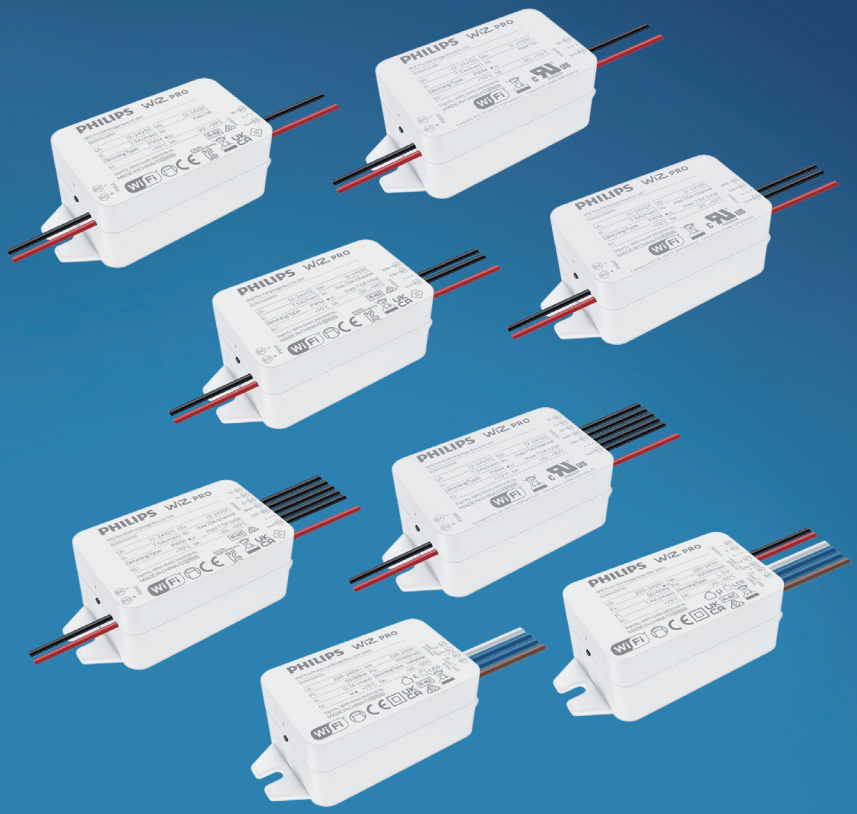
PHILIPS

WiZ PRO

Wireless

Bridge box



Design-in Guide

Philips WiZ Pro bridge box

January 2023

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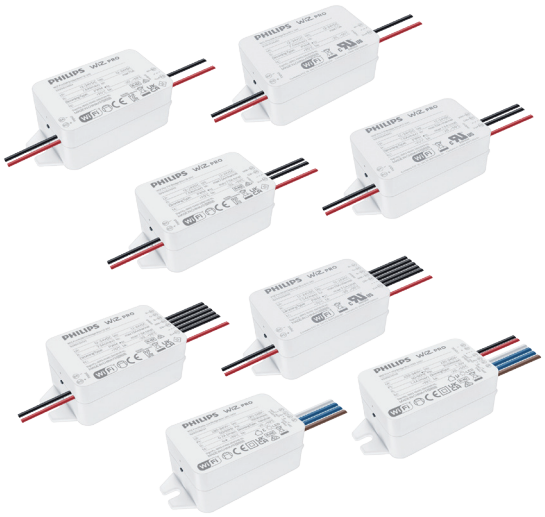
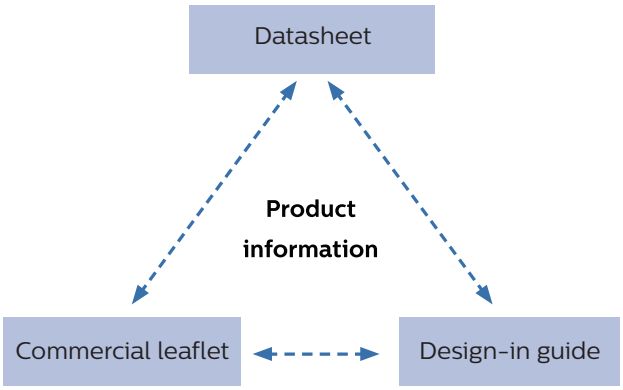


Bridge box



Thank you for choosing the Philips WiZ Pro bridge box. In this guide you will find the information required to design this bridge box into a luminaire or related product as well as valuable hints and tips.

