

## 60 W **Constant Current** LED driver

Product code: 5963

**60 W 220 – 240 V 0 / 50 – 60 Hz**

- Highly energy- and cost-efficient design
- High efficiency up to 92 %
- Low current ripple, complying with IEEE 1789 recommendation
- Selectable current output through dip-switch
- Suitable for emergency lighting applications
- Driver protection Class I
- Ideal solution for Class I luminaires, suitable for Class II luminaires too\*



\* See page 4 for details.



### Functional Description

- Adjustable constant current output: 175 / 250 / 300 / 350 mA (default)
- Current setting adjustable via dip-switch
- U<sub>out</sub> limited to 250 V max
- Fault load situation protection (open circuit, short-circuit), see page 4 for details

### Mains Characteristics

|                                  |                                       |
|----------------------------------|---------------------------------------|
| Nominal rated voltage range      | 220 V – 240 V, 0 / 50 – 60 Hz         |
| AC voltage range                 | 198 VAC – 264 VAC                     |
|                                  | Withstands max. 300 VAC (max. 1 hour) |
|                                  | Withstands min. 176 VAC (max. 1 hour) |
| DC voltage range                 | 176 VDC – 280 VDC                     |
| DC starting voltage              | > 186 VDC                             |
| Mains current at full load       | 0.38 A max.                           |
| Frequency                        | 0 / 50 Hz – 60 Hz                     |
| THD at full power                | < 10 %                                |
| Leakage current to earth         | < 0.7 mA                              |
| Tested surge protection          | 2 kV L-N, 2 kV L-GND (IEC 61000-4-5)  |
| Tested fast transient protection | 2 kV (IEC 61000-4-4)                  |

### Insulation between circuits & driver case

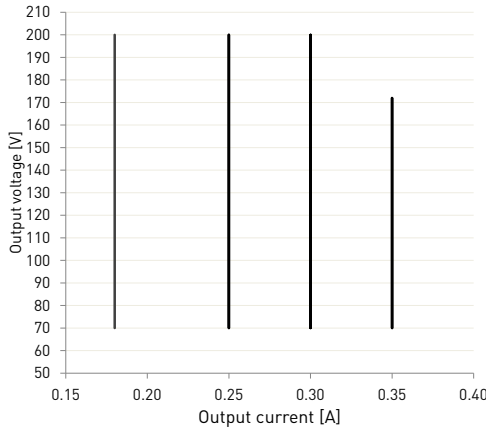
|                                |                  |
|--------------------------------|------------------|
| Mains circuit - Output         | Non-isolated     |
| Mains and output - Driver case | Basic insulation |

### Load Output (non-isolated)

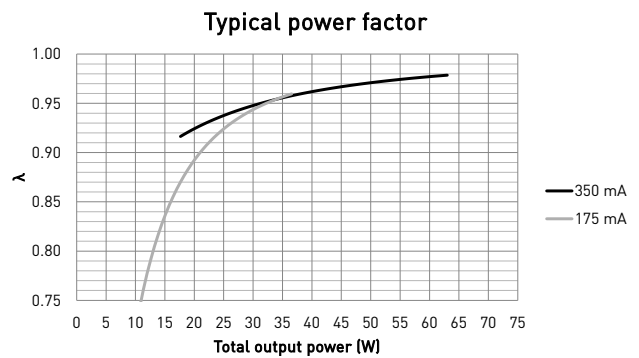
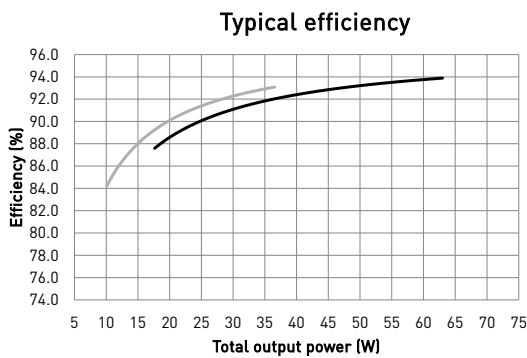
|                                    |   |
|------------------------------------|---|
| Output current (I <sub>out</sub> ) | 175 / 250 / 300 / 350 mA (default)  |
| Accuracy                           | ± 5 %*  |
|                                    | *] ± 5 % tolerance between 175-250 mA. ± 10% tolerance between 300-350 mA |
| Ripple                             | < 5 %** at ≤ 120 Hz   |
|                                    | **] Low frequency, LED load: Cree MX3 LEDs                                |
| PstLM                              | < 1   |
| SVM                                | < 0.4***  |
|                                    | ***] At full power, measured with Cree XP-G LED modules.                  |
| U <sub>OUT</sub> (max) (abnormal)  | 250 V   |

