



Standard Test Method for Sampling of Particulate Matter in High Pressure Hydrogen used as a Gaseous Fuel with an In-Stream Filter¹

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1. Scope

1.1 This test method is primarily for sampling particulates in hydrogen fuel used in hydrogen fuel cell vehicles or gaseous hydrogen powered internal combustion vehicle engines up to pressures of 70 MPa (700 bars) using an in-stream filter. This test method describes sampling apparatus design, operating procedures, and quality control procedures required to obtain the stated levels of precision and accuracy.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.2.1 *Exception*—In 7.1 and 10.1.1 the values stated in psi are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards*:²

D7651 Test Method for Gravimetric Measurement of Particulate Concentration of Hydrogen Fuel

2.2 *SAE Standards*:³

SAE J2719 Hydrogen Fuel Quality for Fuel Cell Vehicles

SAE J2600 Compressed Hydrogen Surface Vehicle Refueling Connection Devices

2.3 *ISO Standard*:⁴

ISO/CD 14687-2 Hydrogen fuel — Product Specification — Part 2: Proton exchange membrane (PEM) fuel cell

¹ This test method is under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D03.14 on Hydrogen and Fuel Cells.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

⁴ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, <http://www.iso.org>.

applications for road vehicles.

2.4 *EU Standard*:⁵

97/23/EC Pressure Equipment Directive of the EU set out the standards for the design and fabrication of pressure equipment

2.5 *DIN Standard*:⁶

DIN EN 12266-1 Industrial valves—Testing of metallic valves—Part 1: Pressure test, test procedures and acceptance criteria Mandatory Requirements

2.6 *API Standard*:⁷

API 598 Valve Inspection and Testing

3. Terminology

3.1 *Acronyms*:

3.1.1 *FCV*—Hydrogen Fuel Cell Vehicle.

3.1.2 *HQSA*—Hydrogen quality sampling assembly for sampling gaseous hydrogen fuel.

3.1.3 *PEM*—Polymer Electrolyte Membrane or Proton Exchange Membrane

3.1.4 *PSA-H70*—Particulate sampling adapter for sampling particulate in hydrogen fuel up to pressures of 70 MPa.

3.1.5 *SAE International*—Society of Automotive Engineering

3.2 *Definitions*:

3.2.1 *pinhole*—a small hole generated during sampling of particulate in hydrogen that can be identified by microscope.

3.3 *SAE J2719 Hydrogen Fuel Quality for Fuel Cell Vehicles*—This document specifies allowable levels of constituents in the hydrogen fuel at the vehicle/station interface.

3.4 *SAE J2600—Compressed Hydrogen Surface Vehicle Refueling Connection Devices*—This document specifies the design requirements for nozzles and receptacles used in high pressure hydrogen applications such as delivery from a fueling station to a FCV.

⁵ Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, <http://www.cen.eu>.

⁶ Available from Deutsches Institut für Normung e.V. (DIN), Burggrafenstrasse 6, 10787 Berlin, Germany, <http://www.din.de>.

⁷ Available from American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005-4070, <http://www.api.org>.