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## Small craft — Bilge-pumping systems

*Petit navires — Systèmes de pompe de cale*





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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*.

This second edition cancels and replaces the first edition (ISO 15083:2003), which has been technically revised.

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

- the definitions have been updated ([Clause 3](#));
- in [5.1.2](#), a requirement has been added for craft not fully enclosed with bilge compartments to have a bilge pump system installed;
- exposed and enclosed steering position requirements have been removed from [5.1.3.2](#);
- a requirement has been added ([7.13](#)) for the system design to ensure that accidental discharge is prevented.

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).



## Introduction

Bilge-pumping systems as specified in this document are limited to normal amounts of water in an intact boat due to spray, rain, seepage, spillage, and occasional small amounts of water shipped from boat movements in heavy weather.

This document is not intended to control flooding resulting from hull damage.





# Small craft — Bilge-pumping systems

## 1 Scope

This document specifies requirements for pumping or alternative means designed to remove normal accumulations of bilge water for small craft with a length of hull,  $L_H$ , as defined in ISO 8666:2016, of up to 24 m.

This document does not set requirements for bilge pumps or bilge-pumping systems designed for damage control.

## 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 8666:2016, *Small craft — Principal data*

ISO 8849:2003, *Small craft — Electrically operated direct-current bilge pumps*

ISO 9093-1:1994, *Small craft — Seacocks and through-hull fittings — Part 1: Metallic*

ISO 9093-2:2002, *Small craft — Seacocks and through-hull fittings — Part 2: Non-metallic*

ISO 10133:2012, *Small craft — Electrical systems — Extra-low-voltage d.c. installations*

ISO 11591:2019, *Small craft — Field of vision from the steering position*

ISO 12217-1:2015, *Small craft — Stability and buoyancy assessment and categorization — Part 1: Non-sailing boats of hull length greater than or equal to 6 m*

ISO 12217-2:2015, *Small craft — Stability and buoyancy assessment and categorization — Part 2: Sailing boats of hull length greater than or equal to 6 m*

ISO 12217-3:2015, *Small craft — Stability and buoyancy assessment and categorization — Part 3: Boats of hull length less than 6 m*

ISO 13297:2014, *Small craft — Electrical systems — Alternating current installations*

IEC 60529:1989/AMD2:2013/COR1:2019, *Degrees of protection provided by enclosures (IP Code)*

## 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

#### **design category**

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

Note 1 to entry: The design categories are specified in ISO 12217-1:2015, ISO 12217-2:2015 and ISO 12217-3:2015.



### 3.2

#### **sailing boat**

craft for which the primary means of propulsion is by wind power, having a reference sail area  $A_S \geq 0,07 (m_{LDC})^{2/3}$  in  $m^2$

### 3.3

#### **non-sailing boat**

craft for which the primary means of propulsion is other than by wind power, having reference sail area  $A_S < 0,07 (m_{LDC})^{2/3}$  in  $m^2$

### 3.4

#### **fully enclosed boat**

craft in which the horizontal projection of the *sheerline* (3.13) area comprises any combination of

- watertight deck and superstructure, and/or
- quick-draining recesses, and/or
- watertight recesses with a combined volume of less than  $(L_H B_H F_M)/40$ , and with all closing appliances having a degree of watertightness meeting the requirements of ISO 12216:2002

Note 1 to entry: Quick-draining recesses and watertight recesses are covered in ISO 11812.

### 3.5

#### **accumulation of bilge water**

minor amounts of water collecting in the bilge from spray, rain, seepage, spillage, and water shipped from normal boat movements or breaking waves

### 3.6

#### **critical bilge water level**

level at which bilge water contacts metallic fuel tanks, couplings, engine pans, non-submersible machinery, or non-watertight electrical circuits and connections, with the craft in the static upright floating position at maximum load condition ( $m_{LDC}$ )

### 3.7

#### **heeled waterline**

level of the water on the hull in the fully loaded, ready-for-use condition when the craft is inclined to:

- an angle of  $7^\circ$ , for *non-sailing boats* (3.3) and sailing multihulls; or
- $30^\circ$  or immersion of the *sheerline* (3.13), whichever occurs first, for monohull *sailing boats* (3.2)

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

### 3.8

#### **submersible bilge pump**

pump designed to be operated completely immersed in water

### 3.9

#### **water head**

maximum head of water in the bilge pump discharge line, measured vertically from the pump inlet port to the centre of the discharge line's highest position

### 3.10

#### **accessible**

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

### 3.11

#### **readily accessible**

capable of being reached for use, inspection, removal or maintenance without the use of tools



**3.12****bilge water compartment**

area, not self-draining, where spray, rain and normal accumulation of water collects internally

**3.13****sheerline**

intersection between deck and hull, for rounded deck edges the natural intersection, or, where no deck is fitted or the hull extends above the deck (bulwark), the upper edge of the craft's hull

Note 1 to entry: The upper position of the sheerline depends on the inclination between the hull/deck intersection and the actual deck.

