

## **DALI CS**



### **Datasheet** **Combi Sensor Module**

Sensor unit for automatic lighting  
control in DALI systems

Art. Nr. 86458621 (DALI CS Temp)

Art.Nr. 86458672 (DALI CS IR)

# DALI CS Combi Sensor Module

## Overview

- Sensor Module for DALI lighting systems
- Motion detection
- Light intensity measurement
- motion dependent control
- Sensor for ambient temperature measurement and monitoring (type DALI CS Temp)
- integrated IR remote control receiver (DALI CS IR)
- The DALI CS module can be used either as active lighting control unit or just for measurements and monitoring
- Sensor properties are set easily via the “DALI-Cockpit” software tool
- The DALI CS is able to transmit DALI-commands (e.g. ON, OFF, RECALL MIN/MAX, GO TO SCENE X, ...) to single destination addresses, group addresses or broadcast.
- The rotary switch on the back of the housing helps to assign a destination group address easily
- Several DALI CS modules can be used within one DALI-line
- The compact module can easily be installed in recessed conduit boxes or directly on cavity walls.
- The DALI CS must not be connected to the mains. It is directly supplied by the DALI-line.

## Specification, Characteristics

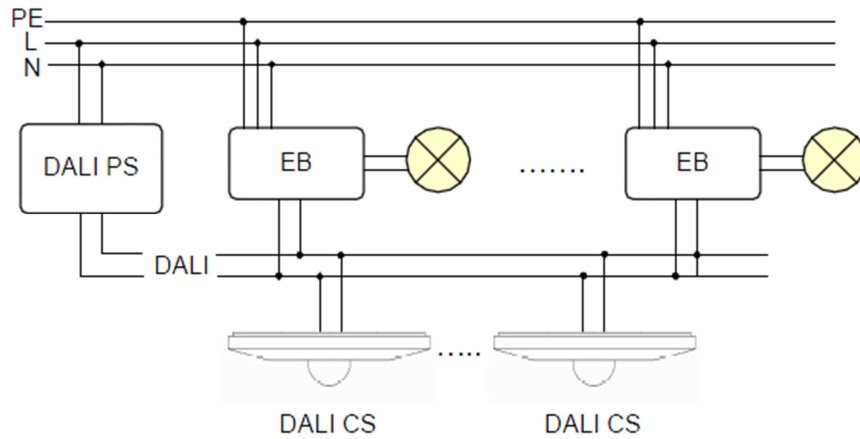
Type	DALI CS Temp	DALI CS IR
article number	86458621	86458672
power supply	aus DALI- Bus	
typ. current consumption	3.5 mA (Temp)	4.1mA (IR)
input/ouput	DALI	
sensors	motion light intensity temperature	motion light intensity IR receiver
function	adjustable	
operating temperature	0°C-70°C	
storage temperature	-25°C-85°C	
protection class	IP20	
connecting wire cross section	0.5-1.5 mm <sup>2</sup>	
operating temperature	RAL9010	

**PIR Motion Detection:**  
distance: <12m, 92 zones  
range: hor.: ±51°, vert. ±46°  
temp.diff. target to ambience:  
>4°C

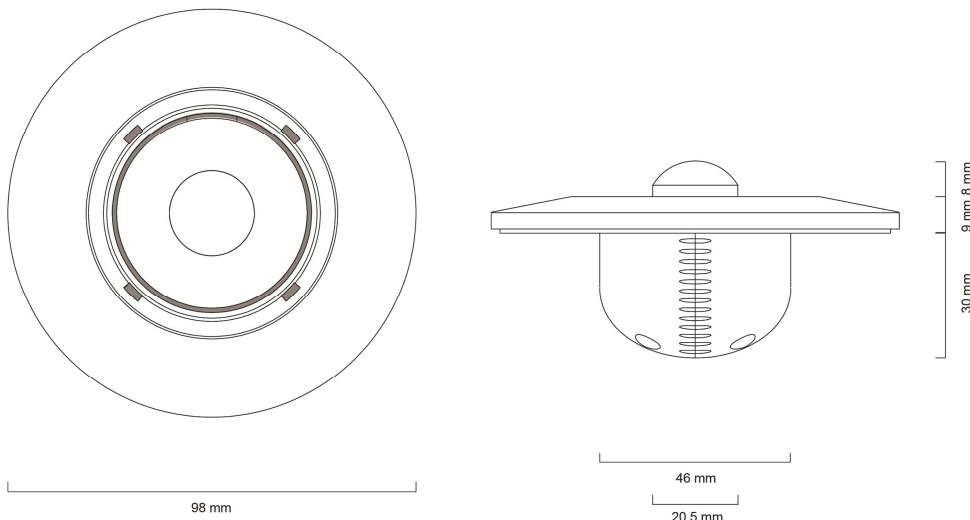
**Light Intensity Measurement:**  
range: 0-2500lux, resolution: 1lux

