

## 110 W Dimmable DALI LED driver

Product code: 5532

110 W 220 – 240 V 0 / 50 – 60 Hz

- DALI dimmable LED driver, 1 - 100 % dimming range
- Enhanced Hybrid dimming, with varying PWM frequency
- Very high efficiency up to 95%
- Low current ripple
- Suitable for DC use
- Long lifetime up to 100 000 h
- Driver protection Class I
- Ideal solution for Class I luminaires, suitable for Class II luminaires too\*



\* See page 5 for details.



### Functional Description

- Adjustable constant current output: 350 mA (default) to 700 mA
- Current setting programmable via DALI or with external resistors
- Switch-Control functionality for easy-to-use intensity control
- Full load recognition with automatic recovery and adaptive LED overload / open circuit / short circuit protection
- Multipurpose terminal Iset/NTC for current setting or overtemperature protection
- Constant Light Output (CLO), adjustable up to 100 000 h (default disabled)
- Power consumption monitor (real time), running hour monitor (accumulative), energy management (accumulative)

### Mains Characteristics

|                                  |  |
|----------------------------------|--|
| Voltage range                    | 198 VAC – 264 VAC<br>Withstands max. 320 VAC (max. 1 hour) |
| DC range                         | 176 VDC – 280 VDC  |
| starting voltage                 | > 190 VDC  |
| Mains current at full load       | 0.44 – 0.60 A  |
| Frequency                        | 0 / 50 Hz – 60 Hz  |
| Stand-by power consumption       | < 0.5 W  |
| THD at full power                | < 10 %   |
| Leakage current to earth         | < 0.4 mA   |
| Tested surge protection          | 1 kV L-N, 2 kV L-GND (IEC 61000-4-5)                       |
| Tested fast transient protection | 4 kV (IEC 61000-4-4)                                       |

### Insulation between circuits & driver case

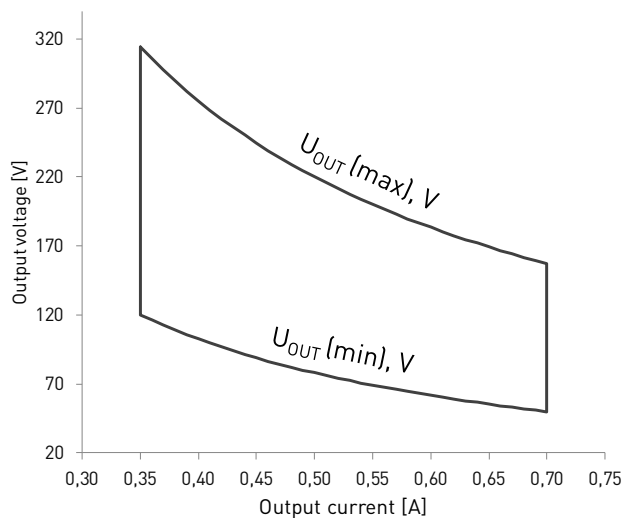
|                                      |                  |
|--------------------------------------|------------------|
| Mains circuit - Output               | Non-isolated     |
| DALI circuit - Output                | Basic insulation |
| Mains circuit - DALI circuit         | Basic insulation |
| Mains, DALI and output - Driver case | Basic insulation |

### Load Output (non-isolated)

|                              |  |
|------------------------------|--|
| Output current ( $I_{out}$ ) | 350 mA (default) – 700 mA  |
| Accuracy                     | ± 5 %  |
| Ripple                       | < 2 %* at ≤ 120 Hz   |
|                              | *] Low frequency, LED load: Cree MX3 LEDs  |
| $U_{out}$ (max) (abnormal)   | 400 V  |
| Outrush current              | 1350 mA*   |
|                              | *] When starting driver with short-circuited load or connecting load to running driver |

| $I_{out}$                          | 350 mA      | 700 mA     |
|------------------------------------|-------------|------------|
| $P_{OUT(MAX)}$                     | 110 W       | 110 W      |
| $U_{OUT}$                          | 120 – 314 V | 50 – 157 V |
| PF ( $\lambda$ ) at full load      | 0.98        | 0.98       |
| Efficiency ( $\eta$ ) at full load | 95 %        | 94 %       |

