

DESCRIPTION

The Cielo series of LED drivers generate one constant current output from an AC input. Dual Dimming allows the Cielo high efficiency drivers to be used with compatible 0-10V or TRIAC/ELV dimmers.



KEY FEATURES

- 120/220-240/277V_{AC} Input
 - Dims with TRIAC and ELV dimmers at 120V_{AC} only
 - Dims with industry standard 0-10V dimmers (108-305V_{AC})
 - Max Output Power: 10W to 50W
 - 2 case sizes, 10-30W and 40-50W
 - Efficiency up to 84%
 - 90°C Top case rated
 - <20% THD, >0.9 PF
 - Fast start up time
 - UL 8750 Approved, LVLE outputs*. Class II isolation
 - Long Life
 - RoHS Compliant
- *UL Class 2 under evaluation



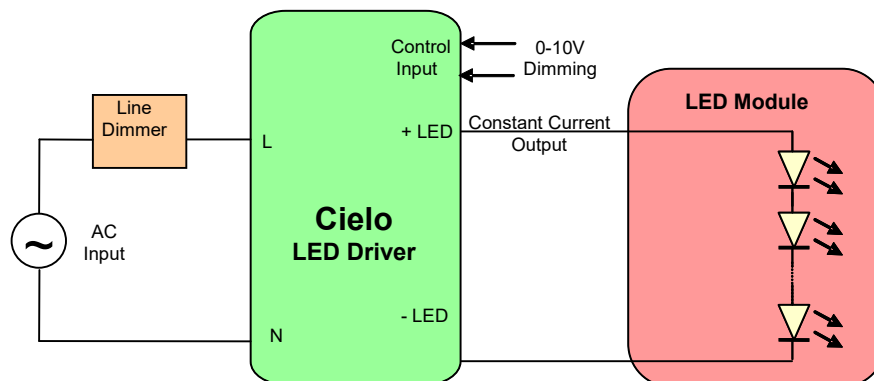
APPLICATIONS AND BENEFITS

Cielo LED drivers are designed for powering LED luminaries using standard lighting controls. Their discreet size easily fits into the space constrained LED fixtures of today's growing Commercial, Residential and Architectural lighting markets.

The modules operate with:

- Standard Light Switches
- 0-10V Dimmers
- Triac based Incandescent Dimmers (Forward phase – leading edge)
- Electronic Low Voltage Dimmers (Reverse Phase – trailing edge)

The following diagram depicts a typical installation utilizing the Cielo:



Cielo's Dimming Options:

- Analog Dimming (0-10V) input provides 10-100% out Dimming
- AC line dimming from Triac or ELV dimmers (120V_{AC})
- Dimming range down to less than 10% nominal output current


MODEL CODING AND OUTPUT RATINGS

| | Model Number | Pout Max (W) | Iout (mA) | Vout Min (V _{DC}) | Vout Max (V _{DC}) | Vout No_Load |
|--------------------------|---------------|--------------|-----------|-----------------------------|-----------------------------|--------------|
| 10 to 30W Housing | | | | | | |
| 10 - 15W | RCL010-0250A | 10.5 | 250 | 24 | 42 | 50 |
| | RCL015-0300A | 12.6 | 300 | 24 | 42 | 50 |
| | RCL015-0350A | 14.7 | 350 | 24 | 42 | 50 |
| | RCL015-0350B | 11.2 | 350 | 21 | 32 | 41.6 |
| | RCL015-0440A | 15.0 | 440 | 24 | 34 | 44.2 |
| | RCL015-0440B | 11.0 | 440 | 19 | 25 | 32.5 |
| 16 - 20W | RCL020-0350A | 19.6 | 350 | 40 | 56 | 60 |
| | RCL020-0450A | 18.9 | 450 | 24 | 42 | 50 |
| | RCL020-0500A | 16.0 | 500 | 21 | 32 | 41.6 |
| | RCL020-0600A | 16.2 | 600 | 20 | 27 | 35 |
| | RCL020-0700A | 16.8 | 700 | 14 | 24 | 31.2 |
| 21 - 30W | RCL030-0500A | 21.0 | 500 | 24 | 42 | 50 |
| | RCL030-0550A | 23.1 | 550 | 24 | 42 | 50 |
| | RCL030-0620A | 26.0 | 620 | 24 | 42 | 50 |
| | RCL030-0700A | 22.4 | 700 | 21 | 32 | 41.6 |
| | RCL030-0700B | 29.4 | 700 | 24 | 42 | 50 |
| | RCL030-0700C | 27.3 | 700 | 27 | 39 | 50 |
| | RCL030-0900A | 24.3 | 900 | 20 | 27 | 35 |
| | RCL030-0900B* | 28.8 | 900 | 21 | 32 | 41.6 |
| | RCL030-1100A | 29.7 | 1100 | 20 | 27 | 35 |



