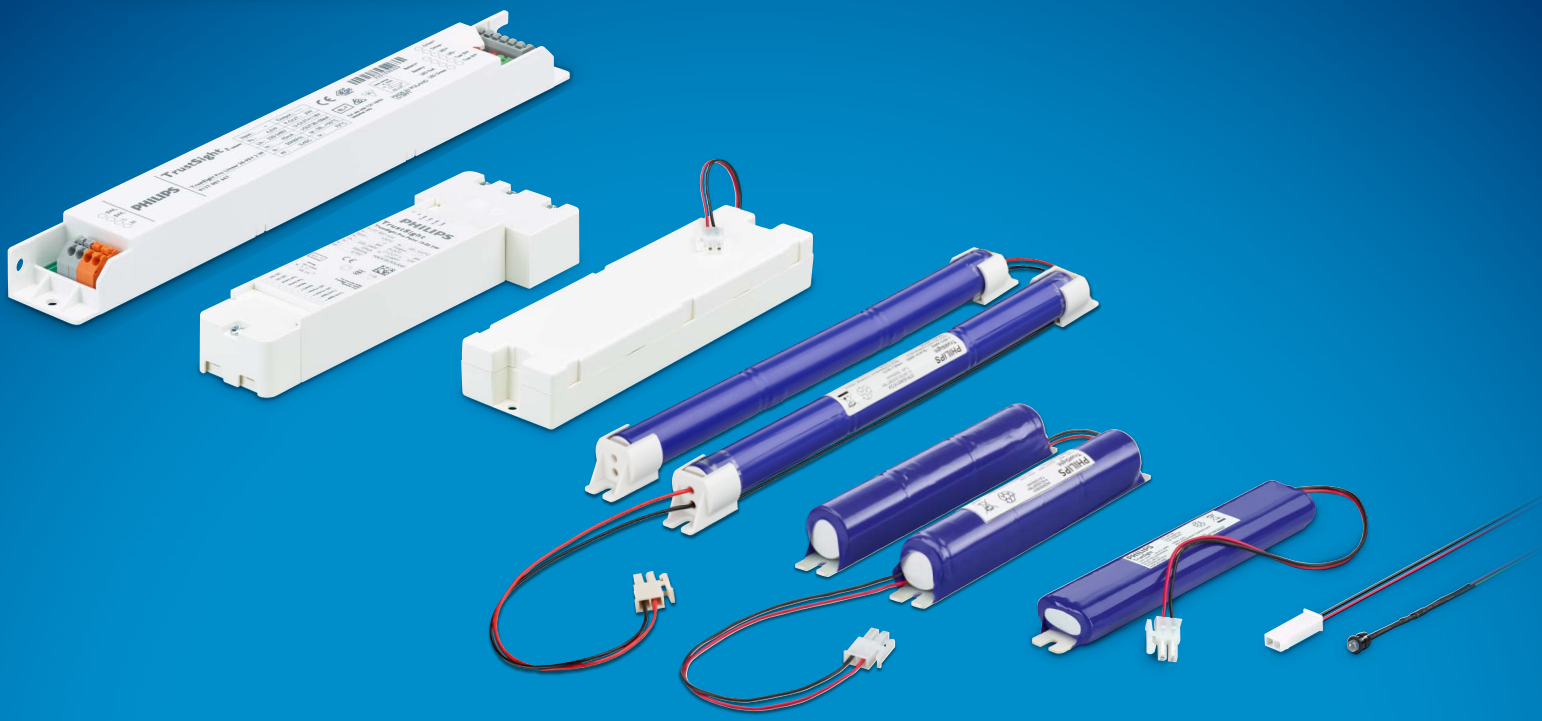
PHILIPS

TrustSight

Emergency driver



Design-in Guide

TrustSight
LED Emergency driver

May 2017

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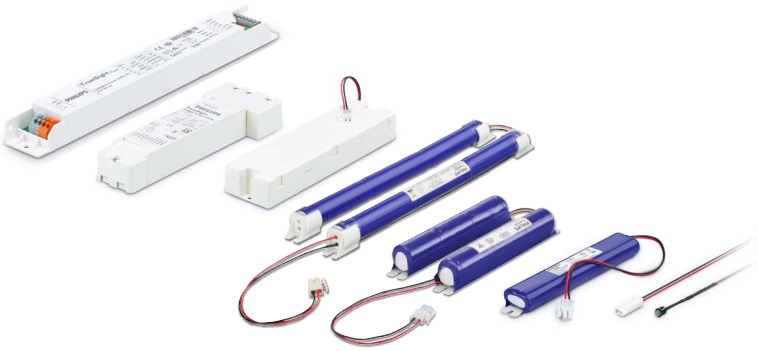


Philips TrustSight Emergency driver (EM)

Thank you for choosing the Philips TrustSight Emergency driver (EM). In this guide you will find the information needed to integrate an emergency driver into a LED luminaire or LED system.
This design-in guide describes the TrustSight LED Emergency kit developed for indoor lighting applications. We advise you to consult our websites for the latest up-to-date information.

Applications

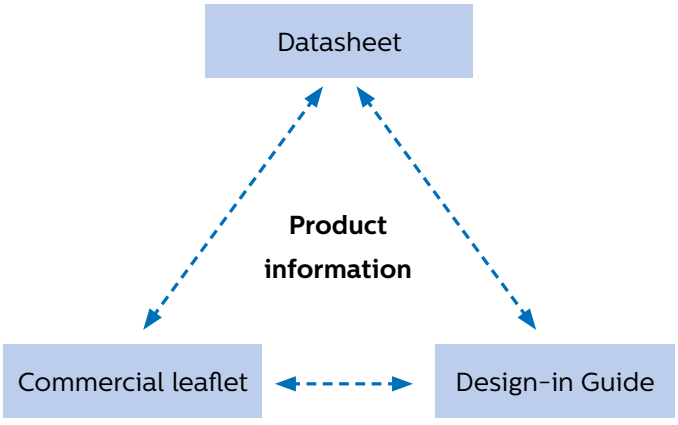
Typical applications are linear or point source type of luminaires applied in: offices, public buildings, industrial and retail environments.

Information and support

Please consult your local Philips office or visit: www.philips.com/technology

Design-in support

On request Design-in support from Philips is available. For this service please contact your Philips sales representative.



Determine which documents contain what information

In order to provide information in the best possible way, Philips' philosophy on product documentation is the following.

- Commercial leaflet contains product family information & system combinations
- Datasheet contains the product specific specifications
- Design-in guide describes how the product is to be designed-in

All these documents can be found on the download page of the OEM website www.philips.com/technology. If you require any further information or support please consult your local Philips office.

Safety precautions

Safety warnings and installation instructions

- Do not use damaged or defective contacts or housings
- Do not use damaged products
- Cap off all unused wires to prevent accidental contact with the luminaire or driver housing
- The luminaire manufacturer is responsible for his own luminaire design and has to comply with all relevant safety standards
- The Philips TrustSight Emergency driver is intended for indoor use and should not be exposed to the elements such as snow, water and ice. It is the luminaire manufacturer's responsibility to prevent exposure.
- Do not service the driver when the mains voltage is connected, this includes connecting or disconnecting the LED load. Replacing the battery can be done with the mains connected, because of the insulation barriers in the TrustSight driver.
- Please provide adequate earth connection when applicable.

The test switch, LED indicator and the battery are insulated from the mains power supply

Introduction to the TrustSight Emergency Driver

Introduction

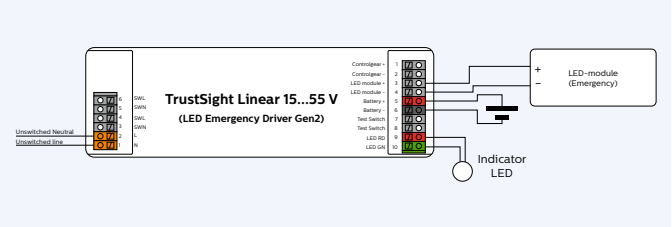
The TrustSight LED Emergency kit is a self-contained and/or maintained solution, designed to operate LED modules in case of a mains power failure. An un-switched mains line is used to continuously charge TrustSight batteries and keep them in a state of readiness. At the same time the un-switched mains line is being monitored in order to detect mains power failure. When this happens, the TrustSight LED Emergency LED driver uses the TrustSight battery as energy source and provides power to (a part of) the LED array.

Non-maintained

A non-maintained luminaire only operates when mains power fails, in case the power failure the non-maintained luminaire will start-up on battery supply at 3 or 6 W depending on driver type.

- Example scheme

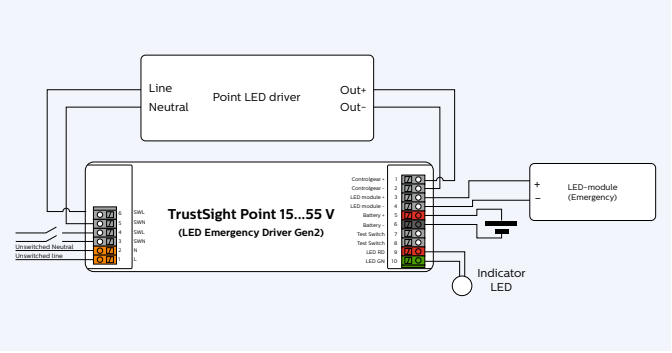
Point non-maintained



Maintained

A maintained luminaire is designed to be lit continuously and will continue to work, even in the event of a power failure the TrustSight driver will switch the connected LED module to the battery supply.

Point maintained



Sustained

This is an exit or emergency luminaire with two or more lamps where at least one lamp operates in non-maintained mode and is only illuminated when normal supply fails. The other lamp operates on the normal supply only. This is identical in functionality to having a Non-Maintained Luminaire and a Normal Luminaire both in the same housing. Sustained Luminaires have two line inputs. One is connected to the Normal lighting output of the load controller. The Sustained input is connected to the load side of the load controllers circuit breaker, which supplies power to charge the internal battery and to use as a signal to turn the lamp on in the event of a power failure.

TrustSight emergency versions

Linear

Product description	12NC	Pieces per box
TrustSight Basic L 20-95V 3W	9137 007 67366	10
TrustSight Pro L 20-95V 3W	9137 007 66766	10
TrustSight DALI L 20-95V 3W	9290 009 95966	10
TrustSight Basic L 20-95V 6W	9137 007 67466	10
TrustSight Pro L 20-95V 6W	9137 007 66866	10
TrustSight DALI L 20-95V 6W	9290 009 96066	10

Point

Product description	12NC	Pieces per box
TrustSight Basic P 15-55V 3W	9137 007 67266	10
TrustSight Pro P 15-55V 3W	9137 007 66666	10
TrustSight DALI P 15-55V 3W	9290 009 95866	10

Batteries

Product description	12NC	Pieces per box
TrustSight Batt Box NiMH 7.2V 1300mA	9137 007 68166	10
TrustSight Batt Box NiMH 7.2V 2500mAh	9137 007 68266	10
TrustSight Batt Box NiMH 7.2V 3000mAh	9290 015 72466	10
TrustSight Battery Pack independent Housing	9290 009 97606	10

Batteries

Connection

The batteries are supplied with short (± 8 cm) cables (AWG22) with Tyco Micro Mate-n-Lok 794617-2 connector. Together with the emergency driver and batteries, a battery harness is shipped, which has two flying leads on one end and a Tyco connector on the other end. The insulation class of the battery is basic.

