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

**Part 2:
Test methods**

*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).

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 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. (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 2: Test methods

1 Scope

This document specifies performance and general test methods for liquefied natural gas fuel system components 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 gas in accordance with the ISO 15403 series. It is not applicable to the following: original-production and converted vehicles.

This document is only applicable on the components in the "LNG system" meaning an assembly of components (tanks, valves, flexible fuel lines, etc.) 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.

NOTE All references to pressures, given in megapascals and bar (1 bar = 0,1 MPa = 105 Pa; 1 MPa = 1 N/mm²) are considered gauge pressures, unless otherwise specified.

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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 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread*

ISO 6487, *Road vehicles — Measurement techniques in impact tests — Instrumentation*

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

ISO 12991:2012, *Liquefied natural gas (LNG) — Tanks for on-board storage as a fuel for automotive vehicles*

ISO 19723-1:2018, *Road vehicles — Liquefied natural gas (LNG) fuel systems — Part 1: Safety requirements*

3 Terms and definitions

No terms and definitions are listed in this document.

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/>

4 Test methods

4.1 Tank mounting strength tests

4.1.1 General

When a vehicle is equipped with several tanks, they should be tested as a unit.

When a tank or groups of tanks are installed on a vehicle such that they are separately anchored to the original structure of the vehicle, then each tank or separate group of tank can be tested individually.

When performing these tests, accessories and piping shall not contribute to reinforcing the tank mounting.

The requirements of ISO 19723-1:2018, 4.4.3, shall be verified by the test specified in [4.1.1](#), [4.1.2](#) or [4.1.3](#).

4.1.2 Inertia test

The tank or group of tanks to be tested shall be mounted on the vehicle body or a part of the vehicle body, according to the specifications of the original equipment manufacturer (OEM) or after-market converter.

The vehicle body or part of the vehicle body shall be firmly anchored to the test trolley. The method used for anchoring the vehicle body to the test trolley shall not result in reinforcement of the tank anchorages or the part of the vehicle structure participating in anchoring the tank or tanks. Testing performed with a trolley shall geometrically match original vehicle conditions.

The test shall be carried out using the following procedure.

- a) Fill the tank or tanks with an equivalent full weight of liquid nitrogen saturated to one-half the working pressure. <https://standards.iteh.ai/catalog/standards/sist/ad0112fb-2f56-4357-8e6c-5e32f2ac04fe/iso-19723-2-2018>
- b) Measure the trolley deceleration with data channels of channel frequency class (CFC) 60 corresponding to the characteristics given in ISO 6487.
- c) Maintain the value of the deceleration as defined in ISO 19723-1:2018, 4.4.3, for at least 30 ms.

4.1.3 Static test

This test may be carried out on a vehicle body or on a part of a vehicle body.

The tank or group of tanks to be tested shall be mounted on the vehicle body or on part of the vehicle body, according to OEM or after-market converter specifications.

The method used for anchoring the vehicle body or the part of the vehicle body in this test shall not:

- submit the anchorages and anchorage area (300 mm diameter circle) to abnormal stresses and/or deformation;
- result in reinforcement of the tank or group of tanks anchorages, or the part of the vehicle structure participating in anchoring the tank or group of tanks.

The traction force is defined by Formula (1):

$$F = (M_c + 0,9 \rho V)a \quad (1)$$

where

- F is the traction force, in newtons;
- M_c is the mass of empty tank(s), in kilograms;
- a is the acceleration as defined in ISO 19723-1:2018, 4.4.3;
- V is the volume of the tank(s) in litres;
- ρ is the density of LNG at 20 MPa 0,2 kg/l.

The test shall be carried out using the following procedure.

- a) Apply the traction force to the tank or tanks' centre of gravity in the specified directions within 0,2 s.
- b) Hold the specified traction force for at least 0,2 s.
- c) Release the traction force.

4.1.4 Acceptance criteria

4.1.4.1 By testing

At the conclusion of either of these tests, the tank or group of tanks shall:

- remain attached to the vehicle body or part of the vehicle body;
- not interfere with the seat structure.

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4.1.4.2 By calculation

Appropriate calculations shall be carried out, depending on the individual technical parameters. The method of calculation shall be approved by the relevant authority.

4.1.4.3 By engineering experience (steel tanks)

For details of a practical means of compliance for tanks (in accordance with ISO 12991), determined as a result of calculations and substantiated by experience over time, see [Annex A](#).

4.2 Leak test

This test may be conducted at ambient temperature. It shall be performed on each vehicle after the fuel system installation has been completed.

- a) Fill the vehicle fuelling system with an appropriate medium at 90 % of working pressure.
- b) During this test, provisions shall be made to have the main shut-off valve open as well as the other automatic valves on the system that should be open during the normal operation of the vehicle.
- c) Check all components (valves, fittings excluding re-cosable components) with a bubble-producing liquid. No bubbles shall be detected during three minutes or have a leakage rate less than 20 Ncm³/h. Other equivalent methods are acceptable.

If the tank and all components upstream the pressure regulator have already been leak tested, the leak test shall be performed with the tank valve closed.