# 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 SELV

## 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

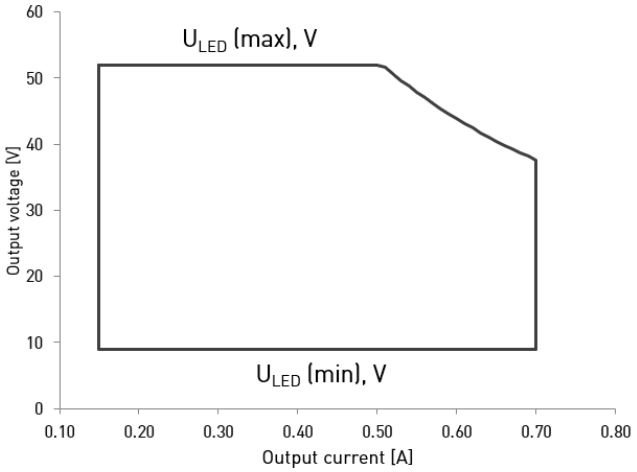
| | |
|---|---|
| Mains circuit - SELV output circuit | Double/reinforced insulation |
| Output - Driver case | Basic insulation |
| Mains input - Driver case | Double/reinforced insulation |

## 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 % |

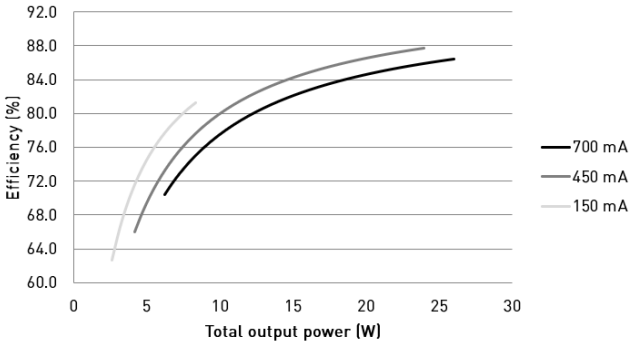
## Operating window



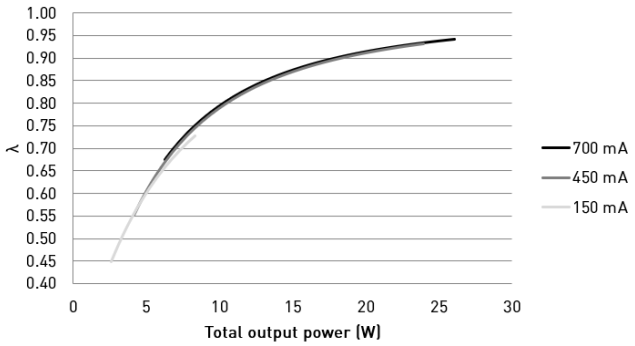

*Note: 1) Dimming between 1 % - 100 % possible across the operating window, restricted by the absolute minimum dimming current of 5 mA.*
*2) Current value is adjustable in steps via dip-switch. See dip-switch settings in page 3 for details.*

## Driver performance

### Typical efficiency




### Typical power factor

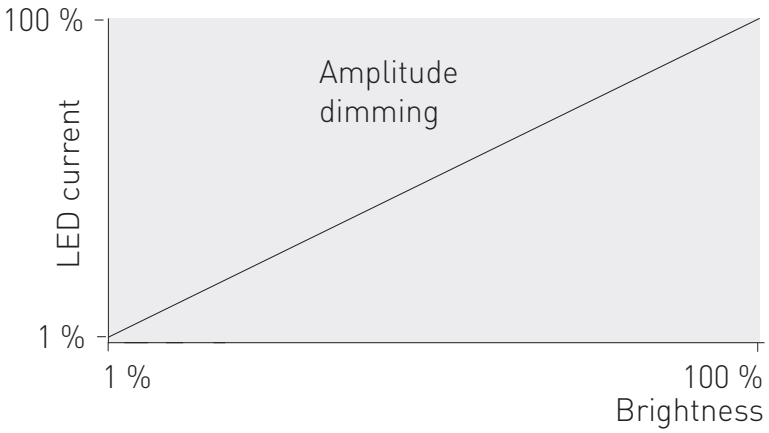



## Operating Conditions and Characteristics

| | |
|---|---|
| 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.

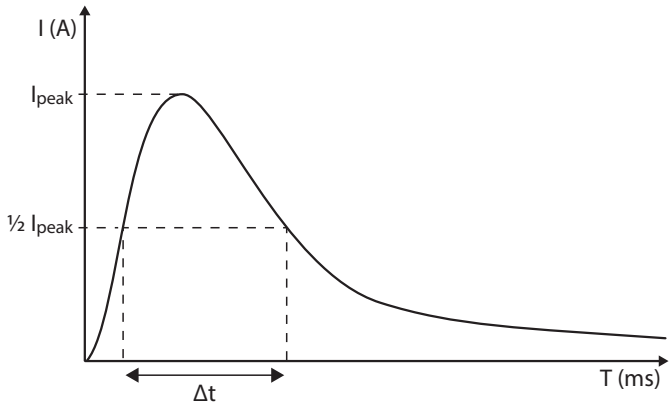
## Quantity of drivers per miniature circuit breaker 16 A Type C

| Based on inrush current $I_{peak}$ | Typ. peak inrush current $I_{peak}$ | 1/2 value time, Δt |
|---|---|---|
| 2936 pcs* | 5 A | 21 µs |

