# BELIMO

**Multifunctional rotary actuator for 2 and 3-way control ball valves**

• Torque 20 Nm
• Nominal voltage AC/DC 24 V
• Control: modulating DC 0 ... 10 V or variable
• Position feedback DC 2 ... 10 V or variable
• Communication via LONWORKS® (FTT-10A)
• Conversion of sensor signals

LONMARK®

## Technical data

**Electrical data**

| | |
|---|---|
| Nominal voltage | AC 24 V, 50/60 Hz / DC 24 V |
| Power supply range | AC 19.2 ... 28.8 V / DC 21.6 ... 28.8 V |
| Power consumption in operation | 4 W at nominal torque |
| At rest | 1.25 W |
| For wire sizing | 6 VA |
| Connection | Cable 1 m, 6 x 0.75 mm$^2$ |

**Data for LONWORKS®**

| | |
|---|---|
| Certified | According to LonMARK® 3.3 |
| Processor | Neuron 3120 |
| Transceiver | FTT-10A, compatible with LPT-10 |
| Functional profile | According to LONMARK® Damper actuator object #8110 Open loop sensor object #1 |
| LNS plug-in for actuator / sensor | Can be run with any LNS-based integration tool (min. for LNS 3.x) |
| Service button and status LED | According to LONMARK® guidelines |
| Conductors, cables | Conductor lengths, cable specifications and topology of the LONWORKS® network according to the ECHELON® directives |

| Functional data | Factory settings | Variable | Settings |
|---|---|---|---|
| Torque (nominal torque) | Min. 20 Nm @ nominal voltage | 25%, 50%, 75% reduced | ............................. |
| Position feedback (measuring voltage U) | DC 2 ... 10 V, max. 0.5 mA | Starting point DC 0.5 ... 8 V<br>End point      DC 2.5 ... 10 V | ............................. |
| Uni-rotation | ±5% absolutely | | |
| Running time | 90 s / 90°◁ | 90 ... 346 s | ............................. |
| Automatic adjustment of running time, control and feedback to match the mechanical angle of rotation | Manual triggering of the adaption by pressing the „Adaption" button or with the PC-Tool | Automatic adaption whenever the supply voltage is switched on, or manual triggering | ............................. |
| Angle of rotation limiting | MAX (maximum position)      = 100%<br>MIN (minimum position)      =     0%<br>ZS (intermediate position, only AC)      =   50% | MAX   =   (MIN +30°◁ ) ... 100%<br>MIN   =   0% ... (MAX -30°◁ )<br>ZS      =   MIN ... MAX | ............................. |
| Sound power level | Max. 45 dB (A) | With a            90 s  <  45 dB (A)<br>running      346 s  =  35 dB (A)<br>time of | |
| Position indication | Mechanical, plug-on | | |

**Safety**

| | |
|---|---|
| Protection class | **III** Safety extra-low voltage |
| Degree of protection | IP54 in all mounting positions |
| EMC | CE according to 89/336/EEC |
| Mode of operation | Type 1 (in acc. with EN 60730-1) |
| Rated impulse voltage | 0.8 kV (in acc. with EN 60730-1) |
| Control pollution degree | 3 (in acc. with EN 60730-1) |

## Technical data  *(continued)*

### Safety

| | |
|---|---|
| Ambient temperature range | +0 ... +50°C |
| Temperatur of medium | +5 ... +100°C in control ball valve<br>–10°C with stem heating upon request |
| Non-operating temperature range | –40 ... +80°C |
| Ambient humidity range | 95% RH, non-condensating (in acc. with EN 60730-1) |
| Maintenance | Maintenance-free |

### Dimensions/weight

| | |
|---|---|
| Dimensions | See „Dimensions" on page 5 |
| Weight | approx. 500 g |

