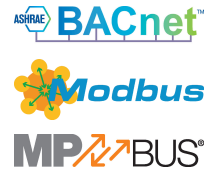
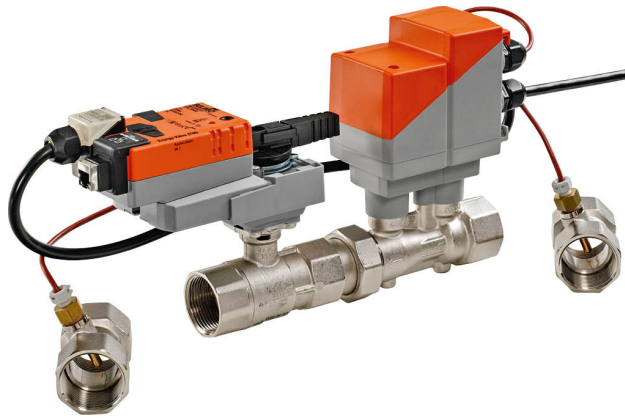


Characterised control valve with sensor-operated flow rate or power control, power and energy-monitoring function, 2-way, Internal thread, PN 25 (Energy Valve)

- Nominal voltage AC/DC 24 V
- Control modulating, communicative, hybrid, Cloud
- For closed cold and warm water systems
- For modulating control of air-handling and heating systems on the water side
- Ethernet 10/100 Mbit/s, TCP/IP, integrated web server
- Communication via BACnet, Modbus, Belimo MP-Bus or conventional control
- optional Belimo Cloud connection
- Glycol monitoring


Type Overview

Type	DN	Rp ["]	V'nom [l/s]	V'nom [l/min]	V'nom [m ³ /h]	kvs theor. [m ³ /h]	PN
EV015R+BAC	15	1/2	0.35	21	1.26	2.9	25
EV020R+BAC	20	3/4	0.65	39	2.34	4.9	25
EV025R+BAC	25	1	1.15	69	4.14	8.6	25
EV032R+BAC	32	1 1/4	1.8	108	6.48	14.2	25
EV040R+BAC	40	1 1/2	2.5	150	9	21.3	25
EV050R+BAC	50	2	4.8	288	17.28	32.0	25

kvs theor.: Theoretical kvs value for pressure drop calculation

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption in operation	4 W (DN 15, 20, 25) 5 W (DN 32, 40, 50)
	Power consumption in rest position	3.7 W (DN 15, 20, 25) 3.9 W (DN 32, 40, 50)
	Power consumption for wire sizing	6.5 VA (DN 15, 20, 25) 7.5 VA (DN 32, 40, 50)
	Connection supply / control	Cable 1 m, 6 x 0.75 mm ²
	Connection Ethernet	RJ45 socket
	Parallel operation	Yes (note the performance data)
Data bus communication	Communicative control	BACnet IP, BACnet MS/TP Modbus TCP, Modbus RTU MP-Bus Cloud
	Number of nodes	BACnet / Modbus see interface description MP-Bus max. 8
Functional data	Operating range Y	2...10 V
	Input Impedance	100 kΩ
	Operating range Y variable	0.5...10 V
	Position feedback U	2...10 V
	Position feedback U note	Max. 1 mA
	Position feedback U variable	0...10 V 0.5...10 V
	Sound power level Motor	35 dB(A) (DN 15, 20, 25, 32, 40) 45 dB(A) (DN 50)

