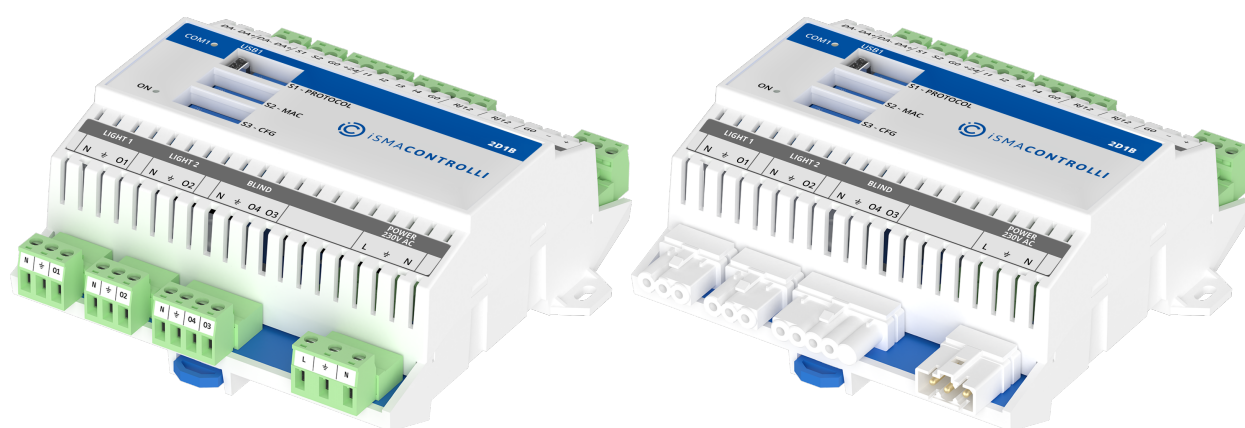


# iSMA-B-2D1B

User Manual

## 2D1B(-WD)



## Table of Contents

1	Introduction .....	5
1.1	Revision History.....	5
2	Safety Rules.....	6
3	Technical Specification .....	7
4	Hardware Specification .....	9
4.1	Dimensions .....	9
4.2	Power Supply.....	10
4.2.1	24 V DC Power Supply for External Equipment .....	11
4.3	Terminals and Internal Connections.....	11
4.3.1	iSMA-B-2D1B-(WD).....	12
4.4	RS485 Communication.....	13
4.4.1	Connecting RS485 Communication Bus.....	13
4.4.2	RS485 Grounding and Shielding.....	13
4.4.3	RS485 Network Termination.....	13
4.5	RJ12 .....	14
4.6	Front Panel and DIP Switches.....	15
4.6.1	USB1 Port.....	15
4.6.2	LED.....	15
4.6.3	DIP Switches.....	16
4.7	Default Settings.....	19
4.7.1	Restoring Default Settings.....	21
4.8	DALI Interface .....	21
5	Inputs and Outputs.....	23
5.1	Special Inputs .....	23
5.2	Digital Inputs.....	23
5.3	Light Outputs.....	24
5.4	Blind Output .....	25
5.5	24 V DC Power Supply Output .....	26
6	Control Application .....	27
6.1	DALI Light Control .....	27
6.1.1	Monostable Switch Control.....	27
6.1.2	Bistable Switch Control .....	28
6.1.3	Motion Sensor/Presence Detector Control .....	28
6.1.4	DALI Interface Multicontrol .....	29
6.2	ON/OFF Light Control .....	30

6.2.1	Monostable Switch Control.....	30
6.2.2	Bistable Switch Control .....	31
6.2.3	Motion Sensor/Presence Detector Control .....	31
6.2.4	Light Output Multicontrol.....	32
6.3	Blind/Shutter Control .....	32
6.3.1	Monostable Switch Control.....	32
6.3.2	Bistable Switch Control .....	35
6.3.3	Blinds Calibration Procedure.....	35
6.3.4	Slats Calibration Procedure .....	36
7	Modbus Registers.....	38
7.1	Configuration Registers.....	38
7.1.1	VERSION_TYPE (30001) .....	38
7.1.2	ADDR_DIPSWITCH (30002).....	38
7.1.3	DIPSWITCH_CFG_REGISTER (30003) .....	39
7.1.4	RECEIVED_FRAMES_COUNTER (30004).....	39
7.1.5	ERROR_FRAMES_COUNTER (30006) .....	39
7.1.6	TRANSMITTED_FRAME_COUNTER (30008).....	39
7.1.7	UP_TIME (30012).....	39
7.1.8	BAUD_RATE (40017).....	39
7.1.9	STOP_BITS (30018).....	39
7.1.10	PARITY_BITS (30020) .....	40
7.1.11	REPLY_DELAY (40021).....	40
7.1.12	DIPSWITCH_CFG_REGISTER (30156) .....	40
7.2	I/O Registers.....	41
7.2.1	DIGITAL_OUTPUTS_STATUS_REGISTER (30042).....	41
7.2.2	DIGITAL_INPUTS_STATUS_REGISTER (30041) .....	42
7.2.3	DIGITAL_INPUTS_COMMAND_REGISTER (40101) .....	42
7.2.4	DIGITAL_INPUTS_BLOCKING_REGISTER (40102).....	43
7.2.5	SPECIAL_INPUTS_STATUS_REGISTER (30043).....	44
7.2.6	SI1_PIR_TYPE (40103).....	44
7.2.7	SI2_PIR_TYPE (40104).....	45
7.2.8	SI1_DELAY_OFF_TIME (40107) .....	45
7.2.9	SI2_DELAY_OFF_TIME (40108) .....	45
7.2.10	SI_PIR_STATUS (30148).....	45
7.3	DALI Registers.....	46
7.3.1	DALI_COMMAND_REGISTER (40253) .....	46
7.3.2	DALI1_RECEIVED_FRAMES_COUNTER (30229) .....	48

7.3.3	DALI1_ERROR_FRAMES_COUNTER (30237).....	48
7.3.4	DALI1_TRANSMITTED_FRAMES_COUNTER (30245).....	48
7.3.5	DALI1_CFG_REGISTER (40254).....	48
7.3.6	DALI1_DIMMING_STATE (40266).....	49
7.3.7	DALI1_FADE_RATE (40462) .....	49
7.3.8	DALI1_FADE_TIME (40466).....	51
7.3.9	DALI1_POWER_ON_LEVEL (40470) .....	51
7.3.10	DALI1_SYSTEM_FAILURE_LEVEL (40474).....	51
7.3.11	DALI2_RECEIVED_FRAMES_COUNTER (30231) .....	51
7.3.12	DALI2_ERROR_FRAMES_COUNTER (30239).....	51
7.3.13	DALI2_TRANSMITTED_FRAMES_COUNTER (30247).....	51
7.3.14	DALI2_CFG_REGISTER (40255).....	51
7.3.15	DALI2_DIMMING_STATE (40267).....	53
7.3.16	DALI2_FADE_RATE (40463) .....	53
7.3.17	DALI2_FADE_TIME (40467).....	54
7.3.18	DALI2_POWER_ON_LEVEL (40471) .....	54
7.3.19	DALI2_SYSTEM_FAILURE_LEVEL (40475).....	54
7.3.20	DALI Network Advanced Control .....	54
7.3.21	DALI Registers Available Only After DALI X Network Commissioning .....	59
7.4	Blind Control Registers.....	64
7.4.1	BLIND_UP_TIME (40601) .....	64
7.4.2	BLIND_DOWN_TIME (40617).....	65
7.4.3	SLATS_OPENING_TIME (40633).....	65
7.4.4	BLIND_STATE (40649) .....	65
7.4.5	SLATS_STATE (40657) .....	65
7.4.6	BLIND_OFF_DELAY (40665) .....	65
7.4.7	SLATS_NUMBER_OF STEPS (40673) .....	66
7.5	List of Modbus Registers .....	66

# 1 Introduction

The iSMA-B-2D1B device has been built in order to control the light and blind/shutter in a single space in the building. The device is designed for controlling two separate DALI light areas with up to 32 DALI ballasts (16 ballasts for each DALI interface). Two built-in special inputs and two digital inputs are designed to connect the presence detectors and light switches. A dedicated DIP switch allows for activating a predefined inputs configuration. The device allows for controlling DALI ballasts by a common light switch and a common presence detector without the need of programming, which makes the device a unique plug & play type device designed for DALI network control.

In addition, the iSMA-B-2D1B-(WD) device has a blind/shutter control function implemented, which allows for controlling a blind/shutter with a common double-switch.

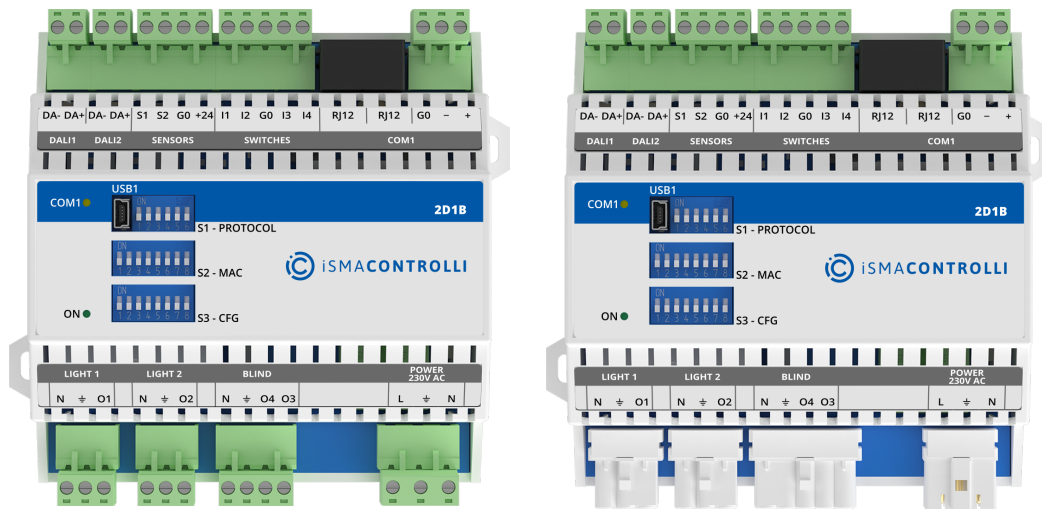


Table 1. 2D1B controllers

## 1.1 Revision History

Rev.	Date	Description
1.0	16 Aug 2017	First edition
1.1	29 Mar 2021	Company data update
1.2	25 May 2022	Rebranded

Table 2. Revision history

## 2 Safety Rules

- Improper wiring of the product can damage it and lead to other hazards. Make sure that the product has been correctly wired before turning the power on.
- Before wiring or removing/mounting the product, make sure to turn the power off. Failure to do so might cause an electric shock.
- Do not touch electrically charged parts such as power terminals. Doing so might cause an electric shock.
- Do not disassemble the product. Doing so might cause an electric shock or faulty operation.
- Use the product only within the operating ranges recommended in the specification (temperature, humidity, voltage, shock, mounting direction, atmosphere, etc.). Failure to do so might cause a fire or faulty operation.
- Firmly tighten the wires to the terminal. Failure to do so might cause a fire.
- Avoid installing the product in close proximity to high-power electrical devices and cables, inductive loads, and switching devices. Proximity of such objects may cause an uncontrolled interference, resulting in an instable operation of the product.
- Proper arrangement of the power and signal cabling affects the operation of the entire control system. Avoid laying the power and signal wiring in parallel cable trays. It can cause interferences in monitored and control signals.
- It is recommended to power controllers/modules with AC/DC power suppliers. They provide better and more stable insulation for devices compared to AC/AC transformer systems, which transmit disturbances and transient phenomena like surges and bursts to devices. They also isolate products from inductive phenomena from other transformers and loads.
- Power supply systems for the product should be protected by external devices limiting overvoltage and effects of lightning discharges.
- Avoid powering the product and its controlled/monitored devices, especially high power and inductive loads, from a single power source. Powering devices from a single power source causes a risk of introducing disturbances from the loads to the control devices.
- If an AC/AC transformer is used to supply control devices, it is strongly recommended to use a maximum 100 VA Class 2 transformer to avoid unwanted inductive effects, which are dangerous for devices.
- Long monitoring and control lines may cause loops in connection with the shared power supply, causing disturbances in the operation of devices, including external communication. It is recommended to use galvanic separators.
- To protect signal and communication lines against external electromagnetic interferences, use properly grounded shielded cables and ferrite beads.
- Switching the digital output relays of large (exceeding specification) inductive loads can cause interference pulses to the electronics installed inside the product. Therefore, it is recommended to use external relays/contactors, etc. to switch such loads. The use of controllers with triac outputs also limits similar overvoltage phenomena.
- Many cases of disturbances and overvoltage in control systems are generated by switched, inductive loads supplied by alternating mains voltage (AC 120/230 V). If they do not have appropriate built-in noise reduction circuits, it is recommended to use external circuits such as snubbers, varistors, or protection diodes to limit these effects.

### 3 Technical Specification

<b>Power Supply</b>	Voltage	230 V AC $\pm$ 10%
	Power consumption	Max. 8 VA
<b>Special Inputs</b>	Dry contact input	Output current $\sim$ 0.2 mA
<b>Digital Inputs</b>	Type	Dry contact
	Max. input frequency	100 Hz
<b>Blind Output (Relay)</b>	Resistive load	Max. 1.5 A at 230 V AC
	Inductive load AC3	Max. 1.5 A at 230 V AC
<b>Light Outputs (Relays)</b>	Resistive load	Max. 2 x 4 A at 230 V AC
<b>Power Supply Output</b>	Voltage	24 V DC, max. 80 mA
<b>RS485 Interface</b>	RS485	Up to 128 devices Fail-safe receiver (bus open, bus shorted, bus idle)
	Communication protocols	Modbus RTU/ASCII
	Baud rate	From 2400 to 115200 set by switch
	Address	0 to 254 set by DIP switch
<b>RJ12 Interface</b>	RS485	Up to 128 devices
	Communication protocol	Modbus RTU/ASCII
	Baud rate	From 2400 to 115200
<b>DALI Interface</b>	DALI version	1.0
	Max. ballasts number	16
	Max. power supply	40 mA
<b>USB</b>	USB	Mini USB 2.0
<b>Ingress Protection</b>	IP	IP40
<b>Temperature</b>	Storage	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
	Operating	$0^{\circ}\text{C}$ to $+50^{\circ}\text{C}$
<b>Humidity</b>	Relative	5% to 95%

<b>Connectors</b>	Inputs/outputs Power supply and communication	Pluggable screw terminals Wieland type (iSMA-B-2D1B-WD only)
	Max. cable size	2.5 mm <sup>2</sup>
<b>Dimension</b>	Width	124 mm
	Length	137 mm
	Height	55 mm

*Table 3. Technical specification*



## 4 Hardware Specification

### 4.1 Dimensions

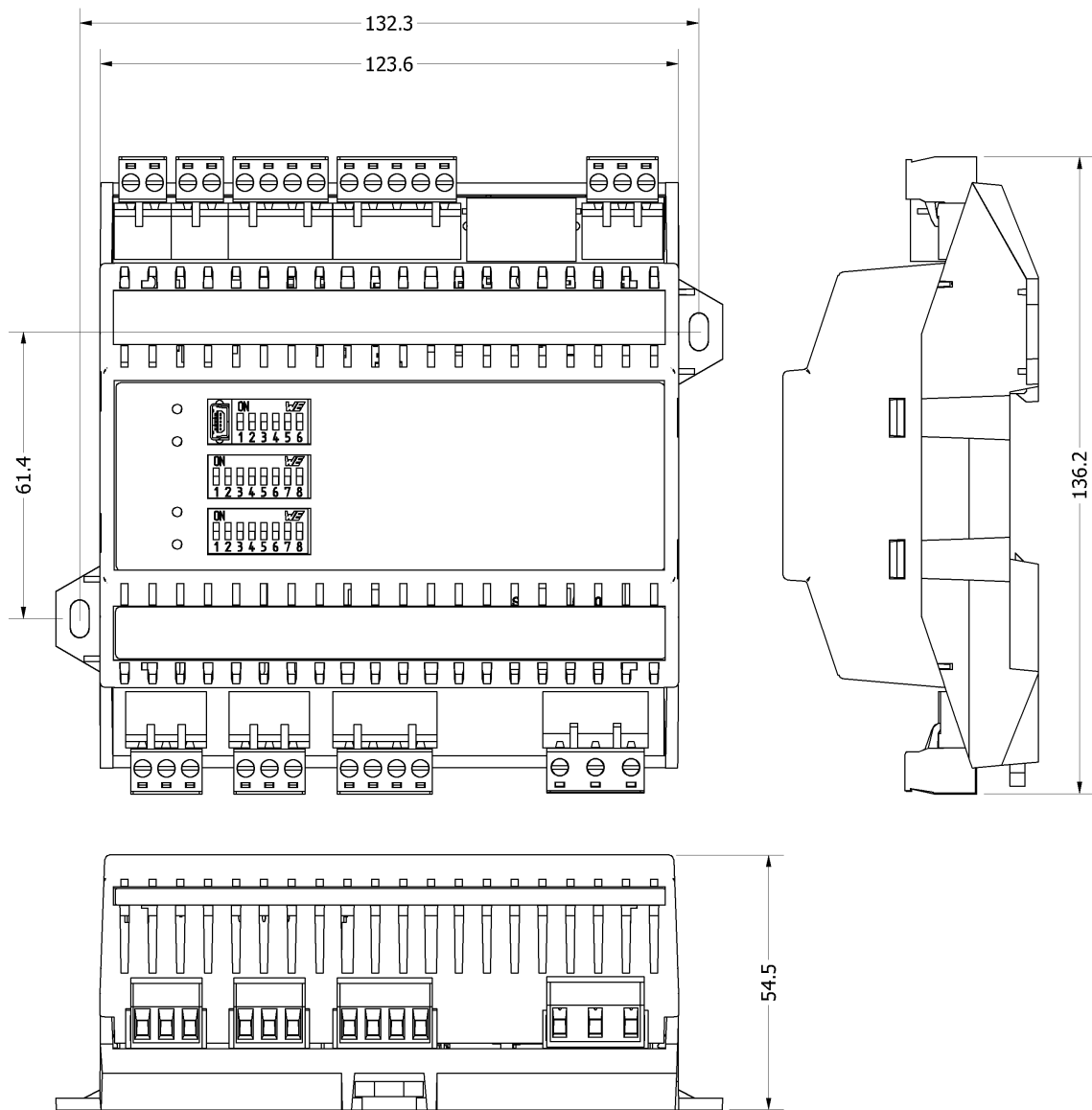


Figure 1. 2D1B dimensions

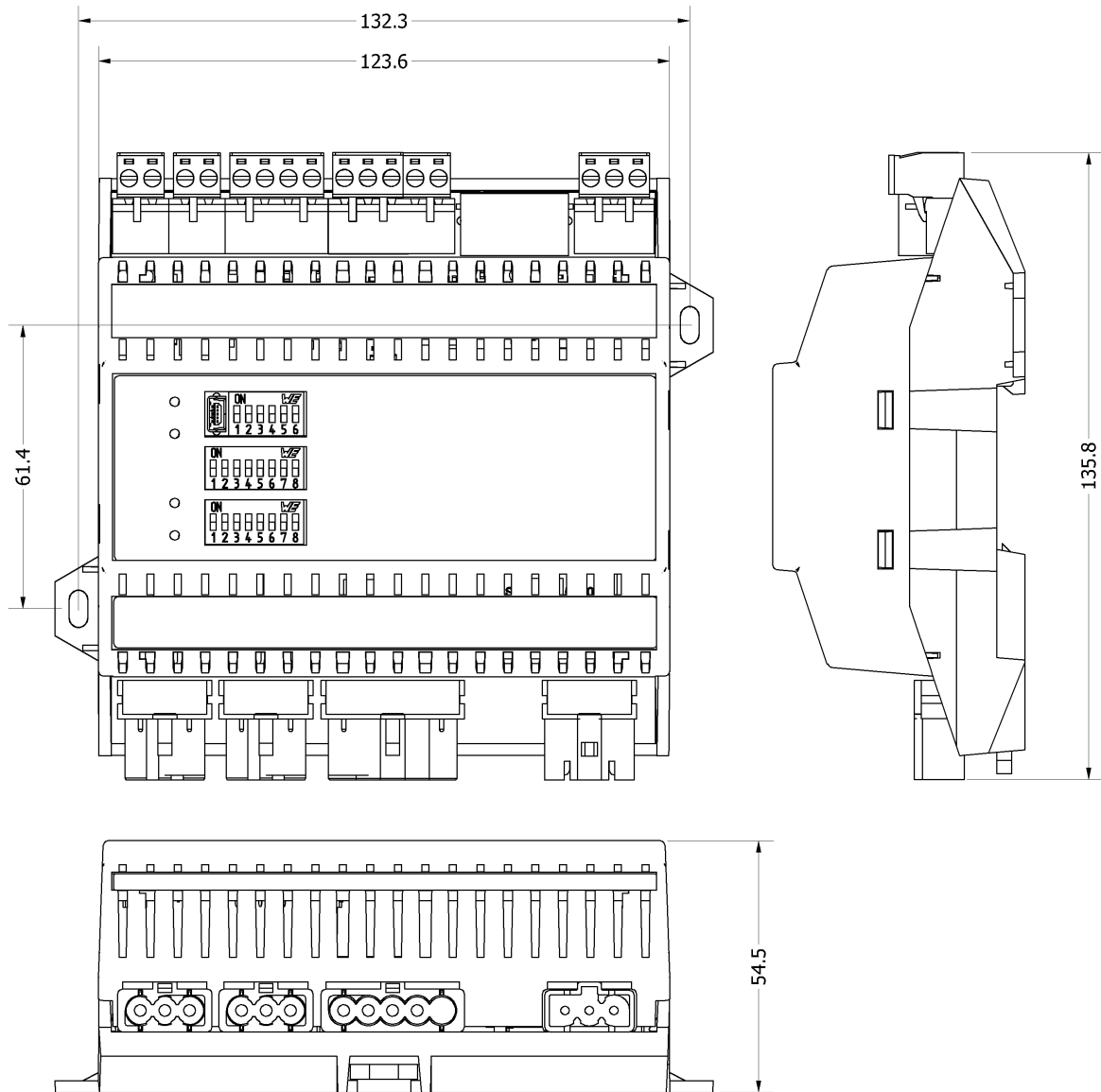


Figure 2. 2D1B-WD dimensions

## 4.2 Power Supply

The device is designed to work with 230 V AC power supply. Appropriate circuit breaker for overcurrent protection is 10 A class B.

