ICS 83.080.01
CCS G 32

# NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA



# GB/T 15047-2025

Replacing GB/T 15047-1994

## Test method for stiffness properties in torsion of plastics

塑料扭转刚性试验方法

**Issued on: October 31, 2025** **Implemented on: May 1, 2026**

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

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## 1 Scope

GB/T 15047-2025 is the Chinese national standard covering the torsional stiffness of a plastic - the specimen and the applied twist, the modulus derived from the torque and the angle, and the temperature at which the measurement is made, which for a polymer changes the answer entirely. It replaces GB/T 15047-1994, a standard thirty-one years old. In force from 1 May 2026. Issued on 31 October 2025, it has been in force since 1 May 2026, replacing GB/T 15047-1994.

This document describes a test method for determining the torsional stiffness of a plastic material within a certain temperature range by measuring its apparent modulus of rigidity. This document applies to the determination of torsional stiffness in thermoplastics.

## 2 Normative references

The provisions of the following documents constitute the essential clauses of this document through normative references in this text. Among them, for any dated reference, only the version corresponding to that date applies to this document; for any undated reference, the latest version (including all amendments) applies to this document.

GB/T 2035 Plastics Terminology

GB/T 2918 Plastics - Standard atmospheres for conditioning and testing

## 3 Terms and definitions

The terms and definitions defined in GB/T 2035, as well as the following terms and definitions, apply to this document.

3.1 apparent modulus of rigidity When the specimen is distorted due to exceeding its elastic limit and the creep characteristics of the material are taken into account, the measured modulus of rigidity is different from its value within the elastic limit.

3.2 elastic limit The maximum stress a material can withstand without undergoing permanent plastic deformation.

## 4 Principle

At a set temperature, a torque is applied to the specimen for a specified time, and the apparent modulus of rigidity is calculated by measuring the torsion angle.

## 5 Instruments and equipment

5.1 Torsion testing machine The torsion testing machine shall be able to apply a controllable torque to induce a deflection of the specimen within the range of 5°~100°. The specific deflection angle depends on the stiffness characteristics, thickness, and span of the specimen. A typical schematic diagram of a torsion testing machine is shown in Figure

1.The torsion testing machine shall be able to apply and measure torque within the range of 0.0113 N - m to

1.81 N - m; this range can be achieved by using a single torsion testing machine or by combining two devices with different ranges (e.g., torsion testing machine A. 0.0113 N-m~

0.113 N - m, torsion testing machine B.

0.113 N - m~

1.81 N - m). It shall be equipped with replaceable standard counterweights to allow for precise torque adjustment based on specimen stiffness, ensuring effective testing within the target deflection angle range. The torsion testing machine should preferably be designed to allow for span adjustment, which is particularly important when testing materials prone to shear failure (such as laminates with a span-to-width ratio of 6). When the torsion testing machine is intended to be used in a low-temperature environment, its spindle (especially the shaft end part near the lower bearing) shall be equipped with a heating jacket or other effective antifreeze device to prevent the shaft from freezing and affecting the torque transmission accuracy and normal operation of the torsion testing machine. Figure 1 -- Torsion testing machine

### 5.2 Temperature control device

5.2.1 Insulated container A properly sized insulated container shall be able to keep the

internal temperature stable within ±1 °C during the test.

5.2.2 Thermometer A thermometer with the necessary temperature range and an accuracy of not less than ±1 °C shall be provided, with a display resolution of 0.1 °C (digital) or a minimum division value of <=0.5 °C (analog). The thermometer's sensing bulb or inductive head shall be placed close to the sample.

5.2.3 Heat transfer medium A liquid that remains liquid within the required temperature range and does not soften or affect the sample shall be used as the heat transfer medium. Commonly used heat transfer media include, but are not limited to, water, acetone, ethanol, butanol, methanol, n-hexane, silicone oil, and a mixture of methyl phosphate and water in a volume ratio of 87.13.Furthermore, a mixture of 50 portions of ethanol, 30 portions of ethylene glycol, and 20 portions of water is suitable for temperature conditions down to -70 °C. An appropriate heat transfer medium should be chosen according to the physical properties of different liquids (such as the applicable temperature range). For example, water is suitable for 0 °C~100 °C, ethanol is suitable for -70 °C~78 °C, and silicone oil is suitable for -40 °C~300 °C.

5.2.4 Refrigeration Effective cooling methods shall be provided to cool the heat transfer medium. This can be achieved through immersion cooling coils built into the instrument, or by pre-cooling the insulated container filled with the heat transfer liquid in a low-temperature environment. To ensure efficient use of the equipment for low-temperature testing, sufficient space should be reserved to cool the heat transfer medium container required for one day. For different temperature ranges, mechanical refrigeration, dry ice, or a combination of both can be used.

5.2.5 Heater A controllable immersion electric heater shall be used in conjunction with a stirrer in the insulated container.

5.3 Micrometer The accuracy is no less than ±

0.001 mm.

5.4 Counterweight The precision is 1 g.

**5.5 Timer A timing device with an accuracy of**

0.1 seconds.