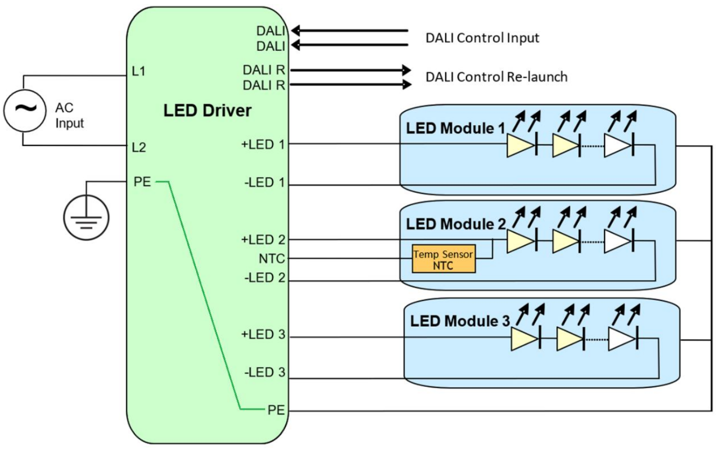
DLD1500-L120-DA (Model 1500DA-L)

MAIN FEATURES

- High-End constant current LED driver for professional and very high light flux LED modules (over 82.000 lm)
- Nominal input voltage: 120/220 – 240/277 V_{AC}
- Non-isolated, Class I
- 3 independent output channels
- Max output power 500 W (per output channel)
- Output current range 350 – 1200 mA (per output channel), DALI-2 programmable
- Output voltage range 260 – 520 V_{DC} (per output channel)
- IEEE 1789 Flicker Recommended Practice Compliant
- Max remote distance 200 meters
- DALI-2 control up to 33 fps
- Hot restrike (below 1 s from 0 to 100%)
- Surge level 10 kV for common mode and differential mode
- Certification CE and ENEC; suitable for emergency lighting (EL), with AC supply only, in centralized control systems. Full design conformity to UL, Chinese, Australian and New Zeeland safety standards
- Adjustable thermal protection for LED Modules
- Lifetime: >95.000 hours at maximum load
- Short circuit, overpower, over voltage protections
- DALI-2 configurable single-channel (1 x DT6) or multi-channel (up to 3 x DT6) operating mode
- Autonomous “Middle-Of-The-Night” dimming (“Adjustable Dimming”)
- Constant Lumen function
- PMD implementation according to DiiA Part 251 and Part 253 specifications
- Remote firmware update
- IP66 enclosure

DESCRIPTION

This datasheet details the electrical, mechanical and environmental specifications of a Class I non-insulated, 1500 W, 3 (three) output constant current channels DALI-2 programmable. An IP66 enclosure makes it also suitable for outdoor applications and its electrical characteristics make it suitable for TV broadcasting applications.
This LED driver has been specifically conceived and intended to supply high quality and programmable constant current to high end professional LED modules capable of very high luminous flux (>82000 lm). This driver is therefore specifically suitable for high end professional lighting sectors requiring high luminous flux, high power and quality standards such as sport venues lighting, large area lighting, horticulture, tunnel and high-mast lighting. The technical performances ensure high luminous flux, higher energy efficiency and higher current quality than most common and multi-purpose low / medium power control-gear.
The DLD1500-L120-DA LED driver is ENEC certified according the IEC/EN 61347-2-13, IEC/EN 61347-1 and IEC/EN 62384.

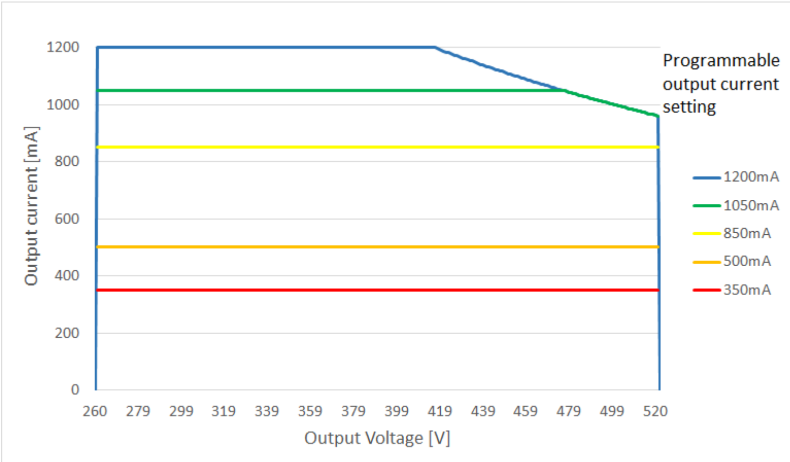


MODEL CODING AND OUTPUT RATINGS

Model Ordering Code	Dimming	Output Channels	Pout Max [W]	V_{OUT} Min [V_{DC}]	V_{OUT} Max [V_{DC}]	I_{OUT} Programmable Settings [mA]				
DLD1500-L120-DA (Eng Code: RHPS541A-A)	**DALI-2**	**3**	**1500**	**260**	**520**	350	500	850	1050	**1200 (*)**

