DALI-2 SI
DALI-2 SI-1L

Datasheet

Combi Sensor Module

DALI-2 sensor module for
the integration of sensors
with relay output
in DALI systems

Art.Nr. 89453477-P
Art.Nr. 89453477-1L-P

DALI-2 SI / SI-1L Multifunctional Sensor Module

Overview

- Module with switching input for sensor input
- Easy integration of occupancy and movement sensors, contact switches, photoelectric barrier sensors etc.
- Application controller: Movement triggered
- Operating modes can be changed via scenes and external DALI commands
- Corridor function – second light level before off in case of absence
- Easy configuration via DALI-Cockpit Software Tool and Lunatone DALI USB interface.
- Multiple modules can be installed within a DALI system.
- Version with potential free input (DALI-2 SI) and with input for mains (DALI-2 SI-1L) are available
- Supply via the DALI bus, no additional power supply needed
- the compact device is suitable for back box installation

Specification, Characteristics

Type	**DALI-2 SI**	**DALI-2 SI-1L**
article number	89453477	89453477-1L
GTIN	GTIN 9010342013492	GTIN 9010342013492

DALI interface DA, DA		
output type	DALI, DALI-2, Multimaster	
terminal markings	DA, DA	
voltage range	9,5V … 22,5Vdc according to IEC62386	
typical current consumption DALI (16.5V)	5.1 mA	4.3 mA
max current consumption DALI (22.5V)	5.7 mA	4.8 mA
DALI addresses	none	
DALI-2 addresses	1	

input		
input type	potential free switching input	switching input for mains voltage
number of inputs	1	1
marking input terminals	T1, COM	LT1, N
input voltage range	--	230Vac +10% / -15%
input frequency	--	50Hz … 60Hz
input resistance	--	175kΩ
minimum length of control pulse	40ms	40ms
max wire length	5m	10m (up to 50m in an interference-free environment i.e. no parallel power lines)

insulation data

impulse voltage category	II	
pollution degree	2	
rated insulation voltage	250V	
insulation	reinforced isolation DALI / housing	reinforced isolation DALI / switching input (mains)
insulation test voltage	3000Vac DALI / housing	3000Vac DALI / switching input (mains)

environmental conditions

storing and transportation temperature	-20°C … +75°C
operational ambient temperature	-20°C … +60°C
rel. humidity, not condensing	15% … 90%

general data

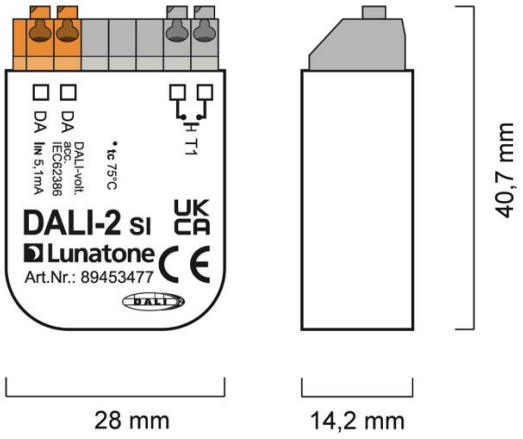
dimensions (l x w x h)	40mm x 28mm x 15mm	59mm x 33mm x 15mm
mounting	back box installation, installation in protection class II devices	
rated maximum temperature tc	75°C	
expected life time	100.000h	
protection class	SKII (when used/installed as intended)	
protection degree housing	IP40	
protection degree terminals	IP20	

terminals

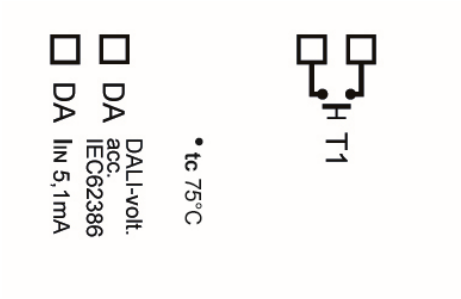
connection type	spring terminal connectors
wire size: solid core	0,5 … 1,5 mm^2 (AWG20 … AWG16)
wire size: fine wired	0,5 … 1,5 mm^2 (AWG20 …AWG16)
wire size: using wire end ferrule	0,25 … 1 mm^2
stripping length	8,5 … 9,5 mm / 0,33 … 0,37 inch
tightening/ release of wire	push mechanism

