



Designation: D8004 – 23

Standard Test Method for Fuel Dilution of In-Service Lubricants Using Surface Acoustic Wave Sensing¹

This standard is issued under the fixed designation D8004; 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 describes a means for determining the amount of fuel dilution present in an in-service lubricant. This is achieved by drawing into a surface acoustic wave (SAW) sensor vapor from the lubricant. Fuel vapor will be absorbed by the SAW sensor's polymer coating. The amount of absorbance is then related to fuel content in the lubricant.

1.2 The range of fuel dilution capable of being measured by the test method is from 0.1 % to 10.0 % by mass fuel dilution.

1.3 This test method is specifically tailored to determining the fuel dilution of in-service lubricants, including newly utilized lubricants. The method is applicable to contamination with diesel, gasoline, and jet fuels.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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. See Section 9.*

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:²

[E456 Terminology Relating to Quality and Statistics](#)

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.

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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.

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

[D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants](#)

[D6708 Practice for Statistical Assessment and Improvement of Expected Agreement Between Two Test Methods that Purport to Measure the Same Property of a Material](#)

[D7235 Guide for Establishing a Linear Correlation Relationship Between Analyzer and Primary Test Method Results Using Relevant ASTM Standard Practices](#)

[D7593 Test Method for Determination of Fuel Dilution for In-Service Engine Oils by Gas Chromatography](#)

[D7669 Guide for Practical Lubricant Condition Data Trend Analysis](#)

[D7720 Guide for Statistically Evaluating Measurand Alarm Limits when Using Oil Analysis to Monitor Equipment and Oil for Fitness and Contamination](#)

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology [D4175](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *fuel dilution sample holder, n*—a bottle that contains the lubricant to be analyzed.

3.2.2 *fuel dilution sample inlet, n*—a tube that connects the sample to the SAW sensor.

3.2.3 *fuel dilution sample stand, n*—mechanical device for holding the bottle of lubricant in the SAW fuel dilution apparatus in a way such that the headspace from the bottle is directly fed into the SAW element.

3.2.4 *fuel dilution seal, n*—a mechanism that seals the fuel dilution sample holder to the vapor path leading to the SAW sensor.

3.2.5 *SAW fuel dilution apparatus, n*—a device that measures fuel dilution using surface acoustic wave (SAW) technology. This is achieved by drawing vapor from the lubricant into a surface acoustic wave (SAW) sensor. The fuel dilution apparatus measures the concentration of contaminating fuel vapor present in the air “headspace” over the lubricant. The fuel dilution apparatus assumes that this headspace fuel vapor concentration is directly proportional to the fuel present in the

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