Characterised control valve (CCV) with sensor-operated flow rate or power control, power and energy-monitoring function, 2-way, PN16 flange

- **Nominal voltage AC/DC 24V**
- **Control modulating**
- **For modulating water-side control of air handling systems and heating systems**
- **Ethernet 10/100 Mbit/s, TCP/IP, integrated web server**
- **Communication via BACnet IP, BACnet MS/TP, Belimo MP-Bus or conventional control**

MP-BUS BACnet

Type overview

Model No.	Frequency [Hz]	V̇nom [l/s]	V̇nom [l/min]	kvs theor.* [m³/h]	DN [mm]	DN ["]	ps** [kPa]	n(gl) [ ]
P6065W800EV-BAC	50	8	480	40	65	2 1/2	1600	3.2
P6080W1100EV-BAC	50	11	660	60	80	3	1600	3.2
P6100W2000EV-BAC	50	20	1200	100	100	4	1600	3.2
P6125W3100EV-BAC	50	31	1860	160	125	5	1600	3.2
P6150W4500EV-BAC	50	45	2700	240	150	6	1600	3.2
P6065W806EV-BAC	60	8	480	40	65	2 1/2	1600	3.2
P6080W1106EV-BAC	60	11	660	60	80	3	1600	3.2
P6100W2006EV-BAC	60	20	1200	100	100	4	1600	3.2
P6125W3106EV-BAC	60	31	1860	160	125	5	1600	3.2
P6150W4506EV-BAC	60	45	2700	240	150	6	1600	3.2

* : Theoretical kvs value for pressure drop calculation
** : Maximum allowable pressure

Technical data

Electrical data	Nominal voltage	AC/DC 24V
	Nominal voltage frequency	50/60Hz
	Nominal voltage range	AC 19.2...28.8V / DC 21.6...28.8V
	Power consumption in operation	10W
	Power consumption in rest position	8.5W
	Power consumption for wire sizing	14VA
	Connection supply / control	Cable 1m, 6 x 0.75mm²
	Connection control Ethernet	RJ45 socket
	Parallel operation	Yes (note the performance data)
Flow measurement	Measuring principle	Magnetic inductive volumetric flow measurement
	Measuring accuracy	±2% (of 25...100% V̇nom at 20°C, Glycol 0% vol.)
	Min. flow measurement	1.25% of V̇nom
Functional data	Torque motor	20Nm (DN 65...80) / 40 Nm (DN 100...150)
	Communication protocol	BACnet IP, BACnet MS/TP TCP/IP Belimo MP-Bus
	Positioning signal Y	DC 0...10V
	Operating range Y	DC 2...10V
	Operating range Y variable	DC 0.5...10V
	Position feedback U	DC 2...10V
	Position feedback U variable	DC 0...10V DC 0.5...10V
	Sound power level motor max.	45dB(A)
	Adjustable flow rate Vmax	30...100% of V̇nom
	Control accuracy	±5% (of 25...100% V̇nom at 20°C, Glycol 0% vol.)
	Configuration	Web browser via TCP/IP Portable handheld ZTH AP via MP-Bus
	Media	Cold and hot water, water with glycol up to max. 60% vol.
	Media temperature	-5°C...120°C

UL marked actuators is optional, please contact your local Sales Representative for details.

