LL80HE-FD-150-850-RAD

80 W **Dimmable Freedom** LED driver

Product codes: see page 7

80 W 220 – 240 V 0/ 50 – 60 Hz

- Integrated antenna and radiocommunication unit in the LED driver itself for standalone wireless luminaire control
- Sensor output connector for optional sensor use
- Very low current ripple and amplitude dimming technology for the highest quality light output, complying with IEEE 1789 recommendations
- NFC technology for wireless programming
- D4i-aligned Smart Data features
- Optimised power factor performance across the operational range
- Suitable for emergency lighting applications with central battery systems (e.g. Eaton-CEAG, Inotec), AC/DC input recognition

Freedom CONSTANT LIGHT OUTPUT (CLO) smart DATA NFC CE UK CA EAC

Functional Description

- Adjustable constant current output: 150 to 850 mA
- Dimming range 1 - 100 %
- Current setting adjustable via DIP switch (default), or then programmable via NFC
- Four output current options via DIP switch: 350 mA (default) / 500 mA / 700 mA / 850 mA
- The output current can be set in a fixed way with with Helvar Driver Configurator (HDC) and DIP switch position ignored
- Innovative Smart Switch technology: the DIP switch current values for different positions can also be programmed by the user in HDC to differ from the factory defaults and driver will follow this in output current setting
- D4i aligned Smart Data features, e.g. OEM customer and luminaire data, energy reporting, diagnostics and maintenance
- Built-in adjustable internal thermal protection to actively reduce the output current in case of extreme temperatures
- Amplitude dimming technology for the highest quality light in every application
- Flicker-free light output suitable for camera recording applications
- Constant Light Output (CLO), adjustable up to 100 000 h (default disabled)

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)
DC voltage range	176 VDC – 280 VDC
DC starting voltage	> 186 VDC
Mains current at full load	0.36 – 0.41 A
Frequency	0 / 50 Hz – 60 Hz
(Networked) standby power consumption	< 0.4 W
THD at full power	< 8 %
Leakage current to earth	< 0.5 mA
Tested surge protection	1 kV L-N, 2 kV L/N-GND (IEC 61000-4-5)
Tested fast transient protection	2 kV (IEC 61000-4-4)

Insulation between circuits & driver case

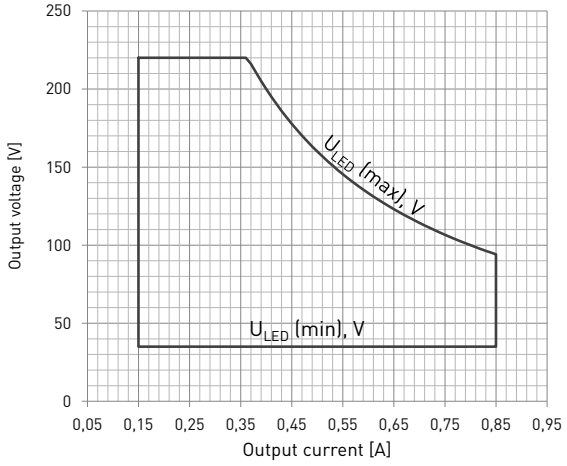
Mains circuit - Output	Non-isolated
Mains circuit - Freedom sensor interface	Non-isolated
Mains, Interface and output - Driver case	Basic insulation

Load Output (non-isolated)

Output current		
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)	250 V	
EOFx (EL use)	15 %*	*) By default setting, available range 1...100 %

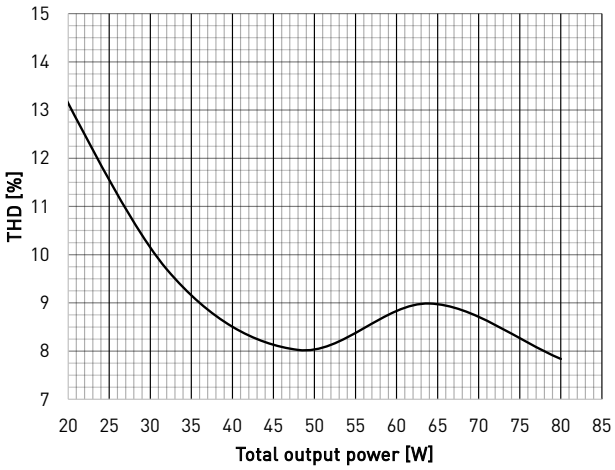
I_{LED}	150 mA	350 mA (default)	500 mA	700 mA	850 mA
P_{Rated}	5.25...33 W	12.25...77 W	17.5...80 W	24.5...80 W	29.75...80 W
U_{LED}	35 – 220 V	35 – 220 V	35 – 160 V	35 – 114 V	35 – 94 V
PF (λ) at full load	0.98	0.98	0.98	0.98	0.98
Efficiency (η) at full load	89 %	93 %	93 %	92 %	91 %

