LC43MINI-FD-300-1050

42 W **SELV Dimmable Freedom** LED driver

Product code: 5951xxx (see last page)

42 W 220 – 240 V 50 – 60 Hz

- Freedom LED driver, 1-100 % dimming range
- Integrated antenna and radiocommunication unit for standalone wireless luminaire control
- Available as Casambi Ready
- Sensor output for simple external Freedom sensor connection
- D4i-aligned Smart Data features, e.g. energy reporting, diagnostics and maintenance
- 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 or LC-SR-MINI-B, LC-SR-MINI-LOOP)

Freedom smart DATA UK CA CE EAC SELV 110

Functional Description

- Adjustable constant current output: 300 mA to 1050 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

Mains Characteristics

Nominal rated voltage range	220 V – 240 V, 50 – 60 Hz
Rated emergency voltage range*	198-254 VDC **) For emergency use, see page 5 for details*
AC voltage range	198–264 VAC
DC voltage range	198-280 VDC
Mains current at full load	Max. 0.21 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})	300 mA – 1050 mA (default)
Accuracy	± 5 %
Ripple	<± 3 % [1] at ⩽ 120 Hz

1) Low frequency, LED load: Cree XP-G LEDs

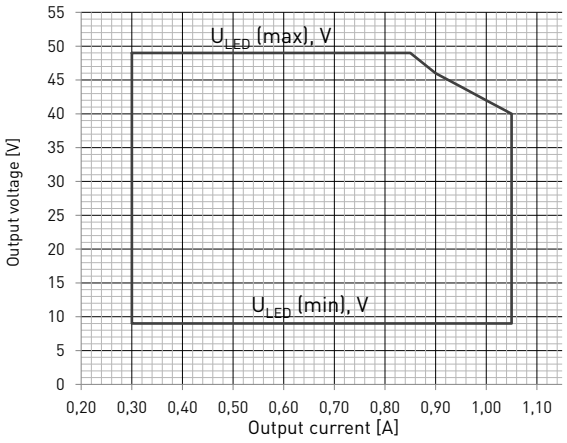
PstLM	< 1 [2]
SVM	< 0.4 [2]

2) At full power, measured with Cree XP-G LED modules.

U_{out} (max) (abnormal)	60 V
EOFx (EL use)	15 %

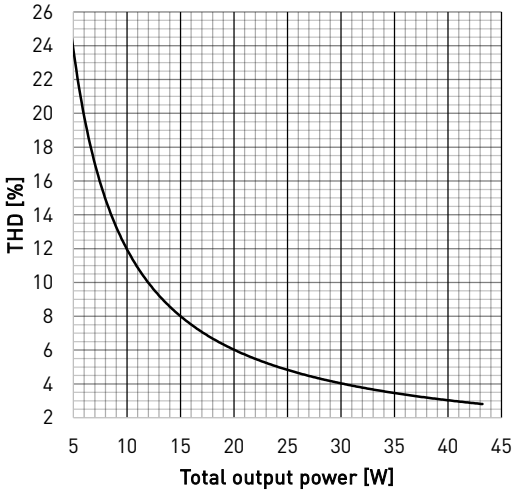
I_{LED}	300 mA	500 mA	700 mA	1050 mA
P_{Rated}	0.8...14.7 W	1.3...24.5 W	1.8...34.3 W	2.6...42 W
U_{LED}	2.5 – 49 V	2.5 – 49 V	2.5 – 49 V	2.5 – 40 V
PF (λ) at full load	> 0.95	> 0.95	> 0.95	> 0.95
Efficiency (η) at full load	87 %	> 89 %	> 89 %	> 89 %

Operating window and driver performance

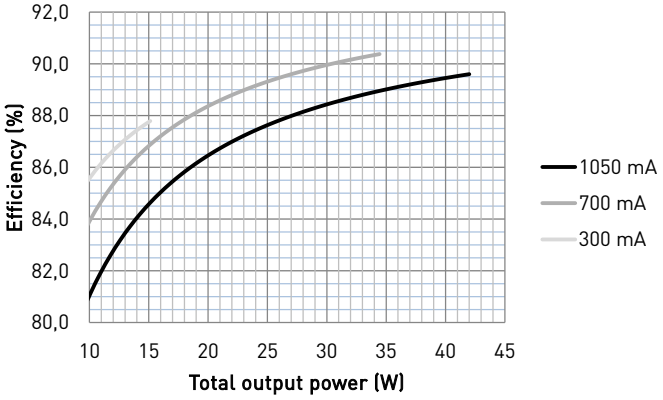


1) Dimming between 1 - 100 % possible across the operating window, restricted by the absolute minimum dimming current of 10 mA
2) Current value is adjustable in steps via DIP switch. See DIP switch settings in page 3 for details.

