SpaceLogic C-Bus Digital Dimmers

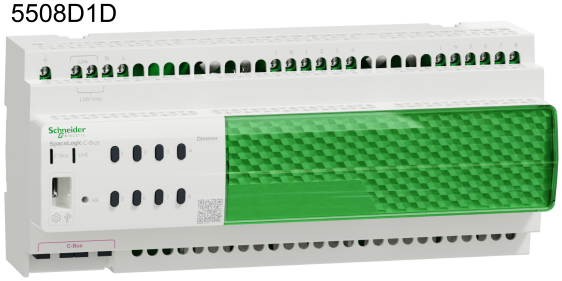
User Guide

Information about features and functionality of the device.

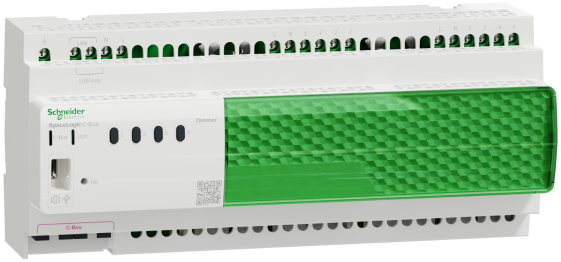
5508D1D
5504D2D

Release Date 10/2023

5508D1D



5504D2D



Legal Information

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Safety information

Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that accompany this symbol to avoid possible injury or death.

⚠⚠DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Safety Precautions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This product must be installed and serviced by appropriately qualified and/or licensed professional in accordance with the local wiring rules.
- Isolate the electrical supply before doing any work on the product.
- Ensure that the product has been correctly installed and tested for safe operation before reconnecting the electrical supply.
- Do not use this product for any other purpose than specified in this instruction.
- Pay attention to the specifications and wiring diagrams related to the installation.
- Do not attempt to open the product casing or perform any action on the internal components of the product.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

INCORRECT C-BUS CABLE INSTALLATION

The C-Bus network cabling is classified as Separated Extra-Low Voltage (SELV) wiring. To maintain this requirement, the approved C-Bus cable must be used.

- Ensure that adequate separation and/or segregation of the C-Bus cable from other wiring (for example Low Voltage wiring) is maintained throughout the entire installation.
- Ensure the C-Bus network cable is installed in accordance with the SELV wiring rules and regulations of the jurisdiction.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE

INCORRECT C-BUS INSTALLATION LOCATION

To prevent the possibility of intentional or unintentional interference with the configuration or operation of the C-Bus installation, this equipment should be installed in a location with appropriate access control.

Failure to follow these instructions can result in equipment damage.

Megger Testing

NOTICE

MEGGER TESTING

Megger testing must never be performed on any cable while connected to the product as it could degrade the performance of the product and/or the network.

Failure to follow these instructions can result in equipment damage.

NOTICE

MAXIMUM LOAD RATINGS APPLY

Ensure that the number of lighting loads connected to a single device does not exceed the maximum load rating of each channel.

Failure to follow these instructions can result in equipment damage.

Disclosure

This documentation contains general descriptions and/or technical characteristics of the products contained herein. It is not intended to determine whether these products are suitable for specific applications or to determine their reliability. In order to determine whether the products are fit for any particular application or use, users or integrators must conduct the appropriate risk analysis, evaluation, and testing. Any misuse of the information contained herein will not be the responsibility or liability of Schneider Electric or any of its affiliates. If you have suggestions for improvements or amendments or have found errors in this publication, please notify us.

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The product must be installed and used in accordance with all applicable state, regional, and local safety regulations. In order to ensure safety and compliance with documented system data, only the manufacturer should perform component repairs.

Devices with technical safety requirements must follow the relevant instructions.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

About the Device

Digital Dimmers are designed to be used in switchboard distribution applications. The 5508D1D and 5504D2D are new generation C-Bus phase cut dimmers compatible with a wide range of load types due to their customizable load profile and dimming curve features.

The units are DIN rail mounted, measuring 12 modules wide (1 module = 18 mm). C-Bus connection is achieved through the use of RJ45 connectors, allowing similar units to be looped together quickly.

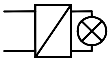
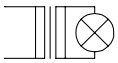
Features:

- DIN Rail mount, 12 M size
- Integrated Switchable C-Bus Power Supply
- Trailing edge or Leading-edge phase control (manually adjustable per channel)
- Fully customizable load profiles and dimming curves
- 230 / 110 V nominal voltage
- Advanced status information for the unit and the channels
- Two phase-independent dimming banks
- Full configuration with SpaceLogic C-Bus Commission
- Programming via C-Bus connection without an energized mains line
- 2 models
  - 8 channel 1 A (5508D1D)
  - 4 channel 2 A (5504D2D)

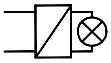
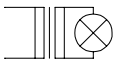
Compatible Loads

The Load compatibility table shows the loads that are compatible with the C-Bus Digital Dimmers: 8 channel and 4 channel.

8 Channel

Load	Compatible Load Types	Load Rating	Lamp Rating	
			at 230 Vac	at 110 Vac
LED	Dimmable LED Lamps and luminaries	1 A per channel	230 W	110 W
	Incandescent/Halogen Lamps			
	Halogen Lamps with electronic transformers			
	Halogen Lamps with dimmable iron core transformers			

4 Channel

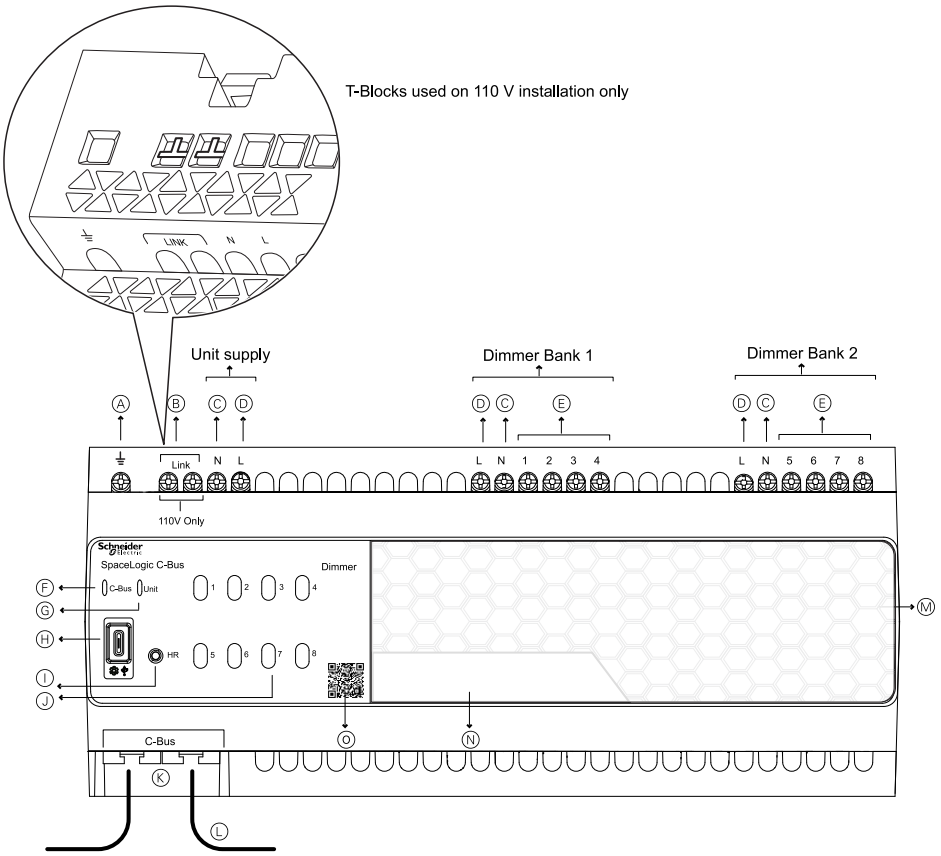
Load	Compatible Load Types	Load Rating	Lamp Rating	
			at 230 Vac	at 110 Vac
LED	Dimmable LED Lamps and luminaries	2 A per channel	460 W	220 W
	Incandescent/Halogen Lamps			
	Halogen Lamps with electronic transformers			
	Halogen Lamps with dimmable iron core transformers			

NOTE: The installer should ensure that an appropriate manually operated mechanical isolating switch and circuit breaker is installed with the load, complying with the local wiring rules.

