
**Plastics — Determination of the
transient extensional viscosity of
polymer melts**

*Plastiques — Détermination de la viscosité élongationnelle transitoire
des polymères à l'état fondu*



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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).

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).

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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 ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

This second edition cancels and replaces the first edition (ISO 20965:2005), which has been technically revised.

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

- figures have been updated and figure keys have been introduced;
- calibration period in 5.6 has been clarified.

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 — Determination of the transient extensional viscosity of polymer melts

1 Scope

This document specifies the general principles of a method for determining the transient extensional viscosity of polymer melts. The procedure details the measurement of polymer melt specimens stretched uniaxially under conditions of constant strain rate and constant temperature.

The method is capable of measuring the transient extensional viscosity of polymer melts at Hencky strain rates typically in the range $0,01 \text{ s}^{-1}$ to 1 s^{-1} , at Hencky strains up to approximately 4 and at temperatures up to approximately 250 °C (see NOTES 1 and 2). It is suitable for measuring transient extensional viscosity values typically in the range from approximately $10^4 \text{ Pa}\cdot\text{s}$ to $10^7 \text{ Pa}\cdot\text{s}$ (see NOTE 3).

NOTE 1 Hencky strains and strain rates are used (see [Clause 3](#)).

NOTE 2 Values of strain, strain rate and temperature outside these limiting values can be attained.

NOTE 3 The operating limit of an instrument, in terms of the lowest transient extensional viscosity values that can be measured, is due to a combination of factors, including the ability of the specimen to maintain its shape during testing and the resolution of the instrument.

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 472, *Plastics — Vocabulary*

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 <http://www.electropedia.org/>

3.1

Hencky strain

ε

strain given by the natural logarithm of the elongation ratio given by [Formula \(1\)](#)

$$\varepsilon = \ln(l/l_0) \quad (1)$$

where

l is the specimen length and

l_0 is the original specimen length

Note 1 to entry: It is also referred to as the natural or true strain.