



Designation: D8080 – 24

Standard Specification for Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) Used as a Motor Vehicle Fuel¹

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1. Scope

1.1 This specification defines the minimum fuel quality requirements for gaseous fuels consisting primarily of methane when used as an internal combustion engine fuel.

1.2 This specification defines the criteria for compressed natural gas (CNG), liquefied natural gas (LNG), renewable natural gas (RNG), or biogas when used as a fuel for internal combustion engines in motor vehicles.

1.3 This specification covers the needs of internal combustion engines designed for use in motor vehicles.

1.4 This specification covers six fuel grades defined by their calculated methane number (MNC) and the maximum allowed volume fraction of sulfur expressed in ppm(v). They are described as follows:

1.4.1 *Grade MNC65 S5*—A blend with up to 5 ppm(v) sulfur and meeting a minimum MNC of 65.

1.4.2 *Grade MNC65 S16*—A blend with up to 16 ppm(v) sulfur and meeting a minimum MNC of 65.

1.4.3 *Grade MNC65 S32*—A blend with up to 32 ppm(v) sulfur and meeting a minimum MNC of 65.

1.4.4 *Grade MNC75 S5*—A blend with up to 5 ppm(v) sulfur and meeting a minimum MNC of 75.

1.4.5 *Grade MNC75 S16*—A blend with up to 16 ppm(v) sulfur and meeting a minimum MNC of 75.

1.4.6 *Grade MNC75 S32*—A blend with up to 32 ppm(v) sulfur and meeting a minimum MNC of 75.

1.5 Fuels that have been enriched with hydrogen are outside the scope of this specification.

1.6 This specification applies to the fuel as delivered into the on-board fuel tanks of a motor vehicle either as a compressed gas or cryogenic liquefied gas.

1.7 This specification may serve as a guide to gaseous fuel quality requirements for internal combustion engines used in stationary applications.

1.8 This specification is not a natural gas pipeline standard; those requirements are determined by national and regional tariffs.

1.9 *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.

1.10 *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.*

1.11 *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

D1142 Test Method for Water Vapor Content of Gaseous Fuels by Measurement of Dew-Point Temperature

D1945 Test Method for Analysis of Natural Gas by Gas Chromatography

D3588 Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels

D4150 Terminology Relating to Gaseous Fuels

D4468 Test Method for Total Sulfur in Gaseous Fuels by Hydrogenolysis and Rateometric Colorimetry

D5454 Test Method for Water Vapor Content of Gaseous Fuels Using Electronic Moisture Analyzers

D5504 Test Method for Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Chemiluminescence

D6228 Test Method for Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Flame Photometric Detection

¹ This specification is under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D03.02 on Specifications and Classifications.

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

D6968 Test Method for Simultaneous Measurement of Sulfur Compounds and Minor Hydrocarbons in Natural Gas and Gaseous Fuels by Gas Chromatography and Atomic Emission Detection (Withdrawn 2024)³

D7165 Practice for Gas Chromatograph Based On-line/At-line Analysis for Sulfur Content of Gaseous Fuels

D7493 Test Method for Online Measurement of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatograph and Electrochemical Detection

D7551 Test Method for Determination of Total Volatile Sulfur in Gaseous Hydrocarbons and Liquefied Petroleum Gases and Natural Gas by Ultraviolet Fluorescence (Withdrawn 2024)³

D7607 Test Method for Analysis of Oxygen in Gaseous Fuels (Electrochemical Sensor Method)

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

D7833 Test Method for Determination of Hydrocarbons and Non-Hydrocarbon Gases in Gaseous Mixtures by Gas Chromatography

D7904 Test Method for Determination of Water Vapor (Moisture Concentration) in Natural Gas by Tunable Diode Laser Spectroscopy (TDLAS)

D8221 Practice for Determining the Calculated Methane Number (MNC) of Gaseous Fuels Used in Internal Combustion Engines

D8230 Test Method for Measurement of Volatile Silicon-Containing Compounds in a Gaseous Fuel Sample Using Gas Chromatography with Spectroscopic Detection

2.2 *ISO Standard*:⁴

ISO 6976 Natural gas – Calculation of calorific values, density, relative density and Wobbe index from composition

2.3 *ASHRAE Standard*:⁵

American Society of Heating, Refrigerating and Air Conditioning Engineer's (ASHRAE) Handbook 1989 Fundamentals Volume

3. Terminology

3.1 For definitions of general terms used in D03 Gaseous Fuels standards, refer to Terminology **D4150**.

3.2 *Acronyms*:

3.2.1 *CFR*—cooperative fuel research

3.2.2 *CNG*—compressed natural gas

3.2.3 *HHV*—higher heating value

3.2.4 *LHV*—lower heating value

3.2.5 *LNG*—liquefied natural gas

3.2.6 *MN*—methane number

3.2.7 *MNC*—calculated methane number

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <https://www.iso.org>.

⁵ Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), 1791 Tullie Circle, NE, Atlanta, GA 30329, <http://www.ashrae.org>.

3.2.8 *MON*—motor octane number

3.2.9 *RNG*—renewable natural gas

4. Sampling

4.1 Review relevant test methods prior to sampling to understand the importance and effects of sampling technique, proper containers, and any special handling required for each test method.

4.2 Samples shall be collected directly from the fuel dispenser.

4.3 CNG samples shall be representative of the product as dispensed into an on-board motor vehicle fuel tank and shall be collected by a suitable sampling procedure.

4.4 LNG samples shall be representative of the product as dispensed into an on-board motor vehicle fuel tank and shall be collected by a suitable sampling procedure.

4.5 *Sample Size*—A volume of sample suitable for performing fuel quality measurements as listed in **Table 1** is required. This should be determined in consultation with the testing laboratory.

4.6 Follow all safety procedures when sampling natural gas.

4.6.1 Never store LNG in a sealed container.

NOTE 1—Warning: Natural gas is a highly flammable substance and poses an asphyxiation hazard. Always perform measurements in a well-ventilated location in the absence of flames or spark sources. CNG and LNG containers can pose an explosion hazard if not handled properly. CNG is stored at high pressures and can pose both an explosion and freezing hazard because of a sudden release of gas. LNG is a cryogenic liquid and can pose a freezing hazard and an explosion hazard as result of liquid vaporization.

5. Detailed Chemical Composition, and Other Requirements

5.1 Natural gas used as a fuel for internal combustion engines in motor vehicles fuel shall conform to the detailed requirements of **Table 1**.

5.2 The criteria contained within this specification were primarily constructed from data collected from North American natural gas distribution systems and engine and vehicle manufacturers. As the data ensemble increases, this specification may be revised based upon the additional data.

6. Workmanship

6.1 The gaseous fuel shall be free of any adulterants or contaminants that can render the fuel unacceptable for its intended use in an internal combustion engine.

7. Test Methods

7.1 Requirements satisfying this specification shall be determined in accordance with the methods listed below.

7.2 *Composition*—Test Method **D7833** or **D1945**. Test Method **D7833** is preferred. All composition values shall be calculated in % by Volume. The volume composition of the gaseous fuel shall be determined for component amount of 0.1 % or more.

7.3 *Calculated Methane Number MNC*—Practice **D8221**. The MNC is determined from the composition of the fuel.

