INTERNATIONAL STANDARD

ISO 17941

First edition
2015-03-01

Ships and marine technology — Hydraulic hinged watertight fireproof doors

Navires et technologie maritime — Portes étanches incombustibles à charnières hydrauliques

Reference number
ISO 17941:2015(E)

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Published in Switzerland

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Foreword

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The committee responsible for this document is ISO/TC 8, *Ships and marine technology*, Subcommittee SC 8, *Ship design*.

Introduction

Fire-proof doors shall comply with the requirements of IMO FTP-code. The standard provides reference for design, manufacturing and inspection of hydraulic watertight hinged fireproof doors, so it is not imperative for shipyards to implement the standard.

Ships and marine technology — Hydraulic hinged watertight fireproof doors

1 Scope

This International Standard specifies classification and designation, requirements, test method, marking, packaging, transport, and storage of hydraulic watertight hinged fireproof doors (hereinafter referred to as "watertight doors").

This International Standard is applicable to the design, manufacture, and acceptance of hydraulic watertight hinged fireproof doors with water pressure not more than 1,0 MPa used for ships, other floating structures and ocean engineering.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3796, *Ships and marine technology — Clear openings for external single-leaf doors*

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*

IEC 61162-1:2010, *Maritime navigation and radio communication equipment and systems — Digital interfaces — Part 1: Single talker and multiple listeners*

AWS D1.1/D1M:2008, *Structural Welding Code — Steel*

IMO Resolution MSC.302 (87), *Adoption of performance standards for Bridge Alert Management*

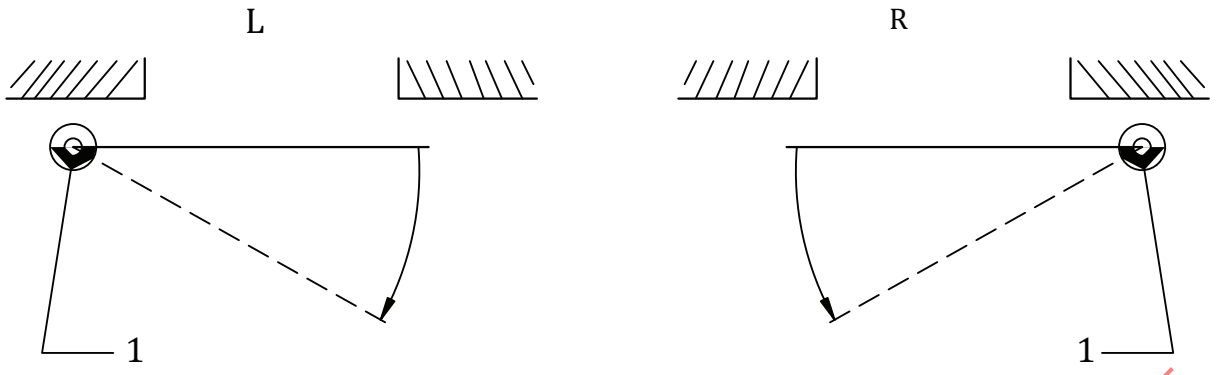
3 Classification and designation

3.1 Types

3.1.1 Depending on the opening direction, watertight doors shall be classified into two types (see Figure 1):

— Type R-Right-hand watertight door (the hinge stays right when the door opens towards the observer);

— Type L-Left-hand watertight door (the hinge stays left when the door opens towards the observer).



Key

1 hinge
L left-hand door
R right-hand door

Figure 1 — Opening directions

3.1.2 According to the fire-protection rating, watertight doors shall be classified into four levels: A-60, A-30, A-15, and A-0.

3.2 Structure and main dimensions

3.2.1 The structure and main dimensions of watertight doors shall be in accordance with Table 1 and Figure 2. The nominal size, $L \times B$, of watertight doors is denoted by reference to the clear opening according to ISO 3796. Watertight doors of other dimensions can be provided upon agreement between manufacturer and purchaser.

