LL1x110-CR-DA

Helvar

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 %
- Wide operating temperature range for various environments
- 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

SWITCH-CONTROL 2 CE EAC DALI 2 120

Functional Description

- Adjustable constant current output: 350 mA (default) to 700 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 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)

Available since 11/2018

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)

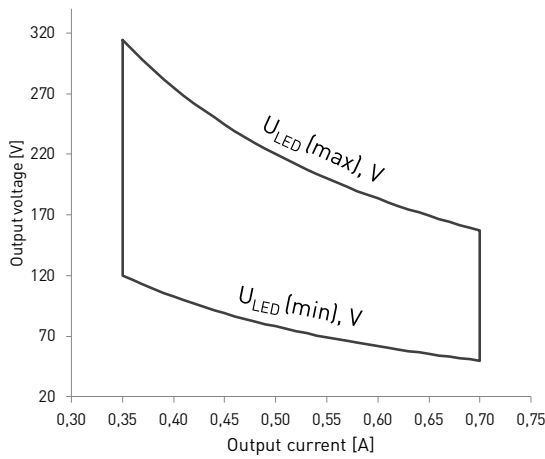## Insulation between circuits & driver case

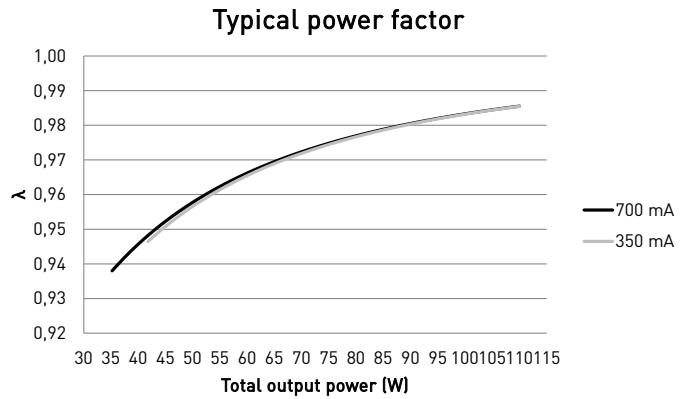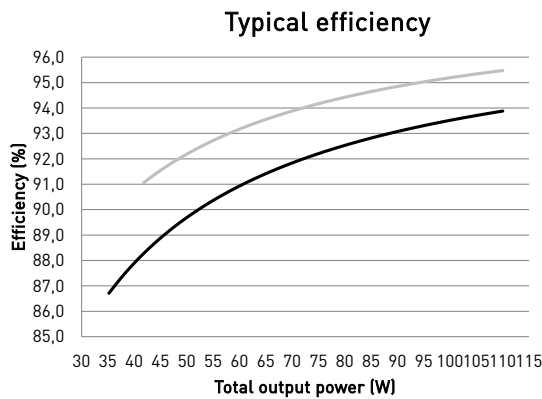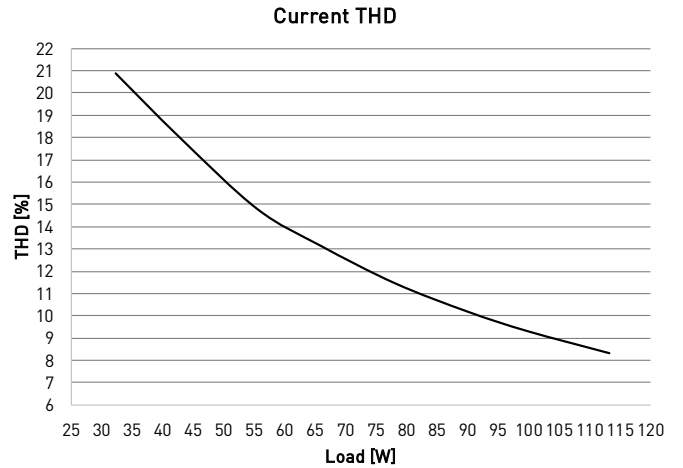|	
Mains circuit - Output	Non-isolated
DALI circuit - Output	Basic insulation
Mains circuit - DALI circuit	Basic insulation
Mains, DALI and output - Driver case	Basic insulation

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 and driver performance

Output voltage [V] vs **Output current [A]**

U_{LED} (max), V

U_{LED} (min), V

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

Current THD

THD [%] vs Load [W]

Typical efficiency

Efficiency [%] vs Total output power (W)

— 700 mA
— 350 mA

Typical power factor

λ vs Total output power (W)

— 700 mA
— 350 mA

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**	−40 °C … +50 °C
in independent use	−40 °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

**) ENEC certified only down to t_a -25 °C.

Below -30 °C DALI performance cannot be guaranteed.

