

## 10-42 W Dimmable DALI-2 LED driver

Product code: 5721

42 W 220 – 240 V 0 / 50 – 60 Hz

- DALI-2 certified LED driver, 1-100 % dimming range
- Very low flicker output complying with IEEE 1789 recommendations
- Suitable for flicker-free camera recording applications
- High efficiency up to 92 %
- Suitable for DC use
- Long lifetime up to 100 000 h
- Driver protection Class I
- Suitable for closed luminaires where protection done with luminaire construction (Class I or II)
- Helvar Driver Configurator support



### Functional Description

- Adjustable constant current output: 120 mA (default) to 350 mA
- Current setting programmable via DALI or with external resistors
- Filtered dimming for high-quality light in every application
- Latest technology Switch-Control 2\* functionality for easy-to-use intensity control
- Adaptive LED overload protection, reduces output current if minor overload (up to 45 W) is detected
- Output current peak limited (600 mA) during load change
- Full load recognition with automatic recovery, open and 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)
- Energy consumption monitor (real time), running hour monitor (accumulative), energy management (accumulative)

\*Available since 11/2018

### Mains Characteristics

|                                  |  |
|----------------------------------|--|
| Voltage range                    | 198 VAC – 264 VAC<br>Withstands max. 330 VAC (max. 1 hour) |
| DC range                         | 176 VDC – 280 VDC  |
| starting voltage                 | > 190 VDC  |
| Mains current at full load       | 0.2 A – 0.22 A   |
| Frequency                        | 0 / 50 Hz – 60 Hz  |
| Stand-by power consumption       | < 0.5 W  |
| THD at full power                | < 12 %   |
| Leakage current to earth         | < 0.5 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

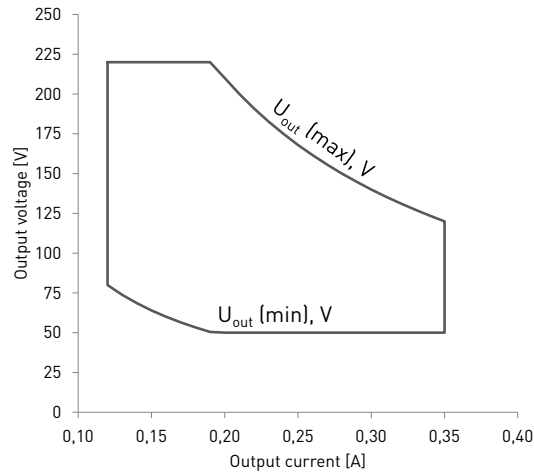
|                              |                           |
|------------------------------|---------------------------|
| Output current ( $I_{out}$ ) | 120 mA (default) – 350 mA |
| Accuracy                     | ± 5 %                     |
| Ripple                       | < 2 %* at ≤ 120 Hz        |
| $U_{OUT}$ (max) (abnormal)   | 250 V                     |
| Outrush current              | 600 mA*                   |

\*] Low frequency, LED load: Cree XM-L LEDs

\*] When starting driver with short-circuited load or connecting load to running driver

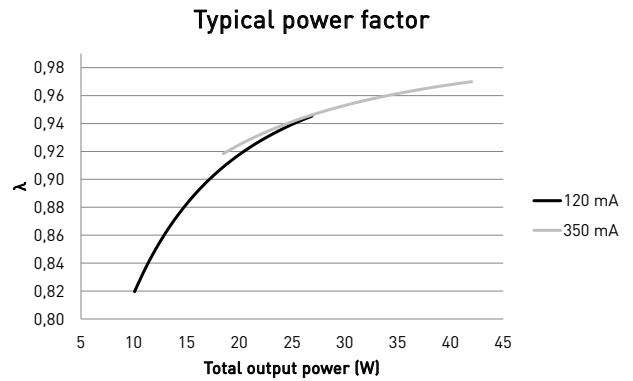
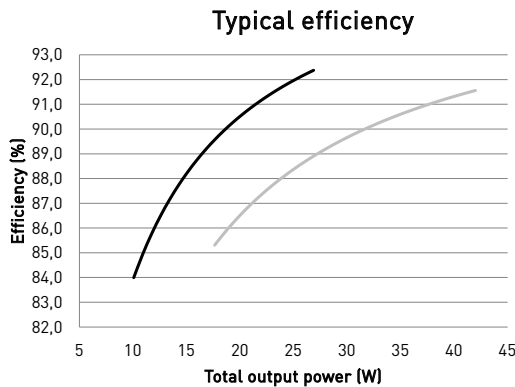
|                                    |              |              |
|------------------------------------|--------------|--------------|
| $I_{LED}$                          | 120 mA       | 350 mA       |
| $P_{Rated}$                        | 26.4 W       | 42 W         |
| $U_{LED}$                          | 80 V – 220 V | 50 V – 120 V |
| PF ( $\lambda$ ) at full load      | 0.95         | 0.97         |
| Efficiency ( $\eta$ ) at full load | 92 %         | 92 %         |

