

**VO Žďár n.S., ulice Strojírenská - Přejchod - výpočet  
osvětlení (13-4-2023)**

## Preface

Notes on planning:

The energy consumption quantities do not take into account light scenes and their dimming levels.

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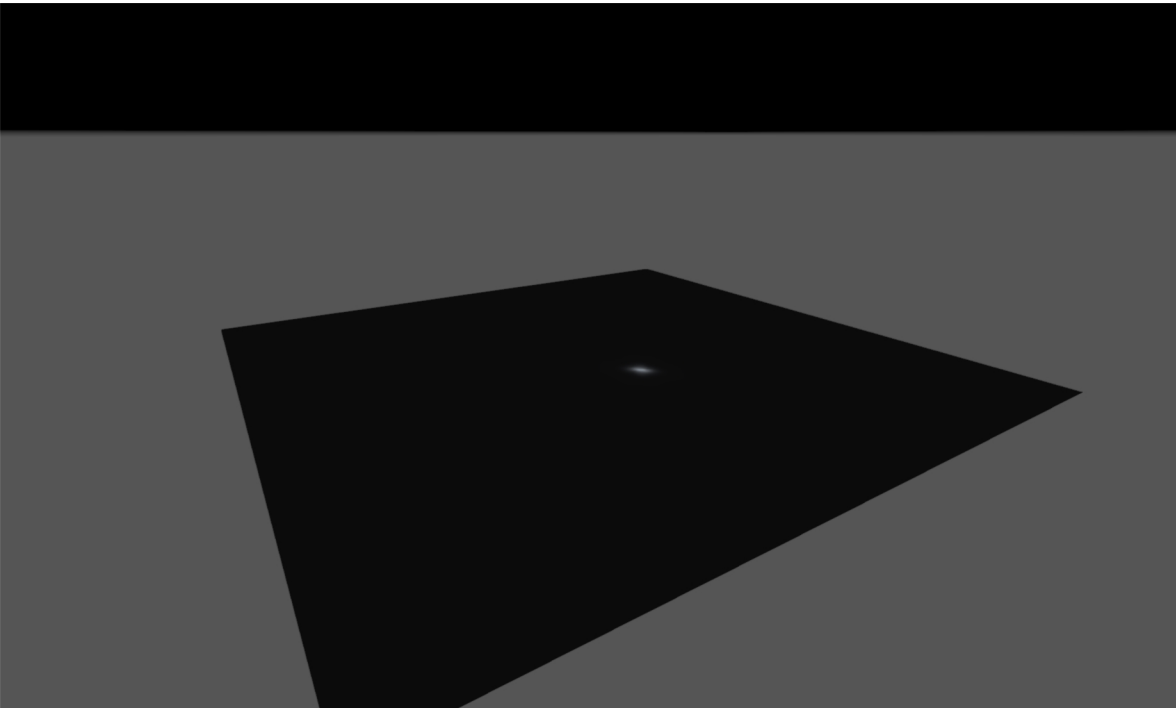
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## Description

## Luminaire list

$\Phi_{\text{total}}$ 37230 lm	$P_{\text{total}}$ 252.0 W	Luminous efficacy 147.7 lm/W
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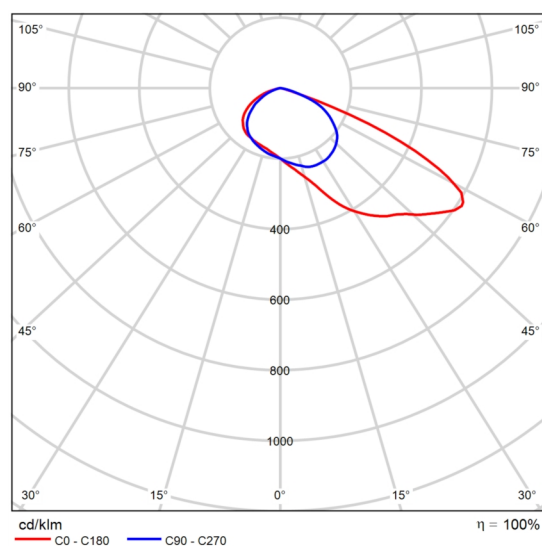
pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
2	Thorn Lighting	R2L2 M 60L70-757 IVS	R2L2 M - 60 x Cold White 5700K LED CRI70 700mA - IVS Optic	126.0 W	18615 lm	147.7 lm/W