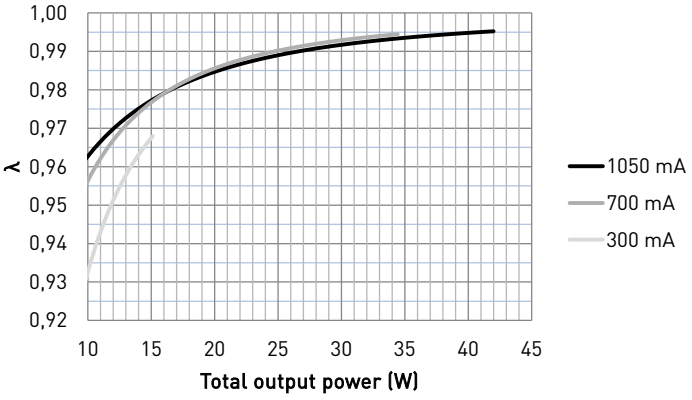
Current THD



Typical efficiency



Typical power factor

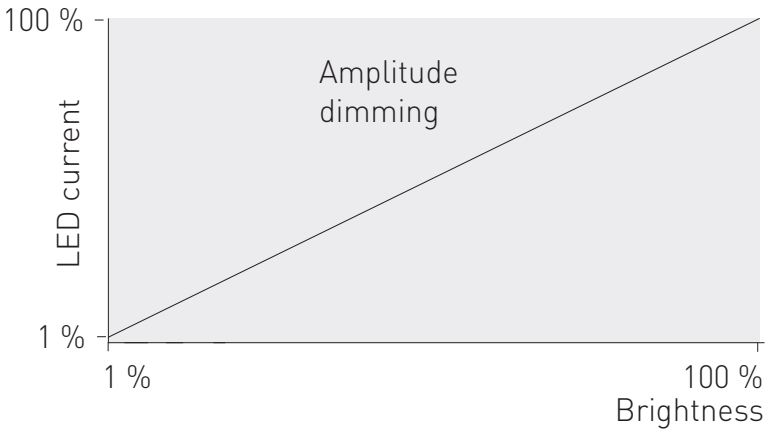


Operating Conditions and Characteristics

Absolute highest allowed t_c point temperature	85 °C
Tc life (50 000 h) temperature	80 °C
Ambient temperature range	–20 °C .. +40 °C*
Storage temperature range	–40 °C ... +80 °C
Maximum relative humidity	No condensation
Life time (90 % survival rate)	30 000 h, at t_c = 85°C 50 000 h, at t_c = 80 °C 100 000 h, at t_c = 70 °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)

LC43MINI-FD-300-1050 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.

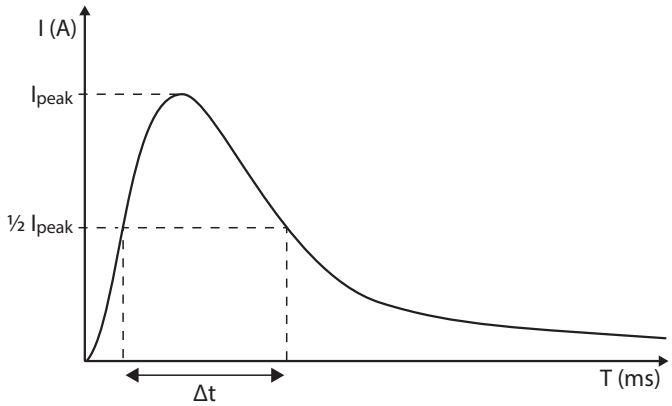
Quantity of drivers per miniature circuit breaker 16 A Type C

Based on inrush current I_{peak}	Typ. peak inrush current I_{peak}	1/2 value time, Δt	Calculated energy, $I_{peak}^2 \Delta t$
> 100 pcs*	8 A	35 µs	**0.0014 A^2s**