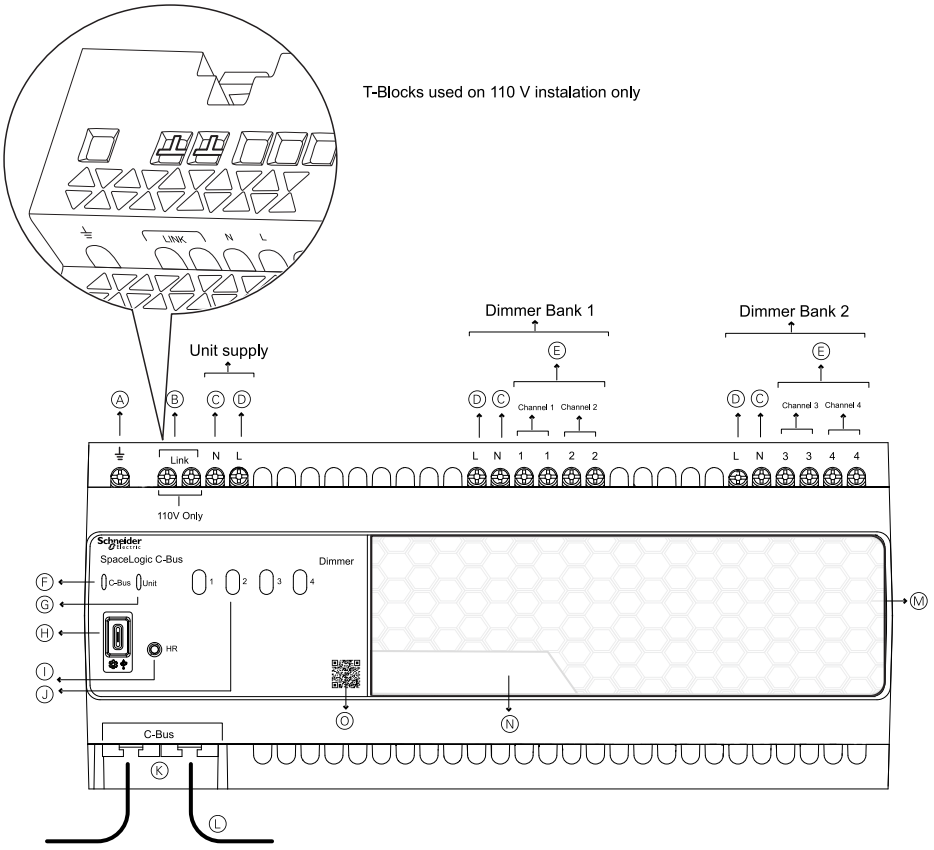
IMPORTANT: It is recommended that motorized loads, such as exhaust fans and ceiling fans are connected to the relevant C-Bus relays rather than dimmers.

Hardware Description

8 Channel Dimmer



4 Channel Dimmer



A: Earth

B: Wire Link Terminal for 110 V

C: Neutral

D: Active Line

E: Load Connections

F: C-Bus Indicator

G: Unit Indicator

H: USB (Type-C) Connector

I : Hard Reset Button

J: Channel Button Indicators

K: C-Bus Connectors 2x RJ-45

L: C-Bus Network Cable.

M: Transparent Removable Cover

N: Space for Labelling

O: QR Code for Product Details and Serial Number

Phase Banks

The Dimmers have 2 separate dimming banks which require separate *active* and *neutral* connections.

The dimming banks can be connected to :

- different phases to each other, and
- can also be connected from different phases to the dimmer’s unit power supply. For details refer, 8 channel dimmer, page 9 and wiring

Project Design and Installation

Installation Requirements

- Airflow around the unit and the ventilation holes must not be restricted. Adequate ventilation should be provided in the enclosure to ensure that the temperature in the enclosure is maintained within the rated operating temperature range of the dimmer.
- If the anticipated ambient temperature levels are higher than operating temperature, it is advised to refer the derating table guidelines to adjust the dimmer load accordingly.
- The operating calorific values and the heat load must be considered when designing the distribution board.
- Connect only compatible load types to the dimmer.
- The use of external protection against power surges is recommended.

Device and channel operating Temperature and Derating

During operation with rated load on all channels (total 8 amps), and with the unit installed in an environment maintained at the rated operating temperature, the internal components are maintained at temperatures which helps in long-term reliability.

As a result, there is a trade-off between the dimmer units total rated load and rated operating temperature. The rated load of 8 amps is at 100% with the temperature of the operating environment equal or below 35° C, and is reduced linearly according to the table to a maximum operating temperature of 55° C where the total dimmer load of 4 amps, 50% is sustained.

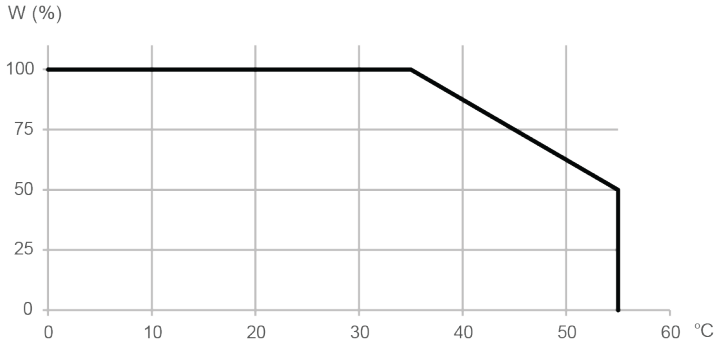
In order to maintain the operating environment within the rated operating temperature range, the operating calorific values and the heat load must be considered when designing the distribution board.

To maximize life span, dimmers incorporate several protection features, page 29, for early diagnosis of adverse environmental factors.

- If the load on the dimmer is too high for the environmental and loading conditions, and the dimmer channel temperature rises above 80° C, the dimmer channels will reduce their brightness to lower the operating temperature, which will be indicated as an "Over Temperature Windback" condition.
- In the "over temperature windback" condition, if the dimmer channel temperature continues to rise and reaches to 100° C, the dimmer channels will shut down to protect the unit.

Once the shutdown condition is triggered, the channel has to be turned off and on again from C-Bus.

Operational environment conditions and status information can be relayed to integrators via the SpaceLogic C-Bus Commission software and via the C-Bus Error Reporting and Measurement Applications (if enabled).



Heat Load Generated by the Dimmer

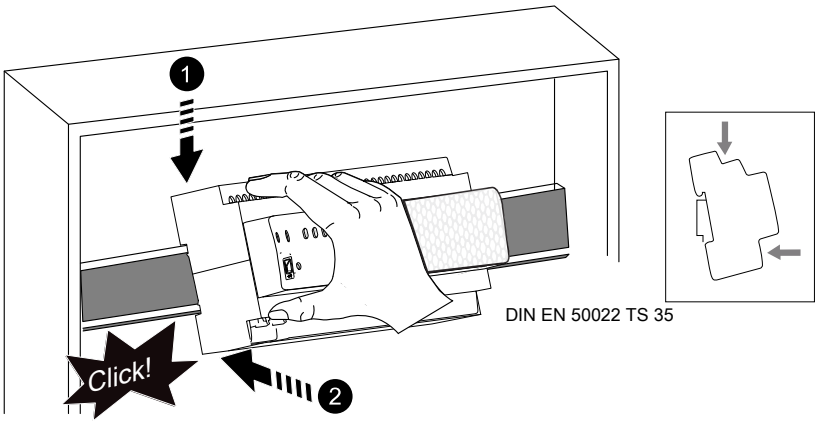
To secure adequate operation temperature, while designing the distribution boards, refer below table for calorific values generated by the dimmer during operation.

