

ICS 87.040



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

GB/T 46024-2025

**Paints and varnishes - Determination of flow time by use of flow
cups**

色漆和清漆 用流出杯测定流出时间

(English Translation)

Issued on: August 1, 2025

Implemented on: February 1, 2026

Issued by: State Administration for Market Regulation

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1 Scope

This document describes a method for determining the flow time of paints, varnishes and related products, which can be used to monitor viscosity.

This document specifies four types of flow cups with similar dimensions but outflow orifice diameters of 3 mm, 4 mm, 5 mm, and 6 mm, and provides two methods for checking the wear of flow cups (see Appendix A).

This document does not include flow cups with replaceable outflow orifices, because the cup body with the outflow orifice does not meet tolerance requirements.

This document does not include commonly used immersion-type flow cups.

NOTE: because the manufacturing tolerances of such flow cups are greater than those specified in this document, the accuracy of obtaining flow time using the immersion-type flow cups is lower than that using the flow cups specified in this document (see Chapter 9).

The method described in this document is applicable to test materials where the breakpoint of the liquid flow from the outflow orifice of the flow cups can be accurately determined. Due to the deceleration effect, for materials with flow times close to the upper limit of the test range (100 s), the breakpoint is difficult to determine and reproduce.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

ISO 1513 Paints and Varnishes - Examination and Preparation of Test Samples

NOTE: GB/T 20777-2006 Paints and Varnishes - Examination and Preparation of Samples for Testing (ISO 1513.1992, IDT)

ISO 4618 Paints and Varnishes - Vocabulary

NOTE: GB/T 5206-2015 Paints and Varnishes - Terms and Definitions (ISO 4618.2014, IDT)

ISO 15528 Paints, Varnishes and Raw Materials for Paints and Varnishes - Sampling

NOTE: GB/T 3186-2006 Paints, Varnishes and Raw Materials for Paints and Varnishes - Sampling (ISO 15528.2000, IDT)

3 Terms and Definitions

The terms and definitions defined in ISO 4618 and the following are applicable to this document.

ISO and IEC maintain terminology databases for standardization at the following addresses.

3.1

flow time

The time elapsed from the instant the test material begins to flow from the outflow orifice of a full flow cup until the instant the material flow initially ceases near the outflow orifice.

3.2 Newtonian flow

A property that shear viscosity is independent of shear rate, shear stress and time.

3.3 non-Newtonian flow

A property that shear viscosity depends on shear rate and shear stress, or a combination of shear rate, shear stress and time.

3.4 kinematic viscosity

The ratio of shear viscosity to liquid density.

NOTE: the unit of kinematic viscosity ν is square meters per second (m^2/s).

4 Temperature Conditions

Temperature and humidity are important factors affecting test results. Deviations from specified requirements may result in incomparable results. However, the parties concerned may agree on alternative parameters and indicate them in the report.

Flow time is affected by temperature, which is very important for workability, and different types of products are affected to varying degrees.

The test temperature specified in this document is $(23.0 \pm 0.5) ^\circ\text{C}$, which is for reference only.

Due to actual temperature conditions, comparison tests may be more convenient at other agreed temperatures (for example, $25 ^\circ\text{C}$) (see Appendix B).

For viscosity monitoring via flow time, the specimen and flow cups shall be conditioned to the specified or agreed temperature, and it shall be ensured that the temperature variation during testing does not exceed $0.5 ^\circ\text{C}$. The flow cups shall be placed in a non-airflow location for testing.

If the test is conducted in a fume hood with the exhaust opening open, this shall be noted in the test report.

5.1.1 Dimensions

The dimensions of the ISO flow cups and the allowable tolerances in their manufacture shall be as shown in Figure 1.

NOTE: flow time is inversely proportional to the fourth power of this dimension (inner diameter);

therefore, the tolerance requirements for the inner diameter of the outflow orifice of the flow cups are the most stringent.

5.1.3 Structure

Unspecified dimensions, for example, wall thickness, shall ensure that the flow cups do not deform during use. The shape of the flow cups should preferably be as shown in Figure 1, but for ease of use or manufacturing, appropriate adjustments may be made, provided that an external protective sleeve is used to prevent accidental damage to the protruding outflow orifice of the flow cups as much as possible. This protective sleeve shall not be adjacent to the outflow orifice to prevent capillary action from occurring when the material under test flows out.

Flow cups with temperature-controlled jackets are preferred.

5.1.4 Degree of finish

The inner surface of the flow cups (including the outflow orifice) shall be smooth, free from cutting marks, cracks, protrusions, and burrs, as these can cause irregular outflow and retention of sample or cleaning material.

The required finish standard is equivalent to a maximum roughness Ra not exceeding 0.5 μm (see ISO 4287).

5.1.5 Measurement range

The flow cups shall be used within the measurement range given in Table 1. Only within this range can valid data be obtained. Furthermore, the conversion between flow time and kinematic viscosity shall be calculated using the formulas given in Table 1.

Table 1 -- Measurement Range of Flow Cups and Conversion between Flow Time and Kinematic Viscosity

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