
**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

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 of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 41, *Specific aspects for gaseous fuels*.

This third edition cancels and replaces the second edition (ISO 15500-6:2012), which has been technically revised. It also incorporates the Amendment ISO 15500-6:2012/Amd.1:2016. The main changes compared to the previous edition are as follows:

- serial number or data code became mandatory in marking;
- update of minimum opening voltage clause.

A list of all parts in the ISO 15500 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

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

All references to pressure in this document are considered to be gauge pressures unless otherwise specified.

This document 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 = 10^5 Pa; 1 MPa = 1 N/mm².

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

Part 6: Automatic valve

1 Scope

This document 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 document is applicable to vehicles (mono-fuel, bi-fuel or dual-fuel applications) using natural gas in accordance with the ISO 15403 series.

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 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 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.

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/>

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) the working pressure or working pressure and temperature range;
- d) the serial number or date code.

The following additional markings are recommended:

- the direction of flow (when necessary for correct installation);
- the type of fuel;
- the electrical ratings (if applicable);
- the symbol of the certification agency;
- the type approval number;
- a reference to this document.

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.

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:

- 1) "H1" if the valve is to be used with an engine that shuts off automatically when the vehicle comes to a halt;
- 2) "H2" if the valve is to be used with an engine that, in addition to 1), also shuts off automatically when the vehicle drives with an electric motor only;
- 3) "H3" if the valve is to be used with an engine that, in addition to 1) or 2), 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 document.

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 document
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 over-voltages	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.

6.4.2 Following the 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 testing:

- 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.

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 the working pressure during the test.

For systems with other nominal voltages the test shall be made at ≤ 66 % of the system's nominal voltage.

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.

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