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English Version

Laminate floor coverings - Elements with a surface layer based on aminoplastic thermosetting resins - Specifications, requirements and test methods

Revêtements de sol stratifiés - Éléments dont la surface est à base de résines aminoplastes thermodurcissables - Spécifications, exigences et méthodes d'essai

Laminatböden - Elemente mit einer Deckschicht auf Basis aminoplastischer, wärmehärtbarer Harze - Spezifikationen, Anforderungen und Prüfverfahren

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Contents

Page

European foreword ... 4

1 Scope ... 5

2 Normative references ... 5

3 Terms and definitions ... 6

4 Requirements ... 7
4.1 General requirements ... 7
4.2 Classification requirements ... 8
4.3 Additional technical characteristics ... 10

5 Marking and packaging ... 10
5.1 Marking ... 10
5.2 Packaging ... 11

6 Test report ... 11

Annex A (normative) Determination of thickness, length, width, squareness, straightness and flatness ... 12
A.1 Sampling ... 12
A.2 Conditioning ... 12
A.3 Apparatus ... 12
A.4 Procedure ... 14
A.4.1 Determination of thickness (t) ... 14
A.4.2 Determination of length (l) ... 15
A.4.3 Determination of width (w) ... 16
A.4.4 Determination of dimensions of squared elements ... 16
A.4.5 Determination of squareness (q) ... 17
A.4.6 Determination of straightness (s) ... 17
A.4.7 Determination of width flatness (f_w) ... 18
A.4.8 Determination of length flatness (f_l) ... 18
A.5 Calculation and expression of results ... 19
A.5.1 Thickness (t) ... 19
A.5.2 Length (l) ... 19
A.5.3 Width (w) ... 19
A.5.4 Squareness (q) ... 19
A.5.5 Straightness (s) ... 20
A.5.6 Width flatness (f_w) ... 20
A.5.7 Length flatness (f_l) ... 20

Annex B (normative) Determination of openings and height difference between elements ... 21
B.1 Sampling ... 21
B.2 Conditioning ... 21
B.3 Apparatus ... 21
B.4 Procedure ... 21
B.4.1 Assembling ... 21
B.4.2 Determination of opening between elements (o) ... 22
B.4.3 Determination of height difference (h) ... 22
B.5 Calculation and expression of results ... 22

Annex C (normative) Determination of dimensional variations after changes in relative humidity 23
C.1 General 23
C.2 Sampling 23
C.3 Conditioning 23
C.4 Calculation and expression of results 24

Annex D (normative) Determination of surface soundness 25
D.1 General 25
D.2 Sampling 25
D.3 Conditioning 25
D.4 Procedure 25
D.4.1 Preparing the test specimen 25
D.4.2 Bonding the steel pad to the surface 26
D.4.3 Determination of force at fracture 26
D.5 Calculation and expression of results 26

Annex E (normative) Determination of abrasion resistance and abrasion classification 27
E.1 Sampling 27
E.2 Conditioning 27
E.3 Apparatus 28
E.3.1 Testing machine 28
E.3.2 Additional material or equipment 31
E.4 Procedure 31
E.4.1 General 31
E.4.2 Preparation of test specimens and abrasive papers 31
E.4.3 Preparation of abrasive wheels 31
E.4.4 Determination of the abrasion rate of abrasive paper 31
E.4.5 Abrasion of test specimen 32
E.4.6 Expression of results 33
E.4.7 Test report 33

Annex F (normative) Calibration and Maintenance of Abrasion equipment 34
F.1 General 34
F.2 Apparatus 34
F.3 Procedure 34
F.3.1 Bearing Wear 34
F.3.2 Shaft Wear 34
F.3.3 Alignment 35

Annex G (normative) Measurement of shore A hardness 37

Annex H (normative) Determination of impact resistance and impact classification 38
H.1 General 38
H.2 Sampling 38
H.3 Apparatus 38
H.4 Procedure 38
H.4.1 Large-diameter ball test 38
H.4.2 Small-diameter ball test 39

Bibliography 42

European foreword

This document (EN 13329:2016) has been prepared by Technical Committee CEN/TC 134 "Resilient, textile and laminate floor coverings", 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 September 2016, and conflicting national standards shall be withdrawn at the latest by September 2016.

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

This document supersedes EN 13329:2006+A1:2008.

Compared to EN 13329:2006+A1:2008, the following changes have been made:

a) general definition for laminate floor coverings included;

b) test method for the light fastness stated more precisely;

c) general requirements for thickness tolerances of elements with pre-attached underlays added;

d) requirements for abrasion resistance changed;

e) requirements for cigarette resistance deleted;

f) general requirements for surface soundness changed into a classification requirement, requirements partly increased;

g) defined underlay for the impact resistance test with the large diameter ball added and requirements for this property changed;

h) requirements for castor chair test changed;

i) requirements for thickness swelling partly changed;

j) requirements for locking strength added;

k) requirements for dimensional stability changed;

l) technical characteristic micro-scratch resistance adde;

m) test method for abrasion resistance in Annex E stated more precisely;

n) Annex G for hardness measurements for abrasion wheels added;

o) test method for impact resistance in Annex H stated more precisely.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies characteristics, requirements and test methods for laminate floor coverings with a surface layer based on aminoplastic thermosetting resins as defined in 3.1 and 3.2. It also specifies requirements for marking and packaging.

It includes a classification system, based on EN ISO 10874, giving practical requirements for areas of use and levels of use, to indicate where laminate floor coverings will give satisfactory service and to encourage the consumer to make an informed choice.

Laminate floor coverings are considered for domestic and commercial levels of use, including domestic kitchens. This standard does not specify requirements relating to areas which are subjected to frequent wetting, such as bathrooms, laundry rooms or saunas.

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 311, *Wood-based panels - Surface soundness - Test method*

EN 318, *Wood based panels - Determination of dimensional changes associated with changes in relative humidity*

EN 322, *Wood-based panels - Determination of moisture content*

EN 424, *Resilient floor coverings - Determination of the effect of simulated movement of a furniture leg*

EN 425:2002, *Resilient and laminate floor coverings - Castor chair test*

EN 438 (all parts), *High-pressure decorative laminates (HPL) — Sheets based on thermosetting resins (Usually called Laminates)*

EN 16094, *Laminate floor coverings - Test method for the determination of micro-scratch resistance*

CEN/TS 16354, *Laminate floor coverings - Underlays - Specification, requirements and test methods*

EN 20105-A02, *Textiles - Tests for colour fastness - Part A02: Grey scale for assessing change in colour (ISO 105-A02)*

EN ISO 105-B02, *Textiles - Tests for colour fastness - Part B02: Colour fastness to artificial light: Xenon arc fading lamp test (ISO 105-B02)*

EN ISO 4892-2:2006/A1:2009, *Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps (ISO 4892-2:2006/Amd1:2009)*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1)*

EN ISO 10874, *Resilient, textile and laminate floor coverings - Classification (ISO 10874)*

EN ISO 24343-1, *Resilient and laminate floor coverings - Determination of indentation and residual indentation - Part 1: Residual indentation (ISO 24343-1)*

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 7267-2, *Rubber-covered rollers — Determination of apparent hardness — Part 2: Shore-type durometer method*

ISO 24334, *Laminate floor coverings — Determination of locking strength for mechanically assembled panels*

ISO 24336, *Laminate floor coverings — Determination of thickness swelling after partial immersion in water*

ISO 24339, *Laminate and textile floor coverings — Determination of dimensional variations after exposure to humid and dry climate conditions*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
laminate floor covering
rigid floor covering, typically in a plank or tile format, with a multiple layer structure: e.g. backer, substrate, décor and worked edges that allow the product to be joined together to form a larger integral unit

Note 1 to entry: Laminate flooring does not include products having a resilient, stone, textile, wood, leather or metal top surfacing material(s).

3.2
surface layer based on aminoplastic thermosetting resins
upper decorative layer, which may vary in surface texture and gloss level, consisting of one or more thin sheets of a fibrous material (usually paper), impregnated with aminoplastic, thermosetting resins (usually melamine)

Note 1 to entry: By the simultaneous action of heat and pressure, these sheets are either pressed as such (HPL, CPL, Compact), and in the case of HPL and CPL bonded on a substrate (usually wood-based panels), or in the case of DPL directly pressed on a substrate (usually wood-based panels). The product is usually finished with a backer (e.g. HPL, CPL, impregnated papers), primarily used as a balancing material.

3.3
substrate
core material of the laminate floor covering

Note 1 to entry: It is generally a particleboard, as defined in EN 309, or a dry process fibreboard (MDF) as defined in EN 316 or a so called High Density Fibreboard (HDF) which is a MDF-board with a density ≥ 800 kg/m^3.

3.4
backer
layer opposite to the surface layer used to balance and stabilize the product

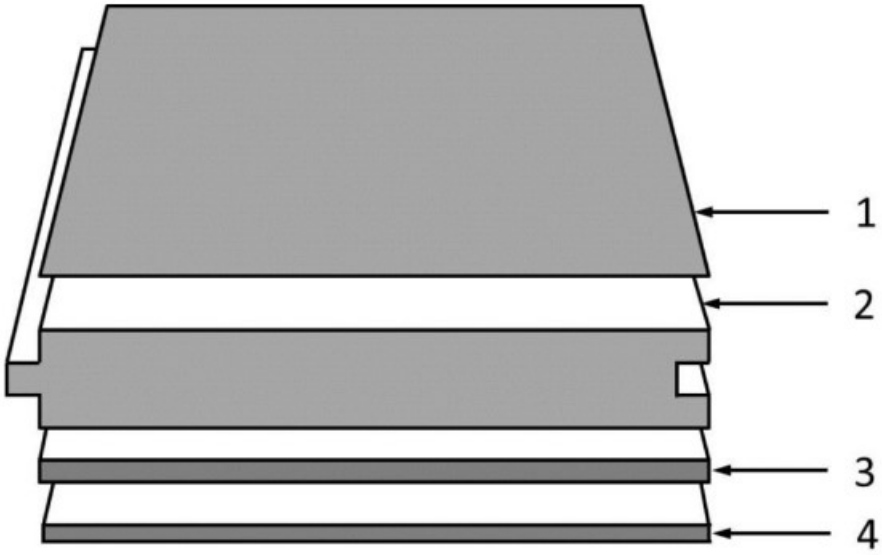
Note 1 to entry: The backer is generally made of impregnated papers.