## Safety notes

⚠

- **The damper actuator is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.**
- **It may only be installed by suitably trained personnel.**
  **All applicable legal or institutional installation regulations must be complied with.**
- **The switch for changing the direction of rotation may only be operated by authorized personnel. The direction of rotation must not be reversed in a frost protection circuit.**
- **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 cable is not allowed to be removed from the unit.**
- **The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. The local and currently valid regulations and requirements must be observed.**
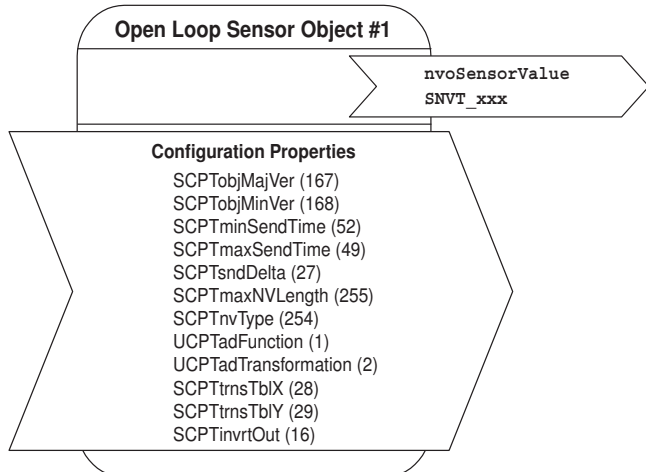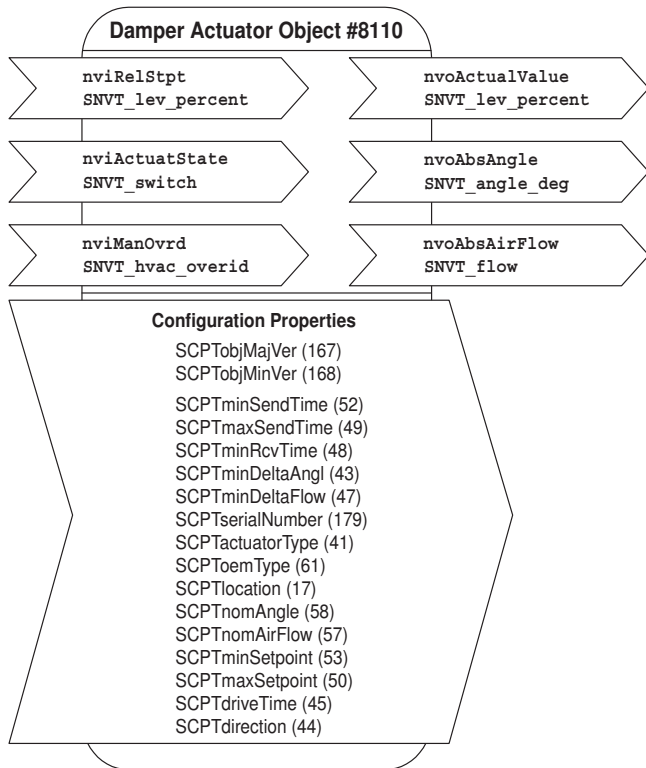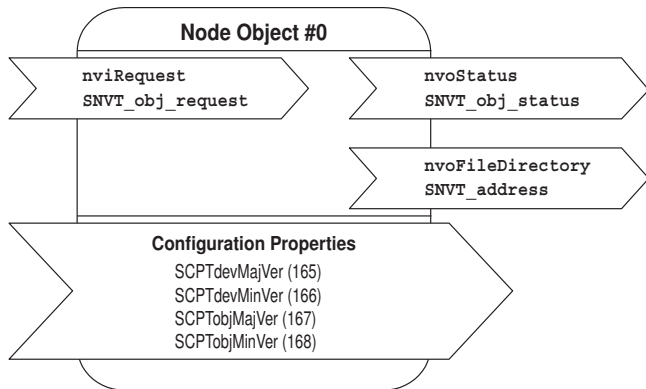
## Product features

