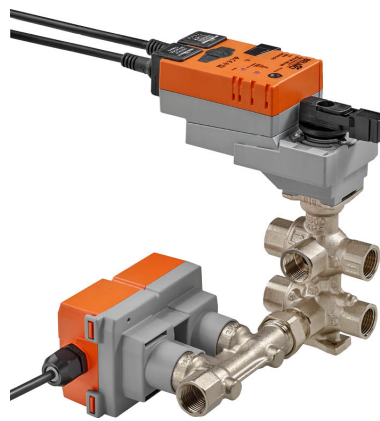


Characterised control valve with sensor-operated flow control, 6-way, Internal thread, PN 16 (EPIV)

- Nominal voltage AC/DC 24 V
- Control modulating, communicative, hybrid
- Two sequences (cooling/heating) with one 90° rotary actuator
- Switching or modulating control on the water side of thermal heating/cooling elements
- For closed cold and warm water systems
- Communication via BACnet MS/TP, Modbus RTU, Belimo MP-Bus or conventional control



Type Overview

Type	DN	Rp ["]	V'nom [l/h]	V'max low-n [l/h]	kvs theor. [m³/h]	PN
EP015R-R6+BAC	15	1/2	1260	840	1.2	16
EP020R-R6+BAC	20	3/4	2340	1620	2.3	16

kvs theor.: Theoretical kvs value for pressure drop calculation

V'max low-n: V'max for low-noise operation

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	2 W
	Power consumption in rest position	1.5 W
	Power consumption for wire sizing	4.5 VA
	Connection supply / control	Cable 1 m, 6 x 0.75 mm ²
	Parallel operation	Yes (note the performance data)
Data bus communication	Communicative control	BACnet MS/TP Modbus RTU MP-Bus
	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	0.5...10 V
	Sound power level Motor	35 dB(A)
	Adjustable flow rate V'max	5...100% of Vnom
	Control accuracy	±5% (of 25...100% V'nom) @ 20°C / Glycol 0% vol.
	Control accuracy note	±10% (of 25...100% V'nom) ±20...10% (of 10...25% V'nom)
	Fluid	Cold and warm water, water with glycol up to max. 50% vol.
	Fluid temperature	6...80°C
	Close-off pressure Δps	350 kPa
Differential pressure Δpmax	110 kPa	
Leakage rate	air-bubble tight, leakage rate A (EN 12266-1)	

Functional data	Angle of rotation note	with room controller CRK24-B1 compelling sequence 1 = cooling and sequence 2 = heating
	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% (of 25...100% V'nom) @ 20°C / Glycol 0% vol.
	Measuring accuracy flow note	±6% (of 25...100% V'nom)
	Min. flow measurement	1% of V'nom
Safety data	Protection class IEC/EN	III, Safety Extra-Low Voltage (SELV)
	Degree of protection IEC/EN	IP54
	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 temperature	-30...50°C
	Storage temperature	-40...80°C
	Ambient humidity	Max. 95% RH, non-condensing
Materials	Valve body	Nickel-plated brass body
	Flow measuring pipe	Brass body nickel-plated
	Closing element	Chrome-plated brass
	Spindle	Nickel-plated brass
	Spindle seal	EPDM O-ring
	Seat	PTFE, O-ring EPDM

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, insulation 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 final controlling device consists of three components: 6-way characterised control valve, measuring pipe with volumetric flow sensor and the actuator itself. The adjusted maximum flows for sequence 1 (V'max1) and sequence 2 (V'max2) are assigned to the positioning signal (2V/0% for sequence 1, 10 V/100% for sequence 2).
- The performance device can be controlled communicatively or by an analogue signal. 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.

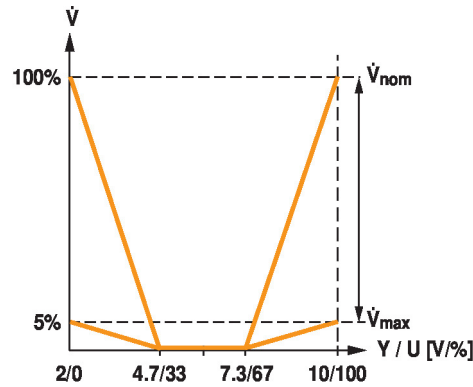
Definition V'_{nom} is the maximum possible flow. ($V'_{nom}=V'_{nom1}=V'_{nom2}$)

V'_{max1} is the maximum flow rate which has been set with the smallest positioning signal, 2 V / 0%.

