

Plastics — Determination of Charpy impact properties —

Part 2: Instrumented impact test

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This British Standard is the UK implementation of EN ISO 179-2:1999+A1:2012. It is identical to ISO 179-2:1997 incorporating corrigendum 1:1998 and amendment 1:2011. It supersedes BS EN ISO 179-2:1999, which is withdrawn.

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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Amendments/corrigenda issued since publication

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English version

**Plastics - Determination of Charpy impact properties - Part 2:
Instrumented impact test (ISO 179-2:1997)**

Plastiques - Détermination des caractéristiques au choc
Charpy - Partie 2: Essai de choc instrumenté (ISO 179-
2:1997)

Kunststoffe - Bestimmung der Charpy-Schlageigenschaften
- Teil 2: Instrumentierte Schlagzähigkeitsprüfung (ISO 179-
2:1997)

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Foreword

The text of the International Standard from Technical Committee ISO/TC 61 "Plastics" of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN.

This European Standard replaces EN ISO 179:1996.

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of an identical text or by endorsement, at the latest by December 1999, and conflicting national standards shall be withdrawn at the latest by December 1999.

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Endorsement notice

The text of the International Standard ISO 179-2:1997 has been approved by CEN as a European Standard without any modification.

Foreword to amendment A1

The text of EN ISO 179-2:1997/Amd 1:2011 has been prepared by Technical Committee ISO/TC 61 "Plastics" of the International Organization for Standardization (ISO) has been taken over as EN ISO 179-2:1999/A1:2012 to the European Standard by Technical Committee CEN/TC 249 "Plastics" the secretariat of which is held by NBN.

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The text of ISO 179-2:1997/Amd 1:2011 has been approved by CEN as a EN ISO 179-2:1999/A1:2012 without any modification.

Plastics — Determination of Charpy impact properties —

Part 2: Instrumented impact test

1 Scope

1.1 This part of ISO 179 specifies a method for determining Charpy impact properties of plastics from force-deflection diagrams. Different types of rod-shaped test specimen and test configuration, as well as test parameters depending on the type of material, the type of test specimen and the type of notch are defined in part 1 of ISO 179.

Dynamic effects such as load-cell/striker resonance, test specimen resonance and initial-contact/inertia peaks are described (see figure 1, curve b, and annex A).

1.2 For the comparison between Charpy and Izod test methods, see ISO 179-1, clause 1.

ISO 179-1 is suitable for characterizing the impact behaviour by the impact strength only and for using apparatus whose potential energy is matched approximately to the particular energy to break to be measured (see ISO 13802, annex C). This part of ISO 179 is used if a force-deflection or force-time diagram is necessary for detailed characterization of the impact behaviour, and for developing automatic apparatus, i.e. avoiding the need, mentioned above, to match energy.

1.3 For the range of materials which may be tested by this method, see ISO 179-1, clause 1.

1.4 For the general comparability of test results, see ISO 179-1, clause 1.

1.5 The method may not be used as a source of data for design calculations on components. However, the possible use of data is not the subject of this part of ISO 179. Any application of data obtained using this part of ISO 179 should be specified by a referring standard or agreed upon by the interested parties.

Information on the typical behaviour of materials can be obtained by testing at different temperatures, by varying the notch radius and/or specimen thickness and by testing specimens prepared under different conditions.

It is not the purpose of this part of ISO 179 to give an interpretation of the mechanism occurring at every point on the force-deflection diagram. These interpretations are a task for on-going scientific research.

1.6 The test results are comparable only if the conditions of test specimen preparation, as well as the test conditions, are the same. Comprehensive evaluation of the reaction to impact stress requires that determinations be made as a function of deformation rate and temperature for different material variables such as crystallinity and moisture content. The impact behaviour of finished products cannot, therefore, be predicted directly from this test, but test specimens may be taken from finished products for testing by this method.

1.7 Impact strengths determined by this method may replace those determined using ISO 179-1 if comparability has been established by previous tests.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 179. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 179 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 13802:—²⁾, *Plastics — Verification of pendulum impact-testing machines — Charpy, Izod and tensile impact testing.*

3 Definitions

For the purposes of this part of ISO 179, the definitions given in part 1 apply, together with the following:

3.1 impact velocity, v_0 : The velocity of the striker relative to the test specimen supports at the moment of impact.

It is expressed in metres per second (m/s).

3.2 inertial peak: The first peak in a force-time or force-deflection diagram. It arises from the inertia of that part of the test specimen accelerated after the first contact with the striker (see figure 1, curve b, and annex A).

3.3 impact force, F : The force exerted by the striking edge on the test specimen in the direction of impact.

It is expressed in newtons (N).

3.4 deflection, s : The displacement of the striker relative to the test specimen supports after impact, starting at first contact between striker and test specimen.

It is expressed in millimetres (mm).

3.5 impact energy, W : The energy expended in accelerating, deforming and breaking the test specimen during the deflection s .

