SLOVENSKI STANDARD
oSIST prEN ISO 899-2 rev:2023

01-april-2023

Nadomešča:

SIST EN ISO 899-2:2003/A1:2015

Polimerni materiali - Ugotavljanje lezenja - 2. del: Lezenje pri tritočkovni obremenitvi (ISO/DIS 899-2:2023)

Plastics - Determination of creep behaviour - Part 2: Flexural creep by three-point loading (ISO/DIS 899-2:2023)

Kunststoffe - Bestimmung des Kriechverhaltens - Teil 2: Zeitstand-Biegeversuch bei Dreipunkt-Belastung (ISO/DIS 899□2:2023)

Plastiques - Détermination du comportement au fluage - Partie 2: Fluage en flexion par mise en charge en trois points (ISO/DIS 899-2:2023)

Ta slovenski standard je istoveten z: **prEN ISO 899-2**

ICS:

83.080.01	Polimerni materiali na splošno	Plastics in general

oSIST prEN ISO 899-2 rev:2023 **en,fr,de**

DRAFT INTERNATIONAL STANDARD
ISO/DIS 899-2

ISO/TC **61**/SC **2** Secretariat: **SAC**

Voting begins on: **2023-02-08** Voting terminates on: **2023-05-03**

Plastics — Determination of creep behaviour —

Part 2: **Flexural creep by three-point loading**

Plastiques — Détermination du comportement au fluage —

Partie 2: Fluage en flexion par mise en charge en trois points

ICS: 83.080.01

IMPORTANT — Please use this updated version dated 2023-01-13, and discard any previous version of this DIS. The link to figure 4 has been corrected.

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 899-2:2023(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 899-2 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

This third edition cancels and replaces the second edition (ISO 899-2:2015), which has been technically revised.

ISO 899 consists of the following parts, under the general title *Plastics — Determination of creep behaviour*:

— *Part 1: Tensile creep*

— *Part 2: Flexural creep by three-point loading*

The main changes are as follows:

— the accuracy requirements for the deflection measurement device were updated

— the text of ISO 899-2:2003/AMD 1:2015 has replaced the existing text in the Annex A.2

— the normative references were updated

— the definition of creep was adapted for more clearness

A list of all parts in the ISO 899 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.

Plastics — Determination of creep behaviour —

Part 2:
Flexural creep by three-point loading

1 Scope

1.1 This part of ISO 899 specifies a method for determining the flexural creep of plastics in the form of standard test specimens under specified conditions such as those of pre-treatment, temperature and humidity. It applies only to a simple freely supported beam loaded at mid-span (three-point-loading test).

1.2 The method is suitable for use with rigid and semi-rigid non-reinforced, filled and fibre-reinforced plastics materials (see ISO 472 for definitions) test specimens moulded directly or machined from sheets or moulded articles.

Note The method may be unsuitable for certain fibre-reinforced materials due to differences in fibre orientation.

1.3 The method is intended to provide data for engineering-design, research and development purposes. Data for engineering-design purposes requires the use of a deflectometer to measure the deflection of the specimen.

1.4 The method may not be suitable for determining the flexural creep of rigid cellular plastics (attention is drawn in this respect to ISO 1209-1, *Cellular plastics, rigid — Flexural tests — Part 1: Bending test*, and ISO 1209-2, *Cellular plastics, rigid — Flexural tests — Part 2: Determination of flexural properties*).

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 62, *Plastics — Determination of water absorption*

ISO 178, *Plastics — Determination of flexural properties*

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 295, *Plastics — Compression moulding of test specimens of thermosetting materials*

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

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

ISO 472, *Plastics — Vocabulary*

ISO 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

ISO 10724-1, *Plastics — Injection moulding of test specimens of thermosetting powder moulding compounds (PMCs) — Part 1: General principles and moulding of multipurpose test specimens*

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

ISO 20753, *Plastics — Test specimens*

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 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
creep
increase in strain with time, measured from the first moment when the loading of the specimen started.

3.2
load
force applied to the test specimen at mid-span

Note 1 to entry: It is expressed in Newtons

3.3
flexural stress
σ
surface stress in the mid-span section of the test specimen

Note 1 to entry: It is expressed in megapascals.

Note 2 to entry: It is calculated from the relationship given in 7.1.3

3.4
deflection
s_t
distance over which the top or bottom surface of the test specimen at mid-span deviates from its unloaded original position during flexure

Note 1 to entry: It is expressed in millimetres.

3.5
flexural-creep strain
ε_t
strain at the surface of the test specimen produced by a stress at any given time t during a creep test, calculated in accordance with 7.1.4

Note 1 to entry: It is expressed as a dimensionless ratio or as a percentage.

3.6
flexural-creep modulus
E_t
ratio of flexural stress to flexural-creep strain, calculated as in 7.1.1

Note 1 to entry: It is expressed in megapascals.

