

# **DALI-2 Devices for Integration**

## **DALI-2 Instances**

**Information**  
**DALI-2 Instance Mode**

# DALI-2 Instances

## Overview

- Instances are used for Integration in systems with a DALI-2 central control unit
- Each functionality of an input device can be an instance of the device.  
Examples:
  - 4 Pushbuttons of a DALI-2 Switch would each be an instance so in total 4 instances (with type: pushbutton)
  - Sensors of a DALI-2 Combi Sensor Module: light sensor, motion sensor, temperature sensor, etc. would each be an instance of the module
- There are different DALI -2 Instance types available (specified in the DALI-2 standard):
  - Instance Type 1: pushbutton, (62386-301)
  - Instance Type 2: analog input (62386-302) (used for all other inputs: sliders, rotary buttons, temperature sensors, humidity sensors, air pressure sensors, air quality sensors, etc.)
  - Instance Type 3: motion detection measurement (PIR), (62386-303)
  - Instance Type 4: light intensity measurement, (62386-304)

## Functionality

DALI-2 devices in Instance mode are for use in systems with higher-level DALI-2 compatible controls / central control units, such as for example by WAGO, Beckhoff, etc.

DALI-2 input devices in instance mode do not send DALI control commands. Instead the higher level control units process the status of each instance in the system and send the necessary DALI control commands.

Each control device pushbutton or other input method (pushbutton, rotary button, etc.) and each detectable sensor value (motion, light, temperature, etc.) is a separate DALI-2 instance of the DALI-2 input device. The instance type is specified by the DALI-2 standard.

The state/value of each instance can always be queried via a “Query” command.

Or it can be set that instances automatically send a DALI-2 event message when changing their state/value.

These instance event messages can be activated or deactivated (independent of the other device instances), filtered and priorities of event messages can be set. Details on the configuration options can be found in the next section.

To structure instances it is also possible to assign all instances to one or several instance groups.

## Instance Settings: General

Each instance can be configured individually. The settings in this section are valid for all instance types, (i.e., regardless if pushbutton, or sensor etc.)

### 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*

Type	Hex Data	Address	Command
DALI24 Event	828402	IT1, IN1	Event 2

Example instance type (iT) 1, instance Number(iN) 1

- Device Addressing:

*device address and instance type*

Type	Hex Data	Address	Command
DALI24 Event	008402	A0, IT1	Event 2

Example device address A0<sup>2</sup>, instance type (iT) 1

- Device/Instance Addressing:

*device address and instance number*

Type	Hex Data	Address	Command
DALI24 Event	008402	A0, IN1	Event 2

Example: device address A0<sup>2</sup>, instance number (iN) 1

- Device Group Addressing:

*Device group and instance type*

Type	Hex Data	Address	Command
DALI24 Event	800402	G0, IT1	Event 2

Example: DALI-2 device group G0<sup>2</sup>, instance type (iT) 1

- ➔ If not part of any DALI-2 group falls back to instance addressing

- Instance Group Addressing:

*Instance group and instance type*

Type	Hex Data	Address	Command
DALI24 Event	C00402	IG0, IT1	Event 2

Example instance group iG0<sup>2</sup>, instance type (iT) 1

- ➔ If no primary instance group is set - falls back to instance addressing

### Instance group

Each instance of an input device can be assigned to up to 3 instance groups. (of the 32 instance groups available). The "Primary Group" is used for the event. Instances of different input devices can be assigned to the same instance group

### 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, each input device can include up to 32 different instance types).

### Instance number

Each instance in a device has a unique instance number. (assigned by the manufacturer)