Information and support

If you require any further information or support please consult your local Philips office or visit our website: www.wizconnected.com

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
- **Datasheet** contains the driver/accessory specification
- **Design-in guide** describes how to be designed-in the products

All these documents can be found on the page: www.wizconnected.com.
If you require any further information or support please consult your local Philips office.

Warnings and instructions

Warnings:

- Avoid touching live parts!
- Do not use drivers with damaged housing and/or connectors!
- Do not use drivers with damaged wiring!
- Class I luminaires must be connected to protective earth!
- Creating an open-load condition on the output of the driver is an abnormal condition for the driver. Any switching function must be done on the primary (AC) side of the driver.

Safety warnings and installation instructions

To be taken into account during design-in and manufacturing

- Do not use damaged or defective contacts or housings
- Do not use damaged products
- Do not service the bridge box when the mains voltage is connected; this includes connecting or disconnecting the LED load
- Cap off all unused wires to prevent accidental contact with the luminaire, bridge box housing or accidental touching
- Do provide an adequate earth connection when applicable
- The luminaire manufacturer is responsible for its own luminaire design and has to comply with all relevant safety standards when designing-in the WiZ Pro bridge boxes
- The Philips WiZ bridge boxes are 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.
- For the strain relief installation, Crosshead PH-2 Screw is recommended to be used, recommended torque requirement for screw is 0.7-0.9 N.m.
- Make sure to keep the bridge box dry, acid-free, oil-free, and at least 20mm distance from the body which is not the mounting surface to wall for the sufficient thermal dissipation and do not exceed the maximum ambient temperature (ta) stated on the device.
- Lamp control gear relies upon the luminaire enclosure for protection against accidental contact with live parts.
- DC bridge box(UL version) was designed for compatibility with class 2 drivers. In special case that class 1 type driver is connected, the bridge box should be placed inside the luminaire. The manufacture should take full liability to ensure safety use and corresponding certification.

Philips Design-in support is available; please contact your Philips sales representative.

Introduction to Philips WiZ Pro Bridge Box

Introduction

Philips WiZ pro bridge box is designed to operate LED solutions for general lighting applications such as lighting in office, downlighting, spot/accent lighting and industry applications. It's designed to give you access to our core WiZ pro offering – the software. Enable the traditional LED luminaires to access the WiZ pro ecosystem, to control lights in multiple locations through the cloud.

Wireless Technology

Both Wi-Fi and Bluetooth connectivity are enabled in the bridge box. Wi-Fi connectivity is how your lights can be connected to the internet so that they can be controlled via the cloud without a hub. Bluetooth will be used to facilitate the pairing process during initial setup, it will also be used for other features e.g. Over-The-Air firmware upgrade.

Electric Design in

Combination list

Bridge box type	Bridge box Description	Dimming method	Driver Description	Driver 12NC
Phase cut bridge box	WiZ Pro Phase-cut Bridge Box I 220-240V, 9290 02 613409	TE	Xitanium 4W 0.1A 40V TE SC 230V	9290 014 20706
		TE	Xitanium 6W 0.15A 40V TE SC 230V	9290 014 20806
		TE	Xitanium 8W 0.2A 40V TE SC 230V	9290 014 21006
		TE	Xitanium 10W 0.25A 40V TE SC 230V	9290 014 21106
		TE	Xitanium 10W 0.5A 20V TE SC 230V	9290 014 21206
		TE	Xitanium 14W 0.35A 40V TE SC 230V	9290 014 21306
		TE	Xitanium 15W 0.75A 20V TE SC 230V	9290 014 21406
		TE	Xitanium 24W 0.5/0.6A 40V TE 230V	9290 028 04906
		TE	Xitanium 32W 0.7/0.8A 40V TE 230V	9290 028 05006
		TE	Xitanium 42W 0.9A/1.05A 40V TE 230V	9290 028 05106
		TE	ET-E 10	9137 100 32179
		TE	ET-S 15 LED	9137 100 32479
		TE	ET-E 30	9137 100 32964
		TE	ET-S 30 LED	9137 100 33264
1-10V bridge box	WiZ Pro 1-10V Bridge Box I 220-240V, 9290 026 13509	1-10V	Xitanium 44W 1.05A 42V 1-10V 230V I	9290 028 82280
		1-10V	Xitanium 21W 0.5A 42V 1-10V 230V I	9290 028 82180
RGBTW/DW/TW bridge box	WiZ Pro DW Bridge Box I 12-24V, 9290 024 99409 WiZ Pro DW Bridge Box B 12-24V, 9290 026 86103 WiZ Pro TW Bridge Box I 12-24V, 9290 024 99509 WiZ Pro TW Bridge Box B 12-24V, 9290 026 86003 WiZ Pro RGBTW Bridge Box I 12-24V, 9290 026 13309 WiZ Pro RGBTW Bridge Box B 12-24V, 9290 026 85903	PWM	CertaDrive LED Transformer 60W 24VDC	9290 021 46380
		PWM	CertaDrive LED Transformer 120W 24VDC	9290 021 46480
		PWM	CertaDrive LED Transformer 180W 24VDC	9290 021 46580
		PWM	LED Transformer 60W 24V 220-240V	9137 100 32267
		PWM	LED Transformer 120W 24V 220-240V	9137 100 32567
		PWM	LED Transformer 20W 24VDC 120-277V	9290 021 05580
		PWM	LED Transformer 40W 24VDC 120-277V	9290 021 05680
		PWM	LED Transformer 60W 24VDC 120-277V	9290 021 05780
		PWM	LED Transformer 100W 24VDC 120-277V	9290 021 05880

