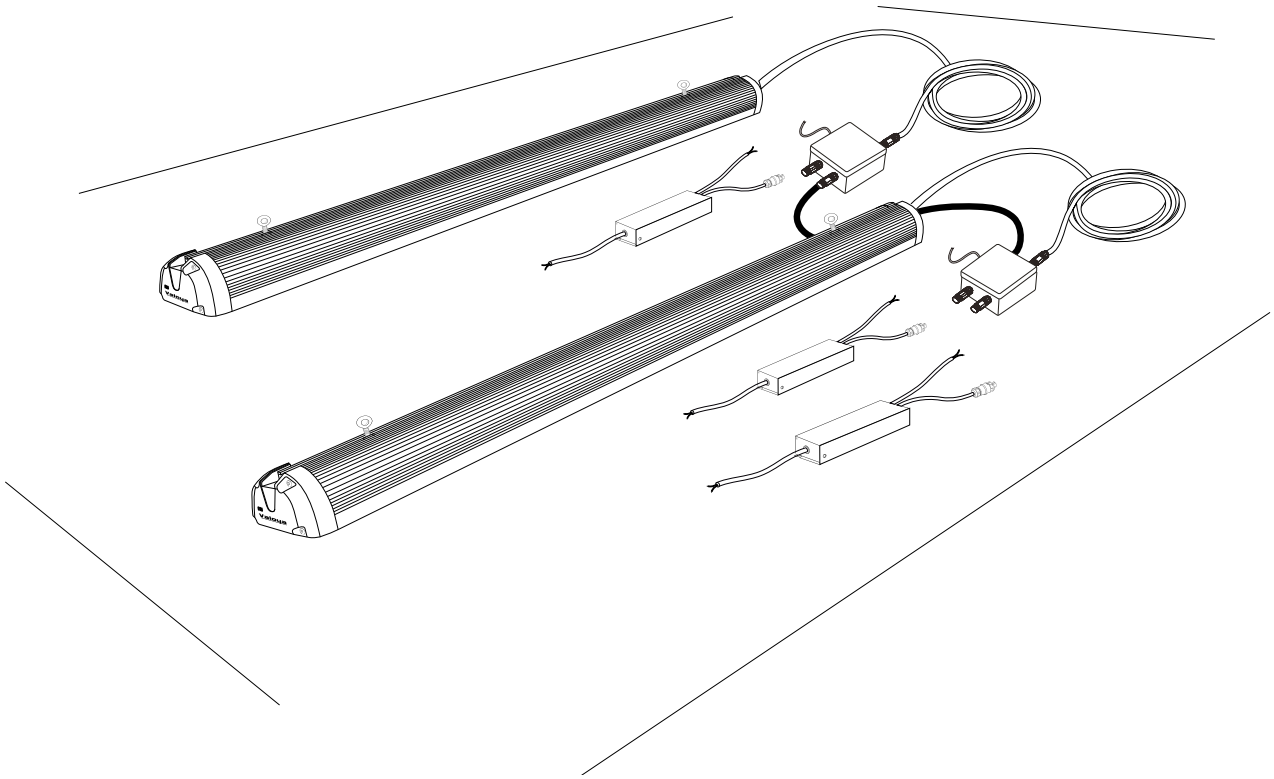
LightDNA-2



INSTALLATION GUIDE | LightDNA

Warnings

ENGLISH

CAUTION!

ESPAÑOL

PELIGRO!

Una instalación inadecuada puede provocar lesiones o daṢar la lámpara.

SUOMIHUOMIO!

DEUTSCH

VORSICHT!

Unsachgemäße Installation kann zu Personen- und Sachschäden führen.

VLAAMS

LET OP!

Verkeerde aansluiting kan schade veroorzaken aan de lamp of leiden tot lichamelijk letsel aan personen.

.

NEDERLANDS

LET OP!

Onjuiste installatie kan schade aan personen of de lamp veroorzaken.

FRANÇAIS

ATTENTION!

Une mauvaise installation peut Ř̈tre source de blessures corporelles et endommager les lampes.

PORTUGUÊS

ATENÇÛO!

A instalaçØo inapropriada pode causar danos na luminária e ferimentos nas pessoas.

SVENSKA

AKTA!

Felaktig installation kan leda till skador pṚ personer och lampan.

ITALIANO

ATTENZIONE!

L'installazione non corretta puṪ causare lesioni alle persone e danni alla lampada.

日本語

注意！

不適切な取り付けは人の傷害、およびランプの損傷の原因となる場合があります。

BEFORE YOU BEGIN

1. Please read this manual thoroughly before use, and retain it for future reference.
2. Due to our continuous program of product development, data is subject to change without notice.
3. Unauthorized product tampering invalidates warranty & is a safety risk.
4. All electrical work must be carried out by qualified persons.
5. Always follow appropriate electrical codes.
6. Disconnect mains power before product installation, connection, or disconnection.
7. Products are fixed luminaires for indoor use (i.e. Install out of reach / Only movable using tools).
8. LED-modules are non-replaceable light sources.
9. Do not use luminaires without LED Drivers (power units) connected (BX-, C-Series).
10. Connect LED drivers to electrical branch circuits (ensure suitable strain relief is fitted).
11. Products with an earth connection must be earthed for safety.
12. Installation of additional electrical circuit protection devices is strongly advised:
    - Type C MCB's (Miniature Circuit Breakers).
    - RCD (Residual Current Device).
    - ICL (Inrush Current Limiter).
    - SPD (Surge Protection Device).
13. Do not high voltage test.
14. Install LED drivers against a flat surface to ensure optimal heat dissipation and lifetime (BX-, C-Series).
15. Do not connect products installed on different mains phases to the same dimming device (dimmable products only).
16. Observe published product temperature specifications and limits.
17. Product surface temperature may become hot to the touch during use.
18. Do not stare directly at any bright light source.
19. As a precaution, use suitable eye protection if working for long periods under high intensity lighting.
20. Dispose of all waste in accordance with local regulations.
21. The external flexible cable of the luminaire is only replaceable by Valoya.
22. For luminaries supplied with open-end supply cables:

    a. Cables should not be concealed or extended through parts of the building structure.

    b. Cables should not be located above a suspended/dropped ceiling, or permanently fixed to the building structure.

    c. Cables must be visible over their full length, not strained, and protected from physical damage.

    d. Cables must be used within their electrical ratings at the maximum temperature of the installed environment.

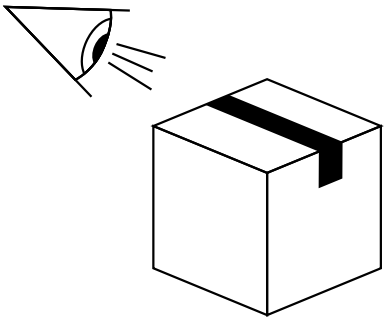
IMPORTANT

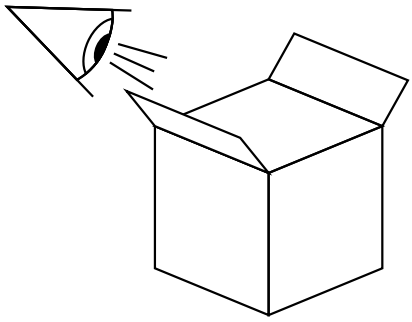
Installation must be carried out by qualified persons, and according to the electrical safety rules & regulations applicable in your country!

CE **RoHS** **PATENTS APPLY**

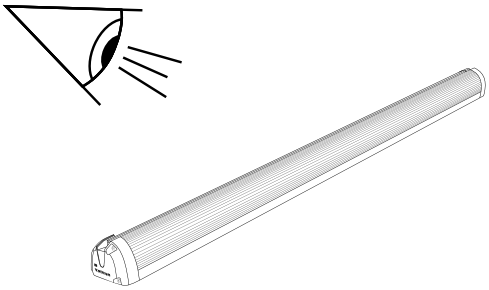
DELIVERY CHECK

- Please inspect the goods upon receipt to ensure that your delivery is complete.'
- If you detect any damage to the packaging, please notify the carrier immediately and ask them to note that "the delivery was not delivered in good condition".
- If the packaging shows no damage but the goods inside are either missing, defective, or show other signs of damage, please contact us.
- In all cases please take pictures as evidence and contact us as soon as possible by phone or e-mail.

