

## 42 W Dimmable DALI LED driver

Product code: 5531

42 W 220 – 240 V 0 / 50 – 60 Hz

- DALI dimmable LED driver, 1 - 100 % dimming range
- Hybrid dimming technology for high quality light
- Very high efficiency up to 93 %
- 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: 120 mA (default) to 350 mA
- Current setting programmable via DALI or with external resistors
- Latest technology Switch-Control 2 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)
- Helvar Driver Configurator Support

### Mains Characteristics

Voltage range	198 VAC – 264 VAC
DC range	Withstands max. 320 VAC (max. 1 hour)
starting voltage	176 VDC – 280 VDC
Mains current at full load	> 190 VDC
Frequency	0.20 – 0.22 A
Stand-by power consumption	0 / 50 Hz – 60 Hz
THD at full power	< 0.5 W
Leakage current to earth	< 15 %
Tested surge protection	< 0.4 mA
Tested fast transient protection	1 kV L-N, 2 kV L-GND (IEC 61000-4-5)
	2 kV (IEC 61000-4-4)

### Insulation between circuits & driver case

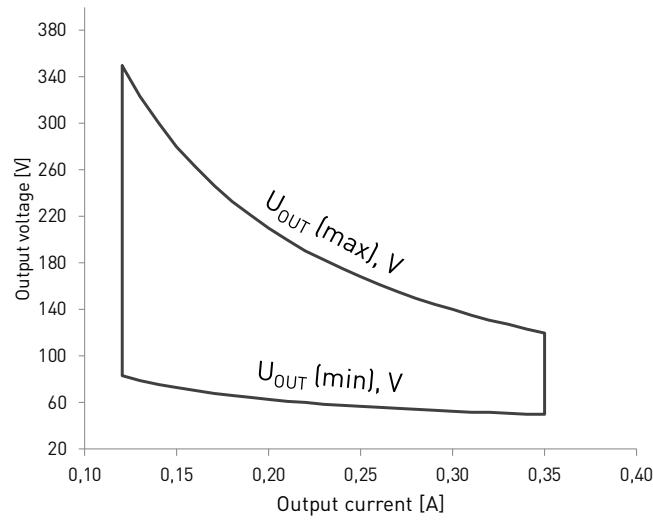
Mains circuit - Output	Non-isolated
DALI circuit - Output	Basic insulation
Mains circuit - DALI circuit	Basic insulation
Mains, DALI and output - Driver case	Basic insulation

### Load Output (non-isolated)

Output current ( $I_{out}$ )	120 mA (default) – 350 mA
Accuracy	± 5 %
Ripple	< 2 %* at ≤ 120 Hz
	*] Low frequency, LED load: Cree MX3 LEDs
PstLM	< 0.01*
SVM	< 0.02*
	*] At full power, measured with Cree XP-G LED modules.
$U_{out}$ (max) (abnormal)	400 V
Outrush current	600 mA*
	*] When starting driver with short-circuited load or connecting load to running driver

$I_{out}$	120 mA	350 mA
$P_{OUT(MAX)}$	42 W	42 W
$U_{OUT}$	80 – 350 V	50 – 120 V
PF (λ) at full load	0.96	0.96
Efficiency (η) at full load	93 %	92 %

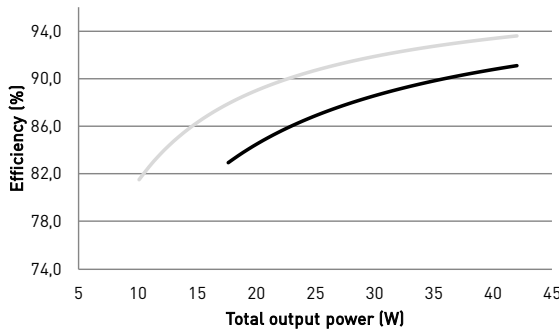
Operating window



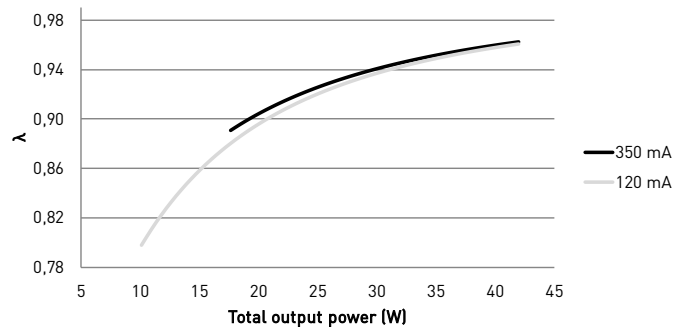
Note: Dimming between 1% - 100% possible across the whole operating window

Driver performance

Typical efficiency



Typical power factor

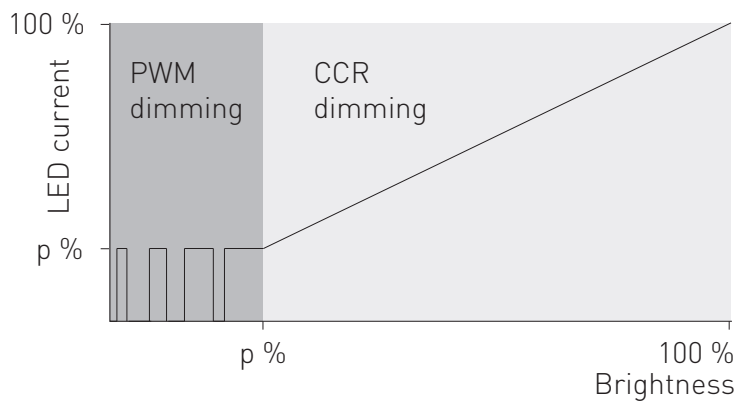


Operating Conditions and Characteristics

Highest allowed $t_c$ point temperature	75 °C
$t_c$ life (60 000 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
	90 000 h, at $t_c = 70$ °C
	60 000 h, at $t_c = 75$ °C

