inventronics

Technical application guide

BackLED[®] and BoxLED[®] portfolio



07/2024

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Please note:

5 Application overview

All information in this guide has been prepared with great care. Inventronics, however, does not accept liability for possible errors, changes and/or omissions. Please check www.inventronics-light.com or contact your sales partner for an updated copy of this guide. This technical application guide is for information purposes only and aims to support you in tackling the challenges and taking full advantage of all opportunities the technology has to offer. Please note that this guide is based on own measurements, tests, specific parameters and assumptions. Individual applications may not be covered and need different handling. Responsibility and testing obligations remain with the luminaire manufacturer/OEM/application planner.

1 Product overview

1.1 BackLED®



BackLED® S CP G5



BackLED® M CP G5/ BackLED® M CP G5 HF



BackLED[®] M HO CP G5



BackLED® L CP G5



BackLED® XL CP G5



BackLED® TW CP G5



BackLED® M CX G5 BackLED® L CX G5



BackLED[®] RGBW Plus G2



BackLED[®] AREA G1 900 540x270 BackLED[®] AREA G1 900 TW

1.2 BoxLED®



BoxLED® XS CP G5



BoxLED® M CP G5



BoxLED® M Plus G3



BoxLED® L CP G5

2 Electrical properties

2.1 Electrical connections

We recommend the following cable lengths and cable cross-sections for the electrical connections between the LED chains and the OPTOTRONIC[®] LED drivers.

2.2 Recommended cable lengths



Max. secondary length = LED driver to first LED module (A) + wire extension LED module to LED module (B1) + (B2)...

Disclaimer:

In terms of electromagnetic compatibility (EMC), the maximum permitted cable length is related to the LED driver used to feed the LED modules (please refer to the technical data sheet of the applied OPTOTRONIC[®] LED driver). Users are responsible to ensure EMC.

Please note:

We recommend to use the LED modules only in combination with OPTOTRONIC[®] LED drivers. The maximum secondary length is the maximum cable length between the LED driver and the first LED module of a chain plus the wire extensions between the LED modules (A + B1 + B2 + Bn; see above).

2.2.1 Recommended cable cross-sections

Product	AWG	A [mm²]	Recommended cable cross-section for connecting an LED chain to other LED modules [mm ²]
BackLED S CP G5	22	0.32	≥0.32
BackLED M CP G5	22	0.32	≥0.32
BackLED M CP G5 HF	22	0.32	≥0.32
BackLED M HO CP G5	22	0.32	≥0.32
BackLED L CP G5	20	0.52	≥0.52
BackLED XL CP G5	18	0.82	≥0.82
BackLED TW CP G5	18	0.82	≥0.82
BackLED M CX G5	22	0.32	≥0.32
BackLED L CX G5	22	0.32	≥0.32
BackLED RGBW Plus G2	20	0.52	≥0.52
BoxLED XS CP G5	18	0.82	≥ 0.82
BoxLED M CP G5	18	0.82	≥ 0.82
BoxLED L CP G5	18	0.82	≥ 0.82
BoxLED M Plus G3	18	0.82	≥ 0.82



BackLED AREA G1 900:

Push-in connector Max. 8 boards in series

Recommended cable: 20...16 AWG / 0.5 ... 1.5 mm² Wire stripping 7 ... 10 mm

AWG20 / 0.5 mm² --> 4 boards in series AWG18 / 0.8 mm² --> 6 boards in series AWG16 / 1.3 mm² --> 8 boards in series

For more details on installation instructions, please find the product user instructions at the following links:

White versions:

https://damfiles.inventronicsglobal.com/ dam/files/inv-dam-13923718/ BackLED%C2%AE+Area+G1.pdf



Tunable White version:

https://damfiles.inventronicsglobal.com/ dam/files/inv-dam-14133860/ BackLED+Area+TW.pdf



Please note that this is the maximum cable length between the power supply and the LED modules and includes any dimmers that may be installed in between the power supply and the LED module.

In some applications, it may be required to extend the maximum permitted cable length. In this case, special EMC filters can be applied on the secondary side (12 V and 24 V). A ferrite close to the output terminals can reduce the effect of radio interference significantly. If OPTOTRONIC[®] dimmers are also installed, place the filters on output wires as close as possible to the dimmer device.

Simple and easy-to-use solutions are available in the market, see pictures below. One possible ferrite is available from TDK, part number ZCAT3035-1330-BK.

ZCAT-C TYPE



EMI compliance must be verified and confirmed by the luminaire manufacturer.

