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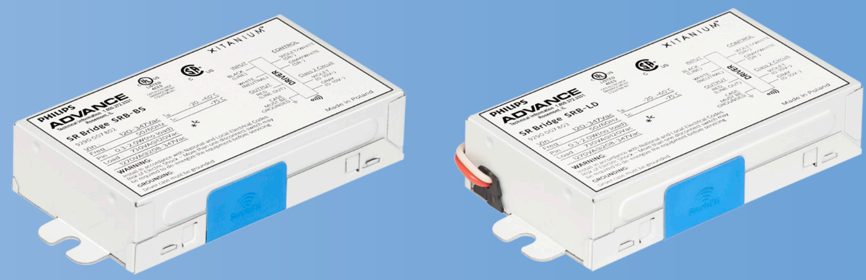
Bridge

Design-in Guide

Xitanium SR Bridge



Reliable SR technology for connected LED applications

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Introduction to this guide

Figure 1. Philips Advance Xitanium SR bridge.

Thank you for choosing the Philips Advance Xitanium sensor ready bridge (SRB). In this guide you will find the information needed to integrate SRB devices into an LED luminaire or LED system.

Information or support

For further information or support please consult your local Philips office or visit:

- Xitanium SR bridges or SR drivers: www.philips.com/xitaniumsr/na
- OEM general info: www.philips.com/oemna

Application note

The Philips Advance Xitanium SR bridge allows existing 0-10V dimming systems to become part of wireless connected lighting systems for indoor lighting such as offices, public buildings, industrial applications and retail environments.

Warnings and instructions

Warnings

- Avoid touching live parts!
- Do not use SR bridge and connected driver(s) with damaged housing and/or connectors!
- Do not use SR bridge and connected driver(s) with damaged wiring!

Safety warnings and installation instructions

- Do not use damaged products.
- Do not short SR bridge output wires.
- SR bridge output wire is a live mains part when switched on.
- The luminaire manufacturer is responsible for complete luminaire design and must comply with all relevant safety standards.
- The SR bridge is suitable for built-in use only and must not be exposed to the elements such as snow, water and ice or to any chemical agent that can be expected to have an adverse effect on the driver (e.g., corrosive environments). It is the responsibility of both luminaire manufacturer and installer to prevent exposure. The SR bridge specified for UL damp and dry locations.
- Do not service the SR bridge and connected driver(s) when the mains voltage is connected; this includes connecting or disconnecting the loads.
- SR bridge and connected driver(s) must be installed in accordance with national and local electrical codes.
- Proper earth and/or equipotential connections are required whenever possible or applicable.

Introduction to Philips Advance Xitanium SR bridge

Figure 2. Philips Advance Xitanium SR bridge.

Xitanium SR bridge

The Philips Advance Xitanium SR bridge is designed to connect existing or new 0-10V dimming indoor lighting systems to SR (wireless) connected systems. Applications include offices, public buildings, industrial applications and retail environments.

With Xitanium SR functionality, flexibility in luminaire design is assured, and with the SR interface it is simpler than ever to connect to SR certified sensors.

Xitanium SR bridge versions

The Xitanium SR bridge described in this guide is available in two versions; a –BS version with mounting studs to mount the box to an existing (downlight) fixture mounting plate and a –LD version to be mounted inside luminaires.

Detailed specifications can be found in the Xitanium SR bridge datasheets, which can be downloaded at www.philips.com/xitaniumsr/na.

Programmable interface – available May 2017

The Xitanium SR bridges are programmable. Some features and parameters can be set via the SR Interface or SimpleSet technology using Philips MultiOne Configurator software.

SimpleSet technology – available May 2017

Philips SimpleSet NFC wireless programming technology allows luminaire manufacturers to quickly and easily program the Xitanium SR bridge during the manufacturing process, without a connection to mains power, offering great flexibility.

For more information on MultiOne or SimpleSet technology, please visit www.philips.com/multione or contact your local Philips representative.

SR bridge wiring diagram

A typical application for the Xitanium SR bridge is to connect the SR bridge to one or more 0-10V (LED) drivers and an SR-certified device (see Figure 3).