| | |
|---|---|
| **Mode of operation** | The actuator is equipped with an integrated interface for LONWORKS®. The actuator can be directly connected and controlled with LONWORKS® via a FTT-10A transceiver. |
| **Converter for sensors** | Connection option for a sensor (passive or active sensor or switching contact). In this way, the analog sensor signal can be easily digitised and transferred to LONWORKS®. |
| **Parameterisable actuators** | The factory settings cover the most common applications. As desired, individual parameters can be adapted for specific systems or servicing with an MFT parameterisation device (e.g. PC-Tool MFT-P). |
| **Simple direct mounting** | Straightforward direct mounting on the ball valve with only one screw. The mounting position in relation to the ball valve can be selected in 90°◁ steps. |
| **Manual override** | Manual operation with pushbutton possible - temporary, permanently. The gear is disengaged and the actuator decoupled for as long as the button is pressed / latched. |
| **Adjustable angle of rotation** | Adjustable angle of rotation with mechanical end stops. |
| **High functional reliability** | The actuator is overload-proof, requires no limit switches and automatically stops when the end stop is reached. |
| **Home position** | When the supply voltage is switched on for the first time, i.e. at commissioning or after pressing the „gear disengagement" switch, the actuator travels to the home position. |

| Rotary actuator | Rotary valve |
|---|---|
| ↘Y2 | A – AB = 0% |
| Y1↙ | A – AB = 100% |

The actuator then moves to the position defined by LONWORKS®.

## Functional profile according to LONMARK®

The LON-capable damper actuator is certified by LonMARK®. The actuator functions are supplied with the LonWorks® network as standardised network variables according to LonMARK®. The node object #0, the damper actuator object #8110 and the open loop sensor object #1 are implemented in the actuator.

### Node Object #0

nviRequest
SNVT_obj_request

nvoStatus
SNVT_obj_status

nvoFileDirectory
SNVT_address

**Configuration Properties**
SCPTdevMajVer (165)
SCPTdevMinVer (166)
SCPTobjMajVer (167)
SCPTobjMinVer (168)

### Damper Actuator Object #8110

nviRelStpt
SNVT_lev_percent

nvoActualValue
SNVT_lev_percent

nviActuatState
SNVT_switch

nvoAbsAngle
SNVT_angle_deg

nviManOvrd
SNVT_hvac_overid

nvoAbsAirFlow
SNVT_flow

**Configuration Properties**
SCPTobjMajVer (167)
SCPTobjMinVer (168)

SCPTminSendTime (52)
SCPTmaxSendTime (49)
SCPTminRcvTime (48)
SCPTminDeltaAngl (43)
SCPTminDeltaFlow (47)
SCPTserialNumber (179)
SCPTactuatorType (41)
SCPToemType (61)
SCPTlocation (17)
SCPTnomAngle (58)
SCPTnomAirFlow (57)
SCPTminSetpoint (53)
SCPTmaxSetpoint (50)
SCPTdriveTime (45)
SCPTdirection (44)

### Open Loop Sensor Object #1

nvoSensorValue
SNVT_xxx

**Configuration Properties**
SCPTobjMajVer (167)
SCPTobjMinVer (168)
SCPTminSendTime (52)
SCPTmaxSendTime (49)
SCPTsndDelta (27)
SCPTmaxNVLength (255)
SCPTnvType (254)
UCPTadFunction (1)
UCPTadTransformation (2)
SCPTtrnsTblX (28)
SCPTtrnsTblY (29)
SCPTinvrtOut (16)

**Notes**
Detailed information on the functional profiles can be found on the website of LonMARK® (www.lonmark.org).

### Node object #0

The node object contains the object status and object request functions.
**nviRequest**      **SNVT_obj_request**
Input variable for requesting the status of a particular object in the node.
**nvoStatus**      **SNVT_obj_status**
Output variable that outputs the current status of a particular object in the node.
**nvoFileDirectory**   **SNVT_address**
Output variable that shows information in the address range of the Neuron chip.

