SLOVENSKI STANDARD
SIST EN ISO 204:2018

01-december-2018

Nadomešča:
SIST EN ISO 204:2011

Kovinski materiali - Preskušanje nesoosnega lezenja pri nategu - Metoda preskušanja (ISO 204:2018)

Metallic materials - Uniaxial creep testing in tension - Method of test (ISO 204:2018)

Metallische Werkstoffe - Einachsiger Zeitstandversuch unter Zugbeanspruchung - Prüfverfahren (ISO 204:2018)

Matériaux métalliques - Essai de fluage uniaxial en traction - Méthode d'essai (ISO 204:2018)

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77.040.10 Mehansko preskušanje kovin Mechanical testing of metals

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Metallic materials - Uniaxial creep testing in tension - Method of test (ISO 204:2018)

Matériaux métalliques - Essai de fluage uniaxial en traction - Méthode d'essai (ISO 204:2018)

Metallische Werkstoffe - Einachsiger Zeitstandversuch unter Zugbeanspruchung - Prüfverfahren (ISO 204:2018)

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

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European foreword

This document (EN ISO 204:2018) has been prepared by Technical Committee ISO/TC 164 "Mechanical testing of metals" in collaboration with Technical Committee ECISS/TC 101 “Test methods for steel (other than chemical analysis)” the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by April 2019, and conflicting national standards shall be withdrawn at the latest by April 2019.

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.

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Endorsement notice

The text of ISO 204:2018 has been approved by CEN as EN ISO 204:2018 without any modification.

INTERNATIONAL STANDARD

ISO 204

Third edition
2018-08

Metallic materials — Uniaxial creep testing in tension — Method of test

Matériaux métalliques — Essai de fluage uniaxial en traction — Méthode d'essai

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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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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 164, *Mechanical testing of metals*, Subcommittee SC 1, *Uniaxial testing*.

This third edition cancels and replaces the second edition (ISO 204:2009), which has been technically revised. The main changes compared to the previous edition are as follows:

— Some of the symbols have been changed to achieve harmonization with the ISO 6892 series.

— For the purpose of this document, the terms “fracture” and “rupture” are interchangeable.

— The term “indicated temperature”, T_i, has been replaced by “corrected measured temperature”, T_c, with errors from all sources being taken into account and any systematic errors having been corrected. The terms “elongation” and “extension” have been clarified and aligned with the terms used in the ISO 6892 series. Elongation refers to the test piece deformation measured manually either during deliberate test interruptions or after fracture, whilst extension is determined by continuous measurement using an extensometer.

— Some information relating to the calibration of thermocouples has been transferred from an informative annex into the main body of the document.

— Some changes have been made to Table 1 and formulae have been amended using reference length, L_r.

— Equation E.1 (now Formula C.1) has been corrected.

— A new informative annex relating to computer compatible representation of standards has been added.

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

Creep is the phenomenon exhibited by materials which slowly deform when subjected to loading at elevated temperature. This document is concerned with the method used to measure such material behaviour.

Annexes are included concerning temperature measurement using thermocouples and their calibration, creep testing test pieces with circumferential V and blunt (Bridgman) notches, estimation of measurement uncertainty, methods of extrapolation of creep rupture life and information about computer compatible representation of standards.

NOTE 1 Information is still sought relating to the influence of off-axis loading or bending on the creep properties of various materials. Based on the future availability of quantitative data, consideration might be given as to whether the maximum amount of bending should be specified and an appropriate calibration procedure be recommended. The decision will need to be based on the availability of quantitative data[43].

NOTE 2 Information concerning the benefit of standards being produced in a computer compatible format is given in Annex F.

This document incorporates many recommendations developed through the European Creep Collaborative Committee (ECCC).

NOTE 3 Several different gauge lengths and reference lengths are specified in this document. These lengths reflect custom and practice used in different laboratories throughout the world. In some cases, the lengths are physically marked on the test piece as lines or ridges; in other cases, the length can be a virtual length based upon calculations to determine an appropriate length to be used for the determination of creep elongation. For some test pieces, L_r, L_o and L_e are the same length (see 3.1, 3.2 and 3.3). "Extension" is used for uninterrupted creep test with continuous measurement of the increase of the length of the test piece by using an extensometer. "Elongation" is mainly used for interrupted creep test with the manual measurement of the increase of the length of the test piece.