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

| Dimming range	Modulation frequency
100 % – 3 %	0 Hz (DC)
3 % – 1 %	> 2 kHz
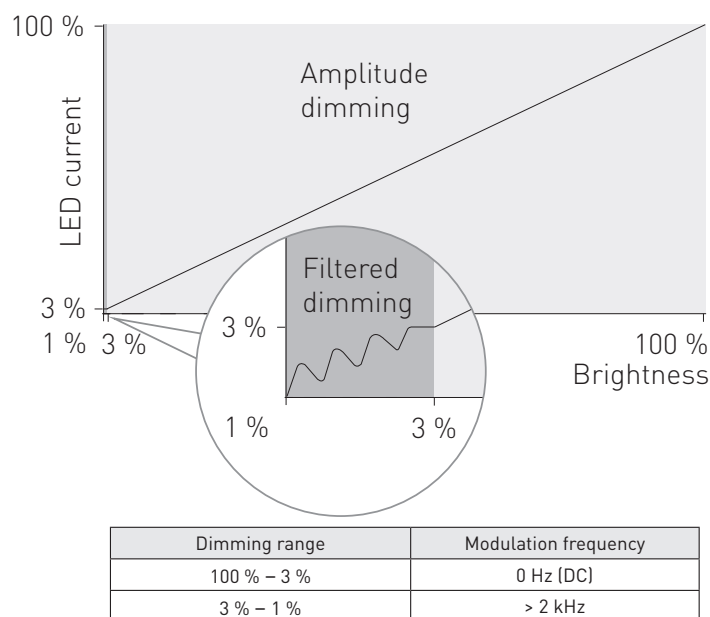
Filtered dimming technology is created to achieve extremely high quality and flicker free light output even at the lowest dimming levels. Light output is dimmed with amplitude dimming until the very lowest light levels (< 3%) and below that, stable light output is provided with filtered high frequency 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 inrush current I_{peak}	Typ. peak inrush current I_{peak}	1/2 value time, Δt	Calculated energy, $I_{peak}^2 \Delta t$
21 pcs.	46 A	240 µs	0.346 **A²s**

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 %
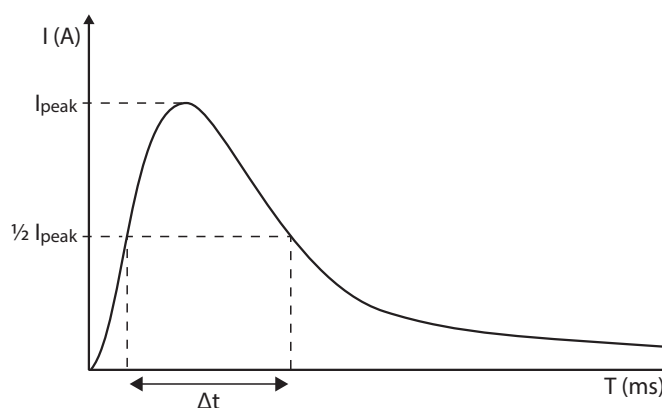
CONTINOUS CURRENT

Total continous current of the drivers and installation environment must always be considered and taken into calculations when installing drivers behind miniature circuit breaker. Example calculation of total drivers amount limited by continous current: $n(I_{cont}) = (16 \text{ A } (I_{nom,Ta}) / $ "nominal mains current with full load") x 0.76). This calculation is an example according to recommended precautions due to multiple adjacent circuit breakers (> 9 MCBs) and installation environment (T_a 30 degrees); variables may vary according to the use case. Both inrush current and continous current calculations are based on ABB S200 series circuit breakers. More specific information in ABB series S200 circuit breaker documentation.

