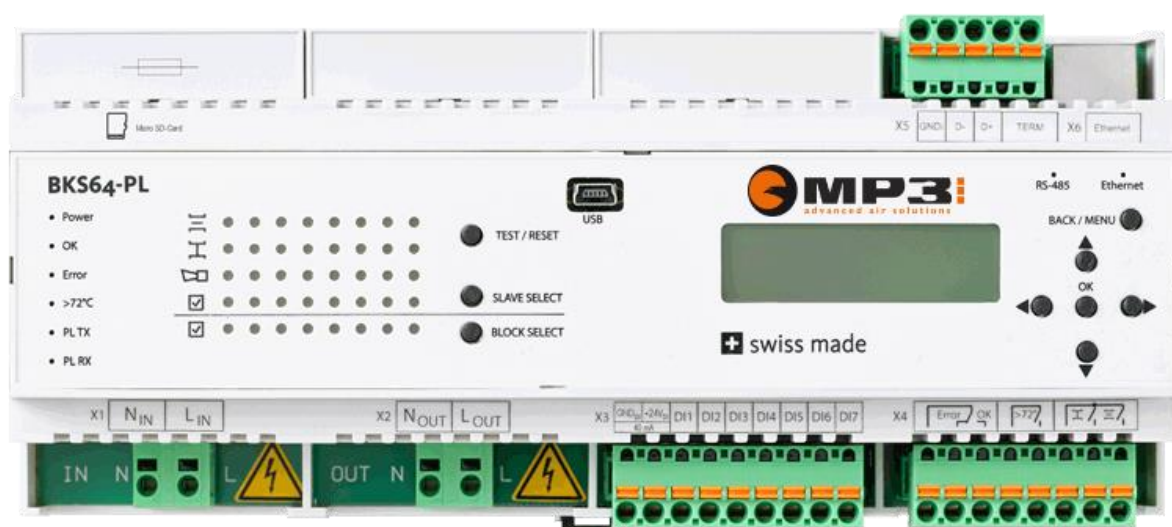Powerline → RECS BKS64-PL (master for 64 dampers)

ReCS BKS64-PL
Technical datasheet

Digital communication and control unit for control and secure monitoring of up to 64 motorized fire protection or smoke extraction dampers in air conditioning systems.

Primary features

+ **Master for up to 64 BKN(E)230-24-PL* units**
+ 230VAC **Powerline** communication on field side
+ Filters included. More than 100 dB attenuation @ 100kHz against power main
+ Topology: Free
+ Max. distance between master and slave: 1200 m
+ Automatic detection of slaves (BKN230-24-PL) due to unique MAC address
+ Automatic or manual assignment of slave addresses (BUS-ID, 1..64) (pre-addressing of slaves possible)
+ Display of damper position (incl. angle**)
+ Button on device for damper function check
+ Conventional actuation via optically isolated control inputs
+ Relay outputs for enabling ventilation
+ Optional control and monitoring via
  Modbus RTU (RS-485)   or   **Modbus TCP/IP (Ethernet)**
  BACnet MS/TP   or   **BACnet IP**
+ Optional monitoring on external computer or on control cabinet touch screen (TCP/IP communication)
+ USB interface and **CDU software** for simple configuration and diagnostics at on-site computer
+ Event logging

* The BKN(E)230-24-PL datasheet is provided in a separate document
**Belimo Top-Line actuators only

1 CONTENTS

2 SUMMARY

The RECS BKS64-PL is a master for up to 64 RECS BKN230-24-PL devices. It is a control and display module for motorized fire protection dampers or smoke extraction dampers. It communicates with the slaves directly via the 230 VAC power cable.

The Powerline slaves (BKN230-24-PL) have a unique physical MAC address and can therefore be detected automatically irrespective of pre-addressing[1] . Automatic or selective addressing, which is primarily for spatial location, can be carried out on the slave itself before installation or later during commissioning.

The damper positions and any faults are displayed directly on the device. Dampers can be selected and tested with the pushbutton. The dampers can be opened and closed via potential-free contact or +24VAC/DC external voltage.

The master can also be controlled via MODBUS (TCP/IP and RTU) or BACnet (IP or MS/TP) and therefore can be considered as a Modbus/Powerline or BACnet/Powerline **Gateway**.

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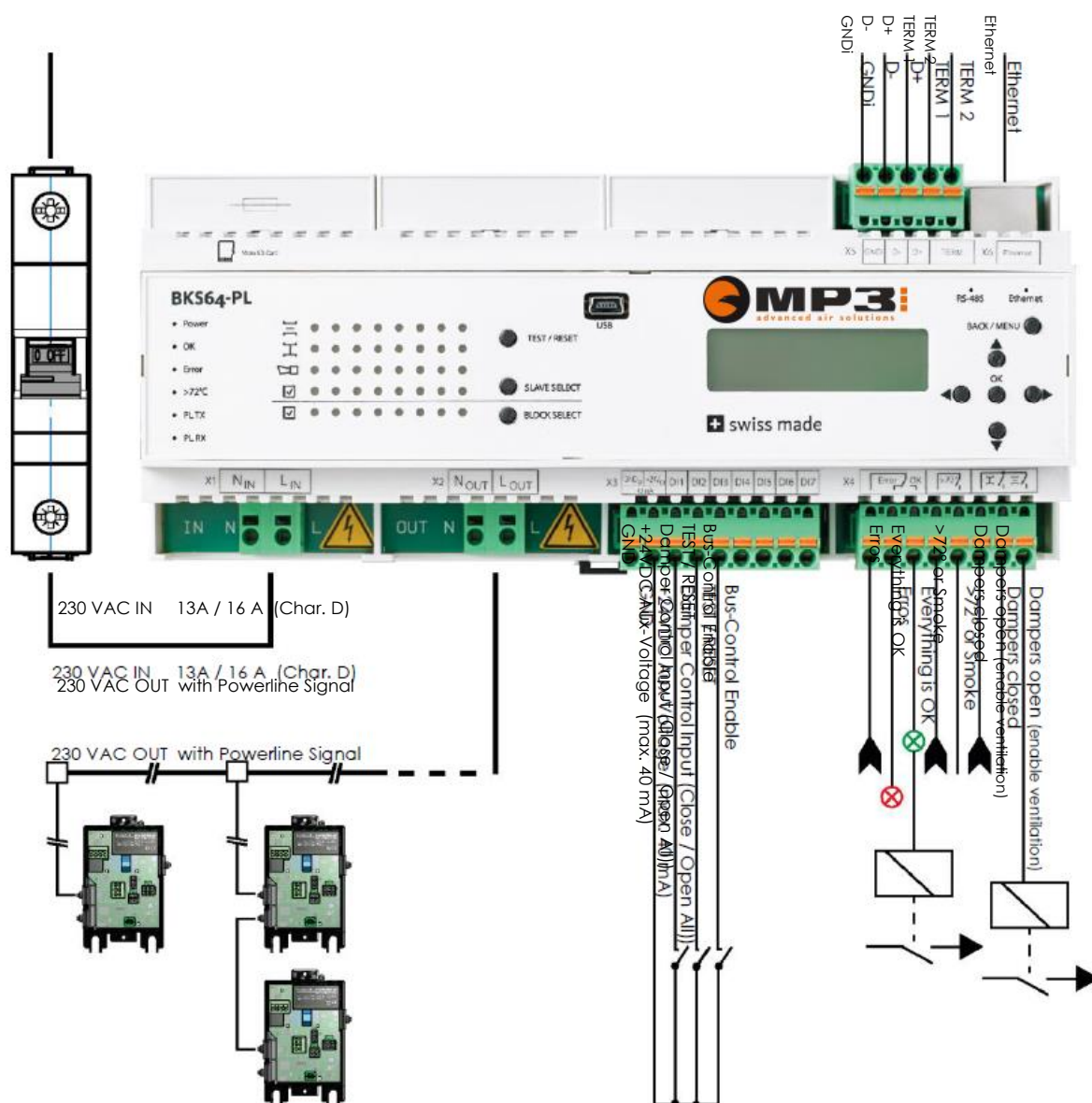
[1] Pre-addressing is described in the BKN230-24-PL datasheet

3 SAFETY INSTRUCTIONS

The device is designed for use in stationary heating, ventilation and air conditioning systems and may not be used for applications outside the specified area of use.

Installation and connection of the 230VAC power supply must be carried out by a qualified electrical fitter. All statutory and official directives must be observed.

DANGER	
⚠️ **230V AC**	**Electric shock in the event of contact with 230 VAC lines**
Wiring may only be carried out when the system is disconnected from the power supply!	

The device may not be disposed of as domestic waste.

