
**Furniture — Tests for surface finishes —
Part 2:
Assessment of resistance to wet heat**

*Ameublement — Essais des finitions de surface —
Partie 2: Évaluation de la résistance à la chaleur humide*



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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. www.iso.org/directives

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

The committee responsible for this document is ISO/TC 136, *Furniture*.

This second edition cancels and replaces the first edition (ISO 4211-2:1993), which has been technically revised. Significant technical changes in this version are as follows:

- change in the illumination of the diffuse light source; it is now (1200 ± 400) lx;
- changes in the descriptive numerical rating code: new descriptions apply.

ISO 4211 consists of the following parts, under the general title *Furniture — Tests for surface finishes*:

- *Part 2: Assessment of resistance to wet heat*
- *Part 3: Assessment of resistance to dry heat*
- *Part 4: Assessment of resistance to impact*

Furniture — Tests for surface finishes —

Part 2: Assessment of resistance to wet heat

1 Scope

This part of ISO 4211 specifies a method for the assessment of the resistance to wet heat of all rigid furniture surfaces regardless of materials.

It does not apply to leather and textile surfaces.

The test is intended to be carried out on a part of the 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.

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.

ISO 209, *Aluminium and aluminium alloys — Chemical composition*

ISO 1770, *Solid-stem general purpose thermometers*

ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

ISO 4288, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

3 Terms and definitions

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

3.1

test panel

panel including the test surface

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

3.2

test surface

part of the test panel

3.3

test area

part of the test surface under the heat source ([5.2](#))

3.4 roughness

R_a
arithmetic mean of the absolute values of the profile deviations from the mean line

4 Principle

A standard aluminium alloy block at a specified test temperature is placed on a damp cloth in contact with the test surface. After a specified test period, the block and damp cloth are removed and the test surface is left for 16 h to 24 h. Thereafter, the test surface is cleaned and examined for damages such as discolouration, change in gloss, change in colour, blistering, and swelling. The test result is stated in a numerical rating code.

5 Apparatus and materials

5.1 Thermometer, as specified in ISO 1770, capable of insertion to the bottom of the centre bore of the heat source (5.2) or other means of measuring the temperature of the heat source to an accuracy of $\pm 1\text{ }^\circ\text{C}$.

5.2 Heat source, a block as shown in Figure 1, manufactured from aluminium alloy according to ISO 209, Al Mg Si (alloy shall contain more than 94 % aluminium). The roughness of the bottom surface shall be $(2 \pm 1)\text{ }\mu\text{m}$, expressed as R_a , according to ISO 4287 and ISO 4288.

NOTE Alloy 6060 and 64430 are suitable.

The following tolerances are applicable:

Lengths: $\pm 0,2\text{ mm}$ of the nominal length

Angles: $\pm 2^\circ$ of the nominal angle

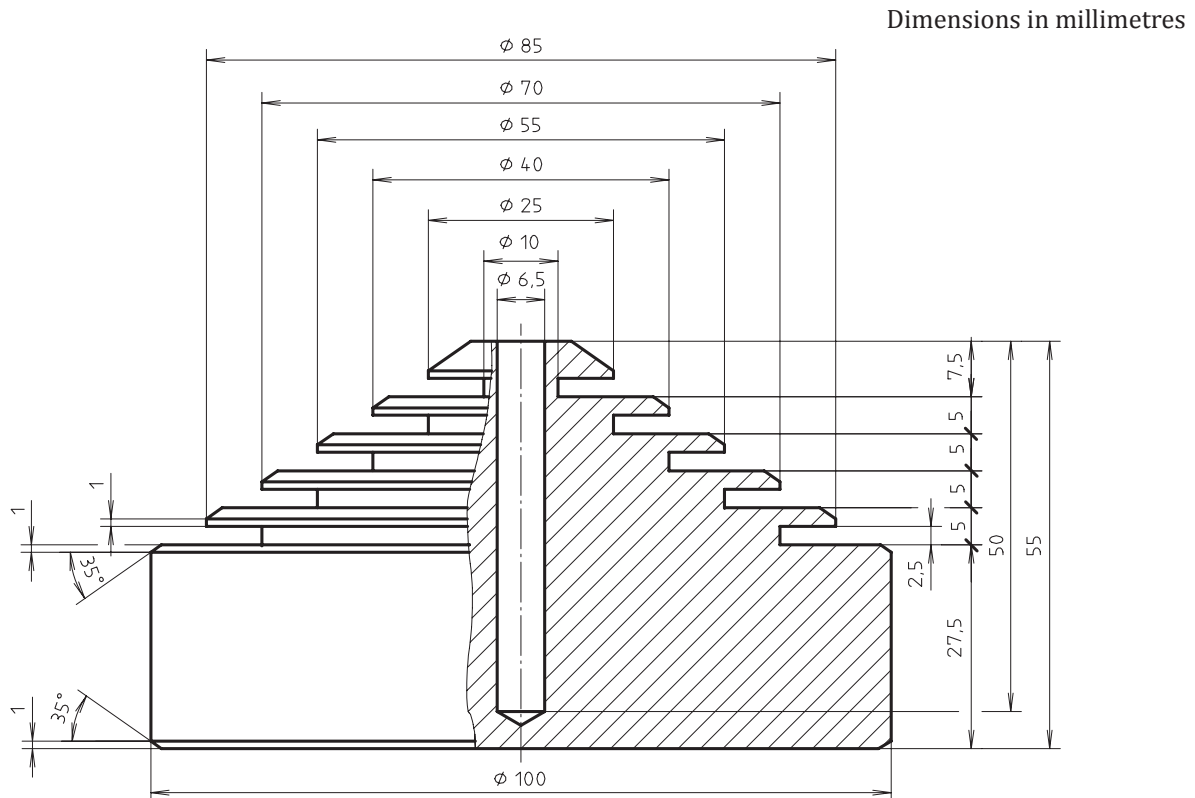


Figure 1 — Aluminium block used as heat source

5.3 Oven, which can heat the heat source to a temperature higher than the test temperature.

5.4 Cleaning cloth, white soft absorbent cloth.

5.5 White polyamide fibre cloth, a plain weave having approximately 40 threads/cm in both warp and weft direction, weighing approximately 50 g/m², and cut (120 ± 3) mm square.