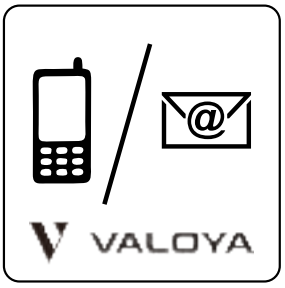




Check content



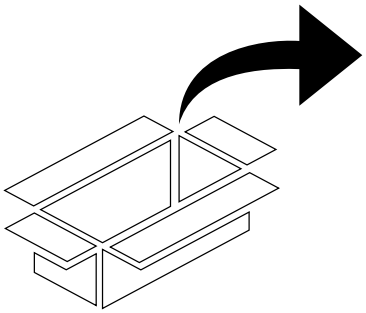
Check operation



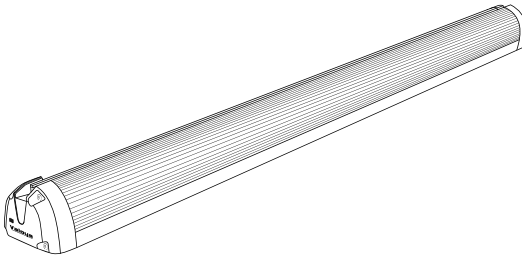
If problems, contact us

Delivery Check & Inspection

PART IDENTIFICATION

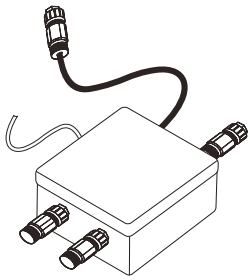


A



B

C



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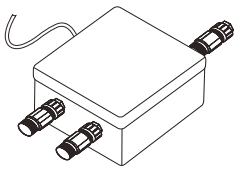

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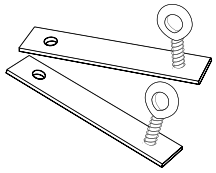
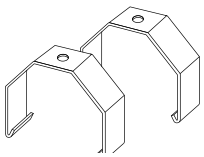


F



- A Luminaire
- B LED Driver
- C Junction box (main)
- D Junction box (terminator)
- E Standard hanger (included)
- F Optional hanger (order separately)

Technical Specifications

SPECIFICATIONS (TYPICAL)		LightDNA-2 (BX120c3)			LightDNA-2 (BX180c3)		
		2 luminaires	3 luminaires	4 luminaires	2 luminaires	3 luminaires	4 luminaires
Electrical	Values Per luminaire	Luminaire Power (W)	156			210	
		Luminaire Input current (mA)	500			500	
		Luminaire NS1 Channel; Input voltage (VDC)	240			360	
		Luminaire FR Channel; Input voltage (VDC	30			45	
	Values Per LED driver – NS1 channel drivers	Driver model	HLG-120H-C-C500B			HLG-185H-C500B	
		Driver type	500 mA constant current				
		Input voltage range (VAC)	100 - 240, 277				
		Frequency (Hz)	50 / 60				
		Input current (A)	0.45 - 1.25			0.6 - 1.67	
		Power (W)	140			185	
		Power Factor	> 0.93				
		Dimmable (Acc. to IEC 60929 Annex E)	Yes (1-10V / PWM)				
		AC mains plug fitted	No				
	Values Per LED driver – FR channel driver	Driver model	HVGC-65-500B	ELG-100-C500B		HLG-120H-C-C500B	
		Driver type	500 mA constant current				
		Input voltage range (VAC)	100-258	100-240, 277			
		Frequency (Hz)	50 / 60				
		Input current (A)	0.06 - 0.17	0.17-0.45	0.21-0.56	0.17-0.47	0.25-0.7	0.34-0.94
		Power (W)	34	51	65	52	78	104
		Power Factor	> 0.93				
		Dimmable (Acc. to IEC 60929 Annex E)	Yes (0-10V / PWM)			Yes (1-10V / PWM)	
		AC mains plug fitted	No				
	Values Per Complete System	Quantity of NS1 LED drivers	2	3	4	2	3	4
		Quantity of FR LED drivers	1	1	1	1	1	1
		Input voltage range (VAC)	**180-240,277**	**100-240, 277**				
		Total NS1 power (W)	280	420	560	370	555	740
		Total FR power (W)	34	51	65	52	78	104
		Total power (W)	314	471	625	422	633	844
		16A Type-C MCB load (max.)	2 sets	1 set		2 sets	1 set	
		AC mains plug fitted	No				

Notes:

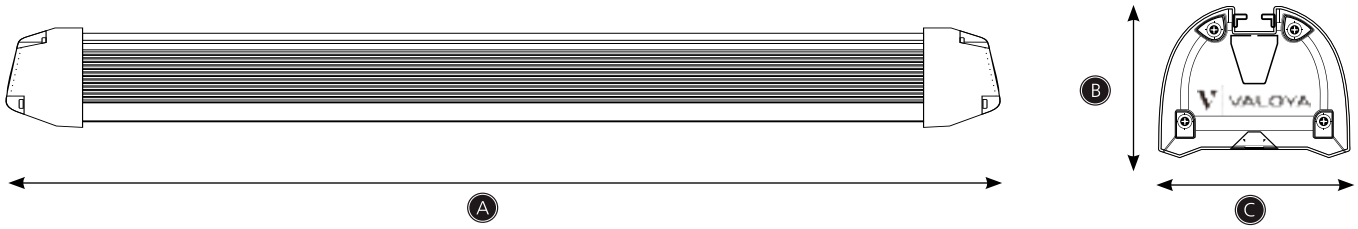
- Electrical values are typical nominal figures (variations may occur due to spectrum, component & production tolerances).
- Due to our continuous program of product development, specifications are subject to change without notice in order to improve spectra, function, performance & reliability.
- Due to manufacturing tolerances, slight variations are possible in cable lengths, weights & package dimensions.

Technical Specifications

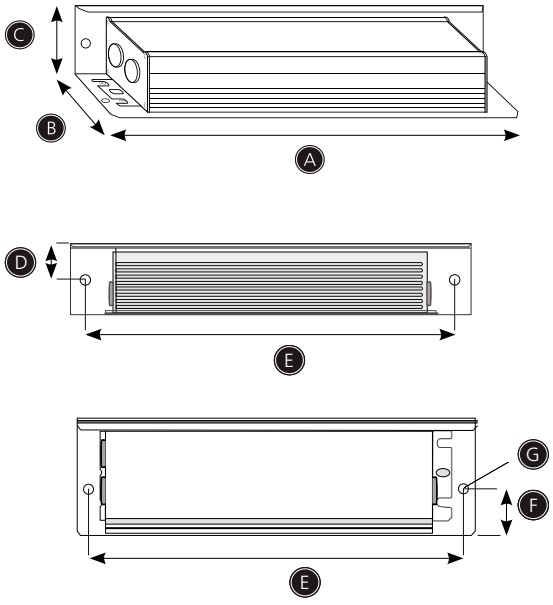
SPECIFICATIONS (TYPICAL)			LightDNA-2 (BX120c3)			LightDNA-2 (BX180c3)		
			2 luminaires	3 luminaires	4 luminaires	2 luminaires	3 luminaires	4 luminaires
Physical	Per luminaire	Weight (kg/lb)	2.6 / 3.7			3.9 / 8.6		
		Max. DC Cable length, to Junction box (mm/in)	1000 / 40					
		Recommended distance from plants (mm/in)	100 - 4000 / 4-158					
	Per LED driver	NS1 channel driver weight (kg/lb)	1.4 / 3.1			1.5. / 3.3		
		NS1 channel driver weight (kg/lb)	1.2 / 2.7	1.25 / 2.8		1.4 / 3.1		
		AC input cable length (mm/in)	300 / 11.8					
		Dimming cable length (mm/in)	300 / 11.8					
		Cable towards junction box length (mm/in)	300 / 11.8					
		Junction box weight (kg/lb)	0.25 / 0.55					
	Per complete system	Minimum cable bending radiius	5x cable diameter					
		Luminaire quantity	2	3	4	2	3	4
		LED Driver quantity (NS1/FR)	2 / 1	3 / 1	4 / 1	2 / 1	3 / 1	4 / 1
		Junction box quantity	2	3	4	2	3	4
		Total weight (kg/lb)	9.7 / 21.4	14 / 30.9	18.3 / 40.3	12.6 / 27.8	18.5 / 40.8	24 / 52.9
Optical		Efficiency, 380-820nm (PBPF) (µmol/W)	1.8					
		Photon Flux (PF); Full Spectrum (µmol/s)	Up to 560	Up to 850	Up to 1125	Up to 760	Up to 1340	Up to 1520
		Light intensity decay, Q90/L90 (hours)	36000					
Environmental		Operational ambient temperature range (°C/°F)	0...+40 / +32...+104					
		Max. allowed luminaire housing (tc) temperature (°C/°F)	75 / 167					
		Maximum Relative Humidity (%)	90 (non-condensing)					
		Storage temperature (°C/°F)	-20...+40 / -4...+104					
		Ingress Protection (IP) rating	IP 67					
		Insulation class	Class I: For Fixed Installations (protective earth required)					
		Cooling method	Passive cooled					
Regulations & Approvals		CE marked	X					
		RoHS compliant	X					
		EMC directive compliant	X					
		Low Voltage Directive compliant	X					
		Eco-design (EuP) directive compliant	X					
		Certified to UL & CSA standards	X (luminaire)					

