Standard Test Method for
Cloud Point of Petroleum Products¹

This standard is issued under the fixed designation D 2500; 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.

This test method was adopted as an ASTM-IP Standard.

This standard has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and
Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This test method covers only petroleum products
which are transparent in layers 40 mm in thickness, and with
a cloud point below 49°C.

1.2 This standard does not purport to address all of the
safety problems, if any, associated with its use. It is the
responsibility of the user of this standard to establish appro-
priate safety and health practices and determine the applica-
bility of regulatory limitations prior to use. For specific
hazard statements see Notes 2, 3, 4, and 5.

2. Referenced Documents

2.1 ASTM Standard:
E 1 Specification for ASTM Thermometers²
2.2 IP Standard:
Specifications for IP Standard Thermometers³

3. Terminology

3.1 Description of Term Specific to This Standard:
3.1.1 cloud point—the temperature at which a cloud of
wax crystals first appears in a liquid when it is cooled under
conditions prescribed in this test method.

4. Summary of Test Method

4.1 The sample is cooled at a specified rate and examined
periodically. The temperature at which a cloud is first
observed at the bottom of the test jar is recorded as the cloud
point.

5. Significance and Use

5.1 The cloud point of a petroleum product is an index of
the lowest temperature of its utility for certain applications.

6. Apparatus (See Fig. 1)

6.1 Test Jar, clear, cylindrical glass, flat bottom, 33.2 to
34.8-mm outside diameter and 115 and 125-mm height. The
inside diameter of the jar may range from 30 to 32.4 mm
within the constraint that the wall thickness be no greater
than 1.6 mm. The jar should be marked with a line to
indicate sample height 54 ± 3 mm above the inside bottom.

6.2 Thermometers, having ranges shown below and con-
foming to the requirements as prescribed in Specifications
E 1 or Specifications for IP Standard Thermometers.

<table>
<thead>
<tr>
<th>Thermometer</th>
<th>Temperature Range</th>
<th>ASTM</th>
<th>IP</th>
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<tbody>
<tr>
<td>High cloud and pour</td>
<td>-38 to +50°C</td>
<td>5C</td>
<td>1C</td>
</tr>
<tr>
<td>Low cloud and pour</td>
<td>-80 to +20°C</td>
<td>6C</td>
<td>2C</td>
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6.3 Cork, to fit the test jar, bored centrally for the test
thermometer.

6.4 Jacket, metal or glass, watertight, cylindrical, flat
bottom, about 115 mm in depth, with an inside diameter of
44.2 to 45.8 mm. It must be supported free of excessive
vibration and firmly in a vertical position in the cooling bath.

¹ This test method is under the jurisdiction of ASTM Committee D-2 on
Petroleum Products and Lubricants and is the direct responsibility of Subcom-
mitee D02.07 on Flow Properties.
³ Available from 61 New Cavendish St., London, England WIM 8AR.
of 6.7 so that not more than 25 mm projects out of the cooling medium.

6.5 Disk, cork or felt, 6 mm thick to fit loosely inside the jacket.

6.6 Gasket, ring form, about 5 mm in thickness, to fit snugly around the outside of the test jar and loosely inside the jacket. The gasket may be made of rubber, leather, or another material which is elastic enough to cling to the test jar and hard enough to hold its shape. Its purpose is to prevent the test jar from touching the jacket.

6.7 Bath or baths, maintained at prescribed temperatures with a firm support to hold the jacket vertical. The required bath temperatures may be maintained by refrigeration if available, otherwise by suitable freezing mixtures.

Note 1—The mixtures commonly used for temperatures down to those shown are as follows:

| Ice and water | 10°C |
| Crushed ice and sodium chloride crystals | -12°C |
| Crushed ice and calcium chloride crystals | -28°C |
| Acetone, methyl or ethyl alcohol, or petroleum | -37°C |
| naphtha chilled in a covered metal beaker with an ice-salt mixture to -12°C, then with enough solid carbon dioxide to give the desired temperature |

7. Reagents and Materials

7.1 Acetone—Technical grade acetone is suitable for the cooling bath, provided it does not leave a residue on drying.

Note 2: Warning—Extremely flammable.

7.2 Calcium Chloride—Commercial or technical grade calcium chloride is suitable.

7.3 Carbon Dioxide (Solid) or Dry Ice—A commercial grade of dry ice is suitable for use in the cooling bath.

7.4 Ethanol or Ethyl Alcohol—A commercial or technical grade of dry ethanol is suitable for the cooling bath.

Note 3: Warning—Flammable. Denatured, cannot be made nontoxic.

7.5 Methanol or Methyl Alcohol—A commercial or technical grade of dry methanol is suitable for the cooling bath.

Note 4: Warning—Flammable. Vapor harmful.

