LL120HE-DA-100-800

120 W **Dimmable DALI-2** LED driver

Product code: 5783

120 W 220 – 240 V 0/ 50 – 60 Hz

- DALI-2 certified LED driver, 1-100 % dimming range
- Very high efficiency up to 95.2 %
- 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 compatible Smart Data features (DALI 251-253)
- Suitable for emergency lighting applications with central battery systems (e.g. Eaton-CEAG, Inotec), AC/DC input recognition
- Corridor Control feature for simple presence sensor applications
- Helvar Driver Configurator (HDC) support
- Ideal solution for Class I luminaires, suitable for Class II luminaires too*

*See page 6 for details.



CONSTANT LIGHT OUTPUT (CLO) CORRIDOR CONTROL SWITCH-CONTROL 3 smart DATA NFC DALI 2

Functional Description

- Adjustable constant current output: 100 to 800 mA
- Output current setting programmable via NFC / DALI with Helvar Driver Configurator (HDC)
- Very high efficiency stability across the operating window - efficiency range from > 90 % achievable from as low as 20 % of the maximum load (24 W)
- D4i compatible 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
- Latest Switch-Control 3 technology for easy-to-use intensity control
- Corridor Control for straightforward lighting control with e.g. external sensors with built-in relay
- 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 input current at full load	0.54 – 0.58 A
Rated input power at full load	127.5 W
Frequency	0 / 50 Hz – 60 Hz
Stand-by power consumption	< 0.3 W
THD at full power	< 5 %
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
DALI circuit - Output	Basic insulation
Mains circuit - DALI circuit	Basic insulation
Mains, DALI and output - Driver case	Basic insulation

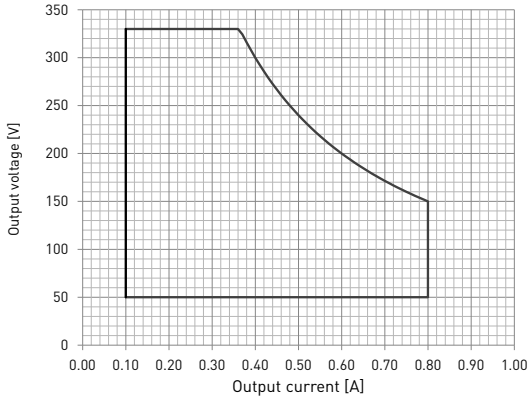
Load Output (non-isolated)

Output current		
Accuracy	± 2 % [1]	1) From 100 - 800 mA, minimum of 99.73 % conformance rate.
Ripple	< 1 % [2] at ⩽ 120 Hz	2) Low frequency, measured with Cree XP-G LED modules.
PstLM	⩽ 0.12 [3]	
SVM	⩽ 0.01 [3]	3) At full power, measured with Cree XP-G LED modules.
U_{OUT} (max) (abnormal)	350 V	
EOFx (EL use)	15 % [4]	4) By default setting, available range 1...100 %

This LED driver does not allow operation with high output capacitance according to IEC 62384 clause 7.3.

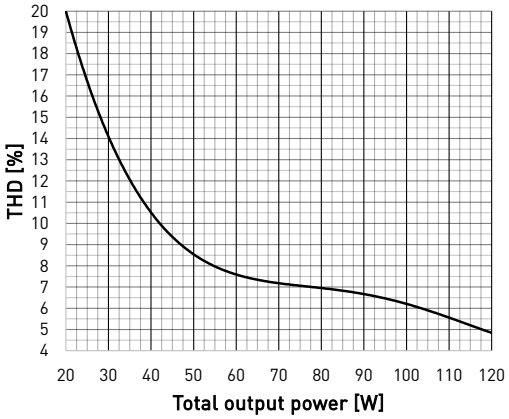
I_{LED}	100 mA	350 mA (default)	450 mA	800 mA
P_{Rated_min} - P_{Rated}	5...33 W	17.5...116 W	22.5...120 W	40...120 W
U_{LED}	50 – 330 V	50 – 330 V	50 – 267 V	50 – 150 V
PF (λ) at full load	0.89	0.98	0.98	0.98
Efficiency (η) at full load	90.5 %	95.2 %	95 %	94 %

