
Natural gas fuelling stations — LNG stations for fuelling vehicles

*Stations-service de gaz naturel — Stations GNL pour le ravitaillement
de véhicules*

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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 on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/PC 252, *Natural gas fuelling stations for vehicles*.

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Natural gas fuelling stations — LNG stations for fuelling vehicles

1 Scope

This document specifies the design, construction, operation, maintenance and inspection of stations for fuelling liquefied natural gas (LNG) to vehicles, including equipment, safety and control devices.

This document also specifies the design, construction, operation, maintenance and inspection of fuelling stations for using LNG as an onsite source for fuelling CNG to vehicles (LCNG fuelling stations), including safety and control devices of the station and specific LCNG fuelling station equipment.

NOTE Specific CNG equipment is dealt with in ISO 16923.

This document is applicable to fuelling stations receiving LNG and other liquefied methane-rich gases that comply with local applicable gas composition regulation or with the gas quality requirements of ISO 13686.

This document includes all equipment from the LNG storage tank filling connection up to the fuelling nozzle on the vehicle. The LNG storage tank filling connection itself and the vehicle fuelling nozzle are not covered in this document.

This document includes fuelling stations having the following characteristics:

- private access;
- public access (self-service or assisted);
- metered dispensing and non metered dispensing;
- fuelling stations with fixed LNG storage;
- fuelling stations with mobile LNG storage;
- movable fuelling stations;
- mobile fuelling stations;
- multi-fuel stations.

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 4126 (all parts), *Safety devices for protection against excessive pressure*

ISO 9606-1, *Qualification testing of welders — Fusion welding — Part 1: Steels*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

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

ISO 13709, *Centrifugal pumps for petroleum, petrochemical and natural gas industries*

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ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding*

ISO 15609-2, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 2: Gas welding*

ISO 15609-3, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 3: Electron beam welding*

ISO 15609-4, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 4: Laser beam welding*

ISO 15609-5, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 5: Resistance welding*

ISO 15609-6, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 6: Laser-arc hybrid welding*

ISO 20421-1, *Cryogenic vessels — Large transportable vacuum-insulated vessels — Part 1: Design, fabrication, inspection and testing*

ISO 21011, *Cryogenic vessels — Valves for cryogenic service*

ISO 21012, *Cryogenic vessels — Hoses*

ISO 21013-1, *Cryogenic vessels — Pressure-relief accessories for cryogenic service — Part 1: Reclosable pressure-relief valves*

ISO 21029-1, *Cryogenic vessels — Transportable vacuum-insulated vessels of not more than 1 000 litres volume — Part 1: Design, fabrication, inspection and tests*

ISO 24490, *Cryogenic vessels — Pumps for cryogenic service*

ISO 31000, *Risk management — Principles and guidelines*

IEC 31010, *Risk management — Risk assessment techniques*

IEC 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres*

IEC 60079-14, *Explosive atmospheres — Part 14: Electrical installations design, selection and erection*

IEC 60079-17, *Explosive atmospheres — Part 17: Electrical installations inspection and maintenance*

IEC 60204-1:2005, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61511 (all parts), *Functional safety — Safety instrumented systems for the process industry sector*

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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 ambient vaporizer

heat exchanger that vaporizes LNG with the heat of ambient air

3.2**assembly**

sub-system of the fuelling station comprising several components

3.3**approved**

having approval for the intended usage from an authority having jurisdiction or having the manufacturer's declaration for intended use

3.4**boil-off gas**

gas produced from evaporation of LNG in the LNG storage tank and other parts of the fuelling station including the gas returned from the vehicle tank

3.5**breakaway device**

coupling which separates at a predetermined section when required and each separated section contains a self-closing shut-off valve which seals automatically

[SOURCE: ISO/TS 18683:2015, 3.1.3]

3.6**buffer storage**

one or more suitable pressure vessels designed for the purpose of storing compressed natural gas

3.7**building**

structure, usually enclosed by walls and a roof, constructed to provide support or shelter for an intended occupancy

3.8**bund**

elevated boundary of the containment, like wall, dike or embankment

3.9**burst pressure**

pb

pressure that causes failure and consequential fluid loss through the component envelope

3.10**canopy**

roof, overhead shelter, or hood, that affords a degree of weather protection

3.11**cold end**

cryogenic part of a reciprocating LNG pump

3.12**competent person**

person having the ability, appropriate training, knowledge and experience, to supervise or carry out the work being undertaken in a safe and proper manner

3.13**compressed natural gas**

CNG

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

[SOURCE: ISO 15500-1:2000, 3.2]

3.14

compressor

machine that increases the pressure of gas

3.15

conduit

casing, tubing or liner, either metallic or non-metallic

[SOURCE: ISO 14310:2008, 3.6]

3.16

containment

area, surrounded by a bund, to contain spilled LNG within that area

3.17

cryogenic

intended for service over the temperature of -153 °C and -196 °C , the lower point being the normal boiling point of nitrogen

3.18

cryogenic pump

pump that delivers LNG at a higher pressure

Note 1 to entry: Pumps used for delivery of LNG to the LNG dispenser are typically centrifugal pumps; however, slow speed reciprocating pumps are also used.

Note 2 to entry: Pumps used for delivery of high-pressure liquid into the high-pressure vaporizer are typically reciprocating piston pumps.

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3.19

detachable joint

mechanical joint that can be readily disassembled

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EXAMPLE Flanges, threaded joints and similar.

3.20

dispenser

equipment through which the fuel is supplied to the vehicle

Note 1 to entry: This equipment can include metering.

