LL35/2-E-DA-iC

Helvar

35 W **Dimmable two channel** intelligent Colour LED driver

Product code: 5537

35 W 220 – 240 V 0 / 50 – 60 Hz

- 2-channel tunable white for human centric lighting
- Colour temperatures adjustable on all dimming levels
- High efficiency up to 89 %
- Low current ripple
- Suitable for DC use
- Long lifetime up to 100 000 h
- Driver protection Class II
- Suitable for Class I and Class II luminaires
- For driving Class III (SELV) luminaires, optional strain relief available for independent use outside of luminaire (LL1x2135-SR) .

SELV

Functional Description

- DALI Type 8 compatible. One DALI address for controlling colour temperature by two output channels
- DALI colour type: Colour temperature T_c
- Adjustable constant current output: 350 mA (default) to 700 mA
- Current setting with external resistors
- Patented Switch-Control funtionality for easy-to-use intensity and colour temperature control with single push button
- Overload, open & short circuit protection
- NTC terminal for overtemperature protection
- Helvar Driver Configurator Support
- Power consumption monitor (real time), running hour monitor (accumulative), energy management (accumulative)

Mains Characteristics

Voltage range	198 VAC – 264 VAC
	Withstands max. 320 VAC (max. 1 hour)
DC range	176 VDC – 280 VDC
starting voltage	> 190 VDC
Mains current at full load	0.16 – 0.23 A
Frequency	0 / 50 Hz – 60 Hz
Stand-by power consumption	< 0.5 W
THD at full power	< 12 %
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 - SELV circuit	Double/reinforced insulation
DALI circuit - SELV circuit	Double/reinforced insulation
Mains circuit - DALI circuit	Basic insulation
Mains circuit - Driver case	Double/reinforced insulation

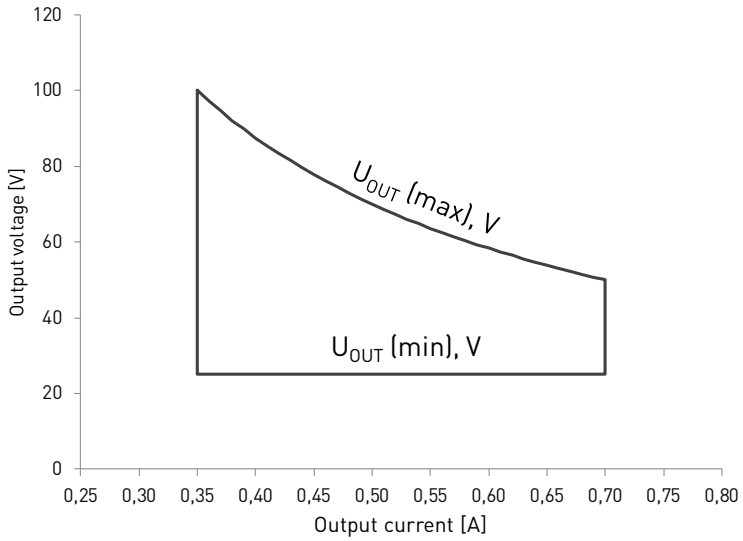
Load Output (SELV <120 V)

Output current (I_{out})	350 mA (default) – 700 mA
Accuracy	± 5 %
Ripple	< 2 %* at ⩽ 120 Hz
	*) Low frequency, LED load: Cree XP-G LEDs
U_{out} (max) (abnormal)	120 V

I_{out*}	350 mA	700 mA
$P_{OUT(MAX)*}$	35 W	35 W
U_{OUT}	25 – 100 V	25 – 50 V
PF (λ) at full load	0.98	0.98
Efficiency (η) at full load	89 %	86 %

**Current and power are divided into two channels according to the chosen CCT and module specifications. Total maximum power of the two channels can't exceed given $P_{OUT(MAX)}$.*

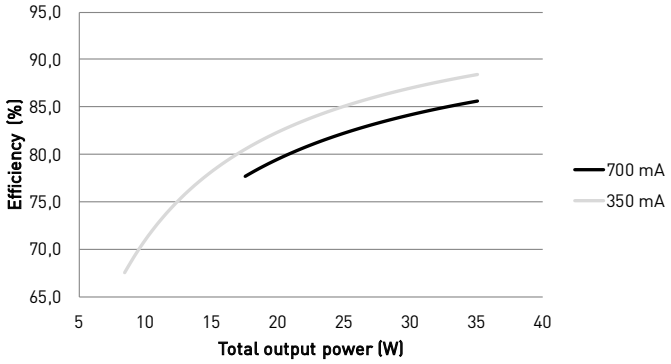
Operating window



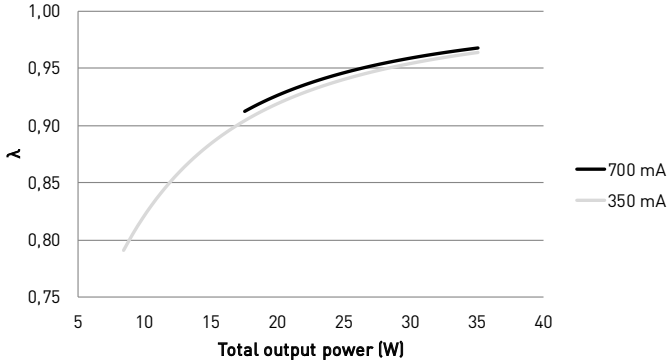
Note: Dimming between 1 % - 100 % per channel possible across the whole operating window