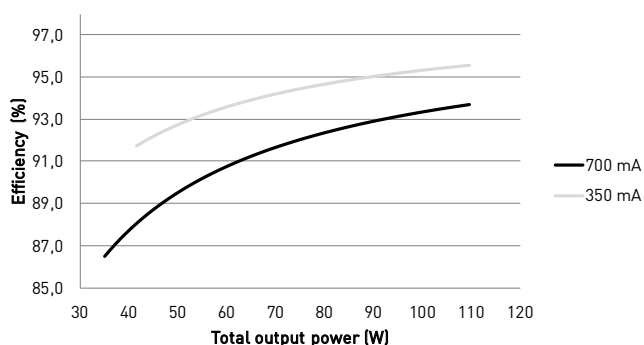
## Operating window



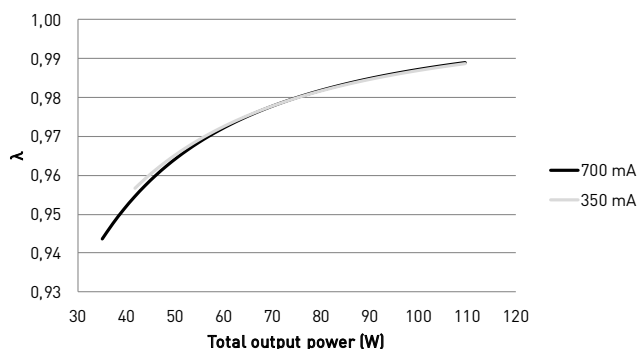
Note: Dimming between 1% - 100% possible across the whole operating window

## Driver performance

Typical efficiency



Typical power factor



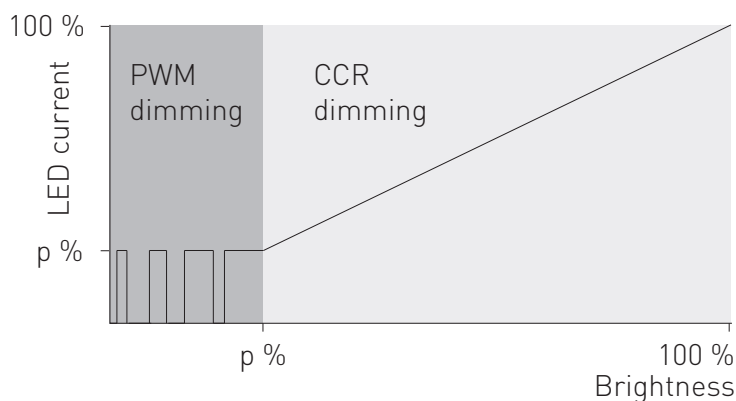
## Operating Conditions and Characteristics

|  |                             |
|--|-----------------------------|
| Highest allowed $t_c$ point temperature* | 85 °C                       |
| $t_c$ life (55 000 h) temperature        | 75 °C                       |
| Ambient temperature range**              | -20 °C ... +50 °C           |
| in independent use                       | -20 °C ... +40 °C           |
| Storage temperature range                | -40 °C ... +80 °C           |
| Maximum relative humidity                | No condensation             |
| Lifetime (90 % survival rate)            | 100 000 h, at $t_c = 65$ °C |
|  | 55 000 h, at $t_c = 75$ °C  |
|  | 25 000 h, at $t_c = 85$ °C  |

\*) ENEC certified only up to  $t_c$  life temperature

\*\*) For other than independent use, higher  $t_a$  of the controlgear possible as long as highest allowed  $t_c$  point temperature is not exceeded

Hybrid dimming technique



| Dimming range | Dimming technique                |
|---------------|----------------------------------|
| 1 % – 20 %    | Pulse Width Modulation (PWM)*    |
| 20 % – 100 %  | Constant Current Reduction (CCR) |

\* PWM dimming frequency 1 kHz - 8 kHz

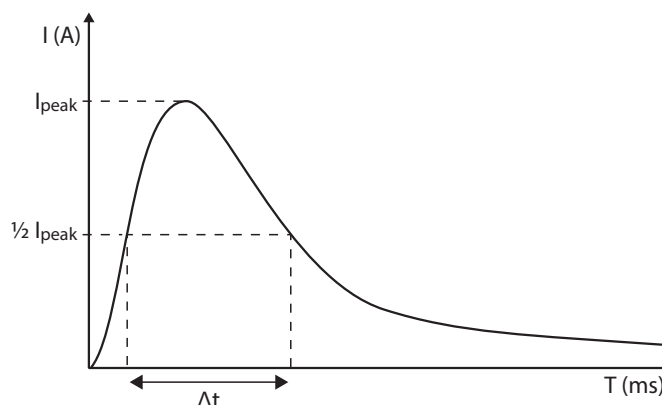
Helvar hybrid dimming products combines both Constant Current Reduction (CCR) amplitude dimming and Pulse Width Modulation (PWM) dimming. CCR is a very efficient technique for dimming the light output, especially on higher range. On lower range, the hybrid dimming products implement high-frequency PWM dimming according to the table above.

