Constant current LEDs are to be wired in **SERIES** and require a **MINIMUM** and maximum number of fixtures connected to a driver as indicated on the following page.

POWERING or TESTING less than the MINIMUM number of fixtures per driver OR connecting fixtures with the driver live OR wiring them in parallel will IMMEDIATELY and PERMANENTLY DESTROY the LEDs.

Carefully read instructions prior to installation and testing.

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tools for lighting

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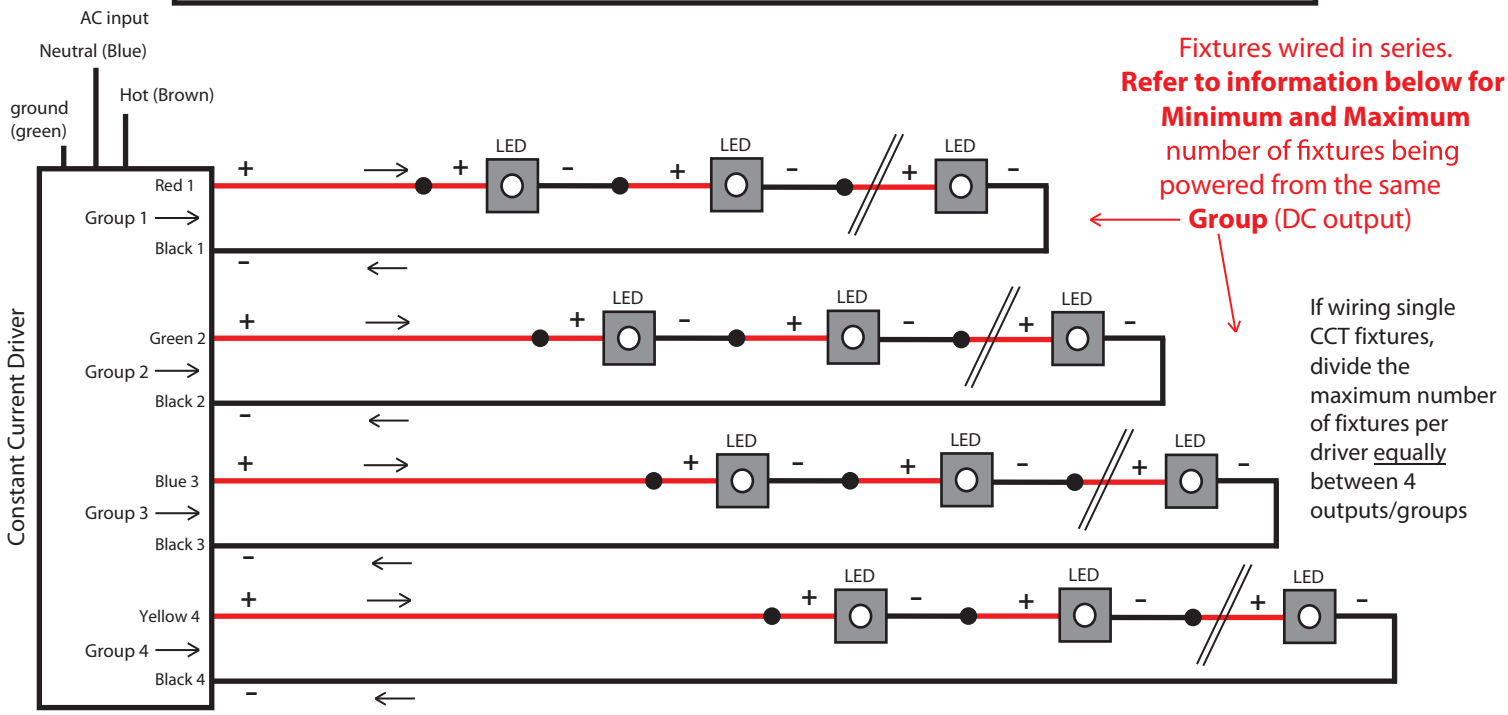
Constant Current drivers

Wiring Key Points

1. This product shall be installed by a qualified electrician.
2. Make sure the main power supply to the driver is turned off when wiring either the LEDs or driver.
3. LEDs shall be wired in series as shown in wiring diagram. CAUTION: parallel wiring will damage LEDs.
4. Wire shall be 18 awg stranded minimum. Large gauge wire shall be used to limit voltage drop in order to maintain the proper operating voltage. Take every precaution to avoid interferance from other electrical circuits and equipment.
5. Dimming circuits are more sensitive to voltage drop and electrical interference from other electrical sources.
6. Isolating LED wiring by dedicated circuit for each control zone is recommended.
7. Contractor shall verify the fixture quantities connected to the driver are compatible with the driver's specifications prior to energizing the circuit.
8. All Class II power cable remote wiring and driver enclosures by others.

LED's can be permanently damaged if these points are not followed



Driver	AC Input	Dimming		Maximum number of RGB/ RGBW fixtures	Maximum number of single CCT fixtures	Current setting (mA)
PW0562S1	120/277V	DMX	Group 1: Group 2: Group 3: Group 4:	1		

Please note: Dimming/control wiring not shown in the diagram above.