Driver performance

Typical efficiency



Typical power factor



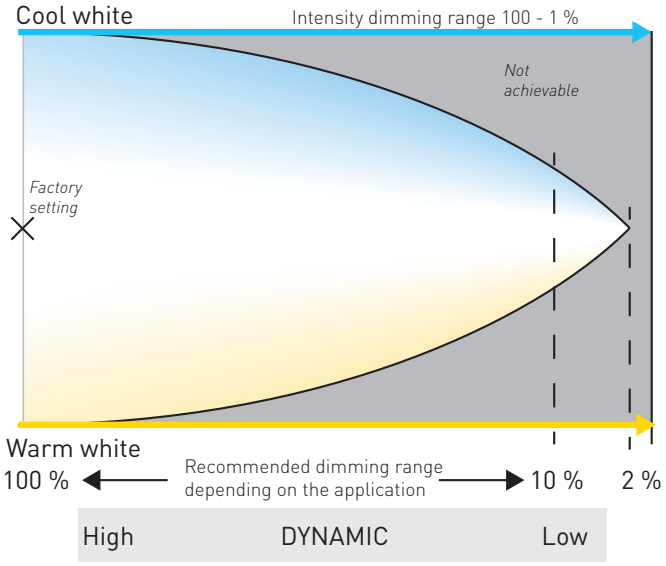
Operating Conditions and Characteristics

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

**) For other than independent use, higher t_a of the controlgear possible as long as highest allowed t_c point temperature is not exceeded*

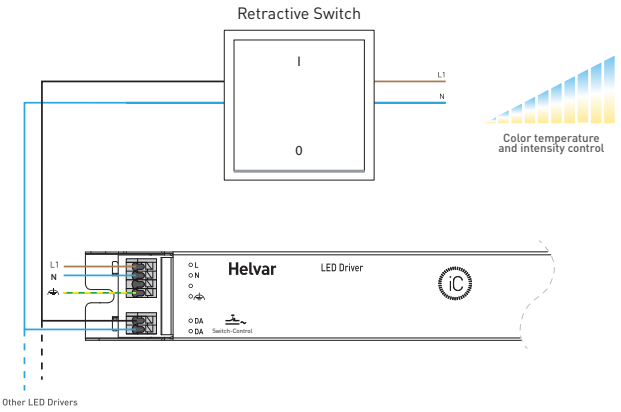
Tunable white functionality

- The LL35/2-E-DA-iC driver has 2 output channels used to control the intensity and temperature of white colour as well known as "Tunable White"
- These drivers respond to DALI type 8 (DT8) commands, which in practice means that they only have 1 common address for both output channels
- The tunable white level of intensity and colour temperature can be set either with a DALI command or by Switch-Control
- The driver will operate correctly once tunable white LED module parameters are programmed to the driver. Use "Helvar DALI Driver Configurator" for the parameter setting
- Default LED module parameters are set according to Helvar iC LED module specifications
- See Helvar DALI Driver Configurator user guide for more information how to set the parameters to the driver



Switch-Control with tunable white

Helvar iC drivers provide the simplest form of control in tunable white with Helvar patented single switch Switch-Control functionality. With single push button the user is able to control both the light intensity and colour temperature to the desired level. The system synchronises the light levels and CCTs every time the colour temperature is adjusted to ensure pleasant user experience and uncompromised lighting comfort. More information about the functionality can be found in Switch-Control user guide at www.helvar.com.

