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Textile floor coverings — Determination of mass loss, fibre bind and stair nosing appearance change using the Lisson Tretrad machine

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Textile floor coverings - Determination of mass loss, fibre bind and stair nosing appearance change using the Lisson Tretrad machine (ISO 12951:2015)

Revêtements de sol textiles - Détermination de la perte de masse, de la sensibilité au défibrage et du changement d'aspect au nez de marche à l'aide la machine Lisson Tretrad (ISO 12951:2015)

Textile Bodenbeläge - Bestimmung des Gewichtsverlustes, der Fasereinbindung und der Treppenkantenprüfung mittels Tretradgerät System Lisson (ISO 12951:2015)

This European Standard was approved by CEN on 6 August 2015.

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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN ISO 12951:2015 E

European foreword

This document (EN ISO 12951:2015) has been prepared by ISO/TC 219 “Floor coverings“ in collaboration with 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of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

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

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Endorsement notice

The text of ISO 12951:2015 has been approved by CEN as EN ISO 12951:2015 without any modification.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 219, *Floor coverings*.

This second edition cancels and replaces the first edition (ISO 12951:1999), which has been technically revised.

INTERNATIONAL STANDARD ISO 12951:2015(E)

Textile floor coverings — Determination of mass loss, fibre bind and stair nosing appearance change using the Lisson Tretrad machine

1 Scope

This International Standard specifies four methods of test of textile floor coverings (with or without an underlay, see Clause 9) using the Lisson Tretrad machine.

— test A: determination of mass loss of textile floor coverings, also used to assess fibre bind of synthetic pile carpets;

— test B: determination of stair nosing appearance change of textile floor coverings;

— test C: determination of fibre bind on synthetic loop pile carpets;

— test D: determination of fibre bind (hairiness) on needled floor coverings and floor coverings without pile.

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.

ISO 139, *Textiles — Standard atmospheres for conditioning and testing*

ISO 1765, *Machine-made textile floor coverings — Determination of thickness*

ISO 1957, *Machine-made textile floor coverings — Selection and cutting of specimens for physical tests*

ISO 2424, *Textile floor coverings — Vocabulary*

ISO 8543, *Textile floor coverings — Methods for determination of mass*

ISO 9405, *Textile floor coverings — Assessment of changes in appearance*

EN 1307, *Textile floor coverings — Classification of pile carpets*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions, in addition to those in ISO 2424, apply:

3.1
mass loss per unit area
m_V
difference between the sample mass before and after the wear test, related to the tested area

Note 1 to entry: See Clause 10.

3.2
relative mass loss for pile carpets
m_{rv}
ratio of the mass loss per unit area m_v as a percentage of the mass of pile per unit area above the substrate (in accordance with ISO 8543)

3.3
I_{TR} index
index calculated according to the following formula:

$$I_{TR} = 0{,}19\sqrt{m_{AP}} \times \left(\frac{100 - m_{rv}}{100}\right)$$

where

m_{AP} is the mass per unit area above the substrate in grams per square metre, determined in accordance with ISO 8543;

m_{rv} is the relative fibre loss expressed as a percentage.

