PD CEN/TS 16611:2016

BSI Standards Publication

Furniture — Assessment of the surface resistance to microscratching

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National foreword

This Published Document is the UK implementation of CEN/TS 16611:2016. It supersedes PD CEN/TS 16611:2014 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FW/0/1, Common Test Methods for Furniture.

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

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Supersedes CEN/TS 16611:2014

English Version

Furniture - Assessment of the surface resistance to microscratching

Ameublement - Évaluation de la résistance des surfaces aux micro-rayures

Möbel - Bestimmung der Mikrokratzbeständigkeit von Möbeloberflächen

This Technical Specification (CEN/TS) was approved by CEN on 18 January 2016 for provisional application.

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European foreword

This document (CEN/TS 16611:2016) has been prepared by Technical Committee CEN/TC 207 “Furniture”, the secretariat of which is held by UNI.

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This document supersedes CEN/TS 16611:2014.

Compared to CEN/TS 16611:2014, the following modification has been made:

— in 8.2.2.1 “2 or 3” is replaced by “3 or 4”.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This Technical Specification specifies a method for the assessment of the surface resistance to microscratching and relates to rigid surfaces of all finished products regardless of materials.

Method A is suitable for all types of surface coatings and coverings except for lacquers with pearly or metallic effects.

Method B is suitable for all types of surface.

It does not apply to finishes on leather and fabrics.

The test is intended to be carried out on a part of finished furniture, but can be carried out on test panels of the same material, finished in an identical manner to the finished product, and of a size sufficient to meet the requirements of the test.

It is essential that the test is carried out on unused surfaces.

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.

EN ISO 2813, *Paints and varnishes - Determination of gloss value at 20°, 60° and 85° (ISO 2813)*

EN ISO 12945-2, *Textiles - Determination of fabric propensity to surface fuzzing and to pilling - Part 2: Modified Martindale method (ISO 12945-2)*

EN ISO 12947-1, *Textiles - Determination of the abrasion resistance of fabrics by the Martindale method - Part 1: Martindale abrasion testing apparatus (ISO 12947-1)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
test surface
part of the test panel

3.2
test panel
panel including the test surface

Note 1 to entry: It can be cut from a finished item of furniture or it can be a separate panel produced in the same manner as the finished item of furniture.

3.3
test area
part of the test surface effected by the scrub material (5.6)

3.4
rub
one revolution of the two outer drives of the Martindale tester

3.5
cycle
completion of all the translational movements tracing a Lissajous figure comprising 16 rubs

Note 1 to entry: This comprises of 16 revolutions of the two outer drives and 15 revolutions of the inner drive of the Martindale tester.

3.6
lissajous figure
figure created by movement which ranges changes from a circle gradually narrowing ellipses, until it becomes a straight line, from which progressively widening ellipses develop, in a diagonally opposite direction before the pattern is repeated

4 Principle

The test surface shall be fixed on a horizontal table. A circular scrub material fixed on a holder impacts on the test surface with a defined load. Table and holder shall be moved perpendicular to each other, in a translational movement, with defined frequencies, tracing a Lissajous figure. The holder is additionally freely rotatable around its own axis perpendicular to the horizontal plane.

The test surface is exposed to the scrub material for a predetermined number of rubs. The changes of the surface are determined by gloss measurement or visual assessment.

5 Apparatus and materials

5.1 Martindale tester

The Martindale tester shall be as described in EN ISO 12947-1 with the following exceptions:

— the “Abrading table” is the table for the test surface;

— the “clamping ring and mechanism” is not necessary;

— the “specimen holder” is the holder for the scrub material;

— the “loading pieces” are not necessary.

5.2 Holder for scrub material

The holder for scrub material shall be as described in EN ISO 12945-2, with the following exceptions:

— consists of a guide plate with an inner diameter of (90 ± 0,5) mm, a large ring weight and a spindle with an overall weight (612 ± 2) g (nominally called 6 N).

5.3 Diffuse light source

Light source providing evenly diffused light giving an illumination on the test surface of (1200 ± 400) lx. This may either be diffuse daylight or be diffuse artificial daylight.

The daylight should be unaffected by surrounding trees, buildings, etc. When artificial light is used it is recommended that it can have a correlated colour temperature of (6500 ± 50) K and an R_a greater than 92, by using a colour matching booth in accordance with EN ISO 3668:2001[1].

