
**Small craft — Windows, portlights, hatches,
deadlights and doors — Strength and
watertightness requirements**

*Petits navires — Fenêtres, hublots, panneaux, tapes et portes —
Exigences de résistance et d'étanchéité*

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Foreword

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

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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

ISO 12216 was prepared by Technical Committee ISO/TC 188, *Small craft*.

Annexes A, B, C, D and E form integral parts of this International Standard. Annexes F and G are for information only.

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Small craft — Windows, portlights, hatches, deadlights and doors — Strength and watertightness requirements

1 Scope

This International Standard specifies technical requirements for windows, portlights, hatches, deadlights and doors on small craft of hull length up to 24 m, taking into account the type of craft, its design category, and the location of the appliance.

The appliances considered in this International Standard are only those that are critical for the craft's watertightness, i.e. those that could lead to flooding in case of rupture of the plate.

This International Standard is mostly intended to be used for recreational craft, but it may be used for non-recreational small craft of hull length up to 24 m, excluding lifeboats. However, it is not applicable to commercial or work boats used in severe conditions.

2 Normative references

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

ISO 6603-1:2000, *Plastics — Determination of multiaxial impact behaviour of rigid plastics — Part 1: Non-instrumented impact testing*

ISO 7823-1:—¹⁾, *Poly(methyl methacrylate) sheets — Types, dimensions and characteristics — Part 1: Cast sheets*

ISO 8666:—²⁾, *Small craft — Principal data*

ISO 9094-1:—²⁾, *Small craft — Fire protection — Part 1: Craft with a hull length of up to and including 15 m*

ISO 9094-2:—²⁾, *Small craft — Fire protection — Part 2: Craft with a hull length of over 15 m*

ISO 11812:2001, *Small craft — Watertight cockpits and quick-draining cockpits*

ISO 12217 (all parts):2002, *Small craft — Stability and buoyancy assessment and categorization*

EN 356:1999, *Glass in building — Security glazing — Testing and classification of resistance against manual attack*

EN 1063:1999, *Glass in building — Security glazing — Testing and classification of resistance against bullet attack*

1) To be published. (Revision of ISO 7823-1:1998)

2) To be published.

3 Terms and definitions

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

3.1

appliance

device made of a plate and possibly a framing system, used to cover an opening in the hull or superstructure of a boat

EXAMPLE Windows, portlights, hatches, deadlights, doors, sliding appliances, escape hatches.

3.2

plate

sheet of material, which may be transparent, that is fixed on the boat structure either directly or via a framing system

3.2.1

stiffened plate

plate equipped with stiffeners

3.2.2

non-stiffened plate

plate directly fixed on its supports

3.2.3

glazing

transparent or translucent plate

3.2.4

unsupported dimensions of a plate

clear dimensions between the supports bearing the plate

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NOTE See annexes B and C.

3.3

passage

clear opening through which people or material may pass

NOTE This definition can be used in defining passage dimensions and passage area.

3.4

window

portlight
glazed appliance

NOTE The term “portlight” is generally used for a small window.

3.5

deck hatch

appliance fitted on decks and superstructures

3.6

companionway door

door or closing appliance intended to close a companionway opening

3.7

escape hatch

appliance intended to provide an exit and designated means of escape

3.8**multihull escape hatch**

appliance allowing a viable means of escape in the event of inversion

NOTE As this hatch is not normally totally immersed in the upright and inverted position, it is usually fitted below deck level on the hull side, nacelle or crossarm bottom, or transom.

3.9**deadlight**

shutter

secondary watertight closure, fitted to a window, a hatch or a door, and which may be fitted inside or outside the plate

3.10**closing appliance**

device used to cover an opening in the cockpit, hull or superstructure

3.11**sliding appliance**

appliance that can slide in a rabbet or a frame

3.11.1**framed plate sliding appliance**

plate mechanically connected to a frame that slides in a rabbet or a frame

3.11.2**frameless plate sliding appliance**

plate without frame that slides in a rabbet or a frame

3.12**design category**

description of the sea and wind conditions for which a boat is assessed to be suitable

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3.12.1**design category A****category for "ocean" sailing**

boat designed for extended voyages where conditions experienced may exceed wind force 8 (Beaufort Scale) and significant wave heights of 4 m and above, but excluding abnormal conditions (e.g. hurricanes)

3.12.2**design category B****category for "offshore" sailing**

boat designed for offshore voyages where conditions up to and including wind force 8 (Beaufort Scale) and significant wave heights up to and including 4 m may be experienced

3.12.3**design category C****category for "inshore" sailing**

boat designed for voyages in coastal waters, large bays, estuaries, lakes and rivers, where conditions up to and including wind force 6 (Beaufort Scale) and significant wave heights up to and including 2 m may be experienced

3.12.4**design category D****category for sailing in "sheltered waters"**

boat designed for voyages in sheltered waters, small bays, estuaries, lakes, rivers and canals, where conditions up to and including wind force 4 (Beaufort Scale) and maximum occasional wave heights up to and including 0,5 m may be experienced

**3.13
sailing boat**

boat for which the primary means of propulsion is by wind power, having:

$$A_S \geq 0,07 \times (m_{LDC})^{2/3}$$

where

A_S is the projected sail area according to ISO 8666;

m_{LDC} is the loaded mass of the boat, expressed in kilograms.