Technical data

Functional data	Pressure rating	PN16
	Closing pressure Δps	690kPa
	Differential pressure Δpmax	340kPa
	Flow characteristic	Equal percentage (VDI/VDE 2178), linear
	Leakage rate	Air bubble-tight (Leakage rate A, EN12266-1)
	Pipe connections	Flange (ISO 7005-2 / EN 1092-1)
	Installation position	Upright to horizontal (in relation to the stem)
	Maintenance	Maintenance-free
	Manual override	Gear disengagement with push-button, can be locked
	Running time	90s
Temperature measurement	Measuring accuracy of the absolute temperature	PT1000 EN60751 Class B (For 1/3 DIN PT1000 EN60751 Class AA, refer to accessories EV-RT-100-AA)
	Measuring accuracy of Delta T	±0.18°C @ ΔT = 10°C
	Resolution	0.1°C
Safety	Protection class IEC/EN	III Safety extra-low voltage
	Degree of protection IEC/EN	IP54 (with protective cap for RJ45 socket)
	EMC	CE according to 2004/108/EC
	Mode of operation	Type 1
	Rated impulse voltage supply / control	0.8kV
	Control pollution degree	3
	Ambient temperature	-10...50°C
	Non-operating temperature	-20...80°C
	Ambient humidity	95% r.h., non-condensing
Materials	Housing	EN-JL1040 (GG25), with protective paint
	Measuring pipe	EN-GJS-500-7U (GGG50 with protective paint)
	Ball	Stainless steel AISI 316
	Stem	Stainless steel AISI 304
	Stem seal	EPDM Perox
	Immersion well	Brass body, nickel-plated

Safety notes

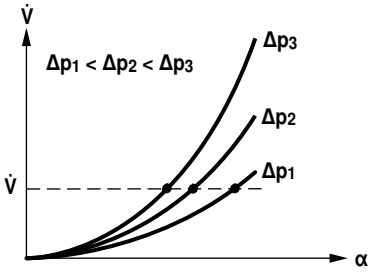
- This device has been designed for use in stationary heating, ventilation and air conditioning systems and is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied with during installation.
- The connection between the control valve and the measuring tube should not be separated.
- 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

Mode of operation

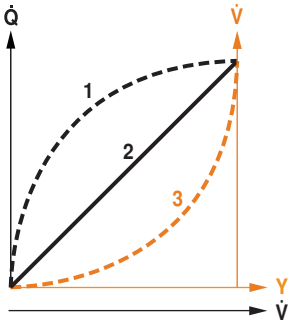
The actuator is comprised of four components: characterised control valve (CCV), measuring pipe with volumetric flow sensor, temperature sensors and the actuator itself.
The adjusted maximum flow ($\dot{V}$max) is assigned to the maximum positioning signal (typically 10V/100%). Alternatively, the positioning signal can be assigned to the valve opening angle or to the power required on the heat exchanger (see power control).
The actuator control can be either communicative or analogue. The medium 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 final controlling element (see volumetric flow curves).

Flow rate curves



Flow characteristic of the characterised control valve

Heat exchanger transfer response
Depending on the construction, temperature spread, medium and hydraulic circuit, the power Q is not proportional to the volumetric flow of the water $\dot{V}$ (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 valve characteristic curve (curve 3).



Power control

Alternatively, the positioning signal Y can be assigned to the output power required on the heat exchanger.
Depending on the water temperature and air conditions, the Energy Valve ensures the amount of water required $\dot{V}$ to achieve the desired power.

Maximum controllable power on heat exchanger in power control mode:

DN 15	30 kW
DN 20	60 kW
DN 25	100 kW
DN 32	160 kW
DN 40	210 kW
DN 50	410 kW

DN 65	700 kW
DN 80	1000 kW
DN 100	1700 kW
DN 125	2700 kW
DN 150	3800 kW

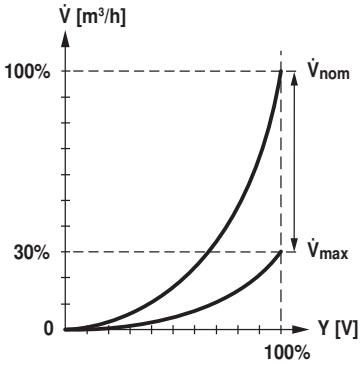
Control characteristics

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

Definition of flow rate

$\dot{V}$nom is the maximum possible flow.

Product features

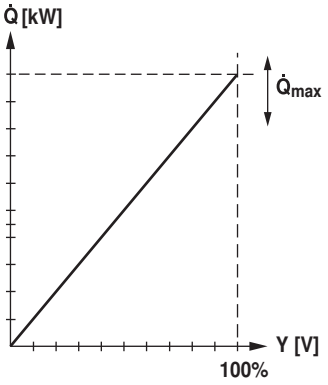


V̇max is the maximum flow rate which has been set with the greatest positioning signal, e.g. 10V. V̇max can be set to between 30% and 100% of V̇ nom.

