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## Small craft — Seacocks and through-hull fittings

*Petits navires — Vannes de coque et passe-coques*

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Reference number  
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CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

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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](http://www.iso.org/directives)).

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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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 188, *Small craft*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 464, *Small craft*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 9093 cancels and replaces ISO 9093-1:1994 and ISO 9093-2:2002, which have been technically revised.

The main changes compared to the previous editions are as follows:

- the previous 2 parts have been combined into a single-part standard;
- the definition of corrosion resistance has changed;
- an installed strength test has been added ([Annex A](#));
- a test for corrosion resistance has been added ([Annex B](#));
- a test for UV stabilisation has been added ([Annex C](#)).

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](http://www.iso.org/members.html).

# Small craft — Seacocks and through-hull fittings

## 1 Scope

This document specifies requirements for through-hull fittings, seacocks, hose connections, their fittings and their installation in small craft with a length of hull,  $L_H$ , as defined in ISO 8666:2016, of up to 24 m.

This document is not applicable to engine and heater exhaust fittings, and sail drive through-hull fittings.

## 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 4892-3:2016, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 6509-1:2014, *Corrosion of metals and alloys — Determination of dezincification resistance of copper alloys with zinc — Part 1: Test method*

ISO 6509-2:2017, *Corrosion of metals and alloys — Determination of dezincification resistance of copper alloys with zinc — Part 2: Assessment criteria*

ISO 14993:2018, *Corrosion of metals and alloys — Accelerated testing involving cyclic exposure to salt mist, dry and wet conditions*

## 3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1

#### **through-hull fitting**

device fitting designed to permit passage of liquids including suspended solids or gases through the hull

### 3.2

#### **seacock**

shut-off device intended to prevent the ingress of water, normally directly fitted to a hull or a through-hull fitting

### 3.3

#### **accessible**

capable of being reached for inspection, removal or maintenance without removal of permanent craft structure

### 3.4

#### **readily accessible**

capable of being reached quickly and safely for effective use under emergency conditions without the use of tools

### 3.5

#### **maximum load waterline**

waterline of the craft when upright in the fully loaded ready-for-use  $m_{LDC}$  condition

Note 1 to entry: The fully loaded ready-for use condition is defined in ISO 8666:2016, 6.3.

### 3.6

#### **heeled waterline**

level of the water on the hull in the fully loaded ready-for-use  $m_{LDC}$  condition when the craft is inclined to

- 7° for motor boats and sailing multihulls; or
- 30° or immersion of the sheerline, whichever occurs first, for monohull sailing boats

Note 1 to entry: The fully loaded ready-for use condition is defined in ISO 8666:2016, 6.3.

### 3.7

#### **hose fitting**

component used to connect a through-hull fitting or a seacock to an associated hose

## 4 Material requirements

### 4.1 General

Materials used for through-hull fittings, seacocks, hose connection and fittings located below the maximum load waterline shall be corrosion-resistant.

Materials used above the waterline shall be corrosion resistant or shall have protection against corrosion, taking into account the various and changing media that pass through the fitting (for example fresh, salt or brackish water with impurities; waste water from toilet systems or holding tanks).

Brass materials shall be dezincification resistant (DZR) when tested in accordance with ISO 6509-1:2014 and assessed in accordance with ISO 6509-2:2017.

### 4.2 Material combinations

The combination of different materials including fastening elements shall take into consideration the possibility of galvanic action.

Materials that act galvanically with others used in the system may be used if they are galvanically isolated.

The combination or choice of non-metallic materials shall be made taking into account the possibility of swelling and/or seizure.

Materials in contact with each other shall not prevent the device and/or system from acting as intended.

Non-ferrous metals other than aluminium alloys shall not be used when aluminium is incorporated in the system.

### 4.3 Resistance to deterioration/corrosion tests

All metallic components shall be corrosion resistant. The requirement for corrosion resistance shall be met through testing as per [Annex B](#).

All non-metallic parts shall be stabilized against oxidation and UV. The requirement for UV stabilisation shall be met through testing as per [Annex C](#).

**4.4 Strength requirements**

Seacocks, through-hull fittings and hose fittings shall fulfil the requirements of the strength test according to [Annex A](#).

**4.5 Range of operating temperatures**

**4.5.1 General operating requirements**

Seacocks and through-hull fittings shall be operable through the full temperature range of 0 °C to + 60 °C and shall show no defect that will impair the function.

**4.5.2 Storage temperature requirement**

Seacocks and through-hull fittings shall withstand a storage temperature without operation of –40 °C to +60 °C when kept dry.

**4.5.3 High temperature operating test**

Seacocks shall be filled with water and, after preconditioning for 24 h at 60 °C, shall be operable.

**4.5.4 Low temperature operating test**

Seacocks shall be filled with salt water and, after preconditioning for 24 h at 0 °C, shall be operable.

