

BS ISO 15500-6:2012+A1:2016



BSI Standards Publication

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

Part 6: Automatic valve

National foreword

This British Standard is the UK implementation of ISO 15500-6:2012+A1:2016. It supersedes BS ISO 15500-6:2012 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment 1 is indicated by A1 A1.

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

**Part 6:
Automatic valve**

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

Partie 6: Valve automatique





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Foreword

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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 15500-6 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 25, *Vehicles using gaseous fuels*.

This second edition cancels and replaces the first edition (ISO 15500-6:2001), 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*

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. 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 tested according to 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.

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

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

Part 6: Automatic valve

1 Scope

This part of ISO 15500 specifies tests and requirements for the automatic valve, a compressed natural gas (CNG) fuel system component 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 natural gas in accordance with ISO 15403.

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.

2 Normative references

The following referenced documents are indispensable for the application 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 15500-1, *Road vehicles — Compressed natural gas (CNG) fuel system components — Part 1: General requirements and definitions*

ISO 15500-2, *Road vehicles — Compressed natural gas (CNG) fuel system components — Part 2: Performance and general test methods*

IEC 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres*

3 Terms and definitions

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

3.1

automatic valve

on/off valve for controlling flow of gas that is not manually operated

4 Marking

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

- a) the manufacturer's or agent's name, trademark or symbol;
- b) the model designation (part number);
- c) working pressure or working pressure and temperature range.

The following additional markings are recommended:

- the direction of flow (when necessary for correct installation);
- the type of fuel;
- electrical ratings (if applicable);
- the symbol of the certification agency;
- the type approval number;
- the serial number or date code;
- reference to this part of ISO 15500.

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.

A1 In addition to the markings specified above, if the valve is compatible with start/stop systems, one of the following additional marks shall be used for automatic cylinder valves:

- "H1" if the valve is to be used with an engine that shuts off automatically when the vehicle comes to a halt;
- "H2" if the valve is to be used with an engine that, in addition to (a), it also shuts off automatically when the vehicle drives with an electric motor only;
- "H3" if the valve is to be used with an engine that, in addition to (a) or (b), it also shuts off automatically when the accelerator pedal is released

5 Construction and assembly

The automatic valve shall comply with the applicable provisions of ISO 15500-1 and ISO 15500-2, and with the tests specified in Clause 6. All automatic valves, including solenoid valves, cylinder valves and valves with manual by-pass, shall comply with the tests specified in Clause 6. Tolerances should follow the specifications of ISO 15500-2.

An automatic valve shall be closed when de-energized.

An automatic valve with manual by-pass shall meet the minimum requirements of this part of ISO 15500. **A1**

6 Tests

6.1 Applicability

The tests required to be carried out are indicated in Table 1.

Table 1 — Applicable tests

Test	Applicable	Test procedure as required by ISO 15500-2	Specific test requirements of this part of ISO 15500
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	X	X	
Ozone ageing	X	X	
Heat Ageing	X	X	
Automotive Fluids	X	X	
Electrical overvoltages	X	X	
Non-metallic material immersion	X	X	
Vibration resistance	X	X	
Brass material compatibility	X	X	
Insulation resistance	X		X (see 6.5)
Minimum opening voltage	X		X (see 6.6)
Pressure impulse	X		X (see 6.7)

6.2 Hydrostatic strength

Test the automatic valve according to the procedure for testing hydrostatic strength specified in ISO 15500-2. The test pressure shall be 2,5 times the working pressure.

6.3 Leakage

Test the automatic valve at the temperatures and pressures given in Table 2.

Table 2 — Test temperatures and pressures

Temperature °C	Pressure Factor × working pressure (WP)	
	First test	Second test
−40 or −20	0,75 × WP	0,025 × WP
20	0,025 × WP	1,5 × WP
85 or 120	0,05 × WP	

6.4 Continued operation

6.4.1 Test the automatic valve in accordance with the procedure for testing continued operation given in ISO 15500-2, for 50 000 cycles, but lower the downstream pressure of the test fixture to less than 2 % of working pressure, and perform the leakage test in accordance with 6.3. The valve shall continue to operate according to the manufacturer's specifications.

A1 6.4.2 Following cycling and leakage testing, perform the hydrostatic strength test in accordance with 6.2.

6.4.3 If the automatic valve is to be used in vehicles with start-stop systems, and closed during commanded stop phases, the valve shall be submitted to the following numbers of operations during test:

- a) 200 000 cycles (mark "H1") if the engine shuts off automatically when the vehicle comes to a halt;
- b) 500 000 cycles (mark "H2") if, in addition to a), the engine also shuts off automatically when the vehicle drives with the electric motor only;
- c) 1 000 000 cycles (mark "H3") if, in addition to a) or b), the engine also shuts off automatically when the accelerator pedal is released. **A1**

6.5 Insulation resistance

The insulation resistance test is designed to check for a potential failure of the insulation between the two-pin coil assembly and the automatic valve casing.

If the automatic valve is electrically operated and is to be used inside a gas-tight housing, it shall be intrinsically safe as defined in IEC 60079-10-1.

Apply DC 1 000 V between one of the connector pins and the housing of the automatic valve for at least 2 s. The minimum allowable resistance shall be 240 k Ω .

6.6 Minimum opening voltage

The minimum opening voltage at room temperature shall be ≤ 8 V for a 12 V system and ≤ 16 V for a 24 V system. The component shall be pressurized at 0,75 times working pressure during the test.

6.7 Pressure impulse

The automatic valve that is exposed in service to cylinder pressure, shall withstand 100 pressure pulses, as follows.

- a) If the automatic valve is external, connect both inlet and outlet to a pipe or tube of the type specified by the manufacturer and of at least 1 m in length each.
- b) If the automatic valve is mounted to or inside the cylinder valve, the cylinder valve containing the automatic valve shall be connected securely by a suitable fitting to a pressurized source of dry air, nitrogen or natural gas. Connect the outlet to a pipe or tube of the type specified by the manufacturer and of at least 1 m in length each.
- c) The outlet of the automatic valve shall be vented until the inlet is at atmospheric pressure, and then the outlet of the valve shall be closed.
- d) Working pressure shall be instantaneously applied to the inlet.
- e) Test the component in the same way with reverse flow direction.

Following the pressure impulse test, the automatic valve should operate according to the manufacturer's specification.

This test was included in order to evaluate the performance of the components that may suffer from the effects of an instantaneous increase in pressure. In normal service, this may happen, for example, when filling gas in an empty system or when a solenoid valve opens the flow of gas to an empty fuel line. Previous tests have revealed that certain designs cannot cope with these instantaneous pulses and the components tend to bend or jam.

Bibliography

- [1] ISO 3833, *Road vehicles — Types — Terms and definitions*
- [2] ISO 15403-1, *Natural gas — Natural gas for use as a compressed fuel for vehicles — Part 1: Designation of the quality*
- [3] ISO/TR 15403-2, *Natural gas — Natural gas for use as a compressed fuel for vehicles — Part 2: Specification of the quality*

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BSI Group Headquarters

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