# LED Driver

## EUCO ARENA SPORT 2.1KW Series

# EUCO ARENA SPORT

### Highlights & Features

- 3 independent output channels: 2100W – max 700W per channel
- Nominal input voltage: 220-400VAC
- Ultra high Efficiency (97.8%)
- Control method: DALI2/D4i and DMX-RDM
- Programmable output current range 700-2000 mA
- Output voltage range from 250-550Vdc per channel
- Very low peak-to-peak current ripple (typ.1%) for HDTV broadcasting
- DALI-2 and DMX-RDM configurable single channel or multi-channel (up to 3 x DT6 or 3 x DMX)
- High-accuracy integrated power metering
- Constant Light Output (CLO) function
- Autonomous dimming via Midnight Centric Timer
- Wide dimming range 0.1-100% or 0.4-100%
- Input surge protection: DM 10kV; CM 10kV
- IP66 & IK08 enclosure
- Max remote distance 200 meters
- Non Isolated, Class I

### Standards & Marks

IP 66
IK 08

**Model Number:** EUCO-2K1200G□A□□

**Unit Weight:** ~5.8kg

**Dimensions (L × W × H):** 500x152x77 mm

## General Description

Delta EUCO ARENA SPORT 2K1 series with DALI 2 & D4i or RDM / DMX control functions are constant current non-isolated LED drivers. Compatible with wide input voltage range 220~400Vac from any system manufacturer for indoor and outdoor applications. With IP66 ingress protection and wide ambient operating temperature range from -40°C to +50°, the driver can fulfill any harsh condition. The extremely low output current ripple makes the driver a typical application for outdoor stadium lighting.

## Model Information

| Model Number | Input Voltage Range | Rated Output Power | Output Current Channel | Control Interface |
|---|---|---|---|---|
| EUCO-2K1200GIA | 220/400Vac(typical)<br>198~440Vac(range) | 2100W | 3 | DALI 2 & D4i |
| EUCO-2K1200GDA | | 2100W | 3 | RDM/DMX |

*Default setting is a single address. Optionally, user could be able to assign a dedicated address per each channel via GUI programming tool for both DALI2 and DMX models.

## Model Numbering

| EU | C | O | 2K1 | □□□ | G | □ | A | □□ |
|---|---|---|---|---|---|---|---|---|
| Market Code | Constant Current | Outdoor | Output power<br>2K1:2100W | Output Current<br>200:2000mA | i-Programming | Function<br>I：DALI 2 & D4i<br>D：RDM/DMX | Variable<br>A - Standard | Mode series, can be 0~9, A~Z or blank. |



All parameters are specified at 25°C ambient for all products unless otherwise indicated.
**www.DeltaPSU.com (Jul 2023, Rev. 01)**

# LED Driver

## EUCO ARENA SPORT 2.1KW Series

## Specifications

### Input Ratings / Characteristics

| Specification | Min. | Typ. | Max. | Conditions |
|---|---|---|---|---|
| Nominal Input Voltage | 220Vac | - | 400Vac | |
| Input Voltage Range | 198Vac | - | 440Vac | |
| Nominal Input Frequency | - | 50/60Hz | - | |
| Input Frequency Range | 47Hz | - | 63Hz | |
| Nominal Input Current | - | 10A | 11.5A | At 220Vac, 25°C, 2100W output |
| | - | 5.4A | 6A | At 400Vac, 25°C, 2100W output |
| Efficiency[1] | - | 96.6% | - | At 220Vac, 25°C, 350V/2A *3 channels output |
| | - | 97.0% | - | At 220Vac, 25°C, 550V/1.27A *3 channels output |
| | - | 97.3% | - | At 400Vac, 25°C, 350V/2A *3 channels output |
| | - | 97.8% | - | At 400Vac, 25°C, 550V/1.27A *3 channels output |
| Standby Power Consumption | - | 0.3W | - | At 230Vac, Dim OFF, in compliance with Erp (EU) 2019/2020 |
| | - | 0.8W | - | At 400Vac, Dim OFF |
| Power Factor | - | 0.99 | - | At 220Vac, 25°C, 2100W output |
| | | 0.97 | - | At 400Vac, 25°C, 2100W output |
| Total Harmonic Distortion | - | 6% | - | At 220Vac, 25°C, 350V/2A *3 channels output |
| | - | 10% | - | At 400Vac, 25°C, 350V/2A *3 channels output |
| Inrush Current (Apk / 50%-us) | - | 15A | - | At 220Vac，50%Apk to 50%Apk time: 2ms |
| | - | 25A | - | At 400Vac，50%Apk to 50%Apk time: 2ms |
| Power metering accuracy | - | ±3% | - | At 220Vac~400Vac，30%~100% load |

1. 100% Load and tested after 30 minutes warming up.

