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Tämä standardi on vahvistettu englanninkielisenä	*This standard is approved in English*

Laminate floor coverings. Specifications, requirements and test methods

Tämä standardi sisältää eurooppalaisen standardin EN 13329:2000 ”Laminate floor coverings. Specifications, requirements and test methods” englanninkielisen tekstin.

Eurooppalainen standardi EN 13329:2000 on vahvistettu suomalaiseksi kansalliseksi standardiksi.

This standard consists of the English text of the European Standard EN 13329:2000 ”Laminate floor coverings. Specifications, requirements and test methods”.

The European Standard EN 13329:2000 has the status of a Finnish national standard.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13329

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English version

Laminate floor coverings - Specifications, requirements and test methods

Revêtements de sol stratifiés - Spécifications, exigences et méthodes d'essai

Laminatböden - Spezifikationen, Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 20 May 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 134 "Resilient and textile floor coverings " , the secretariat of which is held by BSI.

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 2000, and conflicting national standards shall be withdrawn at the latest by december 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

The annexes A, B, C, D, E, F and G are normative.

1 Scope

This European Standard specifies characteristics, states requirements and gives test methods for laminate floor coverings (as defined in paragraph 3.1).

It includes a classification system, based on EN 685, 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. It also specifies requirements for marking and packaging.

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

2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For the undated references, the latest edition of the publication referred to applies.

EN 309	Wood particleboards - Definition and classification
prEN 311:1999	Wood based panels - Surface soundness - Test method
EN 316	Wood fibreboards - Definition, classification and symbols
EN 318	Fibreboards - 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 the simulated movement of a furniture leg
EN 425	Resilient floor coverings - Determination of the effect of a castor chair
EN 433	Resilient floor coverings - Determination of residual indentation after static loading
EN 438	Decorative high pressure laminates (HPL) - Sheets based on thermosetting resins
EN 685	Resilient floor coverings – Classification

EN 12529:1998	Castors and wheels – Castors for furniture – Castors for swivel chairs – Requirements
EN 20105-A02	Textiles - Test for colour fastness – Part A02: Gray scale for assessing change in colours (ISO 105-A02:1993)
EN ISO 105-B02	Textiles - Test for colour fastness – Colour fastness to atificial light: Xenon arc fading lamp test (ISO 105-B02:1994, including amendment 1:1998)
ISO 48	Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)
ISO 6506	Metallic materials – Brinell hardness test

3 Terms and definitions

For the purposes of this standard the following terms and definitions apply:

3.1
laminate floor covering
floor covering with a surface layer consisting of one or more thin sheets of a fibrous material (usually paper), impregnated with aminoplastic, thermosetting resins (usually melamine).

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 backing (e.g. HPL, CPL, impregnated papers and veneers), primarily used as a balancing material.

3.1.1
surface layer
upper decorative layer intended to be the visible side when the floor is installed

This layer consists of sheets impregnated with thermosetting resins, pressed by three different techniques.

- High-pressure laminates (HPL), as defined in EN 438.
- Continuous pressed laminates (CPL).
- Directly pressed to the substrate (DPL).

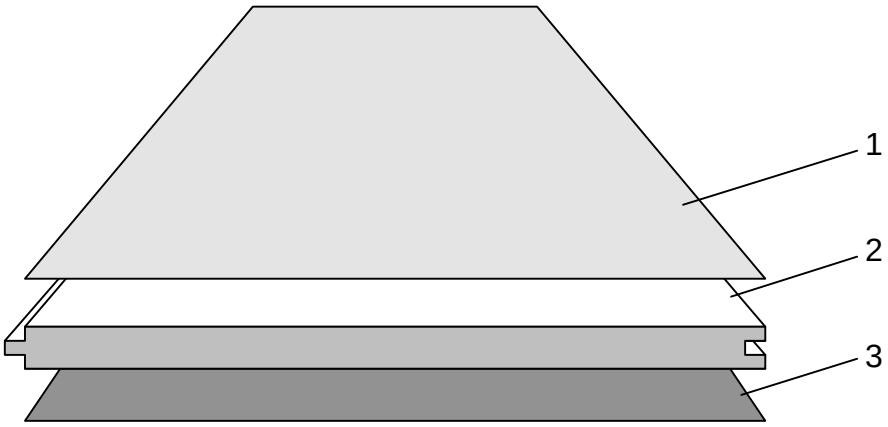
3.1.2
substrate
core material of the laminate floor covering

It is generally a particleboard, as defined in EN 309, or a Medium Density Fibreboard or High Density Fibreboard (MDF or HDF), as defined in EN 316.

3.1.3
backing
layer opposite to the surface layer

The backing is generally made of HPL, CPL, impregnated papers or veneers. It is primarily used to balance and stabilise the product.

3.2
laminate floor covering element
consisting of a surface layer, a substrate and a backing, shaped and machined on its sides to the appropriate dimensions (see Figure 1). The elements are usually tongued and grooved to facilitate assembly at installation.



Key

1 Surface layer
2 Substrate
3 Backing

Figure 1 - Construction of a 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 given therein.

For special applications, such as decorative pattern effects, tighter tolerances may be required.

The tolerances of the tongue and groove shall be such that when, for testing, the elements are assembled without glue, the maximum permissible opening and height difference values are not exceeded.

To determine the capability of laminate floor coverings to withstand ambient humidity variations, a laboratory test in controlled conditions shall be made.

Table 1 - General requirements

Characteristic	Requirement	Test method
Thickness of the element, ***t***	$\Delta t_{average} \leq 0{,}50$ mm, relative to nominal value $t_{max.} - t_{min.} \leq 0{,}50$ mm	Annex A
Length of the surface layer, ***l***	For the nominal values given, no measured value shall exceed: $l \leq 1500$ mm: $\Delta l \leq 0{,}5$ mm $l > 1500$ 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	Blue wool scale, part B02, not worse than 6,	EN ISO 105
	Grey scale, part A02, not worse than 4	EN 20105
Static indentation	No visible change, i.e. $\leq 0{,}01$ mm indentation using a straight steel cylinder, Ø = 11,30 mm	EN 433
Surface soundness	$\geq 1{,}00$ N/mm^2	Annex D

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 685.

