CASAMBI

Features

- Wirelessly controllable with a smart device.
- No need for an external gateway device.
- Forms automatically a fast wireless mesh network.
- Very small form factor for luminaire installation.
- Configurable analog/digital output.
- Analog output: 0-10V sinking/sourcing.
- Digital output: Standalone DALI
- Easily implemented RGB and color temperature controls.
- Controllable switched mains output.
- Dimming from standard on/off wall switches.
- Device firmware can be updated over-the-air.
- Casambi cloud service enhances user experience.
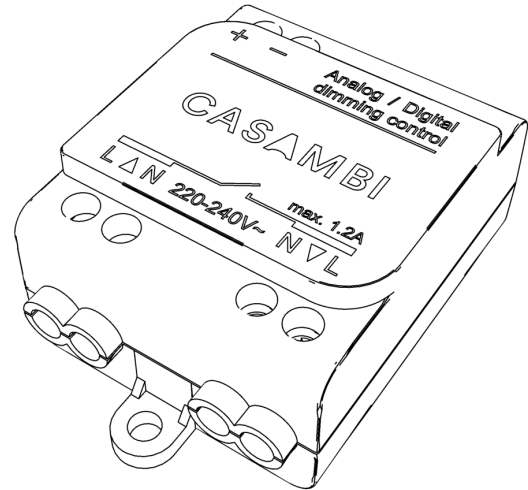
1 Description

CBU-ASD is a wireless control unit for LED and halogen drivers with 0-10V, 1-10V or DALI dimming interface. The device is intended to be integrated into a light fixture. The control output can be configured either as analog 0-10V (and 1-10V) or digital Standalone DALI control interface.

When the output is configured as Standalone DALI, CBU-ASD acts both as a controller and as a power supply making it possible to connect directly to an LED driver with DALI interface without the need for an external DALI power supply. This so called Standalone DALI makes it possible to implement multi-channel light fixtures with adjustable color (RGB) or color temperature, while keeping the wiring and number of components at their minimum.

CBU-ASD does not comply with IEC 60929 and therefore is not designed to be connected to an existing DALI network. The module can be used only in a closed system, i.e. inside a light fixture which does not have an external DALI interface.

CBU-ASD is controlled wirelessly with Casambi smartphone and tablet applications using Bluetooth 4.0 protocol. Devices form automatically a secure wireless mesh network so that a large number of fixtures can be controlled from any point. No external gateway module is needed. CBU-ASD can be controlled also from a standard on/off wall switches.

CASAMBI

2 Revision History

Date	Version	Description
March 2014	0.1	Preliminary product specification
March 2014	1.0	Picture 4 updated, other minor changes
August 2014	1.1	Chapters 4, 7 and 10. Technical Data updated

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 2 of 11

www.casambi.com
info@casambi.com
tel. +358 40 504 2121

CASAMBI

Table of Contents

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 3 of 11

www.casambi.com
info@casambi.com
tel. +358 40 504 2121

3 Operation

Casambi CBU-ASD is a wireless control unit for LED drivers with 0-10V, 1-10V or DALI dimming interface. The device is intended to be integrated into a light fixture. The output can be configured either as analog 0-10V (and 1-10V) or digital Standalone DALI control interface.

When the output is configured as Standalone DALI, CBU-ASD acts both as a controller and a power supply making it possible to connect directly to an LED driver with DALI interface without the need for an external DALI power supply.

For applications where the LED driver cannot be turned completely off through its control interface, CBU-ASD has a controllable switched mains output. This mains output is taken directly from the mains input and routed through a fuse and a solid-state relay.

The control output of CBU-ASD is double insulated from the mains voltage. This makes it possible to use CBU-ASD with isolated LED drivers and maintain protection class II. The control output is protected against short circuit.

CBU-ASD is controlled wirelessly by a smart phone or a tablet with Casambi application. Multiple devices form automatically a mesh network, which can be controlled from any point. The network communicates directly with the smart phone or tablet using Bluetooth 4.0. No external gateway device or Wireless LAN network is needed.

CBU-ASD has an integrated 2,4 GHz antenna. For optimum RF-performance, a special attention will have to be given when the device is integrated to a light fixture. See chapter "9 Placement" for further instructions.

The device can be operated also from a regular on/off wall switch. By flicking the switch on and off the user can select different pre-set modes. These modes can affect one or several devices on the network. This way the user does not have to have the smart phone or tablet at hand all the time in order to select the desired settings or modes.

