LC27MINI-FD-150-700

26.3 W **SELV Dimmable Freedom** LED driver

Product code: see page 8

26.3 W 220 – 240 V 50 – 60 Hz

- Freedom LED driver, 1-100 % dimming range
- Integrated antenna and radiocommunication unit for standalone wireless luminaire control.
- Extensive wireless lighting control systems support to ensure all-around system specification needs.
- Sensor output for external sensor use
- SELV output protection for safety and flexibility in luminaires
- Amplitude dimming for the highest quality light output
- Low current ripple, complying with IEEE 1789 recommendation
- Extremely compact dimensions for flexible usage
- Ideal solution for Class I and Class II
- For driving Class III (SELV) luminaires, optional strain relief for independent use outside of luminaire (LC-SR-MINI, LC-SR-MINI-B or LC-SR-MINI-LOOP, see also last page)

Freedom

Functional Description

- Adjustable constant current output: 150 mA to 700 mA (default).
- Current setting via with dip-switches.
- Amplitude dimming technology for the highest quality light in every application
- Integrated antenna and radiocommunication unit
- Suitable for flicker-free camera recording applications
- 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, open circuit, short circuit and overtemperature protection
- Sensor output for external sensor usage with Freedom Sense - sensors.
- DC emergency lighting mode with pre-defined 15% DC light level.
- D4i-aligned Smart Data features, e.g. energy reporting, diagnostics and maintenance
- Helvar Freedom Interface Protocol v1.7 support.

Mains Characteristics

Nominal rated voltage range	220 V – 240 V, 50 – 60 Hz
AC voltage range	176 – 264 VAC
	Withstands max. 320 VAC (max. 1 hour)
DC voltage range	176 – 280 VDC
Mains current at full load	0.2 A
Frequency	50 Hz – 60 Hz
Stand-by power consumption	< 0.5 W
THD at full power	< 10 %
Tested surge protection	1 kV L-N (IEC 61000-4-5)
	2 kV L/N-GND (IEC 61000-4-5)
Tested fast transient protection	1 kV (IEC 61000-4-4)

Wireless connectivity

Frequency range	2.402 – 2.480 GHz

Insulation between circuits & driver case

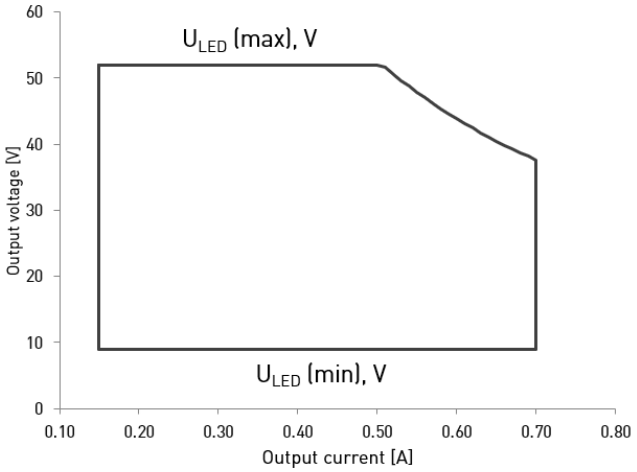
Mains circuit - SELV output circuit	Double/reinforced insulation
Output - Driver case	Basic insulation
Mains input - Driver case	Double/reinforced insulation

Load Output (SELV <60 V)

Output current (I_{out})	150 mA – 700 mA
Accuracy	± 5 %
Ripple	<± 3 %* at ≤ 120 Hz
	*) Low frequency, LED load: Cree XP-G LEDs
U_{out} (max) (abnormal)	60 V
PstLM	≤ 0.2*
SVM	≤ 0.01*
	*) At full power, measured with Cree XP-G LED modules.

