INTERNATIONAL STANDARD

ISO 15500-2

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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

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 15500 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15500-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 25, *Road vehicles using natural gas*.

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*

— *Part 17: Flexible fuel line*

— *Part 18: Filter*

— *Part 19: Fittings*

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 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 using natural gas in accordance with ISO 15403 (mono-fuel, bi-fuel or dual-fuel applications). 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.

NOTE 1 It is recognized that miscellaneous components not specifically covered herein can be examined to meet the criteria of this part of ISO 15500 and tested according to the appropriate functional tests

NOTE 2 All references to pressure in this part of ISO 15500 are to be considered gauge pressures unless otherwise specified.

NOTE 3 This part of ISO 15500 is based upon a service pressure for natural gas as fuel of 20 MPa [200 bar[1)]] 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.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 15500. 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 15500 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. Members of ISO and IEC maintain registers of currently valid International Standards.

1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2

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

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

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

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

ISO 15403, *Natural gas — Designation of the quality of natural gas for use as a compressed fuel for vehicles*.

ISO 15500-1:2000, *Road vehicles — Compressed natural gas (CNG) fuel system components — General requirements and definitions*.

ISO 15500-3, *Road vehicles — Compressed natural gas (CNG) fuel system components — Part 3: Check valve*.

ISO 15500 (parts 4 to 19), *Road vehicles — Compressed natural gas (CNG) fuel system components*.

3 Terms and definitions

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

4 General

4.1 Unless otherwise stated, the tests shall be conducted at room temperature: i.e. 20 °C ± 5 °C.

4.2 Components shall comply with the tests specified in ISO 15500-3 and subsequent parts, as well as the applicable tests specified in this part of ISO 15500. 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 another, relevant part.

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

4.4 It is recognized that new technology may not be covered in ISO 15500-3 or subsequent parts of ISO 15500.

5 Hydrostatic strength

A component shall not 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 ISO 15500-3 and subsequent parts of ISO 15500 to the inlet of the component for a period of at least 3 min.

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 or device with nitrogen and then seal it at 30 % of service 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 have a leakage rate of less than 20 cm^3/h (normal) using the following test method.

6.2 External leakage

6.2.1 Plug each device outlet with the appropriate mating connection and apply the test pressure to the inlet.

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

6.2.3 At all test temperatures, immerse the components in a suitable test medium for 2 min 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 leak rate by an appropriate method.

6.3 Internal leakage

6.3.1 The internal leakage test is applicable only to devices having a 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, with the appropriate mating connection, while leaving the opposite connection or connections open.

6.4 Test conditions

6.4.1 General

The leakage test conditions depend on whether the component is exposed to cylinder pressure or located downstream of the first stage of pressure reduction.

6.4.2 Devices exposed to cylinder pressure

6.4.2.1 The device shall be conditioned at a low temperature of – 40 °C, and pressurized at 75 % and 2,5 % of service pressure.

6.4.2.2 The device shall be conditioned at a room temperature of 20 °C and pressurized at 2,5 % and 150 % of service pressure.

6.4.2.3 The device shall be conditioned at a high temperature of 85 °C or 120 °C and pressurized at 5 % and 150 % of service pressure.

6.4.3 Devices downstream of the first stage of pressure reduction

6.4.3.1 The device shall be conditioned at a low temperature of – 40 °C, and pressurized at 75 % and 2,5 % of working pressure.

6.4.3.2 The device shall be conditioned at a room temperature of 20 °C and pressurized at 2,5 % and 150 % of working pressure.

6.4.3.3 The device shall be conditioned at a high temperature of 85 °C or 120 °C and pressurized at 5 % 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, according to 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 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.

8 Bending moment

A component shall be capable of operation without cracking, breaking, or leaking when tested according to the following procedure.

a) Assemble the connections of the component, leak-tight, to an appropriate mating connection or connections, 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, 25 mm from the component outlet, except in the following cases:

— if the component has an integral mounting means independent of the inlet and outlet connections, the component shall be mounted using the integral mounting means specified by the manufacturer;

— if the component is intended to be mounted by either the integral mounting means or the component outlet, the mounting means that produces the most severe test condition shall be used.

c) Check this assembly for leaks prior to subjecting it to d).

d) With the component in the closed position, pressurize the system to 5 kPa (50 mbar) and apply a force according to Table 1, 300 mm from the inlet, maintaining it for 15 min. Without removing the force, check the component for leakage, in accordance with the test method given in clause 6, at room temperature.

NOTE Depending on how this test is performed, raising the load to compensate buoyancy could be necessary.

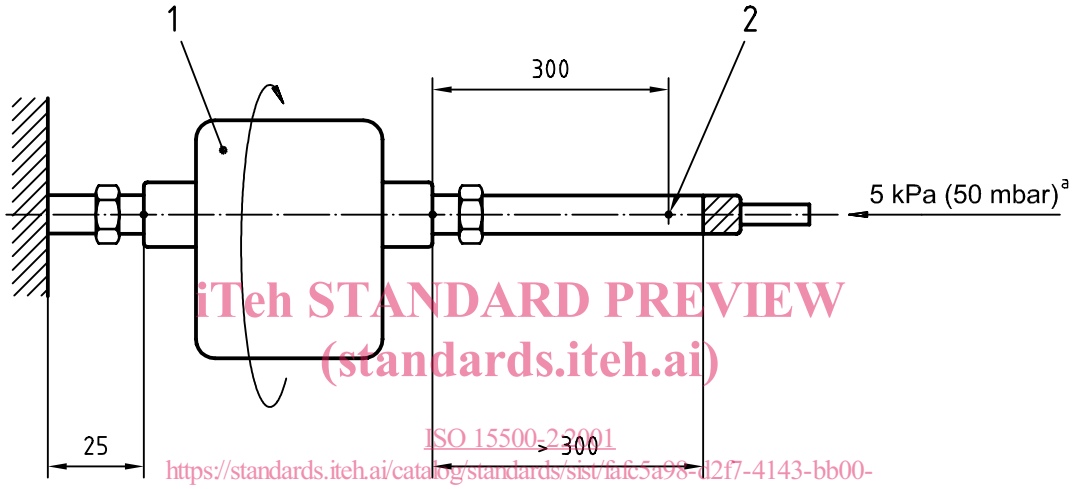
e) Conduct procedure d) four times, rotating the component 90° around the horizontal axis between each test. Between tests, open and close (if applicable) the component three times with the bending moment removed.

f) At the completion of the above tests, remove the component and examine it for deformation; then subject it to the leakage test according to clause 6.

Table 1 — Bending moment test force

Outside diameter of tubing mm	Force N
6	3,4
8	9,0
⩾ 12	17,0

Dimensions in millimetres



Key

1 Component
2 Force point

[a] $4 \times 90°$ rotation.

Figure 1 — Bending moment

9 Continued operation

9.1 General

For the details of test methods for particular components, see the other parts of ISO 15500. The method specified in this clause is general in nature and also applies to miscellaneous components.

9.2 Test method

9.2.1 Test procedure

Connect the component securely by a suitable fitting to a pressurized source of dry air, nitrogen or natural gas and subject it to the number of cycles specified in ISO 15500-3 and subsequent parts of ISO 15500. A cycle shall consist of one opening and (if applicable) one closing of the component within a period of not less than 10 s ± 2 s.