### Output Ratings / Characteristics

| Specification | | Min. | Typ. | Max. | Conditions |
|---|---|---|---|---|---|
| Output Channels | | - | 3 | - | 3 independent output channels |
| Default Output Current | | - | 1250mA | - | |
| Programmable Output Current Range | | 700mA | - | 2000mA | Operation range refer to Appendix 1 |
| Output Voltage Range | | 250V | - | 550V | |
| Max. No Load Output Voltage | | - | - | 600Vrms | |
| Total Output Power | | - | - | 2100W | |
| Output Power Range | | - | - | 700W | |
| Output Current Tolerance | | - | - | ±3% | 700~2000mA |
| Output Current Ripple[2] | | - | 1% | 2% | (ripple = (pk-pk)/avg)，at low frequency(<8kHz) |
| | | - | 5% | 15% | (ripple = (pk-pk)/avg)，at high frequency(>15kHz) |
| Output Remote Distance | | - | - | 200m | The total voltage drop on the cable of each channel should be within 5V |
| Turn on Delay Time | DALI version | - | 0.7s | 1s | Compliant with clause 9.13 of IEC 62386-102:2014 |
| | RDM/DMX version | - | 0.7s | 1s | Connecting to the controller correctly. |
| | | 1.25s | - | 2s | No controller or incorrect connection to the controller, compliant with clause 3.5 of ANSI E1.37-1:2012. |

2. Output Current Ripple could be affected by the parasitic capacitance of LED fixture, more details are given in Appendix 8.

# LED Driver
## EUCO ARENA SPORT 2.1KW Series

### Auxiliary Power Supply Ratings / Characteristics[3]

| Specification | Min. | Typ. | Max. | Conditions |
|---|---|---|---|---|
| ***Integrated 24V Auxiliary Power Supply*** | | | | |
| Operating Voltage | 21.6V | 24.0V | 26.4V | 0.1W~6.0W, reference to "DA-". |
| High frequency ripple of operating voltage | - | - | 1.0 $V_{pp}$ | 21.6V~26.4V, $f_{ripple}$ > 10kHz |
| Voltage in no-load condition | - | - | 30.0V | Output power < 0.1W |
| Average output power capability | - | 3.0W | - | CC mode load：4.0mA~125mA (0.1W~3W). |
| Pulsed output power capability | - | 6.0W | - | Dynamic CC mode load：<br>peak load = 250mA/2.2ms and avg load = 4.0mA~125mA/3.8ms. |
| Start-up time | - | - | 0.6s | From AC power on to Vaux increases and reaches 21.6 V, Mains is applied at any phase angle. |
| ***Integrated DALI-2 Bus Power Supply*** | | | | |
| DALI-2 Bus voltage | 12V | - | 22.5V | CC load: 0~50mA, DALI2 bus power supply is disabled by default, and it can be activated via GUI or DALI controller. |
| Over Current Protection | 50mA | - | 62.5mA | Auto recovery and no component damaged. Limits output current to 50~62.5mA when output is short-circuited. |

3. This part applies to DALI version only: EUCO-2K1200GIA.

### Dimming Control

| Specification | EUCO-2K1200GIA | EUCO-2K1200GDA |
|---|---|---|
| Control interface | DALI 2 & D4i | RDM/DMX |
| Dimming range | 0.1%-100% | 0.4%-100% |

### Control Interface Standards

| Specification | EUCO-2K1200GIA | EUCO-2K1200GDA |
|---|---|---|
| Control interface standards | DALI2 & D4i<br>IEC 62386-101 Ed 2.0<br>IEC 62386-102 Ed 2.0<br>IEC 62386-207 Ed 2.0<br>IEC 62386 part 150: Integrated 24Vdc auxiliary power supply<br>IEC 62386 part 250: Integrated bus power supply[4]<br>IEC 62386 part 251: Memory bank 1 extension (luminaire data)<br>IEC 62386 part 252: Energy report<br>IEC 62386 part 253: Diagnostics and maintenance | DMX & RDM<br>ANSI E1.11 DMX512A<br>ANSI E1.20 RDM – Remote Device Management<br>ANSI E1.37-1 Additional message sets for dimmer |

4. Part 250 - DALI2 bus power supply is disabled by default, and it can be activated via GUI or DALI controller.

# LED Driver
## EUCO ARENA SPORT 2.1KW Series

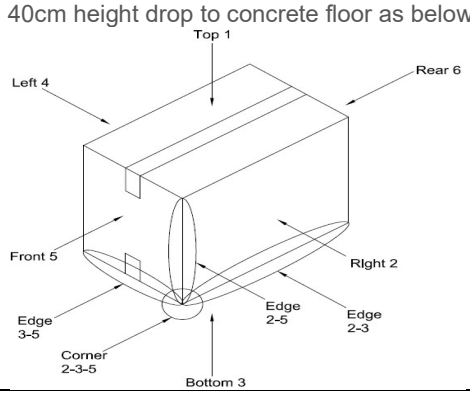
### Additional Dimming Features

| Specification | EUCO-2K1200GIA | EUCO-2K1200GDA |
|---|---|---|
| Autonomous dimming middle of the night | 3 different configurable dimming profiles over the night are available for users to select and set in GUI. Details refer to GUI manual. | |
| Constant lumen output(CLO) | CLO function is to compensate the ageing of the light source, and so to get constant Lumen Output over the lifetime of the product.<br>It's available in GUI to set starting dimming level (for example 90%) and end of life of the product (for example 50,000hrs), so that the driver by counting its functioning hours can do a linear interpolation in between starting dimming level at t=0hrs, and go to 100% at t=end of life. Details refer to GUI manual. | |