(*) 1200 mA is the factory default setting output current

OUTPUT MAXIMUM ABSOLUTE RATINGS



INPUT SPECIFICATION

Specification	Test Conditions / Notes	Min	Nom	Max	Units
AC Input Voltage	Device starts and operates at 110 V_{AC} at all load conditions	110	120/220 – 240/277	305	V_{AC}
Input Frequency		47	50/60	63	Hz
Efficiency at max load	120 V_{AC} Load (1200 mA, 416 V)	-	93	-	%
	230 V_{AC} Load (1200 mA, 416 V)	-	96.5	-	
	277 V_{AC} Load (1200 mA, 416 V)	-	97	-	
Efficiency at minimum load	120 V_{AC} Load (350 mA, 280 V)	-	94	-	%
	230 V_{AC} Load (350 mA, 280 V)	-	93	-	
	277 V_{AC} Load (350 mA, 280 V)	-	90.5	-	
Input Current	120 V_{AC} Load (1200 mA, 416 V)	-	13	13.5	A
	230 V_{AC} Load (1200 mA, 416 V)	-	6.5	6.8	
	277 V_{AC} Load (1200 mA, 416 V)	-	5.5	5.8	
Power Factor	120 V_{AC} Load (1200 mA, 416 V)	0.99	-	-	
	230 V_{AC} Load (1200 mA, 416 V)	0.98	-	-	
	277 V_{AC} Load (1200 mA, 416 V)	0.97	-	-	
THD	120 V_{AC} Load (1200 mA, 416 V)	-	-	5	%
	230 V_{AC} Load (1200 mA, 416 V)	-	-	11	
	277 V_{AC} Load (1200 mA, 416 V)	-	-	12	
Inrush Current (peak)	120 V_{AC} Half value time: 0.9 ms	-	-	35.8	A
	230 V_{AC} Half value time: 0.85 ms	-	-	60.9	
	277 V_{AC} Half value time: 1.65 ms	-	-	62.9	
Harmonic Current	Complies with EN 61000-3-2, Class C load >40%				
Hot Restrike	Hot restrike in less than 1 s preventing the triggering of a circuit breaker “C-Type 16A MCB” connected with 2 Driver				

Note: the specified load conditions reported in the “Test Conditions / Notes” column, are simultaneously applied to all output channels.

OUTPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Min	Nom	Max	Units
Output Channels	3 independent output channels				
Total Output Power		-	-	1500	W
Output Power Rating	Per output channel	-	-	500	W
Output Voltage		260	-	520	V_{DC}
Output Current	Programmable via DALI in 5 steps: 350/500/850/1050/**1200 (default)**	350	-	1200	mA
Minimum dimming level		5	-	-	mA
Ripple Current_HF	High frequency (>15 kHz) $I_{HFPk\text{-}pk}$/$Iout_{AVG}$ at 1200 mA	-	-	20	%
Ripple Current_LF	Low frequency <1 kHz	-	-	2	%
Flicker	IEEE 1789 Flicker Recommended Practice Compliant from 100% to 0.4%				
Current Set Accuracy		-	±3	-	%Iout
Turn-on Time	Compliant with clause 9.13 of IEC 62386-102:2014	-	0.7	1	s
Max Remote distance	Max distance between the LED driver and each LED module connected with an appropriate cable section to ensure a total voltage drop < 5 V on each channel. The total Vf shall not exceed the max V_{OUT} rating			200	m

