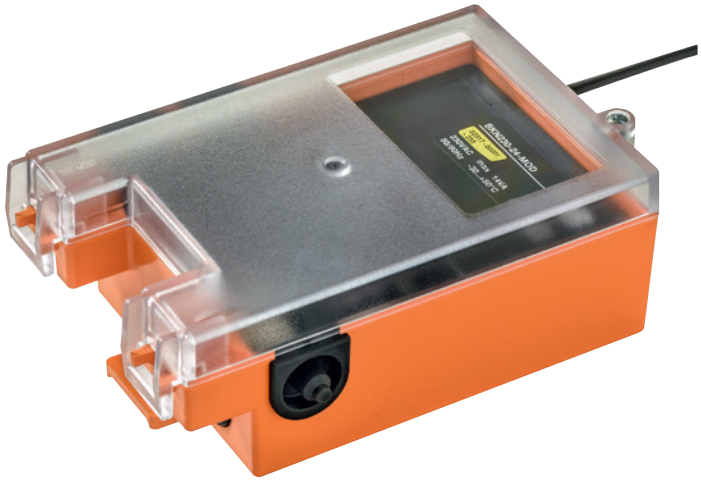
# Technical datasheet BKN230-24-MOD

**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) |
| | Maintenance | Maintenance-free |
| **Dimensions / Weight** | Dimensions | See “Dimensions” on page 12 |
| | Weight | Approx. 325 g |

## Safety notes

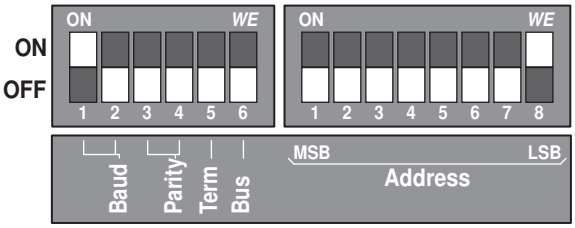
- **This device has been designed for use in stationary heating, ventilation and air-conditioning systems and is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.**
- **Only authorised specialists may carry out installation. 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)**



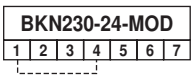

For parametrisation of communication for BACnet MS/TP, see page 4.
For parametrisation of communication for Modbus RTU, see page 7.

**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).



## Electrical installation

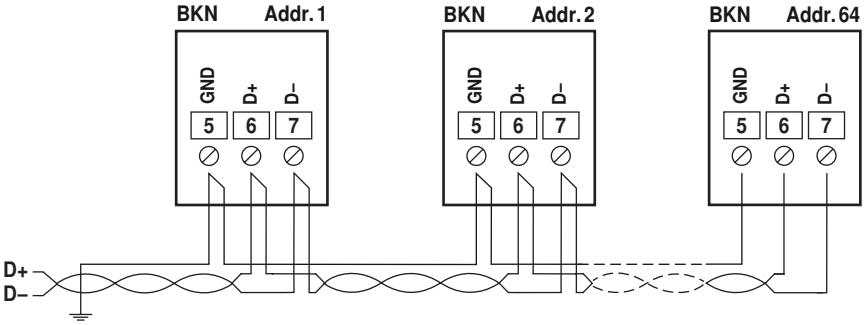
① **Mains connection cable with connector plug, AC 230 V**

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**

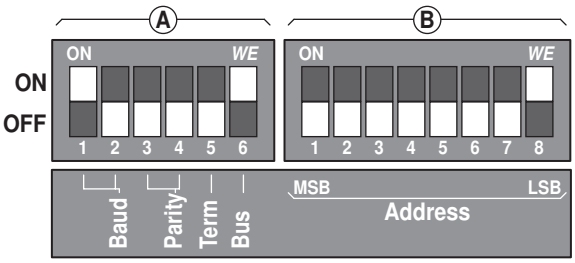
| | |
|---|---|
| Date | 01 October 2023 |
| Manufacturer name | BELIMO Automation AG |
| Manufacturer ID | 423 |
| Product name | Field module for fire damper |
| Product model number | BKN230-24-MOD |
| Application software version | 3.07 |
| Firmware Revision | 1.03 |
| BACnet Protocol Revision | 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,<br>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)**

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| Baud rate | 1 | 2 |
|---|---|---|
| 9’600 | OFF | OFF |
| 19’200 | OFF | ON |
| 38’400 | ON | OFF |
| 76’800 | ON | ON |