## Product data sheet

Thorn Lighting - R2L2 M - 60 x Cold White 5700K LED CRI70 700mA - IVS Optic



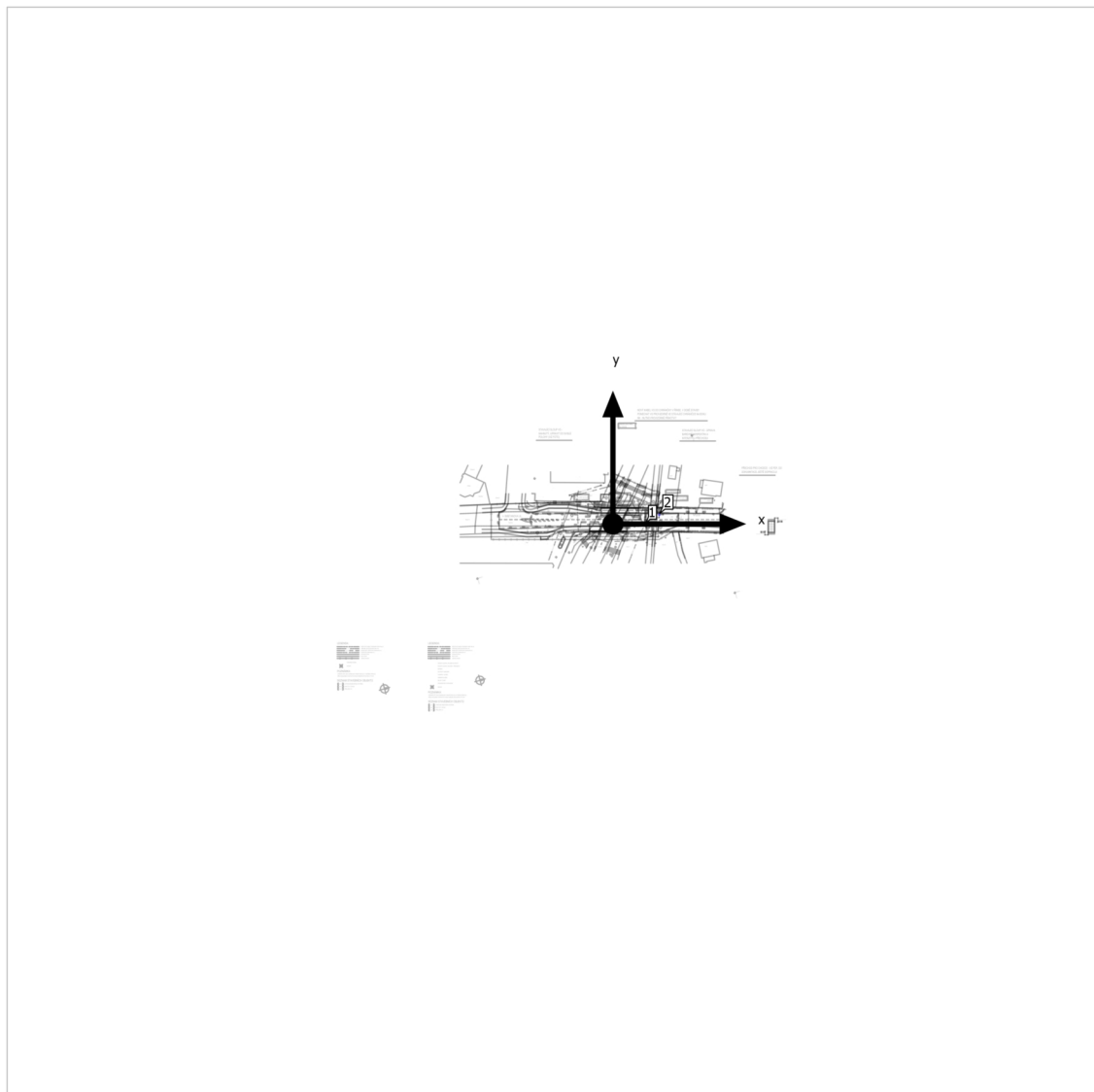
Article No.	R2L2 M 60L70-757 IVS
P	126.0 W
$\Phi_{\text{Lamp}}$	18615 lm
$\Phi_{\text{Luminaire}}$	18615 lm
$\eta$	100.00 %
Luminous efficacy	147.7 lm/W
CCT	5700 K
CRI	70



Polar LDC

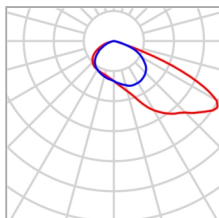
Site 1

## Luminaire layout plan



Site 1

## Luminaire layout plan



Manufacturer	Thorn Lighting	P	126.0 W
Article No.	R2L2 M 60L70-757 IVS	$\Phi_{\text{Luminaire}}$	18615 lm
Article name	R2L2 M - 60 x Cold White 5700K LED CRI70 700mA - IVS Optic		
Fitting	1x LEDs		

### Individual luminaires

X	Y	Mounting height	Luminaire
20.300 m	-0.338 m	6.000 m	1
28.400 m	5.663 m	6.000 m	2