NOTE 4 For many applications, the term "strain" is synonymous with extension.

Metallic materials — Uniaxial creep testing in tension — Method of test

1 Scope

This document specifies the methods for

a) uninterrupted creep tests with continuous monitoring of extension,

b) interrupted creep tests with periodic measurement of elongation,

c) stress rupture tests where normally only the time to fracture is measured,

d) a test to verify that a predetermined time can be exceeded under a given force, with the elongation or extension not necessarily being reported.

NOTE A creep test can be continued until fracture has occurred or it can be stopped before fracture.

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 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 6892-2, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature*

ISO 7500-2, *Metallic materials — Verification of static uniaxial testing machines — Part 2: Tension creep testing machines — Verification of the applied force*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 https://www.iso.org/obp

3.1
reference length
L_r
base length used for the calculation of either percentage elongation or percentage extension

Note 1 to entry: A method to calculate this value is given in 7.5.

3.2
original gauge length
L_o
length between gauge length marks on the test piece measured at ambient temperature before the test

Note 1 to entry: In general, $L_o \geq 5D$.

3.3
extensometer gauge length
L_e
distance between the measuring points of the extensometer

3.4
parallel length
L_c
length of the parallel reduced section of the test piece

3.5
final gauge length after fracture
L_u
length between gauge length marks on the test piece measured after fracture, at ambient temperature, with the pieces carefully fitted back together with their axes in a straight line

3.6
original cross-sectional area
S_o
cross-sectional area of the parallel length as determined at ambient temperature prior to testing

3.7
minimum cross-sectional area after fracture
S_u
minimum cross-sectional area of the parallel length as determined at ambient temperature after fracture, with the pieces carefully fitted back together with their axes in a straight line

3.8
initial stress
R_o
applied force divided by the original cross-section area, S_o, of the test piece

3.9
extension
ΔL_e
increase of extensometer gauge length, L_e, at time t and at test temperature

Note 1 to entry: For further information, see 6.2.

3.10
elongation
ΔL_o
increase of original gauge length, L_o, at time t

Note 1 to entry: For further information, see 6.2.

3.11
percentage extension
e
extension at test temperature expressed as a percentage of the reference length, L_r, as given in Formula (1)

$$e = \frac{\Delta L_e}{L_r} \times 100 \qquad (1)$$

Note 1 to entry: See Figure 1.

3.12
percentage elongation
A
elongation expressed as a percentage of the reference length, L_r, as given in Formula (2)

$$A = \frac{\Delta L_o}{L_r} \times 100 \tag{2}$$

3.13
percentage elastic extension
e_e
extension at test temperature expressed as a percentage of the reference length, L_r, which is proportional to the initial stress, R_o

Note 1 to entry: This value can be calculated from the stress/percentage extension values during loading. See 8.4.2.

Note 2 to entry: See Figure 1.

3.14
percentage initial total extension
e_{ti}
extension at test temperature expressed as a percentage of the reference length, L_r, at end of loading with the initial stress, R_o

Note 1 to entry: See Figure 1.

3.15
percentage initial plastic extension
e_i
extension at end of loading and at test temperature with the initial stress, R_o, expressed as a percentage of the reference length, L_r, and determined as the difference between the percentage initial total extension, e_{ti}, and the percentage elastic extension, e_e, as given in Formula (3)

$$e_i = e_{ti} - e_e \tag{3}$$

Note 1 to entry: See Figure 1.

Note 2 to entry: This value represents the plastic extension during the loading phase.

3.16
percentage total extension
e_t
extension at the test force at time t and at test temperature, expressed as a percentage of the reference length, L_r

Note 1 to entry: See Figure 1.

3.17
percentage plastic extension
e_p
extension at time t and at test temperature determined as the difference between the percentage total extension, e_t, and the percentage elastic extension, e_e, expressed as a percentage of the reference length, L_r, as given in Formula (4)

$$e_p = e_t - e_e \tag{4}$$

Note 1 to entry: See Figure 1.