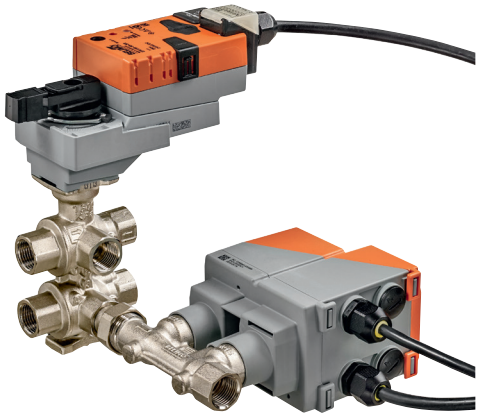
BELIMO

# Technical data sheet EP..R-R6+SR

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

- **Nominal voltage AC/DC 24 V**
- **Control Modulating**
- **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**



## Type overview

| Type | DN [ ] | Rp [“] | Vnom [ l/s] | Vmax low-n [ l/s] | Vnom [ l/h] | Vmax low-n [ l/h] |
|---|---|---|---|---|---|---|
| **EP015R-R6+SR** | 15 | 1/2 | 0.35 | 0.23 | 1260 | 840 |
| **EP020R-R6+SR** | 20 | 3/4 | 0.65 | 0.45 | 2340 | 1620 |

| Type | kvs theor. [ m³/h] | PN [ ] |
|---|---|---|
| **EP015R-R6+SR** | 1.2 | 16 |
| **EP020R-R6+SR** | 2.3 | 16 |

kvs theor.: Theoretical kvs value for pressure drop calculation
Vmax low-n: Vmax 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 | 4 W |
| | Power consumption at rest | 4 W |
| | Power consumption for wire sizing | 6.5 VA |
| | Connection supply / control | Cable 1 m, 4 x 0.75 mm² |
| | Parallel operation | Yes (note the performance data) |
| **Functional data** | Torque Motor | 5 Nm |
| | Positioning signal Y | DC 0...10 V |
| | Operating range Y | DC 2...10 V |
| | Position feedback U | DC 2...10 V |
| | Sound power level motor | 45 dB(A) |
| | Adjustable flow rate Vmax | 5...100% of Vnom |
| | Control accuracy | ±10% (of 10...100% Vnom) |
| | Control accuracy note | ±6% (of 10...100% Vnom) at 20°C / Glykol 0% vol. |
| | Media | Cold and warm water, water with glycol up to max. 50% vol. |
| | Medium temperature | 6...80°C |
| | Permissible pressure ps | 1600 kPa |
| | Differential pressure Δpmax | 110 kPa |
| | Differential pressure note | low-noise operation Δpmax < 50kPa |
| | Flow characteristic | Linear |
| | Leakage rate | Leakage rate A, air-bubble-tight (EN 12266-1) |
| | Pipe connector | Internal thread according to ISO 7-1 |
| | Installation position | Upright to horizontal (in relation to the stem) |
| | Maintenance | Maintenance-free |
| | Manual override | with push-button, can be locked |
| **Flow measurement** | Measuring principle | Ultrasonic volumetric flow measurement |
| | Measuring accuracy | ±6% (of 25...100% Vnom) |
| | Measuring accuracy note | ±2% (of 25...100% Vnom) at 20°C / Glykol 0% vol. |

## Technical data

| | | |
|---|---|---|
| **Flow measurement** | Min. flow measurement | 1% of Vnom |
| **Safety** | Protection class IEC/EN | III Safety extra-low voltage |
| | Degree of protection IEC/EN | IP54 |
| | EMC | CE according to 2004/108/EC |
| | Mode of operation | Type 1 |
| | Rated impulse voltage supply / control | 0.8 kV |
| | Control pollution degree | 3 |
| | Ambient temperature | -30...50 °C |
| | Non-operating temperature | -40...80 °C |
| | Ambient humidity | 95% r.h., non-condensing |
| **Materials** | Housing | Brass body |
| | Measuring pipe | Brass body nickel-plated |
| | Closing element | Chrome-plated brass |
| | Stem | Nickel-plated brass |
| | Stem seal | O-ring EPDM |
| | Ball 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.
- 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**

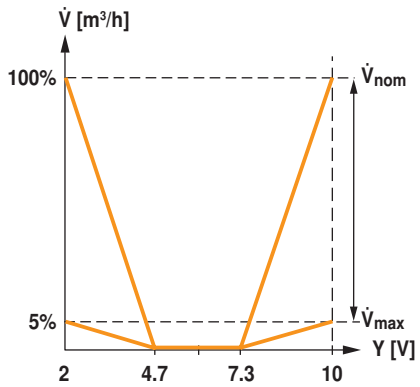
The final controlling device is comprised of three components: 6-way characterised control valve, measuring pipe with volumetric flow sensor and the actuator itself.
The adjusted maximum flows for sequence 1 (V̇max1) and sequence 2 (V̇max2) are assigned to the positioning signal (2V for sequence 1, 10V for sequence 2). The final controlling device is controlled by an analogue signal. 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.