Operating window & driver performance

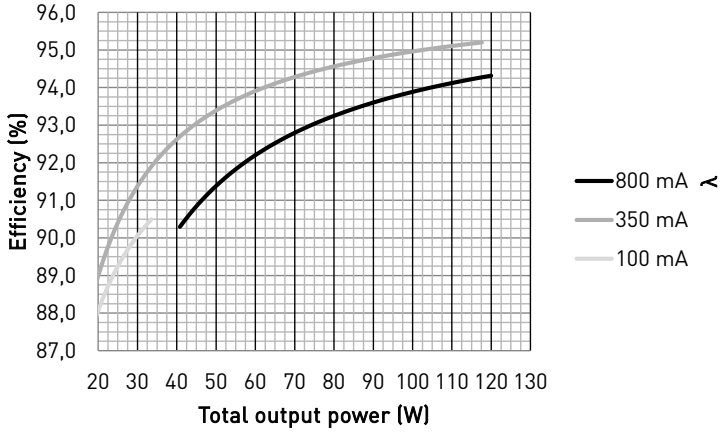


From 100 mA to 800 mA, full dimming range (1 % - 100 %) available in the whole area, restricted by the absolute minimum dimming current of 2 mA.

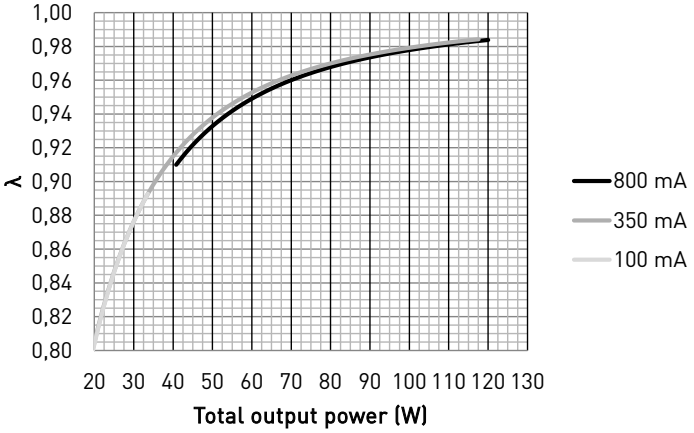
Current THD



Typical efficiency



Typical power factor



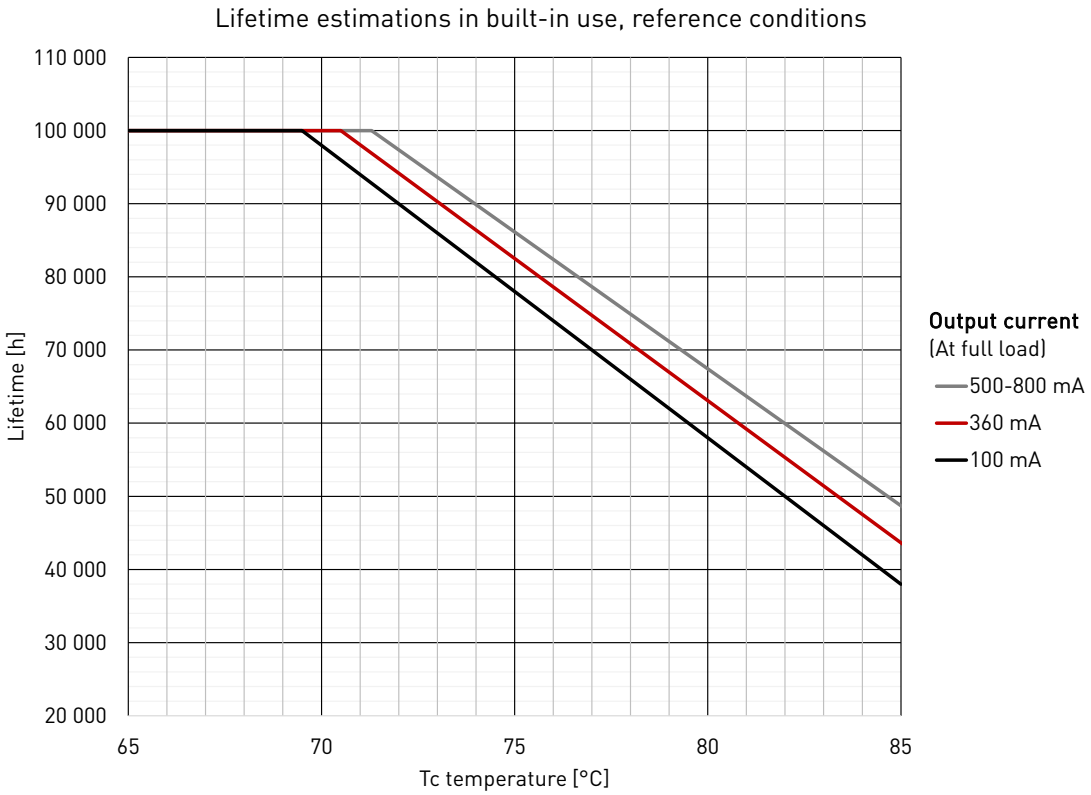
Operating Conditions and Lifetime

Absolute highest allowed t_c point temperature	85 °C
Ambient temperature range t_a	–40°C ... +50 °C*
Storage temperature range	–40 °C ... +80 °C
Maximum relative humidity	No condensation

**) Below -30 °C DALI performance might be limited, and DALI voltage must be > 12 V in the driver terminals.*
Below -35 °C mains switching is not allowed.
