71589-00002.F

**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 is supplied 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) |
| | Connections | See „Connections“ on page 3 |
| **Control** | Communication | BACnet MS/TP or Modbus RTU (ex factory) |
| | BACnet MS/TP | see description from page 4 |
| | Modbus RTU | see description from page 7 |
| | Typical response time | <100 ms |
| **Safety** | Protection class | **II** Protective insulated ⧈ |
| | Degree of protection | IP40 |
| | EMC | CE according to 2014/30/EU |
| | Low-voltage-directive | CE according to 2014/35/EU |
| | Mode of operation | Type 1 (EN 60730-1) |
| | Rated impulse voltage | 2.5 kV (EN 60730-1) |
| | Control pollution degree | 2 (EN 60730-1) |
| | Ambient temperature | –20...+50°C |
| | Non-operating temperature | –40...+80°C |
| | Humidity test | 95% r.h., non-condensing (EN 60730-1) |
| | Maintenance | Maintenance-free |
| **Dimensions / Weight** | Dimensions | see „Dimensions“ on page 12 |
| | Weight | ca. 350 g |

## Safety notes

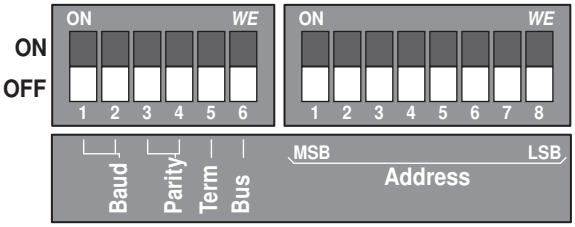
- **The device has been designed for use in stationary heating, ventilation and air-conditioning systems and is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.**
- **Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied with during installation.**
- **The device may only be opened at the manufacturer's site. 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 allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.**

## Product features

**Application**

The BKN230-24-MOD is installed with the motorised fire damper. This unit sets up the communication connection with higher-level systems while the built-in safety isolating transformer supplies DC 24 V voltage to the damper actuator.

**Parameterisation (DIL switch)**



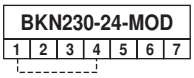

Parameterisation of the communication for BACnet MS/TP refer to Page 4.
Parameterisation of the communication for Modbus RTU refer to Page 7.

**Expansion options**

An optoelectronic smoke detector can be connected directly without add-on devices. If a smoke or temperature alarm is tripped, the local damper immediately moves into the safety position and sends a corresponding message 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. However, the damper can still move into the operating position by means of the wire bridge (Terminal 1 to 4) as soon as power supply voltage is applied. 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 local safety function of the smoke detector is not affected. The actual position of the damper is displayed 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), the stored smoke detector fault must first be reset before the damper can be started up. The reset is executed via test button (test run / fault acknowledgement).



## Electrical installation

① **Power supply cable and plug, AC 230 V**

② **Tab connection for**
– BELIMO damper actuator (motor DC 24 V)

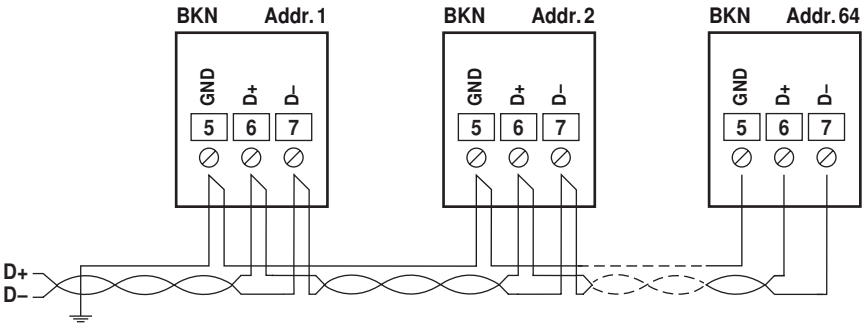
③ **Tab connection for**
– BELIMO damper actuator (limit switch)

④ **USB mini socket for**
– BKN-MOD-BAC Update Tool

⑤ **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 Modbus GND
6 Modbus D+
7 Modbus D–




**BACnet / Modbus wiring**




**BACnet / Modbus-GND**
Implementation of the bus wiring in 3-wire format is mandatory. The GND must be connected to the protective earth of the control cabinet.

The wiring of the line for BACnet (MS/TP) / Modbus (RTU) is to be carried out in accordance with applicable RS485 regulations.

