



Designation: D7593 – 22

Standard Test Method for Determination of Fuel Dilution for In-Service Engine Oils by Gas Chromatography¹

This standard is issued under the fixed designation D7593; 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 determination of fuel dilution for in-service engine oil by gas chromatography.

1.2 Analysis can be performed directly by this test method without pretreatment or dilution of the sample.

1.3 There is no limitation for the determination of the dilution range, provided the amount of sample is within the linear range of the gas chromatograph detector. However, sample dilution can add potential error to the result and may affect the precision obtained as compared to the values presented in Section 14, which were obtained with no dilution.

1.4 This test method covers a quantitation range up to 10 % (m/m) for diesel and biodiesel, and up to 5 % (m/m) for gasoline.

1.5 The values stated in SI units are to be regarded as standard. Where non-SI units are provided, they are shown in parentheses.

1.6 *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.*

1.7 *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

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 D02.96.02 on Chemistry for the Evaluation of In-Service Lubricants.

Current edition approved Dec. 1, 2022. Published January 2023. Originally approved in 2013. Last previous edition approved in 2014 as D7593 – 14. DOI: 10.1520/D7593-22.

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.

D86 Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure
D3524 Test Method for Diesel Fuel Diluent in Used Diesel Engine Oils by Gas Chromatography
D3525 Test Method for Gasoline Fuel Dilution in Used Gasoline Engine Oils by Wide-Bore Capillary Gas Chromatography
D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants
E355 Practice for Gas Chromatography Terms and Relationships
E594 Practice for Testing Flame Ionization Detectors Used in Gas or Supercritical Fluid Chromatography
E1510 Practice for Installing Fused Silica Open Tubular Capillary Columns in Gas Chromatographs

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

3.1.2 This test method makes reference to common gas chromatographic procedures, terms, and relationships. Detailed definitions of these can be found in Practices E355 and E594.

3.1.3 *fuel diluent, n—in service oil analysis*, is the unburned fuel components that enter the engine crankcase causing dilution of the oil.

3.1.4 *fuel dilution, n*—the amount, expressed as a percentage, of engine fuel found in the in-service lubricating oil.

3.1.5 *in-service oil, n*—lubricating oil that is present in a machine that has been at operating temperature for at least one hour.

3.1.6 *Marker Peak (MP), n*—a marker peak is a chromatographic peak used to differentiate sections of a chromatogram by retention time.

3.1.6.1 *Discussion*—For example, components that elute before this marker peak may be considered “fuel,” while components that elute after this marker peak would be considered “oil.” This marker peak retention time could also serve as the timing for physical changes in the chromatographic system, such as the time to initiate a valve change or a back-flush.

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