



BSI Standards Publication

Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)

National foreword

This British Standard is the UK implementation of EN ISO 306:2022. It is identical to ISO 306:2022. It supersedes BS EN ISO 306:2013, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/21, Testing of plastics.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 16213 4

ICS 83.080.20

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 28 February 2023.

Amendments/corrigenda issued since publication

Date	Text affected
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English Version

Plastics - Thermoplastic materials - Determination of Vicat
softening temperature (VST) (ISO 306:2022)

Plastiques - Matières thermoplastiques -
Détermination de la température de ramollissement
Vicat (VST) (ISO 306:2022)

Kunststoffe - Thermoplaste - Bestimmung der Vicat-
Erweichungstemperatur (VST) (ISO 306:2022)

This European Standard was approved by CEN on 20 October 2022.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN ISO 306:2022) has been prepared by Technical Committee ISO/TC 61 "Plastics" in collaboration with Technical Committee CEN/TC 249 "Plastics" the secretariat of which is held by NBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2023, and conflicting national standards shall be withdrawn at the latest by May 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 306:2013.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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Endorsement notice

The text of ISO 306:2022 has been approved by CEN as EN ISO 306:2022 without any modification.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee TC 61, *Plastics*, Subcommittee SC 2, *Mechanical behavior*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This sixth edition cancels and replaces the fifth edition (ISO 306:2013), which has been technically revised.

The main changes are as follows.

- The document has been updated to allow for the use of commercial universal equipment (i.e. covering both ISO 75 and ISO 306) and modern testing practices.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)

1 Scope

1.1 This document specifies four methods for the determination of the Vicat softening temperature (VST) of thermoplastic materials:

- Method A50 using a force of 10 N and a heating rate of 50 °C/h;
- Method B50 using a force of 50 N and a heating rate of 50 °C/h;
- Method A120 using a force of 10 N and a heating rate of 120 °C/h;
- Method B120 using a force of 50 N and a heating rate of 120 °C/h.

1.2 The methods specified are applicable only to thermoplastics, for which they give a measure of the temperature at which the thermoplastics start to soften rapidly.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 293, *Plastics — Compression moulding of test specimens of thermoplastic materials*

ISO 294-1, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 1: General principles, and moulding of multipurpose and bar test specimens*

ISO 294-2, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 2: Small tensile bars*

ISO 294-3, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 3: Small plates*

ISO 472, *Plastics — Vocabulary*

ISO 2818, *Plastics — Preparation of test specimens by machining*

ISO 16012, *Plastics — Determination of linear dimensions of test specimens*

ISO 20753, *Plastics — Test specimens*

IEC 60584-1, *Thermocouples — Part 1: EMF specifications and tolerances*

IEC 60584-3, *Thermocouples — Part 3: Extension and compensating cables — Tolerances and identification system*

IEC 60751, *Industrial platinum resistance thermometers and platinum temperature sensors*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 penetration

distance over which the indenting tip has to penetrate into the specimen under test

Note 1 to entry: It is expressed in millimetres (mm).

3.2 load

force applied to test specimen by means of the indenting tip

Note 1 to entry: It is expressed in Newtons (N).

3.3 Vicat softening temperature VST

temperature at which a flat-ended indenter will penetrate the specimen to a depth of 1 mm under a specified *load* (3.2) using a selected uniform rate of temperature rise

Note 1 to entry: It is expressed in degrees Celsius (°C).

4 Principle

The temperature at which a standard indenting tip with a flat point, under a standardized load, penetrates 1 mm into the surface of a plastic test specimen is determined. The indenting tip exerts a specified force perpendicular to the test specimen, while the specimen is heated at a specified and uniform rate.

The temperature, in degree Celsius (°C), of the specimen, measured as close as possible to the indented area at 1 mm penetration, is quoted as the VST.

5 Apparatus

5.1 Means of producing penetration

The apparatus shall be constructed essentially as shown in [Figure 1](#) (or [Figure 2](#)). It consists of a rigid metal frame in which a rod moves freely in the vertical direction. One end of the rod is fitted with a weight-carrying plate and the other end is equipped with an indenting tip. The base of the frame is fitted with a support plate or other suitable load-application device.

It is recommended that the rod and frame(s) be constructed of low thermal expansion material. Unless vertical parts of the apparatus have the same coefficient of linear thermal expansion, the difference in change of length of these parts during the test introduces an error in the reading of the apparent penetration of the test specimen.

At the time of manufacture, or after repair or replacement of test frame, a blank test shall be made on each apparatus using a test specimen made of rigid material having a low coefficient of expansion and a thickness comparable to that of the specimen under test. The blank test shall cover the temperature ranges to be used in the actual determination, and a correction term shall be determined for each temperature. If the correction term is 0,02 mm or greater, its value and algebraic sign shall be recorded;