Table 2 - Classification requirements and levels of use

	Levels of use						
	Domestic			Commercial			
	Moderate	General	Heavy	Moderate	General	Heavy	
Class:	**21**	**22**	**23**	**31**	**32**	**33**	**Test method**
Abrasion resistance	AC1	AC2	AC3		AC4	AC5	Annex E
Impact resistance	IC1				IC2	IC3	Annex F
Resistance to staining	4, (groups 1 and 2) 3, (group 3)	5, (groups 1 and 2) 4, (group 3)					EN 438
Resistance to cigarette burns	___	4					EN 438
Effect of a furniture leg	___	No damage shall be visible, when tested with foot type 0					EN 424
Effect of a castor chair	___	No change in appearance or damage, as defined in EN 425. Single-wheel castors, as defined in EN 12529:1998, 5.4.4.2 (Type W) shall be used.					EN 425
Thickness swelling	≤ 20,0 %			≤ 18,0 %			Annex G

4.3 Additional requirements

When any of the characteristics given in table 3 are required 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 requirements

Characteristic	Requirement	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 EN 438 are permitted	EN 438

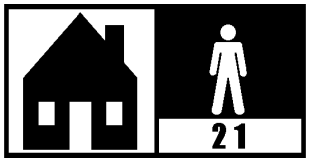
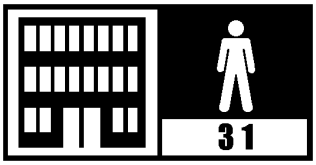
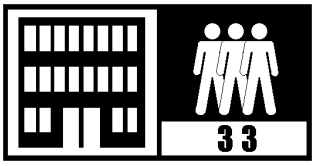
5 Marking, designation and packaging

5.1 Marking

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) number of this European Standard followed by suffix according to clause 5.2;
b) manufacturer's and/or supplier's identification;
c) product name;
d) colour/pattern and batch number;
e) symbol appropriate to the class of product according to figure 2;
f) the nominal dimensions of one floor covering element in millimetres;
g) the number of elements contained in a package;
h) the area in square metres contained in a package;

Table 4 - Classification symbols

	Domestic	Commercial
Moderate		
General		
Heavy		

5.2 Designation

The appropriate class for level of use according to table 2 shall be shown as a suffix to the EN 13329 reference. Example for the designation of a laminate floor covering for general domestic use according to class 22:

Laminate floor covering EN 13329-22

5.3 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) 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 Micrometer, 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.

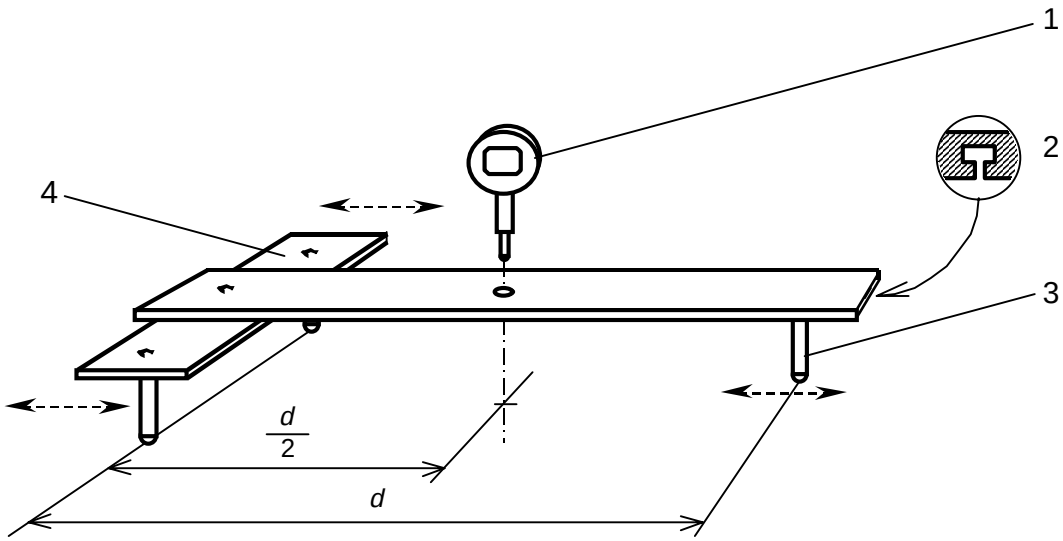
A.3.2 Calliper gauge or any other equivalent tools with an accuracy of ±0,05 mm for width measurements, and ±0,1 mm for length measurements.

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

A.3.4 A 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 A 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 Dial gauge
2 T-groove
3 Adjustable pin
4 Adjustable bridge

Figure A.1 - Instrument for measuring width flatness

A.4 Procedure

A.4.1 Determination of thickness (*t*)

Using the micrometer, 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.2).

Dimensions in millimetres

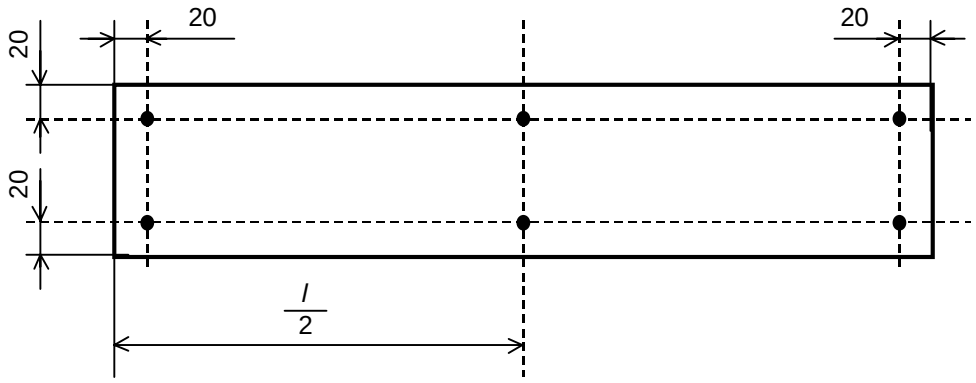


Figure A.2 - Measuring points for determination of thickness (*t*)

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.3).