7.6 Petroleum Naphtha—A commercial or technical grade of petroleum naphtha is suitable for the cooling bath.


7.7 Sodium Chloride Crystals—Commercial or technical grade sodium chloride is suitable.

7.8 Sodium Sulfate—A reagent grade of anhydrous sodium sulfate should be used when required (see Note 7).

8. Procedure

8.1 Bring the oil to be tested to a temperature at least 14°C above the approximate cloud point. Remove any moisture present by a method such as filtration through dry lintless filter paper until the oil is perfectly clear, but make such filtration at a temperature of at least 14°C above the approximate cloud point.

8.2 Pour the clear oil into the test jar to the level mark.

8.3 Close the test jar tightly by the cork carrying the test thermometer. Use the High Cloud and Pour Thermometer if the expected cloud point is above -36°C and the Low Cloud and Pour Thermometer if the expected cloud point is below -36°C. Adjust the position of the cork and the thermometer so that the cork fits tightly, the thermometer and the jar are coaxial, and the thermometer bulb is resting on the bottom of the jar.

Note 6—Liquid column separation of thermometers occasionally occurs and may escape detection. Thermometers should be checked immediately prior to the test and used only if their ice points are 0 ± 1°C, when the thermometer is immersed to the immersion line in an ice bath, and when the emergent column temperature does not differ significantly from 21°C. Alternatively, immerse the thermometer to a reading and correct for the resultant cooler stem temperature.

8.4 See that the disk, gasket, and the inside of the jacket are clean and dry. Place the disk in the bottom of the jacket. The disk and jacket shall have been placed in the cooling medium a minimum of 10 min before the test jar is inserted. The use of a jacket cover while the empty jacket is cooling is permitted. Place the gasket around the test jar, 25 mm from the bottom. Insert the test jar in the jacket. Never place a jar directly into the cooling medium.

Note 7—Failure to keep the disk, gasket and the inside of the jacket clean and dry may lead to frost formation which may cause erroneous results.

8.5 Maintain the temperature of the cooling bath at -1 to +2°C.

8.6 At each test thermometer reading that is a multiple of 1°C, remove the test jar from the jacket quickly but without disturbing the oil, inspect for cloud, and replace in the jacket. This complete operation shall require not more than 3 s. If the oil does not show a cloud when it has been cooled to 10°C, transfer the test jar to a jacket in a second bath maintained at a temperature of -18 to -15°C (see Table 1). Do not transfer the jacket. If the oil does not show a cloud when it has been cooled to -7°C, transfer the test jar to a jacket in a third bath maintained at a temperature of -35 to -32°C. For the determination of very low cloud points additional baths are required, each bath to be maintained at 1°C below the temperature of the preceding bath (see Table 1). In each case transfer the jar to the next bath when the temperature of the oil comes to 28°C above the low end of the temperature setting of the temperature of the next bath (see Table 1).

8.7 Report the cloud point, to the nearest 1°C, at which any cloud is observed at the bottom of the test jar, which is confirmed by continued cooling.

Note 8—A wax cloud or haze is always noted first at the bottom of the test jar where the temperature is lowest. A slight haze throughout the entire sample, which slowly becomes more apparent as the temperature is lowered, is usually due to traces of water in the oil. Generally this water haze will not interfere with the determination of the wax cloud point. In most cases of interference, filtration through dry lintless filter papers such as described in 8.1 is sufficient.

In the case of diesel fuels, however, if the haze is very dense, a fresh portion of the sample should be dried by shaking 100 mL with 5 g of

<table>
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<th>TABLE 1 Bath and Sample Temperature Ranges</th>
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anhydrous sodium sulfate for at least 5 min and then filtering through
dry lintless filter paper. Given sufficient contact time, this procedure will
remove or sufficiently reduce the water haze so that the wax cloud can
be readily discerned.
Drying and filtering should be done always at a temperature at least
14°C above the approximate cloud point but otherwise not in excess of
49°C.

9. Report
9.1 Report the temperature recorded in 8.7 as the Cloud
Point, Test Method D 2500.

10. Precision and Bias
10.1 The precision of this test method as determined by
statistical examination of interlaboratory results is as follows:
10.2 Repeatability—The difference between two test re-
sults, obtained by the same operator with the same apparatus
under constant operating conditions on identical test mate-
rial, would in the long run, in the normal and correct
operation of this test method exceed 2°C for distillate oils
and 6°C for other oils only in one case in twenty.
10.3 Reproducibility—The difference between two single
and independent results obtained by different operators
working in different laboratories on identical test material,
would in the long run, in the normal and correct operation of
this test method, exceed 4°C for distillate oils and 6°C for
other oils only in one case in twenty.
10.4 Bias—The procedure in this test method has no bias,
because the value of cloud point can be defined only in terms
of a test method.

11. Keywords
11.1 cloud point; petroleum products; wax crystals

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technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your
views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428.