standards

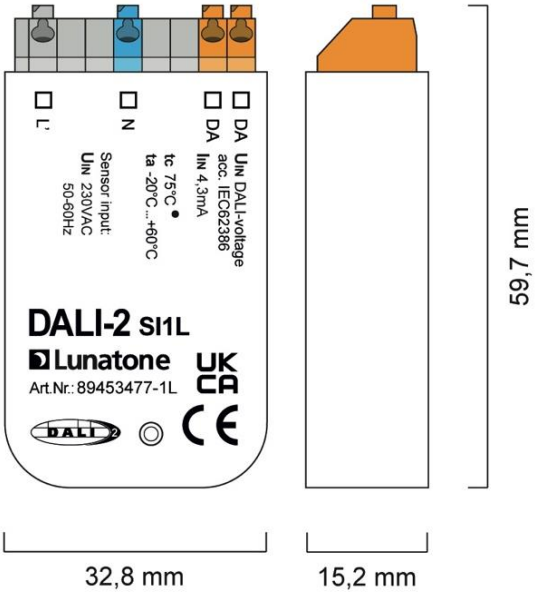
DALI	IEC62386-101:2014 IEC62386-103:2014 IEC62386-303
EMV	EN 61547 EN 50015 / IEC CISPR15
safety	EN 61347-2-11 EN 61347-1
Markings	DALI-2, CE, UKCA



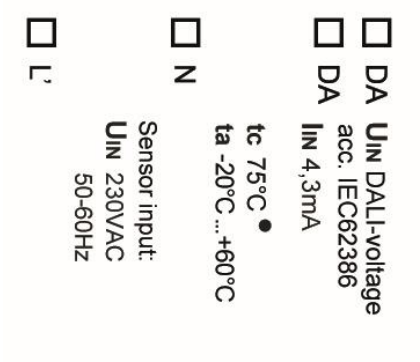
dimensions DALI SI



connection plan DALI SI

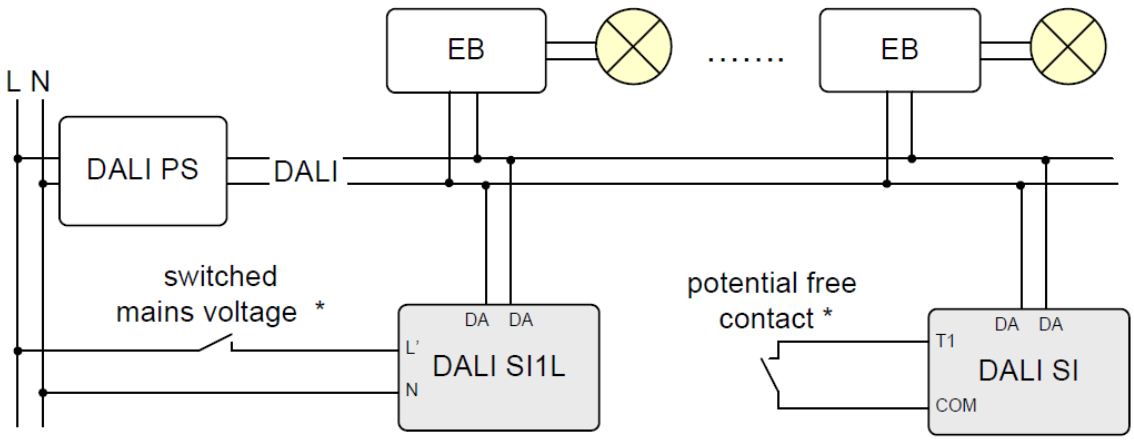


dimensions DALI SI 1L



connection plan DALI SI 1L

Typical Application



* typical devices with switching contact: light barrier, motion sensor, relay, switch

Factory Setting

For simple applications the factory settings are sufficient:

DALI-2 Settings	Application Controller – Master Mode
Functionality and behaviour on external commands	Motion detection**,** an external *ON command* deactivates motion detection until the next external *OFF command*
Effective range	Broadcast
ON command (1)	Recall Max
Hold Time (2)	10min
Absence value (3)	none
Hold Time Absence (4)	0s
OFF command (5)	Off
OnCMD threshold	none
Bright Out threshold	none
Power Up behaviour	no action
Synchronisation on same effective range (eDALI compatibility)	enabled

Installation

- the DALI-2 SI / DALI-2 SI-1L module gets 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 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.
- **DALI-2 SI**: The maximum cable length of the button connections is 5m.
- **DALI-2 SI-1L:** Switching input LT1 is intended for use with line voltage, it is galvanically separated from the DALI-line.