### Mechanical Characteristics

| Specification | | EUCO-2K1200GIA | EUCO-2K1200GDA |
|---|---|---|---|
| Casing | | Aluminum case, Color : Dark Gray | |
| Dimensions (L x W x H) | | 500x152x77 mm | |
| Unit Weight | | 5.8 kg | |
| Cooling System | | Natural Convection | |
| INPUT | Wago 264-103 | With the sign of L1, L2, PE | |
| OUTPUT | Wago 264-111 | With the sign of PE, NTC, V3+ V3-, V2+, V2-, V1+, V1- | |
| DIMMING | | DA+, DA-, +24V | D1+, D1-, COM |

### Environment & Package

| Specification | | EUCO-2K1200GIA | EUCO-2K1200GDA |
|---|---|---|---|
| Ambient Temperature | Operating | -40 ~+50°C | |
| | Storage | -40°C to +85°C | |
| Maximum Case Temperature | | +85°C | |
| Lifetime Case Temperature | | +80°C | |
| Relative Humidity | Operating | 10% to 90% RH (Non-Condensing) | |
| | Storage | 10% to 90% RH (Non-Condensing) | |
| Audible Noise (30cm distance) | | Sound Pressure Level (SPL) < 24dBA | |
| Ingress Protection classification | | IP66 | |
| Impact Protection classification | | IK08 | |
| Drop Test (Non-Operating) | | According to ASTM D-775, 40cm height drop to concrete floor as below drawing, total 10 times.   | |
| Vibration (Non-Operating) | | IEC 60068-2-6, Random: 5 Hz to 10 Hz (1G);<br>30 min per axis for all X, Y, Z direction | |
| Packing | | 1pcs per carton | |

# LED Driver
## EUCO ARENA SPORT 2.1KW Series

### Protections

| Specification | | Min. | Typ. | Max. | Notes |
|---|---|---|---|---|---|
| Input Under Voltage Protection(IUVP) | Protection | 160Vac | - | 180Vac | The driver shuts down and then restarts to normal status when the fault condition is cleared. |
| | Recovery | 170Vac | - | 190Vac | |
| Input Over Voltage Protection(IOVP) | Protection | 460Vac | - | 480Vac | |
| | Recovery | 440Vac | - | 460Vac | |
| Open Load & Output Over Voltage Protection | Protection | - | - | 600Vrms | Hiccup mode. The output voltage shall not exceed 600Vrms under no load, open load or other over voltage conditions. |
| Constant Output Power Protection | | - | 720W | - | Output power limited. The driver shall come back to its original programmed current after the fault condition is cleared. |
| Output Short Circuit Protection | | - | - | - | Hiccup mode |
| Internal Over Temperature Protection | | 85℃ | - | 95℃ | Output power derating. Refer to Appendix 6 “Internal Over Temperature Protection” for more details. |
| Programmable External Over Temperature Protection | | 80℃ | - | 110℃ | Output power derating. Refer to Appendix 7 “Programmable External Over Temperature Protection” for more details. |

### Electro-Magnetic Compatibility (EMC)

| Specification | Standards |
|---|---|
| ***EMC-Emission Characteristics*** | |
| Radiated Emission | EN55015 |
| Conducted Emission | EN55015 |
| Harmonic Current Emission | EN61000-3-2 |
| Voltage Fluctuation & Flicker | EN61000-3-3 |
| ***EMC-Immunity Characteristics*** | |
| Electrostatic Discharge(ESD) | EN 61000-4-2 |
| Radio Frequency Electro –magnetic Fields | EN 61000-4-3 |
| Electrical Fast Transient (EFT) | EN 61000-4-4 |
| Surge(AC Mains) | EN 61000-4-5<br>- Common Mode: 10kV[5] (Line to Earth, Neutral to Earth)<br>- Differential Mode: 10kV (Line to Neutral) |
| Conducted Disturbance | EN61000-4-6 |
| Voltage Dip & Interruptions | EN 61000-4-11 |

5. Level B, the peak of residual common mode voltage pulse from output +/- to Earth is typically around 2.5kV, in worst cases, it could be close to 4kV maximum. Additional SPD in the AC mains may be necessary to protect the LED module, please refer to Appendix 9 for more details.

### Reliability Data

| Specification | Test Conditions / Notes |
|---|---|
| Lifetime | 50,000 hours applicable for 220Vac to 400Vac(50/60Hz) @100% of load, @ Ta 45°C |
| MTBF | 475khrs. at Ta=+45°C Telcordia SR-332 |