Dimensions in millimetres

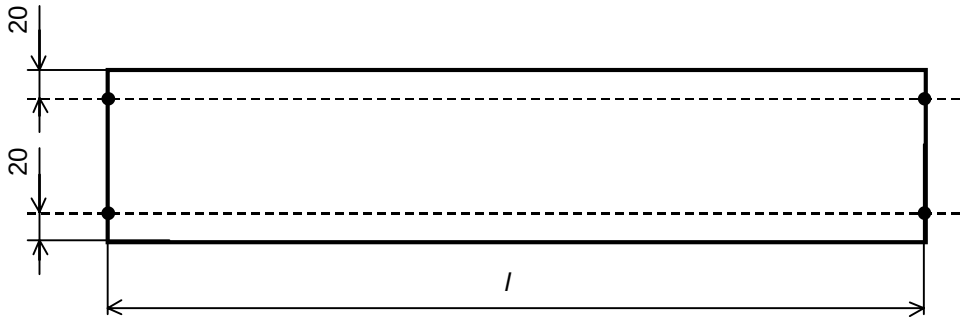


Figure A.3 - Measuring points for determination of length (*l*)

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.4).

Dimensions in millimetres

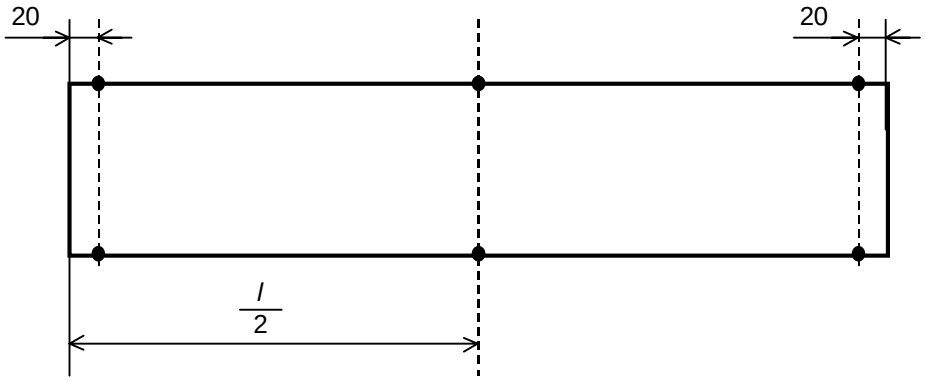


Figure A.4 - Measuring points for determination of width (*w*)

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.5).

Dimensions in millimetres

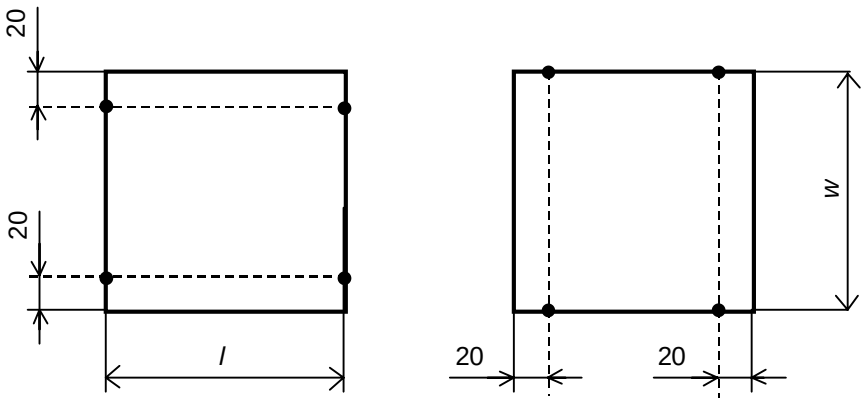


Figure A.5 - Measuring points for determination of width (*w*) and length (*l*) of squared elements

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.6).

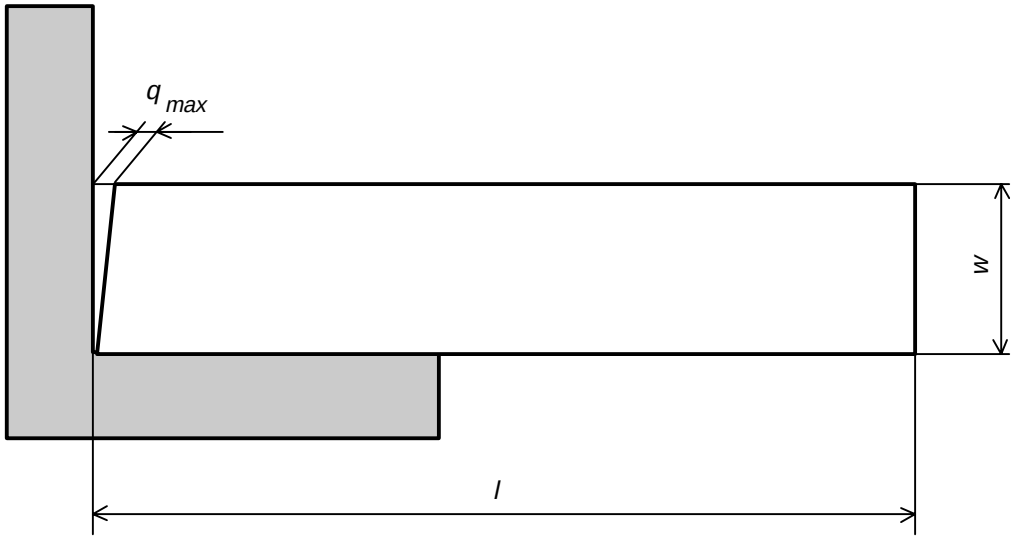


Figure A.6 - Determination of squareness (*q*)

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.7).

