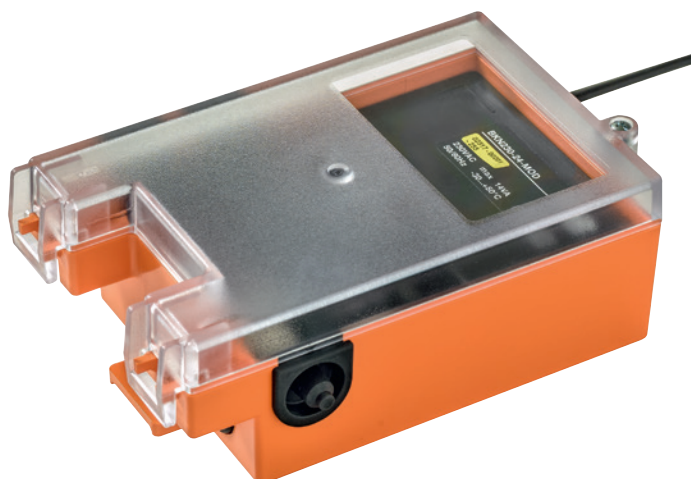


Communication and power supply unit for motorised fire dampers

- Communication via BACnet MS/TP and Modbus RTU (RS-485)
- AC 230 V supply via Euro plug
- Power supply to the actuators via a plug contact (galvanically isolated, DC 24 V)
- Simple integration of a smoke detector with no additional power supply is possible
- Suitable actuators:
BF24...-ST, BFN24...-ST, BFL24...-ST



Technical data

Electrical data	Nominal voltage	AC 230 V, 50/60 Hz
	Nominal voltage range	AC 198...264 V
	Power consumption In operation	3 W (operating position, incl. actuator)
	For wire sizing	14 VA (incl. actuator)
	Max. switch-on current (90°)	Max. 3 A @ 1 ms
	Connections	See "Connections" on page 3
Control	Communication	BACnet MS/TP or Modbus RTU (ex works)
	BACnet MS/TP	See description starting on page 4
	Modbus RTU	See description starting on page 7
	Typical response time	<100 ms
Safety	Protection class	II, reinforced insulation □
	Degree of protection	IP40
	EMC	CE according to 2014/30/EU
	Low-voltage directive	CE according to 2014/35/EU
	Type of action	Type 1 (EN 60730-1)
	Rated impulse voltage	2.5 kV (EN 60730-1)
	Pollution degree	2 (EN 60730-1)
	Ambient temperature	-20...50 °C
	Storage temperature	-40...80 °C
	Humidity test	95% RH, non-condensing (EN 60730-1)
Dimensions / Weight	Maintenance	Maintenance-free
	Dimensions	See "Dimensions" on page 12
	Weight	Approx. 325 g

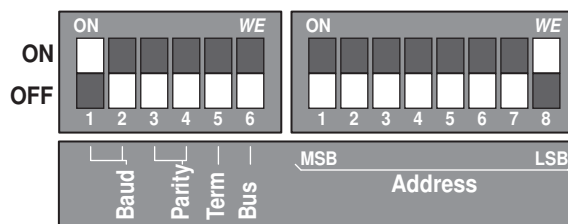
Safety notes



- This device has been designed for use in stationary heating, ventilation and air-conditioning systems and is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- Only authorised specialists may carry out installation.
All applicable legal and government agency regulations must be complied with during use.
- The device may be opened only at the manufacturer's plant. It does not contain any parts that can be replaced or repaired by the user.
- The device contains electrical and electronic components and is not permitted to be disposed of as household waste. Local and currently valid legislation must be observed.

Product features

Application The BKN230-24-MOD is mounted near the motorised fire damper. This device sets up the communication connection with higher-level systems, while the built-in isolating transformer supplies DC 24 V voltage to the damper actuator.

Parametrisation (DIL switch)

For parametrisation of communication for BACnet MS/TP, see page 4.

For parametrisation of communication for Modbus RTU, see page 7.

Expansion options An optoelectronic smoke detector can be connected directly without any add-on devices. If smoke is detected or the temperature exceeds the limit, the local damper immediately moves into the safety position and a corresponding message will be sent to the higher-level system.

