LL50SE-FD-100-1400

Helvar

50 W **Dimmable Freedom** LED driver

Product code: 5776

50.4 W 220 – 240 V 0 / 50 – 60 Hz

- Future-proof Freedom Interface to power Freedom Node, enabling support for various wireless lighting control systems
- SELV output protection for safety and flexibility in luminaires
- Amplitude dimming for the highest quality light output, complying with IEEE 1789 recommendation
- 1 - 100 % dimming range
- NFC technology for wireless programming
- Low current ripple
- Long lifetime up to 100 000 h
- Suitable for DC use
- Ideal solution for Class I and Class II
- Helvar Driver Configurator support

Freedom SELV

Functional Description

- Adjustable constant current output: 100 mA to 1400 mA, 350 mA as default
- Amplitude dimming technology for the highest quality light in every application
- Suitable for flicker-free camera recording applications
- Full load recognition with automatic recovery and overload / underload / open circuit / short circuit protection.
- Inbuilt power supply for external Freedom Node / luminaire intelligent unit use.
- Helvar Freedom Interface 1.5 support.

Mains Characteristics

Nominal rated voltage range	220 V – 240 V, 0 / 50 – 60 Hz
AC voltage range	198 VAC – 264 VAC
	Withstands max. 320 VAC (max. 1 hour)
	Withstands min. 176 VAC (max. 1 hour)
DC voltage range	176 VDC – 280 VDC
DC starting voltage	> 190 VDC
Mains current at full load	0.25 – 0.28 A
Frequency	0 / 50 Hz – 60 Hz
Stand-by power consumption	< 0.5 W
THD at full power	< 10 %
Leakage current to earth	< 0.4 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

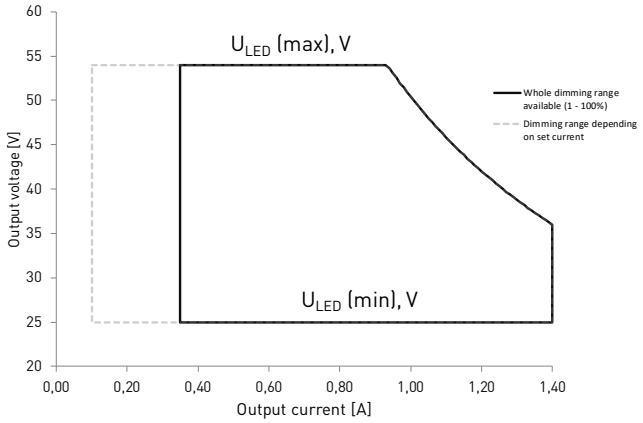
Mains circuit - SELV output circuit	Double/reinforced insulation
Mains and output - Driver case	Double/reinforced insulation
Mains input - Ground input	Double/reinforced insulation

Load Output (SELV <60 V)

Output current (I_{out})	100 mA – 1400 mA
Accuracy	± 5 %
Ripple	< 1 %* at ⩽ 120 Hz
	*) Low frequency, LED load: Cree XP-G LEDs
PstLM	< 0.02*
SVM	< 0.01*
	*) At full power, measured with Cree XP-G LED modules.
U_{out} (max) (abnormal)	60 V

I_{LED}	100 mA	350 mA (default)	1400 mA
P_{Rated}	5.4 W	18.9 W	50.4 W
U_{LED}	25 - 54 V	25 - 54 V	25 - 36 V
PF (λ) at full load	0.75	0.92	0.98
Efficiency (η) at full load	69 %	84 %	88 %

