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**Road vehicles — Compressed gaseous  
hydrogen (CGH<sub>2</sub>) and hydrogen/  
natural gas blends fuel system  
components —**

**Part 16:  
Fittings**

*Véhicules routiers — Composants des circuits d'alimentation pour  
hydrogène gazeux comprimé (CGH<sub>2</sub>) et mélanges de gaz naturel et  
hydrogène —*

*Partie 16: Raccords*

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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](http://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](http://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](http://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 (CGH<sub>2</sub>) and hydrogen/natural gas blends fuel system components —

## Part 16: Fittings

### 1 Scope

This document specifies tests and requirements for the fittings, compressed gaseous hydrogen (CGH<sub>2</sub>) and hydrogen/natural gas blend fuel system components intended for use on the types of motor vehicles defined in ISO 3833.

It is applicable to vehicles using CGH<sub>2</sub> 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<sub>2</sub>) 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<sub>2</sub>) and hydrogen/natural gas blend fuel system components — Part 1: General requirements and definitions*

ISO 12619-2:2014, *Road vehicles — Compressed gaseous hydrogen (CGH<sub>2</sub>) 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 apply.

## ISO 12619-16:2017(E)

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 12619-16:2017.

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

5.1 The fitting 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.

5.2 The fitting shall be compatible with the rigid fuel line.

5.3 Stainless steel lines shall only be fitted with stainless steel fittings.

5.4 Galvanic corrosion shall be prevented.

### 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	X	X	—
Bending moment	X	X	—
Continued operation	X	X	X (see 6.3)
Corrosion resistance	X	X	—
Oxygen ageing	X (only for non-metallic parts)	X	—
Ozone ageing	X (only for non-metallic parts)	X	—
Heat ageing	X (only for non-metallic parts)	X	—
Automotive Fluids	X	X	—
Electrical over-voltages	—	—	—
Non-metallic material immersion	X (only for non-metallic parts)	X	—
Vibration resistance	X	—	X (see 6.4)
Pull-off	X	—	X (see 6.5)
Brass material compatibility	X	X	—

## 6.2 Hydrostatic strength

Test the fitting 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 fittings compared with the other components in the other parts of ISO 12619 is due to consistency with fuel line provisions.

## 6.3 Continued operation

Test the fitting in accordance with the procedure for testing continued operation given in ISO 12619-2 for a total of 100 000 cycles. The fitting shall only be tested while connected with a rigid fuel line.

Following cycling testing, perform the leak test specified in ISO 12619-2, then the hydrostatic strength test in accordance with 6.2.

## 6.4 Vibration resistance

Vibrate the fitting assembly, pressurized to its working pressure and sealed at both ends, for 30 min along each of the three orthogonal axes at the most severe resonant frequencies determined as follows:

- by an acceleration of 1,5 g;
- within a sinusoidal frequency range from 10 Hz to 500 Hz;
- with a sweep time of 10 min.

If the resonance frequency is not found in this range, the test shall be conducted at 500 Hz.

At the completion of the test, the component shall not show any indication of fatigue or component damage and shall meet the leakage test requirements specified in ISO 12619-2 and the hydrostatic strength test in accordance with [6.2](#).

### 6.5 Pull-off

Test the fitting, attached to its rigid fuel line 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 rigid fuel line axis at a maximum rate of 250 N/min until the rigid fuel line separates from the fitting.

The force ( $F$ ), in newtons, required to pull apart the rigid fuel line from its fitting, as measured in the previous test, shall be higher than the one calculated using [Formula \(1\)](#):

$$F = (\pi \times d^2 \times P) / 10 \quad (1)$$

where

$d$  is the internal diameter, in millimetres;

$P$  is the working pressure, in bar.

[Formula \(1\)](#) already includes a safety factor of four.

### 6.6 Repeated assembly

Fittings shall be able to withstand being assembled and disassembled 25 times in a manner that is representative of their field application.

At the completion of the test, the fittings shall comply with the leakage requirement specified in ISO 12619-2:2014, 6.2.