PRODUCT DIMENSIONS

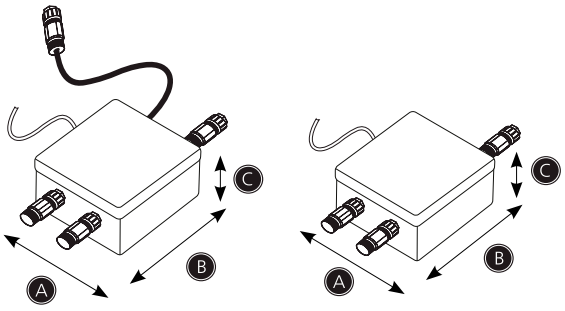
		LUMINAIRE DIMENSION	
		LightDNA-2 (BX120c3)	LightDNA-2 (BX180c3)
A	Length (mm/in)	1176 mm / 46.3 in	1722 mm / 68 in
B	Height (mm/in)	58 mm / 2.3 in	
C	Width (mm/in)	73.5 mm / 2.9 in	



	LED DRIVER (POWER UNIT)	
A	Length (mm/in)	260 mm / 10.2 in
B	Width (mm/in)	76 mm / 3 in
C	Height (mm/in)	43 mm / 1.7 in
D	Screw holes distance (mm/in)	22 mm / 0.85 in
E	Screw holes distance (mm/in)	244 mm / 9.6 in
F	Screw holes distance (mm/in)	26.5 mm / 1.05 in
G	Screw hole (mm/in) (x4)	6.5 mm / 0.25 in

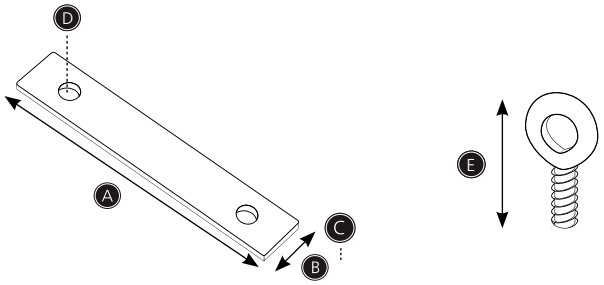


	JUNCTION BOX (BOTH VERSIONS)	
A	Length (mm/in)	90 mm / 3.5 in
B	Width (mm/in)	90 mm / 3.5 in
C	Height (mm/in)	50 mm / 2 in

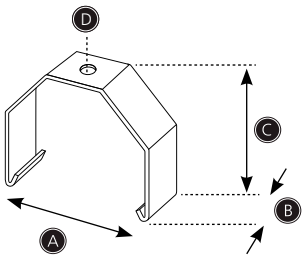


PRODUCT DIMENSIONS

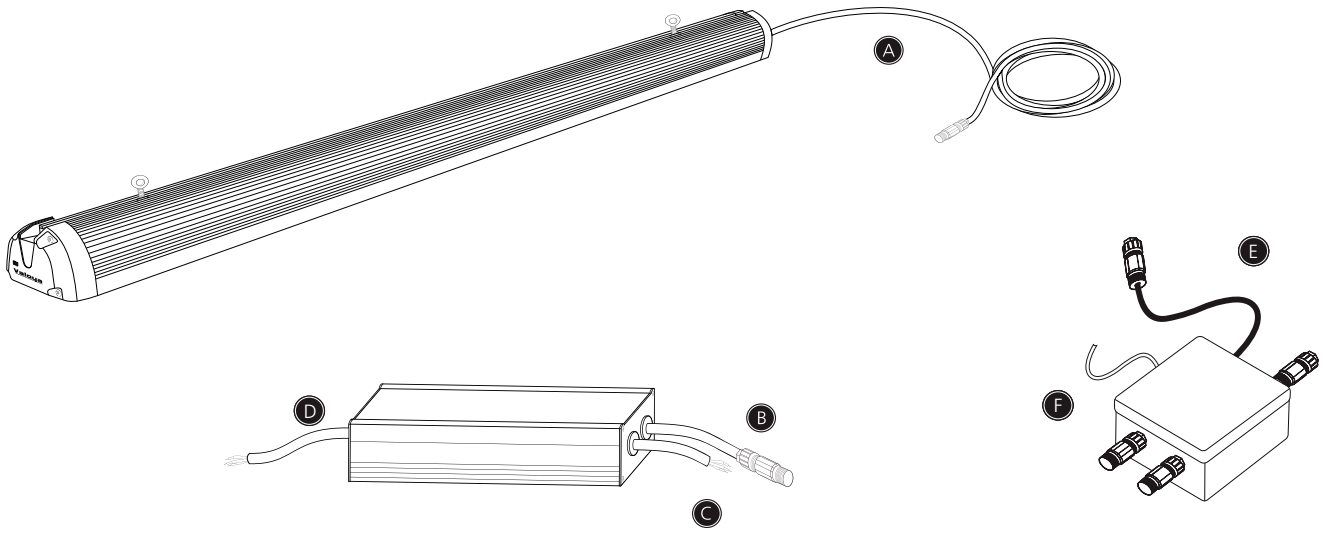
	STANDARD HANGER (2X)	
A	Length (mm/in)	70 mm / 2.8 in
B	Width (mm/in)	14 mm / 0.6 in
C	Height (mm/in)	3 mm / 0.1 in
D	Screw hole	M5 thread
E	Hanger height (mm/in)	35 mm / 1.4 in



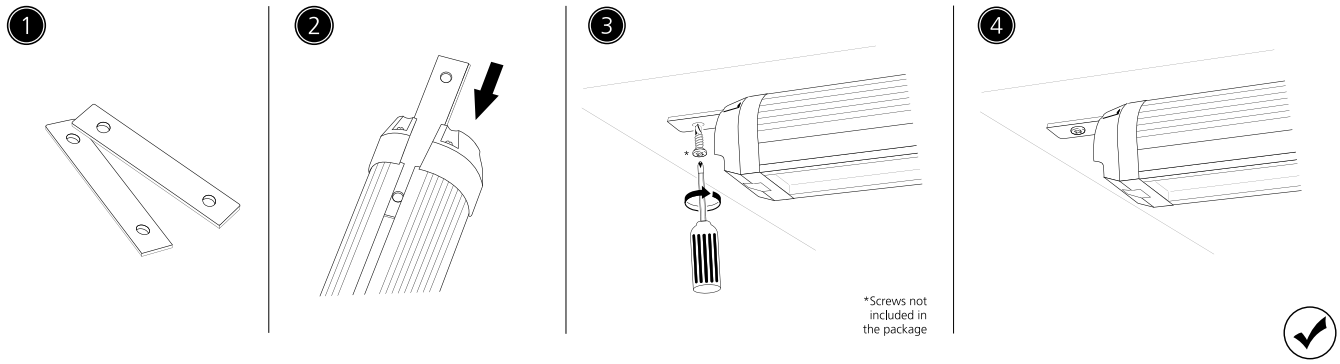
	OPTIONAL HANGER (2X)	
A	Length (mm/in)	76 mm / 3 in
B	Width (mm/in)	20 mm / 0.8 in
C	Height (mm/in)	70 mm / 2.8 in
D	Hole diameter (mm/in)	5 mm / 0.2 in



