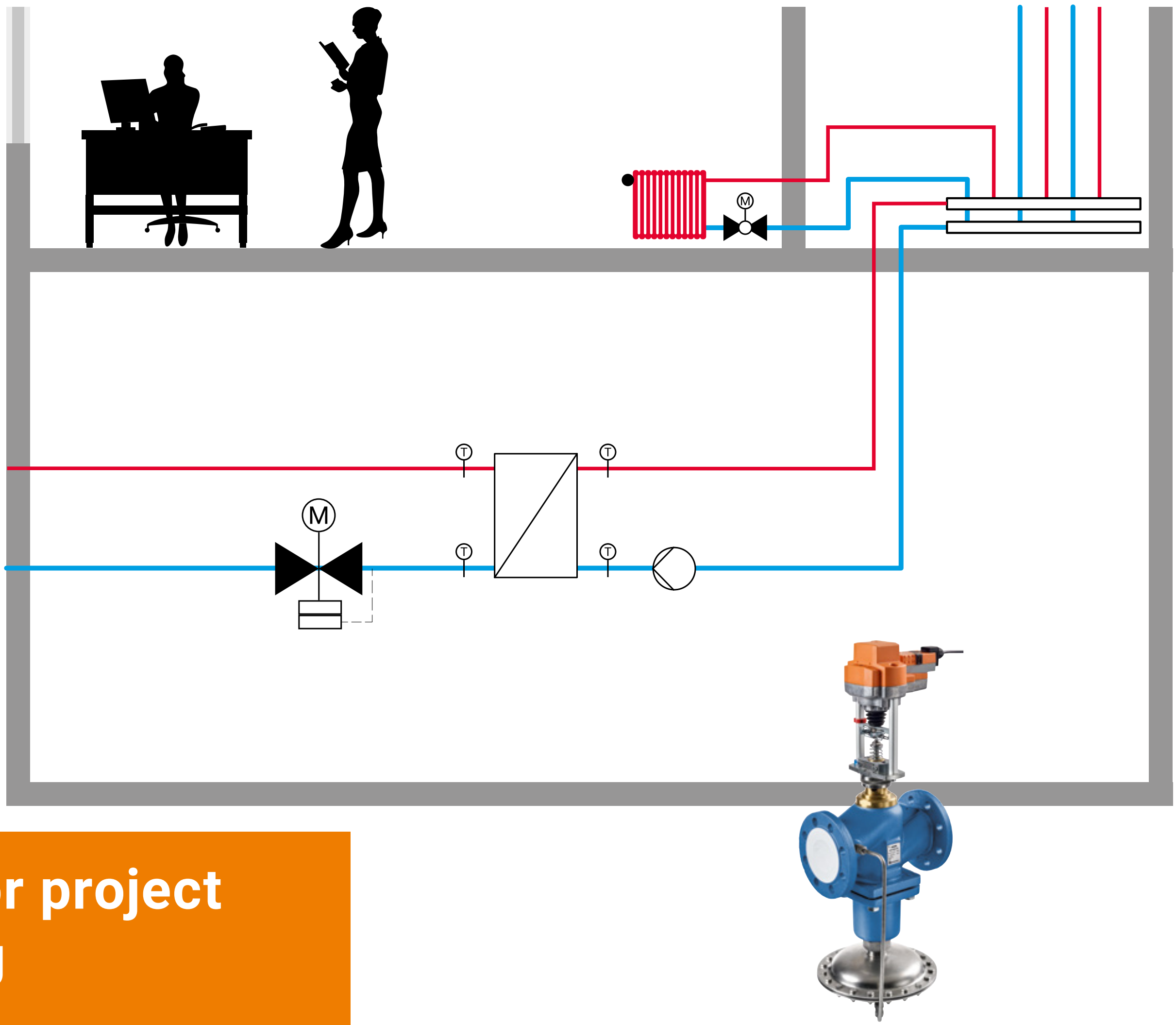

Notes for project planning

EXT-H6..