5.6 Deionised or distilled water.

5.7 Heat-insulating foam, a melamine foam, with the following characteristics: density between 8,5 kg/m³ and 11,5 kg/m³; heat conductivity, less than 0,035 W/mK. The foam shall withstand a temperature higher than 200 °C.

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

The daylight should be unaffected by surrounding trees, etc. When artificial daylight is used, it is recommended that it should 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 ISO 3668:1998.

6 Preparation and conditioning

6.1 Conditioning

Conditioning of the 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 (see [Clause 10](#)).

6.2 Test surface

The test surface shall be substantially flat and with a size sufficient to meet the requirements of [Clause 7](#).

7 Test procedure

7.1 Testing

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

The test surface shall be placed horizontally. It shall accommodate the required number of tests, with at least 15 mm spacing between the perimeter of adjacent test surfaces, and between the perimeters of the test surfaces and the edges of the panel. Where tests are carried out simultaneously, the perimeters of the test surfaces shall be separated by a minimum of 50 mm. If there is any reason to suppose that the properties of the test surface may vary, two identical tests shall be carried out simultaneously.

The test surface shall be lightly wiped with a cleaning cloth ([5.4](#)) before the testing.

Using the oven ([5.3](#)), raise the temperature of the heat source to a temperature higher than the specified test temperature, and transfer it to the heat insulating foam ([5.7](#)).

Place the thermometer ([5.1](#)) or other means of measuring temperature in the centre bore of the heat source ([5.2](#)). If the temperature is not higher than the specified test temperature, the heat source shall be placed again in the oven until achieving this higher temperature.

Place the white polyamide fibre cloth (5.5) centrally on the test surface. Spread $(2 \pm 0,2)$ cm³ of distilled or deionised water (5.6) uniformly over the whole area of the white polyamide fibre cloth.

NOTE A graduated eye dropper is suitable for dispensing the distilled or deionised water.

When the heat source reaches the specified test temperature with an accuracy of ± 1 °C, immediately place it on the centre of the white polyamide fibre cloth.

After 20 min in this position, remove the block.

Wipe the test surface dry with the cleaning cloth (5.4) when it has cooled.

Record the position of each test surface and its temperature.

Allow the test surface to stand undisturbed from 16 h to 24 h.

Wipe each test surface with the cleaning cloth (5.4) and examine the test panel.

7.2 Test temperatures

The test temperatures shall be stated in requirement specifications, selected from the following:

55 °C 70 °C 85 °C 100 °C

8 Examination of the test panel

Carefully examine the test surface using the light source (5.8), for damage, e.g. discoloration, change in gloss and colour, blistering, swelling, and other defects. For this purpose, illuminate the surface separately and examine from different angles, directions, and planes, 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 1,0 m.

Changes caused by the test shall also be determined by touching the surface.

9 Assessment of results

Rate the test surfaces by comparing the test area with the area surrounding it according to [Table 1](#).

Table 1 — Descriptive numerical rating code

Numerical rating	Description
5	No change test area indistinguishable from adjacent surrounding area
4	Minor change test area distinguishable from adjacent surrounding area, only when the light source is mirrored on the test surface and is reflected towards the observer's eye, e.g. discoloration, change in gloss and colour no change in the surface structure, e.g. deformation, swelling, fibre raising, cracking, blistering
3	Moderate change test area distinguishable from adjacent surrounding area, visible in several viewing directions, e.g. discoloration, change in gloss and colour no change in the surface structure, e.g. swelling, fibre raising, cracking, blistering

Table 1 (continued)

Numerical rating	Description
2	<p>Significant change</p> <p>test area clearly distinguishable from adjacent surrounding area, visible in all viewing directions, e.g. discoloration, change in gloss and colour</p> <p>and/or structure of the surface slightly changed, e.g. swelling, fibre raising, cracking, blistering</p>
1	<p>Strong change</p> <p>the structure of the surface being distinctly changed</p> <p>and/or discoloration, change in gloss and colour</p> <p>and/or the surface material being totally or partially removed</p> <p>and/or the polyamide fibre cloth adhering to the surface</p>

Each test surface shall be rated by an experienced observer.

In cases of doubt, three observers shall be required. All observers shall have good colour vision. In case of three observers, the reported rating for the test surface shall be the average to the nearest nominal value.

Duplicate tests shall be assessed and reported separately.

10 Test report

The test report shall include at least the following information:

- a) a reference to this part of ISO 4211 (i.e. ISO 4211-2:2013);
- b) a description of the test panel (relevant data);
- c) the test temperature or temperatures;
- d) the conditioning time;
- e) the assessment of each test surface in accordance with [Clause 9](#);
- f) if applicable, additional information regarding type of damage;
- g) any deviations from this part of ISO 4211;
- h) the name and address of the test facility;
- i) the date of the test.

Bibliography

- [1] ISO 3668, *Paints and varnishes — Visual comparison of the colour of paints*

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