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

**Part 1:
General requirements and definitions**

*Véhicules routiers — Équipements pour véhicules utilisant le gaz
naturel liquéfié (GNL) comme combustible —*

Partie 1: Exigences générales et définitions





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Published in Switzerland

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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).

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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 22, *Road vehicles*, Subcommittee SC 25, *Vehicles using gaseous fuels*.

ISO 12614 consists of the following parts, under the general title *Road vehicles — Liquefied natural gas (LNG) fuel system components*:

- *Part 1: General requirements and definitions*
- *Part 2: Performance and general test methods*
- *Part 3: Check valve*
- *Part 4: Manual valve*
- *Part 5: Tank pressure gauge*
- *Part 6: Overpressure regulator*
- *Part 7: Pressure relief valve*
- *Part 8: Excess flow valve*
- *Part 9: Gas-tight housing and ventilation hose*
- *Part 10: Rigid fuel line in stainless steel*
- *Part 11: Fittings*
- *Part 12: Rigid fuel line in material other than stainless steel*
- *Part 13: Pressure control regulator*
- *Part 14: Differential pressure fuel content gauge*
- *Part 15: Capacitance fuel content gauge*

- *Part 16: Heat exchanger - vaporizer*
- *Part 17: Natural gas detector*
- *Part 18: Gas temperature sensor*

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Road vehicles — Liquefied natural gas (LNG) fuel system components —

Part 1: General requirements and definitions

1 Scope

This part of ISO 12614 specifies general requirements and definitions of liquefied natural gas fuel system components, intended for use on the types of motor vehicles as defined in ISO 3833. It also provides general design principles and specifies requirements for instructions and marking.

This part of ISO 12614 is not applicable to the following:

- a) fuel containers;
- b) stationary gas engines;
- c) container mounting hardware;
- d) electronic fuel management;
- e) fuelling receptacles.

NOTE 1 It is recognized that miscellaneous components, not specifically covered herein can be examined to meet the criteria of this part of ISO 12614 and tested according to the appropriate functional tests.

NOTE 2 All references to pressure in this part of ISO 12614 are to be considered gauge pressures unless otherwise specified.

NOTE 3 This part of ISO 12614 is based upon a working pressure for natural gas as fuel of 1,6 MPa [16 bar¹]. Other working pressures can be accommodated by adjusting the pressure by the appropriate factor (ratio). For example, a 2 MPa (20 bar) working pressure system will require pressures to be multiplied by 1,25.

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 3833:1977, *Road vehicles — Types — Terms and definitions*

ISO 6722 (all parts), *Road vehicles — 60 V and 600 V single-core cables*

ISO 15500:2012, *Road vehicles — Compressed natural gas (CNG) fuel system components*

3 Terms and definitions

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

3.1

burst pressure

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

- 1) 1 bar = 0,1 MPa = 105 Pa; 1 MPa = 1 N/mm².

3.2
electronic control unit
ECU

device for control of the engine — it is not in the scope of ISO 12614

3.3
filter

component that is intended to remove contaminants from the gas stream

3.4
fitting

connector used in joining a piping, tubing, or hose system

3.5
flexible fuel line

flexible tubing or hose through which natural gas flows

3.6
fuel content gauge

device that shows the liquid fuel level in the fuel tank

3.7
differential pressure fuel content gauge

fuel content gauge based on the difference of the pressure at the top and bottom parts of the fuel tank (the system measures the weight of the liquid)

3.8
capacitance fuel content gauge

fuel content gauge based on the relationship between the mass and electrical capacitance of natural gas

3.9
gas-air mixer

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

3.10
gas flow adjuster

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

3.11
gas injector

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

3.12
gas temperature sensor

device for gas temperature measurement, which is placed downstream of the vaporizer

3.13
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

3.14
heat exchanger - vaporizer

device for vaporizing the cryogenic liquid fuel and delivering it as gas to the engine with a gas temperature between -40 °C and +85 °C

3.16
liquefied natural gas
LNG

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

3.17**LNG vehicle**

vehicle which is using liquefied natural gas (LNG) as a source of gaseous fuel for its engine

3.18**natural gas detector**

device for sensing the presence of natural gas

3.19**natural gas vehicle****NGV**

road vehicle powered by natural gas

3.20**pressure regulator**

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

3.21**tank pressure regulator**

pressure regulator for controlling pressure in the fuel tank

3.22**rigid fuel line**

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

3.23**tank pressure gauge**

pressurized device which indicates the pressure of the gas space in the fuel tank