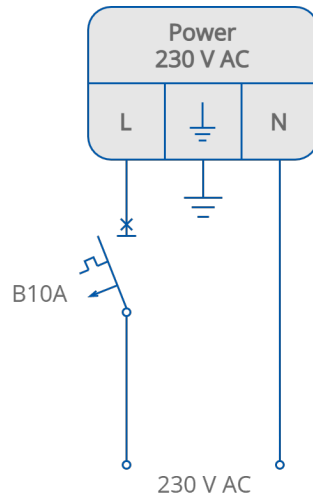


Figure 3. 230 V AC power supply connection

**WARNING!** The maximum current for all the outputs is 8 A!

### 4.2.1 24 V DC Power Supply for External Equipment

The device is equipped with a 24 V DC 80 mA power supply output dedicated to power motion sensors / presence detectors, which require an external power supply.

The 24 V DC power supply terminal connection is labeled +24, G0, and it is placed next to the special input connectors.

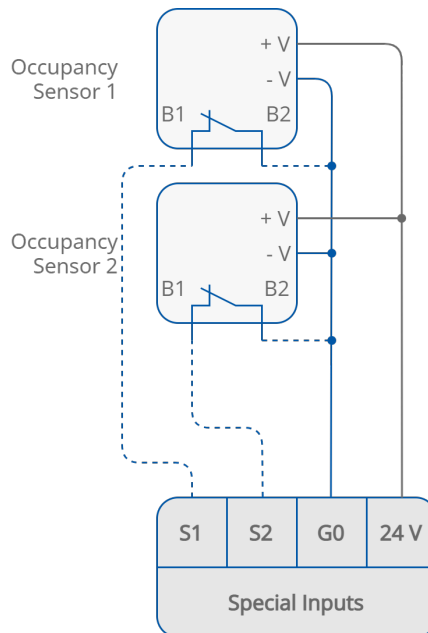


Figure 4. 24 V DC power supply connection

### 4.3 Terminals and Internal Connections

There are 2 types of hardware available:

- iSMA-B-2D1B;
- iSMA-B-2D1B-WD;

The -WD part in the device name indicates that instead of the screw terminals, the Wieland type connectors are used for 230 V AC power supply, light output, and blind output.

### 4.3.1 iSMA-B-2D1B(-WD)

The iSMA-B-2D1B(-WD) is equipped with a 230 V AC power supply and 2x 230 V AC normal closed light outputs for the lamps for power supply if the lighting is controlled with the DALI network, and one double blind output dedicated to blind/shutter control. All these outputs are fuse protected and connected to the controller's main power supply as presented in the figure below.

In addition, the light outputs work as relays in the ON/OFF light control mode.

The controller is equipped with a 24 V DC power supply dedicated for power supply of motion sensors\presence detectors, which need an external power supply.

The input section consists of 2 special inputs dedicated for motion sensors / presence detectors connection and 4 digital inputs for connecting the switches.

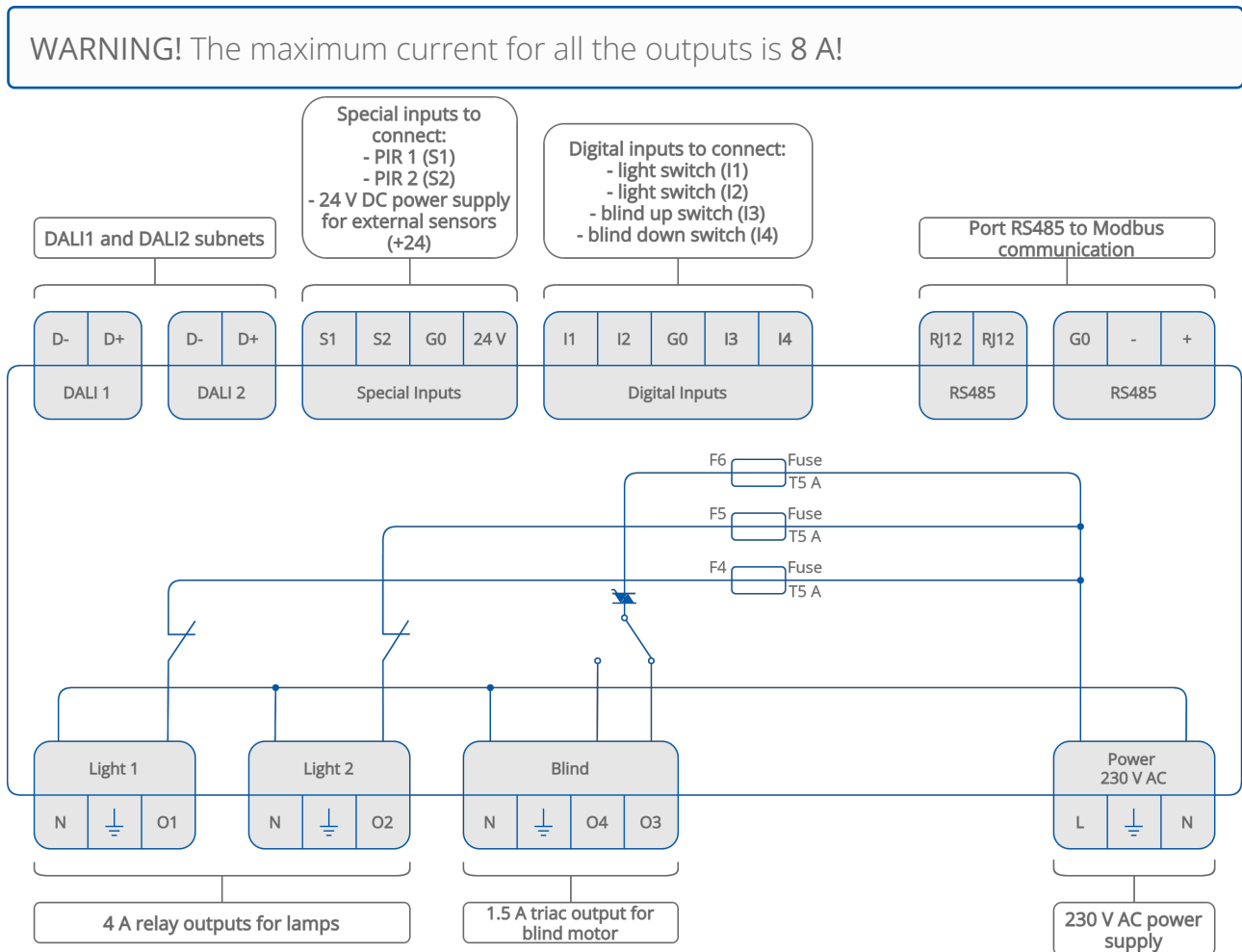


Figure 5. 2D1B(-WD) terminals and internal connections

## 4.4 RS485 Communication

### 4.4.1 Connecting RS485 Communication Bus

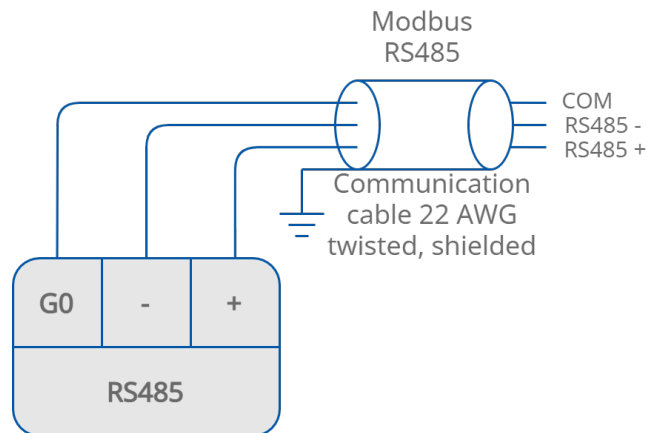


Figure 6. RS485 connection

### 4.4.2 RS485 Grounding and Shielding

In most cases controllers are installed in enclosures along with other devices, which generate electromagnetic radiation (for example, relays, contactors, transformers, motor invertors, etc.). Such electromagnetic radiation can induce electrical noise into both power and signal lines, as well as direct radiation into the controller, causing negative effects on the system. For this reason, an appropriate grounding, shielding, and other protective steps should be taken at the installation stage to prevent negative electromagnetic radiation effects, for example:

- control cabinet grounding;
- cable shield grounding;
- using protective elements for electromagnetic switching devices;
- proper wiring;
- consideration of cable types and their cross sections;
- and other.

### 4.4.3 RS485 Network Termination

Transmission line effects often present problems for data communication networks. These problems include reflections and signal attenuation.

To eliminate the presence of reflections of signal from the end of the cable, the cable must be terminated at both ends with a resistor across the line adequate to its characteristic impedance. Both ends must be terminated since the propagation is bidirectional. In case of an RS485 twisted pair cable this termination is typically 120 Ω.

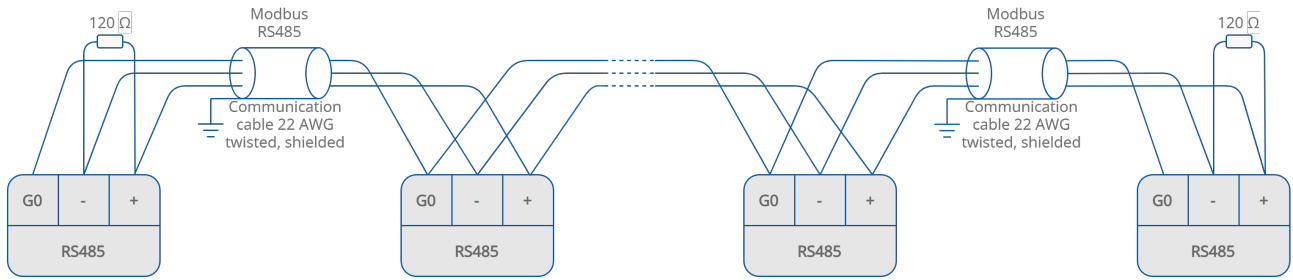


Figure 7. RS485 termination

## 4.5 RJ12

The device is equipped with two parallel sockets with the same pin configuration. These sockets provide communication via the Modbus RTU protocol. The communication pins are internally connected with the main RS485 interface and they have the same functionality. RJ12 sockets are designed for providing an easy connection with devices such as iSMA-B-FCU or iSMA-B-LP.

The RJ12 socket can also transfer power supply through the pins no. 4, 5, and 6, which are internally connected, for example, with the iSMA-B-FCU unit (see the figure below). Before connecting the devices powered from the RJ12 socket, it is necessary to calculate the power load of all the devices.

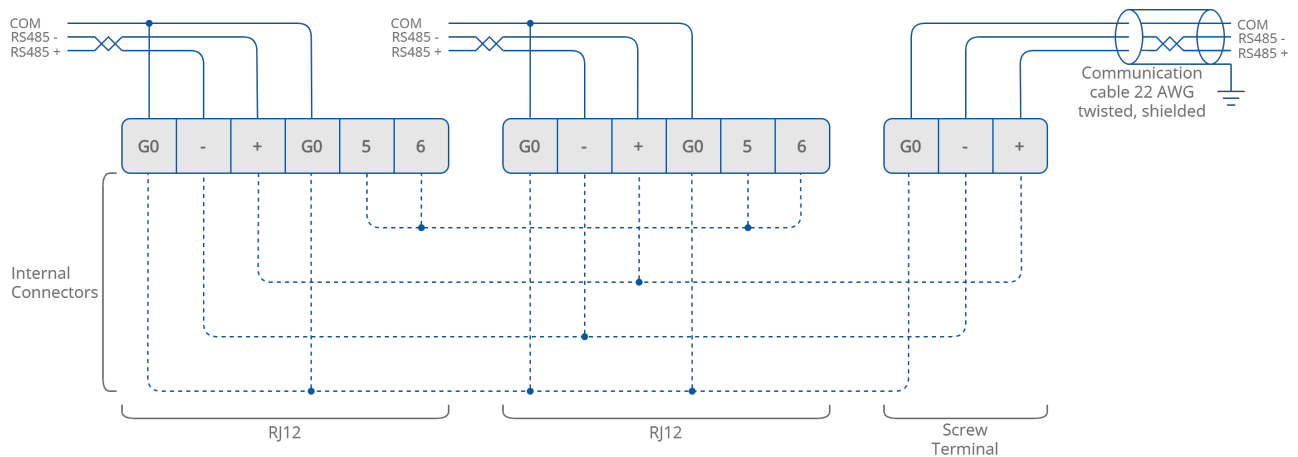


Figure 8. Internal connection between RJ12 sockets and a main RS485 socket

Power supply transferred over RJ12:

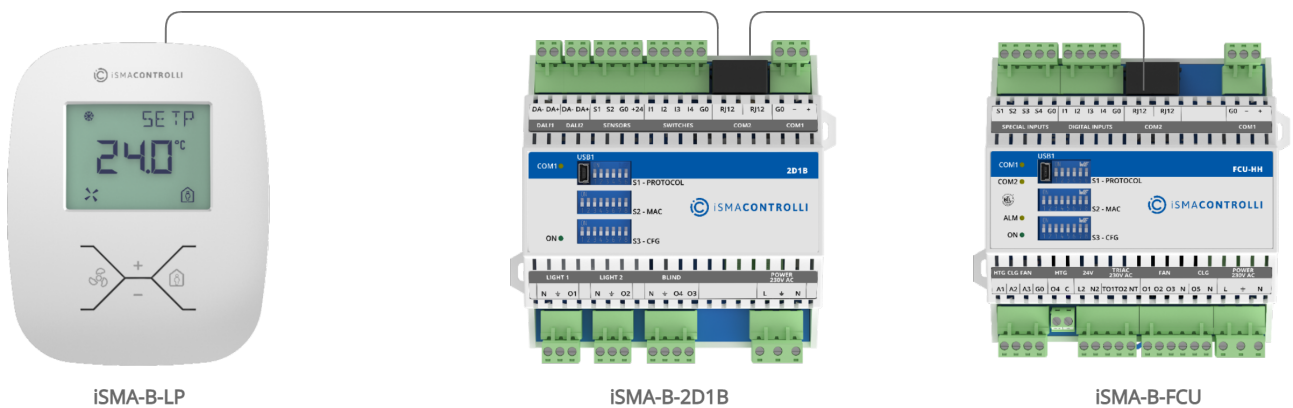


Figure 9. Connecting LP room panel and FCU controller with RJ12 connectors

RJ12 pins are presented in the figure below.

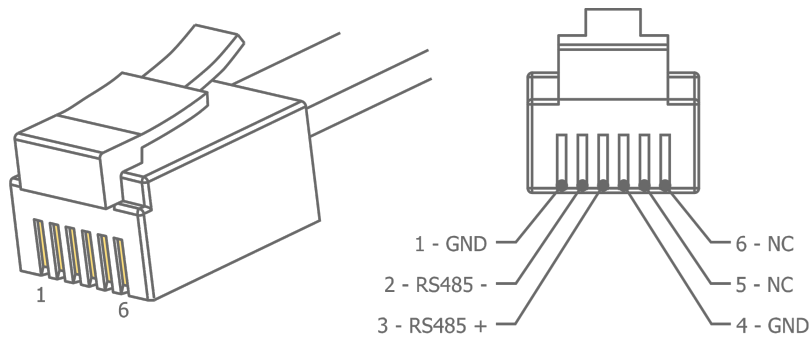


Figure 10. RJ12 pins

If the bus length is up to 100 m, it is recommended to use standard category 3, 4, or 6 wire straight telephone cable without crossing (for example, YTLYP 6x0.12).

For longer bus cables, it is recommended to use twisted shielded Modbus standard cable.

## 4.6 Front Panel and DIP Switches

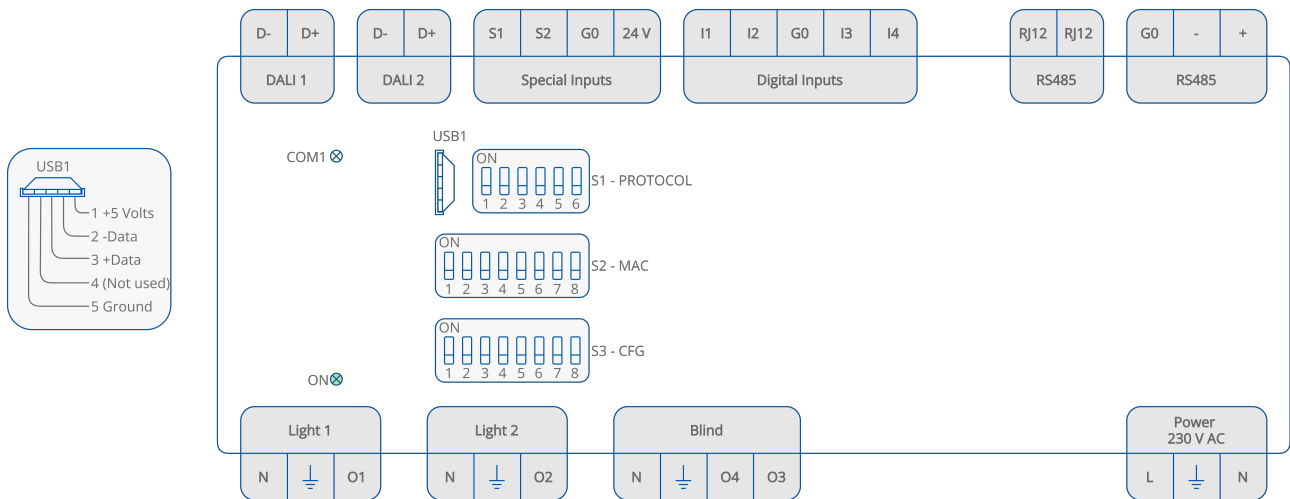


Figure 11. Front panel

### 4.6.1 USB1 Port

The device is equipped with a built-in mini USB port dedicated for managing controller firmware and for diagnostics.

The USB1 port provides also the power supply for device, which might be useful during the process of starting front panel LED functions.

**WARNING!** If the USB1 port is used as the power supply for the device, it is not possible to commission and/or to manage DALI network(s)!

### 4.6.2 LED

The device is equipped with four LEDs for quick status checking and diagnostics:

- The power LED ON lights up (green) and then turns the power supply on.

- The communication LED COM1 lights up (orange) for 20 ms after receiving/sending each package through the main RS485 port. As long as the device receives/sends packages, the communication LED blinks continuously.

### 4.6.3 DIP Switches

The iSMA-B-2D1B device is equipped with 3 DIP switches on its front panel:

- 6-position S1 - PROTOCOL DIP switch;
- 8-position S2 - MAC DIP switch;
- 8-position S3 - CFG DIP switch.

#### PROTOCOL DIP Switch: Baud Rate Selection

Transmission baud rate is determined by the S1 switch (sections 1, 2, and 3) in accordance with the following table:

1	2	3	Baud Rate
OFF (0)	OFF (0)	OFF (0)	Defined by the user
OFF (0)	OFF (0)	ON (1)	76800
OFF (0)	ON (1)	OFF (0)	4800
OFF (0)	ON (1)	ON (1)	9600
ON (1)	OFF (0)	OFF (0)	19200
ON (1)	OFF (0)	ON (1)	38400
ON (1)	ON (1)	OFF (0)	57600
ON (1)	ON (1)	ON (1)	115200

Table 4. Baud rate selection

#### S1 - PROTOCOL DIP Switch: Protocol Selection

Protocol selection is performed with sections 4 and 5 of the S1 switch in accordance with the table below:

4	5	Protocol
OFF (0)	OFF (0)	Modbus RTU
OFF (0)	ON (1)	Modbus ASCII

Table 5. Protocol selection



## MAC DIP Switch: Setting Controller Address

The controller address is setting using the MAC DIP switch. The way of setting the address is presented in the below figure and table. The whole addressing table is presented in the separate chapter MAC DIP SWITCH addressing table.



Figure 12. MAC DIP switch

Switch No.	Position	Function
1	On	Add 1 to Address
	Off	Add 0 to Address
2	On	Add 2 to Address
	Off	Add 0 to Address
3	On	Add 4 to Address
	Off	Add 0 to Address
4	On	Add 8 to Address
	Off	Add 0 to Address
5	On	Add 16 to Address
	Off	Add 0 to Address
6	On	Add 32 to Address
	Off	Add 0 to Address
7	On	Add 64 to Address
	Off	Add 0 to Address
8	On	Add 128 to Address
	Off	Add 0 to Address

Table 6. Setting the address on the MAC DIP switch

**Example:** Setting the device address to 83.

Address 83 contains the following multiplicity of the number 2:

$$83 = 1 + 2 + 16 + 64.$$

The MAC DIP switch settings are presented in the table below.

