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**Road vehicles — Liquefied natural gas  
(LNG) fuel systems —**

**Part 1:  
Safety requirements**

*Véhicules routiers — Systèmes à carburant gaz naturel liquéfié  
(GNL) —*

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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](http://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](http://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 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). (standards.iteh.ai)

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A list of all the parts in the ISO 19723 series, can be found on the ISO website.

## Introduction

For the purposes of this document, all fuel system components in contact with liquid natural gas have been considered suitable for natural gas as defined in the ISO 15403 series.

When applying this document, it is understood that a safety device to prevent overfilling the vehicle's fuel system is part of the refueling station. The pressure gauge has not been considered as a safety component.

When necessary, technical solutions regarding functional requirements are given in [Annex A](#).

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# Road vehicles — Liquefied natural gas (LNG) fuel systems —

## Part 1: Safety requirements

### 1 Scope

This document specifies the minimum safety requirements applicable to liquefied natural gas (LNG) on-board fuel system intended for use on the types of motor vehicles defined in ISO 3833.

This document is applicable to vehicles (mono-fuel, bi-fuel or dual-fuel applications) using liquefied natural gas in accordance with the ISO 15403 series. It is not applicable to original-production and converted vehicles.

All matters relating to the skills of installers and converters have been excluded from this document.

This document is only applicable on the components in the "LNG system" meaning an assembly of components (tanks, valves, flexible fuel lines, etc., see [Annex B](#)) and connecting parts (fuel lines, fittings, etc.) fitted on motor vehicles using LNG in their propulsion system and related components up to and including the vaporizer. Other parts downstream from the vaporizer are considered as CNG components covered by ISO 15501.

### 2 Normative references

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

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

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

ISO 19723-2, *Road vehicles — Liquefied natural gas (LNG) refueling connector — Test methods*

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

IEC 60079-1, *Explosive atmospheres — Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-10, *Electrical apparatus for explosive gas atmospheres — Part 10: Classification of hazardous areas*

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

### 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  
liquefied natural gas**

**LNG**

cryogenic liquid, produced by reducing the temperature of natural gas to about  $-162\text{ }^{\circ}\text{C}$  at atmospheric pressure

**3.2  
pressure relief valve**

device that prevents a pre-determined upstream pressure being exceeded

**3.3  
working pressure**

maximum pressure that an LNG refuelling connector can be expected to withstand in actual service, equal to the setting of the primary relief valve of the vehicle on board fuel tank

Note 1 to entry: An LNG refuelling connector is understood to be a joined assembly of LNG refuelling nozzle and receptacle.

Note 2 to entry: An LNG refuelling nozzle is understood to be a device which permits quick connection and disconnection of fuel supply hose to the LNG receptacle in a safe manner.

**3.4  
service pressure**

intended settled pressure of the tank in use as declared by the manufacturer

**3.5  
check valve**

*automatic valve* (3.11) which allows gas or liquid to flow in only one direction

**3.6  
fuel pump**

device to establish the supply of LNG to the engine by increasing the pressure of the fluid (liquid or vapour)

**3.7  
category M**

<vehicle category> power-driven vehicles having at least four wheels and used for the carriage of passengers

**3.7.1  
M1**

<vehicle category> vehicles used for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat

**3.7.2  
M2**

<vehicle category> vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver's seat and having a maximum authorized mass not exceeding 5 000 kg

**3.7.3  
M3**

<vehicle category> vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver's seat and having a maximum authorized mass exceeding 5 000 kg

**3.8  
category N**

<vehicle category> power-driven vehicles having at least four wheels and used for the carriage of goods



**3.8.1****N1**

<vehicle category> vehicles used for the carriage of goods and having a maximum authorized mass not exceeding 3 500 kg

**3.8.2****N2**

<vehicle category> vehicles used for the carriage of goods and having a maximum authorized mass exceeding 3 500 kg but not exceeding 12 000 kg

**3.8.3****N3**

<vehicle category> vehicles used for the carriage of goods and having a maximum authorized mass exceeding 12 000 kg

**3.9****protected position**

area where components are installed to be protected against impact or collision

**3.10****excess flow limiting device**

device that automatically shuts off, or limits, the gas or liquid flow when the flow exceeds a certain defined criteria

**3.11****automatic valve**

valve or combination of valves that is/are not operated manually

Note 1 to entry: A manual valve is a valve which is operated manually.

**3.12****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 mm<sup>2</sup>

**4 Requirements****4.1 Design****4.1.1 General**

The LNG on-board fuel system components shall comply with ISO 12614 (all parts) and ISO 12617, as applicable.

