
**Ships and marine technology —
Design and test requirements for
small steel hatches using electrical
trace heating**

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ISO 24319:2022

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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).

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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.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 8, *Ship design*.

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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.

Ships and marine technology — Design and test requirements for small steel hatches using electrical trace heating

1 Scope

This document specifies the design, materials, quality of manufacture, test and designation of electrical trace heating for small steel hatches onboard vessels sailing in low temperature environments (below $-10\text{ }^{\circ}\text{C}$).

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 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

IACS UR S26, *Strength and Securing of Small Hatches on the Exposed Fore Deck*

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

heated small steel hatch

hatch made of steel installed onboard vessels, sailing in *low temperature environments* (3.4), enabling people to open normally by adding heat through the *trace heater cable* (3.3)

3.2

trace heater

device designed for the purpose of producing heat on the principle of electrical resistance and typically composed of one or more metallic conductors or an electrically conductive material, suitably electrically insulated and protected

Note 1 to entry: This can be in the form of a *trace heater cable* (3.3), heater panel or heated pad.

[SOURCE: IEC 60519-10:2013, 3.115]

3.3

trace heater cable

circular to flattened cable shaped construction with one or more discrete or continuous electrically insulated heating elements

Note 1 to entry: This cable is able to self-regulate its heating output power due to ambient temperature.

[SOURCE: IEC 60519-10:2013, 3.116]

3.4

low temperature environment

water with the lowest mean daily low temperature below $-10\text{ }^{\circ}\text{C}$, such as the Arctic Ocean, St. Francis Bay, North Baltic, Okhotsk, Bohai and North Yellow Sea

Note 1 to entry: In general, these waters are covered by regional sea ice during winter.

[SOURCE: IMO MSC.385 (94), 1.2.12^[2], modified]

4 Design

4.1 Structure

4.1.1 Types of heated small steel hatches

The heated small steel hatches are classified into three types, as shown in [Table 1](#) and from [Figure 1](#) to [Figure 3](#).

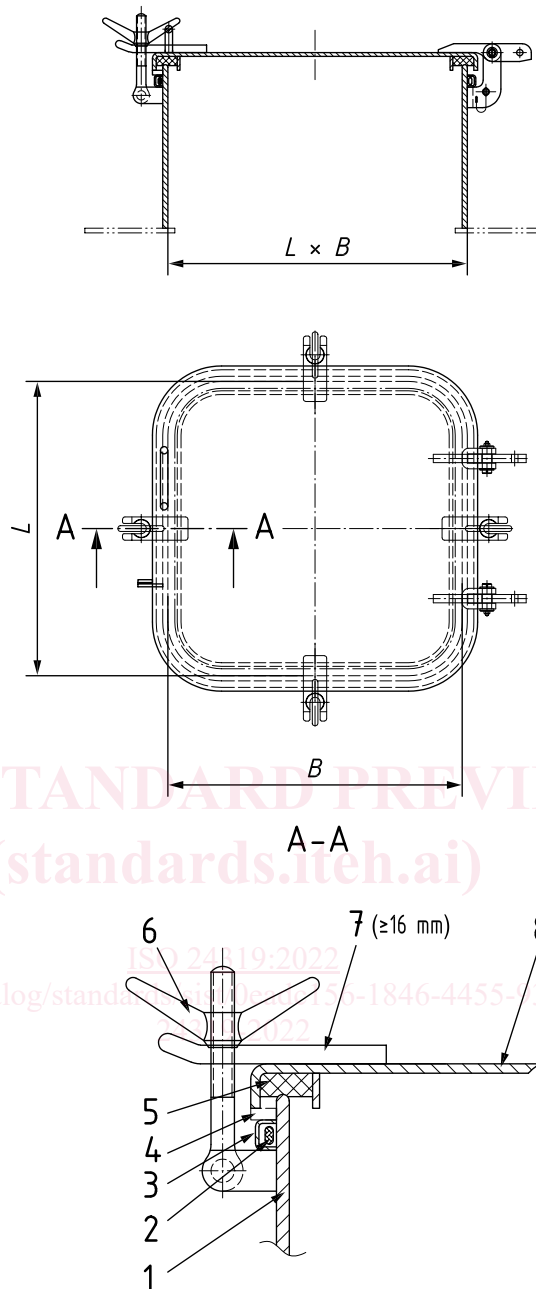
Table 1 — Types of heated steel hatches

Type	Definition
A	heated small steel hatch whose locking mode is butterfly nut open
B	heated small steel hatch whose locking mode is wedge handle open
C	heated small steel hatch whose locking mode is hand wheel linkage open

