



Standard Test Methods for Relative Density of Gaseous Fuels¹

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1. Scope

1.1 These test methods cover the determination of relative density of gaseous fuels, including liquefied petroleum gases, in the gaseous state at normal temperatures and pressures. The test methods specified are sufficiently varied in nature so that one or more may be used for laboratory, control, reference, gas measurement, or in fact, for any purpose in which it is desired to know the relative density of gas or gases as compared to the density of dry air at the same temperature and pressure.

1.2 The procedures appear in the following sections:

	Section
Method A, Ac-Me Gravity Balance	7-9
Method B, Ranarex Recording and Indicating Gravimeter	10-11
Method C, UGC Gravimeter	12-14

NOTE 1—The test methods and apparatus described herein are representative of methods and apparatus used broadly in industry. Manufacturer's instructions for specific models should be consulted for further details and as supplements to the information presented here. In addition to instrumentation described below additional equally accurate and satisfactory instruments may be available.

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:

D 5503 Practice for Natural Gas Sample-Handling and Conditioning Systems for Pipeline Instrumentation²

3. Terminology

3.1 Definitions:

3.1.1 *density*—mass per unit of volume of the fuel gas or air being considered.

3.1.2 *gaseous fuel*—material to be tested, as sampled, without change of composition by drying or otherwise.

3.1.3 *relative density*—ratio of the density of the gaseous fuel, under the observed conditions of temperature and pressure, to the density of dried air, of normal carbon dioxide content, at the same temperature and pressure.

3.1.3.1 *Discussion*—In these test methods the term “relative density” has replaced the term “specific gravity.” The term, specific gravity, as used in a previous edition of these test methods, was used incorrectly.

3.1.4 *relative humidity*—ratio of actual pressure of existing water vapor to maximum possible pressure of water vapor in the atmosphere at the same temperature, expressed as a percentage.

4. Summary of Test Methods

4.1 *Displacement Balances*—This test method is based on the balancing of the weight of a fixed volume of gas at atmospheric pressure against the weight of dry air across the center of gravity of a balance beam. The amount of this “deflection,” subject to correction, for humidity, high CO₂ content or other factor measures the relative density. Instruments of this class may be either visual or chart recording.

4.2 *Kinetic Energy*—This test method measures the ratio of the change in kinetic energy between an impeller and an impulse wheel operating in gas and a second impeller and impulse wheel operating in a reference gas (generally air). The relative torque of the impulse wheels is measured and provides a value for relative density since the relative torque is proportional to the gas and air densities.

5. Significance and Use

5.1 These test methods provide accurate and reliable methods to measure the relative density of gaseous fuels on an intermittent or continuous basis. These measurements are frequently used for regulatory or contract compliance custody transfer and process control.

¹ These test methods are under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D 03.03 on Determination of Heating Value and Relative Density of Gaseous Fuels.

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² *Annual Book of ASTM Standards*, Vol 05.06.