

110 W **Dimmable DALI-2** LED driver

Product code: 5724

110 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 95 %
- Suitable for emergency 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: 350 mA (default) to 700 mA
- Current setting programmable via DALI or with external resistors
- Filtered hybrid dimming for high-quality light in every application
- Switch-Control functionality for easy-to-use intensity control
- Adaptive LED overload protection, reduces output current if minor overload (up to 120 W) is detected
- Output current peak limited (1350 mA) during load change
- Full load recognition with automatic recovery, open & 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)

**Mains Characteristics**

Voltage range	198 VAC – 264 VAC Withstands max. 330 VAC (max. 1 hour)
DC range	176 VDC – 280 VDC
starting voltage	> 190 VDC
Mains current at full load	0.44 A – 0.60 A
Frequency	0 / 50 Hz – 60 Hz
Stand-by power consumption	< 0.5 W
THD at full power	< 10 %
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**

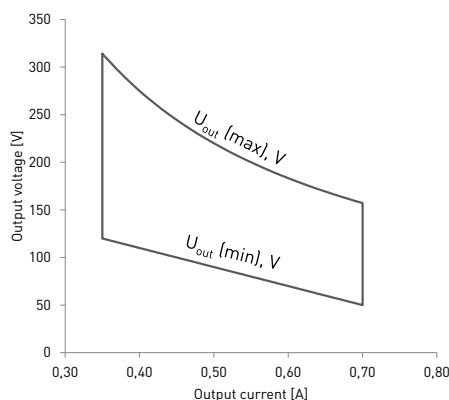
Mains circuit - Output	Non-isolated
DALI circuit - Output	Basic insulation
Mains circuit - DALI circuit	Basic insulation
Mains, DALI and output - Driver case	Basic insulation

**Load Output**

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

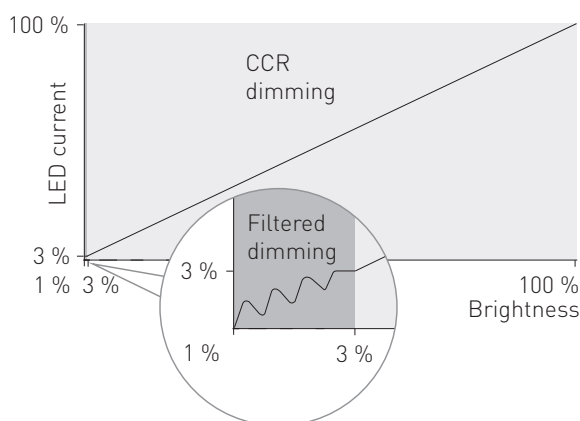
$I_{LED}$	350 mA	700 mA
$P_{Rated}$	110 W	110 W
$U_{LED}$	120 V – 314 V	50 V – 157 V
PF (λ) at full load	0.98	0.98
Efficiency (η) at full load	95 %	94 %

## Operating window



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

## Filtered Hybrid Dimming technology

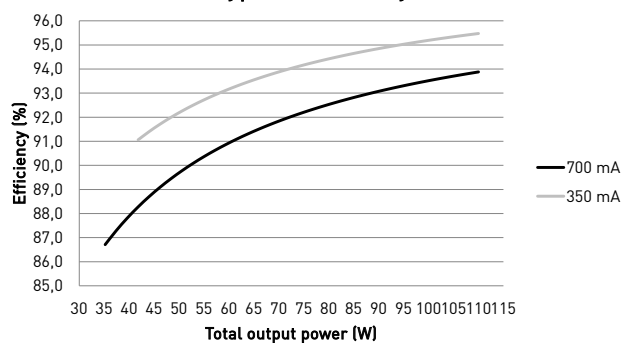


Dimming range	Modulation frequency	Modulation (mod%)
100 % - 3 %	0 Hz (DC)	< 1 %
3 % - 1 %	> 2 kHz	< 20 %

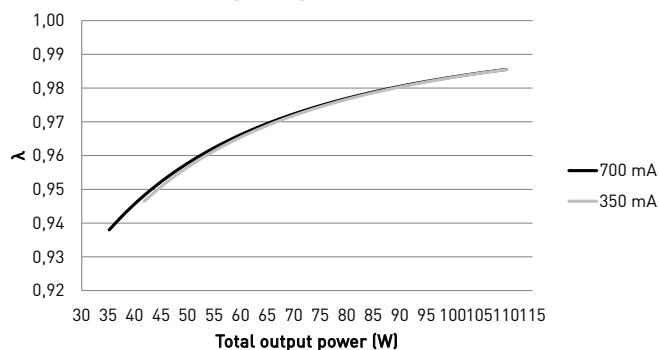
Complies with IEEE standard 1789-2015 recommendations of current modulation for mitigating health risks to viewers.

## Driver performance

## Typical efficiency



## Typical power factor



## Operating Conditions and Characteristics

Absolute highest allowed $t_c$ point temperature*	85 °C
$t_c$ life (55 000 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 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

## 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

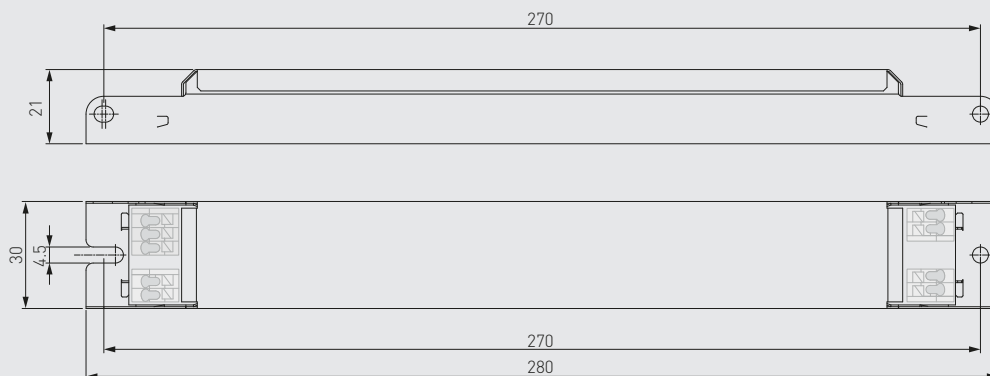
## Connections and Mechanical Data

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



## 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  $R (\Omega) = (5 \text{ V}) / I_{\text{out}} * 1000$ . Below are the available LED-Iset resistors from Helvar, pre-adjusted for the most common output currents.

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

LED-Iset resistor model	MAX	650 mA	600 mA	550 mA	500 mA	475 mA	450 mA	425 mA	400 mA	375 mA	No resistor
$I_{\text{out}}$ (mA)	700	650	600	550	500	475	450	425	400	375	350
Order code	T90000	T90650	T90600	T90550	T90500	T90475	T90450	T90425	T90400	T90375	N/A

The current can be adjusted also with normal resistors by selecting suitable resistor value (formula  $R (\Omega) = (5 \text{ V}) / I_{\text{out}} * 1000$ ).

LL1x110-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

LL1x110-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.

### 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 and X2 rated).
- 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-CR-DA LED driver is supported by Helvar Driver configurator software. The LL1x110-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 120 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: 2008+ A1:2011+A2:2013
Particular safety requirements for DC or AC supplied electronic control gear for LED modules	EN 61347-2-13: 2014
Additional safety requirements for AC or DC supplied electronic controlgear for emergency lighting	EN 61347-2-13: 2014, 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+ 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.