

ICS 75.080



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 3535-2025

**Determination of pour point for petroleum products
(English Translation)**

Issued on: October 5, 2025

Implemented on: May 1, 2026

Issued by: State Administration for Market Regulation

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1 Scope

This Document describes test methods for determining the pour point of petroleum products, as well as test methods for determining the lower (minimum) pour point of fuel oils, heavy lubricating oil base oils, and products containing residual fuel components.

The automatic method described in this Document is applicable to the determination of the pour point of petroleum products with the same cooling procedure as the manual method and a measurement interval of 3 °C. Its precision is suitable for lubricating oils, lubricating oil base oils, and middle distillate oils.

This Document does not apply to the determination of the pour point of crude oil.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 4756 Method for manual sampling of petroleum liquids (GB/T 4756-2015, ISO

3170.2004, MOD)

GB/T 27867 Petroleum liquid - Automatic pipeline sampling (GB/T 27867-2011, ISO

3171.1988, IDT)

3 Terms and Definitions

For the purposes of this Document, the following terms and definitions apply.

3.1 Pour point

The lowest temperature at which a cooled specimen can flow under specified conditions.

3.2 Lower (minimum) pour point

The pour point observed after the sample underwent a specific treatment designed to delay the gelation of wax crystals and the solidification of the specimen.

4 Method Overview

After preheating, the specimen was cooled at a specified rate, and the flowability of the specimen was checked every 3 °C. The lowest temperature at which the specimen could be poured or flowed was recorded as the pour point.

5.1 Manual pour point tester

5.1.1

Test Tube. Made of flat-bottomed, cylindrical transparent glass, with an outer diameter of 33.2 mm to 34.8 mm, a height of 115 mm to 125 mm, an inner diameter of 30.0 mm to 32.4 mm, and a wall thickness not exceeding 1.6 mm. A long graduation mark indicating the volume of the contents (45 mL $\pm$ 1 mL) is marked 54 mm $\pm$ 3 mm from the bottom of the test tube. See

Figure 1.

9 - Cold bath (5.1.7).

Figure 1 -- Manual pour point tester

5.1.2

Temperature measuring device. Meets one of the following requirements.

- a) Contact digital thermometer (DCT), meeting the requirements of A.1 in Appendix A.
- b) Glass liquid thermometer. Partial immersion type, meeting the requirements of A.2.

Because liquid thermometers sometimes experience liquid column separation, which may be missed; the thermometer shall be checked before the test, and its accuracy shall be within ± 1 °C.

5.1.3

Cork. Used for test tube, with a hole in the center for mounting a temperature measuring device.

5.1.4 Sleeve. Made of flat-bottomed, cylindrical metal, leak-proof, washable, with an inner

diameter of 44.2 mm to 45.8 mm, a wall thickness of approximately 1 mm, and a height of 115 mm $\pm$ 3 mm. The sleeve shall remain upright in the cold bath (5.1.7), with the portion protruding above the liquid surface not exceeding 25 mm, and shall be washable.

5.1.5 Disc. Made of cork or felt, approximately 6 mm thick, with a diameter matching the inner diameter of the sleeve. Its size shall allow for easy removal after installation within the sleeve.

5.1.6 Washer. Made of rubber, leather, or other suitable materials. Ring-shaped, approximately

5 mm thick, with a certain degree of elasticity; it shall fit snugly against the outer wall of the test tube while maintaining a loose fit against the inner wall of the sleeve. It shall also possess sufficient rigidity to maintain its shape.

NOTE: The purpose of the ring-shaped washer is to prevent direct contact between the test tube and the sleeve.

5.1.7 Cold bath. Capable of holding the sleeve firmly in a vertical position at a specified temperature. The bath temperature can be obtained through refrigeration or a suitable mixture of refrigerants. Appendix B lists commonly used mixtures of refrigerants.

5.1.8 Timer. The maximum error for a 30-second measurement shall not exceed 0.2 s.

5.2 Automatic pour point tester

5.2.1

Automatic pour point tester. Consists of a computer control system, cooling system, monitor, sensor, and a robotic arm (optional) for lifting and tilting the pour point tube, etc.

Thereof, the computer control system shall be able to control one or more independent testing units; the monitor shall be able to continuously monitor the specimen temperature; and the sensor shall be able to measure slight movements of the specimen during tilting.

5.2.2

Pour point tube. A transparent cylindrical glass tube with a flat bottom, an outer diameter of approximately 32 mm, and a height of approximately 120 mm. It shall have a graduation mark indicating the height of approximately 45 mL of specimen.

NOTE: The outer diameter and height of the pour point tube may vary slightly between different manufacturers and must be matched with an automatic pour point tester.

5.2.3

Pour point tube sleeve. A cylindrical metal product with a flat bottom, an inner diameter of approximately 45 mm, and a height of approximately 115 mm.

NOTE: The inner diameter and height of the pour point tube sleeve may vary slightly between different manufacturers and must be matched with an automatic pour point tester.

5.2.4

Temperature probe. Capable of measuring within the range of -80 °C to 70 °C, with a resolution of 0.1 °C. The temperature probe shall be inside the pour point tube being tested; and the top of the temperature sensing area shall be immersed below the specimen surface.

5.2.5

Cooling system. An internal cooling system or an external cooling system equipped with a circulating pump; capable of maintaining the bath temperature to meet the requirements of Table 1.

6 Sampling

Unless otherwise specified, sampling shall be carried out in accordance with the provisions of

GB/T 4756 or GB/T 27867.

7.1 Manual method

7.1.1

Pour the specimen into the test tube (5.1.1) up to the graduation mark. If necessary, the sample may be heated to flowability in a water bath before being poured into the test tube. If it is known that the specimen has been heated to above 45 °C within 24 h before the start of the test, or if its heating history is unknown, it must stand at room temperature for 24 h before the test can be conducted.

7.1.2

Stopper the test tube with a cork fitted with a high cloud point and high pour point thermometer (see A.2) or a contact digital thermometer with a nominal temperature range of high pour point (see A.1). If the expected pour point of the specimen is above 36 °C, use a melting point temperature measuring device (5.1.2), such as the GB-35 glass liquid thermometer (see A.2) specified in GB/T 514-2005 or a contact digital thermometer with a nominal temperature range of melting point (see A.1). Adjust the position of the cork and