
**Plastics — Determination of creep
behaviour —**

**Part 1:
Tensile creep**

*Plastiques — Détermination du comportement au fluage —
Partie 1: Fluage en traction*

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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 on 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 the following URL: www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical behaviour*.

This third edition cancels and replaces the second edition (ISO 899-1:2003), of which it constitutes a minor revision to update the normative references in [Clause 2](#). It also incorporates the Amendment ISO 899-1:2003/Amd.1:2015.

A list of all parts in the ISO 899 series can be found on the ISO website.

Plastics — Determination of creep behaviour —

Part 1: Tensile creep

1 Scope

This document specifies a method for determining the tensile creep of plastics in the form of standard test specimens under specified conditions such as those of pretreatment, temperature and humidity.

The method is suitable for use with rigid and semi-rigid non-reinforced, filled and fibre-reinforced plastics materials in the form of dumb-bell-shaped test specimens moulded directly or machined from sheets or moulded articles.

The method is intended to provide data for engineering-design and research and development purposes. Data for engineering-design purposes requires the use of extensometers to measure the gauge length of the specimen. Data for research or quality-control purposes may use the change in distance between the grips (nominal extension).

Tensile creep can vary significantly with differences in specimen preparation and dimensions and in the test environment. The thermal history of the test specimen can also have profound effects on its creep behaviour (see [Annex A](#)). Consequently, when precise comparative results are required, these factors are intended to be carefully controlled.

If tensile-creep properties are used for engineering-design purposes, the plastics materials are intended to be tested over a broad range of stresses, times and environmental conditions.

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*

ISO 527-1:2012, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

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:

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

3.1

creep

increase in strain with time when a constant force is applied

3.2

initial stress

σ

tensile force per unit area of the initial cross-section within the gauge length

Note 1 to entry: It is given by the formula

$$\sigma = \frac{F}{A}$$

where

F is the force, in newtons;

A is the average initial cross-sectional area within the narrow (gauge) section of the specimen, in square millimetres.

Note 2 to entry: It is expressed in megapascals.

3.3

extension

$(\Delta L)_t$

increase in the distance between the gauge marks, expressed in millimetres, at time t

Note 1 to entry: It is given by the formula

$$(\Delta L)_t = L_t - L_0$$

where

L_t is the gauge length, in millimetres, at any given time t during the test;

L_0 is the original gauge length, in millimetres, of the specimen after application of a preload but prior to application of the test load.

3.4

nominal extension

$(\Delta L^*)_t$

increase in the distance between the grips (increase in grip separation)

Note 1 to entry: It is given by the formula

$$(\Delta L^*)_t = L_t^* - L_0^*$$

where

L_t^* is the distance between the grips at any given time t during the test, in millimetres;

L_0^* is the initial distance between the grips, expressed in millimetres, holding the specimen after application of a preload but prior to application of the test load.

3.5 tensile-creep strain

ε_t

change in the distance between the gauge marks, relative to the initial distance, produced by the applied load at any given time t during a creep test

Note 1 to entry: It is given by the formula

$$\varepsilon_t = \frac{(\Delta L)_t}{L_0}$$

Note 2 to entry: It is expressed as a dimensionless ratio or as a percentage.

3.6 nominal tensile-creep strain

ε_t^*

change in the distance between the grips, relative to the initial distance, produced by the applied load at any given time t during a creep test

Note 1 to entry: It is given by the formula

$$\varepsilon_t^* = \frac{(\Delta L^*)_t}{L_0^*}$$

Note 2 to entry: It is expressed as a dimensionless ratio or as a percentage.

3.7 tensile-creep modulus

E_t

ratio of initial stress to tensile-creep strain

3.8 nominal tensile-creep modulus

E_t^*

ratio of initial stress to nominal tensile-creep strain

3.9 isochronous stress-strain curve

Cartesian plot of stress versus creep strain, at a specific time after application of the test load

3.10 time to rupture

period of time the specimen is under full load until rupture

3.11 creep-strength limit

initial stress which will just cause rupture ($\sigma_{B,t}$) or will produce a specified strain ($\sigma_{\varepsilon,t}$) at a specified time t , at a given temperature and relative humidity

3.12 recovery from creep

decrease in strain at any given time after completely unloading the specimen, expressed as a percentage of the strain just prior to the removal of the load

4 Apparatus

4.1 Gripping device, capable of ensuring that the direction of the load applied to the test specimen coincides as closely as possible with the longitudinal axis of the specimen. This ensures that the test