ASTM D4052 - 11

Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

Active Standard ASTM D4052 | Developed by Subcommittee: D02.04.0D

Book of Standards Volume: 05.02

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Significance and Use

Density is a fundamental physical property that can be used in conjunction with other properties to characterize both the light and heavy fractions of petroleum and petroleum products.

Determination of the density or relative density of petroleum and its products is necessary for the conversion of measured volumes to volumes at the standard temperature of 15°C.

1. Scope

1.1 This test method covers the determination of the density, relative density, and API Gravity of petroleum distillates and viscous oils that can be handled in a normal fashion as liquids at the temperature of test, utilizing either manual or automated sample injection equipment. Its application is restricted to liquids with total vapor pressures (see Test Method D5191) typically below 100 kPa and viscosities (see Test Method D445 or D7042) typically below about 15 000 mm^2/s at the temperature of test. The total vapor pressure limitation however can be extended to >100 kPa provided that it is first ascertained that no bubbles form in

the U-shaped, oscillating tube, which can affect the density determination. Some examples of products that may be tested by this procedure include: gasoline and gasoline-oxygenate blends, diesel, jet, basestocks, waxes, and lubricating oils.

1.1.1 Waxes were not included in the 1999 interlaboratory study (ILS) sample set that was used to determine the current precision statements of the method, since all samples evaluated at the time were analyzed at a test temperature of 15°C. Wax samples require a temperature cell operated at elevated temperatures necessary to ensure a liquid test specimen is introduced for analysis. Consult instrument manufacturer instructions for appropriate guidance and precautions when attempting to analyze wax sample types. Refer to the Precision and Bias section of the method and Note 6 for more detailed information about the 1999 ILS that was conducted.

1.2 In cases of dispute, the referee method is the one where samples are introduced manually as in 6.3 or 6.4, as appropriate for sample type.

1.3 This test method should not be applied to samples so dark in color that the absence of air bubbles in the sample cell cannot be established with certainty. For the determination of density in crude oil samples use Test Method D5002.

1.4 The values stated in SI units are regarded as the standard, unless stated otherwise, such as the “torr” units of pressure in Eq 1. The accepted units of measure for density are grams per millilitre (g/mL) or kilograms per cubic metre (kg/m^3).

1.5 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. For specific hazard statements, see 7.4, 7.5, and 10.3.

2. Referenced Documents *(purchase separately)*

ASTM Standards

D287 Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)

D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

D1193 Specification for Reagent Water

D1250 Guide for Use of the Petroleum Measurement Tables

D1298 Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D4377 Test Method for Water in Crude Oils by Potentiometric Karl Fischer Titration

D5002 Test Method for Density and Relative Density of Crude Oils by Digital Density Analyzer

D5191 Test Method for Vapor Pressure of Petroleum Products (Mini Method)

D7042 Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer (and the Calculation of Kinematic Viscosity)

Keywords

Api Gravity - Chemical Analyzers - Density - Density And Relative Density - Digital Density Analyzers - Distillate Fuels - Liquid Fuels - Petroleum Distillates - Petroleum Products - Relative Density

ICS Code

ICS Number Code 17.060 (Measurement of volume, mass, density, viscosity)

UNSPSC Code

UNSPSC Code 41103320(Density measurement instrument)

Referencing This Standard

DOI: 10.1520/D4052-11

Citation Format

ASTM D4052-11, Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter, ASTM International, West Conshohocken, PA, 2011, www.astm.org

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