



Designation: D7649 – 19

Standard Test Method for Determination of Trace Carbon Dioxide, Argon, Nitrogen, Oxygen and Water in Hydrogen Fuel by Jet Pulse Injection and Gas Chromatography/Mass Spectrometer Analysis¹

This standard is issued under the fixed designation D7649; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes a procedure primarily for the determination of carbon dioxide, argon, nitrogen, oxygen, and water in high pressure fuel cell grade hydrogen by gas chromatograph/mass spectrometer (GC/MS) with injection of sample at the same pressure as sample without pressure reduction, which is called “Jet Pulse Injection.” The procedures described in this method were designed to measure carbon dioxide at 0.5 micromole per mole (ppmv), Argon 1 ppmv, nitrogen 5 ppmv, oxygen 2 ppmv, and water 4 ppmv.

1.2 *Units*—The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.3 The mention of trade names in standard does not constitute endorsement or recommendation for use. Other manufacturers of equipment or equipment models can be used.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

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.

[E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

2.2 Other Standards:³

[SAE TIR J2719 Information Report on the Development of a Hydrogen Quality Guideline for Fuel Cell Vehicles April 2008](#)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *absolute pressure, n*—pressure measured with reference to absolute zero pressure, usually expressed as kPa, mm Hg, bar or psi.

3.1.1.1 *Discussion*—All the pressures mentioned in this method are absolute pressure.

3.1.2 *constituent, n*—a component (or compound) found within a hydrogen fuel mixture.

3.1.3 *contaminant, n*—impurity that adversely affects the components within the fuel cell system or the hydrogen storage system by reacting with its components.

3.1.3.1 *Discussion*—An adverse effect can be reversible or irreversible.

3.1.4 *dynamic calibration, n*—calibration of an analytical system using calibration gas standard generated by diluting known concentration compressed gas standards with hydrogen, as used in this method for carbon dioxide, argon, nitrogen, and oxygen (7.3 and 7.4).

3.1.5 *extracted ion chromatogram (EIC), n*—a GC/MS chromatogram where a selected ion is plotted to determine the compound(s) of interest.

3.1.6 *fuel cell grade hydrogen, n*—hydrogen satisfying the specifications in SAE TIR J2719.

3.1.7 *hydrogen fuel, n*—hydrogen to be tested without compositional change due to sample introduction, etc.

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