Dimmer	Load Capacity	C-Bus Power Supply Status	Heat	
5508D1D (8 channel 1 A)	At Maximum Load	C-Bus Power Supply Enabled	74.4	BTU/h
		C-Bus Power Supply Disabled	65.9	
	At Minimum Load	C-Bus Power Supply Enabled	19.8	
		C-Bus Power Supply Disabled	11.3	
5504D2D (4 channel 2 A)	At Maximum Load	C-Bus Power Supply Enabled	74.4	
		C-Bus Power Supply Disabled	65.8	
	At Minimum Load	C-Bus Power Supply Enabled	16.4	
		C-Bus Power Supply Disabled	7.8	

Mounting and Wiring

Mounting

The dimmer should only be installed horizontally on the mounting rails (type DIN EN 50022 TS 35) inside a distribution board.



Electrical Connection

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

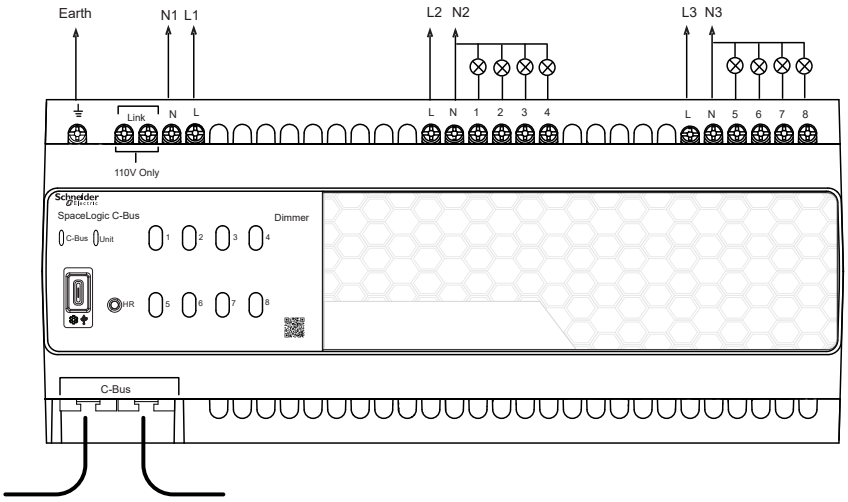
- This product must be installed and serviced by appropriately qualified and/or licensed professional in accordance with the local wiring rules
- Isolate the electrical supply before doing any work on the product
- Ensure that the product has been correctly installed and tested for safe operation before reconnecting the electrical supply
- Do not use this product for any other purpose than specified in this instruction
- Pay attention to the specifications and wiring diagrams related to the installation

Failure to follow these instructions will result in death or serious injury.

The 5508D1D and 5504D2D units are capable of handling up to:

- 5508D1D : 8 A across 8 dimmed channels (1 A per channel)
- 5504D2D : 8 A across 4 dimmed channels (2 A per channel)
- Consider the maximum current drawn and the unit's terminal size when selecting cables

A wiring diagram for the C-Bus Digital Dimmers is provided below:



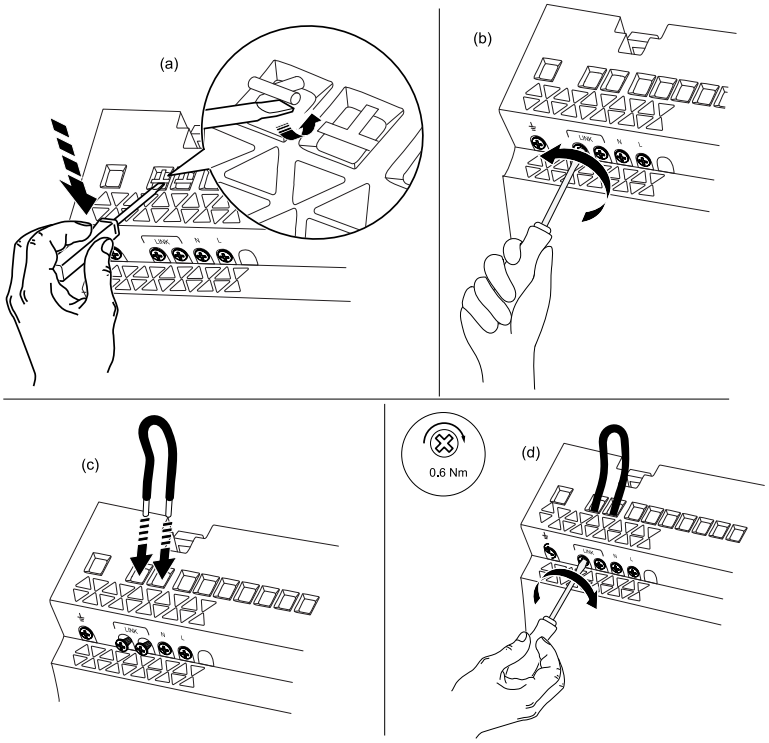
The electrical connection is made via screw terminals. The description of the terminals is defined in Hardware description, page 9

Consider the following points when installing these units:

- Fix mains cabling in the distribution board using cable ties or trunking as required by local cabling rules. Take care not to allow copper strands to enter the DIN unit's apertures
- Rubber bungs are supplied for unused RJ45 connectors, to stop foreign bodies from entering the unit. Always install these bungs when the unit is mounted inside a mains rated enclosure
- Mains terminals accommodates 2 x 1.5 mm² or 1 x 2.5 mm² (2 x 16 AWG or 1 x 13 AWG) cable size
- The screw driver to be used for the terminals is Philips PH1
- The maximum torque to be applied to cable screw is 0.6 Nm

110 V Electrical Wiring

To use the dimmer with a 110 V unit supply, break the T-Block terminal using a screw driver and connect a wire link between terminals.



⚠WARNING

EQUIPMENT DAMAGE HAZARD

Do not break T-Block terminal and/or insert a wire link unless using the dimmer with 110 V unit supply voltage.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE

EQUIPMENT DAMAGE HAZARD

When breaking the T-Block in the terminal, be careful not to damage other terminal blocks.

Failure to follow these instructions can result in equipment damage.

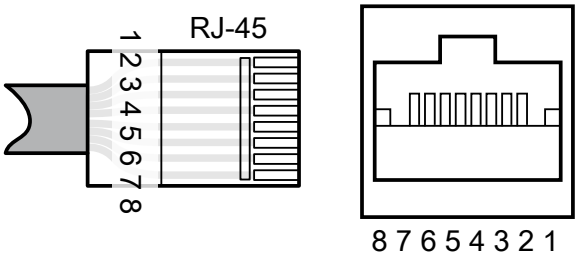
C-Bus Network Connection

Connection to the C-Bus network is made via one of the RJ45 connectors. Use only C-Bus certified cable, which is identifiable by its pink sheath.

For C-Bus cable, refer:

- Catalogue number: 5005C305B (solid)
- Catalogue number: 5005C305BST (stranded)

The RJ45 connectors are internally connected. See below illustration for pinouts and cable conductor assignments.



Pin	**Wire Colour** Compliance to TIA/EIA 568A wiring standard	Signal
1	Green & White	Remote ON
2	Green	Remote ON
3	Orange & White	C-Bus Negative (-)
4	Blue	C-Bus Positive (+)
5	Blue & White	C-Bus Negative (-)
6	Orange	C-Bus Positive (+)
7	Brown & White	Remote OFF
8	Brown	Remote OFF

C-Bus Power Requirements

The dimmer includes a switchable inbuilt C-Bus power supply which can supply 200 mA to the network when enabled.

By default, the inbuilt power supply is disabled, but can be enabled (or disabled) via the front panel.

