

## 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 emergency lighting applications
- 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)

### 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	0.2 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	2 kV (IEC 61000-4-4)

### Insulation between circuits & driver case

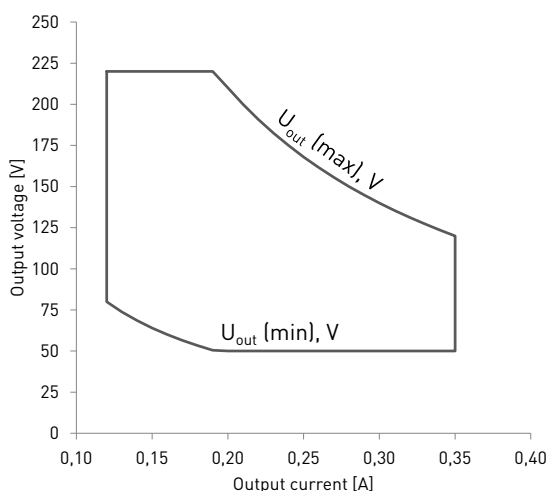
Mains circuit - Output	Non-isolated
DALI circuit - Output	Basic insulation
Mains circuit - DALI circuit	Basic insulation
Mains, DALI and output - Driver case	Basic insulation

### Load Output

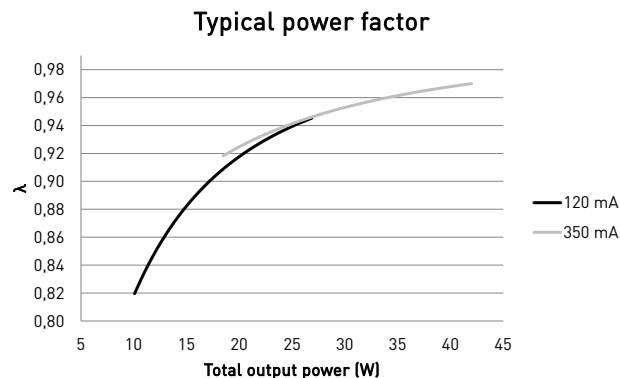
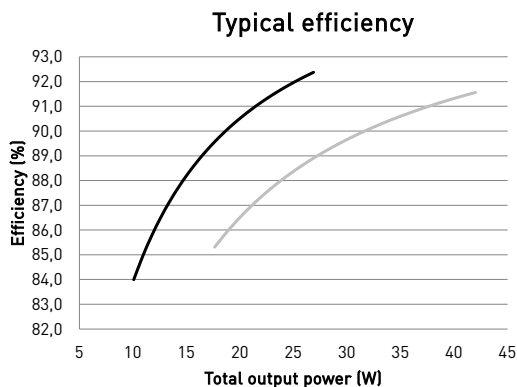
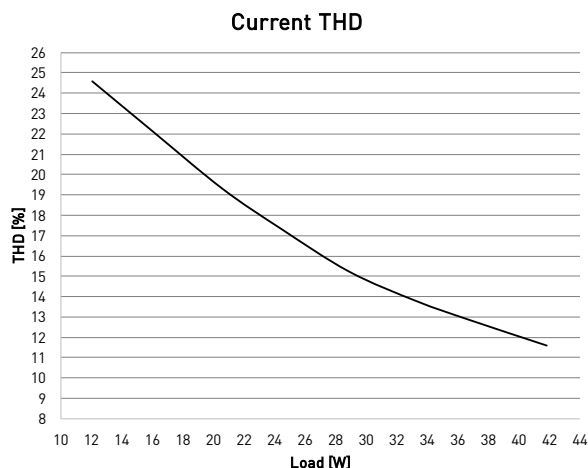
Output current ( $I_{out}$ )	120 mA (default) – 350 mA
Accuracy	± 5 %
Ripple	< 2 %* at ≤ 120 Hz *] Low frequency, LED load: Cree XM-L LEDs
PstLM	< 0.02*
SVM	< 0.01* *] At full power, measured with Cree XP-G LED modules.
$U_{OUT}$ (max) (abnormal)	250 V
Outrush current	600 mA* *] When starting driver with short-circuited load or connecting load to running driver
EOF <sub>I</sub> (EL use)	> 0.98 x output current with AC supply

$I_{LED}$	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 and driver performance



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

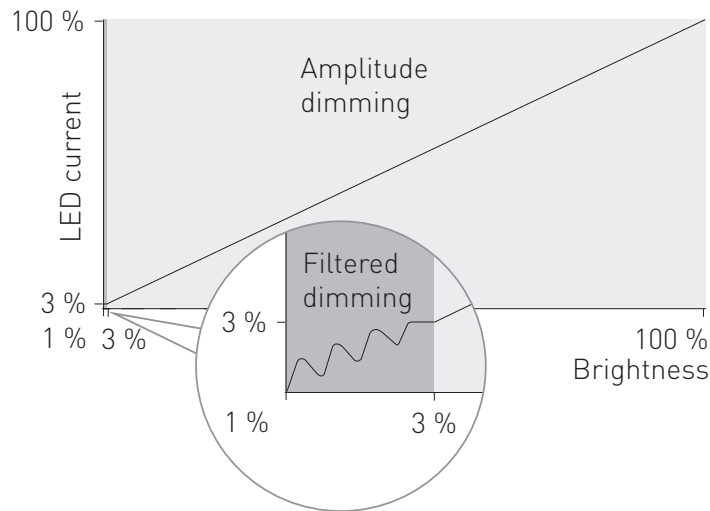


## Operating Conditions and Characteristics

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 60 000 h, at $t_c = 75$ °C 30 000 h, at $t_c = 85$ °C