Operating window & driver performance

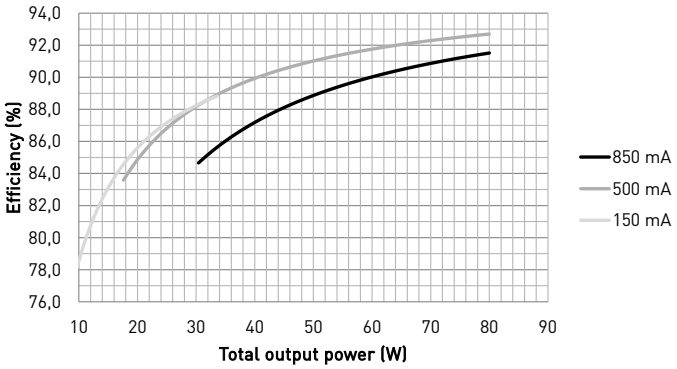


From 150 mA to 850 mA, full dimming range (1 % - 100 %) available in the whole area.

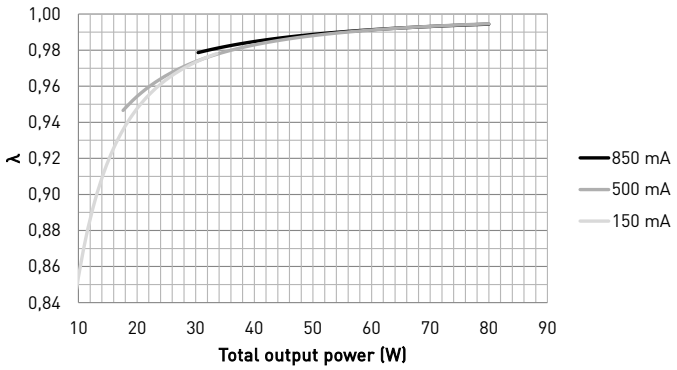
Current THD



Typical efficiency



Typical power factor



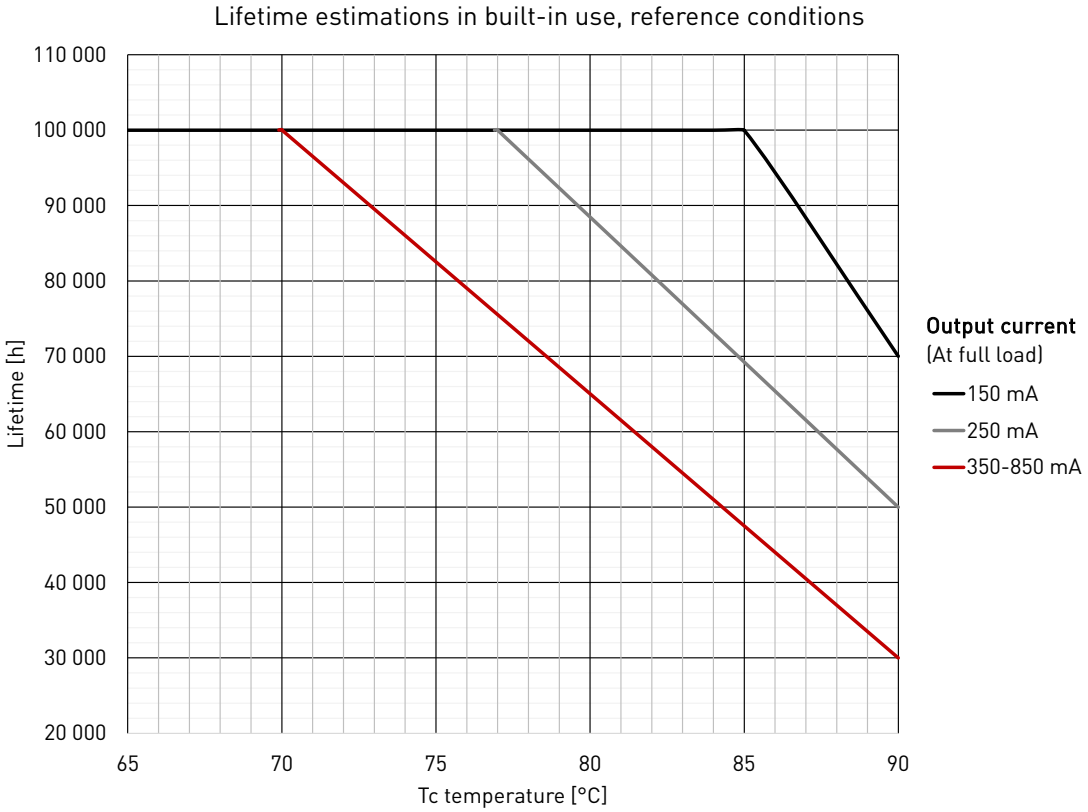
Operating Conditions

Absolute highest allowed t_c point temperature	90 °C