3.5
underlay
layer placed between the laminate floor covering and the subfloor to impart specific properties

Note 1 to entry: Some laminate floor covering products have the underlay pre-attached directly to the backer.

3.6
laminate floor covering element
piece of the floor covering with profiled edges to facilitate assembly at installation

Note 1 to entry: See Figure 1.



Key

1 surface layer
2 substrate
3 backer
4 underlay (optional)

Figure 1— Laminate floor-covering element

4 Requirements

4.1 General requirements

All laminate floor coverings shall conform to the general requirements given in Table 1, when tested by the methods specified therein.

Table 1 — General requirements

Characteristic	Requirement	Test method
Thickness of the element, *(t)* without underlay	$\Delta t_{average} \leq 0{,}50$ mm, relative to nominal value $t_{max.} - t_{min.} \leq 0{,}50$ mm	Annex A
With pre-attached underlay	$\Delta t_{average} \leq 0{,}50$ mm, relative to nominal value $t_{max.} - t_{min.} \leq 0{,}80$ mm	Annex A
Length of the surface layer, *(l)*	For the nominal values given, no measured value shall exceed: $l \leq 1\,500$ mm: $\Delta l \leq 0{,}5$ mm $l > 1\,500$ mm: $\Delta l \leq 0{,}3$ mm/m	Annex A
Width of the surface layer, *(w)*	$\Delta w_{average} \leq 0{,}10$ mm, relative to nominal value $w_{max.} - w_{min.} \leq 0{,}20$ mm	Annex A
Length and width of squared elements, *(l = w)*	$\Delta l_{average} \leq 0{,}10$ mm relative to nominal value $\Delta w_{average} \leq 0{,}10$ mm, relative to nominal value $l_{max.} - l_{min.} \leq 0{,}20$ mm $w_{max.} - w_{min.} \leq 0{,}20$ mm	Annex A
Squareness of the element, *(q)*	$q_{max.} \leq 0{,}20$ mm	Annex A
Straightness of the surface layer, *(s)*	$s_{max.} \leq 0{,}30$ mm/m	Annex A
Flatness of the element, *(f)*	Maximum single values: $f_{w,\,concave} \leq 0{,}15$ % $f_{w,\,convex} \leq 0{,}20$ % $f_{l,\,concave} \leq 0{,}50$ % $f_{l,\,convex} \leq 1{,}00$ %	Annex A
Openings between elements, *(o)*	$o_{average} \leq 0{,}15$ mm $o_{max.} \leq 0{,}20$ mm	Annex B
Height difference between elements, *(h)*	$h_{average} \leq 0{,}10$ mm $h_{max.} \leq 0{,}15$ mm	Annex B
Dimensional variations after changes in relative humidity, *(δl, δw)*	$\delta l_{average} \leq 0{,}9$ mm $\delta w_{average} \leq 0{,}9$ mm	Annex C
Light fastness	Colour contrast between unexposed and exposed sample part ≥ 4 of grey scale according to EN 20105—A02	EN ISO 4892-2:2006/A1:2009 procedure B – cycle 5 (50 % rel. hum.) [a] [b]
Static indentation	residual indentation ≤ 0,05 mm	EN ISO 24343-1

[a] Test until blue wool scale No. 6 according to EN ISO 105-B02 (= colour contrast 4 on the grey scale according to EN 20105-A02 between exposed and unexposed part of blue wool scale).

[b] Allow sample (24 ± 1 h) recovery time without light exposure at 23 °C and 50 % rel. humidity before taking final assessment.

4.2 Classification requirements

All laminate floor coverings shall be classified as suitable for different levels of use according to the requirements specified in Table 2, when tested by the methods given therein. Classification shall conform to the scheme specified in EN ISO 10874.

The large ball impact test and the castor chair test of class 34 products shall be carried out with the pre-attached underlays or with an underlay specified by the manufacturer.. For the large ball impact test of products of the classes 21 – 23 and 31 – 33 a standard EPS foam of (1,8 ± 0,2) mm thickness, with a CS

value of (60 ± 10) kPa[1] and with PC-value of (0,9 ± 0,1) mm shall be used . The three parameters of the foam shall be determined according to CEN/TS 16354.

Table 2 — Classification requirements and levels of use

	Levels of use							
	Domestic			Commercial				
	Moderate	General	Heavy	Moderate	General	Heavy	Very Heavy	
Class:	21	22	23	31	32	33	34	Test method
Abrasion resistance	AC1	AC2	AC3		AC4	AC5	AC 6	Annex E
Impact resistance Small ball Big ball	≥ 8 N ≥ 500 mm				≥ 12 N ≥ 750 mm	≥ 15 N ≥ 1 000 mm	≥ 20 *N* ≥ 1 600 mm	Annex H
Resistance to staining	4, (groups 1 and 2) 3, (group 3)		5, (groups 1 and 2) 4, (group 3)				5, (groups 1, 2 and 3)	EN 438 series
Effect of a furniture leg	_		No damage shall be visible, when tested with foot type 0					EN 424
Effect of a castor chair[a]	_		25 000 cycles, No damage[a]				25 000 cycles No damage[a] with type H wheels	EN 425:2002 [b]
Thickness swelling	≤ 20 %		≤ 18 %			≤ 15 %	≤ 8 %	ISO 24336
Locking strength	-				$f_{l0,2}$ ≥ 1 kN/m (length) $fs_{0,2}$ ≥ 2 kN/m (width)		$f_{l0,2}$ ≥ 3,5 kN/m (length) $fs_{0,2}$ ≥ 3,5 kN/m (width)	ISO 24334
Surface soundness	≥ 1,0 N/mm²				≥ 1,25 N/mm²		≥ 1,50 N/mm²	Annex D
Dimensional stability	_						$\Delta_{w\ avg}$, $\Delta_{l\ avg}$: ≤ 0,15 % - 0,20 % ≤ C_{avg} [c] ≤ 0,25 % $J_{L\ avg}$, $J_{S\ avg}$: ≤ 0,15 mm $h_{L\ avg}$, $h_{S\ avg}$: ≤ 0,15 mm	ISO 24339

[a] No visible damage on the surface of the assembled test area caused by detachment of layers, opening of joints, or crazing. Ignore any flattening or change in appearance, e.g. change in gloss.

[b] Using soft castor wheels W PU (95 ± 5) Shore A except for class 34 wheels H PA (95 ± 5) Shore A.

[c] Take the maximum of C_{avg} from wet climate (23°C, 85 % rel. hum) and the minimum of C_{avg} from dry climate (23°C, 30 % rel. hum.) for the evaluation.

[1] The product "Selitflex 1,6 mm" made by Selit Dämmtechnik GmbH is an example of a suitable product commercially available. This information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN of this product. Equivalent products may be used if they can be shown to lead to the same results.

4.3 Additional technical characteristics

When any of the characteristics given in Table 3 are requested for specific applications, the laminate floor coverings shall be tested by the methods given therein. The properties stated in Table 3 are considered important for some specific products or applications.

Table 3 — Additional technical characteristics

Characteristic	Comment	Test method
Humidity at dispatch from the manufacturer	The elements shall have a moisture content of 4 % to 10 %. Any single batch shall be homogeneous with $H_{max.} - H_{min.} \leq 3$ %	EN 322
Appearance, surface defects	Minor surface defects as defined in the EN 438 series are permitted.	EN 438–2
Micro-scratch resistance	Can be declared as micro-scratch resistance classes according to procedure A and/or B	EN 16094

5 Marking and packaging

5.1 Marking

NOTE For CE-Marking see EN 14041.

Laminate floor coverings which comply with the requirements of this standard shall have the following information clearly marked by the manufacturer, either on their packaging, or on a label or information sheet included in the packaging:

a) a reference to this European Standard;

b) manufacturer's and/or supplier's identification;

c) product name;

d) colour/pattern and batch number;

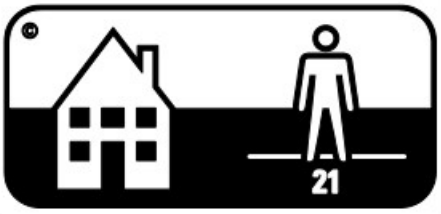
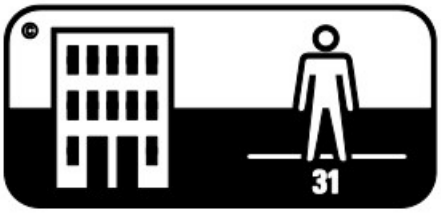
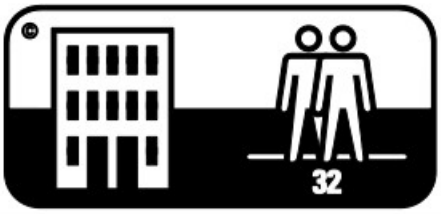
e) level of use symbols appropriate to EN ISO 10874 and in accordance with Table 4;

f) nominal dimensions of one floor covering element in millimetres; if relevant: nominal thickness of pre-attached underlay, nominal thickness of products with pre-attached underlay e.g. 10 (8 + 2) mm;

g) number of elements contained in a package;

h) area contained in a package in square metres.

Table 4 — Classification symbols

Intensity of use according to EN ISO 10874	Domestic	Commercial
Moderate		
General		
Heavy		
Very Heavy	-	

5.2 Packaging

Laminate floor coverings shall be delivered in packages designed to protect the corners, edges and surfaces of the product, under normal conditions of transport and handling. Installation, cleaning and maintenance instructions shall be delivered together with the product.

6 Test report

The test report shall include at least the following information:

a) the name and address of the test laboratory;

b) date of test report;

c) a reference to this standard;

d) full description of the product tested;

e) sampling information;

f) test results;

g) all deviations from this standard.

Annex A
(normative)

Determination of thickness, length, width, squareness, straightness and flatness

A.1 Sampling

Take five laminate floor-covering elements as test specimens.

A.2 Conditioning

Test specimens are measured in the received state. For type approval or verification purposes, the test specimens shall be stabilized to a constant mass in an atmosphere of (23 ± 2) °C and (50 ± 5) % relative humidity. Constant mass is considered to be reached when the results of two successive weighing operations, carried out at an interval of 24 h, do not differ by more than 0,1 % of the mass of the test specimens.