**Inrush current is not the limiting factor for the products per C 16 A 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 %



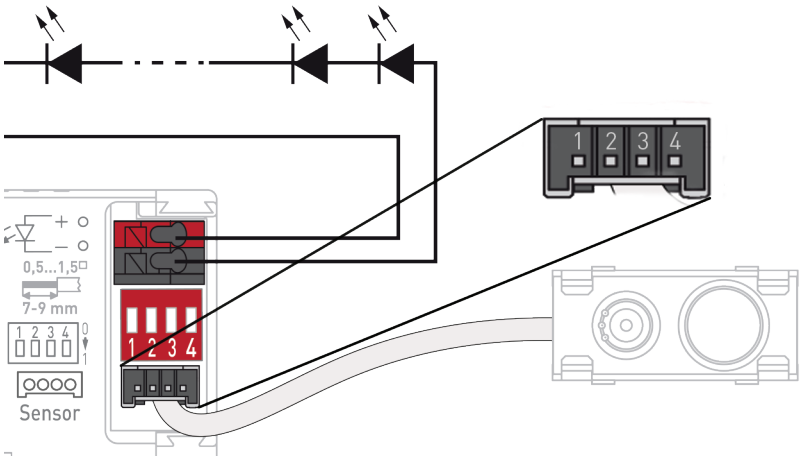
CONTINOUS CURRENT

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 LC43MINI-FD-300-1050 is featured with integrated bluetooth module for flexible and minimal mechanical size solution for wireless luminaire control. On top of this, the LC43MINI-FD-300-1050 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 Freedom 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.

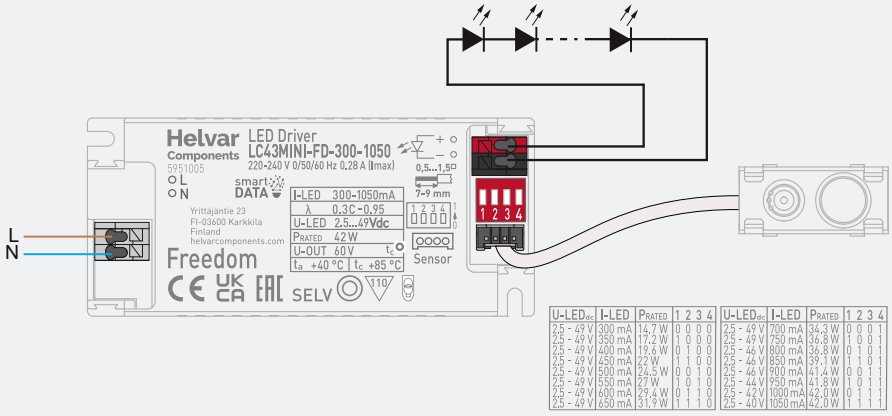
The Smart Data features include data sets as described below, accessible wirelessly via Freedom protocol:

- OEM Customer data (based on DALI part 251)
- Energy reporting (based on DALI part 252)
- Diagnostics and maintenance (based on DALI part 253)