I_{LED}	150 mA	700 mA
P_{Rated}	7.8 W	26.3 W
U_{LED}	9 – 52 V	9 – 37.5 V
PF (λ) at full load	0.72	0.95
Efficiency (η) at full load	82 %	87 %

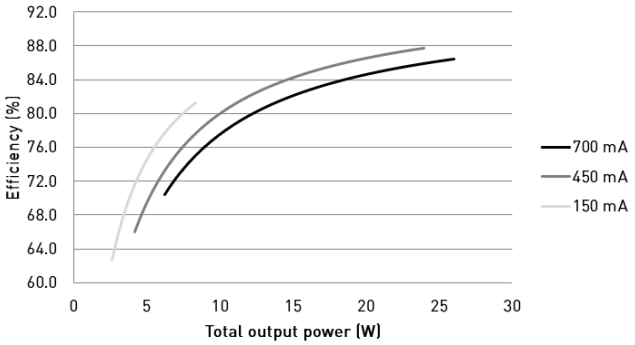
Operating window



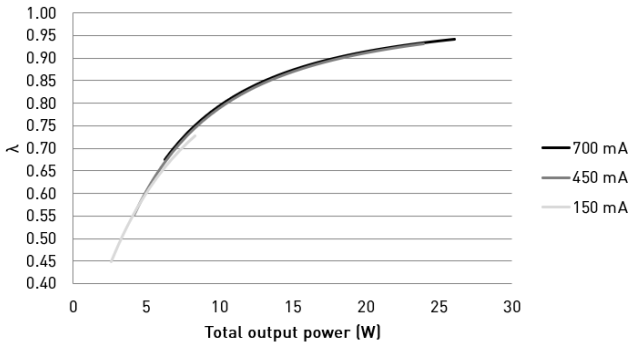
Note: 1) Dimming between 1 % - 100 % possible across the operating window, restricted by the absolute minimum dimming current of 5 mA.
2) Current value is adjustable in steps via dip-switch. See dip-switch settings in page 3 for details.

Driver performance

Typical efficiency



Typical power factor

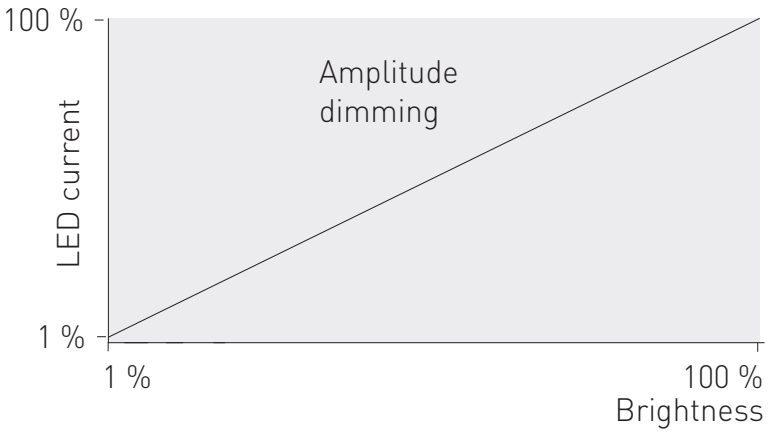


Operating Conditions and Characteristics

Absolute highest allowed t_c point temperature	85 °C
Tc life (50 000 h) temperature	85 °C
Ambient temperature range	–25 °C ... +50 °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*

Amplitude dimming technology



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

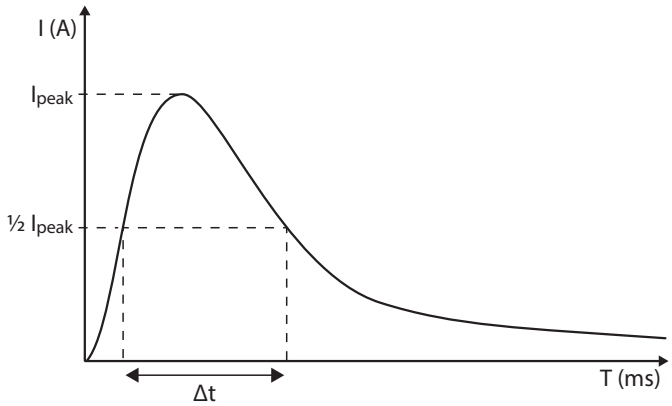
LC27MINI-FD-150-700 LED driver implements amplitude dimming technology across whole dimming range. Amplitude dimming offers the best available technology for dimming the light output in an accurate and flicker-free way to ensure high quality lighting in even the most demanding situations such as camera recording applications. Amplitude dimming technology complies with IEEE 1789-2015 recommendations of current modulation to mitigate health risks to viewers.

