LL120HE-SBS-50-800

120 W **On/off Smart BiSwitchable** LED driver

Product code: 5803

120 W 220 – 240 V 0 / 50 – 60 Hz

- Smart BiSwitchable Series - use it as your normal switchable on/off LED driver, or then as smart & adjustable one - your choice
- Market-leading efficiency up to 97 %
- Innovative Set by Mains technology allows light level adjustment even on site with just mains switching
- Smart Switch technology - customize the DIP switch currents yourself
- 250 V Uout by default - possibility to unlock 350 V Uout mode via NFC for higher module voltages
- Start-up fading, enable and adjust for extra smoothness
- CLO feature for long-term energy-saving
- Suitable for emergency lighting applications with central battery systems (e.g. Eaton-CEAG, Inotec), AC/DC input recognition



SBS | Set by Mains | Smart Switch | CONSTANT LIGHT OUTPUT (CLO) | NFC | EL

Functional Description

- Smart BiSwitchable - install it as traditional on/off driver, or then make use of the smart functionality such as Set by Mains, adjusting the luminaire lumen output levels conveniently on site with just switching the mains in consecutive breaks
- Very low current ripple and PstLM & SVM values mean the highest quality light output - no flicker or strotoscopic effects, complying with IEEE 1789 recommendations
- Adjustable constant current output: 50 to 800 mA
- Current setting adjustable via DIP switch (default), or then programmable via NFC
- Innovative Smart Switch technology: the DIP switch current values for different positions can also be programmed via NFC by the user to differ from the factory defaults and driver will follow this in output current setting
- Doubled output connectors for easy parallel wiring of e.g. multiple rows of LED loads
- Four output current options via DIP switch: 350 mA (default) / 500 mA / 700 mA / 800 mA
- The output current can be set in a fixed way with with Helvar Driver Configurator (HDC) and DIP switch position ignored
- Constant Light Output (CLO), adjustable up to 100 000 h (default disabled)
- Adjustable active internal thermal protection feature
- Helvar Components histograms accessible via HDC, show statistics of the driver operation through the lifetime
- Ideal solution for Class I luminaires, suitable for Class II luminaires too (see page 7 for more information)

Input Characteristics

Nominal rated voltage range	220 V – 240 V, 0 / 50 – 60 Hz
AC voltage range	198 VAC – 264 VAC
	Withstands max. 280 VAC (max. 1 hour)
DC voltage range	176 VDC – 280 VDC
DC starting voltage	> 186 VDC
Mains current at full load	Max. 0.58 A
Frequency	0 / 50 Hz – 60 Hz
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
Mains 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.
PstLM	< 0.02 [3]	
SVM	< 0.01 [3]	3) At full power, measured with Samsung LM281B LEDs.
U_{OUT} (max) (abnormal)	250 V or if enabled via NFC: 350 V	
EOF_X (EL use)	15 % [4]	4) By default setting, available range 1...100 %, see page 6.

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

250 V Uout mode, default

I_{LED}	50 mA	350 mA (default)	500 mA	700 mA	800 mA
P_{Rated}	2.5...11.5 W	17.5...80.5 W	25...115 W	35...119.7 W	40...120 W
U_{LED}	50 – 230 V	50 – 230 V	50 – 230 V	50 – 171 V	50 – 150 V
PF (λ) at full load	0.68	0.97	0.98	0.98	0.98
Efficiency (η) at full load	89.5 %	96 %	96 %	96 %	95.5%