5.4 Reflectometer

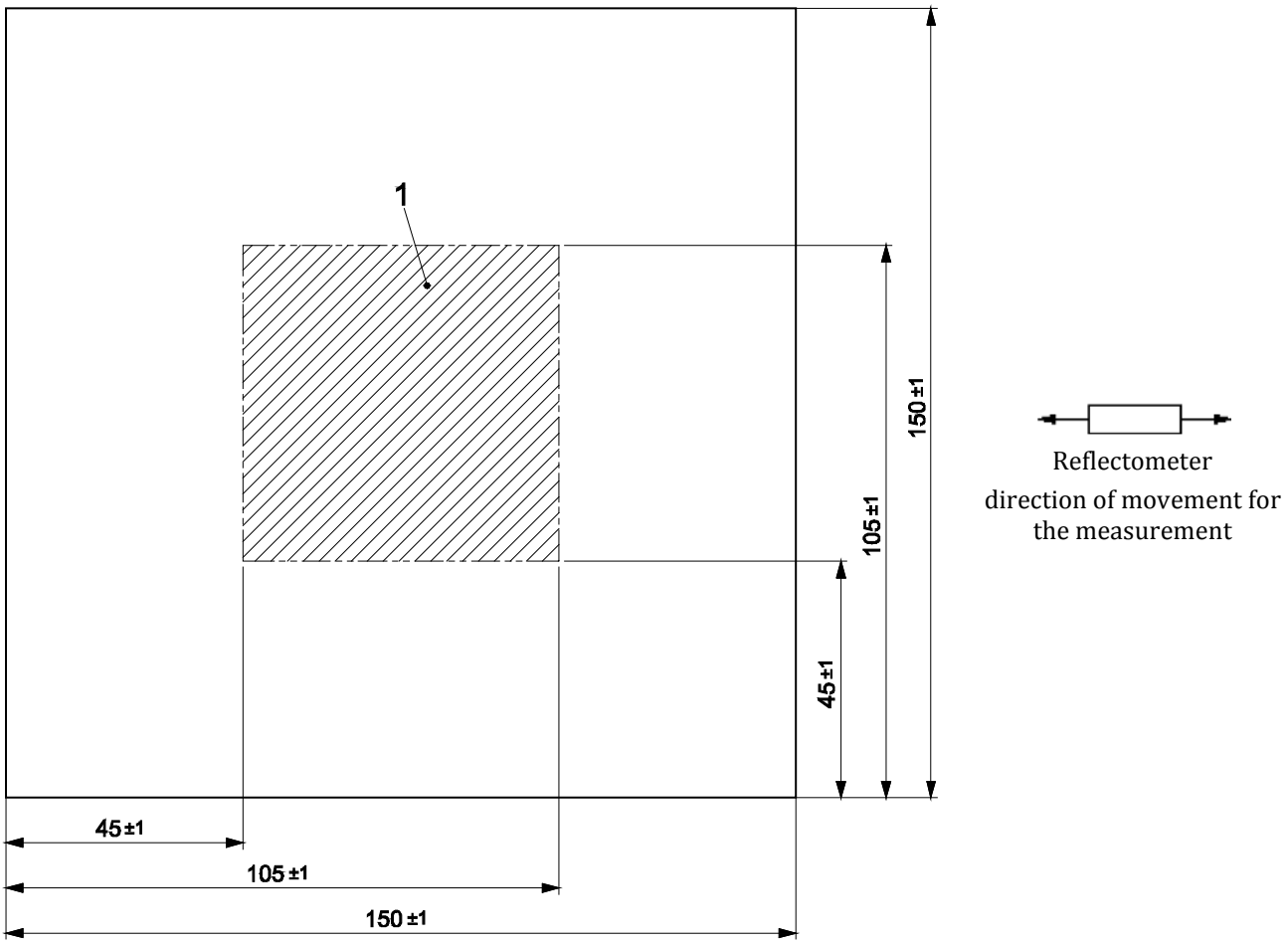
For gloss measurement with 3 angle measurement geometry as described in EN ISO 2813.

5.5 Positioning device

For gloss measurement on the same position before and after the test with 4 measurement points.

An example of a positioning device is shown in Figure 1.

Dimensions in millimetres



Key

1 measurement area

Figure 1 — Scheme of positioning device for the reflectometer on the shaded measurement area

5.6 Scrub materials

The scrub material shall be a nylon web imbedded with alumina abrasive. Two types of scrub materials (very fine and ultra fine) shall be used. The scrub materials shall be cut or stamped on a diameter of (89 ± 1) mm.

NOTE Scotch Brite fleece 7447+ (very fine) and 7448+ (ultra fine) are examples of a suitable product available commercially. This information is given for the convenience of users of this Technical Specification and does not constitute an endorsement by CEN of this product.

5.7 Double-sided tape

To attach the scrub material on the guide plate of the holder and the test surface on the table.

5.8 Cleaning cloth

White soft absorbent cloth.

5.9 Reference black high gloss HPL

Black high gloss lacquered HPL (Reflectometer value R' ≥ 100, measured with 20° geometry of a reflectometer according to 5.4 with antiscratch surface provided by corundum in the top lacquer.