Site 1

**Luminaire list** $\Phi_{\text{total}}$ 

37230 lm

 $P_{\text{total}}$ 

252.0 W

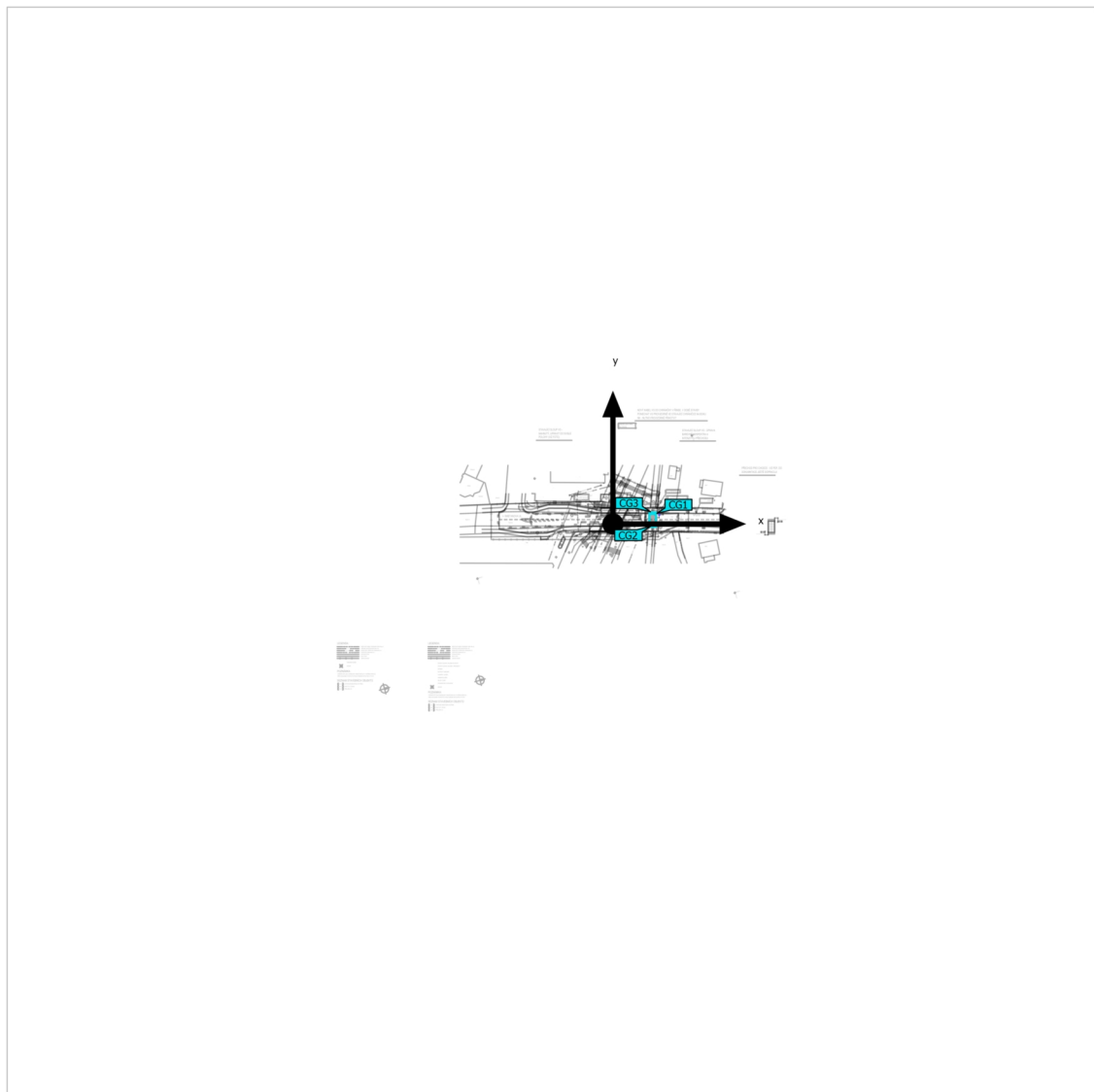
Luminous efficacy

147.7 lm/W

pcs.	Manufacturer	Article No.	Article name	P	$\Phi$	Luminous efficacy
2	Thorn Lighting	R2L2 M 60L70-757 IVS	R2L2 M - 60 x Cold White 5700K LED CRI70 700mA - IVS Optic	126.0 W	18615 lm	147.7 lm/W

Site 1 (Light scene 1)

## Calculation objects



Site 1 (Light scene 1)