Quantity of drivers per miniature circuit breaker 16 A Type C

| Based on $I_{cont}$ | Based on inrush current $I_{peak}$ | Typ. peak inrush current $I_{peak}$ | 1/2 value time, $\Delta t$ | Calculated energy, $I_{peak}^2 \Delta t$ |
|---------------------|------------------------------------|-------------------------------------|----------------------------|--|
| 22 pcs.             | 21 pcs.                            | 46 A                                | 240 $\mu s$                | 0.346 A <sup>2</sup> s                   |

CONVERSION TABLE FOR OTHER TYPES OF MINIATURE CIRCUIT BREAKER

| MCB type | Relative quantity of LED drivers |
|----------|----------------------------------|
| B 10 A   | 37 %                             |
| B 16 A   | 60 %                             |
| B 20 A   | 75 %                             |
| C 10 A   | 62 %                             |
| C 16 A   | 100 % (see table above)          |
| C 20 A   | 125 %                            |



Type C MCB's are strongly recommended to use with LED lighting. Please see more details in "MCB information" document in each driver product page in "downloads & links" section.

## Connections and Mechanical Data

|                                   |   |
|-----------------------------------|---|
| Wire size                         | 0.5 mm <sup>2</sup> – 1.5 mm <sup>2</sup> |
| Wire type                         | Solid core and fine-stranded              |
| Wire insulation                   | According to EN 60598                     |
| Maximum driver to LED wire length | 5 m                                       |
| Weight                            | 238 g                                     |
| IP rating                         | IP20                                      |

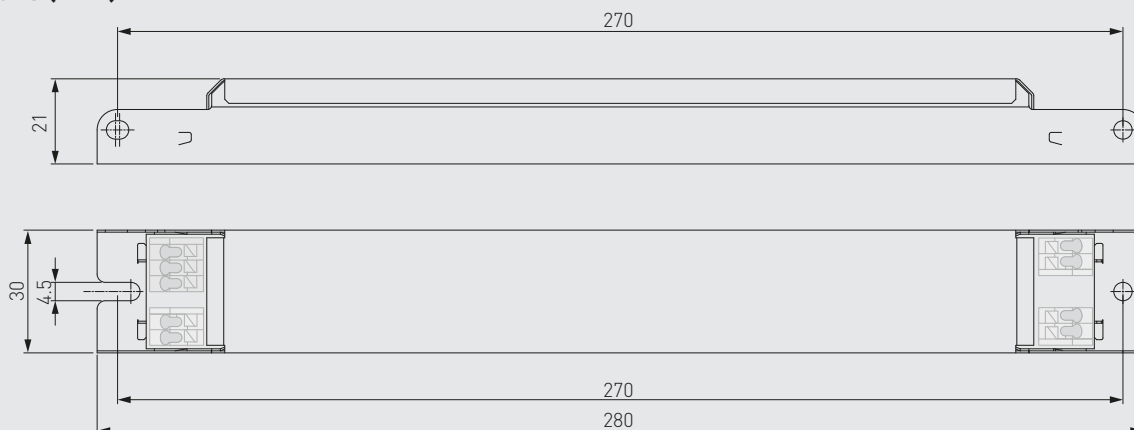
## Connections



Note:

- Label may differ if the unit is preset to fixed current

## Dimensions (mm)



Output current can be set with the current setting resistor connected to the Iset terminal. Example current and resistor values across the range can be found in the following table. More information about the current setting resistor is given on page 5.

## Iset current setting resistor values

| Resistor (Ω)          | 0      | 220 | 470    | 820    | 1,2k | 1,5k   | 2,2k   | 2,74k  | 3,9k   | 5,6k   | 6,8k   | 10k    | 18k    | 39k | ∞   |
|-----------------------|--------|-----|--------|--------|------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|
| I <sub>out</sub> (mA) | 700    | 675 | 650    | 625    | 600  | 575    | 550    | 525    | 500    | 475    | 450    | 425    | 400    | 375 | 350 |
| Order code            | T70000 | N/A | T70471 | T70821 | N/A  | T70152 | T70222 | T72741 | T70392 | T70562 | T70682 | T70103 | T70183 | N/A | N/A |

LL1x110-E-DA LED driver is suited for built-in usage in luminaires. With LL1x2130-SR strain reliefs, independent use is possible too (see the LL1x2130-SR datasheet for details). In order to have safe and reliable LED driver operation, the LED luminaires will need to comply with the relevant standards and regulations (e.g. IEC/EN 60598-1). The LED luminaire shall be designed to adequately protect the LED driver from dust, moisture and pollution. The luminaire manufacturer is responsible for the correct choice and installation of the LED drivers according to the application and product datasheets. Operating conditions of the LED drivers may never exceed the specifications as per the product datasheet.