Adequate C-Bus Power Supply Units must be installed or enabled to support the connected devices. The SpaceLogic
C-Bus Commission software provides information if the inbuilt power supply is enabled/disabled in each unit.

This can be helpful in determining the power supply requirements of a particular network.

NOTE: The dimmers draw 20 mA from the C-Bus network when mains power is not connected and/or when the inbuilt C-Bus power supply is not enabled.

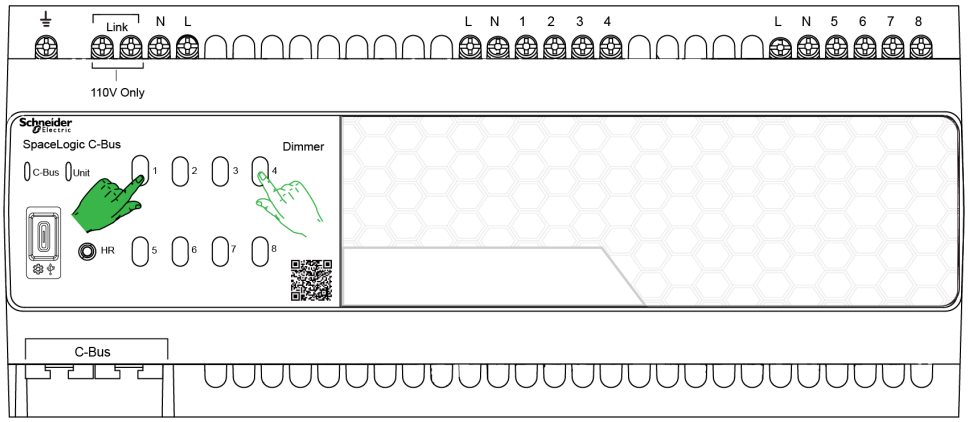
Enable/Disable C-Bus Power Supply from Front Panel

The integrated C-Bus power supply can be enabled or disabled via the front panel by performing a short press on the top right channel button whilst holding down the top left channel button to toggle the enabled state.

The enabled status of the integrated C-Bus power supply is shown on the Unit Indicator, page 30 and Channel Indicator, page 31. The state of the network voltage is shown on the C-Bus Indicator, page 31.

If the C-Bus Indicator is flashing or off, the network voltage is too low, meaning there is insufficient C-Bus Power. additional power supplies may need to be enabled.

NOTE: Changing the power supply state will temporarily disrupt C-Bus network communications, which take several seconds to recover, depending on the network configuration.



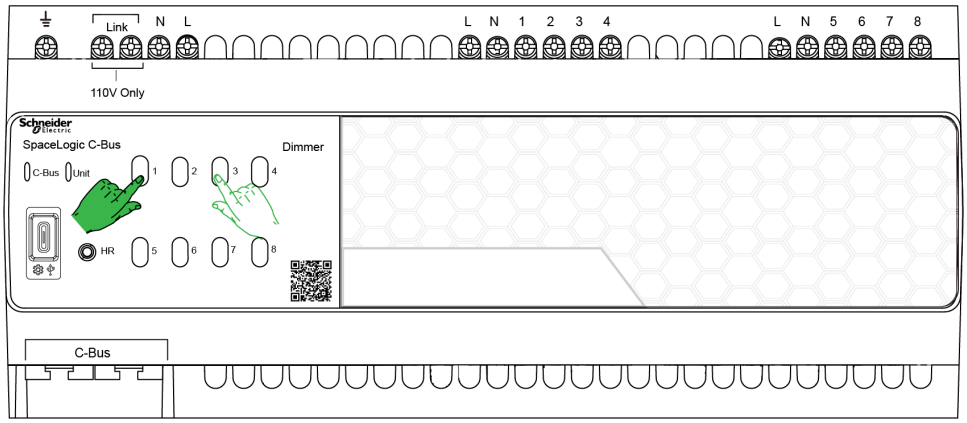
NOTE: SpaceLogic C-Bus Commission also presents the status of the C-Bus power supply and can disable the ability to change the power supply state from the front panel.

IMPORTANT: Ensure that no more than 2 A of total C-Bus Power Supply capacity is enabled/connected to any one C-Bus network.

Enable/Disable C-Bus System Clock Generator

Dimmers incorporate a selectable C-Bus system clock generator. The system clock is used to synchronize data communication over a C-Bus network. At least one active C-Bus system clock is required on each C-Bus network for successful communication. If a system clock is required, it can be enabled from the SpaceLogic C-Bus Commission software and the indicator buttons on the dimmer.

To enable or disable the C-Bus clock generator via the front panel, short press on the top second-to-right button whilst holding down the top left channel button. This toggles the enable state.



NOTE: SpaceLogic C-Bus Commission also displays the status of the clock and can disable the ability to toggle the clock generator enabled state from the front panel.

Using the Device

Dimming Mode Selection (TE/LE)

By default, all dimmer channels are set to Trailing Edge. The dimmer enables selecting the dimming mode per channel, trailing edge (TE), or leading edge (LE), which can be changed via the front panel and/or the SpaceLogic C-Bus Commission software.

To check the operation of the connected load, short press (<0.5 s) the channel button to toggle the state of the channel. The load should turn on, and the channel button will illuminate in the color corresponding to the currently selected dimming mode (Yellow = TE, Green = LE).

If the channel does not turn on, and the indicator flashes red, the channel settings needs to be changed.

For more details refer, selecting the right dimming mode, page 20 and load profiles, page 25.

Selecting the right Dimming Mode

In most cases, the mode on the dimmer need not be changed to LE mode.

Dimmer mode need to be changed only if an inductive load is connected, such as an iron-core low voltage lighting transformer, or a motor.

If an inductive load is connected to the dimmer in TE mode, the dimmer will detect the voltage spikes and shut down the channel, and indicate a Mode Error (flashing red channel indicator).

If this occurs, you can change the channel mode by pressing and holding the flashing red channel indicator for approximately 10 s. The channel will then turn off and then on again in LE mode (indicated by a green channel indicator).

Some LED’s are tolerant of being driven in LE mode, but in most cases they will work better in TE mode.

If an LED is connected to the dimmer in LE mode, sometimes the dimmer will not be able to control it. In this case, the dimmer will shut down the channel and indicate an Incompatible Load Error (flashing red channel indicator).

If this occurs, the channel mode can be changed by pressing and holding the flashing red channel indicator for ~10 s. The channel will then turn off and then on again in TE mode (indicated by a yellow channel indicator).

NOTE: It is also possible to change the mode using the SpaceLogic C-Bus Commission software.

Local Override

The channel indicator buttons on the front of the dimmer toggle the corresponding channel on and off, providing local override capability.

Each button illuminates only when its respective channel is in the ON state.

Local channel indicator buttons perform different functions depending on how they are pressed.

Operation	Function
Short-press (<0.5 second)	A single short press toggles the state of a channel.
Double Short-press	Two short presses in series return the channel to the C-Bus network level.
Long-press (1–2 second)	A long press on any local indicator button for one second or more returns all channels to the C-Bus network level.

A long-press on any local indicator button for one second or more returns all channels to the C-Bus network level.

> **NOTE:** Double short-press and long-press operations only apply when the dimmer/channel is in local override mode.

By default, any C-Bus commands received by the dimmer will override local toggle changes. In this case, only the channel associated with the received commands will revert to the C-Bus network state. This option can be disabled in software using priority of operating modes.

Priority of the Operating Modes

The output status of a C-Bus DIN Rail Digital Dimmer can be changed by:

- Pressing a C-Bus button
- Activating any of the local toggle buttons (local override)
- Using the Remote Override facility

The priority ranking of these actions is as follows:

Mode	Priority	Function
Thermal overload	1 (highest)	Channel automatically dimmed
Remote OFF	2	All channels OFF
Remote ON	3	All channels ON
Local override	4	Toggles the channel
C-Bus Input Unit (Wall plates, sensor etc)	5	Control the channel

Remote Override

The extra two pairs of the C-Bus network cable provide high priority override functions for most C-Bus Output units. The Green & Green/White pair is used for the Remote ON function. The Brown & Brown/White pair is used for the Remote OFF function.

