www.osram.com/boxled

Technical application guide

BoxLED Back Plus DS (double-sided)

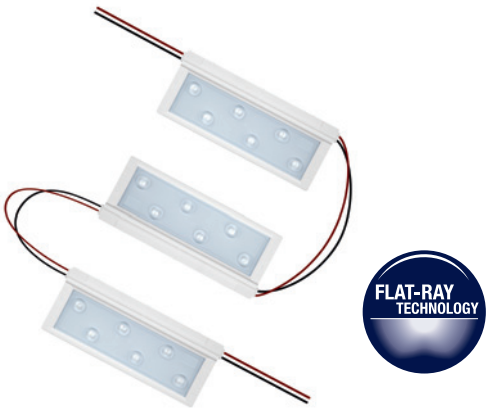
Content

1. Product overview BoxLED Back Plus DS

1.1. Benefits
- Uniform backlighting of double-sided light boxes and advertisement pylons
- Flat-Ray technology provides for high uniformity with a minimum number of modules
- The system comprises LED module chains, mounting profiles and mounting brackets

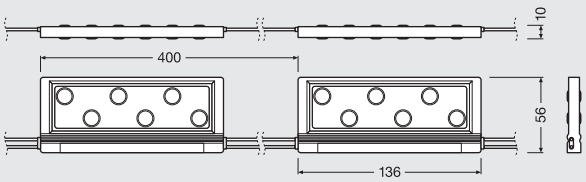
1.2. Applications
- Outdoor and indoor signage and illuminated advertising

1.3. BoxLED DS mounting profile – BX-DS-MP
The universal mounting profile for BoxLED Back Plus DS modules provides the basis for quick and easy installation in double-sided light boxes.



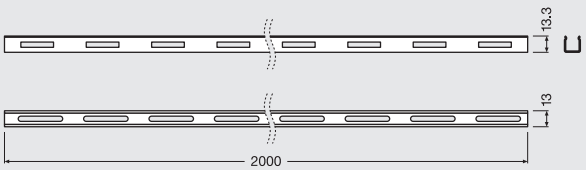
BoxLED Back Plus DS

BoxLED Back Plus DS



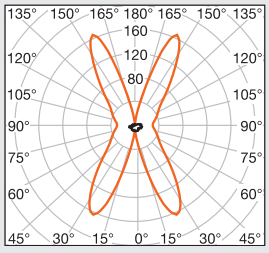
All figures in mm

Mounting profile – BX-DS-MP

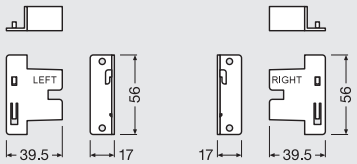


All figures in mm

Light distribution



Mounting brackets – BX-DS-MB



All figures in mm

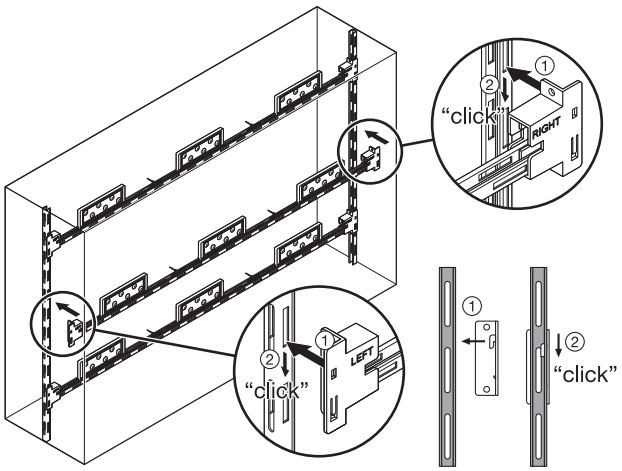
1.4. Backlighting with BoxLED Back Plus DS

Double-sided backlighting

1.5. Options for installing BoxLED Back Plus DS with the BX-DS-MP mounting profile

Possible pitches and positioning of the profiles
The following graphic shows the typical pitches and positioning of the profiles. Different arrangements are possible depending on the application. Be aware, however, that larger LED pitches mean that the depth of the light box will have to be increased.

Double-sided backlighting



1.6. Technical data at a glance

Product reference	Product number	Light color	No. of LED modules per chain (no. of LEDs per module)	Rated output per chain (per module) [W][1]	Luminous flux per chain (per module) [lm][1]	Beam angle [°][1]	Color temperature [K][1]	DC voltage [V][1]	Standard pack/ pcs.
BoxLED Back Plus DS									
BX12BA-W4F-765	4008321**869197**[2]	White	16 (12)	115.2 (7.2)	9280 (580)	155	6500	24	5
BoxLED mounting profile									
BX-DS-MP	4008321**880307**[3]	–	–	–	–	–	–	–	24
Mounting brackets	4008321**872173**[4]	–	–	–	–	–	–	–	5 x 30

Modules are perfectly matched to 24 V OSRAM OPTOTRONIC power supplies. For current photometric data and important safety, installation and application information, see www.osram.com/led-systems.

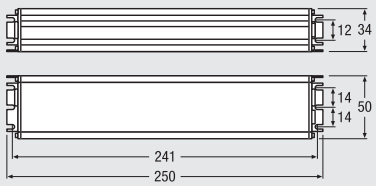
1) In view of the complex manufacturing process for light-emitting diodes, the specified typical values for the technical LED parameters are merely statistical values that do not necessarily correspond to the actual technical parameters of an individual product; individual products may vary from the typical values.
2) EAN: Ordering number per single chain
3) EAN: Ordering number per single profile
4) EAN: Ordering number per 30 brackets (15 x "RIGHT" + 15 x "LEFT")

Note:
Typical performance data are subject to change without any further notice, particularly as LED technology evolves.

2. Product overview OPTOTRONIC power supplies

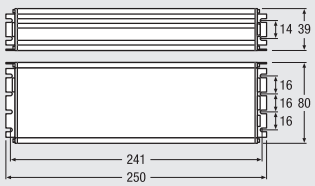
24 V range for BoxLED Back Plus DS			
Power supply	**OT 80/220-240/24 P OT 80/220-240/24 DIM P**	**OT 120/220-240/24 P OT 120/220-240/24 DIM P**	**OT 240/220-240/24 P OT 240/220-240/24 DIM P**
AC voltage, nominal	220–240 V_{AC}	220–240 V_{AC}	220–240 V_{AC}
Output voltage	24.0 V_{DC} - 0.5/+1.0 V	24.0 V_{DC} - 0.5/+1.0 V	24.0 V_{DC} - 0.5/+1.0 V
Protection class and IP rating (type of protection)	Class II, IP67	Class I, IP67	Class I, IP67
Maximum load	80 W	120 W	240 W
Power factor	> 0.95 full load @ 230 V_{AC} > 0.90 half load @ 230 V_{AC}	> 0.95 full load @ 230 V_{AC} > 0.90 half load @ 230 V_{AC}	> 0.95 full load @ 230 V_{AC} > 0.90 half load @ 230 V_{AC}
Ambient temperature range	-25 to +55 °C	-25 to +55 °C	-25 to +55 °C
Surge capability	L-N: 3 kV	L-N: 3 kV, L/N – Ground: 6 kV	L-N: 3 kV, L/N – Ground: 6 kV
No-load proof	Yes	Yes	Yes
Overload/short-circuit protection	Automatic, reversible	Automatic, reversible	Automatic, reversible
Overheating protection	Automatic, reversible	Automatic, reversible	Automatic, reversible
Cable length	Input side/output side ~ 300 mm/~ 300 mm	Input side/output side ~ 300 mm/~ 300 mm	Input side/output side ~ 300 mm/~ 300 mm
Dimensions (L x W x H)	250 x 50 x 34 mm	250 x 60 x 39 mm	250 x 80 x 39 mm
Conformity	CE	CE	CE
Product number non-dim version	4008321**981684**	4008321**981707**	4008321**981721**
Product number dim version	4008321**981677**	4008321**981691**	4008321**981714**