4 TECHNICAL DATA

Electrical data	Rated voltage	**230 VAC 50/60Hz**
	Power consumption	8 W
	Dimensioning	120 VA+ N x $S_{slave+actuator}$
	Connections	230VAC power supply: Spring terminals
		230VAC Powerline: Spring terminals
		Otherwise: plug-in spring terminals
	Relay load	0.5A @ 48VAC ; 1A @ 24VDC
	Inputs	Type: Optical coupler 6mA @ 24 VDC
		(common reference point)
	Auxiliary voltage	+24VDC @ max. 40 mA, galvanically isolated
	USB interface	Mini USB, galvanically isolated
Powerline communication	Frequencies	Frequency 1: 80 kHz … 167 kHz
		Frequency 2: 110 kHz … 197 kHz
		See table in section 7.1
	Modulation type	PSK
	Baud rate	Max. 28.8 kbps
	Receiving sensitivity	Max. 36 dBµV
	Number of slaves	Max. 64
	Max. range of master to BKN with TT Installation cables	Line: 1200 m
		Otherwise: max. 1200 m END to END
	Typical cycle time with 64 slaves	2.6 s … 6.4 s
Powerline Filter	Attenuation	>100 dB @ 100 kHz
Modbus RTU BACnet MS/TP (Default)	Medium	RS-485, galvanically **isolated**
	Transmission formats	1-8-N-2, 1-8-N-1, **1-8-E-1** and 1-8-O-1
		(start bit, data bits, parity, stop bits)
	Baud rates	9600, 19200, **38400,** 57600, 76800 Bd
	Addresses	Modbus 1…247 (0 reserved for broadcast) BACnet 0…127
	Termination	150 Ω connectible by wire bridge
	Typical response time	< **10 ms** (delay can be added)
	Parameterization	Via CDU (configuration and diagnostics tool) or device menu
Modbus TCP/IP BACnet IP	IP address assignment	**Static** or DHCP
		Default: 10.0.0.2
	Configuration	Via CDU software or device menu
Safety	Protection class	**II**
	EMC	CE according to 2014/30/EU
	Low Voltage Directive	CE according to 2014/35/EU
	Mode of operation	Type 1 (EN 60730-1)
	Ambient temperature	-30˚ … +50˚C
	Storage temperature	-30˚ … +80˚C
	Humidity test	95% rel. H., non condensing (EN 60730-1)
	Maintenance	Maintenance-free
Mechanical data	Dimensions	Installation width 212.1 mm
		Height 94 mm
		Depth 58 mm
	Weight	approx. 465 g
	Installation	on 35 mm DIN rail

5 LIMITATIONS AND INSTRUCTIONS

The device has an internal filter which blocks mains interference signals and Powerline signals to the mains. Parallel operation with several masters is thereby possible without additional filters. However since Powerline signals can also be transmitted to adjacent systems via inductive or capacitive lines, different communication channels must be used on the different masters.

If possible do not route the 230VAC Powerline cables immediately parallel to lines to devices which could cause major interference e.g. inverters. If this cannot be avoided, switching channels can remedy any interference.

Use of shielded installation cables can also prevent any interference. The shielding should be earthed on the master side and should be connected to the last slave. The mounting rail and mounting plate should be earthed properly.

The master has an internal 10A fine-wire fuse. However, a **13A** (<32 slaves) or **16A (>32 slaves) circuit breaker, characteristic D** must be installed upstream from the master as line protection.

Note: In the event of short-circuit, e.g. terminal confusion, of slaves which are a long way away the circuit breaker trigger current may not reached. In this case the fine-wire fuse of the master breaks the circuit. Therefore the resistance between L_{Out} and N_{Out} must always be measured before commissioning (high-resistance > 10 kΩ).

The master's 230VAC line with Powerline Signal (L_{Out}, N_{Out}) may not be used for third party slaves.

6 OVERVIEW OF DEVICE
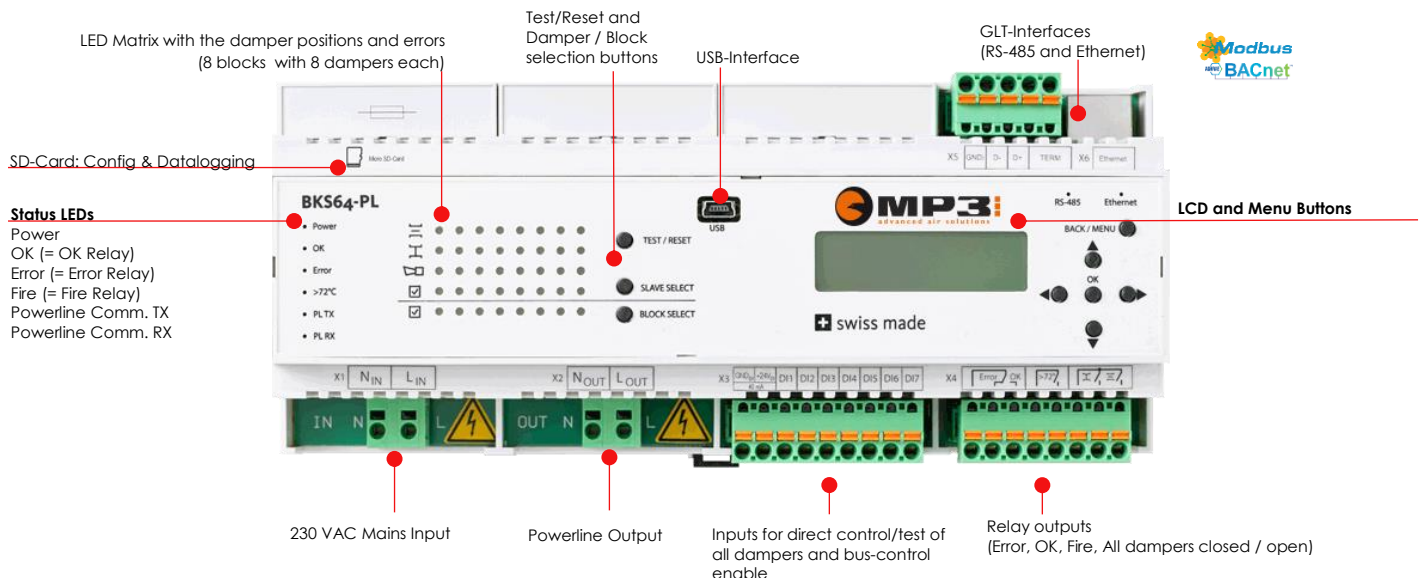
7 CHARACTERISTICS AND FUNCTIONS

7.1 POWERLINE COMMUNICATION

Communication with slaves is via digital phase modulation (phase-shift keying) simultaneously on two frequencies. Depending on the connection quality, for each individual BKN the master can automatically select between different PSK types (B-PSK, Q-PSK, 8-PSK). In addition, if connections are subject to strong interference, communication can only take place in the zero crossing phase.

The two communication frequencies are defined by the communication channel according to the following table:

Channel	Frequency 1 [kHz]	Frequency 2 [kHz]
1	80	110
2	83	113
3	86	116
4	89	119
5	92	122
6	95	125
7	98	128
8	101	131
9	104	134
10	107	137
11	140	170
12	143	173
13	146	176
14	149	179
15	152	182
16	155	185
17	158	188
18	161	191
19	164	194
20	167	197

A Power Cycle must be carried out after changing channels.
The channel is automatically transmitted to the connected slaves at system restart.

7.2 RESPONSE TIMES & BUS MONITORING

A query to the RECS BKN230-24-PL lasts, depending on the type of PSK modulation, between 40 ms and 100 ms, so **with 64 slaves** a typical cycle time is between 2.6 s and 6.4 s. This cycle time is displayed on the LCD of the master.

If the BKN receives no control signal from the master during the pre-set BUS timeout, it forces the actuator to travel to the safety position. In the case of smoke extraction, the Bus Timeout is switched off as both damper positions may be safety positions.

8 OPERATION

The device can be configured and operated directly via the integrated display and the buttons.

8.1 SLAVE MENU

The most important operating parameters can be set via the menu:

Main menu	Function / sub-menu	Characteristic	Range of values / options	Operation
Addressing				
	Rescan		No, Yes	◄► , Power Cycle
	Auto			
	Manual		- , 1…64	Digits: ◄► Numerical value ▼▲
	Clear All		No, Yes	
	Clear Selected			
	Back			
Settings				
	Slaves			
		Application	**Fire Protection**	▼▲
			Smoke Control	
		Max Time to Open [s]	30…600	Digits: ◄► Numerical value ▼▲
		Max Time to Open 15 Degrees [s]	5…600	Digits: ◄► Numerical value ▼▲
		Max Time to Close [s]	10…600	Digits: ◄► Numerical value ▼▲
		Auto Test Wait [s]	1…255	Digits: ◄► Numerical value ▼▲
		Communication Timeout	5…255	Digits: ◄► Numerical value ▼▲
		Max Power [W]	10…30	Digits: ◄► Numerical value ▼▲
		Resolved Error Behavior	Normal Operation	▼▲
			Stay Closed	
		Max Identify Time [min]	1…255	Digits: ◄► Numerical value ▼▲
		Back		
	Control			
		Interface	BACnet IP	
			BACnet MSTP	
			Modbus TCP/IP	▼▲
			Modbus RTU	
			None	
		Bus Watchdog	On	▼▲
			Off	
		Back		
	Network			
		IP Mode	DHCP	▼▲
			STATIC	
		IP	0.0.0.0 - 255.255.255.255	Digits: ◄► Numerical value ▼▲
		MASK	0.0.0.0 - 255.255.255.255	Digits: ◄► Numerical value ▼▲
		Gateway	0.0.0.0 - 255.255.255.255	Digits: ◄► Numerical value ▼▲
		MAC **(read only)**	AA:AA:AA:AA:AA:AA	
		Telnet	On	▼▲
			Off	
		Back		
	RS-485			
		ID	Mode: 1…247	Digits: ◄► Numerical value ▼▲
			BACnet: 0…127	
		Baud Rate	9600	
			19200	
			38400	▼▲
			57600	
			76800	
		Parity	Even	▼▲
			Odd	
			None	
		Stop Bits	1	▼▲
			2	
		Delay	0…255	Digits: ◄► Numerical value ▼▲
		Back		
	BACnet			
		Device ID	1…4 194302	Digits: ◄► Numerical value ▼▲
		APDU Timeout	1000…60000	Digits: ◄► Numerical value ▼▲
		APDU Retries	0…10	Digits: ◄► Numerical value ▼▲
		Max Master	1…127	Digits: ◄► Numerical value ▼▲
		Max Info Frames	1…255	Digits: ◄► Numerical value ▼▲
		Port	0…65535	Digits: ◄► Numerical value ▼▲
		Hide Unaddressed Slaves	On / Off	▼▲
		Back		
	Powerline			
		TX Gain	0…31	▼▲, Power Cycle
		Channel	0…20	▼▲, Power Cycle
	Date Time			
		Time Zone	+0, +1, +2, +3	▼▲
		Daylight Saving	Auto, Off	▼▲
		Set Date Time	1.1.2000 00:00:00 –	Digits: ◄► Numerical value ▼▲
			31.12.2100 23:59:59	
		Back		
	Save & Restart			
	Revert Changes			
	Back			
Reset to Factory Defaults			No, Yes	◄►
Restart Device			No, Yes	◄►
Force Slave Update			No, Yes	◄► , Power Cycle
Lock Menu				
Back				

To activate changed settings, you need to save (Save & Restart) and carry out a Power Cycle depending on the setting.
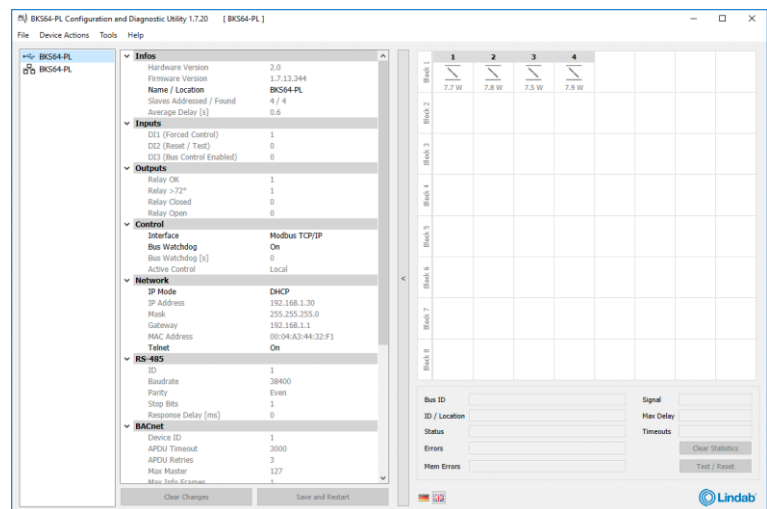
Once the device is ready to operate, the following content will appear:
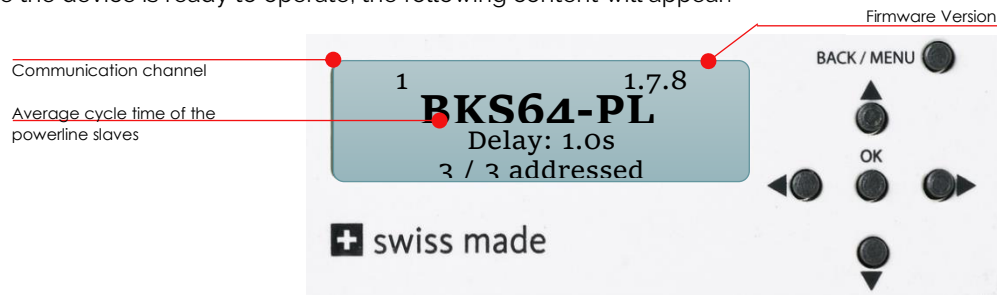
The menu locks automatically after a certain time. Press (> 3 s) the **BACK / MENU** button to unlock.

8.2 CONFIGURATION AND DIAGNOSTIC SOFTWARE (CDU)

The device is easily configured with the CDU. It offers an overview of the hardware inputs and outputs and displays the Powerline slaves and their status.


The most important function is the selective slave addressing. It can be retrieved via **Tools -> Slave Addressing**...

Slaves which have been found but not yet addressed are displayed in the list on the left. Pressing the Test button on a slave selects the corresponding MAC address. The slaves can be set to the corresponding address via **Drag and Drop**. In the alternative automatic process the BUS IDs are assigned ascending corresponding to the MAC address.
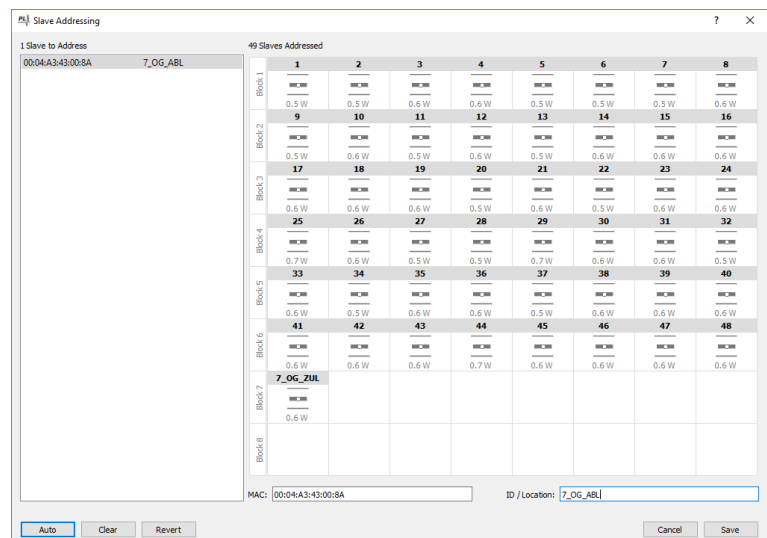

Addressing can also take place directly at the device. (See section 8.4 and 8.5)

Devices running FW 1.7.x and higher log all events to the SD-card. The data can be visualized directly on the device or in the CDU. With a double click on the master in the list or a slave in the matrix, corresponding history will directly show up.
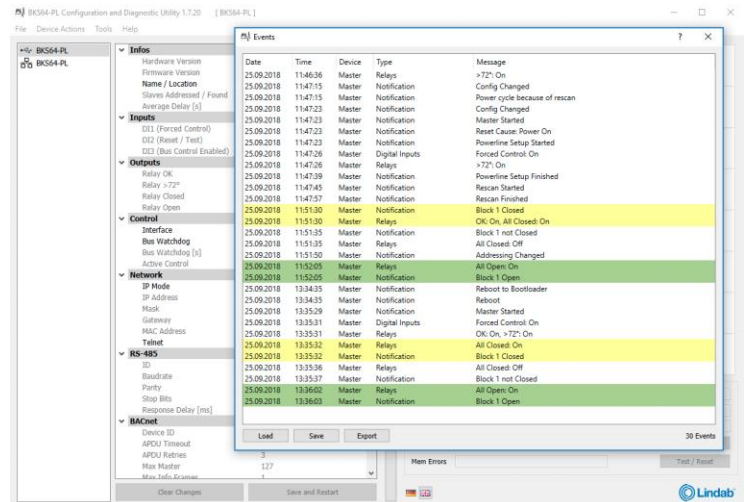
The Events dialog (**Tools -> Events...**) allows to filter the events by device, event type and time range.
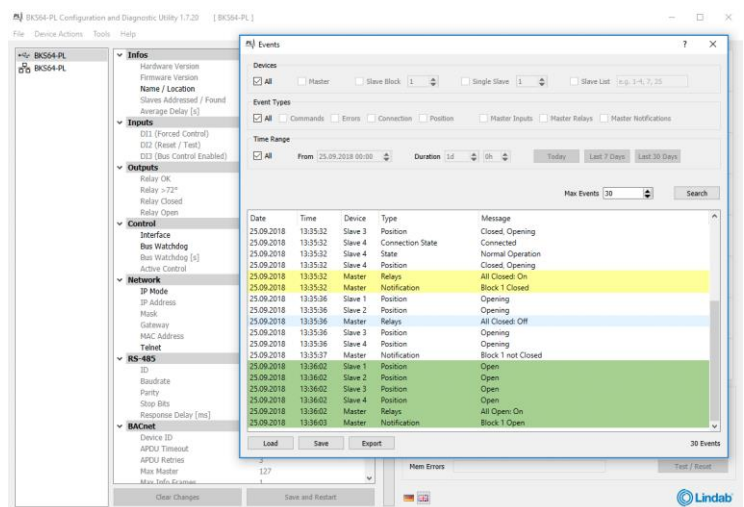
The Data can be exported to a CSV or PDF File and can be used to show that the commission was successful.
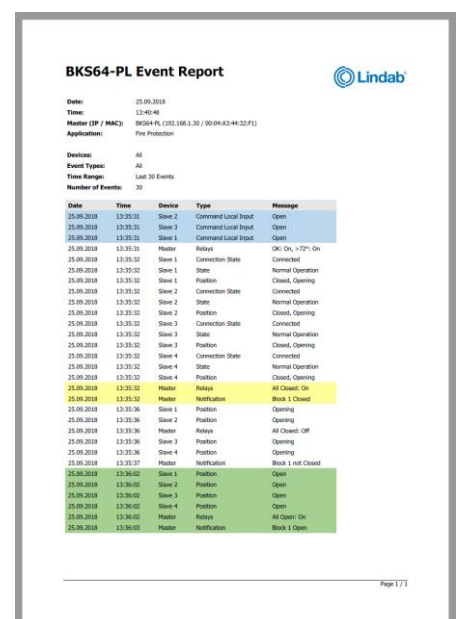
8.3 INITIAL COMMISSIONING

Powerline communication is deactivated under factory settings. This is indicated by the channel **"0"** in the top left corner of the LCD display.