3 BackLED TW G5 and RGBW G2

3.1 BackLED[®] TW CP G5

The BackLED[®] TW CP G5 version has two warm-white LEDs with 2700 K and two cold-white LEDs with 6500 K per single module now equipped with patented Square Lens technology from Inventronics. Connected to light management systems, BackLED[®] TW CP G5 allows simulating daylight in any of your applications.







Light distribution curve 2700K and 6500K



BackLED® TW CP G5



3.2 BackLED® RGBW Plus G2

The BackLED[®] RGBW Plus G2 has two red, green and blue LEDs each, plus two cold-white 6500 K LEDs, thus enabling even a mixing of soothing pastel colors. In combination with light management systems, the BackLED[®] RGBW Plus G2 offers you control over dynamic color effects or very specific colors.





Spectral data red



Spectral data blue



Light distribution curve RGBW



Spectral data green



Spectral data white (6500 K)



3.3 System information

3.3.1 Technical data

Product family

Product group	BackLED RGBW Plus G2 BackLED TW CP G5								
Product reference	BA-RGBW-PL G2 BA-TW-CP-827.865-24								
Product number		4062172	2030168		405289	9627253			
Light color		RG	BW		Т	W			
	white	red	green	blue	cold white	warm white			
No. of LED modules per chain (no. of LEDs per module)	15	, cuttable after ev	30, cuttable after every module (4)						
	(2)	(2)	(2)	(2)	(2)	(2)			
Voltage [V]	24 24								
Total current [A]		1.7	75		2	.5			
Current per color [A]	0.30	0.45	0.65	0.375	1.25	1.25			
Total power per chain (per module) [W]		42.6 (8.52 x min.	60	(2)					
Power per color (per module) [W]	7.2	10.8	15.6	9	30 (1)	30 (1)			
Luminous flux per chain (per module) [Im]	710 (48)	490 (33)	960 (64)	150 (10)	4500 (150)	3810 (127)			
Beam angle [°]	150 155								
Color temperature [K]	6500	_	-	-	6500	2700			
Wavelength [nm]	-	620	525	464	_	_			

3.4 Accessories

Accessory matching table

BA-S-CP-G5	BA-M-CP-G5	BA-M-CP-G5-HF	BA-M-HO-CP-G5	BA-L-CP-G5	BA-XL-CP-G5	BA-M-CX-G5	BA-L-CX-G5	BA-TW-CP-G5	BA-RGBW-PL G2	BX-XS-CP-G5	BX-M-CP-G5	BX-L-CP-G5	BX-M-PL-G3
			B	ack	LED	0				E	BoxL	.ED®	

EAN 10 code (Product short name)	Dimensions [mm] L x W x H														
4052899629196 BA-MP-SM-G5-2M	2000 x 14.4 x 8.1	•	•	•	•										
4052899629349 BA-CLIP-SM-G5	16.2 x 15 x 5.7	•	•	•	•										
4052899629189 BA-MP-L-G5-2M	2000 x 20 x 8.9					•	•		•						
4052899629325 BA-CLIP-L/XL-G5	16.2 x 15 x 5.7					•	•		•						
4008321981110 BX-MP	2365 x 38 x 16									•				•	
4062172379632 BX-MP-XS-CP-G5-2M	2000 x 20.4 x 8										•				
4062172379694 BX-CLIP-XS-G5	15 x 22.4 x 5.4										•				
4062172379618 BX-MP-M-CP-G5-2M	2000 x 28.2 x 7.4											•			
4062172379670 BX-CLIP-M-G5	20 x 29.9 x 11.9											•			
4062172379540 BX-MP-L-CP-G5-2M	16.5 x 15												•		
4062172379656 BX-CLIP-L-G5	25 x 37.1 x 6.7												•		

4 Multi-channel system combination

4.1 System overview: LED chains and control devices



*Refer to the Inventronics website www.inventronics-light.com for the complete range of dimming devices

4.2 System overview: All-in-one devices - LED chains

Product	BackLED RGBW Plus G2	BackLED TW CP G5	BackLED AREA 900 270x540 TW**		
Maximum power per chain	42.6W	60 W	17.6 W nominal		
OTi DALI 50/220-240/24 4CH DT6/8 G3	Maximum: 15 modules	Maximum: 25 modules in DT6 mode, 50 modules in DT8 mode	Maximum: 4 boards (only in DT8)		
OTi DALI 80/220-240/24 4CH DT6/8 G3	0/220-240/24 4CH 1 chain (15 modules) + 12 modules (parallel) Maximum: 40 modules in DT6 mode 80 modules in DT8 mode		Maximum: 8 boards (only in DT8)		
OTi DALI 160/220-240/24 2CH DT6/8 G3		Maximum: 80 modules in DT6 mode, 160 modules in DT8 mode	Maximum: 16 boards (only in DT8)		
OT Wi 50/220-240/24 4CH CA	Maximum: 15 modules	Maximum: 25 modules	Maximum: 4 boards		
OT Wi 80/220-240/24 4CH CA	1 chain (15 modules) + 12 modules (parallel) Total maximum: 27 modules	Maximum: 40 modules	Maximum: 8 boards		
OT Wi 160/220-240/24 2CH CA		Maximum: 80 modules	Maximum: 16 boards		

