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
- D4i-aligned Smart Data features*
- 1 - 100 % dimming range
- NFC technology for wireless programming
- Suitable for emergency lighting use*
- Ideal solution for Class I and Class II
- Helvar Driver Configurator support

**From driver revision H onwards.*

Freedom smart DATA NFC 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
- D4i-aligned Smart Data features, e.g. energy reporting, diagnostics and maintenance *(Note: only from driver revision H onwards)*
- Optimal fit for EPBD/BREEAM/LEED/WELL due to flicker-free light, energy efficiency & monitoring (Smart data) and controllability
- Full load recognition with automatic recovery and overload / underload / open circuit / short circuit protection
- DC emergency lighting mode and adjustable emergency light level *(Note: only from driver revision H onwards)*
- Inbuilt power supply for external Freedom Node / luminaire intelligent unit use
- Helvar Freedom Interface Protocol v1.7 support *(Note: only from driver revision H onwards).*

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 (without Node)	< 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	2 kV (IEC 61000-4-4)

*) (Networked) standby power < 0,5 W when Node connected with max. 10 mA current to Node

Insulation between circuits & driver case

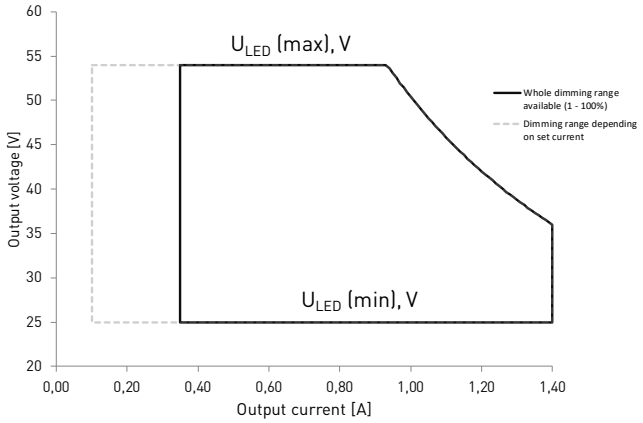
Mains circuit - SELV output circuit	Double/reinforced insulation
Mains and output - Driver case	Double/reinforced insulation
Mains input - Ground input	Double/reinforced insulation

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 %

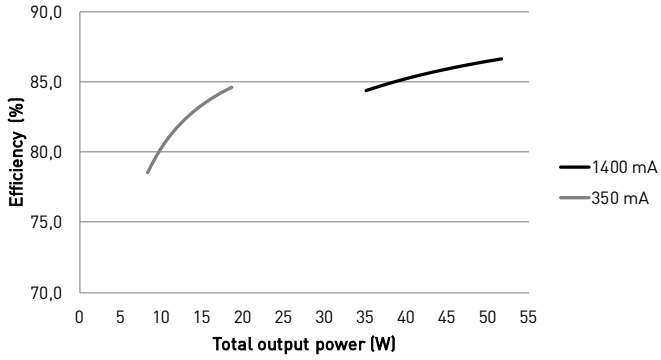
Operating window



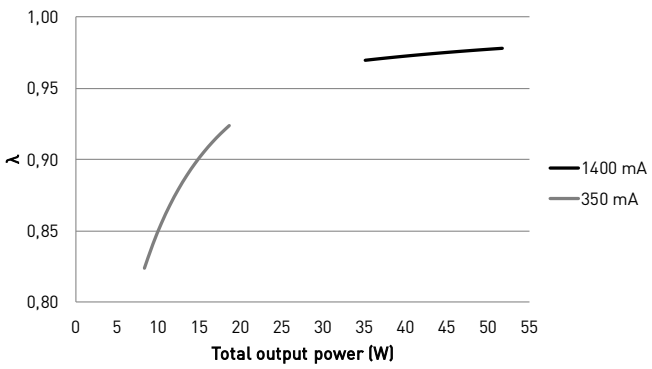
1) From 350 mA to 1400 mA, full dimming range (1 % - 100 %) available in the whole area.
2) From 100 mA to 350 mA, the absolute minimum dimming level is limited to 3.5 mA.

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

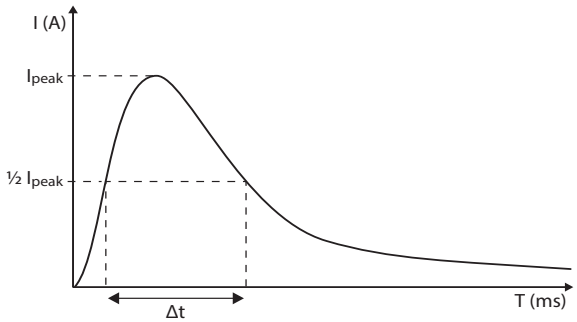
**) For other than independent use, higher t_a of the controlgear possible as long as highest allowed t_c point temperature is not exceeded*