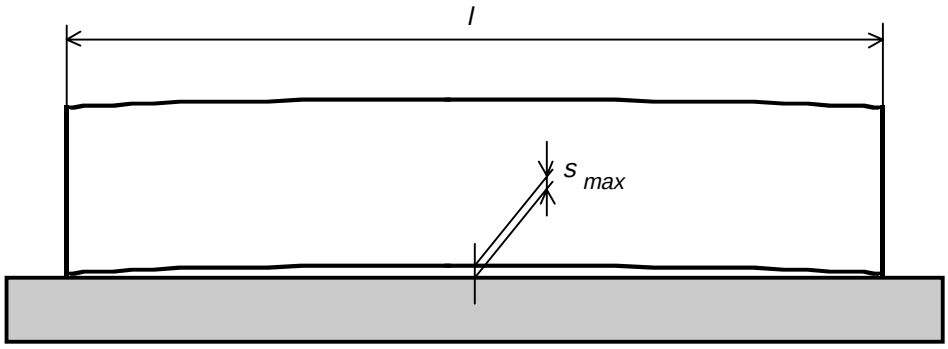


Figure A.7 - Determination of straightness (*s*)

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.8). Determine the maximum deviation f_w for each element. The measurement d shall not be less than the width w of the test specimen minus 10 mm.

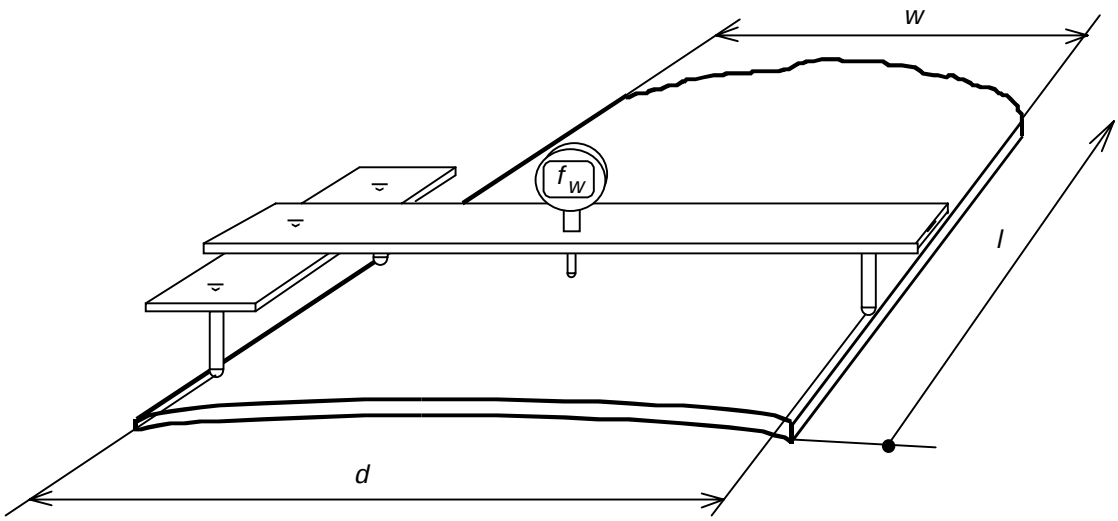
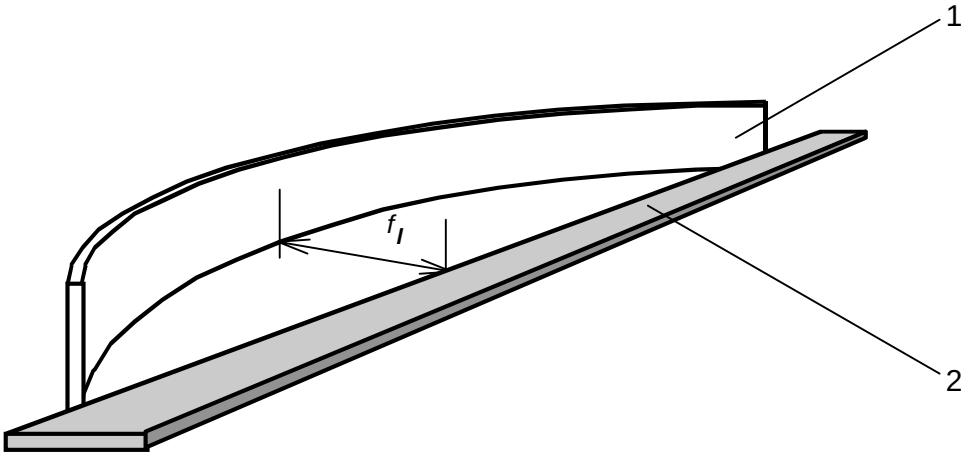


Figure A.8 - Determination of width flatness (f_w)

A.4.8 Determination of length flatness (f_l)

Place the test specimen against the steel ruler as shown in figure A.9. 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.9 - Determination of length flatness (f_l)

A.5 Calculation and expression of results

A.5.1 Thickness (t)

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.5.2 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) ºC 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.