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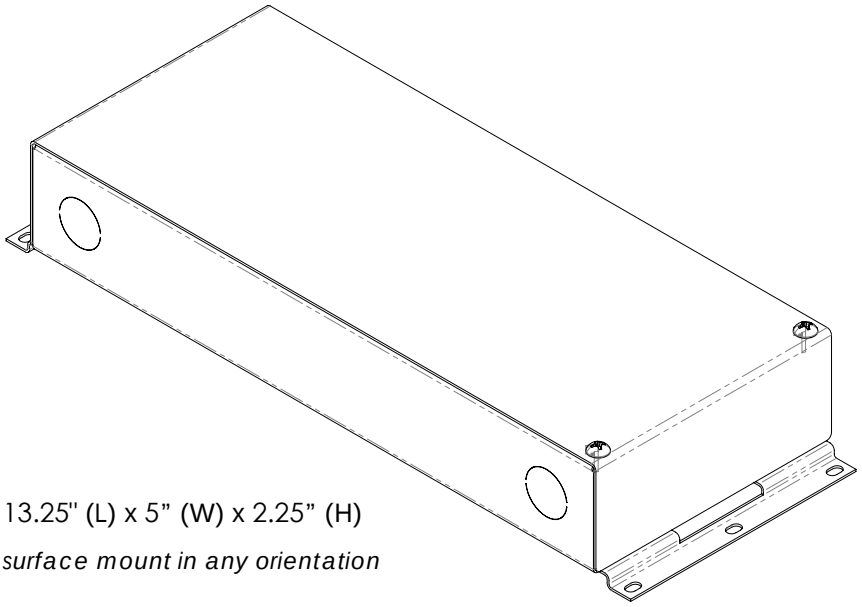
Project:	Type:	Date:
Manufacturer: LINEALIGHT	Fixture:	Page: 2 OF 18

Dry Location Enclosure



13.25'' (L) x 5” (W) x 2.25” (H)

surface mount in any orientation

Maximum Wiring Distance Guide*

Wire Gauge	Maximum Lead Length
18	72 ft (22 m)
16	118 ft (36 m)
14	150 ft (46 m)
12	200 ft (61 m)

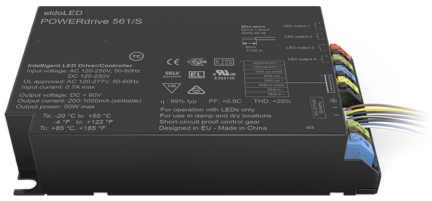
*Actual distance must be calculated by installer. Must comply with NEC code.

50W DMX/RDM Full-Colour (RGBW) Dimmable LED Driver

POWERdrive

POWERdrive's dynamic response can be tuned to fit any content - from exceptionally smooth fades in architecture to fast-paced video in entertainment. This constant current LED driver is DMX/RDM compatible, and allows you to create your colour or dynamic show without an external controller. Symbiosis ensures the LED driver works seamlessly together with LED modules, controls and intelligent luminaire elements.

Product offering



POWERdrive 561/S

Part number P/N	PW0561S1
Product description	POWERdrive AC, 50W, DMX/RDM, 4 control channels, constant current, 4x 55V outputs, square metal
P/N: WH0081S1	Wiring harness, 8pin Molex DMX, POWERdrive 561/S or 561/A **(Included)**

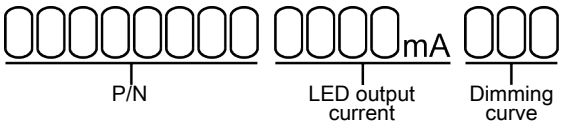
Programming tools (Not Included)

Programming interface	TOOLbox pro (TLU20504)
Programming cable set	TOOLbox pro to LED driver, programming cable, 5pcs (TLC03051)
Programming software	FluxTool

Warranty

Warranty period	General Terms and Conditions

Order number configurator



P/N	LED driver part number.
LED output current	Enter value in 10mA increments, e.g. “0260”, “1010”, etc.
Dimming curve	"LOG" for logarithmic (default) "LIN" for linear "SQU" for square
Note: Wiring harness (accessory)	WH0081S1 is the ready-made counterpart for the molex connector on the POWERdrive 561/S and 561/A.

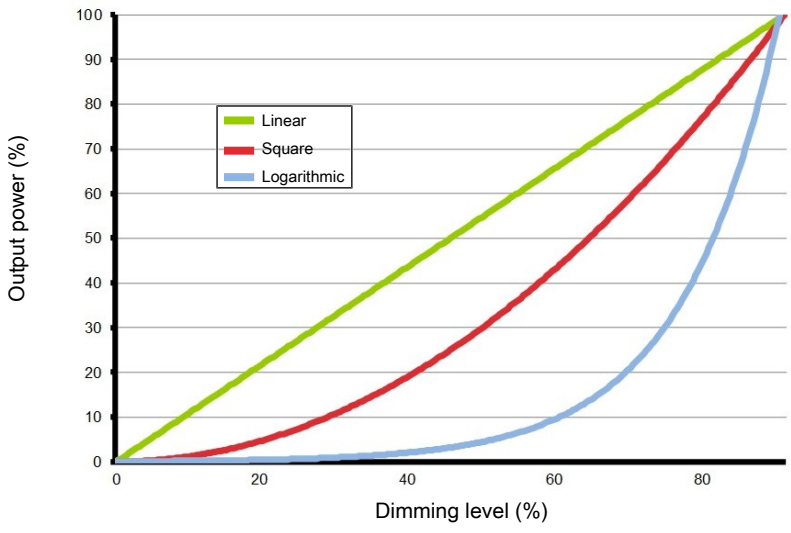
Input characteristics

Nominal input voltage range AC	120 - 250V (ENEC), 120 - 277V (UL)
Nominal input voltage range DC	120 - 250V
Maximum input current	0.7A @ 120V / 60Hz
Input frequency range	50 - 60Hz
Efficiency at full load	89%
Power factor at full load	>0.9
THD at full load	<20%
Maximum inrush current	- @ 120V / 60Hz
Surge protection	1kV differential mode (DM) 2kV common mode (CM)
Maximum standby power	<0.5W

Output characteristics

Maximum LED output power	50W
Number of LED outputs	4 (UL Class 2)
Programmable LED output current range	200 - 1050mA
LED output type	programmable in 10mA steps via DMX terminal and FluxTool
LED output current tolerance	+/- 5% at programmed LED output current
LED output voltage range	2 - 55V

Control characteristics

Control channels	4
Control protocol	DMX/RDM
Dimming range	100% - 0.1%
Dimming curve options	Logarithmic (default) Linear Square
Dimming method	Hybrid HydraDrive
Dimming curves	

Environmental conditions

Operating ambient temperature (Ta) range	-20 ºC to +50 ºC
Maximum operating case temperature (Tc max)	85 ºC

