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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 18581

CNG and LNG equipment and accessories — CNG and LNG propulsion system for small craft — installation requirements

Equipements et accessoires pour le GNC et le GNL- Système de propulsion au GNC et au GNL pour les petites embarcations — Exigences d'installation

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ISO/TC 22/SC 41

Secretariat: **UNI**

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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 document 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).

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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 22, *Road vehicles*, Subcommittee SC 41, *Specific aspects for gaseous fuels*.

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 specifies requirements for the installation of equipment for the use of Compressed Natural Gas (hereafter referred to as CNG) and Liquefied Natural Gas (hereafter referred to as LNG) in the propulsion systems for small crafts.

This document includes procedures which the use substances and procedures that can be injurious to health if adequate precautions are not taken. This document refers only to technical suitability.

Natural gas, either in gaseous (CNG) or liquid phase (LNG), is a very efficient and ready-to-use solution which can facilitate compliance with the more stringent environmental regulations as well as the compliance with the principles of the circular economy. In this context, regulations can concern the impact of a product on the environment during its entire life cycle, including the expenditure of energy and during all phases such as use, scrapping and recycling of materials. Some parts of this document address also environmental aspects.

CNG and LNG equipment and accessories — CNG and LNG propulsion system for small craft — installation requirements

1 Scope

This document specifies the requirements for the installation of compressed natural gas (CNG) and liquefied natural gas (LNG) propulsion systems and components on small crafts.

This document does not cover appliances with directly attached gas cylinders, such as portable container.

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 630, *Structural steels — Plates, wide flats, bars, sections and profiles*

ISO 11439, *Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles*

ISO 12991, *Liquefied natural gas (LNG) — Tanks for on-board storage as a fuel for automotive vehicles*

ISO 12614, *Road vehicles — Liquefied natural gas (LNG) fuel system components*

ISO 12617:2015, *Road vehicles — Liquefied natural gas (LNG) refuelling connector — 3,1 MPa connector*

ISO 14469, *Road vehicles — Compressed natural gas (CNG) refuelling connector*

ISO 15500, *Road vehicles — Compressed natural gas (CNG) fuel system components*

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

EN 28846, *Small craft — Electrical devices — Protection against ignition of surrounding flammable gases*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread*

ISO 9094-1, *Small craft — Fire protection — Part 1: Craft with a hull length of up to and including 15 m*

ISO 9094-2, *Small craft — Fire protection — Part 2: Craft with a hull length of over 15 m*

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

ISO 10239, *Small craft — Liquefied petroleum gas (LPG) systems*

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

ISO 11105, *Small craft — Ventilation of petrol engine and/or petrol tank compartments*

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

EN ISO 12217 (all parts), *Small craft — Stability and buoyancy assessment and categorization*

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

3 Terms and Definitions

For the purposes of this document, the terms and definitions given in EN 12806:2003 and the following 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

accessible

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

Note 1 to entry: Hatches are not regarded as permanent craft structures in this sense, even if tools such as wrenches or screwdrivers are needed to open them.

3.2

appliance

appliance that is designed for heating, cooking, lighting, refrigeration, hot water production or electricity production (fuel cell or generator), using natural gas as its energy source

3.3

automatic cylinder valve

automatic valve rigidly fixed to the cylinder which controls the flow of gas to the fuel system

3.4

automatic valve

valve which is not operated manually

3.5

bi-fuel engine

Engine that has two independent fuel systems (one of them for natural gas) and can run alternatively on either fuel, but only on one at a time

3.6

Capacitive Fuel Content Indicator

Fuel content indicator based on the ratio of mass to natural gas capacity

3.7

check valve

automatic valve (3.4) which allows gas to flow in only one direction

3.8

cockpit

area that may retain water, however briefly, due to rain, waves, boat heeling, etc.

Note 1 to entry: Cockpits are normally designed for accommodation of people but, for the purpose of this Standard, the term "cockpit" is used either for a proper cockpit or for any recess. This means that bulwarks may create a large cockpit, open boats can effectively comprise a cockpit which includes nearly all the boat, cockpit(s) can be situated anywhere in the boat and a cockpit can open aft to the sea.

3.9

CNG propulsion system

fuel system which includes cylinder or cylinders according to ISO 11439, the assembly, one or more refuelling connectors according to ISO 14469, and the components described in the standards from ISO 15500-3 to ISO 15500-20.

Note 1 to entry: Cylinders are replaceable items and may not be supplied with the boat system

3.10

qualified person

individual subjected to a qualification process, and who has passed the qualification

[SOURCE: ISO 23684:2023, 3.26]

3.11

compressed natural gas CNG

natural gas which has been compressed and stored for use as a fuel

3.12

Connector

fittings used to join a conduit, tubing, or hose systems

3.13

container

cryogenic vessel used for the storage of liquefied natural gas (LNG)

3.14

container housing

ventilated enclosure intended solely for storage of one or more CNG cylinders or LNG containers, pressure regulators and safety devices and located on the exterior of the boat where any leakage would flow overboard

3.15

container locker

gas-tight (to the craft) enclosure with an overboard drain, where any leakage would flow overboard, intended solely for storage of one or more CNG cylinders or LNG containers in a cockpit or recessed into the craft

3.16

cylinder

transportable, refillable container with a water capacity from 0,5 l up to and including 150 l for the storage of CNG

3.17

design pressure

highest pressure related to the circumstances for which the system has been designed and is intended to be used

3.18

dual-fuel engine

engine system that is designed to simultaneously operate with liquid fuel and a gaseous fuel, both fuels being metered separately, where the consumed amount of one of the fuels relative to the other one may vary depending on the operation