**Calculation objects**

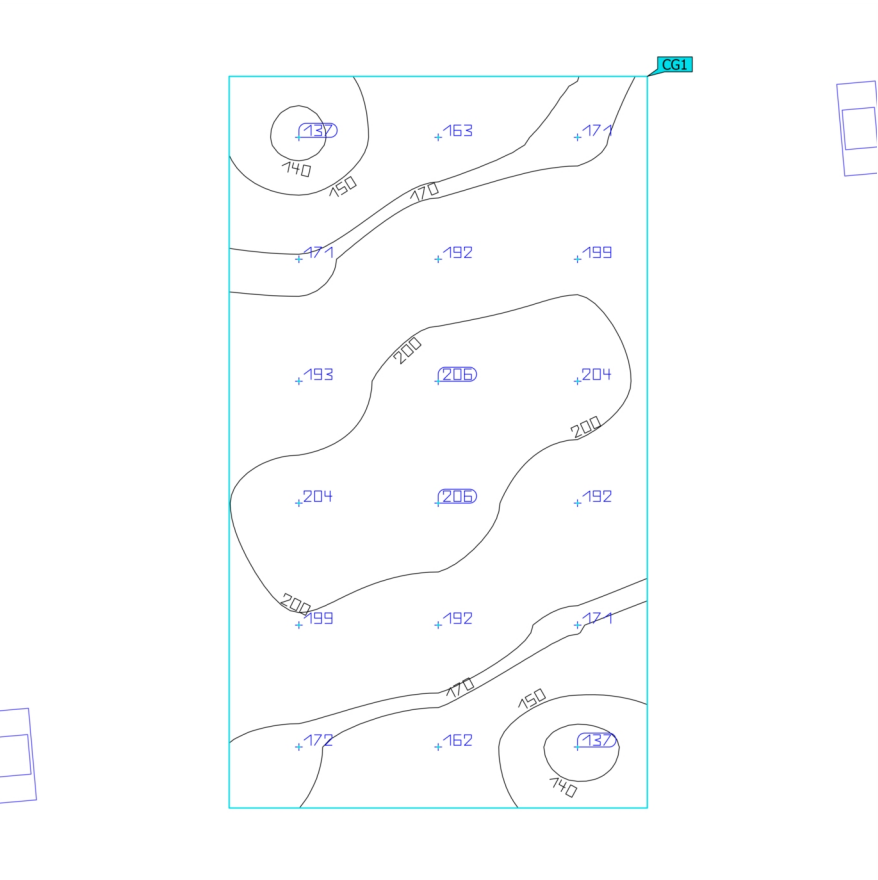
## Calculation surfaces

Properties	$\bar{E}$	$E_{min}$	$E_{max}$	$g_1$	$g_2$	Index
Základní prostor Perpendicular illuminance Height: 0.000 m	182 lx	137 lx	206 lx	0.75	0.67	CG1
Základní prostor Vertical illuminance Rotation: 180.0°, Height: 1.000 m	98.3 lx	39.2 lx	133 lx	0.40	0.29	CG1
Doplňkový prostor (smer 1. Máje) Perpendicular illuminance Height: 0.000 m	117 lx	102 lx	127 lx	0.87	0.80	CG2
Doplňkový prostor (smer 1. Máje) Vertical illuminance Rotation: 180.0°, Height: 1.000 m	75.2 lx	66.0 lx	81.1 lx	0.88	0.81	CG2
Doplňkový prostor (smer Smetanova) Perpendicular illuminance Height: 0.000 m	117 lx	102 lx	127 lx	0.87	0.80	CG3
Doplňkový prostor (smer Smetanova) Vertical illuminance Rotation: 180.0°, Height: 1.000 m	36.4 lx	23.7 lx	49.0 lx	0.65	0.48	CG3

