



Designation: ~~D322 – 97 (Reapproved 2012)~~ **D322 – 97 (Reapproved 2012)^{ε1}**



Designation: ~~23/2000~~

Standard Test Method for Gasoline Diluent in Used Gasoline Engine Oils by Distillation¹

This standard is issued under the fixed designation D322; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

^{ε1} NOTE—The IP logo and designation were removed editorially in September 2016.

1. Scope

1.1 This test method covers determination of the amount of dilution in crankcase oils of engines when gasoline has been used as the fuel.

NOTE 1—There may be cases in dispute, therefore, the user of this test method is advised to establish whether this method will be accepted. There may be cases where Test Method **D3525** results will be set as the referee value.

1.2 The values stated in acceptable SI units are to be regarded as the standard.

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.* For specific precautionary statement, see **6.4**, **7.1**, and **9.3**.

2. Referenced Documents

2.1 *ASTM Standards:*²

D235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

D3525 Test Method for Gasoline Diluent in Used Gasoline Engine Oils by Gas Chromatography

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

2.2 *IP Methods for Analyses and Testing, Vol II, Part I*³

3. Terminology

3.1 *Definitions:*

3.1.1 *fuel diluent, n*—in used oil analysis, unburnt fuel components that enter the engine crankcase causing dilution of the oil.

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 **D02.06** on Analysis of Liquid Fuels and Lubricants.

—This test method was adopted as a joint ASTM-IP standard in 1964. In the IP, this method is under the jurisdiction of the Standardization Committee.

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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.

³ Available from Energy Institute, 61 New Cavendish St., London, WIG 7AR, U.K., <http://www.energyinst.org.uk>.

3.1.1.1 *Discussion*—

In this test method, the fuel diluent components being determined are from gasoline.

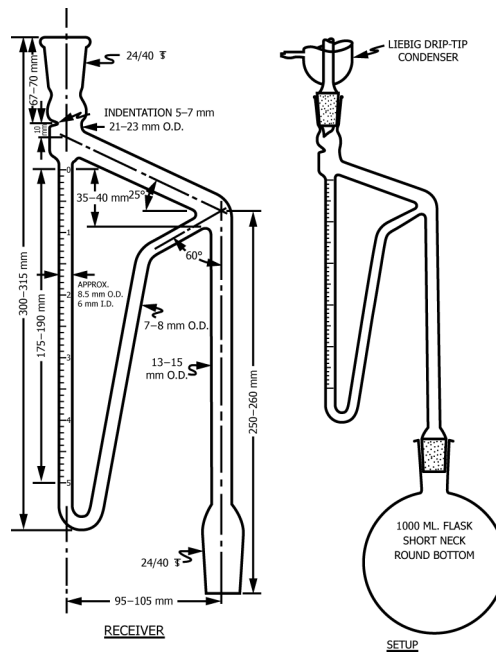


FIG. 1 Apparatus for Determining Diluent in Gasoline Engine Crankcase Oil

3.1.2 *used oil, n*—any oil that has been in a piece of equipment (for example, an engine, gearbox, transformer, or turbine) whether operated or not. D4175

3.1.2.1 *Discussion*—

In this test method, used oil is from a gasoline engine.

4. Summary of Test Method

4.1 The sample, mixed with water, is placed in a glass still provided with a reflux condenser discharging into a graduated trap connected to the still. Heat is applied, and the contents of the still are brought to boiling. The diluent in the sample is vaporized with the water and then liquefied in the condenser. The diluent collects at the top of the trap, and the excess water runs back to the still where it is again vaporized, carrying over an additional quantity of diluent. The boiling is continued until all the diluent has been boiled out and recovered in the trap. The volume is recorded.

5. Significance and Use

5.1 Some fuel dilution of the engine oil may take place during normal operation. However, excessive fuel dilution is of concern in terms of possible performance problems.

6. Apparatus

6.1 *Flask*, round-bottom type (see Fig. 1 and A1.1).

6.2 *Condenser*, Liebig straight-tube type (see A1.2).

6.3 *Trap*, 5 mL, graduated in 0.1 mL increments (see Fig. 1 and Fig. 2 and A1.3).

6.4 *Heater*—Any suitable gas burner or electric heater may be used with the glass flask. (Warning—Hot exposed surface. Avoid contact by wearing protective equipment as required.)

7. Reagents and Materials

7.1 *Ethanol, Denatured*, conforming to either Formula No. 30 or 3A of the US Bureau of Internal Revenue. (Warning—Flammable. Denatured. Cannot be made non-toxic.)

7.2 *Mineral Spirits (Petroleum Spirits)*, conforming to Specification D235.

NOTE 2—In Annex A1.3, the use of reagent grade heptane may be the preferred solvent because the use of commercial grade heptane or mineral spirits can cause complications of container disposal that may not be required for the disposal of the containers for reagent grade heptane.

8. Sampling

8.1 Obtain a representative sample using either Practices D4057 or D4177.