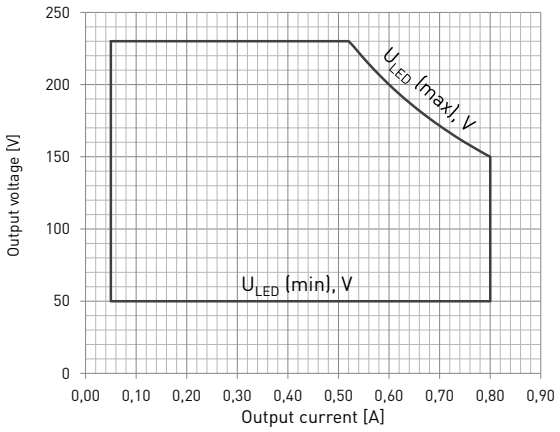
350 V Uout mode, enabled only via NFC

I_{LED}	50 mA	350 mA (default)	500 mA	700 mA	800 mA
P_{Rated}	2.5...16.5 W	17.5...115.5 W	25...120 W	35...119.7 W	40...120 W
U_{LED}	50 – 330 V	50 – 330 V	50 – 240 V	50 – 171 V	50 – 150 V
PF (λ) at full load	0.77	0.98	0.98	0.98	0.98
Efficiency (η) at full load	92 %	97 %	96.5 %	96 %	95.5 %

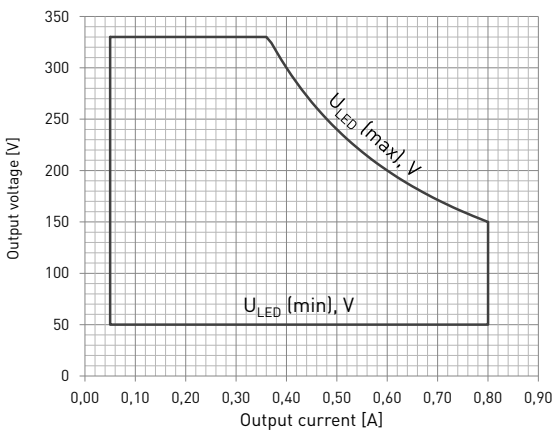
For the electrical safety, higher working voltage range can only be enabled by programming the LED driver with NFC using the Helvar Driver Configurator.