*This product is only UL approved, no CB and no ENEC.

| | Model Number | Pout Max (W) | Iout (mA) | Vout Min (V _{DC}) | Vout Max (V _{DC}) | Vout No_Load |
|--------------------------|--------------|--------------|-----------|-----------------------------|-----------------------------|--------------|
| 31 to 50W Housing | | | | | | |
| 31 - 40W | RCL040-0700B | 39.2 | 700 | 40 | 56 | 60 |
| | RCL040-0800A | 33.6 | 800 | 24 | 42 | 50 |
| | RCL040-0850A | 35.7 | 850 | 24 | 42 | 50 |
| | RCL040-0900A | 37.8 | 900 | 24 | 42 | 50 |
| | RCL040-0940A | 40.4 | 940 | 32 | 43 | 50 |
| 41 - 50W | RCL050-1050A | 44.1 | 1050 | 24 | 42 | 50 |
| | RCL050-1200A | 50.4 | 1200 | 24 | 42 | 50 |
| | RCL050-1400A | 44.8 | 1400 | 21 | 32 | 41.6 |
| | RCL050-1400B | 47.6 | 1400 | 24 | 34 | 44.2 |




INPUT SPECIFICATIONS

| Specification | Test Conditions / Notes | Min. | Nominal | Max. | Units |
|---------------------------------------|---|------|---------|------|-----------------|
| AC Input Voltage | | 108 | 120-277 | 305 | V _{AC} |
| Input Frequency | | 47 | 50/60 | 63 | Hz |
| Input Current | 120V _{AC} (10-30W models) | - | - | 0.35 | A |
| | 120V _{AC} (31-50W models) | - | - | 0.70 | |
| Inrush Current (10-30W models) | 120V _{AC} Half Value time: 200µs | - | - | 6 | Apk |
| | 230V _{AC} Half Value time: 150µs | - | - | 12 | |
| | 277V _{AC} Half Value time: 150µs | - | - | 15 | |
| Inrush Current (31-50W models) | 120V _{AC} Half Value time: 200µs | - | - | 7 | Apk |
| | 230V _{AC} Half Value time: 250µs | - | - | 12 | |
| | 277V _{AC} Half Value time: 250µs | - | - | 14 | |
| THD* | 120V _{AC} Rated Load | - | - | 10 | % |
| | 230V _{AC} Rated Load | - | - | 15 | |
| | 277V _{AC} Rated Load | - | - | 20 | |
| Efficiency | 31-50W models | - | 84 | - | % |
| | 15-30W models | - | 82 | - | |
| | 10-15W models | 78 | 80 | - | |
| Power Factor* | 120V _{AC} Rated Load | - | 0.98 | 0.99 | |
| | 230V _{AC} Rated Load | - | 0.97 | 0.98 | |
| | 277V _{AC} Rated Load | - | 0.95 | 0.96 | |

* please Refer to KPD for further details


OUTPUT SPECIFICATIONS

| Specification | Test Conditions / Notes | Min. | Nom. | Max. | Units |
|----------------------------|--|------|------|------|-------|
| Output Power Rating | 10-30W models | - | - | 29.7 | W |
| | 31-50W models | - | - | 50.4 | |
| Output Voltage | 10-30W models | 14 | - | 56 | V |
| | 31-50W models | 21 | - | 56 | |
| Output Current | 10-30W models | 250 | - | 1100 | mA |
| | 31-50W models | 700 | - | 1400 | |
| Ripple Current | lout_Pk-pk/RMS (except for models identified in the table below) | - | - | 40 | % |
| Output Regulation | | - | - | ±5 | %lout |
| Start-up time | With no dimmer connected | - | 300 | 500 | ms |

