SLOVENSKI STANDARD
oSIST prEN 13032-5:2017

01-april-2017

Svetloba in razsvetljava - Merjenje in podajanje fotometričnih podatkov sijalk in svetil - 5. del: Predstavitev podatkov za svetila za cestno razsvetljavo

Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 5: Presentation of data for luminaires used for road lighting

Licht und Beleuchtung - Messung und Darstellung photometrischer Daten von Lampen und Leuchten - Teil 5: Darstellung von Daten von Leuchten für den Einsatz in der Straßenbeleuchtung

Lumière et éclairage - Mesurage et présentation des données photométriques des lampes et des luminaires - Partie 5 : Présentation des données relatives aux luminaires utilisés pour l'éclairage public

Ta slovenski standard je istoveten z: **prEN 13032-5**

ICS:

93.080.40	Cestna razsvetljava in pripadajoča oprema	Street lighting and related equipment

oSIST prEN 13032-5:2017 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 13032-5

January 2017

ICS 93.080.40

English Version

Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 5: Presentation of data for luminaires used for road lighting

Lumière et éclairage - Mesurage et présentation des données photométriques des lampes et des luminaires - Partie 5 : Présentation des données relatives aux luminaires utilisés pour l'éclairage public

Licht und Beleuchtung - Messung und Darstellung photometrischer Daten von Lampen und Leuchten - Teil 5: Darstellung von Daten von Leuchten für den Einsatz in der Straßenbeleuchtung

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 169.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword 3
Introduction 4
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Utilances road lighting and utilization factor road lighting 5
4.1 General 5
4.2 General assumptions 6
4.3 Calculation of utilance by interpolation in an utilance table 6
4.4 Utilance road lighting table 8
5 Application 9
5.1 General 9
5.2 Accumulated utilances road lighting 9
5.3 Limitations 10
Annex A (informative) Determination of edge illuminance ratio 11
Annex ZA (informative) Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EC) No 245/2009, as amended by Regulation (EU) No 347/2010, aimed to be covered 15
Bibliography 17

European foreword

This document (prEN 13032-5:2017) has been prepared by Technical Committee CEN/TC 169 “Light and Lighting”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Commission Regulation (EC) No 245/2009, as amended by Regulation (EU) No 347/2010.

For relationship with Commission Regulation (EC) No 245/2009, as amended by Regulation (EU) No 347/2010, see informative Annex ZA, which is an integral part of this document.

Introduction

The Eco-design Directive 2009/125/EC requires a reduction of energy consumption of fluorescent lamps without integrated ballast, for high intensity discharge lamps, for LED light sources, and for ballasts and luminaires able to operate such lamps and light sources.

“Utilance is a measurement of the efficiency of the luminous intensity distribution of a luminaire to spread its luminous flux onto a specified surface provided other quality requirements of EN 13201 are met.”

There are many lighting solutions that can satisfy the road lighting criteria specified in EN 13201-2. To design these solutions, photometric data of the equipment are required.

The use and application of utilance can serve as a tool for the pre-selection of adequate luminaires to fulfil the lighting requirements of EN 13201-2.

The knowledge of the utilance is required for the calculation of the installation luminous efficacy as described in EN 13201-5.

This document specifies the presentation of tables of utilances and utilization factors of luminaires used for road lighting.

Utilance is followed in place of utilization factors because it can be applied to luminaires using conventional or integrated light sources.

1 Scope

This document defines the presentation of utilances or utilization factors respectively for luminaires used for road lighting.

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 12665, *Light and lighting - Basic terms and criteria for specifying lighting requirements*

EN 13201-2, *Road lighting - Part 2: Performance requirements*

EN 13201-3, *Road lighting - Part 3: Calculation of performance*

EN 13201-5, *Road lighting - Part 5: Energy performance indicators*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12665 and the following apply.

