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Road vehicles — Compressed gaseous hydrogen (CGH2) and hydrogen/natural gas blends fuel system components —

Part 13: Rigid fuel line in stainless steel

Véhicules routiers — Composants des circuits d'alimentation pour hydrogène gazeux comprimé (CGH2) et mélanges de gaz naturel et hydrogène —

Partie 13: Tuyauterie rigide pour combustible en acier inoxydable

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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 on 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 the following URL: 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*.

A list of all parts in the ISO 12619 series can be found on the ISO website.

Road vehicles — Compressed gaseous hydrogen (CGH2) and hydrogen/natural gas blends fuel system components —

Part 13: Rigid fuel line in stainless steel

1 Scope

This document specifies tests and requirements for the rigid fuel line in stainless steel, a compressed gaseous hydrogen (CGH_2) and hydrogen/natural gas blend fuel system component intended for use on the types of motor vehicles defined in ISO 3833.

It is applicable to vehicles using CGH_2 in accordance with ISO 14687-1 or ISO 14687-2 and hydrogen/natural gas blend using natural gas in accordance with ISO 15403-1 and ISO/TR 15403-2. It is not applicable to the following:

a) liquefied hydrogen (LH_2) fuel system components;

b) fuel containers;

c) stationary gas engines;

d) container mounting hardware;

e) electronic fuel management;

f) refuelling receptacles;

g) fuel cell vehicles.

NOTE 1 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.

NOTE 2 All references to pressure in this document are considered gauge pressures unless otherwise specified.

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 12619-1, *Road vehicles — Compressed gaseous hydrogen (CGH_2) and hydrogen/natural gas blend fuel system components — Part 1: General requirements and definitions*

ISO 12619-2:2014, *Road vehicles — Compressed gaseous hydrogen (CGH_2) and hydrogen/natural gas blend fuel system components — Part 2: Performance and general test methods*

ISO 1127, *Stainless steel tubes — Dimensions, tolerances and conventional masses per unit length*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12619-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

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 temperature range.

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;

— the serial number or date code;

— a reference to this document, i.e. ISO 12619-13:2017.

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 stainless steel rigid fuel line shall comply with the applicable provisions of ISO 12619-1 and ISO 12619-2 and with the tests specified in Clause 6. Tolerances should follow the specifications of ISO 12619-2.

The stainless steel rigid fuel line shall be seamless cold worked austenitic stainless steel tube complying with ISO 1127.

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 12619-2	Specific test requirements of this document
Hydrostatic strength	X	X	X (see 6.2)
Leakage	X	X	—
Excess torque resistance	—	—	—
Bending moment	—	—	—
Continued operation	X	X	X (see 6.3)
Corrosion resistance	X	X	—
Oxygen ageing	—	—	—
Ozone ageing	X	X	—
Heat ageing	X	X	—
Automotive fluids	X	X	—
Electrical over-voltages	—	—	—
Non-metallic material immersion	—	—	—
Vibration resistance	—	—	—
Brass material compatibility	—	—	—
Bending	X		X (see 6.4)
Conductivity	—	—	—

6.2 Hydrostatic strength

Test the rigid fuel line according to the procedure for testing hydrostatic strength specified in ISO 12619-2. The test pressure shall be four times the working pressure.

NOTE The higher hydrostatic test pressure for the rigid fuel line compared with the components in the other parts of ISO 12619 is due to the necessary provisions to cope with eventual damage or abrasions under normal operation.

6.3 Continued operation

Test the rigid fuel line in accordance with the procedure for testing continued operations given in ISO 12619-2 for a total of 100 000 cycles. Following cycling testing, perform the hydrostatic test in accordance with 6.2.

6.4 Bending

Test the rigid fuel line according to the following procedure and acceptance criterion.

a) Select a mandrel with a diameter according to ISO 12619-2:2014, Table 1.

b) Bend the rigid fuel line over this mandrel once forming a “U” shape.

c) Close the ends of the rigid fuel line and subject it to the hydrostatic test of 6.2.

At the completion of the hydrostatic test, the rigid fuel line shall be tested according to the procedure for leakage testing specified in ISO 12619-2.

Bibliography

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

[2] ISO 11114-2, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials*

[3] ISO 13686, *Natural gas — Quality designation*

[4] ISO 14687-1, *Hydrogen fuel — Product specification — Part 1: All applications except proton exchange membrane (PEM) fuel cell for road vehicles*

[5] ISO 14687-2, *Hydrogen fuel — Product specification — Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles*

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

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

[8] ISO/TS 15869, *Gaseous hydrogen and hydrogen blends — Land vehicle fuel tanks*

[9] ISO/TR 15916, *Basic considerations for the safety of hydrogen systems*