V̇min 0% (non-variable).

Performance definition

Qmax is the set maximum power output on the heat exchanger (in power control operating mode)



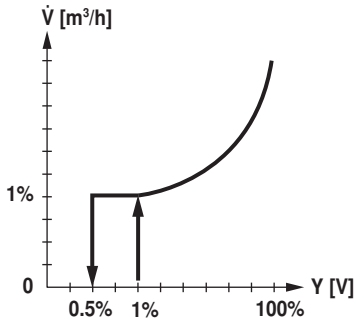
Creep flow suppression

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.

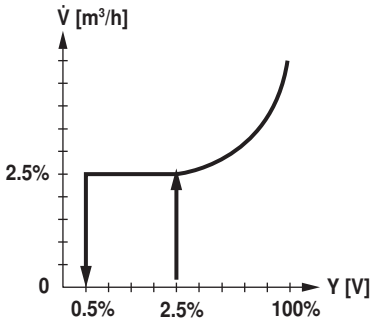
Opening valve
The valve remains closed until the volumetric flow required by the positioning signal Y corresponds to 0.5% of V̇nom(DN15-DN50) / 1.25 of V̇nom(DN65-DN150). The control along the valve characteristic curve is active after this value has been exceeded.

Closing valve (DN15-DN50)
The control along the valve characteristic curve is active up to the required flow rate of 1% of V̇nom. Once the level falls below this value, the flow rate is maintained at 1% of V̇nom. If the level falls below the flow rate of 0.5% of V̇nom required by the reference variable Y, then the valve will close.

Closing valve (DN65-DN150)
The control along the valve characteristic curve is active up to the required flow rate of 2.5% of V̇nom. Once the level falls below this value, the flow rate is maintained at 2.5% of V̇nom. If the level falls below the flow rate of 0.5% of V̇nom required by the reference variable Y, then the valve will close.



DN15-DN50



DN65-DN150

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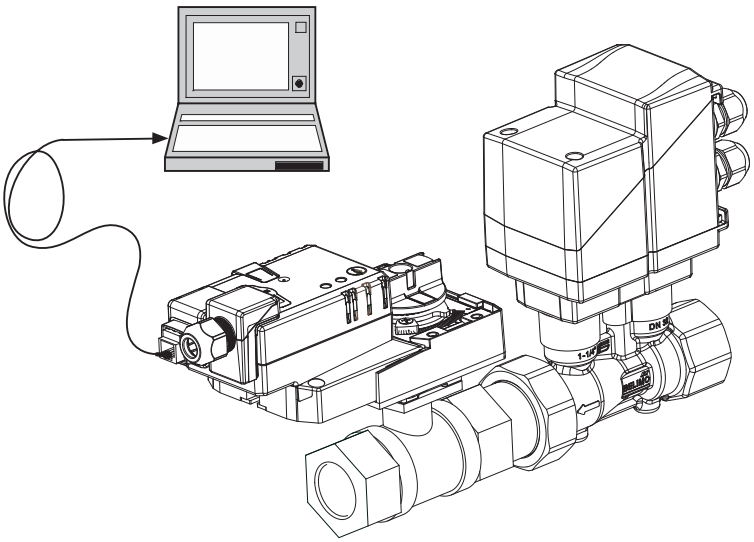
Product features

Communication

The parameterisation 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

Positioning signal inversion

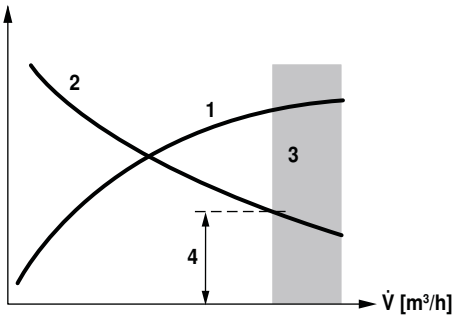
This can be inverted in cases of control with an analogue positioning signal. The inversion causes the reversal of the standard behaviour, i.e. at a positioning signal of 0%, regulation is to V̇max or Qmax, and the valve is closed at a positioning signal of 100%.