## Operating window



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

## Driver performance



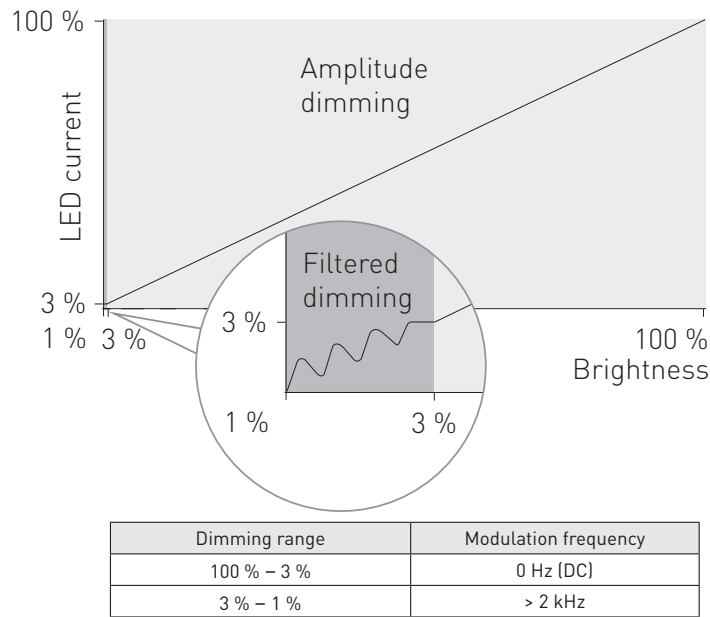
## Operating Conditions and Characteristics

|   |   |
|---|---|
| Absolute highest allowed $t_c$ point temperature* | 85 °C   |
| $t_c$ life (60 000 h) temperature                 | 75 °C   |
| Ambient temperature range**                       | -25 °C ... +50 °C   |
| in independent use                                | -25 °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<br>60 000 h, at $t_c = 75$ °C<br>30 000 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

Filtered dimming technology



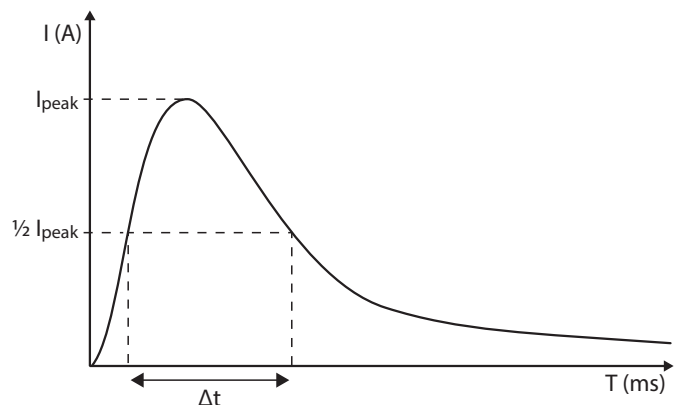
Filtered dimming technology is created to achieve extremely high quality and flicker free light output even at the lowest dimming levels. Light output is dimmed with amplitude dimming until the very lowest light levels (< 3%) and below that, stable light output is provided with filtered high frequency signal. Dimming technology complies with IEEE 1789-2015 recommendations of current modulation to mitigate health risks to viewers.

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, $I_{peak}^2 \Delta t$ |
|---------------------|------------------------------------|-------------------------------------|----------------------------|--|
| 53 pcs.             | 56 pcs.                            | 25 A                                | 177 $\mu s$                | 0.08 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.