## Installation & operation

### Maximum ambient and $t_c$ temperature

- For built-in components inside luminaires, the  $t_a$  ambient temperature range is a guideline given for the optimum operating environment. However, integrator must always ensure proper thermal management (i.e. mounting base of the driver, air flow etc.) so that the  $t_c$  point temperature does not exceed the  $t_c$  maximum limit in any circumstance.
- Reliable operation and lifetime is only guaranteed if the maximum  $t_c$  point temperature is not exceeded under the conditions of use.

### Current setting resistor

LL1x110-E-DA LED driver features a constant current output adjustable via current setting resistor or software.

- An external resistor can be inserted in to the current setting terminal, allowing the user to adjust the LED driver output current
- When no external resistor is connected, then the LED drivers will operate at their default lowest current level
- A standard through-hole resistor can be used for the current setting. To achieve the most accurate output current it is recommended to select a quality low tolerance resistor. Minimum diameter for resistor leg is 0.51mm.
- Always connect the current setting resistor only into the terminals marked with Iset on the LED driver label.
- For the resistor/current value selection, refer to the table on page 4.

### Miniature Circuit Breakers (MCB)

- Type-C MCB's with trip characteristics in according to EN 60898 are recommended.
- Please see more details in "MCB information" document in each driver product page in "downloads & links" section.

### Use of Switch-Control functionality

- Maximum numbers of LED drivers to be connected to one switch is 30.
- The maximum cabling length from the switch to the driver is 25 meters. If longer cabling is needed, please connect a capacitor across the Switch-Control input (1  $\mu$ F, min. 275 VAC RMS and X2 rated, according to IEC60384-14).
- Ensure that all components connected to Switch-Control circuitry are mains rated.

### Installation site

- The general preferred installation position of LED drivers for independent use is to have the top cover facing upwards.

## Helvar Driver Configurator support

LL1x110-E-DA LED driver is supported by Helvar Driver configurator software. The driver supports output current setting with software, the output current of the driver can be programmed using Helvar Driver Configurator, as well as parameters for functions such as CLO. Also the operation of the multifunction Iset terminal usage can be changed from current setting resistor (default) to NTC overtemperature protection operation.

## Lamp failure functionality

**No load:** When open load is detected, driver will go to standby, automatic recovery on first 10 minutes. After 10 minutes if no load is detected driver goes to standby mode and will recover with mains reset.

**Overload:** When high overload is detected, driver goes to standby and follow the same functions described in short circuit condition. High overload is triggered when calculated output power reaches 120W. When low overload is detected, output current is reduced to result maximum rated power. This protection operates until output voltage reaches level of high overload condition.

**Underload:** When under voltage is detected, driver goes to standby, and returns through mains reset.

**Short circuit:** When short circuit is detected, driver goes to standby, and returns through mains reset.

**NTC trigger:** When NTC is enabled via Helvar Driver Configurator, driver follows NTC feature behaviour. Default NTC trigger point is 8,2 k $\Omega$ , after which the driver starts to decrease the output level.

## Conformity & standards

|  |               |
|--|---------------|
| General and safety requirements  | EN 61347-1    |
| Particular safety requirements for DC or AC supplied electronic control gear for LED modules | EN 61347-2-13 |
| Thermal protection class   | EN 61347, C5e |
| Mains current harmonics  | EN 61000-3-2  |
| Limits for voltage fluctuations and flicker  | EN 61000-3-3  |
| Radio frequency interference   | EN 55015      |
| Immunity standard  | EN 61547      |
| Performance requirements   | EN 62384      |
| <b>Digital addressing lighting interface:</b>  |               |
| General requirements for DALI system   | EN 62386-101  |
| Requirements for DALI control gear   | EN 62386-102  |
| Requirements for control gear of LED modules (DALI Device Type 6)                            | EN 62386-207  |
| Compliant with relevant EU directives  |               |
| RoHS / REACH compliant   |               |
| ENEC and CE marked   |               |

## Label symbols



Thermally controlled control gear, incorporating means of protection against overheating to prevent the case temperature under any conditions of use from exceeding 120 °C.



DALI certified control gear.