NOTE Motor sailers are regarded as sailing boats.

**3.14
motor boat**

boat designed to use engine power as its primary means of propulsion

**3.15
waterline**

side projection of the flotation plan, when the boat is upright and in fully loaded ready-for-use conditions

**3.16
length of hull**

L_H
length of hull according to ISO 8666

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**3.17
appliance location area**

area of the boat where the appliance is fitted [ISO 12216:2002](https://standards.iteh.ai/catalog/standards/sist/76d5dbed-422f-4c31-bf50-7a9706f1abe3/iso-12216:2002)

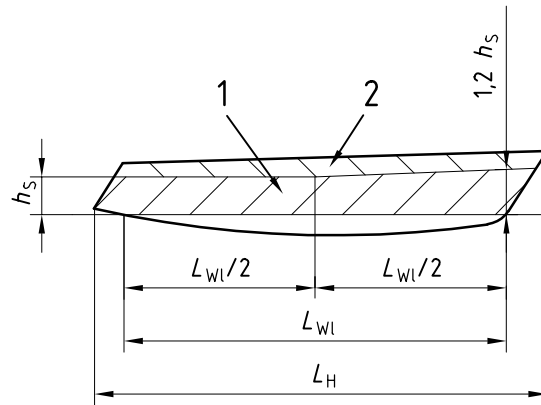
NOTE See annex A for sketches showing examples of appliance location areas.

**3.17.1
area I**

part of the hull sides situated above waterline, i.e. up to its intersection with the weather deck (for decked craft), or the upper edge of the hull (for open craft or partially decked craft), but only to the following upper boundary:

- a horizontal line located at the height h_S above waterline in the rear half of the waterline (see Figure 1);
- a sloped line having a height h_S at mid waterline, and a height $1,2h_S$ at the front end of the waterline, with
 - $h_S = L_H/12$ for sailing monohulls,
 - $h_S = L_H/17$ for motor boats, sailing catamarans and central hull of sailing trimarans.

NOTE The outer hulls of sailing trimarans are considered to be entirely in Area I.

**Key**

- 1 Area I
- 2 Area II b

Figure 1 — Limits of Areas I and II b**3.17.2****area II a**

area, other than Area I, where persons are liable to walk or step, such as decks, superstructures, cockpit soles, at an inclination of less than 25° to the horizontal in a longitudinal direction, and at an inclination of less than 50° to the horizontal in the transversal direction respectively for sailing monohulls, or 25° for multihulls

3.17.3**area II b**

areas from the hull sides not belonging to Area I ISO 12216:2002

NOTE 1 The following areas may be included if they correspond to the definition:
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- transoms of all types of craft;
- rear faces of transverse girders of multihulls when located above the waterline.

NOTE 2 Areas placed below the waterline are not covered by this International Standard.

NOTE 3 Areas on which people may stand or step, even inadvertently, are part of Area II a.

EXAMPLE Top of sailboat coachroof on which one may stand or attend to sails.

NOTE 4 Superstructure areas on which people may not normally stand or step, are not part of Area II a, but Area III.

EXAMPLE Top of motorboat wheelhouse out of normal working deck areas.

3.17.4**area III**

area, other than Area I or II

EXAMPLE Superstructures, decks or cockpits soles which cannot be considered as belonging to Area II.

NOTE On some boat types, Area III may be divided into particular areas. For example superstructure front and superstructure sides on motorboats.

3.17.5**area IV**

parts of Area III protected from the direct impact of sea or slamming waves

EXAMPLE Cockpit sides, rear faces of superstructures.

NOTE Areas other than the ones given in the example may be included in Area IV. The protection against impact from the sea shall be taken into account by the manufacturer.

3.18
type of plate end connection

NOTE See annex B for sketches showing examples of types of plate end-connection.

3.18.1
semi-fixed
SF plate

plate fixed in a way to restrict deflection and prevent lateral movement at its boundaries

EXAMPLE Unframed or framed plate, if bolted and/or glued.

3.18.2
simply supported
SS plate

plate that can deflect at its boundaries and/or perform lateral movement

EXAMPLE Unframed plate, whether hinged or sliding.

3.18.3
flexibly connected plate

simply supported plate where the connection is achieved by an elastic support around the perimeter of the plate

NOTE A car windscreen joint, shown in Figure B.3, is a flexibly connected plate where there is no overlap between the plate and its support, hence the plate may be pushed in the boat by the outside pressure.