**Temperature Measurement:**  
range: 0°C-70°C, resolution: 1°C

**IR receiver:**  
Apple-Remote (7 buttons) or  
4 programmable buttons  
(universal receiver),  
supported protocols: Philips  
RC5/RC6, NEC, Sony, Nokia



typical installation



geometry

## Installation

The DALI CS module is connected to the DALI-line. Like all DALI modules it is powered directly via the DALI signal line, which is supplied by a DALI PS. A separate power supply is not needed. A typical value for the current consumption is 3.5mA.

The DALI-line input is polarity free and protected against overvoltage of up to 270Vac. DALI signals are not SELV. Therefore the same procedures should be applied as working with main voltage. Allowed connection wire cross sections range from 0.5mm<sup>2</sup> to 1.5mm<sup>2</sup>.



rear view / mounting ring

The DALI CS mounting ring can be attached to cavity walls directly or by using an electrical box. The housing can then simply be attached on the mounting ring. Even in a flush-mounted box there is enough room for a sunken sensor head.



sensor head: sunken and extended

Finally the sensor head can be aligned to the desired position. Declination angles of  $40^\circ$  in vertical and  $360^\circ$  in axial direction are provided.



aligned sensor head

## Functionality and Configuration

The DALI CS measures various physical properties (motion, light intensity and temperature) and offers the possibility to react according to the measurements by sending DALI commands.

Via a DALI-USB interface the software tool "DALI-Cockpit" can communicate with the DALI CS. So the desired functionality can be configured easily on PC. DALI-Cockpit and DALI-USB interface are required for the configuration only and can be removed when configuration is finished. The settings of the

sensor components and the configuration of the DALI commands and destination addresses can be defined in the DALI Cockpit. Before going in detail the functionality of the sensors and the basic operating conditions of the DALI CS will be explained.

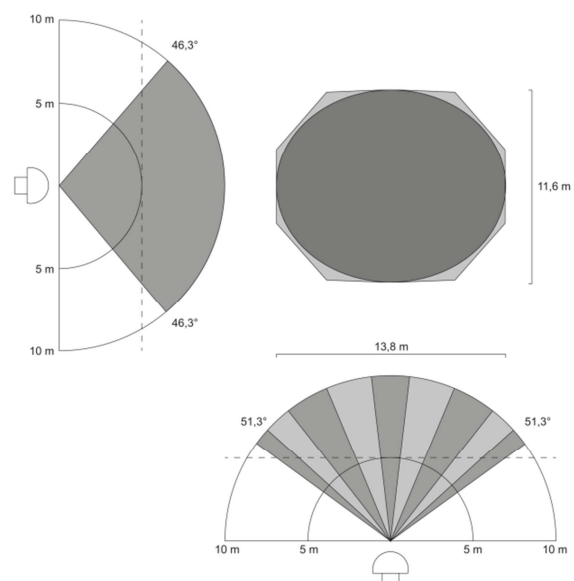
### Motion Detection

The motion sensor is spatially divided into 92 zones. In each zone the received thermal radiation is determined and differentially compared to the adjacent zones (PIR sensor).

For motion detection there is a need for a temperature difference of at least  $4^\circ\text{C}$  between moving object and environment. Heat sources such as copiers or heaters may have a negative influence on motion detection.