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

Základní prostor

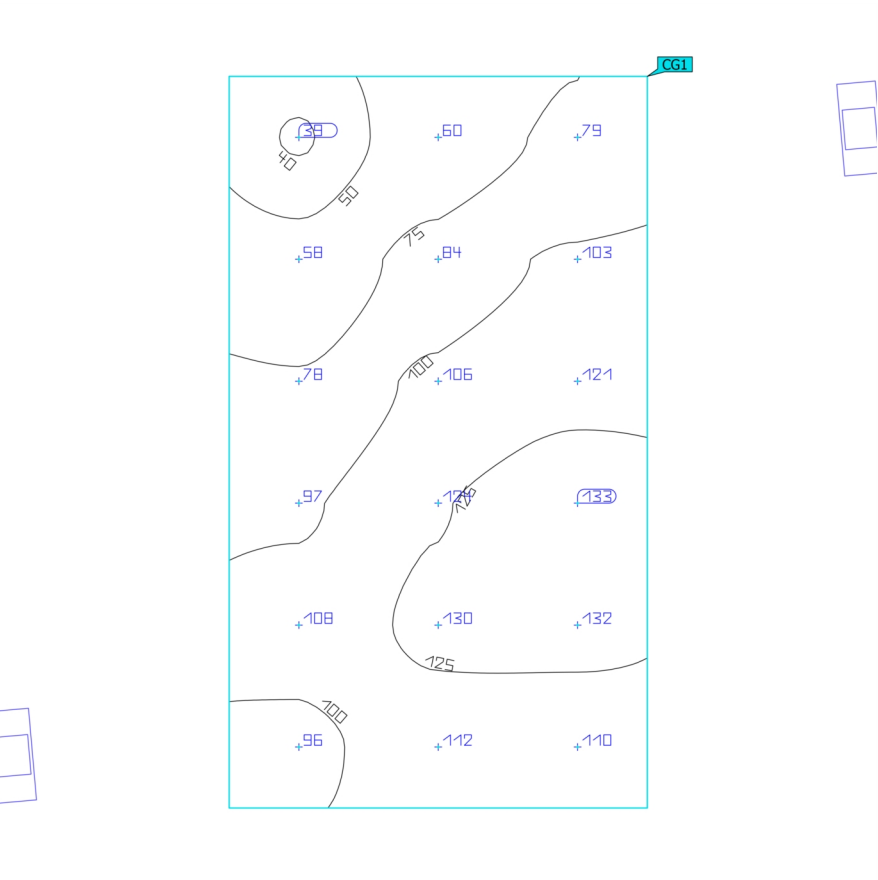


Properties	Ē	E <sub>min</sub>	E <sub>max</sub>	g <sub>1</sub>	g <sub>2</sub>	Index
Základní prostor Perpendicular illuminance Height: 0.000 m	182 lx	137 lx	206 lx	0.75	0.67	CG1

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

Základní prostor

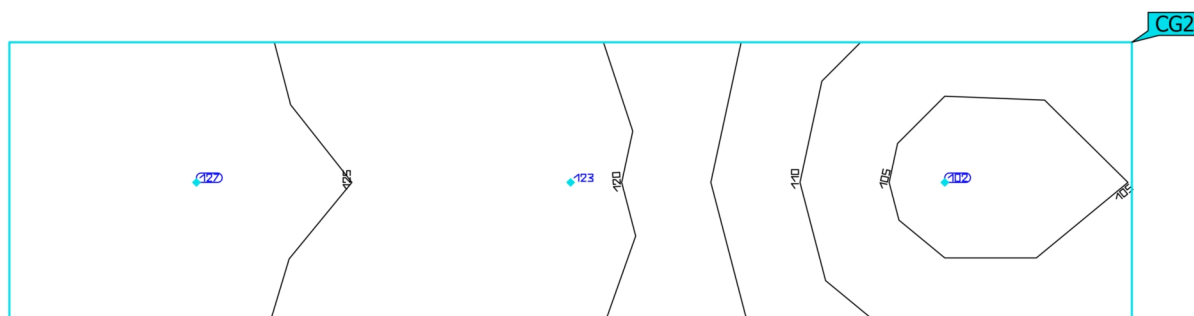


Properties	Ē	E <sub>min</sub>	E <sub>max</sub>	g <sub>1</sub>	g <sub>2</sub>	Index
Základní prostor Vertical illuminance Rotation: 180.0°, Height: 1.000 m	98.3 lx	39.2 lx	133 lx	0.40	0.29	CG1

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

### Doplňkový prostor (smer 1. Máje)

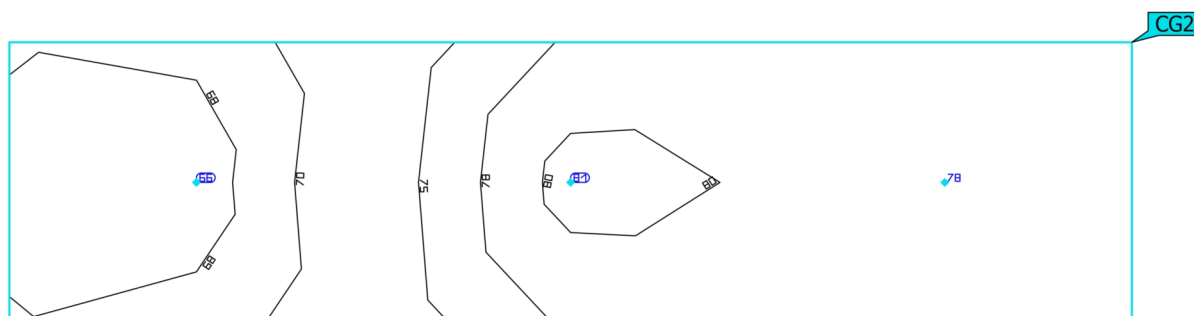


Properties	$\bar{E}$	$E_{min}$	$E_{max}$	$g_1$	$g_2$	Index
Doplňkový prostor (smer 1. Máje) Perpendicular illuminance Height: 0.000 m	117 lx	102 lx	127 lx	0.87	0.80	CG2