Charging

After first installation (and after each emergency mode operation), the batteries need to be charged for at least 24 hours to become sufficiently charged again. If the battery is not completely discharged the required charge time is shorter accordingly. The status of the battery is given by the indicator LED.

Periodic testing

Periodic tests should be performed according to EN 50172:2004, clause 7.2.3 and 7.2.4. monthly, switch on in the emergency mode by simulation of a failure of the supply to the normal lighting for a period sufficient to ensure that each lamp is illuminated. Annually, each luminaire shall be tested for its full rated duration (at least 1hr or 3hrs (depending on product installed)).

Self-Test

The TrustSight Pro versions are equipped with a self-test functionality according IEC 62034. At 28 days after power-up the TrustSight will perform a functional test of 30 seconds.
Every 6th test (after half year) will be a duration test. This test will run until the battery is empty and it will check if the capacity of the battery is sufficient to provide 1hr or 3hrs emergency time for respectively a 1hr or 3hrs system. This will result in 2 full duration tests every year.

During the tests the battery and output is checked. During the duration test also the battery capacity is checked. In case of a failure, an error will be indicated by the indicator LED.
When scheduling a test (functional or duration test) the operation of the AC-driver is also checked. When the AC-driver is active, so normal lighting is on, the test will be postponed for a maximum of 3 days. When the AC-driver is off for at least 1 hour the test is started. The functional and duration test can only be started when the battery is fully charged

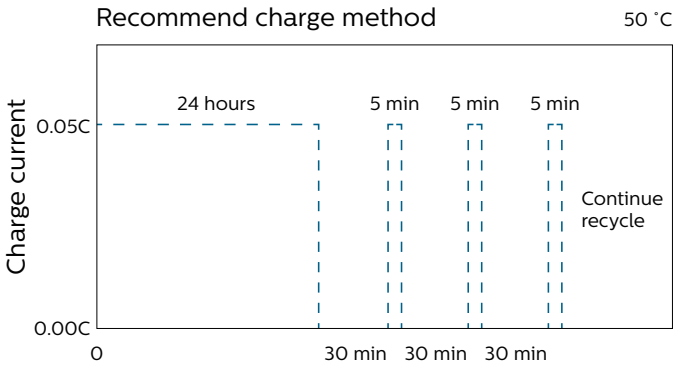
Self-test DALI driver

Duration test (DT) and functional test (FT) default interval.
Duration Test Interval Time can be set at “0”, disabling the duration tests. This means that there will be no Duration Tests initiated by the TrustSight DALI drivers.
The Duration tests must be initiated by ATS (lighting management system). The TrustSight does have the automatic battery detection feature.
This feature will initiate a DT once, after power up and when the battery is fully charged (after 24hrs). At the end of this DT the battery type is set in the driver and the TrustSight drivers will recognize it as an 1hr or 3hr driver by MultiOne (or other DALI tool).
When this DT fails (e.g. mains is disconnected during the test) there will not be a new DT initiated and the TrustSight driver is not defined as 1hr or 3hr driver. To define the battery type the end user/installer should initiate a DT manually when the “Duration Test Interval Time” is set at “0”.

Lifetime

The batteries have a life time expectancy of 4 years when maintained properly, as shown in the table below

Item	Technical Data	International standards Clauses
Cells intended for permanent charge at elevated temperature	Yes	IEC 61-951-2 (ex IEC61436 §7.2 IEC 61-951-2 (ex IEC61436 §7.2 §7.4.2.3 and 7.9
Expected operation life under folowing conditions Maximum continuous temperature Maximum occasional temperature Discharge	> 4 years + 50 °C (55C @charging) + 65 °C (1 month) 1 discharge per year (minimum requirement) **Note**: Pro- and DALI version will have (automatically) 2 discharges per year	



Shelf life

The NiMH batteries will be charged before shipment and need to be used before the date indicated on the battery (packing) due to self-discharging when stored at Tstore ≤ 30 °C.

Initially the battery is charged with a constant current, according to the manufacturer's specification. After 24 hours the battery will be fully charged and the charger will switch over to pulse-charging to keep the battery fully charged. The pulse charge scheme is given in the picture to the left.

Setting a standard driver to Australian mode

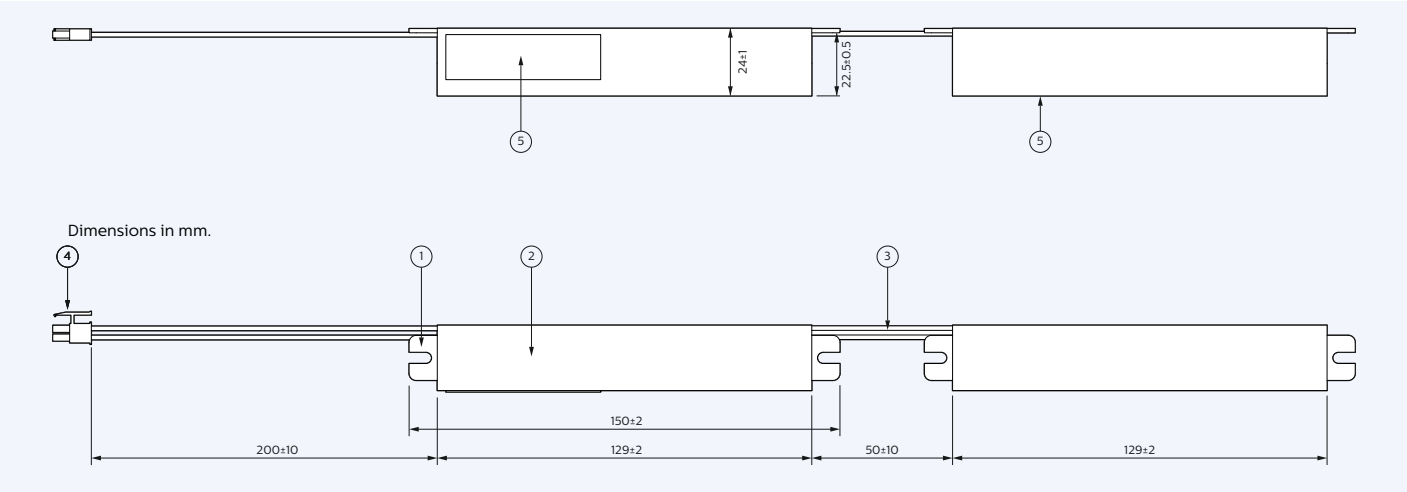
Because in Australia the charge and discharge timing is different the driver needs to be set in specific mode. To change to this mode the test-button can be used. Morse code is used to convert a standard driver to Australia mode. Please contact your local Philips representative for more information.

Procedure:
The test switch short pressing (less than 2 sec)represents a Dit(.) and a test switch long pressing (less than 4 sec but more than 2 sec) represents a Dah(_).
So the trigger sequence is ". _ . . _ . . . ".
When Australia mode triggered, the LED indicator will flash red fast (about 5s) before it flashes green slowly (in charging process).

5 seconds time out for input sequence. That means if the period of no input is more than 5s, the current input sequence will be aborted.
Pressing test switch more than 60s to quit Australia mode.
When Australia mode is cleared, the LED indicator will flash red fast (about 5s) before it flashes green slowly (in charging process).

For convenience of installer, pressing test switch more than 60s, will not trigger a duration test. If Australia mode triggered, when driver is powered on, the LED indicator will flash red once before it flashes green slowly (in charging process).

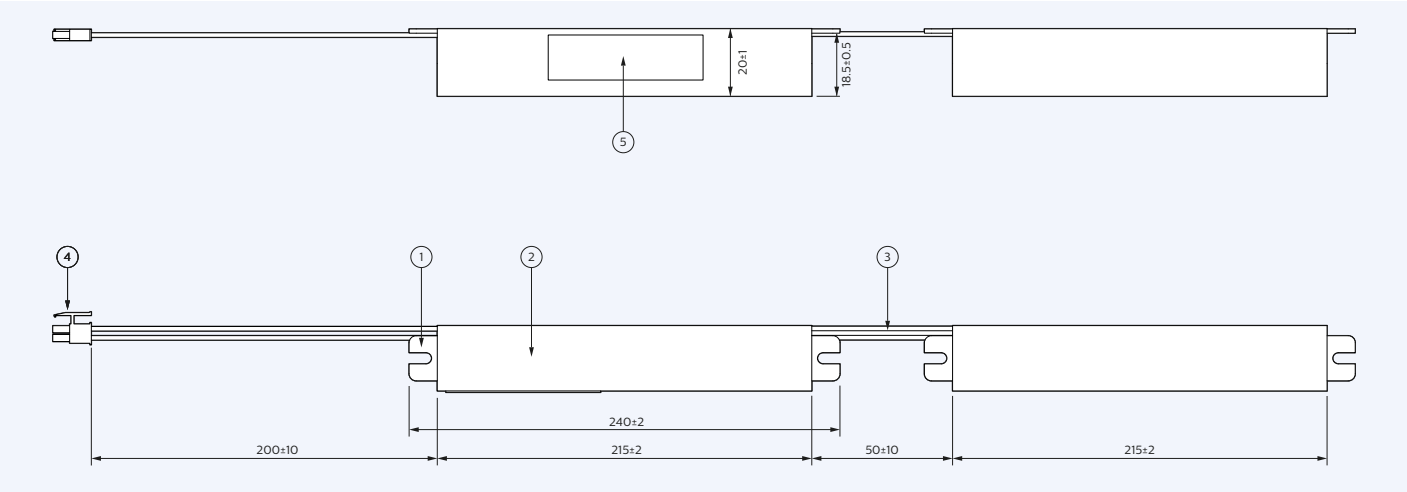
Mechanical drawing of 2500 mAh battery



Parts List

Item	Quantity	Part number	Description
1	1		PCB material CEM1 (no copper)
2	6		Cell H-SC2500BT 42.4*22.2
3	1		Battery/PCB insulator wrap
4	1		Connector + Wire (red/black)
5	1		Label