PROTECTION FEATURES

Specification	Test Conditions / Notes	Min	Nom	Max	Units
Output Over Voltage	The faulty channel shuts down and restarts approximately every 5s	525	-	-	V
Output Under Voltage	The faulty channel shuts down and restarts approximately every 5s	200	-	-	V
Output Short-Circuit	The faulty channel shuts down and restarts approximately every 5s	-	-	-	-
Over Power	If in each channel the output power exceeds this threshold, its current will be reduced. Removing the fault conditions the normal operation is recovered.	510	-	-	W
Internal OTP vs T_{AMB}	The LED Driver checks the internal temperature every 60 seconds. If an OT condition is detected, the output current is gradually reduced at 35 steps every 60 s. In any condition the output current will not decrease below 20% of the set current	45			°C
No Load V_{OUT} Transient (peak)	The faulty channel shuts down and restarts approximately every 5s			520	V
Isolation	Class I (with PE). LED output not isolated from mains				

INFORMATION ON ISOLATIONS

- The DALI control terminals in some installations are considered FELV control terminals.
  Since the DALI circuit have an internal reinforced insulation from live parts there is not any risk to touch the DALI terminals of the control gear when it is connected to a controller with reinforced insulation, or when it is not connected. But in some installations the DALI control wiring is not provided with a reinforced insulation with respect to LV. For this reason, the DALI terminals are marked with the warning of "Risk of electric shock" and this line is considered not safe to touch. This is to protect against the fault of the insulation of the external control circuit.

- NTC control circuit is not separated from Primary/LED outputs circuits.

- LED outputs circuits are not separated from Primary circuit.

- LED outputs circuits are not separated from each other LED outputs circuits.

- U-OUT = 600V

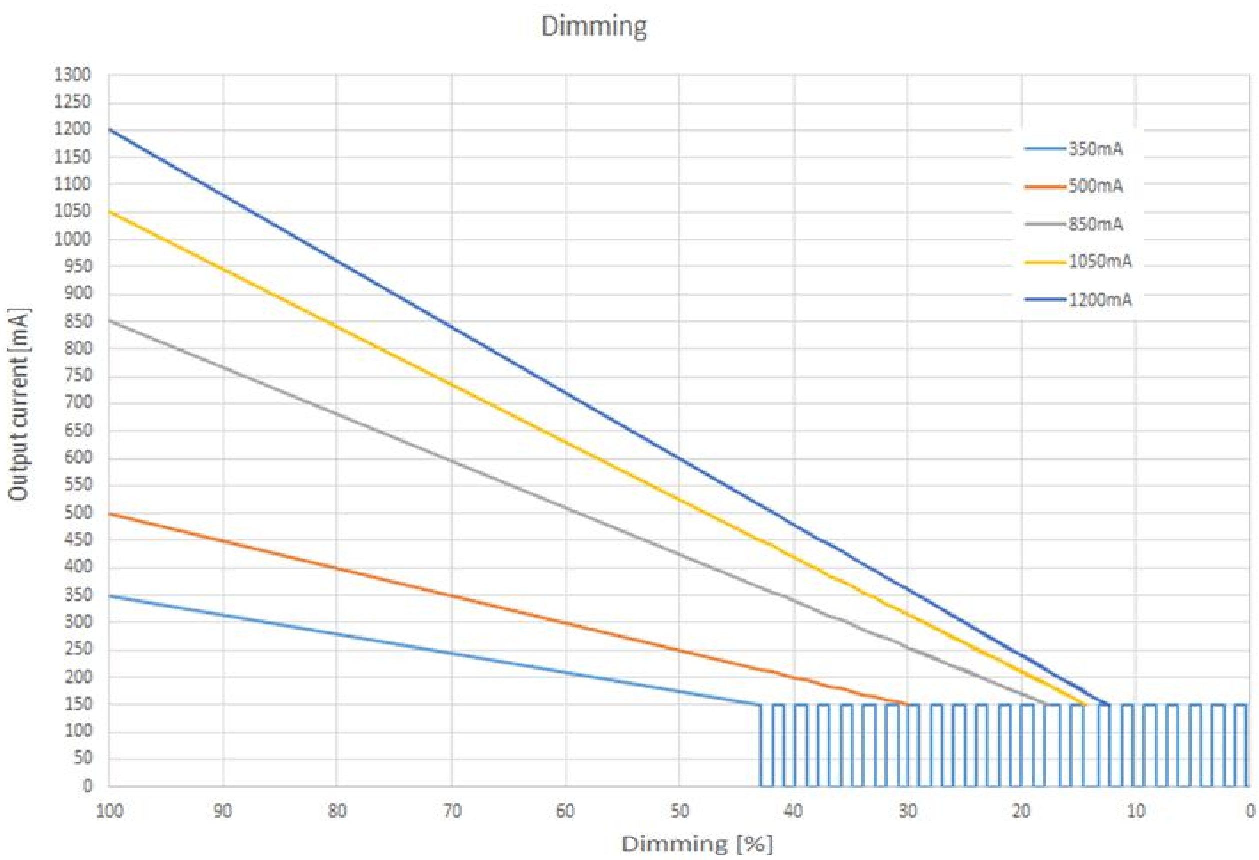
INRUSH CURRENT DATA

The maximum number of LED drivers connectable to a single MCB is reported in the following table for each nominal input voltage.
Due to the different kinds of circuit breakers available on the market, this table is just for reference.