## Indicators and operating elements

⑥ **Button Test run / fault acknowledgement**
Press the button for longer than one second to trigger the following functions:
a) starts test run
b) resets a current error message

⑦ **DIL switch** (see „Parameterisation“)

⑧ **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 fault (BKN) |
| | blinking | External fault = smoke sensor triggered, nominal position not reached |
| | flashing | External fault = If an error is stored (i.e. no longer pending, but not yet acknowledged), then this is displayed on the device by a periodic flash of the red LED. |




⑨ **LED display communication BACnet / Modbus:**
Yellow flickering BACnet / Modbus communication is illuminated during RX and TX

**Signalisation**

| Lower limit position (Damper CLOSED) not reached: | | Upper limit position (Damper OPEN) not reached: | |
|---|---|---|---|
| LED red | blinking | LED red | blinking |
| LED green | blinking | LED green | off |
| LED yellow | off | LED yellow | blinking |
| Signal via LED after 2:30 min | | Signal via LED after 2:30 min | |

## General informations BACnet

**General informations**

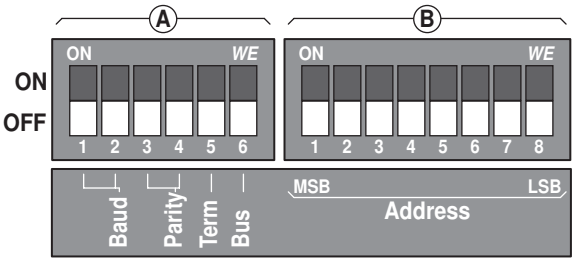
| | |
|---|---|
| Date | 3. February 2018 |
| Vendor Name | BELIMO Automation AG |
| Vendor ID | 423 |
| Product Name | Field Module for Fire Damper |
| Product Model Number | BKN230-24-MOD |
| Applikations Software Version | 2.1 |
| Firmware Revision | 1.0.1 |
| BACnet Protocol Revision | 12 |
| Product Description | Communication and power supply unit for motorised fire damper |
| BACnet Standard Device Profile | BACnet Application Specific Controller (B-ASC) |

**BACnet Interoperability Building Blocks supported (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 capability | No |
| Data Link Layer Options | MS/TP master,<br>Baud rats: 9‘600, 19‘200, 38‘400, 76‘800 |
| Device Address Binding | No static device binding supported |
| Networking Options | None |
| Character Sets supported | ISO 10646 (UTF-8) |
| Gateway Options | None |
| Network Security Options | Non-secure device |
| Conformance | Listed by BTL |

## Parameterisation BACnet

**Parameterisation (DIL switch)**




Ⓐ

| 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 |
| 1-8-N-1 | OFF | ON |
| 1-8-N-1 | ON | OFF |
| 1-8-N-1 | ON | ON |

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

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

Ⓑ

| 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**

| Objekt type | Optional properties | Writeable 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…60‘000)<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 the services CreateObject and DeleteObject.
– The specified maximum length of writable strings 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. No password is required.
– A maximum of 64 active COV subscriptions with a lifetime of 1…28800 sec. (8 hours) are supported.

## BACnet object description

| Object Name | Object Type [Instance] | Description / Comment | Values | Value Default | COV Increment | COV Increment Default | Access |
|---|---|---|---|---|---|---|---|
| Device | Device [Inst.Nr] | Object device<br>*Device Name: If set to an empty string, default Device name is set to factory settings.*<br>*Device Instance Number = Device Offset Object + BACnet MAC address (Dip Switches), not writable with Instance Property* | 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 Watchdog Countdown (Communication Supervision) | 0…3600 | 0 | 0.01...1000 | 1 | R |
| ActPower Consumption | AI[131] | Power consumption in W | 0…2.147e+9 | 0 | 0.01...100 | 1 | R |
| OffsetDeviceID | AV[121] | This value plus the parameterized MAC address (0…127) define the Device Instance Number. | 0…4‘194‘056 (2^22 - 247) | 1000 | 1.0...1000 | 1 | W |
| BusWatchdog | AV[130] | Timeout for Bus Watchdog in s<br>*0 = watchdog deactivated*<br>*If the Present_Value is not ZERO, the implementation tracks write procedures to the Present_Values for Override MO[1].*<br>*If the Present_Values of MO[1] is written, the timer is reset.*<br>*Upon timeout the Priority_Array of the MO[1] object is cleared and the Relinquish_Default becomes valid.* | 0...3600 | 300 | 1.0...1000 | 1 | W |

