



Designation: D1018 – 11 (Reapproved 2016)

## Standard Test Method for Hydrogen In Petroleum Fractions<sup>1</sup>

This standard is issued under the fixed designation D1018; 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.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

### 1. Scope

1.1 This test method covers the determination of hydrogen in petroleum fractions that can be burned completely without smoking in a wick lamp.

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 *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>

[D1266 Test Method for Sulfur in Petroleum Products \(Lamp Method\)](#)

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

[D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products](#)

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

### 3. Summary of Test Method

3.1 The test specimen is burned from a cotton wick in an atmosphere of purified air. The water formed is collected from the combustion gases by a desiccant and weighed.

<sup>1</sup> 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 D02.03 on Elemental Analysis.

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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.

### 4. Significance and Use

4.1 Knowledge of the hydrogen content of petroleum products, particularly fuels, can be helpful in assessing performance characteristics.

4.2 This test method is suitable for most laboratory applications requiring the determination of hydrogen in liquid petroleum lubricants and products.

### 5. Apparatus

5.1 *Lamp*—A lamp (see [Note 1](#)) consisting of a 25 mL Erlenmeyer flask, a burner, and a burner cap conforming to the dimensions shown in [Fig. 1](#). The burner consists of two concentric glass tubes, the external one having an arm, provided with standard-taper glass joints for connection with the flask, chimney, and burner cap. The burner has a small opening near its base to allow equalization of the pressure between the chimney and flask.

*NOTE 1*—The lamp and burner are constructed in accordance with Appendix A3 of Test Method [D1266](#).

5.2 *Chimney*—A chimney (see [Note 2](#)) conforming to the dimensions shown in [Fig. 1](#).

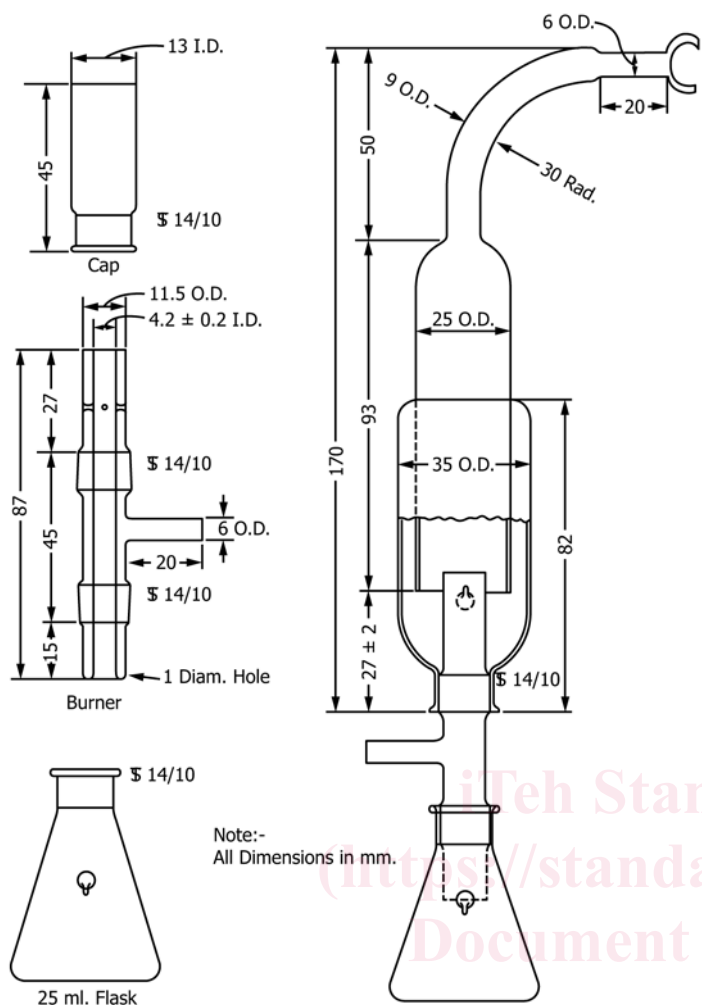
*NOTE 2*—The chimney is constructed in accordance with Appendix A3 of Test Method [D1266](#), except that the delivery tube is cut off and a short length of glass tubing is sealed on at right angles to the chimney. The secondary air inlet is not used and is sealed off.