### Damper actuator object #8110

The actuator object is used to transmit the functions of the actuator to the LONWORKS® network.
**nviRelStpt**      **SNVT_lev_percent**
The nominal position is assigned to the actuator via this input variable. This variable is normally linked to the output variable of an HVAC controller.
**nviActuateState**   **SNVT_switch**
A preset position is assigned to the actuator via this input variable. Note on priority: The last variable that was active, either nviActuatorState or nviRelStpt, has priority.
**nviManOvrd**      **SNVT_hvac_overid**
These input variables can be used to manually override the actuator into a particular position.
**nvoActualValue**    **SNVT_lev_percent**
This output variable shows the current actual position of the actuator and can be used for control circuit feedback or for displaying positions.
**nvoAbsAngle**     **SNVT_angle_deg**
This output variable shows the current angle of rotation of the actuator or the damper blade and can be used to display the position or for service purposes.
**nvoAbsAirFlow**    **SNVT_flow**
This output variable is inactive with the SR24ALON damper actuator and shows a constant value of 65535 (this variable is only active in conjunction with LON-capable VAV controllers).

### Open loop sensor object #1

A sensor can be connected to the damper actuator. A passive resistance sensor (e.g. Ni1000), an active sensor (output 0 ... 32 V) or a switch (on/off) can be connected. In the case of the open loop sensor object, the measured sensor values are transferred to the LonWorks® network.
**nvoSensorValue**   **SNVT_xxx**
This output variable shows the current sensor value.
Depending on the connected sensor, the output variable can be configured via the sensor plug-in and specifically adapted to the system.

| The SNVT_.. can be configured as: | | |
|---|---|---|
| SNVT_temp_p | SNVT_lev_percent | SNVT_lux |
| SNVT_temp | SNVT_abs_humid | SNVT_press_p |
| SNVT_switch | SNVT_enthalpy | SNVT_smo_obscur |
| SNVT_flow | SNVT_ppm | SNVT_power |
| SNVT_flow_p | SNVT_rpm | SNVT_elec_kwh |

## Electrical installation

**Wiring diagrams**

**Connection without sensor**

**Note**

Connect via safety isolation transformer. ⚠

LᴏɴWᴏʀᴋs®

OPEN / MAX / CLOSE / Bus operation

V

| 1 | 2 | 3 | 5 | 6 | 7 |

⊥ / ~ / MFT / LON / LON
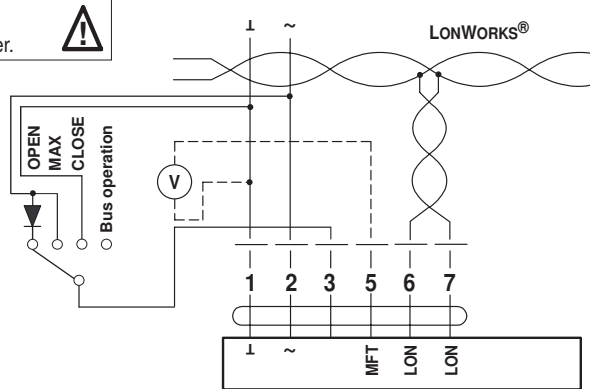
V    Possible connection of a voltmeter for checking the position feedback U.

If no sensor is connected, the analogue override control function can be used.
**Please note:** This only works if the actuator is supplied with AC 24 V.

**Connection with passive sensor**
**e.g. Pt1000, Ni1000, NTC**

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| 1 | 2 | 3 | 5 | 6 | 7 |

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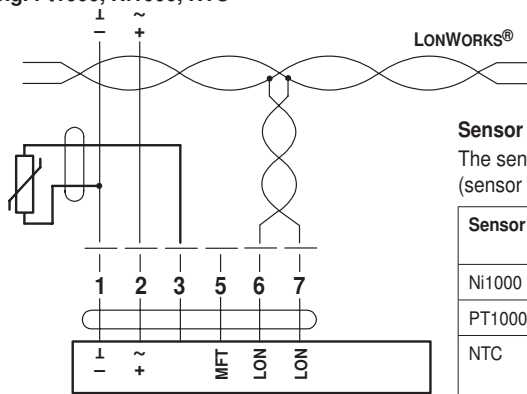
**Sensor scaling:**
The sensors can be scaled with the sensor plug-in (sensor table).