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 %

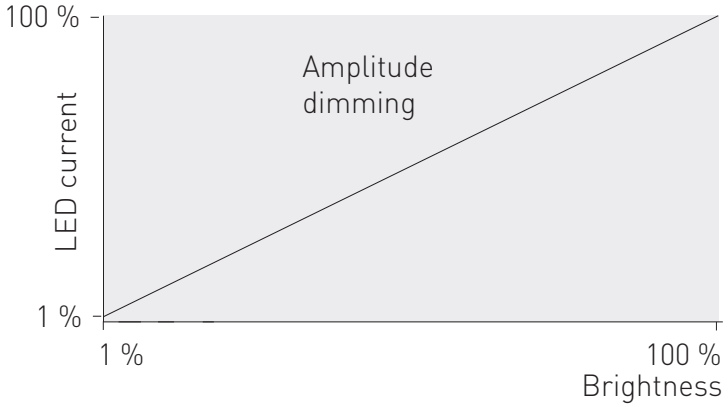


CONTINOUS CURRENT

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

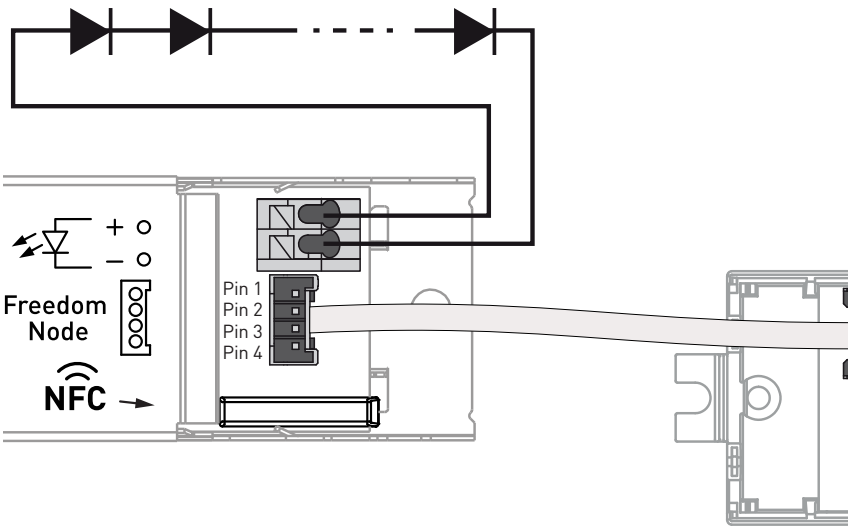


Dimming range	Dimming technology
1 % – 100 %	Amplitude (DC)

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 Protocol v1.7 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 when current max. 10 mA. Up to 16 mA technically possible.*

D4i-aligned Smart Data Features

(Note: only from driver revision H onwards)

This driver has integrated Smart Data features, which monitor, gather and provide key data about the LED driver usage and internal parameters in convenient format through the Freedom protocol. Smart Data contents are aligned to match with the the latest D4i specifications (based on DALI parts 251-253) of smart LED driver data features. This useful data provided by LED driver enables various applications and integrations into data management and IoT services provided by control system partners, establishing the selected Helvar Freedom LED drivers as key components in the latest generation of smart luminaires.

The Smart Data features include data sets as described below, accessible via Freedom protocol:

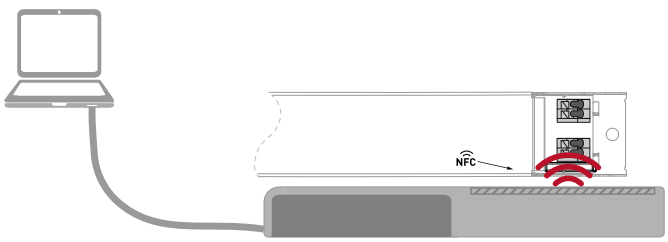
- OEM Customer data
  - Manufacturer GTIN
  - Manufacturer ID number

- Energy reporting
  - Active energy consumption
  - Active power
  - Apparent energy consumption
  - Apparent power
  - Load side energy consumption
  - Load side power

- Diagnostics and maintenance
  - Cumulative control gear operating time
  - Control gear start counter
  - Control gear failure status
  - Dimming curve (linear / logarithmic)
  - Supply frequency
  - Supply overvoltage detection
  - Supply undervoltage detection
  - Output voltage & current
  - Output power limitation (shutdown)
  - Open circuit detection
  - Short circuit detection
  - Control gear internal temperature
  - Control gear thermal derating point
  - Light source on time (resettable)
  - Light source failure status