# LED Driver

## EUCO ARENA SPORT 2.1KW Series

### Safety Agencies Approvals

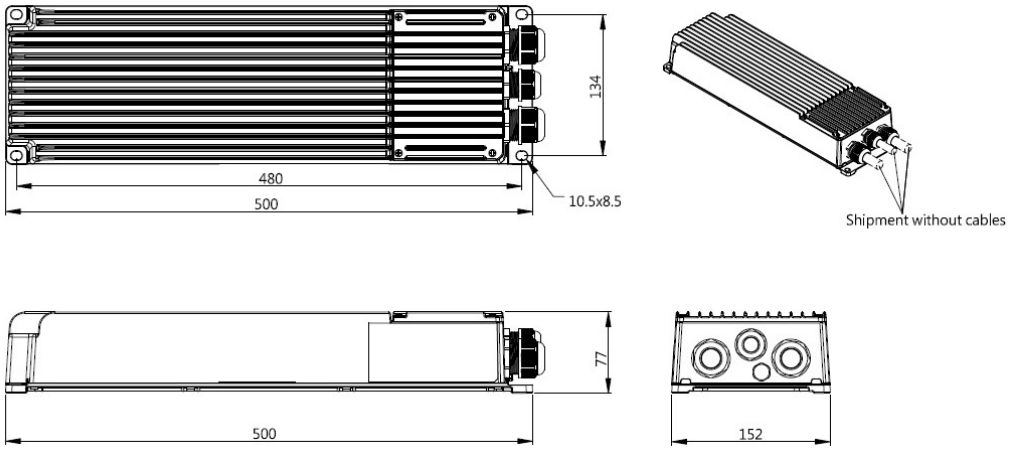
| Specification | | Test Conditions / Notes |
|---|---|---|
| | MARK | EN 61347-2-13:2014, EN 61347-2-13/A1:2017<br>EN 61347-1:2015, EN 61347-1:2015/A1:2021<br>EN IEC 62384:2020 |
| | MARK | BS EN 61347-2-13: 2014+A1:2017 |
| | MARK | CE Declaration of Conformity. |
| | MARK | UL Compliant ANSI / UL8750 2nd Ed. , CSA C22.2 No.250.13, 4th Ed. |
| | MARK | AS 61347-2-13: 2018<br>AS/NZS 61347-1: 2016+A1 |
| | REPORT | CB report. |
| Isolation | | Class I，input to output: non-isolation, RDM/DMX or DALI to input/output: reinforced isolation. |

### Drivers for each circuit breaker

The maximum number of LED drivers connectable to a single MCB is recommended in the following table for maximum 2100W and each nominal input voltage. Due to the different kinds of circuit breakers available on the market, this table is just for reference.

| Input Voltage | MCB Type | 10A | 16A | 20A | 25A | 32A | 40A | 63A |
|---|---|---|---|---|---|---|---|---|
| 220 Vac | B | 0 | 1 | 1 | 1 | 2 | 2 | 4 |
| | C | | | | | | | |
| 400 Vac | B | 1 | 1 | 2 | 2 | 3 | 4 | 6 |
| | C | 1 | 2 | 2 | 3 | 4 | 5 | 8 |

### Physical Dimensions



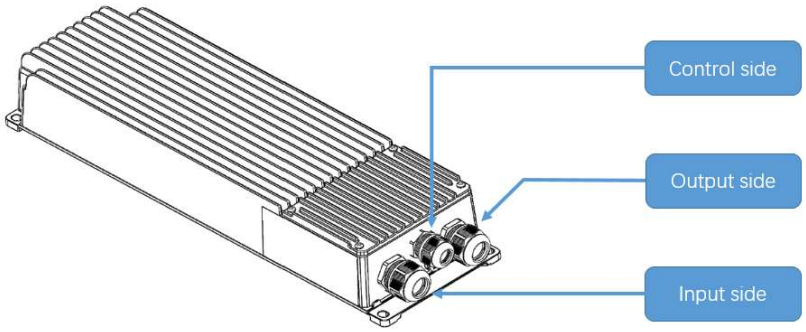

Unit: mm



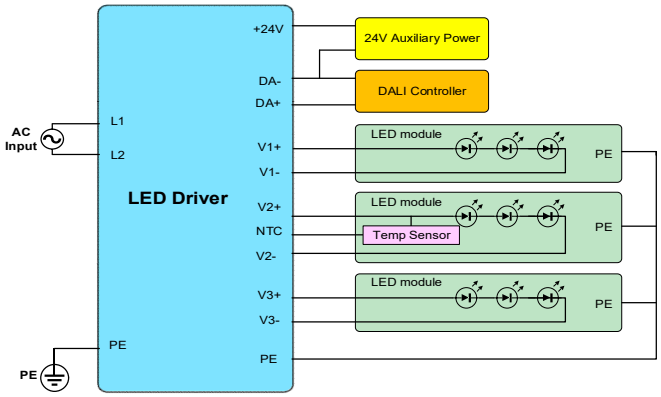
All parameters are specified at 25°C ambient for all products unless otherwise indicated.
**www.DeltaPSU.com (Jul 2023, Rev. 01)**

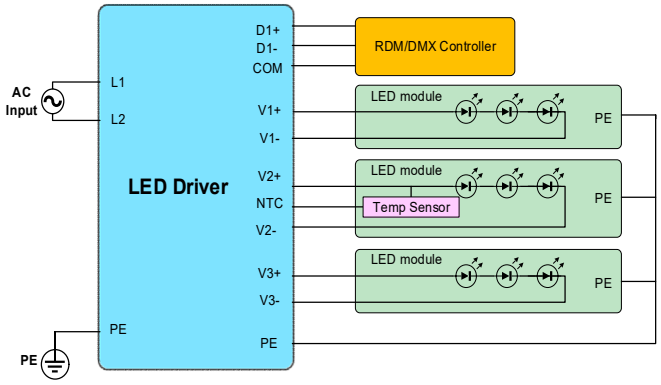
# LED Driver
## EUCO ARENA SPORT 2K1 Series