**Definition**

V̇nom is the maximum possible flow. (Vnom=Vnom1=Vnom2)

V̇max1 is the maximum flow rate which has been set with the smallest positioning signal, 2 V.
V̇max2 is the maximum flow rate which has been set with the greatest positioning signal, 10 V.
V̇max1 and V̇max2 can be adjusted between 5% and 100% of V̇nom.

V̇min 0% (non-variable).



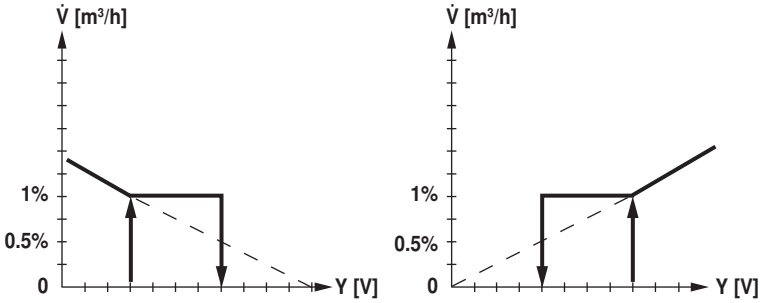
## Product features

**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 V̇nom. 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 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.




**Hydraulic balancing**

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

**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 first time the supply voltage is switched on, i.e. at the time of commissioning, the actuator carries out an adaption, which is when the operating range and position feedback adjust themselves to the mechanical setting range.
After this process the actuator moves into the required position in order to ensure the flow rate defined by the positioning signal.

**Position feedback U5**

The feedback signal is assigned to the flow.

## Accessories

**Mechanical accessories**

| Description | Type |
|---|---|
| Pipe connector to ball valve DN 15 Rp 1/2” | ZR2315 |
| Pipe connector to ball valve DN 20 Rp 3/4” | ZR2320 |
| Fastening angle, for 6-way control valves | ZR-004 |

**Service Tools**

| Description | Type |
|---|---|
| Service Tool, for MF/MP/Modbus/LonWorks actuators and VAV-Controller | ZTH EU |

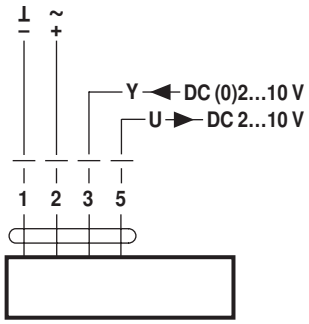
## Electrical installation

**Notes**

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

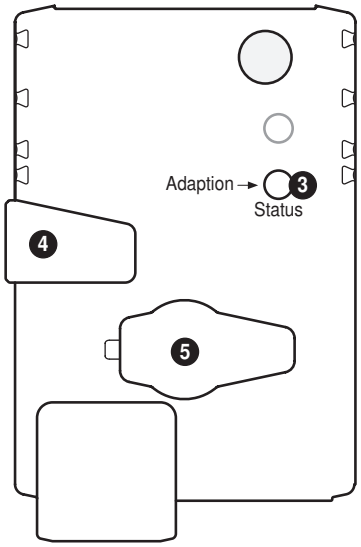
### Wiring diagrams

AC/DC 24 V, modulating




**Cable colours:**
1 = black
2 = red
3 = white
5 = orange

## Operating controls and indicators




**3 Push-button and LED display yellow**

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

**4 Gear disengagement button**

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

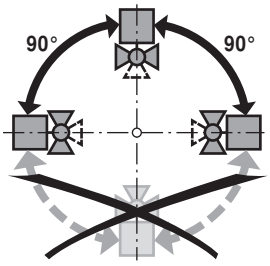
**5 Service plug**

For connecting the ZTH

## 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 stem 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 suitable strainer is recommended.

## Installation notes

**Maintenance**

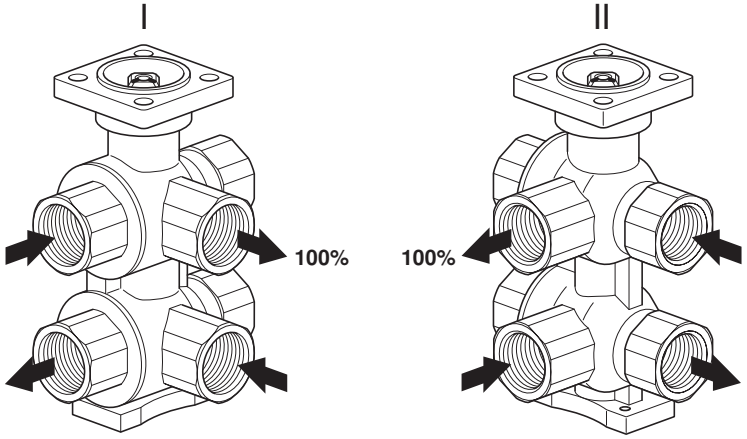
Ball valves, rotary actuators and sensors are maintenance-free.

