



# SLOVENSKI STANDARD

## oSIST prEN ISO 10545-18:2021

01-julij-2021

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**Keramične ploščice - 18. del: Določanje vrednosti odbojnosti svetlobe (LRV)**  
**(ISO/DIS 10545-18:2021)**

Ceramic tiles - Part 18: Determination of Light Reflectance Value (LRV) (ISO/DIS 10545-18:2021)

Keramische Fliesen und Platten - Teil 18: Bestimmung des Lichtreflexionswertes (LRW)  
(ISO/DIS 10545-18:2021)

Carreaux et dalles céramiques - Partie 18: Détermination de la valeur de réflectance  
lumineuse (LRV) (ISO/DIS 10545-18:2021)

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**Ta slovenski standard je istoveten z: prEN ISO 10545-18**

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**ICS:**

91.100.23	Keramične ploščice	Ceramic tiles
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<b>oSIST prEN ISO 10545-18:2021</b>	<b>en,fr,de</b>
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## ISO/DIS 10545-18

ISO/TC 189

Secretariat: ANSI

Voting begins on:  
2021-04-13Voting terminates on:  
2021-07-06

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### Ceramic tiles —

#### Part 18:

#### Determination of Light Reflectance Value (LRV)

ICS: 91.100.23

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Reference number  
ISO/DIS 10545-18:2021(E)

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Published in Switzerland

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## ISO/DIS 10545-18:2021(E)

## Foreword

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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](http://www.iso.org/directives)).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 189, *Ceramic tiles*.

A list of all parts in the ISO 10545 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Ceramic tiles —

## Part 18:

## Determination of Light Reflectance Value (LRV)

### 1 Scope

The objective of this standard is to define a test method to determine the Light Reflectance Value LRV of ceramic tiles, including mosaic tiles.

It is applicable to solid-coloured tile or multicoloured surfaces, with flame effects, speckled or textured, with different types of finishing.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 105-J03:2009, *Textiles — Tests for colour fastness — Part J03: Calculation of colour differences*

ISO/CIE 11664-1:2019, *Colorimetry — Part 1: CIE standard colorimetric observers*

ISO/CIE 11664-3:2019, *Colorimetry — Part 3: CIE tristimulus values*

CIE 130:1998 *Practical Methods for the Measurement of Reflectance and Transmittance*.

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### **Solid Coloured Surfaces**

Surfaces with color uniformity and same shade value.

#### 3.2

##### **Multi-coloured surfaces**

Surfaces formed by distinct areas of different colour, which when viewed from a distance of 3 m, remain distinct, or surface formed from small colour specks, which when viewed from a distance of 1m, assume the appearance of one colour.

#### 3.3

##### **Non-uniform shade, speckled or textured surfaces**

Surfaces with a certain shade variability ("non uniform shade"), or covered with small marks, spots, or shake ("speckled") or surfaces that cause extreme angular dependences of reflected light and those that have a superficial texture with maximum peak-valley distance < 2 mm ("textured").

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## 3.4

**Light Reflectance Value**

LRV is equivalent to CIE Tristimulus Y10 when viewed under Illuminant CIE D65 (daylight) and when measured with the appropriate specimen and measurement geometry. LRV can also be defined as the luminance factor Y of a sample, expressed as a percent, where different observer angles such as 2° and 10° and illuminant such as daylight (CIE D65), incandescent (CIE A), fluorescent (CIE F2), can be also used.

**4 Principle**

The test in question shall determine the amount of visible light reflected by the surface product in each direction; the measurement of this reflected light at different wavelengths in visible range, weighted for the sensitivity of light of the human eye, is Light Reflectance Value

**5 Apparatus****5.1 Type of instrument**

Any sphere-type spectrophotometer or tristimulus colorimeter capable of colour measurements and data colour transformation into CIE tristimulus value, X, Y and Z.

This instrument must have a reproducibility of 1 unit  $\Delta E$  CIE  $L^*a^*b^*$ , and repeatability of  $\sigma = \pm 0.2$  based on five independent measurements.

Moreover, the instrument must have a measurement area at least 8 mm diameter, compatible with the aperture of the spectrophotometers available on the market.

**5.2 Instrument setup**

The LRV measurements can be taken as follows:

- with specular component included (SCI), a 10° visual field and illuminant CIE D65 (standard conditions);
- with specular component included (SCI), a 10° visual field and illuminant CIE F2 (fluorescent);
- with specular component included (SCI), a 10° visual field and illuminant CIE A (incandescent);
- with specular component included (SCI), a 2° visual field and illuminant CIE D65 (daylight);
- with specular component included (SCI), a 2° visual field and illuminant CIE F2 (fluorescent);
- with specular component included (SCI), a 2° visual field and illuminant CIE A (incandescent).

**NOTE** The illuminant CIE D65 is generally representative of a phase of daylight with a correlated colour temperature of approximately 6 500K.