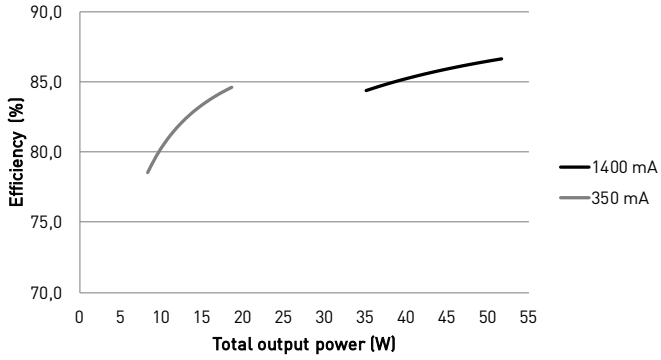
Operating window



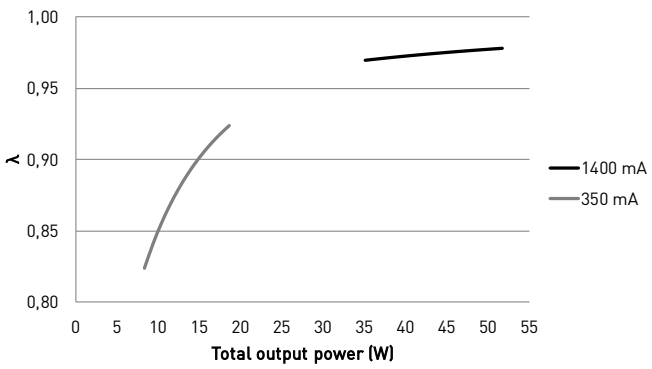
1) From 350 mA to 1400 mA, full dimming range (1 % - 100 %) available in the whole area.
2) From 100 mA to 350 mA, the absolute minimum dimming level is limited to 3.5 mA.

Driver performance

Typical efficiency



Typical power factor



Operating Conditions and Characteristics

Absolute highest allowed t_c point temperature	85 °C
Tc life (50 000 h) temperature	85 °C
Ambient temperature range	–25 °C ... +45 °C*
Storage temperature range	–40 °C ... +80 °C
Maximum relative humidity	No condensation
Life time (90 % survival rate)	100 000 h, at t_c = 75 °C 70 000 h, at t_c = 80 °C 50 000 h, at t_c = 85 °C

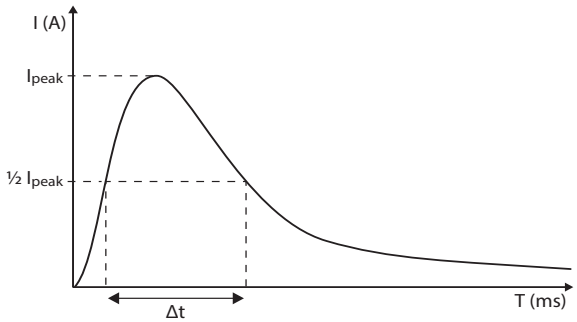
**) For other than independent use, higher t_a of the controlgear possible as long as highest allowed t_c point temperature is not exceeded*

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, $I_{peak}^2 \Delta t$
60 pcs.	18 A	**180 µs**	**0.0412 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 %

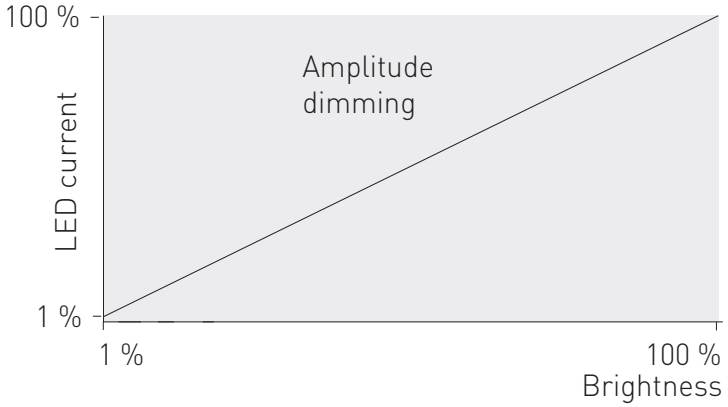


CONTINOUS CURRENT

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 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.