V'_{max2} is the maximum flow rate which has been set with the highest positioning signal, 10 V / 100%.

V'_{max1} and V'_{max2} can be adjusted 5...100% of V'_{nom} .

V'_{min} 0% (non-variable).



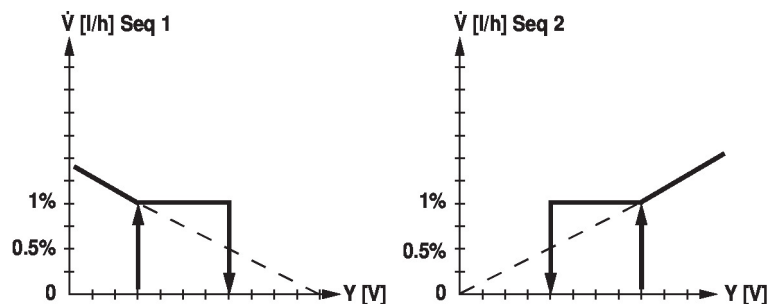
Creep flow suppression Given the very low flow speed in the opening point, this can no longer be measured by the sensor within the required tolerance. This range is overridden electronically.

Opening sequence

The valve remains closed until the volumetric flow required by the positioning signal Y corresponds to 1% of V'_{nom} . The control along the valve characteristic curve is active after this value has been exceeded.

Closing sequence

The control along the valve characteristic curve 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 reference variable Y , then the valve will close.



Configurable actuators The factory settings cover the most common applications.

Hydronic balancing With the ZTH EU and the Belimo Assistant App, the maximum flow rates of sequence 1 and sequence 2 can be adjusted individually on-site in a few simple reliable steps.

Combination analogue - communicative (hybrid mode) With conventional control by means of an analogue positioning signal, BACnet or Modbus can be used for the communicative position feedback.

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

Position feedback Regardless of the setting of the control mode, the feedback signal $U5$ is always assigned to the flow V'_{max1} and V'_{max2} .

Pressure compensation In cases of combined heating/cooling control elements, the fluid remains in the control element when in the closed position (no heating or cooling). The pressure of the enclosed fluid can rise or fall due to changes in fluid temperature caused by the ambient temperature. The 6-way characterised control valves have an integrated pressure relief function for the purpose of compensating for such pressure changes.

The pressure relief function is active in the closed position (45°) of the valve; reliable separation of Sequences 1 and 2 continues. For additional information, consult the notes for project planning for the 6-way characterised control valve.

Accessories

Mechanical accessories	Description	Type
	Pipe connector for ball valve DN 15	ZR2315
	Elbow 90° male/female DN 15 Rp 1/2, R 1/2, Set of 2 pcs.	P2P15PE-1GE
	Fixing bracket for 6-way valve DN 15/20	ZR-004
	Pipe connector for ball valve DN 20	ZR2320
	Elbow 90° male/female DN 20 Rp 3/4, R 3/4, Set of 2 pcs.	P2P20PF-1GE
Service tools	Description	Type
	Belimo Assistant App, Smartphone app for easy commissioning, parametrising and maintenance	Belimo Assistant App
	Converter Bluetooth / NFC	ZIP-BT-NFC
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH EU

Electrical installation

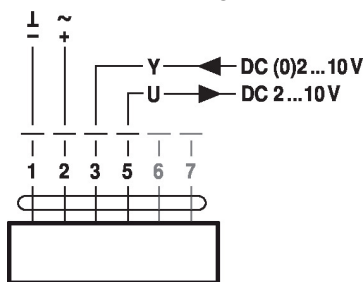

Supply from isolating transformer.

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 RS485 regulations.

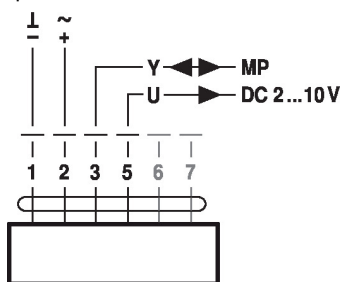
Modbus / BACnet: Supply and communication are not galvanically isolated. Connect earth signal of the devices with one another.