Local override control If no control commands are received by the BKN230-24-MOD or if no communication line is connected, the damper remains in the safety position. The damper is also moved in this case to the operating position by the wire bridge (terminal 1 to 4) as soon as mains voltage is applied. The application of the BKN230-24-MOD can thus be used without a control system, for example if the damper needs to be continuously open without remote monitoring. The connected smoke detector retains its local safety function. The actual position of the damper is indicated by the LEDs in the device. On-site damper test using the test key is possible. In the case of override control (terminal 1+4), stored malfunctions and the smoke detector must first be reset before the damper can be opened. The reset is carried out via the test button (test run/malfunction acknowledgement).

BKN230-24-MOD						
1	2	3	4	5	6	7

Electrical installation

① Mains connection cable with connector plug, AC 230 V

② Plug connection for

– Belimo damper actuator (motor DC 24 V)

③ Plug connection for

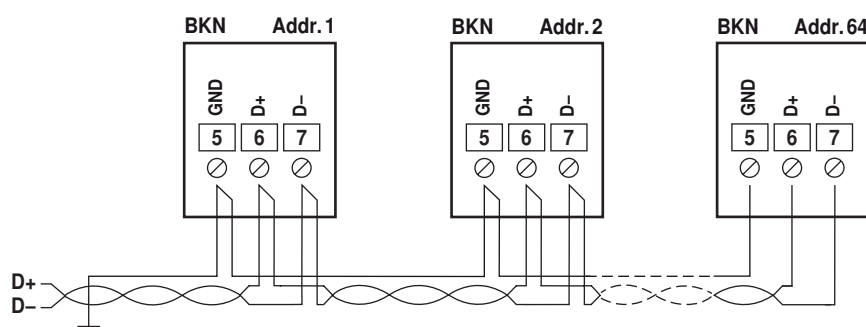
– Belimo damper actuator (limit switch)

④ Connecting terminals for

- 1 External smoke detector, 24 V, max. 50 mA
- 2 External smoke detector, control input
- 3 GND
- 4 BKN Direct Control, override control input
- 5 Communication GND
- 6 Communication D+
- 7 Communication D–



BACnet/Modbus wiring



BACnet/Modbus GND

The bus wiring must be 3-wire. The GND must be connected to the protective earth of the control cabinet.

The wiring of the line for BACnet (MS/TP) and Modbus (RTU) must be carried out according to the relevant RS-485 guidelines.

Indicators and operating elements

⑤ Test run/malfunction acknowledgement button

Press the button for longer than one second to trigger the following functions:

- a) Starts test run
- b) Resets a current error message

⑥ DIL switch (see "Parametrisation")

⑦ LEDs status signalisation Belimo damper actuator:

Green	on	Upper limit switch (damper open)
	blinking	Damper opens (motor is actuated)
Yellow	on	Lower limit switch (damper closed)
	blinking	Damper closes (motor is not actuated)
Red	on	Internal device malfunctions (BKN)
	blinking	External malfunction = smoke detector triggered, target position not reached
	flashing	External malfunction = If a malfunction is stored (i.e. no longer present but not yet acknowledged), this is indicated on the device by a periodic flashing of the red LED

⑧ LED display communication BACnet/Modbus:

Yellow flickering BACnet/Modbus communication lights up during RX and TX



Signalisation

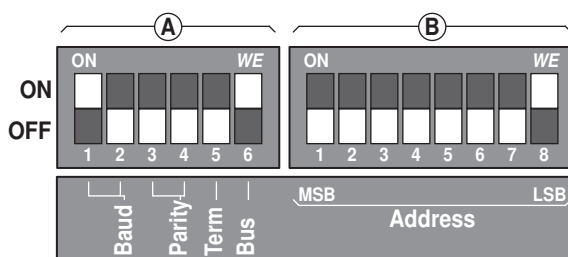
Command OPEN/upper position not reached	Command CLOSE/lower position not reached
LED green blinking	LED green on Damper is in OPEN position
LED yellow on Damper is in CLOSED position	LED green off Damper blade is between OPEN and CLOSED
LED yellow off Damper blade is between CLOSED and OPEN	LED yellow blinking
LED red blinking	LED red blinking
Error message after 180 seconds	Error message after 60 seconds

