INTERNATIONAL STANDARD

ISO 21487

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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

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 21487 was prepared by Technical Committee ISO/TC 188, *Small craft*.

Small craft — Permanently installed petrol and diesel fuel tanks

1 Scope

This International Standard establishes requirements for design and test of petrol and diesel fuel tanks for internal combustion engines that are intended to be permanently installed in small craft of up to 24 m length of hull.

For installation requirements, ISO 10088 applies.

2 Normative references

The following referenced documents are indispensable for the application 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 1817:2005, *Rubber, vulcanized — Determination of the effect of liquids*

ISO 10088:2001, *Small craft — Permanently installed fuel systems and fixed fuel tanks*

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

ISO 12215-5, *Small craft — Hull construction and scantlings — Part 5: Design pressures for monohulls, design stresses, scantlings determination*[1)]

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
petrol
hydrocarbon fuel or blend of hydrocarbon fuels which is liquid at atmospheric pressure and is used in spark ignition engines

3.2
diesel
hydrocarbon fuel or blend of hydrocarbon fuels 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

1) To be published.

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

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.

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.

4.1.3 The melting point of materials used for manufacturing of plastic fuel tanks shall be higher than 150 °C.

4.2 Copper-based alloys

Copper-based alloys for fittings are acceptable for direct coupling with all tank materials specified in Table 1, except aluminium. Copper-based alloy fittings are allowed for aluminium tanks only if a galvanic barrier is arranged between fitting and tank.

4.3 Provisions to tanks

4.3.1 Provisions shall be made to enable the fuel level or quantity in the tank to be determined.

4.3.2 Metal tanks shall be designed or installed so that no exterior surface will trap water.

4.3.3 Rigid fuel suction tubes and fill pipes which extend near the tank bottom shall have sufficient clearance to prevent contact with the bottom during normal operation of the craft.

4.3.4 All non-integral tank supports, chocks or hangers shall either be separated from the surface of metal tanks 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 31,5 mm.

4.3.8 Each ventilation pipe on the tank shall have a minimum inside diameter of 11 mm (95 mm^2).

4.3.9 Suitable metallic tank materials and minimum recommended material thicknesses required for corrosion resistance are given in Table 1. Other materials may be used if they 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 Petrol fuel tanks

Petrol fuel tanks shall comply with the requirements of Clause 5.

4.5 Diesel fuel tanks

Diesel fuel tanks shall comply with the requirements of Clause 6.

4.6 Installation of non-integral tanks

4.6.1 Tank mechanical fixing

Non-integral tanks shall be installed so that the loads due to the mass of the full tank are safely introduced into the structure, with due consideration given to upward and downward acceleration due to the craft's movements at maximum speed in the sea. In this respect, 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.

4.6.2 Other installation requirements

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

5 Petrol fuel tanks: design 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 are not permitted on petrol fuel tanks.

5.2 Tests to be performed

5.2.1 Petrol fuel tanks shall be leakage tested in accordance with 7.1.2.

5.2.2 Petrol fuel tanks shall be pressure-impulse tested in accordance with 7.2.

5.2.3 Non-metallic petrol fuel tanks shall meet the fire test in accordance with 7.3 and 7.4.

6 Diesel fuel tanks: design and tests

6.1 Design

6.1.1 Diesel fuel tanks may be constructed independent of or integral with the hull. Care should be taken to avoid penetration of fuel in the hull.

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

6.1.3 Diesel fuel tanks may have side inspection openings. Fittings in the bottom, sides or ends are allowed provided that each connection has 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 on the outlet that can only be removed by the use of tools, or the handle of the drain shut-off valve shall be removable with the valve in its closed position.

6.2 Tests to be performed

6.2.1 Diesel tanks shall be leakage tested in accordance with 7.1.2.

6.2.2 Diesel tanks shall be pressure tested in accordance with 7.1.3.

7 Tests

7.1 Hydraulic pressure test

7.1.1 General

WARNING — Take care not to exceed the maximum static test pressure. Do not use solutions containing ammonia for testing.

7.1.2 Leakage test

Each test fuel tank shall be internally tested with a hydraulic pressure with all its accessories. The test pressure shall be the greatest of

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

The static test pressure shall be applied for 5 min without pressure drop or rise. After the test, the test fuel tank shall not show any leakage when using a leak detection method other than the pressure-drop method.

7.1.3 Hydraulic pressure/strength type test

After the leakage test (7.1.2), a test fuel tank, representative of the tank series type, with all its accessories shall be pressurized again as given in 7.1.3.1 to 7.1.3.2.2.

7.1.3.1 Metal tanks

The pressure shall be gradually increased to the greater of

— 20 kPa;

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

This pressure shall be maintained for 1 min.

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

7.1.3.2 Thermoplastic tanks

Prior to the hydraulic pressure test, thermoplastic tanks shall be stored filled with test liquid C in accordance with ISO 1817 or the fuel for which the tank is fabricated for at least 28 days at an ambient temperature of not less than 21 °C. The hydraulic pressure test shall be performed immediately after emptying the test liquid out of the tank.

7.1.3.2.1 Thermoplastic of density > 935 kg/m^3

The pressure shall be gradually increased to the greater of

— 20 kPa;

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

This pressure shall be maintained for 60 min.

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

7.1.3.2.2 Thermoplastic of density $\leqslant 935$ kg/m^3

The pressure shall be gradually increased to the greater of

— 20 kPa;

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

This pressure shall be maintained for 5 h.

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

7.2 Pressure-impulse type test for petrol fuel tanks

7.2.1 A test fuel tank, representative of the tank series type, shall not exhibit any leakage or other signs of failure after 25 000 cycles of pressure impulses.