Ambient temperature range	–40°C ... +50 °C*
Storage temperature range	–40 °C ... +80 °C
Maximum relative humidity	No condensation

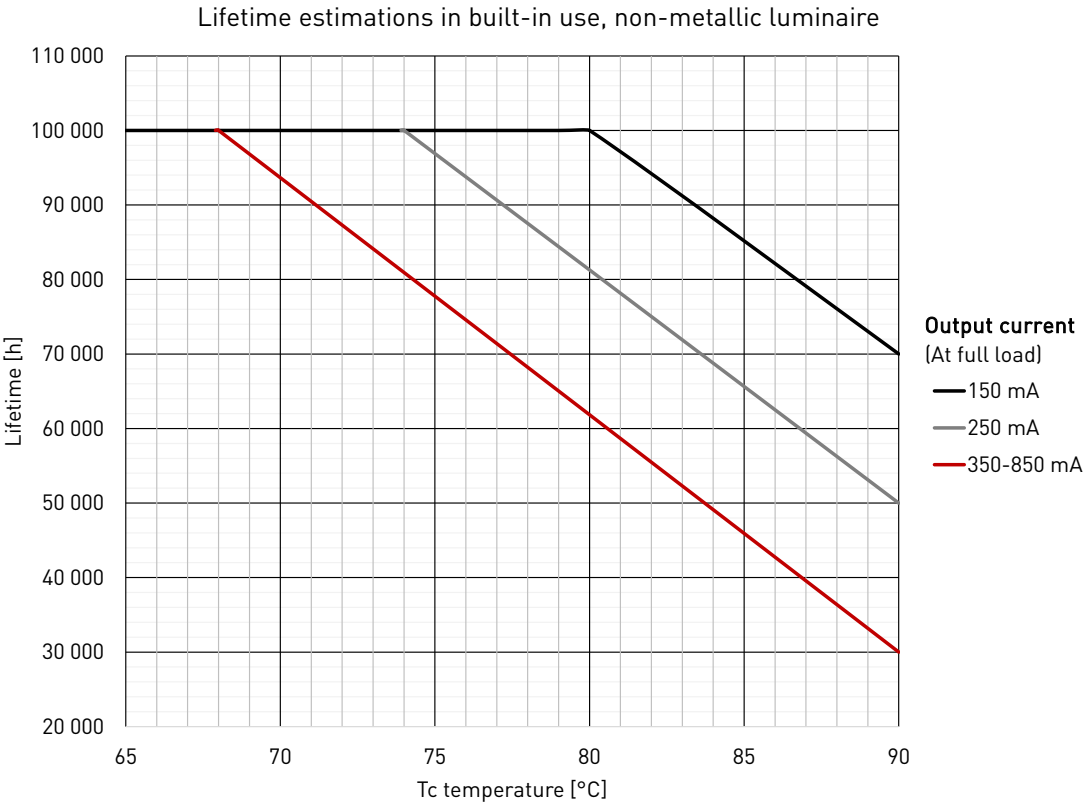
**) In built-in use, higher t_a of the controlgear possible as long as highest allowed t_c point temperature is not exceeded.*

Lifetimes

Lifetime graphs (90 % survival rate)

