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Textile floor coverings — Test methods for the determination of fibre bind

Revêtements de sol textiles — Méthodes d'essai pour la détermination du défibrage

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Contents

Page

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/PAS 11856 was prepared by Technical Committee ISO/TC 219, *Floor coverings*.

Introduction

A test method for this parameter was originally required within ISO/TC 38/SC 12 (now ISO/TC 219) for use in conjunction with the work item *Textile floor coverings — Grading/Classification* (to have been ISO 12950 but subsequently abandoned).

Investigation of available methods highlighted two problems associated with measurement of fibre bind:

a) there are no proven test methods to measure the property on all styles of carpet;

b) the property of fibre bind is more associated with quality control testing than with a basic classification requirement.

It was therefore decided that the fibre bind would not be a specified characteristic in the proposed classification standard but work would continue on the topic in order to provide test method(s) should ISO/TC 219 decide to call up this property in a classification standard at a later date.

It was agreed that a document would be prepared detailing all the proposed test methods to enable TC 219 members to gain practical experience with the tests using the proposed methods on loop, cut, synthetic and natural pile carpets of known on-site performance, both good and poor.

Subsequently, it was agreed to progress the document to a Publicly Available Specification in order to enable comments to be received from a wider audience whilst the experimental work was being carried out.

Textile floor coverings — Test methods for the determination of fibre bind

1 Scope

This Publicly Available Specification describes the following six methods for determining fibre bind of textile floor coverings. Each test method states the type(s) of textile floor coverings for which the test is applicable.

a) Lisson Tretrad test:

- Method A for mass loss for synthetic cut pile carpets;
- Method B for appearance change of synthetic loop pile carpets.

b) Modified Martindale machine test for mass loss/appearance change.

c) Hexapod tumbler test for mass loss.

d) Japanese fibre bind test.

e) Usometer test for fuzzing and pilling of loop pile carpets.

f) Fiberlock tester test for fuzzing and pilling of loop pile carpets.

2 Normative references

The following referenced documents are indispensable for the application of this document. 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*

ISO 10361, *Textile floor coverings — Production of changes in appearance by means of Vettermann drum and hexapod tumbler testers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2424 and the following apply.

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

3.2
relative mass loss
m_{rV}
ratio of mass loss per unit area, m_V, to the mass per unit area of the use surface

3.3
fibre bind
protrusion of fibres above the normal level after mechanical action, assessed using photographic standards

3.4
filament damage
where filaments that have been dislodged or broken away from the tuft loop or the binding site result in a fuzzy or hairy appearance of the loop surface of a pile yarn floor covering

4 Lisson Tretrad tests

4.1 Principle

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

4.2 Apparatus

4.2.1 Test apparatus

The Tretrad testing machine[1)] comprises a bedplate, the front edge of which is rounded with a 10 mm radius to simulate a stair edge. The faces of the bedplate shall be parallel to the track traversed by the Tretrad feet.

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

The Tretrad is mounted in a frame that is able to rotate around an axis. The distance of this axis of rotation from the upper surface of the bedplate shall be 135 mm to 140 mm. The Tretrad comprising 4 legs with rigidly attached feet performs linear to-and-fro traverses over the bedplate. At the points of reversal, it remains stationary for about 1 s.

At the front edge of the bedplate, the Tretrad runs beyond the bed and is held there by a height-adjustable stopper in such a way that the lower edge of the foot (without sole material) at the perpendicular position of the Tretrad leg can be adjusted between − 5 mm below and + 5 mm above the level of the surface of the

1) Producer: Feingeräte Baumberg GmbH and Co. AG. Am Sportplatz 58, D 40789 Mannheim, Germany. This information is given for the convenience of users of this Publicly Available Specification and does not constitute an endorsement by ISO of the product. Equivalent products may be used if they can be shown to lead to the same results.

bedplate. During the brief stoppage, the Tretrad at the forward point of reversal is rotated through an angle by which it is ensured that the test specimen is uniformly exposed to wear.

The diameter of the Tretrad is 225 mm. The peripheral speed of the Tretrad with sole covering is (20 ± 1) % greater than the linear speed. The linear speed is (0,28 ± 0,02) m/s. This causes slippage of the feet on the test specimen in addition to the compressive action.

The surface of the Tretrad feet has a radius of curvature of 112,5 mm, a length of 100 mm and width of 55 mm. The ends of the contact surfaces are rounded with a radius of 4,0 mm.

The load applied by the Tretrad feet to the test specimen is the sum of the mass of the Tretrad and the mass of the frame in which the Tretrad is mounted. In the stationary state, the force shall be (150 ± 2) N.

NOTE A ring dynamometer can be used to check this force.

Two clamp mounts are used to hold the test specimen. By means of a weighted third clamp, the test specimen is subjected to a nominal tension of 200 N and mounted in the clamps at this pre-tension.

The suction nozzles which follow the to-and-fro traverses of the tread-wheels are flexibly mounted on a hinge. On their underside they are equipped with slides which under the dead weight of the suction nozzles rest on the edges of the test specimen not subjected to wear. An industrial suction cleaner is used to extract the abraded fibre.

The suction cleaner shall have the following characteristics:

— power rating 1 000 W

— water gauge pressure 12 kPa

— airflow 38 l/s

4.2.2 Sole material

The rubber soles[2)] with which the Tretrad feet are covered are 190 mm long and 55 mm wide.

