ISO 179 Plastics â€" Determination of Charpy Impact Properties / Brief Test Method and Required Equipment

Description

5 Apparatus

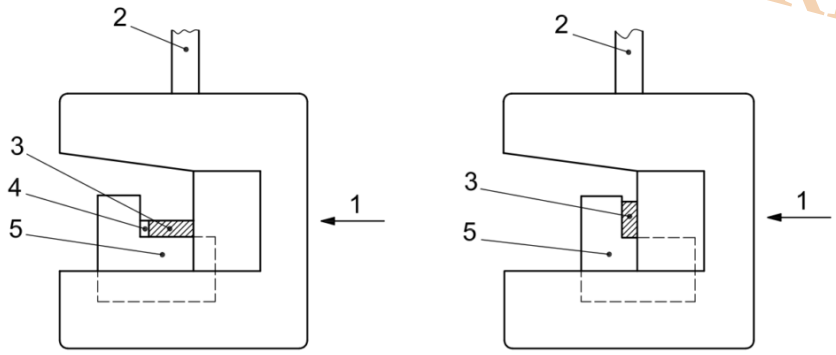
5.1 Test machine

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 bN 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

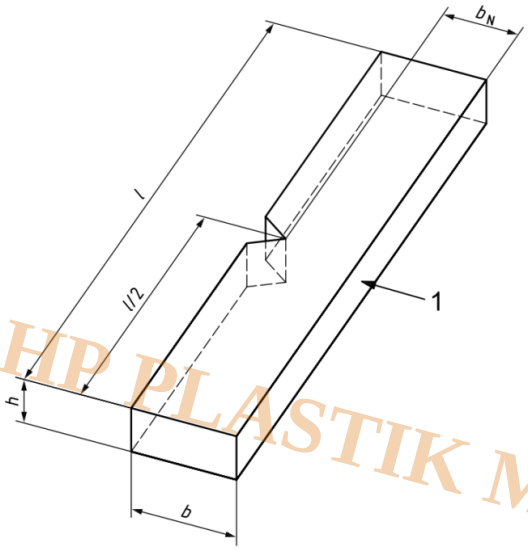
Specimens shall be prepared in accordance with the relevant material specification. The specimens shall be either directly compression moulded in accordance with ISO 293 or ISO 295 or injection moulded from the material in accordance with ISO 294-1, ISO 294-3 or ISO 10724-1, as appropriate, or machined 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.

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6.1.2 Sheets

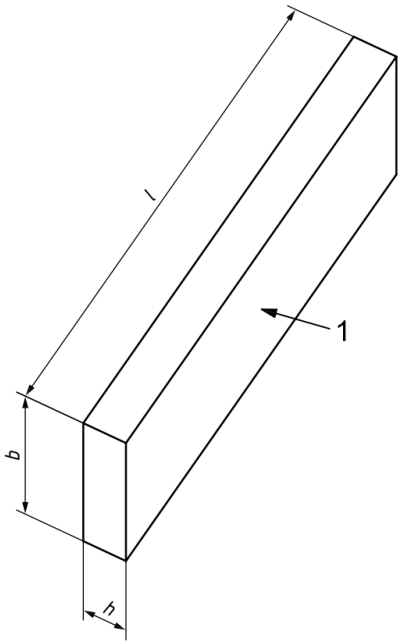
Specimens shall be machined from sheets in accordance with ISO 2818.

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.



