SLOVENSKI STANDARD
oSIST prEN ISO 306:2022

01-januar-2022

Polimerni materiali - Plastomeri - Ugotavljanje temperature zmehčišča po Vicatu (VST) (ISO/DIS 306:2021)

Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST) (ISO/DIS 306:2021)

Kunststoffe - Thermoplaste - Bestimmung der Vicat-Erweichungstemperatur (VST) (ISO/DIS 306:2021)

Plastiques - Matières thermoplastiques - Détermination de la température de ramollissement Vicat (VST) (ISO/DIS 306:2021)

Ta slovenski standard je istoveten z: **prEN ISO 306**

ICS:

83.080.20	Plastomeri	Thermoplastic materials

oSIST prEN ISO 306:2022 **en,fr,de**

DRAFT INTERNATIONAL STANDARD
ISO/DIS 306

ISO/TC **61**/SC **2**

Secretariat: **SAC**

Voting begins on:
2021-11-18

Voting terminates on:
2022-02-10

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

Plastiques — Matières thermoplastiques — Détermination de la température de ramollissement Vicat (VST)

ICS: 83.080.20

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 306:2021(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 *[or Project Committee]* ISO/TC *[or ISO/PC]* 61, *Plastics*, Subcommittee SC 2, *Mechanical behaviour*.

This sixth edition cancels and replaces the fifth edition (ISO 306:2013), several clauses have been edited.

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.

Introduction

The main changes introduced with this revision of ISO 306 can be summarized as follows:

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

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

1 Scope

1.1 This International Standard 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, *Thermocouples (Parts 1 and 3)*

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 terminological 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 indention 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 indention 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 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, 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 can move 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.

Note 1 to entry 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.

~~A~~ At calibration, 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; and the term applied to each test result by adding it algebraically to the reading of the apparent penetration of the test specimen.

Note 2 to entry Invar and borosilicate glass have been found suitable as materials for the test specimen in the blank test.

5.1.1 Indenter

It shall be made of hardened steel, at least 2 mm long, of circular cross-section and of area (1,000 ± 0,015) mm^2 (corresponding to an indenting tip diameter of (1,128 ± 0,008) mm) and fixed at the bottom of the rod. The indenter, when in contact with the specimen, shall be perpendicular to the rod. The tip shall be free from burrs or other imperfections.

5.2 Heating equipment

The heating equipment shall be a heating bath containing a suitable liquid, a fluidized bed, or a direct contact heating unit, see Figure 2. For heat transfer media other than gas (air) the test specimen shall be immersed to a depth of at least 35 mm.

An efficient stirrer or means to fluidize the solid heat transfer medium shall be provided. If liquids are used for heat transfer, it shall be established that the liquid chosen is stable over the temperature range used and does not affect the material under test, for example causing it to swell or crack.

The method using a liquid heat transfer medium shall be considered a reference method in case of doubts or conflicts, if possible, in the temperature range under consideration.

The heating equipment shall be provided with a control unit so that the temperature can be raised at a uniform rate of (50 ± 5) °C/h or (120 ± 10) °C/h.

The heating rate shall be verified periodically either by checking the automatic temperature reading, or manually checking the temperature at least every 6 min. The requirement for the heating rate shall be considered satisfied if, over every 6 min interval during the test, the temperature change is (5,0 ± 0,5) °C/h or (12,0 ± 1,0) °C/h.

It is allowable for the first 10 min or up to 40°C of the ramp to be outside of the prescribed tolerances as many instruments use a PID control for the heating, and it is normal for the controller to tune itself to the correct power and interval requirements to perform the required ramp rate.

Note 1 to entry A means of accelerating the cooling rate of the heating equipment has been found to be desirable

Note 2 to entry Liquid paraffin, transformer oil, glycerol and silicone oils are suitable liquids, but others may be used. For fluidized beds, aluminium oxide powder has been found suitable.

5.3 Weights

A set of weights shall be provided so that the total load applied to the test specimen is (10 ± 0,2) N for methods A50 and A120 or (50 ± 1,0) N for methods B50 and B120.

5.4 Temperature-measuring instrument

Use a suitable temperature-measuring instrument of appropriate range and maximum error limit of ± 1 °C. The temperature-measuring instruments shall be calibrated at the depth of immersion particular to the apparatus in use and in a temperature range that comprises the Vicat softening temperatures to be measured. The temperature-sensing part of the instrument shall be located not farther than 20 mm from the point where the indenting tip contacts the specimen. The temperature sensing part of the instrument shall not touch the specimen or be in contact with any part of the frame.

Note 1 to entry Calibration of the temperature-measuring instrument can be performed by static calibration (at one or more constant temperatures) or by dynamic calibration (using a constant heating-rate). Dynamic calibration is capable of measuring temperature lag of the build-in temperature measuring device but requires a reference temperature measuring device with suitable dynamic properties.

Thermocouples shall comply with the requirements of IEC 60584. Resistance thermometers shall comply with the requirements of IEC 60751.

It is recommended that the heating bath is equipped with a separate temperature-measuring instrument at each test station if there are several.