Address	S1	S2	S3	S4	S5	S6	S7	S8
83	On	On			On		On	

Table 7. Configuration of the MAC DIP switch for a 83 address

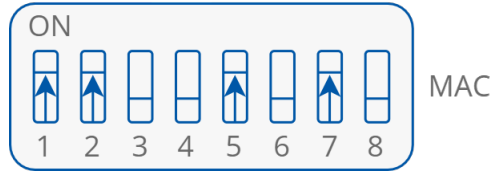


Figure 13. Setting a 83 address on the MAC DIP switch

**WARNING!** Do not set address 255 (all switches in On position). This address setting is reserved for system operation.

### CFG DIP Switch

The device is equipped with an 8-position **CFG** DIP switch on the top panel. Each segment of the CFG determines the operation mode, including the operating of special and digital inputs according to the interactions with the outputs (light or blind output (iSMA-B-2D1B-(WD))).



Figure 14. CFG DIP switch

The relation between particular inputs and outputs with the assigned CFG DIP-Switch configuration is presented in the table below:

DIP Switch No.	Position	Function	Description
1	On	<b>Bistable</b> switches connected to digital inputs I1, I2	Changing between bistable and monostable switches connected to the digital input no. 1 and 2
	Off	<b>Monostable</b> switches connected to Digital Inputs I1, I2	
2	On	Digital input I1 controls DALI1 and DALI2 networks	Changing between the control modes of the digital input no. 1
	Off	Digital input I1 controls only DALI1 network	
3	On	Special input SI1 controls DALI1 and DALI2 networks	Changing between the control modes of the special input no. 1
	Off	Special input SI1 controls only DALI1 network	

DIP Switch No.	Position	Function	Description
4	On	Digital input I2 controls DALI1 and DALI2 networks	Changing between the control modes of the digital input no. 2
	Off	Digital input I2 controls only DALI2 network	
5	On	Special input SI2 controls DALI1 and DALI2 networks	Changing between the control modes of the special input no. 2
	Off	Special input SI2 controls only DALI2 network	
6	On	Light control with <b>light outputs</b>	Changing between light control modes
	Off	Light control with DALI	
7	On	<b>Bistable</b> switches connected to digital inputs I3, I4	Changing between bistable and monostable switches connected to the digital input no. 3 and 4
	Off	<b>Monostable</b> switches connected to digital inputs I3, I4	
8	On	<b>Blind output</b> controls shutters (slats control)	Changing between control object type connected to the blind output
	Off	<b>Blind output</b> controls blinds (without slats control)	

Table 8. CFG DIP switch configuration

## 4.7 Default Settings

If the device is used for the first time or the default settings have just been restored, the following default settings are active:

Communication		
Register	Number	Default Value
BAUD RATE	40017	76800
STOP BITS	40018	1
DATA BITS	40019	8
PARITY BITS	40020	0
REPLY DELAY	40021	0
COUNTERS	30004-30012	0

I/O		
DI BLOCKING	40102	0 (UNBLOCKED)
DI DIMMING OFF	40254-40255 bit 4	0 (ON)
SI PIR TYPE	40103-40104	6 (NC)
SI DELAY OFF TIME	40107-40108	300
SI BLOCKING	40254-40255 bit 3	0 (UNBLOCKED)
DALI1 + DALI2		
ON OFF STATE	40253 (40254 bit 0)	0
COUNTERS	30229-30247	0
DIMMING STATE	40266-40267	0
FADE RATE	40462-40463	7
FADE TIME	40466-40467	0
POWER ON LEVEL	40470-40471	254
SYSTEM FAILURE LEVEL	40474-40475	254
BALLASTS SETPOINT	40270-40301	254
BALLASTS MIN	40334-40365	0
BALLASTS MAX	40398-40429	254
NUMBER OF BALLASTS	30258-30259	0
BLIND		
BLIND UP TIME	40601	0
BLIND DOWN TIME	40617	0
BLIND STATE	40649	0
BLIND OFF DELAY	40665	5
SLATS OPENING TIME	40633	1000
SLATS STATE	40657	0
SLATS NUMBER OF STEPS	40673	10

SLATS BLOCKING LOCAL	40600 bit 0	0 (UNBLOCKED)
----------------------	-------------	---------------

Table 9. Default values

### 4.7.1 Restoring Default Settings

**WARNING!** Be careful with using this function! All registers are set back to their default settings, including I/O, DALI interfaces, blind control, and communication parameters!

To restore the default device settings, please follow the steps below:

1. Turn off the power supply.
2. Set section 6 of the PROTOCOL DIP switch to the ON
3. Turn on the power supply, wait until the power LED is blinking.
4. Switch section 6 of the PROTOCOL DIP switch to the OFF position to restore the default settings. To cancel the reset procedure, turn off the power and switch section 6 of the PROTOCOL DIP switch to the OFF position.

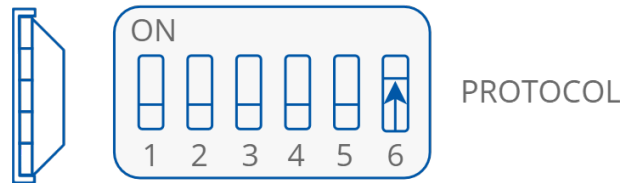


Figure 15. DIP switch configuration for restoring default settings

## 4.8 DALI Interface

DALI is an abbreviation for Digital Addressable Lighting Interface.

In this protocol, DALI devices communicate with each other.

In other words, DALI is the language in which DALI devices talk to each other.

DALI (Digital Addressable Lighting Interface) is a two-way communication system using digital technology to control lighting. An international standard for communication, DALI, defines commands that ballasts need to recognize in order to be considered as DALI ballasts. The system allows individual ballasts to “talk” to the user and allows the user to “talk” back via DALI controllers, computers equipped with appropriate software, or building management systems (BMS).

The device is equipped with two separate DALI interface connectors, DALI1 and DALI2, for connecting DALI ballasts.

It is possible to connect up to 16 ballasts to one single DALI interface, therefore two separated DALI interfaces allow for connecting up to 32 ballasts grouped into two separated DALI loops.

Each DALI interface has an internal power supply with the maximum current load up to 40 mA.

230 V AC power may be supplied to the lights with light outputs. For details, please refer to [Light Outputs section](#).

The device allows for controlling DALI ballasts without any commissioning process. By default, the device uses DALI broadcast command, which allows for controlling the

ballasts connected to a particular interface as a one single DALI group without a discover process. This feature makes the device a unique plug & play type device.

If the user needs to have more detailed information about each ballast or wishes to specify parameters like setpoint, minimum or maximum brightness level, then the discover process is required.

The way of connecting the ballasts to DALI interfaces is presented in the figure below.

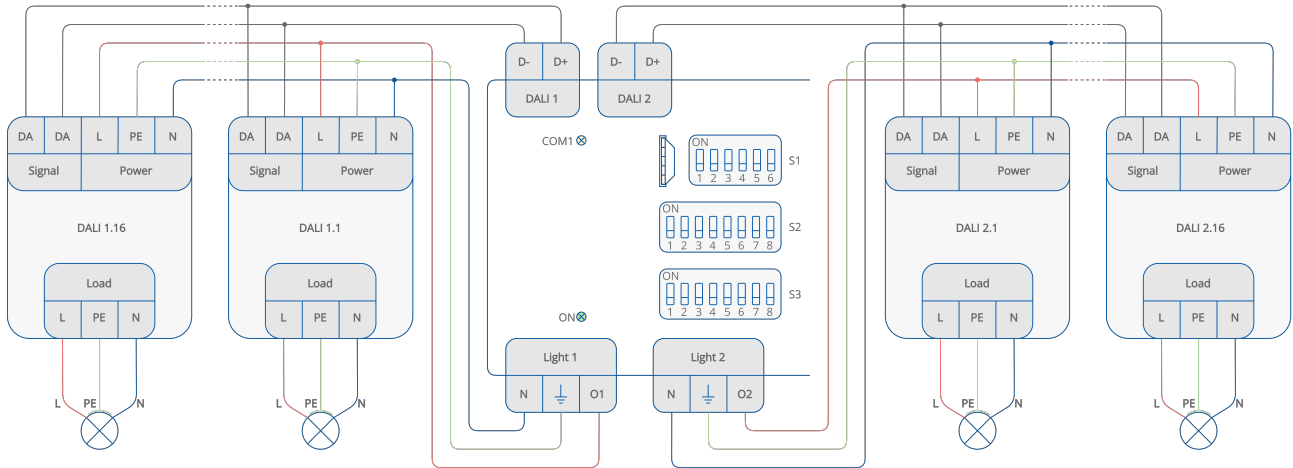


Figure 16. Connection of ballasts and lights to a device

## 5 Inputs and Outputs

The device is equipped with inputs for two different purposes.

The two digital inputs, I1 and I2, are designed for physical ON/OFF switches connection, both monostable or bistable type, in order to control the DALI ballasts connected to DALI1/DALI2 terminals. Depending on a particular CFG DIP switch configuration, I1/I2 can control single DALI network or both DALI1 and DALI2 networks simultaneously. For details, please refer to the table in [CFG DIP Switch](#) section.

The other two digital inputs are designed for blind control (up and down movement). In case of the blind/shutter control, up and down switches can be connected.

The two special inputs, S1 and S2, are designed for connecting motion sensors / presence detectors in order to use them in the light control algorithm.

The device is equipped with three types of outputs: 2 light outputs, 1 blind output, 1 power supply output (24 V DC).

Each of the outputs has a different purpose and a maximum available load.

The light and blind outputs are fuse-protected.

**WARNING!** The maximum current for the light outputs, blind output, and 24 V DC power supply output is **8 A!**

### 5.1 Special Inputs

The device is equipped with 2 special inputs.

The S1 and S2 inputs are designed to control the light by connecting motion sensors or presence detectors. The way of connecting the signals is presented in the figure below.

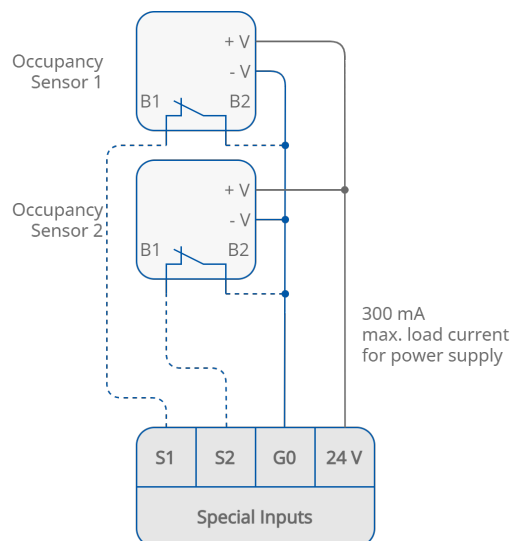


Figure 17. Special inputs connection

### 5.2 Digital Inputs

The device is equipped with 4 digital inputs.

The I1 and I2 inputs are dedicated to control the light by connecting monostable or bistable switches.

The I3 and I4 inputs are used for double-switch connection in order to control blind/shutter (up and down movement).

The way of connecting signals is presented in the figure below.

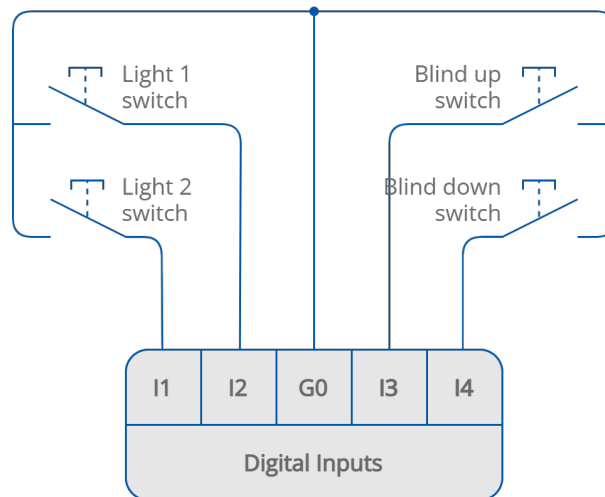


Figure 18. Digital inputs connection

### 5.3 Light Outputs

The device is equipped with two 230 V AC light outputs, LIGHT 1 and LIGHT 2, which can have different functionality depending on the chosen lighting control mode—DALI mode or ON/OFF mode.

To switch between ON/OFF control and DALI mode, please use the CFG DIP switch section no. 6.

The light outputs are implemented in order to provide the opportunity to supply the lamps controlled by the DALI interface with power. It allows to have full control over the lighting within one controller, no need to supply the lamps from the external source.

In addition, the light outputs work as output relays in the ON/OFF lighting control mode.

Both of the outputs are fuse-protected and the maximum load for the single output is 4 A.

**Note:** The maximum load for both of the light outputs is **2x 4 A**, but the maximum load current for the light output 1, light output 2, blind output, and 24 V DC power supply output is **8 A!**

The way of connecting power supply line for the ballasts to the light outputs is presented in the figure below.



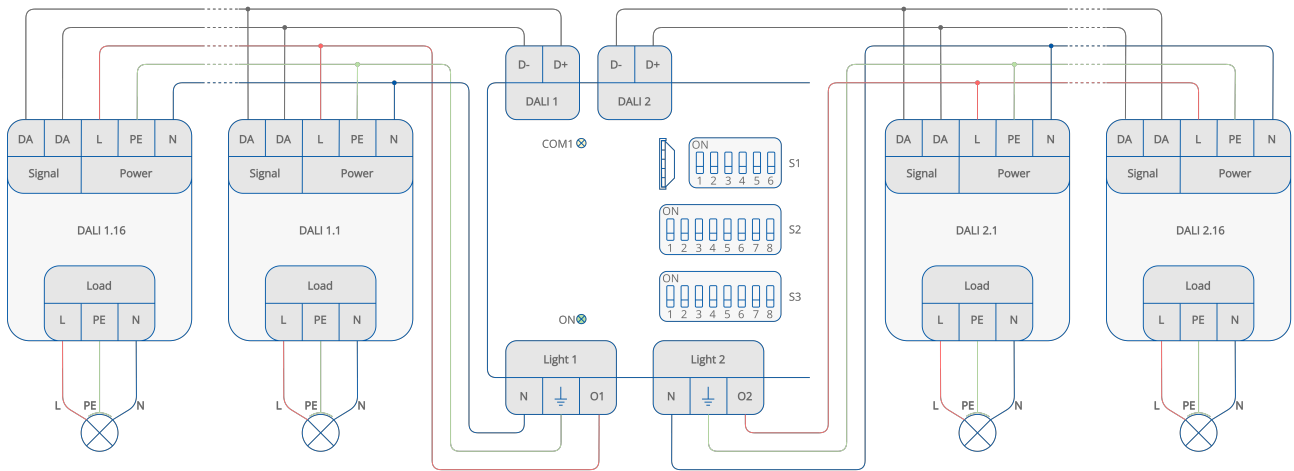


Figure 19. Connection of ballasts and lights to light outputs in the DALI control mode

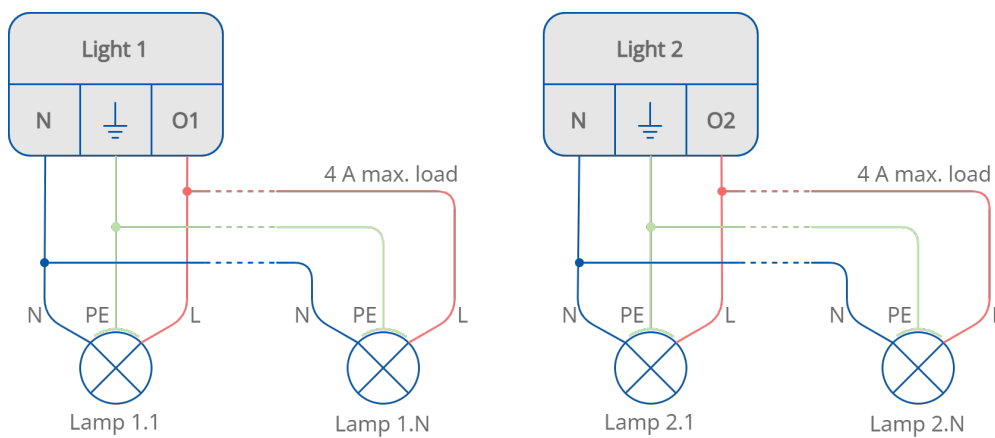


Figure 20. Connection of ballasts and lights to light outputs in the Of/Off control mode

## 5.4 Blind Output

The iSMA-B-2D1B-(WD) device has one double blind output dedicated for a blind/shutter control. The double 230 V AC blind output allows for controlling up and down movement of the blind/shutter.

The maximum load current of the output is 1,5 A.

**WARNING!** The maximum load current for the light outputs, blind output, and 24 V DC power supply output is **8 A!**

The status of a particular relay in the blind output (up and down movement) depends on a built-in control algorithm, which is directly related to the states of digital inputs I3 and I4 (which can be changed by physical switches or by appropriate Modbus register commands). For more information, please refer to the [Blind/Shutter Control](#) section.

The way of connecting a motor to the blind output is presented in the figure below.

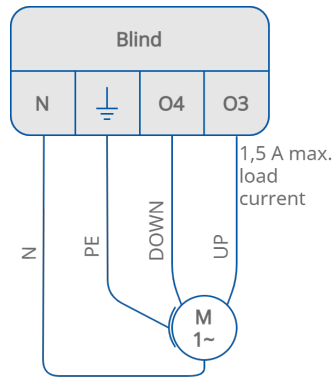


Figure 21. Connection of a motor with a blind output

### 5.5 24 V DC Power Supply Output

The device is equipped with a 24 V DC output for providing power for motion sensors or presence detectors, which demand additional supply. The 24 V DC output is a part of the special inputs block, and it is dedicated specially for providing power for motion sensors / presence detectors connected to special inputs. The maximum load current of all the connected devices must not exceed **300 mA**.

**WARNING!** The maximum load current for the light outputs, blind output, and 24 V DC power supply output is **8 A!**

The 24 V DC power supply output allows for supplying devices with power without the need to use external DC power supply.

The way of connecting an external motion sensor / presence detector to the special input with 24 V DC power supply output is presented in the figure below.

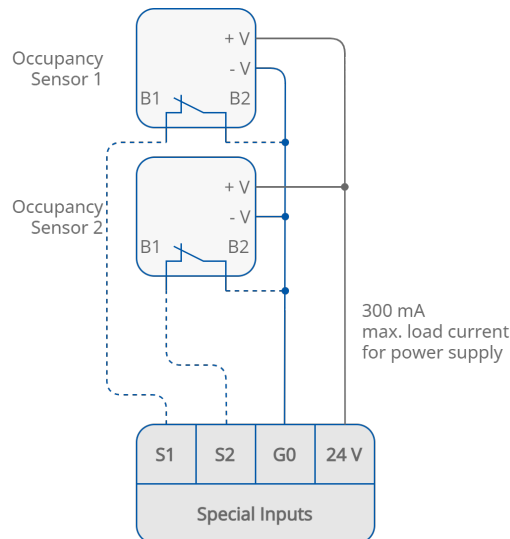


Figure 22. Example of connection occupancy sensors to a 24 V DC power supply output

## 6 Control Application

The iSMA-B-2D1B device has been built in order to control the light and blind/shutter in a single space in the building. The device is designed for controlling two separate DALI light areas with up to 32 DALI ballasts (16 ballasts for each DALI interface). Two built-in special inputs and two digital inputs are designed to connect the presence detectors and light switches. A dedicated DIP switch allows for activating a predefined inputs configuration. The device allows for controlling DALI ballasts by a common light switch and a common presence detector without the need of programming, which makes the device a unique plug & play type device designed for DALI network control.

In addition, the iSMA-B-2D1B-(WD) device has a blind/shutter control function implemented, which allows for controlling a blind/shutter with a common double-switch.

### 6.1 DALI Light Control

The device has two separate DALI interfaces. They can be controlled with dedicated Modbus registers separately or simultaneously, in accordance with the CFG DIP switch setting.

In case of a single DALI network control, DALI1 and DALI2 interfaces are controlled exactly in the same way. This means that DALI1 has exactly the same control algorithm and implemented functions as DALI2.

The DALI interface commands are sent to the connected DALI ballasts if the Modbus registers responsible for particular DALI Interface are changed or by means of physical external devices such as motion sensor / presence detector (connected to special inputs) or switches (connected to digital inputs).

#### 6.1.1 Monostable Switch Control



Figure 23. Monostable switch control configuration

Monostable switches cause a short-time impulse, which closes the loop of the digital input. Depending on the actual state of the DALIX\_ON\_OFF\_STATE, a single impulse on the digital input X sends commands DALIX\_BROADCAST\_LAST\_SCENE or DALIX\_BROADCAST\_OFF to the DALI X interface (where X is a particular number of DALI interface–1 or 2):

- **DALIX\_BROADCAST\_LAST\_SCENE** command is recalled if the DALIX\_ON\_OFF\_STATE is 0 (INACTIVE) and the raising edge of the signal on digital input X is detected.

