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AMENDMENT 1
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**Plastics — Determination of flexural
properties**

AMENDMENT 1

Plastiques — Détermination des propriétés en flexion

AMENDEMENT 1



Reference number
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Foreword

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Amendment 1 to ISO 178:2010 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

Plastics — Determination of flexural properties

AMENDMENT 1

Page iv, Foreword

At the end of the Foreword, add the following paragraph:

The fifth edition specifies measuring tips with an end radius of 50 mm. While this is useful to avoid alignment errors when dimensions on perfectly flat specimens are measured, it has disadvantages with injection-moulded specimens, which constitute the majority of specimens tested according to ISO 178. Injection-moulded specimens are never perfectly rectangular and, especially if made of semi-crystalline materials, also exhibit sink marks. Measuring tips with rounded ends tend to determine the minimum thickness, leading to artificially high values of stress and flexural modulus. Furthermore, the specified tips with round ends are not readily available and in the same instant rendered commonly used flat-ended tips obsolete, causing disagreement in audit processes. This amendment rectifies this error and introduces a specification for measuring the dimensions of the test specimens that allows different instruments to be used, provided they measure not the extreme (maximum or minimum) dimensions, but rather an average value.

Page 7, 5.5.1

Replace the two subclauses (5.5.1.1 and 5.5.1.2) with the following:

Use micrometers with an accuracy of $\pm 0,01$ mm.

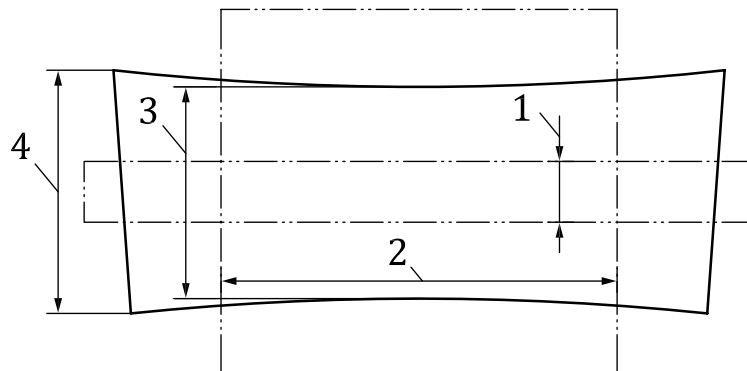
Use measuring tips that allow the determination of the thickness centrally within the measuring range and the width at half height, as indicated in Figure 5.

Different geometry of the contact faces of the measuring tips, i.e. spherical, circular, rectangular or sharp edges are acceptable. Spherical tip faces shall have a radius of ≥ 50 mm. Flat tips are recommended. The face diameter of circular measuring tips shall be between 1,5 mm and 6,4 mm. Rectangular faces of measuring tips shall have a long side of 4 mm to 6,4 mm in length.

It is recommended to use a configuration that allows the determination of the width and the thickness with the same instrument.

Page 11, 8.1

Replace Figure 5 with the following.



Key

- 1 measuring range for width determination $\pm 0,5$ mm
- 2 measuring range for thickness determination $\pm 3,25$ mm
- 3 minimum thickness h_{\min}
- 4 maximum thickness h_{\max}

Pages 10 to 11, 8.1

Replace with the following:

8.1 Measure the width and the thickness of the test specimen within the measurement ranges indicated in Figure 5, to the nearest 0,1 mm for the width and to the nearest 0,01 mm for the thickness. Calculate the mean values of the thickness, h , and the width, b , for the set of test specimens.

Avoid measuring the thickness at the edge of the specimen and directly in the centre (see Note 1). With rectangular or sharp tip faces, the long side of the tip shall be parallel to the width direction when measuring thickness, and parallel to the length direction when measuring width.

NOTE 1 This excludes the maximum and minimum thickness, which for injection-moulded test specimens usually is found at the edge and in the centre, respectively. Injection-moulded test specimens prepared according ISO 294-1, generally have thickness differences due to sink marks of $\Delta h = h_{\max} - h_{\min} \leq 0,1$ mm (see Figure 5).

Discard any specimen(s) with a thickness exceeding the tolerance of ± 2 % of the mean value and replace it with another specimen chosen at random.

NOTE 2 For the purposes of this International Standard, the test specimen dimensions used for calculating flexural properties are measured at room temperature only. For the measurement of properties at other temperatures, therefore, the effects of thermal expansion are not taken into account.

Page 11, 8.2

Replace with the following:

8.2 Adjust the span, L , to comply with the following equation:

$$L = (16 \pm 1) h \quad (1)$$

and measure the resulting span to the nearest 0,5 %. For the preferred test specimen, see 6.1.2; the span is 64 mm.

Equation (1) shall be used except in the following cases.

a) For very thick test specimens, use a span calculated on a higher ratio of L/h to avoid delamination in shear.

NOTE 1 Values of up to $L/h = 60$ might be necessary to avoid delamination due to shear.

b) For very thin specimens with expected modulus below 700 MPa (see 3.12), use a span calculated on a lower ratio of L/h to enable measurements to be made within the load capacity of the testing machine.

NOTE 2 A value of $L/h = 8$ might be necessary.

c) For soft thermoplastics with expected modulus below 700 MPa (see 3.12), use a span calculated on a larger ratio of L/h to prevent indentation of the supports into the test specimen.

NOTE 3 A value of $L/h = 32$ might be necessary.

Page 15, 11 d)

Replace “d) the shape and dimensions of the test specimens;” with “d) the shape and dimensions of the test specimens and, if applicable, the dimensions of the tips used;”.

