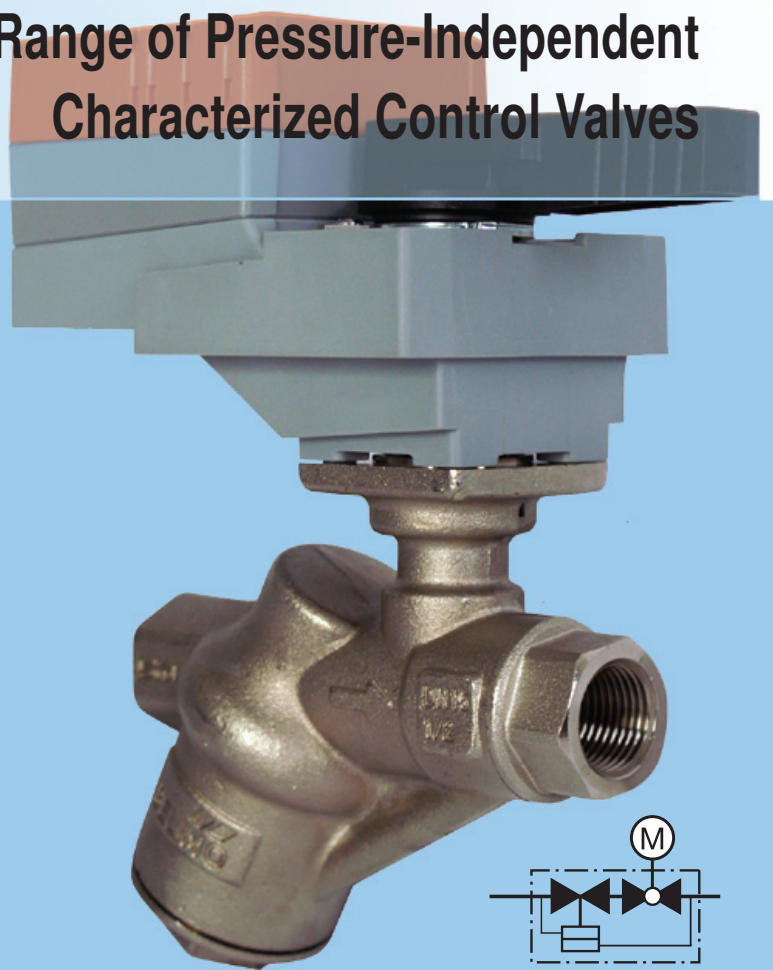


5. R2..P

Three
have
become

Range of Pressure-Independent
Characterized Control Valves

one



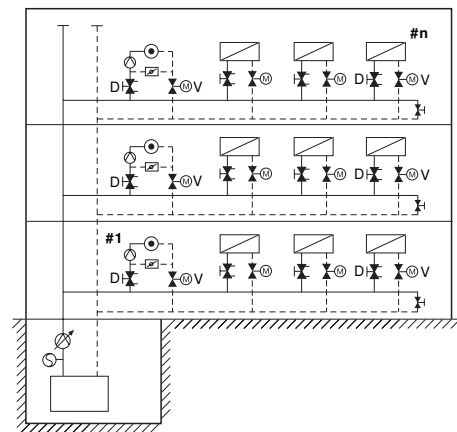
BELIMO[®]

The pressure-independent characterized control valve R2..P sets new standards

The challenge

Energy savings with maximum convenience and low installation prices are requirements for the construction of new buildings and for renovations. Selecting the correct valves for the entire pipeline system and a professional hydraulic balancing costs money.

Valves are conventionally designed with a



Example: Office building with several floors

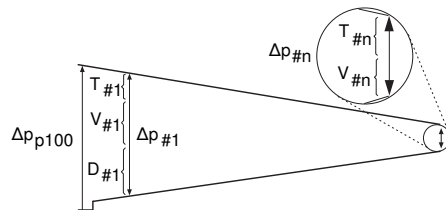
valve authority of 0.5 and installed before each consumer (e.g. air heater, heat exchanger, supply controls).

However, pressure conditions vary depending on the installation site of the consumer

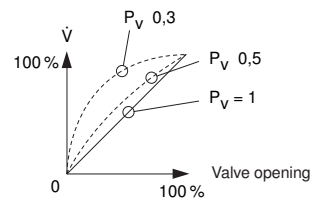
and the load. In the case of consumers (# 1) that are placed near the main pump, the differential pressure between the supply/return pipes is much higher than at the end of the pipes (# n). With nominal volumetric flow, the necessary delivery height Δp_{p100} of the main pump depends on the selected pipe network (DN and pipe lengths) and on the minimum differential pressure at the last consumer (pressure drop at the consumer and valve).

Pressure diagram at full load

The pressure difference $\Delta p \#1$ consists of the pressure drop at consumer T #1, valve V #1 and the balancing valve D #1. The valve V #1 is fully opened here. If



valve #1 closes, the differential pressure can increase up to $\Delta p \#1$, the valve authority sinks markedly, and the flow quantity increases disproportionately.