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).

Cycle of Motion Detection

The motion detection is always processed according to the following sequence (Figure 2):

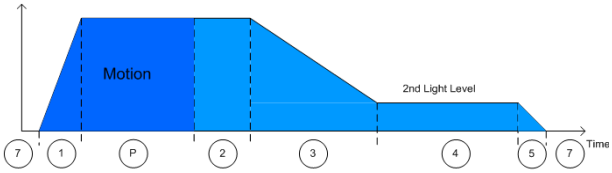


Figure. 1 motion/presence detection sequence

States:
1: Fade In Time – dim to 1st light level
2: Hold Time (On-State)
3: Fade Time – dim to 2nd light level
4: 2nd Hold Time (2nd Light Level)
5: Fade Out Time – dim to off

P: Presence detected - retrigger
7: Off

If motion is detected the sensor switches to the configured light level. While presence is detected (P) or the hold time is running (2) the light level stays on – either on a fix light level or controlled by a constant light control algorithm.
After the hold time, if not further motion was detected, the sensor changes the light level to the 2nd light level for a defined time (4). This 2nd light level is a user defined value (no constant light control). If motion is detected in this state, the sensor switches to the previous states (1, P). In case no further motion is detected the Off command (7) is sent

HINT: set the “absence level” to a low value, otherwise it could be higher than the light level set by the constant light control.

Steps Nr 1, 3 and 5 control the change between the states: 7/P/2/4/7. Depending on the DALI-commands for each state, the fade time can be used to allow smooth changes.

Functionality

The **DALI-2 SI / SI1L** is an application controller. It gives direct DALI control commands that are immediately executed by the DALI drivers.

If movement is detected the time sequence is activated with a user defined fixed light level in State 2 (see Figure. 1 "Motion detection: sequence" on page 6). The light level stays active until no more movement is detected and the hold time has elapsed. Then the light level will be switched to the 2nd user defined light level.

Additional threshold values can be defined, such that the motion control is only active above or below this defined threshold.

The operating behaviour can be influenced by external on / off / dimming and scene commands. The options for each command are described on page 10

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 same destination address (1st address) are interpreted as an **ON command**:

RECALL MAX
RECALL MIN
ON AND STEP UP
Light level (DAP)>0%
GO TO LAST ACTIVE LEVEL
GOTO SCENE X (if the command was

configured to be interpreted as an ON command for the SI / SI-1L)

The following commands sent to the same destination address are interpreted as an **OFF command**:

OFF
Light level (DAP) =0
GOTO SCENE X (if configured to be interpreted as an OFF command for the SI / SI-1L)

Dimming commands: In addition, it can be specified how the motion control or light control should behave when manual dimming commands (UP/DOWN) to the target address (1. Destination address) occurs.

Power-On behaviour

It is possible to configure a start-up command to achieve a defined operating state after power on (return of the bus voltage). The start-up command can either be a DALI-command or a fast run of the motion detection sequence.

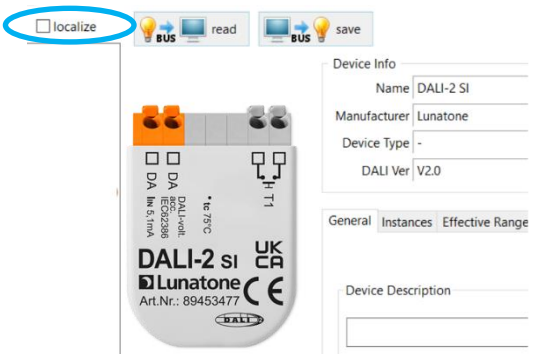
Multiple sensors in same group

Synchronisation and backward compatibility for older generation CS is made possible by the option “Backward compatibility with eDALI CS”. Definition of the same effective range (target address 1) automatically synchronizes the sensors. The parameters of the sensors should be coordinated, especially the hold on times. The option needs to be enabled in all participating sensors (this is automatically the case for eDALI CS)

Configuration in DALI-Cockpit

The addressing and configuration of the DALI SI / SI-1L can be done easily with the help of the DALI Cockpit software tool and a suitable interface module (DALI USB, DALI 4Net, DALI SCI RS232). After an address has been assigned the parameters can be configured to fit the application.