In such case, the DALIX\_ON\_OFF\_STATE register is set to 1 (ACTIVE).

The falling edge of the signal on digital input X starts counting down the time stored in SIX\_DELAY\_OFF\_TIME register (where X is a particular number of the DALI interface–1 or 2). When the time ends, DALIX\_BROADCAST\_OFF command is sent to DALI Interface X.

Time counting can be interrupted by sending another pulse on the digital input, which results in sending the DALIX\_BROADCAST\_OFF command.

- **DALIX\_BROADCAST\_OFF** command is recalled if the **DALIX\_ON\_OFF\_STATE** is 1 (ACTIVE) and the raising edge of the signal on digital input X is detected.

In such case, the **DALIX\_ON\_OFF\_STATE** register is set to 0 (INACTIVE).

Pushing and holding the switch if the **DALIX\_ON\_OFF\_STATE** is 1 (ACTIVE) results in broadcast dimming the light with the step defined in the **DALIX\_FADE\_RATE** register until the ballasts achieve the minimum level stored in the **DALIX\_BALLAST\_MIN** registers.

Releasing the switch sets a new scene for the ballasts and stops dimming.

Ballasts are set to the required brightness level.

Subsequent pushing and holding the switch dims the ballasts in the opposite direction until they achieve the maximum level stored in **DALIX\_BALLAST\_MAX** registers.

### 6.1.2 Bistable Switch Control



Figure 24. Bistable switch control configuration

Bistable switches have two stable states. Depending on the actual state of the **DALIX\_ON\_OFF\_STATE**, changing the state of the bistable switch connected to the digital input X sends commands **DALIX\_BROADCAST\_LAST\_SCENE** or **DALIX\_BROADCAST\_OFF** to the DALI network X:

- **DALIX\_BROADCAST\_LAST\_SCENE** command is recalled if the **DALIX\_ON\_OFF\_STATE** is 0 (INACTIVE) and the raising edge of the signal on digital input X is detected.

In such case, the **DALIX\_ON\_OFF\_STATE** register is set to 1 (ACTIVE).

- **DALIX\_BROADCAST\_OFF** command is recalled when **DALIX\_ON\_OFF\_STATE** X is 1 (ACTIVE) and the falling edge of the signal on Digital Input X is detected.

In such case, the **DALIX\_ON\_OFF\_STATE** register is set to 0 (INACTIVE).

### 6.1.3 Motion Sensor/Presence Detector Control

To activate a motion sensor/presence detector to the control algorithm, the user needs only to connect the sensor to one of the special inputs, S1 or S2. By default, special inputs work in the normal closed mode (NC). In case there is a need to change the PIR working mode from NC to NO, the value of **SI1\_PIR\_TYPE** register needs to be changed.

- If the motion sensor/presence detector connected to the special input X detects a motion and the **DALIX\_ON\_OFF\_STATE** is 0, the **DALIX\_BROADCAST\_LAST\_SCENE** command is sent to the interface X.

A counter starts counting down the time stored in the **SIX\_DELAY\_OFF\_TIME** register. When the time ends, the **DALIX\_BROADCAST\_OFF** command is sent to the DALI X Interface. Time counting can be interrupted when another motion is detected, restarting the time counter. In practice, it means that time counting begins when the last motion detected by the motion sensor / presence detector disappears.

- If the DALIX\_ON\_OFF\_STATE is activated by the signal from the motion sensor/presence detector, it can be overridden by the signal from switch(es) connected to digital input X (send the DALIX\_BROADCAST\_OFF command).

The motion sensor/presence detector can be activated again by another signal on the digital input X or by resetting the power supply.

It is possible to block the motion sensor/presence detector functioning by changing the state of the SIX\_BLOCKING register bit to active. The function of deactivating the motion sensor/presence detector can be useful if the motion sensor/presence detector cannot have any impact on the lighting, for example, after the normal working hours.

Single motion sensor connected to one of the special inputs can control two interfaces simultaneously. In order to do so, the user needs to apply an appropriate DIP CFG configuration. For more details, please refer to chapter Multi DALI interface control.

### 6.1.4 DALI Interface Multicontrol

The device allows for controlling two DALI interfaces, DALI1 and DALI2, simultaneously.

With appropriate CFG DIP switch configuration, the user can control two interfaces with only one special input and/or digital input in a freely chosen configuration. Both special inputs and digital inputs can control DALI 1 and DALI 2 together as a single group.

The feature of multicontrol allows for extending the number of ballasts belonging to one DALI group. With the multicontrol function, it is possible to control up to 32 DALI ballasts divided only in the physical layer into two groups up to 16 ballasts each.

The control algorithm in case of using switches or motion sensors/presence detectors is similar as in case of single DALI interface control.

- DALIX\_BROADCAST\_OFF is sent only to the interface with the DALIX\_ON\_OFF\_STATE active (the one of the DALIX\_ON\_OFF\_STATE can be set in OFF by switch)
- If the motion sensor/presence detector detects any motion, the DALIX\_BROADCAST\_LAST\_SCENE command is sent only to the DALIX\_ON\_OFF\_STATE, which is inactive and not overridden by switch (one of the DALIX\_ON\_OFF\_STATE can be switched OFF with a switch).

Example:

In a room, there is one motion sensor/presence detector connected to the special input 1, and two switches, one connected to the digital input 1 and the other connected to the digital input 2. The motion sensor/presence detector should control two DALI interfaces in a group, and the switches should control two interfaces separately. The CFG DIP switch configuration should be set as in the figure below:

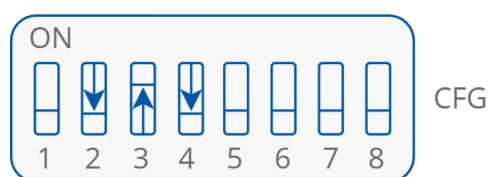


Figure 25. Multi-control configuration

## 6.2 ON/OFF Light Control



Figure 26. On/Off light control configuration

With the CFG DIP switch configuration shown in the figure above, the device does not send any DALI commands. Instead of that, the lighting is controlled by light outputs, LIGHT 1 and LIGHT 2, and the device operates in the ON/OFF light control mode.

In this control mode, it is possible to read or read/write the following Modbus registers, which can be found also in the DALI interface control mode:

- **DALIX\_ON\_OFF\_STATE**, where X is the number of the light output (40254 bit 0, 40255 bit 0);
- **DALIX\_BROADCAST\_LAST\_SCENE**, where X is the number of the light output (40254 bit 1, 40255 bit 1);
- **DALIX\_BROADCAST\_OFF**, where X is the number of the light output (40254 bit 2, 40255 bit 2).

The particular states of the light outputs are determined by means of physical motion sensor / presence detector (connected to special inputs) or switches (connected to digital inputs) in the same way as it is in case of the DALI interface control, but instead of sending DALI commands the device changes the state of the light outputs 1 and 2.

### 6.2.1 Monostable Switch Control

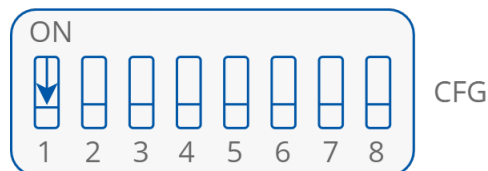


Figure 27. Monostable switch control configuration

Monostable switches cause a short-time pulse, which closes the loop of the digital input. Depending on the actual state of the light output X, a single pulse on the digital input X opens or closes the circuit in the light output X:

- **Circuit close (ON)** is recalled if the light output X is open (OFF) and the raising edge of the signal on digital input X is detected.

In such case, the DALIX\_ON\_OFF\_STATE register is set to 1 (ACTIVE).

- **Circuit open (OFF)** is recalled if the light output X is closed (ON) and the raising edge of the signal on digital input X is detected.

In such case, the DALIX\_ON\_OFF\_STATE register is set to 0 (INACTIVE).

Dimming/lighting up the ballasts in the ON/OFF light control mode is unavailable.

## 6.2.2 Bistable Switch Control

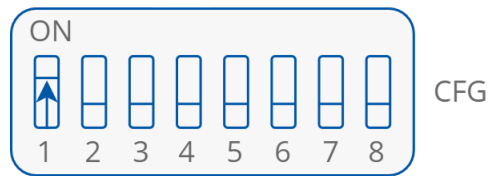


Figure 28. Bistable switch control configuration

Bistable switches have two stable states. Depending on the actual state of the DALI Group Status X, changing using bistable switch state connected to the digital input X opens or closes the relay circuit in the light output X:

- **Circuit close (ON)** is recalled if the relay circuit is open (OFF) and the raising edge of the signal on the digital input X is detected.

In such case, the DALI X Group Status register is set to 1 (ACTIVE).

- **Circuit open (OFF)** is recalled if the relay circuit is closed (ON) and the raising edge of the signal on the digital input X is detected.

In such case, the DALI X Group Status register is set to 0 (INACTIVE).

## 6.2.3 Motion Sensor/Presence Detector Control

To activate a motion sensor/presence detector to the control algorithm the user needs only to connect the sensor to the one of the special input S1 or S2. By default, the special inputs work in normal closed mode (NC). In case there is a need to change the PIR working mode from NC to NO, the value of the SI1\_PIR\_TYPE register needs to be changed.

- If the motion sensor/presence detector connected to the special input X detects a motion, and the DALI Group Status X is 0, the relay circuit of the light output X closes (ON).

The counter starts counting down the time stored in the SIX\_DELAY\_OFF\_TIME register. If the time elapses, then the circuit of the light output X opens. Time counting can be interrupted by the detection of another motion, which results in restarting the time counter. In practice, it means that the time counting begins when the last motion detected by the motion sensor/presence detector disappears.

- In case if the DALI X Group Status is activated by the signal from the motion sensor/presence detector, it can be overridden by the signal from switch(es) connected to the digital input X.

The motion sensor/presence detector functioning can be activated again by another signal on the digital input X or by power supply reset.

It is possible to block the motion sensor/presence detector functioning by changing the state of the SIX\_BLOCKING register bit to active. The function of deactivating a motion sensor / presence detector can be useful if the motion sensor\presence detector cannot have any impact on the lighting, for example, after normal working hours.

Single motion sensor connected to one of the special inputs can control two light outputs simultaneously. In order to do so, the user needs to apply an appropriate CFG DIP configuration. For more details, please refer to chapter Multi Light Output Control.

## 6.2.4 Light Output Multicontrol

The device allows to control two light outputs, LIGHT 1 and LIGHT 2, simultaneously.

With a proper [DIP switch CFG configuration](#), the user can control two outputs by only one special input and/or digital input in a freely chosen configuration. Both special inputs and digital inputs can control LIGHT 1 and LIGHT 2 together as a single group.

Control algorithm in case of using switches or motion sensors/presence detectors is similar as it is by using a single light output in the [ON/OFF Light Control Mode](#).

- The device closes the circuit only in the light output with the DALIX\_ON\_OFF\_STATE active (where X is a number of the output; one of the light output circuit can be already closed by switch).
- If the motion sensor/presence detector detects any motion, the device opens the circuit only in the light output with the DALIX\_ON\_OFF\_STATE inactive and not overridden by the switch (where X is a number of the output, one of the light output circuits can be already closed or open by switch).

Example:

In the room there is one motion sensor/presence detector connected to the special input 1 and two switches, one connected to the digital input 1 and the other to the digital input 2. The motion sensor/presence detector should control two light outputs, LIGHT 1 and LIGHT 2, in a group and the switches should control each output separately. The CFG DIP switch configuration should be set as it is in the figure below:



Figure 29. Motion sensor configuration

## 6.3 Blind/Shutter Control

The iSMA-B-2D1B device is equipped one output for controlling blind/shutter with bistable or monostable switch(es) or/and appropriate Modbus registers values.

### 6.3.1 Monostable Switch Control

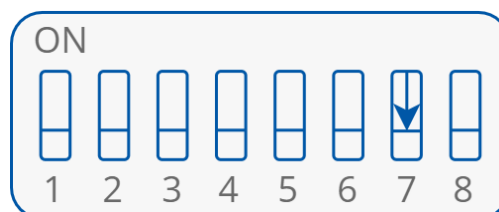


Figure 30. Monostable switch control configuration

Monostable switches create a pulse and close the loop of the digital inputs. Monostable switches connected to the particular digital inputs, I3 and I4, send the following commands to the blind/shutter motor through the dedicated digital output(s), O3 and O4:

- Monostable switch connected to the digital input, I3:



- A single short pushing the switch (< 350 ms) results in moving the slats with the value calculated with the SLATS\_OPENING\_TIME and SLATS\_NUMBER\_OF\_STEPS registers.

The I3 digital input has a direct connection to the O3 digital output, which is dedicated to connecting the motor that opens the shutter.

Example:

The default value of the SLATS\_NUMBER\_OF\_STEPS register is 10. It means that the slats move from 0% to 100% in 10 steps. In such case, each step corresponds to 10% of full range of the possible movement of the slats—the single short click of the monostable switch, by default, moves the slats by 10% of the full moving range.

The time needed for the shutter motor to move the slats from 0% to 100% is determined in the SLATS\_OPENING\_TIME register, and it can be changed by overwriting the register manually or automatically by slats calibration procedure. By default, the time of opening the slats is 1 second.

If the slats reach the full moving range position, a single push of the monostable switch opens the shutter (provided that the shutter is not fully open).

- If the monostable switch is pushed longer than 350 ms (but < 2 s), it opens the shutter to the maximum open position (BLIND\_STATE register = 100%). The I3 has a direct impact on the O3, dedicated for connecting the motor which opens the shutters.

The time needed for the shutter motor to move from 0% to 100 % is set in the BLIND\_UP\_TIME register, and it can be changed by overwriting the register manually or automatically with the shutter calibration procedure.

In addition to the BLIND\_UP\_TIME, the shutter is pulled up with the value stored in BLIND\_OFF\_DELAY register (by default, 5% of the BLIND\_UP\_TIME). If the BLIND\_UP\_TIME ends, the shutter motor runs longer by the time value calculated by the BLIND\_OFF\_DELAY in order to ensure that the shutter is fully open. The function was implemented because the shutter control is based on the time, but not on the position sensor.

A short single push of any switch (raising edge of the signal, connected to I3 or I4) stops the shutter and sets the slats in the position set in the SLATS\_STATE register.

- The monostable switch pushed longer than 2 seconds opens the shutter. Releasing the switch stops the movement of the shutter and sets the slats in the position set in the SLATS\_STATE register. The I3 digital input has a direct impact on the O3 digital output connecting the motor, which opens the shutter.

The blind position is calculated proportionally to the time of pushing the monostable switch and BLIND\_UP\_TIME register value.

Example:

The switch is pushed for 5 seconds. The BLIND\_UP\_TIME value is 20 seconds.

In such case, the position of the blind is 15% open because the shutter starts opening after 2 seconds of pushing the monostable switch, therefore, the shutter moves 3 seconds. If the full opening time is 20 seconds, the shutter position is  $3/20 = 15\%$  open.

- Monostable switch connected to Digital Input No. 4

- A single short push of the switch (< 350 ms) results in moving the slats with the value calculated by using the SLATS\_OPENING\_TIME and SLATS\_NUMBER\_OF\_STEPS registers. The I4 digital input has a direct impact on the O4 digital output which connects the motor in such a way that it closes the shutter.

Example:

The default value of the SLATS\_NUMBER\_OF\_STEPS register is 10. It means that the slats move from 100% to 0% in 10 steps. In such case, each step corresponds to 10% of full range of the possible movement of the slats—the single short click of monostable switch, by default, closes the slats in 10% of the full moving range.

The time necessary for the shutter motor to move the slats from 100% to 0% is set in the SLATS\_OPENING\_TIME register, and it can be changed by overwriting the register manually or automatically with the slats calibration procedure. By default, the time of closing the slats is 1 second.

If the slats reach the full moving range position, a single push of the monostable switch effects in closing the shutter (provided that the shutter is not fully closed).

- If the monostable switch is pushed for longer than 350 ms (but < 2 s), it sets the shutter in the fully closed position (BLIND\_STATUS register = 0 %). The I4 digital input has a direct impact on the O4 digital output, which connects the motor closing the shutter.

The time needed for the shutter motor to move from 100% to 0% is set in BLIND\_DOWN\_TIME register, and it can be changed by overwriting the register manually or automatically with the shutter calibration procedure.

In addition to the BLIND\_DOWN\_TIME, the shutter is pulled up with the value set in BLIND\_OFF\_DELAY register (by default, 5% of the BLIND\_DOWN\_TIME). If the BLIND\_DOWN\_TIME ends, the shutter motor runs longer by the time value calculated by the BLIND\_OFF\_DELAY in order to ensure that the shutter is fully closed. The function was implemented because the shutter control is based on the time, but not on the position sensor.

A single short push of any of the switches (raising edge of the signal, connected to I3 or I4) results in stopping the shutter and setting the slats in the position set in the SLATS\_STATE register.

- The monostable switch pushed for longer than 2 seconds closes the shutter. Releasing the switch stops the shutter and sets the slats in the position set in the SLATS\_STATE register. The I4 digital input has a direct impact on the O4 digital output, which connects the motor closing the shutter.

The position of the blind is calculated proportionally to the time of pushing the monostable switch and the BLIND\_DOWN\_TIME register value.

Example:

The switch is pushed for 5 seconds. The BLIND\_DOWN\_TIME value is 19 seconds.

The shutter starts opening after 2 seconds of pushing the monostable switch, therefore, the shutter is moving for 3 seconds. In such case, provided that the full closing time is 20 seconds, the shutter position is  $3/19 = 16\%$  closed.

### 6.3.2 Bistable Switch Control

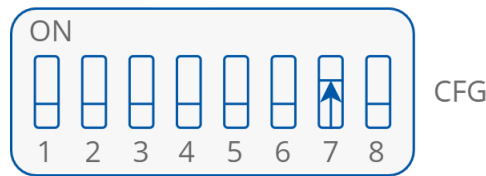


Figure 31. Bistable switch control configuration

Bistable switches have two stable states. Bistable switches connected to digital inputs I3 and I4 send the following commands to the blind/shutter through the dedicated digital outputs, O3 and O4:

- **BLIND UP:** closed circuit on the I3 closes the circuit on the O3. The blind motor should be connected to the O3 in such a manner that the motor opens the controlled blind.

The open circuit on the I3 opens the circuit on the O3. In such case there is no movement of the blind motor. If the bistable switch changes its state during the movement of the blind motor, the controlled blind stops.

- **BLIND DOWN:** closed circuit on the I4 closes the circuit on the O4. The blind motor should be connected to the O4 in such a manner that the motor closes the controlled blind.

The open circuit on the I4 opens the circuit on the O4. In such case there is no movement of the blind motor. If the bistable switch changes its state during the movement of the blind motor, the controlled blind stops.

**WARNING!** It is highly recommended to use the changeover bistable switches. It prevents the user from closing both digital outputs circuits at the same time and protects the motor from damage.

**Note:** Please note that in addition to common single bistable switches, there are 3-states bistable switches available on the market, which can be a good replacement for single bistable switches.

### 6.3.3 Blinds Calibration Procedure

The calibration process is necessary always if the blind/shutter is used for the first time or if there is a need of recalibration or the command restoring the default settings is invoked. The process records the time values in the BLIND\_UP\_TIME and BLIND\_DOWN\_TIME registers (by default, values in the registers is 0).

The difference between the BLIND\_UP\_TIME\BLIND\_DOWN\_TIME values from the first calibration and recalibration process cannot be greater than 20%.

The calibration can be done by using monostable switches or three-state bistable switches.

1. To begin the calibration process the blind/shutter should be in the closed position.
2. From the closed position, the blind/shutter needs to be raised to the desired maximum open position.
3. The blind/shutter needs to be lowered back to the closed position.
4. Points no. 2 and 3 need to be repeated.

Conditions which have to be fulfilled for the calibration to succeed:

1. Difference between the two opening time values cannot be higher than 20%.
2. Difference between the two closing time values cannot be higher than 20%. **Example:** The first opening time is 20 seconds. The second one has to be no more than 24 seconds and not less than 16 seconds.
3. Each opening/closing movement has to be initiated within 3 seconds after stopping the previous one.

If the the above conditions are met, the opening time values and the closing time values are averaged and written to the BLIND\_UP\_TIME and BLIND\_DOWN\_TIME registers. This is indicated by a quick up and down movement of the slats in case of the shutter control or quick up and down movement of the blind.

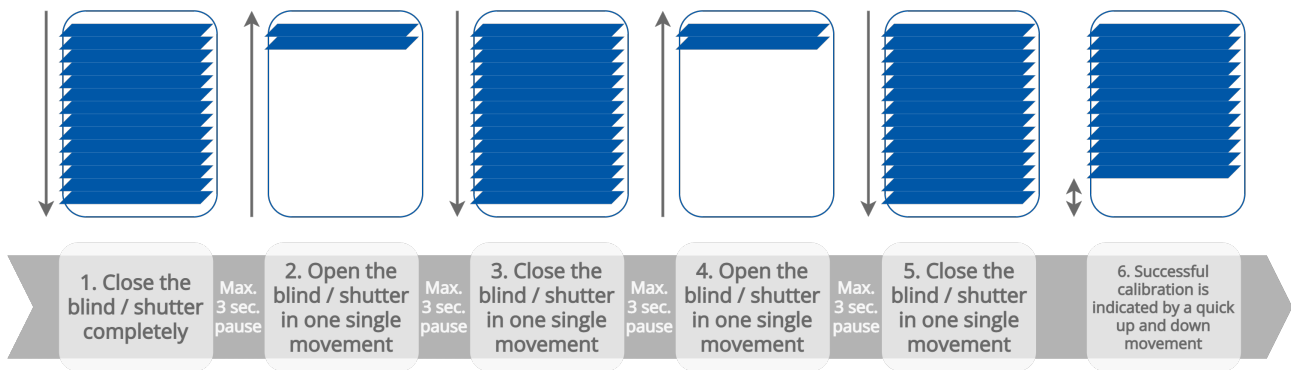


Figure 32. Blind shutter calibration procedure

### 6.3.4 Slats Calibration Procedure

The calibration process is necessary in case when the time of slats opening is different than the default value stored in SLATS\_OPENING\_TIME register (1 second).