V_{IN}	Inrush Current Data		# Drivers For Each Circuit Breaker											
Nominal [V_{AC}]	I peak [A]	Half Value Time [µs]	Type B 10A	Type B 16A	Type B 20A	Type B 25A	Type C 10A	Type C 16A	Type C 20A	Type C 25A	Type D 10A	Type D 16A	Type D 20A	Type D 25A
120	36	900	0	1	1	1	0	1	1	1	0	1	1	1
230	61	850	1	1	2	3	1	1	2	3	1	1	2	3
277	63	1650	0	1	1	1	1	1	2	3	1	2	2	3

OUTPUT CONTROLS

DALI-2 Dimming Control:
The driver provides a DALI-2 interface "standards IEC 62386-101:2014, IEC 62386-102:2014 and IEC 62386-207:2009 (LED modules, device type 6)"
The 3 output channels will have the same current setting.
Dimming range: 5 mA to 100% of the rated current.
Dimming Type: Constant Amplitude dimming from 100% to 150 mA, PWM dimming from 150 mA to 5 mA @ 2 kHz.



OUTPUT CURRENT SETTINGS (DALI-2)

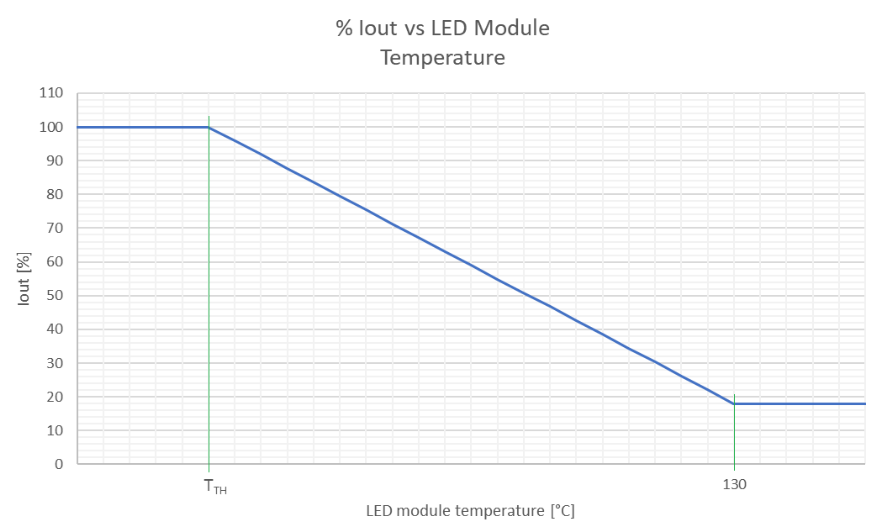
The output current index set by the factory is stored at address 0x03 of DALI memory bank2. This location can be read and written as stated by the IEC62386-102:2014.

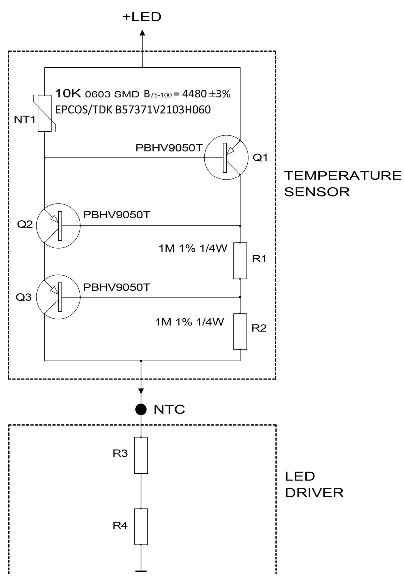
Engineering Code	Ordering Code	Output Current	Index
		350	0
		500	1
		850	2
		1050	3
RHPS541A-A	DLD1500-L120-DA	**1200 (*)**	4

(*) factory default

NTC DIMMING

The External LED module temperature can be read and controlled connecting the following circuit using an NTC thermistor to the LED driver.