A.3 Apparatus

A.3.1 Micrometre, calliper gauge or any other equivalent tool, having flat and parallel circular measuring surfaces of at least 16 mm diameter and an operating force of (4 ± 1) N, with an accuracy of ± 0,05 mm, for thickness measurements.

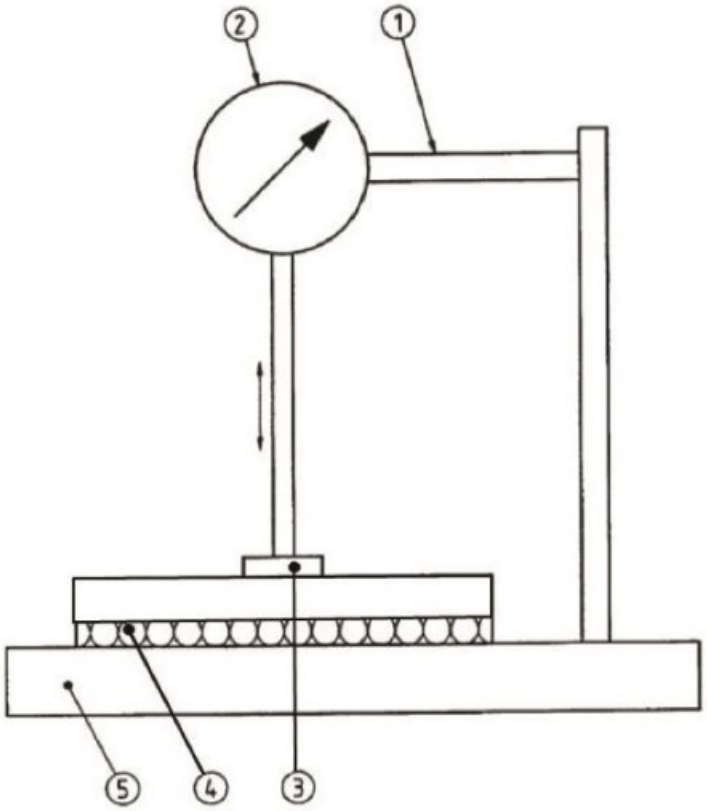
A.3.2 Calliper gauge or any other equivalent tools with an accuracy of ± 0,05 mm for width measurements, and ± 0,1 mm for length measurements.

A.3.3 Square with arms of at least 300 mm and having a maximum angular deviation of 0,02 mm over 300 mm.

A.3.4 Set of thickness gauges ranging from 0,05 mm to 0,10 mm in steps of 0,01 mm, and from 0,10 mm to 0,50 mm in steps of 0,05 mm.

A.3.5 Steel ruler of length at least equal to the length of the test specimen, and having a maximum straightness deviation of 0,05 mm over 1 000 mm.

A.3.6 Apparatus for measuring width flatness consisting of a dial gauge accurate to ± 0,01 mm with a rounded tip of radius ≤ 5,5 mm, installed centrally in relation to three rounded supports with radii ≥ 5 mm. The supports shall be adjustable along a T-shaped assembly of bars to provide the required gauge length. The measurement d shall not be less than the width w of the test specimen minus 10 mm. The tip of the gauge in contact with the face of the test specimen shall apply a force of (1,0 ± 0,5) N. The mass of the apparatus shall not affect the flatness of the test specimen beyond the limit of the accuracy of the gauge. See Figure A.1 for illustration. The instrument shall be set to zero against a suitable reference plate.



Key

1 rigid frame
2 dial gauge
3 circular pressure foot
4 floor covering element with pre-attached underlay (downward)
5 flat rigid baseplate

Figure A.2 — Instrument for measuring thickness of an element with pre-attached underlay

A.4 Procedure

A.4.1 Determination of thickness (t)

A.4.1.1 Determination of thickness (t) of an element without pre-attached underlay

Using the micrometre, calliper gauge or any other equivalent tool, measure the thickness *t* at a distance of 20 mm from the edges of the surface layer, at points located in each corner and in the middle of each long side (only four corner points if length < 600 mm) (see Figure A.3).

Dimensions in millimetres

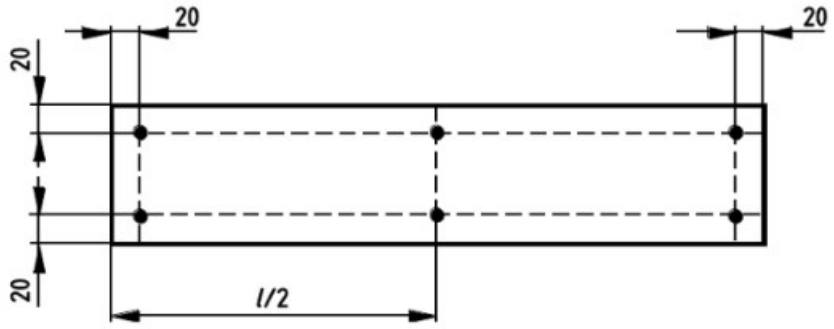


Figure A.3 — Measuring points for determination of thickness (t)

A.4.1.2 Determination of thickness (t) of an element with pre-attached underlay

Take one laminate floor-covering element. Take from this element three test specimens measuring approximately 100 mm x 100 mm, two centred 10 mm in from the short edges and one exactly in the centre of the element (see Figure A.4).

If the elements measure less than 100 mm, cut a square sample with the actual width of the element. Measure in the middle of each sample with an apparatus according to A.3.7 (see Figure A.2) and calculate the average of the three samples.

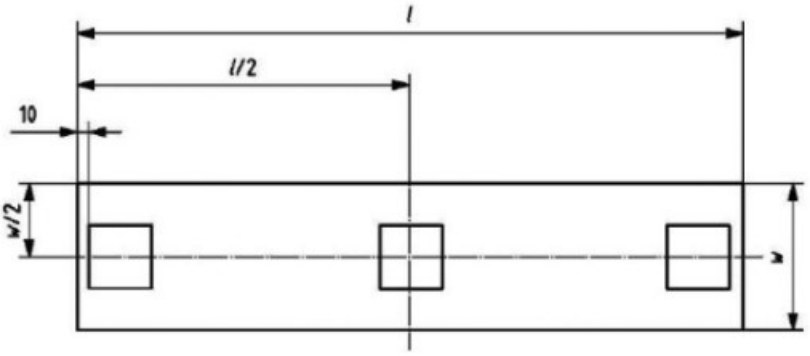


Figure A.4 — Sampling from one floor covering element

A.4.2 Determination of length (l)

Using the appropriate calliper gauge or any other equivalent tool, measure the length *l* of the surface layer along two lines parallel to the axis of the test specimen, at a distance of 20 mm from the long sides (see Figure A.5).

Dimensions in millimetres

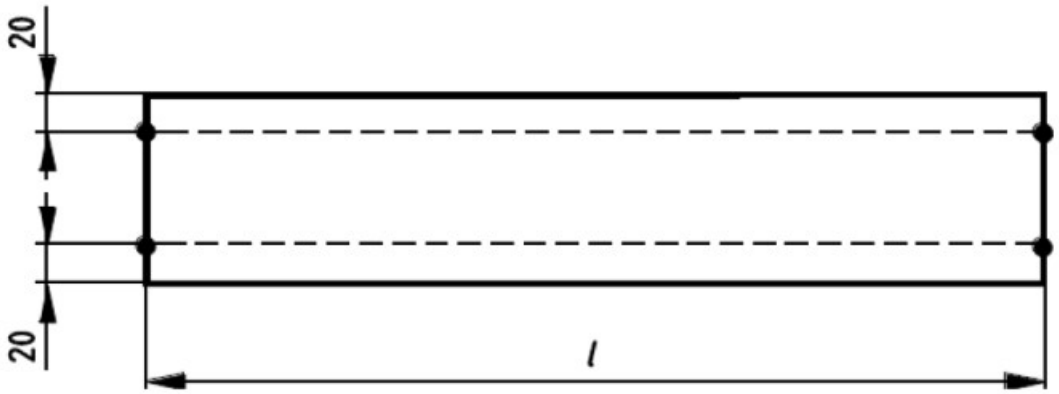


Figure A.5 — Measuring points for determination of length (l)

A.4.3 Determination of width (w)

Using the appropriate calliper gauge or any other equivalent tool, measure the width *w*, along two lines parallel to the sides of the surface layer, at a distance of 20 mm from the sides, and in the middle for elements with a length greater than 600 mm (see Figure A.6).

Dimensions in millimetres

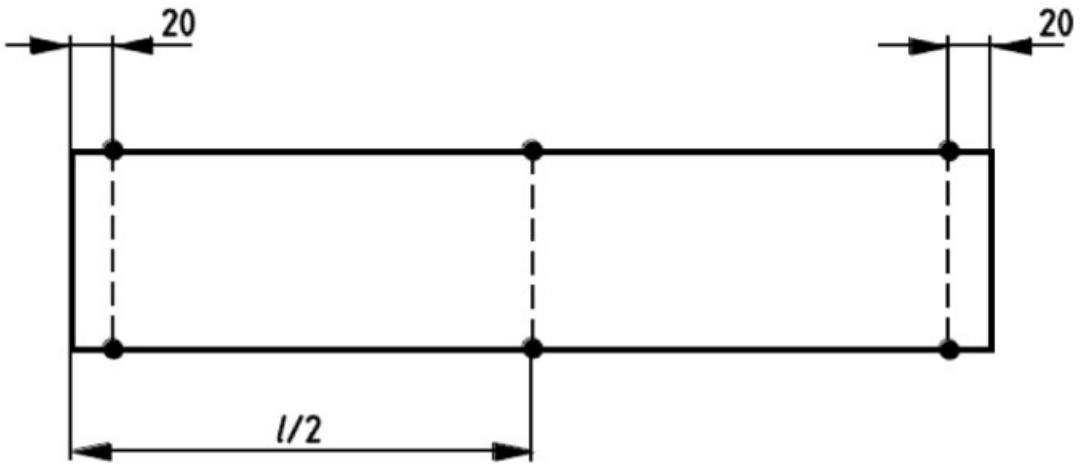


Figure A.6 — Measuring points for determination of width (w)

A.4.4 Determination of dimensions of squared elements

Using the appropriate calliper gauge or any other equivalent tool, measure the width *w*, and the length *l* along two lines parallel to the sides of the surface layer, at a distance of 20 mm from the sides (see Figure A.7).