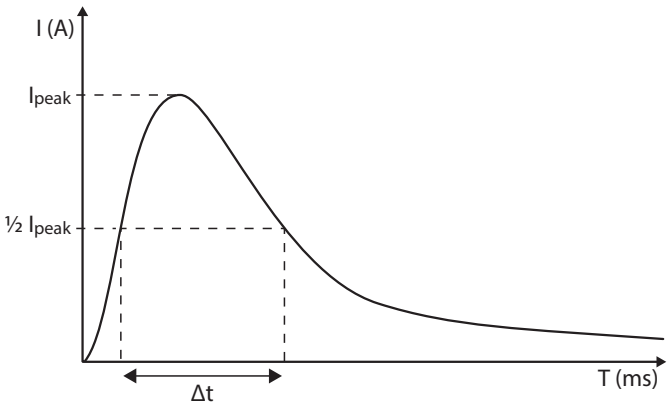


Quantity of drivers per miniature circuit breaker 16 A Type C

Based on I_{cont}	Based on inrush current I_{peak}	Typ. peak inrush current I_{peak}	1/2 value time, Δt	Calculated energy, $I_{peak}^2 \Delta t$
53 pcs.	30 pcs.	42 A	189 µs	0.2381 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 %



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

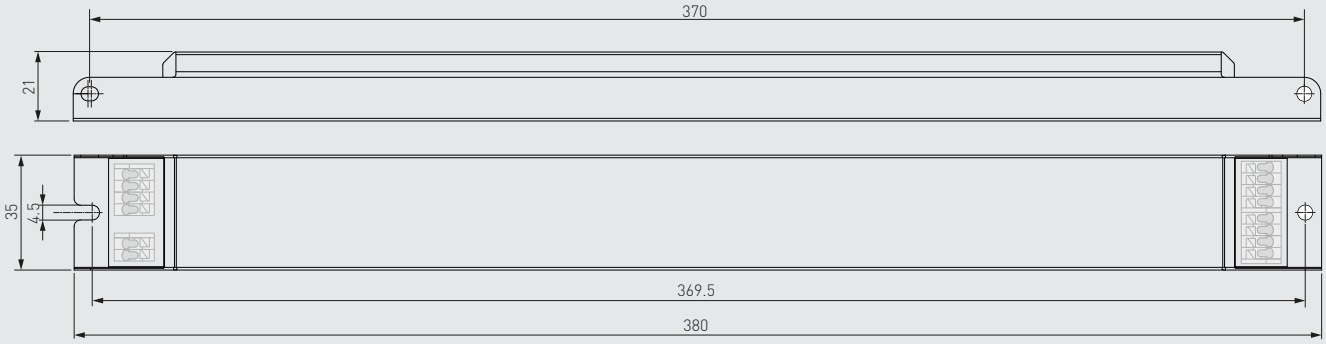
Wire size	0.5 mm^2 – 1.5 mm^2
Wire type	Solid core and fine-stranded
Wire insulation	According to EN 60598
Maximum driver to LED wire length	5 m
Weight	365 g
IP rating	IP20
NTC trigger point	8.2 kΩ

Connections

Note:

- *Not suitable for load side switching operation*
- *Label may differ if the unit is preset to fixed current*
- *Switch-Control with this driver is only allowed to be used in Class I luminaires*

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 4.

Iset current setting resistor values

Resistor (Ω)	0	1k	1,8k	2,74k	3,3k	4,7k	6,8k	8,2k	10k	15k	22k	39k	Open
I_{out} (mA)	700	650	620	600	580	550	520	500	480	450	430	400	350
Order code	T70000	T70102	N/A	T72741	T70332	T70472	T70682	T70822	T70103	N/A	N/A	N/A	N/A

LL35/2-E-DA-iC LED driver is suited for built-in usage in luminaires. With LL1x2135-SR strain reliefs, independent use is possible too (see the LL1x2135-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

LL35/2-E-DA-iC LED driver features a constant current output adjustable via current setting resistor.

- 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.

LED driver earthing

- LED drivers are designed to support different luminaire classifications, such as Class I or Class II fittings (no earth required). LL35/2-E-DA-iC is Class II driver and suitable for Class I and II luminaires, as well as driving SELV Class III luminaires in independent installation with strain reliefs.
- In Class I or Class II luminaires LL35/2-E-DA-iC does not need the earth connection for electrical safety. To improve e.g. EMC performance, functional earth can be connected.

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.

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 µF, min. 275 VAC RMS and X2 rated, according to IEC 60384-14).
- Ensure that all components connected to Switch-Control circuitry are mains rated.
- Switch-Control with this driver is only allowed to be used in Class I luminaires.
- More information in Switch-Control User Guide at www.helvar.com.

Helvar Driver Configurator support

LL35/2-E-DA-IC LED driver is supported by Helvar Driver configurator software. The configurator allows user to control and set the parameters for tunable white such as colour temperature limit and lumen output on both channels. The linear dimming curve can be enabled from the configurator as well.

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 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
Digital addressing lighting interface:	
General requirements for DALI system	EN 62386-101
Requirements for DALI control gear	EN 62386-102
Requirements for control gear of LED modules	EN 62386-207
Particular requirements for control gear - Colour control (Dali Device Type 8)	EN 62386-209
Compliant with relevant EU directives	
RoHS / REACH compliant	
ENEC and CE marked	

Label symbols

Double insulated controlgear suitable for built-in use.

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.

Helvar Intelligent Colour drivers providing DALI colour control (tunable white) functionality.