
Small craft — Liquefied petroleum gas (LPG) systems

*Petits navires — Installations alimentées en gaz de pétrole
liquéfiés (GPL)*

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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. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 188, *Small craft*.

This third edition cancels and replaces the second edition (ISO 10239:2008), which has been technically revised. The major technical changes include:

- suitable user and manufacturer checks of the LPG system tightness;
- specifying a suitable hose material;
- describing the information to be provided in the owner's manual;
- clarification on LPG powered fuel cells included or excluded from standard.

Introduction

This International Standard does not contain procedures for commissioning new LPG installations or system maintenance or upgrades. Competent persons responsible for commissioning LPG installations should use relevant national codes and procedures appropriate to the country concerned.

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Small craft — Liquefied petroleum gas (LPG) systems

1 Scope

This International Standard covers the installation of permanently installed liquefied petroleum gas LPG systems and LPG burning appliances on small craft of up to 24 m length of hull.

It does not cover devices used for LPG-fuelled propulsion engines or LPG-driven generators.

This International Standard covers cooking appliances with internal LPG cartridges, with a capacity of 225 g or less (See [Annex D](#)).

It covers storage of all LPG cylinders but is not intended to regulate the technical requirements for such cylinders that are subject to national regulations

It does not contain procedures for commissioning the LPG installation.

NOTE New designs, materials and methods of assembly giving at least equivalent results can be considered to be complying with the requirements of this International Standard when approved by a relevant body.

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 7-1, *Pipe threads where pressure-tight joints are made on the threads* — Part 1: Dimensions, tolerances and designation
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ISO 8434-1:2007, *Metallic tube connections for fluid power and general use — Part 1: 24 degree cone connectors*

ISO 8846, *Small craft — Electrical devices — Protection against ignition of surrounding flammable gases*

ISO 9094¹⁾, *Small craft — Fire protection*

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

ISO 10240, *Small craft — Owner's manual*

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

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

EN 751-2, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 2: Non-hardening jointing compounds*

EN 751-3, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 3: Unsintered PTFE tapes*

EN 1254-2, *Copper and copper alloys - Plumbing fittings - Part 2: Fittings with compression ends for use with copper tubes*

EN 1949, *Specification for the installation of LPG systems for habitation purposes in leisure accommodation vehicles and in other road vehicles*

1) Under preparation.

EN 14291, *Foam producing solutions for leak detection on gas installations*

EN 15266, *Stainless steel pliable corrugated tubing kits in buildings for gas with an operating pressure up to 0,5 bar*

EN 16129:2013, *Pressure regulators, automatic change-over devices, having a maximum regulated pressure of 4 bar, with a maximum capacity of 150 kg / h, associated safety devices and adaptors for butane, propane, and their mixtures*

3 Terms and definitions

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

3.1 liquefied petroleum gas LPG

mixture of light hydrocarbons, gaseous under conditions of normal temperature and pressure, and maintained in the liquid state by increase of pressure or lowering of temperature

Note 1 to entry: The principal components are propane, propene, butanes or butenes.

Note 2 to entry: LPG can be obtained as commercial butane, commercial propane or a mixture of the two.

[SOURCE: EN 624:2011, 3.1.7 — modified with addition of Note 2 to entry]

3.2 permanently installed

securely fastened so that tools need to be used for removal

[SOURCE: ISO 10088:2013, definition 3.3]

3.3 cylinder housing

ventilated enclosure intended solely for storage of one or more LPG cylinders, pressure regulation device and safety devices, and located so that leakage flows to the outside

3.4 cylinder locker

enclosure which is vapour tight to the interior of the craft with a drain to the outside intended solely for storage of one or more LPG cylinders in a cockpit or recessed into the craft

3.5 LPG system

system consisting of an arrangement of cylinder(s), safety device(s), pressure regulation device(s), connection(s), valve(s), piping, tubing, hose, fitting(s) and devices intended to store, supply, monitor or control the flow of LPG up to and including the appliance

Note 1 to entry: The cylinders are replacement items and might or might not be supplied with the LPG system in the craft.

3.6 interior space

enclosed space that is surrounded by permanent boat structure and that is intended to remain dry during normal use

3.7 readily accessible

capable of being reached quickly and safely for maintenance or effective use under emergency conditions without the use of tools

[SOURCE: ISO 10088:2013, definition 3.2]

3.8**unattended appliance**

device intended to function without the constant attention of an operator and which can cycle on and off automatically

3.9**high pressure side**

part of an installation between the cylinder valve and the inlet of a pressure regulation device in a LPG system

Note 1 to entry: Vapour pressure at 20 °C for propane = 700 kPa and for butane = 175 kPa²⁾.

3.10**low pressure side**

part of an installation exposed to the regulated pressure of the LPG pressure regulation device in a LPG system

3.11**pressure regulation device**

device to reduce the high pressure of the LPG system to the required operating pressure of the appliances

3.12**pipng**

pipeline of rigid metallic material

[SOURCE: EN 624:2011, definition 3.1.8]

3.13**hose**

pipeline of flexible material

3.14**shut-off valve**

device to isolate an appliance from the gas supply

3.15**main shut-off valve**

device to isolate the entire LPG system from the high pressure side of the supply

3.16**flame supervision device**

device that has a sensing element, that causes the inlet of the LPG supply to a burner to be open in the presence of a flame and closed in the absence of a flame

3.17**operating pressure**

inlet pressure of the LPG appliances

3.18**ventilator**

device that allows air to pass into and out of an interior space

4 General provisions

4.1 An LPG system and all its components shall be capable of withstanding storage at –30 °C to +60 °C.

4.2 LPG systems shall be of the vapour withdrawal type, i.e. LPG released only under gas phase conditions.

2) 100 kPa = 1 bar.

