

---

**Polimerni materiali - Določanje udarne žilavosti po Charpyju**

Plastics -- Determination of Charpy impact strength

Plastiques -- Détermination de la résistance au choc Charpy

Ta slovenski standard je istoveten z: **ISO 179:1993**[SIST ISO 179:1996](https://standards.iteh.ai/catalog/standards/sist/452a10e4-1aa7-42bf-8649-3b0d96020554/sist-iso-179-1996)<https://standards.iteh.ai/catalog/standards/sist/452a10e4-1aa7-42bf-8649-3b0d96020554/sist-iso-179-1996>**ICS:**

83.080.01	Polimerni materiali na splošno	Plastics in general
-----------	--------------------------------	---------------------

**SIST ISO 179:1996****en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST ISO 179:1996

<https://standards.iteh.ai/catalog/standards/sist/452a10e4-1aa7-42bf-8649-3b0d96020554/sist-iso-179-1996>

INTERNATIONAL  
STANDARD

**ISO**  
**179**

Second edition  
1993-05-15

Corrected and reprinted  
1993-08-15

---

---

**Plastics — Determination of Charpy impact  
strength**

**iTeh STANDARD PREVIEW**  
*Plastiques — Détermination de la résistance au choc Charpy*  
**(standards.iteh.ai)**

SIST ISO 179:1996

<https://standards.iteh.ai/catalog/standards/sist/452a10e4-1aa7-42bf-8649-3b0d96020554/sist-iso-179-1996>



Reference number  
ISO 179:1993(E)

## 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.

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.

International Standard ISO 179 was prepared by Technical Committee ISO/TC 61, *Plastics*, Sub-Committee SC 2, *Mechanical properties*.

This second edition cancels and replaces the first edition (ISO 179:1982), which has been revised in the following ways:

- The recommended specimen types for testing moulding materials are reduced to one only, which can be taken from the multipurpose test specimen complying with ISO 3167 by simple machining.
- The notch types are reduced to three only: V-type, 45°, with different notch base radii.
- The preferred direction of blow is changed from "flatwise" (parallel to the dimension thickness) to "edgewise" (parallel to the dimension width) in order to align the test method with that of the Izod test according to ISO 180.
- Special test methods are included for laminated sheets in order to respect the thicknesses of semifinished products and interlaminar shear failure.
- The designation of sizes are harmonized with those of a great number of other International Standards for testing plastics, in accordance with ISO 31.

© ISO 1993

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization  
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

- The method designations are harmonized with the modifications described above (direction of blow and types of notch).

Annex A of this International Standard is for information only.

## **iTeh STANDARD PREVIEW (standards.iteh.ai)**

SIST ISO 179:1996

<https://standards.iteh.ai/catalog/standards/sist/452a10e4-1aa7-42bf-8649-3b0d96020554/sist-iso-179-1996>

**iTeh STANDARD PREVIEW**  
This page intentionally left blank  
**(standards.iteh.ai)**

SIST ISO 179:1996

<https://standards.iteh.ai/catalog/standards/sist/452a10e4-1aa7-42bf-8649-3b0d96020554/sist-iso-179-1996>

# Plastics — Determination of Charpy impact strength

## 1 Scope

**1.1** This International Standard 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 is 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.

The method has a greater range of applicability than that given in ISO 180 (Izod)<sup>1)</sup> and is more suitable for the testing of materials showing interlaminar shear fracture or of materials exhibiting surface effects due to environmental factors.

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

- rigid thermoplastics moulding and extrusion materials, including filled and reinforced compounds in addition to unfilled types; rigid thermoplastics sheets;
- rigid thermosetting moulding materials, including filled and reinforced compounds; rigid thermosetting sheets, including laminates;
- fibre-reinforced thermoset and thermoplastics composites incorporating unidirectional or non-unidirectional reinforcements such as mat, woven fabrics, woven rovings, chopped strands, combination and hybrid reinforcements, rovings and milled fibres; sheets made from pre-impregnated materials (prepregs);
- thermotropic liquid-crystal polymers.

The method is not normally suitable for use with rigid cellular materials and sandwich structures containing cellular material. Also, notched specimens are not normally used for long-fibre-reinforced composites or for thermotropic liquid-crystal polymers.

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

**1.5** The method specifies preferred dimensions for the test specimen. Tests which are carried out on specimens of different dimensions and notches, or on specimens which are prepared under different conditions, may produce results which are not comparable. Other factors, such as the energy capacity of the pendulum, its 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.

**1.6** The method should not be used as a source of data for design calculations of components. 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 thickness and by testing specimens prepared under different conditions.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

1) ISO 180:1993, *Plastics — Determination of Izod impact strength*.

## ISO 179:1993(E)

Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing*.

ISO 293:1986, *Plastics — Compression moulding test specimens of thermoplastic materials*.

ISO 294:—<sup>2)</sup>, *Plastics — Injection moulding of test specimens of thermoplastic materials*.

ISO 295:1991, *Plastics — Compression moulding of test specimens of thermosetting materials*.

ISO 1268:1974, *Plastics — Preparation of glass fibre reinforced, resin bonded, low-pressure laminated plates or panels for test purposes*.

ISO 2557-1:1989, *Plastics — Amorphous thermoplastics — Preparation of test specimens with a specified maximum reversion — Part 1: Bars*.

ISO 2557-2:1986, *Plastics — Amorphous thermoplastics — Preparation of test specimens with a specified reversion — Part 2: Plates*.

ISO 2602:1980, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*.

ISO 2818:—<sup>3)</sup>, *Plastics — Preparation of test specimens by machining*.