3.21

dry air

air with a maximum dew point of -40 °C

3.22

enclosure

structure, not being a building or canopy, that encloses a component of the fuelling station

EXAMPLE Housing, container and machine cabinet.

3.23

explosive gas atmosphere

mixture of substances with air, under atmospheric conditions, in the form of gases, vapours or mists in which, after ignition has occurred, combustion spreads to the entire unburned mixture

Note 1 to entry: Derived from definition of “explosive atmosphere” in IEC 61340-4-4:2014, 11, 3.4.

3.24

fail-safe

design feature that ensures that safe conditions are maintained in the event of a malfunction of a control device or an interruption of a supply source

3.25**filling**

process of transferring LNG into the LNG storage tank

3.26**fire resistance**

property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under specified conditions

3.27**fire wall**

wall or separating partition erected to reduce the effects of radiated heat

3.28**flash gas**

gas generated from liquid when delivered to the tank to lower pressure than is its boiling pressure at its temperature

3.29**fuelling**

transfer of fuel from dispenser to the vehicle

3.30**fuelling nozzle**

device which permits quick connection and disconnection of the fuelling hose to/from the refuelling receptacle

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3.31**fuelling pressure**

pressure at which the fuel is delivered to the vehicle

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3.32**fuelling station**

facility at which vehicle fuels are dispensed

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3.33**grounding**

electrical connection of potentially live exposed metallic parts to earth

3.34**hazardous area**

area in which an explosive gas atmosphere is present, or can be expected to be present, in quantities such as to require special precautions for the construction, installation and use of apparatus to prevent ignition

[SOURCE: IEC 60079-10-1:2015, 3.3]

3.35**hose**

pipeline of flexible material with end fittings attached

3.36**hose assembly**

hose, or hoses, with ancillary components, such as bend restrictors, breakaways and nozzles, attached

3.37**LCNG fuelling station**

facility at which CNG derived from LNG is dispensed to vehicles

3.38

liquefied natural gas

LNG

natural gas that has been liquefied, after processing, for storage or transportation purposes

3.39

LNG fuelling station

facility at which LNG is dispensed to vehicles

3.40

LNG offloading area

area where the LNG tanker connects to the LNG fuelling station for offloading LNG into the LNG storage tank

3.41

LNG pump

cryogenic pump for transferring LNG

3.42

LNG storage tank

cryogenic vessel used for the purpose of storing LNG

3.43

LNG tanker

vehicle that delivers LNG for offloading to the LNG storage tank at the LNG fuelling station

3.44

LNG transfer point

connection point between the hose of the LNG tanker and the fixed pipeline to the LNG storage tank

3.45

lower explosion limit

LEL

volume concentration of flammable gas or vapour in air, below which the mixture is not flammable

[SOURCE: ISO 19372:2015, 3.7, modified — “explosive” has been changed to “flammable”.]

3.46

maximum allowable working pressure

MAWP

maximum pressure to which a component or system is designed to be subjected and which is the basis for determining the strength of the component or system

[SOURCE: ISO 12991:2012, 3.10, modified — “or system” has been added and “under consideration” has been removed.]

3.47

maximum fuelling pressure

maximum pressure to which the vehicle tank can be filled

3.48

mobile LNG fuelling station

LNG fuelling station (and/or LCNG fuelling station) having an LNG storage tank capacity of more than 1 000 litres that can be transported with LNG onboard

3.49

mobile storage

LNG storage tank assembly, having a gross volume of more than 1 000 litres, mounted on a vehicle and used at the LNG fuelling station as a temporary LNG storage tank

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3.50**movable LNG fuelling station**

LNG fuelling station (and/or LCNG fuelling station) having an LNG storage tank capacity of more than 1 000 litres and consisting of one or more units intended for easy installation and possible relocation

3.51**multi-fuel station**

fuelling station that can fuel natural gas as well as other fuels, for example diesel, petrol, LPG

3.52**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

Note 1 to entry: Natural gas can also contain components or containments such as sulphur compounds and/or other chemicals.

[SOURCE: ISO 14532:2014, 2.1.1.1]

3.53**net positive suction head****NPSH**

inlet total head increased by the head (in flowing liquid) corresponding to the atmospheric pressure at the test location and decreased by the sum of the head corresponding to the vapour pressure of the pump liquid at the inlet temperature and the inlet impeller height

[SOURCE: ISO 24490:2016, 3.5]

3.54**non-combustible**

not capable of undergoing combustion under specified conditions

[SOURCE: ISO 13943:2008, 4.239] <https://standards.iteh.ai/catalog/standards/sist/d8dbad38-c771-42c8-a9ee-386df9887e4b/iso-16924-2016>

3.55**normal operation**

situation when the equipment is operating within its design parameters

[SOURCE: ISO 16110-1:2007, 3.50]

3.56**odorant**

intensely smelling organic chemical or combination of chemicals added to natural gas at low concentration and capable of imparting a characteristic and distinctive (usually disagreeable) warning odour so gas leaks can be detected at concentrations below their lower flammability limit

Note 1 to entry: ISO/TR 16922 gives the specifications and guidelines for the methods to be used in the odorization of natural gas under a safety point of view and specifies the principles for the odorization technique (including handling and storage of odorants) and the control of odorization of natural gas.

[SOURCE: ISO 14532:2014, 2.8.1, modified — Note 1 to entry has been added.]

3.57**odorization**

process of introducing odorant(s) into natural gas

3.58**odorizer**

equipment used to introduce odorant into natural gas