**Inrush current is not the limiting factor for the products per MCB, please notice the continuous current limitations.*

## 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 % |



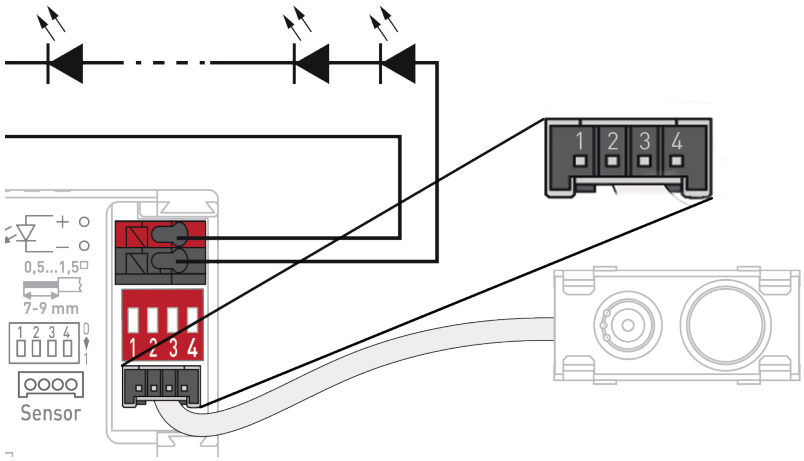

## CONTINOUS CURRENT

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

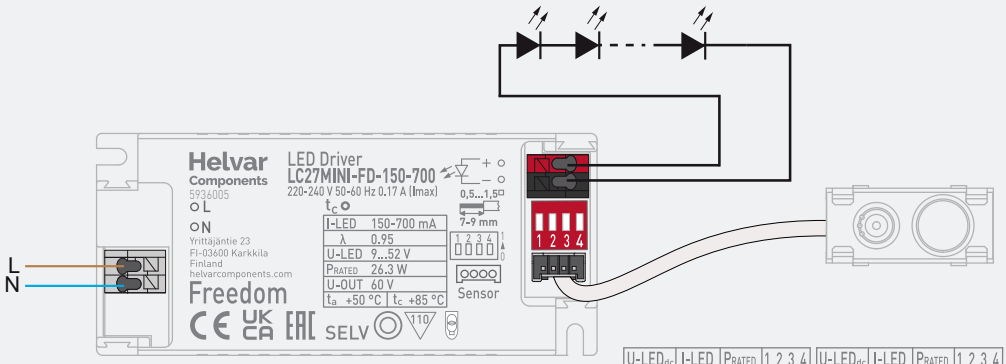
**Diagnostics and maintenance**

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



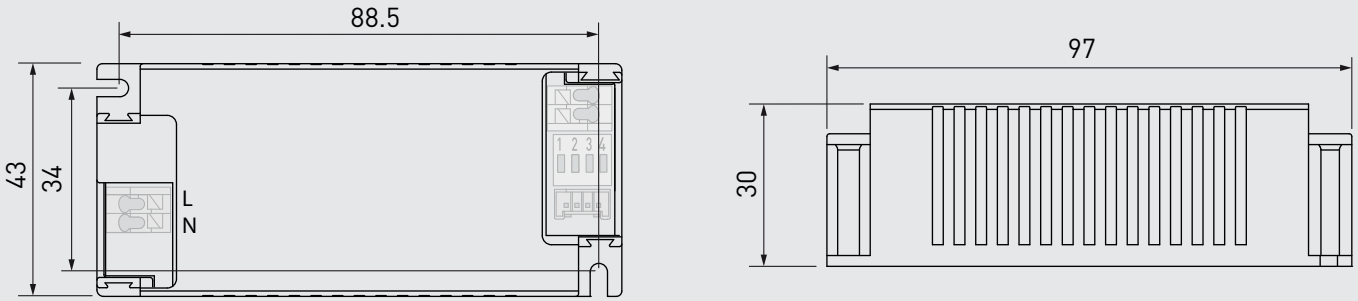

| U-LED$_{dc}$ | I-LED | PRATED | 1 2 3 4 |
|---|---|---|---|
| 9 - 52 V | 150 mA | 7.8 W | 0 1 0 0 |
| 9 - 52 V | 200 mA | 10.4 W | 0 1 0 1 |
| 9 - 52 V | 250 mA | 13 W | 0 1 1 0 |
| 9 - 52 V | 300 mA | 15.6 W | 0 1 1 1 |
| 9 - 52 V | 350 mA | 18.2 W | 1 0 0 0 |
| 9 - 52 V | 400 mA | 20.8 W | 1 0 0 1 |

| U-LED$_{dc}$ | I-LED | PRATED | 1 2 3 4 |
|---|---|---|---|
| 9 - 52 V | 450 mA | 23.4 W | 1 0 1 0 |
| 9 - 52 V | 500 mA | 26 W | 1 0 1 1 |
| 9 - 47.5 V | 550 mA | 26.1 W | 1 1 0 0 |
| 9 - 43.5 V | 600 mA | 26.1 W | 1 1 0 1 |
| 9 - 40 V | 650 mA | 26 W | 1 1 1 0 |
| 9 - 37.5 V | 700 mA | 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.

## 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<br>Broadband Data Transmission Systems | EN 301489-17 |
| Data transmission equipment operating in the 2,4 GHz band;<br>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 |
| | 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 |