[SOURCE: ISO 8666:2016, 2.3]

**3.14****bilge pumping system**

manual, electrical or mechanical bilge pump or combination of pumps, and associated fittings, strainers, manifolds and equipment, designed to remove water from *bilge water compartments* (3.12)

**3.15****means of bailing**

means for manual operation to remove water from the bilge

EXAMPLE Bucket, scoop, sponge.

**4 Symbols and codes**

For the purposes of this document, the symbols, associated units and codes in [Table 1](#) apply.

**Table 1 — Symbols, associated units and codes**

Symbol	Unit	
$A_S$	m <sup>2</sup>	Reference sail area, according to ISO 8666:2016
$B_H$	m	Beam of the hull, according to ISO 8666:2016
$F_M$	m	Freeboard, midship, to the loaded waterline, according to ISO 8666:2016
$L_H$	m	Length of the hull, according to ISO 8666:2016
$m_{LDC}$	kg	Mass of the boat in the maximum loaded displacement, according to ISO 8666:2016
IP 56	—	Protected from limited dust ingress. Protected from high pressure water jets from any direction. According to IEC 60529:1989/AMD2:2013/COR1:2019

**5 Requirements****5.1 Type, number and location****5.1.1 General requirements**

Bilge pumping systems shall be capable of removing normal accumulations of water from all separate bilge water compartments.

Bilge pumping systems may be provided with power (electrical or mechanical) bilge pumps or manual bilge pumps.

Fore and aft peaks need not be linked to the bilge pumping system if

- their combined volume is less than or equal to 10 % of the displacement of the craft in the loaded displacement condition ( $m_{LDC}$ ), according to ISO 8666:2016, and



- trapped water in those compartments can be emptied into the main bilges by a valve or drained by other means.

Bilge water compartments not readily accessible shall have a bilge pump installed. The pump may be manually, mechanically or electrically operated.

Type(s), number(s) and location(s) of bilge-pumping systems shall be in accordance with the requirements in [5.1.2](#) and [5.1.3](#).

### 5.1.2 Non fully enclosed boats

A bilge pumping system is not required for boats without bilge compartments, but a means of bailing shall be specified in the owner's manual.

A bilge pumping system is required for non-fully enclosed boats with bilge compartments.

NOTE This includes open and partially protected boats.

### 5.1.3 Fully enclosed boats

#### 5.1.3.1 General

Fully enclosed boats shall be fitted with one or more bilge pumping systems according to the requirements in [5.1.3.2](#) and [5.1.3.3](#).

#### 5.1.3.2 Primary bilge pumping systems

For craft in design categories A, B and C:

- a) a bilge pumping system shall be installed, permanently attached to the boat structure,
- b) the activation of the bilge pumping system shall be in the vicinity of, and readily accessible from, the main steering position as specified in ISO 11591:2019.

For craft in design category D:

- if  $L_{II}$  is greater than 6 m, one bilge-pumping system shall be installed;
- if  $L_H$  is less than or equal to 6 m, one bilge pumping system or means of bailing shall be available, which shall be specified in the owner's manual.

#### 5.1.3.3 Secondary bilge pumping systems

For craft in design categories A, B and C, one additional manual, mechanical or electric bilge pump or bilge-pumping system shall be installed, which shall be capable of removing water from all bilge compartments and which shall be operable from a readily accessible position.

For craft of design category C fulfilling basic or level flotation requirements as specified in ISO 12217-1:2015, ISO 12217-2:2015 and ISO 12217-3:2015, no secondary bilge pump is required.

## 5.2 Summary of requirements

[Table 2](#) is a summary of the requirements listed in [5.1](#).