How to... Select an appropriate WiZ pro bridge box

Selecting appropriate bridge box mostly depends on the type of existing LED drivers. Phase cut bridge boxes could work with phase cut drivers to upgrade the existing system to WiZ pro ecosystem. 1-10V bridge boxes could work with 1-10V drivers. For RGBTW bridge boxes, TW bridge boxes, DM bridge boxes, they could work with Philips constant voltage (CV) Transformer or 3rd party compatible drivers.

Attention:

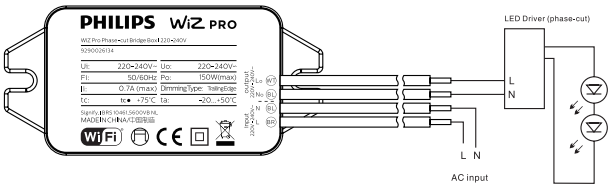
1. Not all the drivers comply with bridge boxes, the bridge boxes only work with the scenarios mentioned above. Our recommended driver list is on the left. If there is any concern about this, please contact your Philips sales representative.
2. To achieve an accurate color or CCT rendering when connected with TW/RGBTW bridge box, it is recommended to use LED strip/luminaire with CCT range 2700K-6500K. Other CCT range might lead to unexpected light effect that is different from app setting.

Bridge box power limitation

Besides the voltage and current windows, user needs to pay attention for the power handling range for the bridge boxes and LED drivers. The load power should not exceed the bridge box power capacity indicated in bridge box datasheet. For example, the WiZ phase cut bridge box max output power is 150W, hereby total LED drivers input power more than 150W is out of window which will be considered as a prohibited combination.

Consider the driver is not a typical linear load, besides the sum of the total input power of drivers, we need to provide with 10% margin to avoid over load. For WiZ Pro phase cut bridge box, the max power capacity is 135W, for WiZ Pro 1-10V bridge box, it's 270W.

System wiring diagram



Wire definition

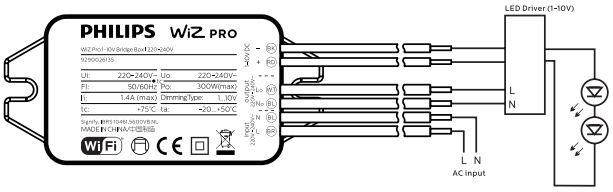
Bridge box wiring diagram

WiZ Pro Phase-cut Bridge Box I 220-240V

Please approach the wiring diagram on the left

	Specification item	Definition	Remark
A	220V-240V~ Lo - White	Live output	
B	220V-240V~ No - Blue	Neutral output	
C	220V-240V~ N - Blue	Neutral input	
D	220V-240V~ L - Brown	Live input	
E	Push button	Reset button	
F	LED light	LED light	