Calibration can be performed with monostable switches.

1. To begin the calibration process, the slats should be completely rotated down as presented on the figure (position 1).
2. From this position, the slats need to be completely rotated up (position 2 on the figure) by pressing the up switch shortly. Each press of the switch rotates the slats by a step proportional to the value stored in SLATS\_OPENING\_TIME.
3. The slats need to be rotated down back to position 1.
4. Points no. 2 and 3 need to be repeated.

Conditions necessary for the calibration to succeed:

1. Number of up/down steps to rotate the slats completely must be equal.
2. Number of up/down steps to rotate the slats completely must be greater than 5 and lower than 15.
3. Each opening/closing movement has to be initiated within 3 seconds after stopping the previous one.
4. Each rotation movement has to be initiated within 3 seconds after stopping the previous one.
5. The SLATS\_NUMBER\_OF\_STEPS register needs to be set at the default value of 10 steps.

If the above conditions are met, the new opening time value is calculated by multiplying the old SLATS\_OPENING\_TIME by the number of opening/ closing steps used in calibration and then dividing it by 10.

**Example:** SLATS\_OPENING\_TIME value is 1000 ms. Twelve steps are needed to completely rotate the slats in the calibration process. The new value stored in the register is:  $(1000 \text{ ms} * 12) / 10$ , which equals 1200 ms.

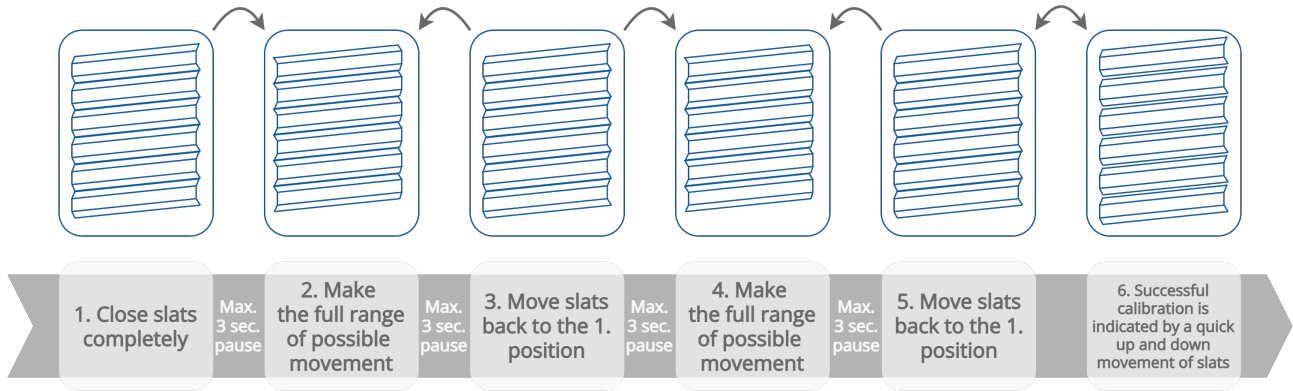


Figure 33. Slats calibration procedure

## 7 Modbus Registers

This section outlines all Modbus registers available for the iSMA-B-2D1B device.

### 7.1 Configuration Registers

**WARNING!** Changing the parameters concerning the transmission configuration (except for registers which value is read from the switch) only takes effect after restarting the unit.

#### 7.1.1 VERSION\_TYPE (30001)

In this register the type and firmware version of the module are encoded.

Low byte contains information about the type of module. High byte contains the module firmware version multiplied by 10.

Value	Type
114 <sub>10</sub> (0x72 <sub>16</sub> )	2D1B-(WD)
115 <sub>10</sub> (0x73 <sub>16</sub> )	2D-(WD)

Table 10. Version Type register

Example:

In the 30001 register, there is a following number: 29194<sub>10</sub> = 0x720A<sub>16</sub>. It means that it is a iSMA-B-2D1B (0x72) with firmware in version 1.0 (0x0A<sub>16</sub> = 10<sub>10</sub>).

#### VERSION\_TYPE: Device Actions (40001)

Setting the 40001 register according to the table below enables 1 of 4 available actions: reset module, reload settings, set to default, and enter bootloader.

Value	Action
511	Reset
767	Reload settings
1023	Set to default
1279	Enter Bootloader

Table 11. Device actions

#### 7.1.2 ADDR\_DIPSWITCH (30002)

The register contains the number which represents the controller address set by the MAC DIP switch.

### 7.1.3 DIPSWITCH\_CFG\_REGISTER (30003)

The register contains an integer value representing actual configuration of the CFG DIP switch.

### 7.1.4 RECEIVED\_FRAMES\_COUNTER (30004)

The 32-bit register with the number of valid Modbus received messages by the device from last powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

### 7.1.5 ERROR\_FRAMES\_COUNTER (30006)

The 32-bit register with the number of Modbus errors sent by the device recently powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

### 7.1.6 TRANSMITTED\_FRAME\_COUNTER (30008)

The 32-bit register with the number of Modbus messages sent by the device recently powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

### 7.1.7 UP\_TIME (30012)

The 16-bit register contains information about device working time, in seconds, from the last power up or reset.

### 7.1.8 BAUD\_RATE (40017)

If sections 1, 2, and 3 of S3 switch are in off position, the baud rate is determined in accordance with this register. Baud rate is determined by the following formula:

$$\text{Baud rate} = \text{register value} \cdot 10$$

The default value of the register is 7680 (76800 bps).

### 7.1.9 STOP\_BITS (30018)

The number of stop bits is constant and equals 1.

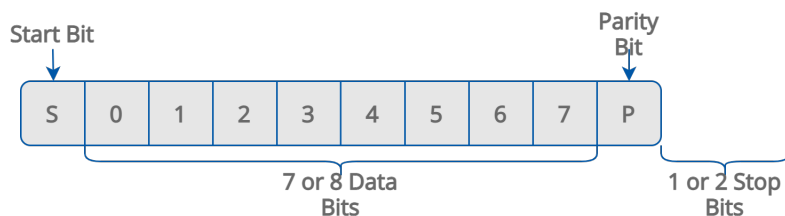


Figure 34. Modbus frame

### DATA\_BITS (30019)

The number of the data bits is constant and equals 8.

### 7.1.10 PARITY\_BITS (30020)

The type of parity bit is constant and it is 0. It means that there is no parity bit in the Modbus message frame.

### 7.1.11 REPLY\_DELAY (40021)

The value of this 16-bits register determines the number of milliseconds to wait before the unit answers the question. This time is used to extend the interval between question and answer. The default value of 0 means no delay (the answer is sent when the 3.5 character is required by the Modbus RTU protocol).

### 7.1.12 DIPSWITCH\_CFG\_REGISTER (30156)

The register contains an integer value representing actual configuration of the CFG DIP switch.

#### DI1\_DI2\_SWITCH\_TYPE (30156) Bit 0

The bit state shows the actual physical state of the segment 1 in the CFG DIP switch.

If the bit is active (bit 0=1), the digital inputs 1 and 2 are dedicated to work with bistable switches.

If the bit is inactive (bit 0=0), the digital inputs 1 and 2 are dedicated to work with monostable switches.

#### DI1\_CONTROL\_MODE (30156) Bit 1

The bit state shows the actual physical state of the segment 2 in the CFG DIP switch.

If the bit is active (bit 1=1), the digital input 1 controls DALI1 and DALI2 interfaces (light output 1 and light output 2).

If the bit is inactive (bit 1=0), the digital input 1 controls the DALI1 Interface (light output 1).

#### SI1\_CONTROL\_MODE (30156) Bit 2

The bit state shows the actual physical state of the segment 3 in the DIP switch CFG.

If the bit is active (bit 2=1), the special input 1 controls DALI1 and DALI2 interfaces (light output 1 and light output 2).

If the bit is inactive (bit 2=0), the special input 1 controls the DALI1 interface (light output 1).

#### DI2\_CONTROL\_MODE (30156) Bit 3

The bit state shows the actual physical state of the segment 4 in the CFG DIP switch.

If the bit is active (bit 3=1), the digital input 2 controls DALI1 and DALI2 interfaces (light output 1 and light output 2).

If the bit is inactive (bit 3=0), the digital input 2 controls the DALI2 interface (light output 2).



**SI2\_CONTROL\_MODE (30156) Bit 4**

The bit state shows the actual physical state of the segment 5 in the CFG DIP switch.

If the bit is active (bit 4=1), the special input 2 controls DALI1 and DALI2 interfaces (light output 1 and light output 2)

If the bit is inactive (bit 4=0), the special input 2 controls the DALI2 interface (light output 2).

**LIGHT\_CONTROL\_MODE (30156) Bit 5**

The bit state shows the actual physical state of the segment 6 in the CFG DIP switch.

If the bit is active (bit 5=1), the ON/OFF light control mode is active.

If the bit is inactive (bit 5=0), the DALI interface control mode is active (single or multi).

**DI3\_DI4\_SWITCH\_TYPE (30156) Bit 6**

The bit state shows the actual physical state of the segment 7 in the CFG DIP switch.

If the bit is active (bit 6=1), digital inputs 3 and 4 are dedicated to work with bistable switches.

If the bit is inactive (bit 6=0), digital inputs 3 and 4 are dedicated to work with monostable switches.

**BLIND\_CONTROL\_MODE (30156) Bit 7**

The bit state shows the actual physical state of the segment 8 in the CFG DIP switch.

If the bit is active (bit 7=1), the blind output is dedicated to control the blinds (without slats control).

If the bit is inactive (bit 7=0), the blind output is dedicated to control the shutters (slats control).

**7.2 I/O Registers****7.2.1 DIGITAL\_OUTPUTS\_STATUS\_REGISTER (30042)**

The register contains an integer value representing the states of digital outputs (O1-O2).

**LIGHT1\_STATUS\_O1 (30042) Bit 0**

The bit state shows the actual state of the light output 1.

If the bit is active (bit 0=1), the circuit of the light output 1 relay is closed. If the bit is inactive (bit 0=0), the circuit of the light output 1 relay is open.

**LIGHT2\_STATUS\_O2 (30042) Bit 1**

The bit state shows the actual state of the light output 2.

If the bit is active (bit 1=1), the circuit of the light output 2 relay is closed. If the bit is inactive (bit 1=0), the circuit of the light output 2 relay is open.

**BLIND\_UP\_STATUS\_O3 (30042) Bit 2**

The bit state shows the actual state of the blind output, O3.

If the bit is active (bit 1=1), the circuit of the blind output O3 relay is closed. If the bit is inactive (bit 1=0), the circuit of the blind output O3 relay is open.

**BLIND\_DOWN\_STATUS\_O4 (30042) Bit 3**

The bit state shows the actual state of the blind output O4.

If the bit is active (bit 1=1), the circuit of the blind output O4 relay is closed. If the bit is inactive (bit 1 =0), the circuit of the blind output O4 relay is open.

**7.2.2 DIGITAL\_INPUTS\_STATUS\_REGISTER (30041)**

The register contains an integer value representing the states of all digital inputs (I1-I4).

**DI1\_STATUS (30041) Bit 0**

The bit state shows the actual state of the digital input 1.

If the bit is active (bit 0 =1), the digital input 1 is active (closed circuit). If the bit is inactive (bit 0=0), the digital input 1 is inactive (open circuit).

**DI2\_STATUS (30041) Bit 1**

The bit state shows the actual state of the digital input 2.

If the bit is active (bit 1=1), the digital input 2 is active (closed circuit). If the bit is inactive (bit 1=0), the digital input 2 is inactive (open circuit).

**DI3\_STATUS (30041) Bit 2**

The bit state shows the actual state of the digital input 3.

If the bit is active (bit 2=1), the digital input 3 is active (closed circuit). If the bit is inactive (bit 2=0), the digital input 3 is inactive (open circuit).

**DI4\_STATUS (30041) Bit 3**

The bit state shows the actual state of the digital input 4.

If the bit is active (bit 3=1), the digital input 4 is active (closed circuit). If the bit is inactive (bit 3=0), the digital input 4 is inactive (open circuit).

**7.2.3 DIGITAL\_INPUTS\_COMMAND\_REGISTER (40101)**

The register contains an integer value representing command states of all digital inputs (I1-I4). The Digital Input Command simulates physical signal on the digital input (closed or open loop). The feature can be useful for the signal test, emergency use in case of a switch failure, or for remote control from BMS.

### **DI1\_COMMAND (40101) Bit 0**

The bit overrides the signal from the digital input 1. The command simulates the physical signal on I1 from BMS.

If the bit is active (bit 0=1), the digital Input 1 is overridden and considered active (closed circuit). If the bit is inactive (bit 0=0), the digital input 1 is overridden and considered inactive (open circuit).

### **DI2\_COMMAND (40101) Bit 1**

The bit overrides the signal from the digital input 2. The command simulates the physical signal on I2 from BMS.

If the bit is active (bit 1=1), the digital input 2 is overridden and considered active (closed circuit). If the bit is inactive (bit 1=0), the digital input 2 is overridden and considered inactive (open circuit).

### **DI3\_COMMAND (40101) Bit 2**

The bit overrides the signal from the digital input 3. The command simulates the physical signal on I3 from BMS.

If the bit is active (bit 2=1), then the digital input 3 is overridden and considered active (closed circuit). If the bit is inactive (bit 2=0), then the digital input 3 is overridden and considered inactive (open circuit).

### **DI4\_COMMAND (40101) Bit 3**

The bit overrides a signal from the digital input 4. Command is dedicated to simulate the physical signal on I4 from BMS.

If the bit is active (bit 3=1), the digital input 4 is overridden and considered active (closed circuit). If the bit is inactive (bit 3=0), the digital input 4 is overridden and considered inactive (open circuit).

## **7.2.4 DIGITAL\_INPUTS\_BLOCKING\_REGISTER (40102)**

The register contains an integer value allowing to block all digital inputs (I1-I4). By default, all digital inputs are unblocked (all bits of the register are inactive (0)). The feature allows to block a particular digital input in order to withhold the functioning of manual control of light (or blind) by switch(es). The function can be useful in open spaces or common use areas, where the manual switching of light needs to be disabled, for example, after working hours.

### **DI1\_BLOCKING (40102) Bit 0**

If the bit is active (bit 0=1), the digital input 1 is blocked. Any signal appearing on the digital input 1 has no effect on the control algorithm.

If the bit is inactive (bit 0=0), the digital input 1 works in normal mode, which means that changes on the digital input 1 (opening and closing the circuit) have impact on the control algorithm.

### **DI2\_BLOCKING (40102) Bit 1**

If the bit is active (bit 1=1), the digital input 2 is blocked. Any signal appearing on the digital input 2 has no effect on the control algorithm.

If the bit is inactive (bit 1=0), the digital input 2 works in normal mode, which means that changes on the digital input 2 (opening and closing the circuit) have impact on the control algorithm.

### **DI3\_BLOCKING (40102) Bit 2**

If the bit is active (bit 2=1), the digital input 3 is blocked. Any signal appearing on the digital input 3 has no effect on the control algorithm.

If the bit is inactive (bit 2=0), the digital input 3 works in normal mode, which means that changes on the digital input 3 (opening and closing the circuit) have impact on the control algorithm.

### **DI4\_BLOCKING (40102) Bit 3**

If the bit is active (bit 3=1), the digital input 4 is blocked. Any signal appearing on the digital input 4 has no effect on the control algorithm.

If the bit is inactive (bit 3=0), the digital input 4 works in normal mode, which means that changes on the digital input 4 (opening and closing the circuit) have impact on the control algorithm.

## **7.2.5 SPECIAL\_INPUTS\_STATUS\_REGISTER (30043)**

The register contains an integer value representing the physical states of special inputs (S1 and S2).

### **SI1\_STATUS (30043) Bit 0**

The bit state shows the actual physical state of the special input 1 (**without** DelayOFF time consideration).

If the bit is active (bit 0=1), the special input 1 is active (closed circuit). If the bit is inactive (bit 0=0), the special input 1 is inactive (open circuit).

### **SI2\_STATUS (30043) Bit 1**

The state of the bit shows the actual physical state of the special input 2 (**without** DelayOFF time consideration).

If the bit is active (bit 1=1), the special input 2 is active (closed circuit). If the bit is inactive (bit 1=0), the special input 2 is inactive (open circuit).

## **7.2.6 SI1\_PIR\_TYPE (40103)**

The register contains an integer value representing the type of motion sensor/presence detector, which is connected to the special input 1. By default, the motion sensor/presence detector is set as normal closed type, but it can be changed in accordance with the table below:

Value	Type
5	NO
6 (default)	NC

Table 12. SI1 PIR Type register

### 7.2.7 SI2\_PIR\_TYPE (40104)

The register contains an integer value representing the type of motion sensor/presence detector, which is connected to the special input 2. By default, the motion sensor/presence detector is set as normal closed type, but it can be changed in accordance with the table below:

Value	Type
5	NO
6 (default)	NC

Table 13. SI2 PIR Type register

### 7.2.8 SI1\_DELAY\_OFF\_TIME (40107)

The register contains an integer value representing a time value in seconds.

The Delay OFF time stored in this register is a minimal time when the light is ON after a motion detection by motion sensor/presence detector connected to the special input 1.

If there is no motion during the period of time stored in this register, the light is switched OFF. The default value is 300 seconds.

### 7.2.9 SI2\_DELAY\_OFF\_TIME (40108)

The register contains an integer value representing a time value in seconds.

The Delay OFF time stored in this register is a minimal time when the light is ON after a motion detection by motion sensor/presence detector connected to the special input 1.

If there is no motion during the period of time stored in this register, the light is switched OFF. The default value is 300 seconds.

### 7.2.10 SI\_PIR\_STATUS (30148)

The register contains an integer value representing states of special inputs (S1 and S2) including the DELAY\_OFF\_TIME.

#### SI1\_PIR\_STATUS (30148) Bit 0

The bit state shows the actual state of the special input 1 with DelayOff time consideration.

If the bit is active (bit 0=1), the special input 1 is active (closed circuit). If the bit is inactive (bit 0=0), the special input 1 is inactive (open circuit).

## **SI2\_PIR\_STATUS (30148) Bit 1**

The bit state shows the actual state of the special input 2 with DelayOFF time consideration.

If the bit is active (bit 4=1), the special input 2 is active (closed circuit). If the bit is inactive (bit 4=0), the special input 2 is inactive (open circuit).

## **7.3 DALI Registers**

### **7.3.1 DALI\_COMMAND\_REGISTER (40253)**

The register contains an integer value representing actual configuration of particular functions assigned to the DALI interfaces. The register contains statuses and commands of both DALI interfaces in order to allow for the use of the only one register in the BMS to control the DALI network.

#### **DALI1\_ON\_OFF\_STATE (40253) Bit 0**

The bit state shows the actual state of the DALI 1 interface.

If the bit is active (bit 0=1), the DALI 1 interface is ON, which means that the ballasts are set in a scene. Changing the bit state to 0 (inactive) sends the DALI1\_BROADCAST\_OFF command into the network.

If the bit is inactive (bit 0 =0), the DALI 1 interface is OFF, which means that the ballast are OFF. Changing the bit state to 1 (active) sends the DALI1\_BROADCAST\_LAST\_SCENE command into the network.

The bit allows to read actual state of the ballasts connected to the DALI 1 interface and to send BROADCAST\_OFF and BROADCAST\_LAST\_SCENE commands to the DALI 1 network. This functionality allows for using the only one single bit to read status and write commands, which makes it easier to create a visualization and limit the number of variables.

#### **DALI1\_BROADCAST\_LAST\_SCENE (40253) Bit 1**

The raising edge of the bit sends the Last Scene Command to DALI 1 Interface to all the ballasts connected to the interface. The command is useful if there is a need of light up all ballasts connected to the DALI 1 interface remotely from BMS also without a discovery procedure (all ballasts connected to the DALI 1 interface react for Broadcast Last Scene even if short addresses of the ballasts are unknown). The command allows for recalling the last scene by activating only the one single bit, which can be really useful in case of creating a visualization.

#### **DALI1\_BROADCAST\_OFF (40253) Bit 2**

The raising edge of the bit sends the OFF command to the DALI 1 interface to all ballasts connected to the interface. The command is useful if there is a need of turn off all ballasts connected to the DALI 1 interface remotely from BMS also without a discovery procedure (all ballasts connected to the DALI 1 interface react for Broadcast OFF even if short addresses of the ballasts are unknown). The command allows for recalling the last scene by activating only one bit, which can be really useful in case of creating a visualization.

### **DI1\_COMMAND (40253) Bit 3**

The bit overrides a signal from the digital input 1. The command simulates the physical signal on I1 from BMS.

If the bit is active (bit 3=1), the digital input 1 is overridden and considered active (closed circuit). If the bit is inactive (bit 3=0), the digital input 1 is overridden and considered inactive (open circuit).