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
TBA	20 A	200 µs

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 %



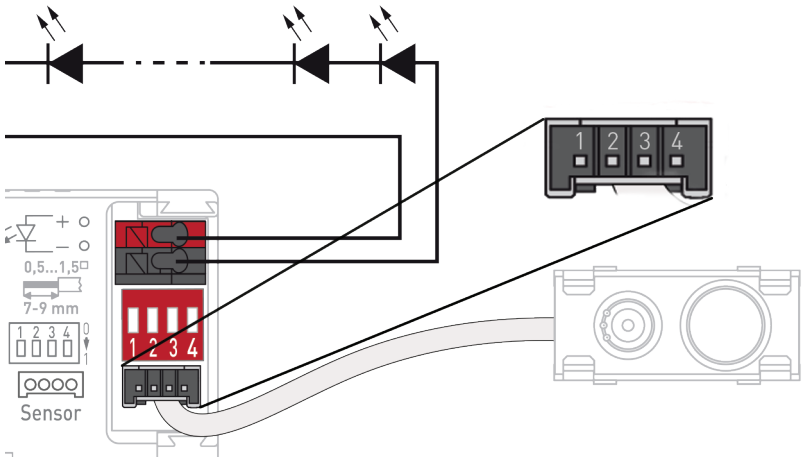
CONTINOUS CURRENT

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.

Freedom sensor output

Helvar Components LC27MINI-FD-150-700 is featured with integrated bluetooth module for flexible and minimal mechanical size solution for wireless luminaire control. On top of this, the LC27MINI-FD-150-700 supports external sensor usage connected to the "Sensor" connector (see picture below). This allows the usage of luminaire integrated sensors as accessory to the LED driver, allowing a complete luminaire solution with presense detection and daylight harvesting through the sensor. Please see the whole Freedom Sense sensor portfolio from www.helvarcomponents.com.



Sensor pin connections

Pin 1	PIR (Occupancy)
Pin 2	VDD
Pin 3	Ground
Pin 4	Lx (Ambient Light)

Sensor specification

Voltage	3.3 V (±0.3 V)
Max. output current	1 mA
Connector	MOLEX (35363-0460)

The sensor interface is made as great fit for Helvar Components Sense - sensors. Please see the whole offering at www.helvarcomponents.com

D4i-aligned Smart Data Features

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 Helvar Components 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

Luminaire GTIN
manufacturing time (year / week)
Nominal Input Power [W]
Power at minimum dim level [W]
Nominal Minimum AC mains voltage [V]
Nominal Maximum AC mains voltage [V]
Nominal light output [lm]
CRI
CCT [K]
Light Distribution Type
Colour
Identification number

Energy reporting

Active energy consumption
Active power
Apparent energy consumption
Apparent power
Load side energy consumption
Load side power

