

DALI-2 LS

Datasheet

Light Sensor Module



DALI-2 sensor module
for light detection
and lighting control

Master device:
application controller active

Art. Nr. 68791433

Colour variants: -W16
Installation type variants: -ZD, -AP

DALI-2 Light Sensor Light Sensor Module

Overview

- Light sensor module for DALI and DALI-2 lighting systems
- light intensity measurement instance type 3 (62386-304)
- 2 operating modes:
 - Constant light control
 - Light control (4 thresholds)
- Operating mode specific behaviour can be changed via scenes and external DALI commands.
- Light threshold-controlled regulation for the control of blinds or roller blinds
- The module can be used as a DALI light controller or just as sensor unit for integration in building management systems.
- Easy configuration via DALI-Cockpit Software Tool and Lunatone PC interface.
- Multiple DALI-2 LS can be installed within a DALI system
- Supply via the DALI bus, no additional power supply needed.
- Double terminals for easy installation
- Different installation types: for back box installation, for remote ceiling installation, or surface installation



Specification, Characteristics

type	DALI-2 LS
article number	68791433
electrical data:	
supply	via DALI signal line (DALI-voltage according IEC62386)
marking terminals	DA, DA
typical current consumption DALI	5.8 mA
power consumption	<120mW
control	DALI
insulation data:	
impulse voltage category	II
pollution degree	2
rated insulation voltage	250V
rated impulse withstanding voltage	4kV
insulation DALI/housing	reinforced isolation
insulation test voltage	3000Vac

environmental conditions:

storing and transportation temperature	-20°C ... +70°C
operational ambient temperature	-20°C ... +60°C
rel. humidity, none condensing	15% ... 90%

technical data:

light sensor (62386-304)	range: 0-2047lux (11bit), resolution: 1lux event:0-2047lux(10bit), resolution: 2lux
function	configurable

general data:

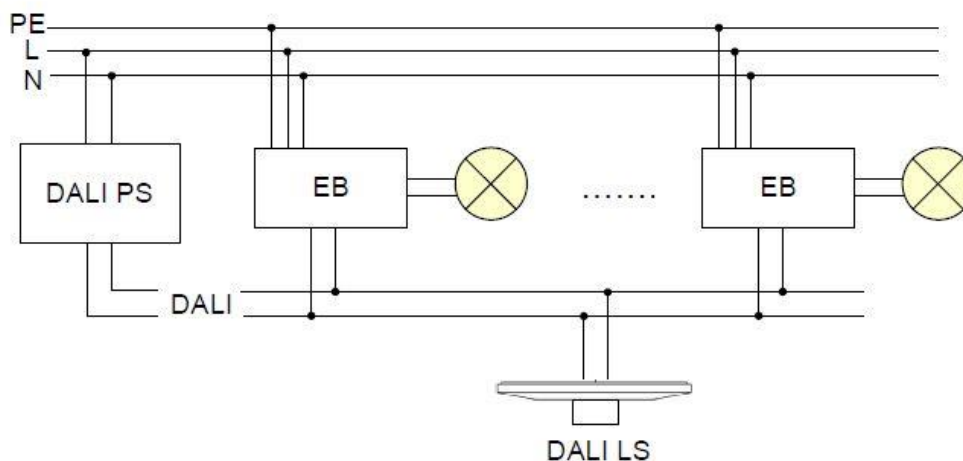
protection class	II in intended use
protection degree	IP20
mounting	back box – dimensions see page 4 surface mounted (article number extension „-AP“) – dimensions page 5 suspended ceiling (article number extension „-ZD“) – dimensions page 5
available colours for version backbox	RAL9010 and RAL9016 (article number extension “-W16“)

terminals:

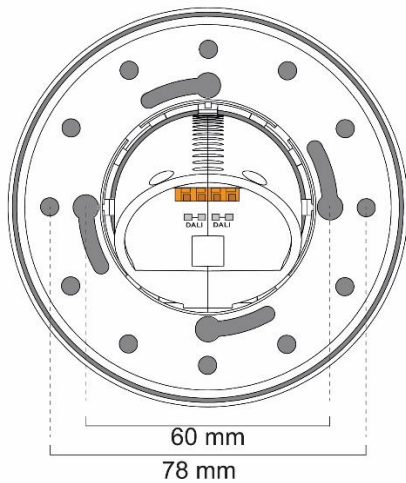
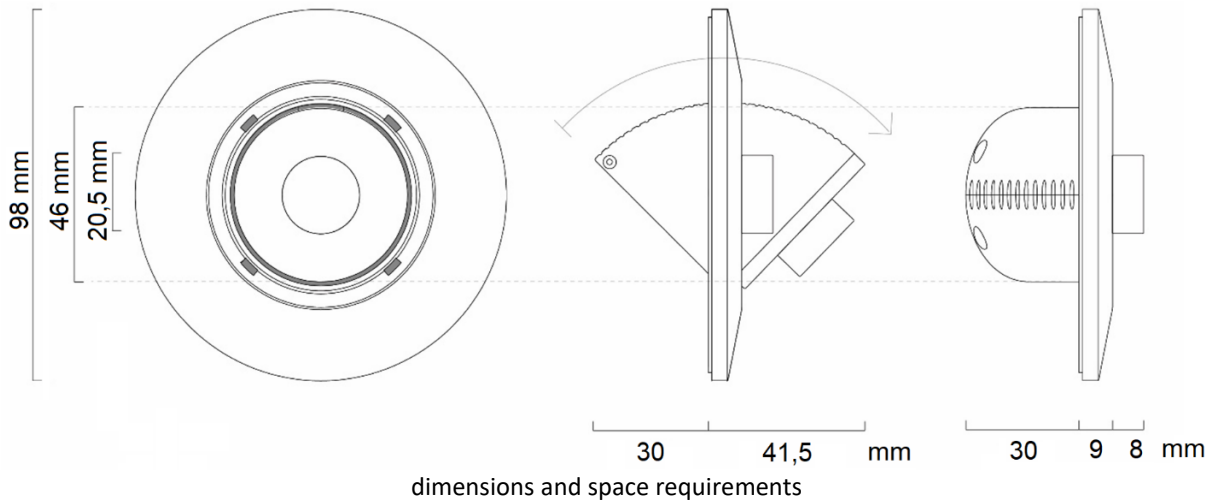
connection type	spring terminal connector
wire size solid core	0,5 ... 1,5 mm ² (AWG20 ... AWG16)
wire size fine wired	0,5 ... 1,5 mm ² (AWG20 ... AWG16)
wire size using wire end ferrule	0,25 ... 1,5 mm ²
stripping length	8,5 ... 9,5 mm / 0,33 ... 0,37 inch