| Sensor | Temperature range | Resistance range | Resolution |
|---|---|---|---|
| Ni1000 | -28 ... +98 °C | 850 ... 1600 Ω | 1 Ω |
| PT1000 | -35 ... +155 °C | 850 ... 1600 Ω | 1 Ω |
| NTC | −10 ... +160 °C (depending on type) | 200 ... 60 kΩ | 1 Ω |

**Connection with switching contact,**
**e.g. Δp-monitor**

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Δp

| 1 | 2 | 3 | 5 | 6 | 7 |

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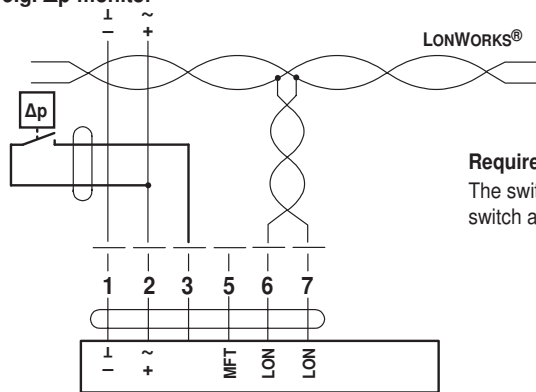
**Requirements for switching contact:**
The switching contact must be able to accurately switch a current of 16 mA @ 24 V.

**Connection with active sensor,**
**e.g. 0 ... 10 V @ 0 ... 50 °C**

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| 1 | 2 | 3 | 5 | 6 | 7 |

⊥/− / ~/+ / MFT / LON / LON
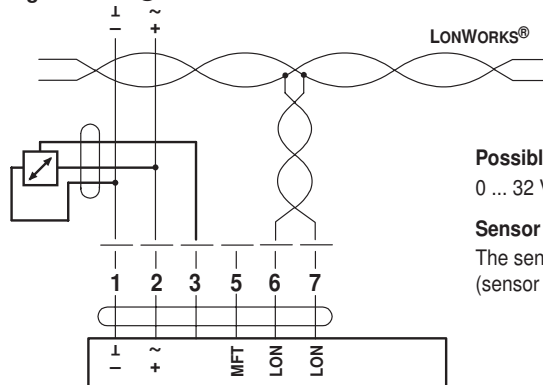
**Possible input voltage range:**
0 ... 32 V (resolution 30 mV)

**Sensor scaling:**
The sensors can be scaled with the sensor plug-in (sensor table)

## Parameterisation

**Connection of the MFT parameterisation devices, e.g. Belimo PC-Tool MFT-P**

**The actuator can be parameterised as follows:**
– Electronic angle of rotation limitation
– Torque reduction
– Direction of operation reversible
– Running time
– Function test or adaption can be triggered
– Position feedback (measuring voltage U)

**Parameterisation of the actuator when it has already been integrated in the complete system and is supplied with AC 24 V**

**Notes**
• The actuator can be triggered with the PC-Tool under „PP".
• The scope of delivery of ZIP-232-KA includes the RS232 cable.
• The connection cable ZK1-GEN has to be ordered separately.
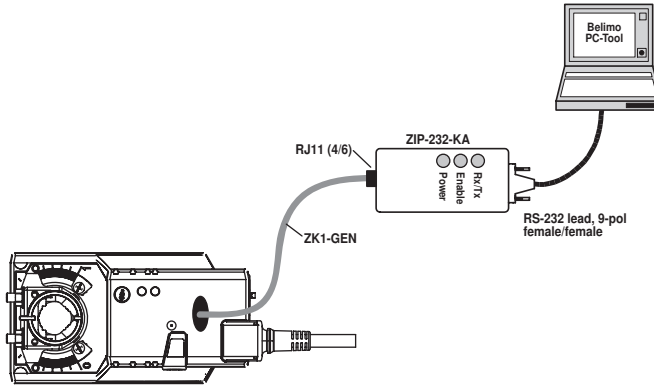


