

<b>STN</b>	<b>Plasty</b> <b>Hodnotenie procesu tavenia (teplota tavenia alebo rozsah teplôt tavenia) semikryštalických polymérov kapilárnou rúrkou a polarizačným mikroskopom (ISO 3146: 2022)</b>	<b>STN</b> <b>EN ISO 3146</b>  64 0135
------------	--	---

Plastics - Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods (ISO 3146:2022)

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 06/22

Obsahuje: EN ISO 3146:2022, ISO 3146:2022

Oznámením tejto normy sa ruší  
STN EN ISO 3146 (70 1654) z októbra 2001

**134986**

EUROPEAN STANDARD

EN ISO 3146

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2022

ICS 83.080.01

Supersedes EN ISO 3146:2000, EN ISO  
3146:2000/AC:2003

English Version

Plastics - Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods (ISO 3146:2022)

Plastiques - Détermination du comportement à la fusion (température de fusion ou plage de températures de fusion) des polymères semi-cristallins par méthodes du tube capillaire et du microscope polarisant (ISO 3146:2022)

Kunststoffe - Bestimmung des Schmelzverhaltens (Schmelztemperatur oder Schmelzbereich) von teilkristallinen Polymeren im Kapillarrohr- und Polarisationsmikroskop-Verfahren (ISO 3146:2022)

This European Standard was approved by CEN on 12 February 2022.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

**EN ISO 3146:2022 (E)**

<b>Contents</b>	<b>Page</b>
<b>European foreword.....</b>	<b>3</b>

## **European foreword**

This document (EN ISO 3146:2022) 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 September 2022, and conflicting national standards shall be withdrawn at the latest by September 2022.

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 3146:2000, EN ISO 3146:2000/AC:2003.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Endorsement notice**

The text of ISO 3146:2022 has been approved by CEN as EN ISO 3146:2022 without any modification.

# INTERNATIONAL STANDARD

# ISO 3146

Fourth edition  
2022-03

---

---

## **Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods**

*Plastiques — Détermination du comportement à la fusion  
(température de fusion ou plage de températures de fusion) des  
polymères semi-cristallins par méthodes du tube capillaire et du  
microscope polarisant*



Reference number  
ISO 3146:2022(E)

© ISO 2022

**ISO 3146:2022(E)****COPYRIGHT PROTECTED DOCUMENT**

© ISO 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

# Contents

	Page
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Method A — Capillary tube</b> .....	<b>2</b>
4.1 Principle.....	2
4.2 Apparatus (see Figure 1).....	2
4.3 Test samples.....	2
4.3.1 General.....	2
4.3.2 Characteristics.....	3
4.3.3 Conditioning.....	3
4.4 Procedure.....	4
4.4.1 Calibration.....	4
4.4.2 Determination.....	5
4.5 Test report.....	5
<b>5 Method B — Polarizing microscope</b> .....	<b>6</b>
5.1 Principle.....	6
5.2 Apparatus.....	6
5.3 Test samples.....	6
5.3.1 Powdered materials.....	6
5.3.2 Moulded or pelleted materials.....	7
5.3.3 Film or sheet materials.....	7
5.3.4 Conditioning.....	7
5.4 Procedure.....	7
5.4.1 Calibration.....	7
5.4.2 Determination.....	7
5.5 Precision.....	8
5.6 Test report.....	8
<b>Bibliography</b> .....	<b>9</b>

## ISO 3146:2022(E)

### 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](http://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](http://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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*, 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 fourth edition cancels and replaces the third edition (ISO 3146:2000), which has been technically revised. It also incorporates the Technical Corrigendum ISO 3146:2000/Cor 1:2002.

The main changes compared to the previous edition are as follows:

- the specifications of the apparatus and measurement procedure have been revised;
- the table of calibration standards has been revised by adding further entries, synonyms and CAS numbers of organic chemicals, correcting errors and modifying melting temperatures according to added references.

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](http://www.iso.org/members.html).



## Introduction

The melting behaviour of a crystalline or semi-crystalline polymer is a structure-sensitive property.

In polymers, a sharp melting point, such as is observed for low molecular mass substances, usually does not occur; instead, a melting temperature range is observed on heating, from the first change of shape of the solid particles to the transformation into a highly viscous or viscoelastic liquid, with accompanying disappearance of the crystalline phase. The melting range depends upon a number of parameters, such as molecular mass, molecular mass distribution, per cent crystallinity, and thermodynamic properties.

The melting range can also depend on experimental parameters such as previous thermal history of the specimen, heating or cooling rate, etc. The lower or upper limit of the melting range, or its average value, is sometimes conventionally referred to as the “melting temperature”.

The melting temperatures determined by different methods can differ by several kelvins for above reasons.

# Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods

## 1 Scope

This document specifies two methods for evaluating the melting behaviour of semi-crystalline polymers.

### a) Method A: Capillary tube

This method is based on the changes in shape of the polymer. It is applicable to all semi-crystalline polymers and their compounds.

NOTE 1 Method A can also be useful for the evaluation of the softening of non-crystalline solids.

### b) Method B: Polarizing microscope

This method is based on changes in the optical properties of the polymer. It is applicable to polymers containing a birefringent crystalline phase. It might not be suitable for plastics compounds containing pigments and/or other additives which can interfere with the birefringence of the polymeric crystalline zone.

NOTE 2 Another method applicable to semi-crystalline polymers is described in ISO 11357-3.

## 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 472, *Plastics — Vocabulary*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**