### Electrical Connection




| Connection | Pole | Input | Control | Output |
|---|---|---|---|---|
| L1/L2/PE | 3 | M25 Cable Gland | - | - |
| GIA series: DA+/DA-/+24V | 3 | - | M20 Cable Gland | - |
| GDA series: D1+/D1-/COM | | | | |
| V1+, V1-/V2+, V2-/V3+, V3-/ NTC /PE | 8 | - | - | M25 Cable Gland |

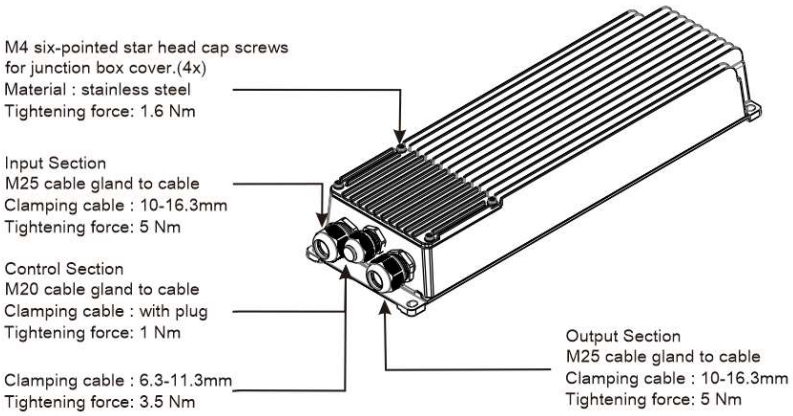


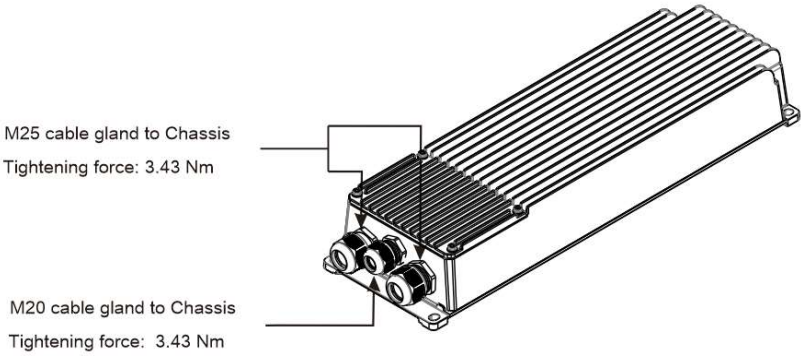




**Note:** All the output channels are independent, any series or parallel connections are not allowed, the user should strictly follow the connection schematic.

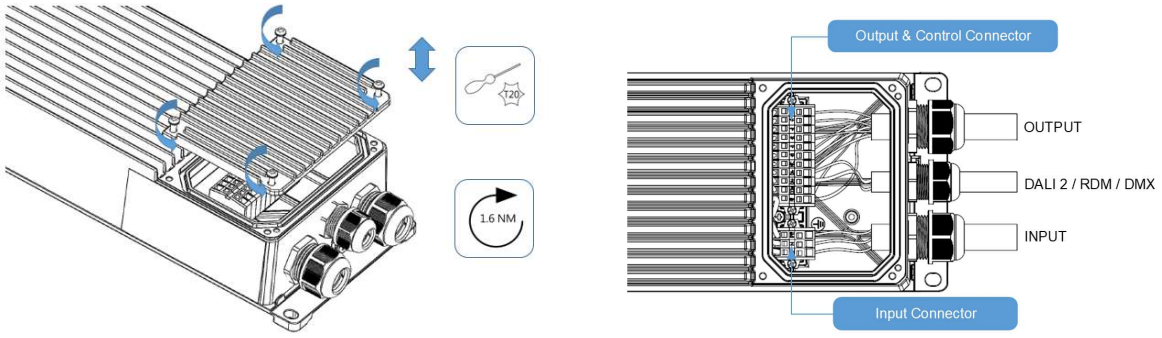
# LED Driver
## EUCO ARENA SPORT 2K1 Series

### Torque Force Requirement for IP66




### The Feature of Junction Box




**Note:** The cap and fastening 4 screws all have the function of anti-falling off.

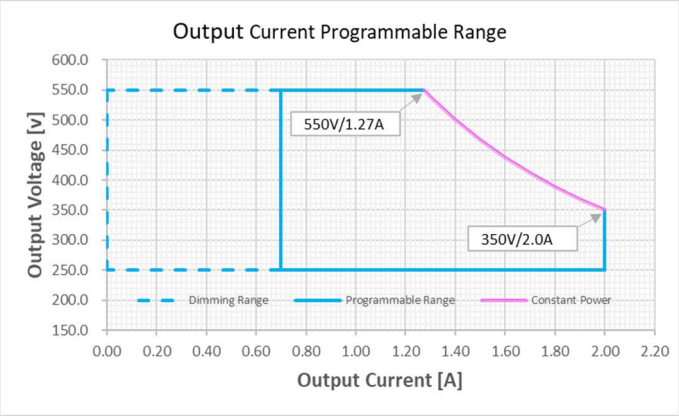


All parameters are specified at 25°C ambient for all products unless otherwise indicated.
**www.DeltaPSU.com (Jul 2023, Rev. 01)**