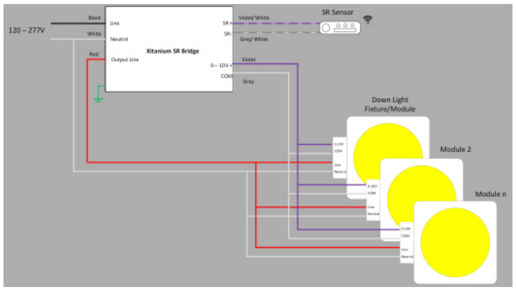

Figure 3. Xitanium SR bridge wiring diagram.

Features of Xitanium SR bridge

Wide mains input range

The Philips Advance Xitanium SR bridge can operate on a wide range of mains input voltages from 120Vac – 347Vac.

Switchable output using zero crossing detection

The output of the Xitanium SR bridge can be switched on/off via integrated relay switching with advanced zero crossing technology. This allows for higher loads to be switched on/off with high reliability.

Programmable interface – available May 2017

The Xitanium SR bridge is programmable. A number of features and parameters can be set via MultiOne Configurator or SimpleSet technology. Items that can be programmed are:

- 0-10V dimming curve (logarithmic or linear).
- 0-10V dimming range.
- Fault detection.
- OEM read/write protection.

Sensor ready (SR) interface

The Xitanium SR bridge features a digital interface (SR interface) to enable direct connection to any suitable SR-certified RF sensor.

Energy metering

The Xitanium SR bridge has built-in energy/power measurement capability.

OEM write protection (OWP) – available May 2017

OWP allows the OEM to protect the SR bridge settings over the lifetime of the SR bridge by using a password. The SR bridge and connected driver(s) equipped with OWP will show this in the feature list when read out by the tool MultiOne. Specific features and also the OWP can be enabled and protected with that password to prevent unauthorized changes. The password management is under the responsibility of the company that is setting it.

Sensor ready (SR) interface

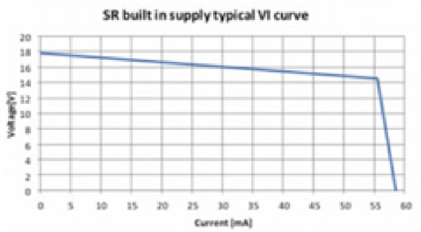

Figure 4. Typical VI-curve SR bus power supply.

Sensor ready interface

The Philips Advance Xitanium LED SR bridge features a digital SR interface to enable direct connection to any suitable SR-certified RF sensor.

The simple two-wire SR interface supports these key functions:

- Switchable built-in SR bus power supply to provide power to the connected control device (e.g., an RF module or a CMS controller)
- Two-way digital communication between the SR bridge and control device, using standard DALI 2.0 protocol
- Standard DALI dimming, ON/OFF and control functions
- Power and energy reporting utilizing the power monitoring integrated in the SR bridge
- Diagnostic information

Built-in SR bus power supply

The SR bridge has the ability to supply the SR bus with a built-in power supply that can be turned ON/OFF. By default the power supply is turned on and ready to be used with an external control device (e.g., RF sensor).

This should in principle be turned off if used in DALI networks with multiple drivers to avoid incorrect polarity, which can lead to very high currents on the DALI bus. However, we do not recommend to use this SR bridge in a wired DALI network.

The internal power supply can be turned ON/OFF with the MultiOne configuration software using the SimpleSet tool or the SR interface (DALI) tool.

The built-in SR supply is capable of delivering a minimum current of 52 mA (ISR) to the SR bus and the connected device(s).

The built-in SR supply will never supply more than 60mA (ISR_MAX).

The SR bus voltage will be between 12V and 20V depending on the connected device load and the amount of SR supplies put in parallel. See Figure 4 for the typical VI curve for one SR supply.

When the internal SR supply is switched OFF, the SR bridge will extract a maximum of 2 mA from the SR bus (like standard DALI gear).