Table 2 — Summary of bilge-pump requirements

Boat type	Boat characteristics	Type of pump	Bilge-pump requirements or means of bailing	Subclause
Non fully enclosed boats	No bilge compartment	None required	1 means of bailing	<a href="#">5.1.2</a>
Design categories B, C, D	Bilge compartment	Primary pump	1 manual, mechanical or electric pump	<a href="#">5.1.2</a>
Fully enclosed boats		Primary pump	1 manual, mechanical or electric pump	<a href="#">5.1.3.2</a>
Design category A, B, C		Secondary pump <sup>a)</sup>	1 manual, mechanical or electric pump	<a href="#">5.1.3.3</a>
Fully enclosed boats	$L_H$ greater than 6 m	Primary pump	1 manual, mechanical or electric pump	<a href="#">5.1.3.2</a>
Design category D	$L_H$ less than or equal to 6 m	Primary pump	1 pump, or other means of bailing	<a href="#">5.1.3.2</a>
<sup>a)</sup> For fully enclosed boats of design category C fulfilling basic or level flotation requirements as specified in ISO 12217-1:2015, ISO 12217-2:2015 and ISO 12217-3:2015, no secondary bilge pump is required as per <a href="#">5.1.3.3</a>				

### 5.3 Capacity

The combined capacity of the bilge pump systems installed according to [5.1.2](#) or [5.1.3](#) and as per the bilge pump manufacturers installation instructions, shall be not less than:

- 600 l/h for boats with  $L_H$  less than or equal to 6 m,
- 900 l/h for boats with  $L_H$  greater than 6 m and less than 12 m, or
- 1 800 l/h for boats with  $L_H$  greater than or equal to 12 m.

For manual bilge pumps, the capacity shall be rated for 45 strokes per minute or less.

When assessing the discharge capacity of the system the water head losses shall be considered.

## 6 Design and construction

### 6.1 General

**6.1.1** The design and construction of bilge-pumping systems shall withstand the pressures, temperatures and stresses likely to be encountered under normal operating conditions.

Bilge pumps shall be operable within temperature limits ranging from 0 °C to + 60 °C and shall withstand storage temperatures, without operation, of -40 °C to +60 °C when in the dry condition.

**6.1.2** Spigots/spuds of bilge pumps and other components shall be long enough to provide support for the hose and permit the use of a clamp.

**6.1.3** Unless permanently fitted, manual bilge-pump handles shall be secured to minimize the risk of accidental loss.

**6.1.4** Bilge pumps systems shall not discharge into a recess nor be connected to recess drains.

### 6.2 Electrically operated pumps

**6.2.1** Electric bilge pumps shall comply with ISO 8849:2003.



**6.2.2** Electrical installations shall meet the requirements in ISO 13297:2014 (a.c.) and ISO 10133:2012 (d.c.).

**6.2.3** Where control switches are subject to spray water, they shall be water resistant to a degree of IP 56 according to IEC 60529:1989/AMD2:2013/COR1:2019.

## **7 Installation**

**7.1** Bilge pumps shall be mounted in an accessible location for servicing and clearing the intake.

**7.2** Bilge-pump water inlets (e.g. strainers) shall be designed and installed to minimize ingestion of debris likely to cause pump failure and shall be accessible for cleaning.

**7.3** Intake hoses shall not collapse under maximum pump suction.

**7.4** Bilge-pump pipes and hoses shall be installed to minimize flow restriction.

**7.5** Outlets on the hull shall be above the heeled waterline (3.7), unless a metallic seacock is installed in accordance with ISO 9093-1:1994 or a non-metallic seacock is installed in accordance with ISO 9093-2:2002 and there is a means to prevent backflow into the boat.

**7.6** Where several pumps discharge through one through-hull fitting, the system shall be designed so that the operation of one pump does not feedback through another pump, and the simultaneous operation of the pumps does not diminish the pumping capacity of the system.

**7.7** Hose connections shall be secured with a non-corrosive type of clamp, or with permanently attached end-fittings.

**7.8** Non-submersible bilge pump motors shall be located above the critical bilge water level (3.6).

**7.9** Each individual electrical bilge pump shall be provided with a readily accessible manual power-supply switch.

**7.10** Bilge pumps with automatic controls shall be provided with a readily accessible manual power-supply switch.

**7.11** Controls for automatic bilge pumps shall be provided with a visual indication by the switch position or a light when the bilge pump is set to operate in the automatic mode.

**7.12** Manual pumps, if permanently installed, shall be installed in such a way that they can be operated at their rated capacity according to 5.3.

**7.13** Bilge pumping systems and bilge arrangements shall be designed and constructed so as to prevent the accidental discharge of pollutants (oil, fuel, etc.) overboard in the upright or heeled waterline position.

**NOTE** A filter in the discharge line, or drip trays under engines, for example, meet the requirements.



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## Bibliography

- [1] ISO 11812, *Small craft — Watertight cockpits and quick-draining cockpits*
- [2] ISO 12216:2002, *Small craft — Windows, portlights, hatches, deadlights and doors — Strength and watertightness requirements*