Functional data	Adjustable flow rate V'max	30...100% of Vnom	
	Control accuracy	±5% (of 25...100% V'nom)	
	Control accuracy note	±10% (of 25...100% V'nom)	
	Min. controllable flow	1% of V'nom	
	Parametrisation	via integrated web server / ZTH EU	
	Fluid	Water	
	Fluid temperature	-10...120°C [14...248°F]	
	Fluid temperature note	At a fluid temperature of -10...2°C, a spindle heater or a valve neck extension is recommended.	
	Close-off pressure Δps	1400 kPa	
	Differential pressure Δpmax	350 kPa	
	Differential pressure note	200 kPa for low-noise operation	
	Flow characteristic	equal percentage, optimised in the opening range (switchable to linear)	
	Leakage rate	air-bubble tight, leakage rate A (EN 12266-1)	
	Pipe connection	Internal thread according to ISO 7-1	
	Installation position	upright to horizontal (in relation to the stem)	
	Servicing	maintenance-free	
	Manual override	with push-button, can be locked	
Flow measurement	Measuring principle	Ultrasonic volumetric flow measurement	
	Measuring accuracy flow	±(2 + 0.02 V'nom/V') % of the measured value (V'), but not more than ±5%	
	Min. flow measurement	0.5% of V'nom	
Temperature measurement	Measuring accuracy absolute temperature	± 0.35°C @ 10°C (Pt1000 EN60751 Class B) ± 0.6°C @ 60°C (Pt1000 EN60751 Class B)	
	Measuring accuracy temperature difference	±0.22 K @ ΔT = 10 K ±0.32 K @ ΔT = 20 K	
Safety data	Protection class IEC/EN	III, Protective Extra-Low Voltage (PELV)	
	Degree of protection IEC/EN	IP54 Logic module: IP54 (with grommet A-22PEM-A04) Sensor module: IP65	
	Pressure equipment directive	CE according to 2014/68/EU	
	EMC	CE according to 2014/30/EU	
	Mode of operation	Type 1	
	Rated impulse voltage supply / control	0.8 kV	
	Pollution degree	3	
	Ambient humidity	Max. 95% RH, non-condensing	
	Ambient temperature	-30...50°C [-22...122°F]	
	Storage temperature	-40...80°C [-40...176°F]	
	Materials	Valve body	Brass
		Flow measuring pipe	Brass body nickel-plated
Closing element		Stainless steel	
Spindle		Stainless steel	
Spindle seal		EPDM O-ring	
Immersion sleeve		Stainless steel	

Safety notes

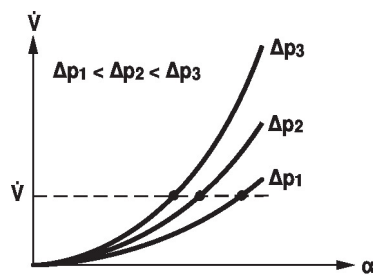


- This device has been designed for use in stationary heating, ventilation and air-conditioning systems and must not be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- Outdoor application: only possible in case that no (sea) water, snow, ice, insolation or aggressive gases interfere directly with the device and that it is ensured that the ambient conditions remain within the thresholds according to the data sheet at any time.
- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.
- The device contains electrical and electronic components and must not be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Product features

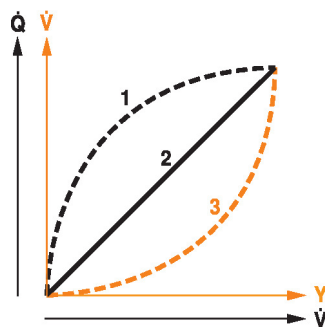
Mode of operation The HVAC performance device is comprised of four components: characterised control valve (CCV), measuring pipe with volumetric flow sensor, temperature sensors and the actuator itself. The adjusted maximum flow ($V'max$) is assigned to the maximum control signal DDC (typically 10 V / 100%). Alternatively, the control signal DDC can be assigned to the valve opening angle or to the power required on the heat exchanger (see power control). The HVAC performance device can be controlled via communicative or analogue signals. The fluid is detected by the sensor in the measuring pipe and is applied as the flow value. The measured value is balanced with the setpoint. The actuator corrects the deviation by changing the valve position. The angle of rotation α varies according to the differential pressure through the control element (see flow rate curves).

Flow rate curves



Transmission behaviour HE

Heat exchanger transmission behaviour Depending on the construction, temperature spread, fluid characteristics and hydronic circuit, the power Q is not proportional to the water volumetric flow V' (Curve 1). With the classical type of temperature control, an attempt is made to maintain the control signal Y proportional to the power Q (Curve 2). This is achieved by means of an equal-percentage flow characteristic (Curve 3).



Power control Alternatively, the control signal DDC can be assigned to the output power required at the heat exchanger.

Depending on the water temperature and air conditions, the Energy Valve ensures the amount of water V' required to achieve the desired power.