The pressure system, specified in ISO 12614-1, shall be designed on the basis of the service pressure.

For bi-fuel vehicles, provision shall be made to avoid accelerated deterioration of the non-LNG fuel system as a result of sustained operation on natural gas. Such measures shall be as recommended by the original vehicle manufacturer (e.g. fuel hoses).

All fuel system components shall fulfill the following conditions.

- a) They shall withstand the environmental temperatures and other environmental conditions safely during their operational life.
- b) They shall be located with full regard for anticipated damage while the vehicle is being used safely. Such damage can be caused by the vehicle itself, by extraneous factors such as heat, road debris, automotive chemical splash (brake liquid, oil, petrol, cooling liquid, etc.), or by rust, etc.

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- c) They shall not exceed the outermost, highest or lowest parts of the vehicles without further protection.
- d) They shall be fitted so as not to affect ground clearance, approach angle, ramp (break-over) angle or departure angles as defined by the vehicle manufacturer.
- e) They shall be located so that they will not suffer corrosion damage by accumulation of water or cargo chemicals.
- f) They shall assure the proper electrical conductivity throughout the fuel system in order to avoid electrostatic charges. This provision does not apply to gas-tight housing and ventilation hoses.
- g) All connections shall be made in locations where access is possible for inspection.

The system shall be so designed that galvanic corrosion is minimized.

The system shall be so designed that using a grounding point protects it against electrical discharge.

The following tank components, when used, shall be placed in a safe place or suitably protected against damage, such as that arising from moving vehicle components, collision and grit or that due to loading or unloading of the vehicle or the shifting of those loads:

- manual valve(s);
- pressure relief valve(s) (PRV);
- automatic shut-off valve;
- excess flow limiting device;
- fill check valve.

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The manual valves shall be easily accessible; <https://standards.iteh.ai/catalog/standards/sist/af6c0103-8df0-4a45-a574-ace0244d73f/iso-19723-1-2018>

The LNG on-board fuel system shall include:

- LNG tank(s) or vessel(s);
- LNG heat exchanger/vaporizer;
- LNG pressure relief valve(s);
- LNG venting system;
- LNG receptacle;
- LNG excess flow limiting device;
- LNG manual valve or means to isolate the tank;
- LNG/CNG automatic valve or means to isolate the tank;
- LNG fuel line;
- LNG couplings;
- LNG check valve or non-return valve;
- LNG pressure indicator or fuel indicator;
- Electronic Control Unit (no separate ECU necessarily – can be integrated);
- natural gas detector or gas-tight housing for category M vehicles.

The LNG on-board fuel system may include:

- LNG pressure control regulator;
- LNG pressure and/or temperature sensor;
- LNG fuel pump;
- LNG level gauge;
- a device inside the gas tank or a functionally equivalent system to control gas leakage in the event of a rupture in the fuel supply system (see [Annex A](#));
- gas-tight housing.

## 4.1.2 Components

### 4.1.2.1 Receptacle

The receptacle shall comply with the applicable part of ISO 12617. The receptacle shall be provided with a cap to minimize the entry of dust, fluid or other foreign matter, which shall be attached to the vehicle or to the fuel system.

The following data should be displayed near the receptacle (marking shall be made either by labels attached, by adhesive or plates attached by welds):

- type of fuel (i.e. “LNG” for liquefied natural gas);
- service pressure for the vehicle.

### 4.1.2.2 LNG pressure relief valves (primary and secondary)

The primary pressure relief valve outlet shall be connected to an open ended pipe-away system to move vented gas away to a high level. Consideration shall be given to preventing any blockage or freezing of the pipe away.

The secondary relief valve may relieve gas immediately from its outlet. Protection from water ingress and damage shall be considered. The secondary relief valve outlet shall not be connected to the same pipe away as the primary relief valve.

### 4.1.2.3 LNG excess flow limiting device

The LNG excess flow limiting device can be fitted inside or directly on the LNG tank (in a protected position).

The LNG excess flow limiting device function may be fulfilled by an LNG/CNG valve (automatic) in a protected position.

### 4.1.2.4 LNG/CNG valve (automatic)

The LNG/CNG valve (automatic) shall only be open when:

- LNG operation has been selected, either manually or automatically; and
- the engine is cranking or running, irrespective of the position of the ignition switch.

An auxiliary system may be permitted if the propulsion system and related components are adequately protected and the required operation of the LNG system is not affected.

Only automatic valves that are normally closed when deactivated shall be used in the LNG on-board fuel system for each LNG tank mounted.