4.3 All LPG appliances installed on a single LPG system shall be designed for use at the same operating pressure and the same LPG type, e.g. propane, butane, or a mixture of the two. The operating pressure shall be clearly labelled in the vicinity of the cylinder shut-off valve.

The cylinder(s) selected and other supply equipment shall be of sufficient capacity to ensure safe and satisfactory operation of all appliances simultaneously. The cylinder locker or cylinder housing shall be capable of accommodating the capacity of cylinders needed.

4.4 Where an additional LPG system is installed:

- there shall be no connection between each of the LPG supplies;
- the cylinder(s) for each gas supply may be installed in the same cylinder locker or cylinder housing.

If an additional cylinder locker or cylinder housing is used, there shall be a warning sign inside each cylinder locker or cylinder housing which indicates that there is an additional LPG supply

Inside the cylinder locker or cylinder housing it shall be clearly indicated which appliances are supplied by each LPG supply. This shall also be stated in the owner's manual.

4.5 Each LPG system shall be fitted with simple means to test the LPG system for leakage before use of any appliances (e.g. a pressure gauge, bubble leak tester).

Where a bubble leak detector is fitted in the LPG system, it shall be securely mounted in the low pressure side of the LPG system and in the cylinder housing or cylinder locker.

If pressure gauges are used, they shall read the cylinder pressure side of the pressure regulation device. The gauge scale shall have a pressure range from 0 kPa to a maximum of between 1 000 kPa and 1 600 kPa to be able to show pressure drops during the LPG system check (see [C.3](#)).

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5 Pressure regulation device

5.1 Each LPG system shall be equipped with, or have provision for the installation of, a pressure regulation device (see [3.11](#)). This device shall be designed to provide a defined operating pressure suitable for the consuming appliances, but not more than 5 kPa. A label indicating the operating pressure of the LPG appliances installed shall be affixed in the vicinity of the LPG cylinder locker or cylinder housing.

5.2 The LPG pressure regulation device shall have an overpressure unit to prevent uncontrolled pressure increase in the low pressure side to a value above 15 kPa. Any LPG discharge of the unit shall be inside the cylinder locker or housing, or shall be separately vented outside the craft. The unit may be a pressure relief governor, a pressure relief valve or an automatic safety shut off valve.

5.3 The operating pressure shall be marked on the pressure regulation device.

5.4 Pressure regulation devices with external manual output pressure adjustment shall not be fitted.

5.5 The pressure regulation device shall be located within the cylinder locker or housing.

5.6 If not rigidly connected to, and supported by, the cylinder connection, the pressure regulation device shall be separately secured within the cylinder locker or cylinder housing to protect it from damage and exposure to dirt and water.

It shall be mounted above the cylinder valve so that the flow of LPG from the cylinder valve is always in a rise to the pressure regulation device.

5.7 Pressure regulation devices shall be made of corrosion-resistant metallic material or have an effective coating against external corrosion. Fasteners used shall be of corrosion-resistant material or have a corrosion-resistant plating or coating.

NOTE Pressure regulation devices in accordance with EN 16129:2013, Annex M, meet these requirements.

6 LPG supply line

6.1 General

6.1.1 The LPG supply line shall be either solid piping in accordance with [6.2](#), except for short hose connections to the pressure regulation device or to stoves, or continuous hose in accordance with [6.3](#).

The layout of the supply line shall be such that the length of piping and hoses is as short as possible.

6.1.2 Hoses shall be used to connect

- gimballed stoves to their LPG supply,
- supply piping to the pressure regulation device (either high or low pressure side of the system).

The hose and its connections to the pressure regulation device shall be within the cylinder locker or cylinder housing.

6.1.3 Piping and hose shall be sized so that any pressure drop due to pipe resistance does not reduce the operating pressure at any appliance below that required by the appliance manufacturer when all appliances are operating simultaneously. See [Annex A](#).

6.2 Piping

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6.2.1 Only solid drawn copper or drawn stainless steel piping shall be used for rigid supply lines. Attention should be given to galvanic compatibility when connecting different materials.

Wall thickness for piping shall be equal or greater than 0,6 mm for piping up to 12 mm outside diameter and a minimum of 0,9 mm for piping with an outside diameter greater than 12 mm. Semi-rigid, pliable corrugated stainless steel tubing (PCT) shall conform to EN 15266, or equivalent.

6.2.2 There shall be no joints or fittings in piping passing through engine compartments.

6.2.3 Metallic LPG supply piping routed through engine compartments shall be protected by conduit or trunking, or supported by non-abrasive attachments which are no more than 300 mm apart.

6.2.4 Fittings for connections and joints in piping shall be metallic and of any of the following types:

- hard soldered and brazed connections;
- cutting ring fittings in accordance with ISO 8434-1:2007, Table 4 (see also [6.4.2](#), [6.4.4](#), [6.4.5](#));
- copper rings on copper piping and compression fittings in accordance with EN 1254-2 or equivalent;
- stainless steel rings on stainless steel piping;
- connections in accordance with EN 16129:2013, Annex M;
- pliable corrugated stainless steel tubing (PCT) fittings to EN 15266, or equivalent.