OT 80/220-240/24 (DIM) P



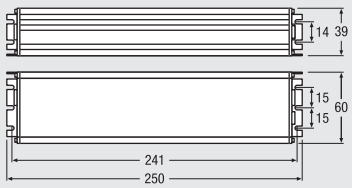
All figures in mm

OT 240/220-240/24 (DIM) P



All figures in mm

OT 120/220-240/24 (DIM) P



All figures in mm

3. System combinations LED modules – OPTOTRONIC power supplies

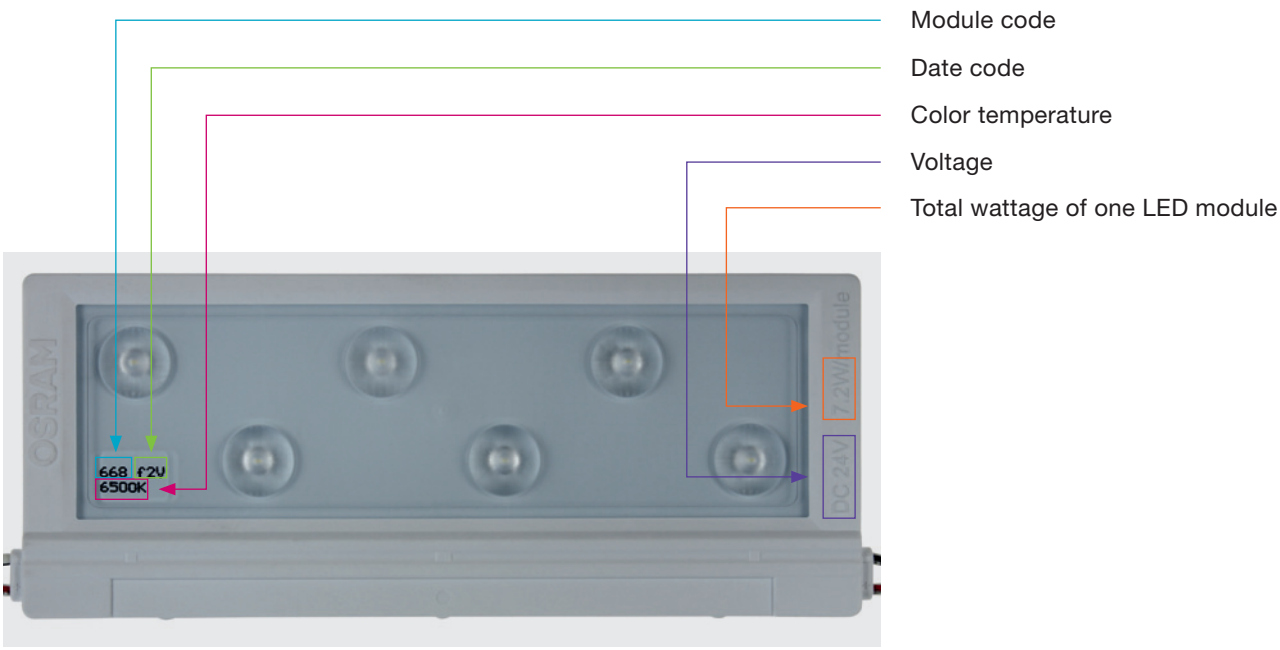
	BoxLED Back Plus DS	
	Maximum no. of chains per power supply	**Maximum no. of modules per power supply**
OT 80/220-240/24 (DIM) P	2/3	11
OT 120/220-240/24 (DIM) P	1	16
OT 240/220-240/24 (DIM) P[1)]	2	32

Electrical connection is made by the connecting cables of the module.

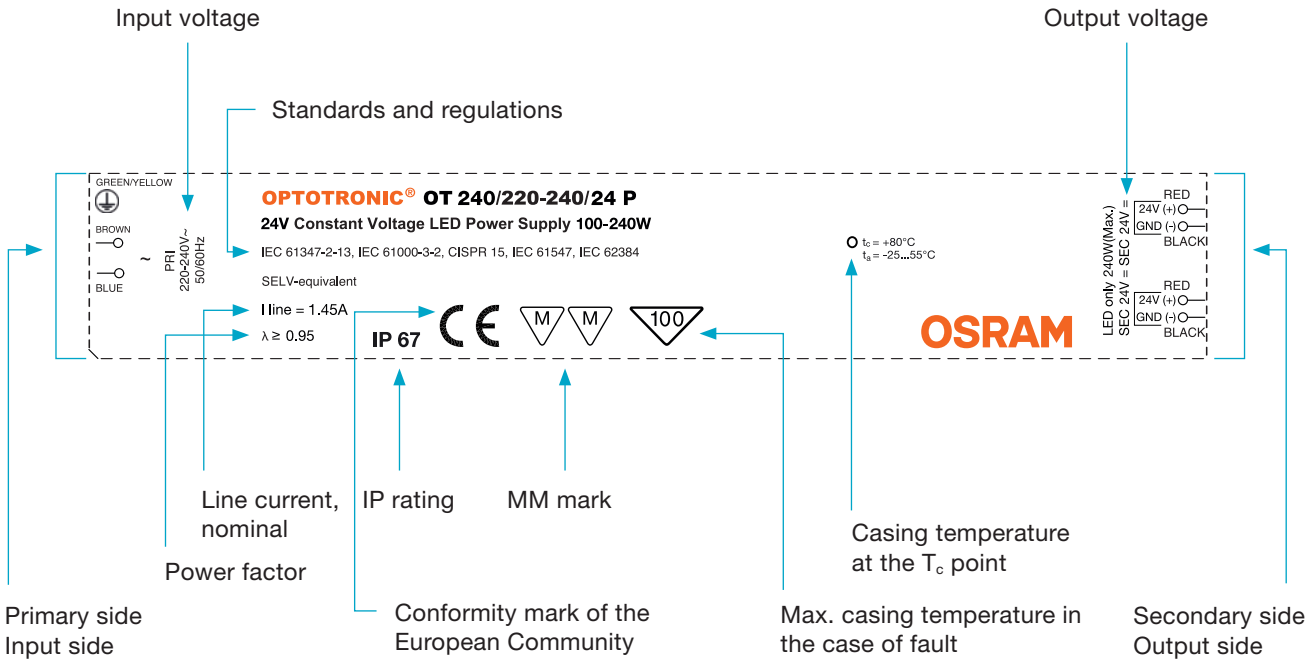
1) If more than 16 LED modules (= a complete LED chain) are to be connected to a 240 W OPTOTRONIC power supply, there must be a new separate electrical feed. A common star point is also possible.