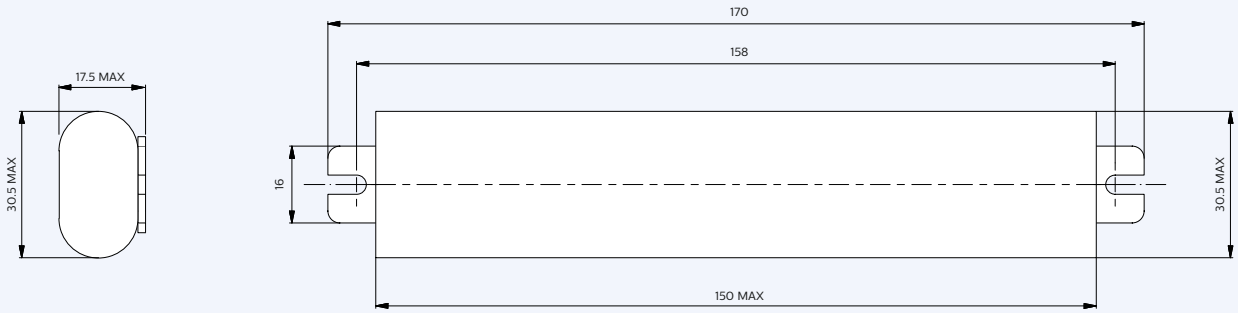
Mechanical drawing of 3000 mAh battery



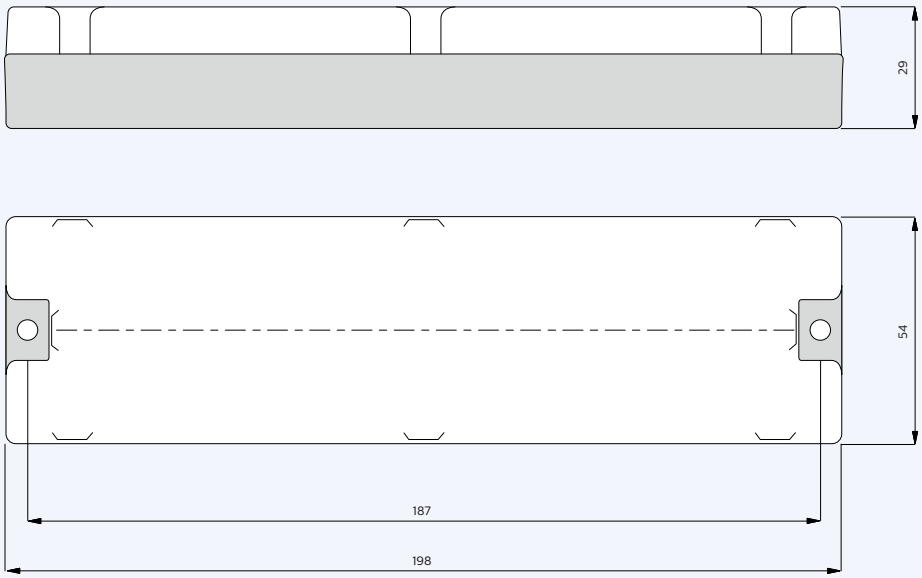
Parts List

Item	Quantity	Part number	Description
1	1		Plastic
2	6		Cell H-18700 70*18
3	1		Battery/PCB Insulation wrap
4	1		Connector + Wire (red/black)
5	1		Label

Mechanical drawing of 1300 mAh battery



Mechanical drawing of independent battery housing



Features

- Constant output power
- Small, low profile batteries
- Loop “wire” through capability switched mains wires for point driver
- Compatible with all dimmable and non-dimmable constant current LED control gear
  - The maximum allowed output current rating of the associated LED control gear is 2.0 A peak (current rating of switching relays of TrustSight emergency driver)
  - The maximum allowed output voltage of the associated LED control gear applied to the TrustSight emergency driver output is 60 V in case of the point driver and 110 V for the linear driver.
- Over-voltage protected LED output
- Short circuit proof LED output and battery connection
- Battery polarity reversal protection
- Deep discharge protection

LED status indicator

The LED status indicator shows whether:

- The system is in charging mode
- Batteries are fully charged
- A system error has occurred
  See also overview table in chapter quality This LED status indicator will have the same response for the Basic, Pro and DALI version

LED indicator status

LED indicator (colour / flashing)	**Error condition**	**Cause**	**Solution**
Green / no		System OK, battery fully charged	
Green / slow		System OK, battery is charging, not full	
Green / fast		System OK, recently tested (< 5 days)	
RED / no	Battery voltage too high	No battery connected	Connect a battery
RED / no	Battery voltage too low	Wrong or bad battery connected	Replace battery
RED / fast	Output voltage too low	Wrong LED load connected	Connect a right load and perform a functional test
RED / fast	Output voltage too high	Wrong LED load connected	Connect a right load and perform a functional test
RED / slow	Too short time during duration test	Battery end of life	Replace battery and perform a duration test.

Fast flashing: f = 2 Hz (on-time = 250 ms, off-time = 250 ms)
Slow flashing: f = 0.66 Hz (on-time = 250 ms, off-time = 1250 ms)

Test switch

An optional test switch can be connected to the TrustSight emergency driver.
This can be used to:

- Initiate functional test as long as switch pressed: press 0 < time < 10 s
- By entering the functional test the previous error (if available) will be cleared.
- Initiate duration test: press > 10 s
- In manual test mode, the battery and LED load will be checked. If any error occurs, corresponding error bit (for DALI drivers) will be set and the TrustSight will go into charge mode regardless of the test button pressing.
- Pressing the test button in Emergency mode or during a self-test mode will not have any effect.

Automatic emergency time selection

Philips TrustSight emergency drivers are equipped with an automatic battery detection feature. At shipment, the emergency driver is not defined as a 1hr or 3hrs version. The procedure for automatic battery detection is as follows:

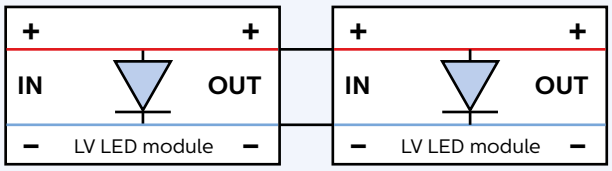
- After installation the driver will charge the battery for 24hrs.
- After 24hrs a duration test will be performed.
- At the end of the duration test the TrustSight will set the battery type and will charge the battery again until it is fully charged. This only applies for the 3W version. The 6W version is only available as a 1hr version . This 6W TrustSight driver is already configurated in the factory.

After that, the system is defined and fully operational. The battery type definition has influence on the performance during the self-test and on the battery charge method. When the automatic battery detection process is disrupted, e.g. by switching off the permanent mains, the detection process is stopped and the TrustSight emergency driver will go into emergency mode. At a next power up, the automatic detection process will start again with 24h charging.

1 hour and 3 hours emergency time

Specification item	Type	Condition
3 W	NiMH 1300 mAh AA-Cells	1 hour rate duration
3 W or 6 W	NiMH 2500 mAh sC-Cells	1 or 3 hours rate duration
3 W or 6 W	NiMH 3000mAh 18700 Cells	1 or 3 hours rate duration

Electrical design-in



Schematic representation of the wiring of 2 connected LV LED modules in an LV system, not needing a Return-End cable

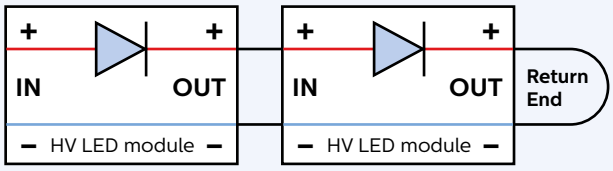
Short introduction into High- and Low voltage systems

Low voltage system

Low Voltage (LV) systems typically use LV LED modules or Hybrid LED modules suitable for LV usage, connected to an isolated driver. LV products make a parallel system; adding a LED module requires a higher current.
The majority of the LV systems are point source systems which can be installed outside the luminaire (in-depended) or build-in the luminaire

Warning

- Avoid touching live parts
- Avoid touching any bare components on the PCB, e.g, LEDs!
- Do not use damage LED modules!



Schematic representation of the wiring of 2 connected HV LED modules, including the Return-End cable.

High voltage system

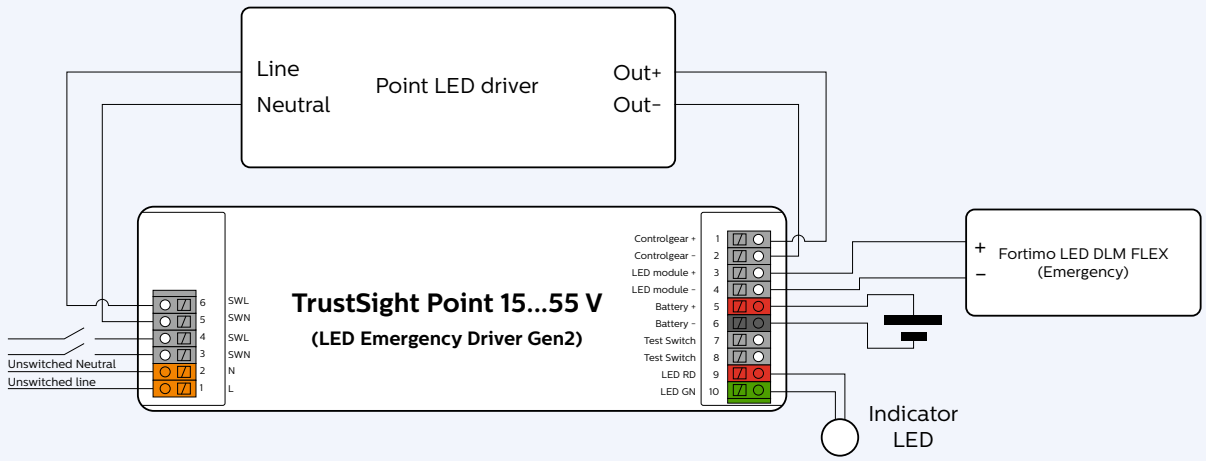
High Voltage (HV) systems typically use HV LED modules or Hybrid LED modules suitable for HV usage, connected to a non-isolated driver. HV products make a series system; adding a LED module requires a higher voltage.
The majority of the HV systems are build-in linear systems

Warning

- Avoid touching live parts
- Avoid touching any bare components on the PCB, e.g, LEDs!
- Do not use damage LED modules!
- Class 1 luminaires must be connected to protective earth!

How to Configure a LV system in combination with a EM system

A typical LV system in combination with an EM system consists of a point-source LED driver, a LED module and a TrustSight Point emergency lighting kit. An example of a connection scheme with a Philips LED DLM is given below. Any LED module with a forward voltage between 15 V and 55 V can be used.



