



Design-In Guide

Electronic (start)Xtreme gears
for CosmoPolis, SON and CDO lamps

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sense and simplicity

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General information

1.1 Introduction

Thank you for choosing Philips Xtreme and startXtreme gears.

Xtreme gears have been specially developed for outdoor applications with long lifetime and high reliability as the key specifications. The electronic driver is designed for lamp types CPO/CDO/SON and can therefore be used in a wide range of applications:

- Decorative floodlighting of architecture, monuments, etc.
- Decorative lighting of (large) city centres and shopping areas.
- Major and minor roads.

The electronic gear converts AC mains voltage by means of an AC/AC converter into a low-frequency square wave lamp current. The electronic gear provides means to ignite and control the lamp. Mains and lamp power is independent of fluctuations within the performance mains voltage range. The electronic gear is compliant with all relevant lamp specifications. The product has been developed to be easily designed-in into Class I and Class II fixtures.

1.2 Version management

V 0.3 Final Version

1.3 Available Xtreme and startXtreme gears

At the date of release of this document the following gears incorporating Philips Xtreme technology are available:

Product name
Philips HID-PV Xt 45 /S COSMOPOLIS-TW
Philips HID-PV Xt 60 /S COSMOPOLIS-TW
Philips HID-PV Xt 90 /S COSMOPOLIS-TW
Philips HID-PV Xt 140 /S COSMOPOLIS-TW
Philips HID-DV LS6 60 /S COSMOPOLIS-TW
Philips HID-DV LS6 90 /S COSMOPOLIS-TW
Philips HID-DV LS6 140 /S COSMOPOLIS-TW
Philips HID-DV LS8 60 /S COSMOPOLIS-TW
Philips HID-DV LS8 90 /S COSMOPOLIS-TW
Philips HID-DV LS8 140 /S COSMOPOLIS-TW
Philips HID-DV LS10 60 /S COSMOPOLIS-TW
Philips HID-DV LS10 90 /S COSMOPOLIS-TW
Philips HID-DV LS10 140 /S COSMOPOLIS-TW
Philips HID-PV sXt 45 /S COSMOPOLIS 208-277V
Philips HID-PV sXt 60 /S COSMOPOLIS 208-277V
Philips HID-PV sXt 90 /S COSMOPOLIS 208-277V
Philips HID-PV sXt 140 /S COSMOPOLIS 208-277V
Philips HID-DV sXt 60 COSMOPOLIS / 0-6-60%
Philips HID-DV sXt 90 COSMOPOLIS / 0-6-60%
Philips HID-DV sXt 140 COSMOPOLIS / 0-6-60%
Philips HID-DV sXt 60 COSMOPOLIS / 2-6-60%
Philips HID-DV sXt 90 COSMOPOLIS / 2-6-60%
Philips HID-DV sXt 140 COSMOPOLIS / 2-6-60%
Philips HID-DV DALI Xt 45 /S COSMOPOLIS 208-277V
Philips HID-DV DALI Xt 60 /S COSMOPOLIS 208-277V
Philips HID-DV DALI Xt 90 /S COSMOPOLIS 208-277V
Philips HID-DV DALI Xt 140 /S COSMOPOLIS 208-277V
Philips HID-DV DALI Xt 50 SON
Philips HID-DV DALI Xt 70 SON
Philips HID-DV DALI Xt 100 SON
Philips HID-DV DALI Xt 150 SON
Philips HID-DV DALI Xt 50 /S CDO 208-277V
Philips HID-DV DALI Xt 70/S CDO 208-277V
Philips HID-DV DALI Xt 100 /S CDO 208-277V
Philips HID-DV DALI Xt 150 /S CDO 208-277V

2 Designing-in Low Wattage Xtreme systems

2.1 Dimensions of Philips Xtreme and startXtreme gears

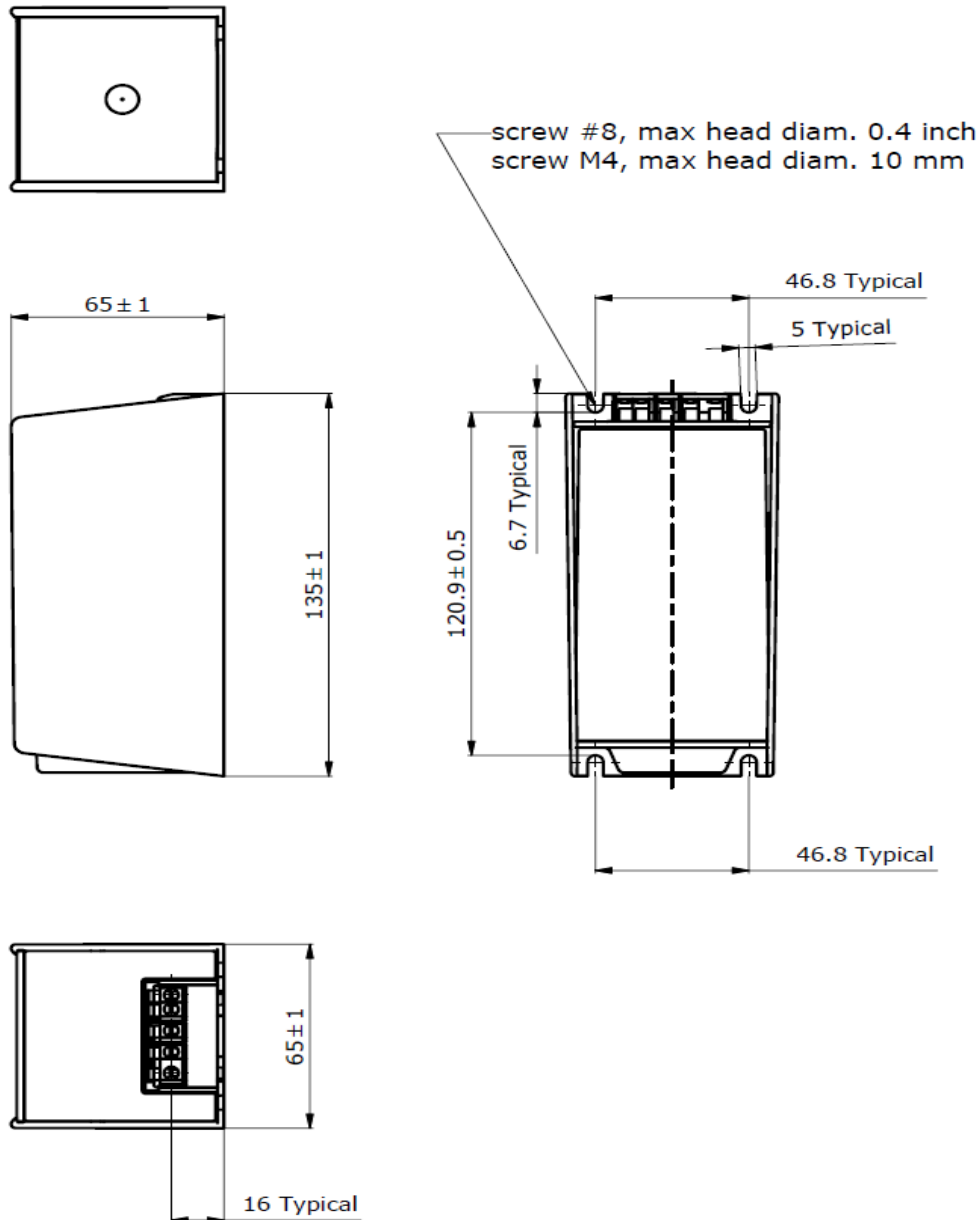


Figure 1.

All four screws are required for correct installation of the gear (for reasons of vibration/cooling)

Dimensions according to Figure 1. For the following products:

	A	B	C
Philips HID-PV Xt 45 /S COSMOPOLIS-TW	135mm	65mm	65mm
Philips HID-PV Xt 60 /S COSMOPOLIS-TW	135mm	65mm	65mm
Philips HID-DV LS6,8,10 60 /S COSMOPOLIS-TW	135mm	65mm	65mm

