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

Part 2: Performance and general test methods

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

Partie 2: Performances et méthodes d'essai générales

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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.

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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.

ISO 12614-2 was prepared by Technical Committee 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 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*

It is recognised that miscellaneous components specifically covered herein can be examined to meet the criteria of this standard and tested in accordance to the appropriate functional tests.

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Road vehicles — Liquefied natural gas (LNG) fuel system components — Part 2: Performance and general test methods

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. This part of ISO 12614 is also applicable to other LNG fueled motor vehicles (for example ships) as far as appropriate, until any specific norm would be worked out for such a type of vehicle. It also provides general design principles, and specifies requirements for instructions and marking.

This part of ISO 12614 is applicable to vehicles using natural gas in accordance with ISO 15403 (mono-fuel, bi-fuel or dual-fuel applications). It is not applicable to the following:

- a) fuel containers;
- b) stationary gas engines;
- c) container mounting hardware;
- d) electronic fuel management;
- e) refueling 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 maximum 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 normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 12614. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 12614 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

1) 1bar=0,1MPa=105Pa; 1MPa=1N/mm²

Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 188:1998, Rubber, vulcanized or thermoplastic - Accelerated ageing and heat resistance tests.

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

ISO 9227: 1990, Corrosion tests in artificial atmospheres - Salt spray tests.

3 Terms and definitions

The terms and definitions specified in Part 1 of this Standard shall apply.

4 General

4.1 Unless stated otherwise, the tests specified herein shall be conducted at room temperature i.e. $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

4.2 Components shall comply with the tests outlined in Part 3 and subsequent parts of this Standard and any other applicable tests specified in this standard. Because of the peculiarities of some components, the list of tests described in this Part of the Standard from clause 5 to 15 is not exhaustive. If additional tests are required their requirements are provided in the respective Part of the Standard.

4.3 Unless otherwise specified, all tests shall be conducted using dry air or nitrogen. Qualified personnel can also test with natural gas providing that appropriate safety measures are fulfilled. The dewpoint of the test gas at the test pressure shall be at the temperature which ensures no icing, hydrate or liquid formation. For testing at low temperatures, liquid nitrogen will be used, which will be specifically mentioned at the respective parts of the norm.

4.4 It is recognized that new technology may not be covered in Part 3 and subsequent parts of this Standard.

5 Hydrostatic strength

A component shall not rupture when subjected to the following test method.

Outlet opening of the component shall be plugged. Valves or internal blocks shall be assured in the open position. The hydrostatic pressure specified for each component in Part 3 and subsequent parts shall be applied with a test fluid to the inlet of the component for a period of at least 3 min.

Test samples shall not be used for any other testing.

6 Leakage

Prior to conditioning, the devices shall be purged with nitrogen and then sealed at 30% of working pressure using nitrogen, dry air or natural gas.

All tests shall be conducted while the devices are continuously exposed to the specified test temperatures. The device shall either be bubble free or have a leakage rate less than $20 \text{ normal cm}^3/\text{h}$ according to the following test method:

External leakage

Each device outlet shall be plugged with the appropriate mating connection and the test pressure applied to the inlet.

Pressurized air, nitrogen, or natural gas shall be applied to the test devices.

At all the test temperatures, immerse the components in a suitable test medium for two minutes or use a helium vacuum test (global accumulation method) or other equivalent methods.

If there are no bubbles for the specified time period, the sample passes the test. If bubbles are detected, then the leak rate shall be measured by an appropriate method.

Internal leakage

The internal leakage is applicable only to devices having a closed position. The aim of this test is to check the pressure tightness of the closed system.

The inlet or outlet of the device (as applicable) shall be connected with the appropriate mating connection while the opposite connection(s) shall be left open.

Test conditions for internal and external leakage

6.1 The device shall be conditioned at low temperature of less -160°C and pressurized at 100% and 25% of working pressure

6.2 The device shall be conditioned at room temperature of 20 °C and pressurized at 25% and 150% of working pressure

6.3 The device shall be conditioned at high temperature of 85°C /120°C and pressurized at 25% and 150% of working pressure.

7 Excess torque resistance

A component designed to be connected directly to threaded fittings shall be capable of withstanding without deformation, breakage or leakage a torque effort of 150% of the rated installation value.

The following test method shall apply:

An unused component shall be used for this test. The torque shall be applied adjacent to the fitting.

For a component having threaded connection(s) the turning effort shall be applied for 15 minutes, then released, and the component removed and examined for deformation and breakage. The component shall then be subjected to the leakage test specified in clause 6.

8 Bending moment

A component subject to bending moment tests shall be capable of operation without cracking, breaking, or leaking when subjected to the following test method:

- a) The connections of the component shall be assembled leak-tight to an appropriate mating connection(s), representative of design intent. After assembly, the length of the inlet tubing shall be greater than 300 mm (see figure 1).
- b) The outlet connection shall be rigidly supported 25mm from the component outlet, unless the following exceptions apply:
 - when the component has an integral mounting means independent of the inlet and outlet connections, the component shall be mounted using the integral mounting means as specified by the manufacturer
 - when the component is intended to be mounted by either the integral mounting means or the component outlet, the mounting means, which produces the most severe test condition, shall be used.
- c) This assembly above shall be checked for leaks prior to section (d).