Table 1 — Main dimensions for watertight door

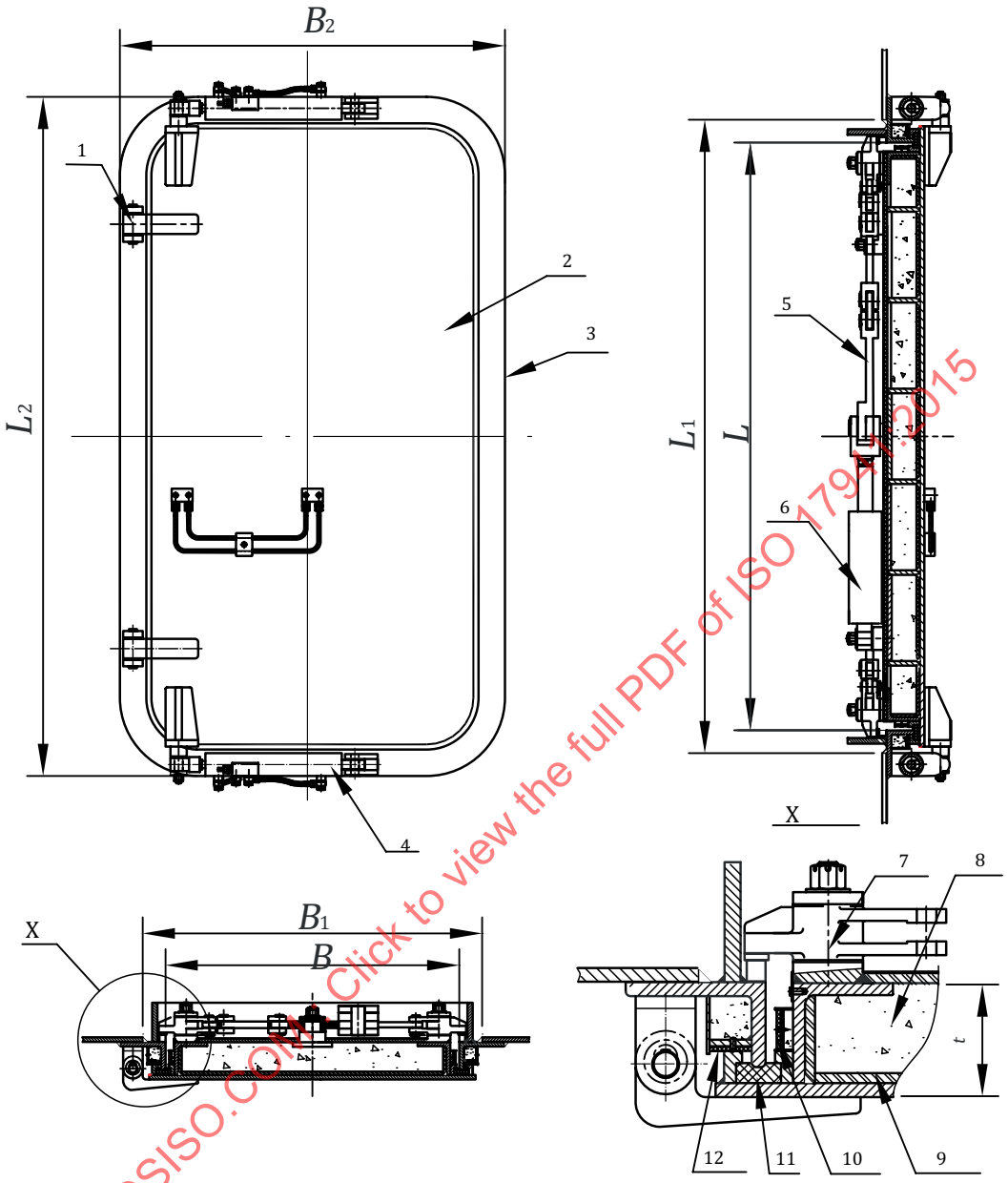
Dimensions in millimetres

Nominal size	Opening in the bulkhead plate		Door frames	
$L \times B$	L_1	B_1	L_2	B_2
1 200 × 600	1 340	740	1 480	880
1 400 × 600	1 540	740	1 680	880
1 400 × 750	1 540	890	1 680	1 030
1 400 × 900	1 540	1 040	1 680	1 180
1 600 × 600	1 740	740	1 880	880
1 600 × 750	1 740	890	1 880	1 030
1 600 × 900	1 740	1 040	1 880	1 180
1 800 × 750	1 940	890	2 080	1 030
1 800 × 900	1 940	1 040	2 080	1 180

The tolerance is as follows:

— Nominal size: $^{0}_{-2}$ mm;

— Opening in the bulkhead panel and door frames: $^{+2}_{-2}$ mm.