standards:

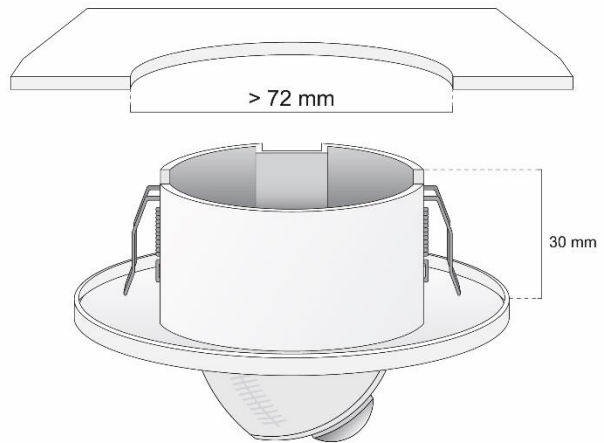
DALI	IEC62386-101:2014 IEC62386-103:2014
EMC	EN 61547 EN 55015
safety	EN 61347-2-11 EN 61347-1
markings	DALI-2, CE, UKCA



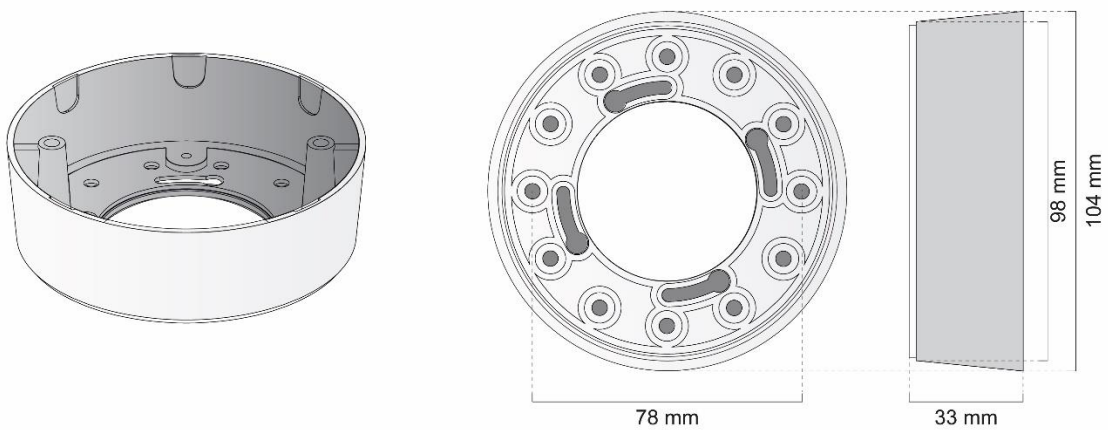
typical application



dimensions mounting ring



suspended ceiling
dimensions mounting hole diameter
article number addition „-ZD“



surface mounting, dimensions accessory, article number addition „-AP“

Factory Settings

For simple applications the factory settings are sufficient. The device configuration can be changed via the [DALI Cockpit](#) and adapted to the current application.

	DALI-2 LS
DALI-2 Settings	Application Controller – Master Mode
Operating Mode	Constant light control
Reference light level	500 lx
Effective range	Broadcast
Power Up behaviour	No action
Instance 0 – light intensity event messages	inactive

Installation

- the DALI-2 LS is directly connected and supplied by the DALI bus. A DALI bus power supply is required.
- The connection to the DALI terminals can be made regardless of polarity.
- The terminals are suitable for wire cross-sections ranging from 0.5 mm² to 1.5 mm².
- back box mounting: installation of the mounting ring directly on the back box. The housing is then simply plugged onto to the mounting ring. The recessed head has sufficient space within the electrical installation box, enabling a flat installation.
- For mounting the sensor on cavity walls or suspended ceilings a version including additional fixtures with spring-clips is available: article number extension “-ZD”.
- Version for surface mounting is available: article number extension “-AP”.
- The LS Module enables alignment to the desired detection area through 360 ° axial rotation and vertical inclination of up to 40 °.
- The wiring should be carried out as a permanent installation in a dry and clean environment.
- Installation may only be carried out in a voltage-free state of the system and by qualified specialists.
- National regulations for setting up electrical systems must be followed.
- The DALI wiring can be realized with standard low-voltage installation material. No special cables are required.
- Only 1 wire may be connected to each terminal. When using double wire end ferrules, the connection capacity of the terminal must be considered.