General information BACnet

General information	Date	01 October 2023
	Manufacturer name	BELIMO Automation AG
	Manufacturer ID	423
	Product name	Field module for fire damper
	Product model number	BKN230-24-MOD
	Application software version	3.07
	Firmware Revision	1.03
	BACnet Protocol Revision	14
	Product description	Communication and power supply unit for motorised fire dampers
	BACnet standard device profile	BACnet Application-Specific Controller (B-ASC)
	Supported BACnet Interoperability Building Blocks (BIBBs):	
	– Data sharing – ReadProperty-B (DS-RP-B)	
	– Data sharing – ReadPropertyMultiple-B (DS-RPM-B)	
	– Data sharing – WriteProperty-B (DS-WP-B)	
	– Data sharing – COV-B (DS-COV-B)	
	– Device management – DynamicDeviceBinding-B (DM-DDB-B)	
	– Device management – DynamicObjectBinding-B (DM-DOB-B)	
	– Device management – DeviceCommunicationControl-B (DM-DCC-B)	
	Segmentation supported	No
	Data link layer options	MS/TP Master, Baud rates: 9600, 19200, 38400, 76800
	Device address management	No static device addresses supported
	Network options	None
	Supported character sets	ISO 10646 (UTF-8)
	Gateway options	None
	Network security options	Non-secure device
	Conformity	Listed by BTL

BACnet parametrisation

Parametrisation (DIL switch)



A	Baud rate	1	2	Parity	3	4	Termination	5	Bus	6
	9'600	OFF	OFF	1-8-N-1	OFF	OFF	with 150 Ω	ON	BACnet	ON
	19'200	OFF	ON				OFF	OFF	Modbus	OFF
	38'400	ON	OFF							
	76'800	ON	ON							

B	BACnet address	1	2	3	4	5	6	7	8
	0		OFF	OFF	OFF	OFF	OFF	OFF	OFF
	1		OFF	OFF	OFF	OFF	OFF	OFF	ON
	2		OFF	OFF	OFF	OFF	OFF	ON	OFF
	...								
	127		ON	ON	ON	ON	ON	ON	ON

Protocol Implementation Conformance Statement – PICS

Object processing

Object type	Optional properties	Writable properties
Analog Input [AI]	Description COV increment	COV increment
Analog Value [AV]	Description COV increment	Present value COV increment
Binary Input [BI]	Description Active text Inactive text	
Device	Description Location Active COV subscriptions Max master Max info frames	Object name Location APDU timeout (1000...60000) Number of APDU retries (0...10) Max master (1...127) Max info frames (1...255)
Multi-state Input [MI]	Description State text	
Multi-state Output [MO]	Description State text	Present value
Multi-state Value [MV]	Description State text	Present value

- The device does not support CreateObject and DeleteObject services.
- The maximum length of the writable texts is based on single-byte characters.
 - Object name: 32 char
 - Location: 64 char
 - Description: 64 char

Service processing

- The device supports the DeviceCommunicationControl and ReinitializeDevice services. The execution of the services is not password-protected.
- A maximum of 64 active COV subscriptions with a lifetime of 1...28800 s (8 hours) are supported.

Description BACnet Objects

Object Name	Object Type [Instance]	Description/Comment	Values	Value Default	COV Increment	COV Increment Default	Access
Device	Device [Inst.No]	Device name <i>Device Name: Entering blanks will reset the device to factory setting. Device Instance Number = Device Offset Object + BACnet MAC address (Dip Switches), Instance Property not writable</i>	0...4194302	–	–	–	W
RelPos	AI[1]	Relative Position in %	0-50-100	–	0.01...100	1	R
AbsPos	AI[2]	Absolute Position in °	0-45-90	–	0.01...65535	1	R
BusWatchdog Countdown	AI[130]	Current timer value of the bus monitoring countdown (communication monitoring)	0...3600	0	0.01...1000	1	R
ActPower Consumption	AI[131]	Power consumption of the actuator in W	0...2.147e+9	0	0.01...100	1	R
OffsetDeviceID	AV[121]	This value plus the set MAC address (0...127) defines the Device Instance Number.	0...4'194'056 (2 ²² - 247)	1000	1.0...1000	1	W
BusWatchdog	AV[130]	Timeout for bus monitoring in s <i>0 = No bus monitoring If Present_Value is not 0, the bus watchdog will monitor the renewal of the Present_Value of the override MO[1]. If the Present_Value of MO[1] is written, then the timer of the monitoring is reset once again. If the timeout is reached, then the Priority_Array of the MO[1] is deleted and the Relinquish_Default value becomes valid.</i>	0...3600	300	1.0...1000	1	W