Dimensions in millimetres

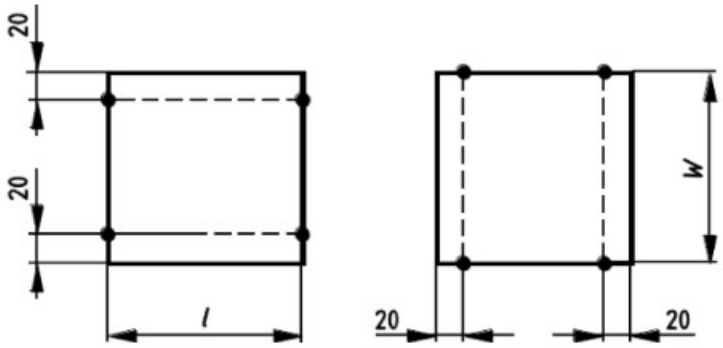


Figure A.7 — Measuring points for determination of width (w) and length (l) of squared elements

A.4.5 Determination of squareness (q)

Place one side of the square against one long side of the surface layer of the element. Using the thickness gauges, determine the maximum deviation from square q max. at the small side. Repeat the procedure on the diagonally opposite corner (see Figure A.8).

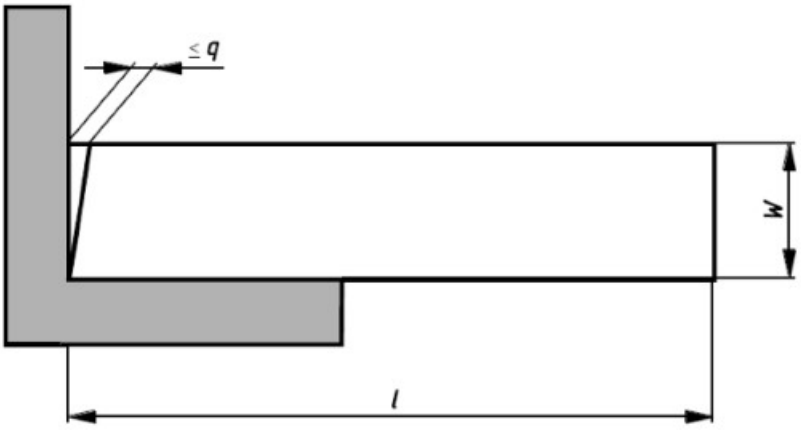


Figure A.8 — Determination of squareness (q)

A.4.6 Determination of straightness (s)

Place the steel ruler against one long side of the surface layer. Using the thickness gauges, determine the maximum deviation $s_{max.}$ from the ruler. Measure only the concave or cupped side (see Figure A.9).

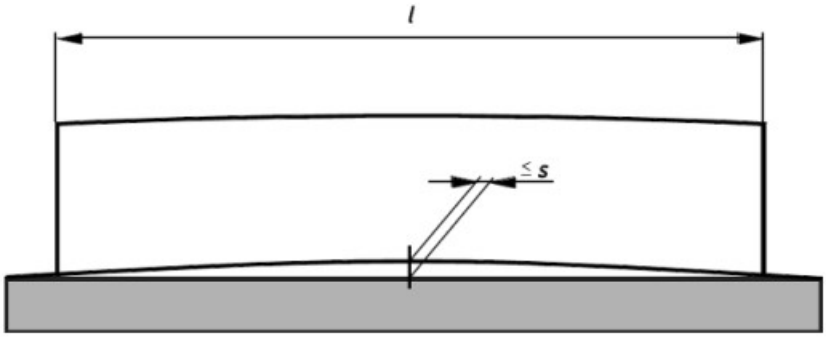


Figure A.9 — Determination of straightness (s)

A.4.7 Determination of width flatness (f_w)

Adjust the supports along the T-shaped assembly of bars according to the width of the test specimen to evaluate (see Figure A.10). Determine the maximum deviation *fw* for each element. The measurement *d* shall not be less than the width *w* of the test specimen minus 10 mm.

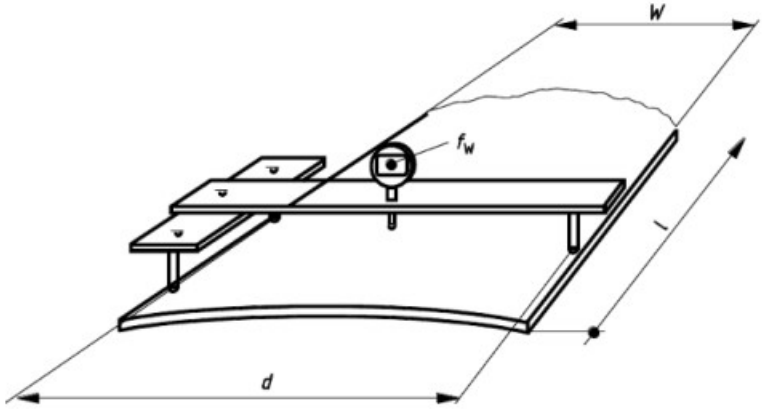
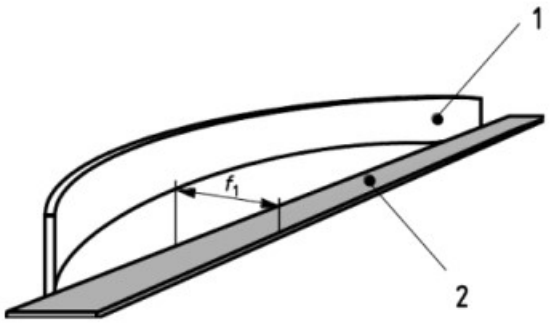


Figure A.10 — Determination of width flatness (f_w)

A.4.8 Determination of length flatness (f_l)

Place the test specimen against the steel ruler as shown in Figure A.11. Using the thickness gauges or the calliper gauge, determine the maximum deviation f_l from the ruler for each element. The measured value shall be expressed as concave when the surface layer is facing towards the ruler and as convex when the surface layer is facing away from the ruler.



Key

1 test specimen

2 steel ruler

Figure A.11 — Determination of length flatness (f_l)

A.5 Calculation and expression of results

A.5.1 Thickness (t)

A.5.1.1 Thickness ($\Delta t_{average}$)

Using all the measurements taken, calculate the mean value $t_{average}$, and also record the single maximum value $t_{max.}$ and the single minimum value $t_{min.}$.

Calculate $\Delta t_{average} = /t_{nominal} - t_{average}/$ and $t_{max.} - t_{min.}$ and express the results in millimetres to the nearest 0,05 mm.

A.5.1.2 Thickness (t)

Using all the measurements taken, calculate the mean value t average and express the results in millimetres to the nearest 0,05 mm.

A.5.2 Length (l)

Record all measured values $l_{measured}$. Calculate for all measured values

$\Delta l = /l_{nominal} - l_{measured}/$ and express the results in millimetres to the nearest 0,1 mm.

If $l_{nominal} > 1500$ mm divide Δl by $l_{nominal}$ and express the results in millimetres to the nearest 0,1 mm/m.

A.5.3 Width (w)

Using all the measurements taken, calculate the mean value $w_{average}$, and also record the single maximum value $w_{max.}$ and the single minimum value $w_{min.}$

Calculate $\Delta w_{average} = /w_{nominal} - w_{average}/$ and $w_{max.} - w_{min.}$ and express the results in millimetres to the nearest 0,05 mm.

A.5.4 Squareness (q)

Record all measured values q and take the largest value $q_{max.}$ of the deviation from square to the nearest 0,05 mm as the result.

A.5.5 Straightness (s)

Record all maximum deviations from the ruler and divide the largest value by the nominal length and express this value $s_{max.}$ as the result to the nearest 0,05 mm/m.

A.5.6 Width flatness (f_w)

Record all measured values f_w and take the largest convex and concave values and divide each by the measurement d (see A.3.5). Express the results to the nearest 0,01 %.

A.5.7 Length flatness (f_l)

Record all measured values f_l and take the largest convex and concave values and divide each by the nominal length of the element. Express the result to the nearest 0,01 %.

Annex B
(normative)

Determination of openings and height difference between elements

B.1 Sampling

Take 8 laminate floor-covering elements as test specimens.

B.2 Conditioning

Test specimens are measured in the received state. For type approval or verification purposes, the test specimens shall be stabilized to a constant mass in an atmosphere of (23 ± 2) °C and (50 ± 5) % relative humidity. Constant mass is considered to be reached when the results of two successive weighing operations, carried out at an interval of 24 h, do not differ by more than 0,1 % of the mass of the test specimens.

B.3 Apparatus

B.3.1 Set of thickness gauges ranging from 0,05 mm to 0,10 mm in steps of 0,01 mm, and from 0,10 mm to 0,50 mm in steps of 0,05 mm.

B.3.2 Calliper gauge or a depth gauge with a scale interval of 0,01 mm.

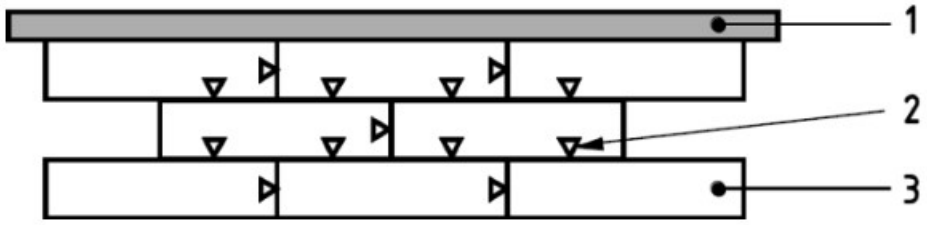
B.3.3 Test surface of appropriate size that is rigid, horizontal and flat.

B.3.4 Ruler or any other device, by which the first strip row shall be aligned and whose length is ≥ 2,50 m.

B.4 Procedure

B.4.1 Assembling

By hand force, firmly assemble the test specimens on the test surface without using any glue, as in Figure B.1, using the ruler as a guide. The ∇-symbol indicates the 13 measuring points.