4 Principle

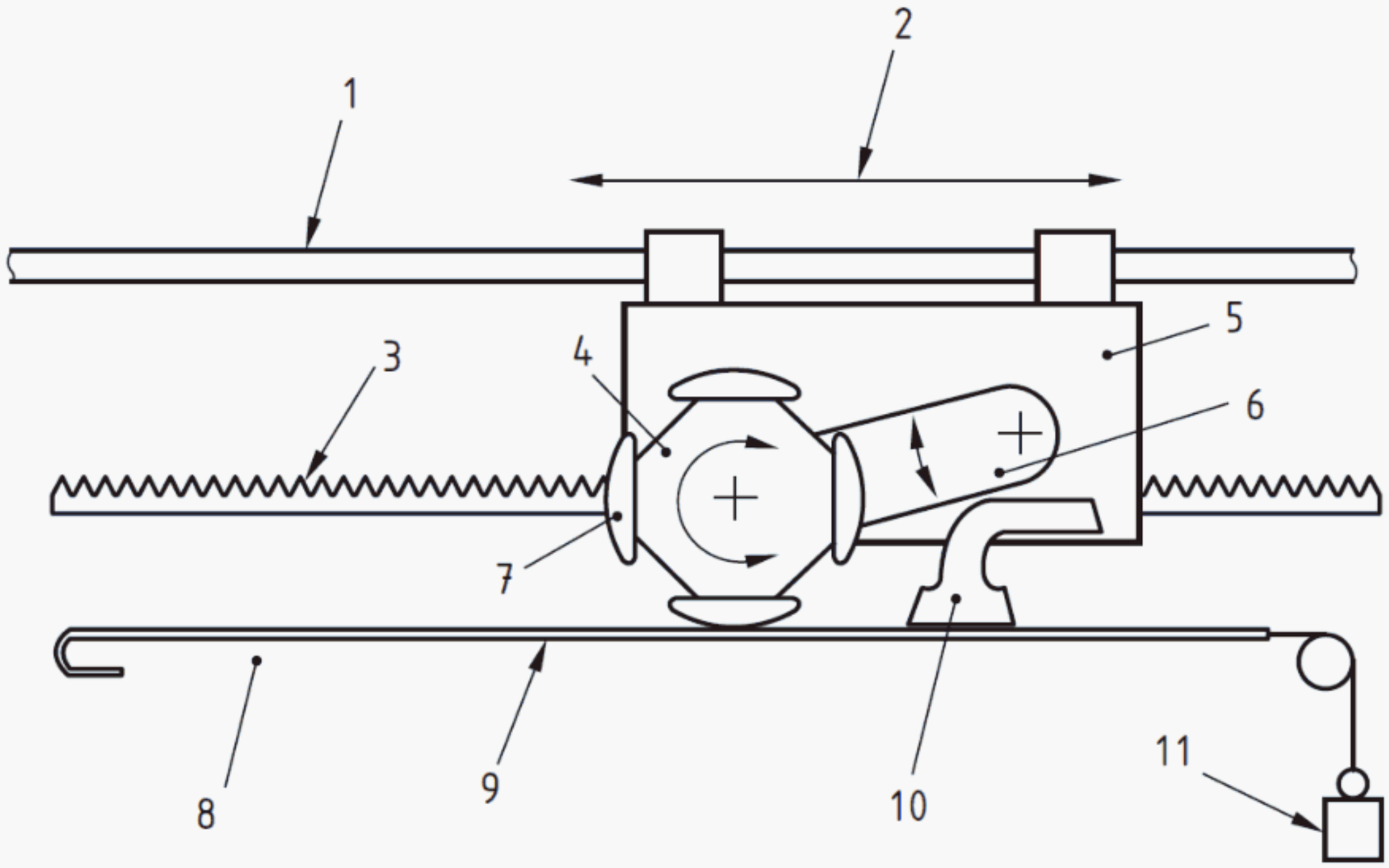
The specimens of a textile floor covering are exposed, at constant load and slippage and for a prescribed number of double passages, to the action of a four-footed wheel (Tretrad), the feet of which are fitted with interchangeable rubber soles.

5 Apparatus

5.1 Lisson Tretrad machine

5.1.1 General

A Lisson Tretrad machine comprises of a bed plate, a vacuum cleaning system, and two Tretrad assemblies (see Figure 1).



Key

1 support	2 movement of the Tretrad	3 cog bar	4 Tretrad wheel
5 frame	6 drive	7 foot	8 bed plate
9 specimen	10 dust extraction	11 tension weight	

Figure 1 — Lisson Tretrad machine

5.1.2 Bed plate

The bed plate faces are parallel to the track travelled by the Tretrad feet and the front edge of the plate is rounded with a 10 mm radius to simulate a stair nosing.

