



Designation: D6378 – 22

Standard Test Method for Determination of Vapor Pressure (VP_x) of Petroleum Products, Hydrocarbons, and Hydrocarbon-Oxygenate Mixtures (Triple Expansion Method)¹

This standard is issued under the fixed designation D6378; 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 covers the use of automated vapor pressure instruments to determine the vapor pressure exerted in vacuum by volatile, liquid petroleum products, hydrocarbons, and hydrocarbon-oxygenate mixtures including ethanol blends up to 85 % (volume fraction). This test method is suitable for testing samples with boiling points above 0 °C (32 °F) that exert a vapor pressure between 7 kPa and 150 kPa (1.0 psi and 21 psi) at 37.8 °C (100 °F) at a vapor-to-liquid ratio of 4:1. The liquid sample volume size required for analysis is dependent upon the vapor-to-liquid ratio chosen (see [Note 1](#)) and the measuring chamber volume capacity of the instrument (see [6.1.1](#) and [Note 5](#)).

NOTE 1—The test method is suitable for the determination of the vapor pressure of volatile, liquid petroleum products at temperatures from 0 °C to 100 °C at vapor to liquid ratios of 4:1 to 1:1 ($X = 4$ to 1) and pressures up to 500 kPa (70 psi), but the precision statement (see [Section 16](#)) may not be applicable.

NOTE 2—The precision (see [Section 16](#)) using 1 L containers was determined in a 2003 interlaboratory study (ILS);² the precision using 250 mL containers was determined in a 2016 ILS.³

1.2 This test method also covers the use of automated vapor pressure instruments to determine the vapor pressure exerted in vacuum by aviation turbine fuels. This test method is suitable for testing aviation turbine fuel samples with boiling points above 0 °C (32 °F) that exert a vapor pressure between 0 kPa and 110 kPa (0 psi and 15.5 psi) at a vapor-to-liquid ratio of 4:1, in the temperature range from 25 °C to 100 °C (77 °F to 212 °F).

NOTE 3—The precision (see [Section 16](#)) for aviation turbine fuels using

100 mL containers was determined in a 2007 ILS.⁴

1.3 The vapor pressure (VP_x) determined by this test method at a vapor-liquid ratio of 4:1 ($X = 4$) of gasoline and gasoline-oxygenate blends at 37.8 °C can be correlated to the dry vapor pressure equivalent (DVPE) value determined by Test Method [D5191](#) (see [16.3](#)). This condition does not apply when the sample is aviation turbine fuel.

1.4 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.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For specific warning statements, see [7.2 – 7.8](#).

1.6 *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:⁵

[D323 Test Method for Vapor Pressure of Petroleum Products \(Reid Method\)](#)

[D2892 Test Method for Distillation of Crude Petroleum \(15-Theoretical Plate Column\)](#)

[D4057 Practice for Manual Sampling of Petroleum and Petroleum Products](#)

[D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products](#)

¹ This test method is under the jurisdiction of ASTM Committee [D02](#) on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee [D02.08](#) on Volatility.

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² Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1619. Contact ASTM Customer Service at service@astm.org.

³ Research Report IP 394 (EN 130161) and IP 619 (EN 130163) 2016, available from the Energy Institute, 61 New Cavendish Street, London W1G 7AR, UK, email: ILS@energyinst.org.

⁴ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1651. Contact ASTM Customer Service at service@astm.org.

⁵ 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.

*A Summary of Changes section appears at the end of this standard