\*) For other than independent use, higher  $t_g$  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

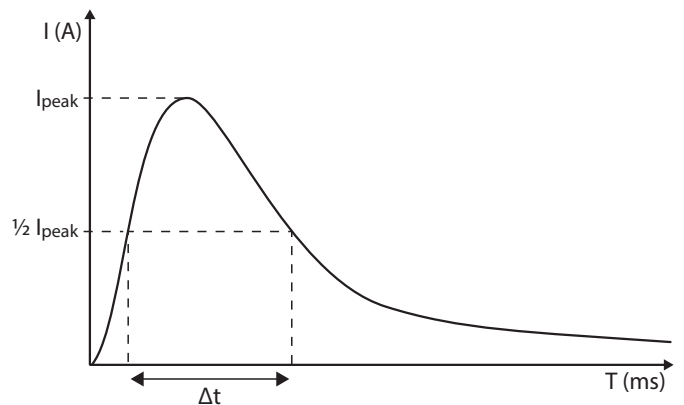
Filtered dimming technology is created to achieve extremely high quality and flicker free light output even at the lowest dimming levels. Light output is dimmed with amplitude dimming until the very lowest light levels (< 3%) and below that, stable light output is provided with filtered high frequency 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, $\Delta t$	Calculated energy, $I_{peak}^2 \Delta t$
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 %



CONTINUOUS CURRENT

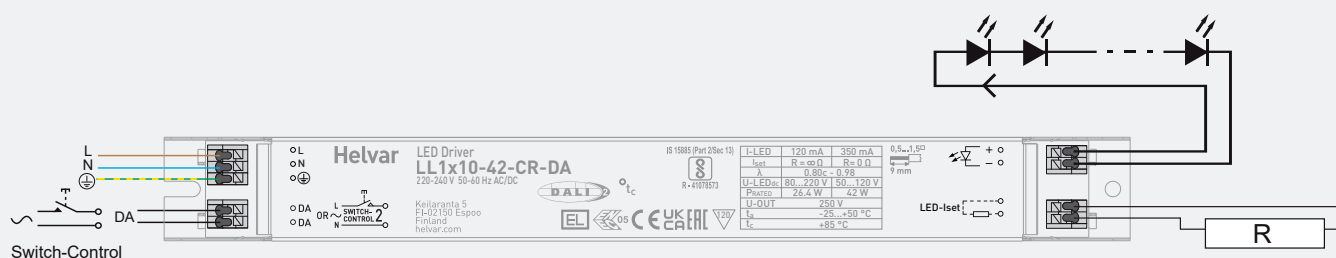
Total continuous current of the drivers and installation environment must always be considered and taken into calculations when installing drivers behind miniature circuit breaker. Example calculation of total drivers amount limited by continuous current:  $n(I_{cont}) = (16 A (I_{nom,Ta}) / \text{“nominal mains current with full load”} \times 0.76)$ . 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 in-rush current and continuous 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.

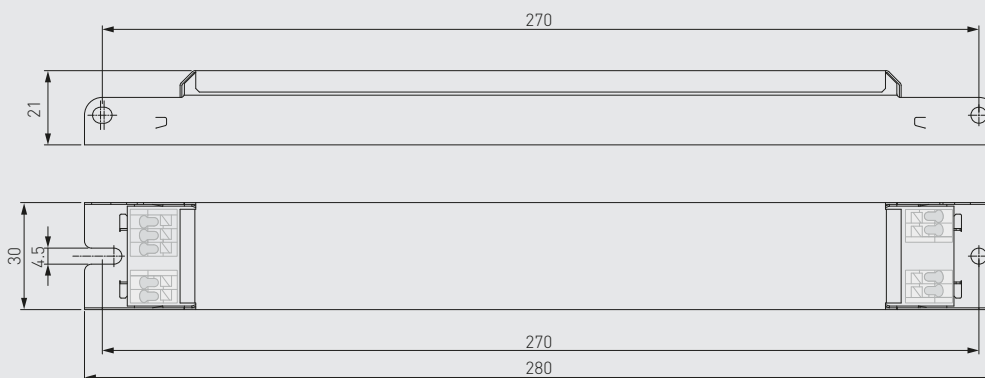
## Connections and Mechanical Data

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.

- 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.

### LED driver earthing

- LL1x10-42-CR-DA LED driver is a protective Class I device and designed for Class I luminaires.
- If used inside **Class I** luminaires, this LED driver must always have the protective earth cable connected for safety reasons.
- The driver is designed to be used inside Class I luminaires. For usage inside **Class II** luminaires, the safety of the luminaire shall be ensured through double/reinforced insulation of live parts and through supplementary insulation of conductive parts of the casing, or any conductive parts connected to the casing, as the casing is only basic insulated from the live parts. The earth connector of the driver shall be left unconnected and there shall be no protective earth terminals in the luminaire terminal block to fulfill the requirements of IEC/EN 60598-1 for Class II luminaires. The EMC performance of the driver change when left unearthed, so it is always the responsibility of the integrator to take measures and necessary actions, for example by luminaire design to ensure the assembled luminaire complies with latest EMC standard.

### 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.

## 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.

## Switch-Control 2

Before installation and for troubleshoot and guidance, refer to Switch-Control User Guide at [www.helvar.com](http://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  $\mu$ F) capacitor has to be installed between control lines incase of unwanted behavior of lights. See details and guidance from the user guide.

## 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 (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)
Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers	IEEE 1789-2015
Compliant with relevant EU directives	
RoHS / REACH compliant	
ENEC and CE / UKCA 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.