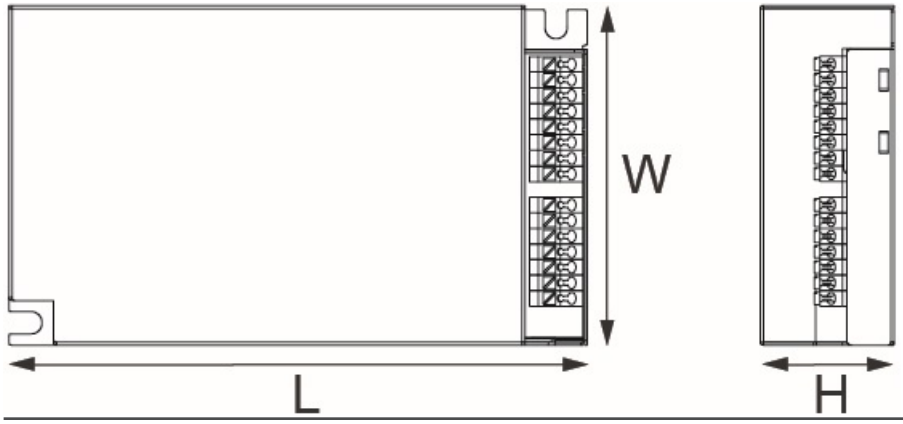
LED driver protection

Thermal	The LED output current is decreased whenever the internal LED driver temperature exceeds factory preset temperature. The LED output current is increased again once the internal LED driver temperature drops below this internal temperature threshold. If the internal LED driver temperature continues to increase, despite a decrease in output current, the LED driver will shut down.
LED output short circuit	The LED output current is cut off whenever the LED driver detects a short-circuit. The LED driver will attempt a restart every 400ms after a short-circuit is detected.
LED output overload	The LED driver decreases the LED output current sequentially, until it reaches its maximum rated power, whenever a load that exceeds the LED driver's maximum rated power is connected to the LED output.
Reverse polarity	The LED driver will not yield any current if the polarity of the load on the LED output is reversed. This situation will not damage the LED driver but may damage the LED load.

LED protection

Thermal protection LED	An external NTC thermistor, which is placed on a PCB near the LEDs, can be connected to the driver via the LEDcode/NTC terminals. The output current to the LEDs is then decreased by 75% whenever the NTC exceeds a maximum allowable temperature, which is specified by the user in the FluxTool software. The default NTC temperature limit is set to 70 °C.
Thermistor value	47kΩ
Suitable thermistors	leaded: Vishay, P/N 238164063473 screw: Vishay, P/N NTCASCWE3473J

LED driver mechanical details

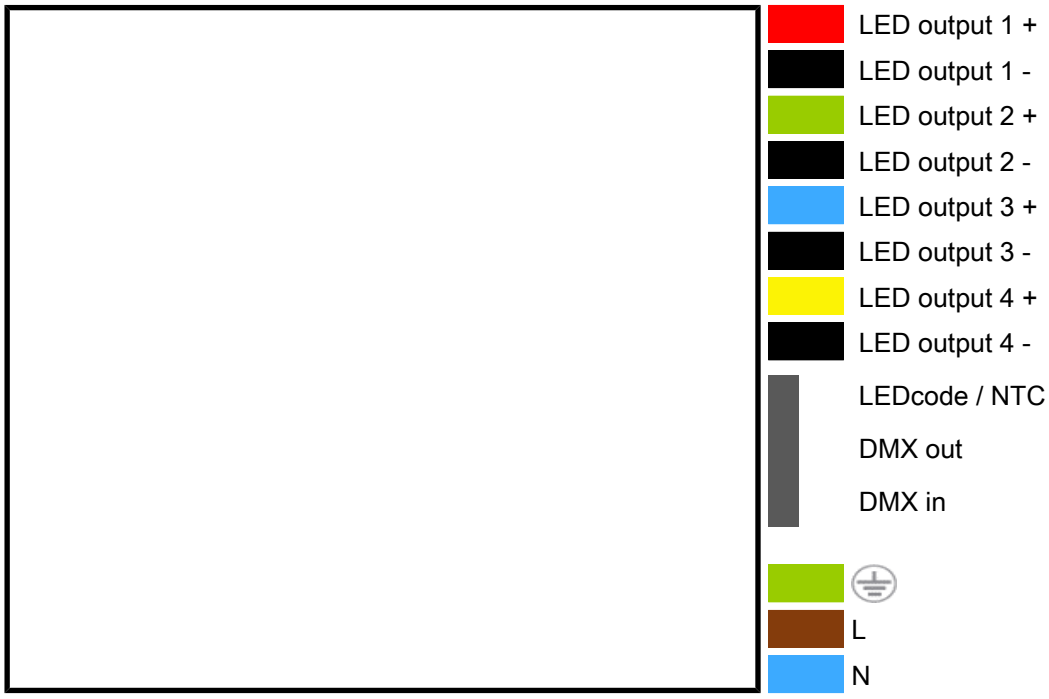


Length (L)	typical: 130 mm / 5.12 in
Width (W)	typical: 76 mm / 2.99 in
Height (H)	typical: 30 mm / 1.18 in
Weight	350 g

Packaging

Products per box	6, 10 or 45 pcs

Connector layout



Wiring Specifications

Wire Type	AWG 20-16, 0.5-1.5mm² solid or stranded copper
Wire strip length	9mm / 0.35in
WH0081S1 wire colors	LEDcode/NTC: brown (-), yellow (+) DMX out: black (shield), black-blue (-), black-white (+) DMX in: black (shield), blue (-), white (+)

Automatic circuit breakers (MCB)

Maximum loading	MCB type	B10	B13	B16	C10	C13	C16
	Number of LED drivers	14	18	22	14	18	22

Calibrated start-up procedure

For optimized DMX dimming performance.	While switching the mains input voltage, the DMX signal to the LED driver needs to be at 100% (255). Unused or open LED outputs of the driver need to be disabled. This can be achieved by programming the driver with the eldoLED Fluxtool software. In the “Setup – Control menu”, select “Group scaling” for each unused or open LED output and change the actual value to ‘0’, and write into the driver. For all LED outputs in use, change the value to ‘255’.