Key

1	hinge	7	dog
2	door panel	8	insulation
3	door frame	9	insulation plate
4	door opening/closing cylinder	10	fire-resistant sealing strip II
5	driving mechanism	11	sealing strip
6	lock cylinder	12	fire-resistant sealing strip I

Figure 2 — Left-hand watertight door (Right-hand watertight door in contrast)

3.2.2 The door panel's sealing mechanism shall ensure the door is watertight.

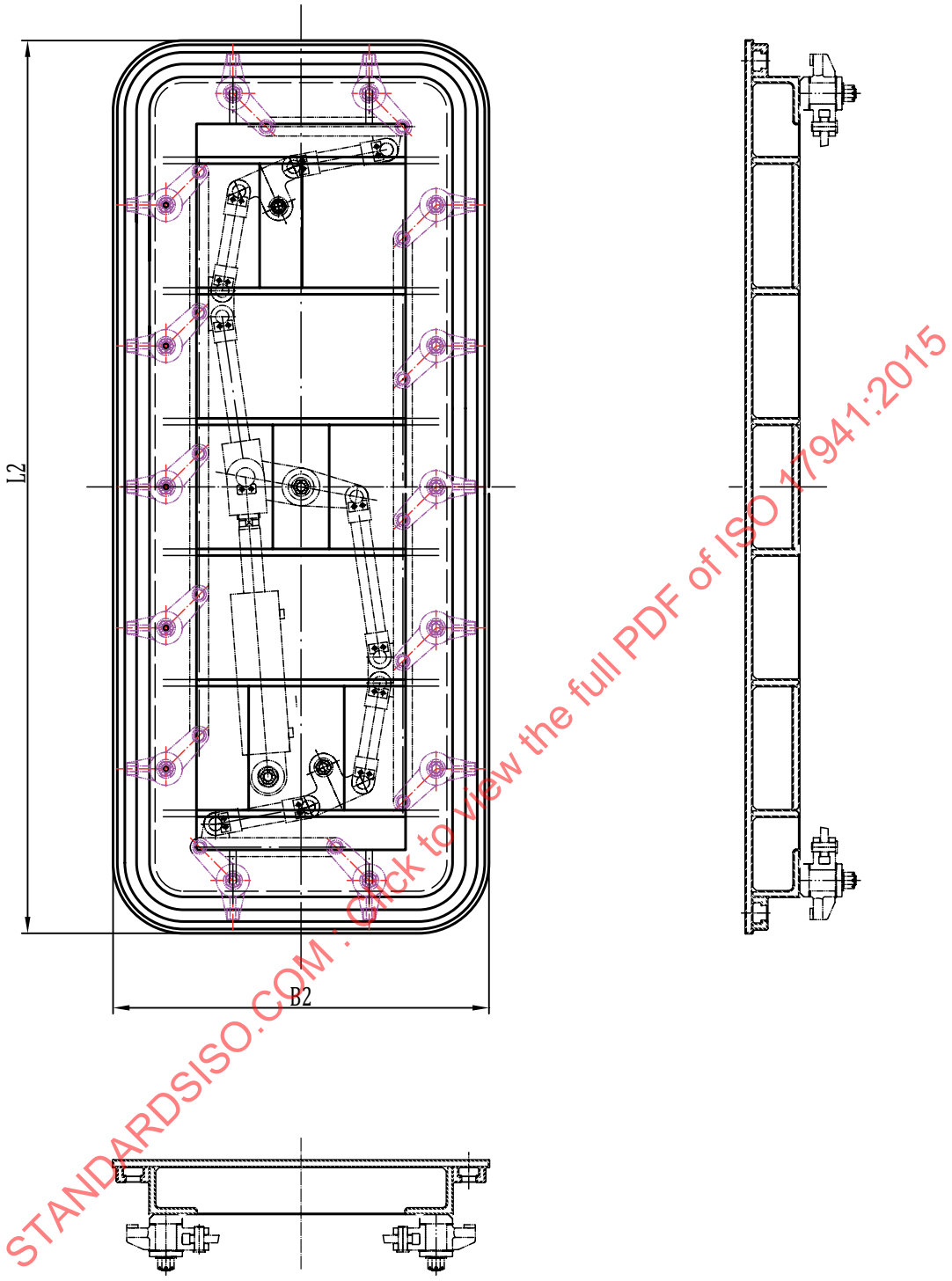


Figure 3 — Door panel's sealing mechanism

3.3 Manual hydraulic and electric-hydraulic system schematic diagram

The watertight door's manual hydraulic and electric-hydraulic system schematic diagram is provided in Annex A. Hydraulic pumps, cylinders, accumulators, piping, valves, and other components shall comply with requirements of the Administration and/or Classification Society.

3.4 Electrical system diagram

The watertight door's electrical system diagram is provided in Annex B. Electric wiring, motors, and electric components shall comply with requirements of the Administration and/or Classification Society.