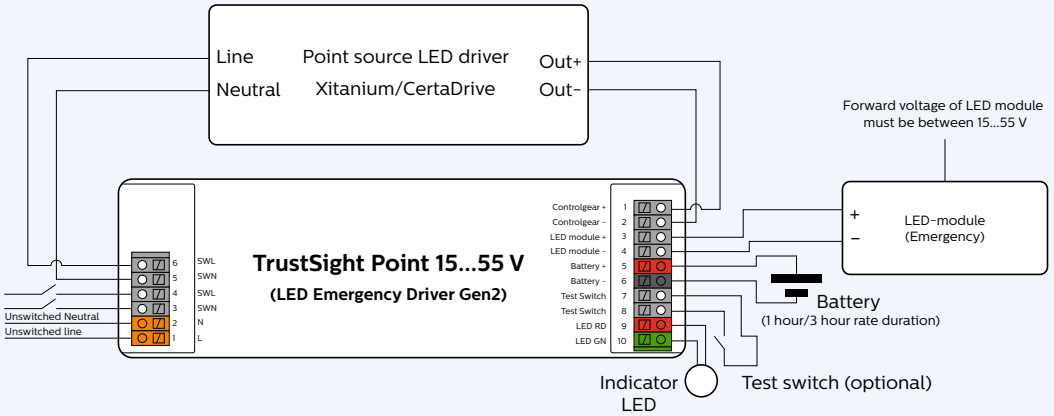
How to Configure a HV system in combination with an EM system

Due to the fact that a linear system can consists of multiple LED modules, a HV system has a lot of potential configurations possibilities.
The following steps can help you in selecting the right one based on your requirements:

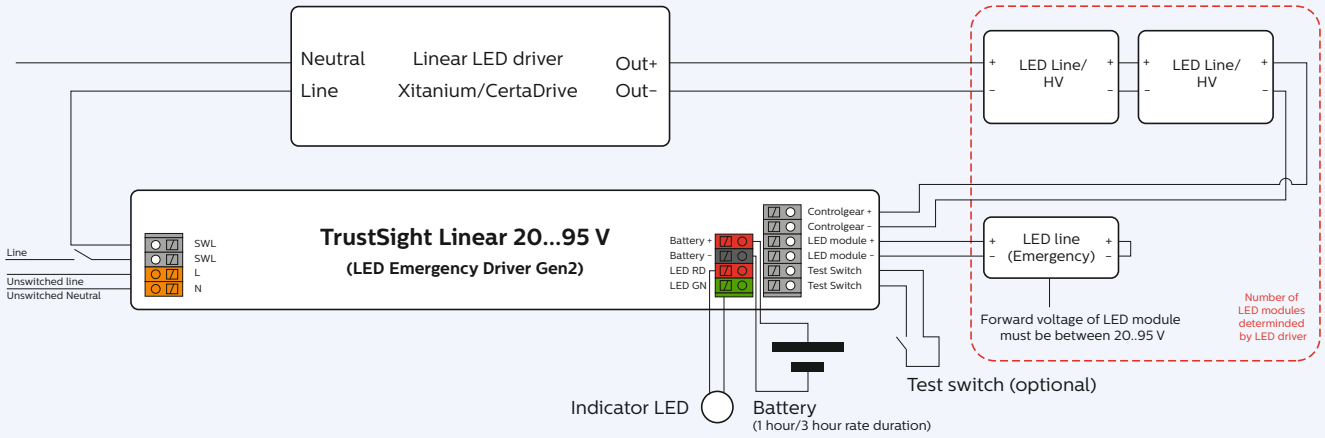
1. Determine the LED driver- and LED module settings in normal operation mode
2. Determine the required amount of lumen in an emergency situation
3. Based on the applied LED module determine (from the module datasheet) the specified amount of lumen per watt (lm/w).
   Depending on EM-power configuration
   (3 W, 1-3 hours / 6 W, 1 hour) the outcome of this calculation will be the amount of lumen in an emergency situation for the selected duration.
4. Based on the outcome of above mentioned questions it can be possible that within a given application some LED module will be illuminated in EM-mode and some not.

Basic connection scheme

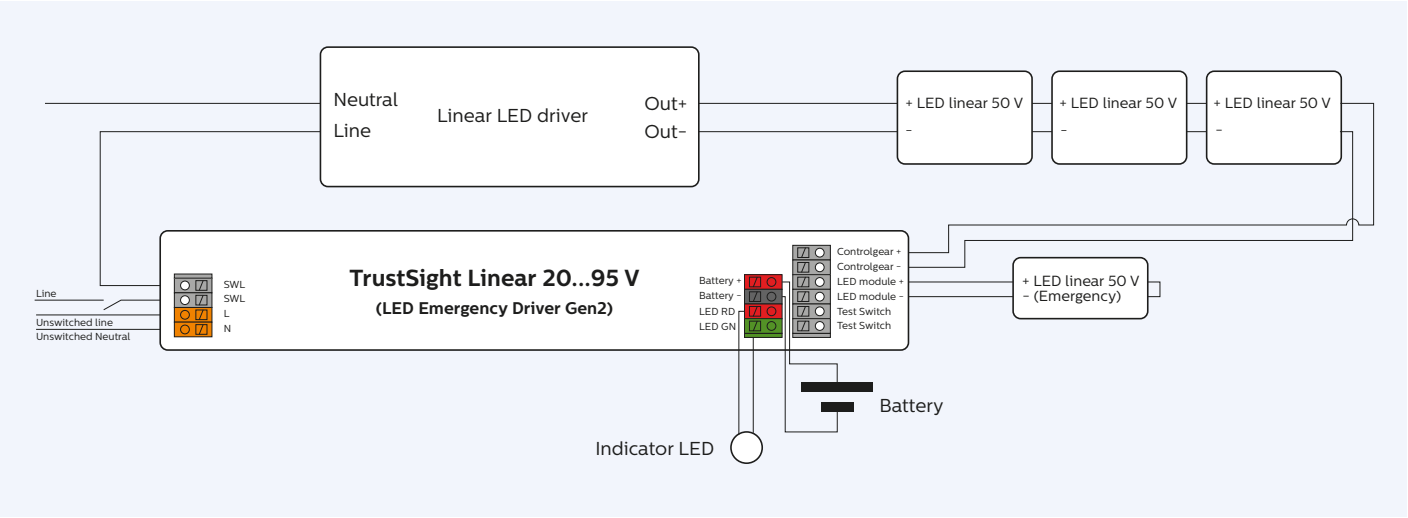
Point source emergency driver



Linear HV emergency driver

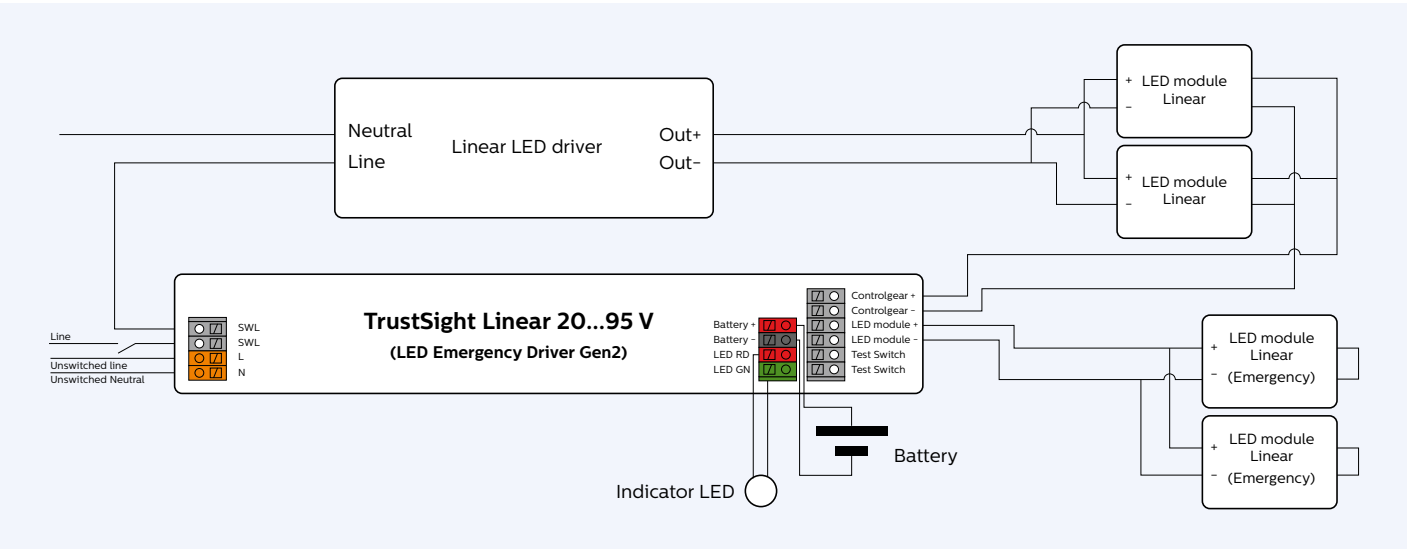


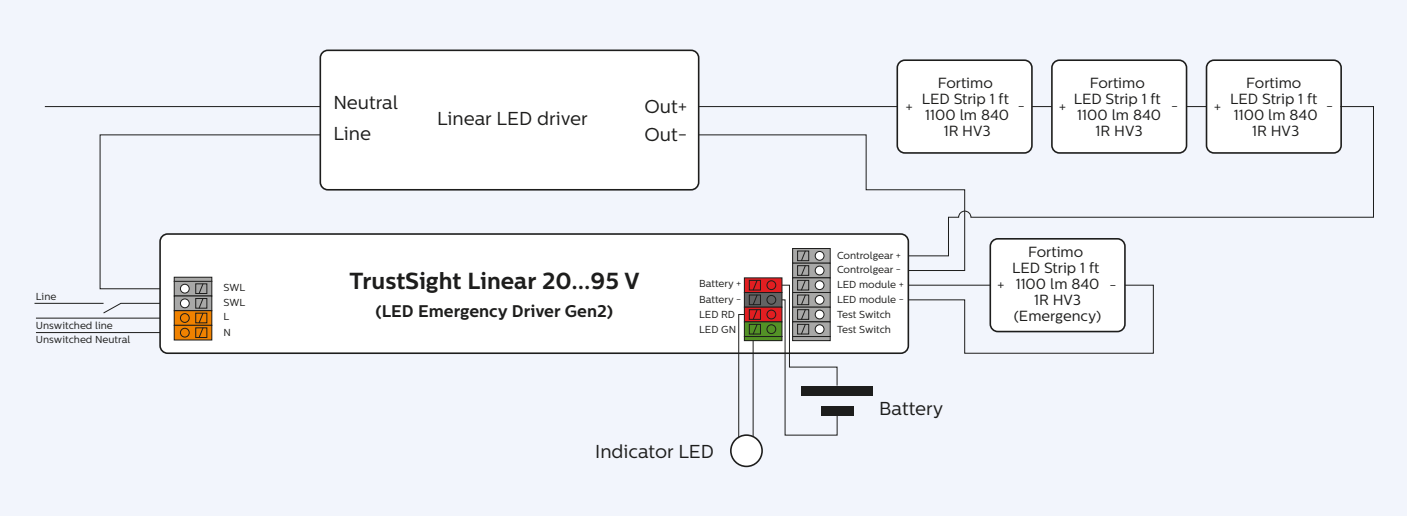
Other examples of Linear HV systems



If the light-output in EM-mode must be more homogenous one should connected more LED modules to the TrustSight EM driver. These LED modules can be connected in parallel or in series to the EM-driver. The power will be divided between the LED modules
But be aware that this has also consequences in normal operating condition