Operating windows & driver performance

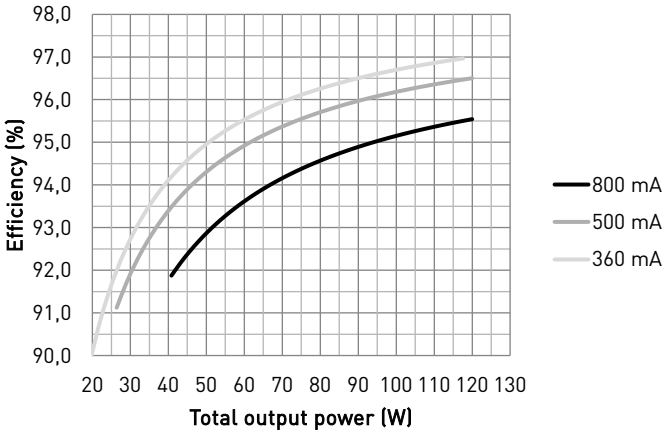
250 V Uout mode, default



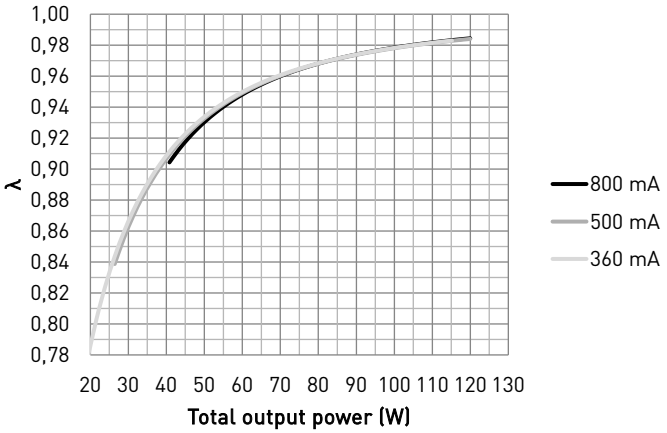
350 V Uout mode, enabled only via NFC



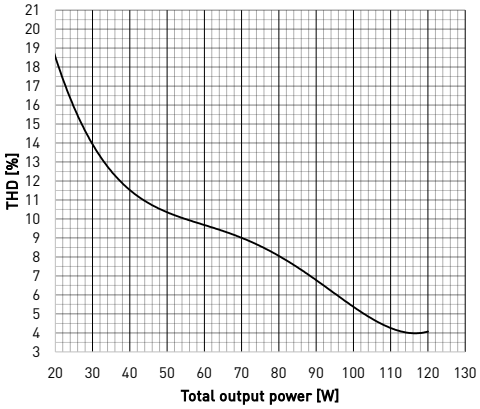
Typical efficiency



Typical power factor



Current THD



Set by Mains technology

LL120HE-SBS-50-800 LED driver is equipped with innovative Set by Mains technology. This feature transforms it from an ordinary ON/OFF LED driver into a intelligent adjustable device with up to 5 configurable output light levels. No extra accessories, tools or even disassembly of the luminaires are needed, as the setting of the desired choice between preset light levels is done with just switching the mains input in a certain cycle. Three short mains breaks within specified time frame will activate the adjustment mode with looping levels. One last short mains break will confirm the selected light level that will be kept in LED driver memory unless a new level is adjusted again.

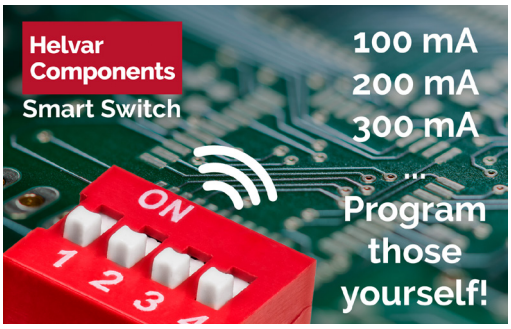
Set by Mains is disabled by default, but this innovative value-adding feature can be activated and configured in Helvar Driver Configurator via NFC technology. Please see more details on pages 6-7.



Smart Switch technology

LL120HE-SBS-50-800 LED driver is equipped with unique Smart Switch feature to help you customise the LED drivers according to your exact needs for luminaire production. In case when the factory-default output currents behind the DIP switch combinations are not optimal for you, just use the Smart Switch - by programming your own currents behind the different DIP switch positions, you can streamline the production process according to your specifications and lumen levels!

This innovative feature allows the output currents to be configured in Helvar Driver Configurator via NFC technology.



Wireless configuration

LL120HE-SBS-50-800 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 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

Operating Conditions and Lifetime

Absolute highest allowed t_c point temperature	82 °C
Maximum ambient temperature range	–25 °C ... +50 °C*
Storage temperature range	–40 °C ... +80 °C
Maximum relative humidity	No condensation
Mains switching cycles	> 100 000 cycles

**) In built-in use, higher t_a of the controlgear possible as long as highest allowed t_c point temperature is not exceeded (acc. to EN IEC 61347-1).*

Lifetimes

Lifetime tables (90 % survival rate)

Metallic luminaires (built-in use)

Output current	Ta	55 °C	60 °C	65 °C	70 °C
800 mA	**Tc at full load**	66 °C	71 °C	76 °C	81 °C
	Lifetime	>100 000 h	>100 000 h	90 000 h	63 000 h
700 mA	**Tc at full load**	65 °C	70 °C	75 °C	80 °C
	Lifetime	>100 000 h	> 100 000 h	93 000 h	66 000 h
500 mA	**Tc at full load**	62 °C	67 °C	72 °C	77 °C
	Lifetime	>100 000 h	>100 000 h	97 000 h	68 000 h
350 mA	**Tc at full load**	60 °C	65 °C	70 °C	75 °C
	Lifetime	>100 000 h	>100 000 h	99 000 h	70 000 h
50 mA	**Tc at full load**	59 °C	64 °C	69 °C	74 °C
	Lifetime	>100 000 h	>100 000 h	>100 000 h	>100 000 h

The shown t_c temperatures and lifetimes were measured in reference conditions i.e. metallic luminaire design and built-in use.