NOTE! 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.
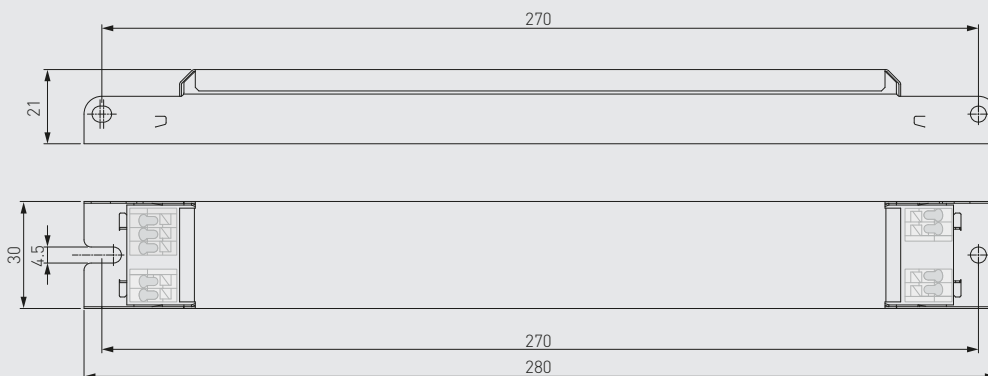
LL1x110-CR-DA

Connections and Mechanical Data

Wire size	$0.5\ mm^2 - 1.5\ mm^2$
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
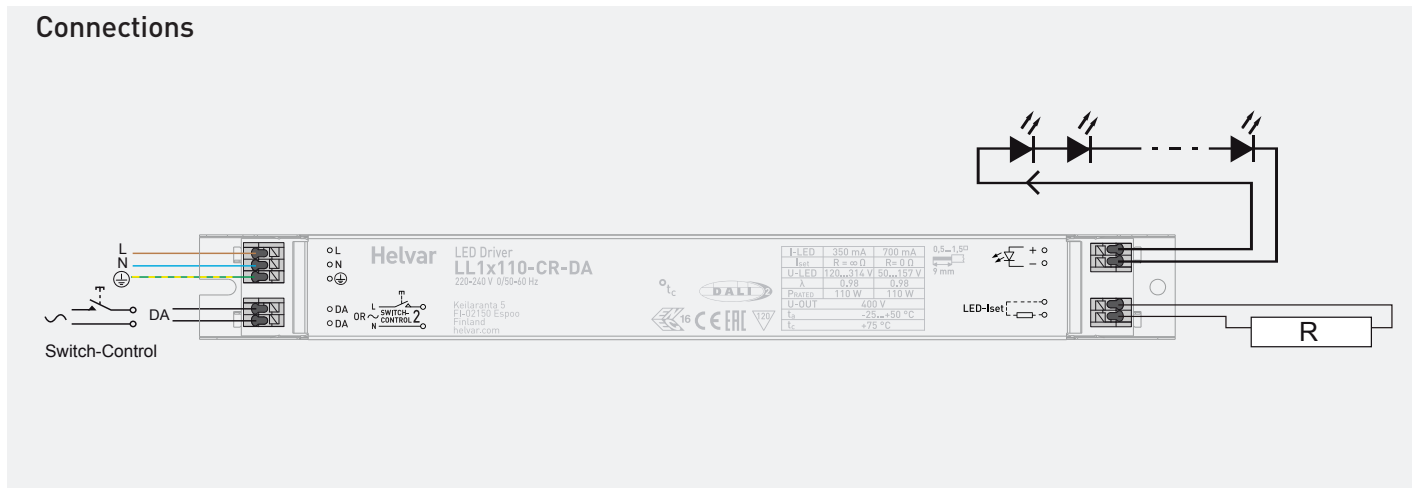
Dimensions (mm)

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 [Ω] = (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	650 mA	600 mA	550 mA	500 mA	475 mA	450 mA	425 mA	400 mA	375 mA	No resistor
I_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
Resistance values (Ω)	0	7.68k	8.25k	9.09k	10k	10.5k	11k	11.8k	12.4k	13.3k	∞

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

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.

Switch-Control 2

Before installation and for troubleshoot and guidance, refer to Switch-Control User Guide at www.helvar.com.

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.
- The X2 rated (1 μF) capacitor has to be installed between control lines incase of unwanted behavior of lights. See details and guidance from the user guide.

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 kΩ, 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+ A1:2017
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
Digital addressing lighting interface:	
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.