Edition 2024-10/C

BELIMO®

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Introduction

Relevant information

The data, information and limit values listed on the data sheets for the globe valves and globe valve actuators must be considered for planning and complied with during operation.

Pipeline clearances

The minimum clearances between the pipelines and the walls and ceilings required for project planning depend not only on the valve dimensions but also on the design. The dimensions can be found in the associated data sheets.

2-way globe valves

2-way globe valves are throttling devices. Installation in the return is recommended in applications with high temperature. This leads to a lower thermal load on the sealing elements in the valve as well as lower energy loss. The prescribed direction of flow must be observed.

Strainers

Globe valves are regulating devices. Central strainers are recommended to ensure the control task in the long term.

Open/close valves

Make sure that sufficient open/close valves are installed on the plant for service purposes.

Water quality

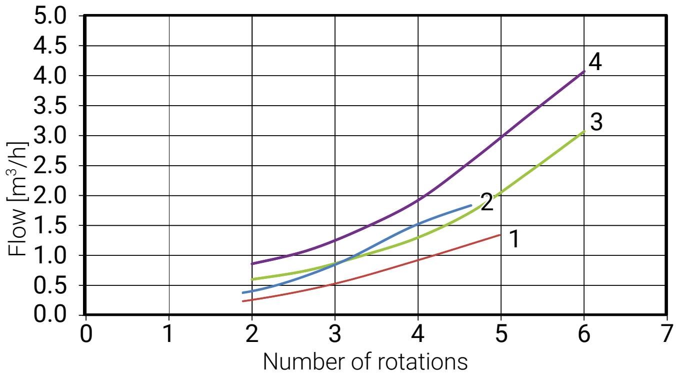
Adhere to the water quality requirements specified in VDI 2035.

Flow settings

V'$_{max}$ is an adjustable parameter that can be controlled by rotating the setting ring located on the valve neck. The valve offers the ability to adjust the flow rate via a counterclockwise rotation from its minimum position. The values on the X-axes represent the number of full rotations of the setting ring.
The values in the diagram are approximate.

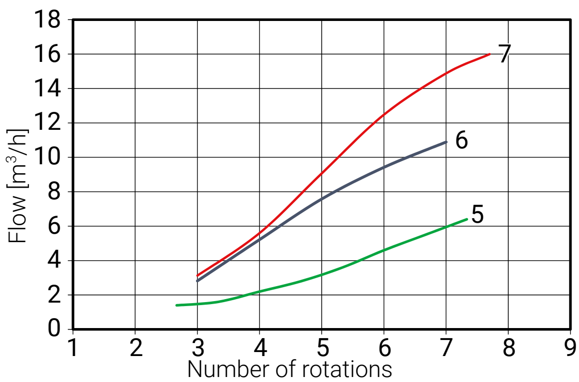
DN 15/25

1 EXT-H615P-125 / EXT-H615P-125
2 EXT-H615P-200 / EXT-H615P-200
3 EXT-H625P-315 / EXT-H625P-315
4 EXT-H625P-400 / EXT-H625P-400



