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

*Revêtements de sol textiles — Production de changements d'aspect au
moyen du tambour Vettermann et du tambour d'essai pour hexapode*



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 main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
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Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 10361, which is a Technical Report of type 2, was prepared by Technical Committee ISO/TC 38, *Textiles*.

This document is being issued in the type 2 Technical Report series of publications (according to subclause G.6.2.2 of part 1 of the IEC/ISO Directives) as a "prospective standard for provisional application" in the field of textile floor coverings because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

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This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

A review of this type 2 Technical Report will be carried out not later than two years after this publication with the options of: extension for another two years; conversion into an International Standard; or withdrawal.

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Introduction

This Technical Report describes two instruments for fatiguing textile floor covering specimens and the production of changes in appearance in laboratory simulation of wear. The fatigued specimens are examined and assessed by the method described in ISO/TR 9405.

The method of assessment in ISO/TR 9405 is to be published as a technical report because some members of ISO/TC 38/SC 12 expressed concern over certain aspects of the assessment which required further work before being progressed to full International Standard status.

Accordingly, this document describing drum testers for fatiguing textile floor coverings is also to have the status of a type 2 Technical Report while ISO/TR 9405 exists in this form.

The original work using the testers correlated the appearance retention after a number of revolutions with long-term use in a heavy-wear situation.

For the Vettermann drum tester, the number of revolutions used was 22 000, whilst the number used with the hexapod tumbler tester was 12 000.

Since drafting this technical report, suggestions have been raised that a shorter test (both Vettermann drum and hexapod tumbler) could provide more useful information for the early changes in appearance or for less severe wear sites.

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

1 Scope

This Technical Report describes procedures for using the Vettermann drum tester and the hexapod tumbler tester to produce changes in appearance due to changes in surface structure and colour produced by mechanical agencies. It does not include pilling or colour changes due to other agencies.

Changes produced by these drum testers are assessed in accordance with ISO/TR 9405.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Technical Report. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 48:1979, *Vulcanized rubbers — Determination of hardness (Hardness between 30 and 85 IRHD)*.

ISO 139:1973, *Textiles — Standard atmospheres for conditioning and testing*.

ISO 868:1985, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*.

ISO 1957:1986, *Machine-made textile floor coverings — Sampling and cutting specimens for physical tests*.

ISO 2424:1977, *Textile floor coverings — Classification and terminology*.

ISO/TR 9405:1990, *Textile floor coverings — Assessment of changes in appearance*.

3 Definitions

For the purposes of this Technical Report, the definitions given in ISO/TR 9405 apply.

4 Principle

A metal ball or hexapod with studs rolls randomly inside a rotating drum which is lined with the textile floor covering specimens.

After fatiguing, the change in appearance of the specimens is assessed in accordance with ISO/TR 9405.

5 Apparatus

5.1 Method A

5.1.1 Vettermann drum tester, with a metal drum of the following dimensions:

- internal diameter: 730 mm \pm 10 mm;
- internal depth: 270 mm \pm 5 mm;
- effective depth: 240 mm \pm 7 mm;
- thickness of curved surface: 8 mm \pm 0,5 mm.

The drum shall be capable of rotating at a speed of 16 rev/min \pm 1 rev/min and shall have facilities for reversing the direction of rotation every 5 min with approximately 1 s stationary time.

The drum system shall incorporate a revolution counter, and specimens shall be held in place by four adjustable retaining segments (thickness: 15 mm \pm 1 mm) on each side wall of the drum.

Loose-pile fibres shall be removed by means of a free-running circular brush mounted so as to be in light contact with the surface of the specimens, and the fibres continuously extracted by a vacuum cleaner.

Figure 1 illustrates the drum in cross-section.

A vulcanized-fibre backing sheet of size 2 320 mm × 270 mm × 1,5 mm thick and of density 1,1 g/cm³ to 1,3 g/cm³ at 20 °C is loosely laid inside the drum shell on the working side.

The sheet remains permanently in the drum.

5.1.2 Steel ball, fitted with 14 cylindrical rubber studs located so as to be equally spaced on the ball surface. The studs shall be replaceable and screwed into flat faces machined into the surface of the ball. Figure 2 illustrates the complete ball.

Diameter of the ball: 120 mm ± 0,2 mm

Distance between diametrically opposed flat stud-mounting faces: 118 mm ± 0,1 mm

Mass (without studs): 6 800 g ± 100 g

Mass with 14 studs: 7 600 g ± 100 g

Each stud shall consist of a light-grey composite rubber disc attached to a steel backing plate having an integral mounting screw.