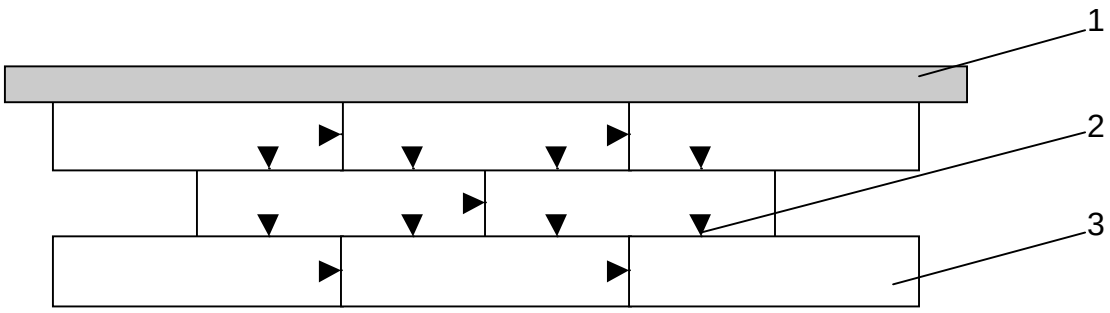
B.3 Apparatus
B.3.1 A set of thickness gauges ranging from 0,05 mm to 0,10 mm in steps of 0,01 mm, and from 0,10 mm to 0,50 mm in steps of 0,05 mm.

B.3.2 A calliper gauge or a depth gauge with a scale interval of 0,05 mm.

B.3.3 A 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*)
Using the thickness gauges, measure the openings, without applying any force to the elements, at the 13 indicated points.

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 millimetres to the nearest 0,05 mm.

Annex C (normative)

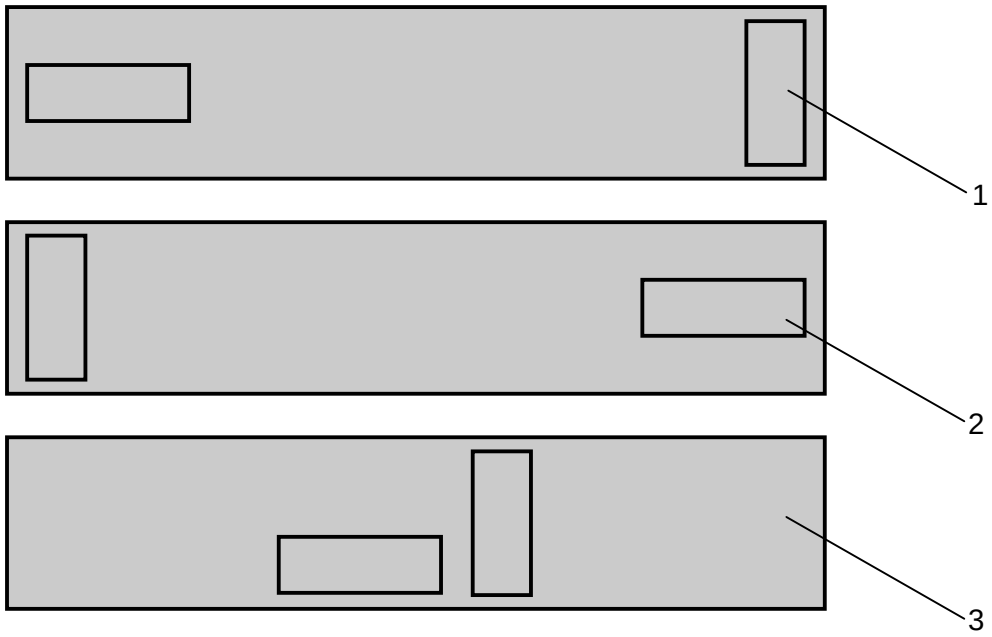
Determination of dimensional variations after changes in relative humidity

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

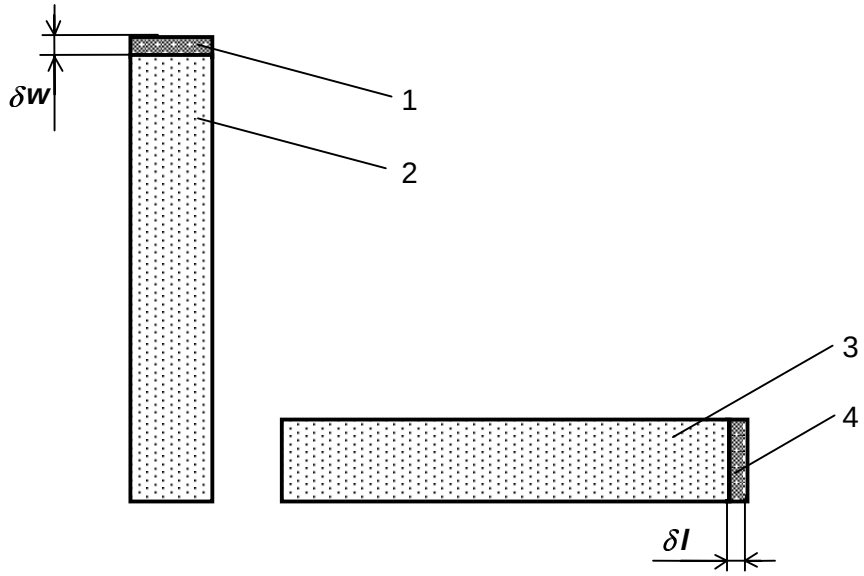
Figure C.1 - Example of sampling

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) ºC 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

NOTE 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 can not 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 prEN 311:1999, with the following modifications.