**Important note concerning BackLED AREA 900 270x540 TW:

Only use this product with DALI TW versions (DT8) or TW/2xTW BLE lamp profile available on Casambi app.

Product		BackLED	RGBW Plus G2	BackLEI	D TW CP G5	BackLED AREA TW			
Color	Ē	Per chain	Per min. 3-modules unit	Per chain	Per single module	Per board			
2700 K				1.25 A → 30 W	0.042 A → 1 W	0.375 A → 9 W			
6500 K					0.042A → 1W	0.358 A → 8.6 W			
Red	C	0.55A → 13.2W	0.11 A → 2.64 W						
Green	C).9A → 21.6W	0.18A → 4.32W						
Blue	C	0.45 A → 10.8 W	0.9A → 2.16W						
White	C).30A → 7.2W	0.06A → 1.44W						
Total	2	2.20 A → 52.8 W		2.5A → 60W		0.733 A → 17.6 W			

Overview: Power consumption of individual channels

4.3 Recommended solutions

In most cases, the four following options are the four easiest solutions:

Option 1: OTi DALI 2 or 4 CH + BackLED® TW CP G5 OTi DALI 2 or 4 CH + BackLED[®] AREA TW



OTi DALI 2-4 CH configuration	DIP1
DALI Device Type 6 operation	ON
DALI Device Type 8 operation	OFF

Option 2: OTi DALI 4 CH + BackLED® RGBW Plus G2



OTi DALI 4 CH configuration	DIP1
DALI Device Type 6 operation	ON
DALI Device Type 8 operation (TW or RGBW mode available)	OFF

Option 3: OT...24 V + OTi DALI DIM 1-4CH D + BackLED® TW oder RGBW Plus G2 oder BackLED® AREA TW

PE N L





DIP1	ON = DT6		OFF = DT8		
DIP2 DIP3	ON	OFF	ON	OFF	
ON	CH1	CH1-2	2700-6500K	2700-5700K	
OFF	CH1-3	CH1-4	2500-4000K	2200-3500K	

Please refer to OTi DALI DIM 1-4CH D user instructions and product printing for details of DIP switch settings.



Option 4: OT...24V + OT Wi DIM + BackLED® TW or RGBW Plus G2 or BackLED® AREA TW



Option 5: OT Wi 2-4 CH CA + BackLED TW or RGBW Plus G2 or BackLED AREA TW



5 Application overview

BackLED G5 module application overview also available by looking at the product datasheet in the **download section** of each module version at: https://inventronics-light.com/backlighting.

Product name	Box depth [mm]	Module pitch [mm] with translucent material:		Modules/m ² with translucent materia		erial:	
Diffuser type		Vinyl	Acrylic	Acrylic	Vinyl	Acrylic	Acrylic
Target intensity		600 cd/m ²	1000 cd/m ²	1000 cd/m ²	600 cd/m ²	1000 cd/m ²	1000 cd/m ²
Translucency		41 %	35%	45 %	41 %	35 %	45 %
BA-S-CP-8xx-G5	80	138	93	96	52	115	109
	130	129	88	87	61	130	133
	180	120	82	82	70	149	149

Product name	Box depth [mm]	Module pitch [mm] with translucent material:		Modules/m ² with translucent material:		erial:	
Diffuser type		Vinyl	Acrylic	Acrylic	Vinyl	Acrylic	Acrylic
Target intensity		900 cd/m ²	900 cd/m ²	900 cd/m ²	900 cd/m ²	900 cd/m ²	900 cd/m ²
Translucency		41 %	35 %	45 %	41 %	35 %	45 %
BA-M-CP-8xx-G5	80	140	131	135	40	59	55
	130	148	123	127	46	67	63
	180	137	115	119	54	76	71