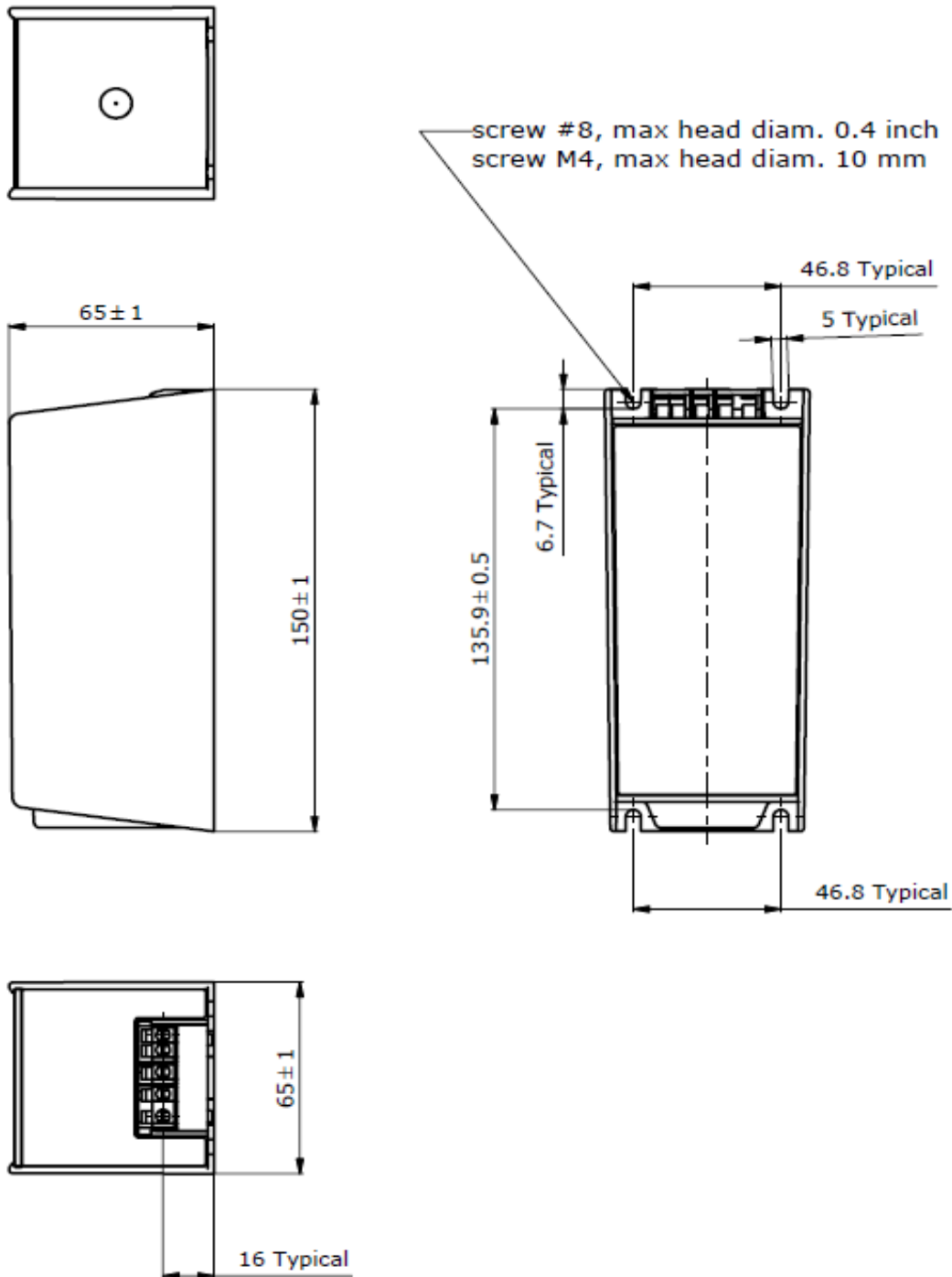


Figure 2.

All four screws are required for correct installation of the gear (for reasons of vibration/cooling)

Dimensions according to Figure 2. For the following products:

	A	B	C
Philips HID-PV Xt 90 /S COSMOPOLIS-TW	150mm	65mm	65mm
Philips HID-PV Xt 140 /S COSMOPOLIS-TW	150mm	65mm	65mm
Philips HID-DV LS6,8,10 90 /S COSMOPOLIS-TW	150mm	65mm	65mm
Philips HID-DV LS6,8,10 140 /S COSMOPOLIS-TW	150mm	65mm	65mm
Philips HID-DV sXt	150mm	65mm	65mm
Philips HID-DV DALI Xt	150mm	65mm	65mm

2.2 Mains properties

The new DynaVision gears have a wide operating voltage performance range (198-254V), Within this range the electronic gear provides an almost constant power output ($\pm 3\%$). This is favourable for lamp life and energy consumption (no overpower situation possible).

If the mains voltage falls below this specified performance range of the gear (see gear specification), the gear operates the lamp at a lower power. If the mains voltage drops below 160V or rises above 320V, the gear shuts down.

In Figure 3, the lamp power supplied by the electronic gear is shown in green as a function of mains voltage.

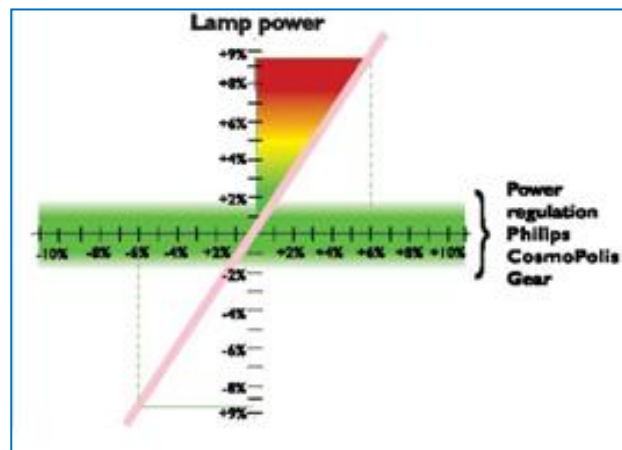


Figure 3

Mains voltage range, 208V – 277V	$P_{\text{mains_MAX}}$ [W] @ $R_{\text{sub_lamp}}$ with $P_{\text{la}} = \text{nom.}$							
Nominal output power	45W	50W	60W	70W	90W	100W	140W	150W
Nominal input power	51W	56W	67W	78W	98W	106W	153W	160W

Table 1

2.3 Mains behaviour

The absolute mains voltage range is specified as shown below. If the mains voltage is too low, the gear will dim the lamp to 50% power so as to protect it against too high an input current. If the mains voltage drops below the minimum, the gear will shut down the lamp.

Un: fn:	208V - 277V 50Hz / 60Hz	
	Min	Max
Performance input voltage range ($V_{\text{performance}}$)	187V	305V
Performance input frequency range	47.5Hz	63Hz
Operational/safety input voltage range	160V	305V
Operational/safety input frequency range	45Hz	66Hz
v_input_low_OFF v_input_low_ON v_input_high_ON v_input_high_OFF	150V \square 5% 172V \square 5% 310V \square 5% 320V \square 5%	See Figure 4
Performance mains frequency range	47.5Hz	63Hz
Operational/safety mains voltage range	160V	264V
Operational/safety mains frequency range	45Hz	66Hz

Table 2

This behaviour is represented in Figure 4:

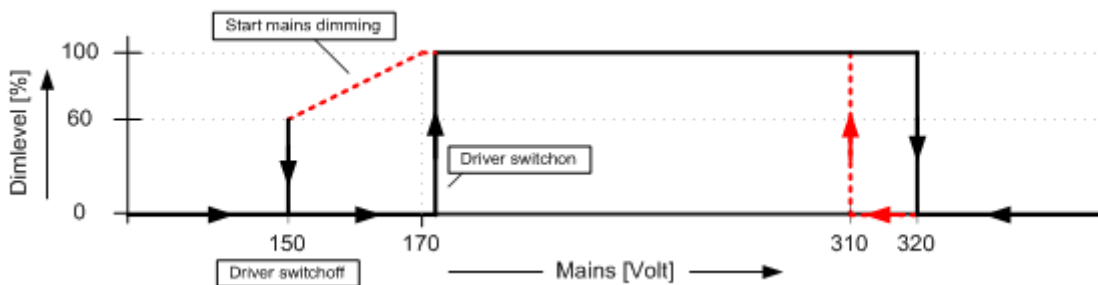


Figure 4

2.4 Inrush current

Test conditions:

$$V_{\text{mains}} = 230V$$

$$f_{\text{mains}} = 50\text{Hz}$$

$$Z_{\text{mains_nom}} = R_{\text{mains_nom}} + L_{\text{mains_nom}}$$

$$R_{\text{mains_nom}} = 0.4\Omega$$

$$L_{\text{mains_nom}} = 0.8\text{mH}$$

Inrush Current @ 230V	45W	50W	60W	70W	90W	100W	140W	150W
I mains –peak	28A	28A	28A	28A	52A	52A	52A	52A
I mains -pulse time (μs)	420μs	420μs	420μs	420μs	470μs	470μs	470μs	470μs
"number "	11	11	11	11	5	5	5	5

Table 3

2.4 Other mains properties

The earth leakage current will be smaller than 0.7mA_p.

Xtreme gear can withstand 320V for 48 hours, which in most cases is sufficient to survive a loose Neutral line.

Such high mains voltages adversely affect gear lifetime.

2.5 Connections

Connectors are 'push-in contacts' suitable for 0.5 to 2.5mm² solid or stranded wiring. When using stranded wires the contacts should be pushed in using the release button. However, ferules are advised when stranded wire is used. The wire can be released by pressing the release button and pulling the wire. The mains connections are L and N-indifferent. Lamp connections 1 and 2 are suitable for handling 4.4kV (symmetric) pulses. The strip length of all wires is 10 to 11mm.

Connector colour	Colour
Lamp 1:	Grey
Lamp 2:	Grey
Mains input (Neutral):**	Black
Mains input (Line):**	White
Dali (+) *	Blue
Dali (-) *	Blue
Functional earth	Pink

* Not present on sXt

** Orange mains input connector still used in Hid–PV Xt 45/60/90 and 140/S CPO

Table 4

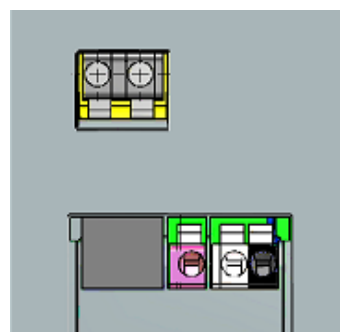
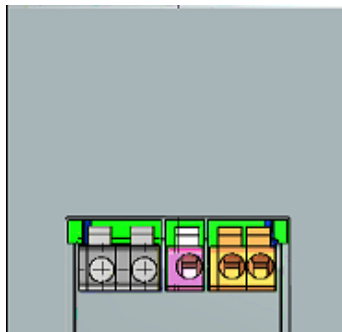
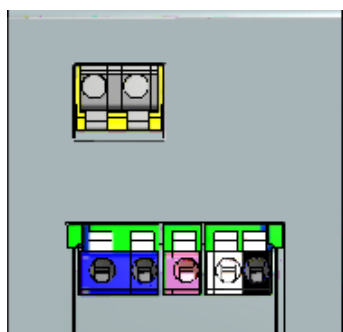
2.6 Lamp connection

The interconnection between gear and lamp has to be designed to withstand the ignition voltage. For optimal surge protection this interconnection has to withstand 8kV in respect of earth/fixture.

DALI XT

PV XT

sXT



3.1 Factors affecting lifetime

The temperature of the electronics is an important parameter for the system's lifetime and reliability. During the design stage everything possible is done to keep the component temperature as low as possible. but the design of the fixture and its ability to guide the heat out of the fixture are very important. Lifetime is based on one switching cycle per day; if more switching cycles are used this will have a negative effect on the lifetime of the gear.

3.2 Definitions

- Gear temperature: temperature measured at the Tc point of the gear.
- Gear ambient temperature: temperature inside the fixture around the gear.
- Fixture ambient temperature: temperature outside the fixture.