AC/DC 24 V, modulating


Cable colours:

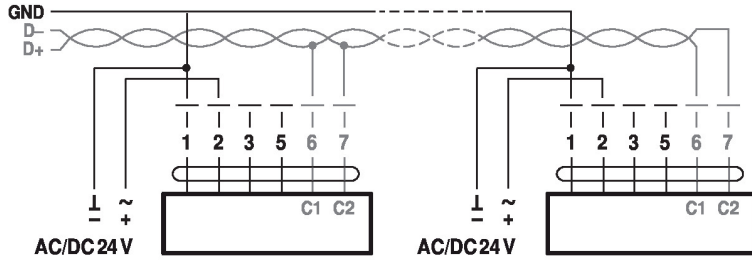
- 1 = black
- 2 = red
- 3 = white
- 5 = orange
- 6 = pink
- 7 = grey

Operation on the MP-Bus


Cable colours:

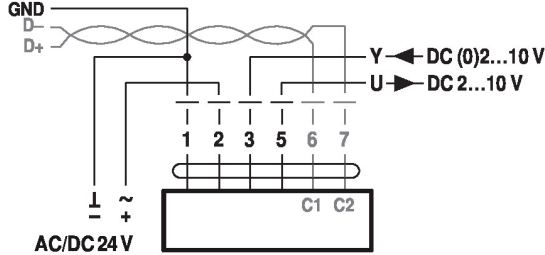
- 1 = black
- 2 = red
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BACnet MS/TP / Modbus RTU



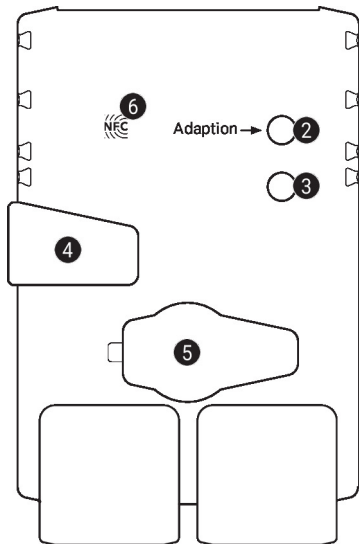
C₁ = D- = A
C₂ = D+ = B

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



C₁ = D- = A
C₂ = D+ = B

Operating controls and indicators



2 Push-button and LED display green

Off: No power supply or malfunction
On: In operation
Press: Triggers angle of rotation adaptation, followed by standard mode button:

3 Push-button and LED display yellow

Off: Standard mode
On: Adaptation or synchronisation process active
Flickering: BACnet / Modbus communication active
Press button: No function

4 Gear disengagement button

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

5 Service plug

For connecting parametrisation and service tools

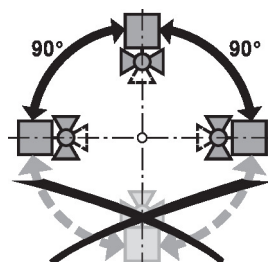
6 NFC logo

Operated with Belimo Assistant App

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.



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.

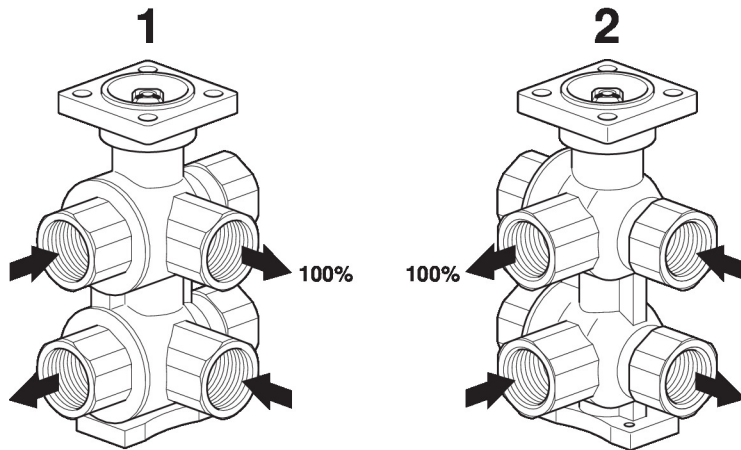
Servicing Ball valves, rotary actuators and sensors are maintenance-free.

Before any service work on the final controlling device 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.