Key

1 steel ruler

2 measuring point

3 test specimen

Figure B.1 — Test specimens assembled, with the 13 measuring points indicated by ∇

B.4.2 Determination of opening between elements (*o*)

The openings shall be measured at the 13 indicated points (∇), using the thickness gauges, without applying any force to the elements.

B.4.3 Determination of height difference (h)

Using the calliper or depth gauge, measure the height differences, without applying any force to the elements, at the 13 indicated points. Place the base of the instrument at one side of the joint, and measure the maximum height difference at the other side of the joint. Do not carry out the measurement further than 5 mm from the joint edge.

B.5 Calculation and expression of results

Calculate the mean values $o_{average}$ and $h_{average}$ from the number of measurements taken. Record the maximum individual values $o_{max.}$. and $h_{max.}$. Express the results in millimetre to the nearest 0,05 mm.

Annex C
(normative)

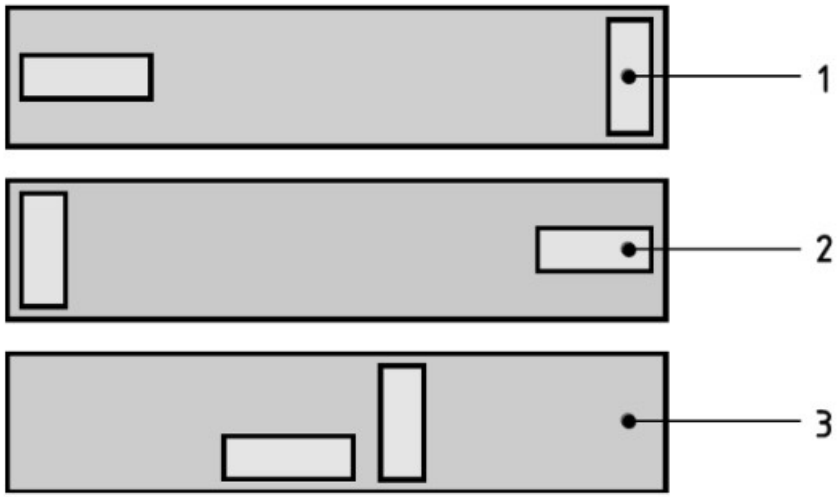
Determination of dimensional variations after changes in relative humidity

C.1 General

Test in accordance with EN 318, with the following modifications.

C.2 Sampling

Take from each of three laminate floor-covering elements one test specimen in the length direction and another in the width direction. The test specimens may be taken from any part of the element as long as the length direction and width direction is maintained (see Figure C.1). The dimension of a test specimen shall be (180 ± 1) mm x (20 ± 1) mm. If the nominal width of the element is less than 180 mm, no test specimen in the width direction shall be taken.



Key

1 test specimen taken in the width direction

2 test specimen taken in the length direction

3 laminate floor covering element

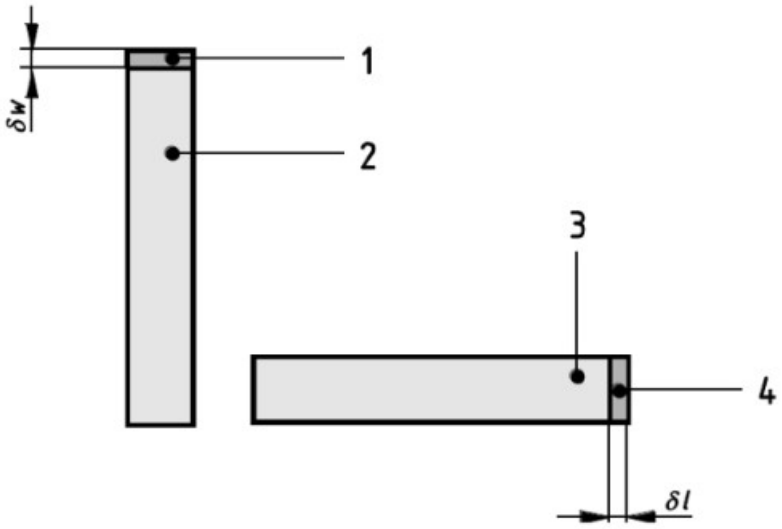
Figure C.1 — Example of sampling

C.3 Conditioning

Test specimens are measured in the received state. For type approval or verification purposes, the test specimens shall be stabilized to a constant mass in an atmosphere of (23 ± 2) °C and (50 ± 5) % relative humidity. Constant mass is considered to be reached when the results of two successive weighing operations, carried out at an interval of 24 h, do not differ by more than 0,1 % of the mass of the test specimens.

C.4 Calculation and expression of results

Only the variations in length and width are considered. Determine the dimensional variations δl and δw for each test specimen, see Figure C.2, between 30 % relative humidity and 90 % relative humidity. Calculate the average length variation $\delta l_{average}$ and average width variation $\delta w_{average}$ respectively. Express the results in millimetres to the nearest 0,1 mm.



Key

1 dimensional variation δw

2 test specimen taken in the width direction

3 test specimen taken in the length direction

4 dimensional variation δl

Figure C.2 — Illustration of the dimensional variations δl and δw

The small size of test specimen in this test method has been chosen in order to obtain reliable results in a reasonably short period of time. The achieved results cannot be scaled-up to large flooring elements, and should never be used as a basis for calculation of the dimensional changes of a laminate floor covering in service.

Annex D
(normative)

Determination of surface soundness

D.1 General

Test in accordance with EN 311, with the following modifications.

D.2 Sampling

From three laminate floor covering elements, take from each element three test specimens of (50 × 50) mm, two centred 10 mm in from the short edges and one exactly in the centre of the element (see Figure D.1).

Dimensions in millimetres

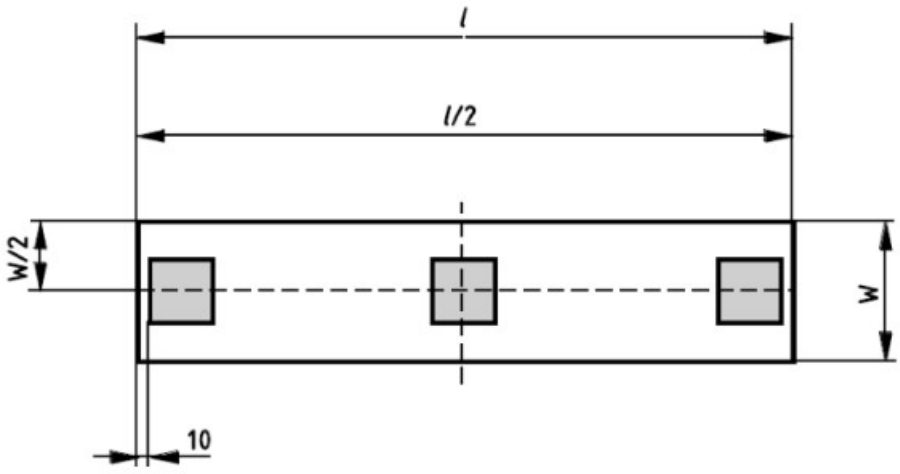


Figure D.1 — Sampling from one of the floor covering elements

D.3 Conditioning

Test specimens are measured in the received state. For type approval or verification purposes, the specimens shall be stabilized to a constant mass in an atmosphere of (23 ± 2) °C and (50 ± 5) % relative humidity. Constant mass is considered to be reached when the results of two successive weighing operations, carried out at an interval of 24 h, do not differ by more than 0,1 % of the mass of the test specimens.

D.4 Procedure

D.4.1 Preparing the test specimen

A circular groove shall be cut through the surface layer by means of a milling tool. The groove shall have an inside diameter of Ø 35,7 mm (enclosing an area of 1000 mm^2) and a depth of (0,3 ± 0,1) mm into the substrate. If the floor covering elements to be tested are thinner than 10 mm, the test specimen shall be strengthened by bonding a 50 mm x 50 mm aluminium plate with a thickness of at least 10 mm to the bottom side of the test specimen.

D.4.2 Bonding the steel pad to the surface

To obtain sufficient bonding to the decorative surface layer it may be necessary to sandpaper the surface with a coarse-grained abrasive paper.

D.4.3 Determination of force at fracture

Record the force at fracture for each test specimen. Ignore the results for any test specimens which display total or partial breakage of the bond between the steel pad and the test specimen, or between the test specimen and the aluminium plate. Under these circumstances, repeat the test, using new test specimens.

D.5 Calculation and expression of results

Calculate the individual value for each test specimen tested. Express the results to the nearest 0,01 N/mm^2.

Annex E
(normative)

Determination of abrasion resistance and abrasion classification

E.1 Sampling

One laminate floor covering element is needed. Take from this element three test specimens, measuring approximately 100 mm x 100 mm:

— two centred 10 mm in from the short edges; and

— one exactly in the centre of the element (see Figure E.1).

Machined edges and machined surfaces shall be avoided in the specimens. If the thickness of the specimens exceeds 8 mm the specimens shall be milled down from the backside to (7,5 ± 0,5) mm to ensure a horizontal load of the abrader arms. Make sure that specimens are uniformly flat and parallel after milling.

If the dimension of the elements makes the described sampling impossible, the test specimens shall be sampled from the nearest available area. If the elements measure less than 100 mm, then a joint is necessary. The joint shall be positioned in the middle of the 100 mm x 100 mm specimen.

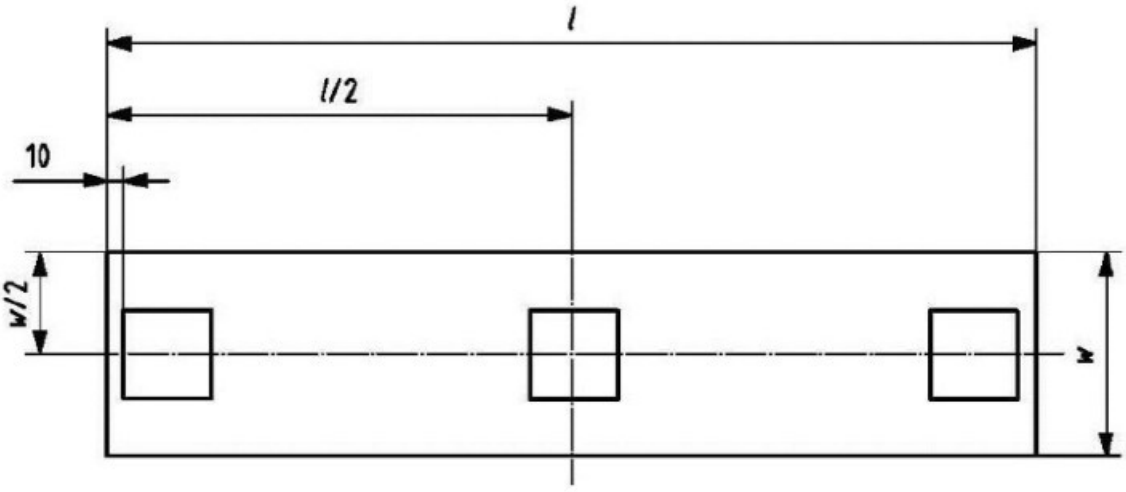


Figure E.1 — Sampling from one floor covering element

Drill a (7,2 ± 0,1) mm centre hole into the test specimen.