For localisation a buzzer is integrated in each DALI-2 MC device. Alternatively, the allocation can also be done via the serial number of the device.



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

Tab: “General“

On tab general the synchronisation of sensors via the effective range (1st input of destination address) can be enabled/disabled, see section “Synchronisation – multiple sensors in the same group”. Additionally, the behaviour of the module on a DALI Reset command can be set: ignore the reset command, change settings to DALI standard settings (only instance values are effected), change settings to Lunatone delivery default.

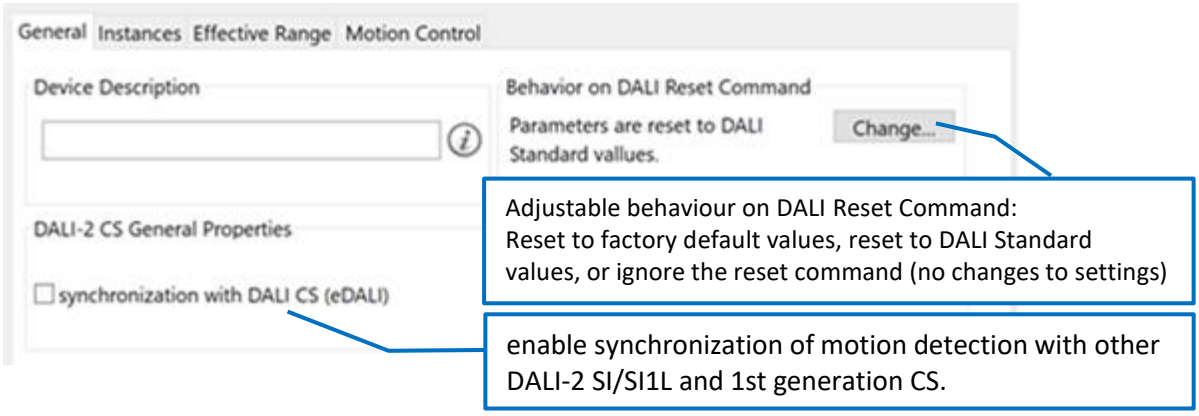


Figure. 2 Tab: "General" – sensor mode, operating mode

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

See Figure. 3. On this tab the effective range of is defined: which DALI-gears are controlled. In addition, external control addresses can be defined, which the DALI-2 SI/SI-1L monitors. The behaviour of the DALI-2 SI / SI-1L 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 motion detection or constant light control.