Connecting either pair to the C-Bus negative pair activates the corresponding function.

The SpaceLogic C-Bus Network Automation and Application Controllers provide facilities to control these overrides.

IMPORTANT: During the installation, it is important to make sure these pairs are not left unplugged, as this may cause the override functions to be triggered by accident.

Power-Up Load Status

The dimmer has on-board non-volatile memory, which by default is used to store the operating state of each channel in case of power loss.

The SpaceLogic C-Bus Commission software allows the channels to be configured to restore any fixed level, or restore to their previous level upon restoration of power.

On restoration of power, the dimmer waits approximately 5 seconds for power to stabilize before restoring the channel states.

Phase-Cut Dimming

A phase control (phase-cutting) dimmer adjusts the brightness of the connected load by varying the portion of the mains AC waveform that is passed through to the connected load.

In a 50 Hz system, a full mains cycle takes 20 milliseconds (ms), which consists of a 10 ms positive half-cycle and a
10 ms negative half cycle.

At the beginning of the cycle the mains voltage is zero ("zero crossing"), it then rises to reach its peak value
(~340 V peak in a 240 V rms system) after 5 ms, before reducing again to zero at 10 ms. The cycle then repeats with the opposite polarity.

The portion of this 10 ms half-cycle time for which the dimmer passes power to the load is called the Conduction Time, and might be expressed in milliseconds (ms) or microseconds (us) where 1 ms = 1000 us.

"Triac" and "MOSFET" are two main types of electronic switch used in dimmers to control the flow of power to the load.

Older Dimmer used Triac's.

A triac can be turned ON at any point in the mains cycle, but once turned on, they cannot be turned OFF without reducing the load current to zero. Due to this limitation, triac dimmers can only perform "Leading Edge" (LE) phase control, where triac turns the power to the load on part way through the cycle and it then remains on until the current drops to zero as the voltage drops to zero.

To set a high brightness, the triac is turned on right at the start of the cycle, immediately after the zero crossing, and then allows power through the load for the whole cycle.

To reduce the brightness, the triac is turned on part way into the cycle, some time after the zero crossing. The longer the delay, the lower the conduction time, and the lower the brightness.

This means depending on where in the cycle the triac turns on, there can be a very large step change in the voltage applied to the load. At 50% conduction, the step change is equal to the peak of the mains (340 V in a 240 V rms system).

This works well for older style loads such as incandescent lamps and for inductive loads like iron-core low voltage lighting transformers or motors, which naturally limit the inrush current. It is not good for electronic loads such as electronic transformers or LED lighting, which have a capacitance at the input, as this capacitor looks like a short circuit to the triac, causing large inrush current spikes.

To overcome this older dimmer limitation:

Digital Dimmer uses MOSFETs, which can be turned both on AND off at any point in the cycle.

These designs allow "Trailing Edge" (TE) phase control, where the power to the load is turned on at zero crossing, and turned off after the desired conduction time.

Trailing phase control is ideal for modern electronic loads like LED lighting, since turning power to the load on at zero voltage means the inrush current is minimized.

However, it is not suitable for inductive loads, since an inductance resists rapid changes in current, resulting in generation of high voltage spikes when the load is switched off.

As a result, Trailing Edge dimmers have a protection mechanism whereby they will shut down if voltage spikes are detected, usually due to an incompatible inductive load being connected.

Since MOSFETs can turn on AND off, MOSFET dimmers can also be designed to operate in Leading Edge mode.

A dimmer which can operate in both modes is often referred to as a "universal" dimmer, which usually start in trailing edge mode (since this is the correct mode for most modern load types), and then switch automatically to leading edge mode if over voltage spikes are detected.

Automatic mode selection is not always reliable and often results in erratic or inconsistent behavior.

Configure the Device

Configuration and Commissioning of the C-Bus unit is done by the C-Bus connection using the “SpaceLogic C-Bus Commission” software. To download the software click here

The dimmer unit can be powered up by the USB-C connection for programming via C-Bus (without an energized mains connection).

Load Profiles

A Load Profile adjusts certain settings within each dimmer channel which tailors the dimming behavior to improve the end to end dimming experience.

Inbuilt Load Profiles and Inbuilt Dimming Curve, have the pre configured settings which cannot be modified. If the acceptable results cannot be realized with the load being used, the settings are customized and applied to a dimmer channel.

A custom file is allowed to be saved and used within other channels of the dimmer and also shared across other compatible dimmer devices.

In inbuilt, default dimmer channel profile is selected to be the most universal. There are 4 user-configurable dimmer channel profiles. Each channel can be assigned to any one of these 5 profiles. In each case there is a improvement for the light source behavior during dimming, the load profile can be adjusted by the SpaceLogic C-Bus Commission software.

The SpaceLogic C-Bus Commission software enables:

- The customization of the load profiles per channel
- 4 user configurable profile per channel/device
- Saving and sharing of endless load profiles for future project uses
- Provides guidance for starting point for adjusting the parameters for the most known loads
  - LED Lighting (TE Dimmable)
  - LED Lighting (LE Dimmable)
  - Electronic Transformer (TE Dimmable)
  - Electronic Transformer (LE Dimmable)
  - Incandescent Lighting (TE Preferred)
  - Incandescent Lighting (LE)
  - Sweep Fan
  - Exhaust Fan

NOTE: For future use, SpaceLogic C-Bus Commission enables saving, uploading or sharing of load profile files which includes the following :

- Load Brand
- Load Model
- Load Quantity
- Custom notes associated with the load
- Dimming Setting which include the following:

Minimum Brightness: Sets the level where the load operates or is visibly On.

Maximum Brightness: Sets the level where the load exhibits no further change in brightness or output.

Soft Turn On: Sets the role of change for Instant Ramps. The value is the time taken to transit from Off to Maximum Brightness. This value can also affect the timing of C-Bus Ramps between levels and the output of a dimming curve, which is set to 1 second or less.

Soft Turn Off: Sets the role of change for Instant Ramps. The value is the time taken to transit from Off to ON.

Kickstart

Some types of loads have problems starting at low conduction/brightness settings. This shows up as a lamp taking a long time to turn on when turned on at a low setting, or taking along time to respond and they suddenly turning on at a higher level when ramped up slowly from off.

In the case of a motor such as a sweep fan, it might take a long time to start moving or not move at all at low settings.

The Kickstart is a feature which, when enabled, uses a higher brightness setting for a short amount of time when transitioning from off to on, which improves the startup behavior of loads with these kinds of problem.

When Kickstart is enabled, each time the channel is turned on, if the level is less than the "Kickstart Brightness", the channel will fade to the "Kickstart Brightness" setting over the duration set by the "Kickstart Turn On" setting. It will then stay at the Kickstart Brightness setting for the duration set by the "Kickstart Duration", and then fade to the current level over the duration set by the "Kickstart Recovery" setting.

Kickstart Duration: When enabled, sets the duration to maintain the Kickstart Brightness level before recovering to a lower level if set.

Kickstart Brightness: When enabled, sets the dimmer Kickstart Minimum Brightness level before when transition from Off to On (at any level).

Kickstart Turn On: When enabled, sets the time in which the Kickstart Brightness level is applied to the load. A value of 10 ms is a Fast or Hard Start (same as a

switch). This value is recommended to be set to Fast between 0.010 ton 0.100 seconds.

Kickstart Recovery: When enabled, sets the time taken at the end of the Kickstart duration to transition from the Kickstart Brightness level to the currently set level of the load.