Valve authority P_V

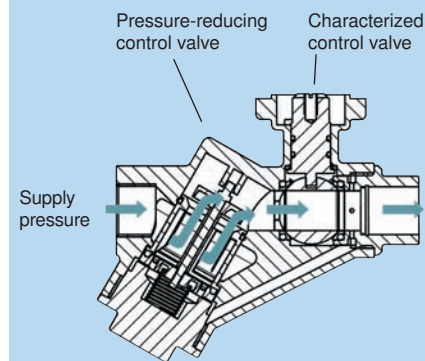
The solution

As a result of the consistent further development of the tried-and-tested Belimo characterized control valve, the valve design has been simplified with the new pressure-independent characterized control valve R2..P. The flow rate is constant, even when the valve closes and the differential pressure increases. The valve authority is 1, even with oversized valve sizes.

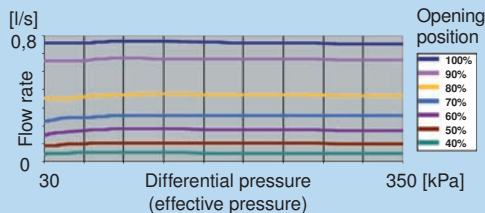
The advantages

Hydraulic balancing is no longer necessary. Equipping a building becomes simpler, and only one valve per consumer is needed. Since no more balancing valves are needed and the hydraulic balancing is eliminated, it is possible to save costs while – at the same time – increasing convenience.

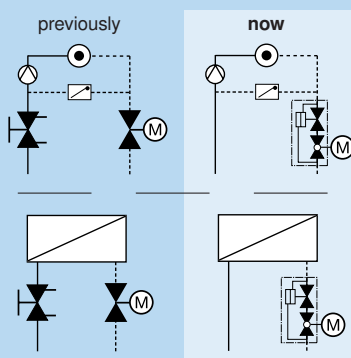
R2..P: the simplest way to control the flow rate