Diameter of stud: 40 mm ± 0,5 mm

Total height (including backing plate, but not mounting screw): 15 mm ± 0,5 mm

Usable thread length: 20 mm

Thickness of steel backing plate: 3 mm

Rubber hardness, measured in accordance with ISO 48: 48 IRHD ± 3 IRHD

It is recommended that the studs have a run-in period of 10 h before starting first tests.

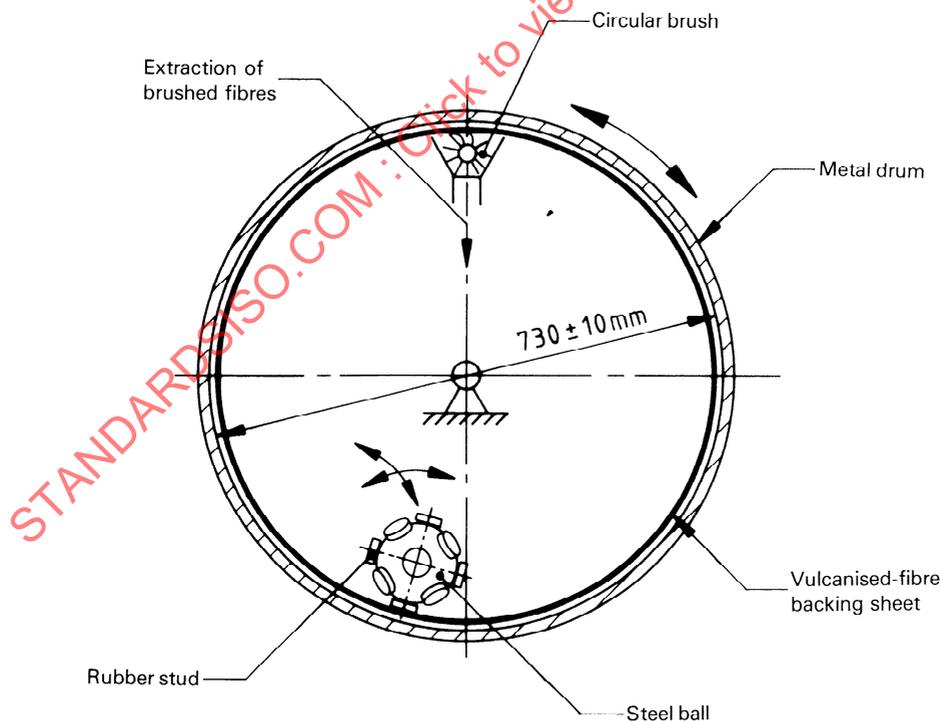


Figure 1 — Vettermann drum tester

The studs shall be replaced after 110 000 revolutions of the drum.

NOTES

1 Instead of replacing all 14 studs, it could also be useful to replace only two studs after each test. These two studs which have been used longest, should be replaced first.

2 For information on the availability of replaceable studs for the Vettermann drum tester, apply to the ISO/TC 38/SC 12 Secretariat.

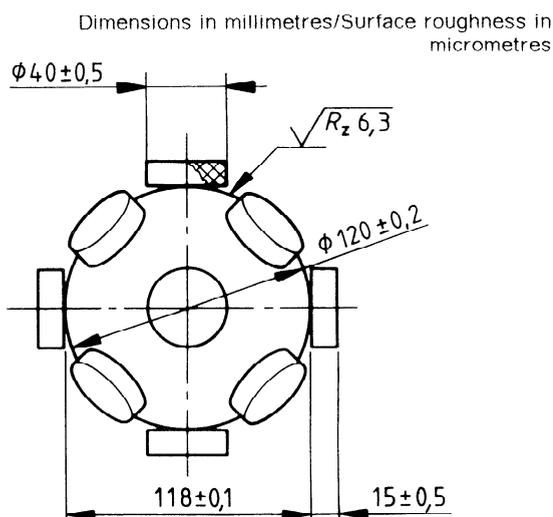


Figure 2 — Steel ball

5.1.3 Upright vacuum cleaner, with rotating brush and beater bar.

5.2 Method B

5.2.1 Hexapod tumbler tester, with a plastics drum of the following dimensions:

- a) internal diameter: $305 \text{ mm} \pm 1 \text{ mm}$;
- b) wall thickness: 8 mm approx;
- c) internal depth: $200 \text{ mm} \pm 1 \text{ mm}$.

The drum shall be capable of rotating at a speed of $35 \text{ rev/min} \pm 2 \text{ rev/min}$ and shall have facilities for reversing the direction of rotation every 15 min. The drum system shall incorporate a revolution counter and the drum base and lid shall have a locating groove to hold a specimen-backing sheet (5.2.2) flat against the inner wall of the drum. Figure 3 illustrates the drum and lid disassembled.