# LED Driver
## EUCO ARENA SPORT 2K1 Series

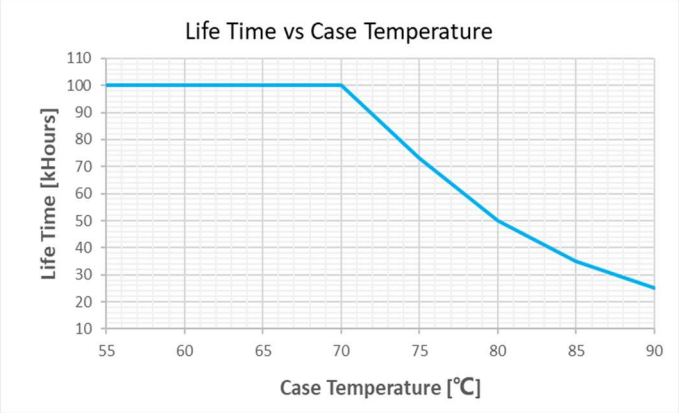
## Appendix

### 1. Operating Range Curve



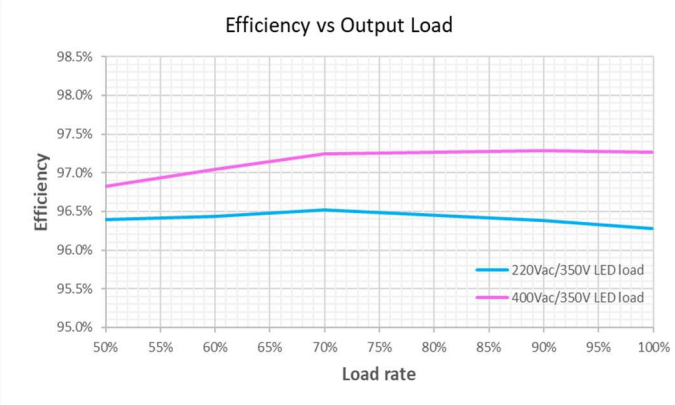

**Note:** EUCO ARENA SPORT 2K1 series can be programmed with wide output current through computer and programming tool. For more details, please refer to DALI programming User Manual or RDM/DMX programming User Manual.

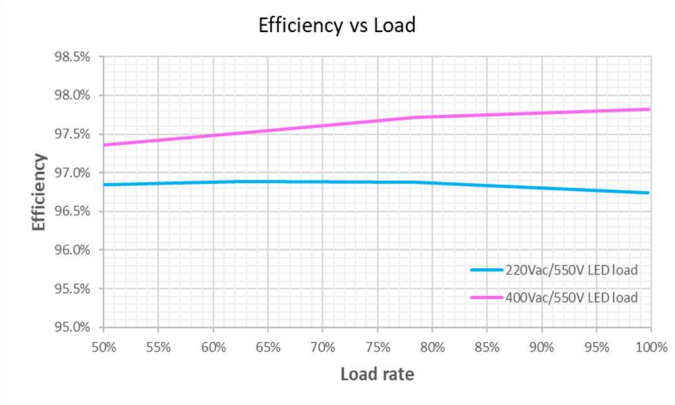
### 2. Life Time versus Case Temperature Curve