Flow diagram R220P

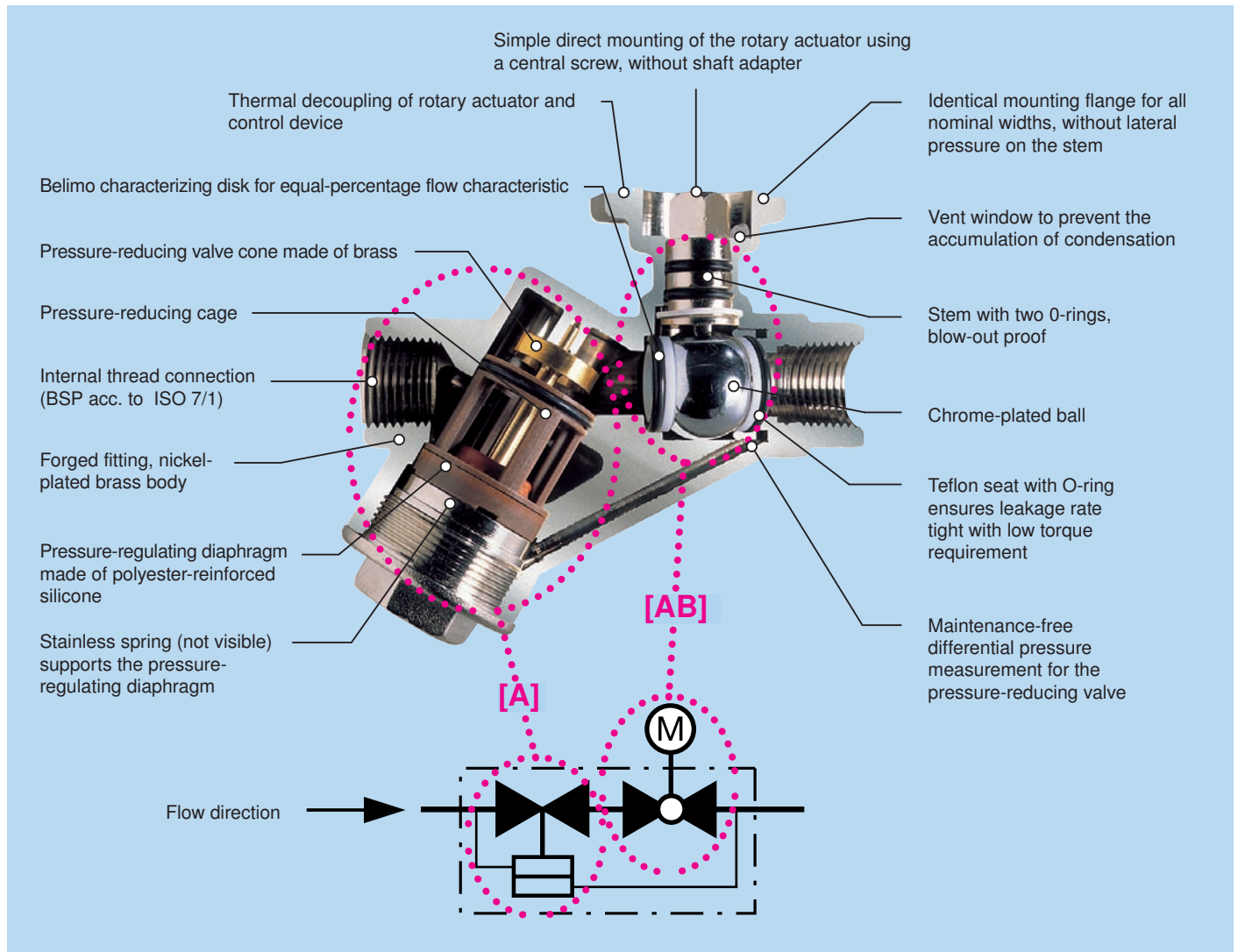


Only one valve is needed per consumer:



Principle of operation

Cross-section of the pressure-independent characterized control valve R2..P



The characteristics

The pressure-independent characterized control valve R2..P contains two valves: the self-regulating pressure-reducing valve [A] and the characterized control valve [AB] that works with equal percentage characteristics. When the differential pressure increases, the pressure-reducing valve reduces accordingly the flow cross-section and ensures a constant pressure over the characterized control valve. This is necessary for the flow rate to remain constant $\pm 5\%$ (at a differential pressure of 30 ... 350 kPa) with the current opening position of the characterized control valve.

The selection

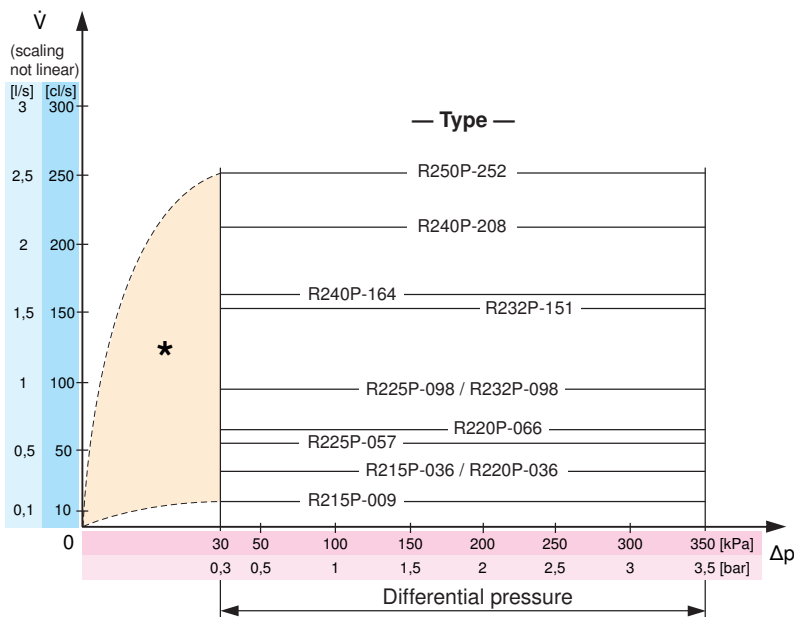
The range of motorized, pressure-independent characterized control valves comprises a practical spectrum. All valves are:

- 2-way valves in the most common nominal widths (DN 15 ... 50)
- Designed for a flow rate of 0.09 l/s to 2.52 l/s

The corresponding drives

Optimum functionality of the Belimo pressure-independent characterized control valve is ensured by the corresponding motorization. Depending on the application, the pressure-independent characterized control valves are supplied with different rotary actuators. You can choose from the LR..A, SR..A and NR.. rotary actuators. Depending on the type, they can be controlled by a modulating or 3-point control system.

Dimensioning diagram for pressure-independent characterized control valves R2..P



Legend *

The differential pressure of 30...350 kPa should be lower than the delivery pressure (delivery height) of the pump (HP) with nominal flow rate. If the delivery pressure of the pump (HP) is below the differential pressure, the flow rate decreases to

$$\dot{V}_{100} = \dot{V} (R2..P) \times 6 \times \sqrt{\Delta p_{V100}}$$

$$k_{Vs} \quad [m^3/h]$$

$$\dot{V}_{100} \quad [m^3/h]$$

$$\Delta p_{V100} \quad [bar]$$

$$\dot{V} (R2..P) \quad [l/s]$$

Δp_{V100} Differential pressure with fully opened control valve

\dot{V}_{100} Nominal flow rate with Δp_{V100}

Definition

$\Delta p_s = 1400 \text{ kPa}$

Closing pressure at which the rotary actuator is still able to close the fitting tightly in relation to the corresponding leakage rate.