The shown Tc temperatures for each Ta environment in the table above are for guidance only, as the real relation between Ta and Tc depends always on the luminaire design. In built-in use, refer to the used output current and Tc for lifetime estimation. Never exceed the Tc maximum of the driver stated in the datasheet!

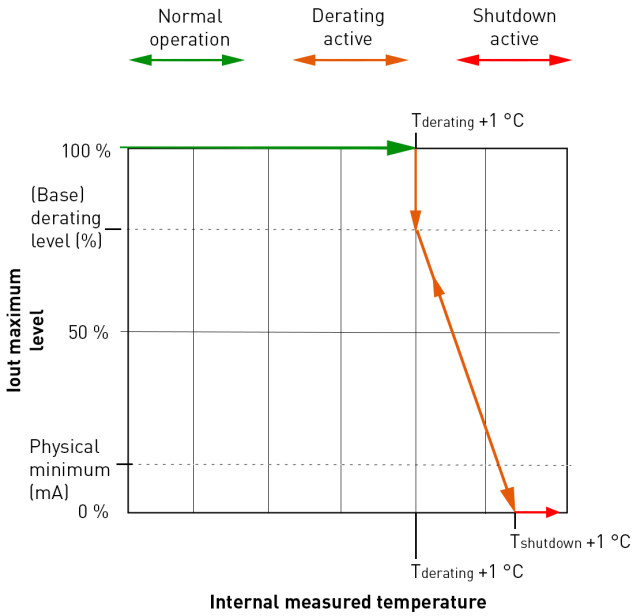
Internal thermal protection

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**.

After a shutdown of the output, the LED driver will restart after a while to the 100% level. If the temperature is still too high the driver will continue the thermal protection mode and limit the output current again.

If the derating level is set below the physical minimum level of the LED driver, the driver will remain in physical minimum level unless shutdown is triggered.



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!**

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.

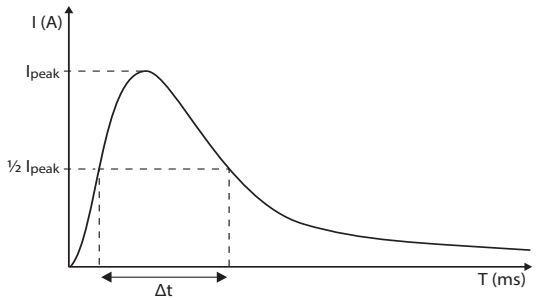
Quantity of drivers per miniature circuit breaker 16 A Type C

Based on inrush current I_{peak}	Typ. peak inrush current I_{peak}	1/2 value time, Δt	Calculated energy, $I_{peak}^2 \Delta t$
26 pcs*	59 A	164 µs	0.383 A²s

**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

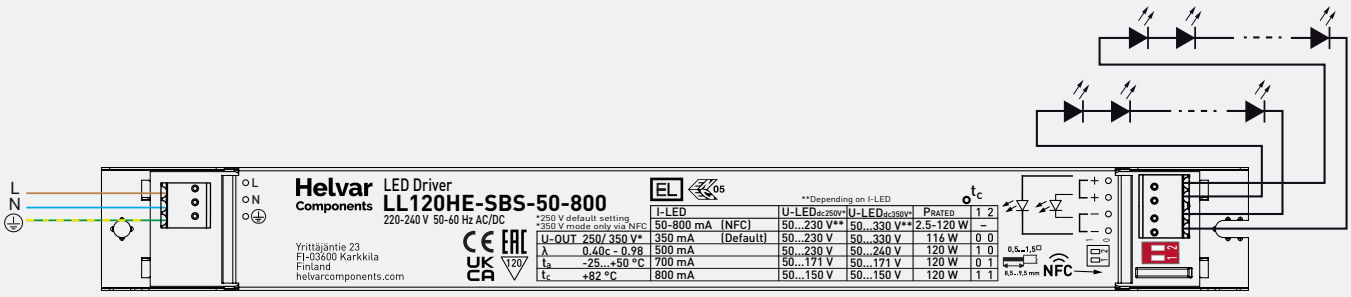
Total continous current of the drivers and installation environment must always be considered and taken into calculations when installing drivers behind miniature circuit breaker. Example calculation of total drivers amount limited by continous current: $n(I_{cont}) = (16\ A\ (I_{nom,Ta}) / \text{"nominal mains current with full load"}) \times 0.76)$. 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.