The test surface is formed by the width of the Tretrad feet and the length of the track over which the Tretrad runs. The track length shall be determined for each machine by measuring the distance between the front edge of the base plate and the perpendicular projection of the Tretrad axis at its furthermost point of reversal. The length of track shall be (800 ± 20) mm.

Two clamps mounted at each end of the bed plate are used to hold each specimen under tension. The tension is applied by means of a weighted third clamp, each specimen being subjected to a force of (20 ± 2) kg.

5.1.3 Tretrad assemblies

The Lisson Tretrad apparatus has two Tretrad assemblies, each of which comprises a Tretrad mounted in a frame that is free to rotate around an axis that is 135 mm to 140 mm above the upper surface of the bed plate.

Each Tretrad comprises four equally-spaced legs with rigidly attached feet platforms.

The surface of the foot platform has a radius of curvature of (112,5 ± 1) mm, a circumferential length of (100,0 ± 1,0) mm, and a width of (55,0 ± 0,5) mm. The ends of the contact surfaces of the platforms are rounded with a radius of (4,0 ± 0,5) mm.

The vertical force applied by the Tretrad feet, in the stationary state, shall be (15,0 ± 2,0) kg measured without the soles in position (see Figure 2).

The linear speed of the Tretrad is (0,28 ± 0,02) m/s and the peripheral speed of the Tretrad with sole coverings is (20,0 ± 2,0) % greater than the linear speed. This causes slippage of the feet on the test specimen in addition to the compressive action.

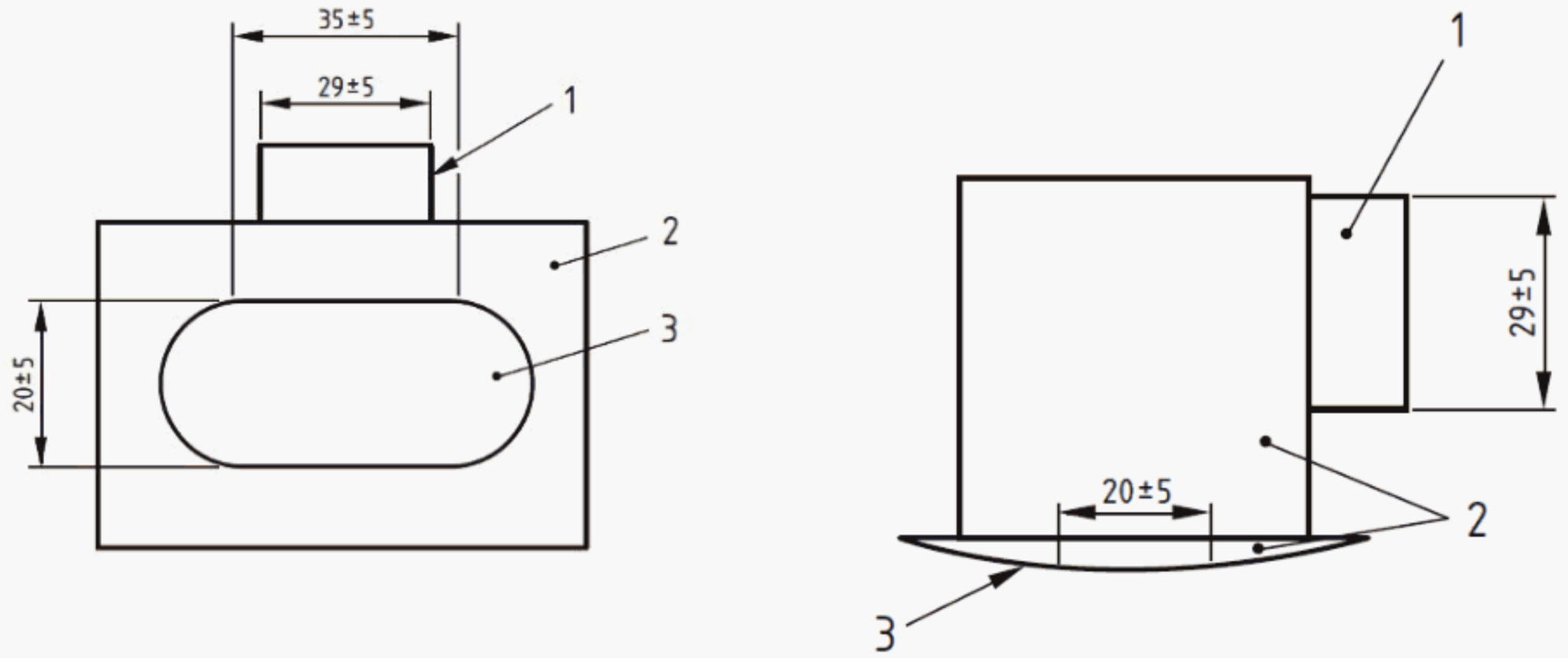
At the front edge of the bed plate, the Tretrad runs beyond the bed and is held horizontally by a height adjustable stopper, in such a way that the lower edge of the foot (without sole material) can be adjusted between 5 mm below and 5 mm above the level of the surface of the bed plate (see Figure 2).

