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

Part 9: Pressure relief valve (PRV)

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

Partie 9: Soupape de surpression

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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).

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).

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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 9: Pressure relief valve (PRV)

1 Scope

This document specifies tests and requirements for the pressure relief valve (PRV), 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, *Road vehicles — Compressed gaseous hydrogen (CGH_2) and hydrogen/natural gas blend 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 12619-1 and the following 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

3.1
set pressure
pressure at which it is intended that the PRV opens

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;

— 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 12619-9:2017.

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 PRV 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 PRV may be integrated with other components. The other components shall not interfere with the operation/activation of the PRV.

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 (see 6.2)
Leakage	X	—	X (see 6.3)
Excess torque resistance	X	X	—
Bending moment	X	X	—
Continued operation	X	—	X (see 6.4)
Operational	X	—	X (see 6.5)
Corrosion resistance	X	X	—
Oxygen ageing	X	X	—
Ozone ageing	X	X	—
N-pentane	X	X	—
Heat ageing	X	X	—
Automotive fluid exposure	X	X	—
Non-metallic material immersion	X	X	—
Non-metallic material compatibility to hydrogen	X	X	—
Ultraviolet resistance of external surfaces	X	X	—
Vibration resistance	X	X	—
Brass material compatibility	X	X	—

6.2 Hydrostatic strength

Test the PRV according to the procedure for testing hydrostatic strength specified in ISO 12619-2 to at least 2,5 times its working pressure.

For the purposes of this test, the PRV's mechanism shall be removed and its orifice blocked.

6.3 Leakage

Test the PRV at –40 °C or –20 °C, room temperature and 85 °C or 120 °C (if required by the operating conditions), at working pressure.

6.4 Continued operation

The PRV shall be capable of withstanding 600 cycles of operation when tested according to the provisions of the continued operation test procedure given in ISO 12619-2 and the following:

a) a test cycle consists of, first, pressurizing the PRV to the set pressure. This action shall cause the PRV to open and vent. Once the valve is venting, reduce the inlet pressure; when the PRV re-seats, the cycle is finished;

b) after 600 cycles, test the PRV for leakage at (20 ± 5) °C at its working pressure. Cycle time shall be within a period of (10 ± 2) s.

6.5 Operational test

6.5.1 General

Verify the opening and re-seating pressures of the PRV. The opening pressure shall be equal to the set pressure ±5 % at 20 °C, –40 °C or –20 °C (as applicable) and 85 °C or 120 °C (as required by the operating conditions).

6.5.2 Test procedure

Three randomly selected samples shall be subjected to the following test procedure. This test has three steps, which shall be conducted in the order given. Appropriate test media shall be chosen (i.e. air, nitrogen, natural gas, pure hydrogen or helium). If the test medium is not pure hydrogen and/or helium, then the calculated flow values shall be corrected for pure hydrogen and/or helium.

a) Establish the opening and re-seating values for the samples at (20 ± 2) °C. Do this by first slowly pressurizing the inlet of the sample to 110 % of the set pressure, noting the value at which it first opens.

b) Lower the inlet pressure until the PRV re-seats; note that value. The valves are considered to have passed if all the following requirements are met:

   1) opening pressures shall be ±5 % of the manufacturer's set pressure;

   2) re-seating pressures shall be no less than 90 % of the set pressure;

   3) all re-seating pressures shall be within ±5 % of the average re-seating pressure.

c) Repeat steps a) and b) at –40 °C or –20 °C (as applicable) and 85 °C or 120 °C (as required by the operating conditions). At each test temperature, the following criteria shall be met:

   1) opening pressures shall be ±15 % of the manufacturer's set pressure;

   2) re-seating pressures shall be no less than 80 % of the set pressure;

   3) all re-seating pressures shall be within ±15 % of the average re-seating pressure.