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	198 g
IP rating	IP20

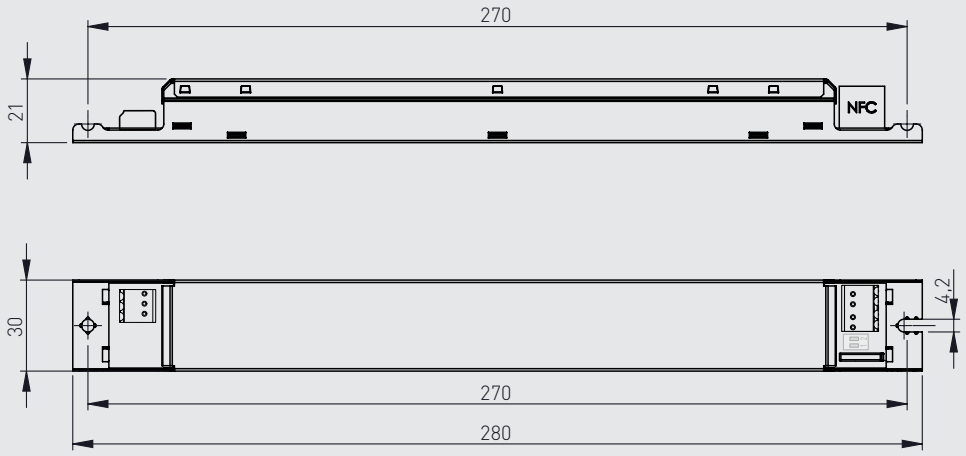
Connections



Note:

- *Not suitable for load side switching operation*

Dimensions (mm)



In LL120HE-SBS-50-800, 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 body and minimum with setting "00" (pushed away from the driver body, 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} (±3 % tol.))

DIP switch combination	00 (default)	10	01	11
I_{out} (mA)	350	500	700	800
Voltage range, default (V)	50 - 230	50 - 230	50 - 171	50 - 150
Voltage range, 350 V Uout mode (V)	50 - 330	50 - 240	50 - 171	50 - 150

LL120HE-SBS-50-800 LED driver is suited for built-in usage in luminaires. 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-SBS-50-800 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.

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.

Functionality in abnormal conditions

No load

The driver can withstand no load situation.

Short circuit

When short circuit is detected, the driver shuts down the output. After resolving the fault, normal operation can be resumed by switching the supply voltage off and then back on.

Overload

When overload is detected, the driver shuts down the output. After resolving the fault, normal operation can be resumed by switching the supply voltage off and then back on.

Underload

When underload is detected, the driver shuts down the output. After resolving the fault, normal operation can be resumed by switching the supply voltage off and then back on.

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. This level can be configured or the whole feature disabled through Helvar Driver Configurator.
If Set by Mains is enabled, the emergency output level is calculated from the **highest** of the programmed output current levels, even if that would not be selected at the moment. When the AC is switched back on, the driver returns to normal operation.

Note 1: The internal temperature protection feature can never force the light level off or below the set emergency level in DC emergency mode.
Note 2: The absolute minimum output level is **50 mA**.

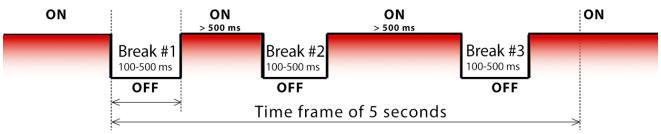
Helvar Driver Configurator -support

LL120HE-SBS-50-800 LED driver supports Helvar Driver Configurator software. The output current of the driver can be programmed using the HDC software, as well as the parameters for the Set by Mains and CLO features. Programming the driver with Helvar Driver Configurator shall be done wirelessly via NFC technology.

