INTERNATIONAL STANDARD

ISO 15500-7

First edition
2002-09-01

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
ISO 15500-7:2002(E)

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Printed in Switzerland

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 15500-7 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 7: Gas injector

1 Scope

This part of ISO 15500 specifies tests and requirements for the gas injector, 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 (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] 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.

NOTE 4 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

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.

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

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*

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

3 Terms and definitions

For the purposes of this part of ISO 15500, 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 It is expressed in milliseconds.

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 service pressure or pressure and temperature range.

The following additional markings are recommended:

d) the direction of flow (when necessary for correct installation);

e) the type of fuel;

f) electrical ratings (if applicable);

g) the symbol of the certification agency;

h) the type approval number;

i) the serial number or date code;

j) the 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 of this part of ISO 15500.

6 Tests

6.1 Applicability

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

Table 1 — Test applicable

Test	Applicable	Test procedure as required by ISO 15500-2	Specific test requirements of this part of ISO 15500
Pneumatic strength	X		X (see 6.2)
Leakage	X	X	
Excess torque resistance	X	X	
Bending moment	X	X	
Continued operation	X		X (see 6.3)
Corrosion resistance	X	X	
Oxygen ageing	X	X	
Electrical overvoltages	X	X	
Non-metallic synthetic immersion	X	X	
Vibration resistance	X	X	
Brass material compatibility	X	X	
Insulation resistance	X		X (see 6.4)
Minimum opening voltage	X		X (see clause 7)

6.2 Pneumatic strength

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

a) Plug the outlet opening of the gas injector and have the valve seat or internal blocks assume the open position. Apply two times the working pressure to the inlet of the gas injector for a period of at least 3 min.

   On completion of this procedure, the gas injector shall remain gas-tight.

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

   On completion of this procedure, the gas injector 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 shall pass the leakage test in accordance with ISO 15500-2:2001, clause 6, and the insulation resistance test given in this part of ISO 15500 (see 6.4).

Subject the gas injector 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.

Upon completion of this test, the gas injector shall pass the leakage test in accordance with ISO 15500-2:2001, clause 6, and the insulation resistance test given in this part of ISO 15500 (see 6.4).

6.3.2 Temperature

6.3.2.1 Hot static

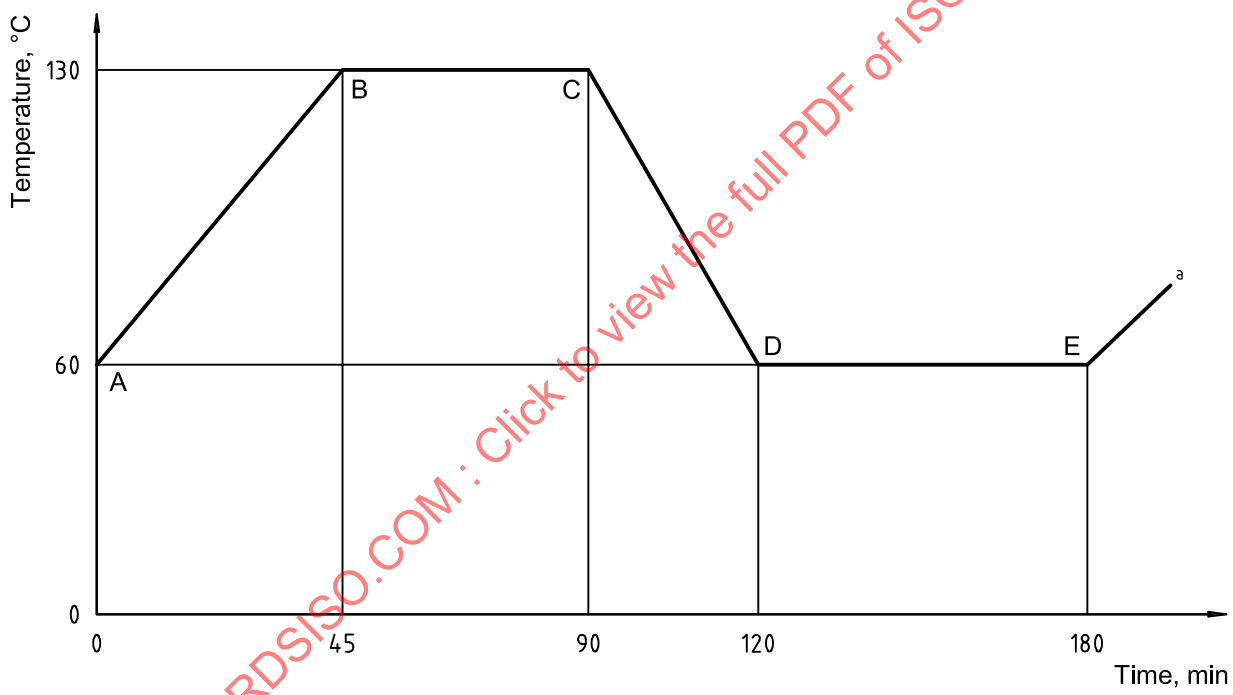
Expose the gas injector to a stabilized ambient temperature of 140 °C ± 2 °C for 16 h. The gas injector shall not be operated during this test.

6.3.2.2 Cold static

Expose the gas injector to a stabilized ambient temperature of −40 °C ± 2 °C for 16 h. The gas injector shall not be operated during this test.

6.3.2.3 Thermocycle

Expose the gas injector to the thermocycle in accordance with Figure 1 for a total of 140 cycles. The gas injector shall be operated only during segment D to E as shown in Figure 1 with a 50 % duty cycle and a period of 7 ms.



[a] Repeat cycle.

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 15500-2:2001, clause 6, and the insulation resistance test given in this part of ISO 15500 (see 6.4).