Control device(s)

- Most control devices intended to be used in an SR system will be powered from the SR bus.
- When communication is present on the SR bus, the bus gets pulled down by the data packages. This reduces the average current available for the power consuming control device. When communicating the average available current can drop approximately 50%. This should be taken into account when designing the control device.
- The extracted peak current (ISR_EXTRACTED) should be limited by the control device.

Rules for building an SR system

- Respect SR bus polarity when more than one SR supply is connected in parallel.
- The total maximum SR bus current (ISR_MAX_TOTAL) must be ≤250 mA. This current can be determined by adding ISR_MAX of all SR supplies. As a consequence, a maximum of four SR supplies can be connected in parallel. The total current delivered to the SR bus (ISR_DELIVERED) can be determined by adding ISR of all SR supplies.
- The total current extracted from the SR bus (ISR_ EXTRACTED) can be determined by adding up consuming devices like SR drivers with switched OFF SR supply, other DALI gear and control devices.
- To guarantee good communication, a margin of 8 mA is needed to drive the SR bus itself (ISR_MARGIN).
- The following rule should be respected:
  ISR_EXTRACTED + ISR_MARGIN ≤ ISR_DELIVERED.

Caution

- When the above rules are not taken into account, communication cannot be guaranteed and damage to components may occur.

Typical examples

One SR bridge is connected to a control device. The internal SR supply of this bridge is switched ON. The specification of the control device states that the extracted peak current is 40 mA. Will this SR system have good communication?

- One SR supply is involved, so BUS polarity is not an issue.
- ISR_MAX_TOTAL = 60 mA. This is ≤250 mA.
- ISR_DELIVERED = 52 mA
- ISR_EXTRACTED = 40 mA
- ISR_MARGIN = 8 mA
- 40 + 8 mA ≤52 mA

Is it allowed to add an SR bridge with switched OFF SR supply to this SR system?

- Yes, an SR driver with switched OFF SR supply extracts 2 mA from the SR bus.
- ISR_EXTRACTED = 40 + 2 = 42 mA
- 42 + 8 mA ≤52 mA

Can this SR supply also be switched on?

- Yes, but you should check the polarity of both SR supplies.
- ISR_TOTAL = 2 * 60 = 120 mA. This is ≤250 mA.

Digital communication

Dimming is possible through the standard digital interface based on DALI 2.0 (IEC 62386 101, 102 Ed2.0). Dimming range is 1%-100%. Dimming curves can be either logarithmic or linear (see Figures 5 and 6).

- Note that the output current at 1% and 100% level is determined by the connected driver.
- The SR bridge has built-in energy measurement capability and can report energy and actual power consumption. Accuracy of power measurement is higher of following two values: 0.5W or +/-4 % measured input power. This feature stores parameters in the non-volatile memory bank provision specified in the DALI 2.0 standard and the SR Certified specification.
- The SR bridge also supports many diagnostic features/parameters, which can be accessed via the SR interface, as per SR Certified specification.
- Although the SR interface supports DALI commands, it is not a DALI interface as such since the interface is polarity-sensitive. We do not advise use of the SR bridge in wired DALI networks.

Other considerations for SR interface

- Length of wiring: using 18AWG (0.8 mm2), the maximum length of the SR wiring, when used for DALI communication, should not exceed 50ft (15m).
- The SR control interface terminals are Class 2 as per UL.

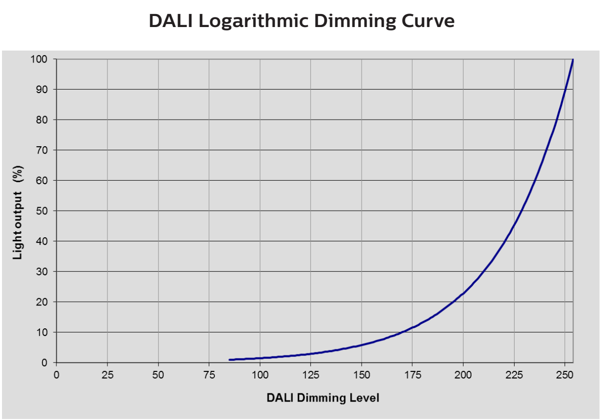

Figure 5. DALI logarithmic dimming curve.

