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Small craft — Permanently installed petrol and diesel fuel tanks

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

ICS: 47.080

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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).

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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 188, *Small craft*.

This fourth edition cancels and replaces the third edition (ISO 21487:2012), which has been technically revised.

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

Added informative [Annex A](#) defining how non-metallic fuel tanks are tested to determine evaporative emissions.

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.

Small craft — Permanently installed petrol and diesel fuel tanks

1 Scope

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

For installation requirements, ISO 10088:2013 applies.

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 1817:2015, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 5817:2014, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

ISO 10088:2013, *Small craft — Permanently installed fuel systems*

ISO 11192:2005, *Small craft — Graphical symbols*

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 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

petrol

hydrocarbon fuel or blend of hydrocarbon fuel and denatured ethanol which is liquid at atmospheric pressure and is used in spark ignition engines

3.2

diesel

hydrocarbon fuel, biofuel or blend of these which is liquid at atmospheric pressure and is used in compression ignition engines

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 so that tools need to be used for removal

3.6

integral tank

tank which forms part of the outer hull envelope

Note 1 to entry: An integral tank is one where at least one boundary of the tank is formed by the hull. Other structural components such as bulkheads are not part of the hull.

3.7

tank family

fuel tanks that are characterized by the following attributes: General geometric shape, material, and wall thickness.

3.8

craft

small craft

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

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

[SOURCE: ISO 8666:2016, 2.13, modified – Note 1 to entry has been added.]

4 General properties

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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.

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 fuel tanks unless a galvanic barrier is arranged between fitting and 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 [6.1.3](#) for diesel fuel tanks.

4.3.2 Metal tanks shall be designed and installed so that no exterior surface will trap 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 prevent the fuel flow across the bottom or trap vapour across the top 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 (95 mm²) 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 10088:2013.

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

Note Other materials may be used if the tank manufacturer can demonstrate equivalent fuel and corrosion resistance.

4.3.10 Diesel tanks shall be equipped with inspection hatch(es) having a suitable diameter of at least 120 mm at suitable position(s) for cleaning and inspection of the lowest part(s) of the tank. The hatch shall remain accessible without removal of permanent structure when the tank has been installed in the craft. The hatch(es) may be located on the top or side of the tank.

Table 1 — Metallic tank materials
<https://standards.iteh.ai/catalog/standards/sist/3db4ab47-141f-43d8-9932-d20e9d6f9673/iso-dis-21487>

| 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 non-integral tanks

4.4.1 Tank mechanical fixing

Non-integral tanks shall be installed so that the loads due to the mass of the tank when filled to 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 in the sea.

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

For other installation requirements (filling, vent lines, fuel circuit, etc.), ISO 10088: 2013 applies.

5 Petrol fuel tanks: design, construction and 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 metallic fill and ventilation pipes, which may be connected to the sides or ends of metal 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 to be performed

5.2.1 Petrol fuel tanks shall be leakage tested in accordance with [7.2.1](#)

5.2.2 Petrol fuel tanks shall be pressure-impulse tested in accordance with [7.3](#).

5.2.3 Metallic tanks may as an alternative method be pressure tested in accordance with [7.2.2](#), using a pressure which is the higher of the following:

- 30 kPa, or
- 1,5 times the highest hydrostatic pressure to which the tank may be subjected in service (maximum fill-up height above tank top) plus 10 kPa.

During this test, the tank shall not crack or leak, however, it may be permanently deformed.

The following alternative test method for metal tanks may only be used if:

- plating thicknesses, section modules and web shear areas of stiffeners meet the requirements in ISO 12215-5 for integral tanks, and
- construction follows the recommendations in ISO 12215-6 regarding structural details of metal construction, and
- welding quality meets at least class B in accordance with ISO 5817 or other equivalent national welding standards.

5.2.4 Non-metallic petrol fuel tanks shall meet the fire test in accordance with [7.4](#) or [7.5](#).

5.3 Evaporative emissions from non-metallic tanks

5.3.1 Non-metallic fuel tanks shall be constructed such that evaporative emissions from the tank do not exceed 1,5 g/m²/day when measured according to the procedures in [Annex A](#).

6 Diesel fuel tanks: design, construction and tests

6.1 Design

6.1.1 Diesel fuel tanks may be constructed independent of 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 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 alternatively, other acknowledged national standards and/classification rules may be applied to proof 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 coupled 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 a self-closing valve at the bottom that can only be manually operated to the open position while attended. The top valve is not required to be self-closing.

6.2 Tests to be performed (standards.iteh.ai)

6.2.1 Diesel tanks shall be leakage tested in accordance with 7.2.1.

[https://standards.iteh.ai/catalog/standards/sist/3db4ab47-f41f-43d8-9932-](https://standards.iteh.ai/catalog/standards/sist/3db4ab47-f41f-43d8-9932-d20e9d69673/iso-dis-21487)

6.2.2 Diesel tanks shall be pressure tested in accordance with 7.2.2.

6.2.3 Non-metallic, non-integral tanks, if installed in an engine compartment, shall be fire tested in accordance with 7.4 or 7.5.

7 Tests

7.1 General

Representative samples of the fuel tanks shall be subjected to the tests described herein. The tank to be tested shall be a complete assembly [excluding sight gauges which are protected by a self closing valve] and include the fuel pick-up tube, fuel fill pipe, and fuel gauge/sender specified for the fuel tank.

A single fuel tank from a tank family shall be tested as a representative of the tank family. It shall be the largest volume in the tank family and shall be of the same general geometric shape, material, and wall thickness. If the tank is a plastic tank the number of internal cones shall be the same to be considered in the same family. See [table 1](#).

NOTE Fuel type, capacity, length, width, height, cross-section, surface area, # of joints/joint type, # of inserts, and fill location, can all vary within a family.