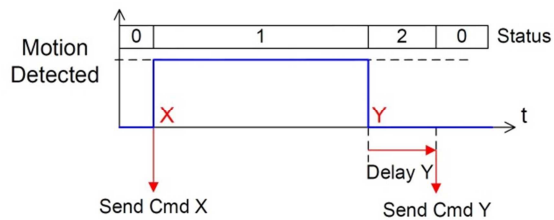
This method allows observation of relatively large areas by using only one sensor head. With opening angles of  $46.3^\circ$  and  $51.3^\circ$  and a sensor mounted at a height of 5 meters the 92 zones cover an area of more than  $100\text{m}^2$ .

The distance between sensor and the object of interest should be less than 12 meters.



relationship opening angle / detection area

The DALI CS can send DALI commands on movement detection as well as on disappearance of a previously detected motion. In the case of the disappearance of a previously detected motion a delay time between the occurrence of the event and the transmission of the DALI command can be defined.



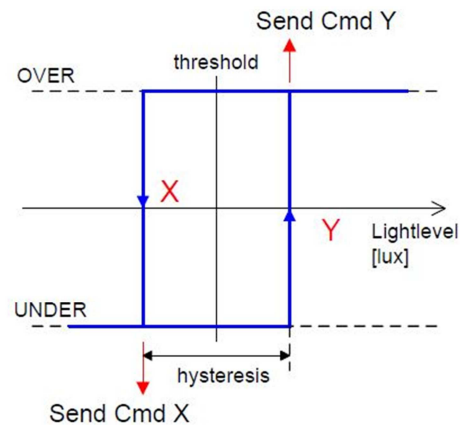
timing motion detection / reaction

This functionality offers a simple and convenient way to implement an automatic lighting control. The light is turned on and off as reaction on motion.

### **Light Intensity Sensor**

The light sensor measures illuminance in a range from 0 to 2500 lux. The resolution is 1 lux. The incident light is rated by the spectral sensitivity of the human eye and thus a property for the subjective visual perception of brightness.

In the DALI-Cockpit switching thresholds for light intensity can be defined by setting values for threshold and hysteresis. When the measured value falls below the lower limit or exceeds the upper one various DALI-commands can be selected to be sent as response.

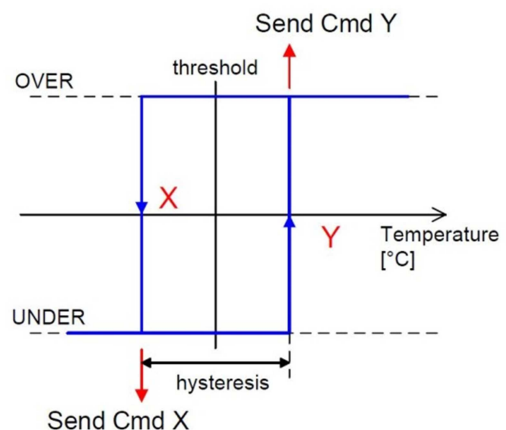


hysteresis light sensor

Besides direct lighting control the light sensor can be used for measurement and monitoring as well. The measured value can be transmitted to a superimposed control.

A combined functionality of light intensity sensor and motion detector can be selected optionally. With this option the motion sensor can be forced to work only at night while it is deactivated during daytime.

### **Temperature Measurement**



hysteresis temperature sensor

The temperature sensor covers a range from 0°C to 70°C. The resolution is 1°C. The setting of switching thresholds is implemented similar to the light sensor.

The temperature sensor can be used for measurement and monitoring purposes only.

The measured value can then be transmitted to a higher level controller.

### **IR Remote Control Empfänger**

The DALI CS is available with infrared (IR) remote control receiver.

The transmission of DALI commands can then be manually triggered by a remote control.

The 7 button Apple-Remote is the standard remote control. Optional learning of up to 4 IR-codes is supported (protocols: Philips RC5, Philips RC6, NEC, Sony, Nokia, RCAA and X-Sat).

### **Configuration**

For applications requiring a motion sensor only the default configuration may be sufficient. The destination address can be set by the rotary switch on the rear side of the sensor (0...Broadcast, 1...15 -> group addresses G0...G14).

