

# INTERNATIONAL STANDARD

# ISO 9093

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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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## 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)).

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](http://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](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 8666:2020, 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 8666:2020, 7.3.

### 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 8666:2020, 7.3.

### 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 connections 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 their 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**

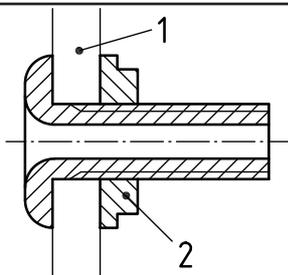
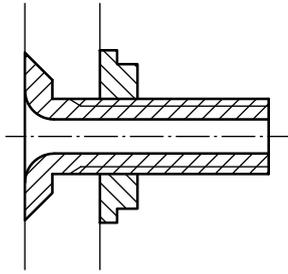
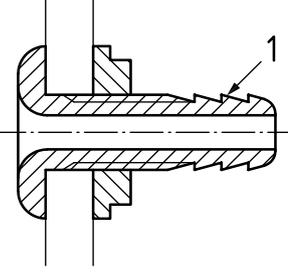
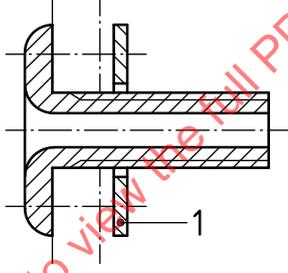
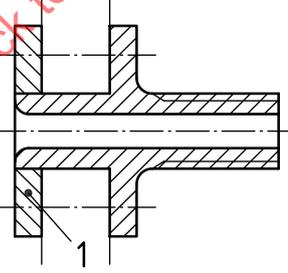
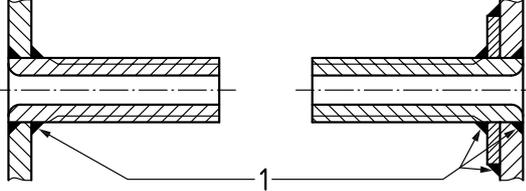
No	Description	Illustration
1	Through-hull fitting with a plate outside and a flanged nut inside, with the stem threaded, where tightness is achieved by tightening the flanged nut.	 <p>1) hull 2) flanged nut</p>

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](#)).

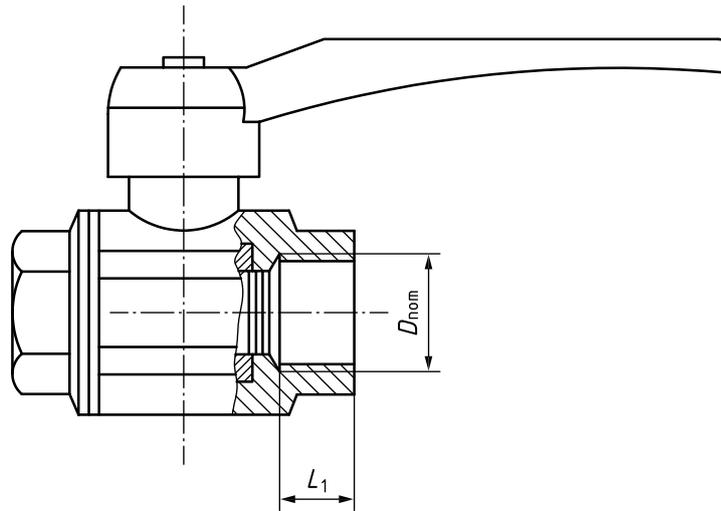


Figure 1 — Seacock

## 7 Hose fittings

### 7.1 Design requirements

The hose fitting end shall be one of the following configurations (see [Figure 2](#)):

- a) ribbed or serrated (all nominal sizes);
- b) plain pipe end with nominal size 31,75 mm (1¼ in) and above.

The clamping length,  $L$  (see [Figure 2](#)), shall allow for double clamp fastening of the hose and shall be not less than:

- c) 25 mm for nominal sizes 25,4 mm (1 in) and below;
- d) 35 mm for nominal sizes above 25,4 mm (1 in).

The end of the hose fitting shall be rounded or chamfered.

### 7.2 Hose connection

**7.2.1** Where the centreline of the through-hull fitting is lower than the heeled waterline, hoses shall be fastened by:

- a) double clamps for nominal hose sizes of 25,4 mm (1 in) and below, or
- b) double clamps or a single T bolt clamp for nominal sizes of more than 25,4 mm (1 in).