The settings and modes can be configured using the Casambi application. They are automatically stored in Casambi cloud service. This way the same settings are available for everyone who is connected to the network.

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 4 of 11

www.casambi.com
info@casambi.com
tel. +358 40 504 2121

4 Connection

The analog/digital output of CBU-ASD is connected to the control input of an LED driver. Plus and minus signs on the case denotes the polarity of 0-10V control interface. When CBU-ASD is used in a DALI configuration, the control interface can be used without regard for polarity.

It is highly recommended to use only LED drivers which can be switched completely off from its control input. However, CBU-ASD has a switched mains output for cases where the selected driver requires an external mains voltage relay. In this case a special attention is needed. The designer of the system will have to take into careful concideration the inrush current and power of the driver as well as maximum ambient temperature where CBU-ASD will be operated. For additional information please see chapters "7 Mains Output", "10 Inrush Current" and "11 Ambient Temperature".

If CBU-ASD in used in a protection class II light fixture, at least basic insulated wires will have to be used in 0-10V/DALI control interface.

Warning!
If you are using the switched mains output of CBU-ASD, you must read chapters "7 Mains Output" and "10 Inrush Current".
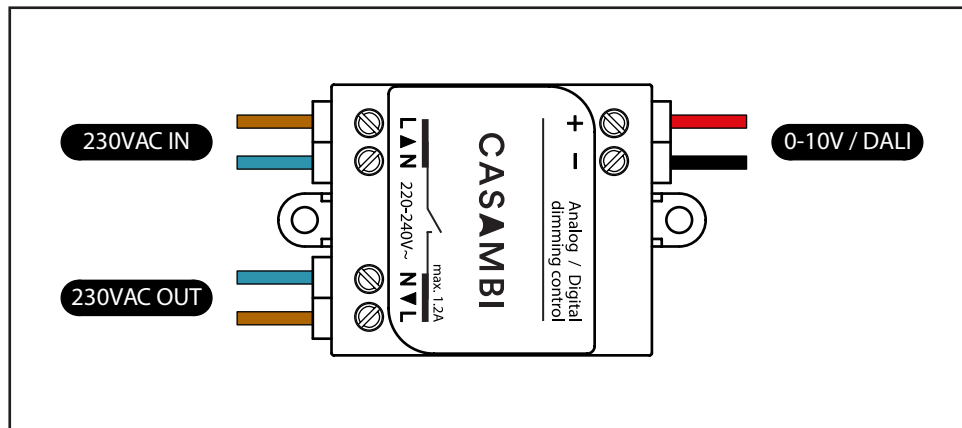
Picture 1. CBU-ASD connections

5 0-10V Output

By default, the output of CBU-ASD is configured as analog 0-10V dimming interface. In this mode CBU-ASD can be connected to any LED driver with 0-10V or 1-10V dimming interface. Analog dimming interface of CBU-ASD can sink or source up to 7 mA and is protected against short circuit.

0-10V dimming interface enables only one channel dimming. If several channels are required, for example in RGB solution, multiple CBU-ASD modules will have to be used together with multiple LED drivers with 0-10V dimming interface. The 0-10V output may be used with only one LED driver and it should never be branched to multiple drivers.

It is important to make sure that the wires of 0-10V control interface are connected in right polarity. For this there are plus and minus signs printed on the top cover of CBU-ASD.

In multi-channel applications other option is to configure the output to digital Standalone DALI interface. This way the CBU-ASD can be used together with a multi-channel LED driver with DALI control interface. See chapter "6 Standalone DALI Output" for more information.

CBU-ASD has also a switched mains output for powering the connected LED driver. See chapter "7 Mains Output" for more information on this feature.

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 5 of 11

www.casambi.com
info@casambi.com
tel. +358 40 504 2121

6 Standalone DALI Output

The control output of CBU-ASD can be configured also as a digital Standalone DALI control interface. With this configuration the module can be connected to an LED driver with DALI interface. The DALI interface makes it possible, for example, to use multi-channel LED drivers in applications where color or color temperature can be controlled.

CBU-ASD is designed to control only one driver, whether it has a 0-10V or DALI control interface. If multiple channels are wanted to be controlled simultaneously, a multi-channel driver with DALI interface, or multiple CBU-ASDs connected to individual drivers, will have to be used.

The operation of the DALI interface has been divided into two. Basic operation does not require the use of LED driver short addresses, i.e. it does not require pre-configured drivers. Instead it utilizes broadcast commands "forcing" the driver into a desired state. This method of control does not support multi-channel systems.