Type designation

R2 20 P - 036

Flow rate in cl /s

Pressure-independent

DN in mm

Two-way characterized control valve with internal thread

Design

In the case of classic control valves, the valves are selected $k_{Vs} = \frac{\dot{V}_{100}}{\sqrt{\Delta p_{V100}}}$ in m^3/h .

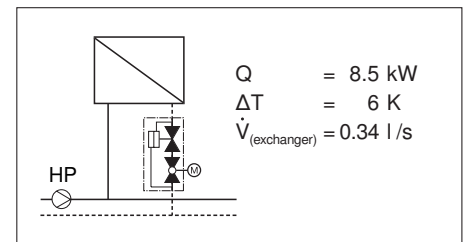
The decisive factor for the design of the pressure-independent characterized control valve is the flow rate after the consumer or the heat exchanger.

In the case of a maximum flow rate of $< 2 \text{ m/s}$, the diameter of the pipe connector at the heat exchanger can be set equal to the diameter of R2..P (max. flow rate).

Examples

The flow rate through the pressure-independent characterized control valve should be higher than through the consumer or heat exchanger:

Example of an air cooler (throttling circuit)

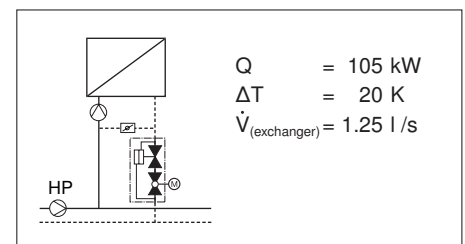


$$\dot{V}_{(valve)} = \dot{V}_{(exchanger)}$$

$$0.36 \text{ l/s} > 0.34 \text{ l/s}$$

→ R220P-036 (Type)

Example of an air preheater (injection circuit with 2-way valve)



$$\dot{V}_{(valve)} = \dot{V}_{(exchanger)}$$

$$1.51 \text{ l/s} > 1.25 \text{ l/s}$$

→ R232P-151 (Type)

Technical data of the pressure-independent characterized control valves R2..P

Type		R2..P
Nominal width DN [mm]	15...50	•
Design	2-way: inlet A, outlet AB	•
Characteristic	equal-percentage (A-AB)	•
Areas of application	cold and warm water	•
Temperature of medium	+5° C...+100° C (lower medium temperatures on request)	•
Material	housing nickel-plated brass ball and spindle chrome-plated brass	•
Connections	Internal thread BSP (ISO 7/1)	•
Rated pressure	4140 kPa [DN 15...25], 2760 kPa [DN 32...50]	•
Closing pressure Δps	1400 kPa	•
Differential pressure	30...350 kPa	•

Rotary actuator LR..A, SR..A and NR.. for pressure-independent characterized control valves R2..P (modulating)

Type		SR24A-SR	LR24A-SR	NR24-SR	NRV24-SR
Nominal voltage	AC / DC 24 V	•	•	•	•
Duration	140 s 90 s 35 s	•	•	•	•
Control	modulating, DC 0...10 V	•	•	•	•
Operating range	DC 2...10 V	•	•	•	•
Position feedback	DC 2...10 V	•	•	•	•
Manual override	temporary permanent	•	•	•	•
Connection	cable 1 m Integrated screw terminals	•	•	•	•

Other versions and spring return actuators available on request

Rotary actuator LR..A, SR..A and NR.. for pressure-independent characterized control valves R2..P (3-point)

Type		LR230A	SR230A	LR24A	SR24A	NR230-3	NR230-3-S	NR24-3	NR24-3-S
Nominal voltage	AC 230 V AC / DC 24 V AC 24 V	•	•	•	•	•	•	•	•
Duration	90 s 140 s	•	•	•	•	•	•	•	•
Control	3-point	•	•	•	•	•	•	•	•
1 auxiliary switch	adjustable, floating	(*)	(*)	(*)	(*)	•	•	•	•
Manual override	temporary permanent	•	•	•	•	•	•	•	•
Connection	cable 1 m integrated screw terminals	•	•	•	•	•	•	•	•

Other versions and spring return actuators available on request

Valve

The range includes the pressure-independent characterized control valve, the characterized control valve and the open/closed ball valve. Sizes: DN15 to 50 mm.

Actuator types

For motorizing valves, there are two rating classes of actuators available that are suitable for different power supplies and methods of control.

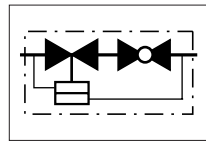
Other versions and spring return actuators available on request.

Assembling

A successful order will need the following information:

NEW: available as an option with individual pipe connectors supplied separately.