Attention: The DALI-signal is not classified as SELV circuit (Safety Extra Low Voltage). Therefore, the installation regulations for low voltage apply.



Note: The cross section: the voltage drop on the DALI line must not exceed 2V at maximum length (300m) and maximum bus load (250mA).

Light Sensor

Light measurement

The light sensor of the DALI-2 LS measures the reflected illuminance in a range from 0 to 2047 lux. The resolution is 2 lux.

The incident light is rated by the spectral sensitivity of the human eye and thus comparable to the subjective visual perception of brightness.

The incident light is accumulated over the area covered by the lens and can be interpreted as average value in the detection area. A reference to the reflecting surface below the sensor can be established with the help of a reference measurement and adjustable offset value.

Functionality

It is necessary to distinguish between application controller and DALI-2 instances.

The **application controller** gives direct DALI control commands that are immediately executed by the DALI drivers.

DALI-2 instances generate event messages that are interpreted and processed by higher-level control units with DALI connection (e.g. DALI-2 LS in Master Mode, DALI-2 CS in Master Mode, WAGO, Beckhoff, LUNATONE DALI-2 KNX gateway).

The DALI-2 LS can be used as either an application controller: *Master Mode*, or in instance mode: *Slave Mode*. For the application controller all operating modes and setting options described in the document are available..

Operating Modes

The DALI-2 LS module offers 2 different operating modes: constant light control or light control via light thresholds.

External commands can also be used to influence the operating behaviour of the sensor (e.g. when operated via another control device). The reaction to external commands is explained in detail for each operating mode.

Operating Mode 1 – constant light control

In this operating mode, the light is dynamically adjusted, dependent on the surrounding light, to keep a constant lighting level (configurable reference level). The constant light control can be switched on and off with DALI commands (e.g. from a control device such as a DALI light switch).

The operating behaviour can be influenced by external on / off / dimming and scene commands. The options for each command are described on page 12.

Operating Mode 2 – light threshold control

In this operating mode the light is controlled via thresholds. The constant light control is inactive. 4 light thresholds can be defined which trigger a DALI command on either falling below or exceeding the threshold. 2 of the 4 thresholds can be used to send commands repeatedly. The commands are sent at a user-defined interval until the threshold condition is no longer met.

The operating behaviour can be influenced by external scene commands. The options are described on page 12.

Additional Functionality

Response to external DALI commands

The behaviour of the control in the event of external commands (e.g. by a switch) can be configured with the DALI cockpit. Depending on the operating mode, different behaviours are possible. The options are described later in the document.

The following commands sent to the configurable “external control address” are interpreted as an **ON command**:

- RECALL MAX
- RECALL MIN
- ON AND STEP UP
- Light level (DAP) > 0%
- GOTO SCENE X

The following commands sent to the configured “external control address” address are interpreted as an **OFF command**:

- OFF
- Light level (DAP) = 0

Dimming commands: In addition, it can be specified how the light control should behave when manual dimming commands (UP/DOWN) occurs.

Power-On behaviour

It is possible to configure a start-up DALI command to achieve a defined operating state after power on (return of the bus voltage).

Multiple sensors in same group

It is possible that several sensors have the same effective range, e.g. if several sensors are used to cover a large detection area. To avoid intersection of control of multiple sensors it is possible to set one sensor for control (Master) and set other sensor addresses for light detection and feedback

(DALI Cockpit software tab: "Synchronisation") see section Tab: “Synchronization” – sensor input and Slaves, page 9.

Configuration

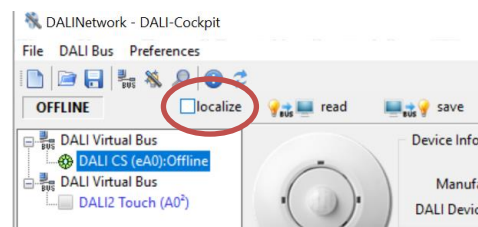
After installation, the device can be used with the default factory settings.

Addressing and changes to the factory settings, such as setting the effective range and functions, are possible with the [DALI Cockpit Software](#) (Windows PC).

When using the [DALI Cockpit Software](#), the PC must be connected to the DALI bus via a suitable interface module ([DALI-2 USB](#); [DALI USB](#), [DALI-2 WLAN](#), [DALI-2 Display](#), [DALI-2 IoT](#), [DALI 4Net](#), [DALI SCI RS232](#)). The DALI-2 LS is automatically recognised by the DALI Cockpit during the addressing process and listed in the device overview. On selection the device configuration can be made.

Configuration of the sensor is possible with the settings of the different tabs, explained in detailed on the following pages.

The spatial allocation of each sensor can be done by visual localisation. Selection of the “localize” check box in the DALI Cockpit will lead to flashing of the red LED of the currently selected sensor.



Tab: “General” – Sensor mode, Operating Mode:

Selection of the fundamental configuration is made on the “General” tab, see Figure. 1. The sensor can be set to Master or Slave Mode.

