SLOVENSKI STANDARD
oSIST prEN ISO 13802:2024

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Polimerni materiali - Preverjanje strojev z nihalom za ugotavljanje udarnih lastnosti - Preskušanje z udarnim preskusom Charpy, Izod in natezno-udarno preskušanje (ISO/DIS 13802:2024)

Plastics - Verification of pendulum impact-testing machines - Charpy, Izod and tensile impact-testing (ISO/DIS 13802:2024)

Kunststoffe - Verifizierung von Pendelschlagwerken - Charpy-, Izod- und Schlagzugversuch (ISO/DIS 13802:2024)

Plastiques - Vérification des machines d'essai de choc pendulaire - Essais de choc Charpy, Izod et de choc-traction (ISO/DIS 13802:2024)

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ISO/DIS 13802

Plastics — Verification of pendulum impact-testing machines — Charpy, Izod and tensile impact-testing

Plastiques — Vérification des machines d'essai de choc pendulaire — Essais de choc Charpy, Izod et de choc-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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 properties*.

This third edition cancels and replaces the second edition (ISO 13802:2015), which has been technically revised. This version incorporates the following changes:

— Removed clauses 3.6 (Gravity length) and 3.7 (Gyration length) and re-enumerate Clause 3 accordingly;

— Corrected the measurement unit and the requirement in 6.2.4;

— Updated acceptance criteria in 6.6.3;

— Updated the references in the Note 2 of the Clause 7;

— Corrected value D_1 in Table A.1 because not in agreement with same value indicated in Table 4;

— Corrected value p_1 in Table B.1 because not in agreement with same value indicated in Table 4;

— Corrected the Formulas (D.4) and (D.5) in Annex D.

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

A pendulum impact-testing machine verified in accordance with this International Standard, and assessed as satisfactory, is considered suitable for impact testing with unnotched and notched test specimens of different types.

Annex A details design requirements for Charpy testing machines.

Annex B details design requirements for Izod testing machines.

Annex C details design requirements for tensile impact machines.

Annex D explains how to calculate the ratio of frame mass to pendulum mass required to avoid errors in the impact energy.

Annex E explains deceleration of pendulum during impact.

Annex F details design requirements for one type of gauge used to verify striker and anvil/support alignment for Charpy testing machine.

Plastics — Verification of pendulum impact-testing machines — Charpy, Izod and tensile impact-testing

1 Scope

This International Standard specifies frequency and methods for the verification of pendulum impact-testing machines used for the Charpy impact test, Izod impact test, and tensile impact test described in ISO 179-1, ISO 180, and ISO 8256, respectively. Verification of instrumented impact machines is covered insofar as the geometrical and physical properties of instrumented machines are identical to non-instrumented machines. The force/work verification of instrumented machines is not covered in this International Standard.

This International Standard is applicable to pendulum-type impact-testing machines, of different capacities and/or designs, with the geometrical and physical properties defined in Clause 5.

Methods are described for verification of the geometrical and physical properties of the different parts of the test machine. The verification of some geometrical properties is difficult to perform on the assembled instrument. It is, therefore, assumed that the manufacturer is responsible for the verification of such properties and for providing reference planes on the instrument that enable proper verification in accordance with this International Standard.

These methods are for use when the machine is being installed, has been repaired, has been moved, or is undergoing periodic checking.

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 179-1, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test*

ISO 179-2, *Plastics — Determination of Charpy impact properties — Part 2: Instrumented impact test*

ISO 180, *Plastics — Determination of Izod impact strength*

ISO 8256, *Plastics — Determination of tensile-impact strength*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 75-1 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
verification
proof, with the use of calibrated standards or standard reference materials, that the calibration of an instrument is acceptable

3.2
calibration
set of operations that establish, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system and values corresponding to appropriate standards or known values derived from standards

3.3
period of oscillation of the pendulum
T_P
period, expressed in seconds, *s*, of a single complete oscillation of the pendulum, oscillating at angles of oscillation of less than 5°, on average, to each side of the vertical

3.4
centre of percussion
point on a pendulum at which a perpendicular impact in the plane of swing does not cause reaction forces at the axis of rotation of the pendulum

3.5
pendulum length
L_P
distance, expressed in metres, between the axis of rotation of the pendulum and the *centre of percussion* (3.4) and it is the distance from the axis of rotation where the mass of a pendulum would have to be concentrated to have the same period of swing, T_P, as the actual pendulum

3.6
impact length
L_I
distance, expressed in metres, between the axis of the rotation of the pendulum and the point of impact of the striking edge at the centre of the specimen face

3.7
release angle
α_0
angle, expressed in degrees, relative to the vertical, from which the pendulum is released

Note 1 to entry: Usually, the test specimen is impacted at the lowest point of the pendulum swing ($\alpha_0 = 0°$). In this case, the release angle will also be the angle of fall [see Figure 1b)].