The material is vulcanized SBR rubber with silicic acid-based white filler additives. The soles have a wave profile on one face. The sole material is a special production for this purpose and its slip resistance is controlled. It shall have the following characteristics:

— Specific gravity (g/cm^3) 1,32 ± 0,03

— Hardness (Shore A) 90 ± 3

— Thickness (mm) 2,0 ± 0,2

— Wave length (mm) 13,0 ± 0,5

— Amplitude (mm) 4,0 ± 0,3

— Profile height (mm) 0,6 ± 0,1

— Slip resistance (cN) 280 ± 10 %

2) Sales: Deutsches Teppich-Forschungsinstitut, Charlottenburger Allee 41, D-52080 Aachen, Germany. This information is given for the convenience of users of this Publicly Available Specification and does not constitute an endorsement by ISO of the product. Equivalent products may be used if they can be shown to lead to the same results.

4.3 Sampling

Sampling shall be carried out in accordance with ISO 1957.

Take at least 4 test specimens from the laboratory sample, each 150 cm long in the longitudinal direction (i.e. in the direction of manufacture) and 10 cm wide, evenly distributed over the sample area.

4.4 Conditioning and preparation

Before testing is carried out, the test specimens shall be numbered or given an identification mark and cleaned with a suction cleaner. In the case of floor coverings with unsealed edges, the cut edges shall be treated so that no parts of the test specimen (e.g. pile tufts) can become detached during the test. Before testing the test specimens shall be conditioned for at least 72 h in the standard atmosphere for textiles specified in ISO 139.

4.5 Calibration of the apparatus

4.5.1 General

The test apparatus shall be checked with a calibration carpet and calibrated by adjusting the set number of to-and-fro traverse cycles. Calibration instructions are supplied with the calibration carpet[3)].

4.5.2 Procedure

Carry out the tests in the standard atmosphere for textiles as given in ISO 139.

Fit new rubber soles the to the Tretrad feet before each test.

Specimens with distinguishable directional lay of the pile (pile lean) shall be placed in accordance with carpet fitting practice on stairs so that pile lay is in the direction of the stair edge.

Perform the tests under continuous operation of the vacuum cleaner. Fit the test specimens over the 10 mm radius rounded edge of the table to the forward mount and clamp on to the table under the pre-tension of 200 N. After 500 to-and-fro traverses of the Tretrad, re-tension the test specimens at a pre-tension of 200 N.

Test specimens that, due to excessive extensibility, become distorted in mounting or during testing, shall be stabilized by suitable means, e.g. adhesive tape. Tiles shall be cut and assembled to table length and similarly adhesively fixed.

4.5.3 Test A — Determination of mass loss

Follow the test conditions specified in 4.5.2. Weigh the test specimens individually to the nearest 0,01 g (m_1), and mount them on the machine table as specified in 4.5.2.

Adjust the height of the wheels in position beyond the table (see Table 1) to the total thickness of the textile floor covering in accordance with ISO 1765.

Subject the test specimens to the calibrated number of to-and-fro traverses of the Tretrad (see 4.5.2).

On completion of the test, remove the specimens, suction clean them and expose them for at least 24 h in the standard atmosphere. Determine the weight of the tested specimens (m_2) to the nearest 0,01 g.

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3) A standard carpet, supplied with calibration details is available from TFI, Charlottenburger Allee 41, 52068 Aachen, Germany. This information is given for the convenience of users of this Publicly Available Specification and does not constitute an endorsement by ISO of the product. equivalent products may be used if they can be shown to lead to the same results.

Table 1 — Wheel height adjustment

Total thickness of specimen	Adjustment of wheel height
Thin textile floor coverings (< 10 mm)	– 5 mm
Thick textile floor coverings (> 10 mm)	0 mm

4.5.4 Test B — Fibre bind of synthetic loop pile carpets

The appropriate test conditions specified in 4.5.2 shall be applied. After the mechanical action, compare the specimens against the most appropriate of a pair of reference standard photographs[4)] representing the borderline of acceptance for the fibre bind:

— of a fine gauge loop pile carpet;

— of a coarse loop pile carpet.

Bend the specimens to 180° using a radius of 15 mm to 20 mm. Assess dark-coloured carpets under good light conditions in front of a white background and bright-coloured carpets in front of a black background.

Carry out the assessment on three places on each specimen by at least three assessors independent of each other. Decide whether the specimens are better or worse than the photo standard.

4.6 Calculation and expression of results

4.6.1 Test A

Calculate the mass loss per unit area, m_v, in g/m^2 by the following equation:

$$m_v = (m_1 - m_2)/A$$

where

m_1 is the conditioned specimen mass in grams before testing;

m_2 is the conditioned specimen mass in grams after testing;

A is the tested area of the test specimen in square metres (product of width of Tretrad feet and measured length of the track according to 4.2.1).

Calculate the absolute and relative confidence limit of m_v results at a confidence level $1 - \alpha = 0{,}95$.

Calculate the relative mass loss, m_{rv}, by the following equation

$$m_{rv} = [m_v/(m_{A,\,P})] \times 100$$

where

$m_{A,\,P}$ is the mass per unit area of the pile surface or use surface of the textile floor covering in accordance with ISO 8543.

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4) Reference Standard Photographs (Loop Pile Carpets) can be obtained from TFI, Charlottenburger Allee 41, 52068 Aachen, Germany. This information is given for the convenience of users of this Publicly Available Specification and does not constitute an endorsement by ISO of the product. Equivalent products may be used if they can be shown to lead to the same results.