In parallel



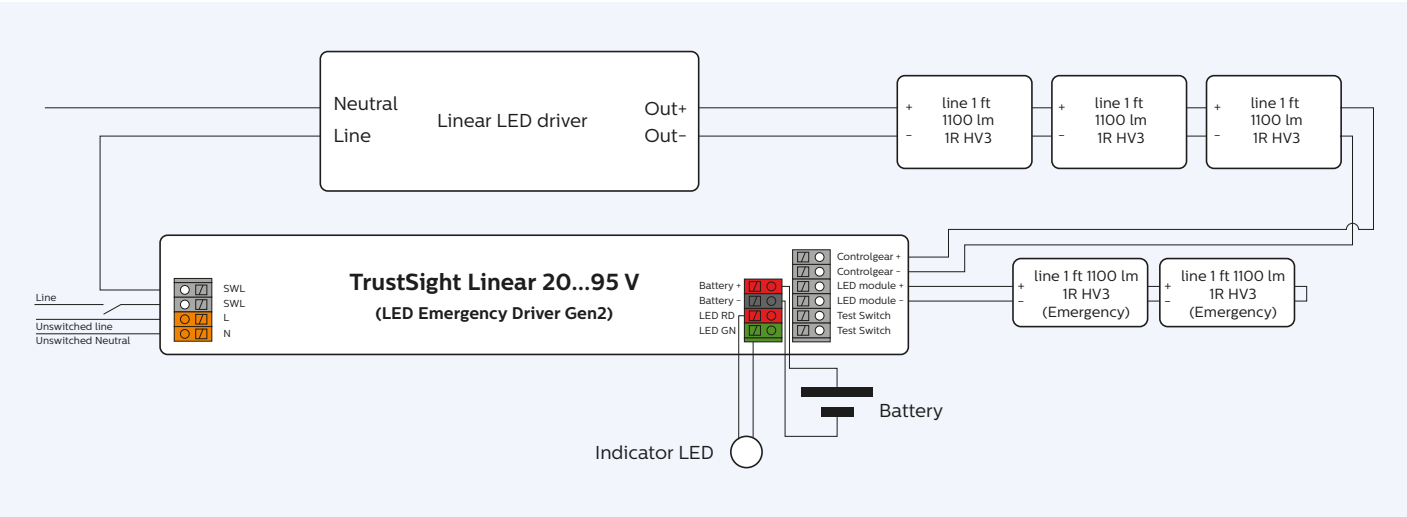


The amount of light in Emergency mode

The amount of light is determined by the numbers and lumens per watt of the LED module(s) connected to the emergency driver.

Example

Application (as shown below) is equipped with LED module: Fortimo LED line 1 ft 1100 lm 1R HV3.



The lumen efficacy of the Fortimo LED line 1 ft 1100 lm 1R HV3 is ± 150 lm/W (source: product datasheet)
The amount of lumen in emergency mode is:
3 W x lumen efficacy of one module

More lumen in emergency mode

- Connect a LED module with a higher lumen efficacy
- Use a 6 W version instead of a 3 W version (this is not possible for the point source emergency driver)

Longer light output in emergency mode

- Use a 3 hours battery pack

In Series

It is important to determine the total forward voltage of the in series connected LED modules
The number of LED modules which can be connected to an EM driver is limited by the maximum output voltage of the TrustSight EM driver.

Important

It is not advised to mix LED modules with different forward voltage in one system.

Example 1

Optical characteristics - table per CCT

Fortimo LED SLM 2000 lm L13 830

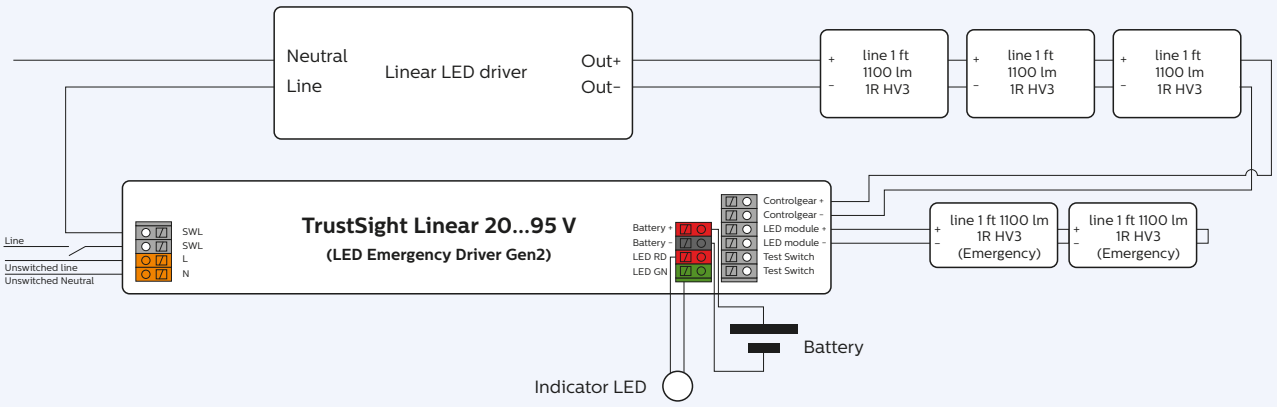
Parameter	Min	Typ	Max	Unit
Luminous Flux	1810	2020	2230	lm
Module Efficiency		117		lm/W
Correlated Colour Temperature		3000		K
Colour Coordinates		(0.434, 0.403)		-
Colour Coordinates Premium White		(0.430, 0.395)		-
Colour Consistency		3		SDCM
CRI		>80		-
Radiation Angle		115		deg
Thermal Power			11.9	W
Energy efficiency label		A+		-

TrustSight Basic P 15-55 V 3 W 1 hour, connected to SLM 2000 lm

Wanted : The amount of light in EM mode
Given : Output power in EM mode is 3 W for 1 hour
Needed : LED efficiency? see datasheet LED-module 117 lm/W

Answer : 117 * 3 = 351 lm

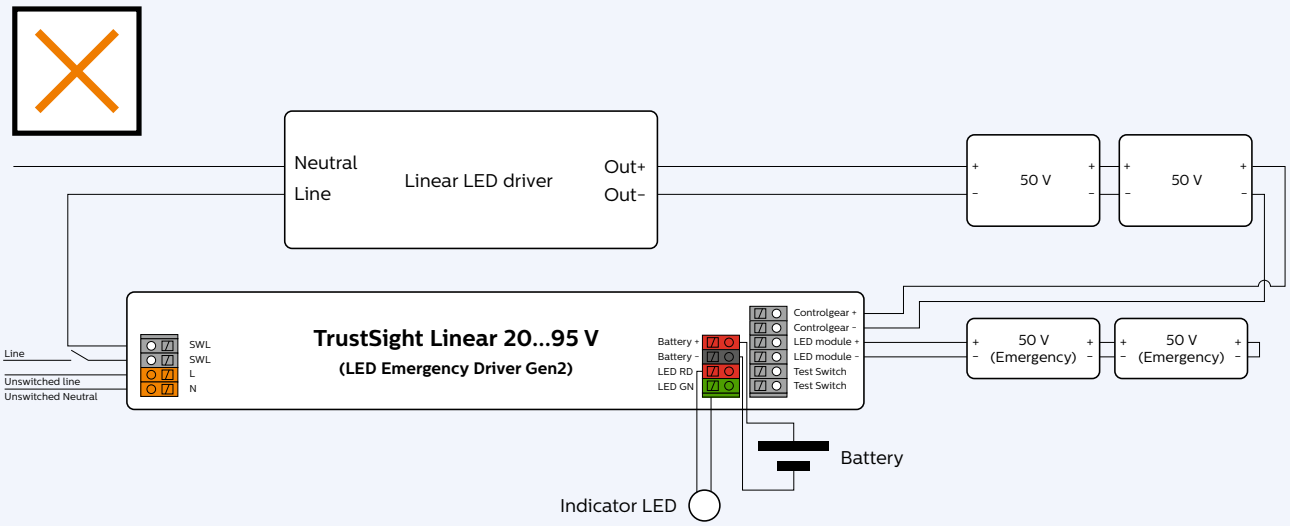
Example 2



Wanted : The amount of light in EM mode per module
Given : Output power in EM mode is 3 W for 1 hour
Needed : LED efficiency? see datasheet LED-module LED Line 1 ft 1100 lm 1R HV3 165 lm/W

Answer : Each module consumes 3 W/2 = 1.5 W light output per LED-module is 1.5* 165 lm = 247.5 lm

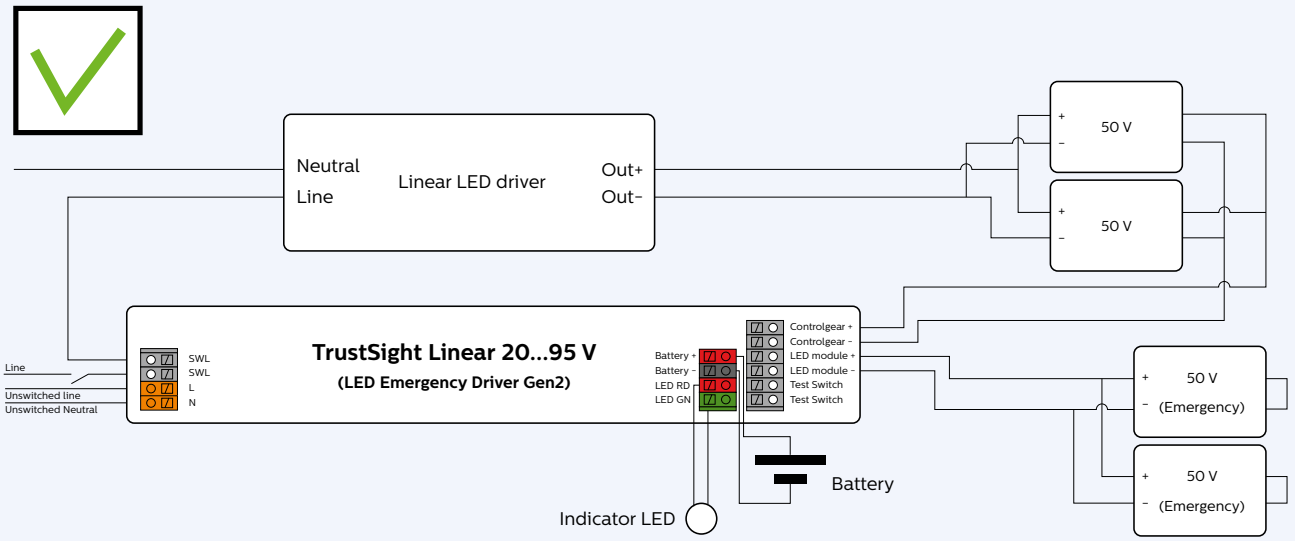
Example 3



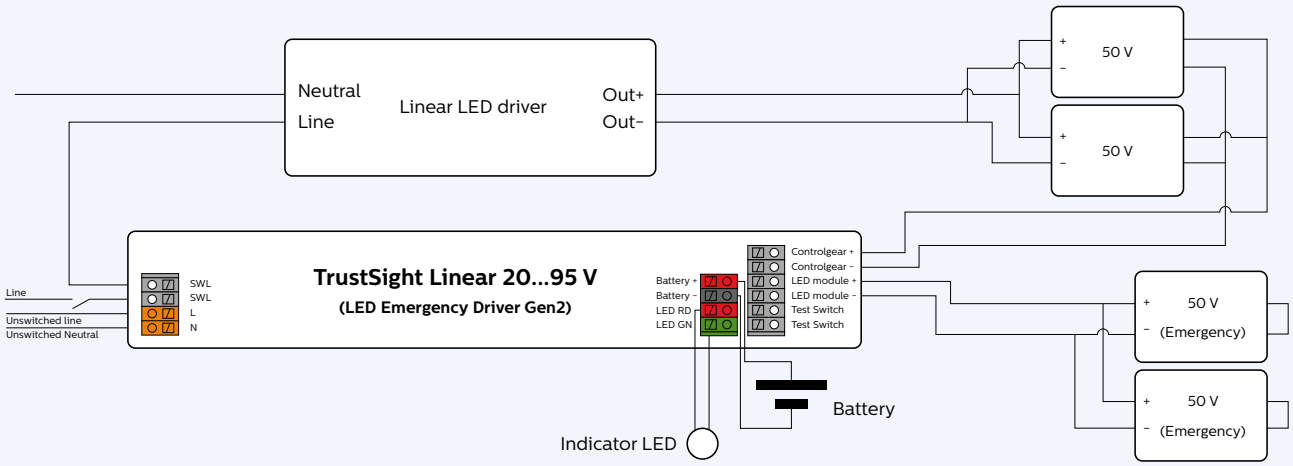
Is this correct?