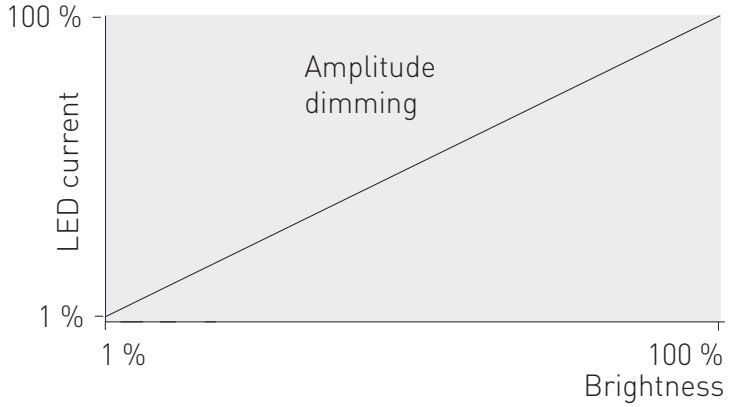


The shown t_c temperatures and lifetimes were measured in reference conditions i.e. metallic luminaire design and built-in use. Please refer to the used output current and t_c for the most accurate lifetime estimation.
Never exceed the t_c maximum of the driver stated in the datasheet!



The shown t_c temperatures and lifetimes were measured in non-metallic luminaire design and built-in use. Please refer to the used output current and t_c for the most accurate lifetime estimation.
Never exceed the t_c maximum of the driver stated in the datasheet!

Amplitude dimming technology

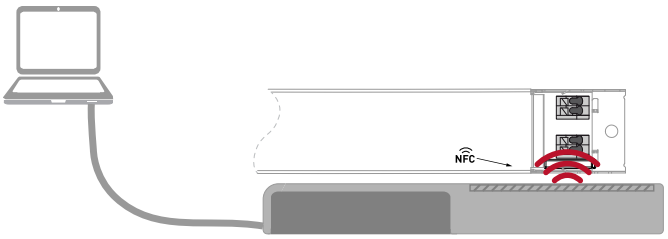


Dimming range	Dimming technology
1 % – 100 %	Amplitude (DC)

LL80HE-FD-150-850-RAD 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.

Wireless configuration

LL80HE-FD-150-850-RAD 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 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



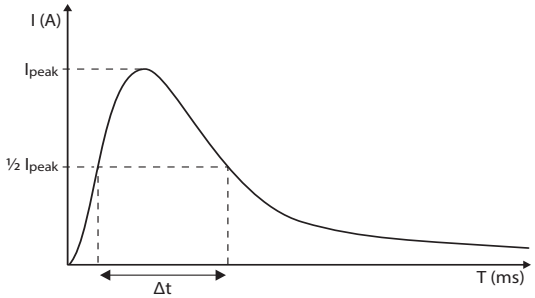
Feig NFC reader

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, $I_{peak}^2 \Delta t$
37 pcs	39 A	174 µs	0.0002 A^2s

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 %



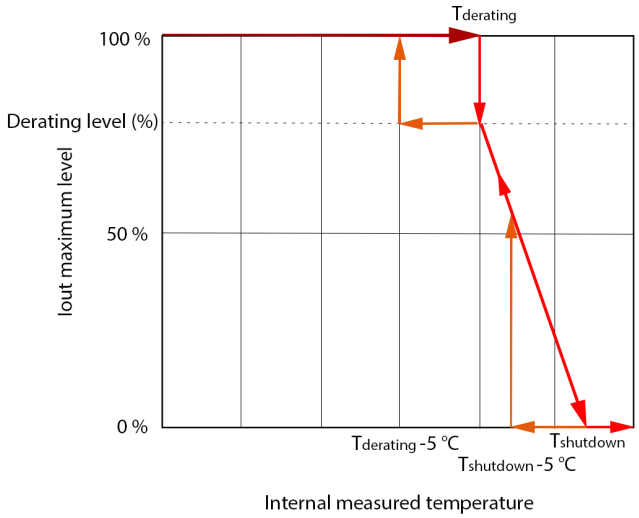
CONTINOUS CURRENT

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: $n(I_{cont}) = (16\ A\ (I_{nom,Ta}) / \text{"nominal mains current with full load"}) \times 0.76)$. 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.

Internal thermal protection

This LED driver has built-in active internal thermal protection. This feature protects the LED driver by limiting the maximum output current based on set limit temperatures. If the temperature exceeds a predefined derating temperature, the output current is reduced within one minute fade time to the derating level. If the temperature increases beyond set derating temperature, the LED driver will reduce output current gradually within the slope set by shutdown and derating temperatures. The shutdown temperature sets the temperature where the output will eventually be shut OFF. If the current increases rapidly to shutdown temperature, the output is set to OFF without fade time. The LED driver returns automatically once the temperature decreases below the threshold. The default behavior is shown in the graph on the right.

