BS EN ISO 179-1:2010

BSI Standards Publication

Plastics — Determination of Charpy impact properties

Part 1: Non-instrumented impact test (ISO 179-1:2010)

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee PRI/21, Testing of plastics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

This document (EN ISO 179-1:2010) 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 NBN.

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of an identical text or by endorsement, at the latest by December 2010, and conflicting national standards shall be withdrawn at the latest by December 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 179-1:2000.

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Endorsement notice

The text of ISO 179-1:2010 has been approved by CEN as a EN ISO 179-1:2010 without any modification.

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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.

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ISO 179-1 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

This second edition cancels and replaces the first edition (ISO 179-1:2000), which has been technically revised. The main changes are as follows:

— a new subclause (6.5) has been added, defining the span between the specimen supports and indicating a convenient position at which it can be measured;

— a new annex, Annex C, has been added, giving a method of measuring the radius of the notch in a notched specimen.

This second edition also incorporates the Amendment ISO 179-1:2000/Amd.1:2005.

ISO 179 consists of the following parts, under the general title *Plastics — Determination of Charpy impact properties*:

— *Part 1: Non-instrumented impact test*

— *Part 2: Instrumented impact test*

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INTERNATIONAL STANDARD ISO 179-1:2010(E)

Plastics — Determination of Charpy impact properties —

Part 1: Non-instrumented impact test

1 Scope

1.1 This part of ISO 179 specifies a method for determining the Charpy impact strength of plastics under defined conditions. A number of different types of specimen and test configurations are defined. Different test parameters are specified according to the type of material, the type of test specimen and the type of notch.

1.2 The method can be used to investigate the behaviour of specified types of specimen under the impact conditions defined and for estimating the brittleness or toughness of specimens within the limitations inherent in the test conditions. It can also be used for the determination of comparative data from similar types of material.

1.3 The method has a greater range of applicability than that given in ISO 180[1] and is more suitable for the testing of materials showing interlaminar shear fracture or of materials exhibiting surface effects due to environmental factors.

1.4 The method is suitable for use with the following range of materials:

— rigid thermoplastic moulding and extrusion materials (including filled and reinforced compounds in addition to unfilled types) and rigid thermoplastics sheets;

— rigid thermosetting moulding materials (including filled and reinforced compounds) and rigid thermosetting sheets (including laminates);

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

— thermotropic liquid-crystal polymers.

1.5 Notched samples are not normally suitable for use with rigid cellular materials, long-fibre-reinforced composites or thermotropic liquid-crystal polymers. In these cases, unnotched samples may be used.

1.6 The method is suited to the use of specimens moulded to the chosen dimensions, machined from the central portion of a standard multipurpose test specimen (see ISO 3167) or machined from finished or semifinished products such as mouldings, laminates and extruded or cast sheet.

1.7 The method specifies preferred dimensions for the test specimen. Tests which are carried out on specimens of different dimensions or with different notches, or specimens which are prepared under different conditions, might produce results which are not comparable. Other factors, such as the energy capacity of the apparatus, the impact velocity and the conditioning of the specimens can also influence the results. Consequently, when comparative data are required, these factors must be carefully controlled and recorded.

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1.8 The method should not be used as a source of data for design calculations. Information on the typical behaviour of a material can be obtained, however, by testing at different temperatures, by varying the notch radius and/or the specimen thickness and by testing specimens prepared under different conditions.

2 Normative references

The following referenced documents are indispensable for the application 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 294-1, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 1: General principles, and moulding of multipurpose and bar test specimens*

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 1268-11, *Fibre-reinforced plastics — Methods of producing test plates — Part 11: Injection moulding of BMC and other long-fibre moulding compounds — Small plates*

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

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

ISO 3167, *Plastics — Multipurpose test specimens*

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 13802, *Plastics — Verification of pendulum impact-testing machines — Charpy, Izod and tensile impact-testing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
Charpy unnotched impact strength
a_{cU}
impact energy absorbed in breaking an unnotched specimen, referred to the original cross-sectional area of the specimen

NOTE It is expressed in kilojoules per square metre (kJ/m^2).

3.2
Charpy notched impact strength
a_{cN}
impact energy absorbed in breaking a notched specimen, referred to the original cross-sectional area of the specimen at the notch, where N = A, B or C, depending on the notch type (see 6.3.1.1.2)

NOTE It is expressed in kilojoules per square metre (kJ/m^2).