D.2 Sampling

From three laminate floor covering elements, take from each element three test specimens of (50 x 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

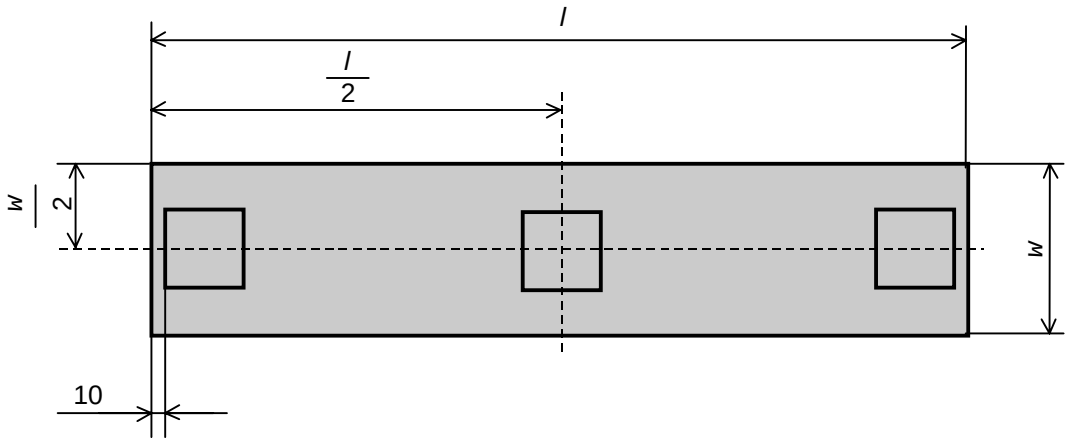


Figure D.1 - Sampling from one of the floor covering elements

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 underside 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 General

This annex specifies the method for measuring abrasion resistance and consequently determining the abrasion class of laminate floor covering elements. The test described measures the ability of the surface layer to resist abrasive wear-through. Abrasion is achieved by rotating a test specimen in contact with a pair of loaded cylindrical wheels covered with specified abrasive paper. The number of revolutions of the test specimen required to cause a defined degree of abrasion is measured.

E.2 Apparatus

E.2.1 Calibration plates (Taber S-34 or equivalent), of rolled zinc sheet, having a thickness of (0,8 ± 0,1) mm and a Brinell hardness of (48 ± 2) when tested in accordance with ISO 6506, 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.

E.2.2 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;

a) paper grammage of 70 g/m² to 100 g/m²,

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) adhesive backing.

E.2.3 Testing machine consisting of the following items: (See figure E.1).

a) **Test specimen holder** in the form of a disc (7) which rotates in a horizontal plane at a frequency of (58 to 62) rpm and to which the test specimen (6) can be clamped with a clamping screw (5).

b) **Abrasive wheels** (3), two cylindrical rubber-covered wheels of width (12,7 ± 0,1) mm and diameter 50 mm which rotate freely about a common axis. The curved surface of the wheels, to a depth of 6 mm, shall be of rubber (2) of hardness (50 to 55) IRHD when tested according to ISO 48. The inside faces of the wheels shall be (50 to 55) mm apart, and their common axis shall be 20 mm from the vertical axis of the test specimen holder.

c) **Holding and lifting device** (8), for the abrasive wheels, so constructed that each wheel exerts a force of (5,4 ± 0,2) N on the test specimen.

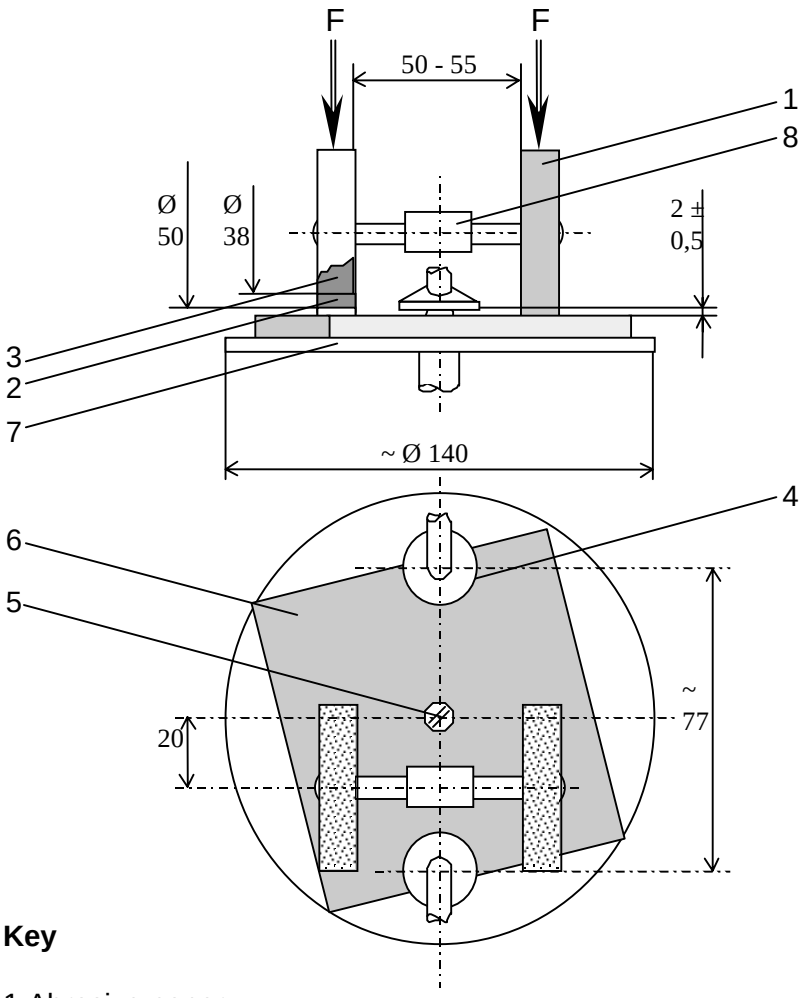
d) **Revolution-counter.**

e) **Suction device,** so fitted that two nozzles (4) 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.

NOTE 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.

E.2.4 Conditioning chamber, with a standard climate of (23 ± 2) °C and (50 ± 5) % relative humidity.

Dimensions in millimetres



Key

1 Abrasive paper
2 Rubber
3 Abrasive wheel
4 Suction nozzle
5 Clamping screw
6 Specimen
7 Specimen holder disc
8 Holding and lifting device

Figure E.1 - Abrasion resistance testing machine

E.3 Sampling

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 E.2).