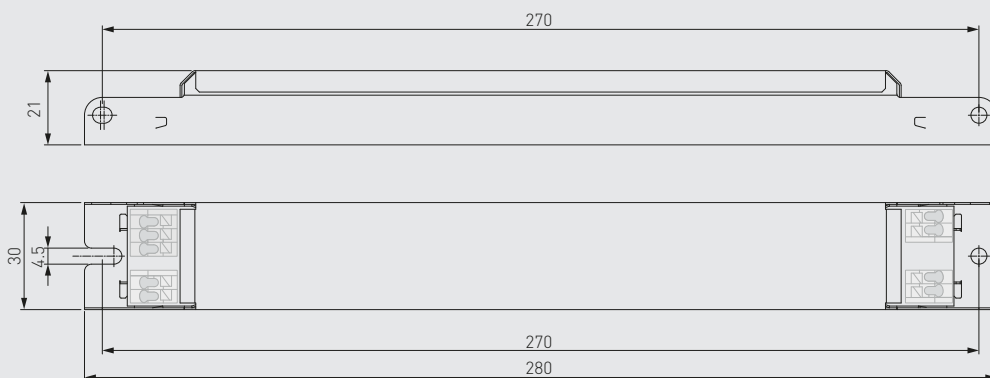
## Connections and Mechanical Data

|                                   |   |
|-----------------------------------|---|
| 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                            | 190 g                                     |
| IP rating                         | IP20                                      |

## Connections



## Dimensions (mm)



The LED-Iset resistor/current setting values are adjusted according to the LEDset specification. The resistor value for each required output current can thus be calculated from the formula  $R [\Omega] = (5 [V] / I_{out} [A]) * 1000$ . Below are the available LED-Iset resistors from Helvar, pre-adjusted for the most common output currents.

### Helvar LED-Iset resistors and currents (Nominal $I_{out}$ (±5 % tol.))

| LED-Iset resistor model | MAX    | 325 mA | 300 mA | 275 mA | 250 mA | 225 mA | 200 mA | 150 mA | No resistor |
|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------------|
| $I_{out}$ (mA)          | 350    | 325    | 300    | 275    | 250    | 225    | 200    | 150    | 120         |
| Order code              | T90000 | T90325 | T90300 | T90275 | T90250 | T90225 | T90200 | T90150 | N/A         |
| Resistance values (Ω)   | 0      | 15.4k  | 16.5k  | 18.2k  | 20k    | 22.1k  | 24.9k  | 33.2k  | ∞           |

The current can be adjusted also with normal resistors by selecting suitable resistor value (formula  $R [\Omega] = (5 [V] / I_{out} [A]) * 1000$ ). Reference resistor values can be found below order code in the table above.

LL1x10-42-CR-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

LL1x10-42-CR-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/LED-Iset on the LED driver label.
- LED-Iset resistor/current values follow LEDset specification. For selection of the right current, refer to the tables on page 3.

### 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.

## Switch-Control 2

### Use of Switch-Control functionality

- Maximum numbers of LED drivers to be connected to one switch is 60. Wire length is not restricted by the driver technology.
- Ensure that all components connected to Switch-Control circuitry are mains rated.
- More information in Switch-Control User Guide a [www.helvar.com](http://www.helvar.com).

## Helvar Driver Configurator -support

LL1x10-42-CR-DA LED driver is supported by Helvar Driver configurator software. The LL1x10-42-CR-DA 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 is on during the first 10 minutes. If open load is still detected after the first 10 minutes, driver goes to standby mode and recovers through mains reset.

### Short circuit

When short circuit is detected, driver goes to standby mode and returns through mains reset or DALI command.

### Overload

When high overload is detected, driver goes to standby mode and follows the same logic as described in the short circuit condition. When low overload is detected (up to 45 W), output current will be reduced to have maximum rated output power.

### Underload

When undervoltage is detected, driver goes to standby mode 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: 2015                |
| Particular safety requirements for DC or AC supplied electronic control gear for LED modules       | EN 61347-2-13: 2014+<br>A1:2017 |
| Additional safety requirements for AC or DC supplied electronic controlgear for emergency lighting | EN 61347-2-13: 2014,<br>Annex J |
| Thermal protection class   | EN 61347, C5e                   |
| Mains current harmonics  | EN 61000-3-2: 2014              |
| Limits for voltage fluctuations and flicker  | EN 61000-3-3: 2013              |
| Radio frequency interference   | EN 55015: 2013                  |
| Immunity standard  | EN 61547: 2009                  |
| Performance requirements   | EN 62384: 2006+<br>A1:2009      |
| <b>Digital addressing lighting interface:</b>  |                                 |
| General requirements for DALI system   | EN 62386-101 (DALI-2)           |
| Requirements for DALI control gear   | EN 62386-102 (DALI-2)           |
| Requirements for control gear of LED modules (DALI Device Type 6)                                  | EN 62386-207 (DALI-2)           |
| 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-2 certified control gear.