| I <sub>LED</sub>            | 175 mA     | 250 mA     | 300 mA     | 350 mA     |
|-----------------------------|------------|------------|------------|------------|
| P <sub>Rated</sub>          | 35 W       | 50 W       | 60 W       | 60 W       |
| U <sub>LED</sub>            | 70 – 200 V | 70 – 200 V | 70 – 200 V | 70 – 172 V |
| PF (λ) at full load         | 0.95       | >0.95      | >0.95      | >0.95      |
| Efficiency (η) at full load | 92 %       | >92 %      | >92 %      | >92 %      |

## Operating window



## Driver performance



## Operating Conditions and Characteristics

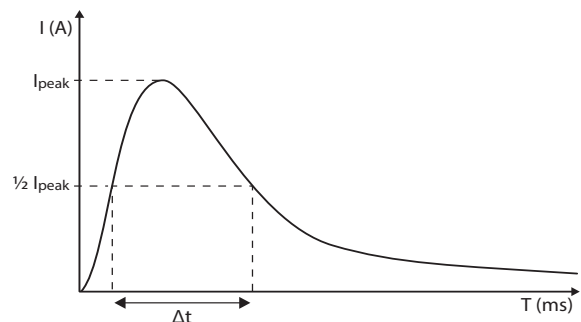
|   |  |
|---|--|
| Highest allowed $t_c$ point temperature | 85 °C  |
| $t_c$ life (60 000 h) temperature       | 80 °C  |
| Ambient temperature range*              | -20 °C ... +50 °C  |
| Storage temperature range               | -25 °C ... +60 °C  |
| Maximum relative humidity               | No condensation  |
| Mains switching cycles                  | > 100 000 cycles   |
| Lifetime (90 % survival rate)           | 60 000 h, at $t_c = 80$ °C<br>30 000 h, at $t_c = 85$ °C |

*\*) For other than independent use, higher  $t_c$  of the control gear possible as long as highest allowed  $t_c$  point temperature is not exceeded*

## 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, $\Delta t$ | Calculated energy, $I_{peak}^2 \Delta t$ |
|------------------------------------|-------------------------------------|----------------------------|--|
| 33 pcs                             | 33.4 A                              | 190                        | 0.212 A <sup>2</sup> s                   |

| 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 %                            |



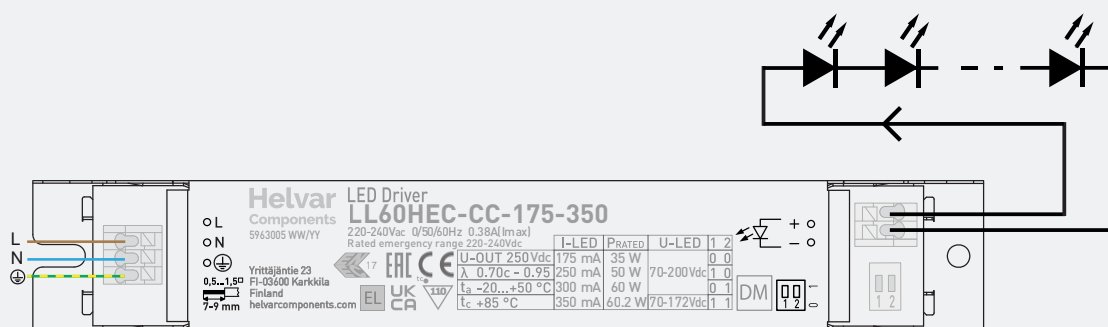
Total continuous current of the drivers and installation environment must always be considered and taken into calculations when installing drivers behind miniature circuit breaker. Example calculation of total drivers amount limited by continuous current:  $n(I_{cont}) = [16 A (I_{nom, Ta}) / \text{"nominal mains current with full load"}] \times 0.76$ . 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 continuous 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 mm <sup>2</sup> – 1.5 mm <sup>2</sup> |
| Wire type                         | Solid core and fine-stranded              |
| Wire insulation                   | According to EN 60598                     |
| Maximum driver to LED wire length | 1.5 m                                     |
| Weight                            | 132 g                                     |
| IP rating                         | IP20                                      |