Standards and compliance

UL, recognized component	UL 1310 UL 8750 (Class 2 output)
ENEC safety	EN 61347-1 EN 61347-2-13 (Emergency lighting)
ENEC performance	EN 62384
Conducted emissions	EN 55015
Radiated emissions	EN 55015
Radio disturbance characteristics	EN 55022
Harmonic current emissions	EN 61000-3-2
Electromagnetic immunity	EN 61547
DMX	E1.11 – 2008, USITT DMX512-A ANSI E1.20
FCC	Meets FCC Title 47 CFR Part 15 class A if the following conditions are met: 277Vac: If ≤ 1050mA (assuming loads on 1, 2, 3, or 4 LED outputs) 120Vac: If ≤ 1050mA (assuming loads on 1 or 2 LED outputs) 120Vac: If ≤ 900mA (assuming loads on 3 LED outputs) 120Vac: If ≤ 700mA (assuming loads on 4 LED outputs) For conditions outside these limits, please contact eldoLED.
Restriction of hazardous substances	RoHS3 (Directives 2011/65/EU-2015/863/EU)

Certifications

E333135

Safety

	Risk of electrical shock. May result in serious injury or death. Disconnect power before servicing or installing.
	The LED driver may only be connected and installed by a qualified electrician. All applicable regulations, legislation, and building codes must be observed. Incorrect installation of the LED driver can cause irreparable damage to the LED driver and the connected LEDs. Pay attention when connecting the LEDs: polarity reversal results in no light output and often damages the LEDs.
	LED drivers are designed and intended to operate LED loads only. Powering non-LED loads may push the LED driver outside its specified design limits and is, therefore, not covered by any warranty.
	eldoLED products are designed to meet the performance specifications as outlined at certain operating conditions in the data sheet. It is the responsibility of the fixture manufacturer to test and validate the design and operation of the system under expected and potential use cases, including faults.
	Please observe voltage drop over long cable lengths. Longer cable lengths increase EMI susceptibility.
	Product renderings and dimensional drawings are generic for the housing type. Product label, connector type and quantity may vary.

Europe, Rest of World

eldoLED B.V.
Science Park Eindhoven 5125
5692 ED Son
The Netherlands

E: info@eldoled.com
W: www.eldoled.com

North America

eldoLED America
One Lithonia Way
Conyers, GA 30012
USA

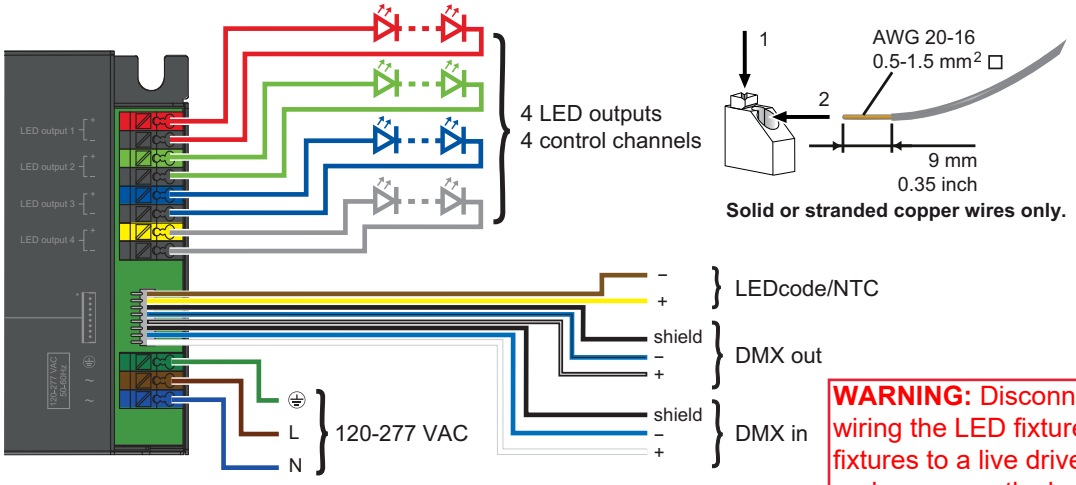
E: info@eldoled.com
W: www.eldoled.com

eldoLED

your product | *our drive*

Wiring diagram POWERdrive 561/S, 561/A (PW0561S1, PW0561A1)

Pay attention when connecting the LED groups:
polarity reversal results in no light output and often damages the LEDs



WARNING: Disconnect power before wiring the LED fixtures. Connecting the fixtures to a live driver will immediately and permanently damage the LEDs

WARNING: Risk of electrical shock. May result in serious injury or death. Disconnect power before servicing or installing.

CAUTION: The device may only be connected and installed by a qualified electrician. All applicable regulations, legislation and building codes must be observed. Incorrect installation of the device can cause irreparable damage to the device and the connected LEDs.

LED outputs

R(ed) represents channel 1, G(reen) represents channel 2, B(lue) represents channel 3, and W(hite) represents channel 4. The default group colour allocation can be changed using the TOOLbox pro and freely available FluxTool application.

Maximum wiring distance at full load (from LED driver to LED load):

AWG value	20	19	18	17	16
Distance (m)	14	18	22	28	36
Distance (ft)	46	59	72	92	118

Please observe voltage drop over long cable lengths.

Longer cable lengths increase EMI susceptibility.

For POWERdrive 561/A it is recommended to use shielded multi-core wires between LED driver and LED engine. Properly connect shield to ground on both sides.

LEDcode/NTC

The LEDcode/NTC interface allows connection of a 47kΩ NTC thermistor for closed loop thermal control. The NTC throttle temperature is programmable through the freely available FluxTool software (see “Configuring your driver over DMX in”).

DMX in/DMX out

Connect the network cable’s DMX+, DMX- and DMX shielding wires to the corresponding pin or wire on the LED driver.
For LED drivers that feature the WH0081S1 wiring harness, the wire colors on the harness and corresponding colors in a CAT 5 cable are listed in the following table.