At the points of reversal, the Tretrad remains stationary for approximately 1 s; during this stoppage at the forward point of reversal, the Tretrad is rotated through an angle (but not a right angle) to ensure that the feet walk evenly over the length of the test area.

5.1.4 Vacuum cleaning system

Suction nozzles follow the horizontal movement of the Tretrad assemblies. The nozzles are flexibly mounted and are equipped on their undersides with slides that rest on the edges of the test specimens, thereby not imposing any wear on the specimens.

Each nozzle has the dimensions shown in Figure 2 and is connected to the vacuum cleaner to extract the abraded fibre.



a) bottom view **b) side view**

Key

1 connection to vacuum
2 nozzle casing
3 nozzle mouth

Figure 2 — Vacuum inlet

The vacuum cleaner performance shall be such as to produce airflow of at least 30 l/s measured at the connection point of the nozzles by an appropriate anemometer in order to remove loose fibre from the surface of the specimens.

5.2 Other equipment

5.2.1 Soles

The soles[1)] shall be made from vulcanized styrene butadiene rubber (SBR) with silicic acid-based white filler additives and meet the requirements specified in Table 1. The soles shall have a wave profile on one face. The slip resistance of the sole material is controlled to ensure standard behaviour in the Lisson Tretrad test.

The sole material shall be stored in the dark and air exchange shall be avoided. After long times of storage of the soles (e.g. two years), they shall be validated by the calibration procedure (calibration carpet).

Table 1 — Properties of rubber soles for Lisson Tretrad machine

Size	minimum (190 ± 2) mm long by (55 ± 0,5) mm wide
Thickness	(2,5 ± 0,3) mm
Hardness	(90 ± 5) Shore A
Wavelength	(13,0 ± 0,5) mm
Amplitude	(2,0 ± 0,5) mm
Profile height	(0,6 ± 0,1) mm

5.2.2 Balance, capable of weighing the test specimens to the nearest 0,01 g.

5.2.3 External vacuum cleaner, equipped with a rotating brush, with or without beaters.

5.2.4 Standard photographs, for assessment of fibre bind of loop pile carpets.[2)]

5.2.5 Standard photographs, for assessment of fibre bind on needled floor coverings.[3)]

6 Sampling and selection of test specimens

Select the specimens in accordance with ISO 1957.

Test A: at least four specimens, each 1 500 mm in the direction of manufacture (machine direction) by 100 mm in the cross-machine direction. In the case of floor coverings without pile, two specimens will be sampled in the machine direction (1 500 mm) and two specimens will be sampled in the cross-machine direction (1 500 mm).

Test B: at least four specimens, each 1 500 mm in the direction of manufacture (machine direction) by 100 mm in the cross-machine direction.

Test C: at least four specimens, each 1 500 mm in the direction of manufacture (machine direction) by 100 mm in the cross-machine direction.