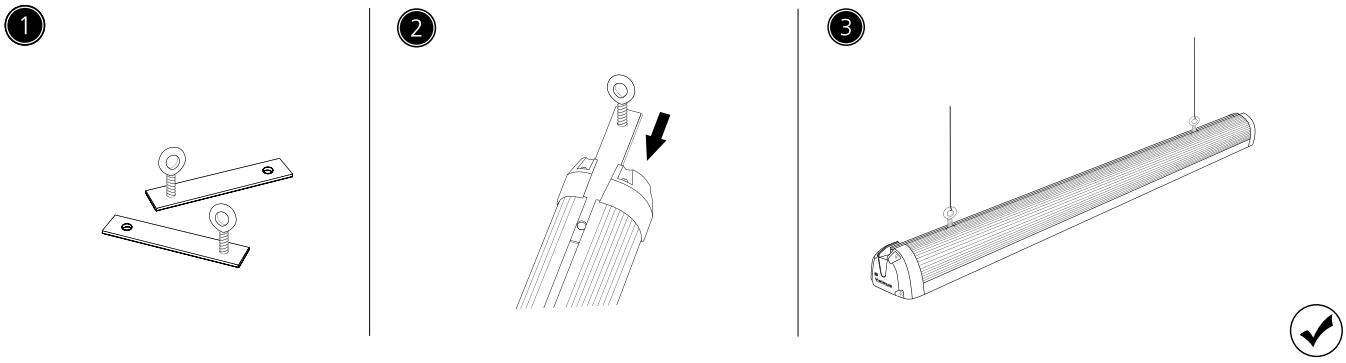
		CABLES
A	DC cable luminaire (mm/in)	1000 mm / 40 in
B	DC cable LED Driver (mm/in)	300 mm / 11.8 in
C	Dimming cable (mm/in)	300 mm / 11.8 in
D	Mains cable LED driver (mm/in)	300 mm / 11.8 in
E	Junction box link cable (mm/in)	400 mm / 15.8 in
F	Junction box earth wire (mm/in)	300 mm / 11.8 in



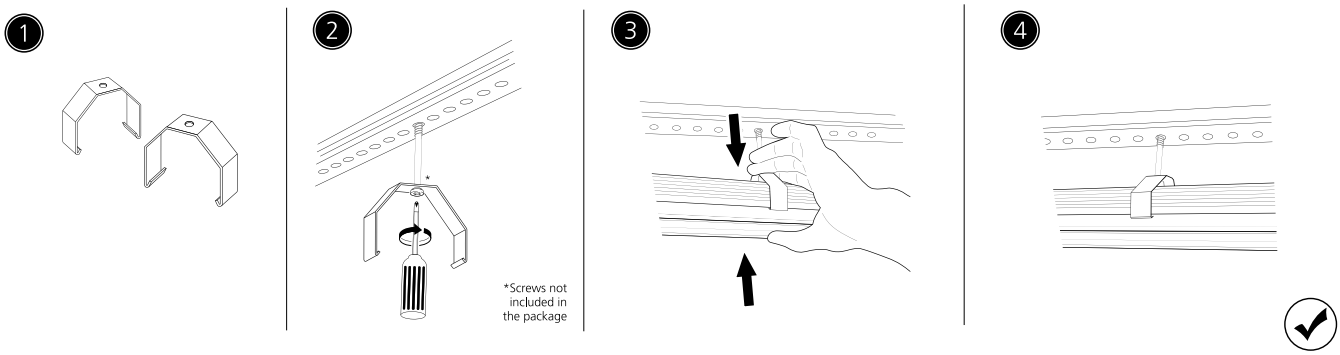
METHOD A (STANDARD HANGER)



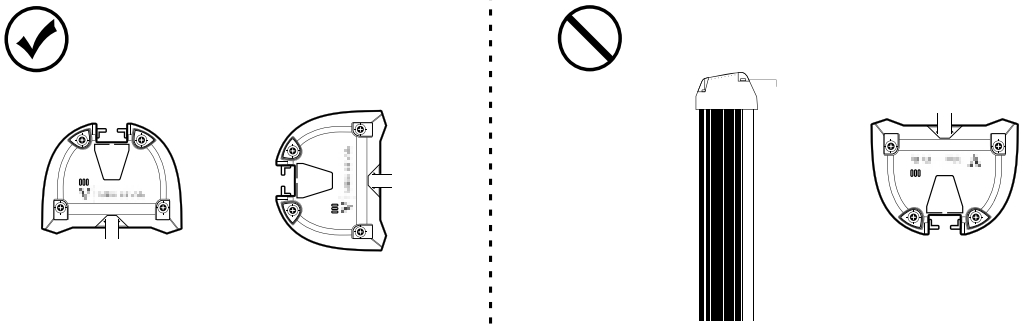
METHOD B (STANDARD HANGER)



METHOD C (OPTIONAL HANGER)

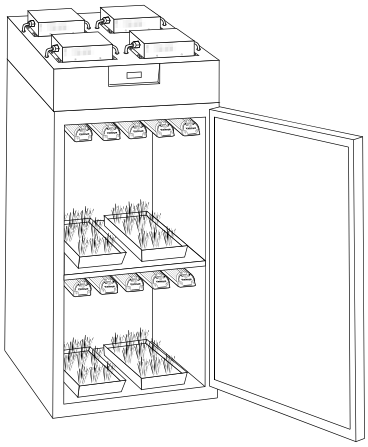


LUMINAIRE ORIENTATION

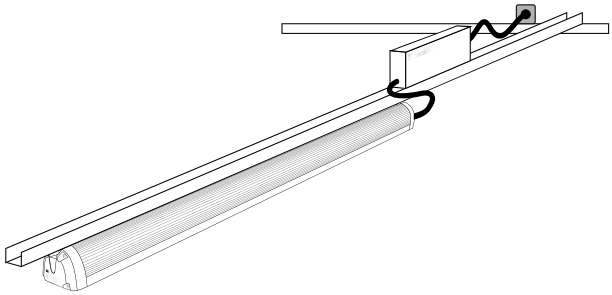


LED DRIVER PLACEMENT EXAMPLES

Install LED drivers against a flat surface to ensure optimal heat dissipation and operational lifetime.



LED drivers installed outside a growth chamber



LED driver installed next to the luminaire

WARNINGS

These photobiological safety markings are based on testing of the light output characteristic of a single horticultural luminaire. Increased exposure risk of facility personnel may be present depending upon the number of horticultural luminaires and their placement and/or positioning within the plant growth facility.