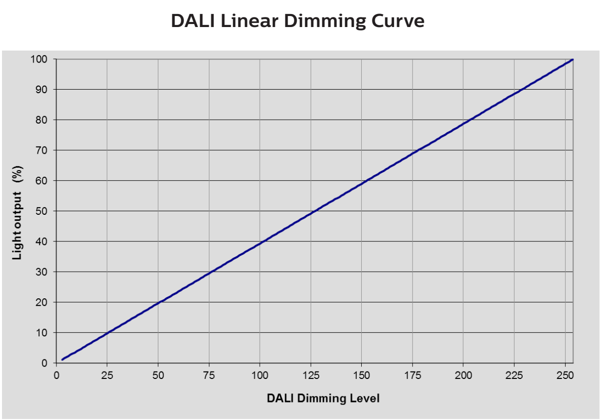

Figure 6. DALI linear dimming curve.

SR bridge use cases

Basic SR bridge use case

The basic use case for the SR bridge is to connect one or more 0-10V dimming drivers and an SR-certified device to the SR bridge as shown in Figure 7.

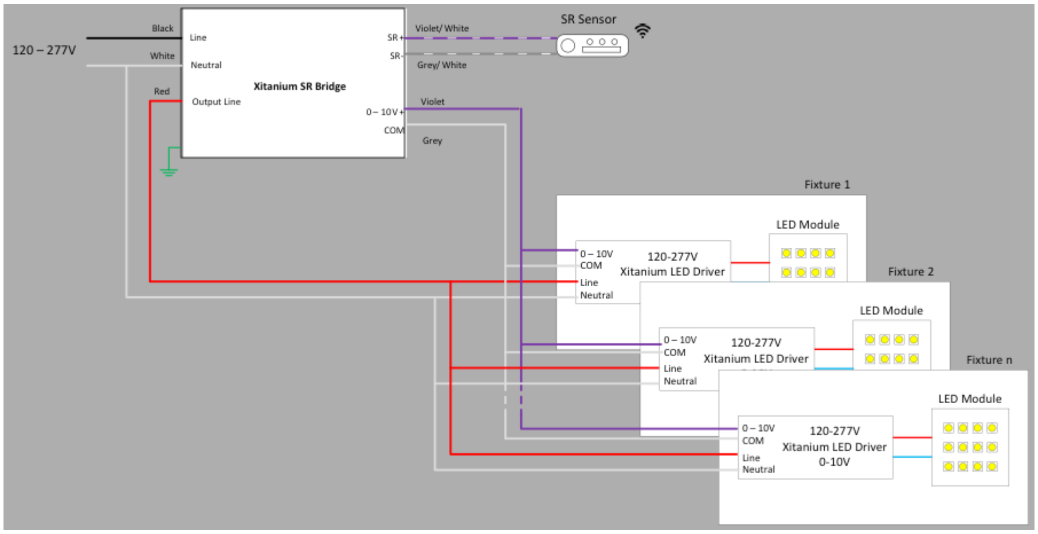

Figure 7. Basic Xitanium SR bridge use case.

By default, the SR bridge dimming curve is set to linear and the range is 1 – 8V and is meant to work with standard 0-10V drivers with linear dimming curve and 1-8V range. If other drivers are used it is possible that the dimming curves will not match.

The maximum load that the SR bridge can handle depends on the mains input voltage. The maximum allowed loads are given in the SR bridge datasheet.

347V SR bridge use case

The SR bridge can handle up to 347V mains input. For basic 347V operation the wiring diagram is similar as for 120/277V operation. Figure 8 shows how a SR bridge can be connected to a 347V 0-10V LED driver and an SR sensor.