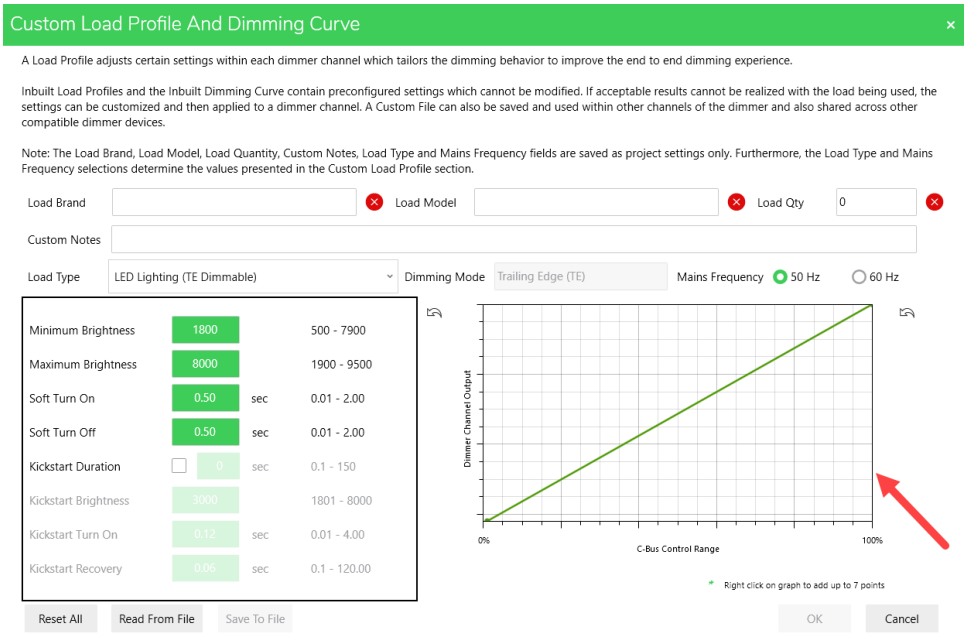
If the set level is less than the Kickstart Brightness level, this value is set to Slow to achieve a smooth unnoticeable transition at the end of the kickstart.

Dimming Curve

A "Dimming Curve" refers to a translation between input level and output level.

With the inbuilt load profiles, dimming curve relationship is linear. However, with some types of load dimming curve will result in a non-linear change with perceived brightness as you dim. In such case, a custom dimming curve can be defined to address.

Example: At low conduction time, a small change in conduction time may result in a large change in brightness.
Since C-Bus ramp rates give a constant rate of change of level and therefore conduction time, this is perceived as very rapid dimming at the low end and slower dimming at the high end. Using a dimming curve with a flatter slope at the bottom end results in smaller changes in conduction time in the lower dimming range, giving more control.



NOTE: The Dimming Curve translation is applied after Min/Max scaling, the Min/Max Scaling feature is effectively just limiting the range rather than altering the space of the curve by squashing it over a smaller range.

Min/Max Scaling

The Min/Max scaling feature takes the input control level range of 1-255 and scales it to the range Min-Max.

- An input control level of 0 is always 0 (off)
- An input control level of 1 is scaled to Min
- An input control level of 255 is scaled to Max

NOTE: Since the adjustments related to load limits are handled by the Dimmer Load Profiles, the primary use case for Min/Max scaling is limiting the control range where a higher minimum or lower maximum is desired.

For example, the kitchen and bedroom can use the same load profile since the load type is the same, but can adjust the range using the Min/Max scaling instead.

Warn Before Off

Warn before OFF is an optional courtesy feature of the Dimmer. It can be enabled by and Enabled Control Group and the duration can be set up to 15 min.

When a command is received from C-Bus, and when warn before OFF is set, the channel:

- Does not immediately turn off
- Initiates a warning, indicating that the light is about to turn OFF
- Turns OFF after the preset warning time

NOTE: The warning consists of going to a pre-set level (1-100%) for a pre-set duration (1-15 minutes), before it turns off. If a second OFF command whilst the warning sequence is active, this will cause the channel to turn off immediately.

Logic

Logic feature combines the level of the primary lighting group with the level of one or more "logic" lighting groups in order to determine the final level that controls the output. In dimmer there are 4 logic groups, and each channel can be combined with any number of these.

In dimmers, there are two logic functions available :

1. In “MIN" logic, the output level takes the minimum value of the primary lighting group and the states of all logic groups which that channel is configured to be combined with.
    a. This is useful as a way of limiting the brightness at different times of day. The primary group can be used to control the level and state, and the logic group can be used to limit the brightness. Example, a schedule can set the logic group to a lower level after dark so that lights turned on during the night only come on at a low level. The schedule would then also set return the logic group level to maximum at sunrise so that the lights starts to function normally again.
2. In "MAX" logic, the output level takes the maximum value of the primary lighting group and the states of all logic groups which that channel is configured to be combined with.

Protection Features

To maximize device life span, digital dimmers incorporate several protection features and transmits information related to the C-Bus network and load status flow to the system integrator via C-Bus measurement and error reporting application for early diagnosis of adverse environmental factors.

Thermal Wind Back and Recovery

In any dimming mode, if the channel's internal temperature exceeds 80°C the dimmer periodically reduces the conduction time (the brightness). This continues until the channel temperature reduces below 80°C.

The brightness will recover when the temperature remains below 80°C. Whilst in this over temperature wind back state, the over temperature channel status will be reflected in the channel indicator state and also via Error Reporting Application (if enabled).

Over Temperature (Thermal Shutdown)

If the channel temperature continues to rise and reaches 100°C, the channel will shut down and indicate over temperature shutdown status on the channel indicator and via Error Reporting Application (if enabled).

Once in this state, the channel will remain off until the state is toggled.

Over Current

Each channel of the dimmer includes over current protection against faults such as wiring faults, incandescent lamp filament failure and excessive load.

If the channel’s over current protection is triggered, the channel will shut down and indicate over current status on the channel indicator and via the Error Reporting Application (if enabled).

Once in this state, the channel will remain off until the state is toggled.

Incompatible Load

If the dimmer channel identifies that the connected load is incompatible with the selected mode or load profile, the channel will turn off and indicate ‘Incompatible Load Error” via the indicator.

Mode Error

In TE mode, if inductive spikes are observed while dimming suggesting a presence of an inductive load, the channel will shut down and indicate mode error.

Indicators

Unit Indicator

Action	LED Indication	Status
Green LED is ON		• Unit powered • C-Bus power supply Enabled
Yellow LED is ON		• Unit powered • C-Bus power supply Disabled
LED OFF		No power to device
Red LED is ON		• Unit powered • Configuration Error
Slow Flash, Red/Green	 0.5 seconds red and 0.5 seconds green	• Internal temperature has exceeded over-temperature threshold • C-Bus power supply enabled
Slow Flash Red, Yellow	 0.5 seconds red and 0.5 seconds yellow	• Internal temperature has exceeded over-temperature threshold • C-Bus power supply disabled
Override Flash Red, Green	 0.1 seconds red and 0.9 seconds green	• Internal temperature has exceeded over-temperature threshold • Override Active, C-Bus power supply enabled
Override Flash Red, Yellow	 0.1 seconds red and 0.9 seconds yellow	• Internal temperature has exceeded over-temperature threshold • Override Active, C-Bus power supply disabled
Override Flash Off, Green	 0.1 seconds off and 0.9 seconds green	• Override active • C-Bus power supply enabled
Override Flash Off, Yellow	 0.1 seconds off and 0.9 seconds yellow	• Override active • C-Bus power supply disabled
Fast Flash, Green	 0.2 seconds green and 0.2 seconds off	Secondary firmware update in progress

C-Bus Indicator

Action	LED Indication	Status
Solid(not flashing)	Regardless of color	C-Bus Voltage OK
Steady Flash		C-Bus Voltage marginal (15-20 V)
Short Flash		C-Bus Voltage critical (<15 V)
Red		No C-Bus clock detected, Host Online
Green		C-Bus clock detected, Host Online
Yellow		C-Bus clock detected, Host Offline
Off		No C-Bus voltage present or unit not powered

Channel Indicator

Action	LED Indication	Status
Short-Press on the channel (< 05 second)		Channel On, Leading Edge mode
		Channel On, Trailing Edge mode
Slow Flash, Red	0.5 seconds red and 0.5 seconds off	Channel shutdown due to incompatible load or mode error
Off		Channel off
On, Red		Channel Offline, Normally due to no mains supply to channel
Fast Flash, Red	0.2 seconds yellow and 0.2 seconds off	Channel shutdown due to over current
Fast Flash, Yellow	 0.2 seconds yellow and 0.2 seconds off	Channel shutdown due to over temperature condition
Slow Flash, Yellow	 0.5 seconds yellow and 0.5 seconds off	Channel operating at reduced setting due to over temperature condition

Firmware Update

The SpaceLogic C-Bus Commission software will notify if a firmware update is required. The update requires a connection to the USB-C connector on the dimmer and is performed using the SpaceLogic C-Bus Commission software. All required firmware files will be included and authenticated as part of the latest SpaceLogic C-Bus Commission software release.