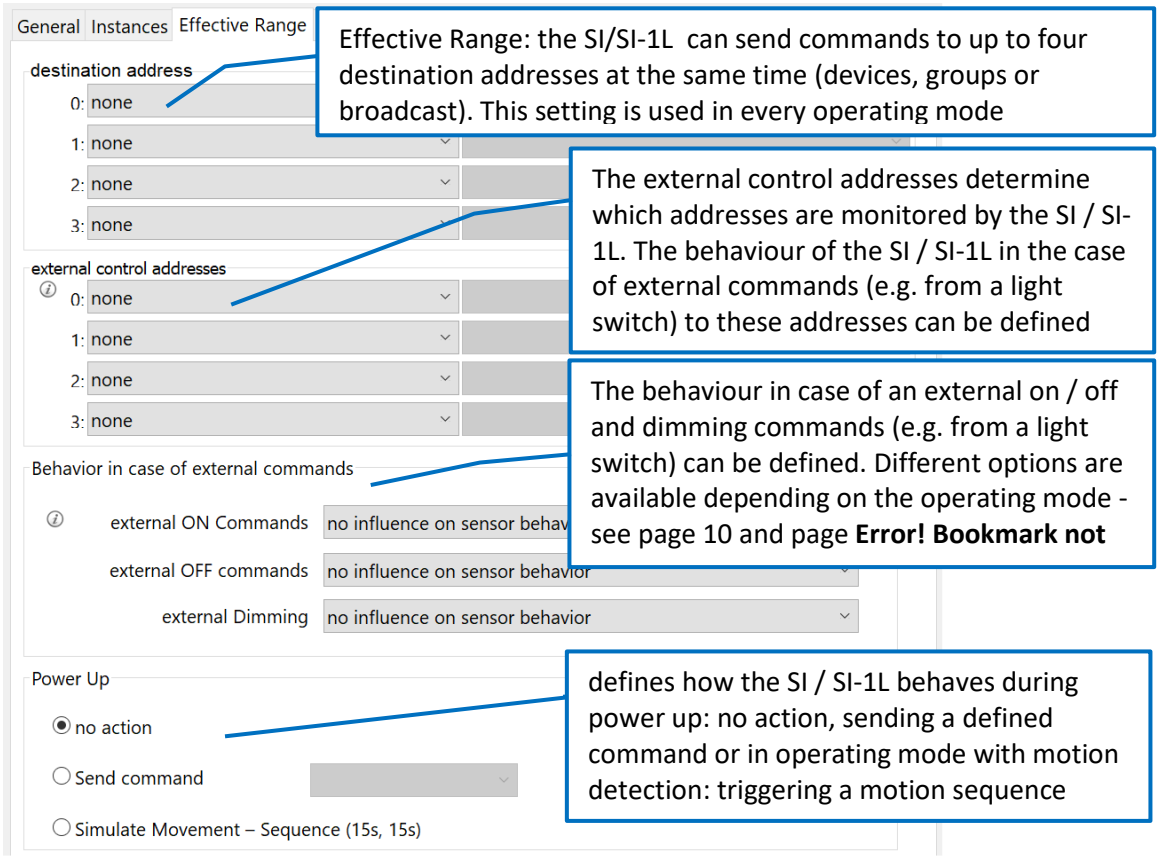


Figure. 3 Tab: "Effective Range" – destination address and external control address

Tab: “Motion Control“

See Figure. 4, in this tab, the times and light levels of the motion detection sequence, that is triggered by movement, can be defined. As well as the light thresholds to activate the motion detection depending on the lighting conditions. (operating mode description see page **Error! Bookmark not defined.** and page 6)