### **DALI2\_ON\_OFF\_STATE (40253) Bit 4**

The bit state shows the actual state of the DALI 2 interface.

If the bit is active (bit 0=1), the DALI 2 interface is ON, which means that the ballasts are set in a scene. Changing the bit state to 0 (inactive) sends the DALI2\_BROADCAST\_OFF command into the network.

If the bit is inactive (bit 0=0), the DALI 2 interface is off, which means that the ballast are off. Changing the bit state to 1(active) sends the DALI2\_BROADCAST\_LAST\_SCENE command into the network.

The bit allows for reading actual state of ballasts connected to DALI 2 and sending BROADCAST\_OFF and BROADCAST\_LAST\_SCENE commands to the DALI 2 network. This functionality allows for using only one bit to read status and write commands, which makes it easier to create a visualization and limit the number of variables.

### **DALI2\_BROADCAST\_LAST\_SCENE (40253) Bit 5**

The raising edge of the bit sends the Last Scene Command to the DALI 2 interface to all ballasts connected to the interface. The command is useful if there is a need of light up all ballasts connected to the DALI 2 interface remotely from BMS also without a discovery procedure (all ballasts connected to the DALI 2 interface react to Broadcast Last Scene even if short addresses of the ballasts are unknown). The command allows for recalling the last scene by activating only one bit, which can be really useful in case of creating a visualization.

### **DALI2\_BROADCAST\_OFF (40253) Bit 6**

The raising edge of the bit sends the OFF command to the DALI 2 interface to all ballasts connected to the interface. The command is useful if there is a need of turn off all ballasts connected to the DALI 2 interface remotely from BMS also without a discovery procedure (all ballasts connected to the DALI 2 interface react to Broadcast OFF even if short addresses of the ballasts are unknown). The command allows to recall the last scene by activating only one bit, which can be really useful in case of creating a visualization.

### **DI2\_COMMAND (40253) Bit 7**

The bit overrides a signal from the digital input 2. The command is dedicated to simulate the physical signal on I2 from BMS.

If the bit is active (bit 7=1), the digital input 2 is overridden and considered as active (closed circuit). If the bit is inactive (bit 7=0), the digital input 2 is overridden and considered inactive (open circuit).

### 7.3.2 DALI1\_RECEIVED\_FRAMES\_COUNTER (30229)

The 32-bit register with the number of valid DALI receives messages by the device from the ballasts since the last powered up through the DALI 1 interface.

### 7.3.3 DALI1\_ERROR\_FRAMES\_COUNTER (30237)

The 32-bit register with DALI messages with the number of error received by the device from the ballasts since the last powered up through the DALI 1 interface.

### 7.3.4 DALI1\_TRANSMITTED\_FRAMES\_COUNTER (30245)

The 32-bit register with the number of transmitted DALI messages sent by the device to the ballasts since the last powered up through the DALI 1 interface.

### 7.3.5 DALI1\_CFG\_REGISTER (40254)

The register contains an integer value representing actual configuration of particular functions assigned to the DALI 1 interface.

#### DALI1\_ON\_OFF\_STATE (40254) Bit 0

The bit state shows the actual state of the DALI 1 interface.

If the bit is active (bit 0=1), the DALI 1 interface is on, which means that the ballast are set in a scene. Changing the bit state to 0 (inactive) sends the DALI1\_BROADCAST\_OFF command into the network.

If the bit is inactive (bit 0 =0), the DALI 1 interface is off, which means that the ballast are off. Changing the bit state to 1 (active) sends the DALI1\_BROADCAST\_LAST\_SCENE command into the network.

The bit allows to read actual state of the ballasts connected to the DALI 1 interface and to send BROADCAST\_OFF and BROADCAST\_LAST\_SCENE commands to the DALI 1 network. This functionality allows for using the only one single bit to read status and write commands, which makes it easier to create a visualization and limit the number of variables.

#### DALI1\_BROADCAST\_LAST\_SCENE (40254) Bit 1

The raising edge of the bit sends the Last Scene Command to the DALI 1 interface to all ballasts connected to the interface. The command is useful if there is a need of light up all ballasts connected to the DALI 1 interface remotely from BMS also without a discovery procedure (all ballasts connected to the DALI 1 interface react to Broadcast Last Scene even if short addresses of the ballasts are unknown). The command allows for recalling the last scene by activating only one bit, which can be really useful in case of creating a visualization.

#### DALI1\_BROADCAST\_OFF (40254) Bit 2

The raising edge of the bit sends the OFF command to the DALI 1 interface to all ballasts connected to the interface. The command is useful if there is a need of turn off all ballasts connected to the DALI 1 interface remotely from BMS also without a discovery procedure (all ballasts connected to the DALI 1 interface react for Broadcast OFF even if the short



addresses of the ballasts are unknown). The command allows for recalling the last scene by activating only one bit, which can be really useful in case of creating a visualization.

### **SI1\_BLOCKING (40254) Bit 3**

The bit allows to activating / deactivating a motion sensor / presence detector operating with connection to the special input 1.

If the bit is active (bit 3=1), the motion sensor / presence detector connected to the special input 1 is active and its signal has an impact on the control algorithm.

If the bit is inactive (bit 3=0), the motion sensor / presence detector connected to the special input 1 is inactive and its signal does not have impact on the control algorithm. The default value is 1 (active).

### **DI1\_DIMMING\_OFF (40254) Bit 4**

The bit allows for activating / deactivating a dimming function assigned with the digital input 1.

If the bit is active (bit 4=1), the dimming function for the switch(es) connected to the digital input 1 is disabled.

If the bit is inactive (bit 4=0), the dimming function for the switch(es) connected to the digital input 1 is enabled.

The switch holds the function to switch on or off the lighting only the dimming function is disabled.

## **7.3.6 DALI1\_DIMMING\_STATE (40266)**

The register contains an integer value representing the dimming state of ballasts connected to the DALI1 interface.

The command is useful if there is a need of dim all ballasts to the specific level remotely from BMS also without a discovery procedure (all ballasts connected to the DALI 1 interface react to dimming state even if the short addresses of the ballasts are unknown).

The minimum value of 0 means that all the ballasts are off, the maximum value of 254 means the maximum possible brightness level of the ballasts. By default, the register value is 0.

## **7.3.7 DALI1\_FADE\_RATE (40462)**

The register contains an integer value representing the fade value in steps per seconds that are performed in response to fade command executed by switches controlling the ballasts connected to the DALI 1 interface.

The fade rate allows to change the precision of brightness level setting from switches. The function can be useful in the areas where the ballasts need to be dimmed, for example, in open spaces where the brightness level need to be set individually. The user can adjust most convenient fade rate to requirements and find the most optimal compromise between the time and the precision of changing the brightness level.

Appropriate number represents the time in seconds, which is needed to fade up / down the ballasts between the minimal brightness value and the maximal brightness value.

The fade rate is expressed in steps per second. The table below shows the register values assigned to the number of steps per seconds, which is valid during the dimming procedure. The minimum and maximum values create a range which sets the number of possible steps.

For example:

Minimum ballast value = 0

Maximum ballast value = 254

There are 254 possible steps.

The Fade Rate register value 1 (358 steps per second) means that dimming / lighting up procedure takes less than one second.

The Fade Rate register value 15 (2.8 steps per second) means that dimming / lighting up procedure takes about  $254 / 2.8 = 90.5$  seconds (Fade Time).

Register Value	Fade Time (Seconds)	Fade Rate (Steps/Seconds)
0	No fade	Not applicable
1	0,7	358
2	1,0	253
3	1,4	179
4	2,0	127
5	2,8	89,4
6	4,0	63,3
7(default)	5,7	44,7
8	8,0	31,6
9	11,3	22,4
10	16,0	15,8
11	22,6	11,2
12	32,0	7,9
13	45,3	5,6
14	64,0	4,0
15	90,5	2,8

Table 14. Fade rate register values

In case if the DALI1 is controlled together with the DALI2 interface by I2, the DALI1\_FADE\_RATE register is blocked and the fade rate value from the DALI2\_FADE\_RATE register is considered in the control algorithm.

### 7.3.8 DALI1\_FADE\_TIME (40466)

The register contains an integer value representing the value of time which is needed for the ballasts to change the brightness level from minimum to maximum or opposite. The Fade Time is used by a control algorithm in case if commands assigned with changing the ballasts setpoint are send by BMS. These commands are: DALI1\_ON\_OFF\_STATE, DALI1\_BROADCAST\_LAST\_SCENE, DALI1\_BROADCAST\_OFF, DALI1\_BALLAST\_SETPOINT.

Possible register values with the assign fade time values are presented in table above.

If the DALI1 is controlled together with the DALI2 interface by I2, the DALI1\_FADE\_TIME register is blocked and the fade time value from the DALI2\_FADE\_TIME register is considered in the control algorithm.

### 7.3.9 DALI1\_POWER\_ON\_LEVEL (40470)

The register contains an integer value representing the value sent to the ballasts connected to the DALI 1 interface and stored in the memory of ballasts. In case of the power supply of the lamps, recovery of the ballasts is accompanied with sending POWER\_ON\_LEVEL value to the lamps. The default value is 254 (maximum possible brightness of the ballasts).

### 7.3.10 DALI1\_SYSTEM\_FAILURE\_LEVEL (40474)

The register contains an integer value representing the value sent to ballasts connected to DALI 1 interface and stored in the memory of the ballasts. In case of system malfunction (for example, the DALI line interruption, DALI power supply failure, etc.), the ballasts send the SYSTEM\_FAILURE\_LEVEL value to the lamps. The default value is 254 (maximum possible brightness of the ballasts).

### 7.3.11 DALI2\_RECEIVED\_FRAMES\_COUNTER (30231)

The 32-bit register with the number of valid DALI received messages by the device from the ballasts since the last powered up through the DALI 2 interface.

### 7.3.12 DALI2\_ERROR\_FRAMES\_COUNTER (30239)

The 32-bit register with the number of error DALI received messages by the device from the ballasts since the last powered up through the DALI 2 interface.

### 7.3.13 DALI2\_TRANSMITTED\_FRAMES\_COUNTER (30247)

The 32-bit register with the number of transmitted DALI messages sent by the device to the ballasts since the last powered up through the DALI 2 interface.

### 7.3.14 DALI2\_CFG\_REGISTER (40255)

The register contains an integer value representing actual configuration of particular functions assigned to the DALI 2 interface.

#### DALI2\_ON\_OFF\_STATE (40255) Bit 0

The bit state shows the actual state of the DALI 2 interface.

If the bit is active (bit 0=1), the DALI 2 interface is on, which means that ballasts are set in a scene. Changing the bit state to 0 (inactive) sends the DALI2\_BROADCAST\_OFF command into the network.

If the bit is inactive (bit 0=0), the DALI 2 interface is off, which means that ballasts are off. Changing the bit state to 1 (active) sends the DALI2\_BROADCAST\_LAST\_SCENE command into the network.

The bit allows to read the actual state of the ballasts connected to the DALI 2 interface as well as send BROADCAST\_OFF and BROADCAST\_LAST\_SCENE commands to the DALI 2 network. This functionality allows to use only one bit to read status and write commands, which makes it easier to create a visualization and limit the number of variables.

### **DALI2\_BROADCAST\_LAST\_SCENE (40255) Bit 1**

The raising edge of the bit sends the Last Scene Command to DALI 2 interface to all ballasts connected to the interface. The command is useful if there is a need of light up all ballasts connected to the DALI 2 interface remotely from BMS also without a discovery procedure (all the ballasts connected to the DALI 2 interface react to Broadcast Last Scene even if the short addresses of the ballasts are unknown). The command allows to recall the last scene by activation only one bit, which can be really useful in case of creating a visualization.

### **DALI2\_BROADCAST\_OFF (40255) Bit 2**

The raising edge of the bit sends the OFF command to the DALI 2 interface to all the ballasts connected to the interface. The command is useful if there is a need of turn off all ballasts connected to the DALI 2 interface remotely from BMS also without a discovery procedure (all ballasts connected to the DALI 2 interface react for Broadcast OFF even if the short addresses of the ballasts are unknown). The command allows to recall the last scene by activation only one bit, which can be really useful in case of creating a visualization.

### **SI2\_BLOCKING (40255) Bit 3**

The bit allows for activating / deactivating a motion sensor / presence detector functioning connected to the special input 2.

If the bit is active (bit 3=1), the motion sensor / presence detector connected to the special input 2 is active and its signal has impact on the control algorithm.

If the bit is inactive (bit 3=0), the motion sensor / presence detector connected to the special input 2 is inactive and its signal does not have impact the control algorithm. The default value is 1 (active).

### **DI2\_DIMMING\_OFF (40255) Bit 4**

The bit allows for activating / deactivating a dimming function assigned with the digital input 2.

If the bit is active (bit 4=1), the dimming function for the switch(es) connected to the digital input 2 is disabled.

If the bit is inactive (bit 4=0), the dimming function for the switch(es) connected to the digital input 2 is enabled.

The switch holds the function to switch on or off the lighting only the dimming function is disabled.

### 7.3.15 DALI2\_DIMMING\_STATE (40267)

The register contains an integer value representing the dimming state value sent to the DALI 2 interface to all ballasts connected to the interface.

The command is useful if there is a need of light up all the ballasts to the specific level remotely without a discovery procedure (all the ballasts connected to the DALI 2 interface react for dimming state even if the short addresses of the ballasts are unknown).

The minimum value of 0 means that all the ballasts light with the minimal brightness, the maximum value of 254 means the maximum possible brightness level of the ballasts. By default, the register value is 0.

### 7.3.16 DALI2\_FADE\_RATE (40463)

The register contains an integer value representing the fade value in steps per seconds that are performed in response to fade command executed by switches controlling the ballasts connected to the DALI 2 interface.

The fade rate allows to change a dimming speed, which results in increasing the precision of brightness level setting. The function can be useful in the areas where the ballasts need to be dimmed, for example, in the case of meetings with video presentations, etc. The user can adjust the fade rate, which is best for requirements, and find the most optimal compromise between the time and the precision of brightness level of the ballasts.

Appropriate number select the time which is needed to dim / light up the ballasts from the minimal brightness value to the maximal brightness value.

The fade rate can be expressed also in steps per second. The table below shows the register values assigned to the number of steps per seconds which is valid during dimming / lighting up procedure. The minimum and maximum values create a range, which sets the number of possible steps.

For example:

Minimum ballast value = 0

Maximum ballast value = 254

The number of possible steps is 254 (0.254)

The Fade Rate register value 1 (358 steps per second) means that dimming / lighting up procedure takes less than one second.

The Fade Rate register value 15 (2.8 steps per second) means that dimming / lighting up procedure takes about  $254 / 2.8 = 90.5$  seconds (Fade Time)

In case if DALI2 is controlled together with the DALI1 interface by I1, then the DALI2\_FADE\_RATE register is blocked and the fade rate value from the DALI1\_FADE\_RATE register is considered in the control algorithm.

### 7.3.17 DALI2\_FADE\_TIME (40467)

The register contains an integer value representing the value of time, which is needed for the ballasts to change the brightness level from minimum to maximum or opposite. The Fade Time is used by a control algorithm in case if commands assigned with changing the ballasts setpoint are send by BMS. These commands are: DALI2\_ON\_OFF\_STATE, DALI2\_BROADCAST\_LAST\_SCENE, DALI2\_BROADCAST\_OFF, and DALI2\_BALLAST\_SETPOINT.

Possible register values with the assign fade time values are presented in the table above.

If DALI2 is controlled together with the DALI1 interface by I1, the DALI2\_FADE\_TIME register is blocked and the fade time value from the DALI1\_FADE\_TIME register is considered in the control algorithm.

### 7.3.18 DALI2\_POWER\_ON\_LEVEL (40471)

The register contains an integer value representing the value sent to ballasts connected to the DALI 2 interface and stored in the memory of ballasts. In the case of lamps power supply recovery, the ballasts send the POWER\_ON\_LEVEL value to the lamps. The default value is 254 (maximum possible brightness of the ballasts).

### 7.3.19 DALI2\_SYSTEM\_FAILURE\_LEVEL (40475)

The register contains an integer value representing the value sent to ballasts connected to the DALI 2 interface and stored in the memory of the ballasts. In the case of system malfunction (for example, DALI line interruption, DALI power supply failure, etc.) the ballasts send the SYSTEM\_FAILURE\_LEVEL value to the lamps. The default value is 254 (maximum possible brightness of the ballasts).

### 7.3.20 DALI Network Advanced Control

If the device is brand new, it is possible to control DALI ballasts connected to DALI1 or DALI2 interfaces without any commissioning by sending Broadcast Commands to all ballasts connected to the particular interfaces.

To activate commissioning of the DALI network, the discovery function needs to be activated. If the discovery is done the device allows to control and maintain particular ballast (for example, read the status, set the minimum or maximum of the brightness level).

The registers assigned with the discovery function are described below.

The new DALI network needs to be discovered by DISCOVER\_NEW\_INITIALIZATION. The function addresses all ballasts connected to the DALI X interface, which have no short addresses assigned.

If there is a possibility that any ballast has a short address already assigned (for example, from a previous discovery process), then the CLEAR\_SHORT\_ADDRESSES function has to be invoked first.

DALIX\_DISCOVERY\_PROGRESS registers indicate the current status of the discovery process.

If there is a need to add a new ballast to the existing network (already discovered), the `ADD_NEW_BALLAST` function should be invoked. The function allows to address an additional ballast with the first available short address.

The `REPLACE_BALLAST` procedure can be used in the case if the ballast connected to one of the DALI interface runs into the faulty state. Newly connected ballast receives the same short address as the faulty ballast had before replacement.

## **DALI1\_CFG\_REGISTER (40254)**

The register contains an integer value representing actual configuration of particular functions assigned to the DALI 1 interface.

### **DALI1\_ALL\_BALLASTS\_RESET (40254) Bit 11**

**WARNING!** Be careful using this function! All parameters of all ballasts will be set to the factory default settings! After reset, a new commissioning process will be necessary!

The `ALL_BALLASTS_RESET` function sets back all parameters stored in the ballasts connected to the DALI 1 interface to the factory settings. The function can be useful if possible problems with the ballasts appear (ballasts do not react to DALI commands or stay in the faulty states).

The bit allows to send `ALL_BALLASTS_RESET` command to all ballasts connected to the DALI 1 interface.

The raising edge of the bit sends the `ALL_BALLASTS_RESET` command to the ballasts.

### **DALI1\_DISCOVER\_NEW\_INITIALIZATION (40254) Bit 12**

The `DISCOVER_NEW_INITIALIZATION` function is used if the user would like to commission a new DALI network. If the DALI network is undiscovered (the device has no information about short addresses) some functions are unavailable, especially these which are directly assigned with a single ballast control. The discovering allows to address all the unaddressed ballast connected to the DALI 1 interface and control each ballast individually.

The bit allows to send `DISCOVER_NEW_INITIALIZATION` to all the ballasts connected to the DALI 1 interface.

The raising edge of the bit sends the `DISCOVER_NEW_INITIALIZATION` to the ballasts. All ballasts are addressed with a short address randomly. This means that each `DISCOVER_NEW_INITIALIZATION` sets a new short addressing configuration of the ballasts.

### **DALI1\_REPLACE\_BALLAST (40254) Bit 13**

The bit allows to send the `REPLACE_BALLAST` command, which allows to find and replace the ballast with a faulty state among all ballasts connected to the DALI 1 interface. The function can be useful if there is a need of replacing faulty ballasts or when there is a rearrangement of the DALI network (for example, in case of rooms adaptation for a new tenant).

If the `DALI1_FAULT_STATUS_REGISTER` value is different than 0 then the raising edge of the bit sends the `REPLACE_BALLAST` command to the ballasts.

All ballasts with faulty states are replaced with a newly connected ballasts. The new ballasts are addressed from the same set of addresses as the faulty ballasts had before replacement. This means that only short addresses of the faulty ballasts are available to reassign them to the new ballasts. The short addresses are assigned to the new ballasts randomly.

In case of replacing more than one faulty ballast, in order to have full control over new ballasts addressing process, it is recommended to replace the ballasts one by one to avoid random assignation of the short addresses.

Example:

Ballasts with a short addresses no. 2 and 4 are in faulty states (DALI1\_FAULT\_STATUS register bits no 1 and 3 are true).

The faulty ballasts are replaced with new ballasts.

After sending REPLACE\_BALLAST, the new ballasts (without short addresses) are addressed with a short addresses no. 2 and 4 randomly.

To avoid random assignation of the addresses, only the ballast No. 2 must to be replaced first. The new ballast which is a replacement for ballast No. 2 receives the same address no 2.

Ballast no. 4 needs to be replaced in the next step.

#### **DALI1\_ADD\_NEW\_BALLAST (40254) Bit 14**

The bit allows for sending the ADD\_NEW\_BALLAST command with a special function, which allows to find new ballasts (not previously addressed) from all ballasts connected to the DALI 1 interface and to address them with a first possible address (from 1 to 16).

The raising edge of the bit sends the ADD\_NEW\_BALLAST to the ballasts. All new ballasts are addresses with the first possible address. All ballasts, which were addressed before sending ADD\_NEW\_BALLAST, keep their addresses.

Example:

Seven ballasts connected to the DALI 1 interface are addressed with the addresses from 1 to 7.

Two new ballasts are connected to the DALI 1 interface.

The ADD\_NEW\_BALLAST is initiated.