Wireless configuration

LL50SE-FD-100-1400 LED driver is equipped with NFC wireless technology for effortless configuration of the driver via Helvar Driver Configurator Support. Helvar Driver Configurator enables easy-to-use automatic configuration of the driver parameters via NFC, without mains connection to the driver. The most popular MD-SIG qualified NFC readers (FEIG CPR30-USB & ISC.MR102-USB) are supported giving flexibility for the operator. For further information about the usage with Helvar Driver Configurator, please see the user guide at www.helvar.com



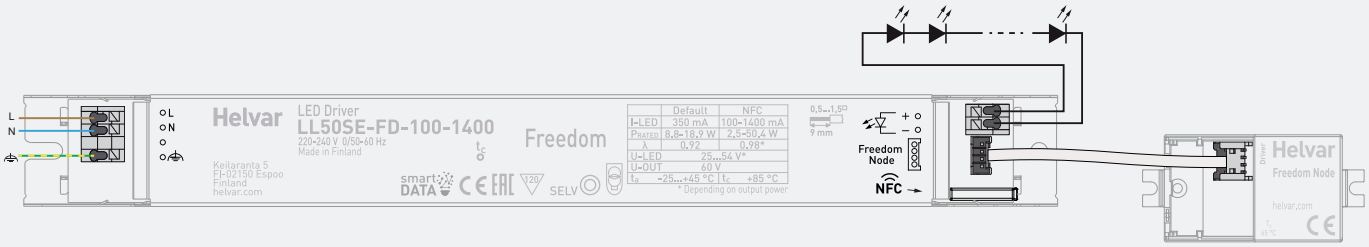
Feig NFC reader

T22 189 1B

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

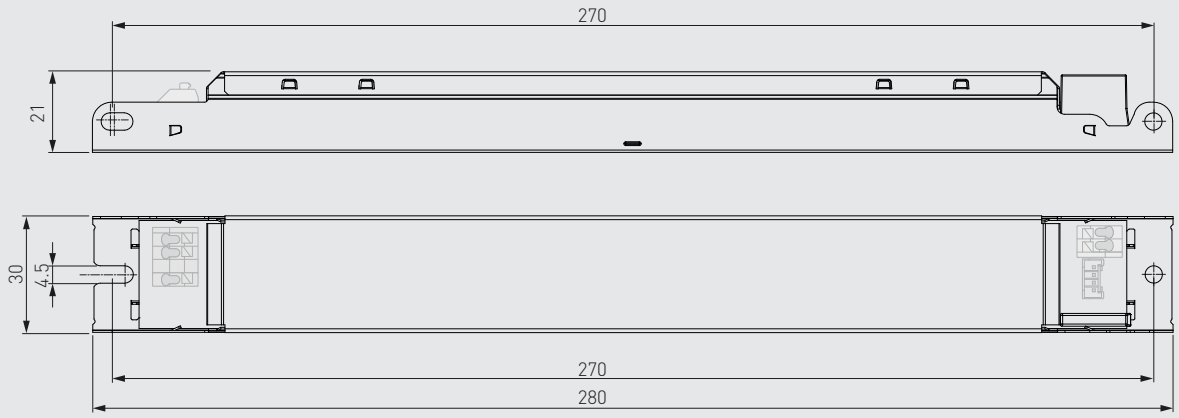
Connections



Note:

- *Earth connection to FE terminal is optional and not needed for the functionality of the driver. See page 5 for details.*
- *Not suitable for load side switching operation*

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.

Current setting

LL50SE-FD-100-1400 LED driver features a constant current output programmable via NFC or via Freedom protocol. When using the NFC current set, the following things shall be considered:

- After the driver has been disconnected from mains, it is recommended to wait 30 s before starting to program via NFC.
- The driver shall not be connected to the mains if active NFC field is nearby.

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

Functionality in abnormal conditions

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 output 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.

AC to DC emergency lighting mode

(Note: only from driver revision H onwards)

When AC supply is switched to DC, driver will recognise this and switch to emergency lighting mode. The light level will be adjusted to 15 % of the nominal AC operation output current by default. The DC light level cannot be adjusted or turned off, unless "DC dimming" is specifically enabled through Helvar Driver Configurator. When the AC is switched back on, the driver returns to normal operation.

Helvar Driver Configurator support

LL50SE-FD-100-1400 LED driver is supported by Helvar Driver Configurator software. The output current of the LL50SE-FD-100-1400 driver can be programmed using Helvar Driver Configurator, as well as OEM customer data fields. Also the AC/DC input recognition and emergency lighting mode parameters (DC emergency light level, DC dimming) can be adjusted through HDC (from driver revision H onwards). Programming the driver with Helvar Driver Configurator can be done via NFC.

Information and conformity

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
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 / UKCA marked	

Label symbols

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

Double insulated control gear suitable for built-in use.

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.

Driver equipped with NFC wireless technology for effortless configuration.

Driver is capable of monitoring and measuring key data about driver usage and providing access to that data via Freedom protocol. This includes data sets such as OEM customer data, energy reporting and diagnostics.