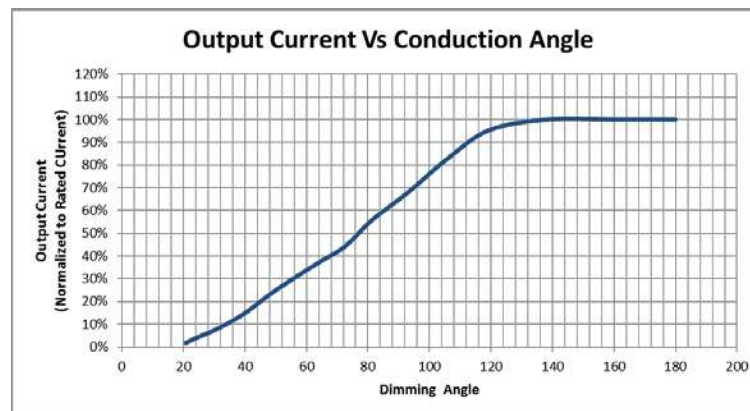
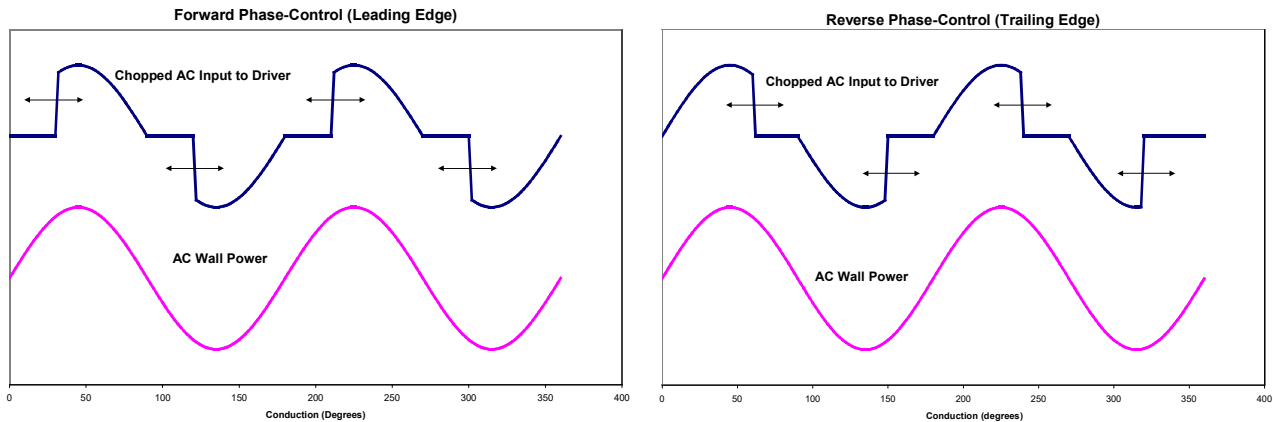
| Model # | Ripple Current Pk-pk/RMS (%) |
|--------------|------------------------------|
| RCL020-0500A | 55 |
| RCL020-0600A | 45 |
| RCL020-0700A | 50 |
| RCL030-0700A | 65 |
| RCL030-0700C | 45 |
| RCL030-0700B | 45 |
| RCL030-0900A | 70 |
| RCL030-0900B | 60 |
| RCL030-1100A | 90 |
| RCL040-0940A | 60 |
| RCL050-1400A | 70 |
| RCL050-1400B | 60 |


PROTECTION FEATURES

| Specification | Test Conditions / Notes | Min. | Nominal | Max. | Units |
|---------------------------------------|---|------|---------|-----------|-------|
| Output Short-Circuit | Hiccup, Auto recovery | - | - | - | - |
| Over-Temperature Top Case | The output current of the driver will be reduced in order to limit case temperature rise, Auto recovery | - | - | >90 | °C |
| lout Over-Shoot | During power on or power off | - | - | 10 | % |
| No Load | Unit will not exceed the Vout Max "Vout No_Load" rating | - | - | V_No_Load | V |
| Isolation Primary-to-Secondary | Reinforced/double Insulation meets IEC/EN61347-2-13 Class II | | | | |


LINE DIMMING

120V_{AC} Dimming of the driver is possible with standard TRIAC based incandescent dimmers that chop the AC voltage, or with ELV dimmers. During the rapid rise time of the AC voltage when the dimmer turns on, the driver does not generate any voltage or current oscillations, and inrush current is controlled. During the on-time of the AC input, the driver regulates the output. The RMS value of the driver output current is proportional to the on-time of the AC input voltage. The RMS output current varies depending upon the conduction angle and RMS value of the applied AC input voltage.