Maximum controllable power on heat exchanger in power control mode:

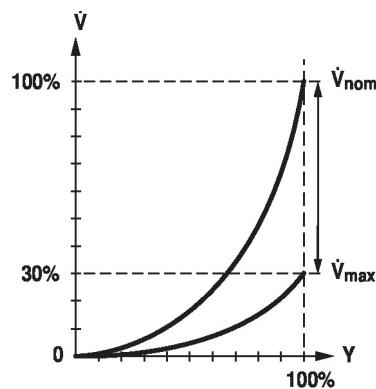
DN 15	80 kW
DN 20	140 kW
DN 25	250 kW
DN 32	380 kW
DN 40	530 kW
DN 50	1010 kW

Control characteristics The specially configured control parameters in connection with the precise velocity sensor ensure a stable quality of control. They are, however, not suitable for rapid control processes, i.e. for domestic water control.

Definition Flow control

V' nom is the maximum possible flow.

V' max is the maximum flow rate which has been set with the highest control signal. V' max can be set between 30% and 100% of V' nom.

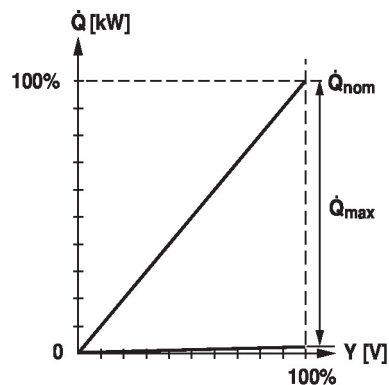


Definition Power control

Q' nom is the maximum possible power output on the heat exchanger.

Q' max is the maximum power output on the heat exchanger which has been set with the highest control signal DDC. Q' max can be set between 1% and 100% of Q' nom.

Q' min 0% (non-variable).



Creep flow suppression

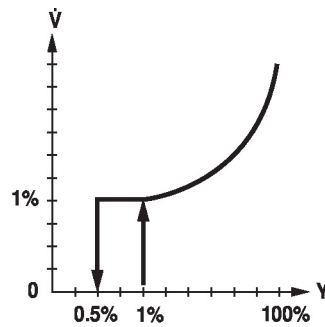
Given the very low flow speed in the opening point, this can no longer be measured by the sensor within the required tolerance. This range is overridden electronically.

Opening valve

The valve remains closed until the flow required by the control signal DDC corresponds to 1% of V'nom. The control along the flow characteristic is active after this value has been exceeded.

Closing valve

The control along the flow characteristic is active up to the required flow rate of 1% of V'nom. Once the level falls below this value, the flow rate is maintained at 1% of V'nom. If the level falls below the flow rate of 0.5% of V'nom required by the control signal DDC, then the valve will close.


Configurable actuators

The factory settings cover the most common applications. Single parameters can be modified with the Belimo Service Tools MFT-P or ZTH EU.

Communication

The parametrisation can be carried out through the integrated web server (RJ45 connection to the web browser) or by communicative means.

Additional information regarding the integrated web server can be found in the separate documentation.

"Peer to Peer" connection

<http://belimo.local:8080>

The Notebook must be set to "DHCP".

Make sure that only one network connection is active.

Standard IP address:

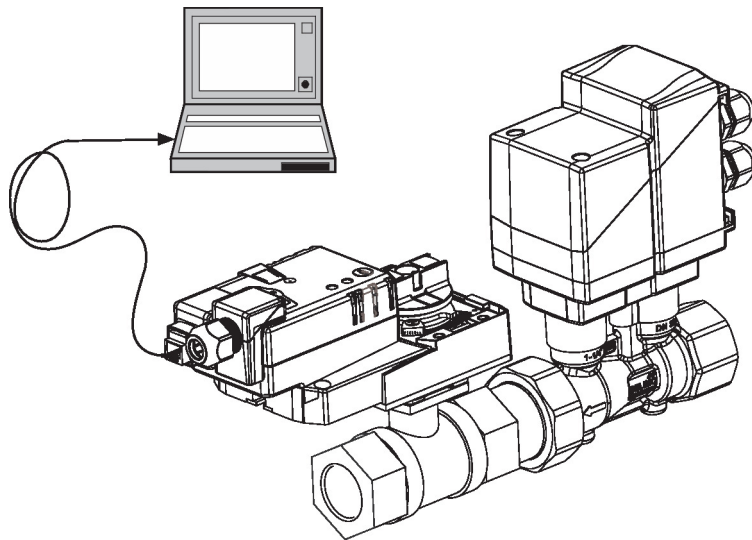
<http://192.168.0.10:8080>

Static IP address

Password (read-only):

User name: «guest»

Password: «guest»


Control signal inversion

This can be inverted in cases of control with an analogue control signal DDC. The inversion causes the reversal of the standard behaviour, i.e. at a control signal DDC of 0%, regulation is to V'max or Q'max, and the valve is closed at a control signal DDC of 100%.