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

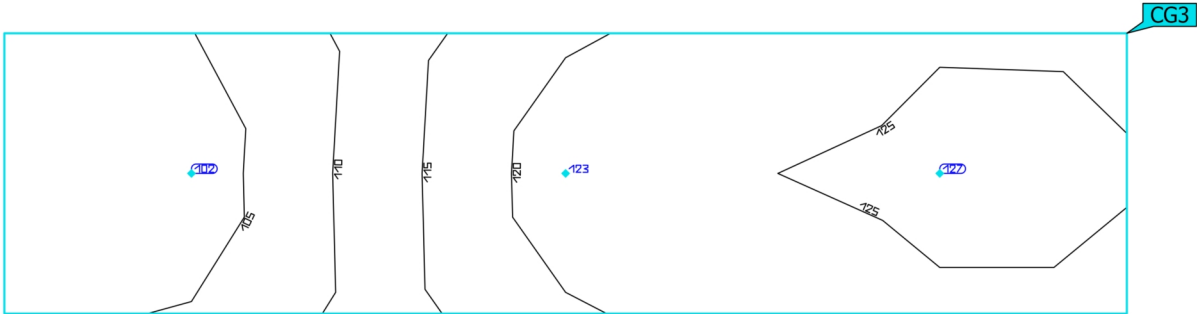
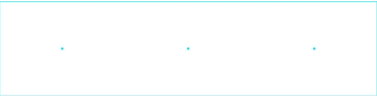
### Doplňkový prostor (smer 1. Máje)



Properties	$\bar{E}$	$E_{min}$	$E_{max}$	$g_1$	$g_2$	Index
Doplňkový prostor (smer 1. Máje) Vertical illuminance Rotation: 180.0°, Height: 1.000 m	75.2 lx	66.0 lx	81.1 lx	0.88	0.81	CG2

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)  
Doplňkový prostor (smer Smetanova)



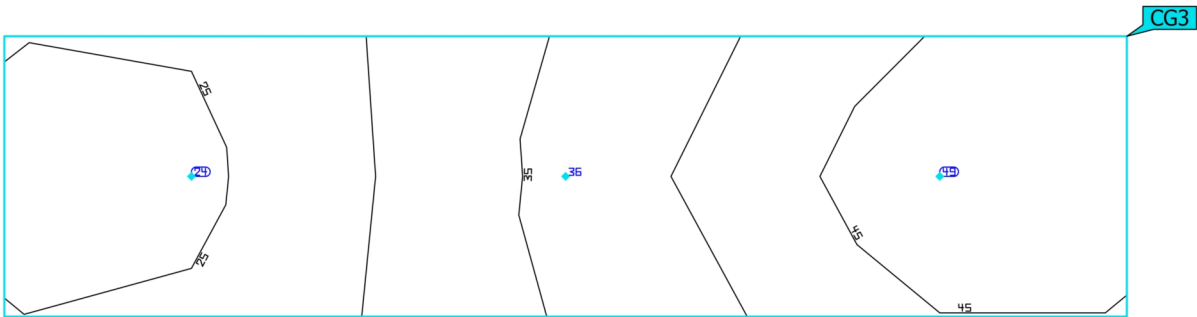
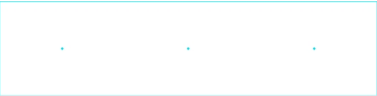
Properties	$\bar{E}$	$E_{min}$	$E_{max}$	$g_1$	$g_2$	Index
Doplňkový prostor (smer Smetanova) Perpendicular illuminance Height: 0.000 m	117 lx	102 lx	127 lx	0.87	0.80	CG3

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))



Site 1 (Light scene 1)

Doplňkový prostor (smer Smetanova)



Properties	$\bar{E}$	$E_{min}$	$E_{max}$	$g_1$	$g_2$	Index
Doplňkový prostor (smer Smetanova)	36.4 lx	23.7 lx	49.0 lx	0.65	0.48	CG3
Vertical illuminance						
Rotation: 180.0°, Height: 1.000 m						

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

## Glossary

### A

A	Formula symbol for a surface in the geometry
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### B

Background area	The background area borders the direct ambient area according to DIN EN 12464-1 and reaches up to the borders of the room. In larger rooms, the background area is at least 3 m wide. It is located horizontally at floor level.
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### C

