

BS ISO 9405:2015



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Textile floor coverings — Assessment of changes in appearance

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee PRI/3, Textile floor coverings.

A list of organizations represented on this committee can be obtained on request to its secretary.

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© The British Standards Institution 2015.
Published by BSI Standards Limited 2015

ISBN 978 0 580 80908 8
ICS 59.080.60

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2015.

Amendments/corrigenda issued since publication

Date	Text affected
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INTERNATIONAL
STANDARD

BS ISO 9405:2015

ISO
9405

Second edition
2015-02-01

**Textile floor coverings — Assessment
of changes in appearance**

Revêtements de sol textiles — Évaluation des changements d'aspect



Reference number
ISO 9405:2015(E)

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Published in Switzerland

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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).

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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 9405:2001), which has been technically revised.

Textile floor coverings — Assessment of changes in appearance

1 Scope

This International Standard describes the procedures for assessing the overall change in appearance of textile floor coverings caused by Vettermann drum and hexapod tumbler testers according to ISO 10361 and ISO 4918.

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 105-A01, *Textiles — Tests for colour fastness — Part A01: General principles of testing*

ISO 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

ISO 2424, *Textile floor coverings — Vocabulary*

ISO 4918, *Resilient, textile and laminate floor coverings — Castor chair test*

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

change in surface appearance

difference between a fatigued and an unfatigued specimen

Note 1 to entry: The degree of change is expressed by reference to standard digital image reference scales and by reference to large grey scales, grade 5 representing no change and grade 1 an extreme change.

Note 2 to entry: Changes in structure, roughness, colour, and/or pattern of a textile floor covering may contribute to change in appearance. It is not always possible to distinguish clearly between the factors since each can have an interaction with others.

3.2

change in structure

textural change

visible change in configuration of loops and tufts and/or fibres at the use-surface of a textile floor covering

3.3

loss of tuft definition

decrease of the pile definition caused by the bursting, opening, and untwisting of the pile yarn and/or decrimping of the fibres in the use-surface of a textile floor covering

3.4

crushing

flattening

loss of thickness of a textile floor covering under the action of a static or dynamic load

3.5
felting
matting

loss of pile definition of a textile floor covering due to entanglement and compression of pile fibres

3.6
hairiness
filamentation

protrusion of fibres above the normal level of the use-surface of a textile floor covering and not removable by brushing or suction

3.7
cobwebbing

extreme form of *hairiness* (3.6) in which the fibres are entangled to form an interlaced web attached to the use-surface

3.8
pilling

extreme form of *hairiness* (3.6) in which the fibres are entangled to form small aggregates, attached to the use-surface, which can or cannot include fibres from other sources

3.9
sprouting

release and appearance during use of extra-long tuft legs which were accidentally trapped within the pile of a textile floor covering during manufacture

3.10
change of pattern definition

change in the colour appearance of patterned textile floor coverings due to mechanical action

Note 1 to entry: A change of pattern definition can be caused by a change in the clarity of the contour lines.

3.11
change in colour

change or apparent change in colour, assessed by a large grey scale, resulting from a change in orientation of the pile (shading), whitening (chalking), fading, glossing, colour bleeding, staining, soiling, or a combination of these

Note 1 to entry: It is not always possible to distinguish clearly between the above factors since each has an interaction with others.

4 Principle

The change in appearance of a specimen after a process of fatiguing is assessed by visual comparison with standard digital image scales. The degree of change is expressed by a single grade. The dominant factors (change in surface appearance, colour, and/or pattern) of the change are observed and recorded.

5 General apparatus

5.1 Viewing cabinet

A viewing cabinet (minimum width 130 cm, minimum height 90 cm, and minimum depth 50 cm) as described in ISO 105-A01 is used. The surfaces of the viewing stand shall be uniformly grey. The surface on which the specimens are presented shall have an inclination of (45 ± 5) degrees. The light source shall be a D65 light source and the light intensity shall be between (700 ± 100) lux at the surface on which the specimens are presented.

5.2 Digital images (reference scales for assessing appearance change)

Two sets of five scales showing reference levels from grade 5,0 (no change in appearance) to grade 1,0 (extreme change in appearance) shall be used. Each scale consists of two zones:

- an “original” zone (grade 5,0);
- a “fatigued” zone representing the defined grade of change in appearance.

Table 1 — Digital image scales

Scale	Description
ISO cut	Cut
ISO loop	Loop
NOTE Universiteit Gent, Department of Textiles, 9052 Zwijnaarde, Belgium. This information is given for the convenience of users of the standard and does not constitute an endorsement by ISO of these products.	