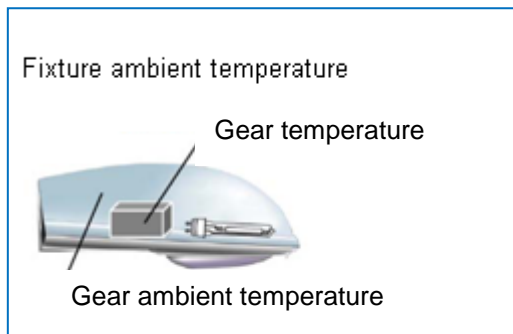


Figure 5

3.3 Temperature

The gear is designed to be cooled at the mounting surface. There is no point in cooling down the Tc point because this point is a temperature reference measurement point. The temperature measured at this point is only valid if the gear is mounted in the way that Philips designed it. If the gear has to be mounted in a different way to that described, the Philips representative should be contacted.

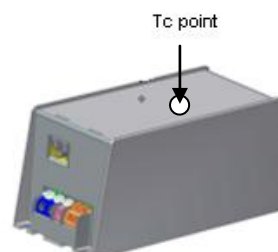
3.4 Tc temperature on Low Wattage Xtreme gear

Tc is specified at 80°C on the label of Xtreme gears. At this temperature the lifetime of 80,000 hours with 90% survivors is achieved. At 90°C the thermal protection will switch off the gear. The gear will start trying to reignite the lamp when the gear cools down to 80°C.

Example:

If in the application the Tc point is 80°C (=Tc at which the lifetime spec of **80,000 hours with 90%** survivors is achieved for CosmoWhite (s)Xtreme gear), then operating or even storing the gear at temperatures above 80°C will shorten the lifetime of the product. We therefore strongly advise that all measures be taken to avoid this possibility.

Figure 6



3.5 Recommendations for thermal design-in

- Ensure good and direct thermal contact between the gear and the coldest point on the fixture. The Low Wattage Xtreme gear is designed to comply with all the requirements for Class 1 and Class 2 applications, so direct contact with the metal parts of the fixture are allowed.
- The Low Wattage Xtreme gear contains heat-producing components in the lower part of the gear, so cooling via the bottom is required for best results.
- Shield the heat emitted by the lamp and reflector. The best way of doing this is by means of a two-chamber solution.
- In larger fixtures internal convection can be used for cooling, or special measures can be taken to transport heat away from the gear by means of airflow.

Note: If the T_c temperature limit is reached before the maximum ambient temperature mentioned on the label is reached, the temperature at the T_c point is the limiting factor in the application.

3.6 Thermal guard

If the gear temperature exceeds the maximum T_{case} , $92\pm 2^\circ\text{C}$, the thermal protection mechanism will start to dim the lamp power. For the COSMOPOLIS the lamp power will be reduced to 60% (50% light) and for SON it will be reduced to 35% (20% light). The gear will be switched off immediately when T_{case} reaches $95\pm 2^\circ\text{C}$. If the temperature drops below T_{case} $92\pm 2^\circ\text{C}$ within 25 minutes, the gear will return to full light level.

If the T_{case} falls below $80\pm 2^\circ\text{C}$, the gear will return to the previous value. Ignition is possible from -30°C upwards. At very low temperatures it may take slightly longer to ignite the lamp.

CPO	45W □ 30W	60W □ 36W	90W □ 54W	140W □ 84W
SON	50W □ 30W	73W □ 30W	98W □ 34W	147W □ 52W
CDO	50W □ 37.5W (75%) {70% light}	73W □ 55W (75%) {70% light}	100W □ 60W (60%) {50% light}	147W □ 88W (60%) {50% light}

3.7 EMC recommendations

COSMOPOLIS, SON and CDO (s)Xtreme gears operate the lamp using a low-frequency square wave.

When designing-in the gear into the fixture the guidelines below can be useful for optimising EMI performance.

- 1 Keep the mains wires (L and N) close together.
- 2 Guide the mains wires immediately away from the gear.
- 3 Preferably do not guide the wires along or on top of the gear.
- 4 Keep the lamp wires close together and as short as possible.
- 5 Do not put the lamp wires close to the mains wires.

This is shown schematically in Figure 7.

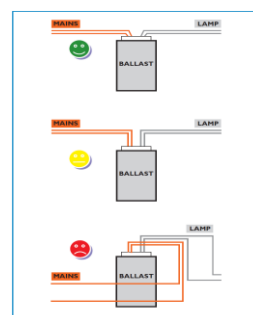


Figure 7

- 6 For optimal EMI behaviour the large metal parts on the fixture (e.g. bottom plate, etc.) must always be connected to the earth contact of the gear, irrespective of whether it is Class I or 2.

Connection of the earth terminal to the metal parts of the fixture should be kept as short as possible.

Note: It is recommended that an EMC filter should be used in order to provide sufficient design-in margin concerning EMC performance in case a combination of CDO 50W gear and a CDO 50W lamp is used.

3.8 Remote lamp operation

Remote operation is the term used for outdoor applications where the gear is not incorporated in the fixture, but, for instance, in the pole.

Two technical aspects determine whether a remote application is possible. First of all the ignition voltage peak is influenced by the cable properties. This means that the peak voltage is flattened by the cable capacity. Depending on the insulation material, some part of the ignition energy may even be absorbed by the cable. In general the cable capacity has a major influence. (s)Xtreme gear is capable of driving a cable capacity of up to 1nF. For an average cable type with a capacity of 100 pF/m this means that remote lamp operation with 10 metres of lamp cable is feasible.

A second point to be aware of is the stray capacitance of the lamp conductors to the environment. Composite or wooden poles have the advantage of having a low spreading capacity. Aluminium or steel poles will pick up more noise from the lamp cables. This disturbance has to be redirected to the gear by a short connection from the metal pole to the functional earth terminal on the gear. For remote gearing, screened lamp cables are not recommended.

To reduce the EM radiation it is recommended that a cable should be used for remote gearing instead of two separate wires.

Note: If pole-mounted, the gear should always be fitted with the connectors pointing down. This prevents moisture from entering the connector block.

3.9 Lightning strike protection

Xtreme gear is provided with a lightning strike protection circuit at its mains entrance. sXt gears do not have this extended form of lightning strike protection. They should not be used in areas prone to lightning strike or in regions with regular thunderstorm activities.

For those applications the extra robustness of the Xt gear is needed. The protection circuit is capable of absorbing at least ten times a common mode surge of 10kV/5kA (defined in EN61000-4-5 as a bi-wave surge). The protection circuit gives a substantial improvement in the survival rate after an indirect lightning strike. Absorption of the current will limit the surge voltage in amplitude and duration and is therefore crucial to the robustness of the product.

To make sure that the lightning strike protection system works as intended, the following guidelines for the fixture have to be obeyed:

- The distance from the lamp contacts to any metal part connected to the earth terminal of the gear must be >8mm and **preferably** >10mm.
- The lamp wires must have the classification 'double insulated' or 'reinforced insulation'

This is the case for both Class 1 and Class 2 fixtures. If a 'double insulated' or 'reinforced insulation' lamp wire is not used, an additional insulation sleeve must be used to provide sufficient insulation.

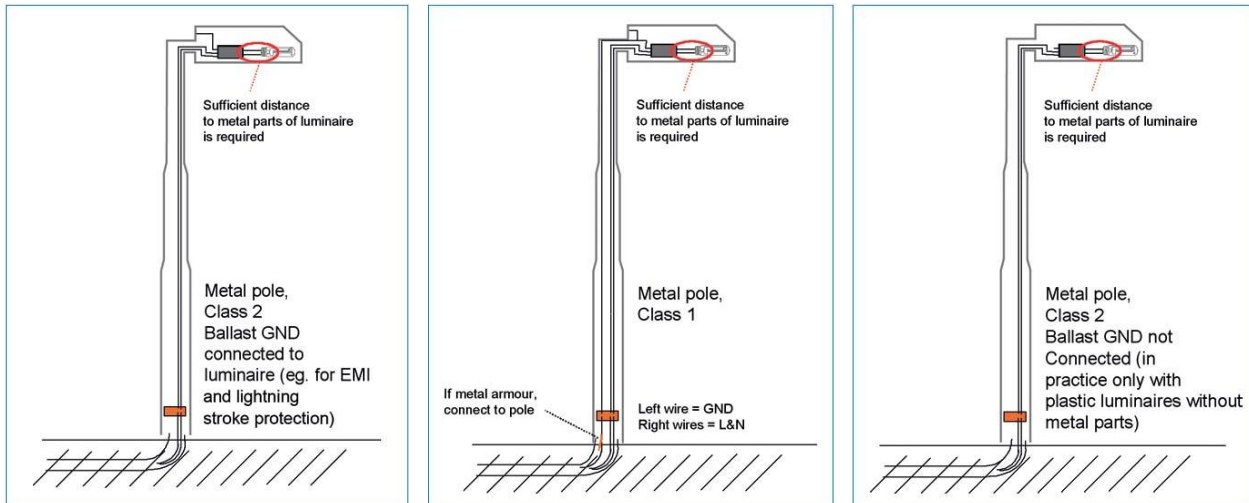
The surge caused by the lightning strike will raise the voltage of the whole system: mains supply, gear, wiring and lamp. During this high voltage surge the level can reach values of up to 8kV. No component of the system may break down until the protection circuit has diverted this surge to the gear's earth terminal, otherwise this breakdown can result in permanent damage. This means that minimum distances of 8mm are required.

The protection circuit will divert the surge current to the gear's functional earth terminal. In a Class I application this contact is not only connected to metal structures attached to the pole/fixture, but also to safety earth. It is important that this current can flow as directly back to earth as possible. For this reason the gear's earth contact must be connected to large metal parts on the fixture and if possible also to the metal pole.