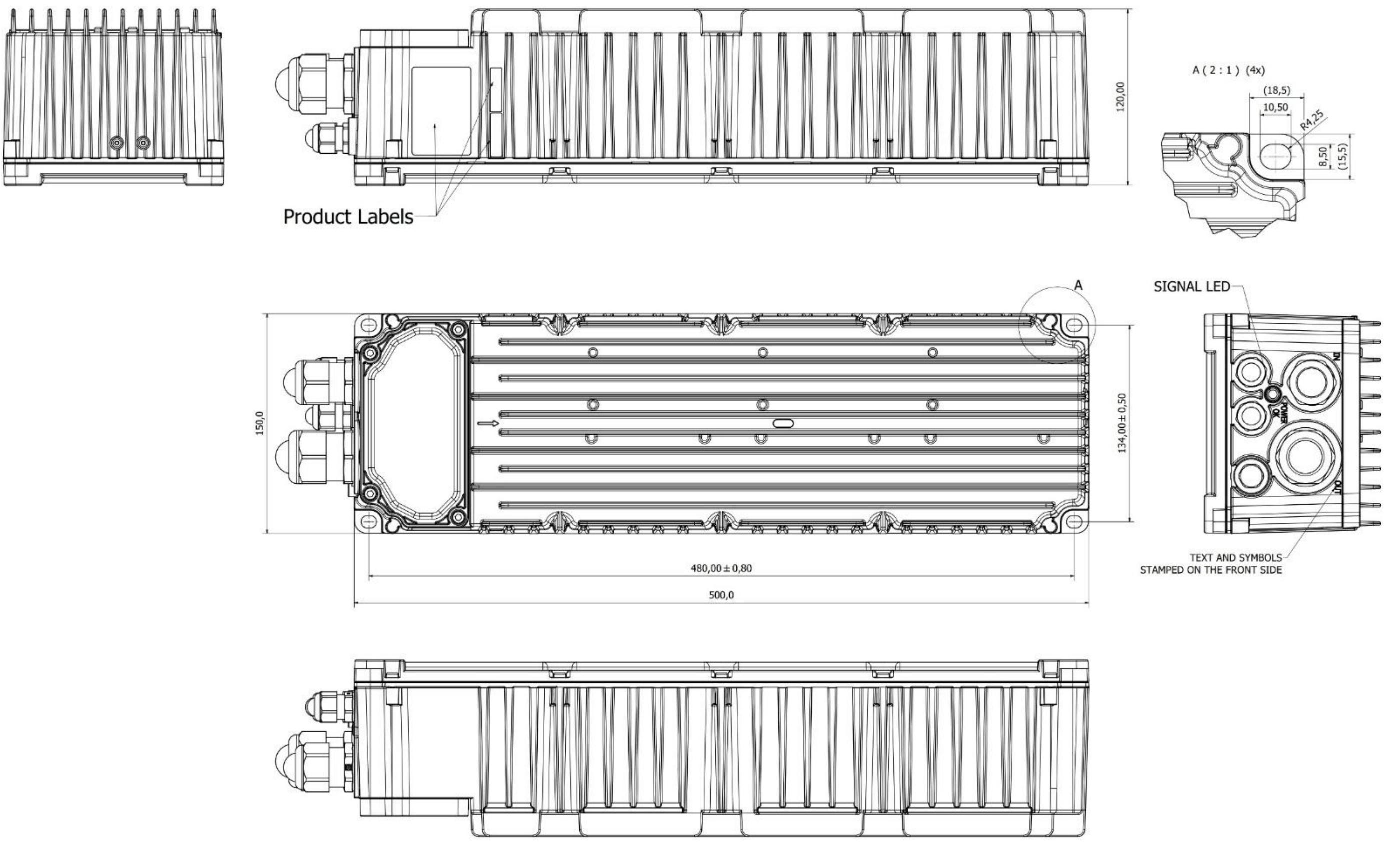
The thermal measurement is performed connecting NTC circuit from the pin LED+ and the NTC pin.
The NTC circuit has to be placed on the LED assembly to monitor its temperature. When the temperature exceeds a predetermined threshold value (T_{TH}), the output current provided to the module will automatically and gradually decrease to bring the temperature of the LED assembly back to safe value.
The NTC signal does access and is read by one single channel, which however replicates the same thermal protection dimming value identified to the other LED output channels.
The driver has been factory set considering a 110°C NTC. It can be used others NTC ratings (90 ÷ 110°C) upon LED driver setting (see User Manual for instruction).

NOTE: The temperature measurement accuracy depends on the load condition.