5.3 Large grey scales

Large grey scales (200 mm × 150 mm) for assessing changes in colour shall be used. They comprise five pairs of grey references each representing a contrast corresponding to grade 5,0; 4,0; 3,0; 2,0; or 1,0 (see ISO 105-A02).

NOTE The use of normal (35 mm × 28 mm) grey scales can lead to incorrect assessment and these cannot therefore be used.

6 Selection and preparation of specimens

Select specimens for fatiguing and assessment that are representative of the carpet. Select also a corresponding area of at least 20 cm × 20 cm of the unfatigued sample as reference (the borders may also be used as reference).

Mark the specimens with a reference direction (which can be the direction of production, if known) for aligning them for the assessment.

7 Assessment of change

7.1 Assessors

The assessments shall be made independently by at least three experienced assessors. The number of assessors shall be extended to five if the difference between the individual test results within an assessor team is greater than one grade.

Each assessor shall grade the specimens independently from the other assessors.

The assessment shall be done by observing the specimens visually at a distance of $(0,75 \pm 0,25)$ m at an angle of (90 ± 10) degrees.

7.2 Procedure

Ensure that the specimens have been vacuum-cleaned and conditioned following treatment for production of changes in appearance (see ISO 10361).

Select an appropriate digital image reference scale set that most nearly resembles the construction of the textile floor covering being assessed (see [Table 1](#)).

Arrange the fatigued and the unfatigued specimens side by side, with the reference directions the same, on the viewing stand positioned centrally under the illumination device. Lay the selected scale alongside the specimens. Specimens of one article treated in steps of increasing intensity (e.g. in a castor chair test) shall be assessed together.

Always evaluate the specimens with the pile lay (upward) in the direction of the lamps.

Assess the level of visual contrast, or differences, between the fatigued and unfatigued specimens and select the grade with most similar level of contrast in the chosen reference scale.

During the assessment, consider the change in surface appearance as defined in [3.1](#), assigning the final grade as the integrated average of all the factors.

The appearance retention rating of the specimen is the number of the grade in the five-grade reference scale which most closely corresponds to the contrast.

Half grades can be assigned if the contrast between the fatigued and unfatigued specimens is judged to be nearer to the (non-existent) half-grade or mid-way, between the two nearest whole grades in the reference scale. Only full and half-grade assessments are permitted.

A rating of 5 is given only when there is no difference between the tested specimen and the original material.

One or more of the factors, as defined in [Clause 3](#), can have an overriding influence in the final grade, if so each assessor shall record the factor(s) for information.

7.3 Change of colour

In addition to including the influence of colour in the above assessment, a separate assessment of colour change is required. Each assessor shall assess the colour change for each specimen only using the large grey scales as defined in ISO 105-A02.

7.4 Test report

The report shall include the following information:

- a) all details necessary for identification of the specimens;
- b) that the assessment was carried out in accordance with this International Standard;
- c) the date the test was completed;
- d) reference scale selected from [Table 1](#);
- e) the grade for the change in appearance for each assessor individually;
- f) median of the grades for the change in appearance of all assessors;
- g) average of the grades for the change in appearance of all assessors;
- h) the grade for the change of colour for each assessor individually;
- i) the median of the colour change;
- j) any deviations from this International Standard.

Annex A (informative)

Precision of the test method

In the course of the development of this International Standard, many trainings and round robin tests were performed. [Table A.1](#) and [Table A.2](#) show the results of a round robin exercise with eight laboratories on six textile floor coverings.

Table A.1 — Test results for an assessment (final grade after 4000–5000 cycles)

		minimum	maximum	median	mean
Hexapod	Cut	3,5	4,0	3,5	3,7
Hexapod	Frisé	4,0	5,0	4,5	4,4
Vetterman	Cut	3,0	4,0	3,5	3,5
Vetterman	High Saxony	2,5	3,5	3,0	3,1
Castor Chair	Cut	2,5	3,5	3,0	2,8
Castor Chair	Cut Patterned	3,0	4,0	3,5	3,5

Table A.2 — Test results for an assessment (final grade after 12000–22000–25000 cycles)

		minimum	maximum	median	mean
Hexapod	Cut	2,5	3,0	3,0	2,8
Hexapod	Frisé	3,0	4,0	3,5	3,5
Vetterman	Cut	2,0	3,0	2,5	2,5
Vetterman	High Saxony	1,5	2,5	2,0	2,1
Castor Chair	Cut	1,5	2,5	2,0	1,9
Castor Chair	Cut Patterned	1,5	2,5	2,0	2,1

Bibliography

- [1] EN 1471:1997, *Textile floor coverings — Assessment of changes in appearance*

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