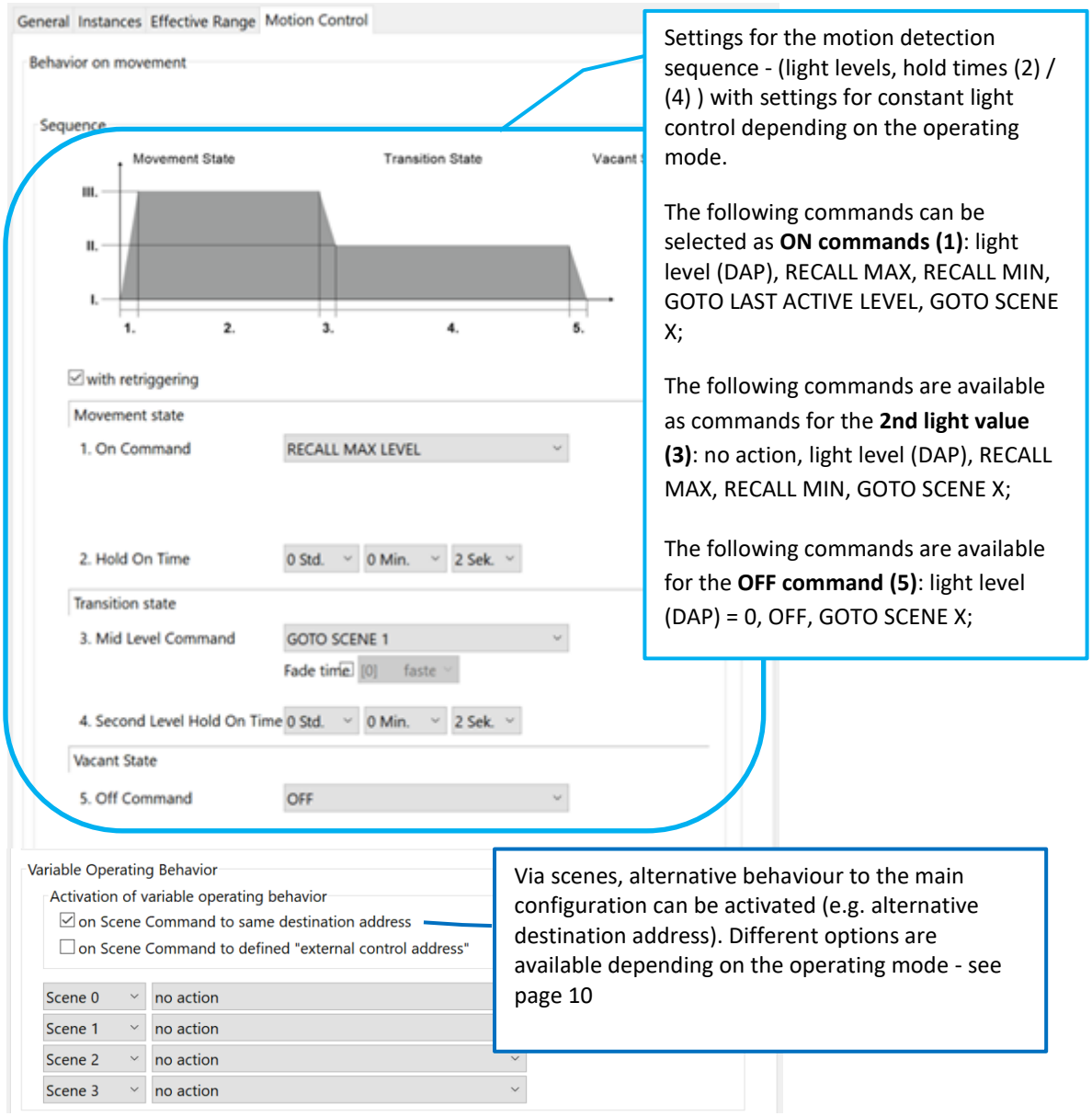


Figure. 4 Tab: „motion detection control“

Motion 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 "Motion detection" -section: Variable Operating Behaviour.

The following settings are available:

Operating mode 1 – motion detection

An external **ON command**
No influence: the ON command is ignored by the SI / SI-1L. The SI / SI-1L continues to carry out the control as configured
External control: motion control is deactivated (The SI / SI-1L does not send any DALI commands), until manually reactivated by an external OFF command.
Simulate movement: start the Motion Detection Sequence (Figure. 1, page 6)
An external **OFF command**
No influence: the OFF command is ignored by the SI / SI-1L. The SI / SI-1L continues to carry out the control as configured
Waiting for motion: change to State 5 and then to OFF state (state 7,Figure. 1), motion detection active - waiting for motion
Disable sensor control: change to state 5 and then to OFF state (state 7,Figure. 1), the motion detection is deactivated until reactivated by an ON command.
an external **DIMMING command:**
No influence: the DIMMING command is ignored by the SI / SI-1L. The SI / SI-1L continues to carry out the control as configured
External control: motion control is deactivated (The SI / SI-1L does not send any DALI commands), until manually reactivated by an external OFF command.
Change light level until end of sequence: the On command light level (State 2, Figure. 1) is changed by dimming. The new light level is retained for the current movement detection sequence

Variable Operating Behaviour - An external **SCENE command**
No action: the SCENE command is ignored by the SI / SI-1L.
Reset to Default: The SI / SI-1L 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 ON Command Light Level DAP: Instead of the currently configured light level DAP command, the alternatively defined DAP is used in state 2 (Motion Detection Sequence Figure. 1).
Alternative ON Command SCENE Instead of the currently configured scene command, the alternatively defined scene is used in state 2 (Motion Detection Sequence Figure. 1, page 6).
Waiting for motion: go to State 5 and then to OFF state (state 7,Figure. 1),. motion detection active - waiting for motion

Instances

The DALI-2 SI and DALI-2 SI1L Integration support an instance standardized according to DALI: motion detector instance (303) for motion detection.

Instance Nr. 0: Type motion detector

Instances – General

enable/disable
If instances are not required, their event messages 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.

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 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

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.

Instance 0 – Motion

Is an instance standardized by DALI-2 (62386-303), for sensors that detect motion. All settings are implemented according to the standard. The instance is DALI-2 certified.

The sensor switches between the following states:

- People in the room and movement (0xFF)
- People in the room and no movement (0xAA)
- Empty room (0x00)

If the sensor detects movement, it immediately changes to the state: "people in the room and movement". This state is exited after 1 second at the earliest if no further movement is detected. In this case it changes to the state "People in the room and no movement". After the hold time has expired it changes to the state "Empty room"- Vacant.

***Report Time*:** can only be set if the event filter "Repeat" is activated and the events: "Still Vacant" and "Still Occupied" are enabled. The time between sending a "Still-Event" again is determined by the Report Time.