E.2 Conditioning

Precondition the test specimens and the abrasive papers (E.3.1.4) for at least 24 h in the conditioning chamber (E.3.2.2). After preconditioning, seal the paper strips in polythene bags (maximum 10 strips per bag) until required for immediate use.

E.3 Apparatus

E.3.1 Testing machine

The testing machine shall consist of the following items (see Figure E.2).

E.3.1.1 Test specimen holder

In form of a disc with a diameter of approximately 105 mm (7 in Figure E.2) which rotates in a horizontal plane with a permitted deviation of ± 2 mm/m at a frequency of 58 r/min to 62 r/min and to which the test specimen (6 in Figure E.2) can be clamped with a clamping screw (5).

E.3.1.2 Holding and lifting device

Holding and lifting device for the abrasive wheels, so constructed that each wheel exerts a force of (5,4 ± 0,2) N on the test specimen.

The calibration and maintenance of the Taber abrader arms should be carried out according to Annex F.

E.3.1.3 Rubber covered abrasive wheels

Two cylindrical rubber-covered wheels of width (12,7 ± 0,1) mm and diameter 50 mm which rotate freely about an axis (3 in Figure E.2). The curved surface of the wheels, to a depth of 6 mm, shall be of rubber (2) of hardness (65 ± 3) IRHD when tested according to ISO 48 or (65 ± 3) Shore A when tested according to ISO 7267-2. A description of measurement and a suitable measurement setup are shown in Annex G.

The inside faces of the wheels shall be (52,5 ± 0,2) mm apart and equally spaced (26,25 ± 0,10) mm from the centre-line of the abrader head and the axis of the wheels shall be (19,05 ± 0,3) mm from the vertical axis of the test specimen holder.

E.3.1.4 Abrasive paper strips

Taber S-42 or equivalent, (12,7 ± 0,1) mm wide in the machine direction by approximately 160 mm long, and having the following composition (1 in Figure E.2):

a) grammage of 70 g/m^2 to 100 g/ m^2;

b) open coated 180 grit Al_2O_3 (aluminium oxide), having a particle size that will pass through a sieve of aperture 100 µm and remain on a sieve of aperture 63 µm;

c) glue bond;

d) adhesive backing.

The abrasive paper strips **"S42"**, made by TABER Industries, are an example of a suitable product available commercially. This information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN of this product. Equivalent products may be used if they can be shown to lead to the same results.

E.3.1.5 Calibration plates

Taber S-34 of rolled zinc sheet, having a thickness of 0,8 mm ± 0,1 mm and a Brinell hardness of (48 ± 2) when tested in accordance with EN ISO 6506-1, except that the ball diameter shall be 5 mm and the load 360 N. For type approval or verification purposes, the zinc plate shall not be used for more than 10 calibrations per side.

Taber S-34 made by TABER Industries 455 Bryant Street, North Tonawanda, New York 14120 USA is an example of a suitable product available commercially. This information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN of this product. Equivalent products may be used if they can be shown to lead to the same results.

E.3.1.6 Suction device

So fitted that two nozzles (4 in Figure E.2) are over the abraded area of the test specimen. One nozzle shall be situated between the wheels, the other diametrically opposite. The centres of the nozzles shall be 77 mm apart and (2 ± 0,5) mm from the surface of the test specimen. When the nozzles are closed, there shall be a vacuum of (1,5 to 1,6) kPa.

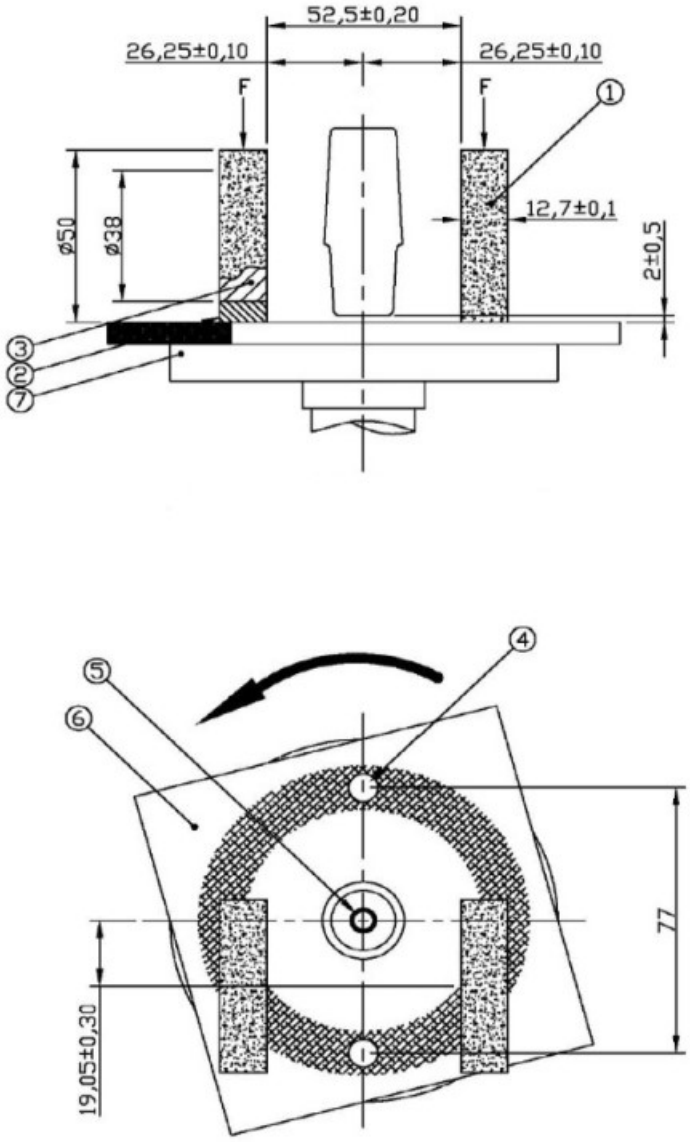
It is important to ensure that the abrasive wheels are in good condition, as variations in flatness, hardness, regularity, roundness and width can significantly affect the test result.

It is important that dimensions listed above and in Figure E.2 are followed as deviations can lead to errors exceeding 100 %. See Annex F for more information.

E.3.1.7 Revolution counter

A revolution counter is needed to record the number of revolutions of the specimen holder.

Dimensions in millimeters



Key

1 abrasive paper
2 rubber
3 abrasive wheel
4 suction nozzle
5 clamping screw
6 specimen
7 specimen holder disc

Figure E.2 — Abrasion resistance testing machine

E.3.2 Additional material or equipment

E.3.2.1 Weighing equipment

For determining the mass loss of the zinc plate by the sand paper or calibrating the grit flow of the abrading material, weighing equipment with an accuracy of ± 1 mg is needed.

E.3.2.2 Conditioning chamber

The conditioning chamber shall be able to maintain a standard climate of 23 °C ± 2 °C and 50 % ± 5 % relative humidity.

E.4 Procedure

E.4.1 General

The resistance to wear is evaluated by abrading the face of test specimens with a specified abrasive paper applied by means of two loaded wheels. Characteristic rub-wear action is produced by contact of the test specimen, against the sliding rotation of the two abrading wheels. As the turntable rotates, the wheels are driven by the sample in opposite directions about a horizontal axis displaced tangentially from the axis of the sample. One abrading wheel rubs the specimen outward toward the periphery and the other, inward toward the centre while a vacuum system removes loose debris during the test. The resulting abrasion marks form a pattern of crossed arcs in a circular band that cover an area approximately 30 cm^2.

E.4.2 Preparation of test specimens and abrasive papers

Clean the surface of the test specimens with an organic solvent which is immiscible with water. Using a marker pen, mark the surface of each test specimen with two lines mutually at right angles so that the surface area is divided into quadrants (see Figure E.3).

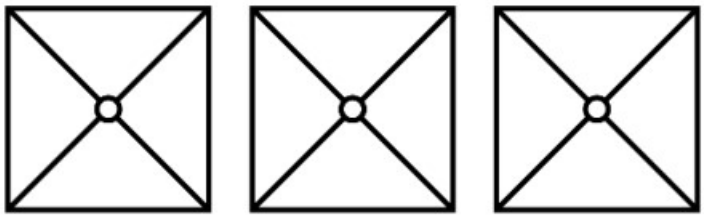


Figure E.3 — Division of the three test specimens into quadrants

E.4.3 Preparation of abrasive wheels

Bond a strip of preconditioned unused abrasive paper to each of the rubber covered wheels (E.3.1.3). Ensure that the cylindrical surface is completely covered without any overlapping of the paper. The outside diameter of the finished assembled wheel shall be (50,90 ± 0,65) mm.

E.4.4 Determination of the abrasion rate of abrasive paper

Prepare two wheels with preconditioned unused abrasive paper according to E.3.1.4 from the same batch to be reserved for testing. Clamp a zinc plate (E.3.1.5) in the test specimen holder (E.3.1.1), start the suction device (E.3.1.6), reset the revolution counter (E.3.1.7) to zero, lower the wheels and abrade the zinc plate for 500 revolutions. Wipe the zinc plate clean and weigh to the nearest 1 mg. Renew the abrasive papers with preconditioned unused strips from the same batch, and abrade the zinc plate for a

further 500 revolutions. Wipe the zinc plate clean and weigh it again to the nearest 1 mg. The loss in mass shall be (120 ± 20) mg. Any lot of abrasive paper which causes a loss in mass outside this range shall not be used for testing.