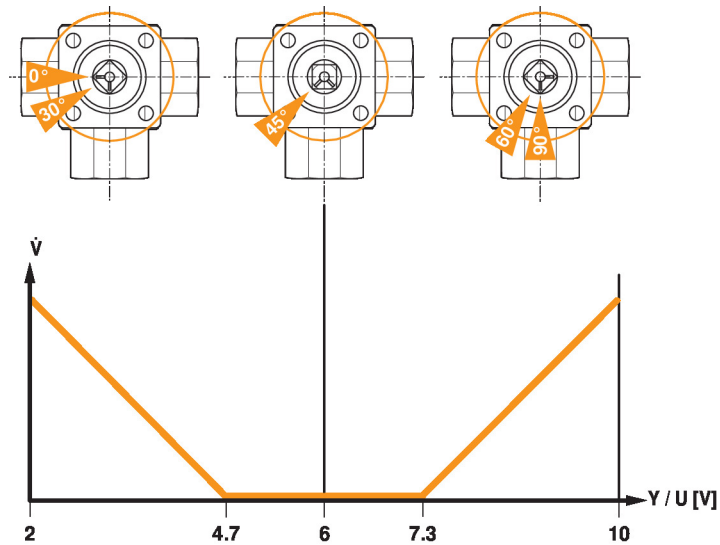
Flow direction The flow direction must be observed. The position of the ball can be identified from the L-marking on the spindle.

Heating and cooling in position accuracy



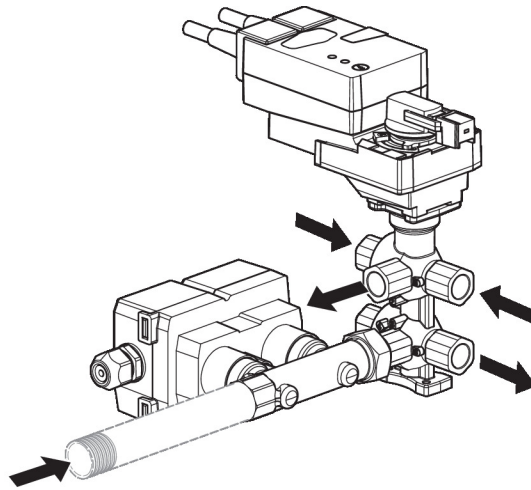
Valve characteristic curve The lower diagram shows the flow characteristic depending on the control signal.

Valve characteristic curve

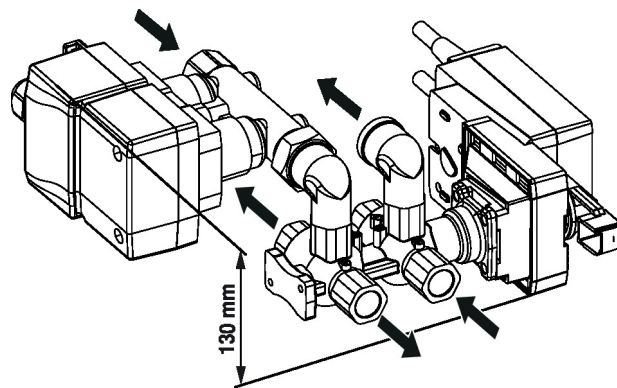


Inlet section In order to achieve the specified measuring accuracy, a flow-calming section or inflow section in the direction of the flow is to be provided upstream from the flow sensor. Its dimensions should be at least 5x DN.

Types of installation



Variant with accessory P2P..-1GE for minimum installation height (130 mm)



General notes

Minimum differential pressure (pressure drop)

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

Formula

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

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

Example (DN 15 with the desired maximum flow rate = 30% \dot{V}_{nom})

EP015R-R6+BAC

$k_{vs \text{ theor.}} = 1.2 \text{ m}^3/\text{h}$

$\dot{V}_{nom} = 1260 \text{ l/h}$

$30\% * 1260 \text{ l/h} = 378 \text{ l/h} = 0.378 \text{ m}^3/\text{h}$

$$\Delta p_{min} = 100 \times \left(\frac{\dot{V}_{max}}{k_{vs \text{ theor.}}} \right)^2 = 100 \times \left(\frac{0.378 \text{ m}^3/\text{h}}{1.2 \text{ m}^3/\text{h}} \right)^2 = 10 \text{ kPa}$$

