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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 18989

Plastics — Strain rate dependent tensile tests for thermoplastics at ambient temperature

ICS: 83.080.01

ISO/TC 61/SC 2

Secretariat: **KATS**

Voting begins on:
2024-10-11

Voting terminates on:
2025-01-03

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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 ISO/TC 61, Plastics, Subcommittee SC 2, Mechanical behaviour.

A list of all parts in the ISO ##### series can be found on the ISO website.

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 method described by this ISO standard provides the general principles for determining stress-strain curves for thermoplastics, with a focus on the data entry of material cards for finite element simulations in the event of transient loads (impact/crash).

The procedure is used to investigate the strain rate dependent uniaxial tensile deformation behaviour of test specimens and to determine the tensile stress-strain relationship under noncyclic, highly dynamic conditions.

The process is particularly suitable for use in the material group of injection-moulded thermoplastics. It should be noted that this standard could, if needed, also be used for other plastic materials and temperature ranges. However, this was not part of the previous investigations. The aim is to expand the standard accordingly in the future.

It is explicitly pointed out that this ISO standard defines boundary conditions including measurements and data elaboration that lead to good and comparable test results. However, this does not explicitly exclude that other boundary conditions that do not correspond to this standard, such as other test specimen geometries, or stress-strain measurement and calculation methodologies, could also produce results that are meaningful, equivalent, or possibly superior in terms of quality.

It is explicitly pointed out that there is no direct comparability of results based on different standards or guidelines.

Plastics — Strain rate dependent tensile tests for thermoplastics at ambient temperature

1 Scope

This ISO standard defines the general principles for determining stress-strain curves for thermoplastics in a wide strain rate field, with a focus on data entry of material cards for finite element simulations in the event of transient loads (impact/crash).

The procedure is to be used to investigate the strain rate dependent uniaxial tensile deformation behaviour of test specimens and to determine the tensile stress-strain relationship under noncyclic, highly dynamic conditions.

The procedure is particularly suitable for use in the material group of injection-moulded thermoplastics, unfilled and filled, including short and long fiber reinforced thermoplastics with a fiber length of up to 10 mm. The proposed standard only describes tests in a standard atmosphere.

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 294-5, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 5: Preparation of standard specimens for investigating anisotropy*

ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 1110, *Plastics — Polyamides — Accelerated conditioning of test specimens*

ISO 1302, *Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation*

ISO 2602, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*

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

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

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

ISO 20753, *Plastics — Test specimens*

ISO 22183, *Plastics — Validation of force-time curves obtained from high-speed tensile tests*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 thickness, test specimen thickness

h_0
smaller initial dimension of the rectangular cross-section in the narrow parallel section of a test specimen

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

3.2 width, test specimen width in narrow parallel section

b_1
initial dimension of the rectangular cross-section in the narrow parallel section of a test specimen

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

3.3 test specimen cross-section

A_0
initial area of the test specimen in the narrow parallel section of a test specimen calculated from the specimen thickness h_0 and the specimen width b_1

Note 1 to entry: It is given in square millimetres (mm²).

3.4 overall test specimen length

l_3
largest initial dimension of the test specimen in the axial direction

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

Note 2 to entry: See [Annex A, Figure A.1](#).

3.5 initial distance between grips

L
initial, shortest distance between the edges of the test specimen clamping/test specimen clamping jaws in the tensile testing machine with the test specimen clamped

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

Note 2 to entry: The initial distance between grips L is a test boundary condition and no test specimen dimension.

Note 3 to entry: See [Annex A, Figure A.1](#).

3.6 reduced distance between grips

L_{red}
relevant length for calculating the approximated strain rate which, in contrast to the initial distance between grips l , considers the influence of the radii on the strain in the narrow parallel section of the test specimen (see [Annex A](#))

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

Note 2 to entry: The reduced distance between grips is only used to approximate the machine piston speed to achieve the needed approximated strain rates.

Note 3 to entry: This dimension is fixed for the standard specimen. [Annex A](#) describes a possible calculation method for other specimen dimensions.