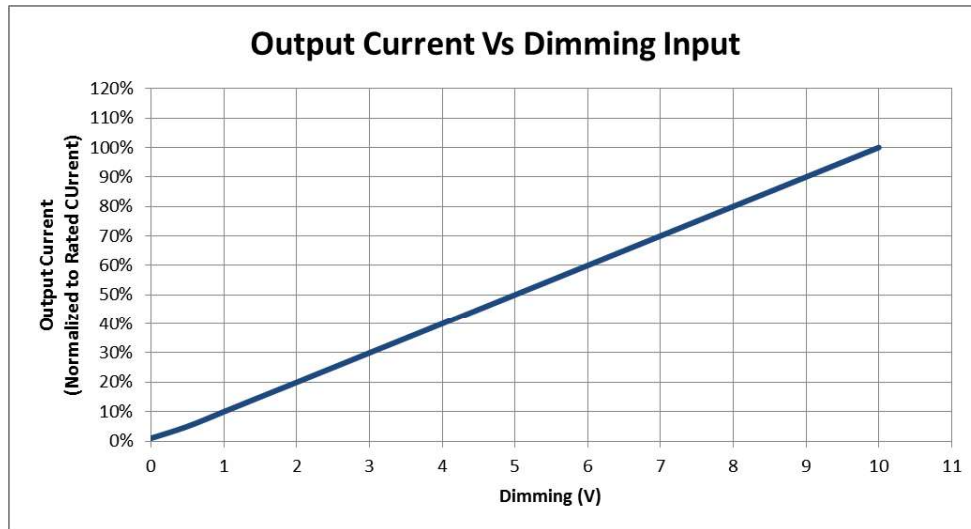


COMPATIBLE LINE DIMMERS:

| 120V _{AC} Dimmers only | | | | | |
|---------------------------------|-----------|---------|-----------|------------|----------|
| Mfg. | Model | Mfg. | Model | Mfg. | Model |
| Lutron | S-603PG | Lutron | DVELV303P | Lutron | CT103P |
| Leviton | IPI06-1LZ | Lutron | SELV300P | Cooper | SLC03P |
| Leviton | 6631-2 | Leviton | 6683-IW | Leviton | IPE04 |
| Lutron | DVCL-153P | Leviton | 6161 | Lutron | MAELV600 |
| Lutron | DV600P | Leviton | 6633-P | Lutron | FAELV500 |
| Lutron | TGCL-153P | Lutron | TG-600P | Lightolier | ZP260QEW |
| Lutron | S600P | Cooper | DLC03P | Cooper | DAL06P |
| Leviton | VPE06 | Lutron | LG600P | | |

0-10V DIMMING

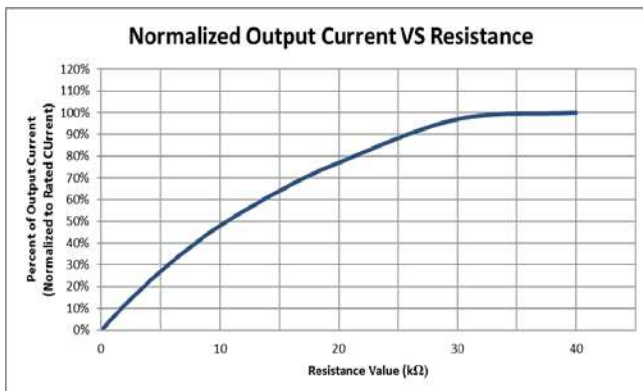
The dimming inputs (purple/grey wires) can be used to adjust the output setting via a standard commercial wall dimmer, an external control voltage source (0 to 10VDC), or a variable resistor. Any dimmer must be capable of sinking 1mA per driver from the dimming wires. This input permits 100% to 1% dimming. With the dimming input at 1V, the output will dim to 10% of nominal current. At a dimming input of 0.1V, the output current shall decrease to 1% of nominal current.



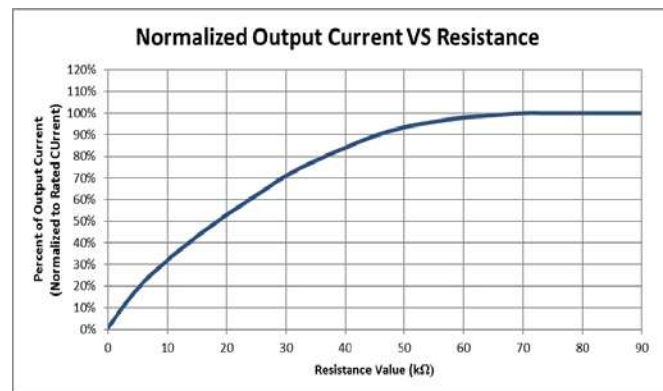
Approved Dimmers: Lutron (Part Number Nova NFTV); Lutron (Part Number Diva DVTV); Leviton (Ilumatech IP710-DL)

RESISTOR DIMMING

The following graphs show the relationship between the value of the resistor connected across the dimming input versus the output current of a single driver.