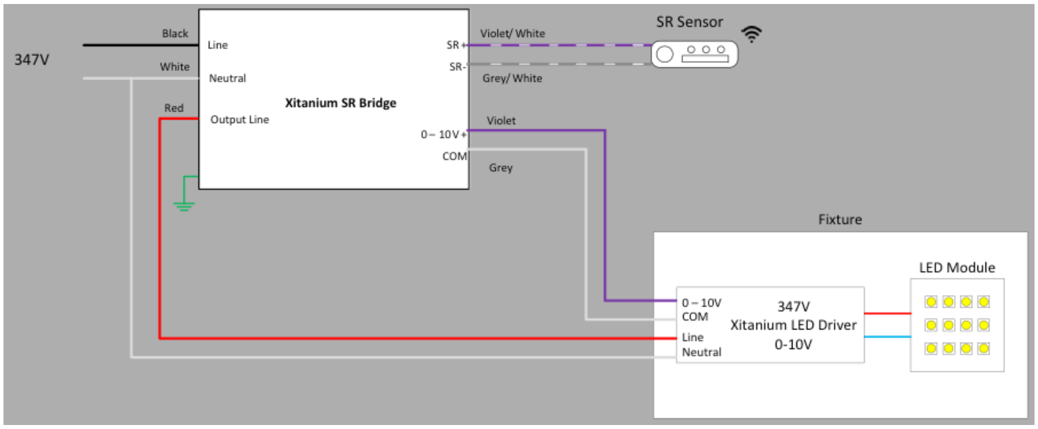

Figure 8. Basic Xitanium SR bridge 347V operation.

SR bridge dimming curve and dimming range

The SR bridge dimming curve and dimming range can be programmed using the MultiOne Configurator or SimpleSet. By default, the dimming curve is set for DALI linear and the dimming range is set at 1 – 8V.

The dimming curve can be programmed as either being (DALI) logarithmic or linear.

To meet the DALI logarithmic or linear curve, the physical minimum dimming level and dimming curve of the connected 0-10V driver should be configured correctly in the SR bridge using the MultiOne Configurator or SimpleSet.

If you are using a Philips 0-10V driver, you can select the dimming curve and physical minimum dimming level that are used in that driver. However, if you are using a driver from another manufacturer, you possibly have to customize/configure the dimming curve vs. dim percentage and physical minimum dimming level for that driver.

The SR bridge dimming range can be programmed in 19 steps. For each step a voltage value and dimming percentage need to be set.

The voltage values can be from 0 – 10. The dimming percentage values need to be within 1 – 100%.

SR bridge fault detection use case

The SR bridge is measuring the power/energy consumed of the connected loads constantly. This feature can be used to monitor the connected load and determine if a portion of the load has failed. During normal operation (at full output) the connected load/drivers draw a certain amount of power. If one or more connected loads fail, the power consumption will be reduced. The SR bridge has the capability to set an alarm/message flag based on a trigger point that the load has been reduced. The fault detection accuracy depends on the trigger point and minimum detection dim level, which can be configured by MultiOne.

Mechanical design-in

Form factors

The Philips Advance Xitanium SR bridge is available in two different versions: model SRB-LD is for mounting inside luminaires (see Figure 9) and model SRB-BS includes studs to easily mount the SR bridge onto a mounting plate of a downlight fixture (see Figure 10). The specific dimensions can be found in the SR bridge datasheet.

It is highly recommended to mount the SR bridge by using all available mounting feet/studs in order to achieve maximum mechanical robustness against shocks and vibration.

Mounting screw dimensions should be based on the specified fixing hole diameter in the SR bridge datasheet. Oversized and undersized screws should not be used in order to prevent damage to the mounting feet or loose mounting.

Please allow for sufficient free space around the SimpleSet antenna (blue areas as shown in Figure 9 and 10) if the SR bridge is to be configured after mounting in the luminaire. The minimum recommended space is dependent on the type of SimpleSet configuration tool. Using the tool as shown in Figure 11 (Feig Electronic Desktop Reader ID CPR30-USB), the minimum distance is 19 mm (+/-1mm).