Product name	Box depth [mm]	Module pitch [mm] with translucent material:		with	Modules/m ² translucent mat	erial:	
Diffuser type		Vinyl	Acrylic	Acrylic	Vinyl	Acrylic	Acrylic
Target intensity		1200 cd/m ²	1200 cd/m ²	1200 cd/m ²	1200 cd/m ²	1200 cd/m ²	1200 cd/m ²
Translucency		41 %	35%	45 %	41 %	35 %	45 %
BA-M-HO-CP-8xx-G5	80	169	139	144	36	52	49
	130	157	132	136	41	58	55
	180	146	123	126	47	67	63

Product name	Box depth [mm]	Module pitch [mm] with translucent material:		with	Modules/m ² translucent mat	terial:	
Diffuser type		Vinyl	Acrylic	Acrylic	Vinyl	Acrylic	Acrylic
Target intensity		900 cd/m ²	600 cd/m ²	1000 cd/m ²	900 cd/m ²	600 cd/m ²	1000 cd/m ²
Translucency		41 %	35%	45 %	41 %	35%	45 %
BA-L-CP-8xx-G5	100	189	197	158	28	26	41
	180	172	182	146	34	31	47
	260	155	169	134	42	36	56

Product name	Box depth [mm]	Module pitch [mm] with translucent material:		with	Modules/m ² translucent mat	erial:	
Diffuser type		Vinyl	Acrylic	Acrylic	Vinyl	Acrylic	Acrylic
Target intensity		900 cd/m ²	900 cd/m ²	900 cd/m ²	900 cd/m ²	900 cd/m ²	900 cd/m ²
Translucency		41 %	35 %	45 %	41 %	35 %	45 %
BA-XL-CP-8xx-G5	100	241	216	230	18	22	19
	180	206	196	211	24	27	23
	260	188	183	203	29	30	25

Product name	Box depth [mm]	Module pitch [mm] with translucent material:			Modules/m ² with translucent material:		
Diffuser type		Vinyl	Acrylic	Acrylic	Vinyl	Acrylic	Acrylic
Target intensity		750 cd/m ²	900 cd/m ²	900 cd/m ²	750 cd/m ²	900 cd/m ²	900 cd/m ²
Translucency		41 %	35 %	45 %	41 %	35 %	45 %
BA-TW-CP-827.865-G5 _ (DT8)* _	100	189	153	157	28	43	41
	180	163	141	148	38	51	46
	260	148	130	140	46	60	52

*) Data refer to BA-TW-CP-827.865-24-G5 under DT8 operation. In case of DT6 operation, data can vary.

Please contact the Inventronics support team for layout suggestions.

Suggestions based on high luminance requirements. This guideline is only an approximation. The actual luminance and uniformity results can deviate due to many different application parameters, e.g. including (but not limited to) reflections of inner box surfaces, overall box/letter dimensions, optical parameters of the light emitting surface, etc. Inventronics suggests testing LED module performance in the project design phase in order to ensure brightness, uniformity and final color appearance. The Inventronics professional team is available for final light planning suggestions. Contact us at support@inventronicsglobal.com

BackLED® RGBW Plus G2 homogeneity

Product name	Box depth [mm]	Module pitch [mm] with translucent material:	Modules/m ² with translucent material:
		WH72	WH72
Diffuser type		Acrylic	Acrylic
Target intensity		900 cd/m ²	900 cd/m ²
Translucency		45 %	45%
	250	167	36
BA-RGBW-PL-G2"	300	154	42
	350	143	48

*) Data refer to BA-RGBW-PL-G2 under full power on all channels operation. In case of DALI DT8 operation or lower luminance requirements, data can vary. Suggestion based on high luminance requirements. This guideline is only an approximation. The actual luminance and uniformity results can deviate due to many different application parameters, e.g. including (but not limited to) reflections of inner box surfaces, overall box/letter dimensions, optical parameters of the light emitting surface, single color operation, etc. Inventronics suggests testing LED module performance in the project design phase in order to ensure brightness, uniformity and final color appearance. The Inventronics professional team is available for final light planning suggestions. Contact us at support@inventronicsglobal.com

6 Application overviews for BoxLED®

6.1 Recommended dimensions for light boxes

BoxLED[®] modules provide uniform illumination thanks to a beneficial mix of direct and indirect light.

Direct and indirect light output of a single-sided light box



For the illumination of light boxes, we recommend BoxLED[®] modules to be arranged in the center of the light box frame in order to achieve a uniform distribution of light. Placing the LED modules closer to the light-emitting surface increases the direct light output at such surfaces, possibly causing hot spots.

Note:

See recommended Y/X dimensions for each module in the following charts.