To commission the system the master first needs to search for and address all connected slaves. Addressing can be done directly at the master or via the CDU.

During the search process, the master checks whether all slaves have the current firmware. If not, the corresponding slaves are updated first. This process can take several minutes depending on the connection quality.

The master detects the slaves based on their unique MAC address, irrespective of whether they have been previously addressed (e.g. directly by the BKN tool) or not. Only addressed slaves are controlled by the master, appear on the LCD display, influence the relay logic and can be observed or monitored by Modbus or BACnet. Duplicated addresses (BUS IDs) are detected by the master and reset to **0**.

If non-addressed slaves are present, they can be addressed via the device menu (see example) or via the CDU.

An installation list or an electrical or ventilation plan can be used as a basis for addressing.
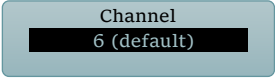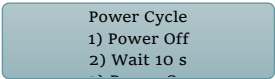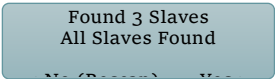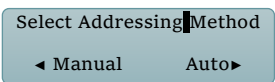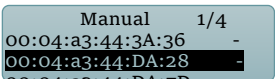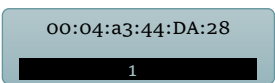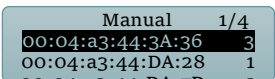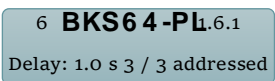
Note: If you press the button on the slave the corresponding MAC-address is automatically selected on the master.

Example project with 3 dampers

Damper with BKN230-24-PL   08.03.2018

BUS-ID	ID	MAC Address
1	HB_VW03_U04_TL001_F01	00:04:A3:44:3A:36
2	HB_VW03_U04_TL001_F02	00:04:a3:42:DA:28
3	HB_VW03_U04_TL001_F03	00:04:a3:42:DA:7D
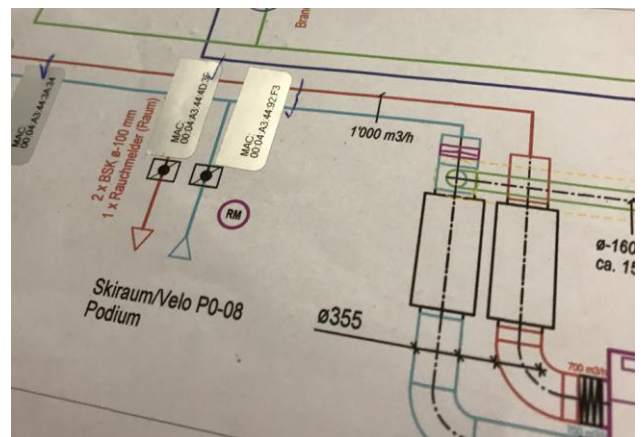
8.3.1 Commissioning with direct addressing on the master

The following commissioning process need only be carried out once.

Step	Display	Operation	LED matrix
1	O **BKS64-PL** 1.6.1 Press ► to scan for	Start scan ►	Only addressed slaves are displayed on the matrix
2	Channel 6 (default)	Select channel ▼ ▲, OK	
3	Power Cycle 1) Power Off 2) Wait 10 s	Switch off device via circuit breaker	
4		Wait 10 seconds Switch on device again	
	6 **BKS64-PL** 1.6.1 Init		
	6 **BKS64-PL** 1.6.1 Init	Slaves with outdated firmware are updated	
	6 **BKS64-PL** 1.6.1 Init	Scans for slaves	
5	Found 3 Slaves All Slaves Found	► When all slaves are found ◄ Repeat search (back to **step 2**)	
6	Select Addressing Method ◄ Manual Auto►	◄ Manual addressing or ► automatic addressing (continue to **step 11**)	
7	Manual 1/4 00:04:a3:44:3A:36 - 00:04:a3:44:DA:28 -	Select MAC address ▼ ▲, OK	
8	00:04:a3:44:DA:28 1	Set Address (BUS-ID) Digits: ◄► Numerical value: ▼ ▲ OK	
9	Manual 1/4 00:04:a3:44:3A:36 3 00:04:a3:44:DA:28 1	Repeat steps 7 and 8 until all slaves have been addressed and click **BACK** to end	
10	ALL Slaves Correctly Addressed?	► confirm that all slaves have been addressed or ◄ back to **step 9**	
11	6 **BKS64-PL** 1.6.1 Delay: 1.0 s 3 / 3 addressed	Commissioning complete	

8.3.2 Remove, replace or add slaves

Slaves may only be removed, replaced or added when the system is disconnected from the power supply. After a system modification a new search must be started and the addresses reset if necessary. The addresses of untouched slaves remain unchanged.

8.4 COMMISSIONING WITH SEVERAL MASTERS

In a system in which the Powerline cables from different masters are routed immediately in parallel, **different channels must be set** because the signals can couple by capacitive or inductive means to those of other systems. **The Powerline commissioning must only take place simultaneously on one master. All masters must be fused separately in order to be able to commission them in turn.** Once commissioning is complete, simultaneous start-ups, e.g. after a power failure, are not a problem.

Method:

1. Switch off both masters
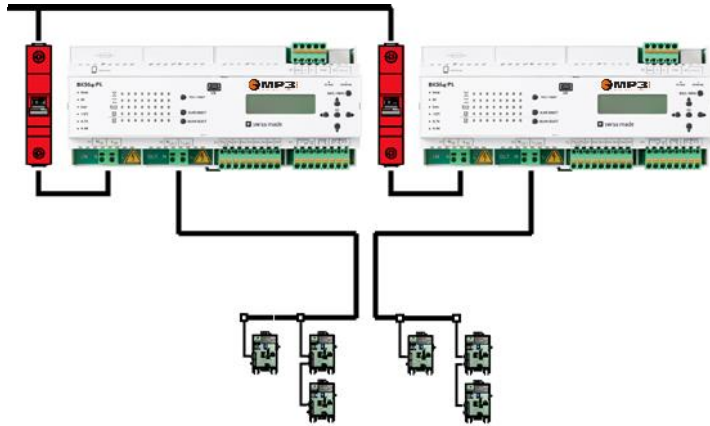
2. Switch on power to first master and commission Powerline with **standard channel 6**
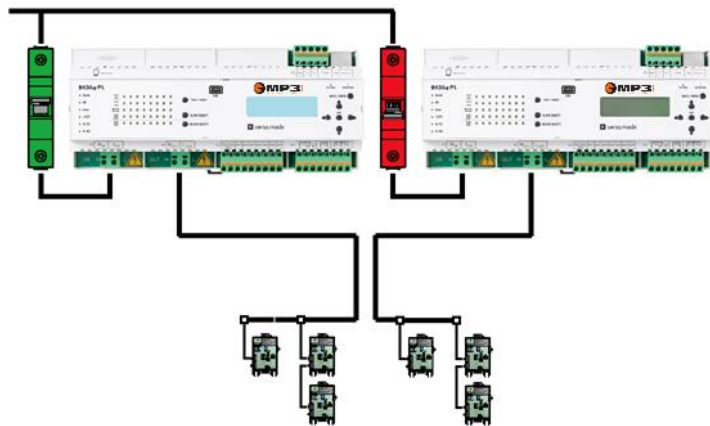
3. Switch on power to second master and commission Powerline with **another channel**.
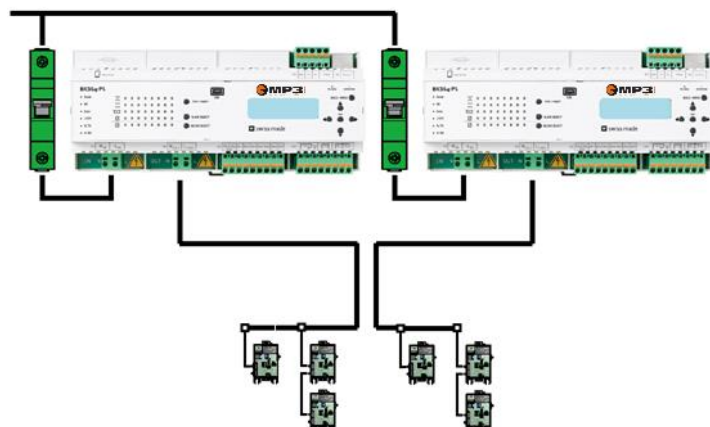
8.5 DAMPER TESTS AND STATUS DISPLAY

To test a specific damper, these must first be selected via **Block Select** and **Slave Select**.