4. Product identifiers

BoxLED Back Plus DS:



OPTOTRONIC power supplies:

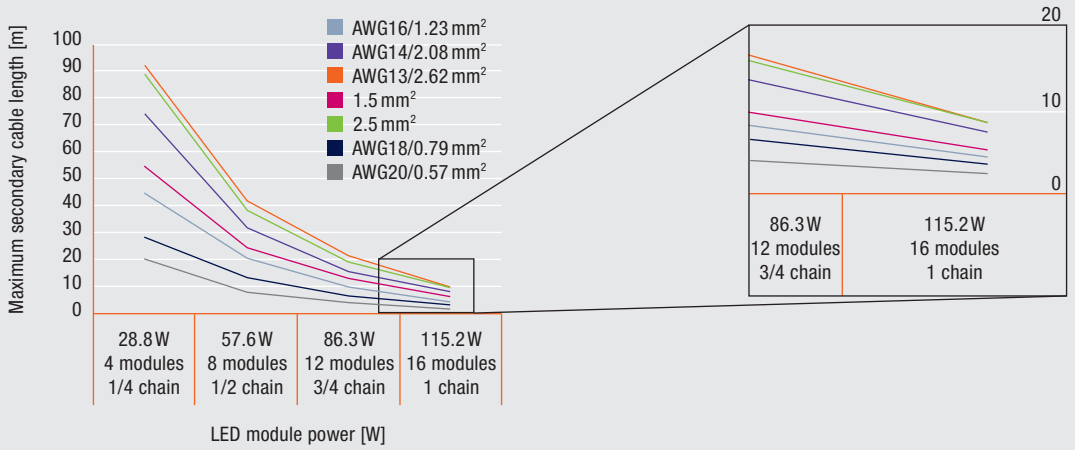


5. Electrical properties

5.1. Electrical connections

We recommend the following cable lengths and cable cross-sections for the electrical connections between the LED chains and the OPTOTRONIC power supplies.

BoxLED Back Plus DS

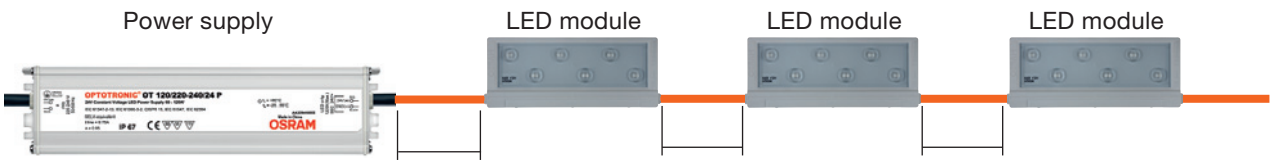


Disclaimer:
In terms of electromagnetic compatibility (EMC), the maximum permitted cable length is 10 meters (please refer to the technical data sheet of the applied OSRAM OPTOTRONIC power supply). Users are responsible to ensure EMC.

Notes:
We recommend to use the LED modules only in combination with OSRAM OPTOTRONIC power supplies. The maximum secondary length is the maximum cable length between power supply and the first LED module of a chain plus the wire extensions between the LED modules (see below).

Recommended cable cross-section for connecting an LED chain to other LED modules [mm²]

Product	Type of cable	AWG	A [mm²]	Cable cross-section for cable extension [mm²]
BoxLED Back Plus DS	Multi-wire (stranded)	18	1.23	≥ 1.23



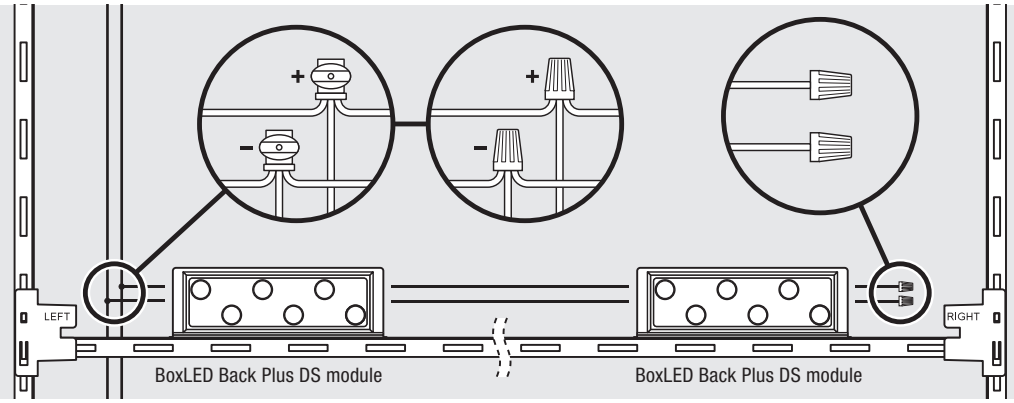
Max. secondary length = power supply – first LED module + wire extension LED module – LED module + ...

5.2. Electrical connectors

5.2.1. General

Electrical connectors are manufactured in many different versions, including screw-type terminals, wire nuts, plug connectors and joining terminals (connectors).

- Use only appropriate cables and connectors to link the LED modules to the OPTOTRONIC power supplies.
- Electrical terminals must not be used where they may be directly exposed to the weather without adequate protection. For outdoor applications, plug connectors (without moisture protection) must therefore be protected by IP junction boxes or light boxes.



If you are using plug connectors that do not have IP protection (moisture protection), make sure that the openings are always pointing downwards.

5.2.2. Overview of connectors

Among others, the following standard terminals are suitable for the electrical connections between the LED chains and the connections to the OPTOTRONIC power supplies:

Manufacturer	Reference	Type of cable*	Maximum outer diameter	AWG cable cross-section	Operating temperature	Special properties	
3M	316IR	Single-wire/multi-wire	0.160" (4.064 mm)	AWG22–16 (0.34–1.305 mm²)	Max. 105 °C (221 °F)	UL-listed, standard 486C, UL file E23438	
3M	314	Single-wire/multi-wire	0.082" (2.08 mm)	AWG22–14 (0.34–2.5 mm²)	Max. 105 °C (221 °F)	Sealed against moisture	
WAGO	Series 222	Single-wire/multi-wire		AWG28–12 (0.09–4.0 mm²)	Max. 85 °C (185 °F)		
PHOENIX	JBC 2.5/X	Single-wire/multi-wire		AWG20–14 (0.75–2.5 mm²)			

* Not all connectors are suitable for multi-wire and fine-wire conductors. In some cases, therefore, end sleeves must be provided. Please read the manufacturer's instructions.

6. Application overview

6.1. Selection table for BoxLED Back Plus DS in light boxes[1)]

Depth of light box [mm]	75	100	125	150	175	200	250	300	350	400
Double-sided light boxes							275[2)]	330[2)]	400[2)]	400[2)]

	Optimal product performance at maximum distance between module centers
	Good product performance at maximum distance between module centers
	Good product performance at reduced distance between module centers
	Limited performance – risk of non-uniform backlighting

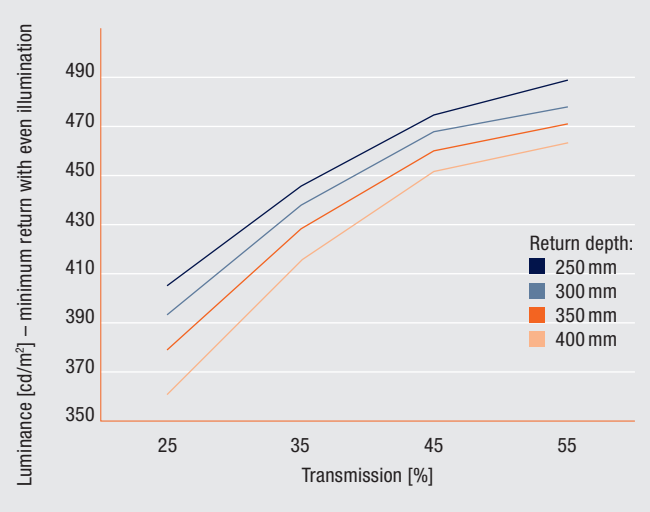
1) The selection can vary depending on the special characteristics of the illuminated sign, e.g. concerning front material or type of application.
2) Maximum distance between module centers in mm.

