how to launch the liferaft and inflate it (consideration shall be given to giving guidance on the mass of the liferaft and its method of launching);

   2) how to right the liferaft;

3) diagram of the inflated liferaft with the locations of the knife, sea anchor, lifebuoy (quoit) and inflation points;

4) first measures to be taken as soon as the persons have boarded the liferaft, including in particular:

i) disengage the painter and move away from the parent vessel;

ii) deploy the sea anchor to resist capsize;

iii) close the liferaft entrance;

iv) maintain the liferaft in good condition, by bailing out the water, inflating or deploying the insulated bottom (if fitted and if requiring manual deployment), checking for leaks and repairing if required;

j) advice on survival on board, maintenance and servicing of the liferaft;

k) information on the contents of the pack held within the liferaft;

l) suitable for float free stowage if applicable.

5.2.9.3 Operating handbook (in the interior of the liferaft)

Indelibly printed instructions, comprehensible to the potential users, shall be provided in the interior of the liferaft on a durable waterproof medium and shall cover the following:

a) type of onboard equipment or the list of items contained;

b) use of the liferaft;

c) how to survive on board;

d) how to right the liferaft after capsizing;

e) diagram of the inflated liferaft with the locations of the knife, painter/towing attachment, sea anchor, throwing line, equipment and all inflation points;

f) first measures to be taken as soon as the persons have boarded the liferaft, for example:

1) disengage the painter and move away from the parent vessel;

2) deploy the sea anchor to resist capsize;

3) close the liferaft entrance;

4) maintain the liferaft in good condition, by bailing out the water, inflating or deploying the insulated bottom (if fitted and if requiring manual deployment), checking for leaks and repairing, if required.

5.2.9.4 Service record sheets (in the interior of the liferaft and the pack)

Information about the servicing history (type of interventions, date and name of the service station with its stamp and signature, etc.) shall be recorded inside the liferaft.

5.2.9.5 Marking

The liferaft and its protective outer container shall bear the information specified in Table 6.

These markings shall be visible, clear and indelible and shall have no harmful effect on adjacent materials.

All instructions and markings shall be written in a language that is comprehensible to the potential users. The use of pictograms is strongly recommended.

It is permitted to mark this information on a securely attached seawater-resistant label.

Provision shall be made for marking each liferaft with the name of the owner or the name and port of registry of the vessel to which it is to be fitted, in such a form that the vessel identification can be changed at any time without opening the container.

Table 6 — Information on the manufacturer's identification plate and on the valise or canister

Marking on the liferaft	Marking on protective outer container
a) number of persons;	a) number of persons;
b) manufacturer's name or trademark;	b) manufacturer's name or trademark;
c) conformity to this document, i.e. ISO 9650-1;	c) conformity to this document, i.e. ISO 9650-1;
d) serial number and date of manufacture;	d) date of last service and identification of service station;
e) liferaft type.	e) recommended service interval;
	f) liferaft type, including limitations on area of usage;
	g) liferaft serial number;
	h) maximum launching height (6 m);
	i) information on the painter length (pictogram or plain written information);
	j) launching instructions (pictograms or plain written text);
	k) if a separate grab bag is required (see 5.2.8.4);
	l) reference to the liferaft pack contents in the owner's manual;
	m) "manual only launching" or "manual and float free launching" if applicable.

5.2.10 Packaging

The liferaft and its equipment shall be packed inside a protective outer container.

Appropriate means shall be provided for reasonable ease of handling the liferaft in its protective outer container.

6 Testing

6.1 General

The tests in Table 7 shall be satisfactorily completed.

Weights used in the following tests may be bags filled with water or sand.

Table 7 — Test procedures

Test requirement		Prototype tests	In production tests	Servicing test
6.2 Launching (drop) test		X		
6.3 Inflation tests under temperature	6.3.2 Ambient-temperature test	X	2 %	
	6.3.3 High-temperature test	X		
	6.3.4 Low-temperature test	X		
6.4 Testing of stabilization means		X		
6.5 Righting test		X		
6.6 Boarding test		X		
6.7 Towing test with sea anchor deployed		X		
6.8 Pressure test	6.8.1.1 Test for air-pressure conservation	X	100 %	100 %
	6.8.1.2 Excess pressure test	X		
	6.8.2 Inflatable floor (if fitted)	X		
6.9 Canopy watertightness test		X		
6.10 Visual inspection of the protective outer container			100 %	100 %
6.11 Visual inspection of the liferaft seams			100 %	100 %
6.12 Equipment			100 %	100 %
6.13 Pressure relief valve test			100 %	100 %
6.14 Lights and batteries test			100 %	100 %
6.15 Mooring out test		X[a]		
6.16 Float free buoyancy test		X		

[a] This test should be carried out on a representative sample.

6.2 Launching (drop) test

A launching test for each type of packaging shall be carried out under the following conditions.

Position the complete liferaft, packaged in a valise or canister, at a height of 6 m above the water.

Attach the painter to a fixed point so that it pays out when the liferaft drops.

Let the liferaft drop into the water and leave it to float for 30 min, then inflate it by pulling on the painter. Measure the time taken:

a) by the buoyancy chambers to inflate to their final shape and for the canopy to fully deploy;

b) to reach the design operating pressure.

The buoyancy chambers shall be inflated to their final shape and the canopy support deployed within 60 s of actuating the inflation device, enabling persons to board.

The operating pressure shall be achieved within 3 min of actuating the inflation device.

Remove the liferaft from the water and inspect it. No deterioration of the liferaft, or of its equipment, likely to affect the use of the liferaft shall be observed.

6.3 Inflation tests under temperature

6.3.1 General

These tests shall be carried out for each packaging type according to the procedures described in 6.3.2, 6.3.3 and 6.3.4.

6.3.2 Ambient-temperature test

Let the liferaft packaged in its valise or canister stand for 24 h at an ambient temperature of (20 ± 2) °C.

Inflate the liferaft by pulling on the painter.

The buoyancy chambers shall be inflated to their final shape and the canopy deployed within 60 secs of actuating the inflation device, enabling persons to board.

The operating pressure shall be achieved within 3 min of actuating the inflation device.

NOTE This test can be omitted provided neither the water nor air temperatures during the launching test in 6.2 exceed 22 °C.

6.3.3 High-temperature test

Each type of liferaft shall be tested according to the following procedure.

Place the liferaft, packaged in its protective outer container, valise or canister, in a preheated chamber set at +65 °C and leave it for at least 7 h at +65 °C.

Remove from the chamber and immediately inflate the liferaft by pulling on the painter to trigger the firing mechanism.

The maximum pressure attained shall be recorded and shall not exceed that required for the pressure test described in 6.8.1.2.

Inspect the liferaft for any defects that can give problems with the intended use of the raft.

There shall be no evidence of seam slippage, constructional defects, valve dysfunction or material deterioration as a result of the test.

6.3.4 Low-temperature test

Each type of liferaft shall be tested according to the procedure described below.

Place the liferaft, packaged in its protective outer container, valise or canister, in a precooled chamber set at −15 °C for type 1 liferafts and at 0 °C for type 2 liferafts, and leave it for at least 24 h.

Remove from the chamber and immediately inflate the liferaft by pulling on the painter to trigger the firing mechanism.

The buoyancy chambers shall be inflated to their operating pressure and the canopy deployed within 5 min of actuating the inflation device, enabling persons to board.

Inspect the liferaft for any defects that can give problems with the intended use of the raft.

There shall be no evidence of seam slippage, constructional defects, valve dysfunction or material deterioration as a result of the test.