Cielo 10-30W Models



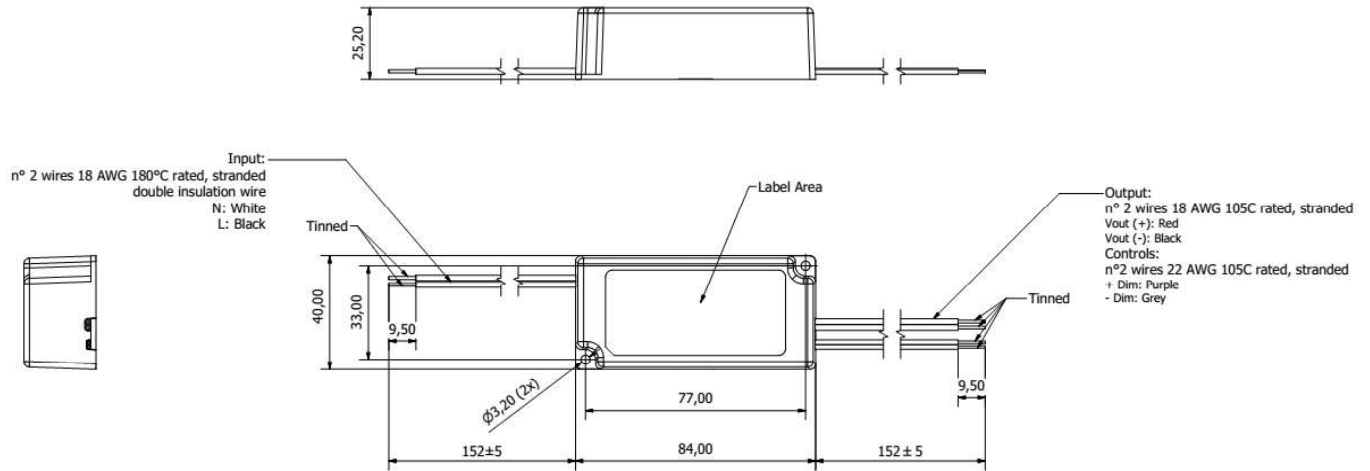
Cielo 40-50W

DIMMING NOTES

1. The length of the dimming circuit wiring, wire size and the number of drivers connected to the dimming control must be designed so that the total voltage drop is less than 0.3V between the drivers and the dimming control.
2. Line dimming and 0-10V dimming interfaces cannot be used at the same time.
3. Trimming of the output current with the resistor applied on the 0-10V wires is not permitted when using Line Dimming.