3.1
utilization factor (of an installation, for a reference area)
F_U
ratio of the luminous flux received by the reference area to the sum of the individual luminous fluxes of the lamps of the installation

3.2
utilance (of an installation, for a reference area)
U
ratio of the luminous flux received by the reference area to the sum of the individual total fluxes of the luminaires of the installation

3.3
utilance road lighting
U_{rl}
ratio of the luminous flux received by one or more strips along the road to the sum of the individual total fluxes of the luminaires of the installation

3.4
utilization factor road lighting
$F_{u,rl}$
ratio of the luminous flux received by one or more strips along the road to the sum of the individual total fluxes of the luminaires of the installation

4 Utilances road lighting and utilization factor road lighting

4.1 General

In this standard the average illuminance on a reference area, a longitudinal strip of a road, representing, for example, the carriageway, a single lane, a cycle path, or a footpath, can be calculated as:

$$E_{av} = U_{rl} \cdot f_m \cdot \phi_{Lum} \cdot W^{-1} \cdot S^{-1} \quad (1)$$

where

E_{av} is the average illuminance in lx on the strip under consideration;

U_{rl} is the utilance road lighting:

f_m is the overall maintenance factor;

ϕ_{Lum} is the luminaire luminous flux in lm;

W is the width of reference area, in m;

S is the luminaire spacing in m.

NOTE If the luminaire luminous flux is not known it can be determined from the knowledge of the total luminous flux of the light sources in the luminaire and the light output ratio of the luminaire.

The utilance road lighting U_{rl} is given by the ratio of the luminous flux emitted by the luminaire within a specified solid angle to the total luminous flux emitted by the same luminaire, whereas the utilization factor road lighting $F_{u,rl}$ is given by the ratio of the luminous flux emitted by the luminaire within a specified solid angle to the total luminous flux of the light source(s) in the same luminaire. The utilization factor road lighting can be expressed as utilance road lighting multiplied by the light output ratio.

The utilance can be derived from the luminous intensity distribution of the luminaire (measured according to EN 13032-1 or EN 13032-4) and should be provided in an approved format.

4.2 General assumptions

The tables are applicable for regular arrangements on straight sections of roads.

The luminous intensity distribution of the luminaire is part of the basic data needed for installation performance calculations. This data should be given for luminaires used in road lighting in the format specified in EN 13201-3.

With the luminaire as origin and the reference area of the road between two lines parallel to its axis (which extends in principle from -∞ to +∞) a solid angle is defined. The position of the two circumscribing lines is given by their transverse angle. It is common practice to choose one of these circumscriptions at a transverse distance equal to zero.

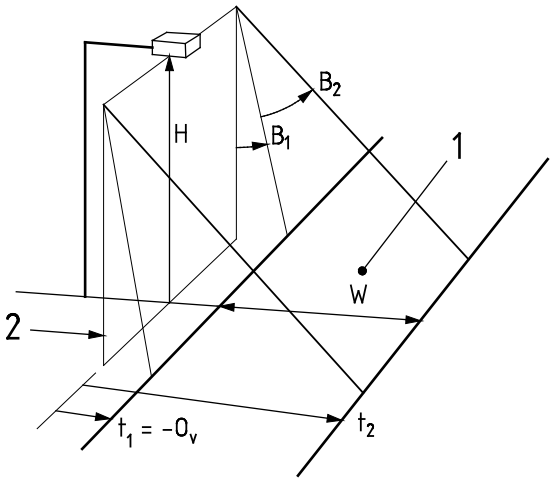
A reference area represents one or more carriageways, footpaths, cycle paths, emergency lanes and other road areas lying separately or adjacent to a carriageway, strips just outside or inside a carriageway (for the evaluation of the edge illuminance ratio), etc.

Each area is to be lit to the lighting requirements as defined in EN 13201-2.

Further, it is assumed that the areas are illuminated by a lighting installation with luminaires of the same type in one or more rows that are parallel to the above-mentioned lines that confine the areas.

4.3 Calculation of utilance by interpolation in an utilance table

The limiting lines of a reference area (strip) in relation to a row of luminaires are shown in Figure 1. The limiting lines are part of the inclined planes B_1 and B_2 which pass through both the limiting lines and the luminaire. The angles of inclination of the planes B_1 and B_2 are given by $\tan^{-1}(t_1 / H)$ and $\tan^{-1}(t_2 / H)$ respectively, where t_1 and t_2 are the transverse distances to the limiting lines and H is the luminaire mounting height (centre point of light above the reference area).