MECHANICAL DETAILS

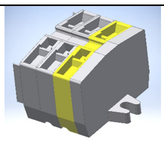
Packaging:	Die cast EN AC-43400 or EN AC-44300 Aluminium alloy
Finishing:	Powder coating, colour grey anthracite RAL 7016
I/O Connections:	Push-in connectors
	Input Connections: L1, L2, PE
	Control Connections: DA, DA double connection for DALI line for re-launch
	Output connections (LED+, LED-) x 3 channels + PE lum + NTC
Signal LED	Shows the LED driver state
Ingress Protection:	IP66
IK Code:	IK08
Dimensions:	500 x 150 x 120 mm (19.68 x 5.90 x 4.72 in)
Mass:	6.10 kg (13.45 lbs)
Packaging:	carton box 590 x 195 x H160 mm (23.22 x 7.67 x 6.29 in)

OUTLINE DRAWINGS

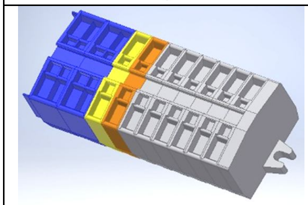


ELECTRICAL CONNECTION

All connections to and from the DLD1500 LED driver are made by means of mini feed-through terminal block.



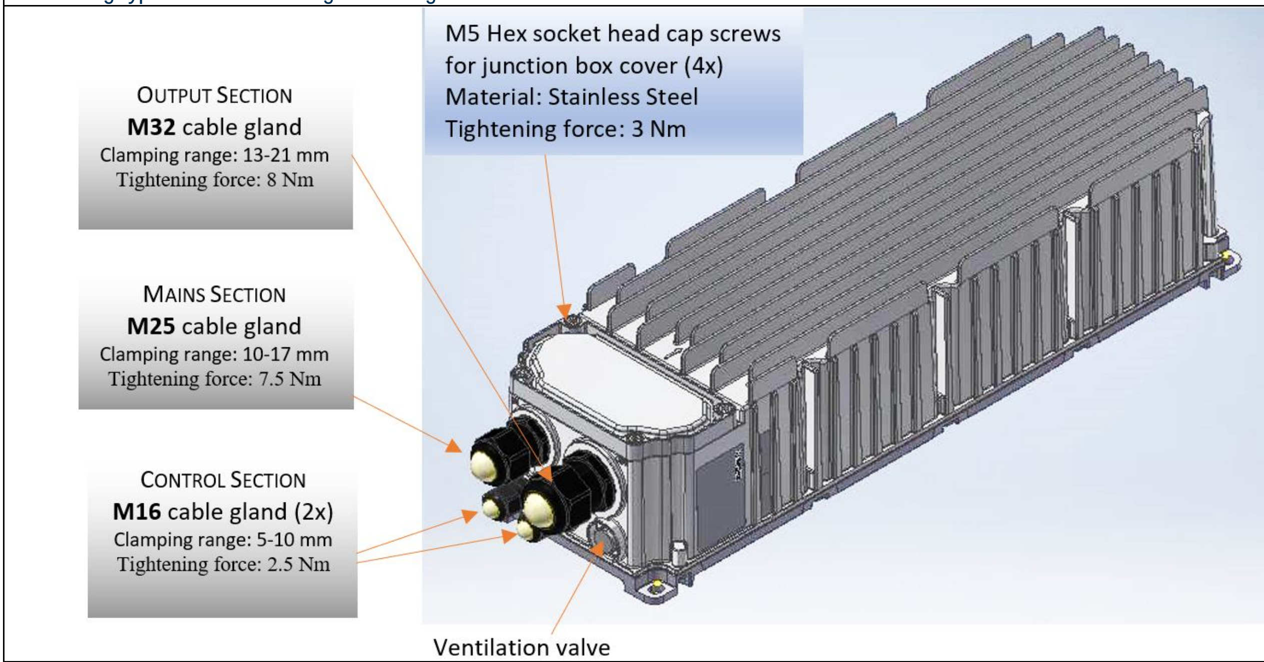
Mains Section (AC Side)
Three input terminal blocks, for AC input L1, L2 and PE connections (M25 Cable Gland).
Total number of mains connection is composed of 3 positions.