For multi-channel systems, an advanced DALI interface will have to be used. This requires assigning short addresses to the LED driver as well as configuring these addresses to the CBU-ASD firmware. The short addresses are assigned to the driver by using a USB-DALI configuration tool which is usually provided by the driver manufacturer.

The CBU-ASD firmware can be configured by using Casambi Utility application. For large quantities CBU-ASD can be factory-configured.

Drivers with DALI control interface can be switched off though DALI commands, so when using the CBU-ASD in Standalone DALI configuration, it is recommended to power the driver directly from mains voltage and not through CBU-ASD. This way the driver power consumption and inrush current may be ignored when designing a light fixture.

Warning!

CBU-ASD is not designed according to IEC 60929 and therefore should not be connected to an existing DALI network. The module can be used only in a closed system, i.e. inside a light fixture which does not have an external DALI interface. To make a distinction between regular DALI system and a closed DALI system, term "Standalone DALI" is used in this datasheet.

CBU-ASD is designed to control only one driver, whether it has a 0-10V or DALI control interface. If multiple channels are wanted to be controlled simultaneously, a multi-channel driver with DALI interface, or multiple CBU-ASDs connected to individual drivers, will have to be used.

7 Mains Output

For applications where the LED driver cannot be turned completely off through its control interface (e.g. 0-10V and 1-10V), CBU-ASD has a controllable switched mains output. This mains output is taken from the mains input and routed through a solid-state relay. Solid-state relay switches only the live wire of mains voltage, while neutral is directly connected between mains input and output. Both the mains input and output are protected with a common 2A slow blow fuse connected to the live wire.

The maximum allowable current drawn from the mains output is 1,2 A. This is the absolute maximum rating and it is highly dependent on the operating (ambient) temperature. It is strongly recommended to keep the mains load under 100 W in normal operation. Please see, chapter "11 Ambient Temperature" for more information.

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 6 of 11

www.casambi.com
info@casambi.com
tel. +358 40 504 2121

A special care must be taken when choosing the right LED driver for CBU-ASD. The mains voltage inrush current of the driver shall not exceed the maximum amount allowed by the CBU-ASD. More information on the inrush current can be found in chapter "10 Inrush Current".

DALI controlled drivers and some 0-10V controlled drivers can be switched off though its control interface. It is strongly recommended to use such drivers and power the driver directly from mains voltage and not through CBU-ASD. This way the driver power consumption and inrush current may be ignored when designing a light fixture.

8 Protection Class

CBU-ASD is a built-in class II device with SELV (Safety Extra-Low Voltage) output. This means that CBU-ASD is a protection class II device which is designed to be used inside a light fixture. A symbol for this is two concentric circles.

However, if the module is connected to a device with only basic insulation, the output of CBU-ASD is considered ELV, not SELV. For example, DALI and 0-10V are considered as basic insulated control interfaces, which means that even if the driver and CBU-ASD are both specified as double insulated devices, the DALI or 0-10V control interface between them, by definition, is not.
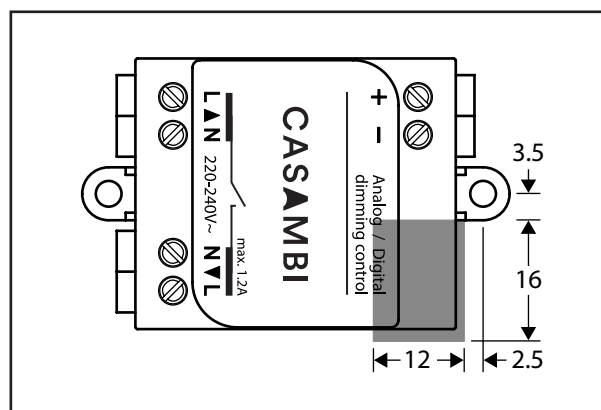
In such a case, the control wires between CBU-ASD and the driver are considered having only a basic insulation. If the light fixture is intended to be a protection class II device, the connecting wires will have to provide at least basic insulation making the control connection double insulated.

9 Placement

CBU-ASD has an integrated antenna for easy integration. In order to maximize the range in every direction some design guidelines should be taken into consideration when mounting the device.

The antenna is located on the corner of the enclosure. It is on the bottom side of the internal PCB (Printed Circuit Board) right above the bottom of the device. CBU-ASD has some large components on the top side of the PCB, so by placing the antenna on the bottom side the other components have as little impact on the antenna performance as possible.