Description BACnet Objects

Object Name	Object Type [Instance]	Description/Comment	Values	Default	Access
SummaryStatus	BI[101]	Summary status <i>Note: The summary status combines the states of MI[106], MI[110], MI[111].</i>	0: OK 1: Not OK	–	R
Override	MO[1]	Override control Status Flags: {FALSE, FALSE, OVERRIDDEN, OUT_OF_SERVICE} Overridden: This flag is activated when the local test button is pressed. Out of service: This flag is activated when local override control is active (bridge between terminals 1 and 4). If local override control is not used, then the bridge between terminals 1 and 4 must be removed. <i>Note: This object can be monitored (see BusWatchdog AV[130]).</i>	1: None 2: Open 3: Close	1	C
Command	MV[120]	Command <i>Initiation of actuator functions for service and test. The selected command is transmitted to the actuator and then the present value is reset to None (1).</i>	1: None 2: – 3: Test 4: Reset	1	W
InternalActivity	MI[100]	Internal operating state Test: Internal test active, activated via bus <i>Note: An activated local test button is indicated with the MO[1] override status flag.</i>	1: None 2: Test	–	R
StatusActuator *	MI[106]	Actuator status: mechanical overload due to a blocked actuator etc.	1: OK 2: Actuator cannot move 3: – 4: – 5: Actuator disconnected 6: Actuator too much current	–	R
StatusDevice *	MI[110]	Device status: Internal malfunctions, hardware defect, bus monitoring, etc.	1: OK 2: BusWatchdog triggered 3: InternalError	–	R
StatusTripping *	MI[111]	Sensor status: Shows status information of the smoke detector and temperature sensor (BAT)	1: OK 2: Smoke Detector triggered 3: Temperature Sensor triggered 4: Smoke Detector & Temp Sensor triggered	–	R

Access (access rights): R = readable, W = writable, C = commands executable with priority array

* All status information with the exception of the "BusWatchdog triggered" state then require a reset command to return to normal operating mode.

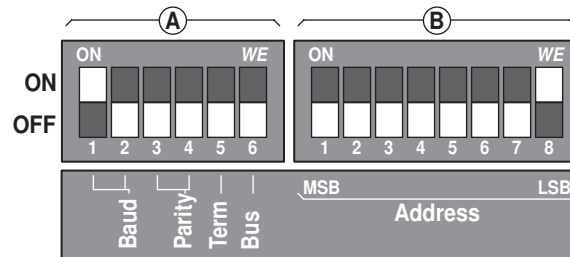
Specific malfunction description*	Possible causes	Recommended actions
Status Actuator: Actuator cannot move	– Final position was not reached within the time limit – Actuator leaves the end position for no apparent reason (e.g. "Open") – Limit switches are not connected The actuator then moves to the safety position (closed).	– Check the operating range of the actuator, damper and limit switches – Check the actuator and limit switch connector plug on the BKN230-...-MOD
Status Actuator: Actuator disconnected	– Actuator not connected – Temperature sensor (BAT) triggered The actuator then moves to the safety position (closed).	– In case of high duct temperature or fire: Replace the temperature sensor (BAT) – Check the connection of the actuator on the BKN230-...-MOD
Status Actuator: Actuator too much current	– Actuator defective – Short circuit	– Replace actuator
StatusDevice: InternalError	Internal device error	– Contact Belimo

General information Modbus

General information	Parametrisation	via DIP switch
	Protocol	Modbus RTU/RS-486
	Number of nodes	Max. 64 (without repeater)
	Transmission formats	1-8-N-2, 1-8-N-1, 1-8-E-1, 1-8-O-1 Default: 1-8-N-2 (Start bits, Data bits, Parity, Stop bits)
	Baud rates	9600, 19200, 38000, 76800 Bd Default: 38400 Bd
	Addresses	1...247, values over 247 are interpreted as 247, 0 = Broadcast
	Termination	150 Ω , can be switched if necessary

