SLOVENSKI STANDARD
SIST EN ISO 6603-2:2023

01-september-2023

Polimerni materiali - Ugotavljanje prebodne odpornosti togih polimernih materialov - 2. del: Instrumentalni udarni preskus (ISO 6603-2:2023)

Plastics - Determination of puncture impact behaviour of rigid plastics - Part 2: Instrumented impact testing (ISO 6603-2:2023)

Kunststoffe - Bestimmung des Durchstoßverhaltens von festen Kunststoffen - Teil 2: Instrumentierter Schlagversuch (ISO 6603-2:2023)

Plastiques - Détermination du comportement des plastiques rigides perforés sous l'effet d'un choc - Partie 2: Essais de choc instrumentés (ISO 6603-2:2023)

Ta slovenski standard je istoveten z: **EN ISO 6603-2:2023**

ICS:

83.080.01	Polimerni materiali na splošno	Plastics in general

SIST EN ISO 6603-2:2023 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 6603-2

June 2023

ICS 83.080.01

Supersedes EN ISO 6603-2:2000

English Version

Plastics - Determination of puncture impact behaviour of rigid plastics - Part 2: Instrumented impact testing (ISO 6603-2:2023)

Plastiques - Détermination du comportement des plastiques rigides perforés sous l'effet d'un choc - Partie 2: Essais de choc instrumentés (ISO 6603-2:2023)

Kunststoffe - Bestimmung des Durchstoßverhaltens von festen Kunststoffen - Teil 2: Instrumentierter Schlagversuch (ISO 6603-2:2023)

This European Standard was approved by CEN on 26 May 2023.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword

This document (EN ISO 6603-2:2023) has been prepared by Technical Committee ISO/TC 61 "Plastics" in collaboration with Technical Committee CEN/TC 249 “Plastics” the secretariat of which is held by SIS.

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 December 2023, and conflicting national standards shall be withdrawn at the latest by December 2023.

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.

This document supersedes EN ISO 6603-2:2000.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO 6603-2:2023 has been approved by CEN as EN ISO 6603-2:2023 without any modification.

INTERNATIONAL STANDARD

ISO 6603-2

Third edition
2023-06

Plastics — Determination of puncture impact behaviour of rigid plastics —

Part 2: Instrumented impact testing

Plastiques — Détermination du comportement des plastiques rigides perforés sous l'effet d'un choc —

Partie 2: Essais de choc instrumentés

Reference number
ISO 6603-2:2023(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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

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 behavior,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 6603-2:2000), which has been technically revised.

The main changes are as follows:

— references to ISO 6603-1 were replaced by the corresponding text;

— normative references and bibliography were updated and completed;

— requirements for force measurement accuracy were revised;

— definitions for conditioning and test climate were updated;

— testing in a clamped situation were defined as the preferred method;

— precision data was added to Annex G.

A list of all parts in the ISO 6603 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 puncture impact behaviour of rigid plastics —

Part 2: Instrumented impact testing

1 Scope

This document specifies a test method for the determination of puncture impact properties of rigid plastics, in the form of flat specimens, using instruments for measuring force and deflection. It is applicable if a force-deflection or force-time diagram, recorded at nominal constant striker velocity, is necessary for detailed characterization of the impact behaviour.

The test method is applicable to specimens with a thickness between 1 mm to 4 mm.

The method is suitable for use with the following types of material:

— rigid thermoplastic moulding and extrusion materials, including filled, unfilled and reinforced compounds and sheets;

— rigid thermosetting moulding and extrusion materials, including filled and reinforced compounds, sheets and laminates;

— fibre-reinforced thermoset and thermoplastic composites incorporating unidirectional or multi-directional reinforcements such as mats, woven fabrics, woven rovings, chopped strands, combination and hybrid reinforcements, rovings, milled fibres and sheets made from pre-impregnated materials (prepregs).

The method is also applicable to specimens which are either moulded or machined from finished products, laminates and extruded or cast sheet.

The test results are comparable only if the conditions of preparation of the specimens, their dimensions and surfaces as well as the test conditions are the same. In particular, results determined on specimens of different thickness cannot be compared with one another (see Annex E). Comprehensive evaluation of the reaction to impact stress can be obtained by determinations made as a function of impact velocity and temperature for different material variables, such as crystallinity and moisture content.

The impact behaviour of finished products cannot be predicted directly from this test, but specimens may be taken from finished products (see above) for tests by this method.

Test data developed by this method is not intended to be used for design calculations. However, information on the typical behaviour of the material can be obtained by testing at different temperatures and impact velocities (see Annex D) by varying the thickness (see Annex E) and by testing specimens prepared under different conditions.

It is not the purpose of this document to give an interpretation of the mechanism occurring on every particular point of the force-deflection diagram. These interpretations are a task for scientific research.

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 293, *Plastics — Compression moulding of test specimens of thermoplastic materials*

ISO 294-3, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 3: Small plates*

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

ISO 1268-1, *Fibre-reinforced plastics — Methods of producing test plates — Part 1: General conditions*

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

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

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 following terms and definitions 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 https://www.electropedia.org/

3.1
impact velocity
v_0
velocity of the striker relative to the support at the moment of impact

Note 1 to entry: Impact velocity is expressed in metres per second (m/s).

3.2
force
F
force exerted by the striker on the test specimen in the direction of impact

Note 1 to entry: Force is expressed in newtons (N).

3.3
deflection
l
relative displacement between the striker and the specimen support, starting from the first contact between the striker and the test specimen

Note 1 to entry: Deflection is expressed in millimetres (mm).

3.4
energy
E
energy expended in deforming and penetrating the test specimen up to a deflection l

Note 1 to entry: Energy is expressed in joules (J).

Note 2 to entry: Energy is measured as the integral of the force-deflection curve starting from the point of impact up to a deflection l.

3.5
maximum force
F_M
maximum force which occurs during the test

Note 1 to entry: See Figures 1 to 4.

Note 2 to entry: Maximum force is expressed in newtons (N).

3.6
deflection at maximum force
l_M
deflection that occurs at maximum force F_M

Note 1 to entry: See Figures 1 to 4.

Note 2 to entry: Deflection at maximum force is expressed in millimetres (mm).

3.7
energy to maximum force
E_M
energy expended up to the deflection l_M at maximum force

Note 1 to entry: See Figures 1 to 4.

Note 2 to entry: Energy to maximum force is expressed in joules (J).

3.8
puncture deflection
l_P
deflection at which the force has dropped to half the maximum force F_M

Note 1 to entry: See Figures 1 to 4 and Note 3 to entry of 3.9.

Note 2 to entry: Puncture deflection is expressed in millimetres (mm).

3.9
puncture energy
E_P
energy expended up to the puncture deflection l_P

Note 1 to entry: See Figures 1 to 4.

Note 2 to entry: Puncture energy is expressed in joules (J).

Note 3 to entry: When testing tough materials, a transducer mounted at some distance from the impacting tip may record frictional force acting between the cylindrical part of the striker and the punctured material. The corresponding frictional energy shall not be included in the puncture energy, which, therefore, is restricted to that deflection, at which the force drops to half the maximum force F_M.

3.10
impact failure
mechanical behaviour of the material under test which may be either one of the following types:

a) YD yielding followed by deep drawing, see Figure 1

b) YS yielding followed by an at least partially stable cracking, see Figure 2

c) YU yielding followed by unstable cracking, see Figure 3

d) NY no yielding, see Figure 4

Note 1 to entry: The classification of the type of failure shall take into account the shape of the curve as well as the assessment of the broken specimen.