6.2. Luminance as a function of transmission

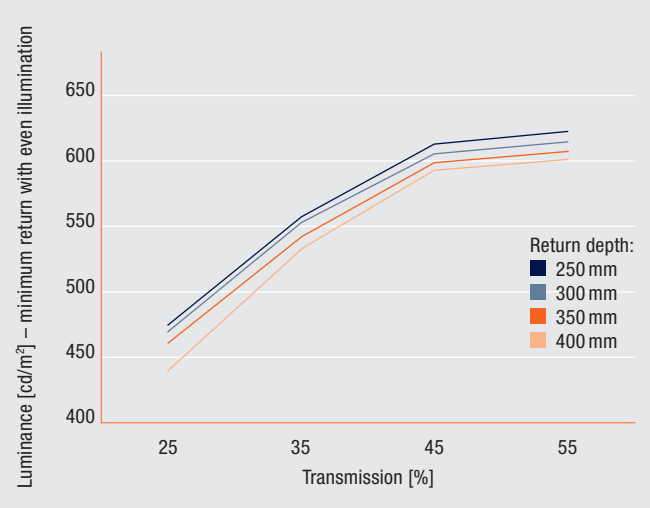
The following graphs show the dependency between the transmission of a light-emitting surface and the resulting luminance at constant module distances of 400 mm (i.e. the distance between the module centers of each module string as well as the distance between parallel module strings).

The luminance can vary depending on the specific characteristics of the application, such as the reflectance inside the application or the dispersion parameters of the light-emitting surface.

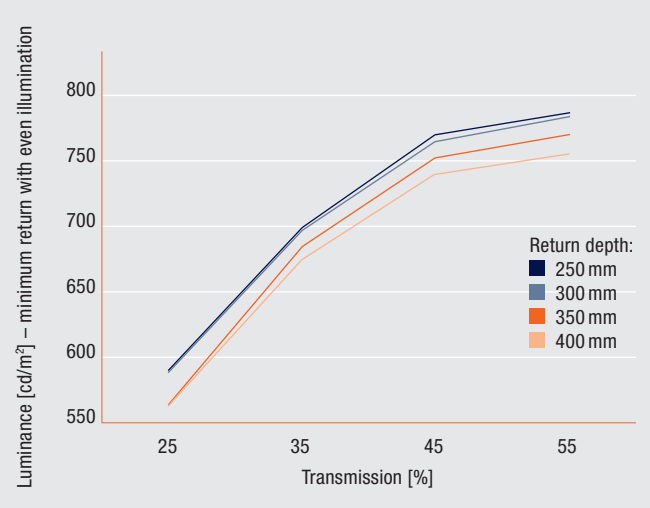
Please note: The resulting luminance applies to one of the two light-emitting surfaces of a double-sided light box.