1) Certified soles are available from Textiles & Flooring Institute GmbH - Deutsches Teppichforschungsinstitut - Charlottenburger Allee 41, 52068 Aachen, Germany. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product. Equivalent products may be used if they can be shown to lead to similar results.

2) These standard photographs are available from Textiles & Flooring Institute GmbH - Deutsches Teppichforschungsinstitut - Charlottenburger Allee 41 52068 Aachen–Germany. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product. Equivalent products may be used if they can be shown to lead to similar results.

3) These standard photographs are available from CSTB -84 Avenue Jean Jaurès -BP 02-Champs Sur Marne-77421 Marne La Vallee - France. This information is given for the convenience of users of the standard and does not constitute an endorsement by CEN of the product. Equivalent products may be used if they can be shown to lead to the same results.

Tests D: two specimens, each 1 500 mm in the machine direction by 100 mm in the across machine direction; and two specimens, each 100 mm in the machine direction by 1 500 mm in the across machine direction. Tiles shall be cut and assembled into the appropriate dimensions of the required specimens. Where appropriate, unsealed cut edges shall be sealed to prevent edge tuft loss during the test.

7 Atmosphere for conditioning and testing

The specimens shall be conditioned for at least 48 h in the standard atmosphere for testing textiles specified in ISO 139, prior to testing in the same atmosphere. The specimens shall be laid out singly, use surface uppermost.

8 Calibration of the apparatus

The test apparatus shall be checked with a calibration carpet[4)] and calibrated by adjusting the number of to and fro transverse cycles set for that calibration carpet. This calibration covers the whole apparatus. If the calibration fails, the separate settings shall be checked.

The Tretrad machine shall be calibrated against the weight loss of the above mentioned calibration carpet. The number of cycles is adjusted to result in a weight loss that corresponds to the set weight loss of the calibration carpet (within a tolerance spread of ±7,5 %).

The tests shall be carried out at standard atmosphere (ISO 139). For conditioning, hang up the specimens singly or lay them out singly with the use-surface uppermost in the same atmosphere for at least 48 h. Test specimens shall be conditioned twice, i.e. at the beginning and after the Tretrad test, before the weights of the specimens are taken. The conditioning, also after the test, is extremely important for the determination of the correct number of treads at the calibration.

Use a balance with an accuracy of 0,01 g.

Determine the exact area treated by the Tretrad machine. The stressed area is the product of the width of the Tretrad feet (5,5 cm) and the traverse length of the wheels. The traverse length is the measure from the stair edge in the front of the table to the opposite stop position of the wheels.

Important: take for this measure the point below the wheel axis and calculate the average after a least 10 movements. The traverse length shall be between (80 ± 2) cm. If not, correct the machine accordingly by changing the position of the metal strip for the contact switch.

The specimens are signed crossways with a line on one end on the pile side. Clamp the specimens always on the machine, in a way that the specimen-end with the line is next to the stair edge of the table.

The specimens have to be stretched again with the 20 kg weight of the machine after the first 500 cycles.

The vacuum cleaner of the machine shall work continuously. Ensure the nozzle is positioned symmetrically above the stressed area and always in contact with the specimen-surface. If not, provide the machine for a longer pair of plastic tubes.

Start the calibration at the first run with 2 000 cycles on the stop counter. If the average weight loss of the first two specimens is xxx g/m^2 ± 7,5 %, continue testing with another two calibration specimens for confirmation. If the first two results are not within this range, correct the number of cycles appropriately at the next tests.

The outcome of the calibration procedure gives a number of cycles necessary to result in a weight loss of the calibration carpet corresponding to the weight loss that is set for the calibration carpet (within the specified tolerance spread of ±7,5 %).

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4) A standard carpet, supplied with calibration details is available from Textiles & Flooring Institute GmbH - Deutsches Teppichforschungsinstitut - Charlottenburger Allee 41 52068 Aachen - Germany. This information is given for the convenience of users of the standard and does not constitute an endorsement by CEN of the product. Equivalent products may be used if they can be shown to lead to the same results.