E.4.5 Abrasion of test specimen

Perform the test immediately after the determination of the abrasion rate. Prepare two wheels with preconditioned unused abrasive paper from the same batch previously approved by determination of abrasion rate (E.4.4). Fit the wheels to the machine and reset the revolution-counter to zero. Clamp the first test specimen in the holder. Ensure that the surface of the test specimen is flat. Lower the wheels, start the suction device and abrade the test specimen.

Examine the test specimen for abrasion after each 100 revolutions and renew the abrasive papers after every 200 revolutions.

Continue the test in this way until the initial wear point (IP) is reached.

The initial wear point (IP) is that point at which the first clearly recognizable wear-through of the print appears and the sub-layer becomes exposed in three quadrants. The initial wear point is reached when there are areas of at least 0,60 mm^2 wear-through in two quadrants and an area of 0,60 mm^2 wear-through becomes visible in a third quadrant. The sub-layer for printed patterns is the background on which the pattern is printed. For plain colours, it is the first layer of different colour.

For specimens with a joint, disregard the wear that occurs within 10 mm on either side of the joint.

Record the number of revolutions as the IP-value. Repeat the test immediately using the two remaining test specimens.

To determine the initial wear point (IP), Figure E.4 can be used. To precisely determine the size of the wear-through area, the "Dirt size estimation chart"[2)] can be used. The chart is recommended by both ISO/TC 219 and CEN/TC 134.



a) Insufficient test: Wear-through is evident only in one quadrant

b) Correct test: Wear-through is evident in three quadrants

c) Excessive test: Wear-through has passed beyond the initial wear point

Figure E.4 — Assessment of initial point

1) "Dirt size estimation chart" is the trade name of a product supplied by TAPPI, Technology Park, P.O. Box 105113, Atlanta, GA 30348-5113, USA, tel. +1 770 446 1400, fax +1 770 446 6947. The article reference is: TAPPI - Dirt size estimation chart.

"Dirt size estimation chart" is an example of a suitable product available commercially. This information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN-CENELEC of this product.

E.4.6 Expression of results

Calculate the average of the IP-values obtained from the three test specimens to the nearest 100 revolutions.

Express the abrasion resistance of a laminate floor covering as one of the abrasion classes (AC1 to AC6) according to Table E.1.

Table E.1 — Abrasion classes

Abrasion class	AC1	AC2	AC3	AC4	AC5	AC6
Average IP-value from three test specimens	≥ 500	≥ 1000	≥ 2000	≥ 4000	≥ 6000	> 8500

E.4.7 Test report

The test report shall include the following information:

a) a reference to this European Standard (EN 13329)

b) the name and type of product;

c) the average IP-values in revolutions of the three samples rounded to the nearest 100 cycles; abrasion class

d) any deviation from the specified procedure;

e) the date of the test.

Annex F
(normative)

Calibration and Maintenance of Abrasion equipment

F.1 General

This Annex F is an example of a procedure for calibration and maintenance of equipment utilized for abrasion resistance testing. The information contained has been developed for specific equipment. Other manufacturers of similar equipment may have other calibration procedures and methods.

The procedures outlined below do not necessarily address all potential sources of variance. The schedule for use of described procedures has not been established. Good laboratory practice and experience will indicate required intervals in each laboratory.

Improper alignment of the abrasive wheels can lead to each wheel abrading a different path from its complementary wheel across the sample as well as the wheels on other machines. Path surface area can differ by as much as 20 % and the area abraded by both wheels on a sample could be less than 50 % of the total abraded area for that sample, hence the source of potential error.

Three parts have been identified as potential sources of errors. Each is addressed separately; however each is dependent upon the other. The first is bearing wear (looseness), the second is shaft wear and the third is alignment of the arms. They are addressed without any order of priority below.

F.2 Apparatus

F.2.1 Calibration block of preferably steel measuring (77,9 × 77,9 × 25) mm with a hole drilled and threaded with UNF 1/4 inch in the centre (38,95 ± 0,02) mm of the (77,9 × 77,9) mm face such that the block can be threaded onto the holder disc of the abrader. All edges shall be made with a radius of 1 mm.

F.2.2 Feeler gages of various thickness.

F.2.3 Shim washers of various thickness ranging from 0,05 mm and up. The inside diameter shall be 8 mm and the outside diameter shall be 13 mm.

F.3 Procedure

F.3.1 Bearing Wear

Examine each arm of the abrader visually and by hand for any bearing wear. Specific areas to examine are the pivot areas of the abrader arm and the shaft on which the wheel revolve. This includes but is not limited to any sideways, twisting, or other motion outside the specific rotation of the arm or the shaft. Any movement noted other than the pivoting of the arm or shaft requires that further examination be made to determine the cause of the excess movement.

Specific repairs shall be completed before attempting subsequent portions of the procedure.

F.3.2 Shaft Wear

In certain instances, the shaft for the abrader wheel may slide end to end. This movement shall be eliminated by placing shim washers of appropriate thickness between the bearing face and the shaft keeper ring on the end of the shaft opposite the abrader wheel mounting. This can be measured using

the feeler gauges to measure the gap prior to disassembly and the appropriate thickness of shim washers placed on the shaft.

F.3.3 Alignment

Remove the rubber wheels from their respective shaft mounting and set aside. Remove the rubber mat on the sample table (if used).

Attach the calibration block to the table by the threaded mount.

Gently lower the arms with the exposed shaft ends onto the block. Rotate the block to square the block with the shaft face of each arm. The face of each shaft shall squarely meet the adjacent face of the calibration block without force and without any gap. If the arm does not seat squarely onto the block or leaves a gap between the face and block then that arm shall be aligned.

If the alignment does not allow the wheel shaft to rest against the shaft hub and face, the arm shall be moved away from the block by loosening the two set screws on the top of the machine toward the back that holds the shaft on which the arm pivots and moving the entire arm assembly away from the block enough so that the shaft face and hub rest squarely against the calibration block. Retighten the set screws and recheck.

If the alignment leaves a gap between the shaft hub/face and the calibration block, the arm shall be moved toward the block by loosening the two set screws on the top of the machine toward the back that holds the shaft on which the arm pivots and moving the entire arm assembly towards the block enough so that the shaft face and hub rest squarely against the calibration block. Retighten the set screws and recheck.

In the case of a dual head abrader, the alignment is more complex due to the common mount utilized by the shaft holding the interior arms for each side of the abrader. In the case of a dual head abrader, the following order of alignment adjustments is made.

1) Remove rubber wheels and table mats from both heads and attach the calibration block to the left head.

2) Check Arm 1 for correct alignment. If adjustment is required loosen SS1 and SS2 and move the arm assembly in or out to squarely align the shaft face/hub to the calibration block. Retighten the set screws and recheck.

3) Check Arm 2 for correct alignment. If adjustment is required loosen SS3, SS4 and SS5 and move the arm assembly in or out to squarely align the shaft face/hub to the calibration block. Retighten the set screws SS3 and SS4 and recheck.

4) Remove the calibration block from the left head and attach to the right head.

5) Check Arm 3 for correct alignment. SS5 is loose. Seat the shaft beneath SS5 fully to the left and check the Arm 3 alignment. If the shaft face/hub is too tight to the calibration block, shims shall be removed from Arm 3 assembly at the point the shaft seats into the arm at point X. Part the assembly by moving the Arm 3 and shaft under SS5 fully to the right and remove the shims as needed to squarely place the shaft face/hub against the calibration block. Retighten the set screw SS5 and recheck. If the shaft face/hub is loose against the calibration block, shims shall be added to the arm 3 at the point the shaft seats into the arm at point X. Measure the gap between the block and the shaft face/hub with the feeler gauge to determine the thickness of shim washers to add. Part the assembly by moving the Arm 3 and shaft under SS5 fully to the right and add the shims as needed to squarely place the shaft face/hub against the calibration block. Retighten the set screw SS5 and recheck.

6) Check Arm 4 for correct alignment. If adjustment is required loosen SS6 and SS7 and move the arm assembly in or out to squarely align the shaft face/hub to the calibration block. Retighten the set screws and recheck.