Hydronic balancing

Via the integrated web server, the maximum flow rate (equivalent to 100% requirement) can be adjusted on the device itself, simply and reliably, in a few steps. If the device is integrated in the management system, then the balancing can be handled directly by the management system.

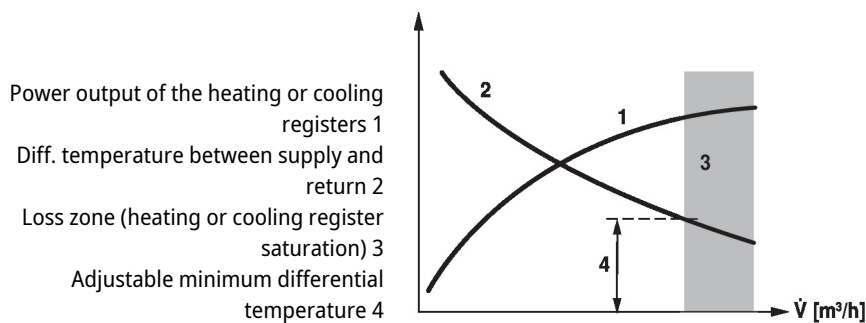
Delta-T manager

If a heating or cooling register is operated with a differential temperature that is too low and thus with a flow rate that is too high, this will not result in an increased power output. Nevertheless, heating or cooling machines must provide the energy at a lower degree of efficiency. This means, that pumps circulate too much water and increase energy consumption unnecessarily.

With the aid of the Energy Valve, it is simple to discover that operation is being carried out at a differential temperature that is too low, resulting in the inefficient use of energy.

Necessary setting adjustments can now be carried out quickly and easily at any time. The integrated differential temperature limiting offers the user the possibility of defining a low limit value. The Energy Valve limits the flow rate automatically to prevent the level from falling below this value.

The settings of the Delta-T manager can be made either directly on the web server or via the Belimo Cloud a direct analysis of the Delta-T behavior is carried out by Belimo experts.



Power output of the heating or cooling registers 1
 Diff. temperature between supply and return 2
 Loss zone (heating or cooling register saturation) 3
 Adjustable minimum differential temperature 4

Combination analogue - communicative (hybrid mode)

With conventional control by means of an analogue control signal DDC, the integrated web server, BACnet, Modbus or MP-Bus can be used for the communicative position feedback.

Power and energy monitoring function

The HVAC performance device is equipped with two temperature sensors. A sensor (T2) must be installed at the valve and the second sensor (T1) must be installed on-site on the other side of the water circuit. The two sensors are enclosed with the system already wired. The sensors are used to record the fluid temperature of the supply and return lines of the consumer (heating/cooling coil). As the water quantity is also known, thanks to the flow measurement integrated in the system, the power released from the consumer can be calculated. Furthermore, the heating/cooling energy is also determined automatically by means of the evaluation of the power over time.

The current data, e.g. temperatures, volumetric flow volumes, exchanger energy consumption etc. can be recorded and accessed at any time by means of web browsers or communication.

Data recording

The recorded data (integrated data recording for 13 months) can be used for the optimisation of the overall system and for the determination of the performance of the consumer (heating/cooling coil).

Download csv files through web browser.

Belimo Cloud

Additional services are available if the Energy Valve is connected to the Belimo Cloud: for instance, several devices may be managed via Internet. Also, Belimo experts may help analyse the delta-T behaviour or provide written reports about the Energy Valve performance. Under certain conditions, the product warranty according to the applicable Terms and Conditions of Sale may be prolonged. The "Terms of Use for Belimo Cloud Services" in their currently valid version apply to the use of Belimo Cloud services. Further details may be found under [www.belimo.com/ext-warranty]

Glycol monitoring

Glycol monitoring measures the actual glycol content, which is necessary for safe operation and optimised heat exchange.

Manual override

Manual override with push-button possible (the gear train is disengaged for as long as the button is pressed or remains locked).