## BACnet object description

| Object Name | Object Type [Instance] | Description / Comment | Values | Default | Access |
|---|---|---|---|---|---|
| SummaryStatus | BI[101] | Summary status<br>*Note: Summary Status summarizes the state from 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: Flag set if Local Test Button activated.<br>Out of service: Flag set if Local control / bridge connected between terminal 1 and 4. If local override control should not be used, remove the control / bridge between terminal 1 and 4.<br>*Remark: Object can be monitored by BusWatchdog (see AV[130])* | 1: None<br>2: Open<br>3: Close | 1 | C |
| Command | MV[120] | Initiate Function<br>*Initiation of actuator functions for service and test, the value goes after the command back to None (1) automatically.* | 1: None<br>2: –<br>3: Test<br>4: Reset | 1 | W |
| InternalActivity | MI[100] | Detailed Status Information<br>Test: Internal Test running, activated by bus<br>*Remark: An activated Local Test Button is shown on MO[1]-Overridden Status Flag.* | 1: None<br>2: Test | – | R |
| StatusActuator * | MI[106] | Status Actuator: Mechanical overload due to 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] | Status Device: Internal Error, Hardware Defect, BusWatchdog, etc. | 1: OK,<br>2: BusWatchdog triggered,<br>3: InternalError | – | R |
| StatusTripping * | MI[111] | Status Sensor: Indicates information about the status of the smoke detector and temperature sensor. | 1: OK<br>2: Smoke Detector triggered<br>3: Temperature Sensor triggered<br>4: Smoke Detector & Temp Sensor triggered | – | R |

Access: R = Read, W = Write, C = Commandable with priority array
* All Status Information except the „BusWatchdog triggered“ need a reset command to go back to normal operation

| Specific Malfunction description* | Possible Causes | Recommended Actions |
|---|---|---|
| Status Actuator:<br>Actuator cannot move | – End position not reached within time<br>– Actuator leaves end position (e.g. open) with no reason<br>– End switches not connected<br>As consequence actuator runs into safety position Close. | – Check working range /damper blade and limitation switches<br>– Check actuator /end switches connection on BKN230-..-MOD |
| Status Actuator:<br>Actuator disconnected | – Actuator not connected<br>– Temperature Sensor (BAE/BAT) triggered<br>As consequence actuator runs into safety position Close. | – Replace Temperature Sensor (BAE / BAT) in case it is broken due to high temperature / fire<br>– Check actuator connection on BKN230-..-MOD |
| Status Actuator:<br>Actuator too much current | – Actuator broken<br>– Short circuit | – Replace actuator |
| StatusDevice:<br>InternalError | Internal Device Error | – Contact Belimo |

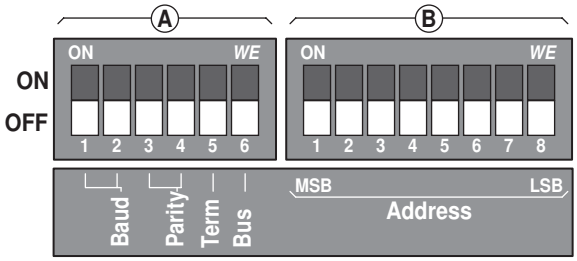
## General information Modbus

**General information**

| | |
|---|---|
| Parameterisation | via DIP-swichtes |
| 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 rate | 9‘600, 19‘200, 38‘400, 76‘800 Bd<br>Default: 38‘400 Bd |
| Address range | 1...247, values over 247 are interpreted as 247,<br>0 = Broadcast |
| Terminating resistor | 150 Ω, can be activated by DIP-Switch |

## Parameterisation Modbus

**Parameterisation (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-2 | OFF | OFF |
| 1-8-N-1 | OFF | ON |
| 1-8-E-1 | ON | OFF |
| 1-8-O-1 | ON | ON |

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

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

Ⓑ

| 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 |

## Modbus overview

**Register**

| | No. | Adr | Register | R / W |
|---|---|---|---|---|
| In 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 | Collective fault | 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 (Modbus module) | R |
| | 105 | 104 | Malfunction and service information | R |
| | 106 | 105 | – | |
| | 107 | 106 | – | |
| | 108 | 107 | Bus Watchdog countdown | R |
| | 109 | 108 | **Bus fail position** | R / W |
| | 110 | 109 | **Bus Watchdog** | R / W |

- Registers in Bold can be written
- Registers <100 (In operation) which can be written are non-permanent and should therefore be updated periodically
- Registers >100 which can be written are permanent

**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 Register. The commands for Discrete Inputs and Input Registers can be used as an alternative.

**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 (Adr 104). The Start address for "BAT (duct temperature sensor) triggered" is calculated with
104 * 16 + 6 = 1670

Standard commands:
Read Holding Registers [3]
Write Single Register [6]

Optional commands:
Read Discrete Inputs [2]
Read Input Registers [4]
Write Multiple Registers [16]

## Modbus register description

**Register 1 (reserved)**

Not used in this device. Constant value 65'535.

