



Designation: D7546 – 09

# Standard Test Method for Determination of Moisture in New and In-Service Lubricating Oils and Additives by Relative Humidity Sensor<sup>1</sup>

This standard is issued under the fixed designation D7546; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method covers the quantitative determination of water in new and in-service lubricating oils and additives in the range of 10 to 100 000 mg/kg (0.001 to 10% wt./wt.) using a relative humidity (RH) sensor. Methanol, acetonitrile, and other compounds are known to interfere with this test method.

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

1.3 **Warning**—Samples tested in this test method can be flammable, explosive, and toxic. Use caution when handling them before and after testing.

1.4 *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.*

## 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

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

## 3. Terminology

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

## 4. Summary of Test Method

4.1 An aliquot of sample is injected onto a heated stainless steel coil. The temperature of the coil is programmable in 1°C

increments from 25°C to 200°C. The coil is maintained at a constant temperature for the duration of the test. As the sample travels down the coil, an opposing dry inert gas carries the thermally evolved moisture past a relative humidity sensor. The sensor signal is integrated over time to provide a measurement of total mass of water in the sample.

4.2 The sample injection may be done either by mass or by volume.

4.3 This test method utilizes anhydrous compressed gas or ambient air passed through a desiccant to prevent contamination from moisture present in the atmosphere.

4.4 Viscous samples can be analyzed by preheating them to place them in a more fluid state allowing them to be drawn into a syringe, or by dissolving them in a compatible anhydrous solvent. Care should be taken to minimize time spent preheating samples to prevent moisture loss.

## 5. Significance and Use

5.1 Knowledge of the water content of lubricating oils, additives, and similar products is important in the manufacture, purchase, sale, transfer, or use of such petroleum products to help in predicting their quality and performance characteristics.

5.2 For lubricating oils, the presence of water can lead to premature corrosion and wear, an increase in the debris load resulting in diminished lubrication and premature plugging of filters, impedance to the effect of additives, and undesirable support of deleterious bacterial growth.

## 6. Interferences

6.1 Methanol and acetonitrile are known to interfere with the determination of moisture by this test method. These substances contribute to a high bias in the final results. More generally, some short-chained polar molecules mimic the effect of water at the RH sensor resulting in a positive interference. Strong polar solvents, such as n-methyl-pyrrolidone, can severely damage the RH sensor.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products 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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<sup>2</sup> 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.