In *Master-Mode*, the DALI-2 LS takes over control according to the subsequently selected operating mode. The DALI-2 LS *Master* is an **application controller** and gives

direct DALI control commands that are immediately executed by the DALI gears.

In *Slave-Mode*, the DALI-2 LS is in **instance mode** and does not send any control commands. Instead, the DALI-2 instances generate event messages that are interpreted and processed by a DALI-2 LS in *Master* mode or by higher-level DALI control unit (e.g. WAGO, Beckhoff, LUNATONE DALI-2 KNX gateway).

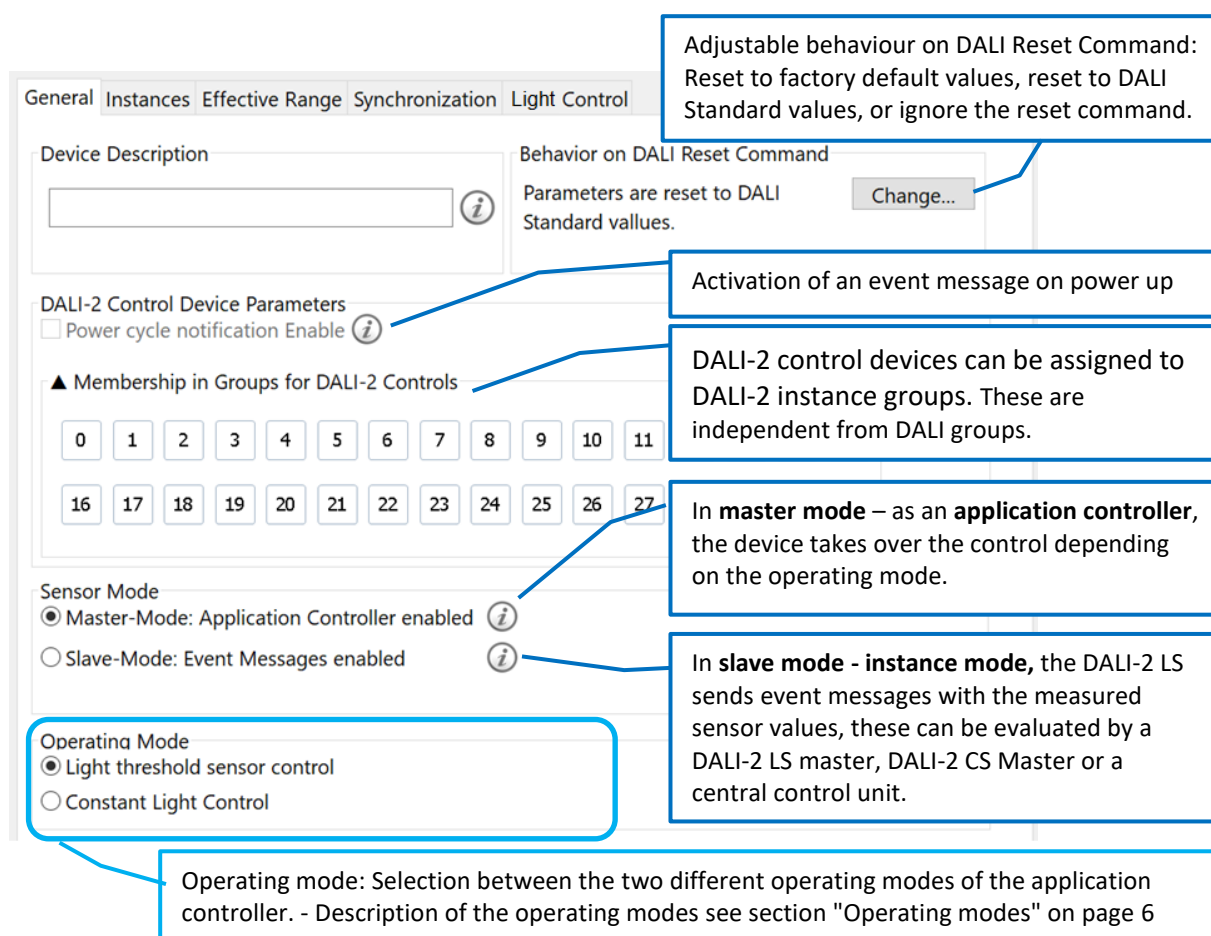


Figure. 1 Tab: “General” – sensor mode, operating mode

Tab: "Effective range" - effective range, external control and power-up behaviour

See Figure. 2. On this tab the effective range of is defined: which DALI-gears are controlled by the DALI-2 LS. In addition, external control addresses can be defined, which the DALI-2 LS also monitors. The behaviour of the DALI-2 LS

in case of other control units sending commands to these addresses can be defined. This way, manual control of lights via a switch can be realised, without interference of the constant light control.