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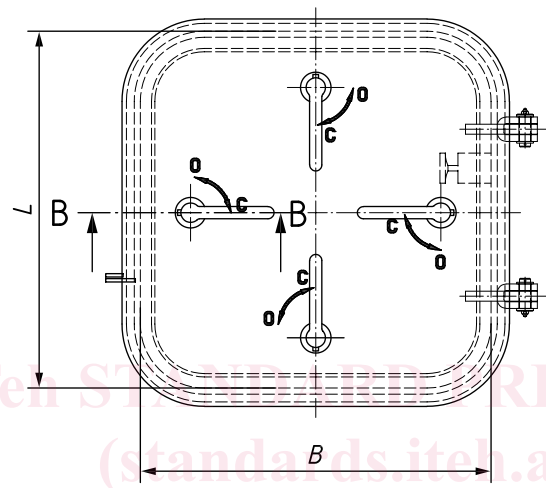
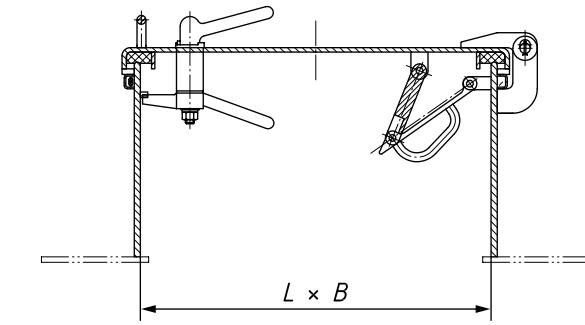


Key

- | | | | |
|---|--|----------|--------------------------------|
| 1 | coaming | 6 | wing nut clamp (typical shape) |
| 2 | electrical self-regulating trace heating cable | 7 | press plate |
| 3 | protect housing | 8 | cover |
| 4 | metal load-bearing plate | <i>B</i> | breadth |
| 5 | sealing rubber stripe | <i>L</i> | length |

NOTE This figure is only a typical form, and the closing devices are determined according to the specification of the heated small steel hatch. For the closing devices and hinges position arrangement, refer to [Annex A](#).