***Hold Time*:** Is the time that must pass before the state "people in the room and no movement" is changed to the state "empty room". If movement is detected during this time the state is changed back to: "People in the room and movement". (min. 1 second)

***Query*:** The current sensor state can be queried using the DALI command "Query input value". The following values are possible: 0x00, 0xAA, 0xFF
(see paragraph above for the possible states)

***Event*:** the sensor status is transmitted by events. The following event information is available:

Bit0 = 0: No Movement
Bit0 = 1: Movement
Bit2/Bit1 = 00: Vacant
Bit2/Bit1 = 10: Still Vacant
Bit2/Bit1 = 01: Occupied
Bit2/Bit1 = 11: Still Occupied
Bit3 = 1: Movement Sensor
Bit5..Bit9 = 0: unused

More details can be found in the standard 62386-303.

Event filter: The event filter defines for which status change an event is generated.
Filter arrangement:

Bit0: Occupied Event active
Bit1: Vacant Event active
Bit2: Still Vacant/Occupied Event active
Bit3: Movement Event active
Bit4: No Movement Event active
Bit5..Bit7: unused

Example events during the movement sequence:
1: Movement detected:
Event filter "Movement", event filter "Occupied":
→ Event data: 0x0B
2: Continued movement: with set report time, event filter "Still Occupied/Vacant": → Event data: 0x0F
3: Movement stops: event filter "No Movement":
→Event data: 0x0A
4. Expiry of set hold time:
Event filter "Vacant":→ Event data: 0x08
5. Still no movement: with set report time: event filter "Still Occupied/Vacant"
→ Event data 0x0C

Cockpit - Instances

The settings for the instances can be made in the Cockpit – tab "Instances".
Example for settings of instance 0 – motion see Figure. 5.

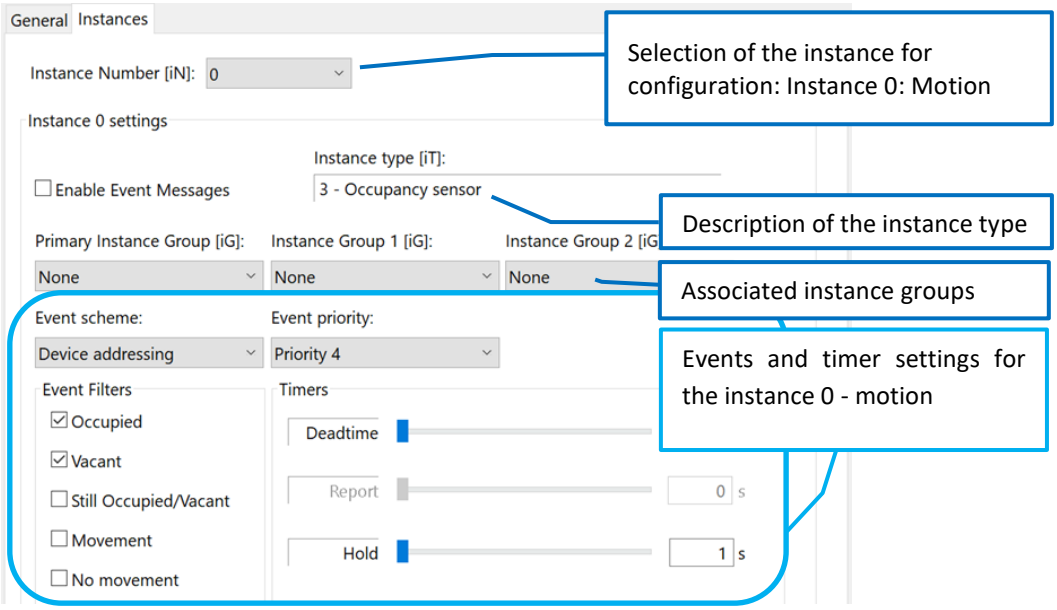


Figure. 5 tab: „Instances“ – motion detector instance

Purchase Order Information

Art.Nr. 89453477: DALI-2 SI, sensor interface with potential free switching input, back box

Art.Nr. 89453477-1L: DALI-2 SI 1L, sensor interface with switching input for mains voltage, galvanic isolation, back box

Additional Information and Equipment

DALI-Cockpit – DALI system configuration tool, free when using a Lunatone interface device
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.