NOTE Salt water test liquid is defined in ISO 14993:2018, Clause 4,

**5 Through-hull fittings**

**5.1 Thread identification**

If the fitting is threaded, the manufacturer shall identify the size and type of thread by permanently marking the fitting or the packaging.

Some examples of through-hull fittings are given in [Table 1](#). Other types are acceptable if equivalent strength and tightness are demonstrated.

**Table 1 — Examples of through-hull fittings**

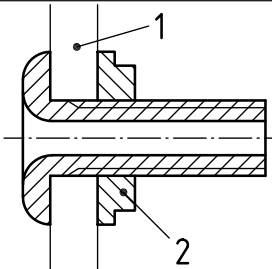
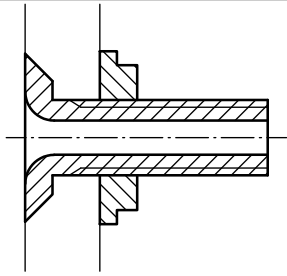
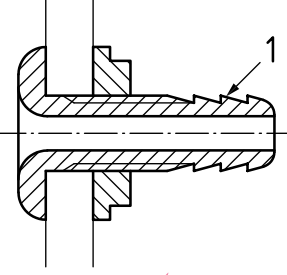
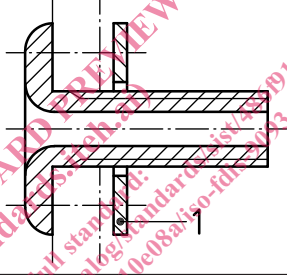
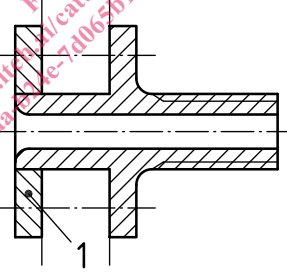
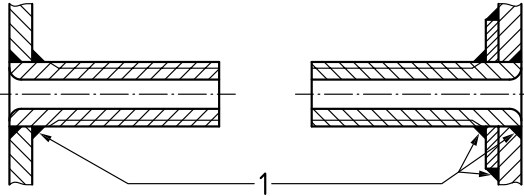
No	Description	Illustration
1	Through-hull fitting with a plate outside and a flanged nut inside, with the stem threaded, where tightness is achieved by tightening the flanged nut.	 <p>1) hull 2) flanged nut</p>

Table 1 (continued)

No	Description	Illustration	
2	Through-hull fitting as under 1, but with a counter-sunk outside plate, forming a flat surface with the outside craft hull.		
3	Through-hull fitting as under 1, where the end of the stem forms a hose fitting.		1) hose fitting
4	Through-hull fitting with a plate outside; the plate is fastened to the hull by screws or screws with nuts and an internal counterplate.		1) counterplate inside
5	Through-hull fitting with a plate inside, where the plate is fastened to the hull by screws, or screws with nuts and an external counterplate.		1) counterplate outside
6	Through-hull fitting consisting of a pipe or stud welded to the hull.		1) welded in

5.2 General design requirements

The through-hull fitting shall present a secure and watertight connection that cannot be dislodged by outside forces due to operation of the fitting and components attached to it, e.g. a seacock.

5.3 Detailed design requirements

5.3.1 Stem

The stem length shall be sized considering the varying hull thicknesses, depending on the hull material and construction.



After installation, the minimum remaining thread length shall be at least 1,5 times the minimum thread length specified in [Table 2](#).

The wall thickness of the stem shall ensure that the remaining strength after machining is adequate for the torque applied during installation and the use of the fitting.

**Table 2 — Through-hull fitting minimum thread lengths**

Minimum length of thread $L_1$ mm	Nominal thread diameter $D_{nom}$ in
10	G 1/4
11	G 3/8
12	G 1/2
13	G 3/4
16	G 1
18	G 1 1/4
20	G 1 1/2
22	G 2
25	G 2 1/4
28	G 3
30	G 4

NOTE G is the thread designation.

### 5.3.2 Flange diameter

The diameter of the plate shall not be less than that of the flanged nut or counterplate.

### 5.3.3 Finish

The surface of the plate, nut or counterplate shall not present a sharp edge towards the hull. Edges shall be rounded or chamfered.

## 6 Seacocks — Design requirements

### 6.1 General

The seacock shall be designed to permit:

- operation under any condition likely to be encountered under normal service conditions;
- a visual check of the open and closed position.

The length of the handle and the clear distance between handle and intake and discharge line shall be sufficient to allow for easy operation.

The design of the seacock shall ensure that no part can come loose under normal service conditions.

### 6.2 Thread length requirements

The seacock assembly shall have a minimum threaded length for attachment to through-hull fittings (see [Table 2](#) and [Figure 1](#)).