Example: Test damper with BUS-ID 12

Press Block Select to enter in the right range (9..16)

Press Slave Select 3 times to select slave No 12
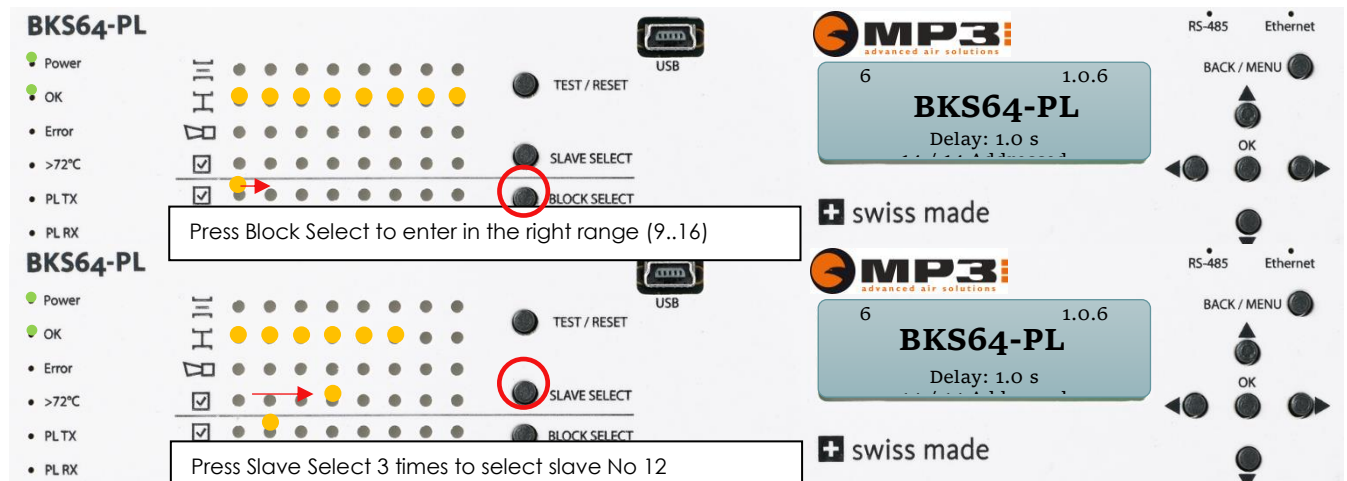
When a damper is selected, its status incl. power consumption is described on the LCD display. Press **TEST/RESET** to reset errors or start an automatic test run.

If a damper has an error, this is signalled with the corresponding LED. If a damper with an error is not in the currently selected block, the corresponding block flashes red. To determine the error, navigate to the corresponding block and select the corresponding damper.

Example: Smoke alarm triggered at damper 12
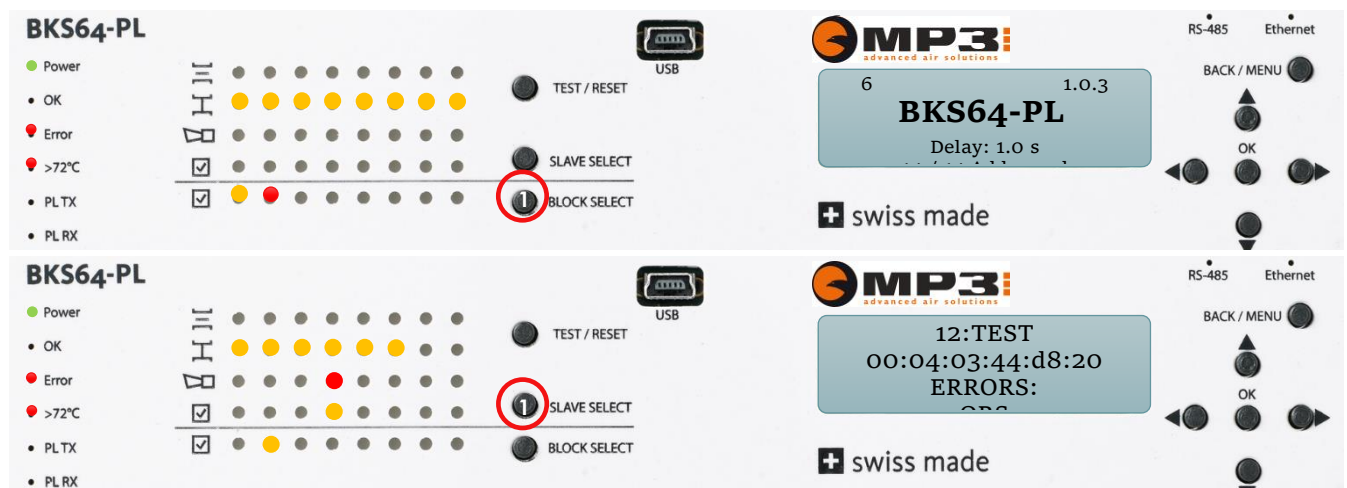
9 TERMINAL CONFIGURATION, INPUTS AND OUTPUTS

X1 Power supply

Spring terminal for 230 VAC 2 x 2.5 mm² installation cable

X1.1   Neutral conductor (N)
X1.2   Phase conductor (L)

Fuse protection:
13 A, characteristic D if less than 32 x RECS BKN230-24-PL
16 A, characteristic D if 32 or more x BKN230-24-PL

(slave fuse:10A, slow-blow)

X2 Powerline output

Spring terminal for 230 VAC installation cable

X1.1   Neutral conductor (N)
X1.2   Phase conductor (L)

Cross section
1.5 mm² if less than 32 x RECS BKN230-24-PL
2.5 mm² if 32 or more x BKN230-24-PL

Connect optional shield to earth only at the master end.
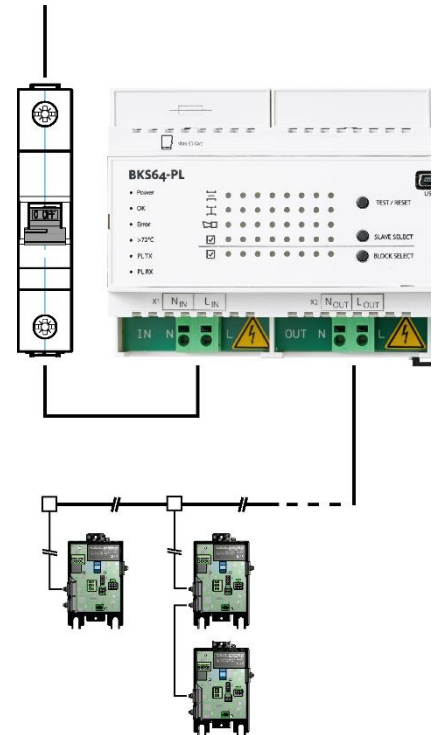
Note:
Poorly connected 230 VAC cables can greatly affect the communication and destroy master or slaves.

X3   **Auxiliary voltage (electrically isolated) and optical coupler inputs**

X3.1 GND_{DI} (common GND)

X3.2 $+24V_{DI}$ (max. load: 40 mA)
       (use only for own inputs DI1 to DI7)

X3.3   DI1, damper control
       +24 VAC/VDC: *Dampers open*
       0V or open: *Dampers close*

X3.4   DI2, Test/Reset
       +24 VAC/VDC:
       Reset error or reverse damper position

X3.5   DI3, bus enable
       +24 VAC/VDC:
       Control via bus enabled and prioritised
       DI1/DI2 ignored
       0V or open:
       Actuation only possible via DI1/DI2,
       BUS control commands are ignored,
       BUS monitoring possible

X3.6   DI4 Reserved (query per BUS possible)
X3.7   DI5 Reserved (query per BUS possible)
X3.8   DI6 Reserved (query per BUS possible)
X3.9   DI7 Reserved (query per BUS possible)
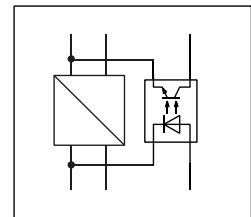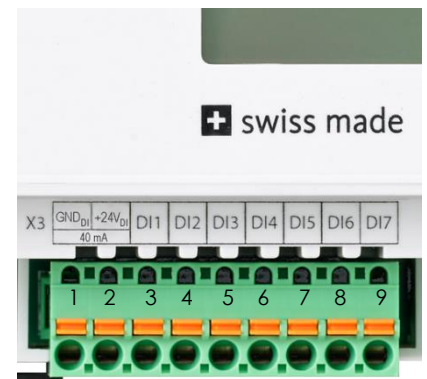
X4   **Relay outputs**

       Operating relay (changeover)
X4.1   COM
X4.2   NC Collective fault
X4.3   NO Everything OK (system on)