1 Valve

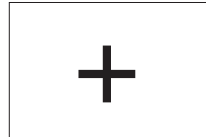


2-way

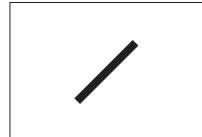
The list is arranged as follows:

- 2-way pressure-independent characterized control valve

2 Assembling



Actuator fitted



Supplied separately

The valves and actuators can be supplied as follows:

- Actuator fitted (+)
- Valve/actuator separately (/)
- Separately at different times (on request)

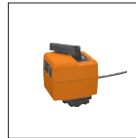
3 Actuator types



LR..A-
rotary actuator



SR..A-
rotary actuator



NR-
rotary actuator

The following data must be provided:

- Control modulating or 3-point
- Nominal voltage AC / DC 24 V, AC 24 V or AC 230 V

4 Pipe connectors separately (option)



Separately

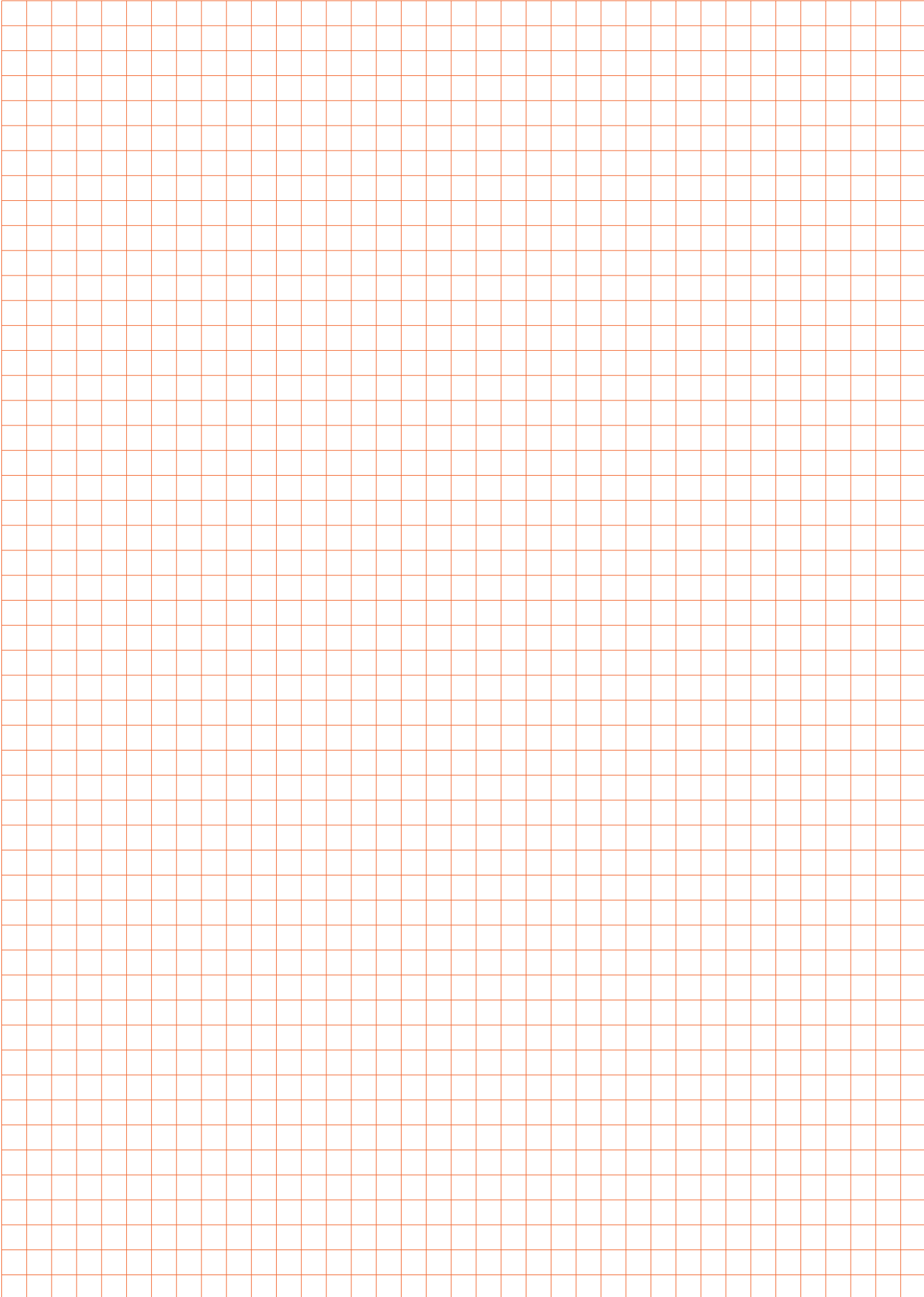
The pressure-independent characterized control valves are available as low-cost fittings with internal thread.

- As an **option**, the types R2..P are available with individual pipe connectors supplied separately (/Z).