System wiring diagram



Wire definition

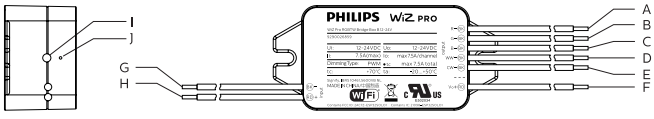
WiZ Pro 1-10V Bridge Box I 220-240V

Please approach the wiring diagram on the left

	Specification item	Definition	Remark
A	1-10V DC (-) - Black	1-10V negative polarity output	
B	1-10V DC (+) - Red	1-10V positive polarity output	
C	220V-240V~ Lo - White	Live output	
D	220V-240V~ No - Blue	Neutral output	
E	220V-240V~ N - Blue	Neutral input	
F	220V-240V~ L - Brown	Live input	
G	Push button	Reset button	
H	LED light	LED light	

System wiring diagram

Wire definition



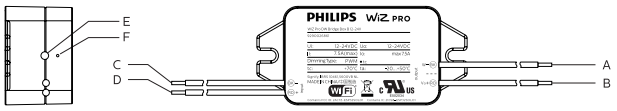
WiZ Pro RGBTW Bridge Box I 12-24V
WiZ Pro RGBTW Bridge Box B 12-24V

Please approach the wiring diagram on the left

	Specification item	Definition	Remark
A	R (-) - Black	Output: R LED strip	
B	G (-) - Black	Output: G LED strip	
C	B (-) - Black	Output: B LED strip	
D	WW (-) - Black	Output: Warm White LED strip	
E	CW (-) - Black	Output: Cool White LED strip	
F	Vo (+) - Red	Output: LED strip V+	
G	V (-) - Black	DC power supply negative input	
H	V (+) - Red	DC power supply positive input	
I	Push button	Reset button	
J	LED light	LED light	

System wiring diagram

Wire definition

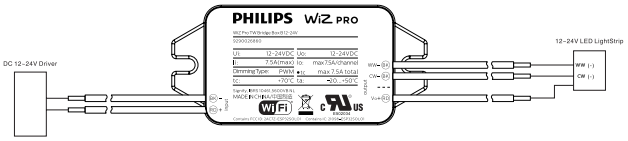


WiZ Pro DW Bridge Box I 12-24V
WiZ Pro DW Bridge Box B 12-24V

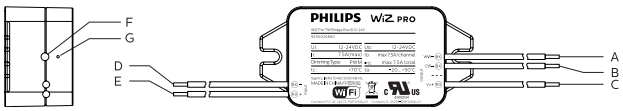
Please approach the wiring diagram on the left

	Specification item	Definition	Remark
A	W (-) - Black	Output: W LED strip	
B	Vo (+) - Red	Output: LED strip V+	
C	V (-) - Black	DC power supply negative input	
D	V (+) - Red	DC power supply positive input	
E	Push button	Reset button	
F	LED light	LED light	

System wiring diagram



Wire definition



WiZ Pro TW Bridge Box I 12-24V
WiZ Pro TW Bridge Box B 12-24V

Please approach the wiring diagram on the left

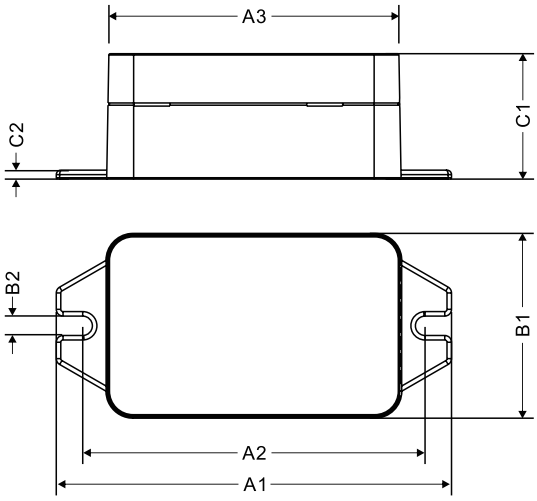
	Specification item	Definition	Remark
A	WW (-) - Black	Output: Warm White LED strip	
B	CW (-) - Black	Output: Cool White LED strip	
C	Vo (+) - Red	Output: LED strip V+	
D	V (-) - Black	DC power supply negative input	
E	V (+) - Red	DC power supply positive input	
F	Push button	Reset button	
G	LED light	LED light	

Note:

If a terminal is used to connect bridge box wires to mains or load, the terminal should be screw clamping type or screwless type with appropriate ratings (e.g, voltage, current, connecting capacity), which should be compliant with IEC 60998 or equivalent standards.

Noise:

There might be some noise generated during dimming state for certain drivers when working together with DC bridge box. It's recommended to place them in the ceiling or some other positions where 0.5m distance from ears can be kept.



