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Road vehicles — Compressed Gaseous Hydrogen (CGH2) and Hydrogen/Natural Gas blend fuel system components —

Part 2:
Performance and general test methods

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

Partie 2: Performance méthodes d'essai en général

ICS 43.060.40

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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 12619-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 25, *Road vehicles using gaseous fuels*.

ISO 12619 consists of the following parts, under the general title *Road vehicles — Compressed Gaseous Hydrogen (CGH2) and Hydrogen/Natural Gas blends fuel system components*:

— *Part 1: General requirements and definitions*

— *Part 2: Performance and general test methods*

— *Part 3: Pressure regulator*

Road vehicles — Compressed Gaseous Hydrogen (CGH2) and Hydrogen/Natural Gas blends fuel system components — Part 2: Perfromance and general test methods

1 Scope

This Standard specifies performance and general test methods for Compressed Gaseous Hydrogen (CGH2) or Hydrogen/CNG blends fuel system components, intended for use on the types of motor vehicles defined in ISO 3833.

It is applicable to vehicles using Compressed Gaseous Hydrogen (CGH2) in accordance with ISO 14687 and Hydrogen/Natural Gas blends. It is not applicable to the following:

a) liquefied hydrogen (LH2) fuel system components;

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 Standard and tested according to the appropriate functional tests.

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

NOTE 3 This Standard may not apply to fuel cell vehicles in compliance with international Regulations.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard 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 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 1817, *Rubber, vulcanized — Determination of the effect of liquids*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 14687, *Hydrogen fuel - Product specification (all parts)*

ISO 12619-1[1] , *Road vehicles* - Compressed Gaseous Hydrogen (CGH2) and Hydrogen/Natural Gas blends *fuel system components - Part 1: General requirements and definitions*

ISO 12619-3 and subsequent parts[2] , *Road vehicles* - Compressed Gaseous Hydrogen (CGH2) and Hydrogen/Natural Gas blends *fuel system components*

ISO 11114-2: Transportable gas cylinders – Compatibility of cylinders and valve material with gas contents – Part-2 – Non-metallic materials

ISO 11114-4: Transportable gas cylinders – Compatibility of cylinders and valve material with gas contents – Part-4 – Tests methods for selecting metallic materials resistant to hydrogen embritlement

ISO 15500-2[3] : 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 Standard, the terms and definitions given in ISO 12619-1 apply.

4 General

4.1 Unless otherwise stated, the tests shall be conducted at room temperature: i.e. 20 °C ± 5 °C.

4.2 Components shall comply with the tests specified in ISO 12619-3 and subsequent parts, as well as the applicable tests specified in this Standard. Because of the peculiarities of some components, the list of tests given in this Standard (clauses 5 to 17) is not exhaustive. Where additional tests are required, their provisions are given in another relevant part.

4.3 Unless otherwise specified, all tests shall be conducted using dry hydrogen, helium or blends of nitrogen with a minimum 5% of hydrogen. Test shall be performed by qualified personnel and appropriate safety measures shall be taken. The dew point of the test gas at the test pressure shall be at the temperature at which there is no icing, or hydrate or liquid formation. The dew point of the test gas at the test pressure shall be at the temperature at which there is no icing, or hydrate or liquid formation.

4.4 It is recognized that new technology may not be covered in ISO 12619-3 or subsequent parts of ISO 12619.

4.5 Hydrogen used for testing shall comply with ISO 14687:1999, *Hydrogen fuel - Product specification.*

5 Hydrostatic strength

A component shall not show any visible evidence of rupture when subjected to the following test procedure.

Plug the outlet opening of the component and have the valve seats or internal blocks assume the open

1) Under development

2) Under development

3) Under development

position. Apply, with a test fluid, the hydrostatic pressure specified in the applicable part of ISO 12619 to the inlet of the component for a period of at least 3 min.

The hydrostatic pressure shall be increased at a rate of less than or equal to 1.4 MPa/sec until component failure. The hydrostatic pressure at failure shall be recorded. The failure pressure of components which have been subjected to previous durability and corrosion tests shall be no less than 80 per cent of the failure pressure of the virgin component, unless the hydrostatic pressure exceeds 1.5 times the working pressure.

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

6 Leakage

6.1 General

6.1.1 Prior to conditioning, purge the component or device with nitrogen and then seal it at 30 % of working pressure using test gases as defined in 4.3. In case of components subjected to more than one working pressures, the test may be conducted in subsequent steps

6.1.2 Conduct all tests while the device is continuously exposed to the specified test temperatures. The device passes the test if it shall have a leakage rate of less than 10 Ncm^3/h (normal referred to helium) of hydrogen gas. If test gas other than pure hydrogen is used, the leak rate shall be converted to a 100 percent hydrogen gas leak rate equivalent using the following test method.

6.2 External leakage

6.2.1 Plug each device outlet with the appropriate mating connection and apply the test pressure to the inlet

6.2.2 Apply test gases as defined in 4.3 to the test device.

6.2.3 At all test temperatures, immerse the components in a suitable test medium for at least 2 min or use a helium vacuum test (global accumulation method) or other equivalent method.

6.3 Internal leakage

6.3.1 The internal leakage test is applicable only to devices having a closed position. The aim of this test is to check the pressure tightness of the closed system.