Ordering example:

Technical data:
Page 8

Designation:	R225P-098+NR24-SR/Z								
1 Valve type:	<table border="0"> <tr> <td style="text-align: center;">↑</td> <td style="text-align: center;">↑</td> <td style="text-align: center;">↑</td> <td style="text-align: center;">↑</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> </tr> </table>	↑	↑	↑	↑	1	2	3	4
↑	↑	↑	↑						
1	2	3	4						
Design	2-way pressure-independent characterized control valve								
Size	internal thread BSP 1", DN 25								
Flow volume	$\dot{V} = 0.98 \text{ l/s}$								
2 Assembling	actuator fitted								
3 Actuator:									
Nominal voltage	rotary actuator AC/DC 24 V								
Control type	modulating								
Running time	140 s								
4 Pipe connectors (option):	2 x ZR2325 separately (for prices, see current price list)								



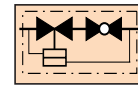
Selection R2..P pressure-independent characterized control valve

\dot{V} [l/s]	DN		Type	Suitable rotary actuator modulating DC 0...10V	Suitable rotary actuator 3-point
	[mm]	[inches]			
0.09	15	½"	R215P-009	 LR24A-SR	 NR(Y)24-SR
0.36	15	½"	R215P-036		
0.36	20	¾"	R220P-036		
0.66	20	¾"	R220P-066		
0.57	25	1"	R225P-057		
0.98	25	1"	R225P-098	 LR..A	 NR24-3(-S)
0.98	32	1¼"	R232P-098		
1.51	32	1¼"	R232P-151	 SR24A-SR	 NR230-3(-S)
1.64	40	1½"	R240P-164		
2.08	40	1½"	R240P-208		
2.52	50	2"	R250P-252		

Emergency control function (rotary actuators with spring) on request

Technical data R2..P pressure-independent characterized control valve

Medium	cold and pump water, water with 50 % volume of glycol
Temp. of medium	+5° C...100° C, lower temp. on request
Rated pressure	4140 kPa (R215P...R225P) / 2760 kPa (R232P...R250P)
Flow characteristic	equal percentage (following VDE 2173)
Rangeability	DN 15 Sv > 50 DN 20...50 Sv > 100
Leakage rate	tight, leakage class IV
Pipe connector	internal thread acc. to ISO 7/1
Differential pressure	30...350 kPa
Closing pressure Δp_s	1400 kPa
Angle of rotation	90°
Installation position	standing to lying (in relation to the stem)
Maintenance	maintenance-free
Material	
Fitting	nickel-plated, hot-pressed brass
Ball	nickel-plated brass
Seal	PTFE
Stem	nickel-plated brass
Stem seal	EPDM O-ring
Characterizing disk	TEFZEL
Valve cone	brass
Diaphragm	polyester-reinforced silicone
Spring for valve cone	stainless steel



2-way pressure-independent characterized control valve DN 15...50



For the modulating control of cold and hot water

Equal-percentage characteristic

Applications

- Water-side control of air handling apparatus in ventilation and air-conditioning plants
- Water-side control in heating plants

Mode of operation

The pressure-independent characterized control valve is motor-operated by a type LR or NR rotary actuator. The actuators are controlled by a standard modulating or 3-point control system and move the ball of the pressure-independent characterized control valve, the throttling element, to the opening position dictated by the control signal.

Product features

Equal-percentage characteristic of the flow ensured by the integrated characterizing disk.

Constant flow volume \dot{V} with a differential pressure of 30...350 kPa, thanks to the integrated pressure-reducing valve. A valve authority of 1 is attained, regardless of the differential pressure before and after the valve.

Even in the part-load range, the flow rate remains constant with each opening position (angle of rotation) and ensures a steady control.

Manual operation by lever after disengaging the gearing latch on the type LR..A, SR..A or NR.. rotary actuator.

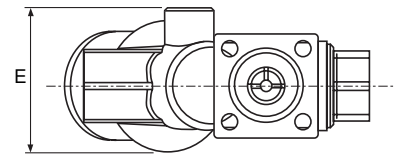
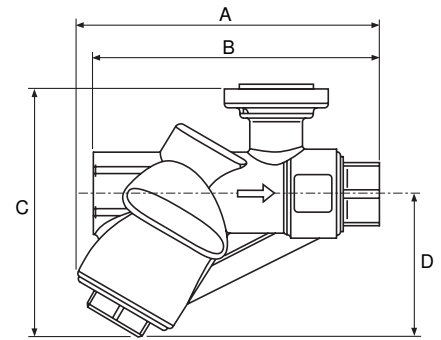
The pressure-independent characterized control valve R2... P can be **ordered** together with the corresponding rotary actuator LR.. or NR..