Two new ballasts are addressed with the addresses 8 and 9 (first free).

#### **DALI1\_CLEAR\_SHORT\_ADDRESSES (40254) Bit 15**

The bit allows to send the CLEAR\_SHORT\_ADDRESSES, which allows to find all ballasts connected to the DALI 1 interface and delete short addresses of all of them.

The raising edge of the bit sends the CLEAR\_SHORT\_ADDRESSES to the ballasts. All short addresses of all ballasts connected to the DALI 1 interface are deleted.

**WARNING!** Be careful using this function! All short addresses of all ballasts will be deleted!



## DALI2\_CFG\_REGISTER (40255)

The register contains an integer value representing actual configuration of particular functions assigned to the DALI 2 interface.

### DALI2\_ALL\_BALLASTS\_RESET (40255) Bit 11

**WARNING!** Be careful using this function! All parameters of all ballasts will be set to the factory default settings! After reset, a new commissioning process will be necessary!

The ALL\_BALLASTS\_RESET function sets back all parameters stored in ballasts connected to the DALI 2 interface to the factory settings. The function can be useful if possible problems with the ballasts appear (ballasts do not react for DALI commands or stay in the faulty states).

The bit allows to send the ALL\_BALLASTS\_RESET command to all ballasts connected to the DALI 2 interface.

The raising edge of the bit sends the ALL\_BALLASTS\_RESET command to the ballasts.

### DALI2\_DISCOVER\_NEW\_INITIALIZATION (40255) Bit 12

The DISCOVER\_NEW\_INITIALIZATION function is used if the user would like to commission a new DALI network. If the DALI network is undiscovered (the device has no information about short addresses) some functions are unavailable, especially these which are directly assigned with a single ballast control. The discovering allows to address all the unaddressed ballast connected to the DALI 2 interface and control each ballast individually.

The bit allows to send the DISCOVER\_NEW\_INITIALIZATION to all ballasts connected to the DALI 2 interface.

The raising edge of the bit sends the DISCOVER\_NEW\_INITIALIZATION to ballasts. All ballasts are addressed with a short address randomly. It means that each DISCOVER\_NEW\_INITIALIZATION sets a new short addressing configuration of the ballasts.

### DALI2\_REPLACE\_BALLAST (40255) Bit 13

The bit allows to send the REPLACE\_BALLAST command, which allows to find and replace the ballast with a faulty state among all ballasts connected to the DALI 2 interface. The function can be useful if there is a need of replacing faulty ballasts or if there is a rearrangement of the DALI network (for example, in case of rooms adaptation for a new tenant).

If DALI2\_FAULT\_STATUS\_REGISTER value is different from 0, then the raising edge of the bit sends the REPLACE\_BALLAST command to the ballasts.

All ballasts with faulty states are replaced with a newly connected ballasts. The new ballasts are addressed from the same set of addresses as the faulty ballasts had before replacement. This means that only short addresses of the faulty ballasts are available to reassign them to the new ballasts. The short addresses are assigned to the new ballasts randomly.

In case of replacing more than one faulty ballast, in order to have full control over new ballasts addressing process, it is recommended to replace the ballasts one by one to avoid assigning the short addresses randomly.

Example:

Ballasts with a short addresses no. 2 and 4 are in faulty states (DALI2\_FAULT\_STATUS register bits no. 1 and 3 are true).

The faulty ballasts are replaced with new ballasts.

After sending REPLACE\_BALLAST, the new ballasts (without short addresses) are addressed with short addresses no. 2 and 4 randomly.

To avoid random assignation of the addresses, only the ballast no. 2 must to be replaced first. The new ballast, which is a replacement for ballast no. 2, receives the same address as no. 2.

Ballast no. 4 needs to be replaced in the next step.

#### **DALI2\_ADD\_NEW\_BALLAST (40255) Bit 14**

The bit allows to send the ADD\_NEW\_BALLAST command with a special function, which allows to find new ballasts (not previously addressed) from all ballasts connected to the DALI 2 interface and to address them with a first possible address (from 1 to 16).

The raising edge of the bit sends the ADD\_NEW\_BALLAST to the ballasts. All new ballasts are addresses with the first possible address. All ballasts, which were addressed before sending the ADD\_NEW\_BALLAST, keep their addresses.

Example:

Seven ballasts connected to the DALI 2 interface have the addresses from 1 to 7.

Two new ballasts are connected to the DALI 2 Interface.

The ADD\_NEW\_BALLAST is initiated.

Two new ballasts are addressed with the addresses 8 and 9 (first free).

#### **DALI2\_CLEAR\_SHORT\_ADDRESSES (40255) Bit 15**

The bit allows to send the CLEAR\_SHORT\_ADDRESSES, which allows to find all ballasts connected to the DALI 2 interface and delete short addresses of all of them.

The raising edge of the bit sends the CLEAR\_SHORT\_ADDRESSES to the ballasts. All short addresses of all ballasts connected to the DALI 2 interface are deleted.

**WARNING!** Be careful using this function! All short addresses of all ballasts will be deleted!

#### **DALI1\_DISCOVERY\_PROGRESS (30225)**

The register contains a percentage value from 0 to 100%, which presents the actual progress of the discovery process initiated on the DALI 1 interface.

#### **DALI2\_DISCOVERY\_PROGRESS (30226)**

The register contains a percentage value from 0 to 100%, which presents the actual progress of the discovery process initiated on the DALI 2 interface.

### 7.3.21 DALI Registers Available Only After DALI X Network Commissioning

Some of the device functions and registers assigned with DALI network(s), DALI1 or DALI2, are available only after the DALI X network commissioning process.

All Modbus registers, which are available only after commissioning, are described below.

#### DALI1\_BALLAST\_ACTUAL\_LEVEL (30161- 30176)

The register contains information about actual brightness level from minimum 0 to maximum 254 of the particular ballast. Each register is assigned to the ballast number according to the following table:

Register No.	Ballast No.
30161	Ballast 1
30162	Ballast 2
...	...
30175	Ballast 15
30176	Ballast 16

Table 15. DALI1 Actual Ballast Level register

#### DALI2\_BALLAST\_ACTUAL\_LEVEL (30177 - 30192)

The register contains information about actual brightness level from minimum 0 to maximum 254 of the particular ballast connected to the DALI 2 interface. Each register is assigned to the ballast number according to the following table:

Register No.	Ballast No.
30177	Ballast 1
30178	Ballast 2
...	...
30191	Ballast 15
30192	Ballast 16

Table 16. DALI2 Actual Ballast Level register

#### DALI1\_BLINK (40262)

Each bit of the register activates blinking of the particular ballast assigned to the bit. It is possible to start blinking of several ballasts at the same time. The function is useful during the commissioning of the DALI network, including ballasts addressing (discover process)

to localize the specific lamp in order to appropriate visualization in BMS. To do so, appropriate bits have to be activated according to the table below:

Bit No.	Active (1)	Inactive (0)
0	Ballast 1 Blinking	Ballast 1 Normal
1	Ballast 2 Blinking	Ballast 2 Normal
...	...	....
14	Ballast 15 Blinking	Ballast 15 Normal
15	Ballast 16 Blinking	Ballast 16 Normal

Table 17. DALI1 Blink register structure

To stop blinking, the ballasts the particular bits have to be set to 0. The default value is 0.

### **DALI2\_BLINK (40263)**

Each bit of the register activates blinking of the particular ballast assigned to the bit. It is possible to start blinking of several ballasts in the same time. The function is useful during the DALI network commissioning including ballasts addressing (discover process) to localize the specific lamp in order to appropriate visualization in BMS. To do so, appropriate bits have to be activated according to the table below:

Bit No.	Active (1)	Inactive (0)
0	Ballast 1 Blinking	Ballast 1 Normal
1	Ballast 2 Blinking	Ballast 2 Normal
...	...	....
14	Ballast 15 Blinking	Ballast 15 Normal
15	Ballast 16 Blinking	Ballast 16 Normal

Table 18. DALI2 Blink register structure

To stop blinking the ballasts the particular bits have to be set to 0. The default value is 0.

### **DALI1\_BALLAST\_SETPOINT (40270-40285)**

Registers contain integer values, which represent the setpoint values sent to the particular ballasts connected to the DALI 1 interface in accordance with the table below.

If there is a need to set particular ballast brightness level in the DALI 1 network remotely from BMS, it is possible to use the DALI1\_BALLASTX\_SETPOINT registers.

If the ballasts brightness levels are set individually for each ballast by BALLAST\_SETPOINT registers, there could be a need to hold this particular scene without a possibility to change the brightness level by switches. To deactivate the dimming function for switches, a register bit [DI1\\_DIMMING\\_OFF](#) has to be activated.

The function can be useful especially in the open spaces, where the brightness level needs to be set individually inside the single DALI network.

The minimum value 0 means that the ballasts send OFF command to the lamps, the maximum value 254 means the maximum possible brightness level of the ballast. By default, the register value is 0.

Register No.	Ballast No.
40270	Ballast 1
40271	Ballast 2
...	...
40284	Ballast 15
40285	Ballast 16

Table 19. DALI1 Ballast Setpoint registers

### **DALI2 BALLAST SETPOINT (40286-40301)**

The register contain integer values representing the setpoint values sent to the particular ballasts connected to the DALI 2 interface in accordance with the table below.

If there is a need to set particular ballast brightness level inside the DALI 2 network remotely from BMS, it is possible to do so using DALI2\_BALLASTX\_SETPOINT registers.

If the ballasts brightness levels are set individually for each ballast by BALLAST\_SETPOINT registers, there could be a need to hold this particular scene without a possibility to change the brightness level by switches. To deactivate a dimming function for switches, the DI2\_DIMMING\_OFF register bit has to be activated.

The function can be useful especially in the open spaces, where the brightness level needs to be set individually in the single DALI network.

The minimum. value 0 means that the ballast lights with the minimum brightness, the maximum value 254 means the maximum possible brightness level of the ballast. By default, the register value is 0.

Register No.	Ballast No.
40286	Ballast 1
40287	Ballast 2
...	...
40300	Ballast 15
40301	Ballast 16

Table 20. DALI2 Ballast Setpoint registers

## DALI1\_BALLAST\_MIN (40334-40349)

The register contain integer values, which represent the minimal brightness levels for the particular ballasts connected to the DALI 1 interface, in accordance with the table below.

The minimum value 0 means that the ballast minimum value is the same as in case of the OFF command (ballast is off), the maximum value 253 means that ballast cannot be dimmed in practice (the ballast setpoint value 254 means maximum possible factory brightness level of the ballast). The minimum value determines a low limit of dimming the ballast, both by dimming procedure initiated by monostable switch (writing down a lower value than it is stored in the register sets the ballast brightness level on the value of the register). By default, all registers values are 0.

Register No.	Ballast No.
40334	Ballast 1 MIN Value
40335	Ballast 2 MIN Value
...	...
40348	Ballast 15 MIN Value
40349	Ballast 16 MIN Value

Table 21. DALI1 Ballast Min value registers

## DALI2\_BALLAST\_MIN (40350-40365)

The registers contain integer values, which represent the minimum brightness levels for the particular ballasts connected to the DALI 2 interface in accordance to the table below.

The minimum value 0 means that the ballast minimum value is the same as in case of the OFF command (ballast is off), the maximum value 253 means that ballast cannot be dimmed in practice (the ballast setpoint value 254 means the maximum possible factory brightness level of the ballast). The minimum value determines a low limit of dimming the ballast, both by dimming procedure initiated by monostable switch (writing down a lower value than it is stored in the register sets the ballast brightness level on the value of the register). By default, all registers values are 0.

Register No.	Ballast No.
40350	Ballast 1 MIN Value
40351	Ballast 2 MIN Value
...	...
40364	Ballast 15 MIN Value
40365	Ballast 16 MIN Value

Table 22. DALI2 Ballast Min values registers

### DALI1\_BALLAST\_MAX (40398-40413)

Registers contain integer values, which represent the maximum brightness levels for the particular ballasts connected to the DALI 1 interface according to the table below.

The maximum value 1 means that ballast cannot be lighted up in practice (the ballast setpoint value 0 means that the ballast is off). The maximum value determines a high limit of lighting up the ballast, both by lighting up procedure initiated by monostable switch (writing down a higher value than it is stored in the register sets the ballast brightness level on the value of the register). By default, all registers values are 254.

Register No.	Ballast No.
40398	Ballast 1 MAX Value
40399	Ballast 2 MAX Value
...	...
40412	Ballast 15 MAX Value
40413	Ballast 16 MAX Value

Table 23. DALI1 Ballast Max values registers

### DALI2\_BALLAST\_MAX (40414-40429)

The registers contain integer values, which represent the maximum brightness levels for the particular ballasts connected to the DALI 2 interface according to the table below.

The maximum value 1 means that ballast cannot be lighted up in practice (the ballast setpoint value 0 means that the ballast is off). The maximum value determines a high limit of lighting up the ballast, both by lighting up procedure initiated by monostable switch (writing down a higher value than it is stored in the register sets the ballast brightness level on the value of the register). By default, all registers values are 254.

Register No.	Ballast No.
40414	Ballast 1 MAX Value
40415	Ballast 2 MAX Value
...	...
40428	Ballast 15 MAX Value
40429	Ballast 16 MAX Value

Table 24. DALI2 Ballast Max values registers

### DALI1\_NUMBER\_OF\_BALLASTS (30258)

The register contains an integer value representing the number of ballasts connected to the DALI 1 interface with the short addresses given during the one of the discovery process (NEW\_INITIALIZATION, REPLACE\_BALLAST, ADD\_NEW\_BALLAST).

## DALI2\_NUMBER\_OF\_BALLASTS (30259)

The register contains an integer value representing the number of ballasts connected to the DALI 2 interface with the short addresses given during the one of the discovery process (NEW\_INITIALIZATION, REPLACE\_BALLAST, ADD\_NEW\_BALLAST).

## DALI1\_FAULT\_STATUS\_REGISTER (30157)

The register contains an integer value representing common fault status from all ballasts connected to the DALI 1 interface. Each bit of the register represents a fault state of the particular ballast in accordance with the following table:

Bit No.	Active (1)	Inactive (0)
0	Ballast 1 Fault	Ballast 1 Normal
1	Ballast 2 Fault	Ballast 2 Normal
...	...	....
14	Ballast 15 Fault	Ballast 15 Normal
15	Ballast 16 Fault	Ballast 16 Normal

Table 25. DALI1 Fault register structure

## DALI2\_FAULT\_STATUS\_REGISTER (30158)

The register contains an integer value representing common fault status from all ballasts connected to the DALI 2 interface. Each bit of the register represents a fault state of the particular ballast in accordance with the following table:

Bit No.	Active (1)	Inactive (0)
0	Ballast 1 Fault	Ballast 1 Normal
1	Ballast 2 Fault	Ballast 2 Normal
...	...	....
14	Ballast 15 Fault	Ballast 15 Normal
15	Ballast 16 Fault	Ballast 16 Normal

Table 26. DALI2 Fault register

## 7.4 Blind Control Registers

### 7.4.1 BLIND\_UP\_TIME (40601)

The register contains an integer value representing the value of time, which is needed to open the blind/shutter from 0% to 100%, in milliseconds. The register value can be



overwritten directly from BMS or set automatically with the blind calibration procedure (see section [Blinds Calibration Procedure](#)). By default, the register value is 0 ms.

#### **7.4.2 BLIND\_DOWN\_TIME (40617)**

The register contains an integer value representing the value of time, which is needed to close the blind/shutter from 100% to 0%, in milliseconds. The register value can be overwritten directly from BMS or set automatically with the blind calibration procedure (see section [Blinds Calibration Procedure](#)). By default, the register value is 0 ms.

#### **7.4.3 SLATS\_OPENING\_TIME (40633)**

The register contains an integer value representing the value of time, which is needed to move the slats in full range of possible movement, in milliseconds. The register value can be overwritten directly from BMS or set automatically with the slats calibration procedure (see section [Slats Calibration Procedure](#)). By default, the register value is 1000 ms.

#### **7.4.4 BLIND\_STATE (40649)**

The register value represents the actual state of the blind/shutter from 0% to 100%.

The 100% value means that the blind/shutter is fully open. The 0% value means that the blind/shutter is fully closed.

If the blind goes up, the state is displayed basing on the BLIND\_UP\_TIME register value.

If the blind goes down, the state is displayed basing on the BLIND\_DOWN\_TIME register value. By default, the state value is 0%.

#### **7.4.5 SLATS\_STATE (40657)**

The register value represents the actual state of the slats from 0% to 100%.

Please notice that normally the slats are fully closed if the state is 0% or 100%. It means that position full open is reached if the SLATS\_STATE register is 50%.

The status displaying based on the SLATS\_OPENING\_TIME register value, therefore, by default, it is adjusted to 1 second full range movement time.

A different value in the SLATS\_OPENING\_TIME register has impact on the SLATS\_STATE value calculation. By default, the state value is 0%.

#### **7.4.6 BLIND\_OFF\_DELAY (40665)**

The register value represents the time value expressed in % of the BLIND\_UP\_TIME/BLIND\_DOWN\_TIME depending on whether the blind/shutter goes up or down. By default, the register value is 5%. The function is activated only if the blind/shutter is set to full open/closed positions. In such case, by default, the blind/shutter motor runs 5% longer than it is set in the BLIND\_UP\_TIME/BLIND\_DOWN\_TIME. The function is made in order to ensure that the blind/shutter achieves full open/closed positions if during the long-term operation the blind/shutter becomes not calibrated or there are some mechanical failures of the motor.

### 7.4.7 SLATS\_NUMBER\_OF STEPS (40673)

The register value represents a number of steps, which are needed to change the slats position from 0% to 100% (full range movement). The possible values are from 1 to 10. Number 1 means that the slats do the full range movement with the single short click of the monostable switch. Number 10, which is the maximum, means that slats needs 10 similar motor movements (clicks of the monostable switch) to go from 0% position to 100% position (full range movement). The default value of the register is 10.

### SLATS\_BLOCKING\_LOCAL (40600) Bit 0

The bit allows for activating / deactivating the slats control by local physical switches. The function is useful if the slats opening level is set from BMS and there is no need to change it locally. In such case the locally connected switches control the shutter in the same way as it is in the blind control mode.

If the bit is active (bit 0=1), the slats control function by using the physical switches is blocked.

If the bit is active (bit 0=0), the slats control function by using the physical switches is unblocked.

The default value is 0 (inactive)–the slats can be controlled by the physical switches.

## 7.5 List of Modbus Registers

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40001	0	0x0	VERSION TYPE	Read/Write Memory	First byte means a version and another one a type of device. Allows to enable 1 of 4 device actions.
30002	1	0x1	ADDRESS DIPSWITCH	Read-only	Address selected by address DIP switches
30003	2	0x2	CFG DIPSWITCH	Read-only	Configuration selected by CFG DIP switches
30004	3	0x3	RECEIVED FRAMES COUNTER	Read-only	Number of received frames
30006	5	0x5	ERROR FRAMES COUNTER	Read-only	Number of error frames
30008	7	0x7	TRANSMITTED FRAMES COUNTER	Read-only	Number of transmitted frames
30012	11	0xB	UP TIME	Read-only	Controller up time
40017	16	0x10	BAUD RATE	Read/Write Memory	The default value is 76800
30018	17	0x11	STOP BITS	Read-only	The constant value is 1

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
30019	18	0x12	DATA BITS	Read-only	The constant value is 8
30020	19	0x13	PARITY BITS	Read-only	The constant value is 0(none)
40021	20	0x14	REPLY DELAY	Read/Write Memory	The default value is 0
30041	40	0x28	DIGITAL INPUTS STATUS	Read-only	Bit0 – DI1 Status Bit1 – DI2 Status Bit2 – DI3 Status Bit3 – DI4 Status
30042	41	0x29	DIGITAL OUTPUTS STATUS	Read-only	Bit0 – Light 1 Status O1 Bit1 – Light 2 Status O2 Bit2 – Blind UP Status O3 Bit3 – Blind DOWN Status O4
30043	42	0x2A	SPECIAL INPUTS STATUS	Read-only	Bit0 – SI1 Status Bit1 – SI2 Status
40101	100	0x64	DIGITAL COMMANDS	Read/Write	Bit0 – DI1 Command Bit1 – DI2 Command Bit2 – DI3 Command Bit3 – DI4 Command
40102	101	0x65	DIGITAL INPUT BLOCKING	Read/Write Memory	Value range from 0 to 1 (0 – no blocking; 1 – blocked) Bit0 – DI1 Blocking Bit1 – DI2 Blocking Bit2 – DI3 Blocking Bit3 – DI4 Blocking
40103	102	0x66	SPECIAL INPUT 1 PIR TYPE	Read/Write Memory	Value range from 5 to 6. 5 – time relay NO, 6 – time relay NC (default value)
40104	103	0x67	SPECIAL INPUT 2 PIR TYPE	Read/Write Memory	Value range from 5 to 6. 5 – time relay NO, 6 – time relay NC (default value)
40107	106	0x6A	SPECIAL INPUT 1 DELAY OFF TIME	Read/Write Memory	Value range from 0 to 65535 seconds. The default value is 300s.

