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

**Part 16:
Heat exchanger - vaporizer**

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

Partie 16: Échangeur de chaleur - vaporisateur





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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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: Pressure 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 copper and its alloys*
- *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 16: Heat exchanger - vaporizer

1 Scope

This part of ISO 12614 specifies tests and requirements for the heat exchanger - vaporizer, a liquefied natural gas fuel system component intended for use on the types of motor vehicles defined in ISO 3833. 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) refuelling 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 a fuel of 1,6 MPa (16 bar). (1 bar = 0,1 MPa = 105 Pa; 1 MPa = 1 N/mm².) 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 12614-1, *Road vehicles — Liquefied natural gas (LNG) fuel system components — Part 1: General requirements and definitions*

ISO 12614-2:2014, *Road vehicles — Liquefied natural gas (LNG) fuel system components — Part 2: Performance and general test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12614-1 apply.

4 Marking

Marking of the component shall provide sufficient information to allow the following to be traced:

- a) the manufacturer's or the agent's name, trademark, or symbol;
- b) the model designation (part number);
- c) the maximum allowable pressure for gas and coolant space;
- d) the maximum and minimum working temperature.

The following additional markings are recommended:

- a) the direction of flow (when necessary for correct installation);
- b) the type of fuel;
- c) electrical ratings (if applicable);
- d) the symbol of the certification agency;
- e) the type approval number;
- f) the serial number or date code;
- g) a reference to this part of ISO 12614 (i.e. ISO 12614-16:2014).

NOTE 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.

5 Construction and assembly

The heat exchanger shall comply with the applicable provisions of ISO 12614-1 and ISO 12614-2, and with the tests specified in [Clause 6](#).

The fittings shall be compatible with rigid fuel line.

6 Test

6.1 Applicability

The tests required to be carried out are indicated in [Table 1](#).

Table 1 — Tests applicable

Test	Applicable	Test procedure as required by ISO 12614-2	Specific test requirements of this part of ISO 12614
Hydrostatic strength	X	X	X (see 6.2)
Leakage	X	X	X (see 6.3)
Excess torque resistance	X	X	
Bending moment	X	X	
Continued operation	X	X	X (see 6.4)
Corrosion resistance	X	X	
Oxygen ageing			
Electrical overvoltages			
Non-metallic synthetic immersion	X	X	

Table 1 (continued)

Test	Applicable	Test procedure as required by ISO 12614-2	Specific test requirements of this part of ISO 12614
Vibration resistance			
Pull-off			
Brass material compatibility	X	X	
Water jacket freezing	X		X (see 6.5)
Compatibility with heat exchange fluids of non-metallic parts	X		X (see 6.6)

6.2 Hydrostatic strength

The LNG space of the heat exchanger shall be tested according to the procedure for testing hydrostatic strength specified in ISO 12614-2.

Test pressure shall be 2,5 times of working pressure.

6.3 Leakage

Test the LNG space of the heat exchanger at the temperatures and pressures given in Table 2.

Table 2 — Test temperatures and pressures

Temperature °C	Pressure (factor × working pressure)	
	First	Second
<-162	1,0 × WP	0,25 × WP
20	0,25 × WP	1,5 × WP
85 or 120	0,25 × WP	

6.4 Continued operation

6.4.1 Subject the fitting to continued operation for a total of 100 cycles. The fitting shall only be tested while connected with a rigid fuel line.

6.4.2 Fittings shall be subjected to 25 connection/disconnection cycles.

6.4.3 Perform the leakage test in accordance with 6.3.

6.5 Water jacket freezing

- Attach 1 m sections of coolant hose to the coolant inlet and outlet of the regulator or water jacket. Fill the regulator or water jacket, which normally contains an antifreeze solution, with water to normal capacity and expose it at -40 °C (or -20 °C as applicable) for 24 h.
- Following the freezing conditioning, and after exposing the assembly to 20 °C for 24 h, conduct an external leakage test at room temperature according to 6.2 of ISO 12614-2:2014.

A separate sample can be used for this test.

6.6 Compatibility with heat exchange fluids of non-metallic parts

6.6.1 Test samples shall be submerged in heat exchange medium for 168 h at 90 °C; then they shall be dried for 48 h at a temperature of 40 °C. The composition of the heat exchange medium used for the test is water/ethylene-glycol fluid of 50 %/50 %.

6.6.2 The test is deemed to be satisfactory if the change in volume is less than 20 %, the change in mass is less than 5 %, the change in tensile strength is less than -25 %, and the change in elongation at break is within -30 % and +10 %.

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Bibliography

- [1] ISO 3833, *Road vehicles — Types — Terms and definitions*

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