3.19
watertightness

capacity of an appliance or a fitting to prevent ingress of water inside the boat

3.20
degree of watertightness

capacity of an appliance or fitting to resist ingress of water according to the conditions of exposure to water

3.20.1
degree of watertightness 1

protection against effects of continuous immersion in water

3.20.2
degree of watertightness 2

protection against effects of temporary immersion in water

3.20.3
degree of watertightness 3

protection against splashing water

3.20.4
degree of watertightness 4

protection against water drops falling at an angle of up to 15° from the vertical

3.21
glass material

3.21.1
annealed glass
sheet glass

glass as delivered directly from the fabrication cycle without subsequent treatment

3.21.2**tempered glass****toughened safety glass**

glass where better mechanical properties are obtained by thermal treatment

3.21.3**chemically reinforced glass**

glass where better mechanical properties are obtained by chemical treatment

3.21.4**monolithic glass**

glass consisting of one ply of glass

3.21.5**laminated glass**

multi-layer sheet having glass as outer plies, where the inside plies are made of plastic inter-layers, plastic sheets, glass, or other glazing material

4 General requirements**4.1 General**

Other International Standards, e.g. dealing with stability and buoyancy, may have restrictions on the position of appliances which are outside the scope of this International Standard and which are therefore not treated here. It is however necessary for the builder or user to ensure that the appliances comply with other relevant International Standards.

4.2 Strength

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The strength of plates, framing, tracks and fastening shall meet the requirements of this International Standard.

4.3 Positive closure

Opening appliances shall be positively fixed, when closed, to avoid any inadvertent opening.

EXAMPLES Bolts, latches.

4.4 Watertightness

To avoid flooding, all appliances shall be designed and fixed to prevent substantial ingress of water when closed.

4.4.1 Minimum degree of watertightness

The required minimum degree of watertightness of an appliance is a function of the boat's design category. These requirements are given in Table 1.

The required degree of watertightness of prefabricated appliances shall be tested by the appliance manufacturer before installation on the craft, according to Table 1, using the test method defined in D.1.1.

The required degree of watertightness of any appliance, after installation on the craft, shall meet the requirements of Table 1.

If tests are made, the method described in D.1.2 should be used. Tests are however not normally required.

Table 1 — Minimum degree of watertightness

Type of boat	Appliance location area	Type of appliance	Design category			
			A	B	C	D
Any	Area I	Any	2	2	2	2
Any	Area II	Any	2	2	3	4
Any	Area II	Sliding companionway hatch	3	3	3	4
Any	Area III	Any	3	3	3	4
Sailing monohull	Area IV	Any	3	3	3	4
Motor + Multihull	Area IV	Any	3	3	4	4

The above degrees of watertightness are only required for appliances. The degree of watertightness of any device which is not built into the appliance, for example a ventilation system, but fitted by the boat manufacturer after the purchase of prefabricated appliances, is outside the scope of this International Standard, but shall meet the requirements of any other relevant International Standard. Regarding watertightness of cockpits, the requirements of ISO 11812 shall be met.

4.4.2 Additional requirements related to watertightness

4.4.2.1 Sliding appliances

Sliding appliances shall not be used in Area I.

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4.4.2.2 Deck hatches of trimaran outrigger hulls

Hatches fitted on the decks of trimaran outrigger hulls shall not be sliding appliances.

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5 Plate materials

5.1 General

Appliance plates shall be made of

- a transparent glazing material, such as poly(methyl)methacrylate (PMMA), polycarbonate (PC), tempered glass (3.21.2), chemically reinforced glass (3.21.3) or laminated glass (3.21.5), or
- a non-transparent plate material, such as plywood (PW), glass-fibre reinforced thermosetting plastic (GRP), aluminium alloy, steel, etc.; or
- any other material of strength and stiffness equivalent to those cited above.

5.2 Acrylic sheet materials

Poly(methyl)methacrylate (PMMA) made with a technique other than the casting procedure shall have mechanical properties and resistance to ageing at least equal to those of cast PMMA.

5.3 Glass

5.3.1 Restrictions of usage

The use of glass is restricted to clauses 5.3.1.1 and 5.3.1.2 plus 6.1.1.1 for use of simply supported plates, 6.3.1.4 for use in Area I and 6.3.2 for use in Area II.

5.3.1.1 Monolithic glass

Monolithic glass (3.21.4) shall only be made of tempered glass (3.21.2), or chemically reinforced glass (3.21.3).

5.3.1.2 Laminated glass

The glass plies used in laminated glass (3.21.5) can be made of any type of glass.

6 Specific requirements

6.1 End connection and location of plate

6.1.1 Simply supported plates

6.1.1.1 Plates in Area I

Simply supported plates shall not be used in Area I:

- on sailing monohulls in design categories A and B and sailing multihulls in design category A;
- on motor boats in design category A.

On other types of craft and design categories, simply supported plates may be used provided that all the following conditions are met:

- the glazing material is PMMA or PC (see clause 5);
- the plate thickness is equal to 1,3 times the one required by clause 7;
- the fixing devices of the plate (hinge bolts, fixing knob, etc.) are not spaced more than 250 mm.

The above restrictions of use need not be considered if the appliance is equipped with a deadlight meeting the requirements of 6.3.6.

6.1.1.2 Flexibly connected plates

Flexibly connected plates may only be used on motor boats of design categories C and D in Areas III and IV.

6.1.2 Semi-fixed plates

6.1.2.1 Plates made of material other than glass

Semi-fixed plates may be used in boats of all design categories and in all location areas with the restrictions of the special requirements given in 6.3.