Set by Mains operation

Starting the light level adjustment mode

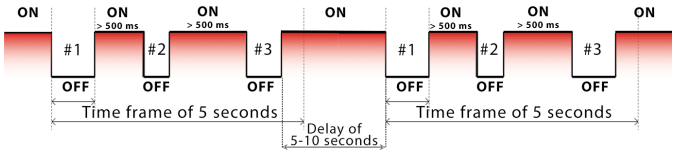
To start the light level adjustment mode where the LED driver loops through preset light levels (up to 5), the user must switch the mains OFF exactly **three** times inside a timeframe of **5 seconds**, starting from the first mains break. Each OFF time must be within 100 - 500 ms of length and minimum of 500 ms must be between OFF cycles. There is a short break in light output (~ 1 second) after the time frame of 5 seconds expires to indicate succesful transition into the light level adjustment mode.



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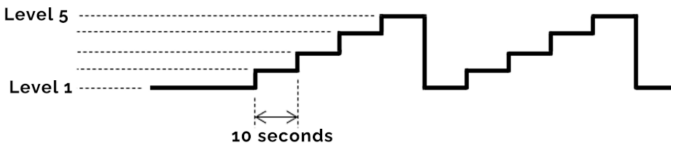
Optional extended starting sequence

In order to ensure that the light level adjustment mode is not started by accident in any case, optional extended starting sequence can be enabled in HDC. In this case, the user must do the same mains switching sequence as in the normal mode too, but after that the mains must be ON for a mandatory "middle" phase of 5 seconds. After this 5 seconds have passed, the user has another 5 seconds time to do the same sequence as in the first phase of the extended mode, identical to the normal mode. See illustrative graph below.
Then again, there is a short break in light output (~ 1 second) after the time frame of the last 5 seconds (counted from the first mains break after the mandatory middle phase of 5 second mains ON) expires to indicate succesful transition into the light level adjustment mode.



Light level adjustment mode

When in the light level adjustment mode the LED driver cycles through all the preset light levels (up to 5) in a loop, staying by default for 10 seconds in single light level before moving to the next one. The driver starts from the level 1 and cycles through to the level 5 before starting again. By factory default, the levels are set from lowest to highest, but user can configure the levels 1-5 freely with HDC software within the LED driver output current range. Skipping levels is possible there too if e.g. only 4 different levels are desired (see "Configuring Set by Mains" below).
If no mains break is detected within total of 10 rounds of all the available levels, the driver will resume normal operation again without any changes.



Selecting the desired light level

When in the light level adjustment mode, if the user switches the mains input OFF for a time between 100 - 1000 ms of length, the LED driver selects the light level active at the time of switching the mains OFF. The driver will memorize and keep that light level with normal operation from that point onwards unless new light level adjustment mode is commenced.

If any other length of mains OFF pulse than 100 - 1000 ms is detected while in light level adjustment mode, the driver will resume the light level adjustment cycle afterwards. Exception is mains breaks longer than four seconds, in that situation the driver exits the light level adjustment mode without changes and continues normal operation.

Configuring Set by Mains

Set by Mains is **disabled** by default, but can be enabled with Helvar Driver Configurator via NFC programming, more information can be found in the HDC User guide. The following parameters of the Set by Mains can also be adjusted through HDC: level hold time [s] and output current values [mA] for each light level of 1 - 5. If output current for certain light level is set to 0 mA, that level will be skipped in the light level adjustment mode.

Startup fade time setting

LL120HE-SBS-50-800 LED driver can be programmed in HDC to activate fading behaviour in the startup of light output when switching the mains power on. This enables very smooth and sophisticated lighting comfort, now even with switchable LED driver! The startup fade time range is between **0.1 seconds - 960 seconds**.

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 A
Thermal protection class	EN 61347-1, B3e
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	
ENEC and CE/UKCA marked	

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

This LED driver is provided with internal protection that supports selectivity in the case of installation with fuse gG 16 A.

Label symbols

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

NFC — Driver equipped with NFC wireless technology for effortless configuration.

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