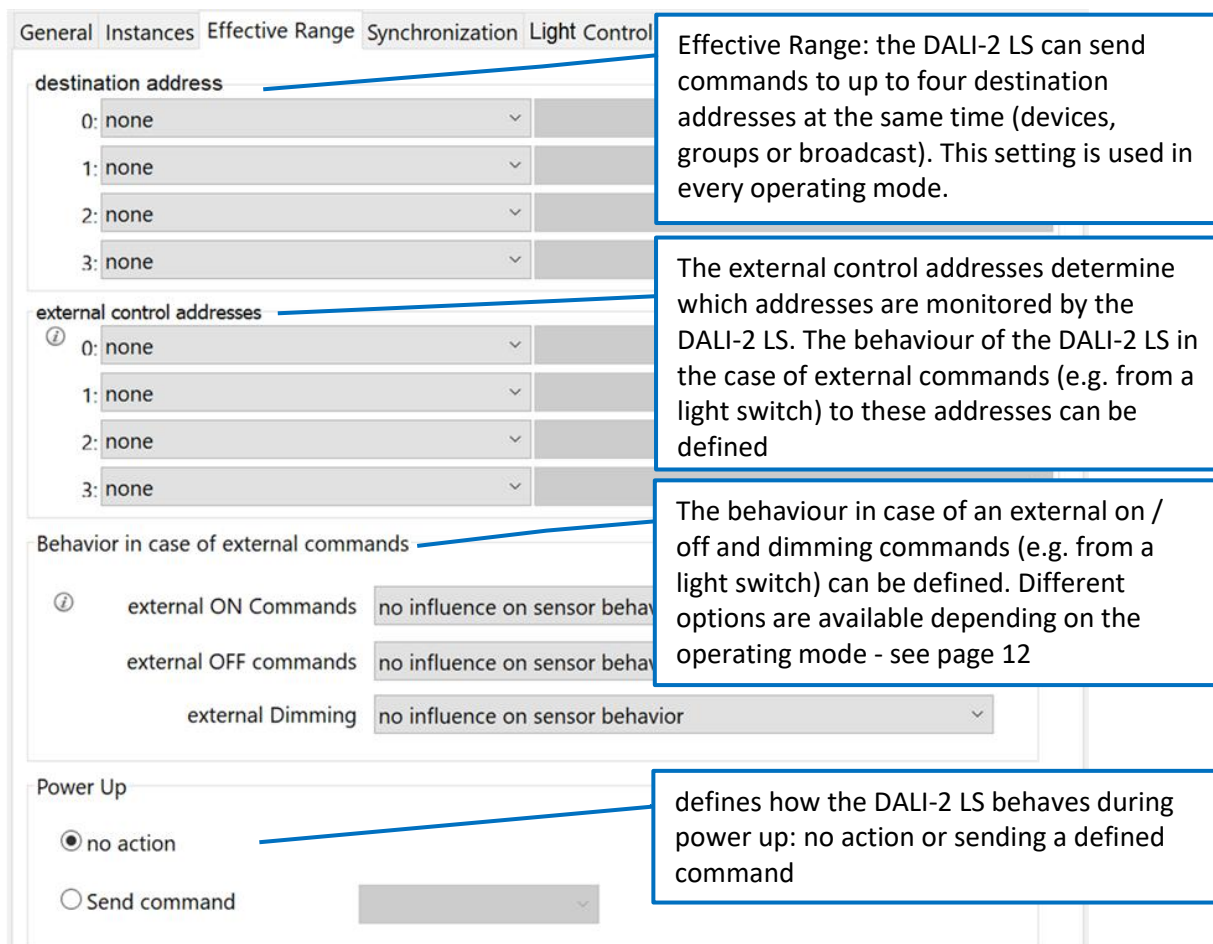


Figure. 2 Tab: "Effective Range" – destination address and external control address

Tab: "Synchronization" – sensor input and Slaves

See Figure. 3. To include other sensor measurements into the evaluation, additional DALI-2 LS can be selected as sensor inputs. The selected DALI-2 LS are automatically set to slave mode by the currently configured DALI-2 LS (Master). Depending on the operating

mode, different sensors input for each sensor-functionality can be defined:

for "Constant light control":
input for constant light control

for "Light control":
input for light thresholds.