	Wiring harness	**CAT5 cable**
DMX out shield	black	brown
DMX out -	black/blue	orange
DMX out +	black/white	orange/white
DMX in shield	black	brown
DMX in -	blue	orange
DMX in +	white	orange/white

The WH0081S1 wiring harness (for LEDcode/NTC/DMX out and DMX in) is included.

Alternatively, if you wish to use a proprietary solution, the following molex parts should be used: 1x wire-to-board housing 87439-0800 and 8x crimp terminal 87421-0000.

Configuring your driver over DMX in

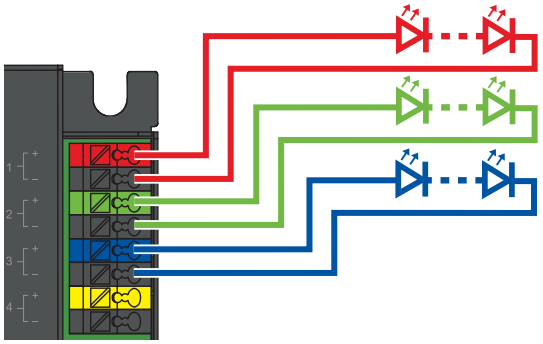
Download the FluxTool software from your eldoLED driver’s product web page and connect a TOOLbox pro to DMX in to configure your driver. You can configure:

- various DMX parameters
- dimming curve
- minimum dimming level
- NTC throttle temperature
- LED drive current per output, from 200mA-1,050mA in 1mA steps

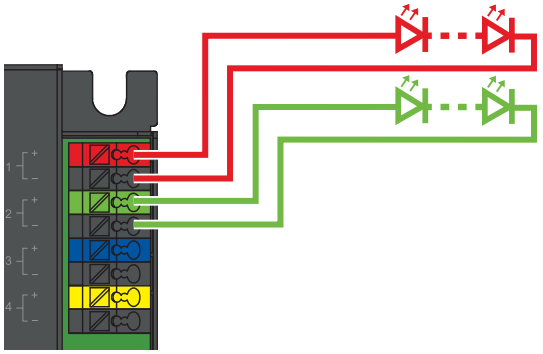
120-277V AC

The driver has been designed for use with universal mains voltage input (120-277V AC, 50/60Hz), and for use with DC input (120-250V, as used in emergency lighting).

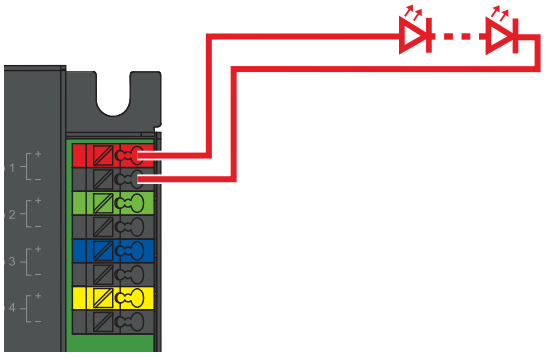
Connecting 3 LED groups



Connecting 2 LED groups



Connecting 1 LED group



How to wire DMX/RDM lighting systems

DMX/RDM is a robust and reliable system for lighting control. However, if not implemented correctly, problems can arise such as random flashing of lights, erratic operation and delays in responding to commands. This document explains the best practices in DMX wiring.

Below, a typical DMX universe is shown. The DMX controller sends signals over the DMX cable to the drivers. At the last driver, the cable has to be terminated with a 120Ω resistor to prevent reflections of the signal.

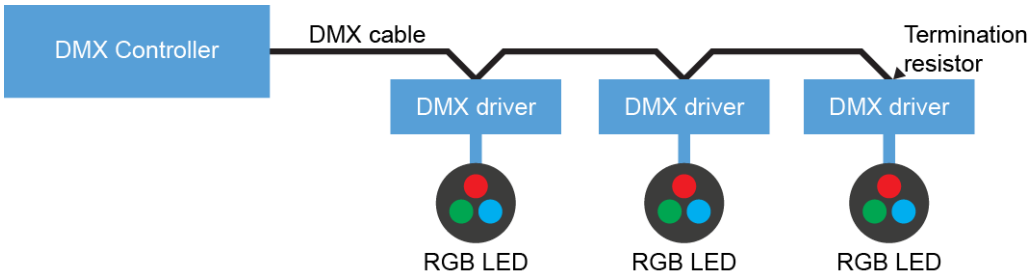


Figure 1 – Typical DMX universe

Important things to consider are:

- DMX is a three-wire system. Use all three!
- DMX is based on the EIA-485/RS-485 standard.
- Always use cable specifically designed for DMX / RS-485. These cables have an impedance of 120Ω and a low capacitance. For instance: Belden 9841 or 3105a.

Figure 2 – Belden 9841 cable

- DMX must be terminated with a 120Ω resistor to prevent reflections.
- A daisy chain topology should be used.
- After 32 unit loads a repeater/booster should be used.
- Keep cabling below 300 metres between the controller and the last driver.
- It is generally considered good practice to provide separate DMX in and DMX out/DMX thru connections to your fixture to aid in installation. This can be in the form of pigtails, RJ-45 connectors or 5-pin XLR-connectors.

Connecting the cable on eldoLED drivers with ‘DMX in’ terminals only

Drivers with only one set of DMX terminals (DMX in +, DMX in -, and DMX in shield) use a standard DMX bus topology (daisy chain). At the last driver, a 120Ω resistor must be connected between the DMX in + and DMX in - pins of the driver as termination. This method is compatible with RDM.