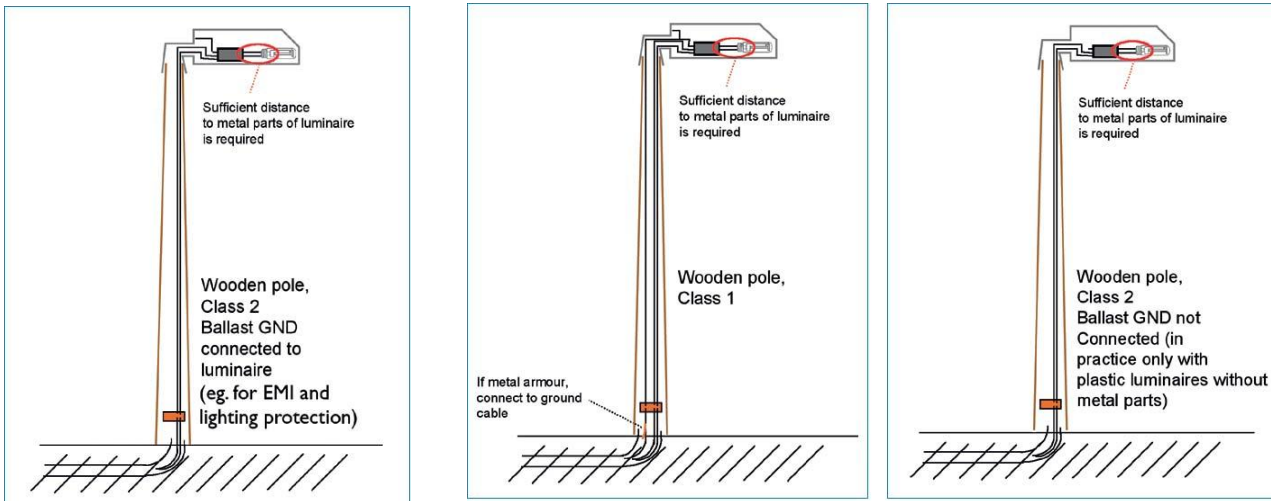
Please note that large metal parts on the fixture, such as the bottom plate, must always be connected to the gear's earth contact, regardless of whether it is Class I or 2. This is needed for EMC and optimal lightning strike protection.

Information for installers: If an earth cable with metal armour is used, the lightning protection can be improved by connecting this armour to the metal pole.

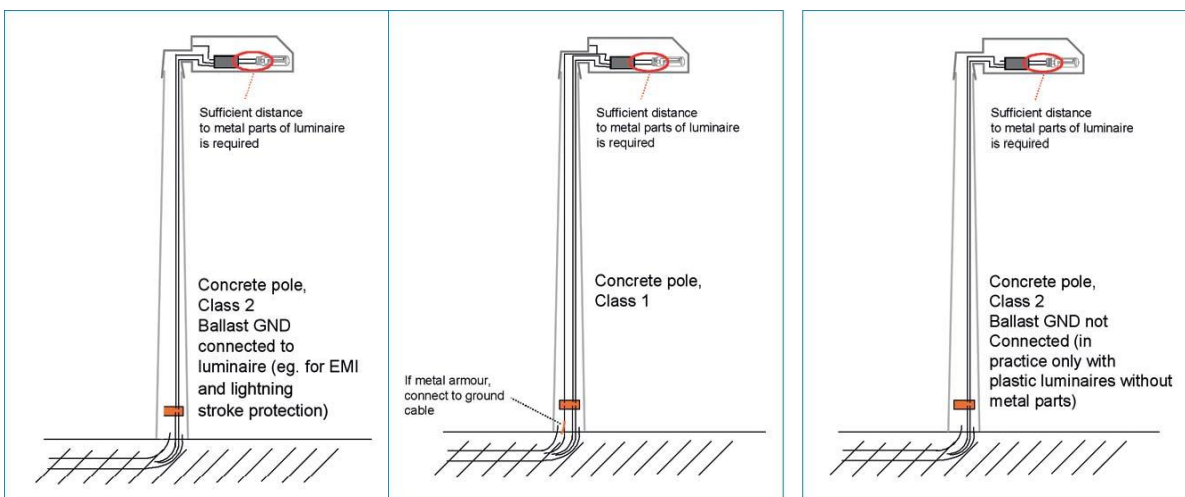
Metal pole



Concrete pole



Wooden pole



4 Fusing Low Wattage Xtreme gear

During surges on the mains network due to lightning strikes, overvoltage is limited by deriving a current between line and neutral or from line and neutral to earth. This current can have a typical wave form of 8/20µs. The protection inside the Low Wattage Xt gear can handle currents of up to 5kA. To make maximum use of this protection, fuses in front of the product have to withstand the surges, otherwise the fuse will blow or the MCB will trip. A minimum value of 350A²s for melting fuses is therefore required.

A 16-amp gG type often has values exceeding 350A²s. Using fuses exceeding 16 amps is not recommended. In the event of a failure of the surge protection inside the gear, this external fuse limits the current. It is very rare for a failure to occur. This is only possible in the case of recurrent stressing of the overvoltage protection.

For the same reason C (or B) type MCBs with a value of 16 amps have to be used.

The fuse or MCB can be mounted in the pole or in a separate gearbox. Low Wattage Xtreme gear is not intended to be used directly on a mains supply fused with values above 16 amps. If the main fuse has a value exceeding 16 amps, the gears have still to be protected by local 16-amp fuses.

Using 10 or 6-amp fuses can result in unwanted tripping during surges. In some cases, however, a 16-amp fuse cannot be used and a smaller fuse must be chosen as an alternative. This is the case if the mains fuse has a value of 16 amps and a local fuse is needed.

4.1 Fusing sXtreme gear

As sXt gear has no lightning strike protection, it can be fused normally. The nominal operating current and the inrush current determine the minimum required value.

For a single 45, 60, 90 and 140W sXt gear a 2-amp melting fuse is recommended. A single 45 or 60W sXt gear can also be protected with a 2-amp MCB.

However, for a 90 or 140W sXt gear a 4-amp MCB is needed due to the higher inrush current.

Maximum number of gears related to inrush current behind a fuse @ 230V mains							
gG type fuse	I _{2t} value	COSMOPOLIS 45/60	COSMOPOLIS 90/140	SON 50/70	SON 100/150	CDO 50/70	CDO 100/150
10A	120	17	9	17	9	17	9
16A	370	25	16	25	16	25	16
20A	670	40	22	40	22	40	22
25A	1200	53	30	53	30	53	30
32A	2200	72	40	72	40	72	40

Table 6

5 Class I and Class II applications

(s)Xtreme gears are compliant with Class I and Class II applications.

Looking from the mains side, the differences between Class I and Class II are as follows: In a Class I application the mains always has a safety earth conductor. All metal parts that can become live in a fault condition are connected to safety earth. Class II equipment has no protective earth terminal (PE). In Class II applications safety is guaranteed by double or reinforced insulation of active conductors.

Class I

In Class I applications all touchable metal parts have to be connected to safety earth. This prevents the parts from becoming live in the event of a failure. First of all the voltage is limited to a low, safe level. After a short time, the fuse protecting the mains will blow or the MCB will trip. Low Wattage Xt gear has a functional earth connector (FE). This connector is pink in colour to distinguish it from a PE connector, which is often green or green/yellow. The functional earth terminal has to be connected to the metal structure for EMC and surge voltage protection reasons. By doing so, the functional earth of the gear is connected to safety earth. But the connector on the gear still has only a functional purpose and is not safety-related.

Class II

In Class II applications no safety earth is present, so a single fault can never cause touchable metal parts to become live. The circuitry inside the gear provides an insulation value that meets Class II specifications. Connecting the functional earth terminal to the metal structure for EMC and surge voltage protection reasons will not violate Class II regulations. The earth terminal of the gear has only a functional earth purpose and must be connected to a large metal part to withstand lightning strikes. The Low Wattage Xt-gear's housing meets Class II specifications, except for the mechanical/electrical connection of wires. The OEM is responsible for the strip length and connection of wires.

5.1 Compliance to Class I/ Class II with maximum performance on EMC

By following the advice below, the (s)Xt gear will comply to Class I or II regulations and will have maximum performance on EMC and also surge voltage protection (Xt gear). The robustness of the Xt gear can only be guaranteed if the following measures are taken:

- The distance from bare mains conductor parts to any metal part should be at least 8mm and preferably 10mm.
- The distance from bare lamp circuit parts to any metal part should be at least 8mm and preferably 10mm.
- All wiring should be of the double or reinforced insulation type.
- All metal parts in the fixture should be connected to the gear's functional earth terminal, regardless of whether the application is Class I or Class II.
- Putting a sleeve around the lamp wires can provide extra insulation in the event of surge voltages and keeps the conductors together for EMC at the same time.
- The dotted line (see Figure 8) shows the difference between Class I and Class II.

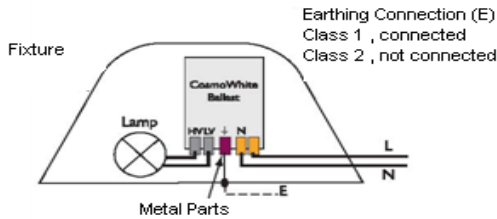


Figure 8

6 Operating in abnormal conditions

6.1 End-of-life behaviour of Philips Xtreme and startXtreme systems

End-of-life causes

The reasons why COSMOPOLIS, CDO and SON lamps may stop functioning after their specified lifetime are similar to the mechanisms for most HID lamps.

Due to chemical reactions between the arc tube filling and the PCA of the tube, the tube will become leaky. The hot gases will flow through this leak into the outer bulb, noticeable as a weak discharge in the outer bulb. In principle, it cannot be excluded that the PCA will break and hot PCA parts may cause a rupture of the COSMOPOLIS, CDO and SON lamps or outer bulb ("non-passive failure"). However, limited containment safety testing has not shown any "non-passive failures" with COSMOPOLIS and CDO lamps. For SON lamps this risk will be even less and can be disregarded.

If the arc tube of a COSMOPOLIS, CDO or SON lamp becomes leaky, the lamp stops functioning. However, in some cases the lamp continues burning for a few hundred hours with a very different colour before it eventually stops completely. Conversely, when a lamp operates with a very different colour, this might be an indication of the arc tube being leaky. SON lamps will not change colour.

The lamp voltage of COSMOPOLIS and CDO lamps and the voltage of SON lamps can rise too much to be sustained by the gear. This voltage rise can be caused by a change in the chemical composition during lifetime or by electrodes wearing out. If a lamp voltage becomes too high, the lamp will stop working.

6.2 End-of-lamp behaviour

When the arc tube becomes leaky and the fill gas flows into the outer bulb, a glow discharge could appear around the metal parts in the outer bulb.

The glow discharge is not harmful to any part of the system because the glow effects are limited in time by a timing function in the electronic gear that switches off the circuit after 20 minutes in the event of a leaky lamp. However, it is advisable to replace end-of-life lamps as soon as possible.