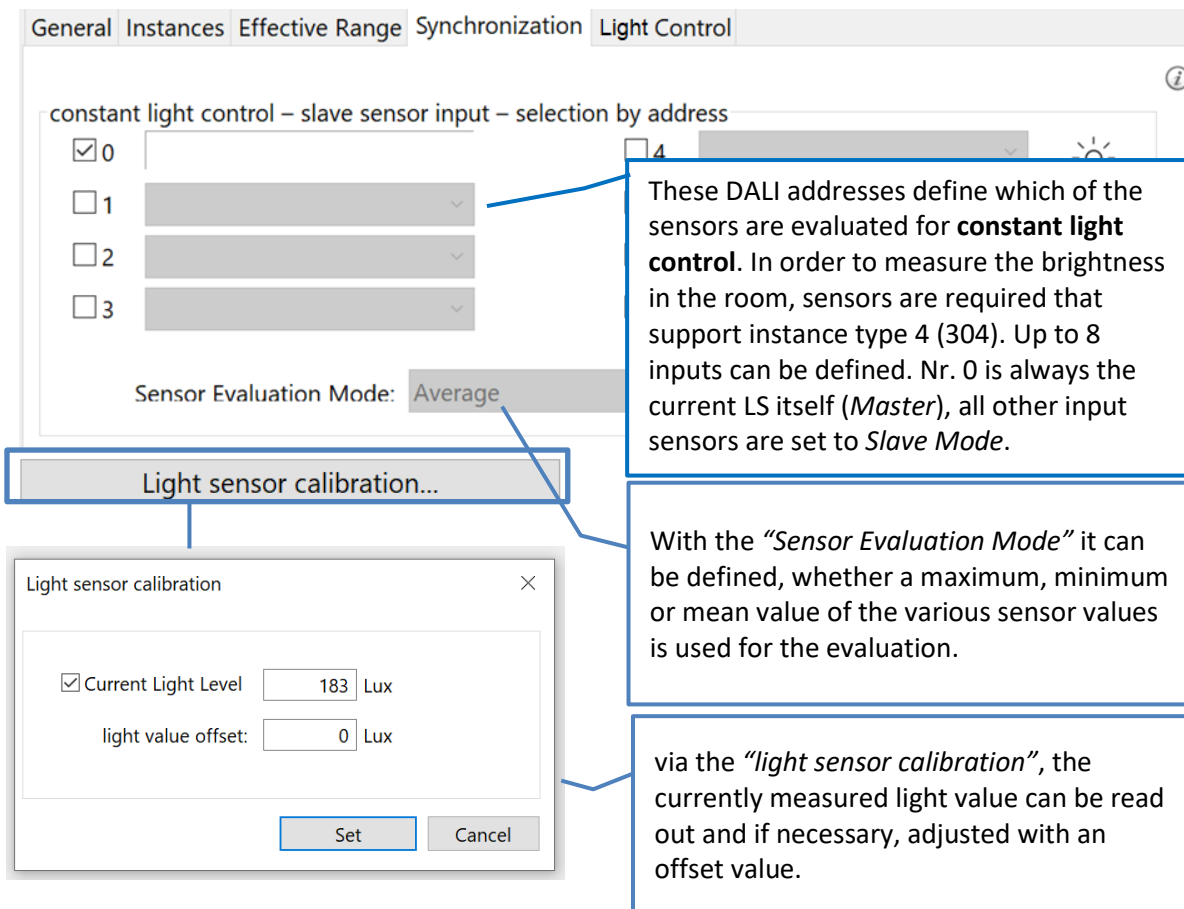


Figure. 3 Tab: "Synchronisation" – sensor inputs for measurement evaluation

Tab: „Light Control“

Depending on the selected operating mode:

Operating mode: Constant light control

See Figure. 4. The tab "light control" contains the settings for constant light control (CLC) if the Operating mode: "constant light control" was selected.

Operating mode: Light threshold control

See Figure. 5. If the Operating Mode: "Light-controlled" was selected the light sensor control functions as a threshold switch. A maximum of 4 thresholds can be defined. The defined DALI commands will be executed if the values are exceeded or fallen below of.

2 of the 4 available thresholds can also be used to send commands periodically. The commands are sent at a user-defined interval until the threshold condition is no longer met.

General Instances Effective Range Synchronization Light Control

Light sensor

Current Light Level ☀️

Constant Light Control (CLC)

Reference Light Level: Lux

Variable Operating Behavior

Activation of variable operating behavior

on Scene Command to same destination address

on Scene Command to defined "external control address"

Scene 0	no action
Scene 1	no action
Scene 2	no action
Scene 3	no action

Display of the currently measured light values of the defined sensor input as a reference.

Setting for constant light control (CLC) desired setpoint (0... 2040Lux, step size 8 Lux)

Via scenes, alternative behaviour to the main configuration can be activated (e.g. alternative destination address). Different options are available depending on the operating mode - see page 12.

Figure. 4 Tab: „Light Control“ – Operating Mode : with constant light control

General Instances Effective Range Synchronization Light Control

Light sensor

Current Light Level ☀️

Light Control – Thresholds

Set thresholds as hysteresis

Threshold

smaller Lux Action: None

Threshold

smaller Lux Action: None

Sending Command repeatedly

time between repetitions: 0 Std. 10 Min. 0 Sek.

Set thresholds as hysteresis

Threshold

greater Lux Action: DOWN Fade rate [1] 358

Threshold

smaller Lux Action: UP Fade rate [1] 358

Variable Operating Behavior

Activation of variable operating behavior

on Scene Command to same destination address

on Scene Command to defined "external control address"

Scene 0	no action
Scene 1	no action
Scene 2	no action
Scene 3	no action

Display of the currently measured light values of the defined sensor input as a reference.

Predefine the two following two thresholds as hysteresis

Activate / deactivate the respective threshold

Setting the threshold value, the DALI command and whether this should be carried out when the threshold is exceeded or fallen below of. (Threshold (0... 1020 lux, step size 4lux), hysteresis: is the difference between the two set thresholds (0 ... 255 lux))

2 of the 4 threshold values can be sent with repetition, by choosing the time between repetitions greater than zero. (With 0h, 0min, 0sec no repetition is carried out). The respective commands are sent with the selected interval until the set condition is no longer met. *Application example: closing blinds when the incidence of light is too strong.*

Via scenes, alternative behaviour to the main configuration can be activated (e.g. alternative destination address). Different options are available depending on the operating mode - see page 12.

Figure. 5 Tab: „Light Control“ -Operating Mode: without constant light control

Light Control - Behaviour with external commands

The operating behaviour can be influenced by external commands (e.g. from a DALI-switch). In the Cockpit tab "Effective range", the behaviour of the sensor on ON- / OFF- and dimming commands, sent to the 4 configurable "external control addresses", can be defined.

Additionally, the operating behaviour of the sensor can be changed with scene commands, via the tab "Light control" in section: "Variable Operating Behaviour".