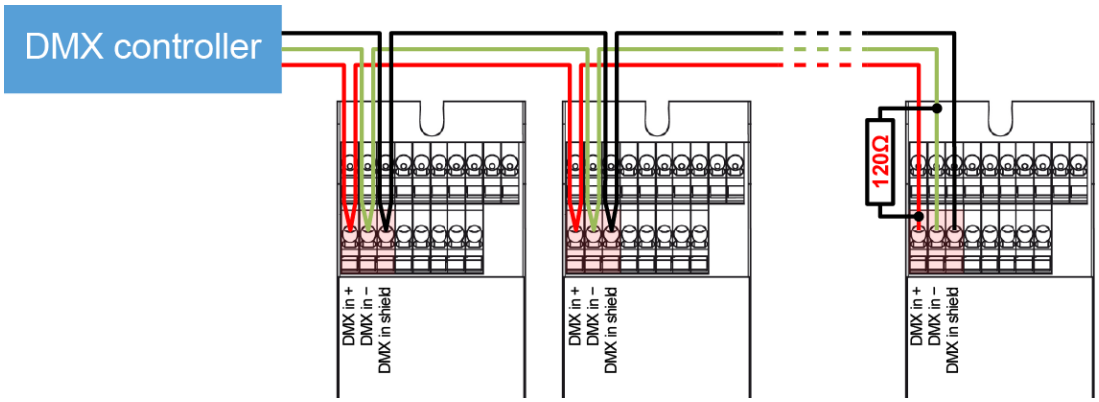


Figure 3 – Daisy chain topology with ‘DMX in’ only

Connecting the cable on eldoLED drivers with ‘DMX in’ and ‘DMX thru’ terminals

Some eldoLED drivers have an extra set of DMX terminals (DMX thru +, DMX thru - and DMX thru shield) in addition to the ‘DMX in’ terminals to make installation easier. Internally, these ‘thru’ terminals are electrically connected to the ‘DMX in’ terminals. These drivers also use standard DMX bus topology (daisy chain). The ‘DMX thru’ connections are compatible with RDM.

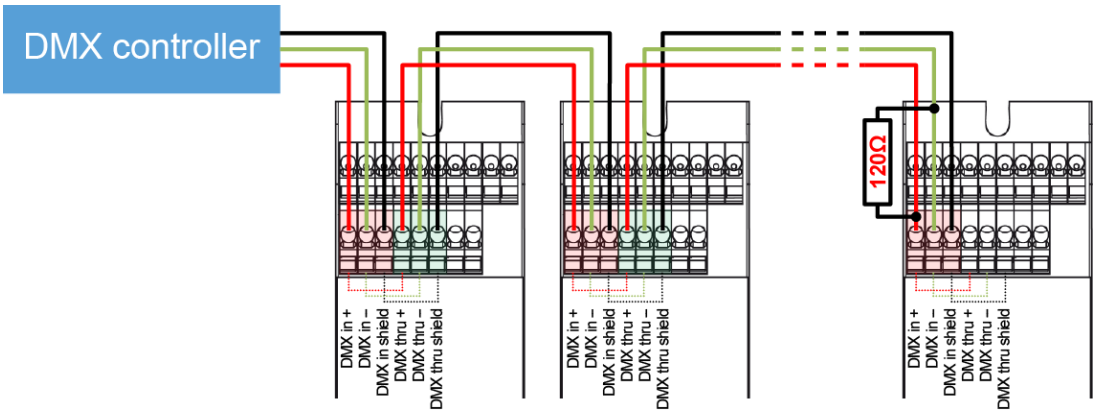


Figure 4 – Daisy chain topology with ‘DMX in’ and ‘DMX thru’

Connecting the cable on eldoLED drivers with ‘DMX in’ and ‘DMX out’ terminals

Drivers with ‘DMX out’ terminals (DMX out +, DMX out - and DMX out shield) in addition to the ‘DMX in’ terminals provide a buffered DMX out signal. These drivers offer additional functionality on top of standard DMX. On some products ‘DMX out’ is called LEDsync.

- DMX out acts as a built-in booster or repeater, so no additional repeaters or boosters are necessary after 32 drivers.
- DMX out provides automatic driver addressing possibilities.
- With DMX out, it is possible to have mixed topologies instead of daisy chain only.
- Only the first driver on the ‘DMX out’-chain (master) is visible on RDM – slaves behind are not visible. If RDM is required, use the ‘DMX in’ terminals instead of ‘DMX out’.
- Each DMX out adds a delay of approximately 300µs. After 75 drivers, this delay will be visible.

- The maximum available DMX address is 480; DMX addresses 481 – 512 are reserved for ‘DMX out’-features.
- If one driver in the chain fails, devices behind the failing driver will stop receiving DMX signals.
- Drivers without ‘DMX out’-terminals or third party drivers should be first in the DMX chain, they cannot be connected behind drivers with ‘DMX out’.

Termination with DMX out

With drivers that have DMX out terminals extra care should be taken with termination, depending of the configuration. In short: termination is necessary after each cable run, but not at any T/Y-connections. Some examples:

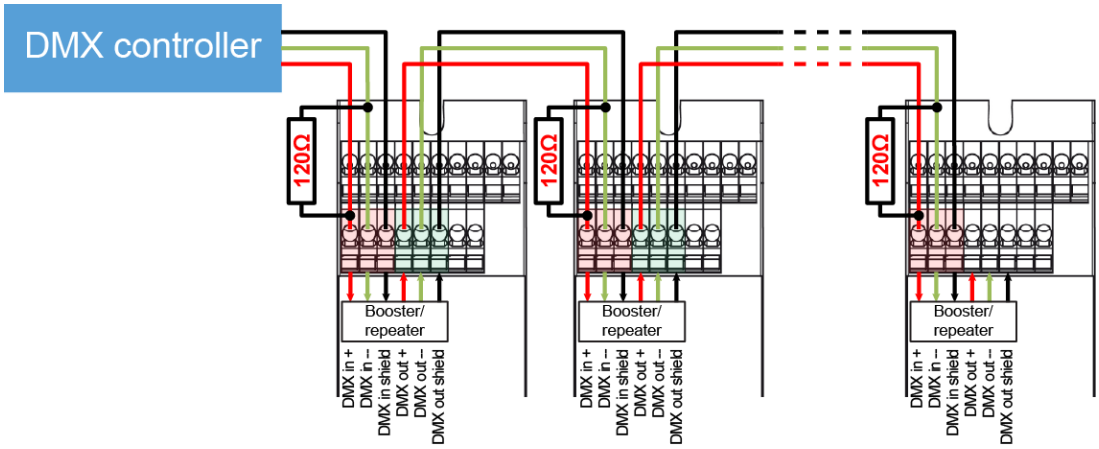


Figure 5 – Termination on each cable run

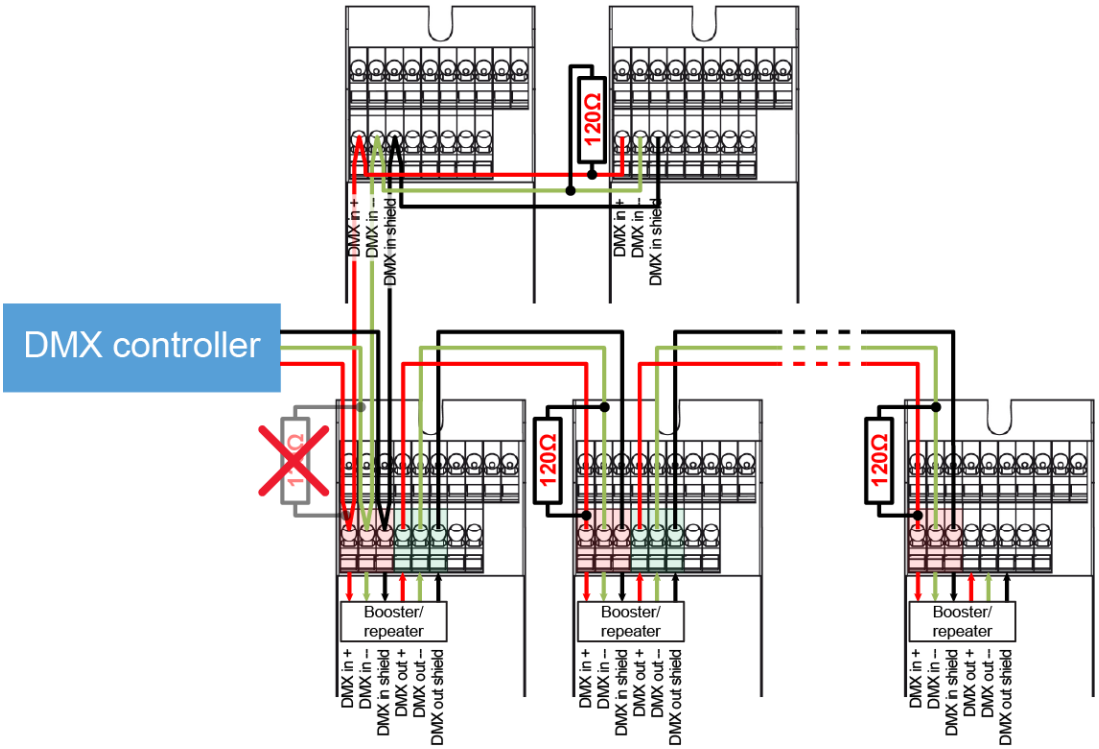


Figure 6 Mixed topology with daisy chain and DMX out

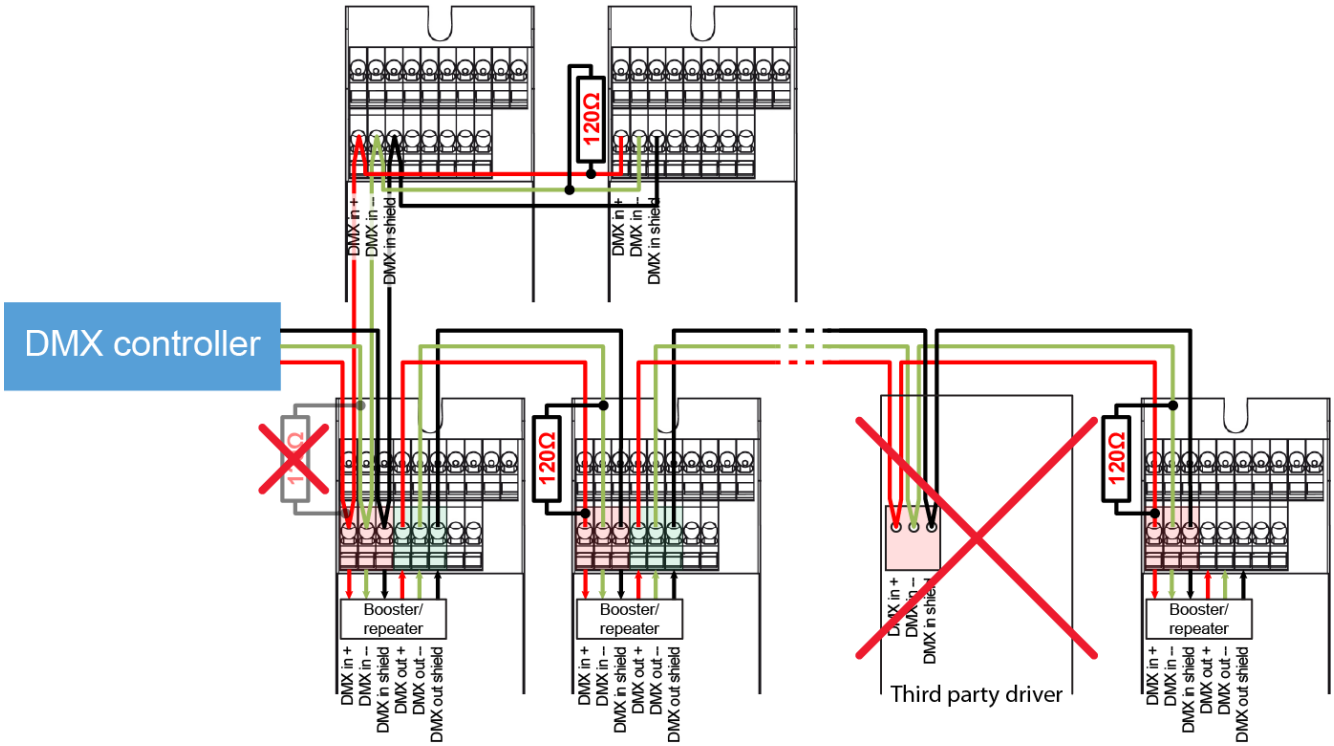


Figure 7 – It is not possible to have third party drivers in the DMX out-chain

Why choosing the right cable is important

External disturbances

DMX is a balanced three wire system. Two wires carry the data signals and one wire acts as common reference. The advantage of a balanced system is that external disturbance signals (EMI or electromagnetic interference) can easily be reduced. Both signal lines in a balanced system carry the same signals with opposite polarity which are subtracted from each other at the receiver (driver).