ISO 3167:1993, *Plastics — Multipurpose test specimens*.

## 3 Definitions

For the purposes of this International Standard, the following definitions apply.

**3.1 Charpy impact strength of unnotched specimens,  $a_{CU}$ :** Impact energy absorbed in breaking an unnotched specimen, referred to the original cross-sectional area of the specimen.

It is expressed in kilojoules per square metre (kJ/m<sup>2</sup>).

**3.2 Charpy impact strength of notched specimens,  $a_{CN}$ :** 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).

2) To be published. (Revision of ISO 294:1975)

3) To be published. (Revision of ISO 2818:1980)

It is expressed in kilojoules per square metre (kJ/m<sup>2</sup>).

**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 5).

**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 5).

**3.5 normal impact (n):** Direction of blow normal to the plane of reinforcement (see figure 5).

It is used for laminar-type reinforced plastics.

**3.6 parallel impact (p):** Direction of blow parallel to the plane of reinforcement (see figure 5).

## 4 Principle

The test specimen, supported as a horizontal beam, is broken by a single swing of a pendulum, with the line of impact midway between the supports.

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 Testing machine

**5.1.1** The testing machine shall be of the pendulum type and shall be of rigid construction. It shall be capable of measuring the impact energy,  $W$ , absorbed in breaking a test specimen. The value of this energy is defined as the difference between the initial energy,  $E$ , of the pendulum and the energy remaining in the pendulum after breaking the test specimen. The energy shall be accurately corrected for losses due to friction and air resistance (see table 1 and 7.4).

**5.1.2** The machine shall have the characteristics shown in table 1.

In order to apply the test to the full range of materials specified in 1.3, it is necessary to use more than one machine or to use a set of interchangeable pendulums (see 7.3). It is not advisable to compare results obtained with different pendulums. The frictional losses shall be periodically checked.

**Table 1 — Characteristics of pendulum impact testing machines**

Energy <i>E</i> (nominal) J	Velocity of impact <i>v</i> <sub>0</sub> m/s	Maximum permissible frictional loss without specimen J	Permissible error <sup>1)</sup> after correction with specimen J
0,5 1,0 2,0 4,0 5,0	2,9 (± 10 %)	0,02	0,01 0,01 0,01 0,02 0,02
7,5 15,0 25,0 50,0	3,8 (± 10 %)	0,04 0,05 0,10 0,20	0,05 0,05 0,10 0,10

1) The permissible error shall not be exceeded within the 10 % to 80 % range of the pendulum capacity.

where

*g*<sub>n</sub> is the standard acceleration of free fall, in metres per second squared (9,81 m/s<sup>2</sup>);

*T* is the period, in seconds, of a single complete swing (to and fro) determined from at least 50 consecutive and uninterrupted swings (known to an accuracy of 1 part in 2 000). The angle of swing shall be less than 5° to each side of the centre.

**5.1.6** The test specimen supports shall be two rigidly mounted smooth blocks, arranged so that the longitudinal axis of a perfectly rectangular test specimen is horizontal to within 1 part in 200, and the striking face of such a test specimen is parallel to the striking edge of the pendulum to within 1 part in 200 at the moment of impact. The specimen supports shall not inhibit the movement of the specimen.

The shape of the supports shall be as shown in figure 1. The span, *L*, is the distance between the contact lines of the specimen on the supports and shall be as specified in table 2. Means shall be provided to centre test specimens, in relation to the striker, to within ± 0,5 mm. Separate support blocks may be required for each type of test specimen.

**5.1.3** The machine shall be securely fixed to a foundation having a mass at least 40 times that of the heaviest pendulum in use. The foundation shall be capable of being adjusted so that the striker and supports are as specified in 5.1.4 and 5.1.6.

**5.1.4** The striking edge of the pendulum shall be hardened steel tapered to an included angle of 30° ± 1° and shall be rounded to a radius *R*<sub>1</sub> = 2 mm ± 0,5 mm. It shall pass midway, to within ± 0,2 mm, between the test specimen supports, and shall be aligned so that it contacts the full width or thickness of rectangular test specimens. The line of contact shall be perpendicular, within ± 2°, to the longitudinal axis of the test specimen.

**5.1.5** The distance between the axis of rotation and the point of impact at the centre of the specimen shall be within ± 1 % of the pendulum length *L*<sub>p</sub>.

NOTE 1 The pendulum length *L*<sub>p</sub>, in metres, may be determined experimentally from the period of small amplitude oscillations of the pendulum by means of the following equation:

$$L_p = \frac{g_n}{4\pi^2} \times T^2 \quad \dots (1)$$

## 5.2 Micrometers and gauges

Micrometers and gauges suitable for measuring the essential dimensions of test specimens to an accuracy of 0,02 mm are required. For measuring the dimension *b*<sub>N</sub> of notched specimens, the micrometer shall be fitted with an anvil of width 2 mm to 3 mm and of suitable profile to fit the shape of the notch.

## 6 Test specimens

### 6.1 Preparation

#### 6.1.1 Moulding or extrusion compounds

Specimens shall be prepared in accordance with the relevant material specification. When none exists, or unless otherwise specified, specimens shall be either directly compression moulded or injection moulded from the material in accordance with ISO 293, ISO 294, ISO 295, ISO 2557-1 or ISO 2557-2 as appropriate, or machined in accordance with ISO 2818 from sheet that has been compression or injection moulded from the compound.

NOTE 2 Type 1 specimens may be cut from multi-purpose test specimens complying with ISO 3167 type A.