The calibration shall be repeated regularly, especially after a repair and after a new delivery of sole material.

9 Procedure

9.1 General

Prior to testing, clean the specimen with the vacuum cleaner (5.2.3), giving four passes in each direction.

Fit the test specimen over the leading 10 mm radius rounded edge of the Lisson Tretrad base plate (5.1.3) to the forward mount and clamp on the table under a tension of (20 ± 2) kg.

Test specimens that might become distorted during the test shall be stabilized by fixing them to the bed plate. For this purpose, first fix single-sided tape to the underside of the specimens and then attach the specimens to the bed plate by means of double-sided tape. This allows for removal of the specimens without weight change (in this case omit the pretension).

Specimens with a distinct pile lay shall be fitted to the bed plate with the pile lay in the direction of the bed plate leading edge.

9.2 Test A: Determination of mass loss of textile floor coverings, also used to assess fibre bind of synthetic pile carpets

In case of floor coverings without pile, two specimens will be sampled in the machine direction and two specimens will be sampled in the cross-machine direction.

Weigh the test specimens individually to determine m_1 (see 10.1) to the nearest 0,01 g, and then mount them on the bed plate as described in 9.1.

If the material is usually fitted with an underlay, then the specimen shall be mounted over the underlay it is intended to be used with.

Adjust the height of each Tretrad in relation to the bed plate in accordance with Table 2.

Fit new rubber soles to the Tretrad before each test.

The tests shall be performed with the vacuum cleaner turned on continuously.

Subject the specimens to 500 double passages of the Tretrad. Then, readjust the clamping tension to (20 ± 2) kg. Operate the machine to the remaining number of the calibrated total double passages of the Tretrad.

Table 2 — Adjustment of wheel height, Test A

Total thickness of specimen measured according to ISO 1765 (mm)	**Adjustment of wheel height in relation to surface of bed plate** (mm)
≤10,0	−5
>10,0	0
≤10,0 plus underlay	0
>10,0 plus underlay	+5

At the end of the test, clean the specimens with four passages of the vacuum cleaner (5.2.3), then lay the specimen use surface uppermost in the standard atmosphere. After about 48 h, weigh the specimen to determine m_2 (see 10.1) to the nearest 0,01 g.

9.3 Test B: Determination of stair nosing: appearance change of textile floor coverings

Mount the test specimens on the bed plate as described in 9.1.

Specimens with a distinct pile lay shall be fitted to the bed plate with the pile lay in the direction of the bed plate leading edge. In the case of patterned carpets, significant parts of the pattern shall be placed at the leading edge.

If the material is usually fitted with an underlay on stairs, then the specimen shall be mounted over the underlay it is intended to be used with.

Adjust the height of each Tretrad in relation to the bed plate in accordance with Table 3.

Fit new rubber soles to the Tretrad before each test.

The tests shall be performed with the vacuum cleaner turned on continuously.

Subject the specimen to 500 double passages of the Tretrad. Then, readjust the clamping tension to (20 ± 2) kg. Operate the machine to the remaining number of the calibrated total double passages of the Tretrad.

Table 3 — Adjustment of wheel height, Test B

Total thickness of specimen measured according to ISO 1765 (mm)	**Adjustment of wheel height in relation to surface of bed plate** (mm)
≤10,0	−5
>10,0	0
≤10,0 plus underlay	0
>10,0 plus underlay	+5

At the end of the test, clean the specimens with four passages of the vacuum cleaner (5.2.3), then lay the specimen, use surface uppermost, in the standard atmosphere for 24 h.

9.4 Test C: Determination of fibre bind on synthetic loop pile carpets

Mount the test specimens on the bed plate as described in 9.1.

Fit new rubber soles to the Tretrad before each test.

The tests shall be performed with the vacuum cleaner turned off and the nozzles raised above the surface of the specimens.

Subject the specimens to 400 double passages and then assess in accordance with 10.3.