Data sheet		
Item	Dimensions	
A1	88mm	± 0.1
A2	76.2mm	± 0.1
A3	64. 6mm	± 0.1
A4	130mm	± 5
A5	10mm	± 5
A6	130mm	± 5
B1	41. 2mm	± 0.1
B2	4.3mm	± 0.1
C1	28mm	± 0.1
C2	2mm	± 0.1

Mechanical housing

Basic dimensions for each bridge box can also be found in the datasheets.

Direct wiring between bridge boxes and LED drivers/ LED boards

Be informed that no components are allowed between the bridge boxes and LED drivers/LED boards other than connectors and wiring intended to connect the bridge box to the LED drivers/LED board. For example, it is not allowed to install a switch between the bridge box and LED boards.

Wiring length

To ensure good performance and reliability for DC bridge box, it is required to control total input cable length within 1m, including RGBTW, TW and DW.

Furthermore, in case of independent usage of AC bridge box, it is required to limit external cable length to 8cm for both input and output side.

Thermal design-In

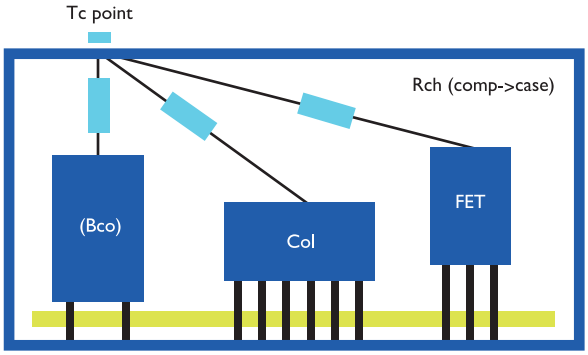
Introduction

The bridge box itself and relationship between case temperature point (Tc) and lifetime of the bridge box. To facilitate design-in of WiZ bridge box, the critical thermal management points of the bridge box 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 points are taken into account this will ensure the optimum performance and lifetime of the system.

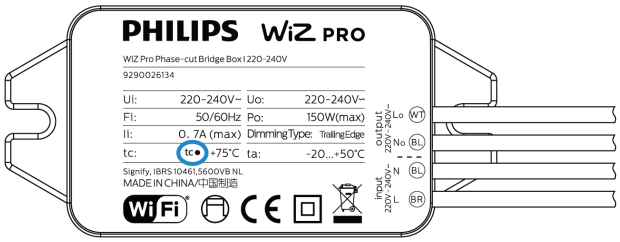
Definitions

- Case temperature: temperature measured at the Tc point of the bridge box
- Ambient temperature (Tamb): temperature outside the luminaire

When switched off >2 hours, temperature at Tc point is likely to equal Tamb



Schematically representation of internal thermal paths to the bridge box Tc point



Example of Tc point position on Phase-cut bridge box housing

Tc point

To achieve optimal lifetime and reliability, it is critical that the temperature of the components in the bridge box remains within its rating.

The Tc test point (case temperature) indicates a reference point for measuring the bridge box's temperature. This can be used during the luminaire design to verify that the temperature remains below the maximum specified temperature for the Tc point. Since there is a direct relation between the case temperature

(Tc) and the bridge box components inside the bridge box, it is sufficient to measure the temperature at the Tc point of the bridge box. This Tc point must not exceed the maximum values stated in the associated datasheets.

How to... Measure Tc at the Tc point

The location of the Tc point is identified on the product label. The temperature can be measured using for example a thermocouple that is firmly glued to the bridge box 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 with the ambient temperature (Tamb). The WiZ bridge box has been designed for indoor use. For approved ambient temperature range please check the associated WiZ bridge box datasheets.

Bridge box lifetime

Tc, Tc-life and Tc-max

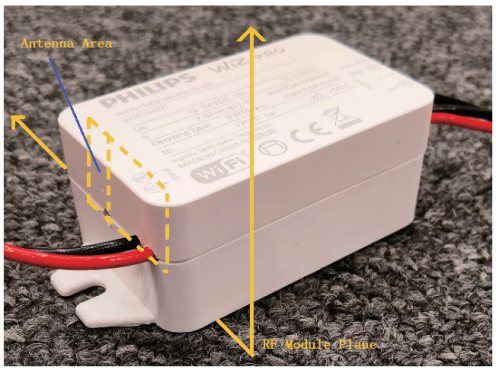
The lifetime of bridge box depends on the temperature during operation. This means there is a relationship between the Tc point on the bridge box and its lifetime in hours.