**7.2.2** Double clamps shall be fitted when plain pipe ends are used.

**7.2.3** Metallic hose clamps shall be made of stainless steel, type Cr18-Ni8 or higher corrosion resistance property and they shall be reusable.

**7.2.4** Clamps depending on spring tension shall not be used.

7.2.5 Clamps shall be fastened to the plain, serrated, or ribbed end of the stem.

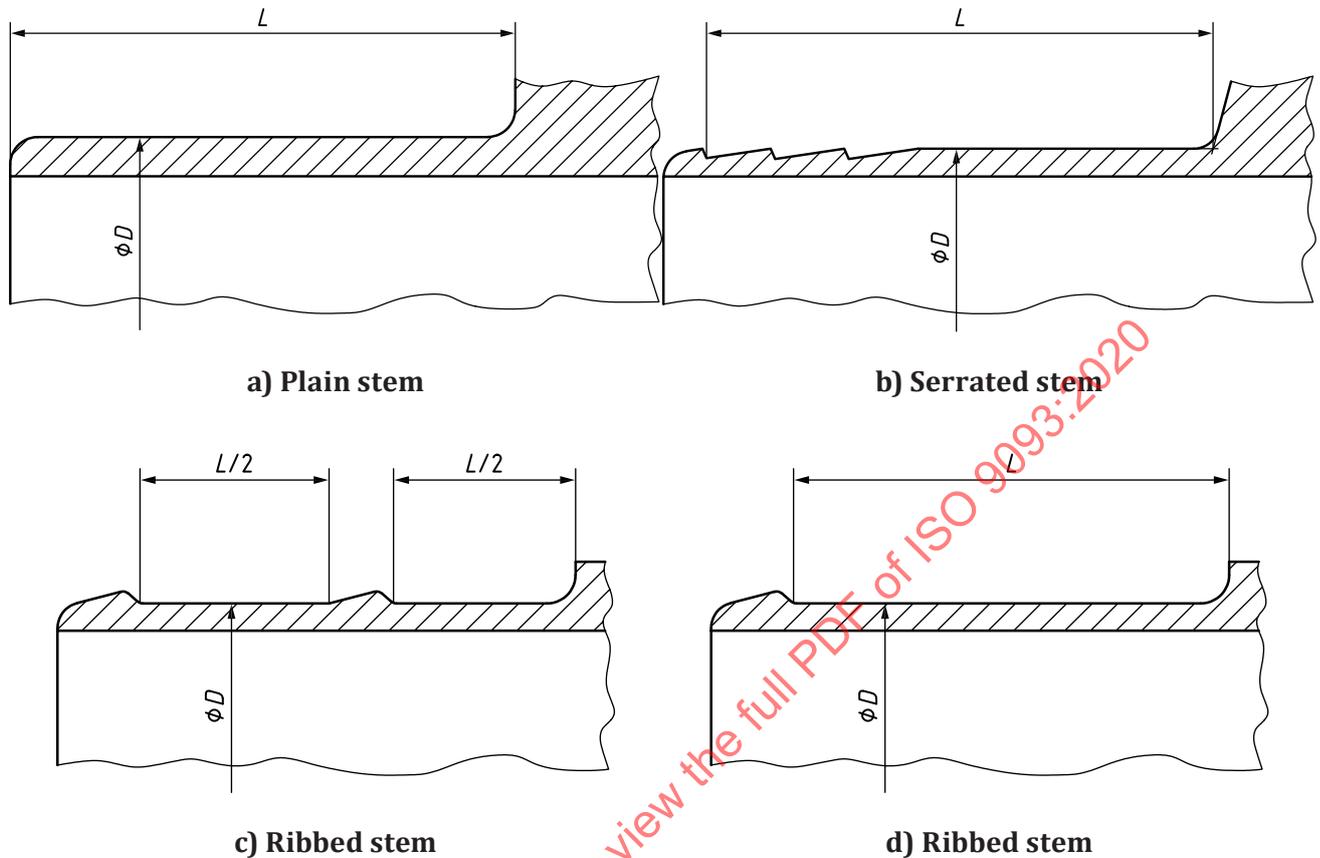


Figure 2 — Examples of hose fittings

## 8 Water scoops and outboard water strainers

Water intake connections may be fitted with outboard strainers and/or water scoops. Where cleaning of the intake piping and through-hull connection cannot be accomplished by other means, outboard strainers and/or water scoops shall be removable.