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3.3
edgewise impact
e
direction of blow parallel to the dimension b, with impact on the narrow longitudinal surface $h \times l$ of the specimen (see Figure 1, left, and Figures 2 and 4)

3.4
flatwise impact
f
direction of blow parallel to the dimension h, with impact on the broad longitudinal surface $b \times l$ of the specimen (see Figure 1, right, and Figures 3 and 4)

3.5
normal impact
n
⟨laminar-reinforced plastics⟩ impact with the direction of blow normal to the plane of reinforcement (see Figure 4)

3.6
parallel impact
p
⟨laminar-reinforced plastics⟩ impact with the direction of blow parallel to the plane of reinforcement (see Figure 4)

4 Principle

The test specimen, supported near its ends as a horizontal beam, is impacted by a single blow of a striker, with the line of impact midway between the supports, and bent at a high, nominally constant, velocity.

In the case of edgewise impact with notched specimens, the line of impact is directly opposite the single notch (see Figure 1, left, and Figure 2).

5 Apparatus

5.1 Test machine

The principles, characteristics and verification of suitable test machines are detailed in ISO 13802.

ISO 13802 describes partial verification and full verification. In the case of full verification, some items are difficult to verify when the apparatus is assembled. Such verifications are assumed to be incumbent on the manufacturer.

5.2 Micrometers and gauges

Micrometers and gauges capable of measuring the essential dimensions of test specimens to an accuracy of 0,02 mm are required. For measuring the dimension b_N of notched specimens, the micrometer shall have a spindle with a measuring tip having a suitable profile to fit the shape of the notch.

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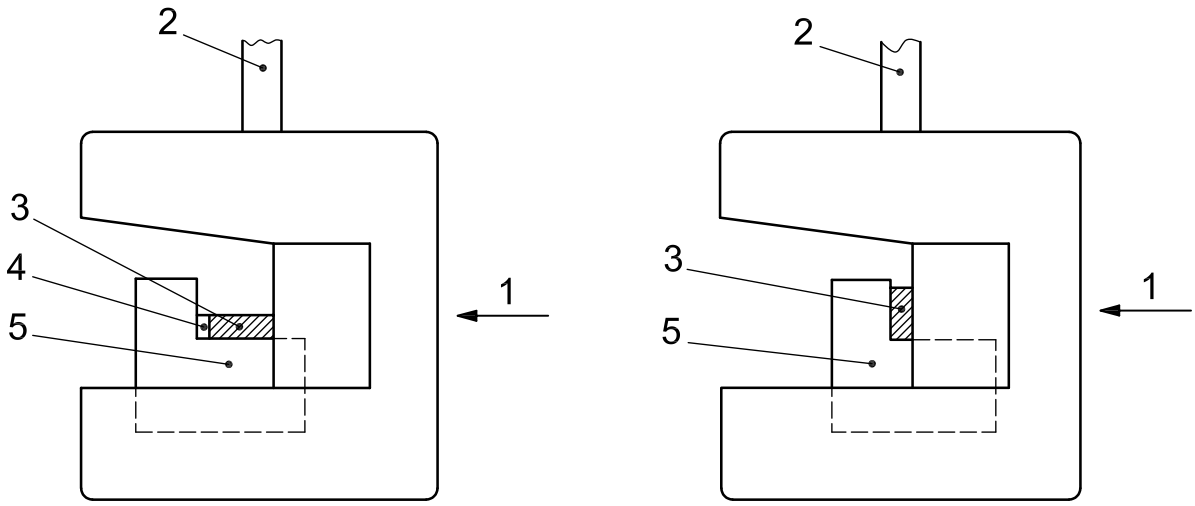

a) Edgewise impact **b) Flatwise impact**

Key

1 direction of blow
2 rod of pendulum
3 test specimen
4 notch
5 support

Figure 1 — Striking edge and support blocks for type 1 test specimen at moment of impact

6 Test specimens

6.1 Preparation

6.1.1 Moulding and extrusion compounds

Specimens shall be prepared in accordance with the relevant material specification. The specimens shall be either directly compression moulded in accordance with ISO 293 or ISO 295 or injection moulded from the material in accordance with ISO 294-1, ISO 294-3 or ISO 10724-1, as appropriate, or machined in accordance with ISO 2818 from sheet that has been compression or injection moulded from the compound. Type 1 specimens may be cut from multipurpose test specimens complying with ISO 3167, type A.

6.1.2 Sheets

Specimens shall be machined from sheets in accordance with ISO 2818.

6.1.3 Long-fibre-reinforced materials

A panel shall be prepared in accordance with ISO 1268-11 or another specified or agreed upon preparation procedure. Specimens shall be machined in accordance with ISO 2818.

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