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

GB/T 1634.1-2025

**Plastics - Determination of temperature of deflection under load
- Part 1: General test method
(English Translation)**

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1 Scope

This document describes the general method for determining the temperature of plastics deflection under load (flexural stress under three-point loading) to evaluate the relative properties of different types of plastic materials when heated to high temperatures at specified rates under specified loads.

This document specifies the preferred dimensions of specimens.

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.

GB/T 1634.2 Plastics - Determination of Temperature of Deflection under Load - Part 2.

Plastics and Ebonite (GB/T 1634.2-2019, ISO 75-2.2013, MOD)

GB/T 1634.3 Plastics - Determination of Temperature of Deflection under Load - Part 3. High-strength Thermosetting Laminates (GB/T 1634.3-2004, ISO 75-3.2003, IDT)

GB/T 2918 Plastics - Standard Atmospheres for Conditioning and Testing (GB/T 2918-2018,

ISO 291.2008, MOD)

GB/T 16839.1 Thermocouples - Part 1.EMF Specifications and Tolerances (GB/T 16839.1-2018, IEC 60584-1.2013, IDT)

GB/T 30121 Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors (GB/T 30121-2013, IEC 60751.2008, IDT)

GB/T 44535 Plastics - Determination of Linear Dimensions of Test Specimens (GB/T 44535-

2024, ISO 16012.2015, MOD)

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1

flexural strain

T_f

As the test temperature increases, the temperature at which the specimen deflection reaches the standard deflection value.

NOTE: it is expressed in degrees Celsius (°C).

4 Principle

The standard specimen is placed flat and subjected to a constant load of three-point bending, so that it generates one of the flexural stresses specified in the relevant parts of GB/T 1634. Under the condition of heating at a constant rate, measure the temperature when the standard deflection corresponding to the specified flexural strain increase is reached.

5.1 Device for Generating Flexural Stress

The device consists of a rigid metal frame, and the basic structure is shown in Figure 1. There is a loading rod in the frame that can freely move in the vertical direction. One end of the rod is equipped with a weight bearing plate, and the other end is equipped with a loading head. The bottom plate of the frame is connected to the specimen support. These components and the vertical part of the frame are made of materials with the same linear expansion coefficient as the loading rod.

The specimen support consists of two metal strips, whose contact surface with the specimen is a cylindrical surface, which is located on the same horizontal plane as the two contact lines of the specimen. The span size, that is, the distance between the two contact lines is specified by

GB/T 1634.2 or GB/T 1634.3. The support is installed on the bottom plate of the frame, so that the vertical force applied to the specimen by the loading head is located at the midpoint of the two supports (± 1 mm). The edge line of the support contact head is parallel to the edge line of the loading head and is at right angles to the long axis direction of the specimen symmetrically placed on the support. The radius of curvature of the support contact head and the loading head is (3.0 ± 0.2) mm, and the length of the edge line shall be greater than the width of the specimen.

Unless the vertical components of the instrument have the same linear expansion coefficient, the different changes in the length direction of these components will cause errors in the apparent deflection readings of the specimen. A blank test shall be performed on each instrument using a standard specimen made of a rigid material with a low linear expansion coefficient (such as Invar and borosilicate glass) and with a thickness comparable to that of the specimen under test. The blank test shall include the various temperature ranges used in the actual determination, and the correction value shall be determined for each temperature. When the correction value is not less than 0.01 mm, it shall be recorded. For each test, it shall be added to the apparent deflection reading of each specimen.

temperature range and has no effect on the material under test, for example, does not lead to swelling or cracking.

In case of dispute or contradiction, if the temperature is within the feasible range, the method of using liquid heat transfer medium shall be used as the arbitration method.

The heating device shall be equipped with control elements, so that the temperature can rise at a constant rate of (120 ± 10) °C/h. The heating rate shall be regularly calibrated by checking the automatic temperature reading or manually checking the temperature at least every 6 minutes. At every 6-min time interval during the test, if the temperature change is (12 ± 1) °C, then, the heating rate requirement is considered to be met.

The instrument can be designed to automatically stop heating when the standard deflection is reached.

NOTE: liquid paraffin, transformer oil, glycerine and silicone oil are suitable liquid heat transfer media, and other liquids may also be used. For fluidized beds, aluminum oxide powder is suitable.

5.3 Weights

A set of weights that can be adjusted in 1 g increments shall be available to load the specimen to the required flexural stress calculated in accordance with 8.1.

5.4 Temperature Measurement Device

Use a temperature measurement device with an appropriate measuring range and an accuracy of ± 1 °C.

The temperature measurement device shall be calibrated at immersion depth. The temperature sensing part shall be located no more than 12.5 mm from the point of contact between the loading head and the specimen and shall not contact any part of the specimen or the frame.

The thermocouples shall comply with the requirements of GB/T 16839.1. Resistance thermometers shall comply with the requirements of GB/T 30121.

If there are multiple test stations, each test station should be equipped with a separate temperature measurement device.

5.5 Deflection Measurement Device

The deflection of the specimen at the point of contact between the loading head and the specimen can be measured using a micrometer or any other indicating or recording device, including an electric displacement sensor. The deflection measurement device shall be accurate to 0.01 mm.

For some types of instruments, the force F_s generated by the micrometer spring acts upward, reducing the downward load applied by the loading rod; in other cases, F_s acts downward, increasing the load applied by the loading rod. For such instruments, the magnitude and direction of the force F_s shall be determined, so that it can be compensated (see 8.1). Since the

F_s of some micrometers considerably varies over the entire measurement range, the calibration shall be carried out over the part of the range in which the instrument is to be used.

5.6 Dimension Measurement Device

It shall comply with the provisions of GB/T 44535 and be used to measure the width and thickness of the specimen, with a division value of 0.01 mm.