       Fire alarm relay (thermoelectric tripping device or smoke detector)
X4.4   COM
X4.5   NC

       Damper position (2 x NO)
X4.6   COM
X4.7   NO damper closed
X4.8   NO damper open

1	2	3	4	5	6	7	8
Collective fault			Smoke detector / thermoelectric tripping device		Damper position		
COM	Fault	No fault	>72˚		COM	CLOSED	OPEN
Changeover			NC		2 x NO		
1 and 2 connected: Error or device disconnected from power **1 and 3** connected: No fault			**4 and 5** connected: Smoke detector on BKN and thermoelectric tripping device at actuator OK **4 and 5** open: Smoke detector on BKN or thermoelectric tripping device at actuator triggered		**6 and 7** connected: All dampers closed **6 and 8** connected: All dampers open Device disconnected from power: Contacts open		

X5   **RS-485 (3-wire, isolated)**

X5.1   GNDi (isolated GND) (**earthed at master end**)
X5.2   D-
X5.3   D+
X5.4   Terminating resistor 1
X5.5   Terminating resistor 2 (bridge to X5.4 for terminating resistor)
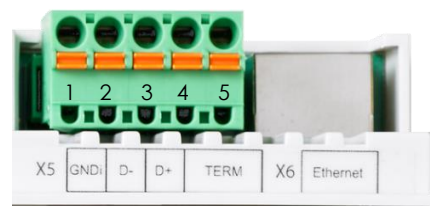
Supported protocols: Modbus RTU and BACnet MS/TP

The interface parameters (baud rate, number of start and stop bits and parity) and the address are defined with the configuration tool or via the menu.

X6   **Ethernet**

The IP address can be obtained automatically via DHCP or assigned statically. This setting takes place via the configuration tool or the menu.

Supported protocols: Modbus TCP/IP and BACnet IP

10 ACTUATION

10.1 CONVENTIONAL ACTUATION

The command to open or close all dampers can be given with the digital input DI1 (terminal X3.3). For this purpose the auxiliary voltage at X3.2 is available. Alternatively an external power supply (24VAC / +24VDC) can be used.

Actuation with auxiliary voltage
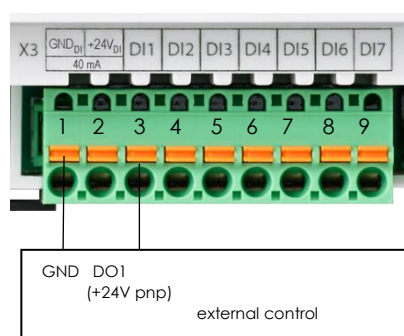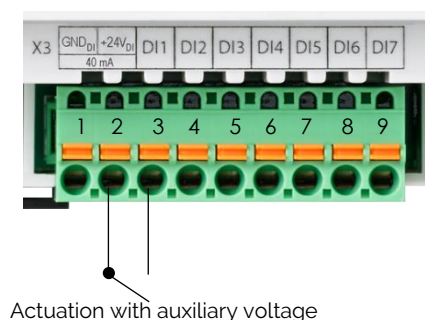
Actuation via the logic voltage of an ext. controller

Note: If you route the actuation signal (DI1) via the fire alarm relay (X4.4/X4.5), all dampers close when the smoke detector / thermoelectric tripping device of any slave triggers.

As a setting (Resolved Error Behavior) you can also set whether a fire alarm, if not active anymore, has to be reset (input DI2, RESET button or bus) or **not (default)** so that the dampers open again.

10.2 BUS ACTUATION

BUS control can be activated via input DI3. Interruption of the input allows the user to switch to conventional actuation (for example manual operation). Monitoring via bus is also possible if DI3 is not active.

The different protocols can be selected via the configuration tool or the menu
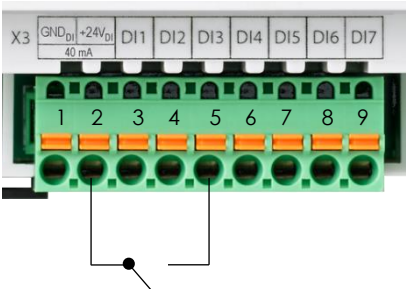
10.2.1 MODBUS (TCP/IP or RTU)

The registers can be read when the control interface is set to Modbus TCP/ IP or RTU. To control the slaves the hardware input DI3 must be enabled. A bus watchdog ensures that the dampers close when no further command is received within two minutes.

10.2.1.1 *Implemented commands*

Standard commands	Read Holding Registers [3] Read Input Register [4] (same as Read Holding Register [3]) Write Single Register [6] Write Multiple Registers [16]

Organization of the registers	**Status register and I/O register** Register **no. 1 to 16** (description follows) **Control and status register (compressed mapping)** Register **no. 10,001 to 10,048** (description follows) **Control and status register (mapping for individual slaves)** Register no. **(100 * BUS-ID) + 1** to **(100 * BUS-ID) + 14** (BUS-ID: 1..64)

10.2.1.2 Status and I/O register

No.	Addr.	Name	Description	Read	Write
1	0	Reserved	Reserved	X	
2	1	Bus watchdog	0: Bus watchdog disabled 1: Bus watchdog enabled	X	
3	2	Bus watchdog countdown	120...0 [s] When bus watchdog is enabled and the countdown to 0 has completed, forced control for all dampers is set to "no command" (fire protection dampers close)	X	
4	3	Reset bus watchdog countdown	A write command (0 or 1) resets the countdown to 120 seconds	X	X
5	4	Local forced control DI1	0: No voltage at DI1 1: +24V at DI1	X	
6	5	TEST/RESET DI2	0: No voltage at DI2 1: +24V at DI2	X	
7	6	Bus control DI3	0: BUS control not active 1: BUS control active	X	
8	7	DI4[1]	0: No voltage at DI4 1: +24V at DI4	X	
9	8	DI5[1]	0: No voltage at DI5 1: +24V at DI5	X	
10	9	DI6[1]	0: No voltage at DI6 1: +24V at DI6	X	
11	10	DI7[1]	0: No voltage at DI7 1: +24V at DI7	X	
12	11	Operating relay	0: Error 1: Everything OK	X	
13	12	Fire alarm relay	0: Relay not activated 1: Relay activated	X	
14	13	Relay all dampers closed	1: All addressed dampers are closed	X	
15	14	Relay all dampers open	1: All addressed dampers are open	X	
16	15	Reset	1: Acknowledge all damper related errors without starting test run[2] (resets the bus countdown)	X	X

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[1] In future software versions the inputs DI4-DI7 may be assigned new operating functions

[2] In case of saved mechanical errors, a test run will be executed as well

10.2.1.3 Control and status register (compressed mapping)

No.	Addr.	Name	Affected Powerline BUS-IDs	Description	Read	Write
10,001 10,002 10,003 10,004 10,005 10,006 10,007 10,008	10,000 10,001 10,002 10,003 10,004 10,005 10,006 10,007	**Forced control**	01 - 08 (Block 1) 09 – 16 (Block 2) 17 – 24 (Block 3) 25 – 32 (Block 4) 33 – 40 (Block 5) 41 – 48 (Block 6) 49 – 56 (Block 7) 57 – 64 (Block 8)	Bit XX: two bits per damper 00 = no command (fire dampers close) 01 = damper open 10 = damper close (11) => 01 (damper open) Value: 01010101b (21845) or value: 11111111b (-1) opens all dampers in the corresponding block	X	X
10,009 10,010 10,011 10,012	10,008 10,009 10,010 10,011	**TEST/Reset**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 1 = resets saved errors and starts automatic test run (resets the bus watchdog countdown)	X	X
10,013 10,014 10,015 10,016	10,012 10,013 10,014 10,015	**Active, addressed dampers**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 0 = Damper not active (BUS-ID not used) 1 = Damper active (BUS-ID is used)	X	
10,017 10,018 10,019 10,020	10,016 10,017 10,018 10,019	**Powerline connection status**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 0 = No connection 1 = Connection via Powerline OK	X	
10,021 10,022 10,023 10,024	10,020 10,021 10,022 10,023	**Initialization**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 0 = Damper in operation 1 = Damper in initialization	X	
10,025 10,026 10,027 10,028	10,024 10,025 10,026 10,027	**TEST mode**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 0 = Normal mode 1 = Damper being tested	X	
10,029 10,030 10,031 10,032	10,028 10,029 10,030 10,031	**Error**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 0 = No error[1] 1 = Error[1]	X	
10,033 10,034 10,035 10,036	10,032 10,033 10,034 10,035	**Damper position Open**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 0 = Damper is not open 1 = Damper is open	X	
10,037 10,038 10,039 10,040	10,036 10,037 10,038 10,039	**Damper position Closed**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 0 = Damper is not closed 1 = Damper is closed	X	
10,041 10,042 10,043	10,040 10,041 10'042 10,043	**Damper position Opening**	1 - 16 17 - 32 33 – 48 49 -64	Bit X: 0 = Damper not opening 1 = Damper opening	X	

[1] With the device setting „**Normal**" (Menu→Settings→Slaves→Resolved Error Behavior) only actual errors are signaled, with „**Stay Closed**" actual and saved errors are signaled