CCT	<p>(Engl. correlated colour temperature)            Body temperature of a thermal radiator which serves to describe its light colour. Unit: Kelvin [K]. The lesser the numerical value the redder; the greater the numerical value the bluer the light colour. The colour temperature of gas-discharge lamps and semi-conductors are termed "correlated colour temperature" in contrast to the colour temperature of thermal radiators.</p> <p>Allocation of the light colours to the colour temperature ranges acc. to EN 12464-1:</p> <p>Light colour - colour temperature [K]            warm white (ww) &lt; 3,300 K            neutral white (nw) ≥ 3,300 – 5,300 K            daylight white (dw) &gt; 5,300 K</p>
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Clearance height	The designation for the distance between upper edge of the floor and bottom edge of the ceiling (in the completely furnished status of room).
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Control group	A group of luminaires that are dimmed and controlled together. For each lighting scene, a control group provides its own dimming value. All luminaires within a control group share this dimming value. The control groups with their luminaires are automatically determined by DIALux on the basis of the created light scenes and their luminaire groups.
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CRI	<p>(Engl. colour rendering index)            Designation for the colour rendering index of a luminaire or a lamp acc. to DIN 6169: 1976 or CIE 13.3: 1995.</p> <p>The general colour rendering index Ra (or CRI) is a dimensionless figure that describes the quality of a white light source in regards to its similarity with the remission spectra of defined 8 test colours (see DIN 6169 or CIE 1974) to a reference light source.</p>
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## Glossary

### D

Daylight autonomy	Describes what percentage of the daily working time the required illuminance is met by daylight. The nominal illuminance is used from the room profile, unlike described in EN 17037. The calculation is not done in the centre of the room but at the placed sensor measuring point. A room is considered sufficiently supplied with daylight if it achieves at least 50% daylight autonomy.
Daylight factor	Ratio of the illuminance achieved solely by daylight incidence at a point in the inside to the horizontal illuminance in the outer area under an unobstructed sky.  Formula symbol: D (Engl. daylight factor) Unit: %
Daylight quotient effective area	A calculation surface within which the daylight quotient is calculated.

### E

Energy evaluation	<p>Based on an hourly calculation procedure for daylight in indoor spaces, considering the project geometry and any existing daylight control systems. Orientation and location of the project are also considered. The calculation uses the specified system power of the luminaires to determine the energy demand. A linear relationship between power and luminous flux in the dimmed state is assumed for daylight-controlled luminaires. Times of use and nominal illuminance are determined from the usage profiles of the spaces. Switched-on luminaires that are explicitly excluded from control also consider the specified times-of-use. The daylight control systems use a simplified control logic that closes them at an outdoor horizontal illuminance of 27,500lx.</p> <p>The calendar year 2022 is used as a reference only. It is not a simulation of this year. The reference year is only used to assign the days of the week to the calculated results. The changeover to summer time is not considered. The reference sky type used is the average sky described in CIE 110 without direct sunlight.</p> <p>The method was developed together with the Fraunhofer Institute for Building Physics and is available for review by the Joint Working Group 1 ISO TC 274 as an extension of the previous annual regression-based method.</p>
Eta ( $\eta$ )	<p>(light output ratio)</p> <p>The light output ratio describes what percentage of the luminous flux of a free radiating lamp (or LED module) is emitted by the luminaire when installed.</p> <p>Unit: %</p>

## Glossary

### G

$g_1$	Often also $U_o$ (Engl. overall uniformity) Designates the overall uniformity of the illuminance on a surface. It is the quotient from $E_{min}$ to $\bar{E}$ and is required, for instance, in standards for illumination of workstations.
$g_2$	Actually it designates the "non-uniformity" of the illuminance on a surface. It is the quotient of $E_{min}$ to $E_{max}$ and is generally only relevant for certifying the emergency lighting acc. to EN 1838.

### I

<b>Illuminance</b>	Describes the ratio of the luminous flux that strikes a certain surface to the size of this surface ( $lm/m^2 = lx$ ). The illuminance is not tied to an object surface. It can be determined anywhere in space (inside or outside). The illuminance is not a product feature because it is a recipient value. Luxometers are used for measuring.  Unit: Lux Abbreviation: lx Formula symbol: E
<b>Illuminance, adaptive</b>	For the determining of the middle adaptive illuminance on a surface, this is rastered "adaptively". In the area of large illuminance differences within the surface, the raster is subdivided finer; within lesser differences, a rougher classification is made.
<b>Illuminance, horizontal</b>	Illuminance that is calculated or measured on a horizontal (level) surface (this can be for example a table top or the floor). The horizontal illuminance is usually identified by the formula letter $E_h$ .
<b>Illuminance, perpendicular</b>	Illuminance that is calculated or measured plumb-vertical to a surface. This needs to be taken into account for tilted surfaces. If the surface is horizontal or vertical, then there is no difference between the perpendicular and the horizontal or vertical illuminance.
<b>Illuminance, vertical</b>	Illuminance that is calculated or measured on a vertical surface (this can be for example the front of some shelves). The vertical illuminance is usually identified by the formula letter $E_v$ .