3.5 Designation

The watertight door conforming to this International Standard shall be designated as follows, in the order given:

a) denomination: "Hydraulic hinged watertight fireproof door";

b) number of this International Standard: ISO 17941;

c) fire resistance rating: A60, A30, A15, A0;

d) type: R or L;

e) nominal size;

f) working pressure.

EXAMPLE The designation for a hydraulic hinged watertight fireproof door type R of nominal size 1 800 × 750, fire resistance rating A60, working pressure 0,5 MPa, is:

Hydraulic hinged watertight fireproof door ISO 17941–A60R1800 × 750 – 0,5

4 Requirement and inspection

4.1 Material

4.1.1 Except as noted below, the main components of the watertight door (door panel, door frames, hinges, locking device) shall be manufactured from the materials given in Table 2. These materials shall have the minimum mechanical properties given in the table. Other materials can be used upon agreement between manufacturer and purchaser.

Table 2 — Minimum mechanical properties of materials

Name of the components	Minimum yield stress N/mm^2	Tensile strength N/mm^2
door panel	355	490-620
door frame	235	375-460
hinge	235	375-460
locking device	315	440-590

4.1.2 Insulation and structural materials used in the structure shall be non-combustible meeting Part 1 of Annex 1 of the 2010 FTP Code as amended.

4.1.3 Fire resistant sealing strips shall comply with the demand of working pressure and be non-combustible meeting Part 1 of Annex 1 of the 2010 FTP Code as amended.

Sealing strips and gaskets for watertight integrity shall comply with the demand of working pressure.

4.2 Appearance

Watertight door surfaces shall be smooth, without defects and sharp edges, scoring, and indentation.

4.3 Welds

All welds of watertight doors (door frames and doors panels) shall be smooth, without pores, cracks, slag, undercut, and lack of fusion defects in accordance with AWS D1.1/D1M:2008.

4.4 Heat Treatment

Except as noted below, welded door frames and panels shall be heat treated after welding to relieve stress in order to ensure their water tightness.

The heat treatment is not necessary for the watertight door under 0,1 MP at relieve stress.

4.5 Anti-corrosion

The preparation grade of watertight doors shall be at least ISO 8501-1, Sa2 1/2 and shall be St3 locally through manual polishing. The anti-corrosion paint shall be applied twice and the grease shall be applied to the movable friction surface.

4.6 Tightness

4.6.1 Degrees of contact

To test the degree of contact between the sealing strip of the door panel and the door frame, apply a powder uniformly on the door frames. The powder shall be of a highly visible contrasting colour such as blue. Next, close the door securely and open the door again. Examine the sealing strip of the door panel which shall have the powder uniformly and continuously pressed on it, and the width of the powder shall not be smaller than one half of the contact width.

4.6.2 Water pressure

Watertight doors shall be tested by water hydrostatic pressure to the working pressure, there shall be no leakage. The test pressure for offshore structure shall be the working pressure plus 5 m of water head.

4.7 System

The hydraulic system of the watertight doors shall be subject to 1,5 times the working pressure without any leakage.

4.8 Control

4.8.1 The watertight door control system shall be provided with “Close all doors”, “Local”, and “Close individually” switches on the control panel.

4.8.2 All opened watertight doors shall be automatically closed within 60 s when the selector switch is set to “Close all doors”. Each open watertight door shall be closed within 20 s approximately 40 s of the start of closing for that door under power.

4.8.3 Watertight doors shall be able to be opened and closed at both sides manually or electrically when the selector switch is on the position of “Local”.

4.8.4 Watertight doors shall be able to be closed individually when the selector switch is on the position of “Close individually”.

4.8.5 At the hydraulic pump cut-in pressure, the accumulator shall have enough energy to operate watertight doors within the control area for 3 times, i.e. Close – Open – Close against an adverse inclination 15°.

4.8.6 In the event of loss of power, the watertight doors shall be able to be opened or closed by manually opening the ball valve of the hydraulic system and then operating the hand pump at either side of the door.

4.8.7 Manual closing of the door via hand pump shall not exceed 90 s from fully open to fully closed position.

4.8.8 For the electro-hydraulic control, the closing time of a single watertight door shall be within 20 s approximately 40 s and the rate of closing shall be roughly even.

4.9 Flexibility

Check the rotational flexibility of watertight doors using local manual hydraulic and electro-hydraulic operation control. There shall be no jam on the transmission components and friction surface.

4.10 Alarm

4.10.1 When remotely controlling the watertight door, the alarm on both sides of the watertight doors shall provide continuous audible and visual alarm signals within 5 s to 10 s before the door starts to close and continue until it is completely closed.