In the default configuration light- and temperature-sensor are deactivated. The motion sensor sends the DALI-command RECALL MAX in case of a detected motion and the DALI-command OFF (without delay) if movement isn't detected any longer. The destination address is G0...G14 or broadcast as selected by the rotary switch.

For any other configuration the free DALI-Cockpit software tool can be used to adjust the sensor individually.

In the DALI-Cockpit the DALI addressing procedure can easily be initiated. After addressing has finished the spatial localization of any DALI CS can be done by forcing the desired sensor to turn on a red LED. Therefore select the check box to switch on the LED in the DALI Cockpit. The relationship between spatial arrangement and assigned number in the software is simply established that way.

The parameters like threshold and hysteresis of light intensity measurement and temperature sensor can be configured in the DALI Cockpit as well as the delay time of the PIR sensor. Moreover each sensor can be separately enabled or disabled.

When a defined event (such as crossing temperature thresholds or detected motion) occurs, each sensor module can send freely configurable DALI-commands (Send Cmd X/Y) to up to four destination addresses. In contrast to the default setting multiple destination addresses can be selected. These can be either individual addresses or group addresses as well as broadcast.

Besides the destination addresses the DALI-command to be transmitted must also be selected. Available DALI-commands can be separated into commands for Switching On (CmdX) and Switching Off (CmdY).

CmdX (ON-commands):

CmdNr	Command	Function
-	DIRECT ARC POWER>0	direct arc power in %
5	RECALL MAX	recalls MAX value
6	RECALL MIN	recalls MIN value
8	ON AND STEP UP	Increases light level by one increment, if OFF switch ON (MIN value)
16-31	GO TO SCENE	go to scene 0-15

CmdY (OFF-commands):

CmdNr	Command	Function
-	DIRECT ARC POWER = 0	direct arc power in %
0	OFF	off
16-31	GO TO SCENE	go to scene 0-15

If there is no destination address, no DALI commands will be sent. The DALI CS may be used for measurement and monitoring purposes in this mode. The measured values can be retrieved using special commands. For more details check the DALI CS manual.

At the IR-Type either the apple remote or a universal IR receiver can be selected. The learning procedure for a button can be easily started in the DALI-Cockpit and as reaction the DALI CS starts blinking, indicating that the DALI CS is ready to learn an IR-code. Press the button on the remote which will result in a permanent lighting of the DALI CS. Release the button again will result in a blinking light again. The procedure (Press/Release) has to be repeated 2 more times, otherwise the code will not be accepted.

The configuration options of the buttons are similar to other input devices like the DALI Switch or DALI MC+.

For each button the effective range, the switching mode and the DALI commands can be defined. The functions vary from simple push buttons or toggle push buttons via lighting based push button dimming keys to standard stairwell function with configurable delay time.

	Function	Action	Description
1	Push Button	short/long: 1 * command X	Briefly pressing or holding down the push button will send command X one time
2	Push Button	short: 1 * command X long: 1 * command X then 1 * command Y	Briefly pressing or holding down the push-button will send command X one time Holding down the push button will send command X once and then command Y once
3	Push Button	short: 1 * command X long: 1 * command X then repeatedly command Y	Briefly pressing or holding down the push-button will send command X one time Holding down the push button will send command X once and then command Y repeatedly
4	Push Button Toggle	short: toggle between command X and Y	Briefly pressing the push button will alternate between sending commands X and Y
5	Push Button Toggle	short: toggle between command X and Y lighting status based	Briefly pressing the push button will alternate between sending commands X and Y lighting based: If the light was previously switched off -> command X If the light was previously switched on -> command Y
6	Push Button Dimming Key	short: toggle between command X and Y, long: ON AND STEP UP and repeatedly: dim UP/DOWN	Briefly pressing the push button will alternate between sending commands X and Y lighting based: If the light was previously switched off -> command X If the light was previously switched on -> command Y Holding down the dimmer starts the ON AND STEP UP function. Afterwards the current light status is dimmable with UP or DOWN.
9	Stairwell Function	short/long: command X, after run-on time command Y	If the pushbutton is pressed, command X is sent and the run-on time starts. Once the run-on time elapsed, command Y is sent.
10	Push Button	short: 1*command X on release long: command Y repeated	Briefly pressing the push button and release will send command X Holding down the push button will send command Y repeated
11	Push Button	short: 1*command X, then command Y repeated without long button delay	Pressing the pushbutton will send command X and then command Y repeated without long button press delay.



