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EUROPEAN STANDARD

EN 59

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2016

ICS 83.120

Supersedes EN 59:1977

English Version

Glass reinforced plastics - Determination of indentation hardness by means of a Barcol hardness tester

Matières plastiques renforcées de verre -
Détermination de la dureté par pénétration au moyen
d'un appareil d'essai de dureté Barcol

Glasfaserverstärkte Kunststoffe - Bestimmung der
Eindruckhärte mit einem Barcol-Härteprüfgerät

This European Standard was approved by CEN on 26 December 2015.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 59:2016) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by August 2016, and conflicting national standards shall be withdrawn at the latest by August 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 59:1977.

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EN 59:2016 (E)

1 Scope

This European Standard specifies a method for determining the indentation hardness of glass reinforced plastics materials by means of a Barcol hardness tester.

The Barcol hardness tester is a portable device which can be used with a stand. This method is suitable for testing the indentation hardness of individual test specimens or finished products for production control purposes.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 291, *Plastics - Standard atmospheres for conditioning and testing (ISO 291)*

3 Principle

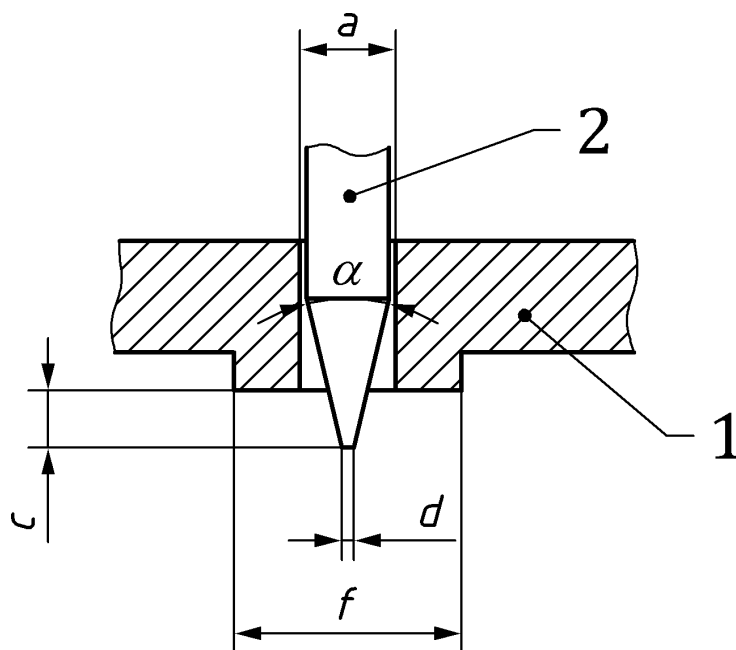
A specified indenter is forced into the test material under specified conditions and the depth of penetration measured.

4 Apparatus

4.1 Barcol hardness tester

4.1.1 Indenter, formed from a hardened steel truncated cone to the shape shown in Figure 1. The dimensions and their tolerances of the indenter are given in Table 1. It shall fit into a hollow spindle and be held down by a spring.

4.1.2 Presser foot, intended to be placed on the test specimen, to the shape shown in Figure 1. The dimensions and their tolerances of the presser foot are given in Table 1.

**Key**

1 presser foot

2 indenter

 a hole diameter of the presser foot c full protrusion of the indenter d diameter of the indenter flat tip f diameter of the presser foot back face α angle of the truncated cone of the indenter

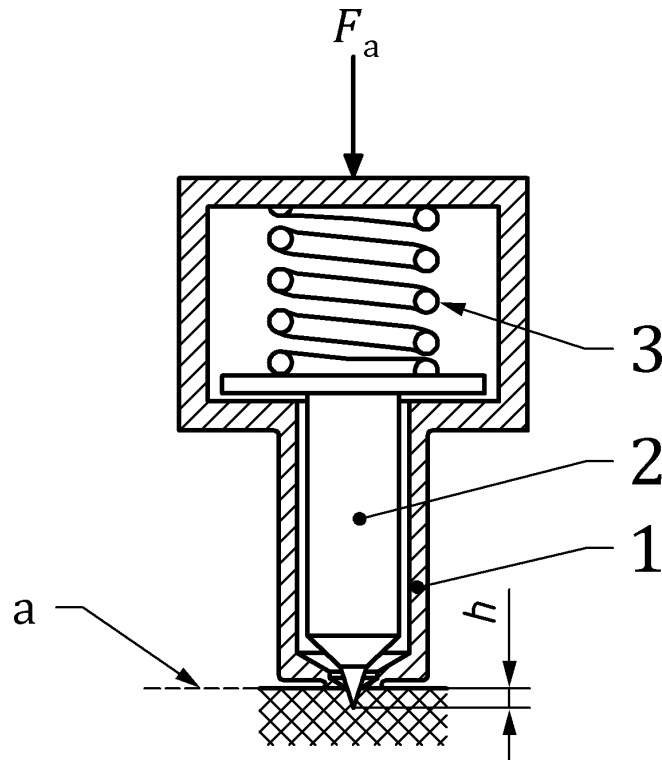
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Figure 1 — View of the indenter and presser foot**Table 1 — Dimensions of the indenter and presser foot**