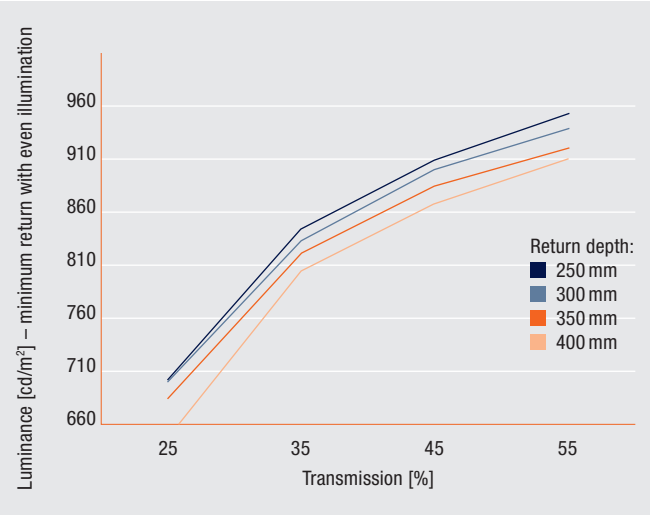
Approx. 5.75 LED modules/m²



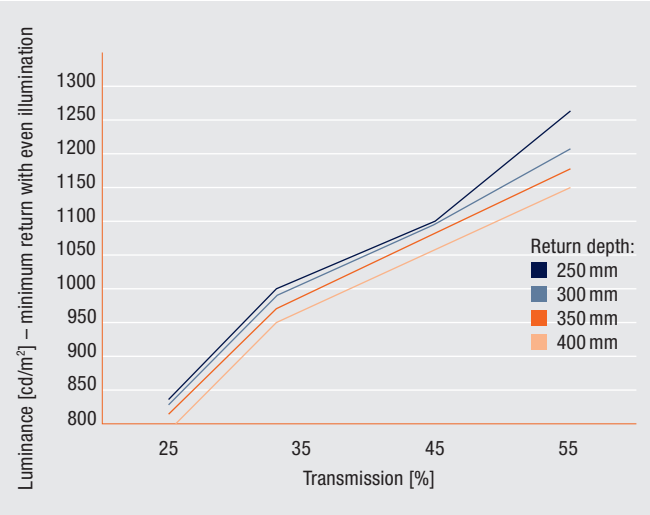
Approx. 7.75 LED modules/m²



Approx. 9.5 LED modules/m²



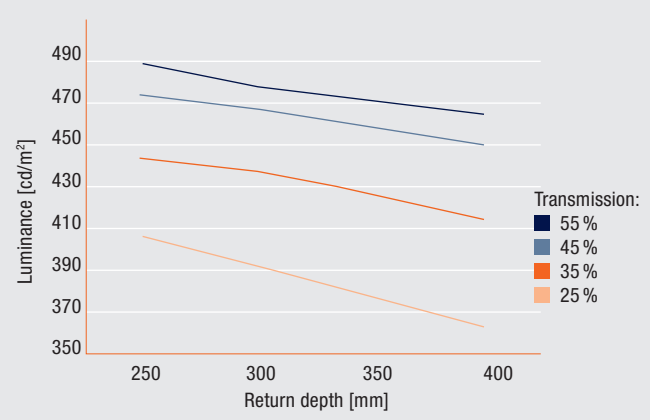
Approx. 11.5 LED modules/m²



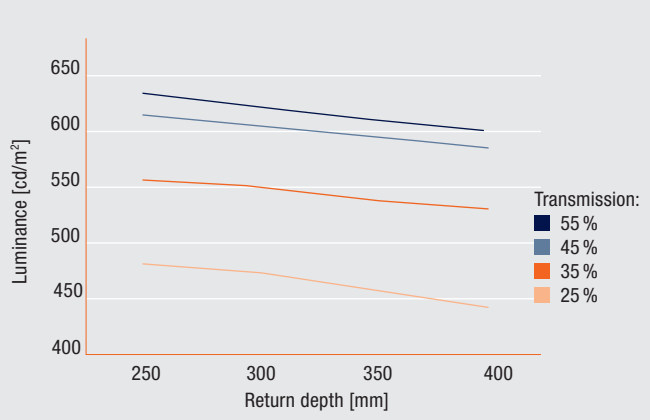
Approx. 14.5 LED modules/m²

6.3. Luminance as a function of return depth

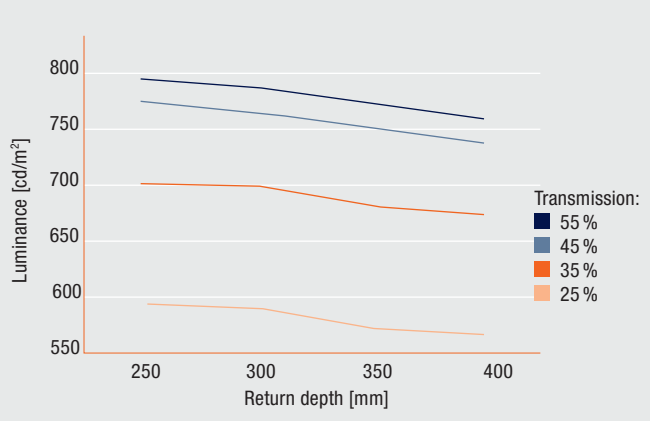
The graphs below show the dependency between the return depth and the resulting luminance related to different transmission values. Each graph refers to a different density of the LED modules (number of LED modules per m²).



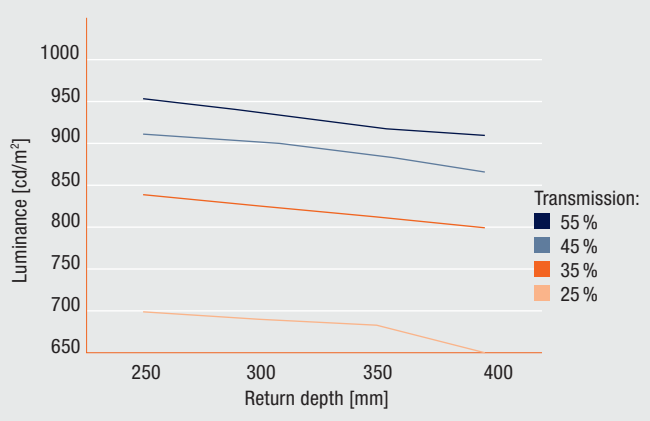
Constant distance between module centers: 400 mm
Constant distance between parallel module strings:
400 mm (approx. 5.5 LED modules/m²)



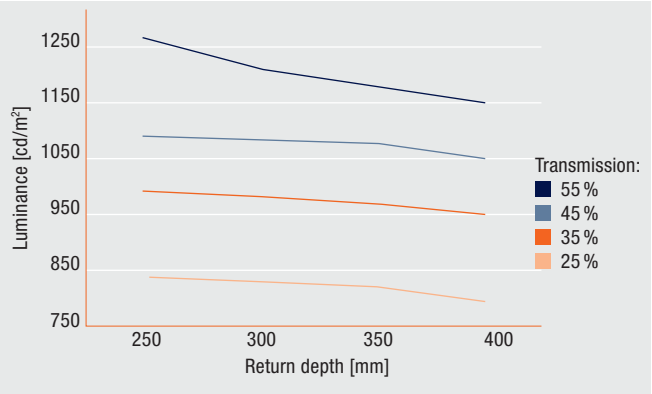
Constant distance between module centers: 325 mm
Constant distance between parallel module strings:
400 mm (approx. 7.5 LED modules/m²)



Constant distance between module centers: 325 mm
Constant distance between parallel module strings:
325 mm (approx. 9.5 LED modules/m²)



Constant distance between module centers: 265 mm
Constant distance between parallel module strings:
325 mm (approx. 11.5 LED modules/m²)



Constant distance between module centers: 265 mm (fully stretched)
Constant distance between parallel module strings:
265 mm (approx. 14.5 LED modules/m²)

Definition:
Return depth: Distance between LED modules (mounting surface) and light-emitting surface (e.g. acrylic sheet, fabric)

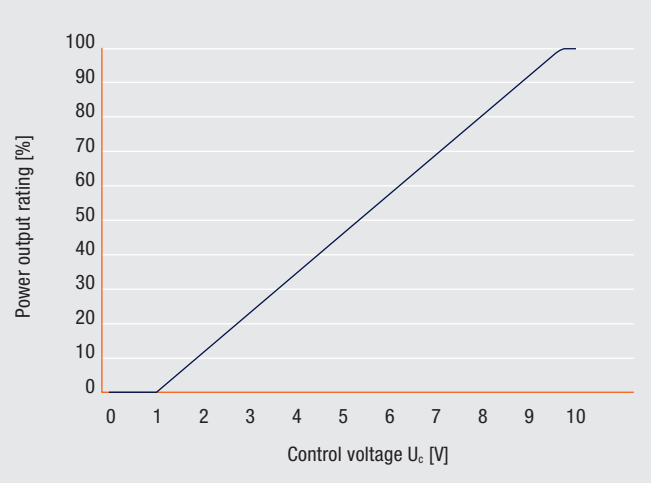
6.4. Dimming matrix

			Output voltage	Maximum output power	Dimming devices		
					OT DIM[1)]	**OTi DALI DIM**[1)]	**OTi DALI DIM LI**[1), 2)]
	OPTOTRONIC	**EAN**			4050300**943459**	4008321**061195**	4008321**624437**
					24 V/max. 5 A ➔ max. 120 W		24 V/max. 4 A ➔ max. 96 W
					1 … 10 V	DALI	DALI
Non-dim version	OT 80/220-240/24 P	4008321**981684**	24 V	80 W	1	1	1
	OT 120/220-240/24 P	4008321**981707**	24 V	120 W	1	1	1
	OT 240/220-240/24 P	4008321**981721**	24 V	240 W	–	–	–
All-in-one version (1 … 10 V)	OT 80/220-240/24 DIM P	4008321**981677**	24 V	80 W	–	–	–
	OT 120/220-240/24 DIM P	4008321**981691**	24 V	120 W	–	–	–
	OT 240/220-240/24 DIM P	4008321**981714**	24 V	240 W	–	–	–

1) For outdoor applications, the dimming device has to be protected by an appropriate IP box.
2) For the OTi DALI DIM LI, OSRAM recommends the use of a protective housing such as the OSRAM OUTKIT (EAN: 4008321**159533**).

6.5. Power output rating

The Φ-U_c characteristic curve in the diagram below shows a general definition of the power output depending on the control voltage of an OT DIM, OTi DALI DIM, OTi DALI DIM LI, OT 80/220-240/24 DIM P, OT 120/220-240/24 DIM P or OT 240/220-240 24 DIM P power supply.