In addition to the switching mode the reaction on a depress action has to be defined.

It is necessary to define the effective range. It is possible to send to single addresses, groups as well as broadcast.

In the table below a summary of the DALI commands available is given.

command number	command name	function
-	DIRECT ARC POWER	direct arc power Level in %
0	OFF	off
1	UP	dim up (using fade rate)
2	DOWN	dim down (using fade rate)
3	STEP UP	increases light level by one increment
4	STEP DOWN	decreases light level by one increment
5	RECALL MAX	recalls MAX value
6	RECALL MIN	recalls MIN value
7	STEP DOWN AND OFF	decreases light level by one increment, if value at MIN switch off
8	ON AND STEP UP	increases light level by one increment, if OFF switch on
16-31	GO TO SCENE	go to scene 0-15

As an alternative to the transmission of any single DALI command initiated by a depress action, it is possible to transmit a set of commands within a DALI-macro. This option can be used for either predefined processes (such as a scene sequencer) or other user-defined DALI-commands sequences.

macro (required memory)	function
Go Home (2 Byte)	Light dims down to DAP 0 with predefined fade time, then fade time is set back to a programmable value
Sequential Scenes (3Byte)	Selectable scenes (or OFF) will be sent sequentially with each button press.
Dynamic Scenes (9 Byte)	Dynamic sequence of up to 4 selectable scenes, fadetimes and delays, stops with next

	button press
DALI-Reset (1 Byte)	Sends DALI-Reset (address can be deleted optionally)
user defined cmds (5 bytes per command, 19 commands max.)	A user defined macro file can be loaded to the switch
DT8 Cooler 3x (0 Byte)	Activates DT8 and sends STEP COOLER command 3x
DT8 Warmer 3x (0 Byte)	Activates DT8 and sends STEP WARMER command 3x

## DALI Instruction Set

The DALI CS operates as control device on the DALI-line and transmits the predefined DALI-commands to the effective range defined.

## Modes of Operation

The DALI CS offers 3 modes of operation.

### Master Mode (Default)

In this operating mode the device works as DALI control device sending DALI commands to DALI ballasts, according to the configuration settings. When used in combination with a central system controller the direct master mode might not be suitable and should be changed to one of the other operating modes.

### Event Message Mode

If an event occurs a special command is sent to a target address as an event indicator, this happens within the scope of the proprietary protocol extension. This message contains information about the type of event or action.

In this operating mode the DALI CS does not control DALI-loads directly.

### Slave Mode

The slave mode is a passive operating mode. The DALI CS is not active, it only replies on queries. For information retrieval a set of



commands can be used, provided within the scope of the proprietary protocol extension. It is also possible to assign the DALI CS an address and information can then be retrieved via scene-retrieval.

The operating mode can be set within the DALI Cockpit.

## Additional Information and Equipment

DALI-Cockpit – free configuration tool from Lunatone for DALI systems

<http://lunatone.at/en/dali-systems/software/>

DALI-Manual [http://www.dali-ag.org/c/manual\\_gb.pdf](http://www.dali-ag.org/c/manual_gb.pdf)

DALI USB – PC interface for DALI system. The DALI-Cockpit can access DALI components using the DALI USB

[http://lunatone.at/en/downloads/Lunatone\\_Art24138923\\_DALI\\_USB\\_Datasheet\\_EN.pdf](http://lunatone.at/en/downloads/Lunatone_Art24138923_DALI_USB_Datasheet_EN.pdf)

DALI PS – power supply for a DALI line

[http://lunatone.at/en/downloads/Lunatone\\_Art24033444\\_DALI\\_PS\\_Datasheet\\_EN.pdf](http://lunatone.at/en/downloads/Lunatone_Art24033444_DALI_PS_Datasheet_EN.pdf)

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