INTERNATIONAL STANDARD

ISO 15500-17

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

Part 17: Flexible fuel line

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

Partie 17: Tuyauterie flexible pour combustible

Reference number
ISO 15500-17:2012(E)

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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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15500-17 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 15500-17:2001), 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 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.

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

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

Part 17: Flexible fuel line

1 Scope

This part of ISO 15500 specifies tests and requirements for the flexible fuel line, a compressed natural gas (CNG) fuel system component in accordance with SAE J517 (100R8 hose) or JIS B 8362 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*

3 Terms and definitions

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

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 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;

— 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.

5 Construction and assembly

The flexible fuel line 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 — 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	
Excess torque resistance	X[a]	X	
Bending moment			
Continued operation	X	X	X (see 6.3)
Corrosion resistance	X	X	
Oxygen ageing	X	X	
Electrical over-voltages			
Non-metallic material immersion	X	X	
Vibration resistance			
Brass material compatibility	X	X	
Bending	X		X (see 6.4)
Pull-off	X		X (see 6.5)
Electrical conductivity	X		X (see 6.6)
Permeability	X		X (see 6.7)

[a] Applicable to the fittings.

6.2 Hydrostatic strength

Test the flexible fuel line according to the procedure for testing hydrostatic strength specified in ISO 15500-2. The test pressure shall be four times the specified working pressure.

NOTE The higher hydrostatic test pressure for the flexible fuel line compared to the other components in the other parts of the ISO 15500 series is due to the necessary provisions to cope for eventual damage or abrasions under normal operation.

6.3 Continued operation

Test high pressure flexible fuel lines in accordance with the procedure for testing continued operation given in ISO 15500-2, for a total of 20 000 cycles and low pressure flexible lines for a total of 100 000 cycles.

Following cycling testing, perform the leak test as specified in ISO 15500-2, then the hydrostatic test in accordance with 6.2 of this part of ISO 15500.

6.4 Bending

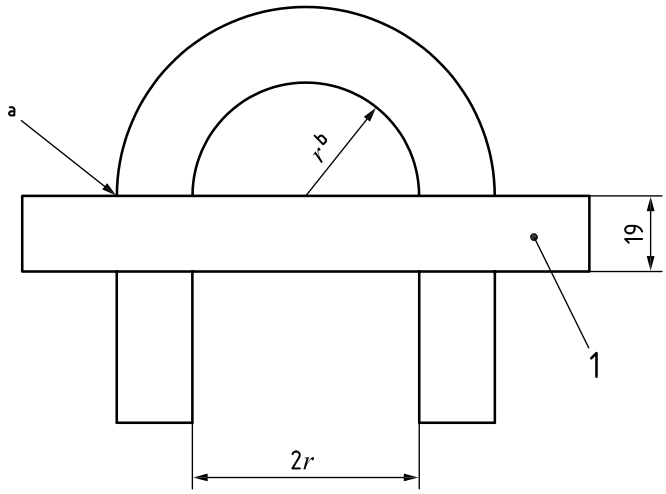
Test the flexible fuel line using a suitable length of flexible fuel line with no end fittings according to the following procedure and acceptance criteria.

a) Carefully bend the flexible fuel line and place it in a fixture as shown in Figure 1.

b) After the flexible fuel line has been left in this position for 5 min, insert into one end of the flexible fuel line a steel ball having a diameter equal to half of the nominal inside diameter of the flexible fuel line.

The fuel line shall not kink and the ball shall pass freely from one end of the flexible fuel line to the other.

Dimension in millimetres



Key

1 board

a Hole size as necessary to fit flexible fuel line outside diameter.

b r = 10 times the nominal flexible fuel line inside diameter, or the flexible fuel line manufacturer's specified minimum bend radius, whichever is less.

Figure 1 — Bending test

6.5 Pull off

Test the flexible fuel line, attached to its fitting or fittings and coupled to its mating part or parts, according to the following procedure and acceptance criterion. Secure the subject specimen in an appropriate test fixture, then

statically apply a tensile load along the flexible fuel line axis at a maximum rate of 250 N/min until the flexible fuel line separates from its fitting.

The force (F), in newtons, required to pull apart the fuel line from its fitting shall be equal to or in excess of that calculated as:

$$F = \left(\pi \cdot d^2 \cdot P\right) \div 10$$

where

d is the inside diameter, in millimetres;

P is the specified working pressure, in bar.

6.6 Electrical conductivity

Conduct the test with the flexible fuel line depressurized and at the specified working pressure. Check the flexible fuel line resistance using an applied potential of up to DC 500 V and measuring the current.

Electrical resistance between couplings at each end of the flexible fuel line shall be < 1 MΩ/m, in order to dissipate static electricity.

6.7 Permeability

Fill a suitable length of flexible fuel line with CNG to service or working pressure, place it in an enclosed sealed chamber at ambient temperature and monitor it for permeation for 14 d.

The hourly permeation rate shall be less than 20 cm^3/m. Section the flexible fuel line and inspect the internal surfaces for any evidence of cracking or deterioration.

Bibliography

[1] ISO 1746, *Rubber or plastics hose or tubing — Bending tests*

[2] ISO 3833, *Road vehicles — Types — Terms and definitions*

[3] ISO 15403-1, *Natural gas — Natural gas for use as a compressed fuel for vehicles — Part 1: Designation of the quality*

[4] ISO/TR 15403-2, *Natural gas — Natural gas for use as a compressed fuel for vehicles — Part 2: Specification of the quality*

[5] SAE J517, *Hydraulic hose*

[6] JIS B 8362, *Textile reinforced thermoplastic hose assemblies for hydraulic use*

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