Amplitude dimming technology

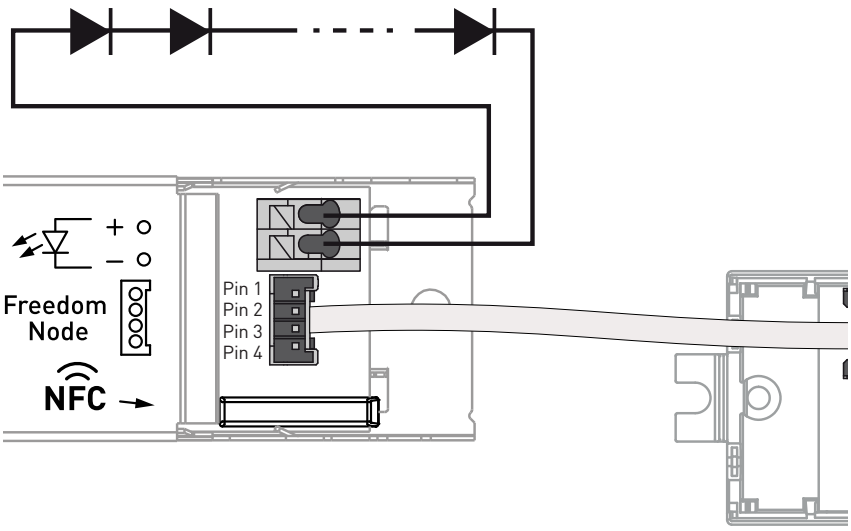


Dimming range	Dimming technology
1 % – 100 %	Amplitude (DC)

LL50SE-FD-100-1400 LED driver implements amplitude dimming technology across whole dimming range. Amplitude dimming offers the best available technology for dimming the light output in an accurate and flicker-free way to ensure high quality lighting in even the most demanding situations such as camera recording applications. Amplitude dimming technology complies with IEEE 1789-2015 recommendations of current modulation to mitigate health risks to viewers.

Freedom power output as external “luminaire intelligence unit” supply

Helvar Freedom drivers supports external control unit usage with the Freedom Node power output. The driver can use the Freedom Node output terminal to supply power and connect with Freedom Node - intelligent communication units via UART digital communication. The power supply specification and pin order for connector are listed in the details below. For further SW side integration, please contact Helvar.



The UART communication follows Helvar Freedom Interface 1.5 by default. For more details about the communication protocol, please contact Helvar.

Pin connections

Pin 1	Rx (Digital signal)*
Pin 2	Ground
Pin 3	VDD
Pin 4	Tx (Digital signal)*

* Rx/Tx From LED driver perspective.

Power supply specification

Voltage	3.3 V (±0.3 V)*
Continous current	max. 16 mA
Peak current	30 mA (max. 100 ms each 5 Hz cycle)
Standby mode current	max. 10 mA**
Connector	MOLEX (35363-0460)

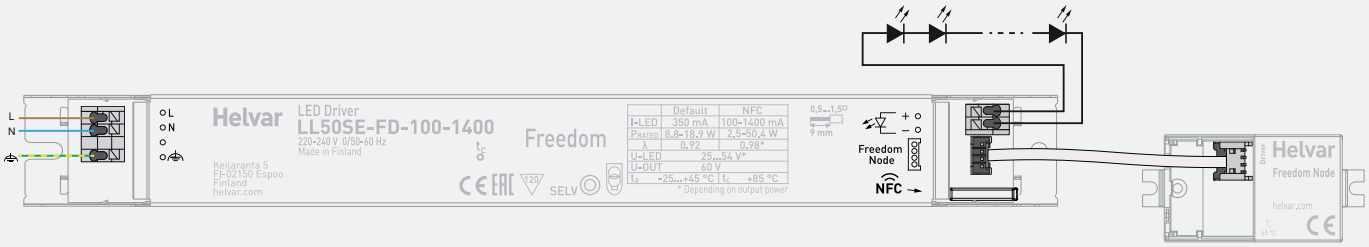
* *Not continous voltage supply by default.*