6.3.2 Connect the inlet or outlet (as applicable) of the device, with the appropriate mating connection, while leaving the opposite connection or connections open.

6.3.3 Apply the test pressure to the inlet or outlet (as applicable) of the device using test gas.

6.3.4 At all applicable temperatures mentioned in clause 6.4, immerse the component in a suitable test medium for at least 2 min or other equivalent method.

6.3.5 Measure the leak rate by an appropriate method and it should not be more than as specified in 6.1.2.

6.4 Test conditions

6.4.1 The device shall be conditioned at least 8 hours at a low temperature of - 40 °C or - 20 °C, as applicable, and pressurized at 80% and 5% of working pressure.

6.4.2 The device shall be conditioned at least 8 hours at a room temperature of 20 °C ±5 °C and pressurized at 5 % and 150 % of working pressure.

6.4.3 The device shall be conditioned at least 8 hours at a high temperature of 85 °C or 120 °C, as applicable, and pressurized at 5 % and 150 % of working pressure.

7 Excess torque resistance

A component designed to be connected directly to threaded fittings shall be capable of withstanding, without deformation, breakage or leakage, a torque effort of 150 % of the rated installation value, according to the following test procedure.

a) Test an unused component, applying the torque adjacent to the fitting.

b) For a component having a threaded connection or threaded connections, apply the turning effort for 15 min, release it, then remove the component and examine it for deformation and breakage.

c) Subject the component to the leakage test specified in clause 6.

d) Subject the component to the hydrostatic strength test specified in clause 5.

8 Bending moment

A component shall be capable of operation without cracking, breaking, or leaking when tested according to the following procedure.

a) Assemble the connections of the component, leak-tight, to an appropriate mating connection or connections, representative of design intent. After assembly, the length of the inlet tubing shall be greater than 300 mm (see Figure 1).

b) The outlet connection shall be rigidly supported, 25 mm from the component outlet, except in the following cases:

— if the component has an integral mounting means independent of the inlet and outlet connections, the component shall be mounted using the integral mounting means specified by the manufacturer;

— if the component is intended to be mounted by either the integral mounting means or the component outlet, the mounting means that produces the most severe test condition shall be used.

c) Check this assembly for leaks prior to subjecting it to d).

d) With the component in the closed position, pressurize the system to 0,25 times the working pressure and apply a force according to Table 1, 300 mm from the inlet, maintaining it for 15 min. Without removing the

force, check the component for leakage, in accordance with the test method given in clause 6, at room temperature.

NOTE Depending on how this test is performed, raising the load to compensate buoyancy could be necessary.

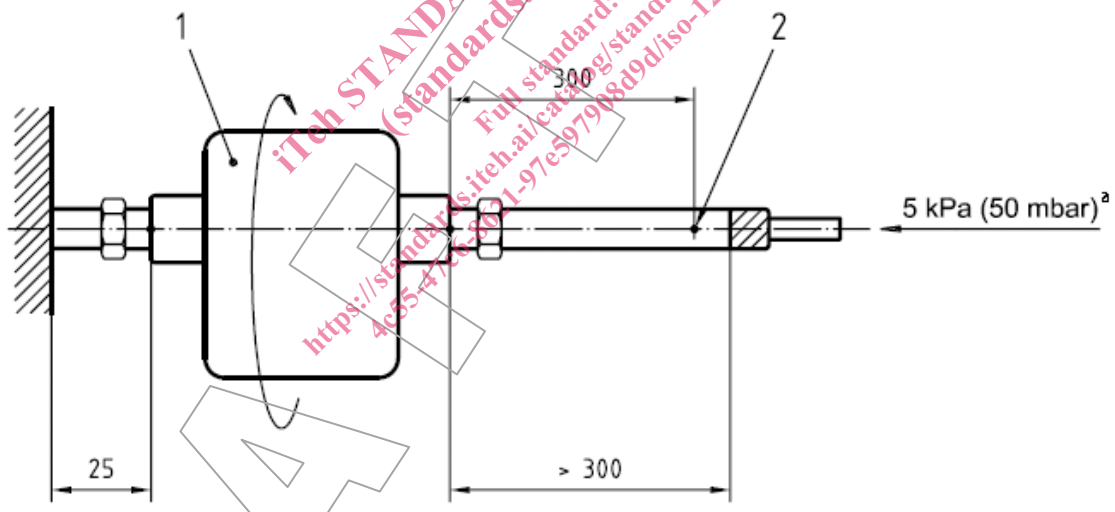
e) Conduct procedure d) four times, rotating the component 90° around the horizontal axis between each test. Between tests, open and close (if applicable) the component three times with the bending moment removed.

f) At the completion of the above tests, remove the component and examine it for deformation; then subject it to the leakage test according to clause 6 and to the hydrostatic test according to clause 5

Outside diameter of tubing mm	**Force** N
6	3,4
8	9,0
≥ 12	17,0

Table 1 — Bending moment test force

Dimensions in millimetres



Key
1 Component
2 Force point
a 4 x 90° rotation.

Figure 1 — Bending moment

9 Continued operations

9.1 General

For the details of test methods for particular components, see the other parts of ISO 12619. The method specified in this clause is general in nature and also applies to miscellaneous components.