Ordering examples: (with NR24-SR)

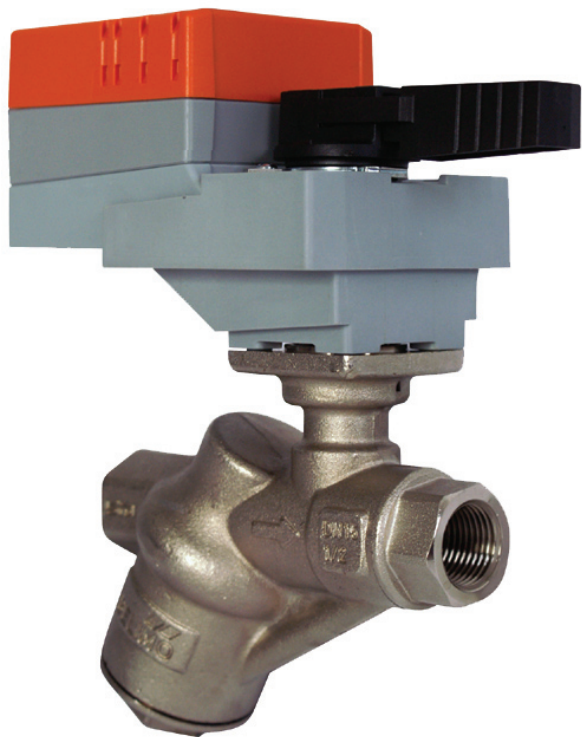
- R240P-208 with NR24-SR
– rotary actuator fitted
– order code: R240P-208+NR24-SR
- R240P-208 with NR24-SR
– rotary actuator supplied separately
– order code: R240P-208/NR24-SR

Sizes R2..P pressure-independent characterized control valve

DN		Dimensions [mm]					G	Thread	Max. thread screwing depth
[mm]	[inches]	A	B	C	D	E	Rp	[mm]	
15	½"	122	116	101	56	57	½"	13	
20	¾"	134	128	106	58	57	¾"	14	
25	1"	179	179	122	74	82	1"	16	
32	1 ¼"	208	226	144	93	86	1 ¼"	19	
40	1 ½"	204	204	144	93	86	1 ½"	19	
50	2"	216	216	150	93	86	2"	23	



The pressure-independent characterized control valve R2..P with LR..A rotary actuator

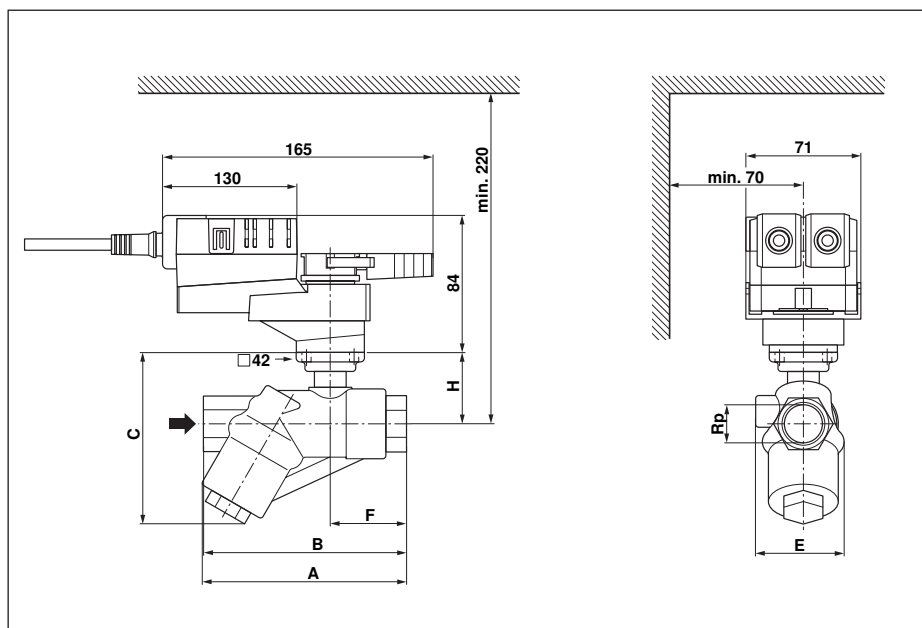


LR..A rotary actuators

The compact LR..A rotary actuator is specially designed for the motorization needs of pressure-independent characterized control valves up to DN 25. In particular, it has the following advantageous characteristics:

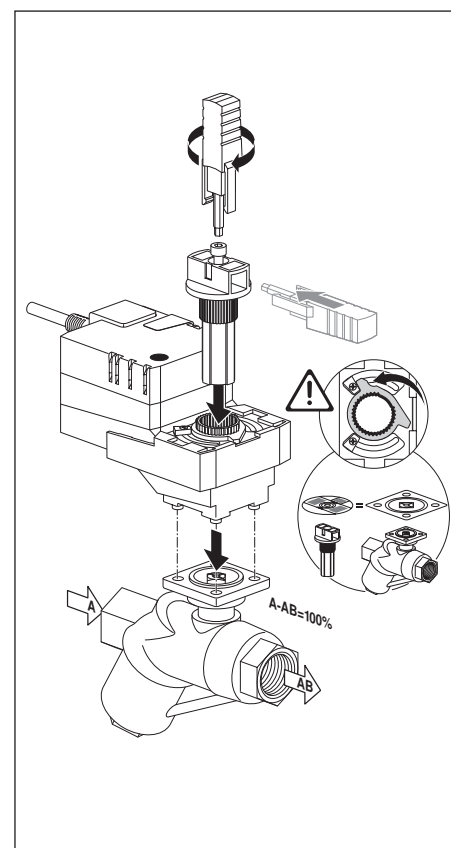
- Modulating control
- Temporary disengagement allows manual operation
- Central fixing bolt for simple mounting
- Clear indication of position
- Installation possible in 4 positions
- Low space requirements due to compact dimensions
- 1 m long, pre-fitted connecting lead