- Philips WiZ bridge boxes typically have a specified minimum lifetime of ≥50,000 hours with a minimum of 90% survivors at the specified Tc-life.

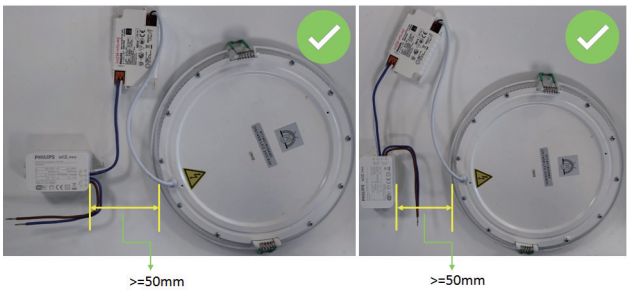
Tc-max is the maximum allowed Tc for the bridge box. Please check the associated datasheet for the lifetime and Tc-life.

RF design-in

RF module plane and antenna position



Example for downlight luminaires



Example for panel luminaires

Introduction

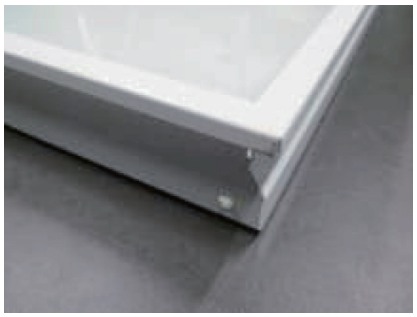
This chapter describes the application of RF (radio frequency) aspects of the bridge boxes.
To facilitate design-in of bridge box, the critical RF application scenarios of the bridge box are set out in this section. In Philips' product design phase all possible precautions have been taken to ensure WiFi and BLE (Bluetooth low energy) signal as good as possible. The bridge box should be set in an expected position to ensure the optimum performance of the system. The typical RF range for wireless communication is 15 meters(line of sight), it may vary depending on many factors e.g. luminaire structure and field setup, please consider following hints for optimal RF performance.

Independent application

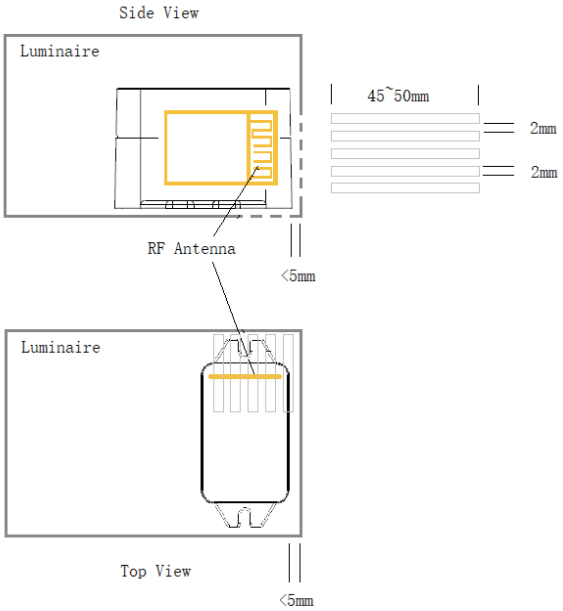
Keep the distance between RF plane on bridge box and luminaires >=50mm. Note: it is also recommended to keep this clearance when there is metal structure (e.g. metal water pipes, metal wall-box) in the building.

Example for plastic housing

Example for folded sheet metal housings



Example for extruded metal housings



Build in application

Inter-luminaire RF signal should be considered for different housings:

1). Plastic housings. There is no impact for RF signal transportation.

For example, the metal gear try has little impact for the waterproof luminaire, the plastic housings are transparent for RF signal.

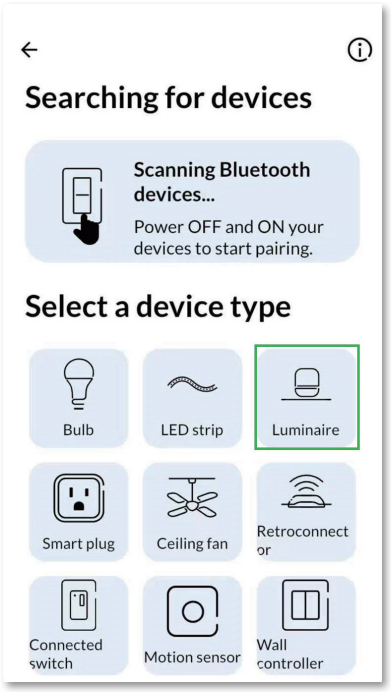
2). Folded sheet metal housings.