The following settings are available:

Operating Mode 1 – constant light control

An external ON command
No influence: the ON command is ignored by the LS. The LS continues to carry out the control as configured
External control: the constant light control is deactivated. (the DALI-2 LS does not send any DALI commands), until reactivated by an external OFF command.
Enable constant light control: The constant light control is activated.
An external OFF command
No influence: the OFF command is ignored by the DALI-2 LS. . The DALI-2 LS continues to carry out the control as configured
Disable constant light control: The constant light control is deactivated.
An external DIMMING command:
No influence: the DIMMING command is ignored by the DALI-2 LS. The DALI-2 LS continues to carry out the control as configured
Disable constant light control temporarily: constant light control is deactivated until the next OFF command.
Change constant light control reference light - temporary: the reference light level for constant light control is changed by dimming. If no further dimming process is detected for 2

seconds, the current light value is adopted as the new setpoint for the constant light control. The new setpoint is only retained until the next OFF command.
Change constant light control reference light level -general: the reference light level for constant light control is changed by dimming. If no dimming process is detected for 2 seconds, the current light value is adopted as the new setpoint for the constant light control.

Variable Operating Behaviour - An external SCENE command
No action: the SCENE command is ignored by the DALI-2 LS
Reset to Default: The DALI-2 LS is set to the basic configuration, all previously forced changes to the operating behaviour are terminated.
Alternative destinations: An alternative destination address (user defined) is used instead of the configured standard destination.
Alternative constant light control reference light level: Instead of the current reference value an alternative user defined light level is used
Enable constant light control: The constant light control is activated.
External Control: The constant light control is deactivated (the DALI-2 LS does not send any DALI commands).

Operating Mode 2 – light threshold control

Variable Operating Behaviour - An external SCENE command
No action: the SCENE command is ignored by the DALI-2 LS
Reset to Defaults: The DALI-2 LS is set to the basic configuration, all previously forced changes to the operating behaviour are terminated.

Alternative Destinations: An alternative destination address (user defined) is used instead of the configured standard destination.

External control: the light threshold control is deactivated (the DALI-2 LS does not send any DALI commands).

Instances

The DALI-2 LS supports one instance standardized according to DALI: light sensor instance (304) for light measurement.

In *Slave mode*, the DALI-2 LS is automatically in instance mode. The factory settings are designed for use in conjunction with a DALI-2 LS *Master* or DALI-2 CS *Master*.

Instance Nr. 0: Type light sensor

Instances – General

Each instance can be configured individually. Some settings have the same functionality for all sensor instances and are therefore described in this section. Instance specific settings are explained for each individual instances in the following respective sections.

enable/disable

If instances are not required, they can be deactivated. In this case, event messages are not sent, and the measured values are not updated. They can, however, still be queried via a “Query” command, and the DALI-2 configuration commands and queries are still supported.

Event Scheme

The event scheme determines which information is transferred with the event. This information is required, to enable recognition and / filtering of events on the bus. The following 5 options are available:

- Instance addressing:
instance type and instance number
- Device Addressing:

device address and instance type

- Device/Instance Addressing:
device address and instance number
- Device Group Addressing:
Device group and instance type
- Instance Group Addressing:
Instance group and instance type

Instance group

Up to three instance groups can be assigned for each instance. Only the "Primary Group" is used for the event.

Instance type

The instance type defines which DALI-2 standard is valid for this instance. (The different instance types are specified in the DALI-2 standard.)

Instance number

Each instance in a device has a unique instance number.

Device group

The device can be assigned to up to 32 device groups (0...31). The lowest device group is used for the event.

Device address

A device address (or short address) (0..63) can be assigned to each device. With this the device can be clearly addressed. (Identical short addresses should be avoided.)

Event priority

The event priority determines the order in which events are sent when they occur simultaneously on the bus. Priority 2 = highest and 5 = lowest.

Dead Time

The dead time can be set for each instance. It determines the time that must pass before an event can be sent again. This also applies if the event information (measured value) changes.

If no dead time is required, it can be deactivated.

Report Time

If the event information does not change, the event is sent cyclically with the report time. The report time can be set for each instance. It determines the maximum time between a sent event and resending.

Hysteresis

Not every change in value leads to an event being generated. The hysteresis can be used to set which percentage change is necessary to trigger a new transmission. Attention, the hysteresis band is not arranged symmetrically. The following applies:

Increasing value

The condition for an event is only fulfilled if the next value falls below the previous value minus the hysteresis or if the next value is greater than the previous value.

Decreasing value

the condition for an event is only fulfilled if the next value exceeds the previous value plus the hysteresis or the next value is smaller than the previous value.

Hysteresis Min

Is the minimal hysteresis value that cannot be fallen below of.

Instance 0 – Light intensity

is an instance standardized by DALI-2 (62386-304). All settings are implemented according to the standard. The instance is DALI-2 certified.

The current light value (lux) is measured by the sensor and can either be queried using a “Query” command or can be automatically provided by the sensor using an event.

The measuring range is 0Lux ... 2046Lux. The resolution differs between queries and generated events. A query supports a resolution of 1Lux (11Bit) and an event a resolution of 2Lux (10Bit).

Hysteresis: For information on the hysteresis see section Instances -General: *Hysteresis* page 14.