Modbus parametrisation

Parametrisation (DIP switch)



A	Baud rate	1	2	Parity	3	4	Termination with 150 Ω	5	Bus BACnet Modbus	6
	9'600	OFF	OFF		1-8-N-2	OFF		ON		ON
	19'200	OFF	ON		1-8-N-1	OFF		OFF		OFF
	38'400	ON	OFF		1-8-E-1	ON		OFF		OFF
	76'800	ON	ON		1-8-O-1	ON		ON		ON

B	Modbus address	1	2	3	4	5	6	7	8
	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
	2	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
	3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
	...								
	247	ON	ON	ON	ON	OFF	ON	ON	ON

Overview Modbus

Register

	No.	Addr.	Register	R / W
Operation	1	0	–	
	2	1	Override control	R / W
	3	2	Command	R / W
	4	3	Actuator type	R
	5	4	Relative Position [%]	R
	6	5	Power consumption of actuator (mW)	R
	7	6	–	
	8	7	–	
	9	8	Summary status	R
Service	101	100	Series number 1st part	R
	102	101	Series number 2nd part	R
	103	102	Series number 4th part	R
	104	103	Firmware Version	R
	105	104	Malfunction and Service Information	R
	106	105	–	
	107	106	–	
	108	107	Bus monitoring countdown	R
	109	108	Bus failure position	R / W
	110	109	Bus monitoring	R / W

- Registers in bold can be written
- Writable registers <100 (in operation) are volatile and must therefore be updated periodically
- Writable registers >100 are non-volatile and must NOT be updated periodically

Commands

All data is arranged in a table and addressed by 1..n (register) or 0..n-1 (address). No distinction is made between data types (Discrete Inputs, Coils, Input Registers, Holding Registers). As a consequence, all data can be accessed with the two commands for Holding Registers. Alternatively, the Discrete Inputs and Input Registers commands can be used.

Standard commands:

Read Holding Registers [3]

Write Single Register [6]

Optional commands:

Read Discrete Inputs [2]

Read Input Registers [4]

Write Multiple Registers [16]

Note regarding Read Discrete Inputs

The command reads one or more bits and can alternatively be applied for reading the malfunction and service information in Register 105 (Addr. 104). Example: The start address for "BAT triggered" is calculated as $104 \cdot 16 + 6 = 1670$.

Description Modbus Register

Register 1 (reserved) Not used in this device. Constant value 65535.

Register 2: Override control Overriding the setpoint with defined values.

Note

If no override is set (value 0), then the fire damper remains in safety position (Closed).

Override control	
0	None
1	Open
2	Close

Register 3: Command Initiation of actuator functions for service and test; the register is reset automatically.

Command	
0	None
2	Test run
4	Reset

Register 4: Actuator type

Actuator type	
3	Fire damper actuator

Register 5: Relative position Position according to limit switch position in hundredths of a percent:

- Damper closed: 0 (0%)
- Intermediate switching: 5000 (50%)
- Damper open: 10000 (100%)

Register 6: Power consumption of actuator Current power consumption of the actuator in mW.
This information can help with troubleshooting or be used for monitoring.

Register 9: Summary status Status is set when one of the bits 0...7 of Register 105 is set (used as sensor value for air/water/VAV).

Summary status	
0	OK
1	Not OK

Register 101, 103: serial number Each node has a unique serial number. The serial number consists of four sections, with only parts 1, 2 and 4 being shown on Modbus.
Example: 00839-31324-064-008

Register 101	Register 102	Register 103
1st part	2nd part	4th part
00839	31324	008

Register 104: Firmware Version Firmware Version (VX.XX)
e.g. 201 V2.01

Description Modbus Register

Register 105:
Malfunction and service information

The status information is split into messages about the actuator (malfunctions) and other service information.