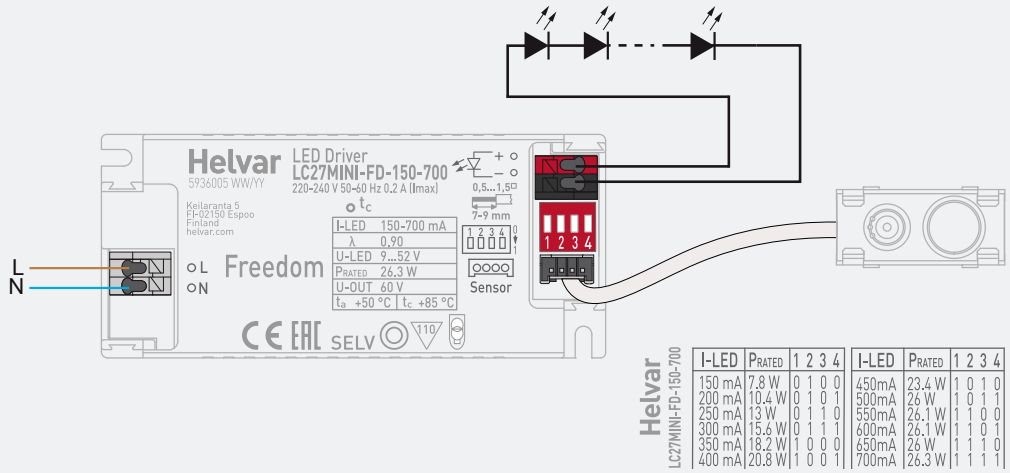
Diagnostics and maintenance

Control gear operating time
Control gear start counter
Light source start counter (resettable)
Light source operating time (resettable)
Light source failure status
Output voltage and current
Open circuit detection
Short circuit detection

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	160 g
IP rating	IP20

Connections

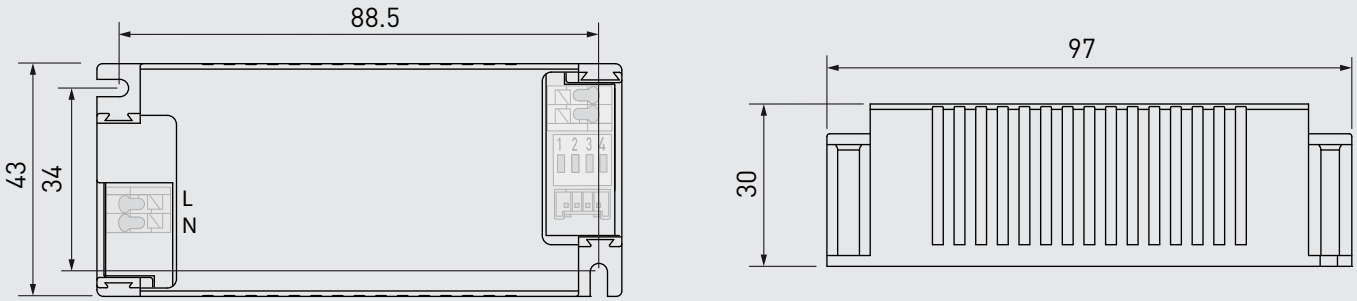


I-LED	PRATED	1 2 3 4	I-LED	PRATED	1 2 3 4
150 mA	7.8 W	0 1 0 0	450mA	23.4 W	1 0 1 0
200 mA	10.4 W	0 1 0 1	500mA	26 W	1 0 1 1
250 mA	13 W	0 1 1 0	550mA	26.1 W	1 1 0 0
300 mA	15.6 W	0 1 1 1	600mA	26.1 W	1 1 0 1
350 mA	18.2 W	1 0 0 0	650mA	26 W	1 1 1 0
400 mA	20.8 W	1 0 0 1	700mA	26.3 W	1 1 1 1

Note:

- *Not suitable for load side switching operation*

Dimensions (mm)



In LC27MINI-FD-150-700, the current can be set with dip-switches. With each combination of switch setup, a different output current value can be set. The maximum value can be reached with all switches set to "1" (pushed downwards, away from the connectors, see connections picture above). All the other dip-switch current setting values available are presented below.

Dip-switch combinations and currents (Nominal I_{out} (±5 % tol.))

Dip-Switch combination	1111	1110	1101	1100	1011	1010
I_{out} (mA)	700	650	600	550	500	450
Voltage range	9 - 37.5 V	9 - 40 V	9 - 43.5 V	9 - 47.5 V	9 - 52 V	9 - 52 V
Dip-Switch combination	1001	1000	0111	0110	0101	0100
I_{out} (mA)	400	350	300	250	200	150
Voltage range	9 - 52 V	9 - 52 V	9 - 52 V	9 - 52 V	9 - 52 V	9 - 52 V

LC27MINI-FD-150-700 LED driver is suited for built-in usage in luminaires. With external strain relief (LC-SR-MINI, LC-SR-MINI-B or LC-SR-MINI-LOOP), independent use is possible too. 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 via dip-switch

LC27MINI-DA-150-700 LED driver features a constant current output adjustable via dip-switch combinations.