For built-in use, higher t_a of the controlgear possible as long as highest allowed t_c point temperature is not exceeded.

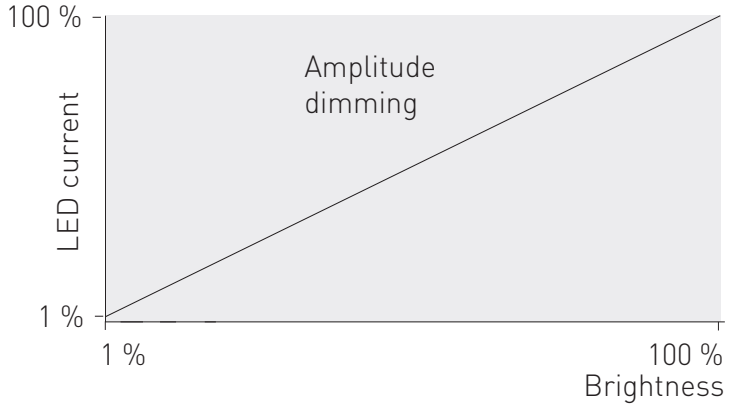
Lifetimes

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!

Amplitude dimming technology

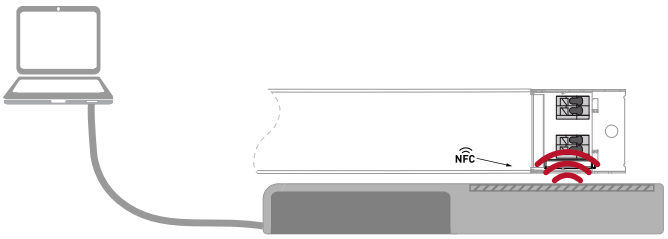


Dimming range	Dimming technology
1 % – 100 %	Amplitude (DC)

LL120HE-DA-100-800 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

LL120HE-DA-100-800 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 or DALI 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.helvarcomponents.com