Folded sheet metal luminaires could “leak” RF signals and are open at the side of the plastic diffuser. In this case, please orient the RF plane of bridge box towards the non-metal diffuser so as to unblock the RF radiation pattern.

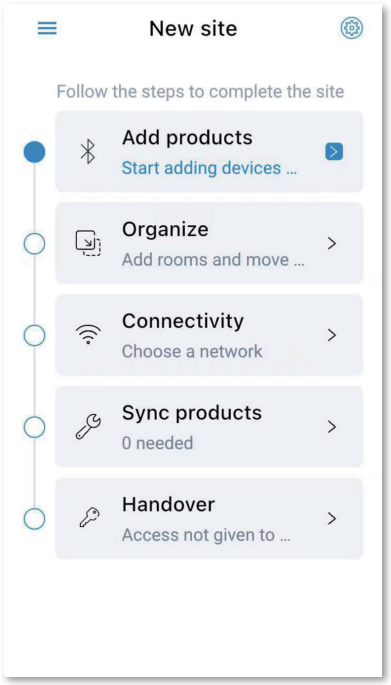
3). Extruded or diecasting aluminum housings can be critical and need to be evaluated.

For extruded or diecasting aluminum housings, a mechanical opening or a window on the housing is highly recommended so as to accommodate the RF plane on product. In some cases, there are also other practical measures which can be further explored by the manufacturer, for instance, several strip slots (>=2mm) may help, where those slots are placed closely with bridge box antenna with 2mm interval gap on each side of housing and LED back plane.

Wireless control



WiZ app



WiZ Pro Setup app

Wireless control

WiZ pro bridge boxes use wireless technology like WiFi, BLE to control the luminaires. The control interfaces may be website, app...

In order to gain the full control and feature of the controller, it must firstly connect the controller to WiZ system by pairing to WiZ app. There is a support page in the WiZ app so that user is able to find what they needed. Also, include access to the WiZ Pro software suite:

- WiZ Pro Setup app for installers to conduct effortless commissioning
- WiZ app for end users to control and automate with ease
- WiZ Pro Dashboard for building managers to perform advanced setting, get actionable usage insights for preventive maintenance and energy optimization

Software available at :
https://www.wizconnected.com/en/pro/getstarted

Note:
When start pairing with WiZ app, please select “Luminaire” in the interface.

Wired control (WiZ Click feature)

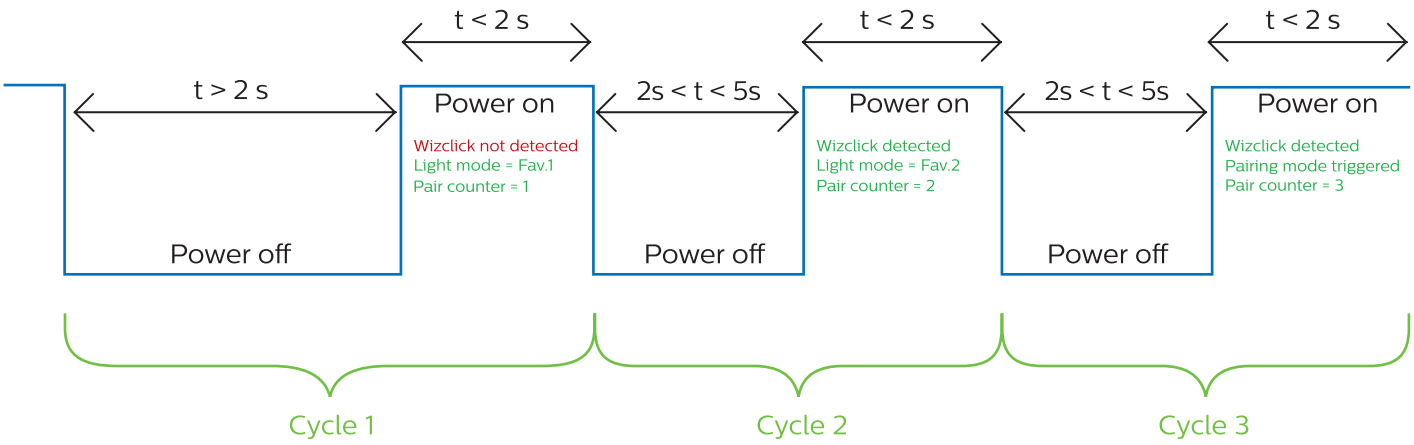
WiZclick is a secondary control option by using main light switch. Toggle the switch on once to activate favorite mode one, twice for favorite mode two.
WiZ Click can be used for quick checking during manufacturing design-in, to verify if the luminaire is assembled correctly and functioning well (no need to pair with app).