Key
1 direction of blow

Figure 2 — Charpy edgewise impact (e) with single-notched specimen

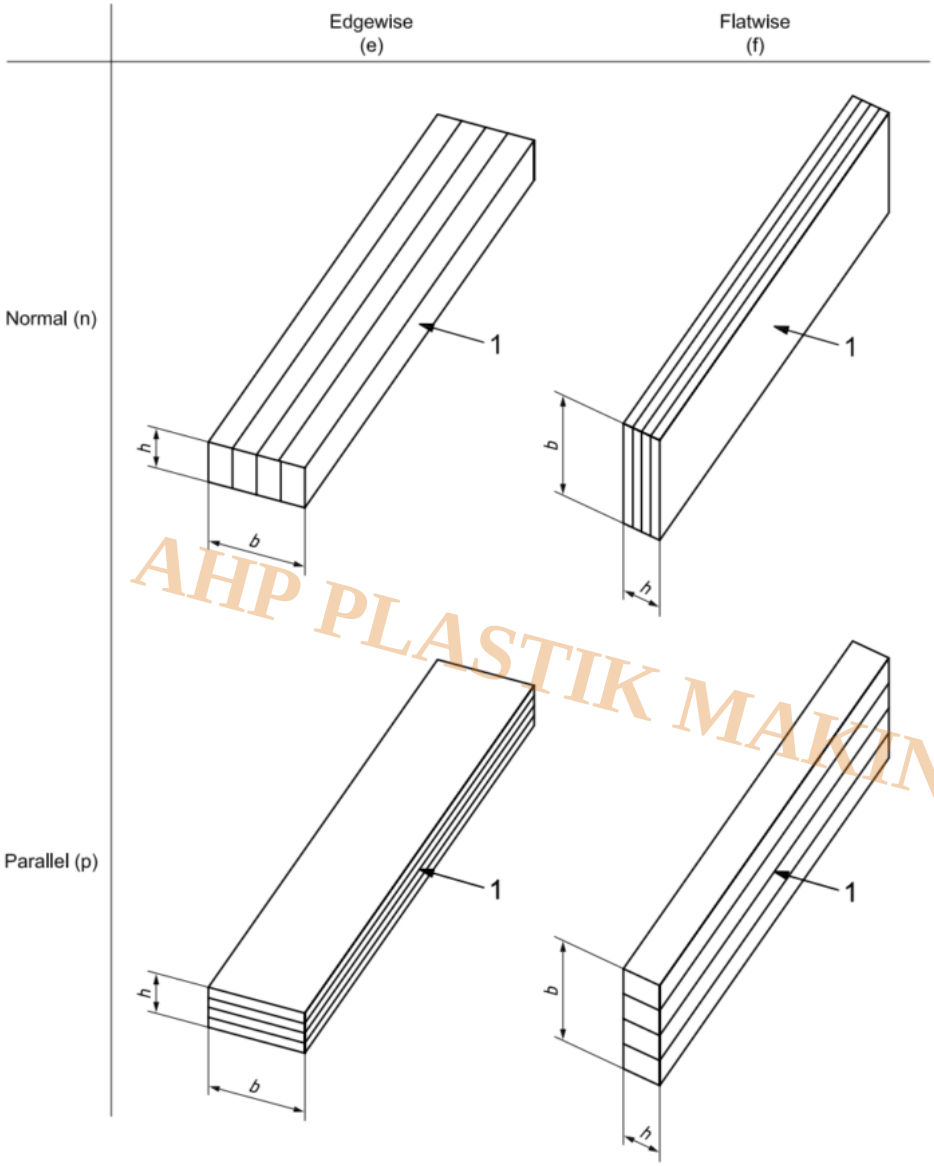


Key
1 direction of blow

Figure 3 — Charpy flatwise impact (f)

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Key

1 direction of blow

Edgewise (e) and flatwise (f) indicate the direction of the blow with respect to the specimen thickness, *h*, and specimen width, *b*. Normal (n) and parallel (p) indicate the direction of the blow with respect to the laminate plane.

The Charpy "fn" and "ep" tests are used for laminates, while both the Charpy "en" and "ep" tests are used for other materials. The Charpy "fn" and "fp" tests are used for testing materials exhibiting surface effects.

Figure 4 — Scheme of designations describing the direction of blow

6.1.4 Checking

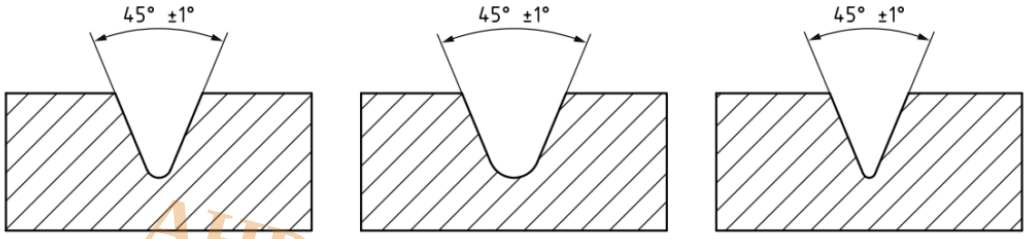
The specimens shall be free of twist and shall have mutually perpendicular parallel surfaces. The surfaces
and edges shall be free from scratches, pits, sink marks and flash.
The specimens shall be checked for conformity with these requirements by visual observation against straightedges, set squares and flat plates, and by measuring with micrometer callipers. Specimens showing measurable or observable departure from one or more of these requirements shall be rejected or machined to proper size and shape before testing.