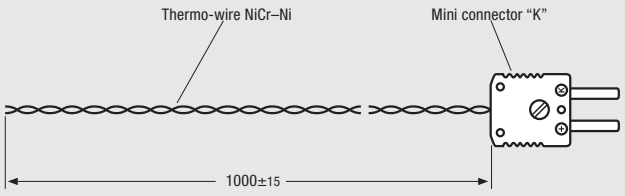
Operation without applied control voltage (shorted) ➔ 0 % power output
Operation without applied control voltage (floating) ➔ 100 % power output

7. Thermal properties

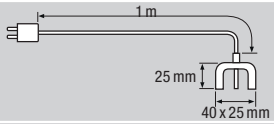
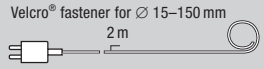
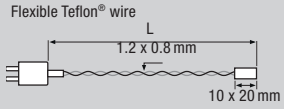
7.1. Casing temperature at the T_c point

The casing temperature is the temperature at a defined point on the LED casing, the T_c point. The maximum T_c temperature is the highest permitted temperature that may occur at the T_c point under the planned ambient and operating conditions in the thermally steady state.

If the maximum permitted T_c temperature is exceeded, the LED module may go into a state in which the load limits on the module (LED, casing, chip, encapsulation materials) are reached. A thermal link between BoxLED Back Plus DS modules and the mounting surface is not absolutely essential.



All figures in mm

Temperature sensors					
Description	**Temperature range**	**Length [mm]**	**Diameter [mm]**	**T90**	
Powerful sensor with a magnetic holding force of 90 N	-30 to +550 °C	1000	40 x 25	18	
Tube sensor with flexible hook-and-loop tape	-10 to +100 °C	2000	For 15–150	20	
Foil sensor, self-adhesive	-50 to +250 °C	1000	10 x 20	12	

Possible suppliers of such temperature sensors include OMEGA: www.omega.de and B+B Thermo-Technik: www.bubthermo.de

7.2. Measuring the T_c temperature

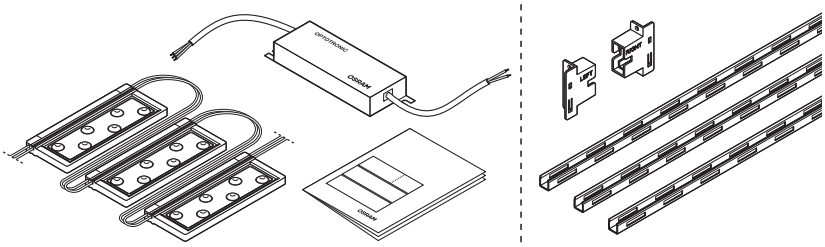
The indicated lifetime can only be achieved if the permitted operating temperatures at the T_c point are maintained. After the LED modules have been installed in a light box, the T_c temperature must be measured under the planned ambient and operating conditions in the thermally steady state. To do this, attach a temperature sensor to the T_c point with suitable adhesive (cyanoacrylate-free). The illustration below shows the respective T_c reference point, marked by a small circle on the back of the LED modules.

Permitted T_c temperatures	
	Operating temperature at the T_c point* [°C]
BoxLED Back Plus DS	-25 to 75

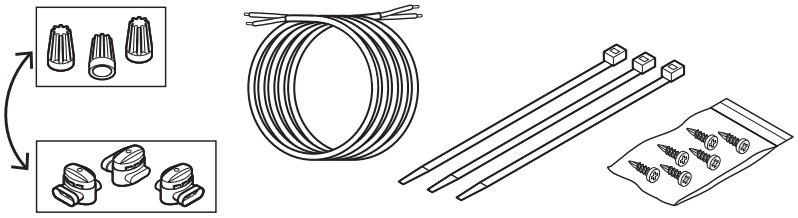
* If the maximum temperature limits are exceeded, the lifetime of the module will be greatly reduced or the module may be destroyed. The temperature of the LED module at the T_c point should be measured in the thermally steady state by means of a temperature sensor or temperature-sensitive sticker in accordance with EN 60598-1. The T_c point is located centrally on the back of the module (see illustration below).

8. Installation instructions

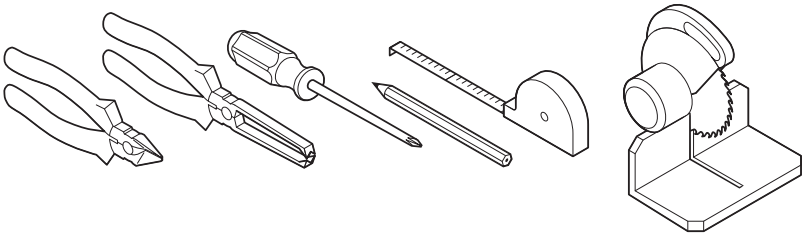
Products
BoxLED Back Plus DS LED modules, power supplies, installation instruction, accessories (e.g. mounting profiles and mounting brackets)



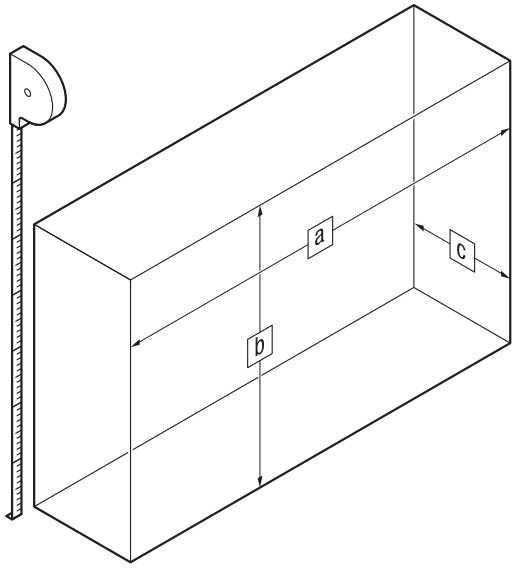
Mounting accessories (e.g.)
Electrical connectors, wires, cable ties and screws



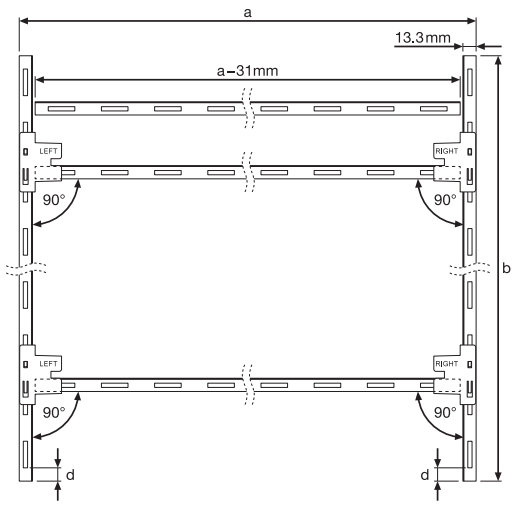
Tools (e.g.)
Wire cutter, wire stripper, screwdriver, pen, measuring tape and saw



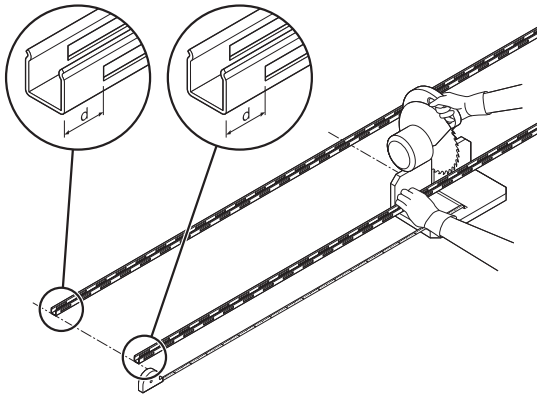
1. Measure the clearance of the frame's inner walls (a, b, c) in order to determine the lengths of the mounting profiles.