NOTE James Heal Article Nr. JH701–501 is an example of a suitable product available commercially. This information is given for the convenience of users of this Technical Specification and does not constitute an endorsement by CEN of this product.

6 Assembly and maintenance of the Martindale tester

The assembly of the tester shall be carried out in accordance with the instructions of the apparatus manufacturer. For the described test, the outer position C shall be used for both axes to create the larger Lissajous figure as explained in EN ISO 12947-1 or the manufacture guidebook.

The checking of the Lissajous figure shall be done according to Annex A.

7 Preparation and conditioning

7.1 Conditioning

Conditioning of test surface shall begin at least one week before testing and shall be carried out in air at a temperature of (23 ± 2) °C and relative humidity of (50 ± 5) %.

The conditioning time shall be stated in the test report.

NOTE Some finishing systems cannot have achieved full cure after one week conditioning.

7.2 Test surface

Six test surfaces with dimensions of 150 mm x 150 mm shall be prepared.

The test surface shall be carefully wiped with a cleaning cloth (5.8) before the test without scratching the surface.

The test surface shall be substantially flat.

8 Test procedure

8.1 General

Two different procedures (A / B) are described. All the necessary parameters (scrub material, speed factor, number of cycles) are shown in Table 1.

Table 1 — Test procedures for determination of resistance to micro scratches

Test parameter	Procedure A	Procedure B
Scrub material	ultra fine	very fine
Speed factor	1	1
Number of rubs	80 rubs (= 5 Lissajous movements)	80 rubs (= 5 Lissajous movements)
Assessment	gloss change after 24 h	Visual assessment according to Annex B after 24 h

8.2 Testing

8.2.1 Procedure A

8.2.1.1 Calibration of ultra fine scrub material

Procedure A is also valid for checking of every new batch of ultra fine scrub materials (5.6). In this case, 3 test surfaces shall be taken from reference high gloss HPL (5.9). The batch of ultra fine scrub materials shall be used for testing if the mean value of gloss change, determined with 20° reflectometer geometry, is in the range from 15 % to 30 % according to EN ISO 2813.

8.2.1.2 Microscratching of test area

Immediately after conditioning, the test shall be carried out in a test temperature of (23 ± 2) °C at 3 test surfaces.

Before the test, 4 gloss measurements on each test surface using the reflectometer (5.4) with a geometry of 60° and the positioning device (5.5) shall be carried out. If there is a decor or preferential structure direction on the test surface the measurement shall be done parallel to this direction. Calculate the mean value for each test surface.

If the mean value is higher than 70 (high gloss surface) additional four measurements with the 20° geometry shall be carried out.

Fix the test surface on the table of the Martindale tester using the adhesive tape (5.7). The ultra fine scrub material shall be fixed with the adhesive tape on the guide plate of holder.

Select 80 rubs on the counter of the Martindale device and start the test.

After finishing remove the test surface from the table and clean it with the cleaning cloth (5.8). Remove also the used scrub material.

Measure the gloss again with the chosen geometry according to the above described procedure.

Calculate for each test surface the gloss change ΔR' according to the following formula:

$$\Delta R' = \frac{R'I - R'F}{R'I} \times 100 \ [\%] \qquad (1)$$

where

$R'I$ is the mean value at initial state;

$R'F$ is the value after finishing the test.

Calculate the mean value of the gloss change of the 3 test surfaces and round it on the next integral number.

8.2.2 Procedure B

8.2.2.1 Calibration of very fine scrub material

Procedure B is also valid for checking of every new batch of very fine scrub materials (5.6). In this case, 3 test surfaces shall be taken from reference high gloss HPL (5.9). The batch of very fine scrub materials shall be used for testing if the mean value of scratch pictures is 3 or 4 (Annex B).

8.2.2.2 Microscratching of test area

Immediately after conditioning, the test shall be carried out in a test temperature of (23 ± 2) °C at 3 test surfaces.

Fix the test surface on the table of the Martindale tester using the adhesive tape (5.7). The very fine scrub material shall be fixed on the guide plate of holder with the adhesive tape.

Select 80 rubs on the counter of the Martindale device and start the test.

After finishing remove the test surface from the table and clean it with the cleaning cloth (5.8). Remove also the used scrub material.

Carefully examine the test area with light coming from all directions for scratches using the scheme according to Annex B. For this purpose illuminate the surface separately using the diffuse light source (5.3) and examine from different angles, including angle combinations such that the light is reflected from the test surface and towards the observer's eye. Viewing distance shall be 0,25 m to 0,5 m.

The visual assessment shall be done by observers experienced in visual assessments of surfaces. In a case of doubt three observers shall assess.