Feig NFC reader

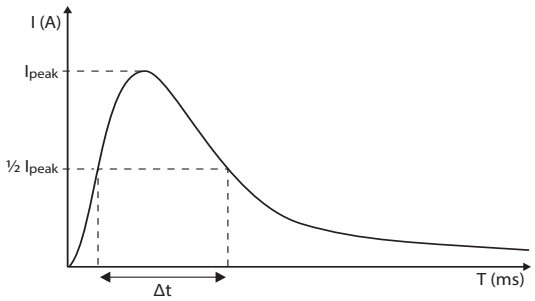
Quantity of drivers per miniature circuit breaker 16 A Type C

Based on inrush current I_{peak}	Typ. peak inrush current I_{peak}	1/2 value time, Δt	Calculated energy, $I_{peak}^2 \Delta t$
27 pcs*	40 A	**208 µs**	**0.249 A^2s**

** The inrush current is not the limiting factor for the products per MCB, please notice the continous 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: $n(I_{cont}) = (16\ A\ (I_{nom,Ta}) / \text{"nominal mains current with full load"}) \times 0.76)$. 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.

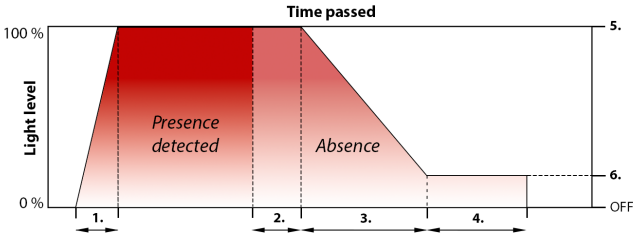
NOTE! Type C MCB's are strongly recommended to use with LED lighting. Please see more details in "MCB information" document in each driver product page in "downloads & links" section.

Corridor Control

Corridor Control is a feature which enables simple and cost-efficient lighting control with relay-based PIR/multisensors. Corridor Control offers straightforward install-and-forget lighting control solution, ensuring increased energy efficiency, lighting comfort and added feeling of safety in various environments. Large base of available different 3rd party PIR sensors with relay can be used in implementing a Corridor Control installation on site.

By installing an external mains voltage sensor and connecting it to the DALI terminal, the driver adapts to preset default mode to increase the light level when presence is detected, while decreasing the light level when no one is nearby anymore.

Corridor Control feature can be activated by connecting mains voltage in the DALI terminal for 55 seconds without interruption. Configuring the Corridor Control parameters is possible via Helvar Driver Configurator.



1. Fade in time
2. Presence light prolong time
3. Fade out time
4. Absence light period
5. Presence level
6. Absence level

D4i-compatible Smart Data Features (DALI 251-253)

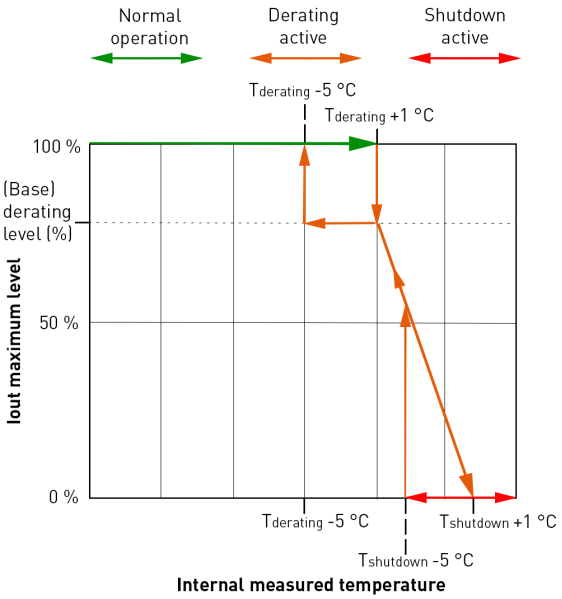
LL120HE-DA-100-800 LED driver has integrated Smart Data features, which monitor, gather and provide key data about the LED driver usage and internal parameters through DALI. This useful data provided by LED driver enables various applications and integrations into data management and IoT services, establishing the Helvar Components LED drivers as key components in the latest generation of smart luminaires.
The DALI parts 251-253 include:

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

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 **threshold temperatures** and **base derating level**. The internal temperature of the LED driver is measured **once per every 5 seconds** with the resolution of one Celsius degree.