**Register 2: Override control**

Overriding the setpoint with defined compulsions

**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 faults |

**Register 4: Actuator type**

| Actuator type | |
|---|---|
| 3 | Fire damper actuator |

**Register 5: Relative position**

Position in accordance with position indicator switches
– Damper closed: 0 (0%)
– Intermediate switching: 5,000 (50%)
– Damper open: 10,000 (100%)

**Register 6: Power consumption of actuator**

Actual power consumption in mW.
Can be used for troubleshooting or monitoring purpose

**Register 9: Collective fault**

Fault is set when one of the bits 0...7 of Register 105 is set
(used as sensor value for air/water/VAV)

| Collective fault | |
|---|---|
| 0 | no fault |
| 1 | fault |

**Register 101, 103: Series number**

Each node has an unambiguous series number. The series number consists of 4 segments, although only parts 1, 2 and 4 are displayed 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

## Modbus register description

**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 | Actuation path increased |
| | 2 | Mechanical overload |
| | 3 | – |
| | 4 | Safety-relevant malfunction |
| | 5 | Actuator too much current |
| | 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 | – |

**Malfunction Description**

**Bit 1 und 2: Mechanical travel increased / Mechanical overload**

| Firmware Version 1.x | Firmware Version 2.x |
|---|---|
| – End position not reached within time<br>– Actuator leaves end position (e.g. open) with no reason<br>– BAE / BAT on actuator triggered<br>– Actuator / end switches not connected | – End position not reached within time<br>– Actuator leaves end position (e.g. open) with no reason<br>– Actuator / end switches not connected<br>As consequence actuator runs into safety position Close |

Recommended Action: – Check working range / damper blade and limitation switches
– Check actuator / end switches connection on BKN230-..-MOD

**Bit 4: Safety-relevant malfunction**

Internal device error

Recommended Action: – Contact Belimo

**Bit 5: Actuator too much current**

| Firmware Version 1.x | Firmware Version 2.x |
|---|---|
| Not supported | – Actuator broken<br>– Short circuit |

Recommended Action: – Replace the actuator

**Bit 6: BAT triggered**

| Firmware Version 1.x | Firmware Version 2.x |
|---|---|
| – Local connected BAE / BAT triggered | – **Temperature sensor** (BAT) on actuator triggered<br>– Actuator / end switches not connected |

Recommended Action: – Replace BAE / BAT in case it is broken due to high temperature / fire
– Check actuator / end switches connection on BKN230-..-MOD

**Bit 7: Smoke detector triggered** (Firmware Version 1.x und 2.x)

Local connected smoke detector triggered

Recommended Action: – Check the smoke detector

**Bit 8: Internal activity** (Firmware Version 1.x und 2.x)

Shows if there is a Test run via BACnet / Modbus active

## Modbus register description

**Bit 10: Bus monitoring triggered** (Firmware Version 1.x und 2.x)

Bus time is up without receiving a command within the set Watchdog time.

Recommended Action:
- Check the Modbus communication in general
- Check the cycle time of the periodic writing to Register 2 „override control“
- If necessary, adjust the watchdog time on Register 110 „Communication Watchdog“

**Bit 11: Local override control active** (Firmware Version 1.x und 2.x)

Local control / bridge connected between terminal 1 and 4.
The actual actuator position can be monitored via Register 5 „Relative position“

Recommended Action:
- If local override control should not be used, remove the control / bridge between terminal 1 and 4.

The malfunction bits can be reset with Register 3 (Command value 4).
Bit 4 Safety relevant malfunction cannot be reset.

**Register 108: Bus Watchdog countdown**

The Bus Watchdog time, set on Register 110, is displayed as countdown (Time until the control command has to get repeated).
This value allows troubleshooting in case of too short defined Watchdog and cycle times.

**Register 109: Bus fail position**

The bus monitoring controls the Modbus communication. If the override control (Register 2) is not renewed within 300 seconds, the actuator controls to the bus fail position (closed).
Activating only the bus fail position will set the Bus Watchdog time on register 110 as default to 300s.
Triggered bus monitoring is indicated in Register 105.

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

**Register 110: Bus Watchdog**

If the Bus Fail Position is activated on Register 109, default setting is 300s.
The value 0 will disable the Watchdog (Register 109 and Register 110).

| Bus Watchdog | |
|---|---|
| 0 | Disabled |
| 1...3600 s | Enabled |

## Firmware history

**Version overview**

| | | |
|---|---|---|
| **Firmware V2.01** | Production date > 2018-05-01 | – Upgrade with BACnet MS/TP<br>– Modbus: Extended with Register 108, 110, power consumption of actuator and additional malfunction and service information. |
| **Firmware V1.10** | Production date > 2016-01-01 | – Time for bus monitoring increased from 120 to 300 seconds |
| **Firmware V1.09** | Production date > 2015-01-01 | – More precise monitoring of the of desired position<br>– Increased communication quality<br>– Implemented display of stored malfunction<br>– At stored malfunction (BAE/ORM) the actuator rest in safety position<br>– Damper test works in local override control mode |
| **Firmware V1.05** | Production date > 2013-04-01 | – Release without restrictions |

## Dimensions [mm]

### Dimensional drawings