High functional safety

The actuator is overload protected, requires no limit switches and automatically stops when the end stop is reached.

Accessories

Electrical accessories	Description	Type
	Grommet for RJ connection module, Multipack 50 pcs.	Z-STRJ.1
Mechanical accessories	Description	Type
	Valve neck extension for ball valve DN 15...50	ZR-EXT-01
	Pipe connector for ball valve DN 15	ZR2315
	Pipe connector for ball valve DN 20	ZR2320
	Pipe connector for ball valve DN 25	ZR2325
	Pipe connector for ball valve DN 32	ZR2332
	Pipe connector for ball valve DN 40	ZR2340
	Pipe connector for ball valve DN 50	ZR2350
Tools	Description	Type
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH EU
	Connection cable 5 m, A: RJ11 6/4 ZTH EU, B: 6-pin for connection to service socket	ZK1-GEN

Electrical installation



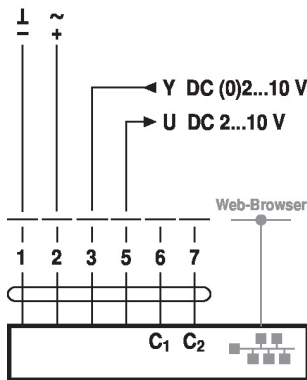
Supply from isolating transformer.

Parallel connection of other actuators possible. Observe the performance data.

The wiring of the line for BACnet MS/TP / Modbus RTU is to be carried out in accordance with applicable RS-485 regulations.

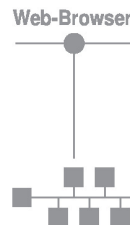
Modbus / BACnet: Supply and communication are not galvanically isolated. Connect earth signal of the devices with one another.

Conventional operation



Cable colours:

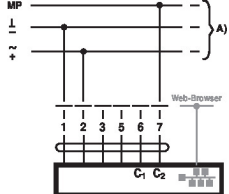
- 1 = black
- 2 = red
- 3 = white
- 5 = orange
- 6 = pink
- 7 = grey



Connection of a notebook for parametrisation and manual control via RJ45.

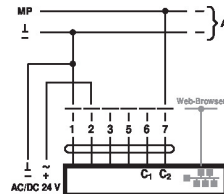
Optional connection via RJ45 (direct connection Notebook / connection via Intranet or Internet) for access to the integrated web server

MP-Bus, supply via 3-wire connection



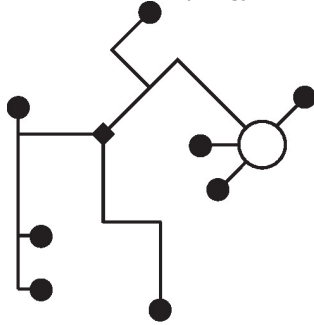
A) additional MP-Bus nodes (max. 8)

MP-Bus via 2-wire connection, local power supply



A) additional MP-Bus nodes (max. 8)

MP-Bus Network topology



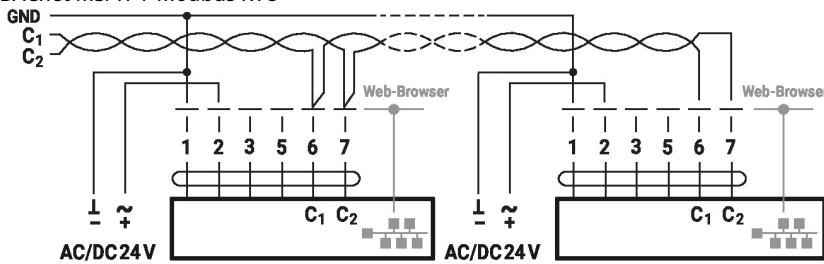
There are no restrictions for the network topology (star, ring, tree or mixed forms are permitted).
Supply and communication in one and the same 3-wire cable

- no shielding or twisting necessary
- no terminating resistors required

Functions

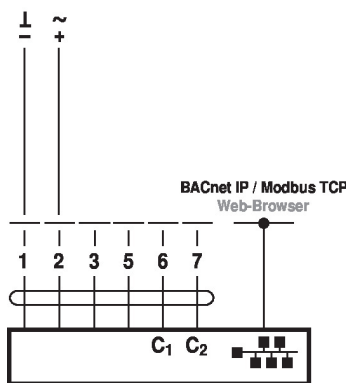
Functions with specific parameters (Parametrisation necessary)