## 9 Installation

### 9.1 Hull reinforcements

Where the fitting of a seacock or through-hull fitting adds stresses and deflection to the hull, the area shall, where relevant, be reinforced/stiffened accordingly

In reinforced plastic hulls built in sandwich construction, the core material shall be made of a material that does not yield significantly when compressed by tightening, or the area around the fitting shall be built in single skin construction with local reinforcement.

NOTE See ISO 12215-6:2008, 7.6.

### 9.2 Installation requirements

9.2.1 When installed, through-hull fittings and seacocks shall be watertight and secure to prevent loosening under normal operating conditions.

9.2.2 Seacocks shall be accessible for inspection.

9.2.3 Seacocks below the maximum load waterline shall be readily accessible for inspection and operation.

9.2.4 Seacocks shall be securely fastened to the hull to permit easy operation without damage to the hull structure or to the seacock itself and without destroying the watertight integrity or the seacock installation.

9.2.5 The assembly, as installed, shall be tested in accordance with [Annex A](#).

9.2.6 Seacocks and through-hull fittings shall be located so as to minimize the likelihood of damage to them or inadvertent operation.

## 10 Device installation information

10.1 The manufacturer of through-hull fittings, seacocks and hose fitting shall supply the following information:

- type of thread nominal bore diameter or thread size.

10.2 In addition, for non-metallic devices, the following information shall also be supplied:

- name of manufacturer;
- types of bedding compounds to be used when relevant;
- installation requirements;
- maximum torque for tightening during installation;
- material specification.

## 11 Owner's manual

The owner's manual for the craft shall contain at least the following information:

- location of the seacocks;
- operating instructions, if relevant;
- maintenance and servicing instructions according to the environment of the craft including the requirement for an annual visual inspection and physical test of the seacocks functionality;
- warning notice as to keeping seacocks closed when not needed for operation to minimize the risk of flooding (e.g. water inlet of toilet flushing line).

## Annex A (normative)

### Strength test

#### A.1 General

Materials for fittings shall meet the minimum physical properties specified in [Clauses A.2](#) and [A.3](#) at room temperature 15 °C to 25 °C (59 °F to 77 °F) in dry condition.

#### A.2 Component test

Fit the component securely to a test rig baseplate, rigid enough to prevent flexing of the rig during the test.

From a position 20 mm inside the outboard end in the most vulnerable direction of the fitting or assembly, to the most inboard end of the assembly, e.g.

- the through-hull fitting; or
- the seacock; or
- the hose fitting,

apply a force of at least:

- a) 1 500 N for nominal sizes 25,4 mm (1 in) and below;
- b) 2 224 N for nominal sizes above 25,4 mm (1 in).

The assembly shall show no leakage to the outside of the assembly when subjected to an internal water pressure of 0,1 MPa (1 bar) after this strength test, and shall perform as intended.

Disassemble the assembly. No part of the fitting or assembly shall display any sign of damage effecting its function and the seacock shall remain operable.

#### A.3 Assembly test

The assembly, as installed or a representative sample, shall be tested for 30 s perpendicular to the inboard end of the assembly. Apply a force of at least:

- a) 1 500 N for nominal sizes 25,4 mm (1 in) and below;
- b) 2 224 N for nominal sizes above 25,4 mm (1 in).

The assembly shall show no leakage to the outside of the assembly when subjected to an internal water pressure of 0,1 MPa (1 bar) after this strength test, and shall perform as intended.

Disassemble the assembly. No part of the fitting or assembly shall display any sign of damage effecting its function and the seacock shall remain operable.

**Annex B**  
(normative)

**Corrosion resistance test**

There shall be no degradation of a component formed of a metallic material to the extent that the operation of a through-hull fitting or seacock is impaired following completion of the tests as described below.

For brass materials, the test shall be as specified in ISO 6509-1:2014. If necessary, the tests should be assessed according to ISO 6509-2:2017.

For all other metallic materials, the test shall be as specified in ISO 14993:2018.

Once the tests above have been completed, the strength test as specified in [Clause A.2](#) shall be successfully completed.

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