Dimensions in millimetres

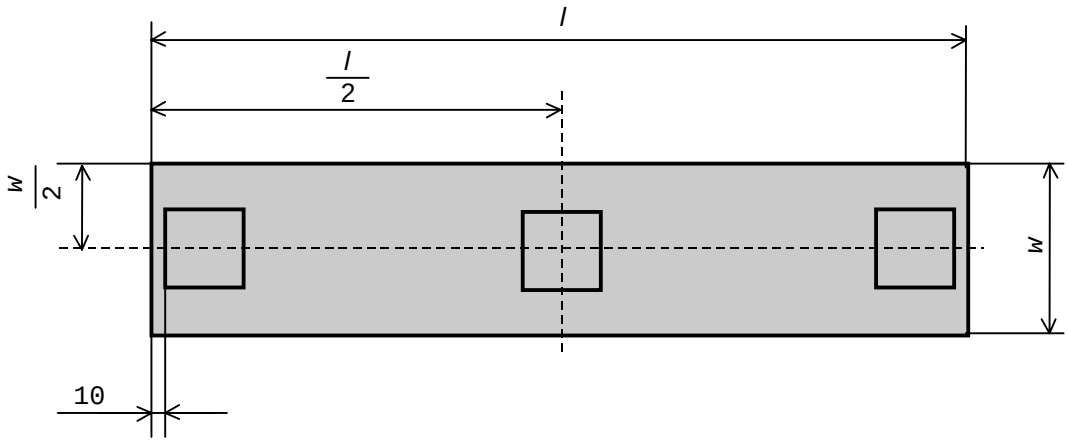


Figure E.2 - Sampling from one floor covering element

E.4 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).

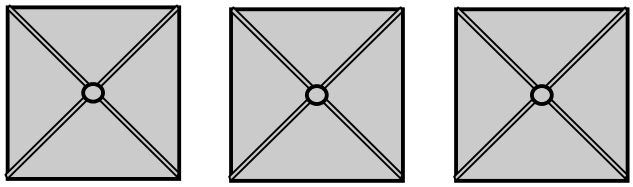


Figure E.3 - Division of the three test specimens into quadrants

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

E.5 Procedure

E.5.1 Preparation of abrasive wheels

Bond a strip of preconditioned unused abrasive paper to each of the rubber-covered wheels. Ensure that the cylindrical surface is completely covered without any overlapping of the paper.

E.5.2 Calibration of abrasive paper

Prepare two wheels with preconditioned unused abrasive paper according to E.5.1 from the same batch to be reserved for testing. Clamp a zinc plate in the test specimen holder, start the suction device, reset the revolution counter 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 . Its loss in mass shall be (130 ± 20) mg. Any batch of abrasive paper which causes a loss in mass outside this range shall not be used for testing.

E.5.3 Abrasion of test specimen
Perform the test immediately after the calibration. Prepare two wheels with preconditioned unused abrasive paper from the same batch previously approved by calibration. 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 recognisable 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.

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

NOTE 1 *IP-poster*, to determine the initial wear point (IP). This is a full-colour photographic visual aid in the three CEN languages to assist correct interpretation, and increase repeatability and reproducibility in the determination of the initial wear point (IP). The poster is developed and recommended by CEN/TC 134/SC 2 and is available from SIS Förlag AB, Box 6455, SE-113 82 STOCKHOLM, Sweden, Tel.: +46 8 610 30 60, Fax.: + 46 8 30 18 50. The article number is; 21824 IP-poster.

NOTE 2 *Dirt size estimation chart*, to precisely determine the size of the wear-through area. The chart is recommended by CEN/TC 134/SC 2 and is available from TAPPI, Technology Park/Atlanta, P.O. Box 105 113, Atlanta, GA 30348-5113, USA, Tel.: +1 770 446 1400, Fax.: +1 770 446 6947. The article reference is; TAPPI - Dirt size estimation chart.

E.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, AC2 ... AC5) according to table E.1.

Table E.1 - Abrasion classes

Abrasion class	**AC1**	**AC2**	**AC3**	**AC4**	**AC5**
Average IP-value from three test specimens	$\geq$ 900	$\geq$ 1800	$\geq$ 2500	$\geq$ 4000	$\geq$ 6500

Annex F (normative)

Determination of impact resistance and impact classification

F.1 General
Test in accordance with EN 438, with the following modifications.

F.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 smaller width than 180 mm, *w* mm x 180 mm). For the small-diameter ball test, the remaining areas of the elements are used as test specimens.

F.3 Apparatus
In addition to the apparatus specified in EN 438, a flexible extruded polyethylene foam sub-layer of (3 ± 0,5) mm thickness, and with a density of (25 ± 5) kg/m³ is required.

F.4 Procedure
F.4.1 Large-diameter ball test
On the five small test specimens carry out the large-diameter ball test in accordance with EN 438, on the steel plate with the polyethylene foam sub-layer but without the clamping frame. Adjust the drop height in steps of 50 mm, to determine the maximum height which does not produce cracks or an imprint greater than 10 mm diameter.

F.4.2 Small-diameter ball test
Carry out the small-diameter ball test in accordance with EN 438. When testing, ensure that the back of the element has full contact with the steel plate.

F.5 Calculation and expression of results
F.5.1 Large-diameter ball test
Record the results of each test and calculate the average to the nearest 50 mm.

F.5.2 Small-diameter ball test
Record the results of each test and calculate the average to the nearest 1 N.

F.6 Evaluation of results, impact classification
The classification system is based on a combination of the results of the large-diameter ball test and the small-diameter ball test. Use figure F.1 to determine the appropriate impact class (IC1...IC3).