*** (Networked) standby power < 0,5 W*

Connections and Mechanical Data

Wire size	0.5 mm² – 1.5 mm²
Wire type	Solid core and fine-stranded
Wire insulation	According to EN 60598
Maximum driver to LED wire length	1.5 m
Weight	195 g
IP rating	IP20

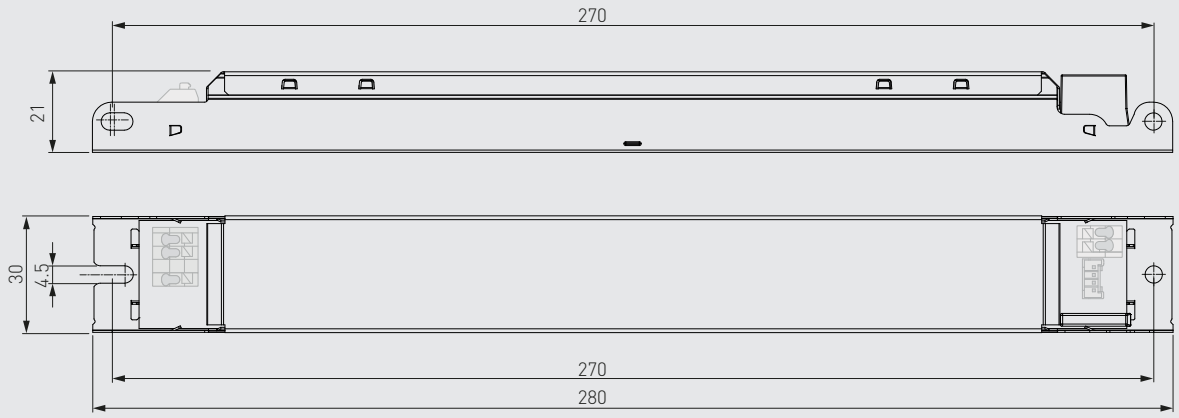
Connections



Note:

- *Earth connection to PE terminal is optional and not needed for the functionality of the driver. See page 5 for details.*
- *Not suitable for load side switching operation*
- *Label may differ if the unit is preset to fixed current*

Dimensions



LL50SE-FD-100-1400 LED driver is suited for built-in usage in luminaires. 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.

LED driver earthing

- LL50SE-FD-100-1400 is LED driver suitable for Class I and II luminaires. When used inside **Class I and Class II** luminaires, the earth cable is recommended to be connected to improve the EMC performance of the driver, but it is not mandatory. It is the responsibility of the integrator to ensure that the assembled luminaire EMC performance complies with the latest standards.

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

Lamp failure functionality

No load

When open load is detected, driver will go to standby power consumption and remains in automatic recovery mode. In automatic recovery mode, the driver waits till load is returned and once that happens, it returns to normal operation.

Short circuit

When short circuit is detected, driver goes to automatic recovery mode and follows the same logic as described in the no load condition.

Overload

When overload is detected, driver goes to standby mode and returns through mains reset.

Underload

When undervoltage is detected, driver goes to standby mode and returns through mains reset.

HDC configuration

LL50SE-FD-100-1400 LED driver is supported by Helvar Driver configurator software. The LL50SE-FD-100-1400 driver supports output current setting with software, the output current of the driver can be programmed using Helvar Driver Configurator, as well as OEM customer data. Programming the driver with Helvar Driver Configurator can be done via NFC.

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
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+ A1: 2015
Immunity standard	EN 61547: 2009
Performance requirements	EN 62384: 2006+ A1:2009
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	
CE marked	

Label symbols

Safety isolating control gear with short circuit protection (SELV control gear).

Double insulated control gear suitable for built-in use.

120 Thermally controlled control gear, incorporating means of protection against overheating to prevent the case temperature under any conditions of use from exceeding 120 °C.

Freedom Control gear supporting wireless luminaire control solutions via Freedom Interface.