4.10.2 When using manual hydraulic control or electro-hydraulic control on both sides of the watertight doors to operate the watertight doors, the alarm on both sides of the watertight door shall provide continuous audible and visual alarm signals until it is completely closed.

4.10.3 A fault alarm lamp shall be provided on the remote control panel. The lamp shall send an alarm signal in case of low level of hydraulic reservoir, low pressure of the hydraulic system, loss of power, or motor overload.

4.10.4 There shall be an interface to the VOYAGE DATA RECORDER (VDR) to transmit each door's status signals to VDR, e.g. opening, closing, single alarm, and integrated alarm. An interface to the Bridge Alert Management system shall be provided for single alarm and integrated alarm in accordance with IMO MSC Res.302(87) and applicable parts of the IEC 61162–1:2010.

4.11 Status indication

On the remote control panels or junction box besides the watertight door, there shall be four indicator lights "Door open" (red), "Door closed" (green), "Unlocking" (red), and "Locking" (green):

a) "Door open" red light that is on indicates the watertight door is fully open;

b) "Door open" red light that flashes indicates that the watertight door is being opened.

c) "Door closed" green light that is on indicates the watertight door is fully closed;

d) "Door closed" green light that flashes indicates that the watertight door is being closed.

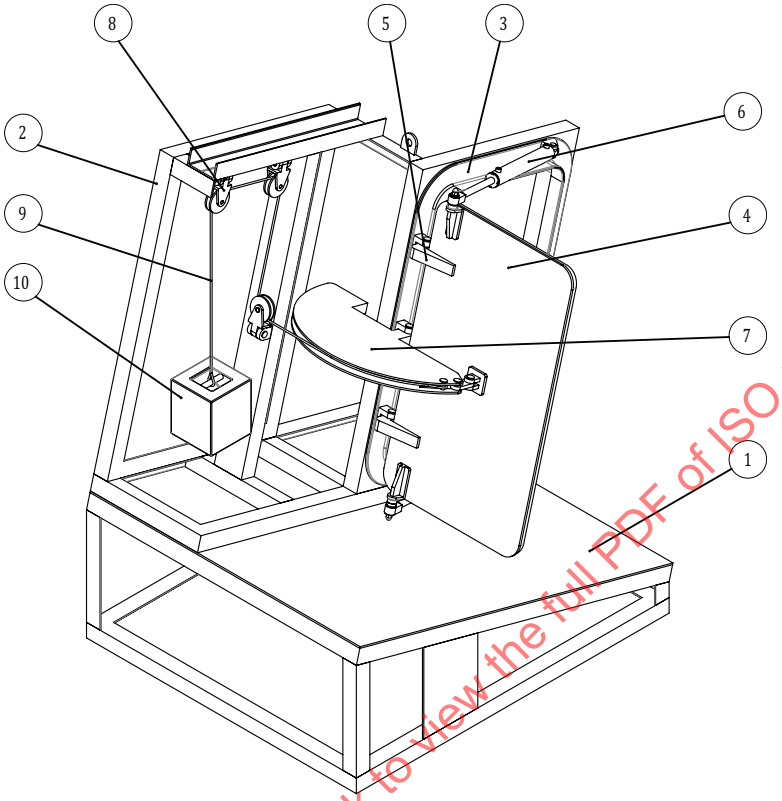
e) "Unlocking" red light that is on indicates that watertight door is being released;

f) "Locking" green light that is on indicates that watertight door is being locked.

4.12 Inclination test

During the inclination test, a force shall be applied to the door in opposition of closing of the door. The opposing force is calculated by multiplying the maximum width of the door in meters by 5,0 kPa-m. The force shall be applied on the centreline of the door at a height of 0,5 m above the sill and perpendicular to the door frame.

The process of inclination test is as follows: Incline the door to each side (front, rear, left, right) equal to the inclination test value. At each position of inclination, the door shall be able to "close – open – close" normally when operated by manual means of operation and again by electric means of operation. The manual and electrical means of operation on both sides of the door shall be tested at each position of inclination. The previously calculated opposing force shall be applied during each closing.



Key

1 15° inclined foundation
2 test bench
3 door frames
4 door leaf
5 hinge
6 cylinder
7 arc flap
8 sheave block
9 steel wire rope
10 counterweight

Figure 4 — 15° inclined foundation simulated test with 1m head of water

4.13 Fire resistance

Fire-resistant properties of watertight doors shall comply with Part 3 and Part 4 of Annex 1 of the 2010 FTP code.