

ICS 83.080.01

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

GB/T 36800.3-2025

**Plastics - Thermomechanical analysis(TMA) - Part 3:
Determination of penetration temperature**

塑料 热机械分析法 (TMA) 第3部分: 针入温度的测定

(English Translation)

Issued on: January 24, 2025

Implemented on: August 1, 2025

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is Part 3 of GB/T 36800 "Thermomechanical analysis of plastics (TMA)". GB/T 36800 has been published for the following part.

--- Part 1: General;

--- Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature;

--- Part 3: Determination of needle penetration temperature.

This document is modified to adopt ISO 11359-3:2019 "Thermomechanical analysis of plastics (TMA) - Part 3: Determination of breakthrough temperature".

The technical differences between this document and ISO 11359-3:2019 and their reasons are as follows.

--- ISO 472 (see Chapter 3) has been replaced by the normative reference GB/T 2035 to adapt to my country's technical conditions and increase operability.

Sex;

--- ISO 11359-1 (see Chapter 3, 5.1, 7.1) has been replaced by the normative reference GB/T 36800.1 to adapt to my country's technology Conditions, increase operability;

--- Adjust 6.1 of ISO 11359-3:2019 "Specimens as thin as 0.01 mm can also be used for testing" to Note (see 6.1);

- ISO 291 (see 6.2) is replaced by the normative reference GB/T 2918 to adapt to my country's technical conditions and increase operability;
- Modified Figure 1 and the reference numbers and descriptions in the result presentation (see Chapter 8) to facilitate the operator's understanding;
- Added the test report requirement "a) indicate the reference to this document", added the sampling direction and other information in "e) sample type", added "g) in "i) Test conditions", the test conditions that need to be reported specifically are added, and in "i) Test results", the TMA curve is added (see Chapter 10).

The following editorial changes were made to this document.

- In order to coordinate with the existing standards, the name of the standard is now changed to "Thermomechanical Analysis of Plastics (TMA) Part 3: Penetration Temperature Determination.
- The scope note is adjusted to the introduction (see Chapter 1);
- Changed the number of significant digits of the nominal diameter of the probe tip in the needle probe (see 5.2);
- Deleted the note in the result presentation, which is repeated in the introduction (see Chapter 8);
- Added unit requirements for result expression (see Chapter 8);
- Added Appendix A (informative) "Precision data of needle penetration temperature obtained from multiple laboratory tests".

Introduction

Thermomechanical analysis (TMA) is a method of heating a sample at a certain heating rate, so that the sample undergoes mechanical changes as the temperature rises under a constant small load.

Deformation, a method for measuring the temperature-deformation curve of a specimen. At present, GB/T 36800.1 and GB/T 36800.2 have adopted ISO 11359-1 and ISO 11359-2, and for this purpose, ISO 11359-3 was adopted and GB/T 36800.3 was formulated.

GB/T 36800 "Thermomechanical Analysis of Plastics (TMA)" is intended to consist of three parts.

- Part 1: General. The purpose is to specify the general requirements for thermomechanical analysis of filled or unfilled thermoplastic and thermosetting materials. condition.
- Part 2: Determination of linear thermal expansion coefficient and glass transition

temperature. The purpose is to specify the thermal mechanical analysis method (TMA) is a method for determining the coefficient of linear thermal expansion and glass transition temperature.

--- Part 3: Determination of needle penetration temperature. The purpose is to specify the method for determining the needle penetration temperature by thermomechanical analysis (TMA).

Needle penetration temperature is used to evaluate the high temperature deformation tendency of thermoplastics and provides an important parameter for quality control, development and material characterization.

There are currently no test methods for needle penetration temperature using TMA other than this document. TMA is also used to determine the softness of thermoplastics.

Point.

Thermomechanical Analysis of Plastics (TMA) Part 3: Determination of needle penetration temperature

1 Scope

This document describes a method for determining the needle penetration temperature of thermoplastics using thermomechanical analysis (TMA).

This document applies to the determination of needle penetration temperature of thermoplastics.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document.

GB/T 2035 Plastics Terminology (GB/T 2035-2024, ISO 472:2013, NEQ) GB/T 2918 Standard environment for conditioning and testing of plastic specimens (GB/T 2918-2018, ISO 291:2008, MOD) GB/T 36800.1 Thermomechanical analysis of plastics (TMA) Part 1: General (GB/T 36800.1-2018, ISO 11359-1:2014, IDT)

3 Terms and definitions

The terms and definitions defined in GB/T 2035 and GB/T 36800.1 and the following apply to this document.

Needle insertion mode penetration mode A thermomechanical analysis mode that measures the probe penetration displacement caused by specimen softening.

The temperature when the probe displacement changes suddenly in the needle penetration mode.

4 Principle

Under specified load and constant heating rate, measure the temperature when the TMA instrument probe starts to penetrate the sample or when the penetration rate changes suddenly.

5.1 TMA Instrument

In accordance with the provisions of GB/T 36800.1.

In addition, the instrument shall be capable of applying a specified constant force to the specimen.