5.2.2 Polyethylene specimen-backing sheet, of size $950 \text{ mm} \times 215 \text{ mm} \times 2 \text{ mm}$ thick.

5.2.3 Hexapod (see figure 4), comprising a 50 mm mild-steel cube with 25-mm-thick plates welded to each face. The outside corners of the plates shall be rounded such that, when the studs are fitted and the hexapod placed on a flat surface, no metal touches the flat surface.

A replaceable polyurethane stud with steel backing shall be screwed centrally into each face.

Diameter of stud:	$40 \text{ mm} \pm 1 \text{ mm}$
Height of stud:	$15 \text{ mm} \pm 1 \text{ mm}$
Edge radius of stud:	$15 \text{ mm} \pm 1 \text{ mm}$
Thickness of steel backing:	$3 \text{ mm} \pm 0,25 \text{ mm}$
Shore A hardness, measured in accordance with ISO 868:	85 to 100
Total mass of hexapod with its six studs:	$3,8 \text{ kg} \pm 0,1 \text{ kg}$

Studs shall be replaced if worn or damaged and in any case after two years' use.

NOTE 3 For information on the availability of replaceable studs for the hexapod tumbler tester, apply to the ISO/TC 38/SC 12 Secretariat.

5.2.4 Double-sided adhesive tape, 50 mm wide.

5.2.5 Upright vacuum cleaner, as described in 5.1.3.

5.2.6 Rectangular cleaning frame, measuring $1000 \text{ mm} \times 300 \text{ mm}$, with a central rectangular aperture measuring $940 \text{ mm} \times 200 \text{ mm}$ to receive the test specimens, made of material similar to that of the test specimen and mounted on a rigid backing sheet.

6 Atmosphere for conditioning and testing

Use an atmosphere of relative humidity $(65 \pm 2) \%$ and of temperature $20^\circ\text{C} \pm 2^\circ\text{C}$, in accordance with ISO 139, for both conditioning and testing.

7 Selection and preparation of test specimens

7.1 Selection

Select the specimens in accordance with ISO 1957 to be as representative as possible of the bulk. Before cutting out the test specimens, mark the sample

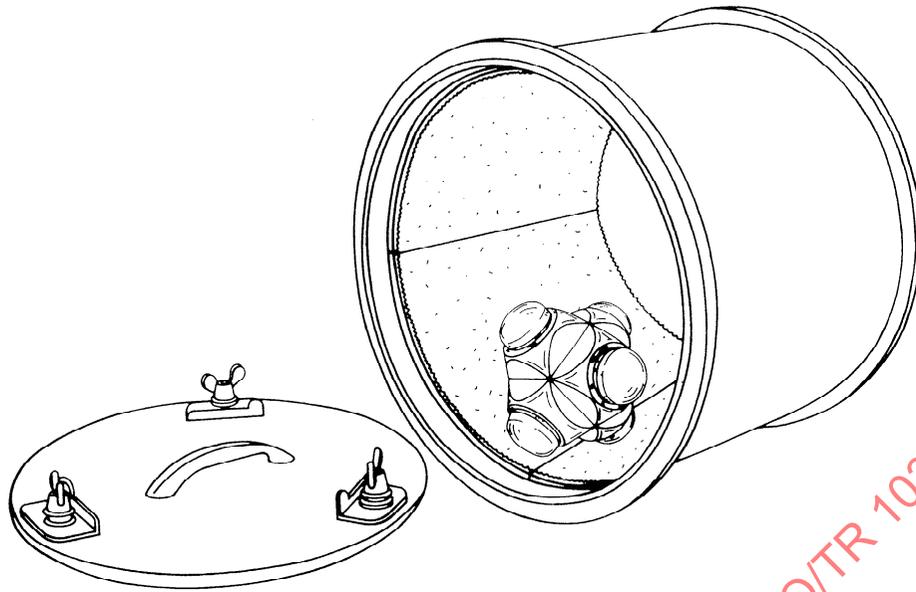


Figure 3 — Hexapod tumbler tester

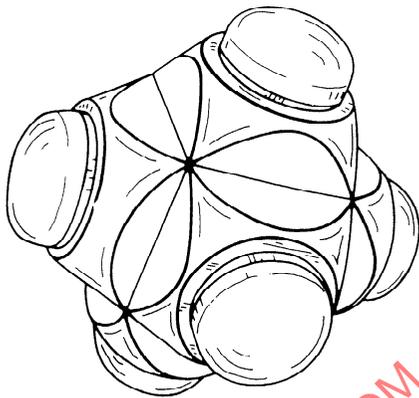


Figure 4 — Hexapod

and each test specimen on the back with an arrow in the direction of pile lay.