3.7
flexural-creep compliance

Dt
ratio of flexural-creep strain to flexural stress, calculated as in 7.1.2

Note 1 to entry: It is expressed in gigapascals^{-1}

3.8
isochronous stress-strain curve
Cartesian plot of stress versus creep strain, at a specific time after application of the load to the specimen

3.9
time to rupture
period of time the specimen is under full load until rupture

3.10
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

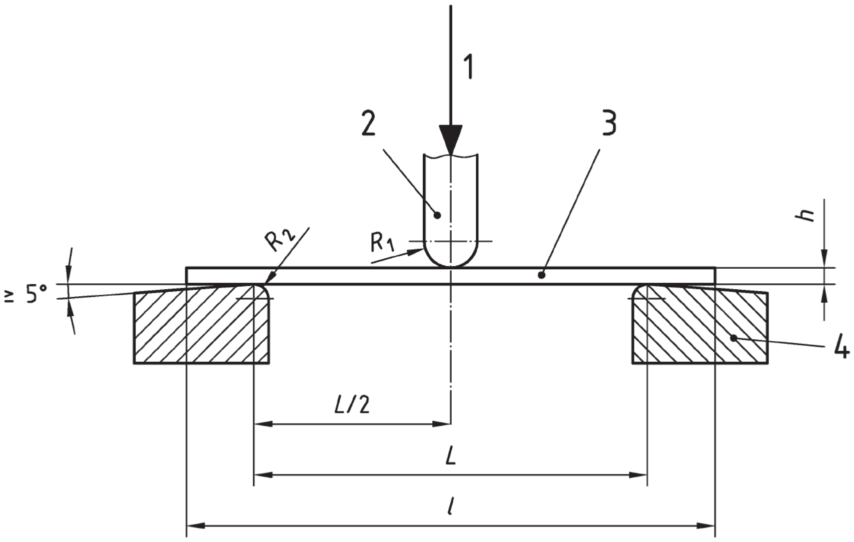
Note 1 to entry: It is expressed in millimetres

3.11
initial distance between specimen supports
span
L
initial distance between lines of contact between test specimen and supports (see Figure 1)

Note 1 to entry: It is expressed in millimetres

4 Apparatus

4.1 Test rack, comprising a rigid frame with two supports, one for each end of the test specimen, the distance between the supports being adjustable to (16 ± 1) times the thickness (height) of the specimen (see Figure 1) for normal specimens, or to greater than 17 times the thickness (height) of the specimen or a fixed distance (100 mm) for rigid unidirectional-fibre-reinforced test specimens (see 6.2). The test rack shall be levelled, and sufficient space shall be allowed below the specimen for the specimen to flex under constant loading at mid-span.



Key

1 applied force, *F*

2 loading edge

3 test specimen

4 support

L distance between supports

l specimen length

h specimen thickness

R_1 radius of the loading edge

R_2 radius of the supports

Figure 1 — Characteristics of flexural-creep apparatus

The radius R_1 of the loading edge and the radius R_2 of the supports shall conform to the values given in Table 1.

Table 1 — Radii of the loading edge and the supports

Values in millimetres

Thickness of test specimen	Radius of loading edge R_1	Radius of supports R_2
≤ 3	5 ± 0,1	2 ± 0,2
> 3	5 ± 0,1	5 ± 0,2

4.2 Loading system, capable of ensuring that the load is applied smoothly, without causing transient overloading, and that the load is maintained to within ±1 % of the desired load. In creep-to-rupture tests, provision shall be made to prevent any shocks which occur at the moment of rupture being transmitted to adjacent loading systems. The loading mechanism shall allow rapid, smooth and reproducible loading.

4.3 Deflection-measuring device, comprising any contactless or contact device capable of measuring the deflection of the specimen under load without influencing the specimen behaviour by mechanical effects (e.g. undesirable deformations, notches), other physical effects (e.g. heating of the specimen) or chemical effects.

The deflection measurement device shall conform to class 1 of ISO 9513. At its calibration, the initial position of the deflection measurement device shall conform to its position at the unloaded specimen before test.

4.4 Time-measurement device, accurate to 0,1 %.

4.5 Micrometer, reading to 0,01 mm or closer, for measuring the initial thickness and width of the test specimen.

4.6 Vernier callipers, accurate to 0,1 % of the span between the test supports or better, for determining the span.

5 Test specimens

Use test specimens of the same shape and dimensions as specified for the determination of flexural properties (see ISO 178).

6 Procedure

Flexural creep may 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 must carefully be controlled.

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

6.1 Conditioning and test atmosphere

Condition the test specimens as specified in the International Standard for the material under test. In the absence of any information on conditioning, use the most appropriate set of conditions specified in ISO 291, unless otherwise agreed by the interested parties.

The creep behaviour will be affected not only by the thermal history of the specimen under test, but also by the temperature and (where applicable) humidity used in conditioning. It is recommended that a conditioning-time ≥ t_{90} (see ISO 62) be used.

Conduct the test in the same atmosphere as used for conditioning, unless otherwise agreed upon by the interested parties, e.g. for testing at elevated or low temperatures. Ensure that the variation in temperature during the duration of the test remains within ±2 °C.

6.2 Measurement of test-specimen dimensions and distance between supports

Measure the dimensions of the conditioned test specimens in accordance with ISO 16012 and ISO 178.

For normal test specimens, adjust the initial distance L between the test specimen supports to

$$(16 \pm 1)\, h$$

where h is the thickness of the specimen.

In the case of rigid unidirectional-fibre-reinforced test specimens, the distance between the supports may be adjusted to a value > $17h$ or to a fixed distance of 100 mm if necessary to avoid delamination by shearing or delamination in the compression zone.

Measure the distance between the supports to within ±0,5 %.

6.3 Mounting the test specimens

Mount a conditioned and measured specimen symmetrically with its long axis at right angles to the supports and set up the deflection-measuring device as required.