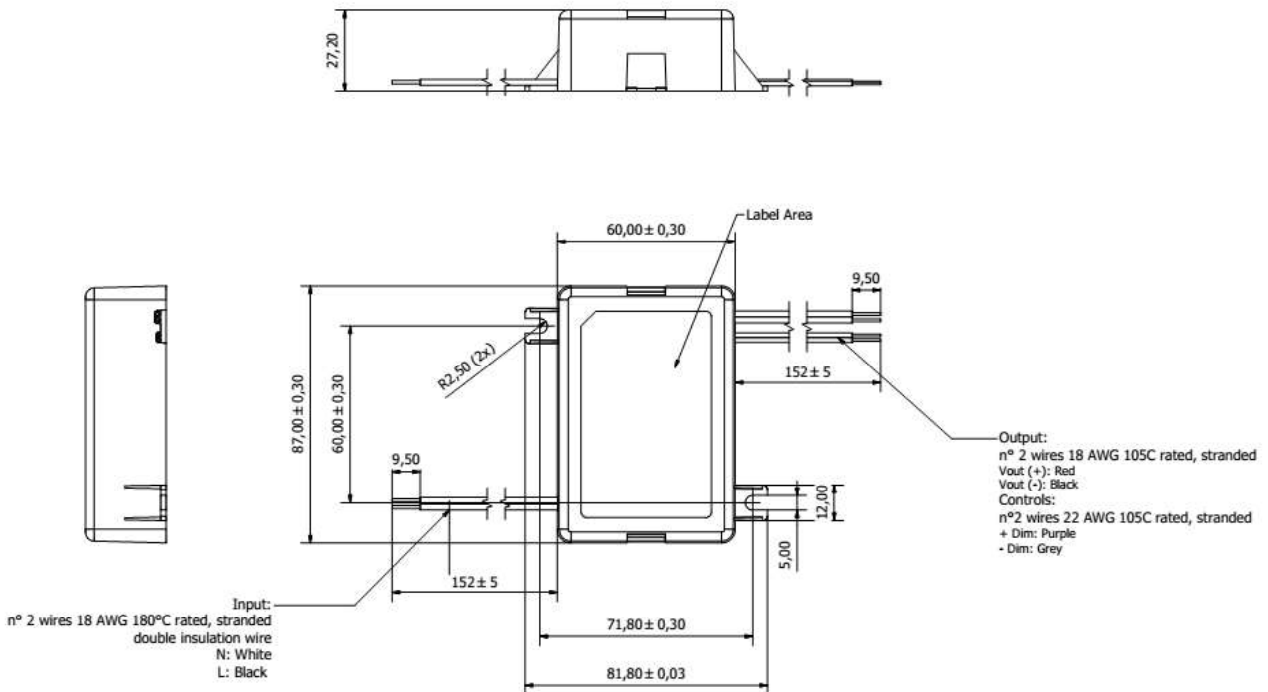

MECHANICAL DETAILS - 10W TO 30W MODELS (RCL010, RCL020, RCL030)

Enclosure Material: Plastic
 I/O Connections: Flying leads
 Ingress Protection: IP 20, UL damp rated
 Dimensions: 84 x 40 x 25.2 mm
 3.30 x 1.57 x 0.99 in



MECHANICAL DETAILS - 40W TO 50W MODELS (RCL040, RCL050)

Enclosure Material: Plastic
 I/O Connections: Flying leads
 Ingress Protection: IP 20, UL damp rated
 Dimensions: 87 x 60 x 27.2 mm
 3.47 x 2.36 x 1.07 in




ENVIRONMENTAL SPECIFICATIONS

| Specification | Test Conditions / Notes | Min | Nominal | Max | Units |
|-----------------------------|---|------|---------|-----|-------|
| Top Case Temperature Range | Refer to the Top Case measurement point | -30 | - | 90 | °C |
| Storage Temperature | | -40 | - | 85 | °C |
| Operating Relative Humidity | Non-condensing | 5 | - | 95 | % |
| Surface Temperature | Exposed surfaces temperature under all operating conditions | - | - | 90 | °C |
| Cooling | Convection cooled | - | - | - | |
| MTBF | Rated Load, 70°C Top Case, Bellcore | 250k | - | - | Hours |
| Useful Life | 70°C Top Case. | - | 50k | - | Hours |





ELECTROMAGNETIC COMPATIBILITY (EMC) – EMISSIONS

| Phenomenon | Conditions / Notes | Standard | Equipment Performance Class |
|--|----------------------------|------------------------------|-----------------------------|
| Conducted and Radiated Emission | Test at 230V _{AC} | EN55015 | |
| Conducted and Radiated Emission | Test at 120V _{AC} | FCC CFR47- part 15/subpart B | Class B |
| Conducted and Radiated Emission | Test at 277V _{AC} | FCC CFR47- part 15/subpart B | Class A |
| Harmonic Current Emissions | | EN61000-3-2 | Class C |
| Voltage Changes, Fluctuation and Flicker | | EN61000-3-3 | |


ELECTROMAGNETIC COMPATIBILITY (EMC) – IMMUNITY

| Phenomenon | Conditions / Notes | Standard | Note |
|--|--------------------|---------------|------------|
| Equipment for general lighting purposes -EMC Immunity Requirements | | EN 61547 | |
| ESD (Electrostatic Discharge) | | EN 61000-4-2 | |
| Radiated Radio-Frequency electromagnetic field | | EN 61000-4-3 | |
| Electric Fast Transient / Burst | 2kV on AC input | EN 61000-4-4 | |
| Surge | Level ±1.5kV L-N | 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 | | ANSI C.62.41 | Category A |


SAFETY AGENCIES APPROVALS

| Certification Body | Safety Standards | Category |
|---|--|----------|
|  | UL Recognized ANSI / UL8750, 1 st Ed., CSA C22.2 No.250-13, 7 th Ed. Models with output voltages <60 V _{DC} include UL and CSA approval (cURus) as LVLE output. LED Driver suitable for dry and damp location | |
|  | To obtain the “CE Declaration of Conformity” please contact info@efore.com | |
|  | IEC/EN 61347-2-13 electronic control gear for LED Modules IEC/EN 62384 DC or AC supplied electronic control gear for LED modules – Performance Requirements | |

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