Hydraulic balancing

Via the integrated web server, the maximum flow rate (equivalent to 100% requirement) can be adjusted directly 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 effectiveness. 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 control offers the user in addition 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.



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

Combination analogue - communicative

The integrated web server, BACnet IP, BACnet MS/TP or MP bus can be used for the communicative position feedback with conventional control by means of an analogue positioning signal.
When the combination of positioning signal Y and communicative position feedback is used, it is imperative to ensure that the communicative path is used solely for data transfer from the Energy Valve to the higher-level management system. If values are transferred communicatively via bus to the Energy Valve, then the analogue control will be automatically deactivated.
This deactivation can be reversed by disconnecting the Energy Valve from the power supply.

UL marked actuators is optional, please contact your local Sales Representative for details.

Product features

Power and energy monitoring function
The actuator 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 circulation. The two sensors are enclosed with the system already wired. The sensors are used to record the medium temperature of the supply and return lines of the consumer (heat/cold register). As the water quantity is also known, thanks to the volumetric 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 (BACnet or MP-Bus).

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.
Download csv files through web browser.

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

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

Home position
The actuator moves to the home position when the supply voltage is switched on for the first time, i.e. at the time of commissioning or after pressing the "gear disengagement" key.
The actuator then moves into the required position in order to ensure the flow rate defined by the positioning signal.

Accessories

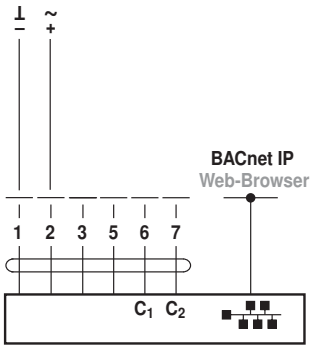
	Description	Type
Service Tools	Service tool, for MF/MP/Modbus/LonWorks actuators and VAV controller	ZTH AP
	Remote temperature sensor pair 1/3m, to DN15-50, 1/3 DIN PT1000 EN60751 Class AA	ZM-T30-AA
	Remote temperature sensor pair 1/10m, to DN65-150, 1/3 DIN PT1000 EN60751 Class AA	EV-RT-100-AA

Electrical installation

Notes
- Connection via safety isolating transformer.
- Parallel connection of other actuators possible. Observe the performance data.

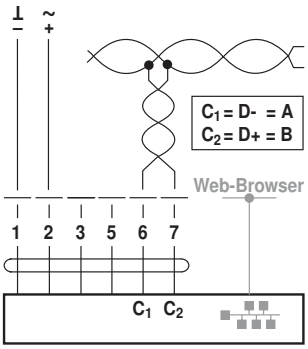
Wiring diagrams

BACnet IP



Cable colours:
1 = black
2 = red
3 = white
5 = orange
6 = pink
7 = grey

BACnet MS/TP



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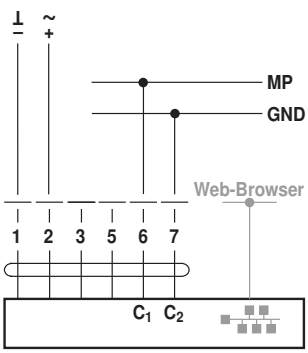
MP-Bus



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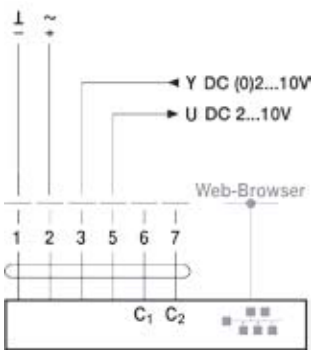
Conventional operation



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