It is expressed in joules (J).

It is measured by integrating the area under the force-deflection curve from the point of impact to the deflection s .

3.6 maximum impact force, F_M : The maximum value of the impact force in a force-time or force-deflection diagram (see figure 1).

It is expressed in newtons (N).

3.7 deflection at maximum impact force, s_M : The deflection at which the maximum impact force F_M occurs (see figure 1).

It is expressed in millimetres (mm).

1) To be published. (Revision of ISO 179:1993)

2) To be published.

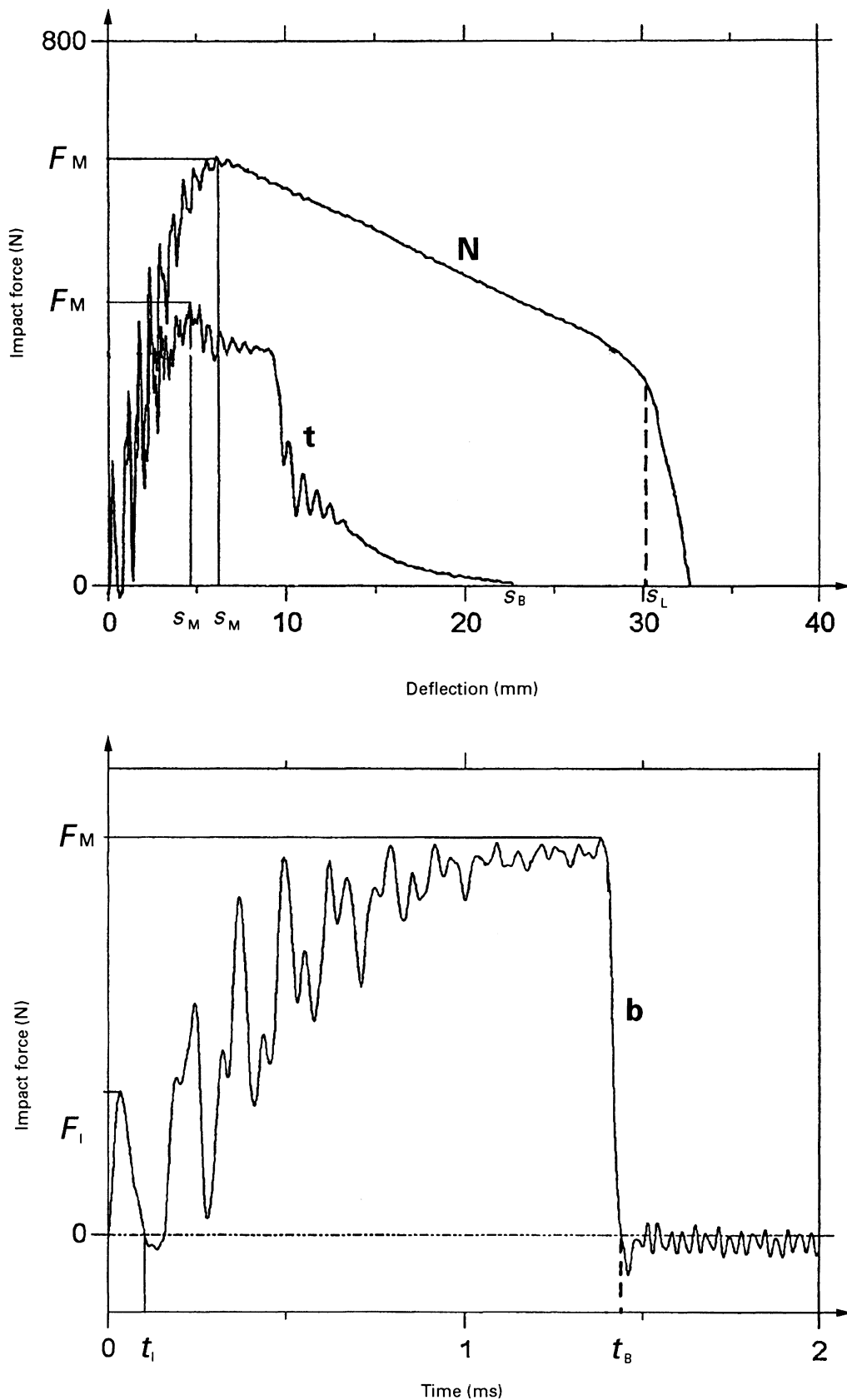
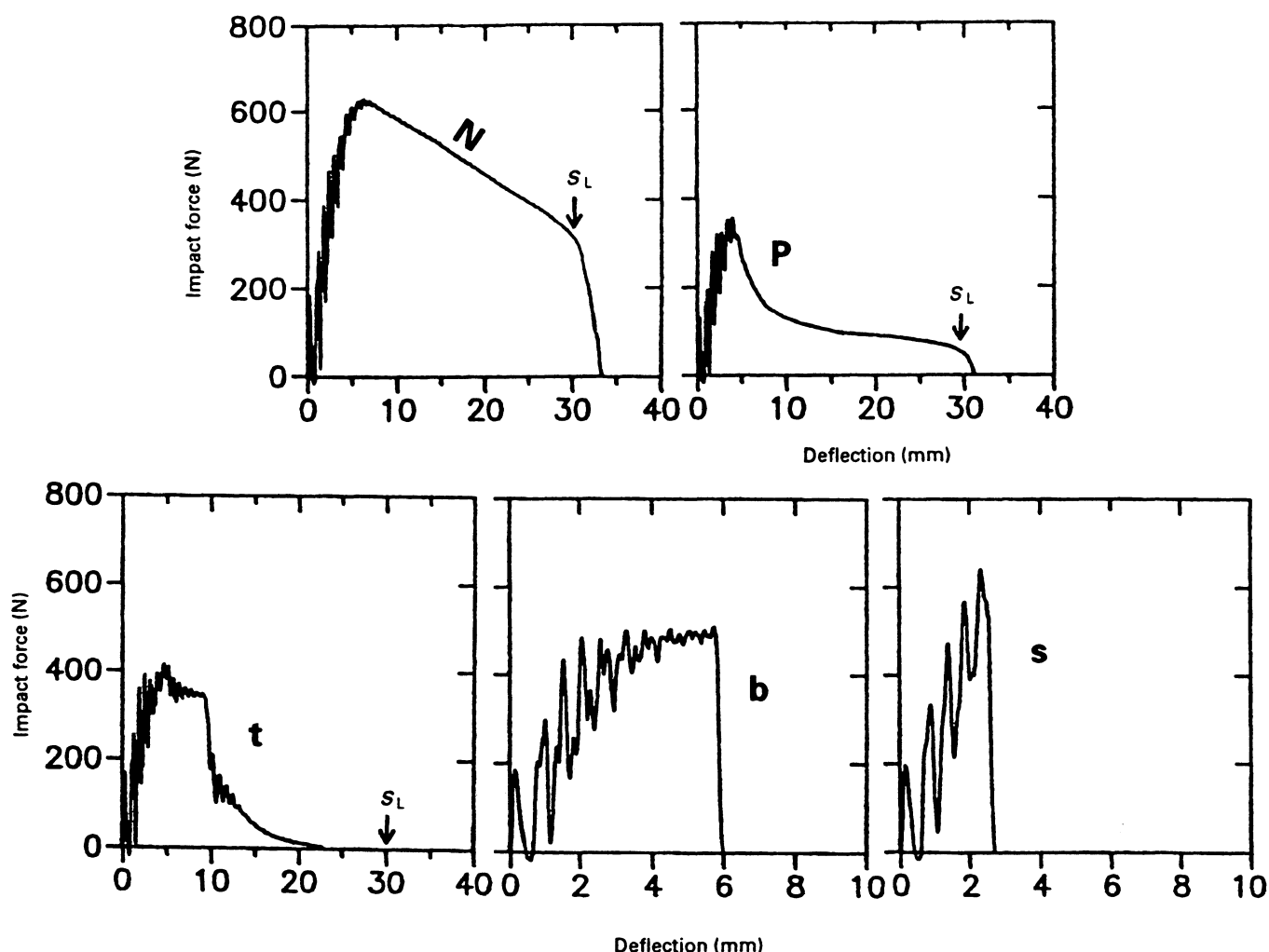