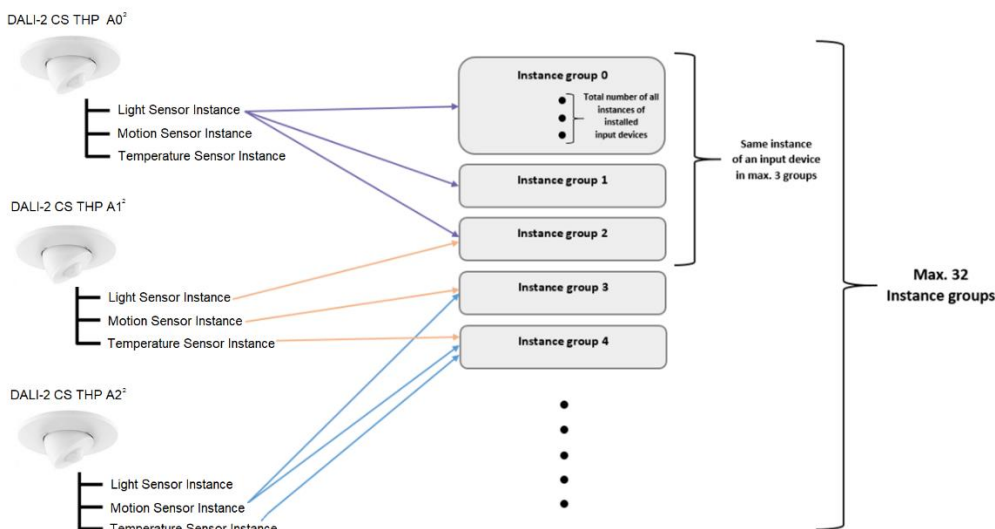
### Device group

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

### Device address

After DALI Addressing each device has a DALI address (input devices have a DALI-2 control address 0<sup>2</sup>..63<sup>2</sup>). With this address the device can be clearly addressed. A different device address can be assigned if needed (Attention: no devices should have the same address).

**Example Instance Groups**



**Event Filter**

Selection from the available events / states that will trigger an event message when on change.

**Event Priority**

*only for instance types 2, 3 and 4*  
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**

*only for instance types 2, 3 and 4*  
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**

*only for instance types 2, 3 and 4*  
By using the report timer, the value is sent periodically as a DALI-2 event regardless of the value changing. 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**

*only for instance types 3 and 4*  
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**

*only for instance types 2,3 and 4*  
Is the minimal hysteresis value that cannot be fallen below of.

## Instance Settings: Instance Type 1 - Pushbutton

As defined in the standard, the following events are supported and sent on the DALI bus as INPUT NOTIFICATIONS:

Event name	Event Information	Description
Button released	0 (0000b)	The button is released
Button pressed	1 (0001b)	The button is pressed
Short press	2 (0010b)	The button is pressed and released, without being pressed quickly again (in case of double press enabled), or the button is pressed and quickly released (in case double press is disabled)
Double press	5 (0101b)	The button is pressed and released, quickly followed by another button press
Long press start	9 (1001b)	The button is pressed without releasing it
Long press repeat	11 (1011b)	Following a long press start condition the button is still pressed, the event occurs at regular intervals as long as the condition holds
Long press stop	12 (1100b)	Following a long press start condition, the button is released
Button free	14 (1110b)	The button has been stuck and is now released
Button stuck	15 (1111b)	The button has been pressed for a very long time and is assumed stuck.

Further parameters of the pushbutton instances are event filters and event timers

### Event Filter

Selection from the available events / states described before:

Button pressed, button released, short press, double press, long press start, long press repeat, long press stop, button stuck/free press

will trigger a DALI-2 event message.

### Event Timer

Definition of the timing for the available events/states in milliseconds:

short press timer: duration of the button press to count as a short key press

double press timer: timing between a double press

Repeat Timer: duration between sending repeat events during a long key press

Stuck Timer: duration the button must be pressed before it is considered to be stuck.

### Examples

Event from instance type 1 (iT1) instance Number 1 (iN1)  
Event 2 (0010b): short press

Type	Hex Data	Address	Command
DALI24 Event	828402	IT1, IN1	Event 2

Event from instance type 1 (iT1) instance Number 0 (iN0)  
Event 9 (1001b): long press start  
Event 11 (1011b): long press repeat  
Event 12 (1100b): long press stop

Type	Hex Data	Address	Command
DALI24 Event	828009	IT1, IN0	Event 9
DALI24 Event	82800B	IT1, IN0	Event 11
DALI24 Event	82800B	IT1, IN0	Event 11
DALI24 Event	82800C	IT1, IN0	Event 12

## Instance Settings: Instance Type 2 - Analog Input

The input value of the analogue instance corresponds to the value of the assigned slider or rotary button. If this value is changed, the instance generates a DALI-2 event.