When the device is mounted on a metal plate (e.g. frame of a light fixture), it may efficiently block the radio frequency signal. In this case, a cut-out underneath the antenna may be needed for the RF signal to exit the structure. The cut-out area should be as large as possible. Also the device should be placed as far away from any vertical metal structures as possible.

Picture 2. Suggested minimum antenna cut-out

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 7 of 11

www.casambi.com
info@casambi.com
tel. +358 40 504 2121

10 Inrush Current

All LED drivers have a steady state operating current and an inrush current (or input surge current, as it is sometimes called). The inrush current refers to the maximum instantaneous input current drawn by the electrical device when it is first turned on. The amount of the inrush current is usually much higher than the device's steady state operating current.

Inrush current is caused by capacitors in the input stage of an LED driver. When these capacitors are suddenly charged during the initial application of power, a large current spike is drawn. The value of the inrush current varies according to the power-on timing and the presence or absence of the inrush current protection devices. Typically inrush current of an LED driver is 10-70 A.

The absolute maximum allowable inrush current flown through CBU-ASD is specified at 12 A for the duration of 8 ms. The amount of inrush current is inversely proportional to the duration of it. In most cases the inrush current spike is much shorter than 8 ms, which means the maximum inrush current may be higher than 12 A.

In order to determine if the inrush current of a certain LED driver is suitable for CBU-ASD, one has to know both the specified inrush current rating and the duration of it. If these values are not given in the datasheet of the LED driver, they will have to be measured or verified from the manufacturer. The duration and amount of inrush current varies a lot, and it cannot be estimated from the other specifications of the driver, such as power rating.

Maximum amount of inrush current for a certain duration can be derived from the following equation:
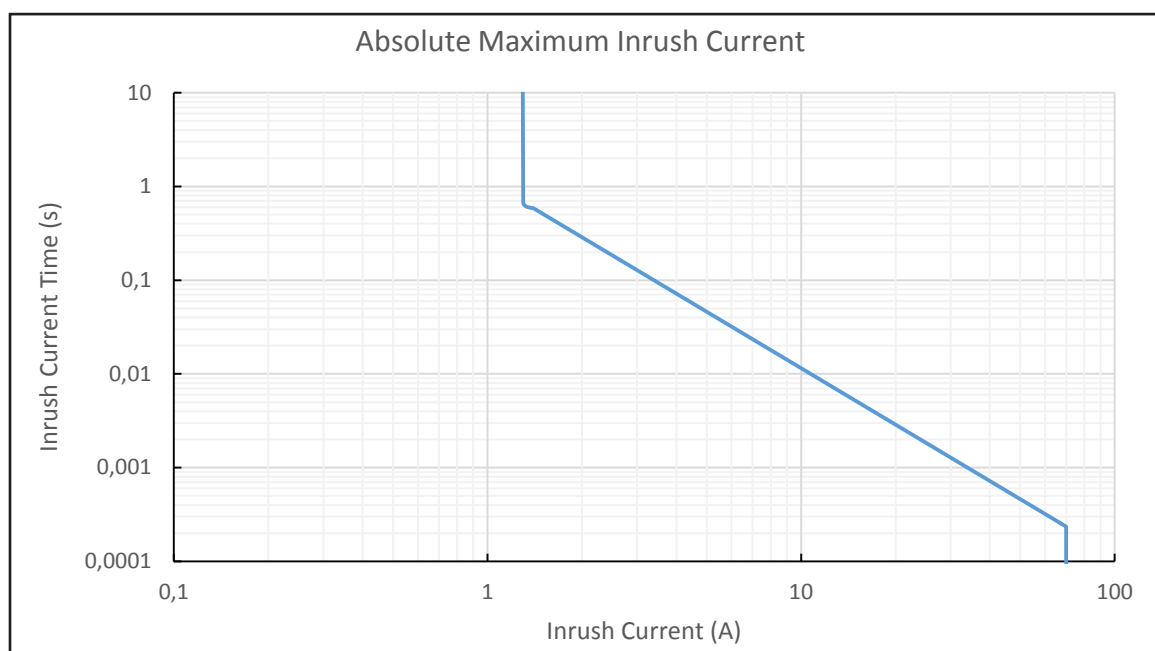
$$I = 12 \sqrt{\frac{8}{t}}$$

where
> I = maximum allowable inrush current
> t = duration of the LED driver inrush current

If the specified inrush current (for the duration of t) of the LED driver is less than I, then the driver is suitable for CBU-ASD.