10,044					
10,045	10,044	**Damper position**	1 - 16	Bit X:	X
10,04 6	10,045	**Closing**	17 - 32	0 = Damper not closing	
	10'046		33 – 48	1 = Damper closing	
10,04 7	10,047		49 -64		
10,04 8					

10,045	10,044	**Damper position**	1 - 16	Bit X:	
10,04	10,045	**Closing**	17 - 32	0 = Damper not closing	
				1 = Damper closing	

10.2.1.4 Status register (block mapping)

No.	Addr.	Name	Description	Read	Write
10'201 10'202 10'203 10'204 10'205 10'206 10'207 10'208	10'200 10'201 10'202 10'203 10'204 10'205 10'206 10'207	**Block 1 Error** **Block 2 Error** **Block 3 Error** **Block 4 Error** **Block 5 Error** **Block 6 Error** **Block 7 Error** **Block 8 Error**	0 = No addressed slave in the corresponding block has an error[1] 1 = At least one addressed slave in the corresponding block has an error**Errore. Il segnalibro non è definito.**	X	
10'209 10'210 10'211 10'212 10'213 10'214 10'215 10'216	10'208 10'209 10'210 10'211 10'212 10'213 10'214 10'215	**Block 1 Open** **Block 2 Open** **Block 3 Open** **Block 4 Open** **Block 5 Open** **Block 6 Open** **Block 7 Open** **Block 8 Open**	0 = Not all addressed slaves in the corresponding block are open 1 = all addressed slaves in the corresponding block are open	X	
10'217 10'218 10'219 10'220 10'221 10'222 10'223 10'224	10'216 10'217 10'218 10'219 10'220 10'221 10'222 10'223	**Block 1 Closed** **Block 2 Closed** **Block 3 Closed** **Block 4 Closed** **Block 5 Closed** **Block 6 Closed** **Block 7 Closed** **Block 8 Closed**	0 = Not all addressed slaves in the corresponding block are closed 1 = all addressed slaves in the corresponding block are closed	X	

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[1] With the device setting „**Normal**" (Menu→Settings→Slaves→Resolved Error Behavior) only actual errors are signaled, with „**Stay Closed**" actual and saved errors are signaled

10.2.1.5 Control and status register (mapping for individual slaves)

The information can also be queried individually for each damper. The information about the damper with Powerline BUS-ID 1 is in registers 101 to 114 and about the damper with BUS-ID 2 in 201 to 214 etc.

E.g. damper with BUS-ID 1

No.	Addr.	Name	Description	Read	Write
101	100	Active	0: not active (BUS-ID not assigned, register no. 102 – no. 114 are not valid and set to -1) 1: active (corresponding BUS-ID is used, register no. 102 – no. 114 are valid)	X	
102	101	Forced control	0 = None -> fire dampers close 1 = Damper open 2 = Damper closed	X	X
103	102	Test / reset	0 = No test 1 = Reset saved errors and start automatic test run	X	X
104	103	Type	3 (fire protection or smoke extraction)		
105	104	Powerline communication	0: not connected (Powerline signal interrupted or error) 1: connected	X	
106	105	Initialization	1: Device in initialization	X	
107	106	Test	2: Device in auto test mode	X	
108	107	Damper position	**Normal actuator** 0: Damper closed 10,000: Damper open 5,000: Otherwise **Belimo Top-Line actuator:** 0: 0% open (damper closed) 1,000: 10% open … 10,000: 100% open (damper open)	X	
109	108	Opening	1: The damper opens (when the damper is open 0)	X	
110	109	Closing	1: The damper is closing (when the damper is closed 0)	X	
111	110	Power consumption of actuator in mW	Examples: 0: The actuator is using no power 2000: The actuator is using 2 W 4800: The actuator is using 4.8 W	X	
112	111	Errors	BIT 0: Actuator's BAE (thermoelectric tripping device) triggered BIT 1: Smoke detector triggered BIT 2: - BIT 3: Internal error BIT 4: Mechanical error BIT 5: Overload BIT 6: Initialization error (requires reset) BIT 7: Connection to actuator lost	X	
113	112	Saved errors	BIT 0: Actuator's BAE (thermoelectric tripping device) triggered BIT 1: Smoke detector triggered BIT 2: - BIT 3: Internal error BIT 4: Mechanical error BIT 5: Overload BIT 6: - BIT 7: Connection to actuator lost	X	
114	113	Error summary	1: At least one error		

10.2.2 BACnet

10.2.2.1 General Information & BIPPs

General Information	Vendor Name	BV-Control AG
	Vendor Identifier	859
	BACnet Protocol Revision	12
	BACnet Standard Device Profile	BACnet Application Specific Controller (B-ASC)
	Segmentation Capability	No
	Data Link Layer Options	MS/TP master Baud Rates: 9600, 19200, 38400, 57600, 76800 BACnet IP master
	Device Address Binding	No static device binding supported
	Character Sets Supported	ISO 10646 (UTF-8)
	Network Security Options	Non-secure device
BIPPS **BACnet Interoperability** **Building Blocks supported**	DS-COV-B	Data Change of Value-B
	DS-RP-B	Data Sharing-Read Property-B
	DS-RPM-B	Data Sharing-Read Property Multiple-B
	DS-WP-B	Data Sharing-Write Property-B
	DM-DDB-B	Device Management-Dynamic Device Binding-B
	DM-DOB-B	Device Management-Dynamic Object Binding-B
	DM-DCC-B	Device Management-Device Communication Control-B
	DM-RD-B	Device Management-Reinitialize Device-B
	DM-UTC-B	Device Management-UTCTimeSynchronization-B

10.2.2.2 PICS Protocol Implementation Conformance Statement

Object Type	Optional Properties	Writable Properties
Analog Input [AI]	Description COV Increment	Object Name [max 63 bytes] Description [max 63 bytes] COV Increment
Binary Input [BI]	Description Active Text Inactive Text	Object Name [max 63 bytes] Description [max 63 bytes]
Binary Value [BV]	Description Active Text Inactive Text	Present Value Object Name [max 63 bytes] Description [max 63 bytes]
CharacterString Value [CSV]	Description	Object Name [max 63 bytes] Description [max 63 bytes]
Device	Description Location Active COV Subscriptions Local Date Local Time UTC Offset Daylight Savings Status **BACnet MS/TP:** Max Master Max Info Frames	Object Identifier Object Name [max 64 bytes] Description [max 64 bytes] Location [max 64 bytes] APDU Timeout (1000…60'000) Number of APDU Retries (0…10) **BACnet MS/TP:** Max Master (1…127) Max Info Frames (1…255)
Multi-state Input [MI]	Description State Text	Object Name [max 63 bytes] Description [max 63 bytes]
Multi-state Output [MO]	Description State Text	Present Value Object Name [max 63 bytes] Description [max 63 bytes]

- The device does not support the services CreateObject and DeleteObject
- The device supports the DeviceCommunicationControl and ReinitializeDevice services. No password is required
- A maximum of 128 active COV subscriptions with a lifetime of 1…28800 sec. (8 hours) are supported

10.2.2.3 BACnet object list

Project Type / Instance(s)	Project name	Values	Active/ inactive or status text	Unit	COV Support	Description	Access[1]
AI 0	Bus Watchdog			Seconds	yes	Bus watchdog countdown (is reset with a bus forced control / Test-Reset command or Control Heartbeat) When the Watchdog counts to 0, the priority arrays of all **MO** objects are cleared (the fire dampers **close)**	r
AI 101-164	Actuator Power Slave x			Watt	yes	Power consumption of the actuator	r
AI 201-264	Actuator Position Slave x			%	yes	Relative Position of the actuator in %	r
BI 0	Relay OK	1.0	on , off	-	yes	Status of the Error/OK Relay	r
BI 1	Relay > 72 Degrees	1.0	on , off	-	yes	Status of the local fire alarm relay	r
BI 2	Relay All Closed	1.0	on , off	-	yes	Status of damper-Closed Relay	r
BI 3	Relay All Open	1.0	on , off	-	yes	Status of damper-Open Relay	r
BI 4	DI1 Local forced control	1.0	on , off	-	yes	Status of DI1 (local forced control)	r
BI 5	DI2 Local Reset	1.0	on , off	-	yes	Status of the DI2 (Local Test/Reset)	r
BI 6	DI3 Bus Control enabled	1.0	on , off	-	yes	Status of DI3 (bus control)	r
BI 7	DI4	1.0	on , off	-	yes	Status of DI4 (can be used for any purpose)	r
BI 8	DI5	1.0	on , off	-	yes	Status of DI5 (can be used for any purpose)	r
BI 9	DI6	1.0	on , off	-	yes	Status of DI6 (can be used for any purpose)	r
BI 10	DI7	1.0	on , off	-	yes	Status of DI7 (can be used for any purpose)	r
BI 11	Heartbeat	1,0	on , off	-	yes	Toggles every second to indicate that the device is running	r
BI12	Heartbeat Slow	1,0	on , off	-	yes	Toggles every 15 seconds	r
BV 0	Reset all Slaves	1.0	on , off	-	yes	Resets all saved errors, resets the bus watchdog countdown	w
BV 1	Control Heartbeat	1.0	on , off	-	yes	Heartbeat in order to obtain bus control The bus watchdog countdown is reset by a write command If the bus forced control (**MO** objects) is not periodically written, the bus watchdog can be reset by periodic writing of 0 or 1 of the Control Heartbeat	w
BV 101-164	Reset/Test Slave x	1.0	on , off	-	yes	Resets saved errors and starts test run on slave x	w