| Dimension | Nominal size | Uncertainty of measurement |
|---|-----------------------|----------------------------|
| Angle of the truncated cone of the indenter, α | $(26 \pm 0,25)^\circ$ | $0,07^\circ$ |
| Hole diameter of the presser foot, a | $(1,0 \pm 0,1)$ mm | 0,01 mm |
| Full protrusion of the indenter, c | $(0,760 \pm 0,02)$ mm | 3,0 μ m |
| Diameter of the indenter flat tip, d | $(0,157 \pm 0,02)$ mm | 3,0 μ m |
| Diameter of the presser foot back face, f | $(2,0 \pm 1,0)$ mm | 0,05 mm |

4.1.3 Force application system, capable to apply a force from 61,10 N to 71,30 N continuously. This force is applied by a sufficient manual force ≥ 80 N from the top cover of the device, even when working with a stand.

**Key**

- 1 presser foot
- 2 indenter
- 3 spring (for spring load, see Table 2)
- a* reference plane
- F_a applied force, ≥ 80 N
- h* penetration depth (0,000 mm to 0,007 6 mm)

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Figure 2 — Schematic view of a Barcol hardness tester in measurement position

4.1.4 Depth measuring system, connected to the stem of the indenter which allows a penetration in the range of 0,000 mm to 0,760 mm. It is also connected to a display device which indicates the indentation hardness of the test specimen in Barcol hardness units. A penetration depth of 0,760 mm is equivalent to 0 Barcol hardness units while a penetration depth of 0,000 mm is equivalent to 100 Barcol hardness units. The scale value of the indicator is 1 Barcol unit per 0,007 6 mm penetration depth.

4.1.5 Feet, capable to support the Barcol hardness tester.

4.1.6 Fixing system, capable to adapt the Barcol hardness tester to a stand (optional).

4.2 Calibrated references plates, made from aluminium.

4.3 Smooth glass plate or hardened steel plate

5 Test specimens

5.1 Test surface

The testing area shall be smooth and free from mechanical damage (such as scratches or holes).

5.2 Test specimen dimensions

The thickness of the test specimens shall be at least 1,5 mm. The test area shall be sufficient to have a minimum distance of 3 mm from the test point to the edges of the test specimen or the previous test point in all directions.

6 Calibration

6.1 Direct calibration

6.1.1 Indenter and presser foot

All parameters of the indenter and the presser foot are calibrated according to the tolerances and uncertainties given in Table 1 with appropriate calibration devices for the measurement of the lengths and the angle. The Barcol hardness tester meets the requirements of this European Standard when the actual values match the target values within the measurement uncertainty.

6.1.2 Test force

Perform the calibration of the test force by means of a force measuring device as a comparison measurement. In this case, the actual values of the nominal values listed in Table 2 are the Barcol hardness unit of the Barcol hardness tester while the force measuring device is used as a reference standard.

The Barcol hardness tester meets the requirements of this European Standard when the actual values match the target values within the measurement uncertainty.

Table 2 — Calibration of the test load

| Barcol hardness unit | Nominal value of the load | Uncertainty of measurement |
|----------------------|---------------------------|----------------------------|
| 0 | 61,10 ± 0,29 | 0,08 |
| 20 | 63,14 ± 0,29 | 0,08 |
| 40 | 65,18 ± 0,29 | 0,08 |
| 60 | 67,22 ± 0,29 | 0,08 |
| 80 | 69,26 ± 0,29 | 0,08 |
| 100 | 71,30 ± 0,29 | 0,08 |

6.1.3 Penetration depth

Perform the calibration of the depth by means of a length measuring device as a comparison measurement. The actual values of the nominal values given in Table 3 are the Barcol hardness units of the Barcol hardness tester while the length measuring device is used as a reference standard. The Barcol hardness tester meets the requirements of this European Standard when the actual values match the target values within the measurement uncertainty.