6.1.5 Notching

6.1.5.1 Machined notches shall be prepared in accordance with ISO 2818. The profile of the cutting

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tooth
shall be such as to produce in the specimen a notch of the contour and depth shown in Figure 5, at right
angles to its principal axes (see Note).
NOTE The radius of the notch tip can be measured by the method given in Annex C. 6.1.5.2
Specimens with moulded-in notches may be used if specified for the material being tested (see Note).
NOTE Specimens with moulded-in notches do not give results comparable to those obtained from specimens with machined notches.



a) Type A — Radius of notch tip $r_N = (0{,}25 \pm 0{,}05)$ mm
b) Type B — Radius of notch tip $r_N = (1{,}00 \pm 0{,}05)$ mm
c) Type C — Radius of notch tip $r_N = (0{,}10 \pm 0{,}02)$ mm

Figure 5 — Notch types

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6.3 Shape and dimensions
6.3.1 Materials not exhibiting interlaminar shear fracture
6.3.1.1 Moulding and extrusion compounds
6.3.1.1.1 Type 1 test specimens, unnotched or with one of three different types of notch, shall be used as
specified in Tables 1 and 2 and shown in Figures 2 and 5. The notch shall be located at the centre of the
specimen. Type 1 specimens (see Table 1) may be taken from the central part of the type A multipurpose test specimen specified in ISO 3167.

Table 1 — Specimen types, specimen dimensions and spans between specimen supports
(see Figures 2 and 6)

Dimensions in millimetres

Specimen type	Length[a] l	Width[a] b	Thickness[a] h	Span L
1	80 ± 2	$10{,}0 \pm 0{,}2$	$4{,}0 \pm 0{,}2$	$62^{+0,5}_{-0,0}$
2[b]	$25h$	10 or 15[c]	3[d]	$20h$
3[b]	$11h$ or $13h$			$6h$ or $8h$

[a] The specimen dimensions (thickness, h, width, b, and length, l) are defined by $h < b < l$.
[b] Specimen types 2 and 3 shall be used only for materials described in 6.3.2.
[c] 10 mm for materials reinforced with a fine structure, 15 mm for those with a large stitch structure (see 6.3.2.2).
[d] Preferred thickness. If the specimen is cut from a sheet or a piece, h shall be equal to the thickness of the sheet or piece, up to 10,2 mm (see 6.3.1.2)

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Table 2 — Method designations, specimen types, notch types and notch dimensions — Materials not exhibiting interlaminar shear fracture

Dimensions in millimetres

Method designation[a]	Specimen type	Blow direction	Notch type	Notch tip radius, r_N (see Figure 5)	Remaining width, b_N, at notch tip (see Figure 2)
ISO 179-1/1eA[b]	1	Edgewise	A	0,25 ± 0,05	8,0 ± 0,2
ISO 179-1/1eB			B	1,00 ± 0,05	8,0 ± 0,2
ISO 179-1/1eC			C	0,10 ± 0,02	8,0 ± 0,2
ISO 179-1/1eU[b]			Unnotched		
ISO 179-1/1fU[c]		Flatwise	Unnotched		

[a] If specimens are taken from sheet or products, the thickness of the sheet or product shall be added to the designation. Unreinforced specimens shall not be tested with their machined surface under tension.

[b] Preferred method.

[c] Especially for the study of surface effects (see 6.3.1.1.3).

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6.3.1.1.2 The preferred type of notch is type A (see Table 2 and Figure 5). For most materials, unnotched
specimens or specimens with a single type A notch tested by edgewise impact (see 3.3) are suitable. If specimens with a type A notch do not break during the test, specimens with a type C notch shall be used. If information on the notch sensitivity of the material is desired, specimens with notch types A, B and C shall be tested.
6.3.1.1.3 Unnotched or double-notched specimens tested by flatwise impact (see 3.4) can be used to study surface effects (see 1.3 and Annex A).

Summary of Equipment Needed to Do the Test

- Pendulum Impact Tester
- Manual Injection Molding Machine
- Notch Milling Machine
- Deep Freezer
- Hot Press (Manual or Hydraulic)

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