Inventronics aim is to provide our customers with competitive products while respecting third parties' intellectual property rights. This also comprises efforts to provide our customers with the best possible protection against third parties' patent claims. All our products are carefully examined for interference with third parties' rights before we introduce them into the market. If products have a very limited scope of applications, these applications may be examined as well.

Recently, there have been uncertainties about some intellectual property rights held by third parties. Our BoxLED[®] products have been thoroughly examined and consequently judged to be not critical.

Direct and indirect light output of a double-sided light box



In particular, we have performed extensive technical investigations on this matter, which have led to the result that, according to Inventronics interpretation, the use of our products in a rectangular parallelepiped according to our application guide would not fall under the scope of those rights. We are confident that this view will also prove true in a judicial review.

This text is neither a legal advice nor a legally binding statement about patent validity, patent claim interpretation, patent infringement or similar matters and we strongly recommend our customers to seek legal advice on these matters. The information contained herein is not for distribution, directly or indirectly, in or into the United States of America (including its territories and possessions of any state of the United States of America or the District of Columbia) and must not be distributed to U.S. persons (as defined in Regulation S of the U.S. Securities Act of 1933, as amended ("Securities Act")) or publications with a general circulation in the United States of America.

Direct and indirect light output of a single-sided light box

BoxLED® XS CP G5



Direct and indirect light output of a double-sided light box

BoxLED® XS CP G5



BoxLED[®] M Plus G3 and M CP G5



BoxLED[®] M Plus G3 and CP G5



BoxLED® L CP G5



BoxLED[®] L CP G5



Direct and indirect light output of a single-sided light box



Direct and indirect light output of a double-sided light box



7 Thermal properties

7.1 Casing temperature at the $T_{\rm c}$ 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 the modules and the mounting surface is not absolutely essential.

Thermo-wire NiCr–Ni



Thermo element Type K with mini connector

7.2.1 Position of the $T_{\rm c}$ point

BackLED® S CP G5 BackLED® M CP G5 BackLED® M HO CP G5



BackLED[®] L CP G5









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).



BoxLED® M Plus G3



BoxLED® L CP G5



7.2.2 Permitted T_c temperatures

	Operating temperature at the T₅ point* [°C]
BackLED S CP G5	-25 to 70
BackLED M CP G5	-25 to 70
BackLED M CP G5 HF	-25 to 70
BackLED M HO CP G5	-25 to 70
BackLED L CP G5	-25 to 70
BackLED XL CP G5	-25 to 70
BackLED M CX G5	-25 to 70
BackLED L CX G5	-25 to 80
BoxLED XS CP G5	-25 to 75
BoxLED M CP G5	-25 to 75
BoxLED L CP G5	-25 to 75
BoxLED M Plus G3	-25 to 85

* 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. For the precise position of the T_c point, see chapter 9.2.1.

Permitted T_c temperatures

BackLED® RGBW Plus G2

	Operating temperature at the T _c point* [°C]
BackLED RGBW Plus G2	-25 to 75
BackLED TW CP G5	-25 to 75
BackLED AREA	-25 to 55

* 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. For the precise position of the T_c point, see the illustration below.

BackLED[®] TW CP G5



BackLED AREA



7.3 Mounting profiles and accessories

Mounting profile BA-MP-SM-G5-2M

EAN 4052899629196

			14.4
 	2000]
	(

BA-CLIP-SM-G5

EAN 4052899629349



BA-MP-L-G5-2M

EAN 4052899629189

		-201
2000		
		80
	2000	

BA-CLIP-L/XL-G5

EAN 4052899629325



Mounting profile BX-MP



Standards and approvals/marking 8

8.1 BackLED[®] and BoxLED[®]

Safety requirements:	EN/IEC 62031 - EN/IEC 61347-1 Clause 18 - EN/ IEC 60598-1 Clause 13 - IEC TR 62778 (eye safety)
Degree of protection (IP):	EN/IEC 60529
EMC/radio disturbance characteristics:	EN/IEC 55015
EMC/immunity:	EN/IEC 61547
Approvals:	See product datasheets for third-party certifications
Marking:	CE

BX-MP-XS-CP-G5-2M

EAN 4062172379632



BX-CLIP-XS-G5 EAN 4062172379694



BX-MP-M-CP-G5-2M EAN 4062172379618

BX-CLIP-M-G5

EAN 4062172379670









EAN 4062172197168

BX-MP-L-CP-G5-2M

EAN 4062172379540

- 25 -

• Ø4.5 31.1

± –

BX-CLIP-L-G5

EAN 4062172379656



All figures in mm

Ø3.2

20

G





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