BACnet MS/TP / Modbus RTU

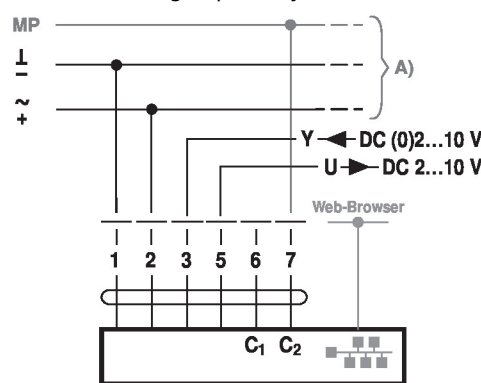


C₁ = D- = A
C₂ = D+ = B

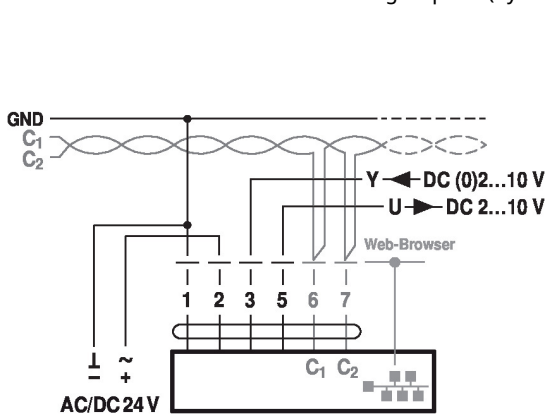
BACnet IP / Modbus TCP



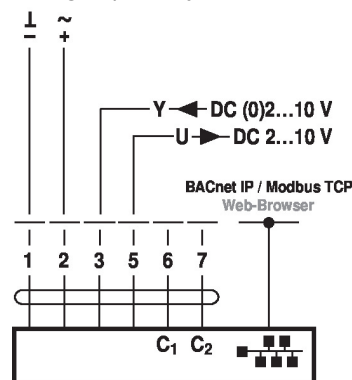
MP-Bus with analog setpoint (hybrid mode)



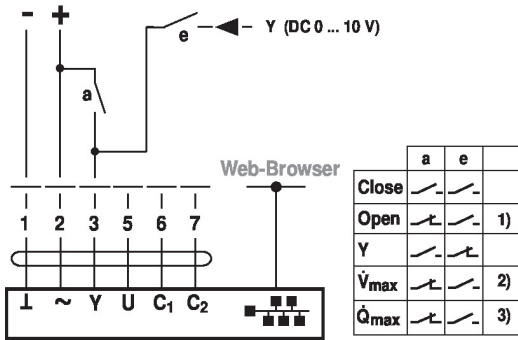
BACnet MS/TP / Modbus RTU with analog setpoint (hybrid mode)



BACnet IP / Modbus TCP with analog setpoint (hybrid mode)

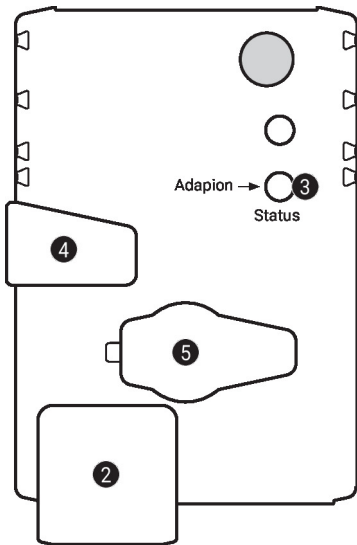


Override control and limiting with DC 24 V with relay contacts (with conventional control or hybrid mode)



- 1) Position control
- 2) Flow control
- 3) Power control

Operating controls and indicators



2 LED display green

- Off: No power supply or wiring error
- On: In operation
- Flickering: Internal communication (Valve/Sensor)

3 Push-button and LED display yellow

- On: Adaptation or synchronisation process active
- Press button: Triggers angle of rotation adaptation, followed by standard mode

4 Manual override button

- Press button: Gear train disengages, motor stops, manual override possible
- Release button: Gear train engages, standard mode

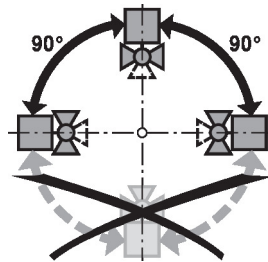
5 Service plug

For connecting parametrisation and service tools

Installation notes

Recommended installation positions

The ball valve can be installed upright to horizontal. The ball valve may not be installed in a hanging position, i.e. with the spindle pointing downwards.