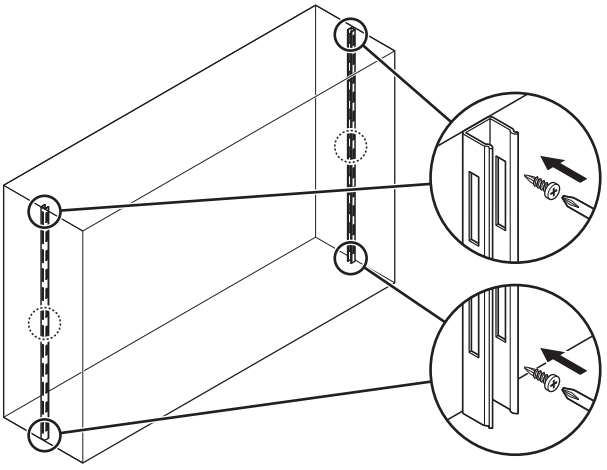
2. Before cutting the profiles, please make sure that the overall length of the horizontal profiles always equals the length of the horizontal clearance minus 31 mm.



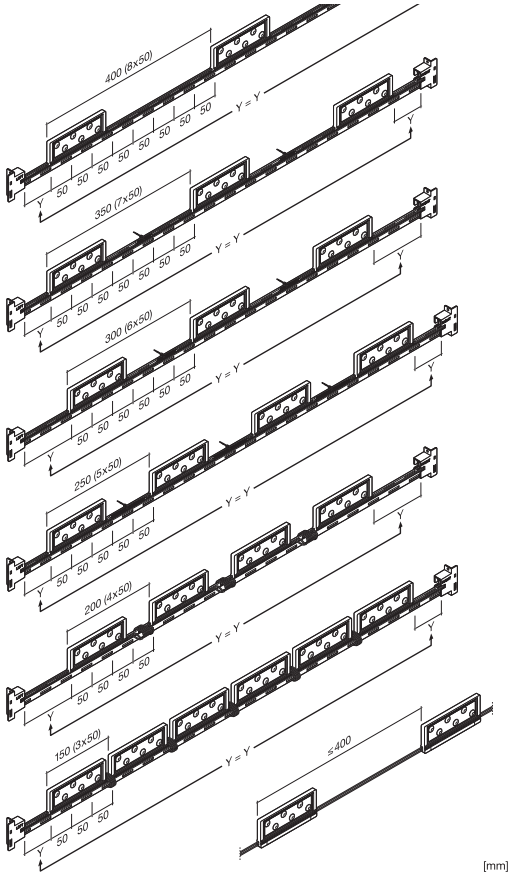
3. Cut the mounting profiles to the required lengths. Make sure that opposite mounting profiles correspond to each other (see the magnifications in the illustration).



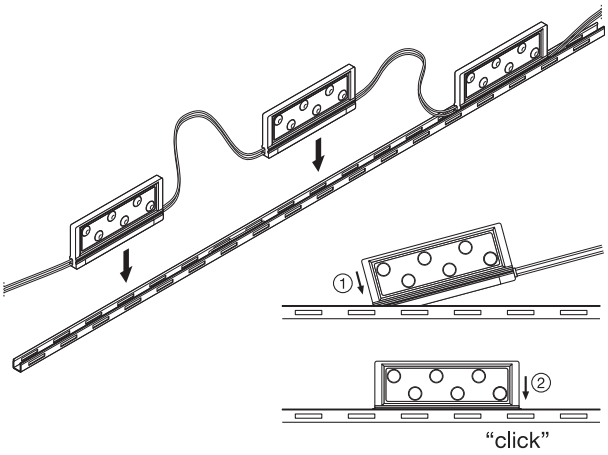
4. Install the lateral mounting profiles in the left and right frame's inner walls of the light box and use a measuring tape to adjust them so that the horizontal profiles can subsequently be mounted at right angles.



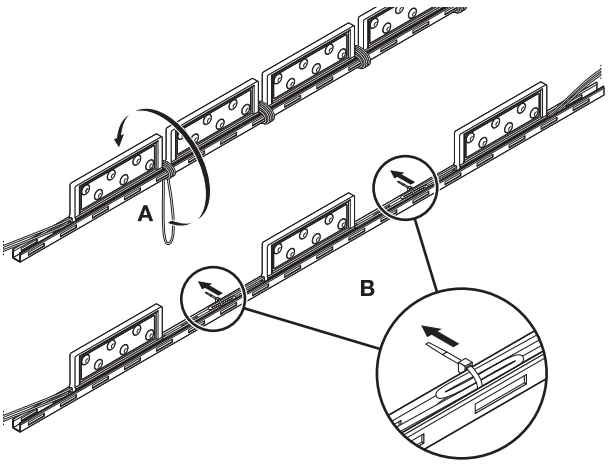
5. In the BoxLED DS mounting profile, there are long holes for orientation at distances of 50 mm. These can be used to position the LED modules. Please make sure that the LED modules always have the same distance to each other (e.g. 6 x 50 mm = 300 mm LED module distance).



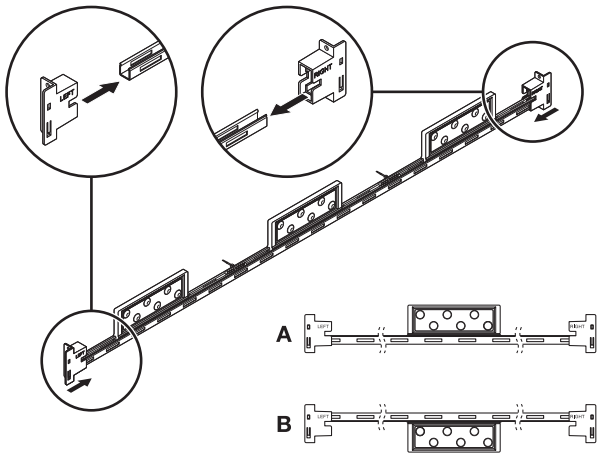
6. Now install the BoxLED Back Plus DS modules into the horizontal mounting profiles, one by one, with an equal distance to each other – first by fixing one end of the module diagonally to the profile and then by clicking it in completely. While doing so, please observe the hole distances specified by the orientation grid (distance 50 mm = LED module distance of 300 mm = grid distance 6 x 50 mm).



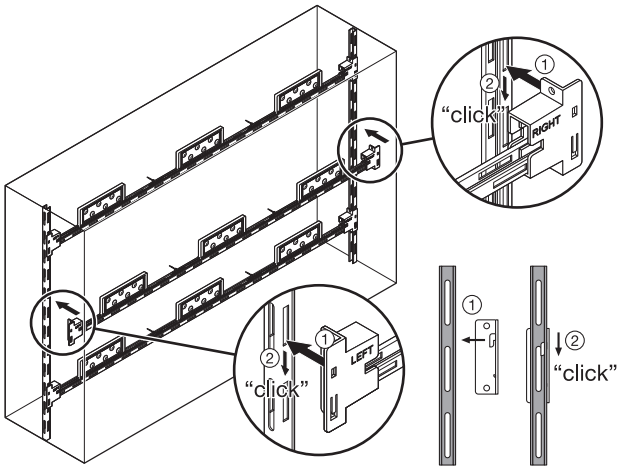
7. In order to avoid shadowing, tie the cable loops between the individual LED modules and use cable ties to fasten them to the mounting profile.