Parameters of the analogue input device instances are: event filter, event timers, report time and deadtime

### **Event and Event Filter**

If the event filter is selected for an event/state the respective value change will trigger an event message. If the filter is deactivated, no event messages will be sent

Available states depends on the instance:

Examples:

- Instance: Touchpanel Slider  
Event: position tapped on the slider
- Rotary - Button: position of the rotary movement

Report time, Dead time and Hysteresis are described in the section "General Settings" on page 4.

## Instance Settings: Instance Type 3 - Motion sensor

Is an instance standardized by DALI-2 (62386-303), for sensors that detect motion.

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".

### **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".

### **Query Input Value**

The current sensor state can be queried using this DALI command. 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 options:

- "Occupied" - Event
- "Vacant" - Event
- "Still Vacant/ Still Occupied" - Event
- "Movement" - Event
- "No Movement" - Event

Report time and Dead time are described in the section "General Settings" on page 4.

## Instance Settings: Instance Type 4 - Light sensor

is an instance standardized by DALI-2 (62386-304). 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.

### **Event**

Light value measurement

### **Event Filter**

If the event filter is selected for the light value change will trigger an event message. if the filter is deactivated, no events will be sent

Report time, Dead time and Hysteresis are described in the section "General Settings" on page 4.

## Instance Settings: Instance Type 0 - Generic

The input value of a generic instance corresponds to the value of the assigned sensor value, the instance generates a DALI-2 event.

For generic instance types information about resolution and value range can be queried. Parameters of the generic input device instances are: event filter, event timers, report time and deadtime

### **Event and Event Filter**

If the event filter is selected for an event/state the respective value change will trigger an event message. if the filter is deactivated, no event messages will be sent

Available states depend on the instance:

Examples:

- Temperature Sensor: temperature value
- Humidity Sensor: humidity value

- Air pressure sensor: air pressure value
- Air Quality Sensor: air quality value

Report time, Dead time and Hysteresis are described in the section "General Settings" on page 4.

## Examples generic Instances

The following examples show the evaluation of sensor values of the generic Lunatone instances based on the temperature instance. The same procedure also applies to air pressure, air quality, CO2 equivalent and humidity. For a technical description of all supported commands of the generic Lunatone instances see the manual: [https://www.lunatone.com/wp-content/uploads/2022/11/Lunatone\\_DALI-2\\_Sensor\\_Instances\\_EN\\_M0026.pdf](https://www.lunatone.com/wp-content/uploads/2022/11/Lunatone_DALI-2_Sensor_Instances_EN_M0026.pdf).

### **Query and evaluation of Temperature value:**

The temperature value is made up of the input value and the input value latch. The number of relevant bits is specified via the resolution:

Query Resolution → answer: 0x0A  
 0x0A [hex] = 10 [dec]: the information is contained in 10 bits:

Query Input Value → answer: 0x6C  
 Query Input Value Latch → answer: 0x9B

0x6C = **0110 1100**  
 0x9B = **1001 1011**  
 → 0110 1100 10 = 434 [dec]

For the DALI-2 CS THP temperature sensor the resolution is 0.1°C, the value range is: -20°C to + 80°C (this information can be found in the sensor datasheet but can also be queried from the device, see next example for more information)

→  $434 * 0.1^{\circ}C = 43.4^{\circ}C$   
 →  $43.4^{\circ}C - 20^{\circ}C = 23.4^{\circ}C$

**More details on temperature value query and evaluation**

**Details on Querying:**

A query (24bit DALI frame) consists of:

device address*2+1	instancenr.	query command code
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In this example we have a sensor with:

DALI-2 address: A0<sup>2</sup>

temperature instance: instancenr. 2

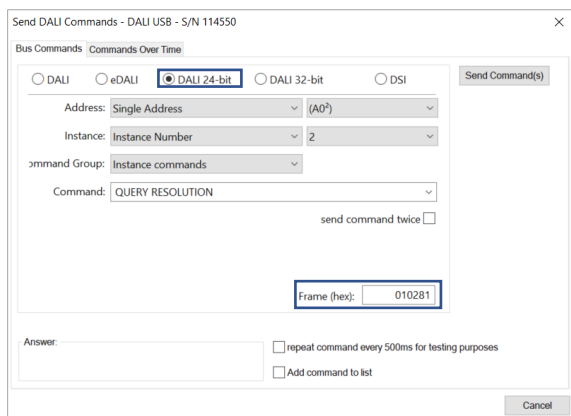
Query command codes:

QUERY VALUE MULTIPLICATOR	0x40
QUERY VALUE DIVISOR	0x41
QUERY OFFSET MSB	0x42
QUERY OFFSET LSB	0x43
QUERY OFFSET MULTIPLICATOR	0x44
QUERY OFFSET DIVISOR	0x45
QUERY UNIT	0x46
QUERY RESOLUTION	0x81

**QUERY Resolution**

device address*2+1	instancenr.	query command code
01	02	81

Queries can be sent from the DALI Cockpit > DALI Bus > DALI Commands...:



Type	Hex Data	Address	Command
DALI24 Inst Query	01 02 81	A0, iN2	QUERY RESOLUTION
DALI8 Answer	0A		= 10 (0x0A)
DALI24 Inst Query	01 02 8C	A0, iN2	QUERY INPUT VALUE
DALI8 Answer	6C		= 108 (0x6C)
DALI24 Inst Query	01 02 8D	A0, iN2	QUERY INPUT VALUE LATCH
DALI8 Answer	9B		= 155 (0x9B)

With the responses from the sensor, the calculation can be continued as in the first example.

**Details on Evaluation:**

Information on the resolution and value range is not only available from the data sheet but can also be queried:

The value is then made up as follows:

$$Value[unit] = Input\ Value \cdot \frac{Value\ Multiplier}{Value\ Divisor} + Offset \cdot \frac{Offset\ Multiplier}{Offset\ Divisor}$$

The read unit value can be assigned from the following table:

Wert	Einheit
0	Thermodynamic temperature [K]
1	CO <sub>2</sub> -eq (CO <sub>2</sub> equivalent) [ppm]
12	Relative humidity [%]
15	Barometric pressure [hPa]
16	IAQ (Indoor Air Quality) [1]

These values and assignment of units are specific to Lunatone sensors

Type	Hex Data	Address	Command
DALI24	01 02 40	A0, iN2	QUERY VALUE MULTIPLICATOR
DALI8 Answer	01		= 1 (0x01)
DALI24	01 02 41	A0, iN2	QUERY VALUE DIVISOR
DALI8 Answer	0A		= 10 (0x0A)
DALI24	01 02 42	A0, iN2	QUERY VALUE MSB
DALI8 Answer	62		= 98 (0x62)
DALI24	01 02 43	A0, iN2	QUERY VALUE LSB
DALI8 Answer	E3		= 227 (0xE3)
DALI24	01 02 44	A0, iN2	QUERY OFFSET MULTIPLICATOR
DALI8 Answer	01		= 1 (0x01)
DALI24	01 02 45	A0, iN2	QUERY OFFSET DIVISOR
DALI8 Answer	64		= 100 (0x64)
DALI24	01 02 46	A0, iN2	QUERY UNIT
DALI8 Answer	00		= 0 (0x00)

From the answers follows:

	[hex]	[dec]
Value Multiplier	0x01	1
Value Divisor	0x0A	10
Offset MSB und LSB	0x62E3	25315
Offset Multiplier	0x01	1
Offset Divisor	0x64	100
Unit	0x00	Kelvin

$$T[K] = InputValue \cdot \frac{1}{10} + 25315 \cdot \frac{1}{100}$$

$$= \frac{InputValue}{10} + 253.15$$

$$= \frac{434}{10} + 253.15 = 296.55\ K$$

$$T[°C] = T[K] - 273.15 = 23.4°C$$



## Contact

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## Disclaimer

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

The compatibility with other devices must be tested in advance to the installation.