Measurement Application

The Measurement application is used for broadcasting values of physical parameters monitored by C-Bus devices.

Measurement application messages can be displayed on eDLT and/or SpaceLogic C-Bus Automation Controllers.

Example: A C-Bus temperature sensor might broadcast the measured temperature for display on an eDLT, or for use by a SpaceLogic C-Bus Automation Controller to control an under-floor heating zone.

Measurement Application messages contain the following information :

- A Device ID to identify the unit which broadcast the message
- The channel number, which is used to differentiate between multiple measurements that the single device may produce

  Example: The 4 channels of a 4 channel temperature sensor, or different parameters measured for a single channel.
- The measured value
- The units of the measured value (example: volts, amperes, degrees)

The dimmers provide measurements of the following values via the Measurement application.

- Lamp Running Times
- Channel Operating Temperatures
- Power Supply Load Current
- C-Bus Voltage
- Unit Operating Temperature

There are multiple quantities available per channel, the different quantities use blocks of channel numbers with different offsets according to the parameter.

Channel Number	Quantity	Units
0-7	Channel 0-7 Lamp Running Time	Hours
128-135	Channel Operating Temperature	Degrees Celsius
252	Power Supply Load Current	Amperes
253	C-Bus Voltage	Volts
254	Unit Operating Temperature	Degrees Celsius

Measurements can be configured to broadcast periodically, by setting the Measurement Periodic Broadcast parameter. This can be set to an interval between 1 and 254 minutes.

> **NOTE:** If periodic broadcast is not required, a trigger group can be configured to request either individual channels (by using the action selector corresponding to the channel requested), or an action selector of 255 to request all channels to be updated. This can also be used in conjunction with a regular broadcast.

In addition, individual quantities may be excluded from the regular broadcast by de-selecting them in the ‘Measurement Regular Broadcast’ options parameter.

Eventually, the ‘Lamp Running time measurements’ can be reset to zero by configuring a ‘Trigger Group’ and sending a ‘Trigger Event’ on that trigger group with the action selector set to the channel which is to be cleared, or an ‘Action Selector’ of 255 to clear all channels.

Error Reporting Application

The C-Bus Error Reporting application is used to notify and manage error of other status information detected by C-Bus devices.

The C-Bus devices can monitor various operational parameters, and can report error or warning conditions using the
C-Bus Error Reporting application.

The reports consists of information on the source, severity and nature of the error or fault condition, and also allow independent tracking and acknowledgement of the most recent and most severe conditions.

The reports are monitored by a device such as a SpaceLogic C-Bus Automation Controller, which can:

- display the status to the user
- allow them to acknowledge reports
- and as well as clear any latched errors

A SpaceLogic C-Bus Automation Controller can also make all of this available to a higher layer such as a BMS via BACnet.

There are 5 Error Reporting Modes. The mode controls:

- which error reports are generated
- and when they are generated

The mode can either be fixed during commissioning time, or can be changed dynamically by assigning a control group on the Enable Control application.

In addition to controlling the generation of error reports using the mode, a Trigger Control Group may be configured to request an update to ALL error channels at any time. This can be useful to manage traffic in an installation, where a large number of Error Reporting devices or channels exist.

Modes	Types of errors	Description
Mode 0	OFF	In this mode, neither live reports or regular reports are generated
Mode 1	All channels: Most Recent Errors only	• In this mode, live reporting is enabled, meaning a change in error state for any channel will be emitted when it occurs • In addition, if the Regular Reporting Interval parameter is configured, the current error state of all channels will be re-sent at the configured interval • Setting the Regular Reporting Interval to zero disables the regular reports, but live reporting remains active. This allows timely notification of error status changes but without the traffic overhead of additional regular reports
Mode 2	All channels: Most Recent and Most Severe Errors	This mode works the same as Mode 1, but also includes tracking of the Most Severe errors for each channel
Mode 3	Minimum reporting: Most Recent Errors only	This mode works the same as Mode 1, but excludes the individual channel reports This can be useful to reduce the amount or traffic where there are a large number of channels or a large number of devices exist. The aggregate channel is included, which is a logical OR of all of the channel error bytes, which still allows channel errors to be monitored
Mode 4	Minimum reporting: Most Recent and Most Severe Errors	This mode works the same as Mode 2, but excludes the individual channel reports

The following channel error status information is available via the Error Reporting application:

- **Mode Error**: The channel has shut down due to the attached load being incompatible with the currently selected mode
- **Incompatible Load**: The channel has shut down due to the attached load being incompatible with load profile
- **Over-temperature Windback active**: The channel is operating at a reduced operating point due to excessive temperature
- **Over-temperature Shutdown** : The channel has shut down due to extreme temperature
- **Over-current Shutdown**: The channel has shut down due to an extreme current overload
- **Channel Offline** : The channel is not responding
- **Channel Overridden** : The channel has been overridden by the local override, and C-Bus priority is disabled

New devices include an aggregate channel (251) which reports the aggregate (logical OR) of all channel errors.

When used in conjunction with Error Modes 3/4 and a Trigger event for requesting update, this can be useful to minimize Error Reporting traffic.

NOTE: To fetch detailed channel error information, request using the Trigger.

New devices which include a C-Bus Power Supply include a Power Supply Error channel (250).

The power supply error channel allows reporting of up to three error conditions:

- **Load warning** : The load current on the C-Bus Power Supply has exceeded the user-configurable warning threshold level
- **Over-current** : The load current on the C-Bus Power Supply has exceeded the rated load current
- **Current Limit** : The power supply is in current-limit mode, meaning the network is probably inoperable

The load warning and over-current errors are optional. If the warning threshold parameters are not configured, both these errors are disabled. Once the warning threshold parameters are configured, both errors are enabled.

The Current Limit error is always enabled. However due to the nature of the fault, it may only ever appear when most severe errors are enabled, as the network may be made inoperable by this condition.

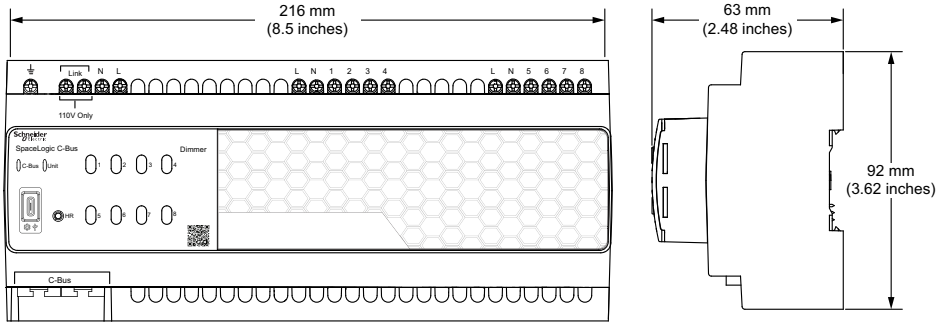
Status and Failure Monitoring and Reporting

All the status of the dimmers full channels can be viewed in the SpaceLogic C-Bus Commission software Property window of the dimmers (device indications, channel indications: setting details).