Over time the lamp voltage will increase and at some point it will reach too high a value: when this occurs the gear will switch off the system. This status will be reset after the mains has been switched off and on again to prevent disturbing cycling effects (lamps switching on and off continuously).

6.3 Lamp-gear combination mismatch

	Philips CosmoPolis 45W gear	Philips CosmoPolis 60W gear	Philips CosmoPolis 90W gear	Philips CosmoPolis 140W gear
Philips CosmoWhite 45W lamp	Ok	Stable lamp operation at 60W (overpower!) Lifetime of lamp will be reduced.	Stable lamp operation at 90W (overpower!) Lifetime of lamp will be reduced.	Stable lamp operation at 140W (overpower!) Lifetime of lamp will be reduced.
Philips CosmoWhite 60W lamp	Stable lamp operation at 45W	Ok	Stable lamp operation at 90W (overpower!) Lifetime of lamp will be reduced.	Stable lamp operation at 140W. Lifetime of lamp will be reduced drastically. Extinguishing is possible.
Philips CosmoWhite 90W lamp	Stable lamp operation at 45W, but greenish colour appearance (power too low). Lamp extinguishing is possible.	Stable lamp operation at 60W	Ok	Stable lamp operation at 140W (overpower!). Lifetime of lamp will be reduced.
Philips CosmoWhite 140W lamp	Stable lamp operation at 45W, but greenish colour appearance (power too low). Lamp extinguishing is possible.	Stable lamp operation at 60W, but greenish colour appearance (power too low). Lamp extinguishing is possible.	Stable lamp operation at 90W.	Ok

Table 7

	Philips Xt SON 50W gear	Philips Xt SON 70W gear	Philips Xt SON 100W gear	Philips Xt SON 150W gear
Philips SON 50W lamp	Ok	Stable lamp operation at 70W (overpower!) Lifetime of lamp will be reduced.	Stable lamp operation at 100W (overpower!) Lifetime of lamp will be reduced drastically. Extinguishing is possible.	Stable lamp operation at 150W (overpower!) Lifetime of lamp will be reduced drastically. Extinguishing is possible.
Philips SON 70W lamp	Stable lamp operation at 50W	Ok	Stable lamp operation at 100W (overpower!) Lifetime of lamp will be reduced.	Stable lamp operation at 150W. Lifetime of lamp will be reduced drastically. Extinguishing is possible.
Philips SON 100W lamp	Stable lamp operation at 50W	Stable lamp operation at 70W	Ok	Stable lamp operation at 150W (overpower!). Lifetime of lamp will be reduced.
Philips SON 150W lamp	Stable lamp operation at 50W (power too low). Lamp extinguishing is possible.	Stable lamp operation at 70W	Stable lamp operation at 100W	Ok

Table 8

	Philips Xt CDO 50W gear	Philips Xt CDO 70W gear	Philips Xt CDO 100W gear	Philips Xt CDO 150W gear
Philips CDO 50W lamp	Ok	Stable lamp operation at 70W (overpower!) Lifetime of lamp will be reduced.	Stable lamp operation at 100W (overpower!) Lifetime of lamp will be reduced.	Stable lamp operation at 150W (overpower!) Lifetime of lamp will be reduced.
Philips CDO 70W lamp	Stable lamp operation at 50W	Ok	Stable lamp operation at 100W (overpower!) Lifetime of lamp will be reduced.	Stable lamp operation at 150W. Lifetime of lamp will be reduced drastically. Extinguishing is possible.
Philips CDO 100W lamp	Stable lamp operation at 50W, but greenish colour appearance (power too low). Lamp extinguishing is possible.	Stable lamp operation at 70W	Ok	Stable lamp operation at 150W (overpower!). Lifetime of lamp will be reduced.
Philips CDO 150W lamp	Stable lamp operation at 50W, but greenish colour appearance (power too low). Lamp extinguishing is possible.	Stable lamp operation at 70W, but greenish colour appearance (power too low). Lamp extinguishing is possible.	Stable lamp operation at 100W.	Ok

Table 9

Tables 7, 8 and 9: Effects of possible combinations

Note: It is strongly advised that an EMC filter should be used in order to provide sufficient design-in margin concerning EMC performance in case a combination of CDO 50W gear and a CDO 50W lamp is used. Please contact your Philips salesperson for more info on what sort of filters should be used for these circumstances.

Interchanging SON, CPO and CDO lamps is not likely to occur because of different lamp holders.

Especially during re-lamping this will not occur.

The OEM should take care that the right gear is built into the fixture.

7. Dimming functionality of Low Wattage Xtreme

The dimming functionality is enabled by DALI. The DALI functionality complies with the HID Standard Commands IEC 62386-203. The DALI standard is described in the following DALI documents:

- General requirements – System, part [101];
- General requirements – Control gear, part [102];
- Particular requirements for control gear – Discharge lamps (excluding fluorescent lamps) (device type 2), part [203];

This design-in document will not discuss any of the above documents. To get access to the above documents they must be ordered from the DALI consortium (www.dali-ag.org).

The DALI input has the following electrical properties:

- Insulation: basic insulation IEC 61347-2-3 clause 15
- Current consumption: $\leq 2\text{mA}$
- Input voltage: $\leq 250\text{Vac}$ (transient protected)
- Control signalling: DALI to IEC 62386
- Lightning protection 10kV/5kA

COSMOPOLIS lamps cannot be dimmed during run-up. Often this will cause unstable lamp operation, resulting in lamps being extinguished. For this reason dimming is blocked by the gear during the run-up time of COSMOPOLIS lamps. SON lamps can be dimmed immediately. This means that SON Low Wattage Xtreme gear will immediately run up the lamp to the desired dimmed level. Table 10 indicates typical values when changing from full-power mode to reduced-power mode (dimming):

Fade-up/down timings (typical values) when changing from full-power mode to reduced-power mode (dimming)

Item	Description	CP0				Son				CD0				Unit
		45W	60W	90W	140W	50W	70W	100W	150W	50W	70W	100W	150W	
	Power dim percentage	67%	60%	60%	60%	60%	40%	35%	35%	75%	75%	60%	60%	
	DALI / light dim percentage	55%	50%	50%	50%	50%	25%	20%	20%	70%	70%	50%	50%	
Fade-down rate	Time between full power and reduced power	80	90	90	90	35	60	70	70	56	56	90	90	sec
Fade-up rate	Time between reduced power and full power	6	6	6	6	4	5	5	5	5	5	6	6	sec
Dim delay	Time after ignition phase before the driver can be dimmed	300	300	300	300	0	0	0	0	300	300	300	300	sec

Table 10

Arc power as a function of Dali steps for Son, CPO and CDO:

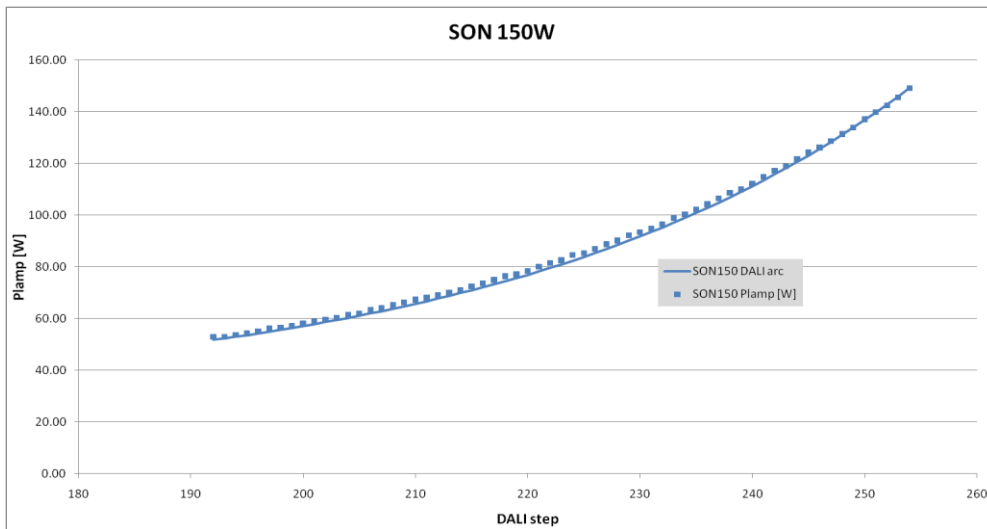


Figure 9

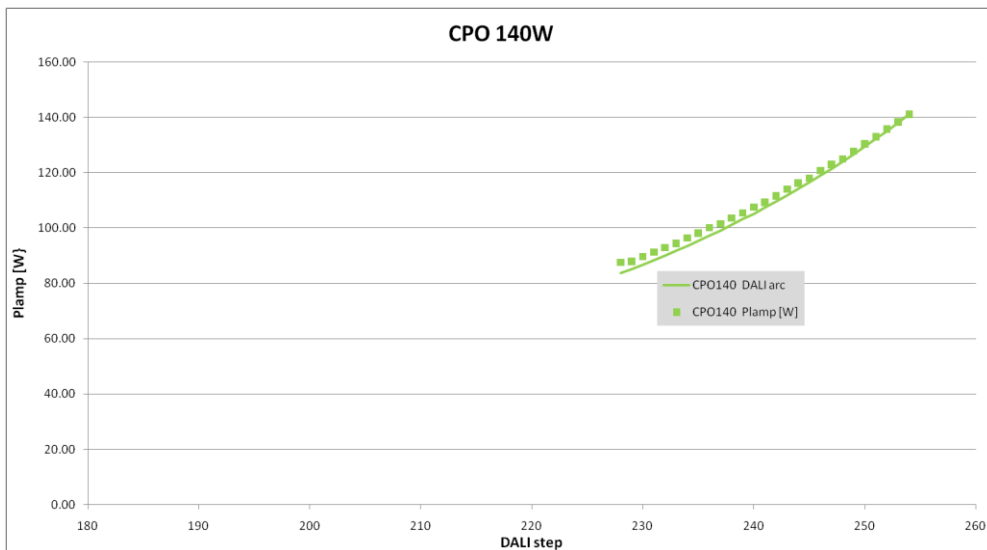


Figure 10

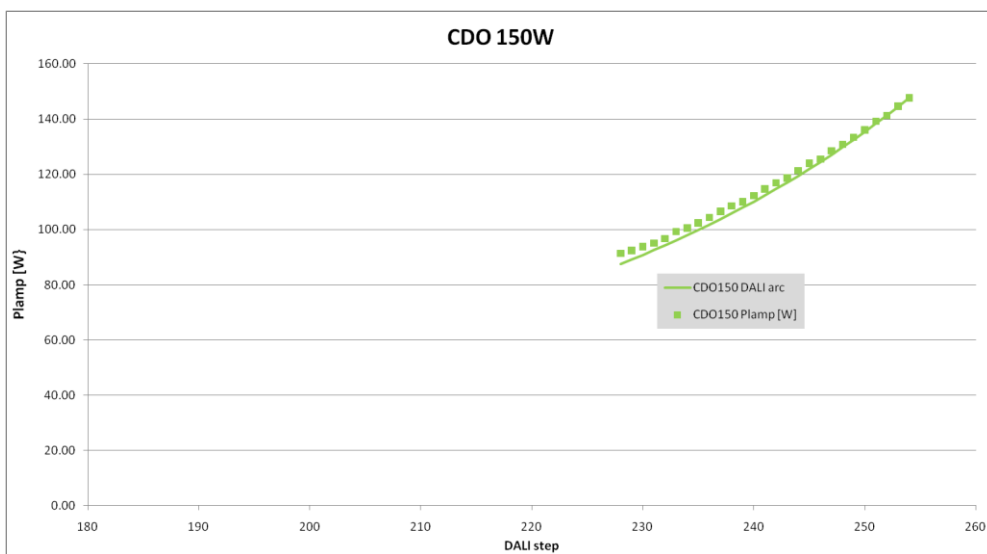


Figure 11

Power consumption with nominal lamp under dimming conditions.

HID-DV DALI Xt ---/S COSMOPOLIS 208-277V

			Power [W] @ dimming level							
		Mains voltage range (208V-277V)	Input power	Output power	Input power	Output power	Input power	Output power	Input power	Output power
DALI level	Light level	Output power	45W		60W		90W		140W	
254	100%	100%	51W	45W	67W	60W	98W	90W	153W	140W
240	69%	75%	-	-	50.5W	45W	-	-	-	-
234	55%	66%	35W	30W	-	-	-	-	-	-
228	50%	60%	n.a.	n.a.	41W	36W	59W	54W	92W	84W

Table 11

DV DALI Xt *** SON

			Power [W] @ dimming level							
		Mains voltage range (208V-277V)	Input power	Output power	Input power	Output power	Input power	Output power	Input power	Output power
DALI scale	Light level [100%]	Output power	50W		70W		98W		147W	
254	100%	100%	56W	50W	78W	70W	106W	98W	160W	147W
228	50%	60%	35W	30W	-	-	-	-	-	-
208	29%	43%	n.a.	n.a.	35W	30W	-	-	-	-
193	19%	35%	n.a.	n.a.	n.a.	n.a.	40W	34W	59W	52W

Table 12

DV LS sXt *** COSMOPOLIS / *-6-60%

			Power [W] @ (LumiStep) dimming level					
		Mains voltage range (208V-277V)	Input power	Output power	Input power	Output power	Input power	Output power
	Light level [100%]	Output power	60W		90W		140W	
	100%	100%	67W	60W	98W	90W	153W	140W
	50%	60%	41W	36W	59W	54W	92W	84W

Table 13

DV DALI Xt *** CDO

			Power [W] @ dimming level							
		Mains voltage range (208V-277V)	Input power	Output power	Input power	Output power	Input power	Output power	Input power	Output power
DALI scale	Light level [100%]	Output power	50W		73W		100W		147W	
254	100%	100%	56W	50W	81W	73W	108W	100W	160W	147W
240	68%	75%	42W	37W	61W	55W				
228	50%	60%					67W	60W	96W	88W

Table 14

Outdoor (Son CDO CosmoPolis) will convert to light level with conversation between light power as given in figure below.

For each lamp type a minimum power level has been defined and will not be changed.

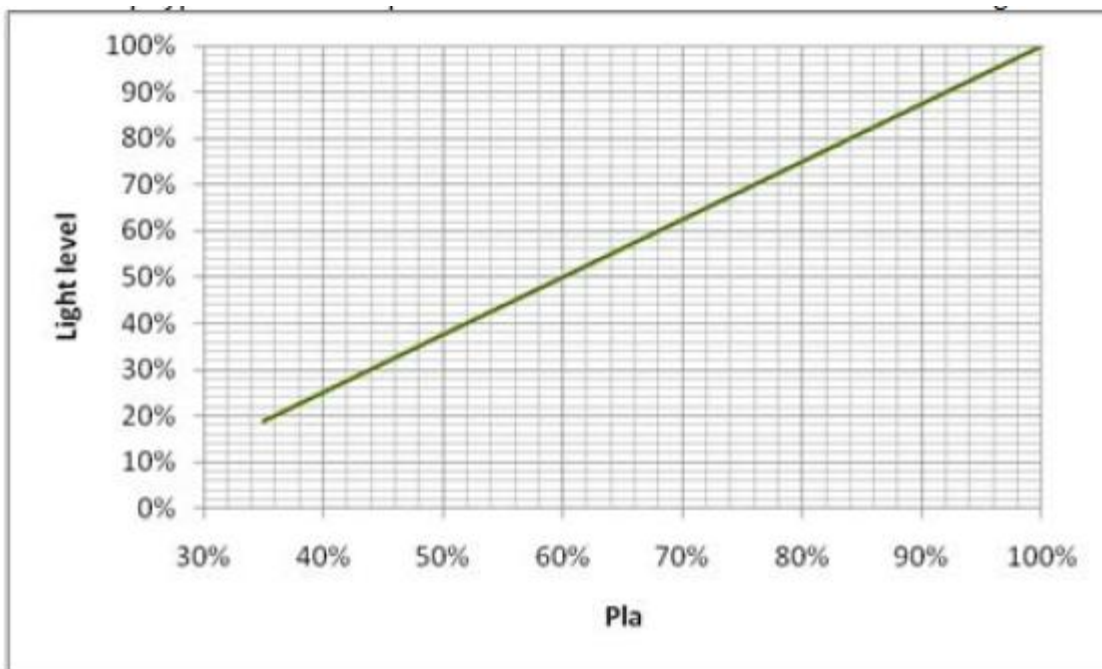


Figure 12

The lamp can be switched off with a DALI command and the gear will go into standby mode..In this standby mode the nominal standby power losses are 800mW +/- 10%.

Warnings

- DO NOT CONNECT THE OUTPUT TERMINAL TO THE INPUT VOLTAGE
- DO NOT SHORTCIRCUIT THE OUTPUT TERMINAL TO EARTH
- DISCONNECT INPUT VOLTAGE BEFORE INSTALLING OR REPLACING
- POWER MUST BE RESET AFTER REPLACING LAMP
- TO PREVENT WATER TRAPS, DO NOT MOUNT THE CONNECTORS POINTING UPWARDS
- DISPOSE OF ANY REPLACED BALLASTS AND LAMPS PROPERLY
- FUNCTIONAL EARTH TERMINAL MEETS DOUBLE INSULATION REQUIREMENT
- ALWAYS CONNECT THE EARTH TERMINAL TO ENABLE THE LIGHTNING STRIKE PROTECTION
- **DO NOT!** PERFORM COMBINED (SIMULTANEOUS) FUNCTIONAL TEST AND INSULATION TEST OF THE GEAR WITH REVERSED LAMPS AND MAINS WIRING. IT CAN CAUSE SEVERE SITUATIONS

8 Disclaimer

Philips will perform the testing of the fixture 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 report regarding the testing of the fixture 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 report 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 report or any other advice, or the conclusions and/or recommendations in the design-in report 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 report 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 reports 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 must be filed within one (1) year of the date of the claim. Any claims that have been brought or filed in conflict with the preceding sentence are null and void.

Appendix

1. **How to use DynaVision Xtreme gear with Line Switch**
2. **How to switch from standard DV gear to DV Xt gear**
3. **Programming DynaVision Dali Xt**
4. **Overview of Dimming HID system**

Appendix 1

How to use DynaVision Xtreme gear with Line Switch.

1.1 Introduction

This document describes how to replace the existing analog systems that have electromagnetic or HID DynaVision 1-10V by an HID DynaVision DALI Xtreme lamp driver.

1.2 Version management

13-12-2010: Version 0.1
Initial document

1.3 Present situation

At this moment it is possible to dim a SON or CDO-TT/ET lamp by switching a second power line in the installation. The pictures below show which configurations are available:

1. for high-pressure sodium on electromagnetic ballast:

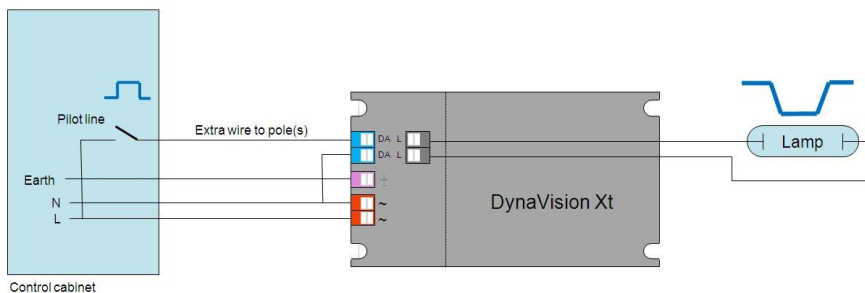


2. for high-pressure sodium and master colour on electronic lamp driver:

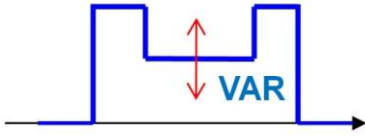


1.4 How to use a DynaVision Xtreme lamp driver instead

The DALI input of the DynaVision Xtreme lamp driver can be directly connected to the Line Switch after the lamp driver has been configured regarding how to respond to this pilot signal.



The dim level and fade time are variable and must be configured before installation.



The DynaVision Xtreme DALI lamp driver is available for SON, CDO and CPO.