In the event of any service work on the final controlling device, it is essential to isolate the rotary actuator from the power supply (by unplugging the electrical cable). Any pumps in the part of the piping system concerned must also be switched off and the appropriate slide valves closed (allow everything to cool down first if necessary and 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 properly reassembled in accordance with the instructions and the pipeline has been refilled in the proper manner.

**Flow direction**

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

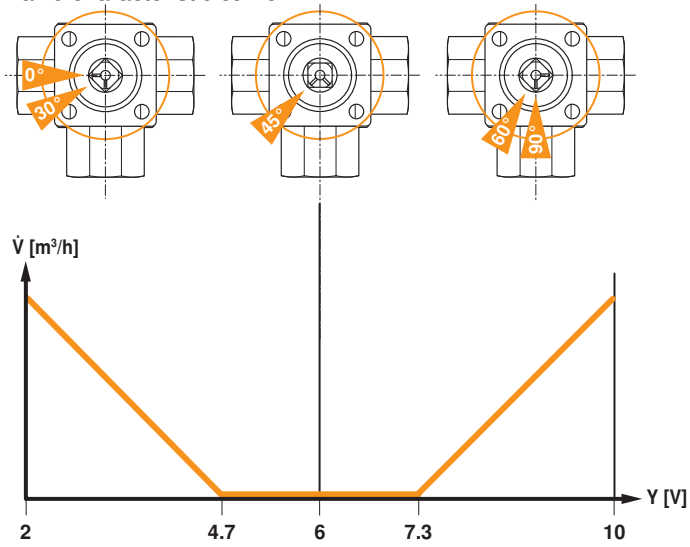
Heating and cooling in position accuracy




**Valve characteristic curve**

The lower diagram shows the flow characteristic in relation to the control signal.

Valve characteristic curve



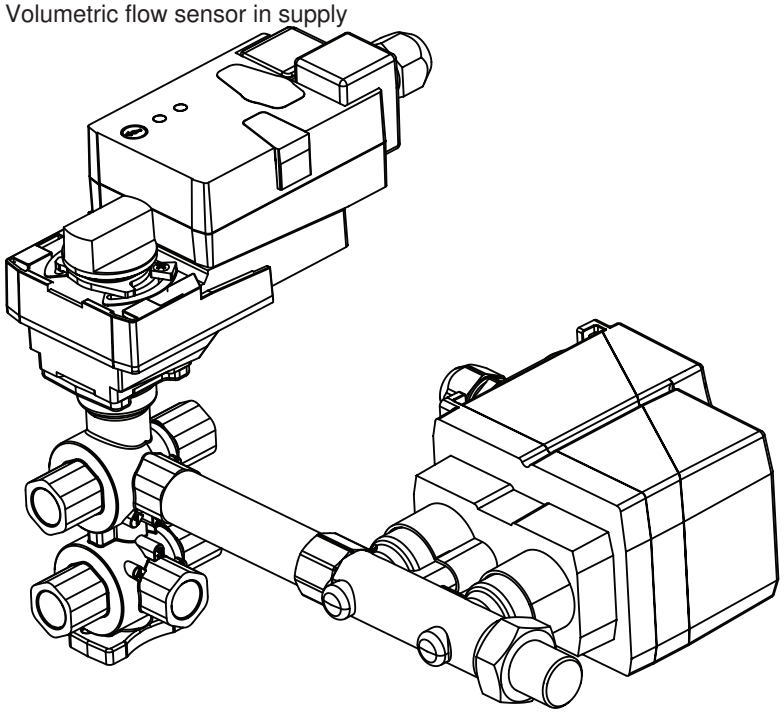

**Inlet section**

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.