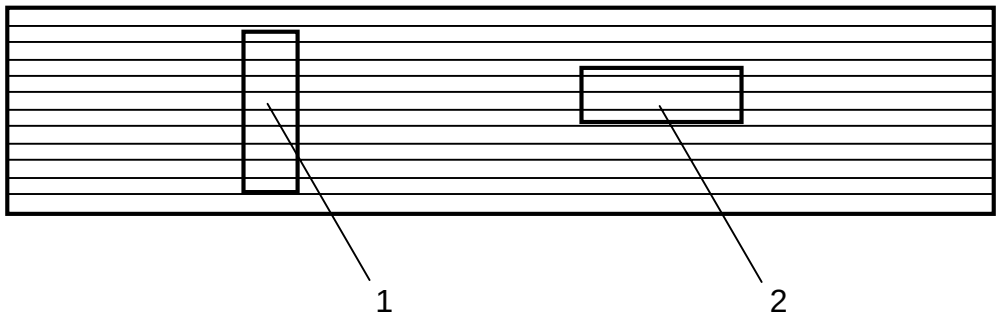
Impact classification		Large-diameter –ball test [mm]				
		≥ 800	≥ 1000	≥ 1200	≥ 1400	≥ 1600
Small-diameter ball test [N]	≥ 8	**None**	**IC1**			
	≥ 10					
	≥ 12				**IC2**	
	≥ 15					
	≥ 20					**IC3**

Figure F.1 - Impact classification

Annex G (normative)

Determination of thickness swelling

G.1 Sampling
Cut two test specimens measuring (150 ± 1) mm x (50 ± 1) mm out of a laminate floor covering element, one in the length direction and one in the width direction (see figure G.1). If the nominal width *w* of the laminate floor covering element is less than 150 mm, the test specimen shall measure (*w* ± 1) mm x (50 ± 1) mm.



Key

1 Sample taken in the width direction
2 Sample taken in the length direction

Figure G.1 - Sampling

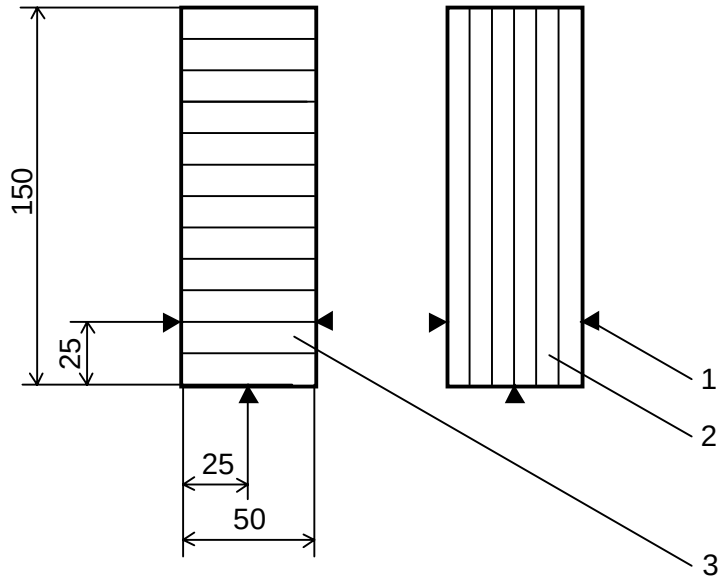
G.2 Conditioning
Test specimens are measured in the received state. For type approval or verification purposes, the test specimens shall be stabilized to a constant mass in an atmosphere of (23 ± 2) °C and (50 ± 5) % relative humidity. Constant mass is considered to be reached when the results of two 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.

G.3 Apparatus
G.3.1 A water bath large enough to ensure a constant water level and capable of maintaining the water temperature at (20 ± 1) °C.

G.3.2 A micrometer with flat and parallel circular measuring surfaces of at least 5 mm diameter, with an accuracy of ± 0,05 mm.

G.4 Procedure
Determine the initial thickness (t_{in}) of the test specimens perpendicular on the extreme edges at the six points indicated in figure G.2. Place the two test specimens in the water bath as illustrated in figure G.3. Remove the test specimens after 24 h ± 15 min, and dry them with a towel. Determine the final thickness (t_{fin}) of the test specimens perpendicular on the extreme edges at the same six measuring points.

Dimensions in millimetres



Key

1 Measuring point
2 Sample taken in the length direction
3 Sample taken in the width direction

Figure G.2 - The six measuring points indicated by ▲

Dimensions in millimetres

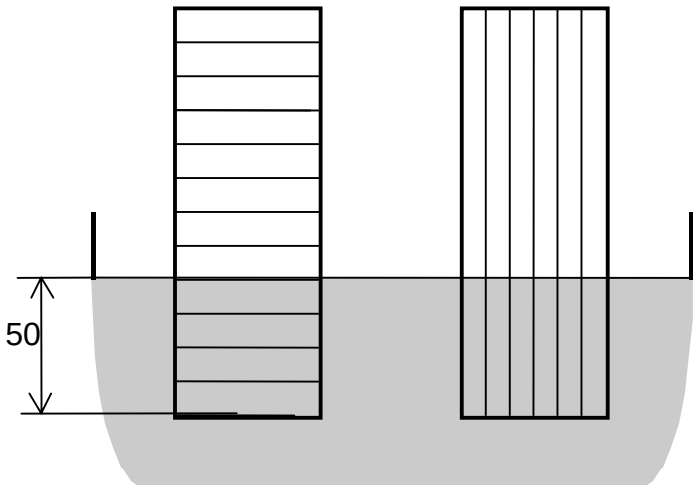


Figure G.3 - The test specimens in the water bath

G.5 Calculation and expression of results

Record all values and determine the differences between initial and corresponding final values. Calculate for each pair of values the thickness swelling in % according to the formula:

$$\frac{(t_{fin} - t_{in}) \times 100}{t_{in}}$$

Express as the result the average thickness swelling, using the individual thickness swelling results from the six measuring points, in % to nearest 0,1%.