**Note:** Test at input voltage 220Vac & 400Vac, at full Load with each channel 2.0A/350V.

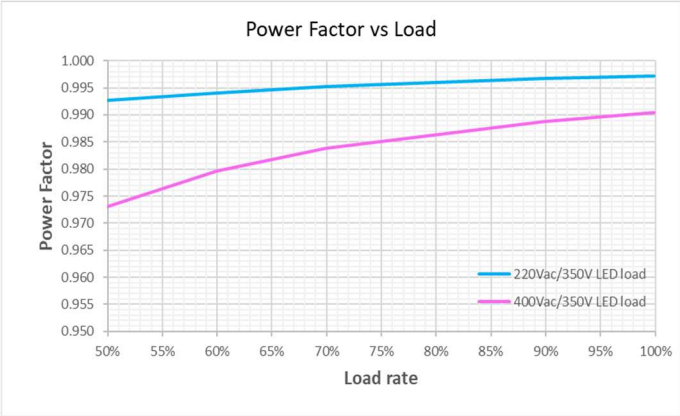
### 3. Efficiency versus Load

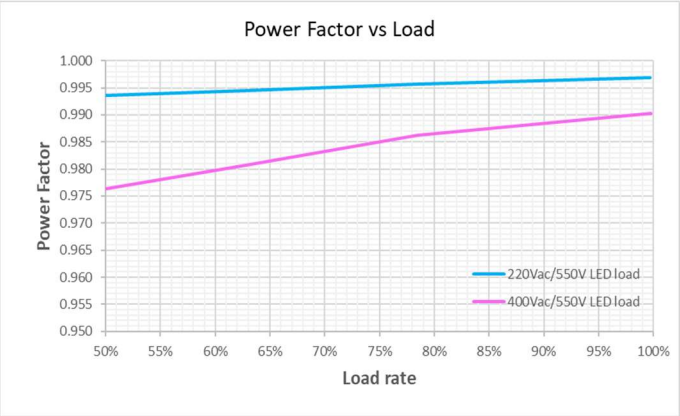


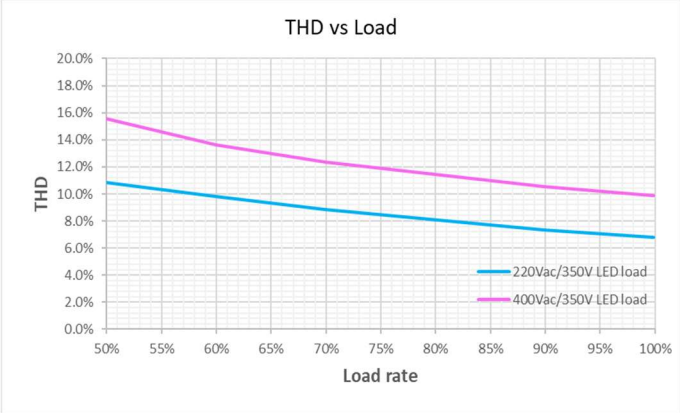
# LED Driver
## EUCO ARENA SPORT 2K1 Series

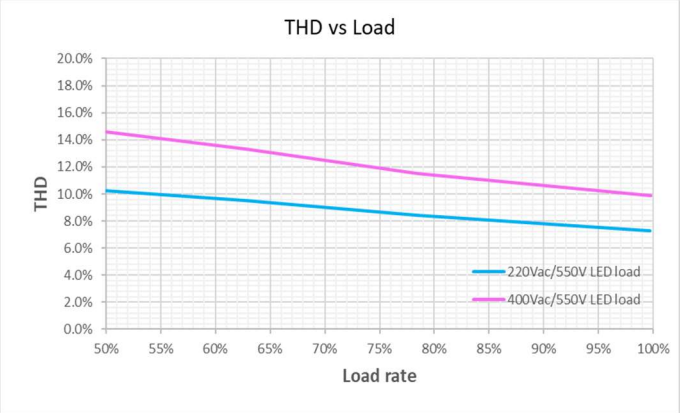
### 4. Power Factor versus Load



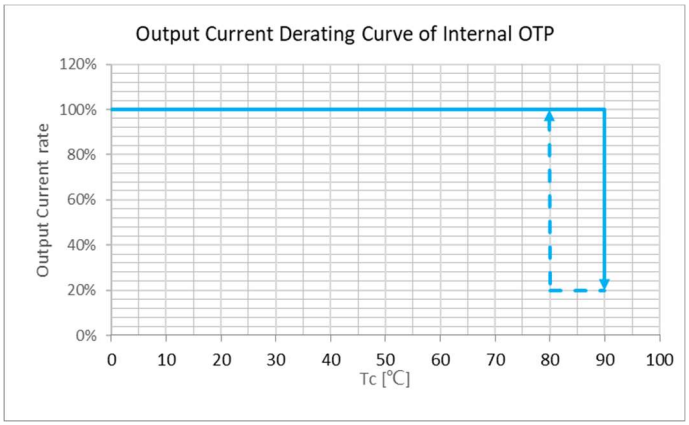

### 5. THD versus Load




### 6. Internal Over Temperature Protection

This function ensures that the driver works under safe operating temperature condition. When the ambient temperature exceeds a fixed threshold ($T_{c1}$ = 90℃ typical), the output current of each channel will decrease to 20% automatically to reduce the internal temperature of the driver. The minimum output current ratio is 20% of the value before the internal OTP enabled. The output current will recover to 100% when the internal temperature is below recovery threshold ($T_{c2}$ = 80℃ typical).



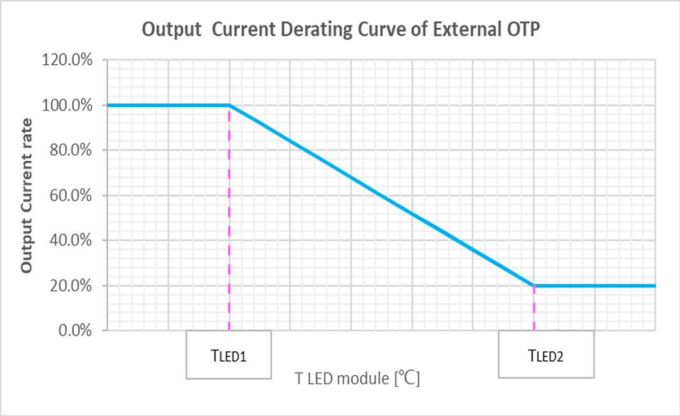


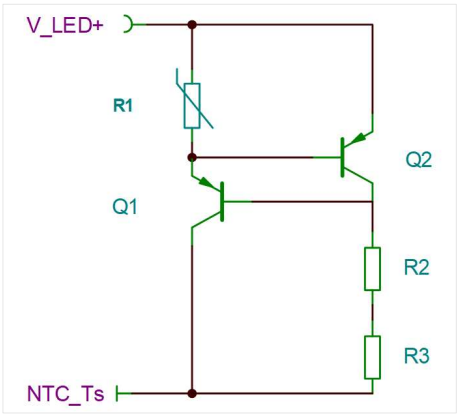

All parameters are specified at 25°C ambient for all products unless otherwise indicated.
**www.DeltaPSU.com (Jul 2023, Rev. 01)**

