**Functional Description**

- Adjustable constant current output: 120 mA (default) to 350 mA
- Current setting programmable via DALI or with external resistors
- Switch-Control functionality for easy-to-use intensity control
- Full load recognition with automatic recovery and adaptive LED overload / open circuit / short circuit protection
- Multipurpose terminal Iset/NTC for current setting or overtemperature protection
- Constant Light Output (CLO), adjustable up to 100 000 h (default disabled)
- Helvar Driver Configurator Support
- Power consumption monitor (real time), running hour monitor (accumulative), energy management (accumulative)

**Mains Characteristics**

- Voltage range: 198 VAC – 264 VAC
- DC range: 176 VDC – 280 VDC
- Starting voltage: > 190 VDC
- Mains current at full load: 0.20 – 0.22 A
- Frequency: 0 / 50 Hz – 60 Hz
- Stand-by power consumption: < 0.5 W
- THD at full power: < 15 %
- Leakage current to earth: < 0.4 mA
- Tested surge protection: 1 kV L-N, 2 kV L-GND (IEC 61000-4-5)
- Tested fast transient protection: 4 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 $I_{out}$: 120 mA (default) – 350 mA
- ± 5 %
- < 2 %* at ≤ 120 Hz
- $U_{out}(max)$ [abnormal]: 400 V
- Outrush current: 600 mA*

*See page 5 for details.

<table>
<thead>
<tr>
<th>$I_{out}$</th>
<th>120 mA</th>
<th>350 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{out(max)}$</td>
<td>42 W</td>
<td>42 W</td>
</tr>
<tr>
<td>$U_{out}$</td>
<td>80 – 350 V</td>
<td>50 – 120 V</td>
</tr>
<tr>
<td>PF (ξ) at full load</td>
<td>0.96</td>
<td>0.96</td>
</tr>
<tr>
<td>Efficiency [η] at full load</td>
<td>93 %</td>
<td>92 %</td>
</tr>
</tbody>
</table>

*When starting driver with short-circuited load or connecting load to running driver.
Operating window

Note: Dimming between 1 % - 100 % possible across the whole operating window

Driver performance

Operating Conditions and Characteristics

- Highest allowed $t_c$ point temperature: 75 °C
- $t_c$ life (60 000 h) temperature: 75 °C
- Ambient temperature range*: $-20$ °C ... $+50$ °C
  - in independent use: $-20$ °C ... $+40$ °C
  - Storage temperature range: $-40$ °C ... $+80$ °C
- Maximum relative humidity: No condensation
- Lifetime (90 % survival rate)
  - 100 000 h, at $t_c = 65$ °C
  - 90 000 h, at $t_c = 70$ °C
  - 60 000 h, at $t_c = 75$ °C

*) For other than independent use, higher $t_c$ of the controlgear possible as long as highest allowed $t_c$ point temperature is not exceeded
Helvar hybrid dimming products combine both Constant Current Reduction (CCR) amplitude dimming and Pulse Width Modulation (PWM) dimming. CCR is a very efficient technique for dimming the light output, especially on higher range. On lower range, the hybrid dimming products implement high-frequency PWM dimming according to the table above.

**Quantity of drivers per miniature circuit breaker 16 A Type C**

<table>
<thead>
<tr>
<th>MCB type</th>
<th>Relative quantity of LED drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>B 10 A</td>
<td>37 %</td>
</tr>
<tr>
<td>B 16 A</td>
<td>60 %</td>
</tr>
<tr>
<td>B 20 A</td>
<td>75 %</td>
</tr>
<tr>
<td>C 10 A</td>
<td>62 %</td>
</tr>
<tr>
<td>C 16 A</td>
<td>100 % (see table above)</td>
</tr>
<tr>
<td>C 20 A</td>
<td>125 %</td>
</tr>
</tbody>
</table>

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**: 5 m
- **Weight**: 190 g
- **IP rating**: IP20

**Connections**

- **Note**: Label may differ if the unit is preset to fixed current

**Dimensions (mm)**

Output current can be set with the current setting resistor connected to the Iset terminal. Example current and resistor values across the range can be found in the following table. More information about the current setting resistor is given on page 5.