3.8
impact velocity
v_I
velocity, expressed in metres per second, of the pendulum at the moment of impact

3.9
potential energy
E
potential energy, expressed in joules, of the pendulum in its starting position, relative to its position at impact

3.10
impact energy
W
energy, expressed in joules, required to deform, break, and push away the test specimen

3.11
frame
part of the machine carrying the pendulum bearings, the supports, the vice and/or clamps, the measurement instruments, and the mechanism for holding and releasing the pendulum

Note 1 to entry: The mass of the frame, m_F, is expressed in kilograms.

3.12
base
part of the framework of the machine located below the horizontal plane of the supports

3.13
anvil
portion of the machine that serves to properly position the test piece for impact, with respect to the striker and the test piece supports, and supports the test piece under the force of the strike

3.14
test specimen supports
portion of the machine that serves to properly position the test specimen for impact, with respect to the centre of percussion of the pendulum, the striker, and the anvils

3.15
striker
portion of the pendulum that contacts the test piece

3.16
period of oscillation of the frame
T_F
period, expressed in seconds, of the freely decaying, horizontal oscillation of the frame and it characterizes the oscillation of the frame vibrating against the stiffness of the (resilient) mounting, e.g. a test bench and/or its foundation (which may include damping material for instance) (see Annex D)

3.17
mass of the pendulum
$m_{P,max}$
mass, expressed in kilograms, of the heaviest pendulum used

3.18
Izod/Charpy impact reference specimen
specimen made from stainless steel 80 mm ± 0,05 mm in length and of rectangular section, 10 mm ± 0,02 mm in height, and 10 mm ± 0,02 mm in width

3.19
half-height Charpy impact reference specimen
specimen made from stainless steel 80 mm ± 0,05 mm in length and of rectangular section, 5 mm ± 0,02 mm in height, and 10 mm ± 0,02 mm in width

3.20
tensile impact reference specimen
specimen made from stainless steel 80 mm ± 0,05 mm in length and of rectangular section, 10 mm ± 0,02 mm in height, and 4 mm ± 0,02 mm in width

4 Measurement instruments

The verification methods described in this International Standard call for the use of straight edges, vernier calipers, set squares, levels and dynamometers, load cells or scales, and timing devices to check if the geometrical and physical properties of the components of the test machine conform to the requirements given in this International Standard.

These measurement instruments shall be accurate enough to measure the parameters within the tolerance limits given in Clause 6 (Table 4).

5 Description of a pendulum impact-testing machine

5.1 Types of pendulum impact-testing machines

Three different types of test machines are covered by this International Standard. Annex A contains details of construction and performance of a machine configured for Charpy testing. Figure A.1 shows a typical example of a Charpy test machine. Important values to be verified are listed in Table A.1. Test conditions are found in ISO 179.

Annex B contains details of construction and performance of a machine configured for Izod testing. Figure B.1 shows a typical example of an Izod test machine. Important values to be verified are listed in Table B.1. Test conditions are found in ISO 180.

Annex C contains details of construction and performance of a machine configured for tensile impact testing. Figure C.1 and Figure C.2 show typical examples of tensile impact-testing machines. Important values to be verified are listed in Table C.1. Test conditions are found in ISO 8256.

5.2 Testing machine components

A pendulum impact testing machine consists of the following parts:

5.2.1 Machine frame — The base of the machine and the structure supporting the pendulum

5.2.1.1 Bearings.

5.2.1.2 Mechanism for holding and releasing the pendulum.

5.2.1.3 Base.

5.2.2 Pendulum

5.2.2.1 Pendulum rod or compound (bifurcated) design.

5.2.2.2 Striker, with striking edge for Charpy or Izod impact tests or with striking surfaces or clamps for tensile impact testing (see ISO 8256, test methods A and B respectively).

5.2.2.3 Add-on weights (optional), for increasing potential energy capacity of pendulum.

NOTE There are several pendulum designs available, and they are acceptable if they meet the requirements of this International Standard.

5.2.3 Test specimen anvils, supports, clamps and/or holders

5.2.3.1 Anvils and test specimen supports, for Charpy impact testing.

The Charpy test supports and anvils shall be located one on each side of the plane of swing of the pendulum. The anvils shall be installed perpendicular to the supports and normal to the plane of swing of the pendulum. Essentially, the specimen rests on the supports and the anvil takes the reaction from the impact on the specimen.

NOTE Recesses in the supports to accommodate flash on specimens are permitted.

5.2.3.2 Vice, for Izod impact testing.

5.2.3.3 Clamps or stops, for tensile impact testing (see ISO 8256, methods A and B).