Dimensions of complete actuator set R2..P and LR..A



DN		Thread Rp	Dimensions [mm]					
[mm]	[inches]		A	B	C	E	F	H
15	½"	½"	122	116	101	57	41	45
20	¾"	¾"	134	128	106	57	48	48
25	1"	1"	179	179	122	82	63	48

Installation of R2..P and rotary actuator LR..A



The pressure-independent characterized control valve R2..P with NR.. rotary actuator

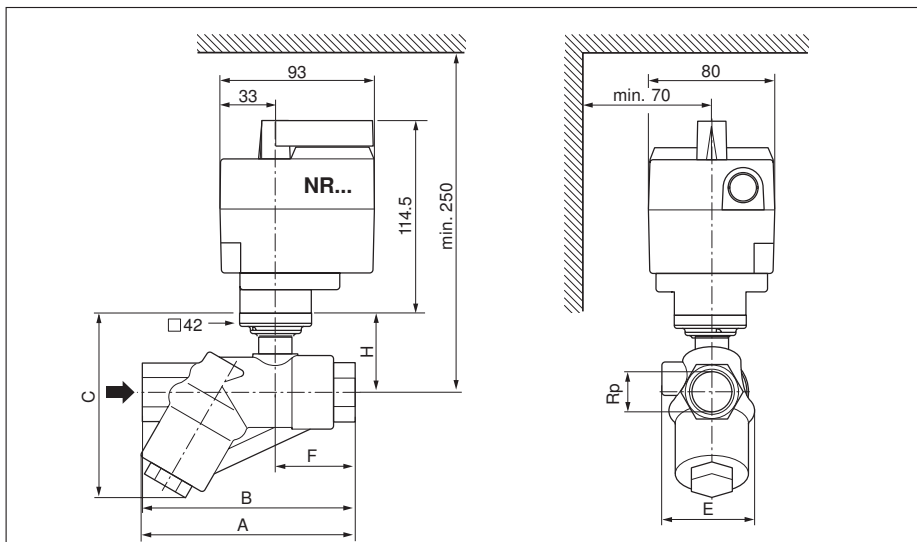


NR.. rotary actuators

The powerful NR.. rotary actuator is suitable for the reliable motorization of pressure-independent characterized control valves up to DN 50. It offers the following application advantages:

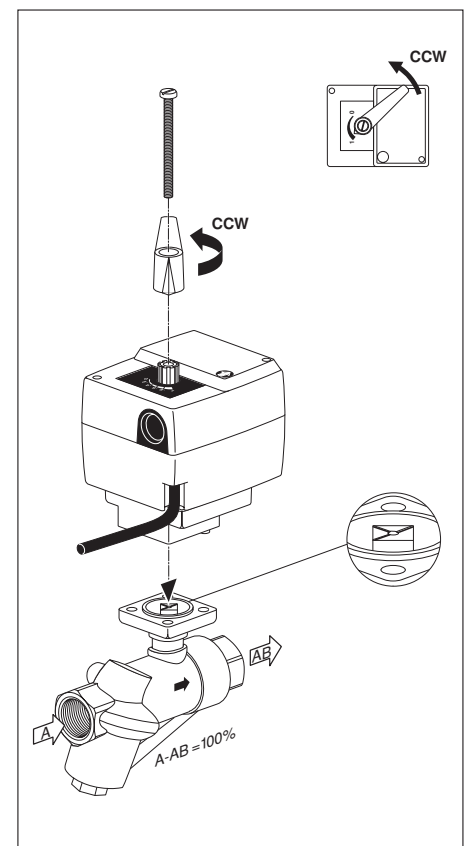
- Modulating or 3-point control
- Temporary and permanent disengagement allows manual operation
- Central fixing bolt for simple mounting
- Clear indication of position
- Installation possible in 4 positions
- Low space requirements due to compact dimensions
- 1 m long, pre-fitted connecting lead
- If desired, with auxiliary switch, adjustable, floating

Dimensions of complete actuator set R2..P and NR..



DN		Thread		Dimensions [mm]				
[mm]	[inches]	Rp	A	B	C	E	F	H
15	½"	½"	122	116	101	57	41	45
20	¾"	¾"	134	128	106	57	48	48
25	1"	1"	179	179	122	82	63	48
32	1 ¼"	1 ¼"	208	226	144	86	65	51
40	1 ½"	1 ½"	204	204	144	86	65	51
50	2"	2"	216	216	150	86	69	57

Installation of R2..P and rotary actuator NR..



All-inclusive.



5 year warranty



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Comprehensive support

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