# LED Driver
## EUCO ARENA SPORT 2K1 Series

### 7. Programmable External Over Temperature Protection

This protection is an optional feature and user can ignore it without connecting to NTC connector in the junction box. The driver monitors the temperature of the LED module through NTC terminal. The output current of all channels will be reduced smoothly and linearly at OTP status and return to normal when the fault condition is removed.
An external temperature detection circuit as shown below is required to achieve the NTC terminal function to prevent the LED fixture from overheating. Strongly recommended that the temperature detection circuit be placed on the hottest LED module in the three channels to monitor its temperature.



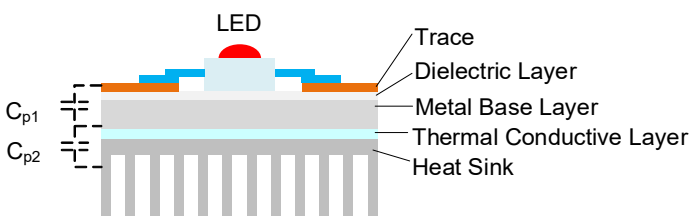



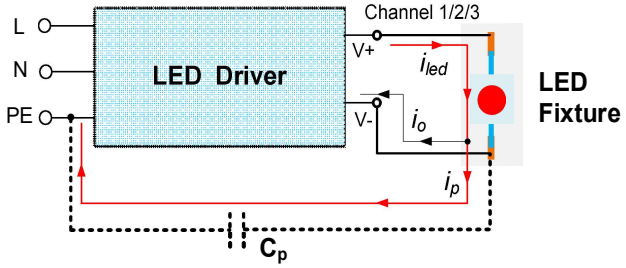

The trigger point of this protection can be set easily according to the actual conditions of the LED fixtures, the user can set the trigger point between 80 ℃ and 110 ℃ by the tool (from Delta), and the default value is 100 ℃. When the temperature exceeds the trigger point ($T_{OTP}$), the output current of each channel will decrease automatically to bring the temperature of the LED module back to safe value. Note that the temperature measurement accuracy depends on the load condition. More details about parameter setting please refer to DALI programming User Manual or RDM/DMX programming User Manual.

| Parameter | Part | Manufacturer | Description |
|---|---|---|---|
| Q1/Q2 | PBHV9050T | NEXPERIA | 500V 150 mA PNP high-voltage low $V_{CEsat}$ transistor |
| R1 | TSM1A333F3952RZA | THINKING | RES NTC 33Kohm F 3950K +/-1% SMD 0603 TP |
| R2/R3 | RC1206FR-07 5M1L | YAGEO | RES SMD 1/4W 5.1Mohm F 1206 |

### 8. Effect of Parasitic Capacitance in LED Fixture

The simplified structure of LED fixtures and leakage current effect are illustrated as following figures. As the driver is non-isolated between input and output, there could be an inevitable leakage current path through LED and equivalent parasitic capacitor $C_p$ ($C_{p1}$ and $C_{p2}$) to the PE (protective earth) in case that Heat Sink of the LED fixture grounds to the PE. This leakage current ip could impact on the output current ripple and the performance at low dimming level or dimming OFF. The equivalent $C_p$ should be kept as low as possible for low leakage current and accordingly optimized performance of the driver.





All parameters are specified at 25°C ambient for all products unless otherwise indicated.

## 9. External SPD requirement for extra LED fixture common mode surge protection

Although, the EUCO Arena Sport driver features the common mode surge protection capability of 10kV through AC mains against unexpected surge pulses, like Lightning phenomenon. However, the peak of residual common mode voltage pulses between the LED+ and PE or LED- and PE terminals of the luminaire could still be typically at 2.5kV or even higher to 4kV. Because of an unexpected surge and in the case that the LED module heat-sink insulation is not robust enough, the pulses possibly will damage the safety insulation in the LED module board (LED+/- to PE) and consequently the driver may actually be damaged due to the high common mode short circuit current induced by the LED board insulation breakdown.

Accordingly, Delta Electronics proposes for Class I luminaire to install an external surge protector device (SPD) in the AC mains cables to improve the robustness of the luminaire surge capability against unexpected surge pulses. This sort of approach would ensure that luminaire would retain a strong common mode surge residual voltage within LED modules capability and it can be easily marketed globally by attributing different surge protector device (SPD) to meet differing surge level requirements.

Warning: Delta strongly advises our customers not to install an SPD at the LED output side due to unexpected surge pulses the high common mode current goes through SPD and it will cause irreversible damage to the driver.