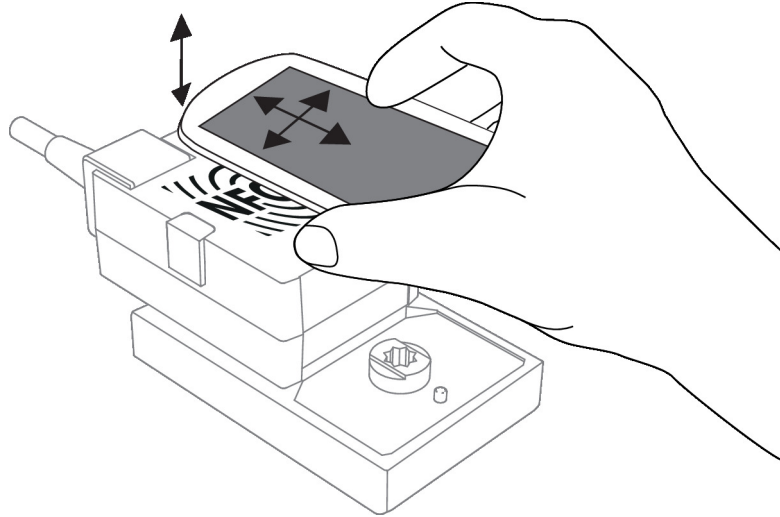
NFC connection Belimo devices marked with the NFC logo can be operated with the Belimo Assistant App.

Requirement:

- NFC- or Bluetooth-capable smartphone
- Belimo Assistant App (Google Play & Apple AppStore)

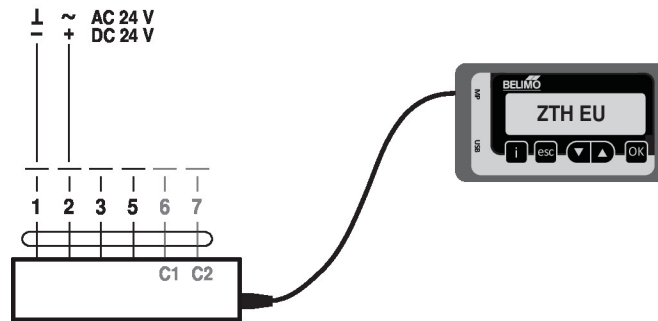
Align NFC-capable smartphone on the device so that both NFC antennas are superposed.

Connect Bluetooth-enabled smartphone via the Bluetooth-to-NFC Converter ZIP-BT-NFC to the device. Technical data and operation instructions are shown in the ZIP-BT-NFC data sheet.



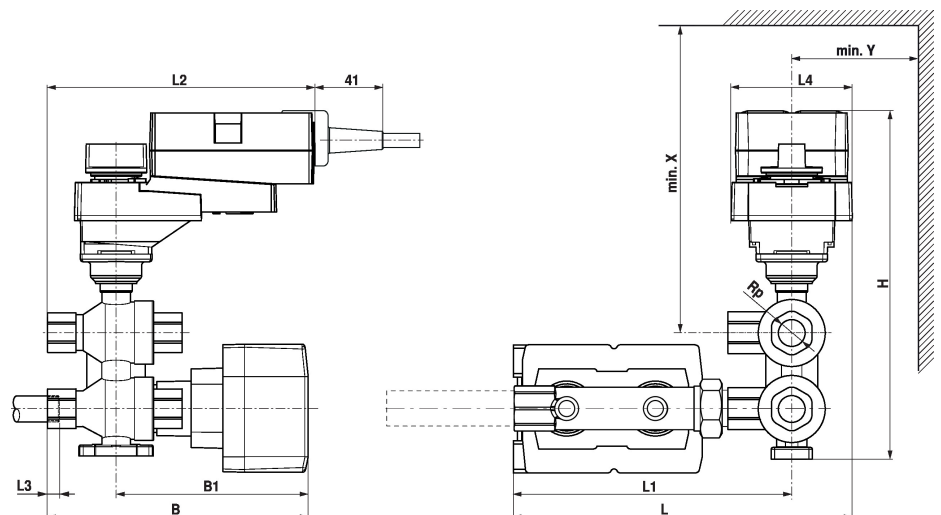
Service Tools connection

ZTH EU connection




Dimensions

Dimensional drawings



The volumetric flow sensor and the pipeline element can also be connected to port 3 (see installation notes).

Type	DN	Rp ["]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	B [mm]	B1 [mm]	H [mm]	X [mm]	Y [mm]	
EP015R-R6+BAC	15	1/2	194	158	187	13	71	150	110	203	200	40	2.8
EP020R-R6+BAC	20	3/4	212	177	198	14	71	161	110	231	230	40	3.7

Further documentation

- General notes for project planning
- Overview MP Cooperation Partners
- Tool connections
- Description Modbus register
- Description Data-Pool Values
- Description Protocol Implementation Conformance Statement PICS
- Introduction to MP-Bus Technology