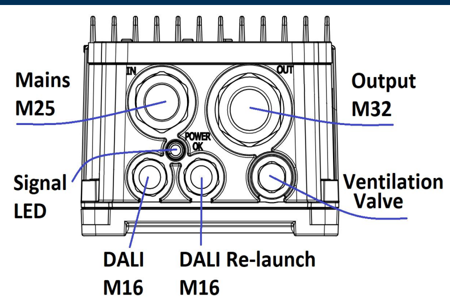


Control Section (DALI/DALI Re-launch)
DALI_in, DALI_in, (M16 Cable Gland); DALI_rel, DALI_rel (M16 Cable Gland).
Total number of Control connections is composed of 4 positions.

Output connection:
PE Lum, NTC, LED1+, LED1-, LED2+, LED2-, LED3+, LED3- (M32 Cable Gland)
Total number of Output connections is composed of 8 positions.

Connection method:
Spring-cage connection, number of connections: 15, cross section: 0.8 - 4 mm², AWG: 18–12.
(1.5-4 mm², AWG: 15-12 for AC input, PE and +/- LEDs)
Mounting type: Direct mounting with flange



Connection	Torque [Nm]	Ø Min [mm]	Ø Max [mm]	Connector AWG	Section (*) [mm²]	Front View
Mains Cable M25	7.5	10	17	15-12	1.5 – 2.5	
DALI Cable M16	2.5	5	10	18-12	0.8 – 2.5	
Output Cable M32	8	13	21	15-12	1.5 – 2.5	

(*) up to 2.5 mm² for stranded conductor, up to 4 mm² for rigid conductor

WIRING CONNECTION

PINOUT		
NUMBER	LABEL	DESCRIPTION
1	L1	AC LINE 1 INPUT
2	L2	AC LINE 2 INPUT
3	⏚	PROTECTIVE EARTH
4	DA	DALI INPUT +
5	DA	DALI-RELAUNCH +
6	DA	DALI INPUT -
7	DA	DALI-RELAUNCH -
8	LUM ⏚	PROTECTIVE EARTH FOR LED MODULE
9	NTC	THERMAL MEASURE INPUT
10	+1	LED1+ CONNECTION
11	-1	LED1- CONNECTION
12	+2	LED2+ CONNECTION
13	-2	LED2- CONNECTION
14	+3	LED3+ CONNECTION
15	-3	LED3- CONNECTION

SIGNALLING LED INDICATIONS

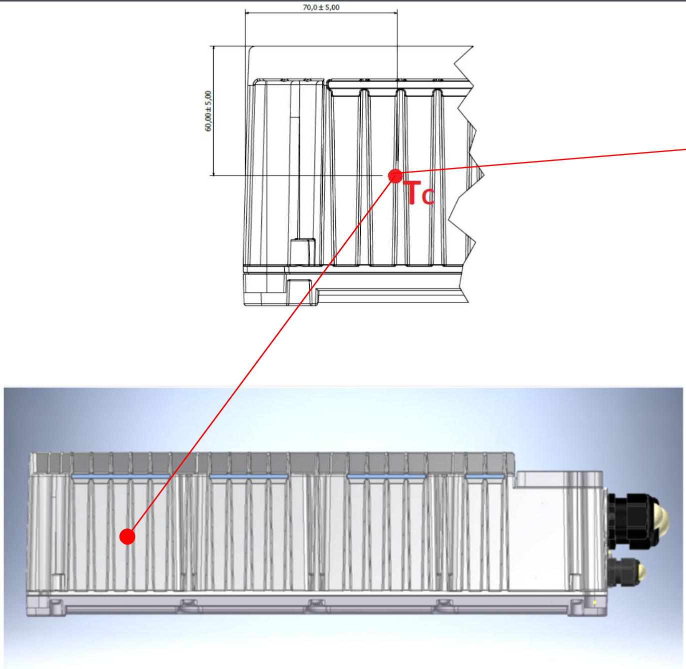
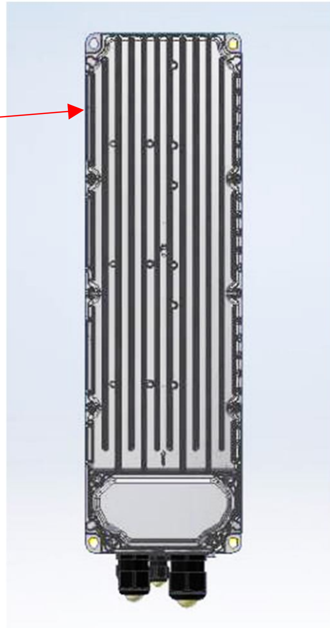
Period	Pulses	Fault description	Priority (3)
The encoded faults are based on pulses emitted every 4 seconds	1	One or more active CCR(1) module is not working	MAXIMUM
	5	Firmware version of one or more CCR(1) module is not compatible with main control board firmware	
	2	One or more active(2) output is short-circuited	
	3	One or more active(2) output is disconnected from load	
	4	Thermal derating active (output current reduction)	MINIMUM