DMX cables should have twisted pair conductors. This means that each pair of wires in the cable are twisted together. This ensures that any external disturbance signal will occur equally on both signal wires (DMX in + and DMX in -). Since the receiver subtracts signals on both wires, the equal disturbance signals will also be subtracted from each other and are cancelled out.

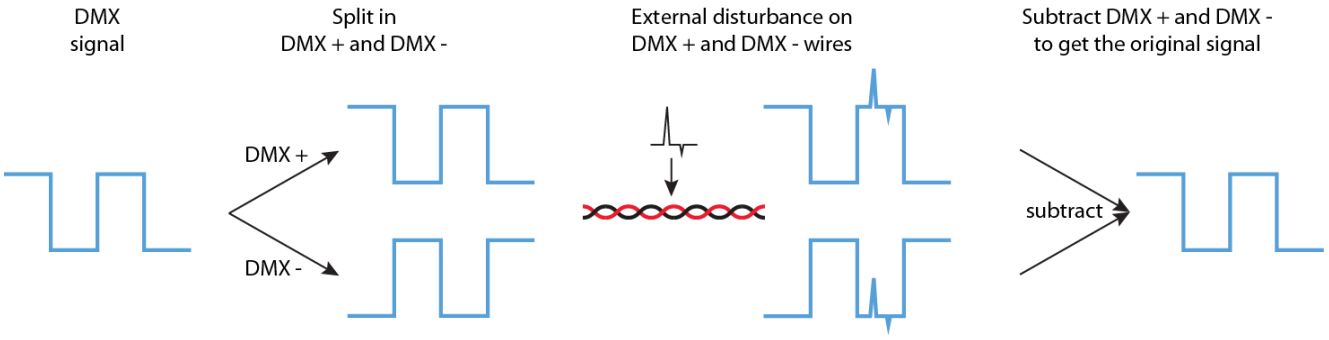


Figure 8 – EMI reduced with balanced system

The use of a shielded cable can further reduce EMI effects. The shield prevents external disturbances from reaching the signal wires. If a shielded cable is used, do not connect the DMX shield to mains ground.

Reflections

DMX works with high frequency signals. In an unterminated cable, these signals will be reflected when they reach the end of the cable. These reflections can cause erratic behaviour like random flashing of lights, wrong brightness levels, etc.

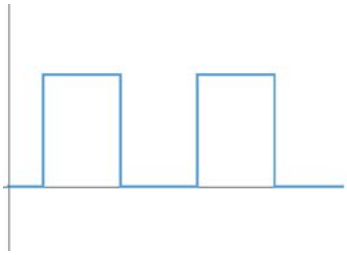


Figure 9 – Ideal signal

Figure 10 – Signal with reflections

To get the most reliable operation with minimal or no reflections, DMX cables should have an impedance of 120Ω as described in the DMX512 standard. Cable designed specifically for DMX (or RS-485) applications is readily available and also contains a shield wire – for instance, Belden 9841 cable. In some installations Cat5 or Cat6 UTP cable can also be used. At the last driver, the cable must be terminated with a 120Ω resistor to prevent reflections. Signal loss Long wires always cause some signal loss due to the resistance of the cable. Therefore, the maximum cable length between the controller and the last driver must be less than 300 metres.

There is also signal loss because of the loading of the connected drivers. The DMX512 standard states that a maximum of 32 unit loads can be connected to one DMX cable. eldoLED drivers are one unit load. If the total unit load exceeds 32, a splitter, repeater or booster can be used. Note, however, that repeaters, boosters and splitters may also add to the total unit load.

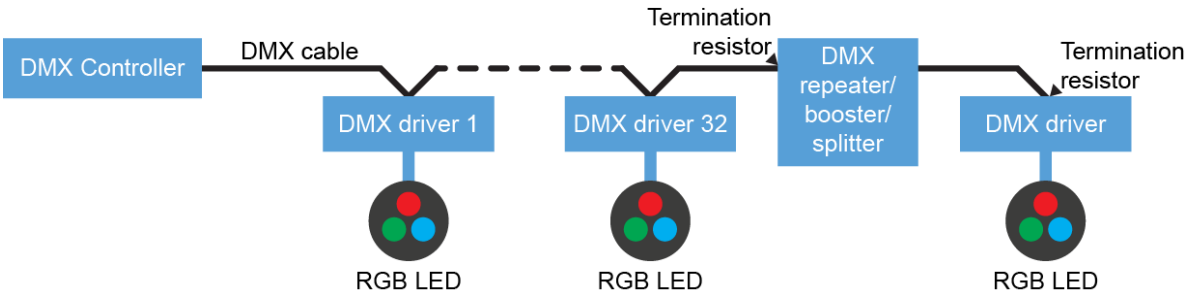


Figure 11 – More than 32 unit loads

Summary of best practices

- Use twisted pair cables with an impedance of 120Ω and a low capacitance.
  - UTP Cat5 or Cat6 network cable can also be used but have a slightly lower impedance of 100Ω.
- Terminate at the last driver with an impedance of 120Ω.
- If shielded cable is used, only connect shield to ground on one side (typically, the controller should have its shield terminal connected to ground).
- DMX is designed to use three wires.
- Not following the above recommendations may seem to work at first, but can cause problems. Sometimes after weeks of seemingly normal operation.