Picture 3. Absolute maximum inrush current

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 8 of 11

www.casambi.com
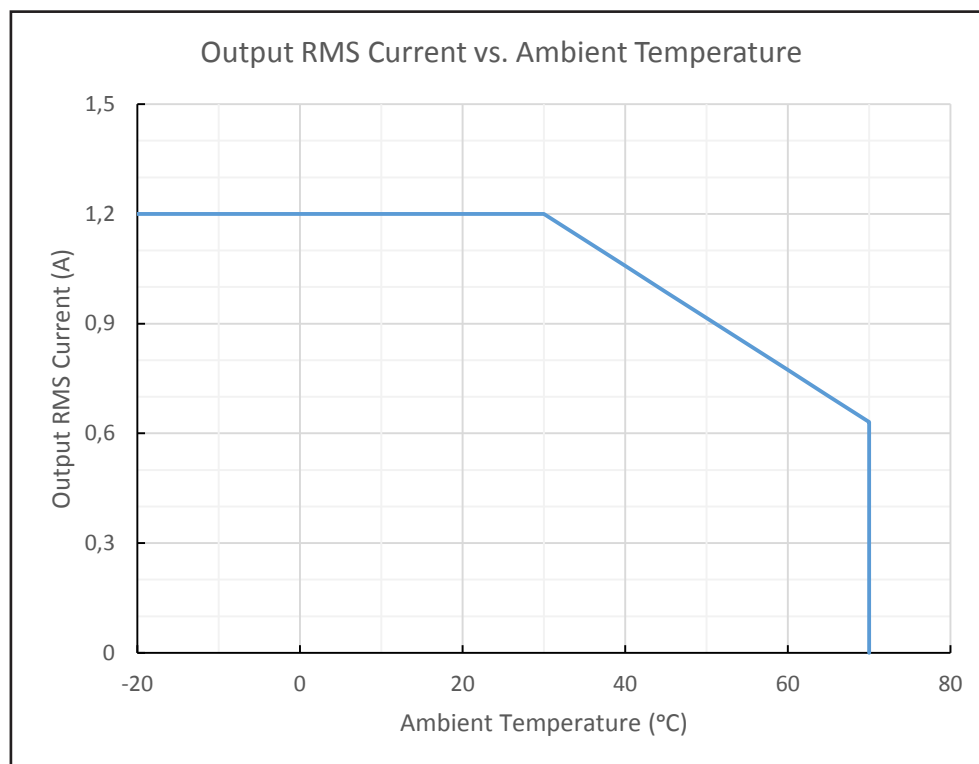info@casambi.com
tel. +358 40 504 2121

Warning!

Exceeding maximum allowable inrush current even once may result to permanent damage to the internal solid state relay. This may cause it to overheat even with low load power causing a fire hazard. When using the mains voltage output of CBU-ASD, always make sure that the inrush current is below its limits.

If the datasheet of the LED driver does not state specific value for inrush current, it will have to be reliably measured. Do not use the mains voltage output of CBU-ASD if you are unsure about the inrush current.

11 Ambient Temperature

The operating temperature range of CBU-ASD is -20...+70°C. However, the ambient temperature affects the maximum allowable AC current (mains) output of CBU-ASD. The maximum specified AC current output of CBU-ASD is 1,2 A, and it is valid at temperatures below +40°C. At temperatures higher than +40°C, the current drawn from CBU-ASD will have to be limited.

If CBU-ASD is mounted in a place where the ambient temperature rises above +40°C, the LED driver connected to the module will have to be selected so that its current consumption does not exceed the maximum current output of CBU-ASD at that temperature.


Picture 4. Output RMS current vs. ambient temperature

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 9 of 11

www.casambi.com
info@casambi.com
tel. +358 40 504 2121

12 Case Temperature

CBU-ASD is intended to be used inside a light fixture. Typically the module is mounted on the frame of the fixture and on the other side is the light source which generates heat. In order to assure that the inside temperature of the CBU-ASD does not exceed +70°C, a t_c point has been defined. Temperature of this point shall not exceed +70°C, otherwise it may have a negative effect on the lifetime or performance of the module.