**5.3 Instrument calibration and standards**

Before measurement, the instrument must be calibrated according to the instructions provided by the manufacturer.

The primary standard for reflectance measurement is a layer of freshly prepared barium sulfate.

Because of the difficulty of preparing a primary standard each time and its variability, calibrated pieces of white opaque glass, porcelain enamel plaques, or glazed ceramic tile are used as working standards and are usually supplied by the manufacturer of the instrument. The manufacturer of each type of instrument provides numerical specifications for the working standards, which have a definite relationship to the CIE values X, Y, and Z.



## 6 Preparation of test specimens

### 6.1 Solid coloured tiles

Take at least 3 tiles and obtain one specimen for each tile representative of the surface color of product concerned.

### 6.2 Multi-coloured, non-uniform shade, speckled or textured surface tile

The specimens shall be chosen in order to be representative of the whole chromatic range exhibited on the tile surface. The number of specimens shall be at least as reported in [Table 1](#).

**Table 1 — Minimum number of test specimens**

Tile Maximum Area, A(cm <sup>2</sup> )	Total n° of tiles	n° of specimens to be tested for each tile	Minimum area of specimen (cm <sup>2</sup> )	Total n° of specimens
A < 900	5	1	100	5
900 ≤ A ≤ 3600	3	2	225	6
A > 3600	3	2	900	6

In the case of high color or shade variability [see Note 1], statistical methods shall be used to determine the number of randomly selected tiles that will be representative, but the minimum number of specimens to be tested shall be at least double the number reported in Column 3 of [Table 1](#).

The testing surface shall be cleaned with a cloth dampened with alcohol and dried before testing.

In case of mosaic, consider a minimum number of tesserae equal to 20 (minimum number of readings per sample reported in [Table 2](#) for A < 900 cm<sup>2</sup>).

Testing surfaces can be also measured in wet conditions. In this case, the surface of the specimens shall be wet being sure that it remains in wet condition for at least 5 min. LRV measurements shall be taken as soon as possible after removing any unabsorbed water from the surface with a cloth or sponge that does not leave any solid residue.

NOTE variability in the colour of the tested specimens will be deemed to have occurred where the difference between the highest and lowest LRV ≥ 4.

## 7 Test

### 7.1 Measurement on solid coloured surfaces

The specimen surface is presented to the aperture of the instrument, and its LRV is measured.

Perform the LRV measurement according to one of the conditions detailed in [clause 5b](#) and record the CIE Tristimulus value Y, x and y. Perform at least 4 measurements for each specimen.

In the case of mosaic tiles, perform the measurement for each tessera

### 7.2 Measurement on multi-coloured surfaces

Perform the LRV measurement according to one of the conditions detailed in [clause 5b](#), and record the CIE Tristimulus value Y, x and y.

Perform at least 4 measurements at each distinct area of colour for each tile or portion of tiles. The results of each measurement shall be recorded and the average LRV for each area of distinct colour determined.

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The average  $LRV_{av}$  for the overall specimen is given by:

$$LRV_{av} = [ (LRV_{av1} \times A_1) + (LRV_{av2} \times A_2) + (LRV_{avn} \times A_n) ] / A$$

where

$LRV_{av}$  = average LRV of the overall specimen (CIE Y);

$LRV_{av1}$  = average LRV of distinct colour "1" of the specimen (CIE Y);

$A_1$  = area of distinct colour "1" ( $m^2$ )

$LRV_{av2}$  = average LRV of distinct colour "2" of the specimen (CIE Y);

$A_2$  = area of distinct colour "2" ( $m^2$ )

$LRV_{avn}$  = average LRV of distinct colour "n" of the specimen (CIE Y);

$A_n$  = area of distinct colour "n" ( $m^2$ )

### 7.3 Measurement on non-uniform shade, speckled or textured surface

Perform the LRV measurement according to one of the conditions detailed in [clause 5b](#) and record the CIE Tristimulus value Y, x and y.

For each specimen, perform the measurements in areas that represent the main chromatic variations of the product.

The number of required minimum sample readings is reported in [Table 2](#).

**Table 2 — Minimum Reading per specimens and per samples**

Tile Area( $cm^2$ )	n° specimens to be tested	Minimum Reading per Specimen	Minimum Reading per Sample
$A < 900$	5	4	20
$A \geq 900$	6	4	24

In the case of mosaic, carry out the measurements on number of tesserae representative of the color surface variability; in any case, the minimum number of readings per sample must be the same as that reported in [Table 2](#) for  $A < 900 cm^2$ .

## 8 Test Report

The test report shall include the following information:

- reference to this standard;
- description of tiles;
- the specimen identification details (in case of [7.2](#) and [7.3](#), including photos indicating the points of measurements);
- the number of specimens measured;
- the method of specimen preparation used;
- details of the instrument used (measurement window diameter included) and specific measurement conditions (illuminant and angle/colorimetric observer);
- description of specimen including CIE Y x y colour identification;