



Designation: D7686 – 23

Standard Test Method for Field-Based Condition Monitoring of Soot in In-Service Lubricants Using a Fixed-Filter Infrared (IR) Instrument¹

This standard is issued under the fixed designation D7686; 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 pertains to field-based monitoring of soot in diesel crankcase engine oils as well as in other types of engine oils where soot may contaminate the lubricant as a result of a blow-by due to incomplete combustion of fuels. It is applicable to oils having soot levels of up to 12 % by mass.

1.2 This test method uses filter-based infrared technology for monitoring of soot build-up in in-service petroleum and hydrocarbon-based lubricants as a result of normal machinery operation. Soot levels in engine oils rise as soot particles contaminate the oil as a result of exhaust gas recirculation from blow-by. This test method is designed as a fast, simple, and field-capable spectroscopic check for soot in in-service hydrocarbon-based lubricants with the objective of helping diagnose the operational condition of the machine based on measuring the level of soot in the oil.

1.3 This test method is intended as a field test only, and should be treated as such. Critical applications should use laboratory based methods, such as Thermal Gravimetric Analysis (TGA) described in Test Method [D5967](#), Annex A4.

1.4 Acquisition of spectral data for measuring soot in in-service oil and lubricant samples with the use of a fixed-filter IR instrument is described in this test method. Calibration against prepared soot standards is also described.

NOTE 1—It is not the intent of this test method to establish or recommend normal, cautionary, warning, or alert limits for any machinery. Such limits should be established in conjunction with advice and guidance from the machinery manufacturer and maintenance group.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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 appro-*

priate 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

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

[D5967](#) Test Method for Evaluation of Diesel Engine Oils in T-8 Diesel Engine

[D6299](#) Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

[D7418](#) Practice for Set-Up and Operation of Fourier Transform Infrared (FT-IR) Spectrometers for In-Service Oil Condition Monitoring

[E131](#) Terminology Relating to Molecular Spectroscopy

[E177](#) Practice for Use of the Terms Precision and Bias in ASTM Test Methods

[E691](#) Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

[E2412](#) Practice for Condition Monitoring of In-Service Lubricants by Trend Analysis Using Fourier Transform Infrared (FT-IR) Spectrometry

3. Terminology

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

3.2 *Definitions*—For definitions of terms relating to infrared spectroscopy used in this test method, refer to Terminology [E131](#).

3.3 *Definitions*—For definition of terms related to in-service oil condition monitoring, refer to Practice [D7418](#).

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 [D02.96.03](#) on FTIR Testing Practices and Techniques Related to 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.

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