3.24**test pressure**

pressure to which a component is taken during acceptance testing

3.25**valve**

device by which the flow of a fluid can be controlled

3.36**manual valve**

valve which is operated manually

3.37**automatic shut-off valve**

valve which is not operated manually and is used on vaporized gas only for emergency operation

3.38**check valve**

automatic valve which allows gas to flow in only one direction

3.39**excess flow valve**

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

3.40**pressure relief valve****PRV**

device which prevents a pre-determined upstream pressure being exceeded

3.41**service valve**

manual valve which is closed only when servicing the vehicle

3.42

working pressure

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

4 Construction and assembly

4.1 For the description of components, see [Annex A](#).

4.2 Components shall be made of materials suitable for use with liquefied natural gas.

4.3 Jointing components shall provide gas-tight sealing performance. Where joints are required to be disassembled, it is recommended that any tapered thread fittings be replaced.

4.4 Components shall be suitable for service within a temperature range as specified below:

4.4.1 Components, which are not intended to be used at temperatures less than $-40\text{ }^{\circ}\text{C}$, shall be designed and specified in accordance with ISO 15500.

4.4.2 Components, which are intended to be used at temperatures less than $-40\text{ }^{\circ}\text{C}$, shall be suitable for service within a temperature range of $-162\text{ }^{\circ}\text{C}$ to $85\text{ }^{\circ}\text{C}$.

4.4.3 Components, which are intended to be used at temperatures less than $-40\text{ }^{\circ}\text{C}$, when placed in the engine compartment, shall be suitable for service within a range of $-162\text{ }^{\circ}\text{C}$ to $120\text{ }^{\circ}\text{C}$.

4.5 All non-metallic materials shall comply with the oxygen ageing test specified in ISO 12614-2.

4.6 All non-metallic materials in contact with natural gas shall comply with the non-metallic material immersion test specified in ISO 12614-2.

4.7 All components subject to weather exposure and other corrosive conditions shall be made of corrosion-resistant material or otherwise protected.

4.8 It is recognized that multifunctional components have the functions of several components where the functions are as defined in ISO 12614-3 and subsequent parts of this International Standard. Such multifunctional components shall be examined for conformance to ISO 12614-3 and subsequent parts of this International Standard and tested according to the appropriate functional tests.

4.9 Fuel flow shut-off valve shall be fail-safe, closing with the loss of actuating energy.

5 Electrical equipment and wiring

5.1 Any openings in electrical wiring components shall be equipped with means to prevent chafing and abrasion of the wire insulation.

5.2 Electrical equipment and circuit wiring in a component shall be of automotive quality with respect to mechanical strength, insulation, and current carrying capacity, in accordance with ISO 6722 (all parts).

For example, possible explosion zones shall be taken into consideration with the component specifications according to existing International Standards.

5.3 Materials used for electrical construction shall be suitable for their particular application. When determining the acceptability of an electrical insulating material, consideration shall be given to its mechanical strength, dielectric strength, heat-resistant properties, the degree to which it is enclosed or protected, and any other features influencing fire and accident hazards.

6 Instructions

6.1 Clear, concise printed instructions and diagrams, stated in terms clearly understandable and adequate for proper assembly, installation, maintenance, and safe operation, shall be made available by the manufacturer of the component and component package.

6.2 Instructions for periodic maintenance of components, as required, shall be provided. Parts which require replacement shall be identified.

6.3 This information shall be in a form easily understood in the country of destination.

7 Marking

The components shall include the following information as required:

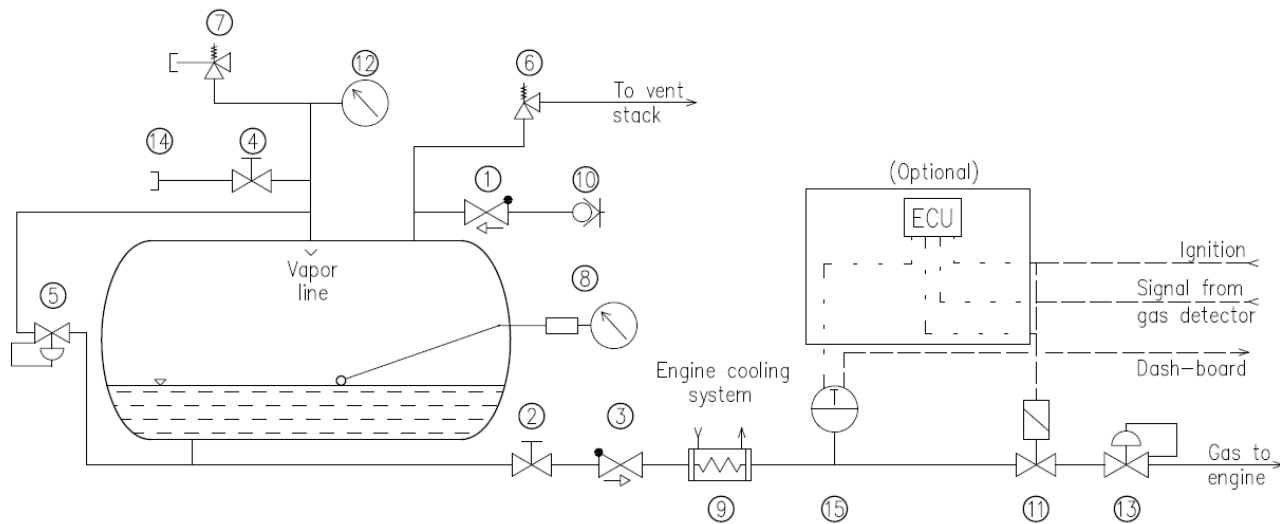
- a) the manufacturer's or agent's name, trademark, or symbol;
- b) the model designation (part number);
- c) the working pressure or pressure and temperature range;
- d) the direction of flow (when necessary for correct installation);
- e) the type of fuel;
- f) electrical ratings;
- g) the symbol of the certification agency;
- h) the type approval number;
- i) the serial number or date code;
- j) reference to this part of ISO 12614 (i.e. ISO 12614-1).

NOTE 1 Specific information required for each component can be found in ISO 12614-3 and subsequent parts of this International Standard.

NOTE 2 This information can be provided by a suitable identification code on at least one part of the component when it consists of more than one part.

Annex A (informative)

Construction and assembly



Key

- | | | | |
|---|------------------------------|-----|-----------------------------------|
| 1 | fill check valve | 9 | heat exchanger – vaporizer |
| 2 | fuel shut-off valve | 10 | fill fitting |
| 3 | excess flow valve | 11 | automatic fuel shut-off valve |
| 4 | vapour shut-off valve | 12 | tank pressure gauge |
| 5 | tank pressure regulator | 13 | pressure regulator |
| 6 | primary relief valve (PRV) | 14 | vent connector |
| 7 | secondary relief valve (PRV) | 15 | gas temperature sensor |
| 8 | fuel content gauge | ECU | electronic control unit of engine |

Figure A.1 — LNG fuelling system

Description of the example flow scheme:

LNG is delivered through the filling receptacle 10, which is equipped with a check valve. The function of the check valve is to close the receptacle after filling and to prevent leak of natural gas. Another check valve 1 doubles the function. Primary relief valve 6 is placed on the fill line. Its outlet is headed to the vent stack, which leads possible vent gas outside of the confined space to a safe location. Secondary relief valve 7, set to higher pressure and equipped with a blow-off cap, is placed on a separate vent line. Pressure gauge 12 and manual vent valve 4, followed with a connector 14, which can be fitted to a hose, is placed on the same line. Tank pressure regulator 5 is placed on a line, connecting the vent line with liquid withdrawal. Its function is to transfer part of the gas to the liquid withdrawal in case of increased pressure in the tank. Manual valve 2 allows separation of the fuel tank system from the line to the engine. Excess flow valve 3 stops flow in case of excess flow rate in case of pipe fraction, e.g. Heat exchanger 9 vaporizes LNG and warms it up to a temperature close to ambient by heat exchange with the engine cooling liquid. The gas temperature sensor 15 delivers a signal on possibly low temperature of the gas, which is further used for signalization to the driver or possibly other safety measures including possible stopping of the engine after a certain time limit. The automatic fuel shut-off valve 11 opens only with the

ignition of the engine and closes at specified hazard situations. The pressure regulator 13 reduces the pressure of the gas in case the pressure in the tank is too high for the engine injection system function.

ICS 43.060.40

Price based on 7 pages