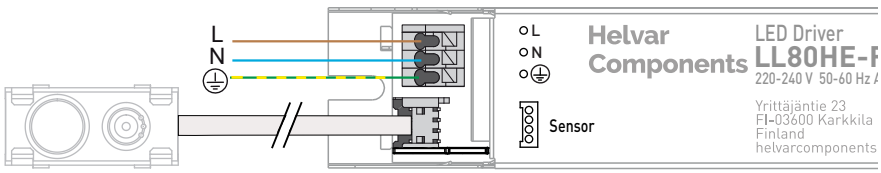


The exact triggering points vary depending of the LED driver model. By factory default, the derating point is adjusted high enough so that the feature should never be triggered below the point of Tc max temperature being exceeded and will thus not affect normal operation of the LED driver. **Note that the internal measured temperature does not equal Tc temperature of the driver!**

Internal thermal protection feature is enabled by default, and it can be either disabled or manually adjusted to trigger earlier if desired. Configuring the internal thermal protection is done via Helvar Driver Configurator.

Freedom sensor output

Helvar LL80HE-FD-150-850-RAD is featured with integrated radio module for easy and convenient solution for wireless luminaire control. On top of this, the LL80HE-FD-150-850-RAD 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.helvar.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 optimally designed for Helvar Sense sensor family. Please see the whole offering at www.helvar.com

D4i-aligned Smart Data Features

LL80HE-FD-150-850-RAD LED driver has integrated Smart Data features, which monitor, gather and provide key data about the LED driver usage and internal parameters through Freedom protocol. This useful data provided by LED driver enables various applications and integrations into data management and IoT services, establishing the Helvar LED drivers as key components in the latest generation of smart luminaires.
The Smart Data databanks include:

- OEM Customer data
- Energy reporting
- Diagnostics and maintenance

Connections and Mechanical Data

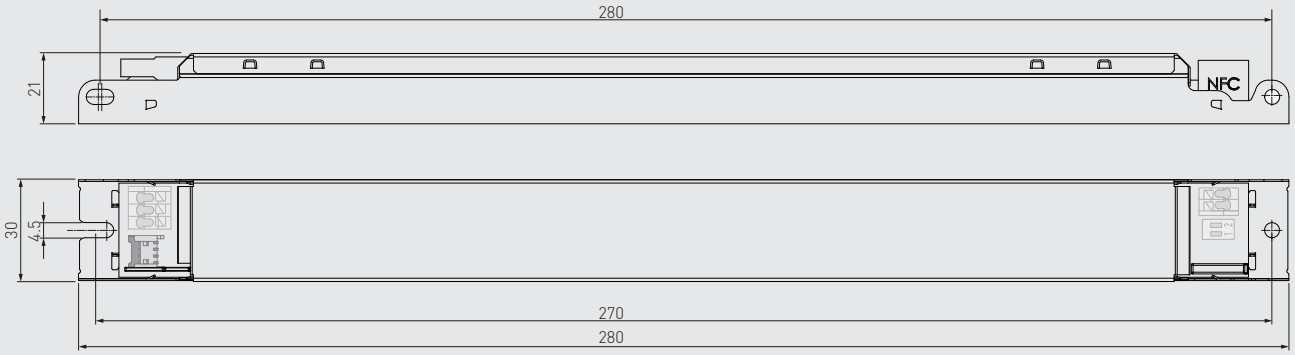
Wire size	0.5 mm^2 – 1.5 mm^2
Wire type	Solid core and fine-stranded
Wire insulation	According to EN 60598
Maximum driver to LED wire length	1.5 m
Weight	218 g
IP rating	IP20

Connections

Note:

- *Not suitable for load side switching operation*

Dimensions (mm)



In LL80HE-FD-150-850-RAD, the current can be set in a simple way with DIP switches, when not programmed through NFC. With each combination of switch setup, a different output current value can be set. The maximum value can be reached with the DIP switch setting "11" (DIP switches pushed towards the driver label) and minimum with setting "00" (pushed away from the driver label, see the connections picture above). The output current values according to the DIP switch settings are presented below.
Note: The DIP switch is always the default method for setting the output current. If the current is programmed with Helvar Driver Configurator however, the DIP switch will be ignored.