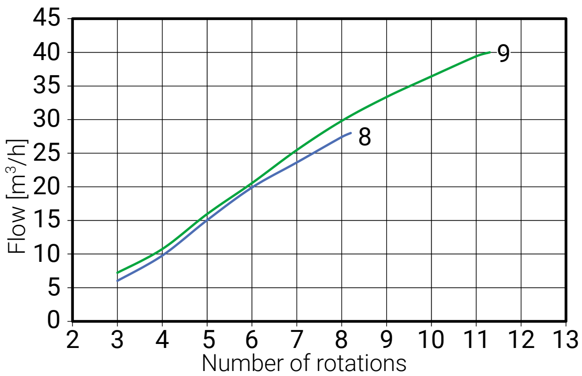
DN 32/40/50

5 EXT-H632P-650 / EXT-H632P-650
6 EXT-H640P-900 / EXT-H640P-900
7 EXT-H650P-1500 / EXT-H650P-1500



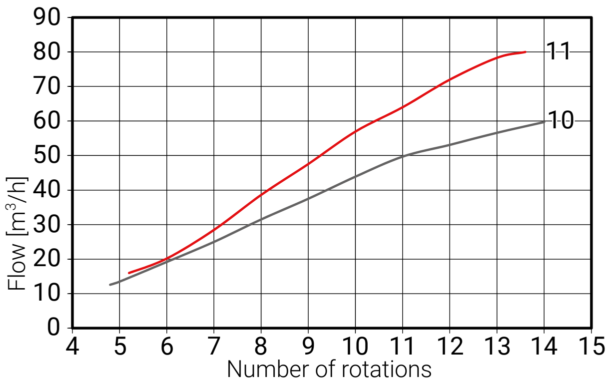
DN 65/80

8 EXT-H665P-2500 / EXT-H665P-2500
9 EXT-H680P-3600 / EXT-H680P-3600



DN 100/125

10 EXT-H6100P-6500 / EXT-H6100P-6500
11 EXT-H6125P-8000 / EXT-H6125P-8000



Calculations for valve sizing

Design flow

Determine the design flow (V'_{max}) of the application based on the thermal energy transfer and ΔT.

$$V'_{max} = 0.86 \cdot \frac{Q_{100}}{\Delta T}$$

V'_{max} : [m³/h]
Q_{100} : [kW]
ΔT : [K]

Minimum differential pressure Δp_{min}

Determine the minimum differential pressure required for proper operation of a valve. It is crucial to maintain the differential pressure above this calculated value to ensure optimal flow control.

V'_{max} = flow rate
Δp_{min} = minimum differential pressure

$$\Delta p_{min} = 0.2 \text{ bar} + \left(\frac{V'_{max}}{K_{vs}}\right)^2$$

Δp_{min} : [bar]
V'_{max} : [m³/h]
K_{vs} : [m³/h]

Maximum differential pressure Δp_{max}

Determine the maximum differential pressure allowed across the valve to ensure cavitation-free operation.

Δp_{max} = maximum differential pressure
Z = cavitation factor
p_1 = absolute pressure at the valve entry
p_v = absolute evaporation pressure at the maximum operating temperature

$$\Delta p_{max} = Z \cdot (p_1 - p_v)$$

Δp_{max} : [bar]
p_1 : [bar]
p_v : [bar]

Fluid velocity v

Determine the fluid velocity at the valve outlet based on your valve size.

v = fluid velocity at the valve outlet
V'_{max} = flow rate
DN = nominal diameter

$$v = 354 \cdot \frac{V'_{max}}{DN^2}$$

v : [m/s]
V'_{max} : [m³/h]
DN : [mm]

Standard values for low-noise operation in HVAC systems are fluid velocities of 1...2 m/s. At fluid velocities above 2 m/s, further flow effects as well as cavitation can occur. This can reduce the service life of a valve depending on the situation.

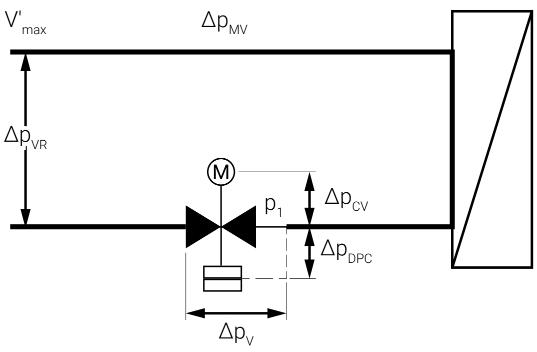
Example of valve sizing

Example

The mechanical pressure-independent globe valve is used for flow limitation and control at a district heating transfer station.