[SOURCE: ISO 8178-4:2020, 3.17]

3.19

excess flow valve

valve which automatically shuts off, or limits, the gas flow when the flow exceeds a set design value

3.20

filler valve

valve system for fill service

3.21

filter

component containing a screen or media that is intended to remove foreign debris from the gas stream

3.22

fixed container

CNG cylinder or LNG container permanently installed to the structure of the craft

3.23

flexible fuel line

flexible tubing or hose through which natural gas flows

3.24

fuel rail

pipe or duct that connects the gas injectors

3.25

gas/air mixer

device for mixing the gaseous fuel and intake air for the engine

3.26

gas detection

revealing of the presence of NG due to exposure outside the NG containment system

3.27

gas flow adjuster

gas flow restricting device, installed downstream of a pressure regulator, controlling gas flow to the engine

3.28

gas injector

device for introducing gaseous fuel into the engine or associated intake system

3.29

gas-tight housing

device which vents gas leakage to outside the vehicle including the gas ventilation hose, the clear opening of which is at least 450 mm²

3.30

inspection body

independent inspection and testing body approved by the qualified authority

3.31

installer

person or organisation, who by qualification, training, experience and resources can assume technical responsibility for the installation of the CNG and LNG propulsion system

3.32

level indicator

fuel content gauge based on the pressure difference between the top and bottom of the container.

Note 1 to entry: The system measures the weight of the liquid in case of LNG

Note 2 to entry: other systems can be used to measure the level of LNG inside the tanks.

3.33

liquefied natural gas (LNG)

natural gas which has been liquefied after processing for storage, transportation, or use as a fuel

[SOURCE: ISO 12614-1:2021, 3.11]

3.34

LNG propulsion system

Liquefied natural gas fuel system which includes container(s) according to ISO 12991, mounting, one or more fuelling connectors and the components described in this standard

Note 1 to entry: LNG containers are replaceable items and may not be supplied with the boat system

Note 2 to entry: See ISO 12991 for further details on containers; see ISO 21593 for further details on connectors; and see ISO 22547 and ISO 22548 for details on the components described.

3.35

manual valve

valve which is operated manually and controls the flow of gas to the fuel system

3.36

manual cylinder valve

manual valve rigidly fixed to the cylinder

3.37

mono-fuel engine

Engine which operates on natural gas only

3.38

Natural gas

Complex gaseous mixture of hydrocarbons primarily methane, but generally includes ethane, propane and higher hydrocarbons, and some non-combustible gases such as nitrogen and carbon dioxide.

3.39

permanently installed

securely fastened so that tools have to be used for removal

3.40

pressure indicator

pressurized device that indicates the gas pressure; it can be an indicator or a sensor

3.41

pressure regulator

device used to control the delivery pressure of gaseous fuel to the engine

3.42

pressure relief device PRD

safety device that releases gases or liquids above a specified pressure value in cases of emergency or abnormal conditions

Note 1 to entry: PRDs can be activated by pressure or another parameter, such as temperature, and can be either re-closing devices (such as valves) or non-re-closing devices (such as rupture disks and fusible plugs). Common designations for these specific types of PRDs are as follows:

- Pressure safety valve (PSV) — pressure activated valve that opens at specified set point to protect a system from rupture and re-closes when the pressure falls below the set point.
- Thermally-activated pressure relief device (TPRD) — a PRD that opens at a specified temperature to protect a system from rupture and remains open.

[SOURCE: ISO 19880-1:2020, 3.59, modified — Note 2 to entry removed.]

3.43

pressure relief valve (discharge valve) PRV

self-closing device which opens to prevent a pre-determined pressure being exceeded

3.44

quality management system

the organization framework whose structure provides the policies, processes, procedures, and resources required to implement the quality management plan

Note 1 to entry: The typical project quality management plan should be compatible to the organization's quality management system.

[SOURCE: ISO 9000:2015, 3.5.4, modified; ISO/IEC 30105-4:2016 3.41]

3.45

readily accessible

capable of being reached for operation, inspection or maintenance without the removal of any craft structure or the use of any tools or the removal of any item of portable equipment stowed in places intended for storage of portable equipment such as lockers, drawers or shelves

Note 1 to entry: Hatches are not regarded as permanent craft structures in this sense.

3.46

rigid fuel line

tubing which has been designed not to flex in normal operation and through which natural gas flows

3.47

service valve

manual valve which is closed only when servicing the engine

3.48

shut-off valve

valve to provide a leak-tight seal which is operated either manually, remotely or is self-closing

3.49

valve

device by which the flow of a fluid may be controlled

3.50

vaporiser

device intended to vaporise the cryogenic liquid fuel to a gaseous state with a gas range from -40 °C to +85 °C

3.51

ventilation system

assembly of ducts and an electrical ventilator that is capable of extracting hydrocarbons from the inside of the craft and allowing the entrance of fresh air

3.52

venting tube

duct that connects the gas-tight housing to the atmosphere

4 Components

4.1 General provisions

4.1.1 All operations on the CNG and LNG systems and propulsion systems shall be operated by a qualified person.

4.1.2 Individual components of the system, and the system as a whole, shall be designed to withstand the combined conditions of pressure, vibration, shocks, corrosion and movement encountered under normal operation.

4.1.3 All materials used in CNG or LNG systems shall be compatible with CNG and LNG and with other liquids or compounds with which it might come into contact under normal operating conditions, e.g. grease, lubricating oil, bilge solvents, fresh and sea water.

4.1.4 Efforts should be made to prevent grease, lubricating oil, bilge solvents and other chemicals contaminating the marine environment.