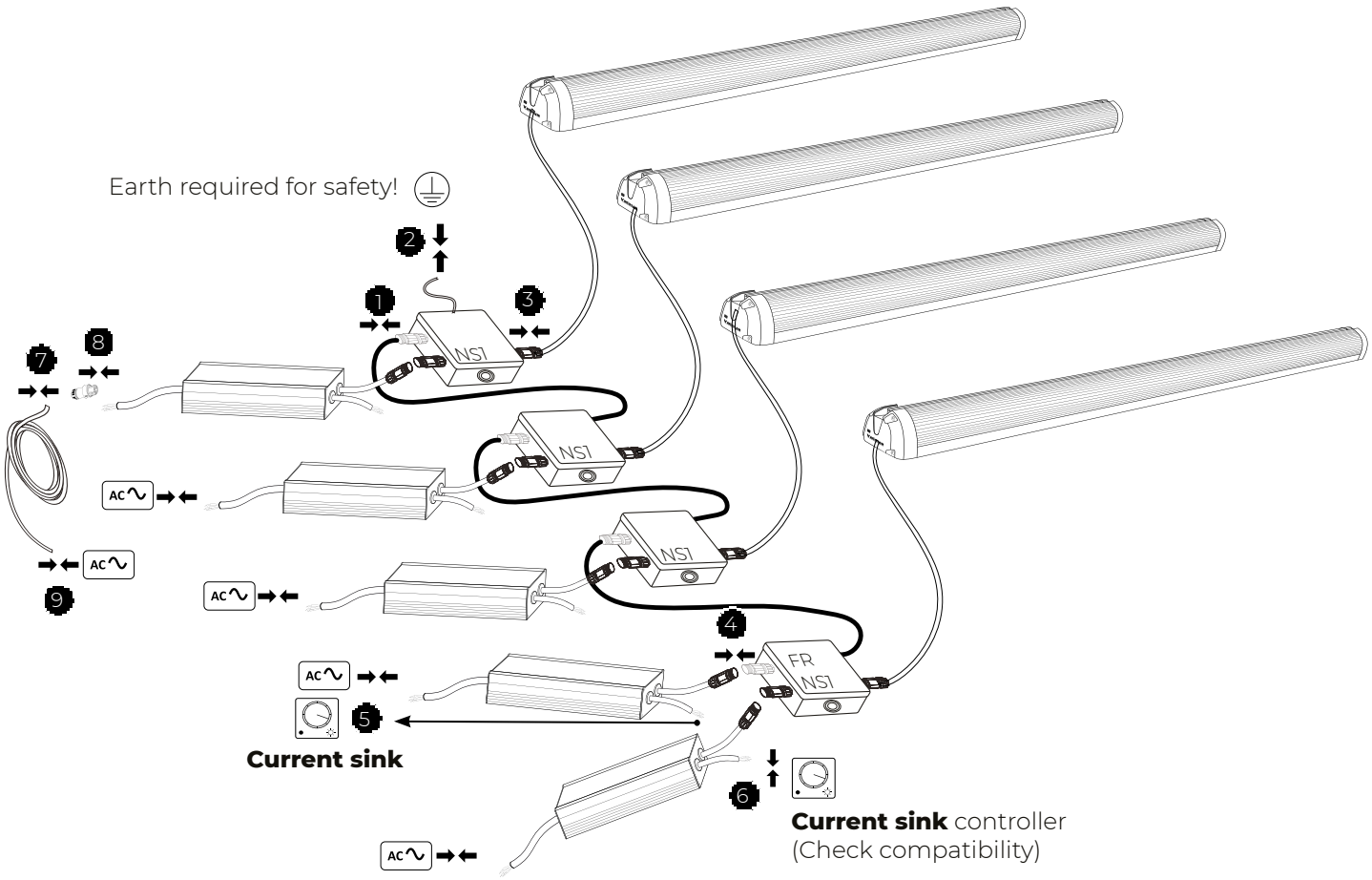
It is the responsibility of the plant growth facility to address these risks at the facility level and to ensure that people entering the plant growth areas while the lights are on, are aware of these risks and that appropriate safeguards are in place.

RISK GROUP 1

LUMINAIRE CONNECTION

LightDNA 2 channel luminaires can be connected in combinations of 2, 3 or 4 luminaires in conjunction junction boxes. There are individual LED drivers per luminaire for the NS1 spectral channels, and one LED driver per complete set-up for simultaneous control of all Far Red channels.

4 luminaire set-up

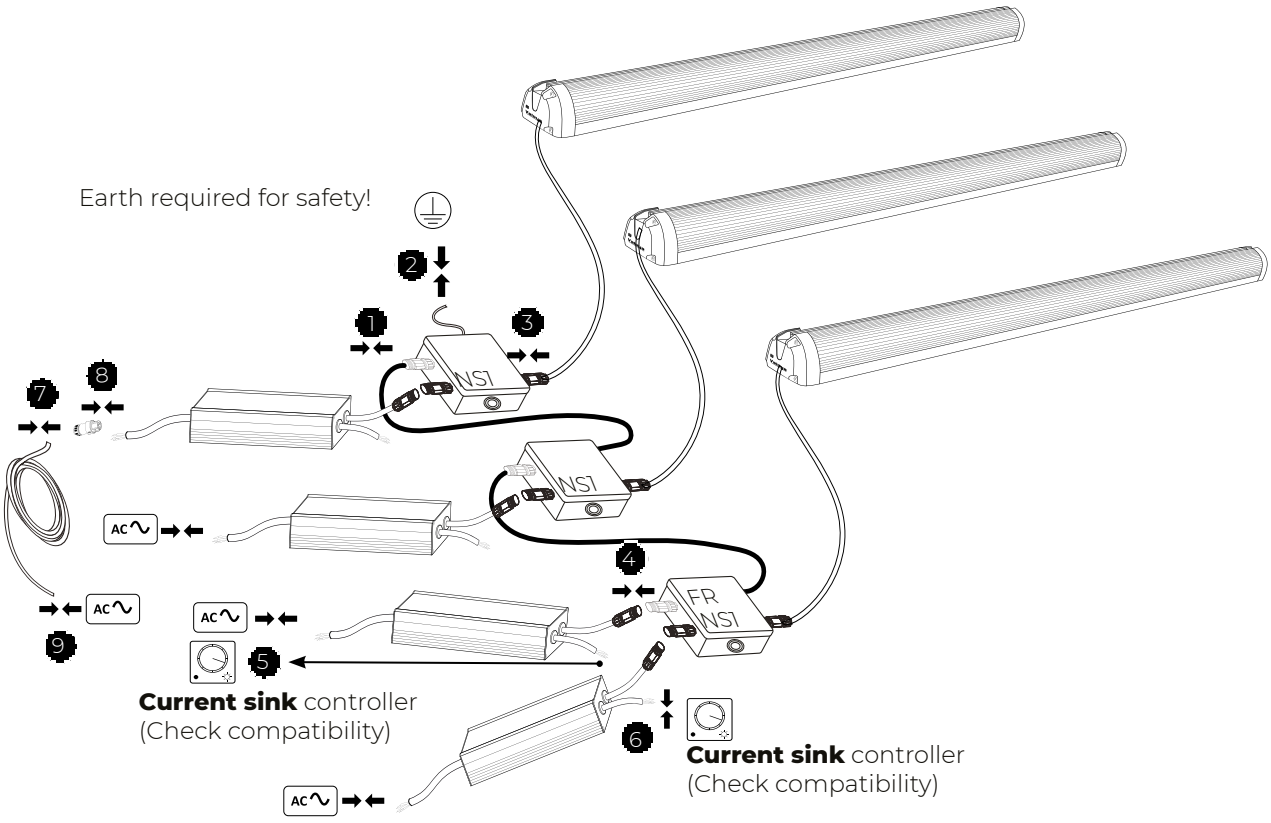


1. Connect all junction box Far Red (FR) channels together (Note that the termination junction box is last in the chain)
2. Connect all junction box earth wires to protective earth
3. Connect luminaires to junction boxes
4. Connect LED drivers to junction boxes (ensure that the correct LED driver is used for the Far Red connection)
5. Connect a compatible dimming controller to the Far Red LED driver
6. Connect a compatible dimming controller to the NS1 LED driver/s (Each NS1 LED driver can be controlled independently by separate controls, or connected together for common control from a single unit)
7. Connect a suitably rated mains cable to the Wieland mains connectors
8. Connect the Wieland connectors to the LED drivers
9. Connect to the mains supply

LUMINAIRE CONNECTION

LightDNA 2 channel luminaires can be connected in combinations of 2, 3 or 4 luminaires in conjunction junction boxes. There are individual LED drivers per luminaire for the NS1 spectral channels, and one LED driver per complete set-up for simultaneous control of all Far Red channels.

