
**Small craft — Permanently installed
petrol and diesel fuel tanks**

*Petits navires — Réservoirs à carburant essence et diesel installés à
demeure*

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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).

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).

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.

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 third edition cancels and replaces the second edition (ISO 21487:2012), which has been technically revised. It also incorporates the Amendments ISO 21487:2012/Amd 1:2014 and ISO 21487:2012/Amd 2:2015.

The main changes are as follows:

- an Introduction has been added to explain the addition of [Annex A](#);
- the Scope has been amended to include installation of fuel tanks;
- some definitions have been updated;
- [Clause 4](#) has been updated, in particular [4.2](#), [4.3.9](#) and [4.4.1](#);
- subclause [5.2](#) has been updated and [Table 2](#) has been introduced for tests;
- subclause [6.2](#) has been redrafted;
- [Clause 7](#) has been revised;
- [Annex A](#) has been added, which provides a permeation test to determine the evaporative emissions from non-metallic tanks.

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.

Introduction

This document provides requirements for the design, installation and testing of permanently installed fuel tanks for small craft.

Some countries have environmental controls for evaporative emissions from petrol fuel systems. [Annex A](#) describes the limits and test procedures for the control of evaporative emissions from permanently installed petrol fuel tanks. The details in [Annex A](#) allow for future standardization and application of evaporative emissions on small craft.

As the international community further restricts fuel system emissions, it is anticipated that [Annex A](#) will have increased global acceptance.

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Small craft — Permanently installed petrol and diesel fuel tanks

1 Scope

This document specifies requirements for the design, installation and testing of petrol and diesel fuel tanks for internal combustion engines, that are intended to be permanently installed in small craft.

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 10088:2022, *Small craft — Permanently installed fuel systems*

ISO 12215-5:2019, *Small craft — Hull construction and scantlings — Part 5: Design pressures for monohulls, design stresses, scantlings determination*

ISO 12215-6:2008, *Small craft — Hull construction and scantlings — Part 6: Structural arrangements and details*

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

petrol

hydrocarbon fuel, or blend of hydrocarbon fuel and denatured ethanol, that is liquid at atmospheric pressure and is used in *spark ignition engines* (3.3)

3.2

diesel

hydrocarbon fuel, biofuel, or blend of these, that is liquid at atmospheric pressure and is used in *compression ignition engines* (3.4)

3.3

spark ignition engine

engine in which an electrical spark is produced to ignite the fuel/air mixture

3.4

compression ignition engine

engine in which ignition is obtained by means of compressing the fuel/air mixture

3.5

permanently installed

securely fastened by bolts, brackets, screws, paint, adhesive, welding or other means, so that it cannot be unattached without the use of tools or chemicals

3.6

integral tank

fuel tank that forms part of the outer hull envelope, so that at least one boundary of the tank is formed by the hull

Note 1 to entry: Structural components, such as bulkheads, are not part of the hull.

3.7

non-integral tank

fuel tank that does not rely on any portion of the craft to retain fuel

3.8

tank range

set of fuel tanks characterized by the following attributes: general geometric shape, material and wall thickness

3.9

craft

small craft

recreational boat, and other watercraft using similar equipment, of up to 24 m length of hull (L_H)

Note 1 to entry: The measurement methodology for length of hull is defined in ISO 8666.

[SOURCE: ISO 8666:2020, 3.15, modified — Note 1 to entry has been added.]

4 General properties

4.1 Resistance to liquids in contact

4.1.1 All seals such as gaskets, O-rings and joint-rings shall be of non-wicking, i.e. non-fuel absorbent, material.

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4.1.2 All materials used shall be resistant to deterioration by the fuel for which the system is designed and to other liquids or compounds with which the material can come in contact as installed under normal operating conditions, e.g. grease, lubricating oil, bilge solvents and sea water.

4.2 Copper-based alloys

Copper-based alloy fittings are not permitted on aluminium alloy fuel tanks unless a galvanic barrier is arranged between the fitting and the tank.

4.3 Provisions to tanks

4.3.1 There shall be provisions to determine the fuel level or quantity in the tank, considering the requirements in [5.1.2](#) for petrol fuel tanks and in [6.1.5](#) for diesel fuel tanks.

4.3.2 Metal tanks shall be designed and installed so that no exterior surface traps water.

4.3.3 All rigid tubes and pipes which extend near the tank bottom shall have sufficient clearance to prevent contact between the tube and the bottom of the tank during normal operation of the craft.

4.3.4 On metallic tanks, all metallic non-integral tank supports, chocks or hangers shall either be separated from the surface of the tank by a non-metallic, non-hygroscopic, non-abrasive material, or welded to the tank.

4.3.5 If baffles are provided, the total open area provided in the baffles shall be not greater than 30 % of the tank cross-section in the plane of the baffle.

4.3.6 Baffle openings shall be designed so that they do not trap vapour across the top of the tank and do not prevent the fuel flow across the bottom of the tank.

4.3.7 The fuel fill pipe on the tank shall have a minimum inside diameter of 28,5 mm.

4.3.8 Each ventilation pipe on the tank shall have a minimum inside diameter of 11 mm or a ventilation opening designed to prevent the tank pressure from exceeding 80 % of the maximum test pressure marked on the tank label when tested in accordance with ISO 10088:2022.

4.3.9 Tanks shall be constructed using suitable metallic materials and shall meet the minimum material thicknesses required for corrosion resistance as listed in [Table 1](#).

Other materials are permitted if the tank manufacturer can demonstrate equivalent fuel and corrosion resistance.