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

DIP switch combination	00 (default)	10	01	11
I_{out} (mA)	350	500	700	850
Voltage range (V)	35 - 220	35 - 160	35 - 114	35 - 94

LL80HE-FD-150-850-RAD LED driver is suited for built-in usage in luminaires. With external LL-SR-NFC strain reliefs, 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.

LED driver earthing

- LL80HE-FD-150-850-RAD LED driver is a protective Class I device and designed for Class I luminaires.
- If used inside **Class I** luminaires, this LED driver must always have the protective earth cable connected for safety reasons.
- The driver is designed to be used inside Class I luminaires. For usage inside **Class II** luminaires, the safety of the luminaire shall be ensured through double/reinforced insulation of live parts and through supplementary insulation of conductive parts of the casing, or any conductive parts connected to the casing, as the casing is only basic insulated from the live parts. The earth connector of the driver shall be left unconnected and there shall be no protective earth terminals in the luminaire terminal block to fulfill the requirements of IEC/EN 60598-1 for Class II luminaires. The EMC performance of the driver change when left unearthed, so it is always the responsibility of the integrator to take measures and necessary actions, for example by luminaire design to ensure the assembled luminaire complies with latest EMC standard.

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.

Helvar Driver Configurator -support

LL80HE-FD-150-850-RAD LED driver is supported by Helvar Driver Configurator software. With the LL80HE-FD-150-850-RAD the output current of the driver can be programmed using the HDC software, as well as OEM customer data and parameters for features such as CLO and Internal Thermal Protection. Programming the driver with Helvar Driver Configurator can be done wirelessly via NFC.

Lamp failure functionality

No load
When open load is detected, the driver will go to standby mode and remain in automatic recovery status. In automatic recovery mode, the driver will check every four seconds if the load has been reconnected. Once that happens, it returns to normal operation.

Short circuit
When short circuit is detected, driver will go to standby mode. It will return to normal operation through light level OFF -> ON command or through mains reset.

Overload
When overload/voltage is detected, driver will act similarly to no load situation, it will go to standby mode and remain in automatic recovery status. In automatic recovery mode, the driver will check every four seconds if the load has been reconnected. Once that happens, it returns to normal operation.

Underload
When underload/voltage is detected, driver will act similarly to short circuit situation, it will go to standby power consumption status. It will return to normal operation through light level OFF -> ON command or through mains reset.

Internal overtemperature
When the driver exceeds the Tc max operating temperature, soon above that point the driver will start decreasing the maximum output current. Details about the operation in page 4 "Internal Thermal Protection". Parameters of this feature can be adjusted via Helvar Driver Configurator, or then the feature disabled if so desired.

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 by default. The DC light level cannot be adjusted or turned off by manual control or by active features, unless "DC dimming" is specifically enabled through Helvar Driver Configurator. When the AC is switched back on, the driver returns to normal operation.
Note: The internal temperature protection feature can never force the light level off or below the set emergency level in DC emergency mode.

Radio performance considerations

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

- The best radio performance is achieved, when the LL80HE-FD-150-850-RAD antenna unit in the input side of the LED driver 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 LL80HE-FD-150-850-RAD.

When the LL80HE-FD-150-850-RAD is installed inside luminaire the following things need to be taken into consideration regarding the wireless communication:

- To ensure good connectivity LL80HE-FD-150-850-RAD shall never be fully surrounded with metallic parts. The radiocommunication signals can't pass through metal.
- The LL80HE-FD-150-850-RAD should be positioned close to such non-blocking materials that bypass radio frequency signals (e.g. plastic, rubber and glass). When inside metallic linear luminaire, there should always be holes (can be either open or spots with non-blocking material) close to the LED driver antenna unit, 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.

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 IEC 61000-3-2
Limits for voltage fluctuations and flicker	EN 61000-3-3
Radio frequency interference	EN IEC 55015
Immunity standard	EN 61547
Performance requirements	EN IEC 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	

Suitable for emergency luminaires complying with the standard EN 60598-2-22.

Label symbols

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

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.

Order codes

	Order code	Product name	What is included
LL80HE-FD-150-850-RAD			
Product order codes	5828200	LL80HE-FD-150-850-RAD **Casambi**	LL80HE-FD-150-850-RAD Casambi LED driver