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Designation: D 3117 – 96ε1

An American National Standard

Standard Test Method for Wax Appearance Point of Distillate Fuels[1]

This standard is issued under the fixed designation D 3117; 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.

ε[1] NOTE— Figure was corrected editorially in October 1997.

1. Scope

1.1 This test method covers the detection of wax in burner fuels, diesel fuels, and turbine engine fuels in the range from − 26 to + 2°C. It is applicable to a dark-colored oil if the stirrer can be seen under illumination.

1.2 *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.* For specific hazard statements, see Notes 2 through 5.

2. Referenced Documents

2.1 *ASTM Standards:*
D 2386 Test Method for Freezing Point of Aviation Fuels[2]
D 2500 Test Method for Cloud Point of Petroleum Oils[2]
E 1 Specification for ASTM Thermometers[3]

3. Terminology

3.1 *Definition of Term Specific to This Standard:*

3.1.1 *wax appearance point*—the temperature at which wax first begins to separate from the liquid when it is cooled under prescribed conditions.

4. Summary of Test Method

4.1 A specimen of distillate fuel is cooled under prescribed conditions while being stirred. The temperature at which wax first appears is recorded as the wax appearance point.

5. Significance and Use

5.1 Wax appearance point is the temperature at which wax crystals begin to precipitate out of a fuel under specified cooling conditions. The presence of wax crystals in the fuel may restrict flow or plug the fuel filter. In critical fuel systems, wax appearance point may define the lower limit of acceptable operability.

6. Apparatus (Fig. 1)

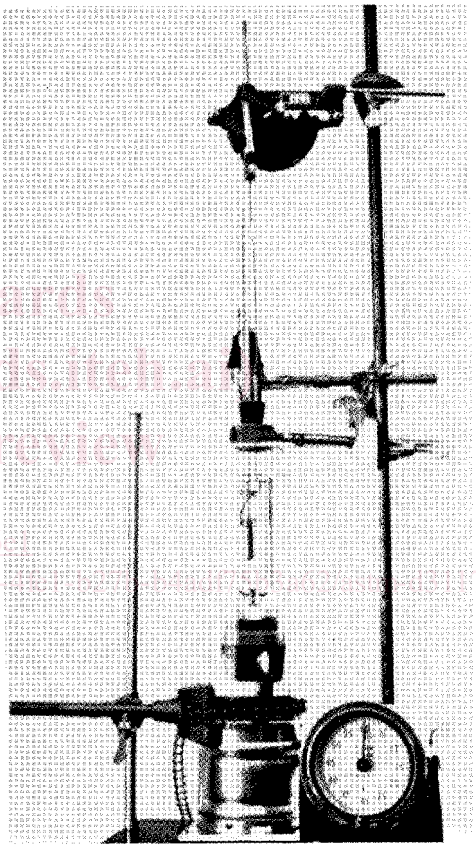

FIG. 1 Complete Assembly

6.1 *Specimen Tube*—A double-walled (Dewar-type) jacketed tube with dimensions shown in Fig. 2.

6.2 *Thermometer*—Conforming to specifications for ASTM Thermometer 62C in accordance with Specification E 1.

6.3 *Stirrer Assembly*—A stainless steel wire configured in the manner described in Fig. 3 and manipulated by a motor or other suitable device in a vertical direction. The frequency of movement shall be 55 ± 5 cycles/min with an amplitude of 50± 5 mm. The stirrer shall be concentric with the thermometer and shall be fitted with the moisture proof collar specified

[1] This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricantsand is the direct responsibility of Subcommittee D02.07 on Flow Properties.

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[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] *Annual Book of ASTM Standards*, Vol 14.03.