Key

O_v	overhang with respect to the reference area in m;
W	width of the reference area in m;
H	luminaire mounting height in m;
δ	angle of tilt of the luminaire for calculation;
$U(B_X)$	utilance as interpolated for the angle B_X
1	vertical plane B = 0°
2	reference area

Figure 1 — Basic position of reference area relative to row of luminaires

Once the plane angles B_1 and B_2 have been calculated for a given installation geometry the resulting utilance can be calculated by interpolation between tabulated utilances given as function of angle B.

For B_1 - δ ≥ 0 and B_2 - δ > 0;

$$U = U\,(B_2 - \delta) - U\,(B_1 - \delta); \tag{2}$$

For B_1 - δ < 0 and B_2 - δ ≥ 0;

$$U = U\,(B_2 - \delta) + U\,(B_1 - \delta); \tag{3}$$

For B_1 - δ < 0 and B_2 - δ ≤ 0;

$$U = U\,(B_1 - \delta) - U\,(B_2 - \delta); \tag{4}$$

where

$$B_1 = \tan^{-1}\,(-O_v / H) \text{ and } B_2 = \tan^{-1}\,[(W - O_v) / H] \tag{5}$$

O_v	is the overhang with respect to the reference area in m;
W	is the width of the reference area in m;
H	is the luminaire mounting height in m;
δ	is the angle of tilt of the luminaire for calculation;
$U(B_x)$	is the utilance as interpolated for the angle B_x.

NOTE The angle of tilt for calculation is the difference in angle between the tilt in application and the tilt during measurement of the luminaire (EN 13201–3).

For a plane angle B_x between two successive angles B_i and B_{i+1} for which the utilances $U(B_i)$ and $U(B_{i+1})$ are given in tabular form the general formula for linear interpolation can be used to calculate the resulting utilance $U(B_x)$:

$$U\left(B_x\right) = U\left(B_i\right) + \frac{B_x - B_i}{B_{i+1} - B_i} \times \left[U\left(B_{i+1}\right) - U(B_i)\right] \quad (6)$$

4.4 Utilance road lighting table

For the determination of the resulting luminaire utilance between two plane angles B_{x1} and B_{x2} it is necessary to calculate the utilance road lighting by linear interpolation between the nearest values in the utilance road lighting data table. To provide for a sufficient accuracy the utilance road lighting should be given at angular interval ΔB not greater than 5° from −90° to +90° (see Table 1). In some cases, it could be required to extend the range, for example, from −180° to +180°. The angle of tilt, usually 0°, to be specified.

Table 1 — Standard Utilance road lighting table for a luminaire used for road lighting

Angle B_i in (°), kerbside	**Utilance road lighting $U_{rl,i}$ (B) as function of angle B, kerbside**	**Angle B_i in (°), roadside**	**Utilance road lighting $U_{rl,i}(B)$ as function of angle B, roadside**
−90	$U(B = -90°)$	90	$U(B = 90°)$
−85	$U(B = -85°)$	85	$U(B = 85°)$
−80	$U(B = -80°)$	80	$U(B = 80°)$
−75	$U(B = -75°)$	75	$U(B = 75°)$
−70	$U(B = -70°)$	70	$U(B = 70°)$
−65	$U(B = -65°)$	65	$U(B = 65°)$
−60	$U(B = -60°)$	60	$U(B = 60°)$
−55	$U(B = -55°)$	55	$U(B = 55°)$
−50	$U(B = -50°)$	50	$U(B = 50°)$
−45	$U(B = -45°)$	45	$U(B = 45°)$
−40	$U(B = -40°)$	40	$U(B = 40°)$
−35	$U(B = -35°)$	35	$U(B = 35°)$
−30	$U(B = -30°)$	30	$U(B = 30°)$
−25	$U(B = -25°)$	25	$U(B = 25°)$
−20	$U(B = -20°)$	20	$U(B = 20°)$
−15	$U(B = -15°)$	15	$U(B = 15°)$
−10	$U(B = -10°)$	10	$U(B = 10°)$
−5	$U(B = -5°)$	5	$U(B = 5°)$
0	$U = 0$	**0**	$U = 0$