- For the combination/current values, refer to the table on page 5.

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 (Uout < 60 V), driver goes to automatic recovery mode and follows the same logic as described in the no load condition.

Underload

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

Overtemperature protection

The driver features automatic overtemperature protection, which reduces the light level incase the driver gets overheated. Once the temperature decreases, the driver resumes to normal operation automatically

AC to DC recognition

When DC voltage is applied to the LED driver, the driver will automatically go to emergency lighting mode and set the light output to 15 % light level. When the DC operation ends and AC supply is resumed, the driver returns to normal operation.

Radioperformance considerations

LC27MINI-FD-150-700 can be installed both in and outside of the luminaire.

In general, the following things is good to be considered:

- The best radio performance is achieved, when the LC27MINI-FD-150-700 is placed on top of non-blocking material (in regard of radiocommunication signals), e.g. on top of plastic.
- It is recommended not to place any wiring over the LC27MINI-FD-150-700.

When the LC27MINI-FD-150-700 is installed inside luminaire the following things needs to be taken in consideration regarding the communication:

- To ensure good connectivity LC27MINI-FD-150-700 shall never be fully surrounded with metallic parts. The radiocommunication signals can't pass through metal.
- The LC27MINI-FD-150-700 should be positioned close to such non-blocking materials that bypass radio frequency signals (e.g. plastic, rubber and glass). When inside metallic linear / downlight luminaire, there should always be holes (can be either open or spots with non-blocking material) close to the LC27MINI-FD-150-700, to allow the radiocommunication flow out of the luminaire.
- If placed on top of metal, inside the luminaire, e.g. metallic luminaire, the luminaire design should have non-blocking material close to the Node. Optimal case is that on the opposite side of metallic material, where the driver lays, is non-blocking material.
- The connectivity distance between two LED drivers is greatly affected, if there is a lot of wireless communication around (WiFi, other bluetooth devices).
- When installed to a long chained linear aluminium / metallic luminaire, the driver should not be installed inside the luminaire e.g. in middle of it.
- When doing the luminaire installation, it is critical to always test the connectivity beforehand due to the things mentioned above.

When the LC27MINI-FD-150-700 is outside the luminaire

- The surrounding material and the available space around the driver should always be considered when the driver is installed outside the luminaire to e.g. dropped ceiling. If the space around is metallic without holes, it will disturb the radiocommunication.
- The strain-relief must always be used when the LC27MINI-FD-150-700 is placed outside the luminaire structure.

Helvar Components

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
EMC standard for radio equipment and services; Specific conditions for Broadband Data Transmission Systems	EN 301489-17
Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum	EN 300328
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 110 °C.

Freedom A control gear supporting a wireless luminaire control solutions via Freedom Interface.

Order codes

LC27MINI-FD-150-700 LED driver can be ordered as just the built-in LED driver itself or then as a combination package with strain reliefs for input and output side. Input strain relief is a LOOPing model with the connector block inside, output strain relief is screwless easy-to-use model. Everything is preassembled from the factory, ready to be connected to your LED luminaire! Please refer to the order codes in the table below.

ORDER CODES

	Order code	Product name	What is included
LC27MINI-FD-150-700			
Product order codes	5936505	LC27MINI-FD-150-700 **ActiveAhead**	LC27MINI-FD-150-700 ActiveAhead LED driver
	5936105	LC27MINI-FD-150-700 **Casambi**	LC27MINI-FD-150-700 Casambi LED driver
	Coming soon	LC27MINI-FD-150-700 **Mount Kelvin**	LC27MINI-FD-150-700 Mount Kelvin LED driver
	5936525	LC27MINI-FD-150-700 **ActiveAhead-LOOP**	LC27MINI-FD-150-700 ActiveAhead LED driver and LC-SR-MINI-LOOP + LC-SR-MINI-B screwless strain reliefs (input + output), preassembled
	5936125	LC27MINI-FD-150-700 **Casambi-LOOP**	LC27MINI-FD-150-700 Casambi LED driver and LC-SR-MINI-LOOP + LC-SR-MINI-B screwless strain reliefs (input + output), preassembled