Hysteresis Min: set in lux. For general information on the hysteresis min see section Instances – General: *Hysteresis Min* page 14

Event Filter: The light instance generates only one event with 10-bit resolution (0... 2047 lux, step size 2lux). If the filter is deactivated, no events will be sent.

Instance Standard Settings

To use the light sensor instance in combination with a DALI-2 CS or DALI-2 LS Master the following instance settings are needed (these are set as delivery default, only event messages need to be enabled (also possible without DALI Cockpit via DALI command ENABLE INSTANCE)):

Event messages	active
Event Schema	device addressing
Event Filter	illuminance level
Deat time	0.8 sec
Report time	unused
Hysteresis Min	5 Lux
Hysteresis	5 %

DALI Cockpit - Instances

The settings for the instances can be made in the Cockpit – tab “Instances”.

Example for settings of instance 0 – light intensity see Figure. 6

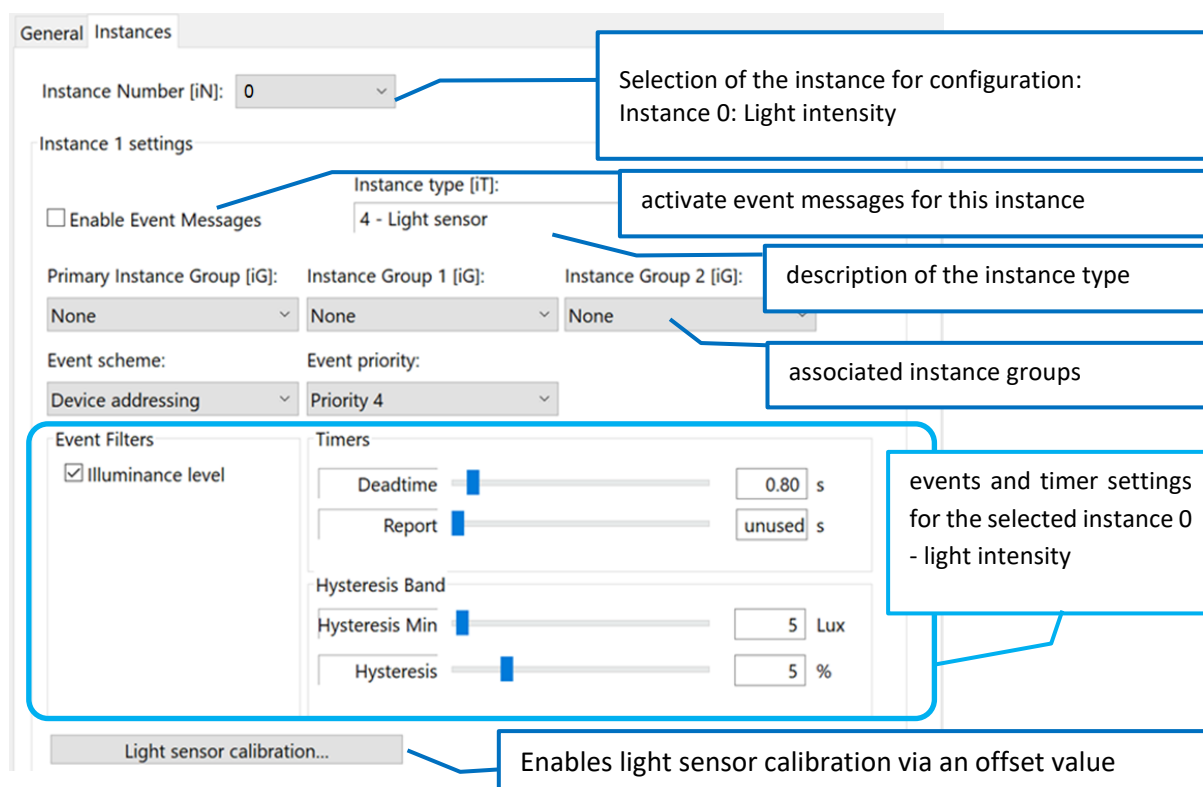


Figure. 6 tab: “instances” – light sensor instance

Purchase Order Information

Art.Nr. 68791433: DALI-2 LS, light sensor module, pure white (RAL9010), back box

Art.Nr. 68791433-AP: DALI-2 LS, light sensor module, pure white (RAL9010), surface mouting

Art.Nr. 68791433 -ZD: DALI-2 LS, light sensor module, pure white (RAL9010), suspended ceiling

Art.Nr. 68791433-W16: : DALI-2 LS, light sensor module, traffic white (RAL9016), back box

Art.Nr. 68791433-W16-AP: : DALI-2 LS, light sensor module, traffic white (RAL9016), surface mouting

Art.Nr. 68791433-W16-ZD: : DALI-2 LS, light sensor module, traffic white (RAL9016), suspended ceiling

Additional Information and Equipment

DALI-Cockpit – free configuration tool from Lunatone for DALI systems
<https://www.lunatone.com/en/product/dali-cockpit/>

Lunatone DALI products
<http://www.lunatone.at/en/>

Lunatone datasheets and manuals
<http://lunatone.at/en/downloads/>

Contact

Technical Support: support@lunatone.com

Requests: sales@lunatone.com

www.lunatone.com



Disclaimer

Subject to change. Information provided without guarantee.
The datasheet refers to the current delivery.

The function in installations with other devices must be tested for compatibility in advance.