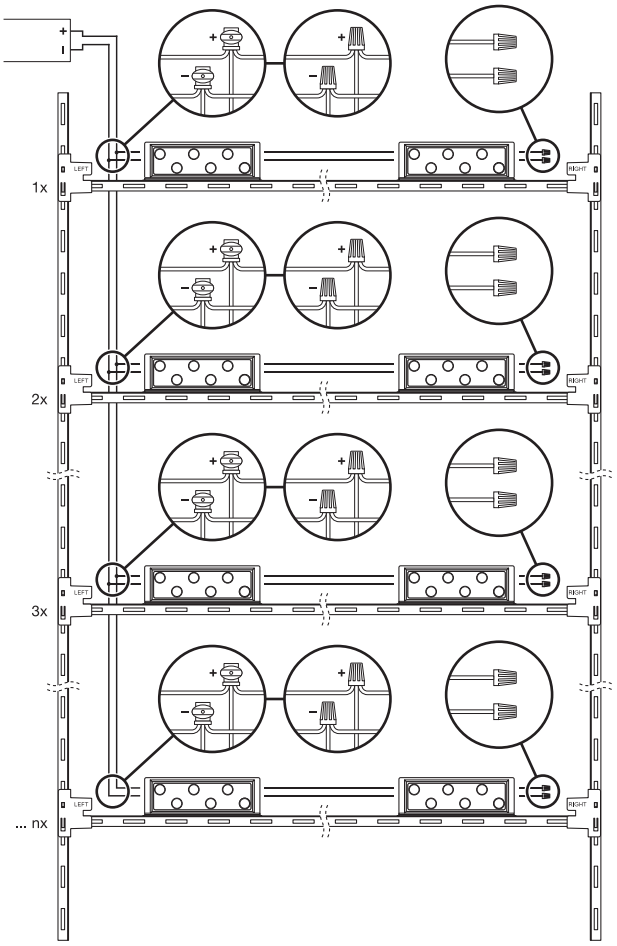
8. Push the corresponding left and right mounting bracket laterally into the prepared horizontal mounting profiles.



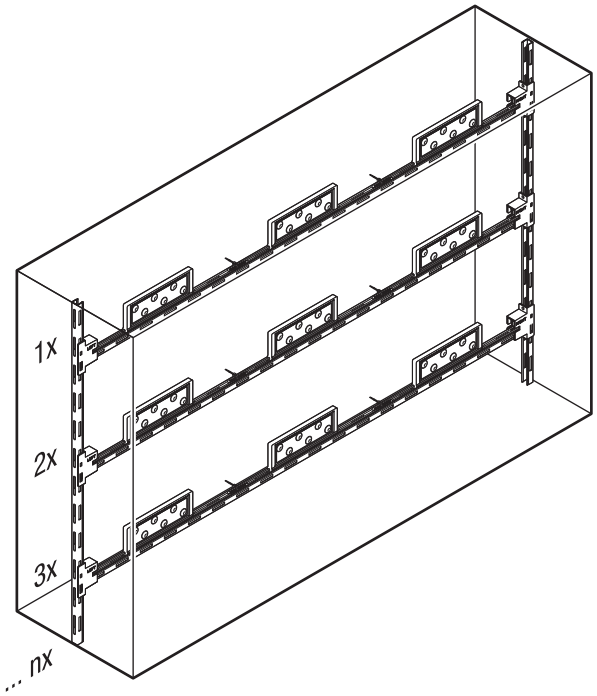
9. Now, the pre-mounted horizontal profiles can be clicked top down into the lateral carrier profiles. Make sure that the guide lugs of the end holders snap into the long holes of the carrier profile.



10. Now find an appropriate spot to mount the power supply into the light box. While doing so, avoid shadowing by the power supply. Use an appropriate wire stripper to remove the insulation at the cable ends of the LED modules and the power supply. Use cable ties to attach the secondary operating cables to the outer mounting profile. By means of electrical connectors, properly connect the secondary side of the power supply to the LED module and the primary side to the power lines.



11. While maintaining equal distances to each other, the amount of the horizontal LED mounting profiles can be doubled according to the height of the light box.



Please note:
All exposed metal parts (such as the mounting profile) must be grounded in accordance with the latest safety requirements. Please also read the general safety instructions on p. 20.

Caution: There is a risk of an electric shock. Disconnect the power supply before installing or maintaining the product.

9. Standards and regulations for LED modules and power supplies

The OSRAM LED modules are perfectly matched to the electronically stabilized OSRAM OPTOTRONIC power supplies, which are protected against short-circuit, overload and overtemperature.

OSRAM LED modules and OPTOTRONIC power supplies comply with all the relevant standards (see below) and ensure safe and reliable operation.

LED modules	
Radio interference	EN 55015
EMC/immunity	EN 61547
Electromagnetic fields	IEC 62493
Photobiological safety	IEC 62471
CE	Yes

OPTOTRONIC power supplies	
Safety	EN 61347-2-13
Radio interference	EN 55015
Immunity	EN 61547
Harmonic content	EN 6100-3-2
CE	Yes

10. Notes

10.1. General notes

- Safe operation is ensured only if the LED chains are connected in parallel. Connecting the LED chains in series is NOT recommended. Unbalanced voltage drops may lead to serious overloads and destruction of individual modules.
- Make sure to take suitable ESD (electrostatic discharge) precautions when installing the modules.
- If drivers other than OSRAM OPTOTRONIC power supplies are used, the output voltage must be 24 V - 0.5/+ 1.0 V for 24 V_{DC} to ensure safe operation of the modules.
- The LED chains must only be shortened by cutting the connecting cables between the LED modules.
- The LED chains must not be used where they may be directly exposed to the weather without adequate protection. In outdoor applications, the LED chains must therefore be protected by suitable housings or covers. The LED chains cannot be operated in or under water.

Recommended properties of light boxes

To ensure uniform illumination, a reflective matt white surface is generally recommended for all internal frame walls for light boxes.

10.2. Safety information

Before you start assembly, please read this information carefully.

- Caution: There is a risk of an electric shock. Disconnect the power supply before installing or maintaining the product.
- To avoid mechanical damage due to vibration, the LED modules must be connected flush with the mounting surface. Avoid exposing the equipment to strong vibrations.
- The LED modules, including the power supply, may only be installed by a qualified electrician in accordance with all the valid regulations and standards.
- Ensure that the poles are connected correctly. No light will be emitted if the polarity is incorrect. In this case, simply reverse the polarity.

11. Tools and links

The following materials and tools relating to signage are available on various web pages:

BoxLED Back Plus DS
BoxLED Back Plus
BoxLED Side and BoxLED Side Plus
BackLED Plus
BackLED MB and LB
- Technical application guides
- Product data sheets

> www.osram.com/boxled
> www.osram.com/backled

LED deSIGNer for the calculation of LED backlighting applications
- LED deSIGNer
- Checklist – signage application

> www.osram.com/led-designer

OPTOTRONIC
- Product data sheets
- Technical guide
- Operating instructions

> www.osram.com/optotronic

Others
- Technical application guide – ESD protection for LED systems
- Technical application guide – IP codes in accordance with IEC 60529
- Signage brochure including pocket guide
- New standards for LED control gear

Note:
Please also read the product data sheets for the BoxLED Back Plus DS modules. These data sheets contain important information regarding safety and installation. The latest data sheets are available at www.osram.com/boxled

Please also read the OPTOTRONIC technical guide and product data sheets, which are available at www.osram.com/optotronic

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