If more than one observer has assessed the test areas calculate the mean value of the assessments of the observers for every test surface. Calculate a mean value from the values of the 3 test surfaces and round it on the next integral number.

9 Test report

The test report shall include at least the following information:

a) reference to this Technical Specification;

b) description of the furniture surface or test panel which the test surfaces were taken from (if possible);

c) the test temperature or temperatures;

d) conditioning time;

e) the number of observers at procedure B;

f) the single values of the three test surfaces and the values for the results of the test according to procedure A and/or B with 8.2;

g) any deviations from this working draft;

h) name and address of the test facility;

i) date of the test.

Annex A
(normative)

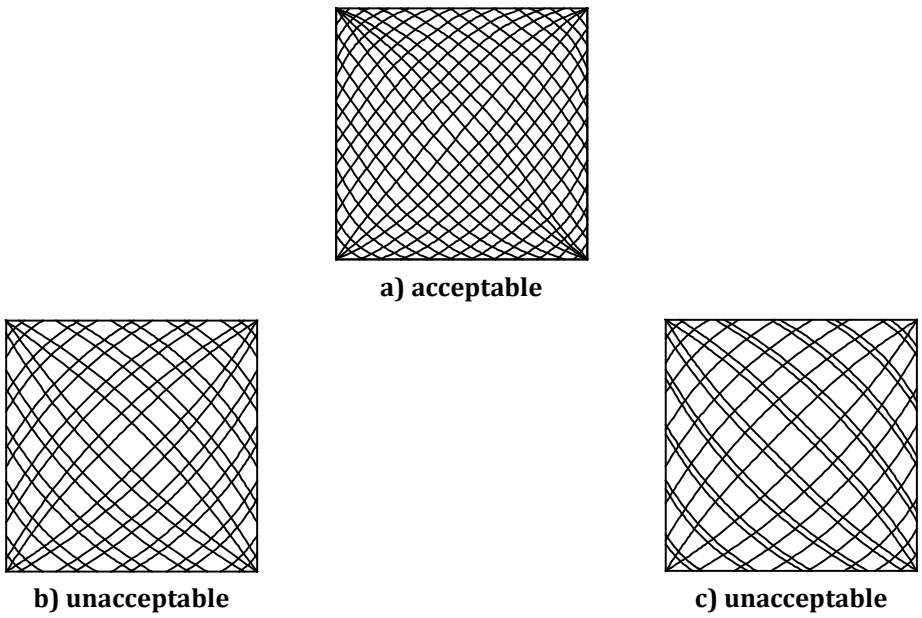
Method for checking the Lissajous figure

Obtain the Lissajous figure for each work station by means of the following method:

Remove materials from the abrading tables. Cover each abrading table surface with a plain paper measuring (100 ± 5) mm in diameter of minimum mass per unit area 100 g/m^2 and secure paper to abrading table ensuring the surface is perfectly flat.

Insert a steel sleeve of the same diameter as the specimen guide spindle counter bored to accept the introduction of a refill from a typical ballpoint pen through each of the specimen holder spindle bearings in turn in the specimen holder guide plate, so that the ball tip is resting on the surface of the paper. Set the machine for 16 rubs to produce one complete Lissajous figure.

Draw two parallel lines which just touch the outermost curves on two opposing sides of the Lissajous figure. Draw two more parallel lines for the other two sides making sure the lines intersect at right angles. Measure each side to an accuracy of ± 0,2 mm using suitable means. Check that 31 curves are drawn. It is important to check the symmetry of the Lissajous figures. If the curves run into one another or the spacing is uneven (Figure A.1) consult the machinery supplier.



a) acceptable

b) unacceptable

c) unacceptable

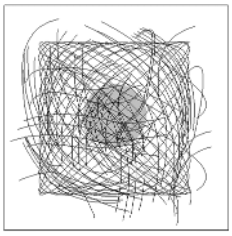
Figure A.1 — Examples of acceptable and unacceptable Lissajous figures

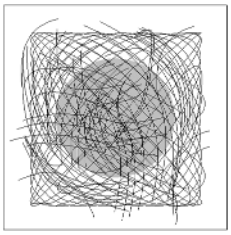
Annex B
(normative)

Classification of the image after scratching according to procedure B

For the visual assessment of the test area after scratching according to procedure B the classification given in Table B.1 shall be used.

Table B.1 — Classification for visual assessment according to procedure B

Class	scratch picture	explanation
5		No visible scratches or only few scratches
4		Many good visible scratches
3		A great many good visible raw and fine scratches, Lissajous Figure partly visible
2		Mix of Lissajous-Figure und great many scratches

1		Mix of Lissajous-Figure und great many scratches, mat abrasion like area in the middle

Bibliography

[1] EN ISO 3668:2001, *Paints and varnishes - Visual comparison of the colour of paints (ISO 3668:1998)*

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