Table 1 — Metallic tank materials

Material	Minimum nominal sheet thickness for corrosion resistance mm	Fuel
Copper, internally tin-coated	1,5	Petrol only
Aluminium alloys containing no more than 0,1 % copper	2,0	Diesel and petrol
Stainless steel, with all welding deposits removed	1	Diesel and petrol
Mild steel	2	Diesel only
Mild steel externally hot-dip zinc-coated after fabrication	1,5	Diesel only
Mild steel externally and internally hot-dip zinc-coated after fabrication	1,5	Petrol only
Aluminized steel	1,2	Diesel and petrol

4.4 Installation of tanks

4.4.1 Non-integral tank mechanical fixing

Non-integral tanks shall be installed so that the loads due to the mass of the tank when filled to its maximum capacity are safely distributed into the structure, with due consideration given to upward and downward acceleration due to the craft's movements at maximum speed.

NOTE Continuous flexible supports spreading loads are preferable to rigid ones. Metal or textile hold-down straps are considered as a good practice provided that chafe and corrosion are kept to a minimum.

4.4.2 Other installation requirements

All other installation requirements (e.g. filling, vent lines, fuel circuit) shall be in accordance with ISO 10088:2022.

5 Petrol fuel tanks: design and type tests

5.1 Design

5.1.1 Petrol fuel tanks shall not be integral with the hull.

5.1.2 Petrol fuel tanks shall have all fittings and openings on top, except non-metallic integrally moulded or welded metallic fill and ventilation pipes, which may be connected to the sides or ends of petrol fuel tanks, provided that they are welded to the tank and reach above the top of the tank.

5.1.3 Tank drains shall not be fitted on petrol fuel tanks.

5.2 Tests

5.2.1 Petrol fuel tanks shall be leakage-tested in accordance with [Table 2](#).

5.2.2 Petrol fuel tanks shall be pressure-impulse-tested in accordance with [Table 2](#).

5.2.3 Non-metallic petrol fuel tanks shall be fire-tested in accordance with [Table 2](#).

6 Diesel fuel tanks: design and type tests

6.1 Design

6.1.1 Diesel fuel tanks may be non-integral, or integral with the structure of the craft. If an integral tank is installed in a cored hull construction, the core shall not deteriorate from exposure to diesel fuel, and to commonly used additives, and shall not permit fuel to migrate.

6.1.2 Diesel fuel integral tanks shall be built in accordance with ISO 12215-5:2019.

NOTE National standards and classification rules can be applied to prove structural integrity and welding quality.

6.1.3 If fittings in the bottom, sides or ends are installed, each connection shall have a shut-off valve directly connected to the tank. The valve shall be protected or located to prevent physical damage, or be of at least 25 mm nominal diameter.

6.1.4 Diesel fuel tank drains, where fitted, shall have a shut-off valve with a plug fitted in the outlet that is permanently installed, or the handle of the drain shut-off valve shall be removable with the valve in its closed position.

6.1.5 Sight gauges, if used, shall be fitted with valves at the top and bottom connections to the tank. The bottom valve shall be a manually operated self-closing valve that can only be in the open position while attended.

6.1.6 Diesel fuel tanks shall be equipped with inspection hatch(es) having a suitable diameter of at least 120 mm at suitable position(s) for cleaning and for the inspection of the lowest part(s) of the tank. The hatch shall remain accessible without the removal of permanent structures when the tank has been installed in the craft.

NOTE The hatch(es) can be located on the top or side of the tank.

6.2 Tests

6.2.1 Diesel fuel tanks shall be leakage-tested in accordance with [Table 2](#).

6.2.2 Diesel fuel tanks shall be pressure-tested in accordance with [Table 2](#).

6.2.3 Non-metallic non-integral diesel fuel tanks installed in an engine compartment shall pass the fire tests:

- a) in accordance with 7.4, where the actual installation conditions are not known; or
- b) in accordance with 7.5, in craft specific installations using a specific tank design.

7 Type tests

7.1 General

Fuel tanks shall be subjected to the tests described in Table 2. The tank to be tested shall be a complete assembly (excluding sight gauges that are protected by a self-closing valve) and shall include the fuel pick-up tube, fuel fill pipe, and fuel gauge/sender specified for the fuel tank.

Table 2 — Tank tests

Tank type	Leakage test	Pressure/ strength test	Pressure impulse test	Fire test
Petrol tanks				
Petrol, metal	7.2.1	7.2.2.2 for 5 min or 7.2.2.3 for 5 min	7.3	Not applicable
Petrol, fibre-reinforced	7.2.1	7.2.2.2 for 5 min	7.3	7.4 or 7.5
Petrol, thermoplastic low density	7.2.1	7.2.2.4 for 5 h	7.3	7.4 or 7.5
Petrol, thermoplastic high density	7.2.1	7.2.2.4 for 60 min	7.3	7.4 or 7.5
Diesel tanks				
Diesel, metal	7.2.1	7.2.2.2 for 5 min	Not applicable	Not applicable
Diesel, thermoplastic low density	7.2.1	7.2.2.4 for 5 h	Not applicable	7.4 or 7.5
Diesel, thermoplastic high density	7.2.1	7.2.2.4 for 60 min	Not applicable	7.4 or 7.5
Diesel, fibre-reinforced, non-integral	7.2.1	7.2.2.2 for 5 min	Not applicable	7.4 or 7.5
Diesel, fibre-reinforced, integral	7.2.1	7.2.2.2 for 5 min	Not applicable	Not applicable

7.2 Pressure tests

WARNING — Do not exceed the maximum static test pressure.

7.2.1 Leakage test

Each fuel tank shall be internally tested with a pressure test. The test pressure shall be the greater of:

- a) 20 kPa; or
- b) 1,5 times the highest hydrostatic pressure to which the tank can be subjected in service (maximum fill-up height above tank top); or
- c) 1,5 times the maximum hydrostatic head at the designed tank fill level plus the system relief pressure, if the tank is to be used in a sealed fuel system.