In our WiZclick definition, if the off time is between 2s and 5s, it said to be WiZclick detected.

- When WiZclick is detected, the light mode will switch between Fav.1 & Fav.2
- When WiZclick is not detected, the lamp will go to Fav.1.

In addition to changing light mode, WiZClick can also be used to force the product into pairing mode.
The product will place itself into pairing mode at boot time (for 1 minute) if not paired, or if the known WiFi is not present. This capabilities is called Ready To Pair(RTP). When pairing is triggered by RTP, the only visual feedback is a little pulse of the light, usually around 8 seconds after boot time.

It might sometimes be needed to force the product into pairing mode and have a stronger visual feedback. WiZCLick can be used to do this, to force the product into pairing mode, and have a strong visual feedback by having the product to pulse.
It will take 3 or 5 cycles to place the product into pairing mode. When the lamp is not
paired, it needs 3 cycles. If the lamp was paired, 5 cycles are needed. The proposed power on/off window for WiZclick would be: on <2s; off 2-5s. The following image is an example of 3 cycles for unpaired products.



Quality and Reliability

Switching & cycling lifetime of WiZ bridge boxes

Impact of on and off switching on lifetime of bridge boxes in LED systems

In this section a description is presented of the impact of mains voltage switching on the lifetime of bridge boxes in lighting systems. Because switching on and off the lighting has an impact on different failure modes, a distinction has to be made between switching on and off, and thermal cycling.

Electrical failures due to switching Vmains on and off

Before the lighting is switched on in the electronic circuit all capacitors are uncharged. By a simple toggle of the mains voltage all capacitors will be charged, causing peak currents in the circuit. Inductors react to this by creating peak voltages. Occurrence of peak currents & voltages during starting is inevitable. The circuit design and component selection should be of sufficient quality that no components are overstressed during the starting conditions. If the quality is not sufficient, failures will occur at a certain rate over time. The failure rate will be influenced by usage conditions such as temperature and mains voltage. The failure rate will be further enhanced by irregular mains voltage events such as dips, surges or black outs. For a good quality design all conditions and components are carefully checked. In general bridge box is designed to withstand >100,000 switches under the specified use conditions.

Mechanical failures due to thermal cycling

A completely different failure mode which is also due to switching on and off the light is the failure of solder joints, due to thermal cycling. Stresses in solder joints are caused by the differences of the thermal expansion coefficients (CTE's) of printed circuit board, solder and component materials.

Due to heating up and cooling down mechanical stresses build up in the solder, which eventually result in cracking and finally failure of the joint. In most cases failure of one solder joint means the end of the product. The solder joint failure mechanism is also referred to as solder joint fatigue. This is a typical wear out failure mechanism with a negligible failure rate for many years, but for which after the typical lifetime has passed, failures come at an accelerated speed.

WiZ app bridge boxes for LED lighting are typically designed to last 50,000 operational hours. The reference for this lifetime is a typical user profile of 10-12 hr usage and up to 2-3 switching on and off every day. For the electrical stresses during switching there is no problem switching many more times, even up to >100,000 times. However for the solder joints there can be a risk for the lifetime of the product.

Impact of thermal cycles per day on the bridge box lifetime

As the bridge boxes are typically designed to withstand 3 full thermal cycles every day, lifetime will reduce with an increasing cycling frequency. However this reduction will be limited by the heating time of the product in the application. As the heating time of a bridge box in real applications varies typically between 60 and 120 minutes, maximum and minimum bridge box temperature will not be reached when the cycling frequency is faster than 60 minutes. Because the solder-joint damage relates to a higher power of the temperature difference between hot and cold condition, the negative effect on lifetime reduces for the higher cycling frequencies.

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Data subject to change