No, the output voltage of the TrustSight is exceeded (2 * 50 V = 100 V)

LED-module must be placed in parallel to lower the combined voltage



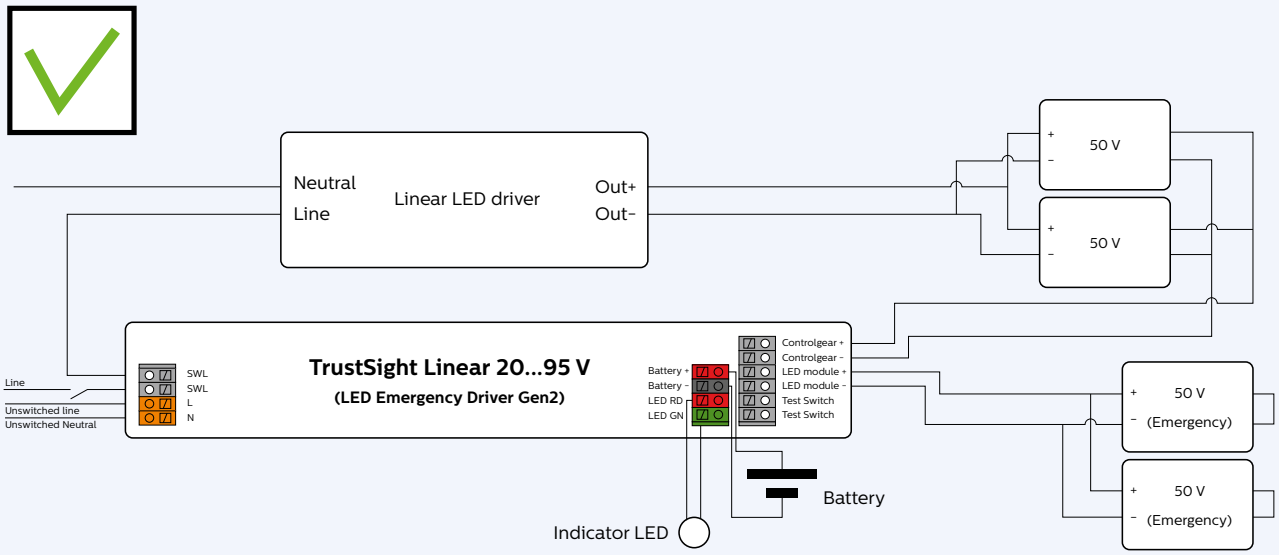
Example 4



Wanted : The current per LED-module in EM-mode
Given : Output power in EM mode is: 3 W for 1 hour
Needed : LED-module voltage = 50 V

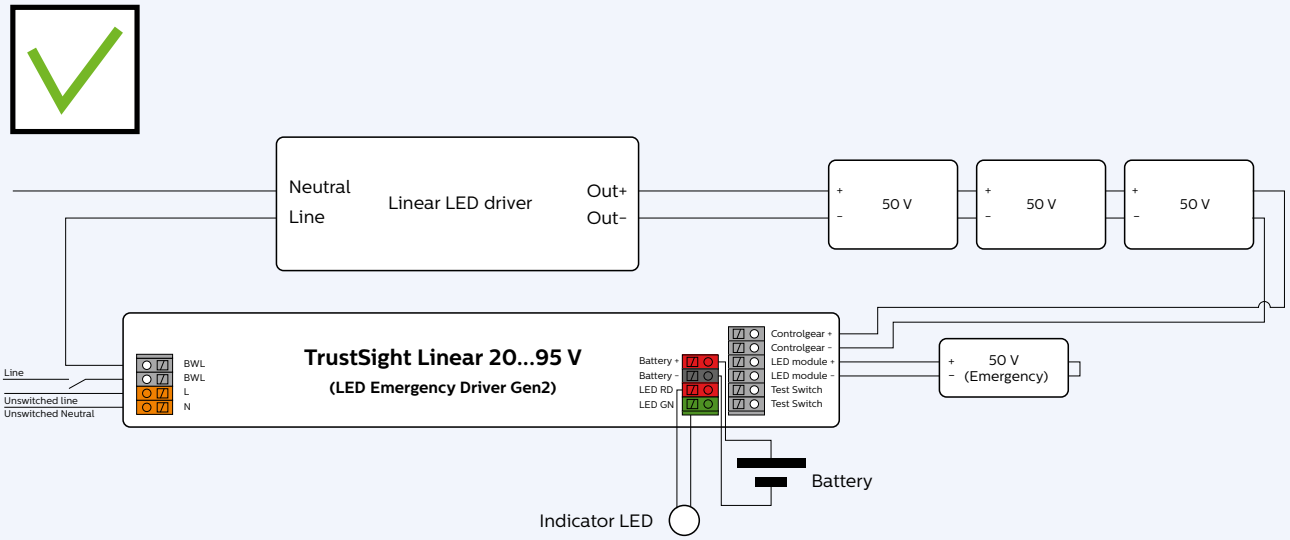
Answer :
- Output voltage EM is 50 V (LED-modules are in parallel)
- Output current in EM is 3 W / 50 V = 60 mA
- Current per LED-module 60 mA / 2 = 30 mA

Example 5



Are these connections correct?

Yes, the voltage connected to the TrustSight is 50 V.



Examples of what solutions could look like for pairing wires.

Twin-wire ferrules.

How to... Wire – general remarks

In the datasheet of the EM driver it is stated what:

- Wire diameters are accepted
- Strip length of the wires are accepted
- Up to what wire length the drivers are tested on EMC

Direct wiring between LED driver, LED module, TrustSight EM driver and battery

Be informed that no components are allowed between the LED driver EM-driver and LED modules other than connectors and wiring intended to connect the LED driver to the LED board. For example it is not allowed to install a switch between the driver and LED boards.

2 wires into one connector hole

In some scenarios two wires need to be connected to one connector hole. In this case the pairing has to be done outside the LED driver or EM-driver, resulting in only one wire going into the driver. Two wires into one connector hole are not supported.
For the point source applications there is a loop-through addition available when installed as s independent application

Ferrules

The reliability of twin-wire ferrules (or wire end stop), accepting the wires intended to use, should be checked with the supplier of these ferrules.

Cables and wires

For the point-source applications installed as an independent device there is an additional box available which can be connected to the existing housing to provide loop-through functionality.

Interconnecting LED drivers and LED modules

See the Design-In Guide for Xitanium Indoor LED drivers and LED modules on www.philips.com/technology.

Electromagnetic compatibility (EMC)

Electromagnetic compatibility (EMC) is the ability of a device or system to operate satisfactorily in its electromagnetic environment without causing unacceptable interference in practical situations. TrustSight EM LED drivers meet EMC requirements per CISPR15 ed 7.2. This test is conducted with a reference luminaire, representing a common application that includes a LED driver, TrustSight emergency driver, LED load (incl. heatsink), battery and LED indicator.

Cable length and EMC

For each setup it is advised to perform EMC tests.
It also advices to place the battery as close as possible to the housing of the TrustSight emergency-driver.

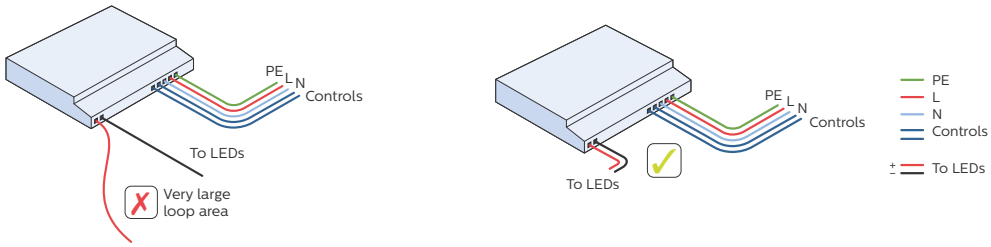
How to... Improve EMC performance

Both applies to a point and linear EM driver. Below a point source LED driver is used as example.

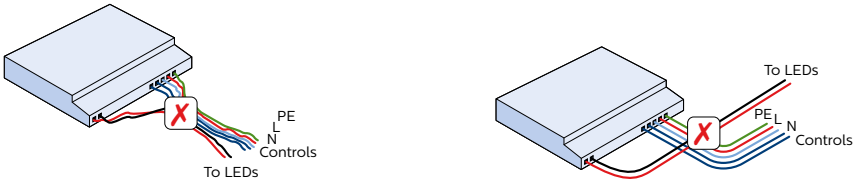
Improvement in EMC Performance

The following practical precautions need to be taken into account in a lighting system to minimize EMC:

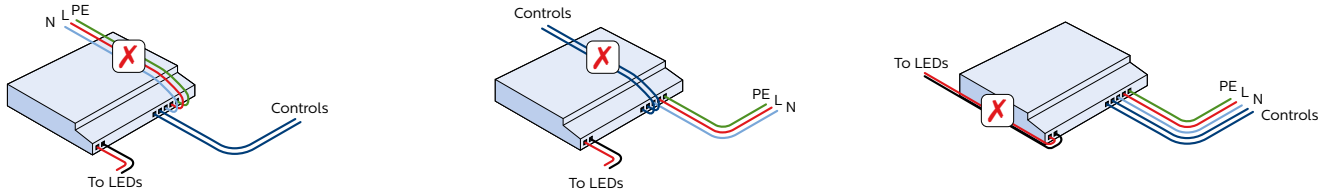
- Minimize the differential mode loop area of the lamp wires going from the driver to the light source by keeping the wires close together (bundling). This will minimize the magnetic field and reduce the radiated EMI.



- Minimize the common mode parasitic capacitance of the output wiring + light source to earth by keeping the length of the wires between driver and light source as short as possible. Keep the length of the incoming mains wire inside the luminaire as short as possible.
- Keep mains and control wires(DALI, 0-10 V) separated from the output wires. Do not bundle or cross the wires.



- Do not route any wiring over and/or along the driver enclosure to avoid any coupling/crosstalk with internal components of the driver.



- Ground the lighting system chassis and other internal metal parts to protective earth (class I luminaires): do not let large metal parts electrically insulated from functional or protective earth. Always connect the protective/functional earth/equipotential connector or wire from the driver and use equipotential bonding wires for all large unconnected metal luminaire parts like luminaire housing, driver mounting plate, reflector, heatsink etc. Keep the protective/ functional earth/equipotential wires as short as possible to maximize their effectiveness and use, as much as possible, large metal areas (chassis, mounting plates, brackets) for earthing purposes instead. Establish a reliable electrical connection by using a toothed washer and screw(s) fastened with adequate torque.