Installation position in return

Installation in the return is recommended.

Water quality requirements

The water quality requirements specified in VDI 2035 must be adhered to.

Belimo valves are regulating devices. For the valves to function correctly in the long term, they must be kept free from particle debris (e.g. welding beads during installation work). The installation of a suitable strainer is recommended.

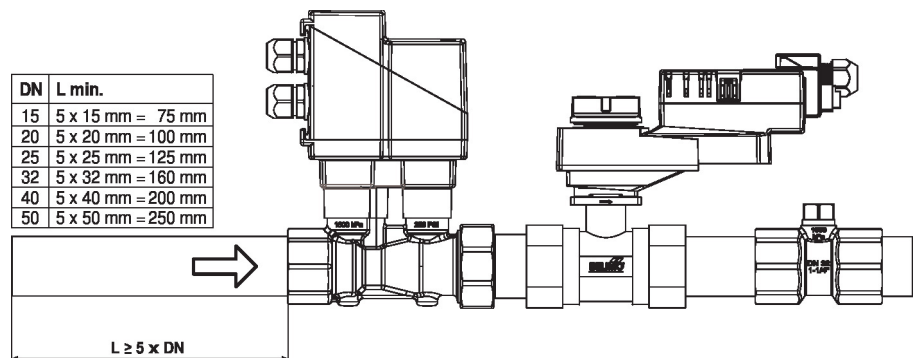
Servicing Ball valves, rotary actuators and sensors are maintenance-free.

Before any service work on the control element is carried out, it is essential to isolate the rotary actuator from the power supply (by unplugging the electrical cable if necessary). Any pumps in the part of the piping system concerned must also be switched off and the appropriate slide valves closed (allow all components to cool down first if necessary and always reduce the system pressure to ambient pressure level).

The system must not be returned to service until the ball valve and the rotary actuator have been correctly reassembled in accordance with the instructions and the pipeline has been refilled by professionally trained personnel.

Flow direction The direction of flow, specified by an arrow on the housing, is to be complied with, since otherwise the flow rate will be measured incorrectly.

Inlet section In order to achieve the specified measuring accuracy, a flow-calming section or inflow section in the direction of the flow is to be provided upstream from the flow sensor. Its dimensions should be at least 5x DN.



Mounting of immersion sleeve and temperature sensor

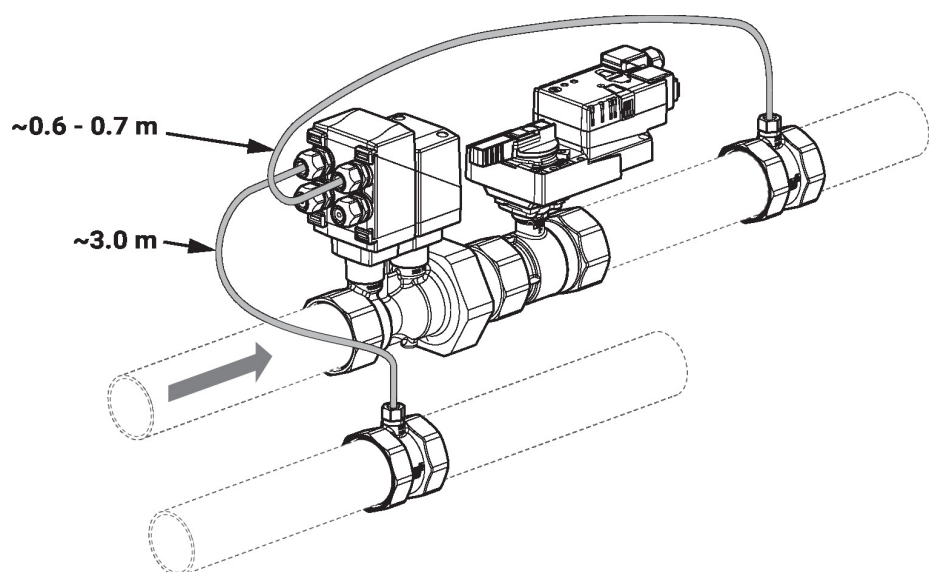
The valve is equipped with two fully-wired temperature sensors.