(1) CCR module stands for Constant Current Regulator module (is the hardware device that controls output current for a single output)

(2) "active" means enabled by product configuration

(3) if more than one error is present at the same time, only the one with higher priority will be shown by the signalling LED

INSTALLATION NOTICE

T_C Reference at Max Ambient Temperature		
HORIZONTAL		VERTICAL
		
120 Vac	**70**	**65**
230 Vac	**60**	**60**
277 Vac	**55**	**55**
Max Ambient Temperature	**45 °C**	**45 °C**

ENVIRONMENTAL SPECIFICATIONS

Specification	Test Conditions / Notes	Min	Nom	Max	Units
Top Case Temperature Range	Top case temperature without derating, please see Installation notice.	-40	-	70	°C
Ambient Temperature Range		-40	-	45	°C
Storage Temperature	Relative Humidity 95% non-condensing	-40	-	85	°C
Cooling	Convection cooled				
Shock EN 60068-2-27	Operating: Half sine 30 g/18 ms, 3 axes, 6x each (3 positive and 3 negative) Non-Operating: Half sine, 50 g/11 ms, 3 axes, 6x each (3 positive and 3 negative)				
Vibration EN 60068-2-64	Operating: 5-500 Hz, 1g_{RMS} (0.02 g^2/Hz), 3 axes, 30 min, random Non-Operating: 5-500 Hz, 2.46 g_{RMS} (0.0122 g^2/Hz), 3 axes, 30 min, random				
Vibration EN 60068-2-6	Operating Sine, 10-500 Hz, 1 g, 3 axes, sweep 1 Oct/min., 60 min, 1 g - survival				
MTBF	Telcordia SR-332 Issue 2 (40 °C ambient, max load, duty 50%)	-	500.000	-	hours
Useful Life	At max load, 45 °C ambient, any nominal input voltage	95.000	-	-	hours

ELECTROMAGNETIC COMPATIBILITY (EMC) – EMISSIONS

Phenomenon	Conditions / Notes	Standard	Performance Class
Conducted Emission	Test at 230 V_{AC}	EN55015	
Radiated Emission	Test at 230 V_{AC}	EN55015	
Conducted Emission	Test at 120/277 V_{AC}	EN55032	Class B
Conducted and Radiated Emission	Test at 120/277 V_{AC}	FCC CFR47- part 15/subpart B	Class B
Harmonic Current Emissions		EN61000-3-2	Class C (Load>40%)
Voltage Changes, Fluctuation and Flicker		EN61000-3-3	

ELECTROMAGNETIC COMPATIBILITY (EMC) – IMMUNITY

Phenomenon	Conditions / Notes	Standard	Note
Equipment for general lighting purposes -EMC Immunity Req.		EN 61547	
ESD (Electrostatic Discharge)		EN 61000-4-2	
Radiated Radio-Frequency electromagnetic field		EN 61000-4-3	
Electric Fast Transient / Burst		EN 61000-4-4	
Surge	Level ±**10** kV L-L; ±**10** kV L/L-PE	EN 61000-4-5	
Conducted disturbances induced by Radio-Frequency fields		EN 61000-4-6	
Voltage Dips, short interruptions and Voltage Variations		EN 61000-4-11	
Non-repetitive damped oscillatory transient, Ring wave	2.5 kV	ANSI C.62.41	Category A

SAFETY AGENCIES APPROVALS

	IEC/EN 61347-2-13 electronic control gear for LED Module and IEC/EN 61347-1 IEC/EN 62384 DC or AC supplied electronic control gear for LED modules – Performance Requirements	**MARK**
	CE Declaration of Conformity	**MARK**
	CB report	**REPORT**
EL	The control gear is tested according to Annex J of IEC/EN 61347-2-13. It is intended for use in AC supply mode for the connection to a centralized emergency supply. The product does not contain any battery. Do not connect it to a DC supply. The rated emergency supply voltage is 220-240 V. The centralized supply system must be able to supply this voltage in order that the control gear be made available the outputs to the LED loads. The Emergency Output Factor is EOFx = 1, at the specified ambient temperature, for which the output current does not differ from the set current more than -/+ 15%.	**MARK**

The DLD1500 is be compliant with UL, Chinese, Australian and New Zeeland safety standards, not certified, the mark will be eventually applied by the customer.