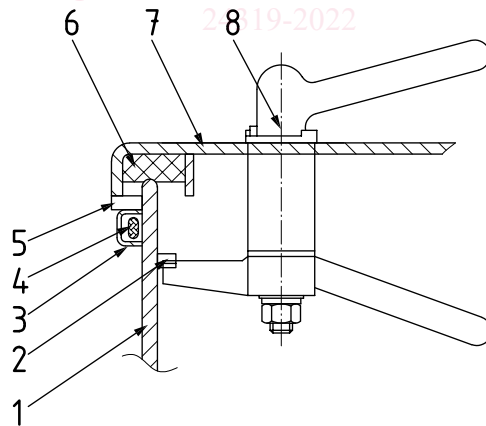
Figure 1 — Type A



B-B

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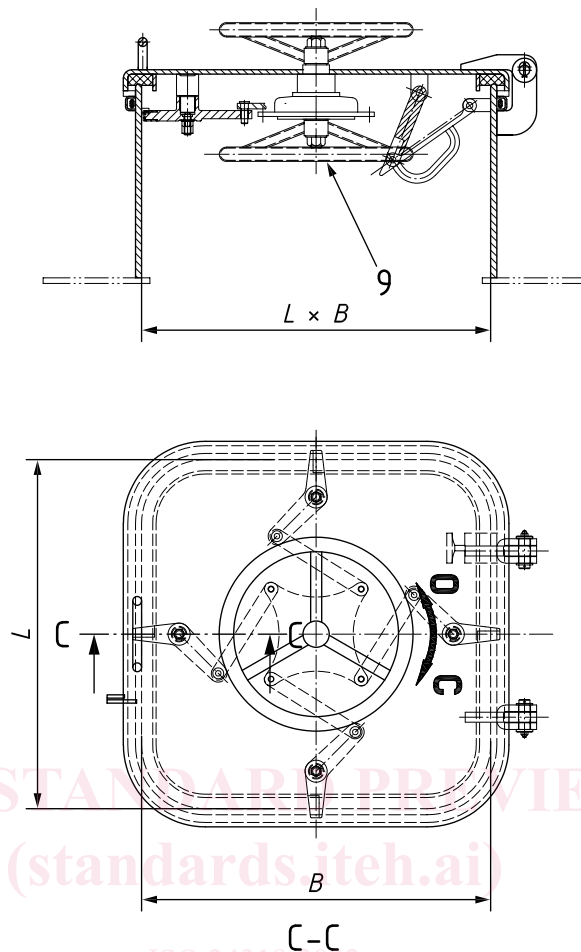


Key

- | | | | |
|---|--|----------|-----------------------|
| 1 | coaming | 6 | sealing rubber stripe |
| 2 | wedge | 7 | cover |
| 3 | protect housing | 8 | wedge handle |
| 4 | electrical self-regulating trace heating cable | <i>B</i> | breadth |
| 5 | metal load-bearing plate | <i>L</i> | length |

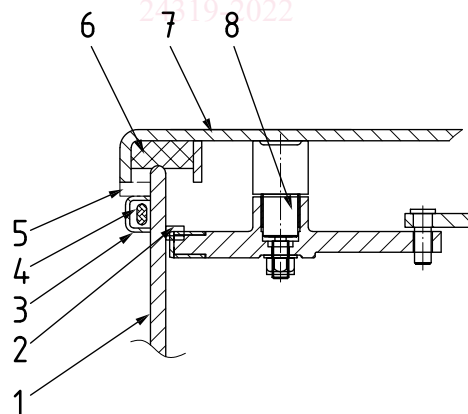
NOTE This figure is only a typical form, and the closing devices are determined according to the specification of the heated small steel hatch. For the closing devices and hinges position arrangement, refer to [Annex A](#).

Figure 2 — Type B



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Key

- | | | | |
|---|--|----------|------------|
| 1 | coaming | 7 | cover |
| 2 | wedge | 8 | clip |
| 3 | protect housing | 9 | hand wheel |
| 4 | electrical self-regulating trace heating cable | <i>B</i> | breadth |
| 5 | metal load-bearing plate | <i>L</i> | length |
| 6 | sealing rubber stripe | | |

NOTE This figure is only a typical form, and the closing devices are determined according to the specification of the heated small steel hatch. For the closing devices and hinges position arrangement, refer to [Annex A](#).

Figure 3 — Type C

4.1.2 Sealing rubber stripe

The section dimension of sealing rubber stripe is 45 mm × 20 mm (see [Figure 4](#)), and allowable initial compression is 2 mm.

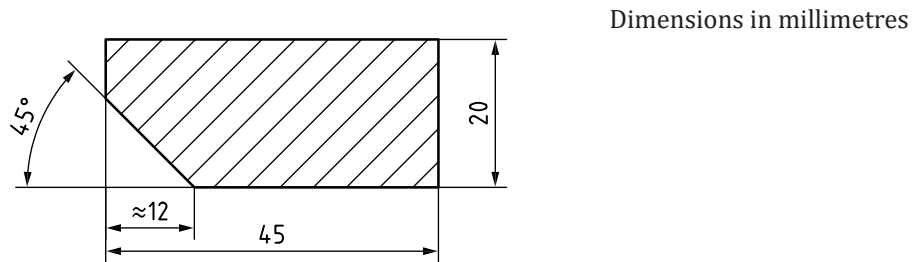


Figure 4 — Cross-section dimension of sealing rubber stripe

The sealing rubber stripe shall be installed on the cover plate as shown in [Figure 2](#), fixed with a baffle and shall be glued on the cover plate with marine glue.

Ensure that there is a metal load-bearing plate on or near the centre line of each closing device, and the compression of the sealing rubber stripe is less than 4 mm.