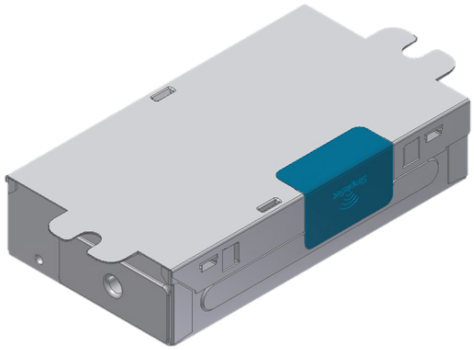

Figure 9. SRB-LD version for luminaire mounting.

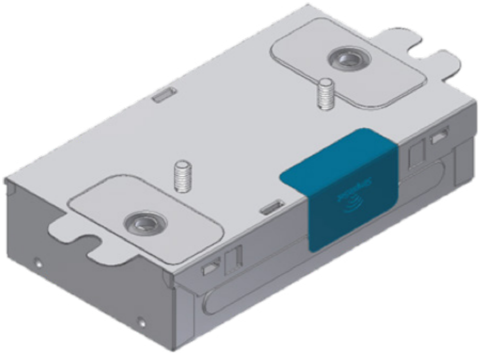

Figure 10. SRB-BS version to mount to (downlight) fixture mounting plate.

Figure 11. Feig Electronic ID CPR30-USB SimpleSet interface tool.

Thermal design-in

Introduction

The following section covers the critical thermal management point to facilitate design-in. Taking thermal considerations into account will ensure optimal performance and lifetime of the system. The maximum case temperature (Tc max) of the SR bridge should not be exceeded. It is mandatory to keep the SR bridge Tc max within specification to meet SR bridge lifetime and failure rate specifications. Please refer to the product datasheet for specific values.

Case temperature point (Tc) point

To achieve optimal lifetime and reliability, it is critical that the temperature of the components in the SR bridge remains within their rating. During design, all precautions are taken to ensure that the internal components are at the lowest possible temperatures.

Initial thermal analysis is performed via IR scans at room temperature to identify the hottest components of the SR bridge. Subsequently, detailed temperature measurements of the critical components are performed under various input/output conditions at worst case operating temperatures.

The temperature measurements are then correlated to a Tcase (Tc) point on the SR bridge as shown in Figure 12. Tc temperature is a proxy for the temperatures of the critical internal SR bridge components.

The location of the Tc point is identified on the product label (Figure 13).

The specified Tc max of the SR bridge must NEVER be exceeded.

Note:

In order to ensure accurate Tc test results, the case temperature should not vary by more than 1°C for a period of at least 30 minutes after a stable temperature has been achieved. Tc point should not be obstructed when mounted in the luminaire/enclosure.

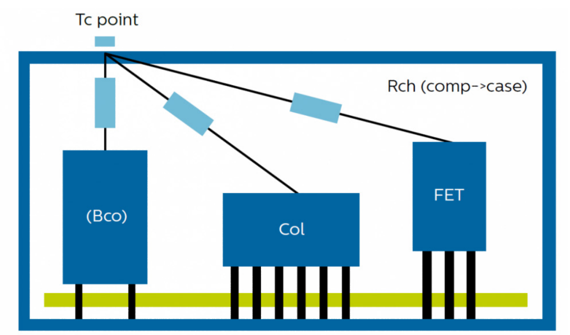

Figure 12. Schematic representation of internal thermal paths to the SR bridge Tc point.

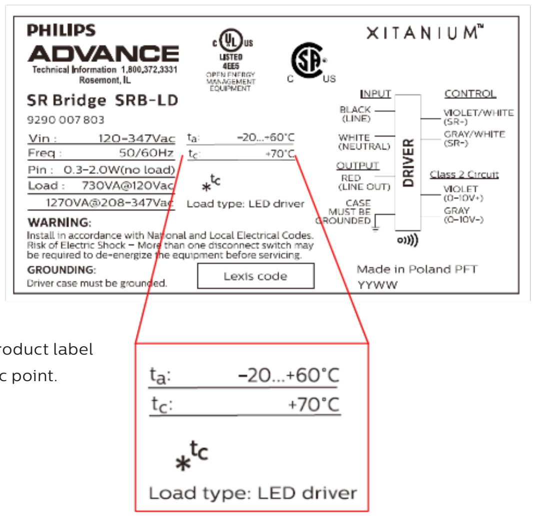

Figure 13. Product label indicating Tc point.