	Bit	Description
Malfunctions (Low Byte)	0	–
	1	Path increased
	2	Mechanical overload
	3	–
	4	Safety-relevant malfunction
	5	Power consumption of the actuator too high
	6	BAT triggered
	7	Smoke detector triggered
Service (High Byte)	8	Internal activity
	9	–
	10	Bus monitoring triggered
	11	Local override control active
	12	–
	13	–
	14	–
	15	–

Description of malfunction

Bit 1 and 2: Mechanical travel increased / Actuator cannot move

Firmware Version 1.x	from Firmware Version 2.x
– Final position was not reached within the time limit – Actuator leaves the end position for no apparent reason (e.g. "Open") – Temperature sensor (BAT) triggered – Actuator / limit switch are not connected	– Final position was not reached within the time limit – Actuator leaves the end position for no apparent reason (e.g. "Open") – Limit switches are not connected. The actuator then moves to the "Closed" safety position.

Recommended response:

- Check the operating range of the actuator, the damper and the limit switches
- Check the actuator and limit switch connector plug on the BKN230-..-MOD

Bit 4: Safety-relevant malfunction

Internal device error

Recommended response: – Contact Belimo

Bit 5: Power consumption of the actuator too high

Firmware Version 1.x	from Firmware Version 2.x
unsupported	– Actuator defective – Short circuit

Recommended response: – Replace actuator

Bit 6: BAT triggered

Firmware Version 1.x	from Firmware Version 2.x
– Locally connected BAE / BAT triggered	– Temperature sensor (BAT) of the actuator triggered – Actuator / limit switch are not connected

Recommended response:

- In case of high duct temperature or fire:
Replace the temperature sensor (BAT)
- Check the actuator and limit switch connector plug on the BKN230-..-MOD

Bit 7: Reset smoke detector

Reset locally at BKN with "Test Reset" button

Recommended response: – Check the smoke detector

Bit 8: Internal activity

Internal test active, activated via BACnet/Modbus

Description Modbus Register

Bit 10: Bus monitoring triggered

No commands were detected on the monitored register within the timer value of the bus monitoring.

Recommended response:

- Check the Modbus communication in general
- Check the cycle time of the repeated write in Register 2 “Override control”
- If necessary, adjust the bus monitoring timer in Register 110 “Bus monitoring”

Bit 11: Local override control active

Local override control (bridge between terminals 1 and 4) activated.

The current actuator position can be queried via Register 5 “Relative Position”.

Recommended response:

- If the local override control is not to be used, the bridge between connection terminal 1 and 4 must be removed

The malfunction bits can be reset with Register 3 (command: 4).

Malfunction 4 cannot be reset.

Register 108: Bus monitoring countdown

Timer value of the bus monitoring countdown (bus monitoring timer is set in Register 110). This value helps with malfunction analysis in cases of bus monitoring timer values that are set too small or of incorrectly implemented write cycles to the monitored register.

Register 109: Bus failure position

The bus monitoring controls the Modbus communication. If the override control (Register 2) is not renewed within the time defined in Register 110, then the actuator will control to the bus failure position (closed).

If only the bus failure position is activated, then the bus monitoring timer in Register 110 is set to the default value of 300 s.

Triggered bus monitoring is indicated in Register 105.

Bus failure position	
0	No bus monitoring
1	Rapid close if time is exceeded (factory setting)

Register 110: Bus monitoring

Timeout for bus monitoring in s. Default setting with activated bus failure position in Register 109 is 300 s. With a value = 0, bus monitoring is deactivated.

Bus watchdog	
0	Switched off
1...3600 s	Switched on

Firmware history

Version overview

Firmware V3.07	Production date > 2023-10-01	– Reduced switch-on current – BACnet Revision 14 – No USB
Firmware V2.2	Production date > 2019-03-01	– Override control command “Open” remains in case of mechanical error
Firmware V2.01	Production date > 2018-05-01	– Upgrade to BACnet MS/TP – Modbus: Addition of Registers 108, 110 as well as additional information on the power consumption of the actuator and additional malfunction and service information
Firmware V1.10	Production date > 2016-01-01	– Time for bus monitoring increased from 120 to 300 s
Firmware V1.09	Production date > 2015-01-01	– More precise monitoring of the target position – Communication quality increased – Display of stored malfunction implemented – If a malfunction is stored (BAE/ORM), the actuator remains in the safety position – Damper test works with local override control
Firmware V1.05	Production date > 2013-04-01	– Release without restrictions

Dimensions [mm]

Dimensional drawings