5.3 *Absorbers*—Two absorption bulbs (see [Note 3](#)) suitable for collecting and weighing the water formed during combustion of the sample. The bulbs shall be filled in the following manner: a 1 cm to 2 cm layer of glass wool, a 5 cm layer of 6 mesh to 10 mesh cp anhydrous calcium chloride, a 1 cm layer of glass wool, a 2 cm layer of phosphorus pentoxide, and glass wool to the top of the absorbers. One filling is sufficient for approximately 10 g of water.

*NOTE 3*—Turner-type absorption bulbs are satisfactory for this test method.

5.4 *Cotton Wicking*—Clean, unused, uniform, two-strand twisted cotton wicking of good quality, weighing 0.5 g/m to 0.6 g/m per strand.

5.5 *Air Purifying System*—The compressed air (**Warning**—Compressed gas under higher pressure) for the combustion



Note:-  
All Dimensions in mm.

FIG. 1 Lamp and Chimney

shall be purified by passage through a scrubber containing sulfuric acid (relative density 1.84), a surge chamber packed with glass wool, and a drying tower filled with 10 mesh to 20 mesh anhydrous calcium sulfate<sup>3</sup> and phosphorus pentoxide in that order. A length of rubber tubing suitable for connection to the inlet tube of the burner shall be connected to the exit of the tower.

5.6 *Drying Tube*—A small U-tube containing anhydrous calcium sulfate.<sup>3</sup>

5.7 *Ice-Water Bath*, large enough to hold the two absorbers in tandem, immersed to a depth of approximately 5 cm.

<sup>3</sup> The sole source of supply of the apparatus known to the committee at this time is Drierite, available from Fisher Scientific, 711 Forbes Avenue, Pittsburgh, PA 15219. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee<sup>1</sup>, which you may attend.

## 6. Reagents and Materials

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society where such specifications are available.<sup>4</sup> Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 Calcium chloride (CaCl<sub>2</sub>).

6.3 Calcium sulfate, anhydrous (CaSO<sub>4</sub>).

6.4 Phosphorous pentoxide (P<sub>2</sub>O<sub>5</sub>).

6.5 Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>), relative density 1.84.

6.6 *Quality Control (QC) Samples*, preferably, portions of one or more liquid petroleum materials that are stable and representative of the samples of interest. These QC samples can be used to check the validity of the testing process, as described in Section 10.

## 7. Sampling

7.1 Obtain samples in accordance with the instructions in Practices D4057 or D4177. Ensure that test specimens are representative of the test unit. Vigorous stirring or shaking may be necessary.

## 8. Procedure

8.1 Connect the charged absorbers to each other and to the chimney delivery tube as shown in the complete assembly of the apparatus in Fig. 2. Attach the U-tube containing anhydrous calcium sulfate<sup>3</sup> to the exit end of the second absorber to eliminate diffusion of water vapor back into the system. Immerse the lower half of the absorbers into the ice-water bath, connect the air flow system to the chimney, and purge the system with air for 15 min (**Warning**—see 5.5.) At the end of the purging period, turn off the air flow, close the absorbers, and remove them from the train. Allow the absorbers to reach room temperature, gently wipe each with a lint-free dry cloth, and place them beside the balance case for 30 min or more. Open the absorbers for a moment to equalize the pressure, close, and weigh to the nearest 1 mg.

8.2 While the absorbers are standing, the lamp may be prepared. Thread the burner with the proper number of wick strands (see Note 4) by drawing the strand through the burner tube with a small metal hook. Trim the wick as closely as possible to the top of the burner, and draw the trimmed wick down until it is flush with or slightly below the top of the burner. Pipet approximately 5 mL of test specimen into the burner flask, and insert the prepared burner into the flask. Cap the burner with its glass cap, and close the burner air inlet with

<sup>4</sup> *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.