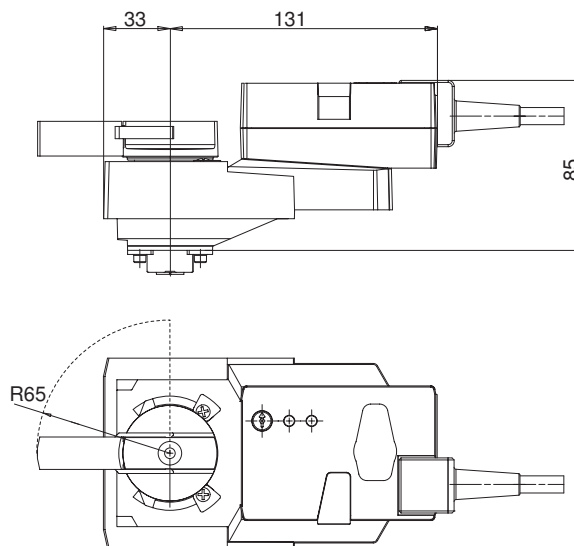**Parameterisation of the actuator before it is integrated in the complete system**

**Notes**
• The actuator can be triggered with the PC-Tool under „PP".
• The RS232 cable is included in the scope of delivery of ZIP-232.
• The power supply unit ZN230-24 has to be ordered separately.
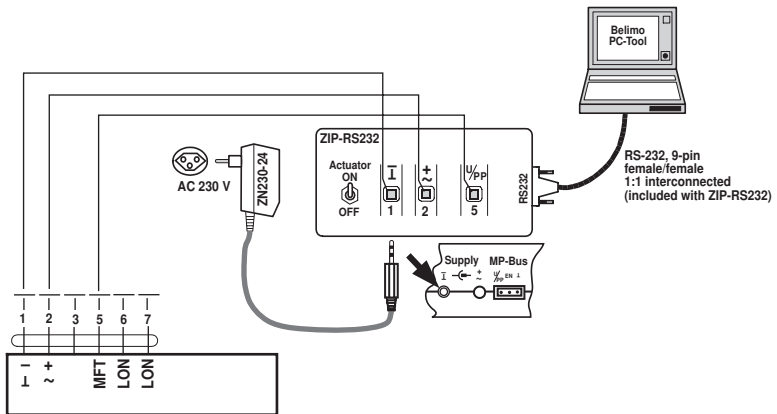


## Dimensions [mm]

**Dimensional diagrams**

## Operating controls and indicators

**① Direction of rotation switch**

| | |
|---|---|
| Switching over: | Direction of rotation changes |

**② Pushbutton and green LED display**

| | |
|---|---|
| Off: | No voltage supply or fault |
| Green, on: | Operation |
| Press button: | Switches on angle of rotation adaption followed by standard operation |

**③ Service button for commissioning for LonWorks® and yellow LED display for the LON status**

| | |
|---|---|
| Off: | The rotary actuator LR24ALON is ready for operation in the LonWorks® network. |
| Yellow, on: | No application software is loaded in the LR24ALON. |
| Yellow, flashing: (flashing interval 2 s) | The LR24ALON is ready for operation but not integrated in the LonWorks® network (unconfigured). |
| Other flashing codes: | A fault is present in the LR24ALON. |
| Press button: | Service pin message is sent to the LonWorks® network. |

**④ Gear disengagement switch**

| | |
|---|---|
| Press button: | Gear disengaged, motor stops, manual override possible |
| Release button: | Gear engaged, synchronisation starts, followed by standard operation |

**⑤ Service plug**

For connecting MFT parameterising and service tools (see page 5)

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**Further documentations**

- Complete overview of actuators for water solutions
- Data sheets for butterfly valves
- Installation instructions for actuators and/or ball valves
- Notes for project planning (hydraulic characteristic curves and circuits, installation regulations, commissioning, maintenance etc.)