

Methods of testing plastics —

Part 3: Mechanical properties —

Method 352F: Determination of impact resistance by the free-falling dart method (instrumented puncture test)

ICS 83.080

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/75, Plastics and rubber films and sheets, upon which the following bodies were represented:

- British Plastics Federation
- Her Majesty’s Stationery Office
- Institute of Trading Standards Administration
- Ministry of Defence
- Packaging and Industrial Films Association
- PIRA International

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National foreword

This British Standard has been prepared by Technical Committee PRI/75. It is identical with ISO 7765:1994 *Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 2: Instrumented puncture test*, published by the International Organization for Standardization (ISO).

BS 2782: Method 352F, together with BS 2782: Method 352E, supersedes BS 2782: Method 352D:1979, which is withdrawn.

Cross-references

Publications referred to	Corresponding British Standard
	BS 2782 <i>Methods of testing plastics</i>
ISO 4593:1993	Part 6 <i>Dimensional properties</i>
	Method 630A:1994 <i>Determination of thickness by mechanical scanning of flexible sheet</i> (Identical)
ISO 6603-2:1989	Part 3 <i>Determination of tensile properties</i>
	Method 353B:1991 <i>Determination of multi-axial impact behaviour by the instrumented puncture test</i> (Identical)
ISO 7765-1:1988	Method 352E:1996 <i>Determination of impact resistance by the free-falling dart method (staircase method)</i> (Identical)

The Technical Committee has reviewed the provisions of ISO 291:1977 to which normative reference is made in the text, and has decided that it is acceptable for use in conjunction with this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

1.1 The impact-penetration test described in the two parts of this International Standard is used for the assessment of plastic films and thin sheets (herein-after referred to as films) under an impact stress applied at right angles to the plane of the film.

1.2 Part 1 of this International Standard can be used if it is sufficient to characterize the impact behaviour of the film by an impact-failure energy. Part 2 is used if a force-deformation or a force-time diagram, recorded at practically constant velocity of the striker, is necessary for characterization of the impact behaviour. This applies if:

- measured quantities derivable only from this diagram are required or
- only a small number of test specimens are available.

1.3 The test method is applicable to films of up to 1 mm thickness and makes it possible to compare impact-penetration forces, biaxial deformabilities and energy-absorption capacities of films. Furthermore, if required, the transition region between brittle and tough behaviour of the film under the conditions of testing can be determined by varying the temperature or the penetration velocity or the relative humidity (see also annex B).

NOTE 1 For thicknesses greater than 1 mm, ISO 6603-2 should be used.

1.4 The test results are comparable only if the conditions for preparation of specimens, their thickness and surfaces, and the test conditions are identical. Comprehensive evaluation of the reaction to impact stress requires that the determinations are made as functions of deformation rate and temperature for different material variables, such as crystallinity and moisture content.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 7765. 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 7765 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 291:1977, *Plastics — Standard atmospheres for conditioning and testing*.

ISO 4593:1993, *Plastics — Film and sheeting — Determination of thickness by mechanical scanning*.

ISO 6603-2:1989, *Plastics — Determination of multiaxial impact behaviour of rigid plastics — Part 2: Instrumented puncture test*.

ISO 7765-1:1988, *Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 1: Staircase methods*.

3 Definitions

For the purposes of this part of ISO 7765, the following definitions apply.

3.1

peak force, F_M

the maximum force exerted by the striker in the direction of impact during the test (see Figure 1 to Figure 3)

3.2

deformation at peak force, s_M

the deformation in the direction of impact at the centre of the test specimen corresponding to the peak force. For materials exhibiting a peak-force plateau, the deformation is taken at the centre of the plateau (see Figure 1)

3.3

energy to peak force, W_M

the area under the force-deformation curve bounded by the origin, the peak force and the deformation at peak force (see Figure 1 to Figure 3)

3.4

total penetration energy, W_T

the total energy expended in penetrating the test specimen (see Figure 1 to Figure 3)

in contrast to the instrumented puncture test applied to test specimens made of brittle plastic (see ISO 6603-2), the force-deformation diagram of this test applied to film and sheeting frequently shows a clear point of first failure (failure point) indicated by a sharp drop in the force. If this is the case, and if the interested parties agree to use this point as a characteristic criterion, the following additional definitions may be used

3.5

failure force, F_F

the force exerted by the striker in the direction of impact, measured at the failure point (see Figure 1 and Figure 2)

3.6 failure deformation, s_F

the deformation in the direction of impact at the centre of the test specimen, measured at the failure point (see Figure 1 and Figure 2)