3 luminaire set-up



1. Connect all junction box Far Red (FR) channels together (Note that the termination junction box is last in the chain)
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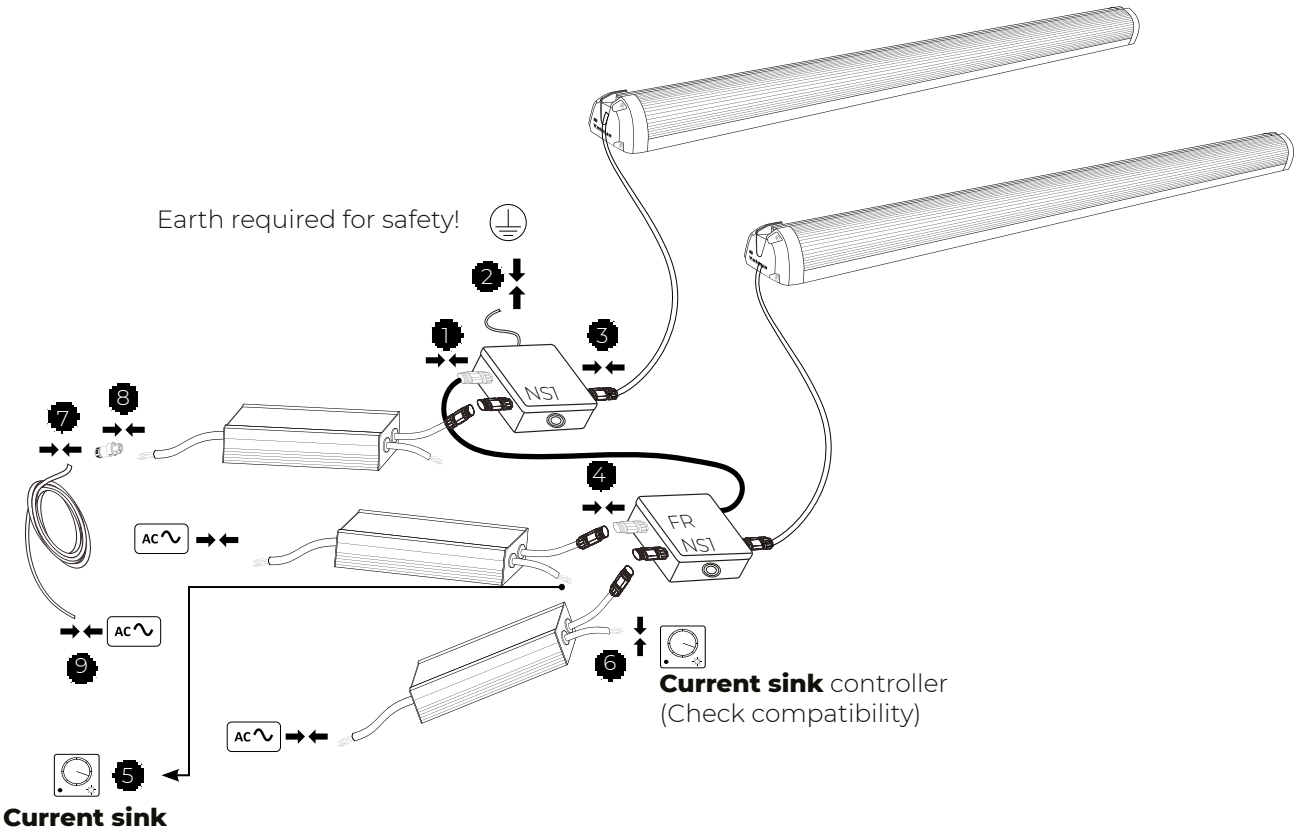
8. Connect the Wieland connectors to the LED drivers
9. Connect to the mains supply

LUMINAIRE CONNECTION

LightDNA 2 channel luminaires can be connected in combinations of 2, 3 or 4 luminaires in conjunction junction boxes. There are individual LED drivers per luminaire for the NS1 spectral channels, and one LED driver per complete set-up for simultaneous control of all Far Red channels.

2 luminaire set-up

NOTE: BX120 LightDNA 2 minimum mains input voltage 180VAC



LED DRIVER CHANNEL COMPATIBILITY INFORMATION

Please check the tables below to ensure the correct LED driver is connected to the correct connection of the junction box based on your system set-up

		LED DRIVER	
4-WAY LIGHTDNA-2			
BX120c3 LightDNA-2	NS1 channel LED driver	HLG-120H-C500B	4 pieces
	FR Channel LED driver	ELG-100-C500B	1 piece
BX180c3 LightDNA-2	NS1 channel LED driver	HLG-185H-C500B	4 pieces
	FR Channel LED driver	HLG-120H-C500B	1 piece
3-WAY LIGHTDNA-2			
BX120c3 LightDNA-2	NS1 channel LED driver	HLG-120H-C500B	3 pieces
	FR Channel LED driver	ELG-75-C500B-3Y	1 piece
BX180c3 LightDNA-2	NS1 channel LED driver	HLG-185H-C500B	3 pieces
	FR Channel LED driver	HLG-120H-C500B	1 piece
2-WAY LIGHTDNA-2			
BX120c3 LightDNA-2 *	NS1 channel LED driver	HLG-120H-C500B	2 pieces
	FR Channel LED driver	HVGC-65-500B	1 piece
BX180c3 LightDNA-2	NS1 channel LED driver	HLG-185H-C500B	2 pieces
	FR Channel LED driver	ELG-75-C500B-3Y	1 piece

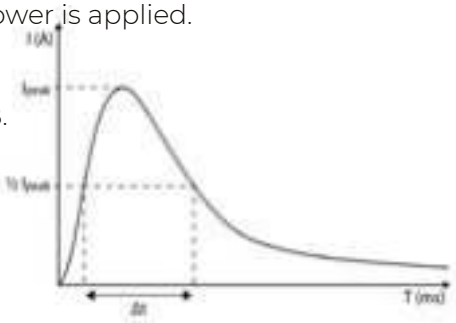
** Not suitable for supply voltages <180VAC*

INRUSH CURRENT

This is the initial current surge drawn during product start-up. Total inrush current rises as the circuit load increases and is one factor that can contribute to nuisance tripping of circuit breakers (MCB's). Practical performance will be affected by the MCB load, MCB tripping characteristics, site wiring impedance, and the angle of the AC mainscycle at the specific moment power is applied.

Nuisance tripping issues may be improved by:

- Reducing the quantity of LED drivers connected to a single MCB.
- Re-distributing the load over multiple mains phases.
- Using an MCB with Type C (EN 60898) tripping characteristics.
- Installing additional inrush current limiting devices.
- Installing a zero crossing relay for powering up the LED drivers.

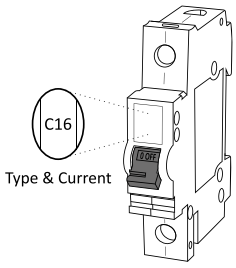


Example of a typical inrush current graph

MCBS (MINIATURE CIRCUIT BREAKERS)

Valoya only recommend using MCB's with "Type C" trip characteristics according to EN 60898.

The maximum quantity of Valoya products recommended for a 16A Type C MCB is stated on the product's technical specifications datasheet (e.g installation guide). This quantity is used as the 100% reference in the table below. The table is provided as a tool to enable calculation of the approximate maximum load for different MCB types and ratings. Installation wiring rating, impedances and mains switch-on angle variations may also influence the actual practical limit.



MCB example

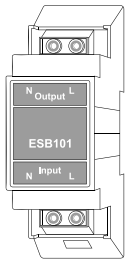
20A branch circuit is the maximum allowed per UL certification according to LED Drivers UL Conditions of Acceptability.

MCB TYPE	Rating (A)	Relative quantity (%)
B	10	37
	16	60
	20	75

MCB TYPE	Rating (A)	Relative quantity (%)
C	10	62
	16	**100 (Ref.)**
	20	125

ICL (INRUSH CURRENT LIMITER)

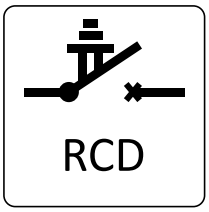
An ICL can help avoid nuisance MCB tripping and can be installed between the MCB and the load. It also enables an increase the luminaire quantity up to the maximum RMS current limit of the Inrush Current Limiter.