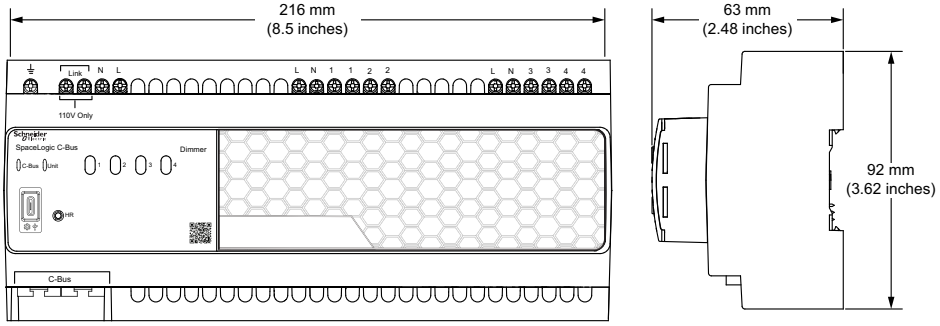
Specifications

Parameter	Description
Nominal Mains Voltage and Frequency	230 V ac ± 10%, 50 Hz ± 3 Hz 110 V ac ± 10%, 60 Hz ± 3 Hz
C-Bus Input Operating Voltage:	20 - 36 V dc
C-Bus Input Operating Current :	20 mA
C-Bus Power Supply (if enabled):	200 mA at 27-35 V dc
Storage Temperature	20 - 60° C
Load Rating	8 channel: Up to 1 A per channel 4 channel: Up to 2 A per channel
Protection Rating	IP20
Dimmer Technology	Adjustable per channel -Trailing edge (TE) / (LE) Leading edge phase control
Compatible Loads	Dimmable LED lamps and luminaires, incandescent/ halogen lamps, halogen lamps with electronic transformers, halogen lamps with dimmable iron core transformers
Operating Temperature	-5 to 55º C with derating
Operating Humidity	10% to 93% Non-condensing
Dimensions (WxHxD)	216 x 92 x 63 mm (8.5 x 3.62 x 2.48 inches)
Mains terminals	Accommodates 2 x 1.5 mm² or 1 x 2.5 mm² (2 x 16 AWG or 1 x 13 AWG) Screw driver for the terminals used is Philips PH1
C-Bus connections	2 x RJ45 Connectors

8 Channel Dimmer



4 Channel Dimmer



Troubleshooting

Symptom	Possible indication (on the front panel of the dimmer)	Possible Causes	Solution
Reduced brightness observed in the dimmer channel outputs	**Channel Indicator**: Slow Flash, Yellow	• Channel is operating at reduced setting due to over temperature condition • Normally due to excessive load and/or inadequate ventilation and/or high operating temperature	• Reduce the load on the channel and/or total the load on the unit • Improve enclosure ventilation to reduce the temperature of the enclosure
Dimmer Channel does not work	**Channel Indicator**: Fast Flash, Yellow	• Channel shutdown due to over temperature condition • Normally due to excessive load and/or inadequate ventilation	
	Channel Indicator: Fast Flash, Red	• Channel shutdown due to over current • Normally due to excessive inrush or load/wiring fault (short circuit)	Check the wiring, rectify the issue and then turn on the dimmer to restore it to its normal operating state
Dimmer does not work	**Unit Indicator**: Slow Flash, Red/ Yellow	Internal temperature has exceeded over-temperature threshold	Improve enclosure ventilation to reduce ambient temperature
	Unit Indicator: Slow Flash, Red/ Green	Unit Over temperature	
	Unit Indicator: Red	Stored configuration is not compatible with firmware version Can occur after a major firmware version update	Redeploy the configuration of the dimmer via the SpaceLogic C-Bus Commission software
Dimmer ignores C-Bus commands	**C-Bus indicator**: Solid Red	No C-Bus clock detected	Enable C-Bus system clock generator
	Unit Indicator : Blinking	Override is active	
Cannot Turn On the channel	**Channel Indicator**: Solid Red	Channel Offline Normally due to no mains supply to channel bank Example: The breaker has tripped or the supply has not been connected If not all channels in the bank are affected, it could be the result of a failed channel firmware update	• Ensure the wiring is done according to the instruction sheet Check breakers if banks have independent circuit protection • If failed firmware update suspected, re-perform the channel firmware update with the SpaceLogic C-Bus Commission software
Cannot turn ON/OFF the C-Bus Power supply from the front panel	Not applicable	Power Supply Toggle from the front panel is disabled by the Software	Change the configuration of the dimmer via the SpaceLogic C-Bus Commission software to enable C-Bus power supply toggle from indicator buttons

Can not enable/ disable the C-Bus clock from the front panel	Not applicable	System Clock Toggle from the front panel is disabled by the Software	Change the configuration of the dimmer via the SpaceLogic C-Bus Commission software to enable System Clock toggle from indicator buttons
No C-Bus Power	**Unit Indicator**: OFF	No mains power supply	Advise to check mains voltage
		C-Bus cable not connected	Advise to check C-bus cable
		Jumper link not fitted for 110 V	Advise to check the connection
Low Voltage	**C-Bus indicator**: Steady Flash	Overload on the network	Enable C-Bus Power supply in additional units
	C-Bus indicator: Short Flash	Low mains voltage	Advise to check mains voltage
		Voltage drop over long distance of cable run	Low voltage indicator - LED provided installer training
Reduced brightness observed in the channel outputs	Not applicable	Warn before off is activated	Expected behavior if warn-before is enabled
		Mixing the loads	Check for load uniformity
Error message after switching ON the dimmer channel	Error message after switching ON the dimmer channel	Incorrect dimming mode	Use the channel button to change to LE mode
The lights are flickering	Not applicable	The default load profile might not be suitable for this light	Customize the load profile and dimming curve to achieve the desired dimming outcome
		Lights can be non-dimmable light sources	Ensure the load that is connected to the dimmer is a dimmable load
		If it occurs at specific times, usually in the evening, there maybe ripple signalling on the grid	Choose a different type of lamp which is less affected by ripple, or install a ripple filter
Cannot find the dimmer on the C-Bus network	Not applicable	Unit is in bootloader state	Cycle the power on the dimmer to exit bootloader
	Unit Indicator: OFF	No mains power supply	Check there is mains power to the unit
		C-Bus cable not connected	Check that the C-bus cable is connected properly
		Jumper link not fitted for 110 V	Check that the 110 V wire link is connected properly
It is difficult to set the brightness level at the bottom or top end of the dimming	Not applicable	The default 1:1 dimming curve may not be suitable for the loads profile	Customize the load profile and dimming curve to achieve the desired dimming outcome
Lights flashes brightly at start up	Not applicable	The default load profile is not suitable for the load or incorrect setting for Kick-start	• Customize the default load profile with minimum and maximum brightness to make the lighting behavior suitable with the load • Ensure there is no incorrectly configured Kick-Start parameter set

The lights do not turn on at lower brightness level set by C-Bus	Not applicable	The default load profile is not suitable for the load	Customize the default load profile with minimum and maximum brightness to make the lighting behavior suitable with the load Consider configuring Kick-Start
Dimmer does not work after firmware update	Not applicable	Interruption during firmware update	• Check the condition of the USB communication cable used between the laptop and the device and ensure good quality cable is used for firmware update, or try a shorter cable Ensure update process is not interrupted, and wait for software to confirm process is complete before removing the cable Check the USB cable connection and ensure it is fully inserted in the USB-C connector • If instructed by the software press the reset button for recovery purposes

Compliance information for Green Premium products

Find and download comprehensive information about Green Premium products, including RoHS compliance and REACH declarations as well as Product Environmental Profile (PEP) and End-of-Life instructions (EOLI).

https://checkaproduct.se.com/

General information about Green Premium products

Click the link below to read about Schneider Electric's Green Premium product strategy.

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