1.5 Line Switch Technical Requirements

The wiring to the dim input of an Xtreme DALI lamp driver must fulfil at least the following requirements:

- Suitable for mains voltage (insulation); copper diameter is not critical because it is a signal line and the running current can be neglected.
- The total cable length of the pilot line may not exceed 56 metres per lamp driver (so for 10 lamp drivers 560 metres of cable is the maximum). This is the length of the cable from lamp driver to lamp driver, so the cables in the lamp posts (if the lamp driver is mounted inside the luminaire) have to be included. For example: if 8-metre lamp posts are used, with a gap of 40 metres in between, the cable length used is just on specification ($2 \times 8 + 40 = 56$ metres to get from one lamp driver to the next).
- If longer cables are being used, a parallel capacitor of 2uF has to be added to avoid residual voltage on the pilot line when switched off, to which the ballast could respond wrongly.

1.6 Benefits

- Reduction of used components
- Less wiring complexity
- Adjustable dim level and fade times
- Also available for CPO

1.7 For more information

- Please contact your local sales representative.
- Check OEM application guide for general information about electronic gear
- Visit our website: http://download.p4c.philips.com/l4bt/3/334083/334083_ffs_aen.pdf

Appendix 2

How to switch from standard DynaVision gear to DynaVision Xtreme gear

2.1 Introduction

This document describes the problems you will face when replacing existing HID PV and DV electronic lamp drivers by an HID PrimaVision or DynaVision DALI Xtreme lamp driver.

2.2 Version management

8-2-2011: Version 0.1

Initial document

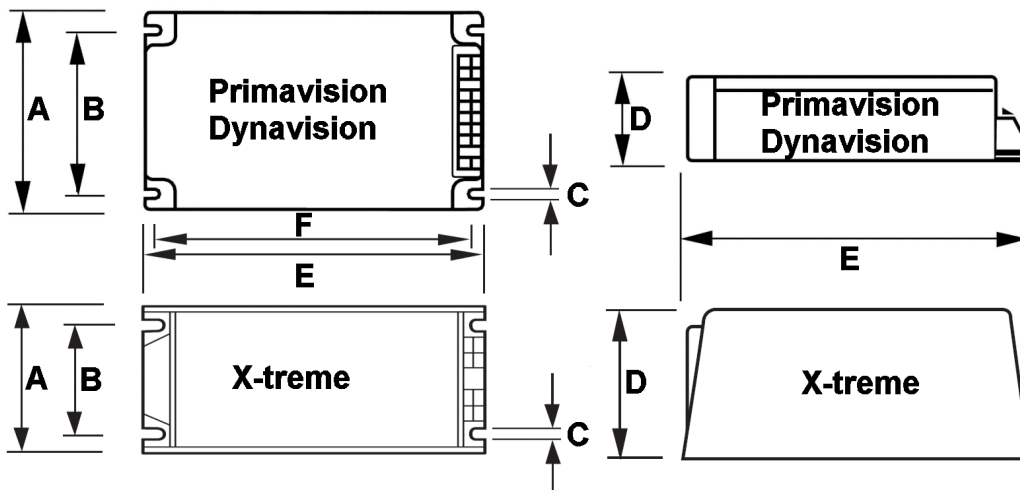
2.3 Present situation

Philips is currently phased over from HID PrimaVision and DynaVision electronic lamp drivers (also known as 'GEN3') to HID PrimaVision and DynaVision **DALI Xtreme** lamp drivers. Electrically, this will be a minor issue, but for systems that previously used a stepless 1-10V dim signal there is no alternative available. If the 1-10V dim signal was generated by an SDU 01/11, please see application note: 'How to use DynaVision Xtreme ballast with Line Switch'.

2.4 Mechanical outline

The height and footprint of the Xtreme lamp driver are different to the PrimaVision / DynaVision non-Xtreme lamp driver.

See pictures below for the differences



	Philips HID-PV / DV	Philips HID-PV / DV Xtreme	
A	90mm	65mm	Width
B	70mm	47mm	Spacing between mounting holes
C	4.5mm	5mm	Diameter of mounting hole
D	40mm	65mm	Height
E	150mm	150mm	Length
F	134mm	135mm	Distance between mounting holes

The main differences are the height and width of the new Xtreme lamp driver.

The length (and distance between the mounting holes in the longitudinal direction) is approximately as it was before.

2.5 Application temperature difference

The present HID PrimaVision and DynaVision lamp driver has a T-case max of 100°C and a T-case life of 90°C. This means that at T-case = 90°C the lifetime will be 50,000 hours (90% survivors), and the lamp driver will switch off as soon as T-case exceeds 100°C.

The new HID PrimaVision and DynaVision Xtreme lamp driver has a T-case life and max of 80°C. This means that at T-case = 80°C the lifetime will be up to 80,000 hours¹ (90% survivors; 1 cycle per 12 hrs.) and the lamp driver will switch off as soon as T-case exceeds 92 (+/-2)°C.

2.6 Benefits of Xtreme lamp driver

- Longer lifetime.
- Robust topology with lightning protection.
- Less wiring complexity (in the case of, say, Line Switch dimming)

2.7 For more information

Please contact your local sales representative.

See the Xtreme video: http://www.lighting.philips.co.uk/subsites/oem/product_pages/cosmopolis_movie.wpd

Check OEM application guide for general information about electronic gear.

Visit our website: http://download.p4c.philips.com/l4bt/3/334083/334083_ffs_aen.pdf

¹ depends on lamp driver version

Appendix 3

DynaVision Dali Xtreme - Programmable Drivers

DynaVision DALI drivers can now be programmed using:

- the DALI programmer
- the DynaVisionPC tool

Please contact your Philips person to get either of these.

3.1.1 Features available for programming

The DynaVisionPC tool can be used to customise various driver coordinates:

- Enable / disable Dynadimmer
- Enable / disable Line Switch
- Change lamp type (SON or CPO types)

3.1.2 The Dynadimmer functionality

The Dynadimmer is a functionality available in all DynaVision DALI Xt drivers. It allows drivers to dim according to a programmable dimming schedule. The Dynadimmer dimming schedule is flexible: up to five dimming levels and five time periods. Easy-to-operate PC-based software and programming equipment enable users to re-program the dim times and dim levels as and when they wish.

3.1.3 The Line Switch functionality

The Line Switch is a functionality available in all DynaVision DALI Xt drivers. It can be enabled and programmed using the DALI programming tool. It is a simple dimming solution that enables the end user to control the dimming schedule from a distance. The trigger for the functionality is the introduction of mains V into the Dali lines. The dimming level is limited to the lamp's minimum dimming levels (see Appendix 4).

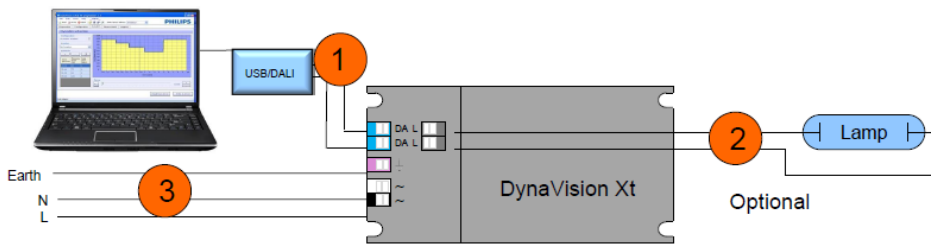
3.1.4 Installation of software and drivers

Install the DynaVision.exe file (the DynaVisionPC tool) – double-click on the setup file. Connect the USB port of the DALI Programmer to your computer - allow Windows to search for the interface drivers on the Internet.

Note Once everything is installed correctly, a red LED should come on (under the plastic housing).

Connecting the driver

Connect the DV DALI Xt driver to the DALI Programmer using two wires – connecting a lamp is only necessary for demo purposes. Connect the driver to the mains.

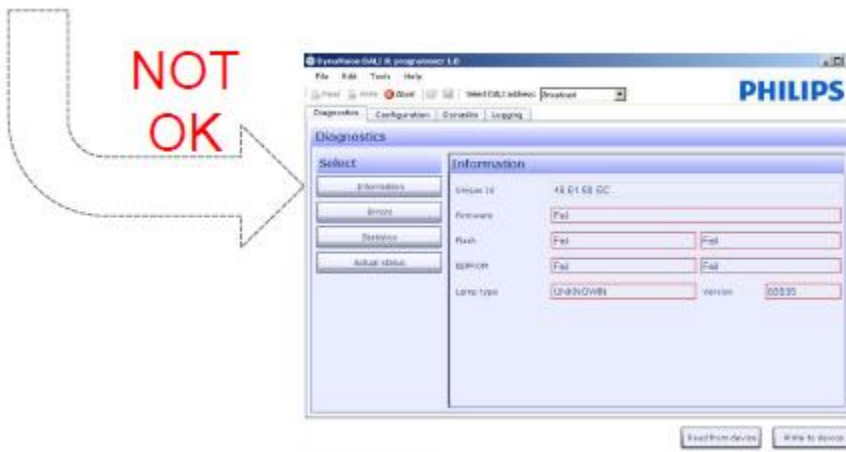
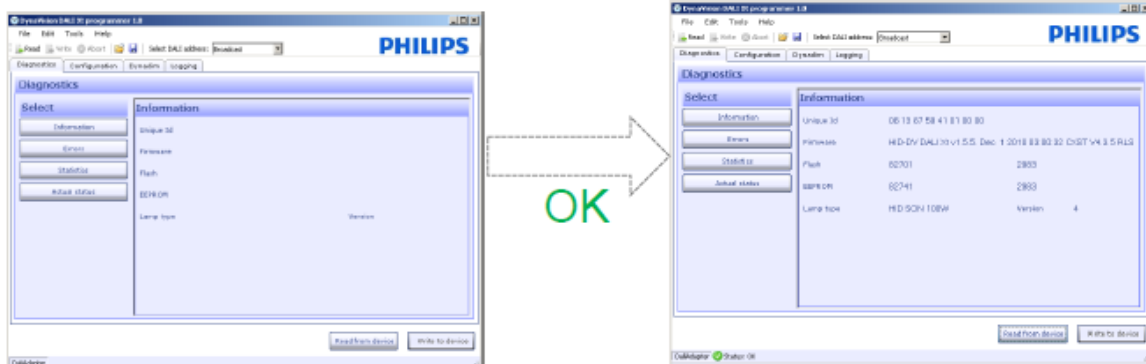


Starting the PC Tool

After installation you will find a help file in C:\Program Files\Philips\DynaVision Xtreme\Help. Follow the steps as described in the help manual to set up the connection to the interface.