Figure 1 — Typical force-deflection (N and t) and force-time (b) curves
(for the types of failure, see figure 2)



- N = no break: yielding followed by plastic deformation up to the deflection limit s_L ;
- P = partial break: yielding followed by stable cracking, resulting in a force at the deflection limit s_L which is greater than 5 % of the maximum force;
- t = tough break: yielding followed by stable cracking, resulting in a force at the deflection limit s_L which is less than or equal to 5 % of the maximum force;
- b = brittle break: yielding followed by unstable cracking;
- s = splintering break: unstable cracking followed by splintering;
- s_L = deflection limit; beginning of pull-through.

NOTE — Due to the different modes of deformation, force-deflection curves obtained using this part of ISO 179 show features which are different from those obtained using ISO 6603-2 [1]. In particular, the first damage event in instrumented puncture tests frequently appears as a slight sudden force decrease (crack initiation), followed by a gradual force increase. Force increases after crack initiation are never observed in instrumented three-point-bending impact tests. Furthermore, inertial effects are not as pronounced in plate impact tests as they are in bending impacts tests (see annex A).

Figure 2 — Typical force-deflection curves showing different failure modes for type 1 specimens tested edgewise

3.8 energy to maximum impact force, W_M : The energy expended up to the deflection at maximum impact force.

It is expressed in joules (J).

3.9 deflection at break, s_B : The deflection at which the impact force is reduced to less than or equal to 5 % of the maximum impact force F_M (see figure 1).