If the temperature exceeds a predefined derating temperature threshold with one degree, the maximum output current is reduced within **fixed one minute fade** time to the base derating level. If the temperature still increases beyond this point, the LED driver will reduce maximum output current gradually within the slope set by shutdown and derating temperatures, always with a new one minute fade time if a new limit is activated. The shutdown temperature sets the other threshold temperature which if exceeded will shut the output completely OFF. If the temperature exceeds the shutdown temperature threshold, the output is **always switched to OFF without any fade time**. The LED driver returns the output from shutdown when the temperature drops and reaches **shutdown limit - 5 degrees**. Identically, the driver stops the current limitation and returns back to 100 % capacity when the temperature drops to **derating limit - 5 degrees or lower**. These will happen again with fixed one minute fade time. The default behavior is shown in the graph on the right.



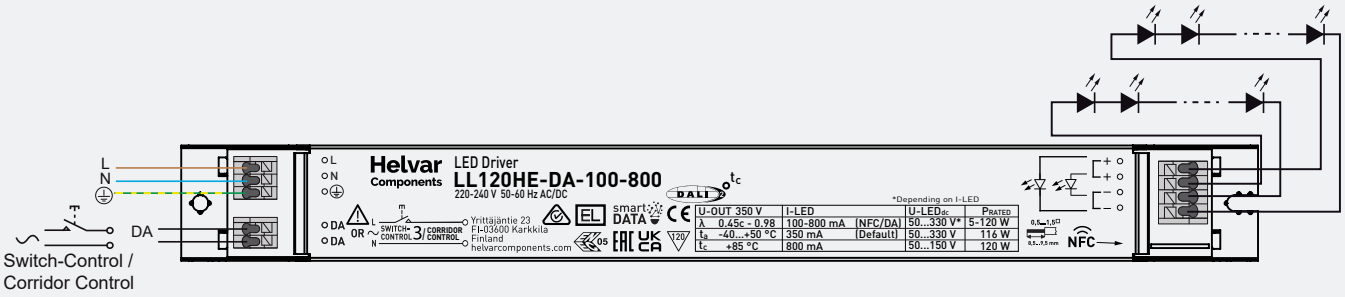
The exact triggering points vary depending of the LED driver model. By factory default, the derating temperature threshold is adjusted high enough so that the feature should never be triggered below the point of Tc max temperature being exceeded and will thus not affect normal operation of the LED driver.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

If the active output dimming level is already lower that the limit restricted by Internal thermal protection, then the output is not affected. This 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.

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	215 g
IP rating	IP20

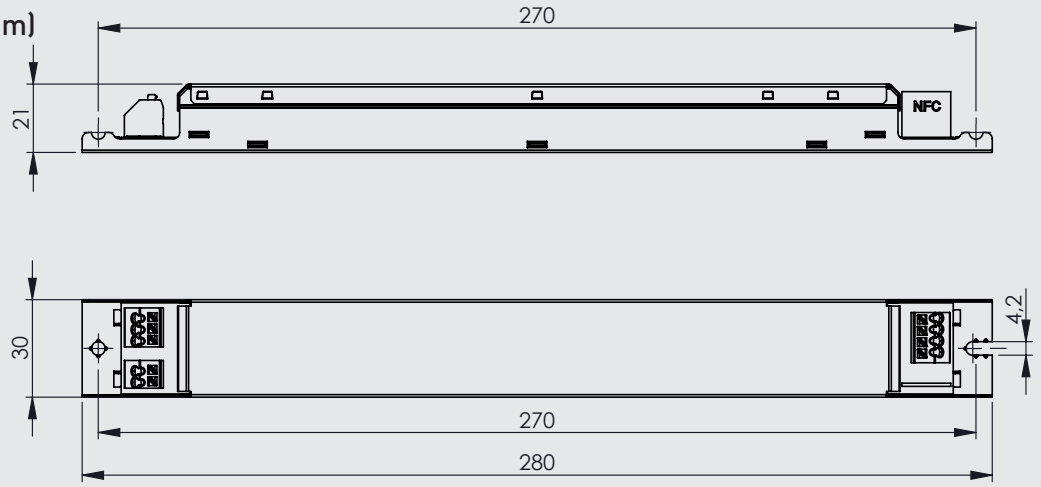
Connections



Note:

- *Not suitable for load side switching operation*

Dimensions (mm)



LL120HE-DA-100-800 LED driver is suited for built-in usage in luminaires and it relies upon the luminaire enclosure for protection against accidental contact with live parts. 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

- LL120HE-DA-100-800 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.

DALI control terminals

- DALI control terminals are classified as FELV terminals and they are not safe to touch. Circuits connected to DALI terminals shall be insulated for the LV supply voltage of the controlgear and any terminals connected to the DALI circuit shall be protected against accidental contact.

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

LL120HE-DA-100-800 LED driver is supported by Helvar Driver Configurator software. With the LL120HE-DA-100-800 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, Corridor Control and Internal Thermal Protection. Programming the driver with Helvar Driver Configurator can be done either wirelessly via NFC or then via DALI bus.

Abnormal situation 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 DALI 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 DALI 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 decrease and limit the maximum output current level. It will be decreased down to 30 % level within one minute fade time, after which in case the temperature still rises, the output of the driver will be eventually shut down. The output will be returned after the temperature drops below a certain threshold. 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.

Switch-Control 3 & Corridor Control

Use of Switch-Control functionality

- Maximum numbers of LED drivers to be connected to one switch is 60. Wire length is not restricted by the driver technology.
- Power on to last level mode is enabled by default, ensuring that the driver returns to the last memorized light level before mains interruption in cases of e.g. power outages. Driver also remembers the dimming direction before power cycle and continues in the opposite dimming direction after powering on.
- Ensure that all components connected to Switch-Control circuitry are mains rated.
- If needed, the synchronisation of light levels in the Switch-Control circuit can be carried out by either of the two options:
  - Press and hold the Switch-Control switch until all lights are ON. Then switch all lights OFF with a short press.
  - Press and hold the Switch-Control switch for 10 seconds without interruption.

Use of Corridor Control

- Activate Corridor Control feature by connecting mains voltage to the DALI terminal for 55 seconds without interruption.
- Disable Corridor Control feature by giving exactly 5 short mains voltage signal pulses (less the 350 ms) to the DALI terminal within 3 seconds.
- Ensure that all components connected to Corridor Control circuitry are mains rated.
- Default settings are described in the User Guide.

See more details in Switch-Control and Corridor Control User Guides at www.helvarcomponents.com.

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.



DALI-2 certified control gear.



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 DALI, complying with DALI parts 251-253. This includes data sets such as OEM customer data, energy reporting and diagnostics.



AC/DC supplied electronic control gear
for emergency lighting purposes intended for connection to a centralized emergency power supply.



DALI (FELV) terminals are not safe to touch and are thus marked with the symbol for the risk of electric shock.



RCM (Regulatory Compliance Mark) indicates that this LED driver model is tested and verified to comply with applicable electrical safety and electromagnetic compatibility requirements in Australia and New Zealand.

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
Additional safety requirements for AC or DC supplied electronic controlgear for emergency lighting*	EN 61347-2-13, Annex J*
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
Digital addressing lighting interface:	
General requirements for DALI system	EN 62386-101 (DALI-2)
Requirements for DALI control gear	EN 62386-102 (DALI-2)
Requirements for control gear of LED modules (DALI Device Type 6)	EN 62386-207 (DALI-2)
Memory Bank 1 extension	DALI Part 251
Energy Reporting	DALI Part 252
Diagnostics & Maintenance	DALI Part 253
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	
ENEC and CE/UKCA marked	

*This LED driver is not intended for use in luminaires for high-risk task area lighting.

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