NOTE 4 Colour and design may play a large part in the assessment of appearance retention, and this should be borne in mind when selecting specimens.

7.2 Number and dimensions

7.2.1 Method A

Cut four specimens measuring 570 mm long in the direction of manufacture by 265 mm wide. Cut a similarly sized and positioned specimen for comparison purposes.

NOTE 5 Provided that there is no fibre or finish transfer, for production control purposes specimens from up to four

different samples of similar thickness may be tested at the same time.

7.2.2 Method B

Either

a) Cut one specimen measuring 940 mm long in the direction of manufacture by 200 mm wide. Cut a similarly sized and positioned specimen for comparison purposes.

Or

b) Provided that there is no fibre or finish transfer, test up to four smaller specimens of similar thickness. In this case, cut the specimens so as to allow for a 5 mm to 10 mm gap between each specimen, and ensure that the pile lay is in the same direction.

In each case, ensure that cut edges are adequately sealed.

For materials with a pronounced direction of pile lay, specimens shall be tested in both machine and cross-machine direction.

7.3 Preparation

7.3.1 Method A

The test specimens and the specimen for comparison shall be cleaned with the upright vacuum cleaner (5.1.3) as described in clause 8, and left to condition flat, singly, pile uppermost for at least 24 h.

To prevent fraying, apply adhesive tape to the edges of the specimens.

For materials with a pronounced direction of pile lay, specimens shall be tested in both machine and cross-machine directions.

7.3.2 Method B

Attach double-sided adhesive tape (5.2.4) along each side and end of the backing sheet (5.2.2), leaving 5 mm clear at each edge and pressing down firmly to ensure adhesion. If testing several specimens, attach a piece of tape at each cross-junction. Mount the specimens, use-surface uppermost, allowing a 5 mm gap at each end and between 5 mm and 10 mm between specimens to allow space for the pile when the backing sheet is curved to fit the drum (5.2.1). Check that each specimen will lie smoothly when the backing sheet is curved to fit the drum and if necessary adjust its length accordingly. Lay out the mounted specimens face uppermost for at least 24 h.

8 Procedure

8.1 Method A

Fit the specimens into the drum (5.2.1), with the use-surface towards the centre of the drum and the edges under the retaining segments. Ensure that the ends of two specimens lie near the centre of the retaining segments and clamp firmly.

Check that the ball (5.1.2), together with its studs, are clean and free from any contamination, if necessary wiping over with a clean tissue and suitable solvent¹⁾. Place the ball in the drum and close the drum. Preset the revolution counter for 22 000 cycles (which will take approximately 23 h) and switch the machine on to start the test.

NOTE 6 Intermediate assessments may be carried out if required provided that the specimens are examined as for the final assessment, except that they are assessed immediately without reconditioning.

After the test, clean the specimens with the upright vacuum cleaner (5.1.3), making four forward and backward passes along the length and ensuring that all of the area is covered and that the final pass is in the direction of pile lay.

Allow the specimens to condition flat, singly and pile uppermost for at least 24 h before assessing in accordance with ISO/TR 9405.

8.2 Method B

Fit the mounted specimens into the drum (5.2.1) ensuring that the backing sheet (5.2.2) lies smoothly around the internal circumference and that it is firmly held by the locating groove.

Check that the studs of the hexapod (5.2.3) are clean, smooth and free from any contamination, if necessary wiping over with a clean tissue and suitable solvent¹⁾. Place the hexapod in the drum and replace the lid.

Preset the revolution counter for 2 000 revolutions (approximately 1 h) and switch the machine on to start the test. At the end of this period, remove the mounted specimens and place in the central aperture of the cleaning frame (5.2.6). Using the vacuum cleaner (5.2.5), make four forward and backward passes along the length of the mounted specimens, ensuring that all the area is covered and that the final pass is in the direction of any pile lay.

Return the specimens to the drum and repeat the above procedure until 12 000 revolutions have been achieved.

Give the specimens a final vacuum cleaning as described above.

Allow the specimens to condition flat, singly and pile uppermost for at least 24 h before assessing in accordance with ISO/TR 9405.

NOTE 7 Intermediate assessments may be carried out if required provided that the specimens are examined as for the final assessment, except that they are assessed immediately without reconditioning.

9 Test report

The test report shall include the following information:

- a) the identifying characteristics of the test material, in accordance with ISO 2424;
- b) the method used (A or B);
- c) the median value for the appearance change and a statement of the most severe change, in accordance with ISO/TR 9405;
- d) the type of vacuum cleaner used;
- e) any special observations concerning the test specimens;
- f) details of any deviations from the standard procedure.

1) Ethanol and dichloromethane are suitable.