ICL example

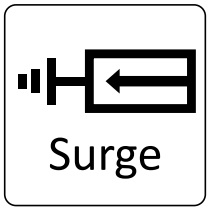
Electrical Recommendations

RCDS (RESIDUAL CURRENT DEVICES)



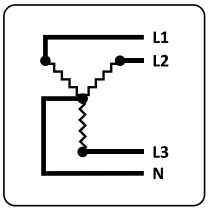
An RCD is a protective safety device used to automatically disconnect the electrical supply when an imbalance is detected between live conductors. Requirements for use, and the needed RCD rating, will vary depending on the type of installation. Valoya luminaires are designed to be installed in fixed electrical installations where no plug is permitted for connecting the luminaire to the mains supply.

SURGE PROTECTORS



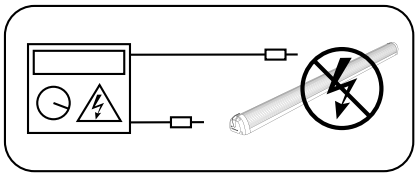
Valoya LED drivers have built-in surge protection. However, to protect against surge peaks above 4KV (e. g. Due to a lightning strike) we recommend the installation of transient voltage surge suppression.

3-PHASE SUPPLIES



- Do not apply power without the Neutral connected.
- Ensure the supply is off before disconnecting the Neutral.
- To avoid erratic dimming or possible product damage, do not connect the same dimmer or controller to luminaires supplied by different mains phases.

INSULATION RESISTANCE/ ELECTRIC STRENGTH TESTING

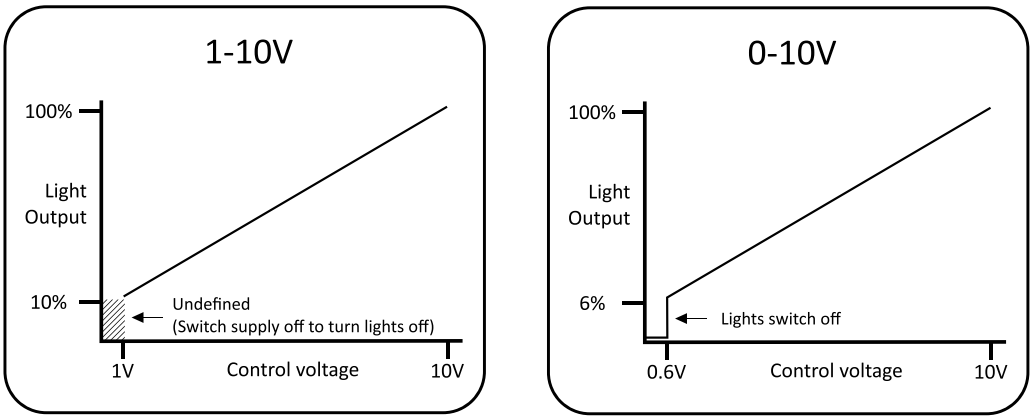


- Valoya products have been fully tested during manufacture. There is no need to test again.
- If the electrical site wiring must be tested, test with the luminaires and LED drivers disconnected from the mains supply.
- If luminaires and LED drivers are connected to the mains supply during the test, all Live phases and Neutral must be connected together before the test is carried out (Remember to check correct reconnection before reapplying the mains supply).

DIMMING METHODS

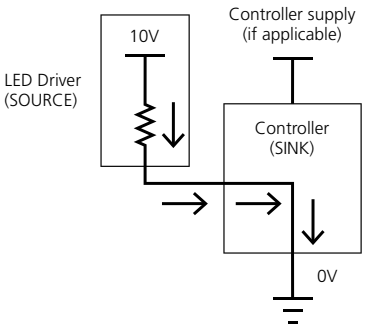
Differences in dimming methods exist depending on the LED driver (power unit) used by the Valoya luminaire.

- 1-10V: Minimum dimmed light output is approximately 10% (Spectra dependent). The mains supply to the driver must be switched in order to turn the light on & off.
- 0-10V: Minimum dimmed light output is approximately 6% (Spectra dependent). Below this the light output is off without the need for mains switching.



DIMMING CONTROL COMPATIBILITY

LED drivers used by Valoya comply with International standard for current sink controls; IEC 60929 Annex E. This specifies that the LED driver is a current source device. Compatible controls MUST be capable of sinking the current provided by the LED driver. Controls supplying a 10V signal ARE NOT compatible.



DIMMING POSSIBILITIES BY PRODUCT RANGE				
BX-Series	**BL-Series**	**L-Series**	**C-Series**	**RX-Series**
1-10V	-	-	0-10V	0-10V

DIMMING CONTROL COMPATIBILITY

Important considerations when choosing a controller

- Please check with you controller provider regarding the specification of the device.
- The number of luminaires possible to connect to a single control device will depend its specification, specifically:
  - The dimming method (1-10V or 0-10V).
  - The control circuit current sink capability.
  - Mains switch inrush current capacity.
- Dimming controls should only be connected to LED drivers on the same mains phase. Cross phase connection may lead to differing control circuitry electrical potentials, reduced dimming performance, or permanent damage to LED drivers

Due to variations in specifications, terminology and connections between different control device manufacturers, it is impossible to list all possible alternatives. The controller manufacturer will be able to verify that their product is a current sink device compatible with LED drivers designed according to IEC60929 Annex E.

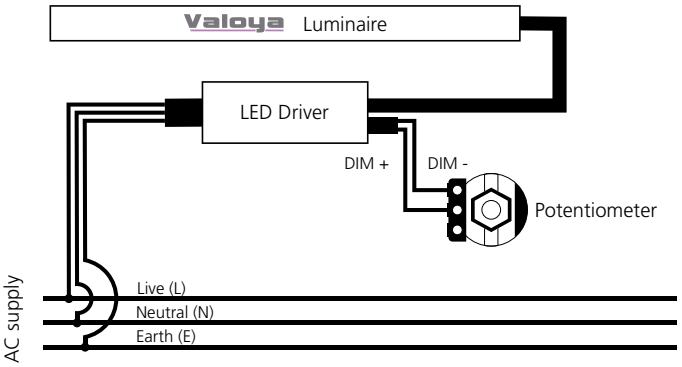
Examples of manufacturers of compatible control products/systems (some example products indicated).

MANUFACTURERS	WEBSITE	EXAMPLE PRODUCT
ABB	www.abb.com	1-10 V 2112UJ-214-510
Argus	www.arguscontrols.com	P1A
Dinuy	www.dinuy.com	RE EL5 002
Ever Shining Optotech Co., Ltd	www.esop-power.com	EC011
Helvar	www.helvar.com	140 (TK4)
Honeywell Peha	www.peha.de	D 430
Jung	www.lutron.com	Electronic potentiometer, 1-10 V
Lutron	www.jung.de	
Osram	www.osram.com	Dim MCU 1-10V
Philips	www.lighting.philips.com	UID8600/00 1-10V Dimmer
Priva	www.priva.com	
RAM	www.ram-group.com	
Siemens	www.siemens.com	5TC8424

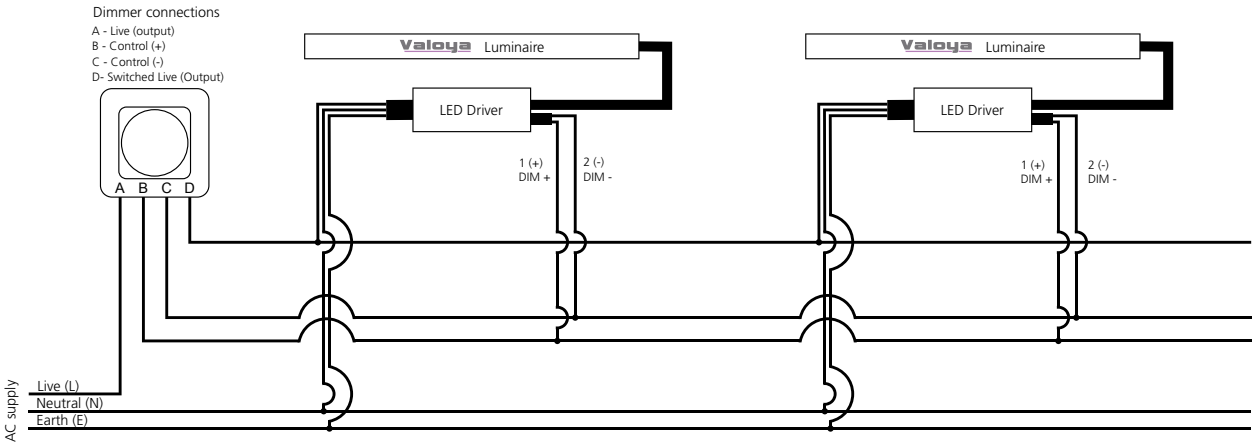
DIMMING CONNECTION EXAMPLES

Using a simple potentiometer (1-10V / 0-10V)