| Parity | 3 | 4 |
|---|---|---|
| 1-8-N-1 | OFF | OFF |

| Termination | 5 |
|---|---|
| with 150 Ω | ON |
| OFF | OFF |

| Bus | 6 |
|---|---|
| BACnet | ON |
| Modbus | OFF |

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| 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<br>COV increment | COV increment |
| Analog Value [AV] | Description<br>COV increment | Present value<br>COV increment |
| Binary Input [BI] | Description<br>Active text<br>Inactive text | |
| Device | Description<br>Location<br>Active COV subscriptions<br>Max master<br>Max info frames | Object name<br>Location<br>APDU timeout (1000…60000)<br>Number of APDU retries (0...10)<br>Max master (1...127)<br>Max info frames (1...255) |
| Multi-state Input [MI] | Description<br>State text | |
| Multi-state Output [MO] | Description<br>State text | Present value |
| Multi-state Value [MV] | Description<br>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<br>*Device Name: Entering blanks will reset the device to factory setting.*<br>*Device Instance Number = Device Offset Object + BACnet MAC address (Dip Switches), Instance Property not writable* | 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<br>*0 = No bus monitoring*<br>*If Present_Value is not 0, the bus watchdog will monitor the renewal of the Present_Value of the override MO[1].*<br>*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.* | 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<br>*Note: The summary status combines the states of MI[106], MI[110], MI[111].* | 0: OK<br>1: Not OK | – | R |
| Override | MO[1] | Override control<br>Status Flags:<br>{FALSE, FALSE, OVERRIDDEN, OUT_OF_SERVICE}<br>Overridden: This flag is activated when the local test button is pressed.<br>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.<br>*Note: This object can be monitored (see BusWatchdog AV[130]).* | 1: None<br>2: Open<br>3: Close | 1 | C |
| Command | MV[120] | Command<br>*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).* | 1: None<br>2: –<br>3: Test<br>4: Reset | 1 | W |
| InternalActivity | MI[100] | Internal operating state<br>Test: Internal test active, activated via bus<br>*Note: An activated local test button is indicated with the MO[1] override status flag.* | 1: None<br>2: Test | – | R |
| StatusActuator * | MI[106] | Actuator status: mechanical overload due to a blocked actuator etc. | 1: OK<br>2: Actuator cannot move<br>3: –<br>4: –<br>5: Actuator disconnected<br>6: Actuator too much current | – | R |
| StatusDevice * | MI[110] | Device status: Internal malfunctions, hardware defect, bus monitoring, etc. | 1: OK<br>2: BusWatchdog triggered<br>3: InternalError | – | R |
| StatusTripping * | MI[111] | Sensor status: Shows status information of the smoke detector and temperature sensor (BAT) | 1: OK<br>2: Smoke Detector triggered<br>3: Temperature Sensor triggered<br>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:<br>Actuator cannot move | – Final position was not reached within the time limit<br>– Actuator leaves the end position for no apparent reason (e.g. "Open")<br>– Limit switches are not connected<br>The actuator then moves to the safety position (closed). | – Check the operating range of the actuator, damper and limit switches<br>– Check the actuator and limit switch connector plug on the BKN230-..-MOD |
| Status Actuator:<br>Actuator disconnected | – Actuator not connected<br>– Temperature sensor (BAT) triggered<br>The actuator then moves to the safety position (closed). | – In case of high duct temperature or fire: Replace the temperature sensor (BAT)<br>– Check the connection of the actuator on the BKN230-...-MOD |
| Status Actuator:<br>Actuator too much current | – Actuator defective<br>– Short circuit | – Replace actuator |
| StatusDevice:<br>InternalError | Internal device error | – Contact Belimo |

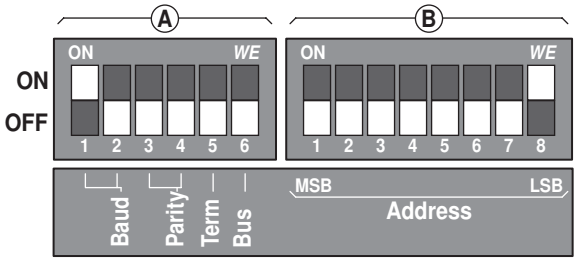
## General information Modbus

**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<br>Default: 1-8-N-2 (Start bits, Data bits, Parity, Stop bits) |
| Baud rates | 9600, 19200, 38000, 76800 Bd<br>Default: 38400 Bd |
| Addresses | 1...247, values over 247 are interpreted as 247,<br>0 = Broadcast |
| Termination | 150 Ω , can be switched if necessary |

## Modbus parametrisation

**Parametrisation (DIP switch)**

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| Baud rate | 1 | 2 |
|---|---|---|
| 9'600 | OFF | OFF |
| 19'200 | OFF | ON |
| 38'400 | ON | OFF |
| 76'800 | ON | ON |

| Parity | 3 | 4 |
|---|---|---|
| 1-8-N-2 | OFF | OFF |
| 1-8-N-1 | OFF | ON |
| 1-8-E-1 | ON | OFF |
| 1-8-O-1 | ON | ON |

| Termination | 5 |
|---|---|
| with 150 Ω | ON |
| OFF | OFF |

| Bus | 6 |
|---|---|
| BACnet | ON |
| Modbus | OFF |

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| 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 * 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<br>– Actuator leaves the end position for no apparent reason (e.g. “Open”)<br>– Temperature sensor (BAT) triggered<br>– Actuator / limit switch are not connected | – Final position was not reached within the time limit<br>– Actuator leaves the end position for no apparent reason (e.g. "Open")<br>– 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<br>– 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<br>– 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<br>– BACnet Revision 14<br>– 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<br>– 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<br>– Communication quality increased<br>– Display of stored malfunction implemented<br>– If a malfunction is stored (BAE/ORM), the actuator remains in the safety position<br>– Damper test works with local override control |
| **Firmware V1.05** | Production date > 2013-04-01 | – Release without restrictions |

## Dimensions [mm]

### Dimensional drawings