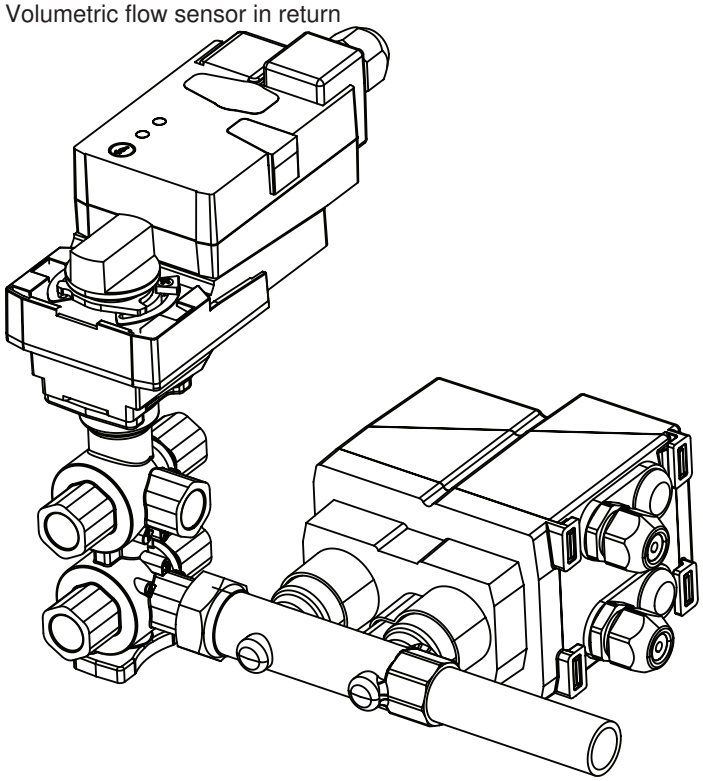
## Installation notes

### Types of installation

Volumetric flow sensor in supply



Volumetric flow sensor in return



## General notes

**Valve selection**

The valve is determined using the maximum required flow rate V̇max.
A calculation of the kvs value is not required.
V̇max = 5…100% of V̇nom

**Minimum differential pressure (pressure drop)**

The minimum required differential pressure (pressure drop through the valve) for achieving the desired volumetric flow V̇max 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 V̇max. Higher differential pressures are compensated for automatically by the valve.

Formula

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

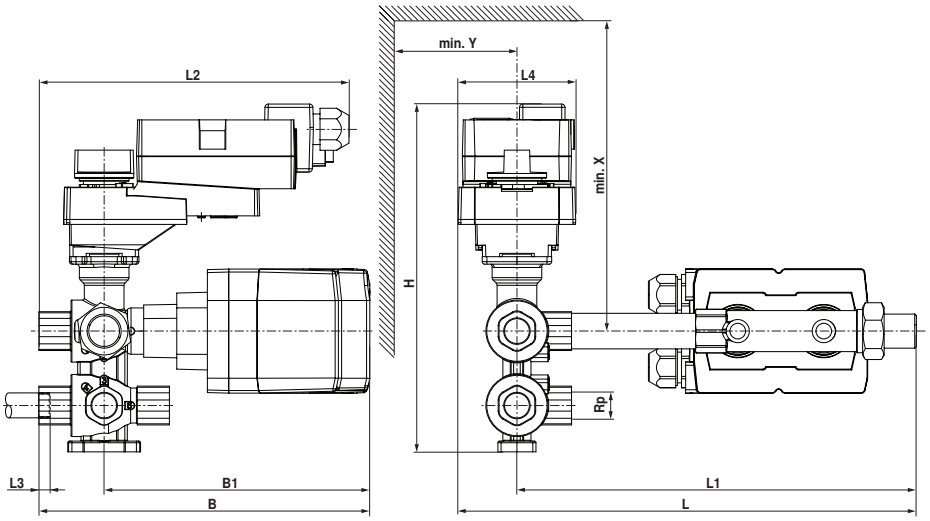
$\Delta p_{min}$: kPa
$\dot{V}_{max}$: $m^3/h$
$k_{vs\ theor.}$: $m^3/h$

Example (DN15 with the desired maximum flow rate = 30% V̇nom)
EP015R-R6+SR
kvs theor. = 1.2 $m^3/h$
V̇nom = 21 l/min
30% * 21 l/min = 6.3 l/min = 0.38 $m^3/h$

$$\Delta p_{min} = 100 \times \left(\frac{\dot{V}_{max}}{k_{vs\ theor.}}\right)^2 = 100 \times \left(\frac{0.38\ m^3/h}{1.2\ m^3/h}\right)^2 = 10\ kPa$$

## Dimensions / Weight

**Dimensional drawings**




The volumetric flow sensor and the pipeline element can also be connected to port 4 (see installation notes).

| Type | DN [ ] | Rp [“] | L [ mm] | L1 [ mm] | L2 [ mm] | L3 [ mm] | B [ mm] | B1 [ mm] | H [ mm] | L4 [ mm] | X [ mm] | Y [ mm] | Weight [ kg] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EP015R-R6+SR** | 15 | 1/2 | 258 | 241 | 187 | 13 | 200 | 160 | 210 | 65 | 200 | 40 | 2.4 |
| **EP020R-R6+SR** | 20 | 3/4 | 312 | 276 | 198 | 14 | 211 | 160 | 238 | 65 | 230 | 40 | 3.5 |

## Further documentation

- General notes for project planning