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40108	107	0x6B	SPECIAL INPUT 2 DELAY OFF TIME	Read/Write Memory	Value range from 0 to 65535 seconds. The default value is 300s.
30148	147	0x93	SPECIAL INPUTS PIR STATUS	Read-only	Bit0 – SI1 PIR Status Bit1 – SI2 PIR Status
30156	155	0x9B	DIPSWITCH_CFG_R EGISTER	Read-only	Value range 0-1. Bit0 – DI1_DI2_SWITCH_TYPE (0 – monostable; 1 – bistable) Bit1 – DI1_CONTROL_MODE (0 - DALI 1 only; 1 - DALI 1 + DALI2) Bit2 – SI1_CONTROL_MODE (0 - DALI 1 only; 1 - DALI 1 + DALI2) Bit3 – DI2_CONTROL_MODE (0 - DALI 2 only; 1 - DALI 1 + DALI2) Bit4 – SI2_CONTROL_MODE (0 - DALI 2 only; 1 - DALI 1 + DALI2) Bit5 - LIGHT_CONTROL_MODE (0 – DALI mode; 1 – ON/ OFF mode) Bit6 – DI3_DI4_SWITCH_TYPE (0 – monostable; 1 – bistable) Bit7 – BLIND_CONTROL_MODE (0 -blind ; 1 - shutter)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
30157	156	0x9C	DALI1 FAULT STATUS REGISTER	Read-only	Ballasts fault status storage (0 – no fault, 1 – fault) Bit0 – Ballast 1 fault Bit1 – Ballast 2 fault Bit2 – Ballast 3 fault Bit3 – Ballast 4 fault Bit4 – Ballast 5 fault Bit5 – Ballast 6 fault Bit6 – Ballast 7 fault Bit7 – Ballast 8 fault Bit8 – Ballast 9 fault Bit9 – Ballast 10 fault Bit10 – Ballast 11 fault Bit11 – Ballast 12 fault Bit12 – Ballast 13 fault Bit13 – Ballast 14 fault Bit14 – Ballast 15 fault Bit15 – Ballast 16 fault
30158	157	0x9D	DALI2 FAULT STATUS REGISTER	Read-only	Ballasts fault status storage (0 – no fault, 1 – fault) Bit0 – Ballast 1 fault Bit1 – Ballast 2 fault Bit2 – Ballast 3 fault Bit3 – Ballast 4 fault Bit4 – Ballast 5 fault Bit5 – Ballast 6 fault Bit6 – Ballast 7 fault Bit7 – Ballast 8 fault Bit8 – Ballast 9 fault Bit9 – Ballast 10 fault Bit10 – Ballast 11 fault Bit11 – Ballast 12 fault Bit12 – Ballast 13 fault Bit13 – Ballast 14 fault Bit14 – Ballast 15 fault Bit15 – Ballast 16 fault
30161	160	0xA0	DALI1 BALLAST 1 ACTUAL LEVEL	Read-only	Actual BALLAST1 state. Value range 0-255. (255 - fault)
30162	161	0xA1	DALI1 BALLAST 2 ACTUAL LEVEL	Read-only	Actual BALLAST2 state. Value range 0-255. (255 - fault)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
30163	162	0xA2	DALI1 BALLAST 3 ACTUAL LEVEL	Read-only	Actual BALLAST3 state. Value range 0-255. (255 - fault)
30164	163	0xA3	DALI1 BALLAST 4 ACTUAL LEVEL	Read-only	Actual BALLAST4 state. Value range 0-255. (255 - fault)
30165	164	0xA4	DALI1 BALLAST 5 ACTUAL LEVEL	Read-only	Actual BALLAST5 state. Value range 0-255. (255 - fault)
30166	165	0xA5	DALI1 BALLAST 6 ACTUAL LEVEL	Read-only	Actual BALLAST6 state. Value range 0-255. (255 - fault)
30167	166	0xA6	DALI1 BALLAST 7 ACTUAL LEVEL	Read-only	Actual BALLAST7 state. Value range 0-255. (255 - fault)
30168	167	0xA7	DALI1 BALLAST 8 ACTUAL LEVEL	Read-only	Actual BALLAST8 state. Value range 0-255. (255 - fault)
30169	168	0xA8	DALI1 BALLAST 9 ACTUAL LEVEL	Read-only	Actual BALLAST9 state. Value range 0-255. (255 - fault)
30170	169	0xA9	DALI1 BALLAST 10 ACTUAL LEVEL	Read-only	Actual BALLAST10 state. Value range 0-255. (255 - fault)
30171	170	0xAA	DALI1 BALLAST 11 ACTUAL LEVEL	Read-only	Actual BALLAST11 state. Value range 0-255. (255 - fault)
30172	171	0xAB	DALI1 BALLAST 12 ACTUAL LEVEL	Read-only	Actual BALLAST12 state. Value range 0-255. (255 - fault)
30173	172	0xAC	DALI1 BALLAST 13 ACTUAL LEVEL	Read-only	Actual BALLAST13 state. Value range 0-255. (255 - fault)
30174	173	0xAD	DALI1 BALLAST 14 ACTUAL LEVEL	Read-only	Actual BALLAST14 state. Value range 0-255. (255 - fault)
30175	174	0xAE	DALI1 BALLAST 15 ACTUAL LEVEL	Read-only	Actual BALLAST15 state. Value range 0-255. (255 - fault)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
30176	175	0xAF	DALI1 BALLAST 16 ACTUAL LEVEL	Read-only	Actual BALLAST16 state. Value range 0-255. (255 - fault)
30177	176	0xB0	DALI2 BALLAST 1 ACTUAL LEVEL	Read-only	Actual BALLAST1 state. Value range 0-255. (255 - fault)
30178	177	0xB1	DALI2 BALLAST 2 ACTUAL LEVEL	Read-only	Actual BALLAST2 state. Value range 0-255. (255 - fault)
30179	178	0xB2	DALI2 BALLAST 3 ACTUAL LEVEL	Read-only	Actual BALLAST3 state. Value range 0-255. (255 - fault)
30180	179	0xB3	DALI2 BALLAST 4 ACTUAL LEVEL	Read-only	Actual BALLAST4 state. Value range 0-255. (255 - fault)
30181	180	0xB4	DALI2 BALLAST 5 ACTUAL LEVEL	Read-only	Actual BALLAST5 state. Value range 0-255. (255 - fault)
30182	181	0xB5	DALI2 BALLAST 6 ACTUAL LEVEL	Read-only	Actual BALLAST6 state. Value range 0-255. (255 - fault)
30183	182	0xB6	DALI2 BALLAST 7 ACTUAL LEVEL	Read-only	Actual BALLAST7 state. Value range 0-255. (255 - fault)
30184	183	0xB7	DALI2 BALLAST 8 ACTUAL LEVEL	Read-only	Actual BALLAST8 state. Value range 0-255. (255 - fault)
30185	184	0xB8	DALI2 BALLAST 9 ACTUAL LEVEL	Read-only	Actual BALLAST9 state. Value range 0-255. (255 - fault)
30186	185	0xB9	DALI2 BALLAST 10 ACTUAL LEVEL	Read-only	Actual BALLAST10 state. Value range 0-255. (255 - fault)
30187	186	0xBA	DALI2 BALLAST 11 ACTUAL LEVEL	Read-only	Actual BALLAST11 state. Value range 0-255. (255 - fault)
30188	187	0xBB	DALI2 BALLAST 12 ACTUAL LEVEL	Read-only	Actual BALLAST12 state. Value range 0-255. (255 - fault)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
30189	188	0xBC	DALI2 BALLAST 13 ACTUAL LEVEL	Read-only	Actual BALLAST13 state. Value range 0-255. (255 - fault)
30190	189	0xBD	DALI2 BALLAST 14 ACTUAL LEVEL	Read-only	Actual BALLAST14 state. Value range 0-255. (255 - fault)
30191	190	0xBE	DALI2 BALLAST 15 ACTUAL LEVEL	Read-only	Actual BALLAST15 state. Value range 0-255. (255 - fault)
30192	191	0xBF	DALI2 BALLAST 16 ACTUAL LEVEL	Read-only	Actual BALLAST16 state. Value range 0-255. (255 - fault)
30225	224	0xE0	DALI1 DISCOVERY PROGRESS	Read-only	Value range 0-100%.
30226	225	0xE1	DALI2 DISCOVERY PROGRESS	Read-only	Value range 0-100%.
30229	228	0xE4	DALI1 RECEIVED FRAMES COUNTER	Read-only	Number of correct answers from ballasts on DALI1 interface
30231	230	0xE6	DALI2 RECEIVED FRAMES COUNTER	Read-only	Number of correct answers from ballasts on DALI2 interface
30237	236	0xEC	DALI1 ERROR FRAMES COUNTER	Read-only	Number of incorrect answers from ballasts on DALI1 interface
30239	238	0xEE	DALI2 ERROR FRAMES COUNTER	Read-only	Number of incorrect answers from ballasts on DALI2 interface
30245	244	0xF4	DALI1 TRANSMITTED FRAMES COUNTER	Read-only	Number of send commands to ballasts on DALI1 interface
30247	246	0xF6	DALI2 TRANSMITTED FRAMES COUNTER	Read-only	Number of send commands to ballasts on DALI2 interface



Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40253	252	0xFC	DALI COMMAND REGISTER	Read/Write Memory	Value range 0-1. (0 – OFF (default); 1 – ON) Bit0 – DALI1 ON/OFF state Bit1 – DALI1 Broadcast Last Scene Bit2 – DALI1 Broadcast OFF Bit3 – DI1 Command Bit4 – DALI2 ON/OFF state Bit5 – DALI2 Broadcast Last Scene Bit6 – DALI2 Broadcast OFF Bit7 – DI2 Command
40254	253	0xFD	DALI1 CFG REGISTER	Read/Write Memory	Value range 0-1. Bit0 – DALI1 ON/OFF state (0 – OFF (default); 1 – ON) Bit1 – Broadcast Last Scene (0 – OFF (default); 1 – ON) Bit2 – Broadcast OFF (0 – OFF (default); 1 – ON) Bit3 – SI1 Blocking (0 – OFF; 1 – ON (default)) Bit4 – DI1 Dimming OFF (0 – Active (default); 1 – Inactive) Bit11 – All ballasts reset (0 – OFF (default); 1 – ON) Bit12 – Discover new initialization (0 – OFF (default); 1 – ON) Bit13 – Replace ballast (0 – OFF (default); 1 – ON) Bit14 – Add new ballast (0 – OFF (default); 1 – ON) Bit15 – Clear short addresses (0 – OFF (default); 1 – ON)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40255	254	0xFE	DALI2 CFG REGISTER	Read/Write Memory	Value range 0-1. Bit0 – DALI1 ON/OFF state (0 – OFF (default); 1 – ON) Bit1 – Broadcast Last Scene (0 – OFF (default); 1 – ON) Bit2 – Broadcast OFF (0 – OFF (default); 1 – ON) Bit3 – S11 Blocking (0 – OFF; 1 – ON (default)) Bit4 – D11 Dimming OFF (0 – Active (default); 1 – Inactive) Bit11 – All ballasts reset (0 – OFF (default); 1 – ON) Bit12 – Discover new initialization (0 – OFF (default); 1 – ON) Bit13 – Replace ballast (0 – OFF (default); 1 – ON) Bit14 – Add new ballast (0 – OFF (default); 1 – ON) Bit15 – Clear short addresses (0 – OFF (default); 1 – ON)
40258	257	0x101	DALI1 NUMBER OF BALLASTS	Read-only	Give the number of detected ballasts on DALI1 interface
40259	258	0x102	DALI2 NUMBER OF BALLASTS	Read-only	Give the number of detected ballasts on DALI2 interface

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40262	261	0x105	DALI1 BLINK REGISTER	Read/Write Memory	Ballasts blinking procedure. Value 1 will turn ON blinking until value 0 would be send or device would be reset. Bit0 – Ballast 1 blink Bit1 – Ballast 2 blink Bit2 – Ballast 3 blink Bit3 – Ballast 4 blink Bit4 – Ballast 5 blink Bit5 – Ballast 6 blink Bit6 – Ballast 7 blink Bit7 – Ballast 8 blink Bit8 – Ballast 9 blink Bit9 – Ballast 10 blink Bit10 – Ballast 11 blink Bit11 – Ballast 12 blink Bit12 – Ballast 13 blink Bit13 – Ballast 14 blink Bit14 – Ballast 15 blink Bit15 – Ballast 16 blink
40263	262	0x106	DALI2 BLINK REGISTER	Read/Write Memory	Ballasts blinking procedure. Value 1 will turn ON blinking until value 0 would be send or device would be reset. Bit0 – Ballast 1 blink Bit1 – Ballast 2 blink Bit2 – Ballast 3 blink Bit3 – Ballast 4 blink Bit4 – Ballast 5 blink Bit5 – Ballast 6 blink Bit6 – Ballast 7 blink Bit7 – Ballast 8 blink Bit8 – Ballast 9 blink Bit9 – Ballast 10 blink Bit10 – Ballast 11 blink Bit11 – Ballast 12 blink Bit12 – Ballast 13 blink Bit13 – Ballast 14 blink Bit14 – Ballast 15 blink Bit15 – Ballast 16 blink
40266	265	0x109	DALI1 DIMMING STATE	Read/Write Memory	Value is set from BMS – send after every value change. 255 – will stop fade if it is in process and

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
					stops there. Value range 0 - 255.
40267	266	0x10A	DALI2 DIMMING STATE	Read/Write Memory	Value is set from BMS – send after every value change. 255 – will stop fade if it is in process and stops there. Value range 0 - 255.
40270	269	0x10D	DALI1 BALLAST1 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40271	270	0x10E	DALI1 BALLAST2 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40272	271	0x10F	DALI1 BALLAST3 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40273	272	0x110	DALI1 BALLAST4 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40274	273	0x111	DALI1 BALLAST5 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40275	274	0x112	DALI1 BALLAST6 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40276	275	0x113	DALI1 BALLAST7 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40277	276	0x114	DALI1 BALLAST8 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40278	277	0x115	DALI1 BALLAST9 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40279	278	0x116	DALI1 BALLAST10 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40280	279	0x117	DALI1 BALLAST11 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40281	280	0x118	DALI1 BALLAST12 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40282	281	0x119	DALI1 BALLAST13 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40283	282	0x11A	DALI1 BALLAST14 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40284	283	0x11B	DALI1 BALLAST15 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40285	284	0x11C	DALI1 BALLAST16 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40286	285	0x11D	DALI2 BALLAST1 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40287	286	0x11E	DALI2 BALLAST2 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40288	287	0x11F	DALI2 BALLAST3 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40289	288	0x120	DALI2 BALLAST4 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40290	289	0x121	DALI2 BALLAST5 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40291	290	0x122	DALI2 BALLAST6 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40292	291	0x123	DALI2 BALLAST7 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40293	292	0x124	DALI2 BALLAST8 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40294	293	0x125	DALI2 BALLAST9 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40295	294	0x126	DALI2 BALLAST10 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40296	295	0x127	DALI2 BALLAST11 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40297	296	0x128	DALI2 BALLAST12 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40298	297	0x129	DALI2 BALLAST13 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40299	298	0x12A	DALI2 BALLAST14 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40300	299	0x12B	DALI2 BALLAST15 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)
40301	300	0x12C	DALI2 BALLAST16 SETPOINT	Read/Write Memory	Value range 1 – 254. (254 – default)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40334	333	0x14D	DALI1 BALLAST1 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40335	334	0x14E	DALI1 BALLAST2 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40336	335	0x14F	DALI1 BALLAST3 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40337	336	0x150	DALI1 BALLAST4 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40338	337	0x151	DALI1 BALLAST5 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40339	338	0x152	DALI1 BALLAST6 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40340	339	0x153	DALI1 BALLAST7 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40341	340	0x154	DALI1 BALLAST8 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40342	341	0x155	DALI1 BALLAST9 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40343	342	0x156	DALI1 BALLAST10 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40344	343	0x157	DALI1 BALLAST11 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40345	344	0x158	DALI1 BALLAST12 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40346	345	0x159	DALI1 BALLAST13 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40347	346	0x15A	DALI1 BALLAST14 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40348	347	0x15B	DALI1 BALLAST15 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40349	348	0x15C	DALI1 BALLAST16 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40350	349	0x15D	DALI2 BALLAST1 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40351	350	0x15E	DALI2 BALLAST2 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40352	351	0x15F	DALI2 BALLAST3 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40353	352	0x160	DALI2 BALLAST4 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40354	353	0x161	DALI2 BALLAST5 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40355	354	0x162	DALI2 BALLAST6 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40356	355	0x163	DALI2 BALLAST7 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40357	356	0x164	DALI2 BALLAST8 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40358	357	0x165	DALI2 BALLAST9 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40359	358	0x166	DALI2 BALLAST10 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40360	359	0x167	DALI2 BALLAST11 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40361	360	0x168	DALI2 BALLAST12 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40362	361	0x169	DALI2 BALLAST13 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40363	362	0x16A	DALI2 BALLAST14 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40364	363	0x16B	DALI2 BALLAST15 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40365	364	0x16C	DALI2 BALLAST16 MIN	Read/Write Memory	Minimum setpoint value. Value range 0 – 253. (0 – default)
40398	397	0x18D	DALI1 BALLAST1 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40399	398	0x18E	DALI1 BALLAST2 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40400	399	0x18F	DALI1 BALLAST3 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40401	400	0x190	DALI1 BALLAST4 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40402	401	0x191	DALI1 BALLAST5 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40403	402	0x192	DALI1 BALLAST6 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40404	403	0x193	DALI1 BALLAST7 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)



Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40405	404	0x194	DALI1 BALLAST8 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40406	405	0x195	DALI1 BALLAST9 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40407	406	0x196	DALI1 BALLAST10 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40408	407	0x197	DALI1 BALLAST11 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40409	408	0x198	DALI1 BALLAST12 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40410	409	0x199	DALI1 BALLAST13 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40411	410	0x19A	DALI1 BALLAST14 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40412	411	0x19B	DALI1 BALLAST15 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40413	412	0x19C	DALI1 BALLAST16 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40414	413	0x19D	DALI2 BALLAST1 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40415	414	0x19E	DALI2 BALLAST2 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40416	415	0x19F	DALI2 BALLAST3 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40417	416	0x1A0	DALI2 BALLAST4 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40418	417	0x1A1	DALI2 BALLAST5 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40419	418	0x1A2	DALI2 BALLAST6 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40420	419	0x1A3	DALI2 BALLAST7 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40421	420	0x1A4	DALI2 BALLAST8 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40422	421	0x1A5	DALI2 BALLAST9 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40423	422	0x1A6	DALI2 BALLAST10 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40424	423	0x1A7	DALI2 BALLAST11 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40425	424	0x1A8	DALI2 BALLAST12 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40426	425	0x1A9	DALI2 BALLAST13 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40427	426	0x1AA	DALI2 BALLAST14 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40428	427	0x1AB	DALI2 BALLAST15 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40429	428	0x1AC	DALI2 BALLAST16 MAX	Read/Write Memory	Maximum setpoint value. Value range 1 – 254. (254 – default)
40462	461	0x1CD	DALI1 FADE RATE	Read/Write Memory	Dimming speed. Value range 1 – 15. (1 – from MIN to MAX in 0.7 sec; 15 – from MIN to MAX in 90 sec)

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40463	462	0x1CD	DALI2 FADE RATE	Read/Write Memory	Dimming speed. Value range 1 – 15. (1 – from MIN to MAX in 0.7 sec; 15 – from MIN to MAX in 90 sec)
40466	465	0x1D1	DALI1 FADE TIME	Read/Write Memory	Setpoint change speed. Value range 0 – 15. (0 – no transition; 15 – transition from one state to another state in 90 sec)
40467	466	0x1D2	DALI2 FADE TIME	Read/Write Memory	Setpoint change speed. Value range 0 – 15. (0 – no transition; 15 – transition from one state to another state in 90 sec)
40470	469	0x1D5	DALI1 POWER ON LEVEL	Read/Write Memory	Ballasts setpoint after power supply. Value range 0 – 254.
40471	470	0x1D6	DALI2 POWER ON LEVEL	Read/Write Memory	Ballasts setpoint after power supply. Value range 0 – 254.
40474	473	0x1D9	DALI1 SYSTEM FAILURE LEVEL	Read/Write Memory	Ballasts setpoint after DALI interface failure or disconnect from it. Value range 0 – 254.
40475	474	0x1DA	DALI2 SYSTEM FAILURE LEVEL	Read/Write Memory	Ballasts setpoint after DALI interface failure or disconnect from it. Value range 0 – 254.
40600	599	0x257	SLATS BLOCKING COIL REG	Read/Write Memory	Value range 0 – 1. (0 – short press control slats; 1 – short press is in middle press function mode) Bit0 – SLATS 1 blocking local
40601	600	0x258	BLIND UP TIME	Read/Write Memory	Blind opening time – could be set from BMS. Default value – 0 ms.
40617	616	0x268	BLIND DOWN TIME	Read/Write Memory	Blind closing time – could be set from BMS. Default value – 0 ms.
40633	632	0x278	SLATS OPENING TIME	Read/Write Memory	Slats full opening time – could be set only from BMS. Default value – 1000 ms.

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
40649	648	0x288	BLIND STATE	Read/Write Memory	Value range 0-100%.
40657	656	0x290	SLATS STATE	Read/Write Memory	Value range 0-100%.
40665	664	0x298	BLIND_OFF_DELAY	Read/Write Memory	Blind\Shutter pull up time. Value range 0 – 100 (5 - default value)
40673	672	0x2A0	SLATS NUMBER OF STEPS	Read/Write Memory	Value range 1-10. (10 - default value)

Table 27. List of Modbus registers