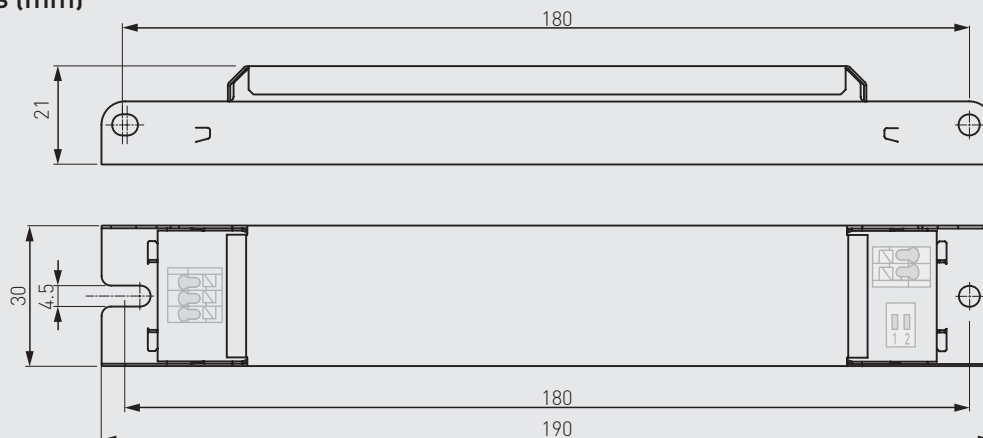
## Connections



Note:

- Not suitable for load side switching operation

## Dimensions (mm)



In LL60HEC-CC-175-350, 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 the dip-switch setting "11" (dip-switches pushed towards input connector) and minimum with setting "00" (pushed away from the input connector, see connections picture above). The output current values according to the dip-switch settings are presented below.

### Dip-switch combinations, output currents and voltage ranges (Nominal $I_{out}$ ( $\pm 5\%$ / $10\%**$ tol.))

| Dip-Switch combination | 00         | 10         | 01         | 11       |
|------------------------|------------|------------|------------|----------|
| $I_{out}$ (mA)         | 175*       | 250*       | 300**      | 350**    |
| Voltage range          | 70 – 200 V | 70 – 200 V | 70 – 200 V | 70-172 V |

LL60HEC-CC-175-350 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.

### Current setting

LL60HEC-CC-175-350 LED driver features a constant current output setable through the dip-switches. See page 3 for more information.

### LED driver earthing

- LL60HEC-CC-175-350 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.

## Lamp failure functionality

### No load

When open load is detected, driver limits output voltage according to  $U_{out} (max)$  (abnormal).

### Overload

No overload protection.

### Short circuit

Driver can withstand output short circuit and after resolving the fault, driver recovers normal operation automatically.

## 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 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         |
| Compliant with relevant EU directives   |                        |
| RoHS/REACH compliant  |                        |
| CE / UKCA and ENEC marked   |                        |

## Label symbols



Thermally controlled control gear, incorporating means of protection against overheating to prevent the case temperature under any conditions of use from exceeding 110 °C.



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