



Designation: D8383 – 21

Standard Test Method for Methyl Hydrogen Content of Hydrocarbon Oils by High Resolution Nuclear Magnetic Resonance Spectroscopy¹

This standard is issued under the fixed designation D8383; 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 the total methyl hydrogen content of unadditized base stock (lubricating oils) hydrocarbon oils that are completely soluble in chloroform at ambient temperature using high-resolution nuclear magnetic resonance (NMR) spectrometers.

1.2 The reported units are mol percent methyl hydrogen atoms. For pulse Fourier transform (FT) spectrometers, the detection limit is typically 0.1 % mol hydrogen atoms. The interim precision is applicable in the range 20.5 % to 38.7 % mol methyl hydrogen.

1.3 This method is applicable to samples containing <0.1 % mol olefinic hydrogens.

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.* Specific precautionary statements are given in 7.2 and 7.3.

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

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

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 D02.04.0F on Absorption Spectroscopic Methods.

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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.

D5292 Test Method for Aromatic Carbon Contents of Hydrocarbon Oils by High Resolution Nuclear Magnetic Resonance Spectroscopy (Withdrawn 2018)³

D6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

D6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products, Liquid Fuels, and Lubricants

E386 Practice for Data Presentation Relating to High-Resolution Nuclear Magnetic Resonance (NMR) Spectroscopy (Withdrawn 2015)³

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *methyl hydrogen, n*—H-NMR signal in the spectral region of 0.1 ppm to the valley at approximately 1 ppm as a percentage of total hydrogens.

3.1.1.1 *Discussion*—NMR spectrometers meeting vendor specifications for signal to noise ratio and resolution are acceptable as defined in 6.1.

3.2 Definitions of chemical shift (reported in parts per million (ppm)), internal reference, spectral width, and other NMR terminology used in this test method can be found in Practice E386 or any suitable vendor recommended method to convert to ppm.

3.3 Chloroform-d refers to chloroform solvent in which hydrogen is replaced by deuterium, the heavier isotope of hydrogen. Chloroform-d is available from a variety of chemical and isotope suppliers (Test Method D5292).

4. Summary of Test Method

4.1 Hydrogen (¹H) nuclear magnetic resonance (NMR) spectra are obtained on solutions of the sample in chloroform-d, using a pulse FT high-resolution NMR spectrometer. Tetramethylsilane is preferred as an internal reference in these solvents for assigning the 0.0 parts per million (ppm) chemical shift position in the ¹H spectra.

³ The last approved version of this historical standard is referenced on www.astm.org.