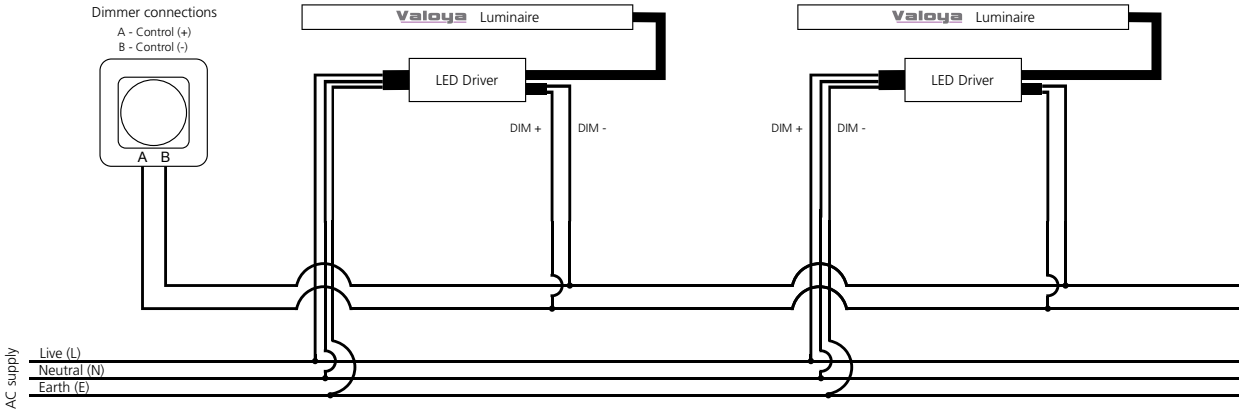
One LED driver can be connected to a standard 100KOhm potentiometer. Note that connection of multiple LED drivers to one 100KOhm potentiometer is not recommended due to possibilities for erratic dimming performance



Using a compatible current sink 1-10V dimmer

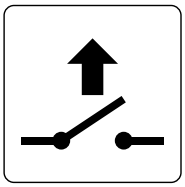


Using a compatible current sink 0-10V dimmer

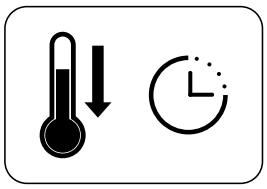


CLEANING

Switch the supply OFF



Allow to cool

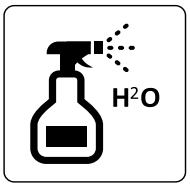


Do not use detergent

Clean with a soft brush

Wipe with soft clothes

IP67 rated products.
Suitable for spray cleaning with water



BASIC FAULT FINDING

Lighting faults can be due to a rare product defect, connection error, or other external issue. Faults are unlikely to affect both luminaire and the LED driver (power unit) together. If possible, please check if the issue is luminaire or LED driver related. This will speed problem resolution and minimize unnecessary shipping costs.

- Switch off the mains supply.
- Disconnect the luminaire from its LED driver.
- Connect the luminaire to an unpowered, working LED driver (if available).
- Connect the mains supply to the working LED driver.
- If the problem remains, then the luminaire may be damaged.
- If the luminaire now works, then the original LED driver, or mains supply to it may be at fault.
- Note details of the problem (product type, quantity, problem description...) and contact Valoya for further assistance.

If a problem reoccurs or affects many products at the same time, please contact Valoya **(www.valoya.com/support)** for further advice and assistance.

WARRANTY

Products are covered by a limited warranty. Warranty starts from date of installation, but latest 3 months from the delivery date.

The warranty offered is “Return-to-Base”, meaning suspected faulty items shall be returned to Valoya for fault and warranty validation before any repair or replacement can be agreed.

Valoya warrants that each Product will be free from defects in material and workmanship for the duration of the warranty period as long as the products are installed and used in accordance with our published specifications and recommendations.

Warranty shall be void in the event any repairs or alterations not duly authorized by Valoya in writing are made to the Product by any person.

CLAIMS

Before returning a suspected faulty item, please contact Valoya **(www.valoya.com/support)** to give details of the issue and obtain a Return Material Authorization (RMA) reference number. Please be prepared to provide the following information about the issue:

- Product model information (e.g. B200 NS1).
- Product serial number plus YF or XF code.
- Quantity showing problems.
- Detailed problem description.
- Photograph or video showing the issue (if possible).
- Installation / invoice date (if known).

After receiving an RMA number, Products should be suitably packed and the package or shipping paperwork clearly marked with the RMA number. Returns received without an RMA reference number may be rejected.

Valoya will inspect the returned items to validate fault and warranty validity. If Valoya determines to its satisfaction that warranty is valid, Valoya will repair or replace the Product with one of similar age. Where a warranty claim is justified, Valoya will pay for the return freight expenses for repaired or replaced items. Valoya reserve the right to invoice for returning Products that are not found to be defective, or do not comply with the terms of this warranty, together with associated freight, testing and handling costs.

*** Above is a summary of our warranty and claim policy. For full details please see: www.valoya.com/warranty.**

Standards applied (where applicable)**:**

EUROPE

EN60598-1: Luminaires. General requirements and tests.
EN60598-2-1: Luminaires. Part 2: Particular requirements. Section one – Fixed general purpose luminaires.
EN62031: LED modules for general lighting. Safety specifications.
EN 62493: Assessment of lighting equipment related to human exposure to electromagnetic fields.
EN55015: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
EN61547: Equipment for general lighting purposes. EMC immunity requirements.
EN61000-3-2: Electromagnetic compatibility - Limits - Limits for harmonic current emissions.
EN61000-3-3: Electromagnetic compatibility – Limits - Limits for Voltage Fluctuations and Flicker.
IEC EN 61000-4-2: Electromagnetic compatibility (EMC)- Part 4-2: Testing and measurement techniques - electrostatic discharge immunity test.
IEC EN 61000-4-3: Electromagnetic compatibility (EMC)- Part 4-3: Testing and measurement techniques - radiated, radio-frequency, electromagnetic field immunity test.
IEC EN 61000-4-4: Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test.
IEC EN 61000-4-5: Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test.
IEC EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.
IEC EN 61000-4-8: Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test.
IEC EN 61000-4-11: Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.
IEC 61347-2-13: Lamp controlgear. Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules.
IEC 61347-1: Lamp controlgear - Part 1: General and safety requirements.
IEC 62384: DC or AC supplied electronic control gear for LED modules. Performance requirements.
EN62471: Photobiological safety of lamps and lamp systems.
EN62560: Self-ballasted LED-lamps for general lighting services by voltage >50V - Safety specifications.
EN62776: Double-capped LED lamps designed to retrofit linear fluorescent lamps - Safety specifications.

NORTH AMERICA

UL1598: Luminare safety.
UL8750: Light Emitting Diode (LED) equipment for use In lighting products.
UL2108: Standard for Low Voltage Lighting Systems.
UL 8800: Outline of Investigation for Horticultural Lighting Equipment
CSA C22.2: #9.0: General Requirements for Luminaires.
CSA C22.2: #250.0.8: Safety for Light emitting diode (LED) equipment for lighting applications.
CSA C22.2 No. 250.13-14: Light Emitting Diode (LED) equipment for use in lighting products.

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