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[1] Access: R = Read, W = Write, C = Commandable with priority array

						resets the bus watchdog countdown	
CSV 101-164	ID / Location Slave x			-	Yes	Contains the "ID / Location" of slave x	r
MI 0	Summary Status all Slaves	[1,2,3,4]	[Inactive, Unknown, Not Ok, Ok]	-	yes	Status summary of all active slaves **Inactive**: No slave addressed **Unknown**: No connection to the slaves **Not Ok**: At least one active slave with status Not Ok[1] **Ok**: All active slaves Ok	r
MI 1-8	Summary Status Block x	[1,2,3,4]	[Inactive, Unknown, Not Ok, Ok]	-	yes	Status summary of active slaves in block x **Inactive**: No slaves in block x **Unknown**: No connection to the slaves in block x **Not Ok**: At least one active slave in block x with status Not Ok[1] **Ok**: All active slaves in block x Ok	r
MI 10	Summary Position of all Slaves	[1,2,3,4,5]	[Inactive, Unknown, Closed, Open, Other]	-	yes	Position summary of all active slaves **Inactive**: No slave addressed **Unknown**: No connection to the slaves **Closed**: Damper of all active slaves closed **Open**: Damper of all active slaves open **Other**: Damper position of the active slaves different or in middle position	r
MI 11-18	Summary Position Block x	[1,2,3,4,5]	[Inactive, Unknown, Closed, Open, Other]	-	yes	Position summary of all active slaves in block x **Inactive**: No slaves in block x **Unknown**: No connection to the slaves in block x **Closed**: Damper of all active slaves in block x closed **Open**: Damper of all active slaves in block x open **Other**: Damper position of the active slaves in block x different or in middle position	r

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[1] **Not Ok:** Status is "Warning", "Error", "Error during initialization", "Overload", "Lost Connection to Slave" or "Internal Error"
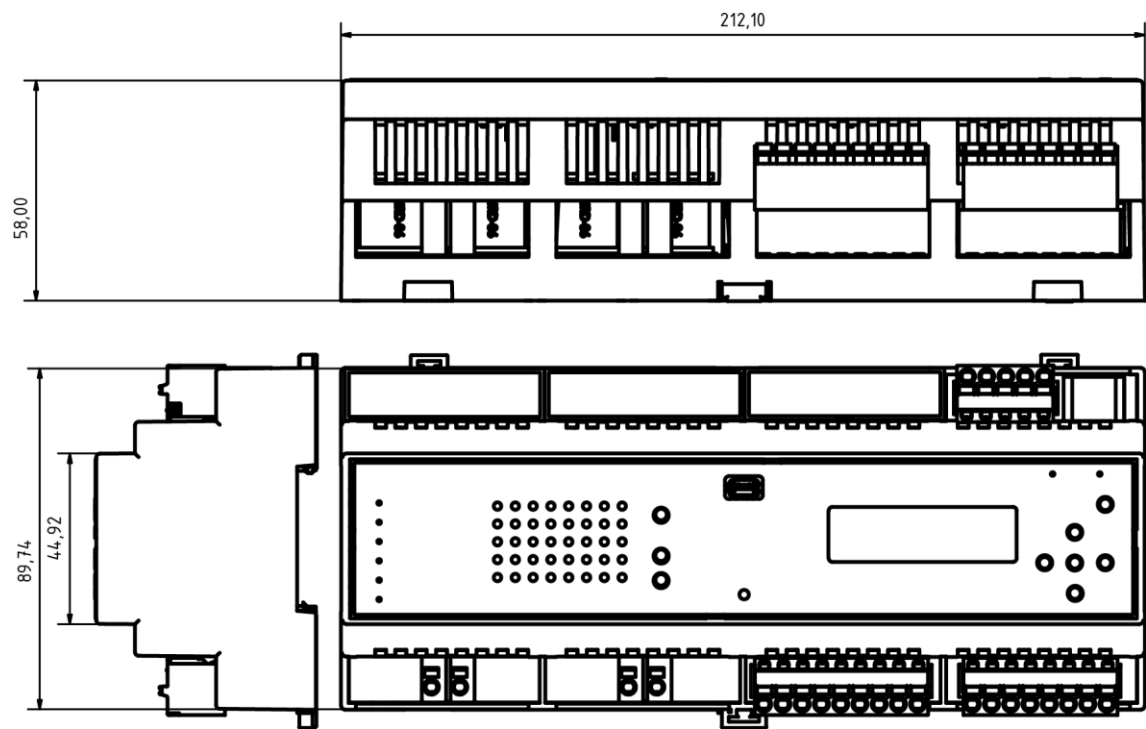
MI 101-164	Status Slave x	[1,2,3,4,5,6,7,8,9,10,11,12]	[Inactive, Unknown, Init, Normal operation, Test, Test (local), Warning, Error, Error during initialization, Overload, Lost Connection to Slave, Internal Error]	-	yes	Detailed status of slave x **Inactive**: No slave with given BUS-ID **Unknown**: No connection to slave **Init**: Slave initializing **Normal operation**: Slave functions correctly **Test**: Slave performs auto-test **Test (local)**: The slave test button is pressed so a test (reversing) is performed **Warning**: At least one saved error **Error**: There is at least one actual error **Error during Initialization**: An error has occurred during initialization which needs a reset (acknowledgement) of the slave **Overload**: The connected actuator caused an overload (to protect the slave the damper is not opened for one minute after which the status is automatically exited) **Lost Connection to Slave**: Interruption of connection to the slave **Internal Error**: Internal error (e.g: defective device)	r
MI 201-264	Position Slave x	[1,2,3,4,5]	[Unknown, Closed, Open, Closing, Opening]	-	yes	Damper position of slave x **Unknown**: Slave not present or no connection to the slave **Closed**: Damper closed **Open**: Damper open **Closing**: Damper in middle position and closing **Opening**: Damper in middle position and opening	r
MI 301-364	Sensor Status Slave x	[1,2,3,4,5,6,7,8,9,10]	[Unknown, OK, ORS, ORS & BAE, ORS & BAE Mem, BAE, BAE & ORS Mem, ORS Mem, BAE Mem, ORS Mem & BAE Mem]	-	yes	ORS (smoke detector) and actuator BAE (thermoelectric tripping device) status of slave x **Unknown**: Slave not present or no connection to the slave **OK**: No error **ORS**: ORS triggered **ORS & BAE**: ORS and BAE triggered **ORS & BAE MEM**: ORS triggered, saved BAE error **BAE**: BAE triggered **BAE & ORS MEM**: BAE triggered, saved ORS error **ORS MEM**: Saved ORS error **BAE MEM**: Saved BAE error **ORS MEM & BAE MEM**: Saved ORS error and saved BAE error	r

MI 401-464	Actuator Status Slave x	[1,2,3,4,5,6,7,8,9,10]	[Unknown, OK, Mechanical, Mechanical & Overload, Mechanical & Overload Mem, Overload, Overload & Mechanical Mem, Mechanical Mem, Overload Mem, Mechanical Mem & Overload Mem]	-	yes	Actuator status on slave x **Unknown**: Slave not present or no connection to the slave **OK**: no error **Mechanical**: Mechanical error **Mechanical & Overload**: Mechanical error and overload **Mechanical & Overload Mem**: Mechanical error and saved overload error **Overload**: Overload **Overload & Mechanical Mem**: Overload and saved mechanical error **Mechanical Mem**: Saved mechanical error **Overload Mem**: Saved overload error **Mechanical Mem & Overload Mem**: Saved mechanical error and saved overload error	r
MI 501-564	Status Actuator Connection of Slave x	[1,2,3,4]	[Unknown, OK, Disconnected, Disconnected Mem]	-	yes	Connection status to actuator of slave x **Unknown**: Slave not present or no connection to the slave **OK**: no error **Disconnected**: Actuator not connected **Disconnected Mem**: Saved "actuator not connected" error	r
MO 0	Forced Control all Slaves	[1,2,3]	[None, Open, Close]	-	yes	Bus forced control for all slaves A write command resets the watchdog countdown **None**: No command (for fire damper equals to **Close**) **Open**: Open command **Close**: Close command	c
MO 1-8	Forced Control of Block x	[1,2,3]	[None, Open, Close]	-	yes	Bus forced control for all slaves in block x A write command resets the watchdog countdown **None**: No command (for fire damper equals to **Close**) **Open**: Open command **Close**: Close command	c
MO 101-164	Forced Control Slave x	[1,2,3]	[None, Open, Close]	-	yes	Bus forced control for slave x A write command resets the watchdog countdown **None**: No command (for fire damper equals to **Close**) **Open**: Open command **Close**: Close command	c

* Access: R = Read, W = Write, C = Commandable with priority array

11 DIMENSIONS

212,10

58,00

89,74

44,92

Dimensions in mm