
**Road vehicles — Compressed natural
gas (CNG) fuel system components —
Part 2:
Performance and general test methods**

*Véhicules routiers — Composants des systèmes de combustible gaz
naturel comprimé (GNC) —*

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.

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 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.

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 41, *Specific aspects for gaseous fuels*.

This third edition cancels and replaces the second edition (ISO 15500-2:2012), which has been technically revised.

ISO 15500 consists of the following parts, under the general title *Road vehicles — Compressed natural gas (CNG) 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: Manual cylinder valve*
- *Part 6: Automatic valve*
- *Part 7: Gas injector*
- *Part 8: Pressure indicator*
- *Part 9: Pressure regulator*
- *Part 10: Gas-flow adjuster*
- *Part 11: Gas/air mixer*
- *Part 12: Pressure relief valve (PRV)*
- *Part 13: Pressure relief device (PRD)*

- *Part 14: Excess flow valve*
- *Part 15: Gas-tight housing and ventilation hose*
- *Part 16: Rigid fuel line in stainless steel*
- *Part 17: Flexible fuel line*
- *Part 18: Filter*
- *Part 19: Fittings*
- *Part 20: Rigid fuel line in material other than stainless steel*

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Introduction

For the purposes of this part of ISO 15500, all fuel system components in contact with natural gas have been considered suitable for natural gas as defined in ISO 15403 (all parts). However, it is recognized that miscellaneous components not specifically covered herein can be examined to meet the criteria of this part of ISO 15500 and can be tested in accordance with the appropriate functional tests.

All references to pressure in this part of ISO 15500 are considered to be gauge pressures unless otherwise specified.

This part of ISO 15500 is based on a service pressure for natural gas used as fuel of 20 MPa (200 bar¹⁾), settled at 15 °C. Other service pressures can be accommodated by adjusting the pressure by the appropriate factor (ratio). For example, a 25 MPa (250 bar) service pressure system will require pressures to be multiplied by 1,25.

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

Road vehicles — Compressed natural gas (CNG) fuel system components —

Part 2: Performance and general test methods

1 Scope

This part of ISO 15500 specifies performance and general test methods for compressed natural gas (CNG) fuel system components intended for use on the types of motor vehicles defined in ISO 3833.

This part of ISO 15500 is applicable to vehicles (mono-fuel, bi-fuel or dual-fuel applications) using compressed natural gas in accordance with ISO 15403 (all parts). It is not applicable to the following:

- a) liquefied natural gas (LNG) fuel system components located upstream of, and including, the vaporizer;
- b) fuel containers;
- c) stationary gas engines;
- d) container-mounting hardware;
- e) electronic fuel management;
- f) refuelling receptacles.

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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 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 15500-1:2015, *Road vehicles — Compressed natural gas (CNG) fuel system components — Part 1: General requirements and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15500-1 apply.

4 General

4.1 Unless otherwise stated, the tests shall be conducted at a room temperature of 20 °C ± 5 °C.

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4.2 Components shall comply with the tests specified in this part of ISO 15500 as well as the relevant parts of ISO 15500, as applicable for each component.

NOTE Because of the peculiarities of some components, the list of tests given in this part of ISO 15500, (Clauses 5 to 15) is not exhaustive. Where additional tests are required, their provisions are given in other parts of ISO 15500.

4.3 Unless otherwise specified, all tests shall be conducted using dry air or nitrogen. Tests may also be conducted with natural gas provided appropriate safety measures are taken. The dew point of the test gas at the test pressure shall be at the temperature at which there is no icing, or hydrate or liquid formation.

Unless otherwise specified, all pressures shall have a maximum tolerance of ± 5 %.

Unless otherwise specified, all temperatures shall have a maximum tolerance of ± 5 %.

Unless otherwise specified, all dimensions shall have a maximum tolerance of ± 5 %.

5 Hydrostatic strength

A component shall not show any visible evidence of rupture when subjected to the following test procedure.

Plug the outlet opening of the component and have the valve seats or internal blocks assume the open position. Apply, with a test fluid, the hydrostatic pressure specified in the applicable part of ISO 15500 to the inlet of the component for a period of at least 3 min.

The hydrostatic pressure shall then be increased at a rate of less than or equal to 1,4 MPa/s until component failure. The hydrostatic pressure at failure shall be recorded. The failure pressure of previously tested components shall be no less than 80 % of the failure pressure of the virgin component.

The samples used in this test shall not be used for any other testing.

6 Leakage

6.1 General

6.1.1 Prior to conditioning, purge the component with nitrogen, then seal it at 30 % of the working pressure using nitrogen, dry air or natural gas.

6.1.2 Conduct all tests while the device is continuously exposed to the specified test temperatures. The device shall either be bubble-free or display a leakage rate of less than 20 Ncm³/h when subjected to the following test method.

If components are subjected to more than one working pressure, the test may be conducted in subsequent steps.

6.2 External leakage

6.2.1 Plug each device outlet into the appropriate mating connection.

6.2.2 Apply pressurized air, nitrogen or natural gas to the inlet of the test device.

6.2.3 At all test temperatures, immerse the components in a suitable test medium for 2 min $\begin{pmatrix} +30 \\ 0 \end{pmatrix}$ s or use a helium vacuum test (global accumulation method) or other equivalent method.

6.2.4 If there are no bubbles for the specified time period, the sample passes the test. If bubbles are detected, measure the leakage rate using an appropriate method; the leakage rate should not be more than that specified in [6.1.2](#).

6.3 Internal leakage

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

6.3.2 Connect the inlet or outlet (as applicable) of the device to the appropriate mating connection, leaving the opposite connection(s) open.

6.3.3 Apply the test pressure to the inlet or outlet (as applicable) of the device using air, nitrogen or natural gas as the test fluid.

6.3.4 At all applicable test temperatures mentioned in [6.4](#), immerse the component in a suitable test medium for 2 min $\left(\begin{smallmatrix} +30 \\ 0 \end{smallmatrix} \right)$ s or used any other equivalent method.

6.3.5 If there are no bubbles for the specified time period, the sample passes the test. If bubbles are detected, measure the leakage rate using an appropriate method; the leakage rate should not be more than that specified in [6.1.2](#).

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6.4 Test conditions

6.4.1 The device shall be conditioned at a low temperature of -40 °C ($+0\text{ °C}$ -5 °C) or -20 °C ($+0\text{ °C}$ -5 °C), as applicable, and pressurized at ~~75 % and 2,5 %~~ of the working pressure.

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6.4.2 The device shall be conditioned at a room temperature and pressurized at 2,5 % and 150 % of the working pressure.

6.4.3 The device shall be conditioned at a high temperature of 85 °C (-0 °C $+5\text{ °C}$) or 120 °C (-0 °C $+5\text{ °C}$), as applicable, and pressurized at 5 % and 150 % of the 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 at least 150 % of the rated installation value, when tested in accordance with the following test procedure.

- a) Test an unused component, applying the torque adjacent to the fitting.
- b) For a component having a threaded connection or threaded connections, apply the turning effort for not less than 15 min, release it, then remove the component and examine it for deformation and breakage.
- c) Subject the component to the leakage test specified in [Clause 6](#).
- d) Subject the component to the hydrostatic strength test specified in [Clause 5](#).