Checking the connection

When all the connections have been made, go to the Diagnostics tab and click on the READ button. The screen will fill with data read out from the driver.

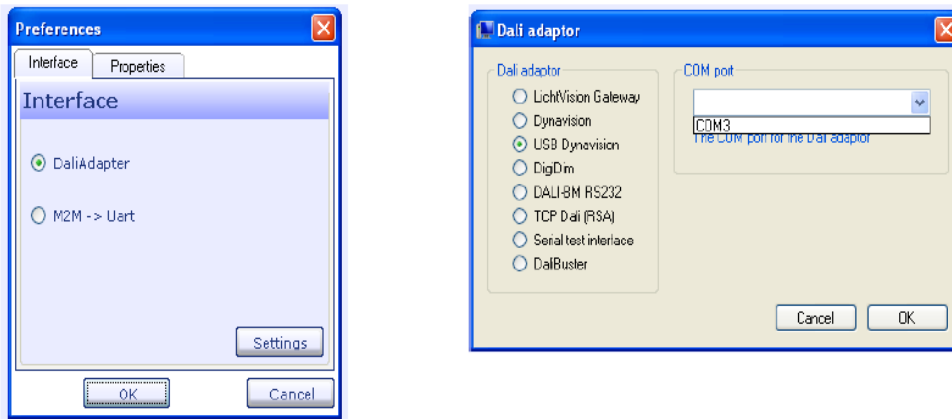


One of the most common problems is the selection of the COM port or the production date of the driver (>1036)

Selecting the correct COM

- Go to Tools -> Preferences
- On the Interface tab choose "DaliAdaptor" and click on "Settings"
- Choose USB DynaVision

- From the COM port list choose the port with the highest number*



*Sometimes this is not the correct COM. To discover the correct one, see the last page of this appendix.

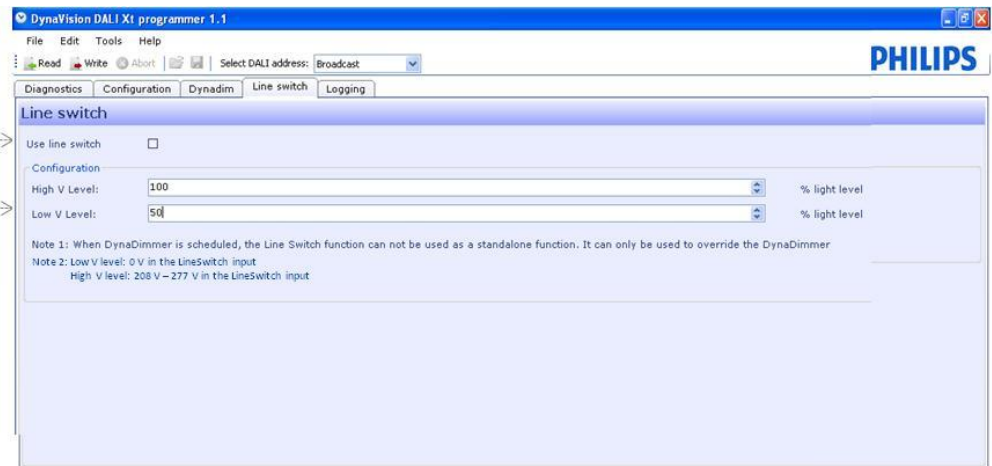
3.2.1 Programming the DynaDimmer functionality

1. Open the DynaDim Tab and
"Read from Device" the previous schedule.
2. Enable the DynaDimmer Functionality
3. Pick the country in which the driver will be functioning
4. To add one more steps in the DynaDimmer program press on the "+" button
5. To delete one step in the DynaDimmer program click on the step you want to delete and press on the "-" button
6. When your DynaDimmer program looks according to your requirements click on "Write on device" and you are DONE.

3.2.2 Programming the Line Switch functionality

1 Enable the Line Switch functionality

3 Set the desired dimming levels.



In the configuration from the figure

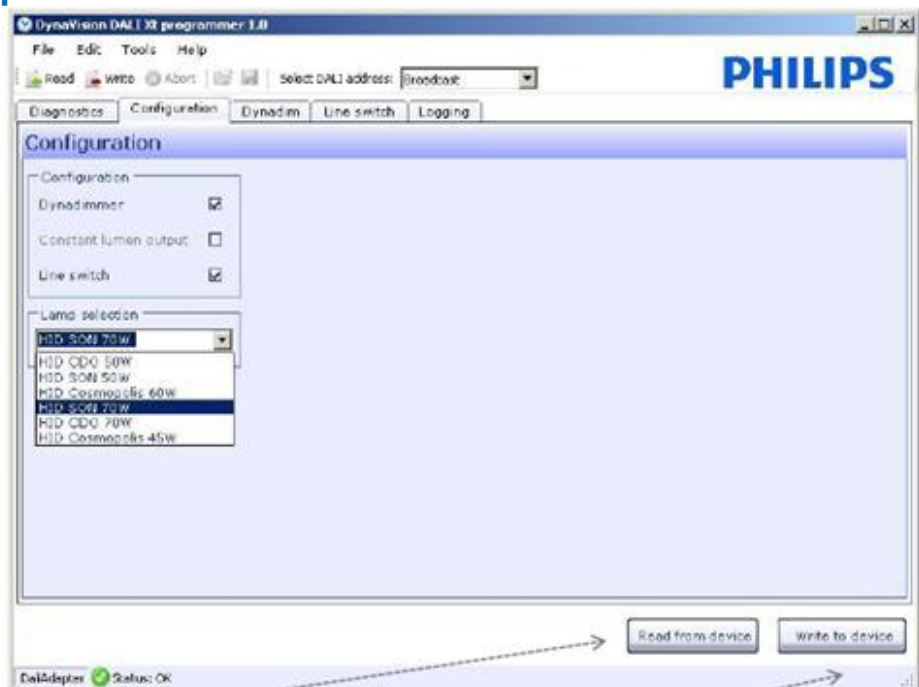
- When input of 208-277V in DALI connections => driver will go to 100% of lamp power
- When input of 0V in DALI connections => driver will dim to 50% of lamp power

2 Read from Device – to make sure the software is in line with the driver's settings

4 Write to Device – to set the new configuration inside the driver and you are DONE.

3.2.3 Changing lamp type

1. Select the desired lamp type



2. Read from device – the lamp types supported by the driver

3. Write to device the desired settings, and you are done

Changing the lamp settings of the DynaVision DALI drivers



Category	Driver	Cosmo	CDMe	CDO+	SON
1	45-70	45 W 60W		50W 70W	50W 70W
2	90-100	90W		100W	100W
3	140-150	140W		150W	150W
4	210-250	210W	210W	250W	250W

You can change the lamp coordinate of your driver into any of the lamp types from the same category. E.g. change a DV DALI Xt45W CPO driver into an DV DALI Xt50W SON.

Important Note



Always check the status of the functionalities of the HID Dynavision Xtreme lamp driver (for example the Dynadimmer functionality, the lamp settings, etc) and ensure the necessary configuration thereof, all in accordance with the Dynavision XT programmer manual, the Xtreme design-in guide and the intended use, before connecting to a lamp or making any other use of the lamp driver. Philips does not accept any responsibility or liability for any defects or damages caused by disregarding this Dynavision XT programmer manual or the Xtreme design-in guide.

Appendix 4

Overview of dimming HID system

- SON lamps can be dimmed on EM and EL systems. CDO, CDMe and CPO lamps can be dimmed on EL only!
- The optimal method of dimming is with electronics.
- Please allow 2-5 minutes for any system to dim down from 100% to the minimum (allowed) level
- EL high-frequency dimming could introduce resonance into the discharge arc, which could result in a disruptive end-of-lamp life, and is therefore not recommended.
- Philips can offer an electronic dimmable driver for all new outdoor HID lamps.
- The new CDO lamps can be dimmed using Philips Xtreme drivers.
- CDO lamps cannot be dimmed in combination with EM gear.

Dim level/ lamp type

	Dimming Method	Types	Min dim level		Ra		Tc		Lifetime (5%)		Maintenance	Time to dim
			Power	Light	100%	Min level	100%	Min level	100%	Max dimmed 50% of life	Max dimmed 50% of life	
SON	Elect	50W	60%	50%	20	<10	2.000	2.000	16.000	20.000	90%	4 min
	Elect	70W	40%	35%	20	<10	2.000	2.000	16.000	20.000	90%	4 min
	Elect	100, 150W	35%	20%	20	<10	2.000	2.000	16.000	20.000	90%	4 min
	Elect	250W	35%	20%	20	<10	2.000	2.000	16.000	20.000	90%	4 min
	Hybrid	250/400W	50%	40%	20	<10	2.000	1.800	16.000	20.000	90%	5 min
	EM	All	65%	50%	20	<10	2.000	1.800	16.000	16.000	90%	3 min
CDO	Elect	50, 70W	70%	60%	80	>65	2.800	3.400	12.000	12.000	70%	4 min
	Elect	100, 150W	60%	50%	80	>65	2.800	3.400	12.000	12.000	70%	4 min
	Elect	250W	60%	50%	80	>65	3.000	>3000	>8.000	>8.000	>70%	4 min
CPO	Elect	45W	66%	55%	65	60	2.800	2.800	16.000	16.000	80%	2 min
	Elect	60W	60%	50%	65	60	2.800	2.800	16.000	16.000	80%	2 min
	Elect	90W	60%	50%	65	60	2.800	2.800	16.000	16.000	80%	2 min
	Elect	140W	60%	50%	65	60	2.800	2.800	16.000	16.000	80%	2 min
	Elect	210W	60%	50%	90	80	3.000	3.000	16.000	16.000	80%	2 min

Note: It is strongly recommended that an EMC filter should be used in order to provide sufficient design-in margin concerning EMC performance in case a combination of CDO 50W gear and a CDO 50W lamp is used. Please contact your Philips salesperson for more info on what sort of filters should be used for these circumstances.