Electrical design-in

Inrush current

Inrush current refers to the brief high input current that flows into a device during the moment of connection to mains; see Figure 14. Typically, the amplitude is much greater than the steady-state input current.

Philips Advance Xitanium products meet the inrush specification values per NEMA 410.

The SR bridge uses advanced “zero-crossing” technology by turning on the connected load only when the mains voltage is near the zero crossing. This reduces the inrush current of the connected load(s) to a minimum.

The peak and duration values are given in the individual product datasheet. It should be noted that the inrush current measurement given in the datasheet is the absolute worst case value.

What does inrush current do? High inrush currents can cause circuit breakers or fuses to open if not designed to handle this current. It can limit how many drivers can be connected to a circuit breaker (CB) or fuse. In case of the SR bridge, it limits how many drivers can be connected to the SR bridge.

Surge protection

The Philips Advance Xitanium SR bridge has limited built-in surge protection (in accordance with IEEE/ANSIC62.41.2 Transient Surge Requirements). The datasheet gives the protection level of the SR bridge. A specification of 2.5kV means that the SR bridge is tested to withstand 2.5kV line transient for 100kHz Ring wave with 30 Ohms source impedance. The SR bridges are tested with the above waveform for all line coupling modes (L to N, L to PE, N to PE and L&N to PE).

In case the SR bridge is built into a luminaire, appropriate surge protection should be designed into the luminaire to meet the specific category for meeting the Energy Star/ANSI requirement.

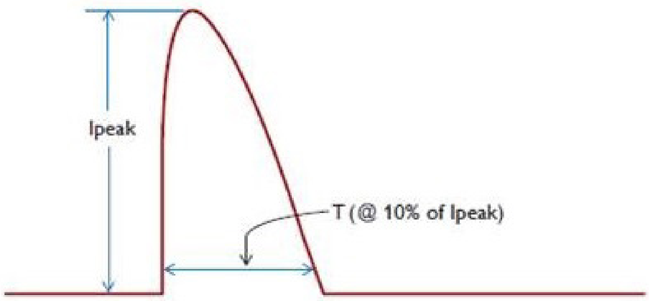

Figure 14.Graphical representation of inrush current.

Leakage current

The Philips Advance Xitanium SR bridge is designed to meet leakage current requirements per UL 916 standards. The specified maximum value is 0.75 mA RMS at 277V. The test is done with the SR bridge alone. In a luminaire, leakage current may be higher since the LED load introduces additional leakage capacitance. As such, precautions should be taken on the luminaire level.

Electromagnetic compatibility (EMC)

The Xitanium LED SR bridge meets EMC requirements per FCC Title 47 Part 15 Class A. These tests are conducted with a reference setup and the SR bridge mounted on a grounded metal plate. To maintain good EMC performance at the luminaire level, the input, output and dim wires should be kept as far apart as possible. The addition of ferrite beads in series with the wires or coupling the wires through ferrite cores within the luminaire may improve the overall EMC performance. However, selection of the type and characteristics of the additional filter depends on what frequency components have to be damped and by how much.

Electrical isolation

The Philips Advance Xitanium SR bridge output is isolated from the primary (Class 2). Isolation is also provided between all the electronic circuits and the chassis.

Xitanium bridges meet UL 916, and the output terminals have been qualified as Class 2 circuit with UL1310 safety standards.

All of the wires in the Philips Advance Xitanium SR bridges meet the UL1452 safety standards.

Disclaimer

Note that the information provided in this document is subject to change.

This document is not an official testing certificate and cannot be used or construed as a document authorizing or otherwise supporting an official release of a luminaire. The user of this document remains at all times liable and responsible for any and all required testing and approbation prior to the manufacture and sale of any luminaire.

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