The specified measuring point of case temperature, t_c, is located at the bottom of the module, as shown in picture 5.
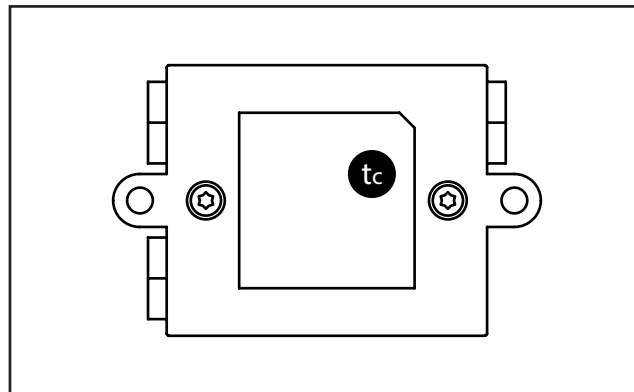
Picture 5. Tc point on the CBU-ASD case.

13 Dimensions
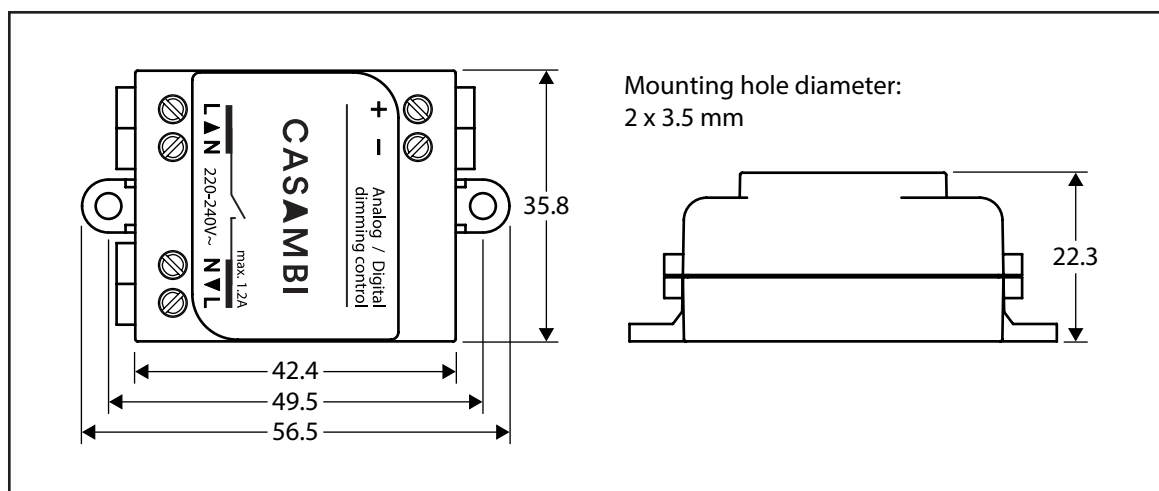
Picture 6. Main dimensions.

14 Technical Data

Mains Input

Voltage range: 220-240 VAC
Frequency: 50 Hz
Max. mains current: 1,2 A

Mains Output

Output relay: SSR on phase line
Suggested max. RMS power: 100 W
Inrush current: 12 A (8 ms)
  Warning!   24 A (2 ms)
  Do not exceed these limits! 36 A (0,9 ms)
                              48 A (0,5 ms)

0-10 V Output

Voltage range: 0-10 VDC
Max. sink/source current: 7 mA

DALI Output

Bus voltage: 12 VDC
Shortcut current: 7 mA

Radio Transceiver

Operating frequencies   2,4...2,483 Ghz
Maximum output power   +4 dBm

Operating Conditions

Ambient temperature, t_a: -20...+70 °C
Max. case temperature, t_c: +70 °C
Storage temperature: -25...+75 °C
Max. relative humidity: 0...80%, non-cond.

Connectors

Wire range: 0,75-1,5 mm^2 □
                              Solid wire: 14-22 AWG
                              Stranded wire: 14-22 AWG
Wire strip lenght: 6-7 mm
Tightening torque: 0,4 Nm/4 Kgf.cm/2,6 Lb-In

Mechanical Data

Dimensions: 56,5 x 35,8 x 22,3 mm
Weight: 48 g
Degree of protection: IP20
Protection Class: Built-in Class II

Conformity and Standards

Radio frequency interference: EN 55015
Mains current harmonics: EN 61000-3-2
Volt. changes, fluctuations and flicker: EN 61000-3-3
General and safety requirements: EN 61347-1
Particular requirements: EN 61347-2-11
EMC immunity requirements   EN 61547

Casambi Technologies Oy
Linnoitustie 4 A
02600 Espoo, Finland

Page 11 of 11

www.casambi.com
info@casambi.com
tel. +358 40 504 2121