### L

<b>LENI</b>	(Engl. lighting energy numeric indicator) Lighting energy numeric indicator acc. to EN 15193  Unit: $kWh/(m^2 \cdot a)$
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## Glossary

LLMF	(Engl. lamp lumen maintenance factor)/acc. to CIE 97: 2005 Lamp flux maintenance factor that takes the luminous flux reduction into account of a luminaire or an LED module in the course of the operating time. The lamp flux maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no luminous flux reduction existing).
LMF	(Engl. luminaire maintenance factor)/acc. to CIE 97: 2005 Luminaire maintenance factor that takes the soiling into account of the luminaire in the course of the operating time. The luminaire maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).
LSF	(Engl. lamp survival factor)/acc. to CIE 97: 2005 Lamp survival factor that takes the total failure into account of a luminaire in the course of the operating time. The lamp survival factor is specified as a decimal digit and can have a maximum value of 1 (no failures existing within the time concerned or prompt replacement after the failure).
Luminance	Dimension for the "brightness impression" that the human eye has of a surface. The surface itself can emit light thereby or light striking it can be reflected (emitter value). It is the only photometric value that the human eye can perceive.  Unit: Candela per square metre Abbreviation: cd/m <sup>2</sup> Formula symbol: L
Luminous efficacy	Ratio of the emitted luminous flux $\Phi$ [lm] to the absorbed electrical power P [W] Unit: lm/W.  This ratio can be formed for the lamp or LED module (lamp or module light output), the lamp or module with control gear (system light output) and the complete luminaire (luminaire light output).
Luminous flux	Dimension for the total light output that is emitted from one light source in all directions. It is thus an "emitter value" that specifies the entire emitting output. The luminous flux of a light source can only be determined in a laboratory. A difference is made between the lamp or LED module luminous flux and the luminaire luminous flux.  Unit: Lumen Abbreviation: lm Formula symbol: $\Phi$
Luminous intensity	Describes the intensity of the light in a certain direction (emitter value). The luminous intensity is a matter of the luminous flux $\Phi$ that is emitted in a certain spherical angle $\Omega$ . The radiation characteristics of a light source are presented graphically in a light distribution curve (LDC). The luminous intensity is an SI base unit.  Unit: Candela Abbreviation: cd Formula symbol: I

## Glossary

### M

Maintenance factor	See MF
MF	<p>(Engl. maintenance factor)/acc. to CIE 97: 2005</p> <p>Maintenance factor as decimal number between 0 and 1 that describes the ratio of the new value of a photometric planning parameter (e.g. of the illuminance) to a maintenance value after a certain time. The maintenance factor takes into account the soiling of luminaires and rooms as well as the luminous flux reduction and the failure of light sources.</p> <p>The maintenance factor is taken into account either overall or determined in detail acc. to CIE 97: 2005 by the formula <math>RMF \times LMF \times LLMF \times LSF</math>.</p>

### P

P	<p>(Engl. power)</p> <p>Electric power consumption</p> <p>Unit: watt</p> <p>Abbreviation: W</p>
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### R

$R_{(UG)} \max$	<p>Measure of the psychological glare in indoor spaces.</p> <p>In addition to the luminance of luminaires, the level of the <math>R_{(UG)}</math> value also depends on the observer position, the viewing direction and the ambient luminance. The calculation is made according to the table method, see CIE 117. Among other things, EN 12464-1:2021 specifies maximum permissible <math>R_{(UG)}</math>- values <math>R_{(UGL)}</math> for various indoor workplaces.</p>
Reflection factor	The reflection factor of a surface describes how much of the striking light is reflected back. The reflection factor is defined by the colour of the surface.
RMF	<p>(Engl. room maintenance factor)/acc. to CIE 97: 2005</p> <p>Room maintenance factor that takes the soiling into account of the space encompassing surfaces in the course of the operating time. The room maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).</p>

### S

Surrounding area	The ambient area directly borders the area of the visual task and should be planned with a width of at least 0.5 m according to DIN EN 12464-1. It is at the same height as the area of the visual task.
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## Glossary

### U

UGR (max)	(unified glare rating) Measure for the psychological glare effect in interiors. In addition to luminaire luminance, the UGR value also depends on the position of the observer, the viewing direction and the ambient luminance. Among other things, EN 12464-1 specifies maximum permissible UGR values for various indoor workplaces.
UGR observer	Calculation point in the room, for the DIALux the UGR value is determined. The location and height of the calculation point should correspond to the typical observer position (position and eye level of the user).

### V

Visual task area	The area that is needed for carrying out the visual task in accordance with DIN EN 12464 -1. The height corresponds with the height at which the visual task is executed.
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### W

Wall zone	Circumferential area between working plane and walls which is not taken into account for the calculation.
Working plane	Virtual measuring or calculation surface at the height of the visual task that generally follows the room geometry. The working plane may also feature a wall zone.