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

Part 2:

**Performance and general test methods**

**AMENDMENT 1**

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

*Partie 2: Performance méthodes d'essai en général*

*AMENDEMENT 1*



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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 41, *Specific aspects for gaseous fuels*.

ISO 12619 consists of the following parts, under the general title *Road vehicles — Compressed Gaseous Hydrogen (CGH<sub>2</sub>) 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*
- *Part 4: Check valve*
- *Part 5: Manual cylinder valve*
- *Part 6: Automatic valve*



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

## Part 2: Performance and general test methods

### AMENDMENT 1

Page 10, 22.2

Add the following clauses after 22.2:

#### **23 Material requirements**

Materials normally in contact with hydrogen shall be determined to be acceptable in hydrogen service, with consideration of hydrogen embrittlement and hydrogen accelerated fatigue. The performance tests cannot guarantee that all cases and conditions of hydrogen service will be validated, so it is still incumbent on the manufacturer to carefully screen materials of construction for their intended use. Materials and design shall be such that there will be no significant change in the functioning of the component, deformation or mechanical change in the component, and no harmful corrosion, deformation, or deterioration of the materials when subject to the service conditions provided in ISO 12619-1, 4.4.

NOTE Material performance data in hydrogen environments can be found in the Sandia National Laboratory Technical Reference for Hydrogen Compatibility of Materials or ANSI/AIAA G-095, ANSI/CSA CHMC 1, ASME B31.12, and SAE J2579, Appendix B.

Non-metallic materials normally in contact with hydrogen shall be determined to be acceptable in hydrogen service. Consideration shall be given to the fact that hydrogen diffuses through these materials more easily than through metals; therefore, the suitability of materials shall be verified. Non-metallic materials shall retain their mechanical stability with respect to strength (fatigue properties, endurance limit, creep strength) when exposed to the full range of service conditions and lifetime as specified by the manufacturer. Materials shall be sufficiently resistant to the chemical and physical action of the fluids that they contain and to environmental degradation. The chemical and physical properties necessary for operational safety shall not be significantly affected within the scheduled lifetime of the equipment unless replacement is foreseen; specifically, when selecting materials and manufacturing methods, due account shall be taken of the material's corrosion and wear resistance, electrical conductivity, impact strength, aging resistance, the effects of temperature variations, the effects arising when materials are put together (for example, galvanic corrosion), the effects of ultraviolet radiation, and the degradation effects of hydrogen on the mechanical performance of a material.

#### **24 Ultraviolet resistance of external surfaces**

##### **24.1 General**

The external non-metallic surfaces, including organic coatings, of the component shall be evaluated for resistance to ultraviolet effects using a minimum 1 000 h exposure using a UVA 340 lamp in accordance with ISO 4892-3. The inlet and outlet connections of the component shall be connected or capped in accordance with the manufacturer's installation instructions.

## **24.2 Pass criteria**

There shall be no evidence of blistering, cracking, chalking, or softening. If the non-metallic material is integral to pressure containment or the function of the device, then, at the conclusion of this test, the device shall meet the requirements of Clauses 5 and 6.

## **25 Automotive fluid exposure**

### **25.1 General**

External portions of components shall be able to withstand exposure to the following fluids without mechanical degradation. Resistance may be determined by the test in 25.2, by comparable published data or by known properties (e.g. 300 series stainless steel). The decision about the applicability of test data and known properties shall be at the discretion of the independent inspection or test agency.

### **25.2 Method**

The external surfaces of the component shall be exposed to the following test. The inlet and outlet connections of the component shall be connected or capped in accordance with the component manufacturer's installation instructions. The component shall be exposed for at ambient temperature by spraying the exterior of the component once per hour, 24 times, over a period of up to three days (e.g. three 8 h shifts over three days or 24 h straight). Alternatively, the component may be immersed in the solution for 24 h. In the immersion method, the fluid shall be replenished as needed to assure complete exposure for the duration of the test. A distinct test shall be performed with each of the three fluids specified in 25.3. One component may be used for all three exposures sequentially.

### **25.3 Fluids**

The following fluids shall be used:

- a) Sulfuric acid: 19 % solution by volume in water;
- b) Ethanol/gasoline: 5/95 % concentration of M5 fuel meeting the requirements of ASTM D4814;
- c) Windshield washer fluid: 50 % by volume solution of methanol and water.

### **25.4 Pass criteria**

After exposure to each chemical, the component shall be wiped off and rinsed with water and examined.

The component shall not show signs of mechanical degradation that could impair the function of the component such as cracking, softening, or swelling. Cosmetic changes such as pitting or staining are not considered failures. At the conclusion of all exposures, the component(s) shall meet the leakage requirements of Clause 6 and hydrostatic strength requirements of Clause 5.

## **26 N-pentane**

Resistance to n-pentane according to ISO 1817 with the following conditions:

- a) Medium: n-pentane;
- b) Temperature: 23 °C (tolerance according to ISO 1817);
- c) Immersion period: 72 h.

Requirements:

- Maximum change in volume: 20 %;
- Maximum change in tensile strength: 25 %;
- Maximum change in elongation at break: 30 %.

After storage in air with a temperature of 40 °C for 48 h, the mass compared with the original value may not decrease more than 5 %.

## 27 Heat ageing

**27.1** The test has to be done in compliance with ISO 188. The test piece has to be exposed to air at a temperature equal to the maximum operating temperature for 168 h.

**27.2** The allowable change in tensile strength should not exceed +25 %. The allowable change in ultimate elongation shall not exceed the following values:

- a) Maximum increase: 10 %;
- b) Maximum decrease: 30 %.

*Page 11, Bibliography*

Add the following entry:

[6] ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