**Iset current setting resistor values**

| R(Ω) | 0 | 47 | 120 | 180 | 270 | 330 | 470 | 560 | 680 | 820 | 1k | 1.2k | 1.5k | 1.8k | 2.2k | 2.74k | 3.3k | 3.9k | 4.7k | 5.6k | 8.2k | 12k | 22k | ∞ |
|------|---|----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| I_{out}(mA) | 350 | 340 | 330 | 320 | 310 | 300 | 290 | 280 | 270 | 260 | 250 | 240 | 230 | 220 | 210 | 200 | 190 | 180 | 170 | 160 | 150 | 140 | 130 | 120 |
| Order Code | T70000 | T70470 | N/A | N/A | T70271 | T70331 | T70471 | N/A | T70831 | T70921 | N/A | T70102 | N/A | T70222 | T70271 | T70332 | T70471 | T70562 | T70822 | T70123 | N/A | N/A |
LL1x10-42-E-DA LED driver is suited for built-in usage in luminaires. With LL1x2130-SR strain reliefs, independent use is possible too (see the LL1x2130-SR datasheet for details). 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 resistor
LL1x10-42-E-DA LED driver features a constant current output adjustable via current setting resistor or software.
- An external resistor can be inserted in to the current setting terminal, allowing the user to adjust the LED driver output current
- When no external resistor is connected, then the LED drivers will operate at their default lowest current level
- A standard through-hole resistor can be used for the current setting. To achieve the most accurate output current it is recommended to select a quality low tolerance resistor. Minimum diameter for resistor leg is 0.51mm.
- Always connect the current setting resistor only into the terminals marked with Iset on the LED driver label.
- For the resistor/current value selection, refer to the table on page 4.

### Miniature Circuit Breakers (MCB)
- Type-C MCB’s with trip characteristics in accordance to EN 60898 are recommended.
- Please see more details in “MCB information” document in each driver product page in “downloads & links” section.

### Use of Switch-Control functionality
- Maximum numbers of LED drivers to be connected to one switch is 30.
- The maximum cabling length from the switch to the driver is 25 meters. If longer cabling is needed, please connect a capacitor across the Switch-Control input (1 \( \mu F \), min. 275 VAC RMS and \( X_2 \) rated, according to IEC60384-14).
- Ensure that all components connected to Switch-Control circuitry are mains rated.

Installation site
- The general preferred installation position of LED drivers for independent use is to have the top cover facing upwards.

### Lamp failure functionality
- **No load**: When open load is detected, driver will go to standby after 10 minutes. Automatic recovery is on during the first 10 minutes and after that, if the open load is still detected, the driver goes to standby mode and recovers through mains reset.
- **Overload**: When high overload is detected, driver goes to standby mode and follows the same logic as described in the short circuit condition. When low overload (< 45 W) is detected, output current will be reduced to have maximum rated output power.
- **Underload**: Driver goes to standby mode and returns through mains reset.
- **Short circuit**: Driver goes to standby mode and returns through mains reset.
- **NTC trigger**: When NTC is enabled via Helvar Driver Configurator, driver follows NTC feature behaviour. Default NTC trigger point is 8.2 k\( \Omega \), after which the driver starts to decrease the output level.
### Conformity & standards

<table>
<thead>
<tr>
<th>Category</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particular safety requirements for DC or AC supplied electronic control gear for LED modules</td>
<td>EN 61347-2-13: 2014</td>
</tr>
<tr>
<td>Thermal protection class</td>
<td>EN 61347, C5e</td>
</tr>
<tr>
<td>Mains current harmonics</td>
<td>EN 61000-3-2: 2014</td>
</tr>
<tr>
<td>Limits for voltage fluctuations and flicker</td>
<td>EN 61000-3-3: 2013</td>
</tr>
<tr>
<td>Radio frequency interference</td>
<td>EN 55015: 2013</td>
</tr>
<tr>
<td>Immunity standard</td>
<td>EN 61547: 2009</td>
</tr>
<tr>
<td>Digital addressing lighting interface:</td>
<td></td>
</tr>
<tr>
<td>General requirements for DALI system</td>
<td>EN 62386-101</td>
</tr>
<tr>
<td>Requirements for DALI control gear</td>
<td>EN 62386-102</td>
</tr>
<tr>
<td>Requirements for control gear of LED modules (DALI Device Type 6)</td>
<td>EN 62386-207</td>
</tr>
<tr>
<td>Compliant with relevant EU directives</td>
<td></td>
</tr>
<tr>
<td>RoHS / REACH compliant</td>
<td></td>
</tr>
<tr>
<td>ENEC and CE marked</td>
<td></td>
</tr>
</tbody>
</table>

### 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 certified control gear.