Electrical insulation and protective earth

Warning

Connecting the luminaire to Protective Earth. If the driver needs to be connected to Protective Earth, like non-isolated Xitanium LED drivers. then also the luminaire needs to be connected to protective earth in order to comply with safety regulations and EMI. Please also consult the Design-In-Guide of the Xitanium Indoor Linear LED drivers on www.philips.com/technology

Surge protection

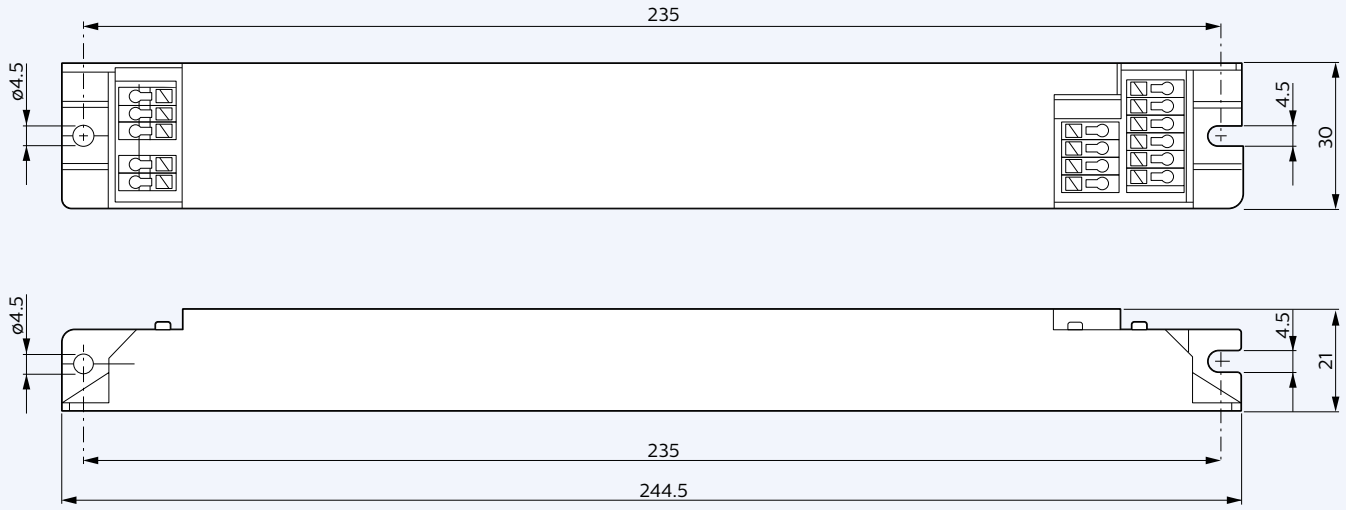
The TrustSight Emergency drivers have built-in surge protection up to a certain limit according EN 61547. It can withstand 1KV differential mode and 2KV common mode surges. Depending on the mains connected, additional protection against excessive high surge voltages may be required by adding a Surge Protection Device. The actual limit can differ per driver and can be found in the driver's datasheet.

Touch current

The TrustSight Emergency LED drivers are designed to meet touch current requirements per IEC 61347-1 standard. The specified maximum values are 0.7 mA peak for IEC and 0.75 mA RMS for UL norms. The test is done with the driver alone. In a luminaire, touch current may be higher, since the LED load may introduce additional touch current. Precautions may be required on the luminaire level and if multiple drivers are used in a single luminaire.

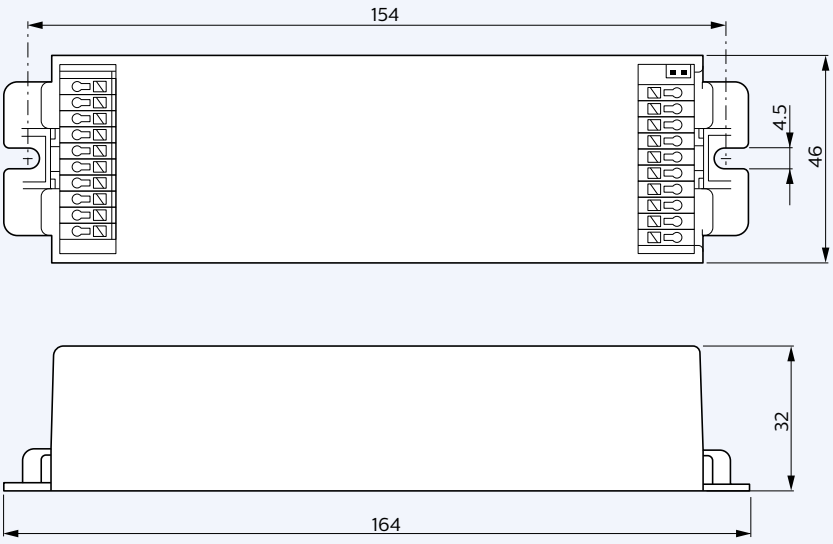
Mechanical design-in

Linear



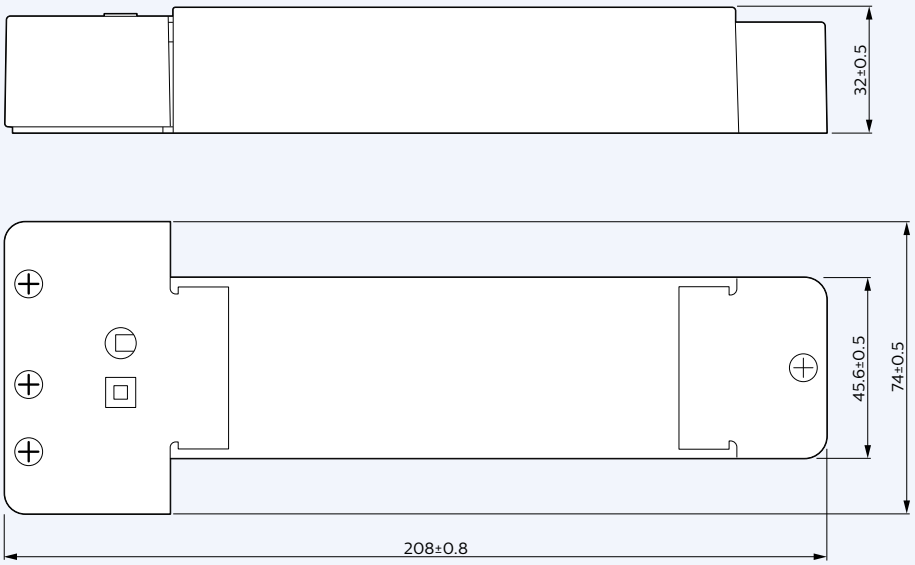
Dimensions in mm.

Point



Dimensions in mm.

Point with stain relief

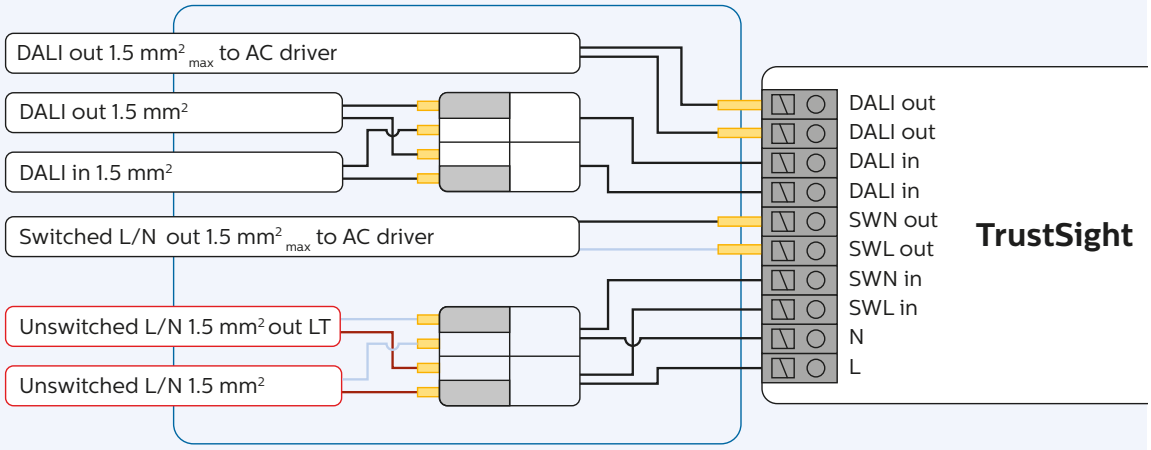


Dimensions in mm.

Loop through

TrustSight point mains side connections

Full DALI and Full loop-through for cables with 1.5 mm² conductors (Loop trhough with 2.5 mm² cables looks like it will be very unpractical).



TrustSight Loop Through adopter

Indicator LED

Mounting diameter LED = 6 mm
Cable length = 1 meter

Switch

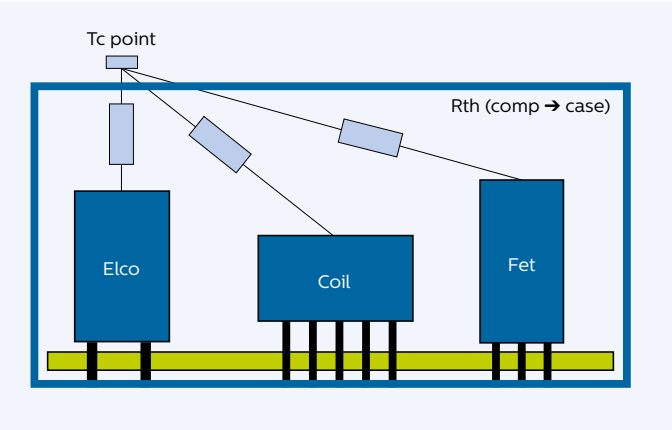
Mounting diameter switch = 7 mm
Cable length = 1 meter

Thermal design-in

This chapter describes two aspects of the thermal design of the Philips TrustSight Emergency driver

1. The LED driver itself and relationship between Tc point and lifetime of the EM driver
2. Module Temperature Protection (MTP) function to ensure lifetime of LED module/PCB.

To facilitate design-in of LED drivers, the critical thermal management points of the LED driver are set out in this section. In Philips' product design phase all possible precautions have been taken to keep the component temperature as low as possible. However, the design of the luminaire and the ability to guide the heat out of the luminaire are of utmost importance. If these thermal points are taken into account this will ensure the optimum performance and lifetime of the system.



Schematic represenatation of intenal thermal resistances and driver T-case

Case Temperature Point (Tc point)

To achieve optimal lifetime and reliability, it is critical that the temperature of the components in the driver remains within its rating. In the LED driver design, all precautions are taken to ensure that the components within the driver are at the lowest possible temperatures.

The case temperature (Tc) is a reference for the temperatures of the critical internal driver components. The location of the Tc point is identified on the product label. Tc point is marked by the *-sign on the label of the driver.

To measure Tc at the Tc point

The temperature can be measured using a thermocouple that is firmly glued to the driver housing. For a representative measurement the temperature must be stable before any reliable data can be obtained (typically > 0.5 hours).