Table 4 — Adjustment of wheel height, Test C

Total thickness of specimen measured according to ISO 1765 (mm)	**Adjustment of wheel height in relation to surface of bed plate** (mm)
≤10,0	−5
>10,0	0

9.5 Test D: Determination of fibre bind (hairiness) on needled floorcoverings and floor coverings without pile

Two specimens will be sampled in the machine direction and two specimens will be sampled in the cross-machine direction. Mount the test specimens on the bed plate as described in 9.1.

Adjust the height of each Tretrad in relation to the bed plate in accordance with Table 5.

Fit new rubber soles to the Tretrad before each test.

The tests shall be performed with the vacuum cleaner turned off and the nozzles raised above the surface of the specimens.

Subject the specimens to 200 double passages and then assess in accordance with 10.4.

Table 5 — Adjustment of wheel height, Test D

Total thickness of specimen measured according to ISO 1765 (mm)	**Adjustment of wheel height in relation to surface of bed plate** (mm)
≤10,0	–5
>10,0	0

10 Calculation and expression of results

10.1 Test A

Calculate the mass loss per unit area m_v in g/m^2 according to:

$$m_v = (m_1 - m_2)/A \quad (1)$$

where

m_1 mass of the initial conditioned specimen, in grams;

m_2 mass of the final conditioned specimen, in grams;

A tested area of the specimen in square meter (width of Tretrad foot x length of tretrad track according to 5.1.1).

Calculate the mean.

When $m_2 > m_1$, then let $m_v = 0$

In the case of pile carpets, calculate I_{TR} according to:

$$I_{TR} = 0{,}19\sqrt{m_{AP}} \times \left(\frac{100 - m_{rv}}{100}\right) \quad (2)$$

where

m_{AP} is the mass per unit area above the substrate in grams per square metre, determined in accordance with ISO 8543;

m_{rv} is the relative fibre loss expressed as a percentage , $m_{rv} = (m_v/m_{AP})$ x 100.

10.2 Test B

Assess the appearance of each specimen using at least three independent assessors according to the criteria given in EN 1307, Annex C.

Perform the assessment under the lighting conditions given in ISO 9405, each specimen being bent at an angle of 90° to simulate a stair edge.

Give individual results for each specimen.

Report the median of all results.

10.3 Test C

Assess the appearance using at least three independent assessors.

Assess against the most appropriate reference photographs that show borderline of acceptability for fibre bind.

The reference photographs show

a) fine gauge loop pile, and

b) coarse gauge loop pile carpets.

Perform the assessment by close inspection under the lighting conditions given in ISO 9405.

The specimen shall be bent through 180° with a radius of 15 mm to 20 mm.

On the specimen, select an area which is the most representative of the tested area and assess against the reference photographs.

Report whether the specimen is better or worse than the photographs, to either pass or fail the test.

Report the median of all results.

10.4 Test D

Assess separately the specimens sampled in the machine direction and the specimen sampled in the across machine direction.

Assess the appearance using at least three independent assessors.

Assess the appearance against the standard reference photographs that show 5 grades of different hairiness.

Perform the assessment by close inspection under the lighting conditions given in ISO 9405.

Specimens shall be bent through 180° with a radius of 15 mm to 20 mm.

Assessment shall be carried out in three places (missing out the length of sample over the stair nosing) by each assessor.

Report the median of all results.

10.5 Unusual phenomena

The tested specimens shall additionally be inspected for unusual phenomena, which can be indicative of a manufacturing fault. These can be, e.g. release of tufts or loops from the pile or fibres from the substrate and changes in the back coating.

11 Test Report

The test report shall contain the following information:

a) reference to this International Standard, i.e. ISO 12951;

b) type of test carried out;

c) a complete identification of the product tested, including type, source, colour, and manufacturer's reference numbers;

d) previous history of the sample;

e) number of test specimens;

f) test results according to Clause 10;

g) type of underlay, if underlay, if used should be specified;

h) unusual phenomena as described in 10.5;

i) any deviation from this International Standard which might have affected results.

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