Given data

V'_{max}: 8 m³/h
Δp_{VR}: 3 bar
Δp_{MV}: 0.5 bar
p_1 = 12 bar
t_{max} = 110°C (pv = 1.434 bar)



Solution

Step 1: Select the required valve size based on the flow rate (V'_{max}).
The optimum valve size is selected using the V'_{nom} values specified in the data sheet. The V'_{max} value must not exceed the V'_{nom} value of the respective valve. For a flow rate of 8 m³/h, a DN 40 valve (with a V'_{nom} value of 11 m³/h) is the most suitable.

Step 2: Calculate the minimum differential pressure (Δp_{min}) required for proper operation of a valve.

$$\Delta p_{min} = 0.2 \text{ bar} + \left(\frac{V'_{max}}{K_{vs}}\right)^2$$

Δp_{min} : [bar]
V'_{max} : [m³/h]
K_{vs} : [m³/h]

In our example, using V'_{max} = 8 m³/h and K_{VS} = 20 m³/h, we perform the calculation:

$$\Delta p_{min} = 0.2 \text{ bar} + \left(\frac{8 \text{ m}^3/\text{h}}{20 \text{ m}^3/\text{h}}\right)^2 = 0.36 \text{ bar}$$

Given that the available differential pressure at the valve is 2.5 bar (calculated from $\Delta p_{VR} - \Delta p_{MV}$ = 3 bar – 0.5 bar), we can ensure that the full functionality of the valve is guaranteed.

Step 3: Check the maximum permissible differential pressure to ensure cavitation-free operation and correct PN rating:

$$\Delta p_{max} = Z \cdot (p_1 - p_v)$$

Δp_{max} : [bar]
p_1 : [bar]
p_v : [bar]

You can perform the calculation using the specified data (p_1 = 12 bar and maximum water temperature 110°C -> pv = 1.434 bar) and parameters of the DN 40 valve (Z = 0.5):

$$\Delta p_{max} = 0.5 \cdot (12 \text{ bar} - 1.434 \text{ bar}) = 5.3 \text{ bar}$$

As the maximum differential pressure (5.3 bar) is less than 10 bar, the EXT-H640P-900 is ideal for this application. If the maximum differential pressure or the Δp_V is between 10 and 15 bar, a PN 25 valve must be selected (in this example, the EXT-H640XP-900).

Definitions

Formula symbols

K_V	The flow coefficient K_V [m^3/h] is the specific flow of a valve at a defined valve position with reference to 100 kPa (1 bar). The K_V value changes depending on the valve position. The flow coefficient is determined for a water temperature of 5…40°C.
K_{VS}	Flow coefficient at 100% valve opening at maximum position of the setting ring
Δp_{min}	The minimum differential pressure required for proper operation of a valve. It is crucial to maintain the differential pressure above this calculated value to ensure optimal flow control.
Δp_{CV}	Pressure drop on the control valve with an actuator (0.2 bar)
Δp_{DPC}	Pressure drop on the differential pressure controller when fully open
Δp_{max}	The maximum differential pressure allowed across the valve to ensure cavitation-free operation
Δp_{VR}	Differential pressure in the heating system (supply/return) at design flow
Δp_{MV}	Pressure drop in the pipeline network of the heating system at the maximum design flow (pressure drop of pipelines, heat exchangers, heat meters, individual resistors)
Δp_V	Available differential pressure across the pressure-independent globe valve in the heating system
p_V	Absolute evaporation pressure at the maximum operating temperature
p_1	Absolute pressure at the valve entry
Q_{100}	Heating or cooling output of the consumer
ΔT	Differential temperature between supply and return
t_{max}	Maximum water temperature
v	Fluid velocity at the valve outlet
V'_{nom}	Maximum possible flow
V'_{max}	Maximum flow rate which has been set with the highest control signal DDC and the desired position of the setting ring
Z	Cavitation factor

All inclusive.

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- Tested quality
- Short delivery times
- Comprehensive support

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