ICS 75.020
CCS E 12

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 28910-2026

Replacing GB/T 28910-2012

Measurement methods for the rheological properties of crude oil

原油流变性测定方法

Issued on: March 31, 2026 **Implemented on: July 1, 2026**

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

1 Scope

GB/T 28910-2026 is the Chinese national standard covering how a crude oil flows - the viscosity against temperature and shear, the pour point and the yield stress of a waxy crude that has gelled in a cooled pipeline, which decides the pumping and the restart pressure. It replaces GB/T 28910-2012 and has been in force since 1 July 2026. It was issued on 31 March 2026 and has been in force since 1 July 2026, replacing GB/T 28910-2012. The document is under the responsibility of the Standardization Administration of China. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document describes the experimental principles for determining the rheological properties of crude oil using the rotation method, capillary tube method, falling ball method, and porous media method, and specifies the viscosity, etc. Experimental equipment, preparation, and measurement procedures for determining rheological characteristic parameters of crude oil, such as rheological curves, viscosity curves, viscosity-temperature curves, yield value, and anomalous points. Technical requirements such as procedures, data processing, and experimental reports. This document applies to the determination of crude oil rheology; the determination of crude oil emulsion rheology should be performed in accordance with this document.

4 Experimental Principle

4.1 Rotation Method Rotational measurement systems (such as coaxial cylinders, single cylinders, and conical plates) determine the viscosity of fluids through relative rotational motion. In a cylindrical system, the rotor is immersed in the sample being tested, forming an annular gap with the outer cup; in a single-cylinder system, the cylindrical measuring probe is placed in the container. The fluid being tested is placed in a container; in a cone-plate system, the sample is placed between the cone and the plate. When one of the components (such as the rotor or the upper cone)... When rotating, the fluid's viscosity creates torque on another component (such as a cup or lower plate). The higher the fluid's viscosity, the greater the torque. By measuring the angular velocity of the rotating component and the torque on the passive component, the shear stress and shear rate are obtained, and thus the flow characteristics of the sample under test are determined. Degenerative characteristic parameters.

4.2 Thin Tube Method Ignoring slippage and endpoint effects, the Hagen-Poiseuile theory is applied to measure the sample. The flow characteristics of a product in a capillary tube are used to calculate the dynamic viscosity of crude oil. Common capillary methods include gravity capillary methods and high-pressure capillary methods. Gravity capillary methods are the most common. The capillary method relies on the height difference between the liquid level at the inlet and outlet of a capillary tube to allow the liquid to flow through the capillary tube, and measures the time required for a certain amount of the sample to pass through the capillary tube. In the process of high-pressure capillary method, the kinematic viscosity of the sample is calculated; under constant temperature, constant speed or constant pressure conditions, the sample is passed through a capillary tube, and the viscosity of the capillary tube is measured. By calculating the pressure difference and flow rate at both ends, the shear stress and shear rate are obtained, thus yielding the rheological characteristic parameters of the sample under these conditions.

4.3 Drop ball method As the ball falls through the liquid, it is acted upon by three forces. gravity, buoyancy, and viscous drag. This is due to the liquid layer adhering to the surface of the ball and... There is relative motion between the surrounding liquid layers, and the falling speed of the ball is related to the magnitude of the viscous drag it experiences. When the ball moves at a constant velocity in a straight line... During motion, the three forces reach equilibrium, and the viscous force on the ball can be obtained, thus yielding the dynamic viscosity of the sample being tested.

4.4 Porous Media Method Ignoring slippage and endpoint effects, and applying Rabinowitsch theory, when the sample being tested passes through multiple [unclear - possibly referring to a specific location or process] at a constant speed or pressure, [unclear - possibly referring to a specific process or process]. When testing a porous medium, the pressure difference and flow rate at the inlet and outlet are measured, and the shear stress and shear rate are calculated to obtain the test sample's performance in the porous medium under these conditions. The rheological characteristic parameters in the model.

5.1 Rotational Viscometer

5.1.1 Measurement system. Usually only coaxial cylinder or single cylinder type; the types of commonly used rotational viscometer measurement systems are shown in GB/T 10247.

5.1.2 Temperature control and acquisition unit. Temperature control accuracy ±0.5°C.

5.1.3 Pressure control unit. pressure gauge accuracy class 0.25, pressure sensor accuracy ±0.5%FS.

5.2 Rotational Rheometer

5.2.1 Measurement System. Commonly used types include coaxial cylinder, cone-plate, parallel plate, etc., with continuous variable shear mode or stepped variable shear mode. It has the ability to measure parameters such as yield stress in shear mode and at extremely low shear rates or stresses.

5.2.2 Temperature control and acquisition unit. It has continuous temperature change or stepped temperature change mode, and the temperature control accuracy is ±0.5°C.

5.2.3 Pressure control unit. pressure gauge accuracy class 0.25, pressure sensor accuracy ±0.5%FS.

5.3 Gravity capillary viscometer

5.3.1 Glass capillary viscometer. The specifications shall be selected in accordance with the provisions of GB/T 10247.

5.3.2 Temperature control unit. Temperature control accuracy ±0.1°C.

5.3.3 Density meter. The scale division value shall not be less than

0.001 g/cm3.

5.3.4 Timer. A stopwatch or other timing device with a resolution of no more than 0.01s.

5.4 High-Pressure Capillary Rheological Measurement Apparatus

5.4.1 A schematic diagram of the high-pressure capillary rheology measuring device is shown in Figure 1.

5.4.2 High-pressure thin tube. The ratio of tube length to tube diameter is greater than 250.

5.4.3 Flow regulation unit. Flow accuracy ±1.0%.

5.4.4 Temperature control unit. Temperature control accuracy ±1°C.

5.4.5 Back pressure control unit. pressure gauge accuracy class 0.25, pressure sensor accuracy ±0.5%FS.

5.4.6 Pressure and Differential Pressure Measurement Unit. Pressure gauge accuracy 0.25%, pressure sensor accuracy ±0.5%FS, differential pressure sensor accuracy... ±0.5%FS.

5.4.7 Gas source and pressure regulation unit. to meet the experimental pressure requirements.

5.5 Falling Ball Viscometer

5.5.1 A schematic diagram of a falling ball viscometer is shown in Figure 2.

5.5.2 Small balls. Drop type with a diameter of 1mm~4mm, and rolling type with a diameter of 11mm~15.8mm; material. stainless steel, alloy steel, or... Glass.

5.5.3 Sample Tube. The timing mark interval of the sample tube shall not be less than 50 mm. The diameter of the drop-type sample tube shall be 5 to 10 times the diameter of the measuring ball. The diameter of the rolling sample tube is

1.5 times the diameter of the measuring ball.

5.5.4 Thermostatic bath. Temperature control accuracy ±1°C.

5.5.5 Timer. A stopwatch or other timing device with a resolution of no more than 0.01s.