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	113 g
IP rating	IP20

Connections

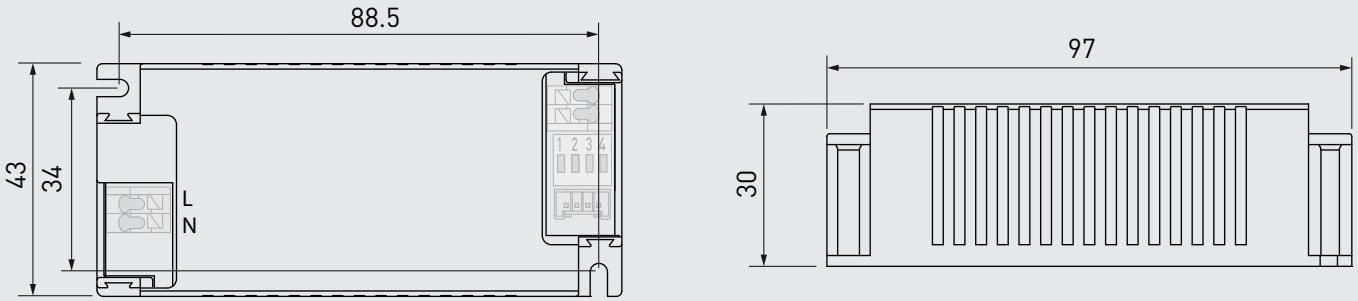


U-LED$_{DC}$	I-LED	PRATED	1 2 3 4	U-LED$_{AC}$	I-LED	PRATED	1 2 3 4
2.5 - 49 V	300 mA	14.7 W	0 0 0 0	2.5 - 49 V	700 mA	34.3 W	0 0 0 1
2.5 - 49 V	350 mA	17.2 W	1 0 0 0	2.5 - 49 V	750 mA	36.8 W	1 0 0 1
2.5 - 49 V	400 mA	19.6 W	0 1 0 0	2.5 - 46 V	800 mA	36.8 W	0 1 0 1
2.5 - 49 V	450 mA	22 W	1 1 0 0	2.5 - 46 V	850 mA	39.1 W	1 1 0 1
2.5 - 49 V	500 mA	24.5 W	0 0 1 0	2.5 - 46 V	900 mA	41.4 W	0 0 1 1
2.5 - 49 V	550 mA	27 W	1 0 1 0	2.5 - 44 V	950 mA	41.8 W	1 0 1 1
2.5 - 49 V	600 mA	29.4 W	0 1 1 0	2.5 - 42 V	1000 mA	42.0 W	0 1 1 1
2.5 - 49 V	650 mA	31.9 W	1 1 1 0	2.5 - 40 V	1050 mA	42.0 W	1 1 1 1

Note:

- *Not suitable for load side switching operation*

Dimensions (mm)



In LC43MINI-FD-300-1050, 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 upwards, towards the connectors, see connections picture above) and minimum with all switches set to "0" (pushed downwards, away from the connectors). The output current values according to the DIP switch settings are presented below.

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

DIP switch combination	1111	0111	1011	0011	1101	0101	1001	0001
I_{out} (mA)	1050	1000	950	900	850	800	750	700
Voltage range	2.5 - 40 V	2.5 - 42 V	2.5 - 44 V	2.5 - 46 V	2.5 - 49 V	2.5 - 49 V	2.5 - 49 V	2.5 - 49 V
DIP switch combination	1110	0110	1010	0010	1100	0100	1000	0000
I_{out} (mA)	650	600	550	500	450	400	350	300
Voltage range	2.5 - 49 V	2.5 - 49 V	2.5 - 49 V	2.5 - 49 V	2.5 - 49 V	2.5 - 49 V	2.5 - 49 V	2.5 - 49 V

LC43MINI-DA-300-1050 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

LC43MINI-DA-300-1050 LED driver features a constant current output adjustable via DIP switch combinations.

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

Emergency use

- The product can be continuously operated only with AC, the DC is reserved only for emergency usage.

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 emergency lighting mode

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. The DC light level cannot be adjusted or turned off by manual control. When the AC is switched back on, the driver returns to normal operation.

Radio performance considerations

LC43MINI-FD-300-1050 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 LC43MINI-FD-300-1050 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 LC43MINI-FD-300-1050.

When the LC43MINI-FD-300-1050 is installed inside luminaire the following things needs to be taken in consideration regarding the communication:

- To ensure good connectivity LC43MINI-FD-300-1050 shall never be fully surrounded with metallic parts. The radiocommunication signals can't pass through metal.
- The LC43MINI-FD-300-1050 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 LC43MINI-FD-300-1050, 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 LC43MINI-FD-300-1050 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 LC43MINI-FD-300-1050 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 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

LC43MINI-FD-300-1050 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
LC43MINI-FD-300-1050			
Product order codes	5951105	LC43MINI-FD-300-1050 **Casambi**	LC43MINI-FD-300-1050 Casambi LED driver
	5951125	LC43MINI-FD-300-1050-LOOP **Casambi LOOP**	LC43MINI-FD-300-1050 Casambi LED driver and LC-SR-MINI-LOOP + LC-SR-MINI-B screwless strain reliefs (input + output), preassembled
	5999005	LC-SR-MINI	1 x Strain relief, screwable
	5998005	LC-SR-MINI-B	1 x Strain relief, screwless
	5996205	LC-SR-MINI-LOOP	1 x Strain relief, LOOP model with 4 x short wires for connector block included
	59950	LC-SR-MINI-COMBO	1 x LC-SR-MINI-B and 1 x LC-SR-MINI-LOOP