BS ISO 15500-7:2015

BSI Standards Publication

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

Part 7: Gas injector

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National foreword

This British Standard is the UK implementation of ISO 15500-7:2015.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

ISO 15500-7

Second edition
2015-12-01

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

Part 7: Gas injector

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

Partie 7: Injecteur de gaz

Reference number
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Foreword

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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).

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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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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

This second edition cancels and replaces the first edition (ISO 15500-7:2002), 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*

INTERNATIONAL STANDARD **ISO 15500-7:2015(E)**

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

Part 7: Gas injector

1 Scope

This part of ISO 15500 specifies tests and requirements for the gas injector and/or fuel rail, a compressed natural gas 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 using natural gas in accordance with ISO 15403-1 (mono-fuel, bi-fuel, or dual-fuel applications). It is not applicable to injectors intended for high-pressure injection to the combustion chamber, or 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 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 15500-1, *Road vehicles — Compressed natural gas (CNG) fuel system components — Part 1: General requirements and definitions*

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

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

2) To be published. (Revision of ISO 15500-2:2012).

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
duty cycle
percentage of time that the gas injector is operating in the period

3.2
period
P
time elapsed between the beginning of one injection pulse and the beginning of the next injection pulse

Note 1 to entry: It is expressed in milliseconds.

3.3
fuel rail assembly
component consisting of gas injector(s) and fuel rail integrated into one component

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 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;

— a 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.

5 Construction and assembly

5.1 The gas injector shall be in the closed position when de-energized.

5.2 The gas injector shall comply with the applicable provisions of ISO 15500-1 and ISO 15500-2, and with the tests specified in Clause 6. Tolerances should follow the specifications of ISO 15500-2.

6 Tests

6.1 Applicability

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

Table 1 — Test applicable

Test	Applicable to injector and fuel rail assembly	Applicable to fuel rail	Test procedure as required by ISO 15500-2	Specific test requirements of this part of ISO 15500
Pneumatic strength	X	X		X (see 6.2)
Leakage	X	X	X	
Excess torque resistance	X	X	X	
Bending moment	X	X	X	
Continued operation	X			X (see 6.3)
Corrosion resistance	X	X	X	
Oxygen ageing	X	X	X	
Ozone ageing	X	X	X	
Heat Ageing	X	X	X	
Automotive Fluids	X	X	X	
Electrical overvoltages	X		X	
Non-metallic material immersion	X	X	X	
Vibration resistance	X		X	
Brass material compatibility	X	X	X	
Insulation resistance	X			X (see 6.4)

6.2 Pneumatic strength

This test has two parts, with the procedures to be carried out in the sequence as given below.

a) Apply two times the working pressure to the inlet and outlet of the gas injector and/or fuel rail for a period of at least 3 min. On completion of this procedure, the gas injector and/or fuel rail shall remain gas-tight.

b) Increase the gas pressure from two times the working pressure up to a maximum of four times the working pressure, until such time as the gas injector and/or fuel rail leaks or bursts.

On completion of this procedure, the gas injector and/or fuel rail shall not have burst before leaking.

NOTE If the gas injector fails in the closed position due to its construction, then it is considered to have passed both parts of this test.

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

6.3 Continued operation

6.3.1 Bench durability

Prior to this test, the gas injector or fuel rail assembly shall pass the leakage test in accordance with ISO 15500-2:—, Clause 6, and the insulation resistance test given in 6.4.

Subject the gas injector or fuel rail assembly to 600 × 10^6 pulses at working pressure and room temperature. This procedure may be interrupted at 20 % intervals in order to check test criteria.

The minimum frequency for the pulses shall be 50 Hz.

Upon completion of this test, the gas injector or fuel rail assembly shall pass the leakage test in accordance with ISO 15500-2:—, Clause 6, and the insulation resistance test given in 6.4.

6.3.2 Temperature

6.3.2.1 Hot static

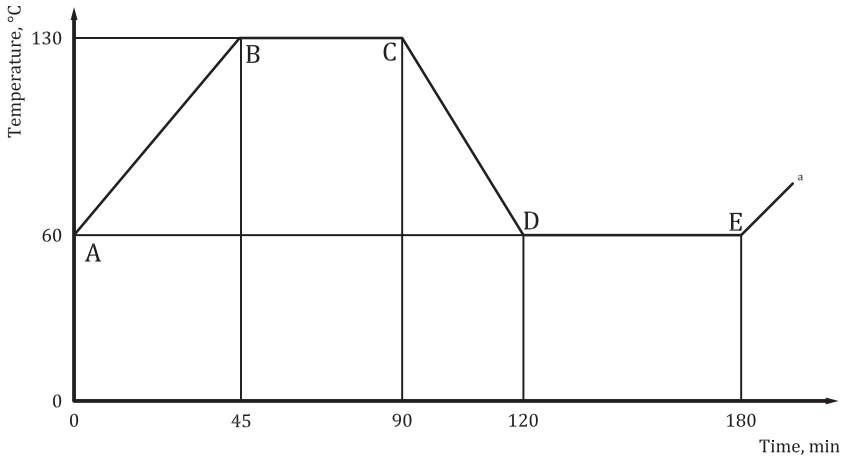
Connect the injector or fuel rail assembly to an appropriate source of pressurized test gas at its working pressure, then expose the pressurized gas injector or fuel rail assembly to an environment with a stabilized temperature of 140 °C ± 2 °C for 16 h. The gas injector or fuel rail assembly shall not be operated during this test.

6.3.2.2 Cold static

Connect the injector or fuel rail assembly to an appropriate source of pressurized test gas at its working pressure, then expose the pressurized gas injector or fuel rail assembly to an environment with a stabilized temperature of –40 °C ± 2 °C or -20 °C ± 2 °C, as applicable for 16 h. The gas injector shall not be operated during this test.

6.3.2.3 Thermocycle

Connect the injector or fuel rail assembly to an appropriate source of pressurized test gas at its working pressure, then expose the pressurized gas injector or fuel rail assembly to the thermocycle in accordance with Figure 1 for a total of 140 cycles. The gas injector or fuel rail assembly shall be operated only during segment D to E as shown in Figure 1 with a 50 % duty cycle and a period of 10 ms.



a Repeat cycle.

NOTE Specified temperatures have a tolerance of ±2 °C.

Figure 1 — Thermocycle

6.3.2.4 Requirements

Upon completion of the procedures given in 6.3.2.1, 6.3.2.2 and 6.3.2.3, the test samples shall pass the leakage test in accordance with ISO 15500-2:—, Clause 6, and the insulation resistance test given in 6.4.

6.4 Insulation resistance

This test is designed for checking the insulation resistance between the connector pin and the housing.

Apply a test voltage of 500 V d.c. for a duration of 60 s; for injectors with circuitry of 3,8 mm pitch or below, 100 V d.c. shall be used.

The minimum allowable resistance shall be >10 MΩ.

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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