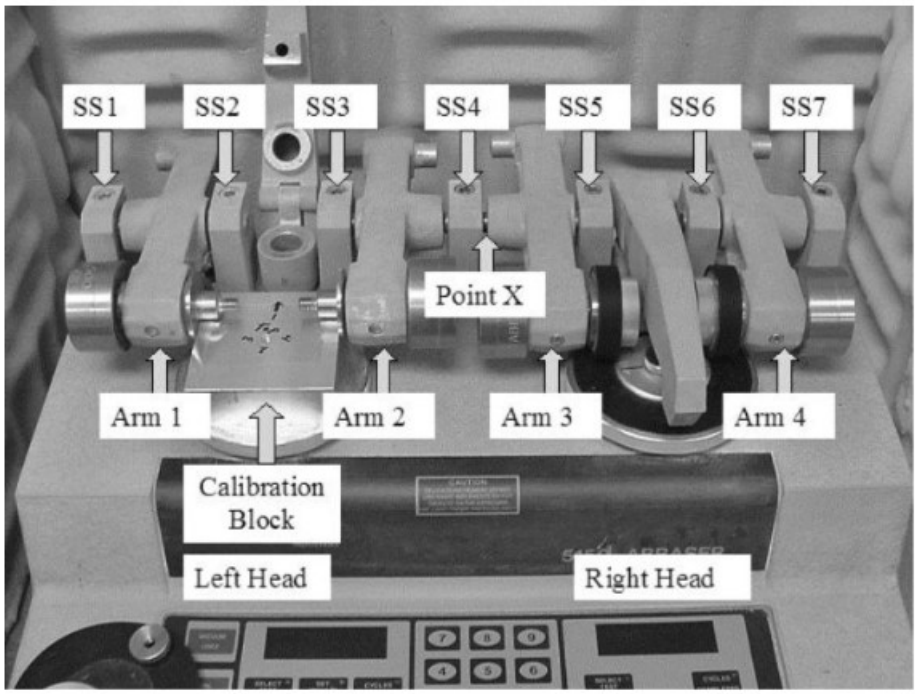


Figure F.1 — Dual Head Abrader with Calibration Block and Identification Points

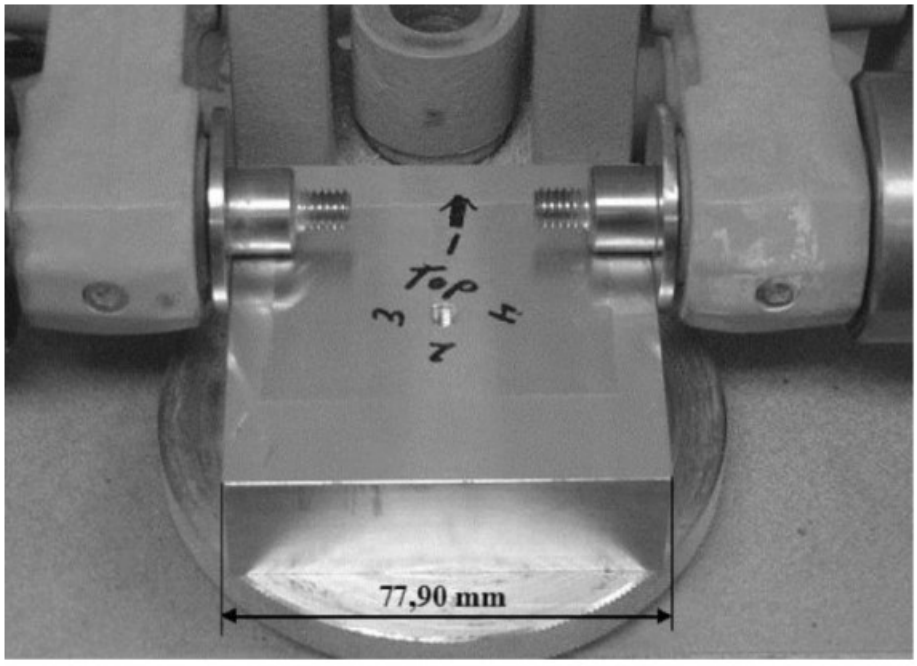


Figure F.2 — Calibration Block with Arms Correctly Aligned

Annex G
(normative)

Measurement of shore A hardness

For shore A test measurements, the apparatus used shall be a shore type A durometer instrument with a 12,7 mm presser foot diameter, operating stand with a mechanically controlled rate of decent, and 1 kg mass centred on the axis of the indenter. The wheel to be tested shall be firmly located with its major axis horizontal and with the area in which the hardness shall be measured uppermost and positioned directly under the durometer indenter by means of a fixture or V-block (Figure G.1). The hardness measurements shall be taken vertically on the apex of the wheel with the indenter normal to the wheel tread surface and in the middle of the wheel tread. The presser foot shall be applied to the wheel tread at a controlled rate of decent, without shock until the full force of the 1 kg mass is applied to the wheel tread surface. The reading shall be taken 5 s after the presser foot is in firm contact with the wheel surface. Four points shall be measured at equally spaced intervals around the diameter of the wheel and the average of these measurements shall be calculated for wheel hardness.



a) **b)**

Figure G.1 — Example for a suitable measurement setup

NOTE A suitable measurement setup can be provided by Rex Gauge Company, Inc. 1250 Busch Parkway, Buffalo Grove, IL 60089 (www.durometer.com)[3)].

3) This information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN-CENELEC of this product. Equivalent products may be used if they can be show to lead to the same results.

Annex H
(normative)

Determination of impact resistance and impact classification

H.1 General

Test in accordance with the EN 438 series, with the following modifications:

The underlay, which is described in 4.2, should be used for the large diameter ball test of products of classes 21 – 23 and 31 – 33.

Products of class 34 should be tested with the pre-attached or specified by the manufacturer underlay. If no underlay is pre-attached or prescribed then the underlay (see 4.2) should be used.

The small ball diameter test shall be carried out without underlay. The pre-attached underlay shall be removed.

H.2 Sampling

Take five laminate floor covering elements. For the large-diameter ball test, take from each element one test specimen measuring approximately 180 mm x 180 mm (or in case of 180 mm < w ≤ 150 mm, *w* mm x 180 mm). If the width is smaller than 150 mm, assemble two panel parts together with the joint in the middle of the sample. Take two more specimens for a pre-trial with the big ball from two elements. For the small-diameter ball test, the remaining areas of the elements are used for 5 test specimens of 180 mm x 180 mm or 180 mm x w.

H.3 Apparatus

H.3.1 Test devices.

For small and big ball as specified in EN 438-2.

H.3.2 Underlay.

As specified in 4.2 or attached or prescribed underlay for class 34 products.

H.3.3 Marking pen.

Water washable marking pen.

H.3.4 Cloth.

A clean, damp, soft, white cloth.

H.4 Procedure

H.4.1 Large-diameter ball test

H.4.1.1 General

On the test specimens, carry out the large-diameter ball test in accordance with EN 438-2, on the steel plate with the underlay (H.3.2) in the case of not pre-attached or prescribed underlay but without the clamping frame and with the deviations described in H.4.1.2 and H.4.1.3. The underlay shall be used for

one test series (6 samples). The black carbon paper shall be changed from time to time to avoid incomplete marks.

H.4.1.2 Pre-trial

Use the pre-trial to determine on one or two samples the maximum height which does not produce damages (cracks or an imprint greater than 10 mm diameter). In the case of assembled samples the impact distance from the joint shall be at least 25 mm.

H.4.1.3 Main investigation

On the other 5 samples carry out maximum 4 impacts per sample using the following described procedure. Change the falling height in dependence from the test result (with or without damage). Increase the falling height if no damage occurs or decrease the falling height in the case of damage.

Procedure on each sample:

— Impact 1: determined falling height of the pre-trial;

— Impact 2: change by 200 mm;

— Impact 3: change by 100 mm;

— Impact 4[4)]: change by 50 mm. Use the cloth to wipe each impact point; use the marking pen to ink over impact points caused by the ball. Cracks may appear as hairline cracks or concentric circles.

Determine the maximum height which does not produce cracks or an imprint greater than 10 mm diameter on each sample.

H.4.1.4 Calculation and expression of results

Calculate the average of the maximum falling heights and round it to the nearest 50 mm.

H.4.2 Small-diameter ball test

H.4.2.1 Procedure

Carry out the small-diameter ball test in accordance with EN 438-2. When testing, ensure that the back of the element has full contact with the steel plate. The following modification for the calibration shall be taken into consideration:

Suspend the tester with the impact bolt pointing upwards so that its longitudinal axis is free to hang vertically under gravity (Figure H.1).

4) If the 4 impacts don't lead to a result a 5. impact on the surface is possible.



Figure H.1 — Suitable device for calibration of the small ball impact tester

Set the force-setting barrel, which serves to vary the impact force, to zero on the scale. Compress the spring by a force Fe (calibration force), using a suitable arrangement (for example weights in a scale-pan) suspended from the knob used to draw back the impact bolt, ensuring that the bolt is clear of the retainer of the release unit.

Turn the force-setting barrel until the retainer of the release unit is just in contact with the impact bolt. This position can be determined by increasing the compressing force very slightly to observe whether the retainer is just in contact. Record the indicated force Fx on the scale of the instrument corresponding to the calibration force Fe.

Repeat this calibration procedure for various values of Fx in the range required, and draw a calibration graph relating values of the scale reading Fx to values of the calibration force Fe using a linear regression program (Figure H.2). Calculate the regression coefficient R. This calibration graph is valid if $R^2 \geq 0{,}98$.

NOTE A suitable software is the function of Microsoft Excel® “trend line / linear regression” or equivalent.

Use the determined formula to correct the indicated force Fx used in the testing.

Prepare a new calibration graph every 500 tests.

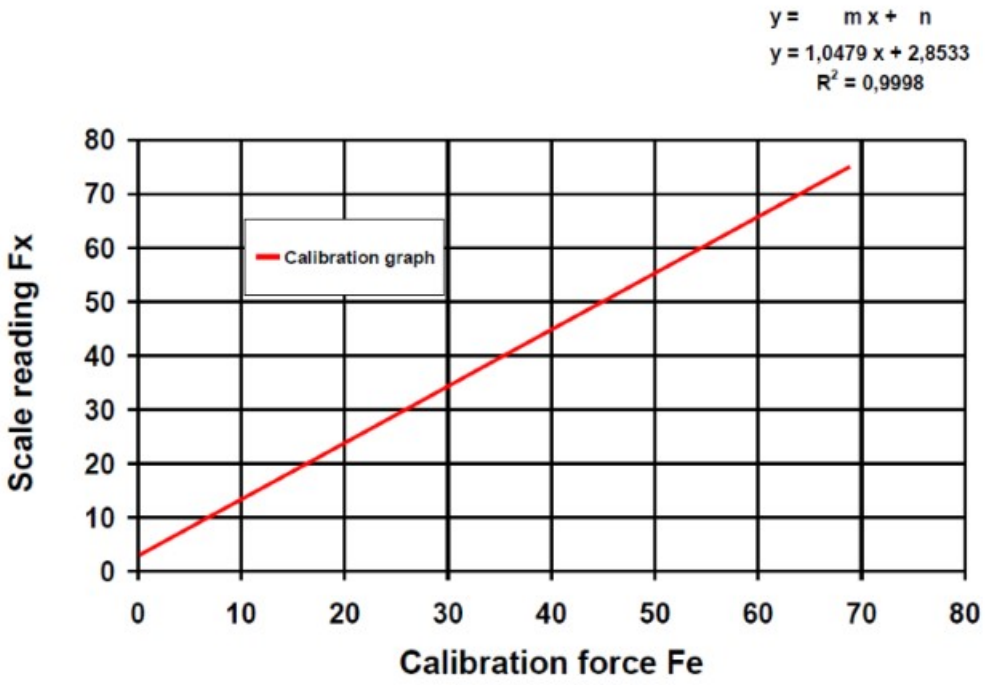


Figure H.2 — Example of calibration method

H.4.2.2 Calculation and expression of results

Record the results of each sample and calculate the average to the nearest 1 N.

Bibliography

[1] EN 309, *Particleboards - Definition and classification*

[2] EN 316, *Wood fibre boards - Definition, classification and symbols*

[3] EN 14041, *Resilient, textile and laminate floor coverings - Essential characteristics*

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