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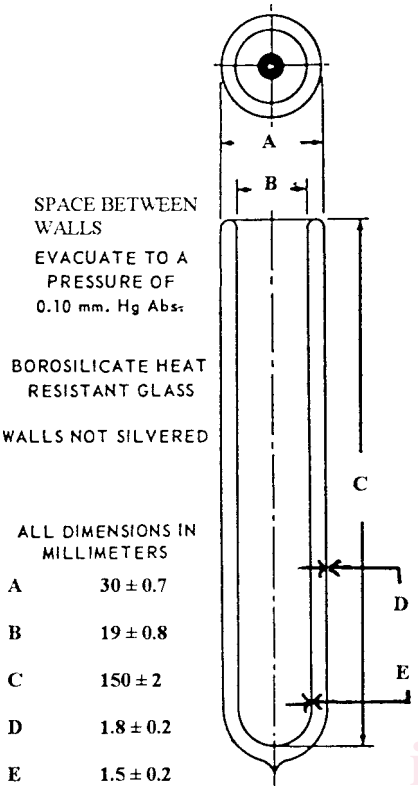
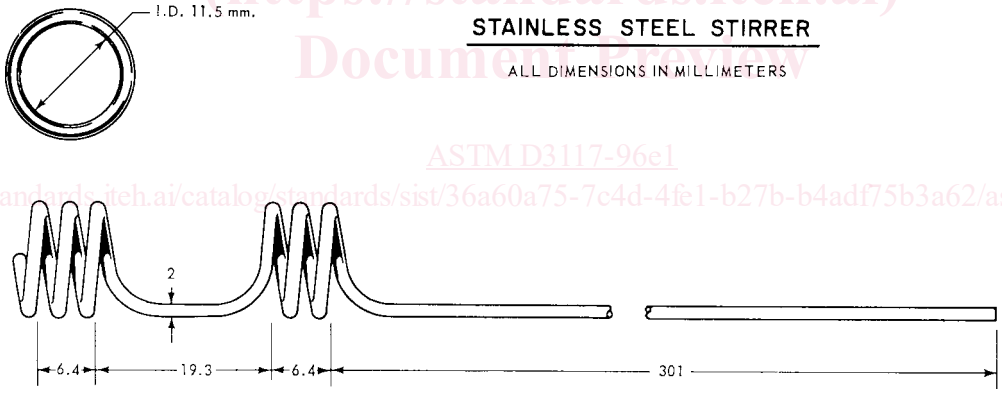


FIG. 2 Specimen Tube



NOTE 1—Tolerance on all dimensions are + or − 2 mm, except on wire thickness.

FIG. 3 Stirrer

in Test Method D 2386. A No. 3, two-hole neoprene rubber stopper shall be used to seal the top of the specimen tube.

6.4 *Cooling Bath*—Use an unsilvered vacuum flask having minimum dimensions of 200-mm depth and 65-mm internal diameter. The bath temperature, below − 45°C, may be maintained by refrigeration or suitable freezing mixtures (Note 2). Bath temperature is monitored with an appropriate thermometer such as ASTM Thermometer 6C/IP2C

NOTE 1—Solid carbon dioxide chips (dry ice) and isopropanol is a recommended mixture for coolant. An excess of dry ice should be avoided to prevent obscuring the sample tube in a continuous stream of bubbles. Isopropanol should be replaced daily or when low temperature viscosity is noticeably higher than a fresh bath. Liquid nitrogen may also be used as coolant instead of liquids cooled with solid carbon dioxide.

6.5 *Illumination*—A 150 to 230-mm long, 5 to 8-W fluorescent tube shall be mounted behind the specimen to illuminate it with transmitted light. Observations shall be made with the sample tube between the observer's eye and the lamp.

6.6 *Clock*—Use a clock or other timing device readable to 10 s to monitor the cooling rate.

7. Materials

7.1 *Carbon Dioxide (Solid) or Dry Ice* —(**Warning**—see Note 2). A commercial grade of dry ice is suitable for use in the cooling bath (Note 6).

NOTE 2—**Warning:** Extremely cold, − 78°C.

7.2 *Isopropanol or Isopropyl Alcohol*—(**Warning**—see Note 3). A commercial or technical grade of isopropanol is suitable for the cooling bath.

NOTE 3—**Warning:** Extremely flammable.

7.3 Liquid Nitrogen (**Warning**—see Note 4). A commercial or technical grade of liquid nitrogen is suitable for the cooling bath. See Note 6.

NOTE 4—**Warning:** Extremely cold, − 196°C.

NOTE 5—**Warning:** Carbon dioxide (solid) and liquid nitrogen liberate gases that can cause suffocation. Contact with skin causes burns, freezing, or both.

8. Procedure

8.1 Check the thermometer each day the test is run by immersing it in an ice-water slurry. An acceptable thermometer will show 0± 0.1°C.

NOTE 6—Because ambient temperatures are well above the range of Thermometer 62C, the mercury thread will extend upward into the expansion chamber. During cooling, the thermometer must be examined to make certain that no mercury separation occurs. If a low reading is obtained in the ice-water slurry, it may be due to separation. Warm the thermometer, tap until the mercury no longer shows any separation, and retest. The thermometer should be stored in a vertical position with the mercury bulb at the bottom.

8.2 Sample temperature shall not be lower than 10°C when starting the measurement. Dry the specimen by filtration through a lintless filter paper.

8.3 Assemble the unit as shown in Fig. 1.

8.4 With the oil at 10°C or above, introduce a 25± 1-mL

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