Relation between Tc and ambient temperature

The Tc increases, by approximation, linearly with the ambient temperature (Tamb). The temperature offset between Tamb and Tc depends on the thermal design of the luminaire. The TrustSight LED driver has been designed for indoor use. For approved ambient temperature range please check the associated LED driver datasheet on www.philps.com/technology.

Battery storage temperature

As mentioned before (refer to the section batteries) the batteries are pre-charged before shipment to extend their shelf life. The indicated date on the batteries is valid when the batteries are stored at temperatures between -20 °C and 30 °C. When the batteries are stored at temperatures between -20 °C and 40 °C they must be used within 2 months, and when stored at 50 °C, they should be used within one week.

Battery operating temperature

The battery operating temperature is specified as follows:

State	Min	Max
Charging	0 °C	55 °C
Discharging	20 °C	50 °C

Using the batteries outside these temperature windows will reduce the lifetime of the batteries.

Controllability

DALI

Digital Addressable Lighting Interface, or DALI, is a digital communication protocol popular in the lighting industry. It is an IEC standard and there are many control devices from Philips and other manufacturers that communicate using DALI. The voltage across DALI wires is typically 16 V (refer IEC specification for details) and it is polarity insensitive. For more information on DALI, refer to the IEC specification for DALI protocol.

- IEC 62386: 102 - General requirements - Control gear.
- IEC 62386: 207 - Particular requirements for control gear - LED modules.
- IEC 62386: 202 - Particular requirements for control gear - Self-contained emergency lighting.

The DALI standard allows additional emergency features to be configured as options.

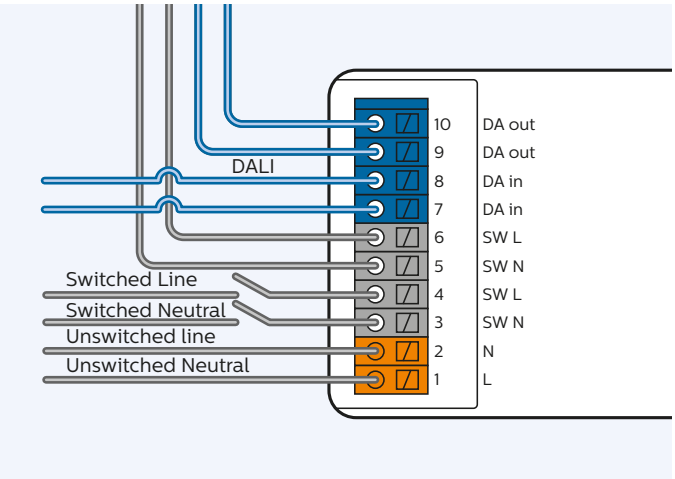
Every emergency gear conforming to the DALI emergency gear standard IEC 62386-202 is able to carry out an emergency test when commanded across the DALI bus – either a short (function) test or a discharge (duration) test.

The emergency gear carries out the test autonomously when requested to do so; it selects its battery as the power source during the test, so that there is no need to interrupt its permanent mains supply. Once the test is complete the test results can then be read over the DALI bus.
In the event that the permanent mains supply fails during a test, the DALI emergency gear immediately stops the test and goes into full emergency operation, so that the requirement for the escape lighting to illuminate quickly, reliably and unconditionally is met.

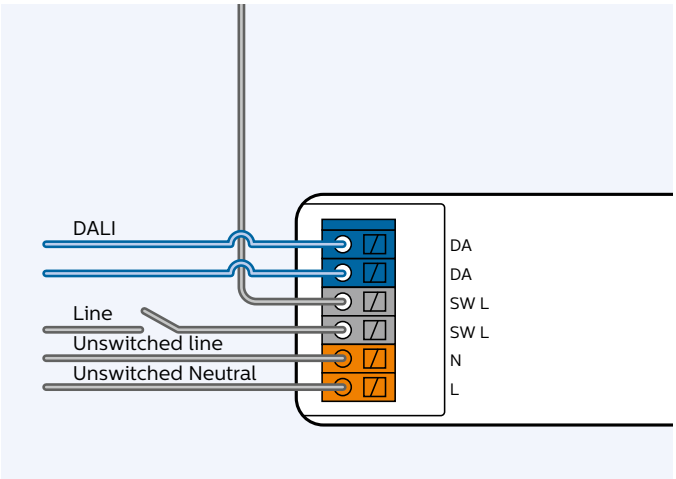
Each DALI emergency gear is individually addressable on its DALI bus and each gear can be commanded individually to carry out an emergency test. So rather than testing all the emergency luminaires in one zone together each emergency luminaire in the zone can be tested at a different time, therefore ensuring the safety of the zone at all times.

If the emergency and normal drivers in a luminaire are both DALI gear, then each can be separately addressed on the same DALI bus. This allows common wiring to be used for both normal lighting control and emergency test control. During a failure of the permanent mains supply, the TrustSight acts autonomously to provide escape lighting, regardless of the state of the DALI bus.

Default test times are factory pre-set, in accordance with the DALI standard EN 62386-202, to conduct an automatic function test every 7 days and a duration test every 52 weeks. Since the DELAY time is factory pre-set to Zero, all units are tested at the same time. Test times can be changed via DALI.



TrustSight point



TrustSight linear

Quality and Reliability

Relevant Standards

Compliance and approval	Generated disturbances, EMI and EMC
EN 55015 A2/CISPR15	Conducted EMI 9 kHz-30 MHz
EN 55015 A2/CISPR15	Radiated EMI 30 MHz-300 MHz
IEC 61000-3-2 A1 + A2	Limits for harmonic current emissions
IEC 61000-3-3	EMC – Limitation of voltage fluctuation and flicker in low voltage supply systems for equipment rated up to 16 A

Immunity	
IEC / EN 61547, A12000	Equipment for general lighting purposes – EMC immunity requirements
IEC / EN 61000-4-2	Electrostatic Discharge
IEC / EN 61000-4-3 A1	Radiated radio frequency, electromagnetic field immunity
IEC / EN 61000-4-4	Electrical fast transient/burst immunity
IEC / EN 61000-4-5	Surge immunity
IEC / EN 61000-4-6	Conducted disturbances induced by RF fields
IEC / EN 61000-4-11	Voltage dips, short interrupts, voltage variations

Performance	
IEC 62384	DC or AC supplied electronic control gear for LED modules - Performance requirements
IEC 62386	Digital Addressable Lighting Interface (DALI)

Safety standards	
IEC 61347-1	General and safety requirements
IEC 61347-2-13	LED Particular requirements for DC or AC supplied electronic control gears for LED modules

Emergency standards	
IEC 61347-2-3	Particular additional safety requirement for AC/DC supplied electronic ballasts for emergency lighting
IEC 61347-2-7	Particular requirements for DC supplied electronic ballasts for emergency lighting

Lifetime

The batteries have a life time expectancy of 4 years when maintained properly, as shown in the table below

Item	Technical Data	International standards Clauses
Cells intended for permanent	Yes	IEC 61-951-2 (ex IEC61436 §7.2
charge at elevated temperature		IEC 61-951-2 (ex IEC61436 §7.2
		§7.4.2.3 and 7.9
Expected operation life under folowing conditions	> 4 years	
Maximum continuous temperature	+ 50 °C (55C @ charging)	
Maximum occasional temperature	+ 65 °C (1 month)	
Discharge	1 discharge / year	

Battery installation at OEM

After the TrustSight Emergency has been installed in a luminaire, the luminaire should not be left in emergency mode (battery powered light) to prevent the batteries from draining. After mains disconnect, the battery should be disconnected and (after a few seconds) connected again. In this way, no energy will be drained from the battery (except for its self-discharge) during the time before installation.

Mains voltage fluctuations

The driver is able to withstand high and low mains voltages for limited periods of time.

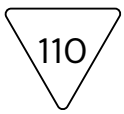
Low mains voltage

A continuous low AC voltage (<198 V) has no adverse effect on the driver's lifetime. However, according IEC 61347-2-7 Ed.3 Clause 21, below 195 V AC mains the TrustSight is allowed to go into emergency mode.

High mains voltage

A high mains voltage will stress the driver and have an adverse effect on the lifetime (maximum 320 V for a period of 48 hours, and 400 V for a period of one hour).

Marking

Standard	Description
	CE marking
	ENEC marking the European certification mark for electrical products that gives a product acces to the markets of countries in the European Union, EFTA, and a number of Eastern European counties. 05 is the body certified to give the marking, KEMA/DEKRA
	F-marking, temperature declared, thermally protected ballest/transformer(s) symbol acc. IEC61347-1 Clause 7.1. m, 110 °C
	Electronic gear complying with IEC61347-2-7 shall be marked with this symbol.

Disclaimer

Philips will perform the testing of the LED systems to high standards of workmanship. The tests are carried out with reference to the EN/IEC standards, if any, which are regarded by Philips as being of major importance for the application of the lamp gear and the lamp within the fixture for horticultural applications.

The design-in guide, regarding the testing and design in of the LED system provided by Philips, is not an official testing certificate, and cannot be regarded as a document for official release of the fixture. The OEM is liable for the official testing by a certified test body and all markings, such as CE and ENEC marks, on the fixture assembly.

The design-in guide is for information purposes only and may contain recommendations for detecting weak points in the design of the system (lamp – lamp gear – fixture), if any.

Specifically mentioned materials and/or tools from third parties are only indicative: other equivalent equipment may be used but it is recommended that you contact Philips for verification.

Philips will not be liable for unforeseen interactions of the proposed solutions when applied in the fixtures or applications using these fixtures. Philips has not investigated whether the recommendations are or will in the future be in conflict with existing patents or any other intellectual property right. Philips does not warrant that its recommendations are technically or commercially the best options.

Since the tests are only performed on one particular fixture provided by the customer, it will be treated as a prototype. This means that there is no statistical evidence regarding later production quality and performance of the lamp – lamp gear – fixture system.

As Philips does not have control over manufacturing of the fixtures, Philips cannot be held liable for the fixture assembly.

Philips will not accept claims for any damage caused by implementing the recommendations.

No warranty whatsoever may be claimed by the OEM with regard to the content and/or quality of the design-in guide or any other advice, or the conclusions and/or recommendations in the design-in guide or any other document, either express or implied, and Philips expressly disclaims any implied warranties of any kind, including without limitation any warranties of satisfactory quality, fitness for a particular purpose or non-infringement and any warranties regarding the design-in guide or any other advice or the use of the results of any activity performed while testing the fixture with respect to its correctness, quality, accuracy, completeness, reliability, performance or otherwise.

The OEM expressly agrees that test design-in guides are provided by Philips on an ‘as is’ basis and an ‘as available’ basis at customer’s sole risk and expense. Philips shall not be liable for any lost profits or lost savings, indirect, incidental, punitive, special, or consequential damages whether or not such damages are based on tort, warranty, contract, or any other legal theory – even if Philips has been advised, or is aware, of the possibility of such damages.

The OEM must bring any claim for damages within ninety (90) days of the day of the event giving rise to any such claim, and all lawsuits relative to any such claim.

05/2017
Data subject to change

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