- T2: This sensor is installed on site near the valve unit.
- T1: This sensor is installed on site ahead of the consumer (valve in the return line) or after the consumer (valve in the supply line).

Two T-pieces for installation of the temperature sensors in the pipelines are included in the shipment.

Note

The cables between valve unit and temperature sensors may not be either shortened or lengthened.



Split installation The valve-actuator combination may be mounted separately from the flow sensor. The direction of flow must be observed.

General notes
Minimum differential pressure (pressure drop)

The minimum required differential pressure (pressure drop through the valve) for achieving the desired volumetric flow V'max can be calculated with the aid of the theoretical kvs value (see type overview) and the below-mentioned formula. The calculated value is dependent on the required maximum volumetric flow V'max. Higher differential pressures are compensated for automatically by the valve.

Formula

$$\Delta p_{\min} = 100 \times \left(\frac{\dot{V}_{\max}}{k_{vs \text{ theor.}}} \right)^2$$

$\Delta p_{\min}: \text{kPa}$
 $\dot{V}_{\max}: \text{m}^3/\text{h}$
 $k_{vs \text{ theor.}}: \text{m}^3/\text{h}$

Example (DN 25 with the desired maximum flow rate = 50% V'nom)

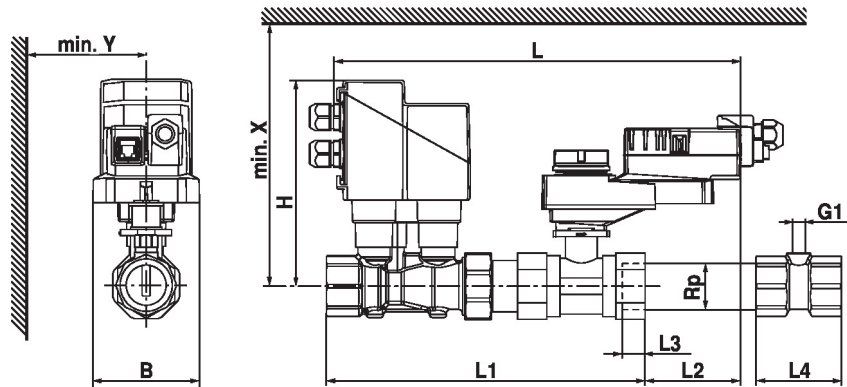
EV025R+BAC
 kvs theor. = 8.6 m³/h
 V'nom = 69 l/min
 50% * 69 l/min = 34.5 l/min = 2.07 m³/h

$$\Delta p_{\min} = 100 \times \left(\frac{\dot{V}_{\max}}{k_{vs \text{ theor.}}} \right)^2 = 100 \times \left(\frac{2.07 \text{ m}^3/\text{h}}{8.6 \text{ m}^3/\text{h}} \right)^2 = 6 \text{ kPa}$$

Behaviour in case of sensor failure

In case of a flow sensor error, the Energy Valve will switch from either power or flow control to position control (Delta-T manager will be deactivated).

Once the error disappears, the Energy Valve will switch back to the normal control setting (Delta-T manager activated)

Dimensions
Dimensional drawings


Type	DN	Rp ["]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	B [mm]	H [mm]	G1 ["]	X [mm]	Y [mm]	kg
EV015R+BAC	15	1/2	275	192	81	13	53	75	160	G1/4	230	77	2.1
EV020R+BAC	20	3/4	291	211	75	14	57	75	162	G1/4	232	77	2.8
EV025R+BAC	25	1	295	230	71	16	65	75	165	G1/4	235	77	2.7
EV032R+BAC	32	1 1/4	323	255	68	19	71	85	168	G1/4	238	77	4.0
EV040R+BAC	40	1 1/2	325	267	65	19	71	85	172	G1/4	242	77	4.8
EV050R+BAC	50	2	343	288	69	22	80	95	177	G1/4	247	77	5.2

Further documentation

- Tool connections
- BACnet Interface description
- Modbus Interface description
- Description Data-Pool Values
- Overview MP Cooperation Partners
- MP Glossary
- Introduction to MP-Bus Technology
- General notes for project planning
- Instruction Webserver