\*) 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

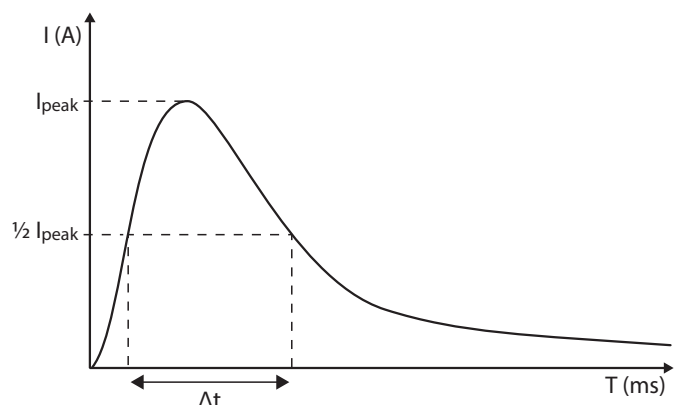
Helvar hybrid dimming products combines both Constant Current Reduction (CCR) amplitude dimming and Pulse Width Modulation (PWM) dimming. CCR is a very efficient technique for dimming the light output, especially on higher range. On lower range, the hybrid dimming products implement high-frequency PWM 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, $I_{peak}^2 \Delta t$
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

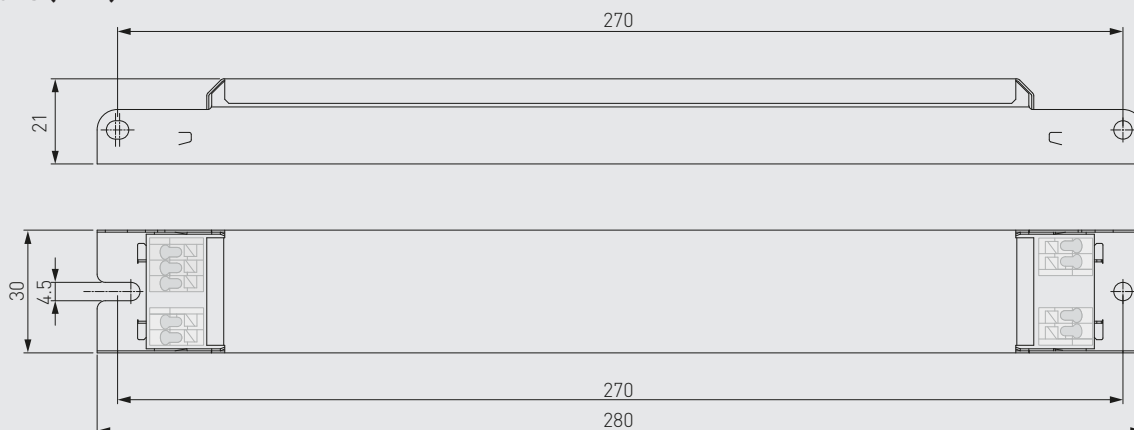
## Connections



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

R(Ω)	0	47	120	180	270	330	470	560	680	820	1k	1,2k	1,5k	1,8k	2,2k	2,74k	3,3k	3,9k	4,7k	5,6k	8,2k	12k	22k	∞
I <sub>out</sub> (mA)	350	340	330	320	310	300	290	280	270	260	250	240	230	220	210	200	190	180	170	160	150	140	130	120
Order Code	T70000	T70470	N/A	N/A	T70271	T70331	T70471	N/A	T70681	T70821	T70102	N/A	T70152	N/A	T70222	T72741	T70332	T70392	T70472	T70562	T70822	T70123	N/A	N/A

LL1x10-42-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

LL1x10-42-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.

### LED driver earthing

- LL1x10-42-E-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.
- If used inside **Class II** luminaires, the safety of the luminaire shall be ensured through double/reinforced insulation of live parts. This LED driver is only basic insulated, and provided that luminaire insulation is done according to the latest standards (e.g. IEC/EN 60598-1), to fulfill the requirements of the standard the earth terminal of the driver **must be left unconnected**. No protective earth symbols shall be visible in the luminaire connector block or elsewhere in the luminaire. However, the EMC performance of Class I LED drivers change when left unearthed, so it is always the responsibility of the integrator to take measures to ensure that the assembled luminaire complies with latest EMC standards.

### Installation site

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

### 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](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 in case of unwanted behavior of lights. See details and guidance from the user guide.

## Helvar Driver Configurator support

LL1x10-42-E-DA 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 after 10 minutes. Automatic recovery is on during the first 10 minutes and after that, if the open load is still detected, the driver goes to standby mode and recovers through mains reset.

**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 (< 45 W) is detected, output current will be reduced to have maximum rated output power.

**Underload:** Driver goes to standby mode and returns through mains reset.

**Short circuit:** 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
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 / 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 certified control gear.