4.1.3 Other

Balancing blocks or spring hinges can be provided for the hatch cover when necessary, to facilitate the opening of the hatch cover.

When the interior of the heated small hatch needs to be filled with insulation material, it should be protected by the sealing plate. The size of clear opening of the heated small hatch should not be affected, whether or not insulation material is installed.

When the heated small hatch is located in accordance with the requirement of IACS UR S26, its cover, coaming and fastening shall also satisfy the requirements of IACS UR S26.

4.2 Performance

4.2.1 Weather-tightness

The heated small steel hatch should be weather-tight.

4.2.2 Anti-icing

The heated small hatch should be anti-icing for the cover coaming and shall be opened in a low temperature.

5 Materials

5.1 Hatch cover

The coamings and covers shall be manufactured by weldable steel with minimum tensile strength of 235 N/mm² or equivalent shipbuilding-quality steel. The low temperature performance of the material shall conform to the specifications or shall not be lower than the material grade of the hull at the installation position.

The hatch-seal retaining bars, hinges, press plates and ancillary fittings shall be manufactured by weldable steel with minimum tensile strength of 235 N/mm². The low temperature performance of the

material shall meet the specifications or shall not be lower than that of the material grade of the hull at the installation position.

Bolts and pins shall be made of corrosion resistant materials with minimum tensile strength of 235 N/mm², which can work normally in a low temperature environment.

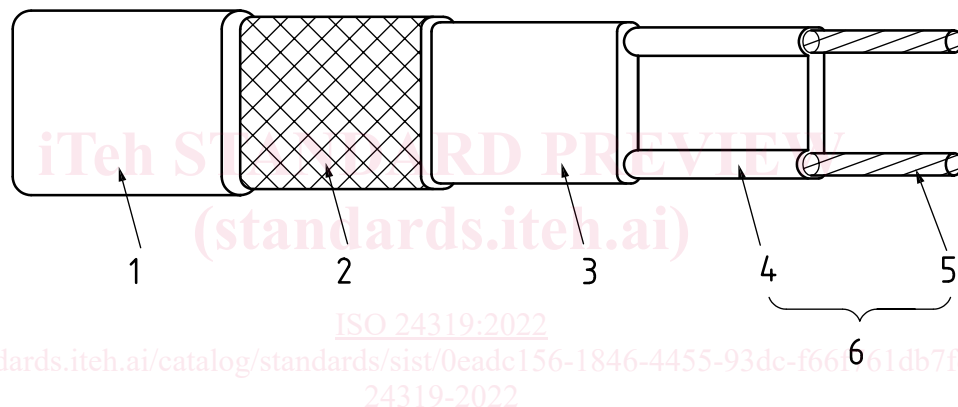
The elastic material of sealing rubber stripe shall meet the requirements of a low temperature environment. The sealing rubber stripe shall work normally in the normal temperature and low temperature alternating cycle environment, and provide effective and lasting sealing and re-sealing performance when the heated small steel hatch is tightened.

Neutral lubricating grease is applied to the movable part of small steel hatches, and it shall work normally in a low temperature environment.

Small steel hatch can be filled inside with insulating material according to the actual condition. The insulating material should operate normally in a low temperature environment.

5.2 Trace heater cable

The structure of trace heater cable^[3] is shown in Figure 5.



Key

- 1 outer sheath
- 2 metal shielding layer
- 3 insulating layer
- 4 thermal resistor
- 5 conductor
- 6 core tape

Figure 5 — Structure of trace heater cable

The trace heater cable is made up of a conductor, thermal resistor, insulating layers and a metal shielding layer that is covered with outer sheath (non-metallic).

The core tape consists of a thermal resistor and conductor. The conductor is made of multiple twisted or braided tinning or nickel-copper wire, and the section shape of core tape is dumbbell or flat circle.

The insulating layer may be high density polyethylene (HDPE), fluorinated ethylene propylene (FEP), perfluoroalkoxy alkane (PFA), or other proven materials.

The metal shielding layers shall be braided with galvanized copper wire or other wire material. The braiding layer shall be evenly and smoothly covered with insulating layer.

The outer sheath may be HDPE, FEP, PFA, or other proven materials.